

LARVAE OF COLEOPTERA

ADAM G. BÖVING

AND

F. C. CRAIGHEAD





LARVAE OF COLEOPTERA

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AN ILLUSTRATED SYNOPSIS
of
THE PRINCIPAL LARVAL FORMS
of
THE ORDER COLEOPTERA

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AN ILLUSTRATED SYNOPSIS OF THE PRINCIPAL LARVAL FORMS OF THE ORDER COLEOPTERA*

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* This study was projected about 1915 when both authors who were working independently on separate families of coleopterous larvae realized that it was practically impossible to go far in descriptive work within these families without having a comparative knowledge of the characters throughout the order. During the following five years the material of all the families represented in the collections of the Bureau of Entomology and of the United States National Museum was examined, family characterizations were prepared, and typical larval characters were illustrated. By 1920 a general scheme of the classification presented herewith was drawn up, including the keys to families and family series, and most of the plates were completed. Since 1923 one of the authors (Craighead) has been able to devote very little time to the work; the other author (Böving) has continued to give much time to it, has remodeled many of the keys, and has introduced those portions treating the subfamilies and lesser groups.

INTRODUCTION

(pl. 125)

The coleopterous larvae belong to three fundamentally different types. Consequently, in the present synopsis the families are arranged into three different suborders, namely:

Suborder 1: Archostemata

Suborder 2: Adepgha

Suborder 3: Polyphaga

According to the views commonly held by entomologists,² only two major divisions of Coleoptera, the Adepgha and the Polyphaga, are recognized. However, the present studies, which intentionally stress larval characters and avoid consideration of imaginal structures, show the necessity of recognizing a third suborder for the inclusion of the Cupedidae and Micromalthidae, whose larval morphology isolates them from all other beetles. The term "Archostemata," first proposed by Kolbe, is here adopted as the subordinal name for these two families. Although very specialized they are nevertheless so ancient that they must be regarded as the representatives of an almost extinct larval type.

It is of great interest that several modern entomologists, working exclusively with the imagines, have realized the isolation of the Cupedidae and Micromalthidae; and Dr. Wm. T. M. Forbes, in his paper on wing-folding patterns of the Coleoptera (*Jour. New York Ent. Soc.*, vol. 34, 1926), has, like the present authors, recognized those two families as forming a separate suborder which he, too, names Archostemata.

In contrast to the primitive and slightly specialized larval types to which the Polyphaga can be traced, the larvae of the Adepgha possess a complex of highly advanced and derivative characters which probably have been acquired through a long evolutionary process from an unknown primitive larval type somewhat different from the existing primitive Polyphaga larva. However, the well developed and well defined tarsus of the Adepgha carrying one or two distinct and movable claws may be a primitive character not altered through the course of their development into high specialization. The ancient Archostemata larvae also possess a distinct tarsus and claw and

² Consult the introduction "Essay on Classification" in C. W. Leng's Catalogue, pp. 3-37, in which a very clear and critical review is given of the different systems from the earliest one by Linnaeus to the one proposed and applied by Leng himself. The bibliography is prepared with the painstaking care so characteristic of the author.

certain Polyphaga larvae (though not necessarily of primitive families) likewise show an indication of a separate tarsus and claw (see footnote 5, p. 9). In neuropterous larvae, as *Raphidia*, *Sialis*, and *Corydalis*, a distinct tarsus and two claws are present and in many other respects the greatest similarity exists between them and the typical Caraboidea. Unquestionably, however, these neuropterous larvae are less primitive than the primitive polyphagous Staphylinoida (p. 25). It would therefore be logical to place the Adephaga as the third suborder, as it is the more modern of the three, and the Polyphaga before it, because the suborder Polyphaga includes existing larvae of a primitive type from which its other larval types can be derived directly or indirectly. But for practical purposes it appears more advisable to rank the suborders in the commonly accepted sequence, and as no traceable phylogenetic connection exists between them, the sequence in which they are placed and treated is rather immaterial.

The primitive type of the Polyphaga is found in its most characteristic and original form in the series Staphylinoida as limited in the present paper, more particularly in such families and subfamilies as the Limnebiidae, Leptinidae, and Anisotomidae; and it is from the larval type found in these families that are derived not only the more or less specialized larvae of the other staphylinoid families but also the different types of the hydrophiloid larvae (p. 31), possibly through larvae of such families as Hydrochidae and Spercheidae.

The larva of the series Byrrhoidea (p. 43) represents a second distinct polyphagous type which, while primitive, is in some respects less primitive than the larva of the primitive Staphylinoida. Probably the two series have ancestors in common, but by no larval type known up to this time are they linked together. However, some of the derived families of the byrrhoid type and some belonging to a third distinct polyphagous type, the cucujoid type, approach one another, and about the direct affinities between the Cucujoidea and the Staphylinoida there can be no doubt. Rather isolated as the series Byrrhoidea appears in the polyphagous suborder, it does not seem necessary to rank it and the families and series derived from it as a separate suborder. Two series, the Dascilloidea (p. 43) and the Cleroidea (p. 55), are descended directly from the Byrrhoidea, supposedly through heterocerid forms and dermestid forms, respectively.

From the byrrhoid family the Byrrhidae (p. 43), the Dryopoidea (p. 44) can be derived through the dryopoid family Ptilo-

daetylidae; from the dryopoid family Eurypogonidae, the Elateroidea (p. 49) may wholly or partly branch; from near this same dryopoid family, or more probably from different Dryopoidea, the Cantharoidea and very likely a minor part of the Elateroidea have come; and from the dascilloid family Dascillidae, the series Scarabaeoidea (p. 51) descends according to their larval forms through scarabaeoid families like the Trogidae and the Lucanidae.

With the cleroid family Ciidae (p. 55) may be associated the series Mordelloidea (p. 60), the series Bostrichoidea (p. 62), and the so-called phytophagous assemblage of different series, including the Cerambycoidea (p. 60), Chrysomeloidea (p. 63), Platystomoidea (p. 66), and Curculionoidea (p. 66). The Meloidea (p. 58) may also belong to the cleroid assemblage of families and series, attaching itself to the cleroid family Melyridae (p. 55), but there are on the other hand some reasons for considering the possibility that it might be related to the Cantharoidea.

The third distinct polyphagous larval type that is more primitive than the byrrhoid type and shows closer affinity with the staphylinoid leptinid association is found as mentioned in the series Cucujoidea, notably in the families Lathridiidae (p. 33), Derodontidae (p. 33), Silvanidae (p. 34), and Endomychidae (p. 38). Most of the cucujoid families are plainly derived from this type; a few, however, not so plainly, such as the larvae of the family Oedemeridae (p. 40), and the whole tenebrionid association (p. 42³⁴⁻⁵⁶), which only indirectly can be traced to the primitive cucujoid larvae through rather advanced cucujoid types like the larvae of the Colydiidae or the Melandryidae.

SUBORDERS

The systematic characters defining the larvae of the three suborders, whose relative phylogenetic positions now have been discussed, are as follows:

- A. *Archostemata*. Legs six-jointed with distinct tarsus and one or two distinct claws;³ always a mandible possessing a strong molar part, and with hypopharyngeal and paragnathal structures fused with prementum into a strong, hard unit.
- B. *Adephaga*. Legs six-jointed with a well defined tarsal joint and one or two distinct, movable claws;⁴ mandible lacking a molar part; hypopharynx never united with prementum into a strong, hard unit.
- C. *Polyphaga*. Legs five-jointed, the tarsal joint fused with a single claw into a tarsungulus; or less than five-jointed; or no legs present.⁵

³ Except in the instars of *Micromalthus*, which are legless or have three-jointed legs.

⁴ All, or some, of the larval instars of the carabid species *Brachinus janthinipennis* Dej. and *Lebia scapularis* Dej. are adapted to an ectoparasitic life to the extent that it is impossible to place them systematically by a mere examination of the body structures. In the series Paussoidea (p. 24), of which, however, only the last larval instar is known, the legs are three-jointed, but this myrmecophilous larva can be recognized by the unique development of the eighth abdominal segment into a large, terminal, glandular disk. Tibia and tarsus fused in a few cicindelid genera (p. 18).

⁵ Several larvae as the staphylinid genera *Philonthus* and *Bledius*, the first instar of the staphylinid species *Aleochara bilineata* Gyllenhal, *Euplectus*, some genera of Histeridae, and the cerambycid genus *Nothorhina* have the tarsungulus divided by a faint suture into a proximal and distal portion which possibly correspond respectively to tarsus and claw. In several of the Bostrichoidea, particularly in *Ptilineurus marmoratus* Reitter, the tarsungulus has not the usual character of a claw but of a long, pointed, upward curved joint carrying many, strong, spinelike setae, the tarsal portion of the tarsungulus here being predominant.

LARVAL FORMS OF COLEOPTERA

SERIES OR SUPERFAMILIES

The *Archostemata* includes one family series: A, Cupesoidea.

The *Adelphaga* includes three family series: B, Caraboidea; C, Gyrimoidea; and D, Paussoidea.

The *Polyphaga* includes eighteen family series: E, Staphylinoidea; F, Hydrophiloidea; G, Cucujoidea; H, Byrrhoidea; I, Dascilloidea; J, Dryopoidea; K, Cantharoidea; L, Elateroidea; M, Scarabaeoidea; N, Cleroidea; O, Meloidea; P, Mordelloidea; Q, Cerambycoidea; R, Bostrichoidea; S, Chrysomeloidea; T, Platystomoidea; U, Curculionoidea; and V, Ly-mexyloidea.

The sequence in which the different family series have been catalogued above and will be treated in the subsequent parts of the paper, except in the key to the series immediately following, intimates a natural arrangement of the series according to the presumed relationship of their larval types (pl. 125).

KEY TO SERIES

1. Leg six-jointed with tarsus distinct and one or two distinct, movable elaws present⁶ 2
Leg either five-jointed with tarsus and claw fused into a single, claw-shaped, terminal tarsungular joint, or less than five-jointed, or vestigial, or absent⁷ 4
2. Mandible with molar structure; hypopharyngeal sclerome fused with prementum and ligula into a strongly chitinized unit *Cupesoidea* (p. 16)
Mandible of the grasping type without molar structure, hypopharyngeal region membranous and not fused with prementum and ligula 3
3. Cardo of normal moderate size or small; prementum having stipites labii fused at least proximally. (Tenth abdominal segment usually not armed with large hooks; spiracles usually present) *Caraboidea* (p. 16)
Cardo very large; prementum having stipites labii completely separated. (Tenth abdominal segment armed with four long hooks; spiracles absent; lateral gills present; mandibles perforate) *Gyrimoidea* (p. 24)

⁶ Except in the instars of *Micromalthus* which are legless or have three-jointed legs.

⁷ For further discussion and information see: Snodgrass, R. E., *Morphology and Mechanism of the Insect*. Smithsonian Miscellaneous Collections, vol. 80, no. 1, 1927, pp. 93-98.

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4. Eighth abdominal segment glandular, discoidal, and terminal. (Ninth and tenth abdominal segments minute, leg three-jointed) *Paussoidea* (p. 24)
Eighth abdominal segment not glandular and not discoidal..... 5
5. Urogomphi jointed,⁸ individually movable. (Often retracted into a terminal breathing pocket in eighth abdominal segment in the Hydrophilidae) 6
Urogomphi solid or absent 7
6. Maxillary palpiger as a rule closely connected with stipes, not often carrying a finger-shaped galea; spiracles annular. *Staphylinoidea* (p. 25)
Maxillary palpiger free and joint-like, usually carrying a finger-shaped galea; spiracles biforous *Hydrophiloidea* (p. 31)
7. Hypermetamorphosis present; mandible without molar part; maxillary mala short, thick, almost vestigial; gular area present; spiracles annuliform and often large; urogomphi absent⁹ *Meloidea* (p. 58)
No hypermetamorphosis;¹⁰ different combination of the five mentioned structural characters 8
8. Larva with mandible bearing an accessory ventral condyle and with either a free galea well separated from a distinct lacinia or with cribriform spiracles, or with both of these characters¹¹ 9
Larva with a different combination of the characters. (A mandible with an accessory ventral condyle never occurring together with either a free galea or actually cribriform spiracles) 10

⁸ Absent in some Pselaphidae, Scydmaenidae, termitophilous Histeridae, and the later instars of parasitic Staphylinidae.

⁹ First larval instar, often named triungulin, triungulinid, or triunguloid, has frequently a pair of setae at the end of the body, and in one subfamily is the eighth abdominal pair of spiracles placed on projecting hooks or warts; the legs have a single, frequently spatulate claw which is provided with one or two setae at the base or at the middle, these setae so large and strong in many genera that they appear as extra claws and for a long time were considered as such; hence the name "triungulinus." Apparently three-clawed legs have occasionally been found in larvae of other series, for instance, in an undetermined lampyrid larva.

¹⁰ *Drilus* has polymorphic metamorphosis and some members of the family Cantharidae have, according to *Verhoeff*, foetometamorphosis, that is, two free embryonic instars preceding the first larval instar.

¹¹ Accessory ventral condyle absent in the family Passalidae which, however, is readily distinguished by possessing atrophied metathoracic legs (pl. 87).

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9. Median epicranial suture present; tenth abdominal segment well developed, usually about as large or larger than the well-developed ninth abdominal segment, sometimes fused with it dorsally, when shorter than ninth provided with a pair of large anal pads; spiracles eribriform¹² and all lateral. *Scarabaeoidea* (p. 51)
- Median epicranial suture absent, frons reaching to the occipital foramen; tenth abdominal segment much smaller than the well-developed ninth and always without anal pads, or both ninth and tenth vestigial; spiracles either eribriform and all lateral, or not cribriform and the eighth abdominal pair terminal. *Dascilloidea* (p. 43)
10. Gular region or median gular suture present or absent; when absent, with mandibles having mola or prostheca or extraordinary structures¹³ except a pseudomola 11
- Gular region or gular suture absent; subfacial region of head and ventral region of prothorax contiguous; mandible with pseudomola or with no mola, except in *Platystomoidea* and *Lymexyloidea*. (Cardo never completely absent and never distinctly exceeding stipes in size; mala when divided having a lobe-shaped galea; paired urogomphi usually absent) 19
11. Maxillary articulating area either large or indistinct; when indistinct, mandible with mola, except in *Catogenidae*, *Epilachninae* and *Lamiinae*¹⁴ 12
- Maxillary articulating area absent, or very small, or concealed by mentum, not large and cushioned; mandible without molar part 13
12. Maxillary mala divided into a well-developed lacinia and a finger-shaped, one- or two-jointed galea; mandible without a distinct molar part but with a longitudinal series of hairs at the base. (*Hypopharynx* membranous) *Byrrhoidea* (p. 43)

¹² Except in some species of *Trox* in which the spiracles are biforous (pl. 87).

¹³ The gular region is completely absent in the cerambycoid subfamily *Disteniinae* having simple mandibles without mola, in some genera of *Lampyridae* with perforate mandibles, of *Phalacridae* without cardo, of *Byrrhidae* with mala divided into a jointed, finger-shaped galea and prominent lacinia, and in a few others.

¹⁴ The maxillary articulating area is indistinct in some *Nitidulidae*, *Laemophloeidae*, *Smicripidae*, and *Lamiinae* through fusion with or loss of cardo (pls. 31, 35-38). In some *Phalacridae* and in the *Catogenidae* the cardines, the maxillary articulating areas, the submentum, and the gular area are fused more or less completely into one large subfacial membranous region between the diverging hypostomal rods (pl. 33, 34).

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- Mala simple, or division either indicated by distal notch or present with lobelike galea; mandible with or without a molar part but without a longitudinal series of hairs at the base. (Hypopharynx membranous or with a sclerome) 18
13. Either with exposed gills below the entire abdomen, or with movable operculum usually covering retractile gills at the end of the body, or with mamillaeform appendices from the tenth abdominal segment;¹⁵ mandible never perforate or deeply cleft. (Usually with one large ocellus on each side and without true urogomphi).
Dryopoidea (p. 44)
 Gills or anal appendices usually absent; in larvae where present, mandibles either perforate or deeply cleft longitudinally 14
14. Ninth abdominal segment operculate, vertical, and terminal. (Spiracles biforous; body cylindrical and strongly chitinized; mental-submental area distinctly triangular.)
Elateroidea-Rhipiceridae (p. 49)
 Ninth abdominal segment otherwise 15
15. Spiracles cribriform; tenth abdominal segment terminal; prothorax large and more or less depressed, usually covered with a plate both dorsally and ventrally.
Elateroidea-Buprestidae (p. 49)
 Spiracles, tenth abdominal segment, and prothorax otherwise 16
16. Labrum present *Cleroidea* (p. 55)
 Labrum absent or included in nasale. (In Throscidae and Melasidae, head capsule or mouthparts very much reduced or abnormal; prothorax provided ventrally, or both dorsally and ventrally, with pairs of rod-shaped scleromes (pl. 81)) 17
17. Frontal sutures present, except in Throscidae and Melasidae in which head capsule and mouthparts are reduced or very much specialized. (Mandible of the biting labidomorphic type; head capsule with deep subfacial sinus for reception of ventral mouthparts) *Elateroidea proper* (p. 50⁷⁻¹²)
 Frontal sutures absent, except in Brachypsectridae and Lampyridae; both with piercing mandibles. (Mandible of the biting labidomorphic type, or of the subulate type adapted for piercing and sucking; subfacial sinus present or absent¹⁶)
Cantharoidea (p. 46)

¹⁵ *Eurypogon*, a type intermediate between the Dryopoidea and the elateroid family Cebriionidae, has no gills or appendices (pl. 69).

¹⁶ Sometimes with pseudocribriform spirales (pl. 78).

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18. Ventral mouthparts retracted.¹⁷ (Mandibular molar part usually present) - *Cucujoidea* (p. 33) and section 23 (p. 15)
 Ventral mouthparts protracted. (Head capsule ventrally with a broad transverse bridge formed completely or mainly by the large hypostomata; mandible without molar part, often of the gouge-shaped coelate type; legs short or absent.)
Cerambycoidea (p. 60)
19. Hypopharyngeal sclerome absent; mandible without a real molar structure 20
 Hypopharyngeal sclerome present; mandible of the mastio-morphic type with veritable molar structure. (Mentum and submentum well separated; head nutant) 23
20. Ninth abdominal tergum armed with a pair of urogomphi or an unpaired spine. (Tenth abdominal segment without a pair of large lobes separated by median longitudinal groove; legs short, soft, but jointed; terminal joint not claw-shaped; frons short and transverse) *Mordelloidea* (p. 60)
 Ninth abdominal tergum without a pair of urogomphi or an unpaired spine¹⁸ 21
21. Tenth abdominal segment in front of anus provided with a pair of cushioned and adjacent lobes separated by a median, longitudinal groove often marked at the anterior end by a small, transverse sclerome. (Frons indistinct, short, and transverse; frontal sutures faint or absent; epicranial suture present and long, or absent through complete fusion of epicranial halves; mentum laterally free and separated from submentum, except in *Caenocara*; legs four- or five-jointed, usually with rather long, setose, distally pointed, and hard tarsungulus, except in *Caenocara* where legs are vestigial, two-jointed, and soft) (pl. 101) *Bostrichoidea* (p. 62)
 Tenth abdominal segment in front of anus without a pair of soft, oval lobes separated by a longitudinal groove 22
22. Hypopharyngeal bracon absent. (Frons usually distinct with converging frontal sutures; usually with distinct, four- or

¹⁷ In some forms, as Phalacridae, Laemophloeidae, and possibly Catogenidae, the ventral mouthparts are apparently protracted as a result of elimination of cardines, or fusion of cardines, submentum, and gular area into a large common subfacial region (pls. 31, 32-34).

¹⁸ In exception, paired urogomphi are present in the first larval instar of *Lycetus*, and an unpaired terminal spine is found on the ninth abdominal segment of the first instar of the *Scobicia* larva, but both of the larvae possess in front of the anus a pair of adjacent lobes separated by a longitudinal groove (pls. 101, 102).

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five-jointed legs with a tarsungular last joint;¹⁹ mentum either free or joined with maxillary stipites; mala often separated into a galea and a lacinia hidden below the galea.)

Chrysomeloidea (p. 63) and *Disteniinae*

Hypopharyngeal bracon present. (Without jointed legs, except in Brenthidæ where they are vestigial; mentum connected completely with maxillary stipites, except in Brenthidæ; mala simple) *Curculionoidea* (p. 66)

23. Legs vestigial, without pointed, tarsungular joint, or absent; maxillary mala divided into a lacinia terminating with a thorn, and a galea; body curved, fleshy, and with dorsal, transverse plicae; tenth abdominal segment small, in continuation of ninth *Platystomoidea* (p. 66)

Legs normal, with strong tarsungulus; maxillary mala with only terminal indentation indicating a division into lacinia and galea; body elongate cylindrical, covered with tergal shields; tenth abdominal segment well-developed, asperate, and placed below base of large, chitinized ninth segment.

*Lymexyloidea*²⁰ (p. 67)

¹⁹ Legs are weak or vestigial without a tarsungular joint in the older larvae of Bruchidæ and absent in many of the leaf-mining larvae.

²⁰ The systematic position of this series is uncertain. Its larval form approaches in important characters the deviating larvae of the two cucujoid families Oedemeridæ and Calopidæ, but also greatly resembles the larval form of the ancient suborder Archostemata.

LARVAL FORMS OF COLEOPTERA

FAMILIES, SUBFAMILIES, AND OCCASIONALLY TRIBES

In the taxonomic arrangement of the larvae, each series includes usually a greater or smaller number of families, subfamilies, and minor subdivisions. In proper order, keys to the families, subfamilies, and occasionally tribes of each of the series listed on page 10 are given below.

A. CUPESOIDEA

KEY TO FAMILIES

1. Ninth abdominal segment extended terminally into a single, conical, straight process, ventrally with a simple, transverse, narrow sternal plate; leg short, conical; tarsus carrying one bifurcate claw with subequal tips. (Polymorphic larval metamorphosis lacking) *Cupesidae* (pl. 1 A-G)
- Ninth abdominal segment with terminal process bent downward and directed toward a similar but upward bent process from the sternal plate; leg (in instar in which fully developed) provided with a long, slender tarsus carrying two claws of equal length. (Polymorphic larval metamorphosis present with partly paedogenetic cycle of larval generations.)²¹
Micromalthidae (pl. 2 A-J)

B. CARABOIDEA

KEY TO FAMILIES

1. Labial palpi latent; prementum and ligula fused into an unpaired anteriorly bilobed piece. (Retracted ventral mouthparts; one claw.)^{22a}
Rhysodidae (pl. 3 A-J)
- Labial palpi distinct and jointed 2
2. Ninth abdominal segment present; eighth abdominal segment never terminal. (One or two claws) 3
- Ninth abdominal segment rudimentary; eighth long, conical, appearing as the terminal segment of the body. (Two claws) 7
3. Tenth abdominal segment developed as a pygopod for locomotory purpose 4
- Tenth abdominal segment not developed as a pygopod 6

²¹ Barber, H. S., Proc. Biol. Soc. Wash., vol. 26, 1913, pp. 185-190.

^{22a} Peyerimhoff, P. de, Rev. d'Ent. vol. 22, 1903, pp. 80-84, one plate.

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4. Two or three pairs of hooks present on tergum of fifth abdominal segment *Cicindelidae*^{22b} (pl. 4 A-E)
 No hooks on fifth abdominal tergum 5
5. Terminal setae of tarsus much shorter than claws; retinaculum single or absent *Carabidae*²³ (pl. 4 F-I)
 Terminal setae of tarsus much longer than claws; retinaculum bicuspidate *Omophronidae* (pl. 5 A-E)
6. Thoracic and abdominal spiracles present, biforous, and all lateral; branchial prolongations absent; ninth and tenth abdominal segments separate; tenth abdominal segment long, bifurcate, and attenuate *Haliplidae-Haliplinae* (pl. 5 E-H)
 Spiracles all absent; branchial prolongations present; ninth and tenth abdominal segments fused into a bifurcate, terminal segment *Haliplidae-Peltodytinae*
7. Head nutant; mandible falcate and simple; eighth abdominal spiracle absent. (Gills present below anterior part of body.)
Hygrobiidae (Hygrobia) (pl. 5 I, J, M)
 Head porrect; mandible not simple; eighth abdominal spiracle terminal. (Gills rarely present) 8
8. Mandible with distinct retinaculum, inner margin neither sulcate nor tubular; legs fossorial
Noteridae (Noterus, Hydrocanthus, and Canthydrus) (pl. 5 K, L, N-P)
 Mandible without distinct retinaculum, inner margin either sulcate or tubular; legs ambulatory or natatory 9
9. Prothoracic presternum large and subquadrate; gula²⁴ present, subquadrate or triangular; gular suture double or anteriorly bifurcate *Dytiscidae*²⁵ (pl. 6 A-H)
 Prothoracic presternum transverse, narrow, and band-shaped; gula absent; gular suture median and simple.
Amphizoidae (pl. 7 A-H)

B.I. CICINDELIDAE

KEY TO MAIN TYPES OF LARVAE

1. Each of the paired protuberances on fifth abdominal segment with two hooks 2

^{22b} Key to the main types of cicindelid larvae on pages 17-18.

²³ Key to subfamilies of Carabidae on pages 18-23.

²⁴ The plate or area which appears as the gula may be a morphologically different structure, namely, a pair of medianly fused pieces separated from the gular margin of the epicranium. However, for practical purposes, it is referred to as the gula.

²⁵ Key to subfamilies of Dytiscidae on pages 23-24.

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- Each with three hooks 4
2. Exterior hook falcate and outwardly concave; basal joint of labial palpus with two or three spines.
Cicindelini (*Cicindela*)
 Exterior hook straight or slightly concave toward the middle line; basal joint of labial palpus without spines 3
3. Dorsal pair of ocelli subequal in size
Tetrachini (*Tetracha*)
 Posterior one of dorsal ocelli decidedly larger than anterior.
Amblycheilini (*Amblycheila*)
 (pl. 4 B, D)
4. Exterior hook much smaller than the other two. (Tibia and tarsus small but separate) *Omini* (*Omus*)
 All three hooks of about the same size. (Tibia and tarsus separate (*Therates?*), or fused)
Collyrini (*Collyris*, *Ctenostoma*, and *Therates* (?))
 (pl. 4 A)

B.II. CARABIDAE

Out of the nineteen subfamilies into which the Carabidae have been divided here according to the characters of the larvae, a single one, the Lebiinae, may not be natural. The evidence of a close relationship between the genera which have been included in it is not strong and, considered as a group, its affinities to other subfamilies, particularly to the Dromiinae, can hardly be traced. Furthermore, because of extreme adaptation to an ectoparasitic life in all or some of the larval instars, it is not always possible even to recognize the larvae of some of its species as carabid larvae. In the following key the main character common to the genera of the Lebiinae appears rather insignificant but it sets the subfamily off from all other carabid larvae. Two of the remaining subfamilies, namely, the Dromiinae and the Loricarinae, occupy an isolated position, but the rest intergrades either with one or with several of the other subfamilies. The Dromiinae is in itself a homogeneous and natural group, and the larval form of the subfamily Loricarinae, represented by a single genus only, is very characteristic and strikingly different from other carabid larvae. The larvae of the Odacanthinae show no close relationship to the larvae of the two other "Truncatipennes", the Lebiinae and the Dromiinae, but they approach the Nebriinae. The Driptinae are closely related to the Nebriinae which are rather distant from the Carabinae, according to their larvae. The Cyehrinae are closely related both

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to the Carabinae and to the Chlaeniinae, and between this latter subfamily and the Liciniinae is an unmistakable affinity. The Bembidiinae, as limited here according to the larvae, represent a natural and well defined subfamily, but the Sphodrinae, Brosicinae, and Dyschiriinae, all of which have but one claw on each tarsus like the Bembidiinae, come near to this group. Regardless of a significant lack of similarity with the whole bembidiine association in the number of claws, the Scaritinae may join it, and the Elaphrinae which like the Scaritinae have two claws on each tarsus, are unquestionably related to this latter subfamily. Another association of subfamilies is formed by the Pterostichinae, Amarinae, and Harpalinae. Connected with this group is the subfamily Patrobinae, which in the larval stage has no connection whatsoever with the Bembidiinae but is difficult to separate from the Pterostichinae. The larvae of the genera *Glyptus* from Africa (pl. 4 I) and *Orthogonius* from India and Africa are termitophilous, blind, with a more or less bottle-shaped, fleshy, soft-skinned body, short legs with but one claw, and no urogomphi. According to the imagines, their systematic position is with the Amarinae and Harpalinae.

KEY TO SUBFAMILIES

1. Ligula almost absent and entirely without setae. (Polymorphic metamorphosis; body often degraded because of parasitism)
 - Lebiinae* (*Lebia*, *Brachinus*, and possibly *Pheropsophus*)²⁶..... 2
2. Ligula with setae 2
2. Tenth abdominal segment with two protrusile prominences carrying a series of sensorial hooks; with a single exception, claws having a round or tooth-shaped enlargement at base.
 - Dromiinae* (*Dromius*, *Demetrias*, *Euproctus*, *Calleida*, *Philophuga*, *Plochionus*, *Cymindis*, and *Onota*)

²⁶ *Brachinus jaethinipennis* Dejean is ectoparasitic in all larval stages on the pupa of *Dineutes americanus* Say (= *assimilis* Kirby) and pupates inside the mud cocoon of its host (Dimmock, G., and Knab, F., Springfield Museum of Natural History, Bul. 1, 1904). *Lebia scapularis* Fourcroy is ectoparasitic on the larva and pupa of *Galerucella luteola* Müller; while feeding, the parasite is inside a sort of capsule (Silvestri, F., Redia, vol. 2, 1904). *Lebia chlorocephala* Hoffman is not parasitic (Rosenberg, E., Entom. Medd., ser. 2, vol. 2, 1903—Larvae of Lebiini and Odacanthini). *Pheropsophus hispanicus* Dejean is probably not parasitic (Emden, F. von, Supplementa Entomologica, no. 8, 1919).

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- Tenth segment with no sensorial hooks; claws normal 3
3. Mandible falcate, at least three times as long as wide at base
(Retinaculum placed at base or in the middle of the inner
edge) 4
- Mandible robust, about twice as long as wide at base, or
shorter. (Retinaculum never placed at base; each leg often
with claws of different sizes) 19
4. Mandible multiserrate in front of retinaculum; nasale not pro-
jecting but armed with a transverse series of several sharp
teeth of the same size; two claws of equal size; urogomphi
immovable *Odacanthinae* (*Odacantha*, *Lep-
totrachelus*, and *Casnoia*
(?))
- Combination of the four characters different 5
5. Mandible not serrate in front of retinaculum and without
groove for antenna; antenna inserted outside of mandible;
urogomphi movable and long; head round and usually large;
collum constricted and narrow (except in *Pelophila*) 6
- Different combination of the characters 7
6. Prementum with lateral setae. (Coxa of front leg with inner
margin of a groove for reception of femur armed with long
spines; urogomphi multijointed)
- Driptinae* (*Galerita*)
- Prementum without lateral setae. (Urogomphi not jointed,
finely nodose) *Nebriinae* (*Notiophilus*, *Pelo-
phila*, *Nebria*, and *Leistus*)
7. Dorsal shield of ninth abdominal segment very small; ligula
broadly rounded and multisetose; mandible with distal part
beset with appendices; retinaculum serrate; inner corner of
mandible receding at base. (Stipes large, swollen; palpus
shorter than galea) *Loricarinae* (*Loricera*)
- Dorsal shield of ninth abdominal segment distinct; ligula with
a pair of setae; mandible without appendices and with inner
corner projecting 8
8. Urogomphi fixed, short, strong, and pointed; prementum with-
out lateral setae; stipes maxillaris subquadrate, depressed 9
- Urogomphi different; prementum with lateral setae; stipes dif-
ferent 10
9. Retinaculum with posterior margin simple; urogomphi antler-
like in mature larvae; labial palpus with apical joint simple
and ovate, or terminally cleft. (Ligula distinct in *Calosoma*,
minute in most species of *Carabus*)
- Carabinae* (*Calosoma*, *Carabus*,
Damaster, and *Procerus*)

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- Retinaculum with posterior margin serrate; urogomphi conical and simple; labial palpus with apical joint securiform. (Head small, body broad and oval)
Cychninae (*Cychnus*, *Maronetes*, and *Sphaeroderus*)
10. Two claws of equal size11
 One claw13
11. Collum indistinct; epicranial suture absent or indistinct; mandible, except in *Rembus*, with serrations, crenulations, or with a few denticulations at least on retinaculum and often also on inner edge in front of retinaculum. (Urogomphi often of unusual shape; distal joint of labial palpus rather thick and conical12
 Collum distinct and broad; epicranial suture distinct; retinaculum, and usually the whole inner edge of mandible, entire...16
12. Antenna not twice as long as mandible. (Urogomphi either thin and stiff with a few seta-bearing tubercles, or very long, rolled up like a spring, and divided into a large number of minute pseudojoints as in *Chlaenius prasinus* Dejean and other species of *Chlaenius*)
Chlaeniinae (*Oodes* and *Chlaenius*)
- Antenna at least twice as long as mandible. (Urogomphi either movable, long, straight, and pubescent as in *Panagaeus*, or immovable, slender, curved toward each other, and pubescent as in *Dicaelus*, or, immovable, nodose, and with a number of long setae as in several genera)
Licininae (*Rembus*, *Dicaelus*, *Licinus*, *Badister*, and *Panagaeus*)²⁷
13. Galea with proximal joint shorter than, or as long as, the distal one. (Ocelli usually six on each side; in *Trechus*, only three, the two anterior coalescent; in *Anophthalmus*, none.)
Bembidiinae (*Asaphidion*, *Bembidion*, *Cilleus*, *Tachys*, *Tachyta*, *Anophthalmus*, and *Trechus*)²⁸
- Galea with proximal joint longer than the distal one14

²⁷ *Panagaeus* has been given many different places in the classification of the imagines, for instance, close to the *Chlaeniinae* or near the *Bembidiinae*, but according to the larva its systematic position is in the *Licininae*.

²⁸ *Anophthalmus* and *Trechus*, according to the larvae, definitely belong in this subfamily and have no connection with the larva of *Patrobis* which, as mentioned above, is very similar to *Pterostichus*.

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14. Lacinia present. (Ocelli absent; urogomphi jointed, with basal joint very long, the five distal joints small.)
Sphodrinae (*Sphodrus*)²⁹ 15
- Lacinia absent 15
15. Meso- and metathorax convex laterally; urogomphi much longer than tenth segment, terete, and nodose. (Galea with the proximal joint twice as large as the distal; six ocelli.)
Broschinae (*Broschus*)
- Meso- and metathorax subparallel laterally; urogomphi as long as or shorter than tenth segment, rather flat and membranous beneath, either very short, almost triangular, and distant at base, in *Dyschirius*, or fairly long, with parallel sides, and united at base, in *Clivina*. (Six ocelli or none.)
Dyschiriinae (*Dyschirius* and *Clivina*)
16. Legs fossorial; body with subparallel sides; prothoracic spiracle very large, first abdominal spiracle large, the rest of normal size. (Sternal sclerites of abdomen closely adjacent; either six ocelli or none; urogomphi either smooth and curved toward each other, in *Pasimachus*, or nodose and straight, in *Scarites*) *Scaritinae* (*Scarites* and *Pasimachus*)
- Legs ambulatory or rasorial; body fusiform; prothoracic spiracles of normal size. (Six ocelli) 17
17. Urogomphi either with short, setose ramuli, in *Elaphrus*, or thick, cylindrical, and beset with numerous setae, in *Blethisa*; four anal prominences. (Nasale extended into a short horn; with or without lacinia.)
Elaphrinae (*Elaphrus* and *Blethisa*)
- Urogomphi terete, nodose or with several setae; two or no anal prominences 18
18. Penicillus absent; lacinia absent; claws slender and not strong; setae of femora fine *Patrobinae* (*Patrobus*)³⁰
- Penicillus present; lacinia present or at least represented by a strong seta; claws of normal strength; setae of femora moderately strong. (Anterior margin of nasale varying much according to genus; six ocelli, except in the blind *Sphodrop-*

²⁹ This subfamily differs considerably from the Pterostichinae in which, according to the characters of the imagines, its only genus, *Sphodrus*, has been placed between *Pterostichus* and *Laemostenus*, but it approaches, together with the Broschinae, the great and well-defined bembidiine association.

³⁰ See explanatory remarks on page 19.

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sis from European caves; urogomphi short, terete, and curved toward each other in *Evarthrus*, in the other genera long and multinodose) *Pterostichinae* (Genera as placed in Leng's Catalogue in tribes *Pterostichini* and *Platynini*) (pl. 4 F-H)

19. Each leg with two claws of equal length; stipes stout and more or less distinctly divided into a proxistipes and a dististipes of about the same size; lacinia with moderately strong, lateral or terminal seta. (Anterior margin of nasale varying much according to genus, in *Zabrus* produced into two conical teeth; retinaculum very small; urogomphi solid, nodose, usually of moderate length, short in *Zabrus* and *Percosia*.)

Amarinae (*Zabrus* and the genera placed by Leng in *Amarini*)

Each leg with two claws of different length; stipes normal, rather slender; lacinia with very strong, spinelike, terminal seta. (Anterior margin of nasale varying much according to genus, but never produced into a pair of strong, conical teeth; retinaculum well-developed; inner edge of mandible in front of retinaculum either entire, serrate, or with one to several teeth; urogomphi usually of moderate length, short in a few genera as *Cratacanthus* in which the pygopod is exceptionally short and thick; trochanter with one or two rows of spines on each side) *Harpalinae* (genera as placed by Leng in his tribe *Harpalini*)

B.III. DYTISCIDAE

KEY TO SUBFAMILIES

1. Head with anterior, distally notched prolongation; mandible turned upward with apex fitting into the notch of the prolongation; maxillary palpus three-jointed

Hydroporinae (*Hyphydrus*, etc.) (pl. 6 B-D, G)

Head without anterior prolongation; mandibles directed forward; maxillary palpus four-jointed or more 2

2. Maxillary stipes broad, suboval, with one or two strong hooks on inner margin 3

Maxillary stipes slender and long, no hooks on inner margin ... 5

3. Seventh and eighth abdominal segments laterally without series of swimming hairs; ligula absent.

Colymbetinae (*Agabus*, *Ilybius*, *Colymbetes*, *Rhantus*, and also *Laccophilus*)

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- Seventh and eighth abdominal segments with swimming hairs; ligula present 4
4. With a pair of long lateral gills on the six anterior abdominal segments *Coptotominae* (*Coptotomus*)
No gills *Thermonectinae* (*Acilius*, *Thermonectes*, *Graphoderes*, and *Eretes*)
5. Head anteriorly without dentation; ligula either absent, or low and bilobed; urogomphi present
Dytiscinae (*Hydaticus* and *Dytiscus*) (pl. 6 A, F, H)
Head anteriorly dentate; ligula long; urogomphi absent.
Cybistrinae

C. GYRINOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Head subcircular with collum narrow and distinct; mandible falcate without refinaeculum
Gyrinidae-Euhyrini (*Dinectes*) (pl. 6 E, I-M)
Head elongate with collum about as wide as rest of head and not distinct; mandible with retinaeculum 2
2. Nasale without teeth *Gyrinidae-Orectochilini* (*Orectochilus*)
Nasale with two to four teeth in a transverse row.
Gyrinidae-Gyrinini (*Gyrinus*)

D. PAUSSOIDEA

The Paussoidea approach the Caraboidea, especially the Rhysodidae and the Carabidae, in fundamental characters but apparently also the series Hydrophiloidea. In common with the first of the two series, the Paussoidea possess a normal maxillary palpiger, four-jointed antenna, and annular spiracles. In common with the second of the series, they have a three-jointed maxillary palpus and a single-jointed galea, characters, however, which also occur in the isolated caraboid family Haliplidae. The posterior part of the abdomen is unique as are also the legs which are only three-jointed and are curved upward. However, reduced legs but of a different type are found both in the Caraboidea, for instance, in stages of *Lebia scapularis*, and in the Hydrophiloidea, for instance, in *Sphaeridium*. It is for practical reasons mostly that the series Paussoidea has been established and placed at the end of the

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Adephaga. This conception, however, is based on the knowledge of the mature larvae of only two genera, namely, *Paussus* (represented by three species) and *Pleuropterus* (one species), and may be altered by the eventual discovery of the earlier instars and of the larvae of the more primitive genera.

FAMILY

The series consists of a single family *Paussidae* (pl. 7 I-M)

E. STAPHYLINOIDEA

The series contains several fairly distinct associations of families or subfamilies. Two of these are outstanding, namely, the leptinid association containing very primitive larvae, and the staphylinine association with greatly mutated and advanced larval types. To the leptinid association belong the Limnebiidae, Leptinidae, Anisotomidae, and Ptiliidae; to the staphylinine association the very specialized subfamilies Staphylininae, Thinopininae, and Paederinae. The four families which constitute the association of primitive larvae have been placed differently in the classification of the imagines: The Limnebiidae, with genera *Limnebius*, *Ochthebius*, and *Hydraena*, were placed in the beginning of the Hydrophiloidea (auct.); the Anisotomidae, with subfamilies Cholevinae (auct.) and Anisotominae (auct.), and the Leptinidae were included in the beginning of the Staphylinoidea (auct.); the Ptiliidae at the end of this latter series. The Hydroscaphidae are closely related to the Limnebiidae.

From the four primitive staphylinoid families are directly derived the Scaphidiidae, the Platypsyllidae, and the Silphidae; the latter merely including *Necrophorus*, *Silpha*, and the few other genera usually listed as "Silphini." The entire family Staphylinidae, as here conceived, consists of a complex of many subfamilies linked together into one large unit.

There is a gradual transition from the Oxytelinae, which represents the nearest approach to the Silphidae, into the Paederinae, which is the most specialized group of all the Staphylinidae. The Pselaphidae and Scydmaenidae are here regarded as families branched off from the Staphylinidae much in the same way as the Hydroscaphidae are branched off from the Limnebiidae, and the Platypsyllidae from the Silphidae or Scaphidiidae. The larvae of the small families Brathinidae, Clambidae, Clavigeridae, Sphaeridae, and Sphaeritidae are either completely unknown or are at least not present in the United States National Museum. The Histeridae

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has been included in our Hydrophiloidea (p. 31) and the Corylophidae placed in the Cucujoidea near the Phalaeridae (p. 36) and Smieripidae (p.36). The Micropeplidae is listed in the Staphylinoida according to an incomplete description by Lubbock (Trans. Ent. Soc. London, 1868, p. 275, one plate) but the larva may not belong in this series at all.

KEY TO FAMILIES AND SUBFAMILIES

- | | |
|---|---|
| 1. Mandible with a, usually large, asperate or tuberculate molar part | 2 |
| Mandible without asperate or tuberculate molar part, usually without molar part | 7 |

Leptinid association:

- | | | |
|---|---|----|
| 2. Tenth abdominal segment provided with a pair of recurved hooks | <i>Limnebiidae</i> (<i>Ochthebius</i> , <i>Hydraena</i> , and <i>Limnebius</i>) (pl. 8 A-L) | |
| Tenth abdominal segment without terminal hooks but sometimes with a pair of long setae | | 3 |
| 3. Spiracles absent; balloonlike appendices on prothorax, first and eighth abdominal segments; antenna very short and two-jointed | <i>Hydroscaphidae</i> (pl. 9 A-F) | |
| Spiracles present; no balloonlike appendices; antenna three-jointed | | 4 |
| 4. Apex of mandible multiserrate; urogomphi short, one-jointed. | <i>Ptiliidae</i> (<i>Nossidium</i>) (pl. 10 F-L) | |
| Apex of mandible bifid or trifid; urogomphi two-jointed, last joint often multiannulate | | 5 |
| 5. Mandible with vestigial retinaculum (r). | <i>Leptinidae</i> (pl. 10 A-E) | |
| Mandible with distinct retinaculum (r), or prostheda (lm), ³¹ or both | | 6 |
| 6. Asperities on molar structure covering entire ventral surface, irregularly arranged; paraglossae as long as ligula. | <i>Anisotomidae-Liodinae</i> ⁸⁷ (pl. 11 A, B) | |
| Asperities on molar structure arranged in fine transverse (often few) rows; paraglossae absent or shorter than ligula. | <i>Anisotomidae - Cholevinae</i> ⁸⁷ (pl. 11 C-M) | |
| 7. Mala and stipes fused | | 8 |
| Mala jointlike, movable | | 23 |

³¹ Except in *Aphaobius*, belonging to the Anisotomidae-Cholevinae but very similar to the Leptinidae. (L. Weber, Allg. Ztseh. f. Ent. vol. 7, 1902).

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Silphid association:

8. Mandible with apex simple, recurved, and bent away from the sagittal plane of the larva. (Ligula rounded and entire.)
Platypsyllidae (pl. 12 E-I, K)
 Mandible with apex differently shaped, never recurved 9
9. Galea present; often developed as a small, hairy lobe on top of lacinia. (Ligula bi- or trilobed) 10
 Mala maxillaris simple. (Ligula either deeply bilobed, or entire, or absent)³² 12
10. Lacinia with entire surface asperate; terminal joint of maxillary palpus subulate; ligula trilobed.
Scaphidiidae (pl. 12 A-D, J)
 Lacinia not asperate or only along posterior margin; terminal joint of maxillary palpus not subulate; ligula bilobed 11
11. Dorsal shields small, the abdominal ones quadrispinose; ventral surface whitish and soft
Silphidae-Necrophorinae
 Dorsal shields large, usually laterally produced with posterior angles acuminate; ventral surface with well sclerotized shields *Silphidae-Silphinae*³⁷ (pl. 13 A-J)
12. Ligula either deeply bilobed anteriorly, or absent; nasale present 22
 Ligula entire anteriorly; labrum distinct, often movable 13

Oxyporine association:

13. Mandible narrowed at the middle, apically bifid and finely mucronate. (Ligula small and quadrate.)
*Staphylinidae-Oxyporinae*³³
 Mandible different 14
14. Ligula broad, anteriorly either rounded, straight, or slightly emarginate 15
 Ligula conical, often transversely bipartite at base 18
15. Mandible with suddenly dilated molarlike base. (Apically with three or four teeth and ocelli several in number) 16
 Mandible with no molarlike base³⁴ 17

³² The mala is crowned in several species of *Bledius* and in *Syntomium* with a hairy, rounded projection which might be interpreted as a vestigial galea, but the ligula is simple and rounded.

³³ The anatomical details of head and body have a primitive character; the systematic relationship to the oxyteline association is rather remote, and the systematic position somewhat isolated.

³⁴ In the aleocharine genera *Leptusa* and *Silusa* the base is somewhat dilated, but the apex is bifid or entire and only one ocellus is present.

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Oxytelinae association:

16. Larva elongate; anal segment conical, ventrally directed; with four ocelli on each side

*Staphylinidae-Piestinae*³⁵ (*Piestus* and *Lispinus*) (pl. 14 B, C, E, F, H)

Larva ovate, short, body capable of contraction into a globe; anal segment small, short, laminate, posteriorly directed; three ocelli on each side.

Staphylinidae - Syntomiinae (*Syntomium*)³⁶

17. Mandibles apically more or less widened, bifid or trifid, sometimes asymmetrical; number of ocelli on each side, three, one, or none *Staphylinidae - Oxytelinae*³⁷ (*Bledius*

with termitiform body and three ocelli, *Platystethus* and *Aploderus* with dark spots laterally on most segments, *Oxytelus*, *Coprophilus*, and *Trogophloeus*) (pl. 15 D, G, H, L)

Mandibles apically not widened, either slightly forked or entire; with one ocellus

*Staphylinidae-Aleocharinae, part one*³⁷ (*Gyrophæna* with eighth abdominal segment terminally produced into a glandular process, *Microglotta*, *Masoechara*, and many other genera) (pls. 14 A, D, G, I and 16 F-I)

18. Ligula simple, conically pointed; one ocellus .

*Staphylinidae-Aleocharinae, part two*³⁷ (*Leptusa* and *Silusa* with mandibles suddenly enlarged at base, *Atheta*, and many other genera).

Ligula transversely bipartite at base; three to six ocelli on each side 19

³⁵ The classification of the Piestinae as a subfamily conforms with the views of many European entomologists, and the larvae are easily recognized, but their subfamily characters are of disputable value. Bernhauer's and Schubert's conception of the group as a mere tribe of the Oxytelinae may prove to be the more satisfactory. It is with great hesitation that the Piestinae are placed here as a subfamily separate from the Oxytelinae.

³⁶ The larva of *Coprophilus* possesses falciform urogomphi shaped like the mandibles of a *Dytiscus* larva. It differs greatly in type from *Syntomium*, and has here been placed in the Oxytelinae.

³⁷ It is a very difficult taxonomic problem to find distinctive characters for the separation of the subfamilies Oxytelinae and Aleo-

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Omaline association:

19. Maxillary mala fanglike, smooth, and as long as entire head.
(Three or six ocelli on each side).
Staphylinidae-Proteininae (*Proctinus*
and *Megarthus*)³⁸ (pl. 16 J-M)
Maxillary mala shorter, with hairs. (Four to six ocelli on each
side) 20
20. Mandible apically entire. Lacinia with or without pectinate
inner edge; (ocelli six or less on each side).
Staphylinidae-Omalinae (*Anthobium*,
Omalium, *Olophrum*, and other
genera) (pl. 17 B, D, F, G)
Mandible bifid. Lacinia with pectinate edge; (ocelli six)..... 21
21. Body biconvex; head nutant, laterally rounded; mala subtrape-
zoidal *Staphylinidae-Tachyporinae* (pl. 15 C,
E, I-K)

charinae. In the Aleocharinae, the "part two" characterized by the presence of a simple, conical ligula is easily set off, thus causing no difficulties, but "part one" with a broad and rounded ligula isomorphous with the one found in the Oxytelinae is not separable from the latter subfamily by a single definite character as a comparison between the alternatives given in section 17 will show. However, in the general appearance of the larvae of the two subfamilies there is a lack of conformity that warns against any digression from the commonly accepted classification. In many aleocharine larvae, certain characteristic changes or radical adaptations to special biological conditions such as a fungicolous, myrmecophilous, termitophilous, or endoparasitic life make the determination to subfamily or even to series extremely difficult or impossible. The urogomphi, for instance, have disappeared in the myrmecophilous larvae of *Lomechusa*, *Xenodusa*, and *Atemeles*; and in *Aleochara bilineata* Gyllenhal only the first instar is built normally and is free living, but having found and gnawed its way into the puparium of a fly it changes into a very reduced endoparasitic second instar which is followed by a similarly reduced endoparasitic third instar. Other species of *Aleochara*, and *Maseochara valida* LeConte are also known to have endoparasitic larval instars in the puparia of flies or cocoons of sawflies. (See: N. A. Kemner: "Die Lebensweise und die parasitische Entwicklung der echten Aleochariden," Entom. Tidskrift, 1929, pp. 133-170, four plates.)

³⁸ The classification of the Proteininae as a subfamily is questionable. It is characterized by the extraordinary development of the mala, but is closely approached in this and other characters by genera such as *Lathrimaeum* belonging to the Omalinae. (See important paper by N. A. Kemner concerning the larvae of the Proteininae; Entom. Tidsskrift, 1925, pp. 61-76, two plates.)

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Body depressed; head porrect, laterally parallel; mala subtriangular *Staphylinidae - Habrocerinae* (*Olisthaerus* and *Habrocerus*)³⁹

Stenine association:

22. Urogomphi long and two-jointed; antenna more than twice as long as head; ligula bilobed; six ocelli on each side.

Staphylinidae-Steninae (pl. 17 A, C, E)

Urogomphi absent or small and immovable; antenna not longer than head; ligula absent; less than six ocelli, sometimes no ocelli 25

Staphylinine association:

23. Legs strong, fossorial; urogomphi one-jointed, thick, sausage-like *Staphylinidae-Thinopinae* (pls. 15 B and 18 A, D, E, G, H-J)

Legs cursorial; urogomphi two- or three-jointed 24

24. Ocelli, four or less on each side.

Staphylinidae-Staphylininae (*Xantholinus* with one ocellus, *Othius* with none, *Quedius* in many species with club-shaped or capitulate setae, *Staphylinus*, *Philonthus*, and other genera.)

Ocelli, five or six *Staphylinidae-Paederinae* (pl. 18 B, C, F)

Pselaphid association:

25. Terga expanded laterally, body oval 26
Terga not expanded. (Antenna not club-shaped.)

*Pselaphidae*⁴⁰ (*Batrisodes* and *Euplectus*) (pl. 19 E-J)

26. Tergal shields smooth, with simple hairs; antenna with second joint very large and club-shaped.

*Scydmaenidae*⁴⁰ (*Scydmaenus* and *Eumicrus*) (pls. 16 A-E and 19 A-D)

³⁹ The larvae of *Olisthaerus*, of which two European species are completely described and figured by Saalas (Ummio Saalas p. 69) agree in every character with *Habrocerus* (*schwarzi* Horn) and the two genera constitute together a subfamily that comes close to the staphylinine association having a porrect head and antennae inserted dorsally near the anterior margin of the head. The subfamily also approaches the *Piestinae* and *Oxytelinae*, thus forming a remarkable link between the more primitive and the highly transformed and advanced *Staphylinidae*.

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Tergal shields tuberculate; with fan shaped hairs.

Micropeplidae (?)

F. HYDROPHILOIDEA

This series is not identical with the series named Hydrophiloidea in the classification of the imagines but it is considered expedient to retain the serial name Hydrophiloidea for the present association of families which according to their larvae constitute a homogeneous unit and to which the genus *Hydrophilus* belongs. The Histeridae are included in this series on account of an unquestionable conformity in the development of the fundamental systematic characters in the larvae of the Histeridae and Helophoridae. The Limnebiinae, Hydraeninae, and Hydroscaphidae of the authors belong in the series Staphylinoidea according to the form of their maxillary palpi and spiracles.

KEY TO FAMILIES AND SUBFAMILIES

1. Nine complete abdominal segments; tenth small. (First to eighth abdominal spiracles lateral and well developed)..... 2
Eight complete abdominal segments. (Ninth and tenth reduced; first to seventh abdominal spiracles lateral and small or apparently absent, eighth abdominal spiracle terminal, sometimes poorly developed; usually with a terminal breathing pocket; occasionally with gills) 3
2. Cardio fused with stipes; one ocellus (*Epiurus*) or none; coxae small and widely separated. (Tarsus either short and falciform, or long, flexible and terminally filiform; urogomphi of moderate length and usually two-jointed, or short and two-jointed with proximal joints fused at base in *Plegaderus* and *Epiurus*, or reduced to a pair of warts. Some termitophilous larvae from British Guiana with rather stiff, digitiform processes on the sides of the body, one pair to each segment) *Histeridae*⁴¹ (pls. 20 A-R and 21 I)
Cardo distinct; six ocelli; coxae large, approximate. (Tarsus falciform; urogomphi diverging, long, three-jointed, tapering into a thread-shaped end; mandibular penicillus very

⁴⁰ The Pselaphidae and Scydmaenidae are very closely related, differing mainly from each other in the form of the antennae and the size of the abdominal spiracles in proportion to the size of the thoracic spiracles. According to the larvae, the Scydmaenidae may have some connection with the Scaphidiidae, but like the Pselaphidae they approach more closely to staphylinid genera like *Bledius*.

⁴¹ The subfamily Hololeptinae with the genus *Hololepta* as type can not be retained in the classification of the larvae.

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- short *Helophoridae* (*Helophorus*) (pl. 21 A, D, E)
3. Head slightly inclined; antenna inserted nearer the lateral margin of the head than is the mandible; ventral mouthparts retracted; gula well developed, quadrangular, and attaining the occipital foramen 4
- Head elevated; antenna inserted farther from the lateral margin of the head than is the mandible; ventral mouthparts protracted; gula reduced to a triangular pregular plate and a single, median, posterior gular suture 5
4. Mandible apically bifid and without molar part; maxillary stipes with strong projecting lacinia; maxillary palpiger with long, conical galea; abdominal segments soft, with short conical gills(?); last three abdominal segments attenuate, not forming a breathing pocket.
Spercheidae (*Spercheus*) (pl. 21 B, C, F-H)
- Mandible apically ending abruptly and with a terminal, short seta, molar part present; stipes with rudimentary lacinia; palpiger without galea; abdominal segments with well-developed plates; last three abdominal segments forming a breathing pocket *Hydrochidae* (*Hydrochus*) (pl. 22 A, D)
5. Seven pairs of very long gills on sides of abdomen; no breathing pocket. (Ninth and tenth abdominal segments apparently absent) *Hydrophilidae - Berosinae* (*Berosus*) (pl. 22 B, E)
- Gills (?) of moderate size or absent; with breathing pocket ... 6
6. Maxillary stipes long and styliform; femora with fringes of long swimming hairs. (Gills(?) present or absent.)
Hydrophilidae - Hydrophilinae (*Hydrophilus*, *Hydrophilus*, and *Tropisternus*) (pls. 22 F, G and 23 A)
- Stipes moderately or very broad; femora without fringes of swimming hairs. (Gills absent) 7
7. Ocellar group often large; ocelli equally developed and rather distant. (Legs generally of normal size and visible from above; abdomen more or less tapering posteriorly; nasale often with more than three teeth; nasale and anguli frontales often asymmetrical) *Hydrophilidae-Hydrobiinae* (pls. 22 II-S and 23 B, G, H)
- Ocellar group small; ocelli of different size, or closely aggregate. (Legs poorly developed or absent; abdomen often truncate posteriorly; nasale with a single tooth or three small teeth; nasale and anguli frontales symmetrical).
Hydrophilidae-Sphaeridiinae (*Chaetarthria*, *Coelostoma* = *Cyctonotum*, *Cereyon*, etc.) (pls. 23 C-F, I-P and 24 A-T)

LARVAL FORMS OF COLEOPTERA

G. CUCUJOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. The back of the mandible either with two long, flagellate setae distally, and the body of the mandible partially fleshy or fully chitinized; or the back of the mandible without long setae distally, and the body of the mandible always fleshy, only with the base, or the tip and the base chitinized. (Maxillary mala entire) *Lathridiidae*,⁴⁹ *major part* (pl. 25 A-J)

The back of the mandible without long, flagellate setae distally, and the body of the mandible completely chitinized 2

2. Maxillary mala with distinguishable lacinia and galea 3
 Maxillary mala entire, sometimes bilobed anteriorly 5
 3. Second antennal joint more than four times as long as the basal joint *Lathridiidae*,⁴⁹ *minor part* (*Eufallia*) (pl. 25 K, L)

Second antennal joint subcylindrical, three times, or less, as long as the basal joint 4

4. Spiracles annular, not on tubes; urogomphi not distinct *Eucinetidae*⁴² (pl. 26 A-H)
 Spiracles biforous, on tubes; urogomphi strong *Derodontidae* (pl. 27 A-H)

5. Mala falciform 6
 Mala obtuse, or with inner margin irregularly jagged 14
 6. Spiracles biforous 7
 Spiracles annular 11

7. Spiracles, at least some, borne on tubes; urogomphi terminating abruptly with two or three conical processes. (A paramedian process present in front of each urogomphus) 8
 Spiracles not on tubes; urogomphi terminally pointed and simple, or urogomphi absent. (Usually without paramedian processes) 9

8. Labial palpus one-jointed. (Tergal plates armed with series of chitinous tubercles with a small, fan shaped hair on the top) *Monotomidae*⁴³ (*Europs* and *Hesperobaenus* but not *Smicrips*) (pl. 25 M-U)

Labial palpus two-jointed *Rhizophagidae* (pl. 28 A-G)

9. Mandible with three apical teeth. (Cutting edge between

⁴² Apart from the lack of jointed urogomphi, the larva of the Eucinetidae agrees with the larval form of the leptinid association of the Staphylinoidea. Usually the family is placed as a subfamily of the Dascillidae.

⁴³ The genus *Smicrips*, usually placed in the Monotomidae, constitutes a separate family, Smicripidae (p. 36²⁰), near the Phalaricidae according to the characters of the larva.

LARVAL FORMS OF COLEOPTERA

- apex and retinaculum entire and incurved; retinaculum short and broad; a fleshy lobe present behind mola; body cylindrical) *Languriidae-Langurinae*⁴⁴ (pl. 28 H-J, L, N)
- Mandible with two apical teeth. (Cutting edge between apex and retinaculum with one or many projections; body fusiform) 10
10. Cutting edge of mandible behind the apical teeth with a single rounded projection; retinaculum short and broad. (Urogomphi present) *Languriidae-Cladoxeninae* (pl. 28 K, M, O-Q)
- Cutting edge of mandible behind the apical teeth multiserrate; retinaculum long, slender and brittle. (With or without urogomphi) *Cryptophagidae* (pl. 29 A-U)
11. Urogomphi absent. (Ninth abdominal segment small or very small; tenth segment conical and often long) 12
- Urogomphi present 13
12. Antenna with second joint large and clavate; apical joint minute *Silvanidae-Silvaninae*⁴⁵ (pl. 30 A-J)
- Antenna with three well-developed normal segments
*Silvanidae-Telephaninae*⁴⁵ (pl. 30 K-O)
13. Tenth abdominal segment long and conical
Cucujidae-Brontinae (= *Hyliotinae*)⁴⁵ (pl. 31 L)
- Tenth abdominal segment short and wart-shaped
*Cucujidae-Cucujinae*⁴⁵ (pl. 31 A-F)
14. Mentum with only apex free, or small, or indistinct by fusion with other areas. (Exceptionally, in the Sphindidae, mentum free to base and distinct, but appearing together with a mandible provided with retinaculum and a ninth abdominal segment without urogomphi) 15
- Mentum with more than apex free, often free to base, always well developed and distinct. (Mandible, except in genus *Deretaphrus*, without retinaculum; urogomphi usually present) 35
15. Head swollen laterally, and much broader than thorax; cardo of normal shape and position; maxillary articulating area round and well developed; hypostomal inner margin concave between fossa for mandible and posterior end of cardo
*Prostomidae*⁴⁵ (pl. 33 A-H)
- Different development of some, or all, of the four characters 16
16. Maxillae appearing protracted in front of the mandibular

⁴⁴ The family Languriidae is usually considered as a subfamily of the Erotylidae. See also footnote⁵¹.

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	articulations by a complete or partial elimination of the cardines	17
	Maxillae deeply retracted. (Cardines distinct, or fused with stipites)	22
17.	Urogomphi present; terga without glandular openings ("foramina" of Peyerimhoff)	18
	Urogomphi absent; terga with paired glandular openings. (Labrum and clypeus fused with frons into a nasale; tarsungulus with a long adhesive hair)	21
18.	Eighth abdominal segment distinctly longer than seventh. (Small ninth abdominal segment with comparatively large urogomphi; often developed as a springing apparatus)	
	<i>Laemophloeidae</i> ⁴⁵ (pls. 31 G-K, and 32 H, I, K, L, P, Q)	
	Eighth abdominal segment about as long as seventh or shorter	19
19.	Larva parasitic and physogastric with slightly chitinized, white head and body. (Mandible without mola)	
	<i>Catogenidae</i> ⁴⁵ (pl. 33 I, J, L, M, O)	
	Larva not parasitic and not physogastric, head and body normally chitinized. (Mandible with, or, in single species, without mola)	20

⁴⁵ All of the following families and subfamilies—

- a. Cucujidae-Brontinae (including the genera *Brontes*, *Dedro- phagus*, and *Psammoecus*),
- b. Cucujidae-Cucujinae (including the genera *Cucujus*, *Pediacus*, and *Platissus*),
- c. Prostomidae (including the genera *Prostomis* and *Dryocora*),
- d. Laemophloeidae (including the genera *Prostominia*, *Narthecius*, *Lathropus*, *Laemophlocus*, *Dysmerus*, *Hemipeplus*, *Inopeplus*, and *Phloeostichus*), and
- e. Catogenidae (including the genera *Scalidia* and *Catogenus*)— are usually considered as one family, the Cucujidae, together with the genera *Oryzaephilus*, *Silvanus*, *Cathartus*, *Nausibius*, *Coccidotrophus*, *Eunausibius*, and *Telephanus*. These latter genera, according to the characters of the imagines, have lately been recognized by J. W. Wilson as constituting a separate family, the Silvanidae. (The Genitalia and Wing Venation of the Cucujidae and Related Families, Ann. Ent. Soc. Amer., June 1930, vol. 23, pp. 305-358). Doctor Wilson, however, does not find that the genitalia, wing venation, and body characters furnish a basis for a division of the Cucujidae (sensu Wilson) into four separate families, Cucujidae, Prostomidae, Laemophloeidae, and Catogenidae, as borne out by the characters of their larvae.

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20. Apical joint of labial palpus normal; hypostomal rods diverging posteriorly. (Submental-gular plate absent, indistinct, or distinct) *Phalacridae* (pls. 32 A-G, and 33 N, P-T)
- Apical joint of labial palpus minute; hypostomal rods parallel. (Submental-gular plate present and distinct) *Smicripidae*⁴³ (pl. 32 J, M-O)
21. Body elongate elliptical; all of the setae normal; first to seventh abdominal segments dorsally with large glandular openings (or "foramina"); nasale transverse and subrectangular *Corylophidae - Arthrolipinae* (*Arthrolips* and *Orthoperus*)⁴⁶ (pl. 34 A-C)
- Body broadly elliptical; many of the setae fanlike, or flagellate, or clubshaped covered with spinulae; first and eighth abdominal segments with "foramina"; nasale forming an eye-shadelike structure which covers all of the mouthparts *Corylophidae - Corylophinae* (*Corylophodes*, *Sericoderus*, *Sacium*, *Molamba*)⁴⁶ (pl. 34 D-I)
22. Cardo either comparatively small, narrow, often spindle-shaped, and longitudinally directed, or large, about as long or longer than stipes, triangular, and immovable, without posterior condyle. (Labial palpus one-jointed) 23
- Cardo either of moderate size, subtriangular, much shorter than stipes, and obliquely directed, or large, elongate-trapezoidal, movable, and with a posterior condyle, or fused with stipes to a large, movable structure with a posterior condyle. (Labial palpus one-jointed or two-jointed) 27
23. Cardo comparatively small, narrow and longitudinally directed 24
- Cardo large and triangular 25
24. Mandible with lamellate, usually long, multiserrate projection from inner margin between apex and molar part; maxillary mala with uncus on middle of inner margin; adhesive tarsungular hair absent. (Spiracles biforous; urogomphi present) *Nitidulidae-Nitidulinae* (pl. 35 A-II, J)
- Mandible with large, lobe-shaped projection from inner margin between apex and molar part; maxillary mala subeylin-

⁴⁶ P. de Peyerimhoff, Études sur les larves des coléoptères, II. *Corylophidae*, Ann. Soc. Ent. France, vol. 90, 1921, pp. 99-106, pl. 3.—According to the imagines the family *Corylophidae* is usually placed as an aberrant family in the Silphid association, but the larvae indicate no relationship to this group.

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- dricul, without uncus on middle of inner margin; adhesive tarsingular hair present and twice as long as tarsungulus itself. (Palpiger large, somewhat jointlike; labrum fused with clypeus; urogomphi reduced to a pair of wart-shaped tubercles) *Nitidulidae - Meligethinae*⁴⁷ (pl. 36 A-I)
25. Urogomphi present, short, broad, flat, and shoe-shaped with tips horizontal and turned toward each other; mala with uncus on middle of inner margin; adhesive tarsingular hair absent. (Mandible without lamellate, multiserrate inner margin between apex and the long, strong molar part; spiracles annular) *Nitidulidae - Prometopinae* (pl. 35 I, K-M)
- Urogomphi absent; mala without uncus; adhesive tarsingular hair present 26
26. Mala well-developed and cylindrical; maxillary palpus three-jointed; cardo not longer than stipes; no projections from eighth and ninth abdominal segments. (Inner margin of mandible behind apex multiserrate but without lamellate, lobe-shaped projection) *Nitidulidae-Cateretinae (Brachypterus, Amartus and Heterostomus)*⁴⁷ (pl. 36 J-P)
- Mala vestigial or absent, maxillary palpus two-jointed; cardo longer than stipes, subtriangular, and separated from stipes by a fine suture, both pieces membranous; eighth and ninth abdominal segments with a pair of conical and membranous projections laterally *Cybocephalidae*⁴⁸ (pl. 37 A-G)
27. Mentum well developed and free to base. (Mandibles symmetrical and with distinct retinaculum; urogomphi absent; spiracles annular; body with only fine and simple setae
*Sphindidae*⁴⁹ (pl. 41 F, H-M)
- Mentum not well developed, often fused with submentum, only free apically 28
28. Mandible with large, multituberculate or multicarinate molar structure; cardo proper distinct and subtriangular. (Body

⁴⁷ K. V. Verhoeff has proposed a new family, the Brachypteridae, including the two subfamilies, the Meligethinae and the Cateretinae, on larval characters. (Beiträge zur Kenntnis der Coleopteren-Larven mit besondere Berücksichtigungen der Clavicornia, Archiv. für Naturgeschichte, vol. 89, A. Heft 1, 1928, pp. 1-109, seven plates).

⁴⁸ The Cybocephalidae are usually considered as a tribe or a subfamily of the Nitidulidae. Larva described and figured by F. Silvestri (Metamorfosi del *Cybocephalus rufifrons* Reitter, Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, vol. 4, 1910, pp. 221-227; 13 figures referring to the larva).

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- often with numerous fan-shaped, spinulose, or otherwise uncommonly formed, small hairs; juxta-cardo present) 29
- Mandible without large, multituberculate or multicarinate molar structure 31
29. Body cheloniform, similar to body of a scale insect; along the sides with flat projections carrying spinulose setae. (Head not visible from above; distal end of maxillary mala provided with a brush of long, club-shaped hairs)
- Murmediidae*⁴⁹ (pl. 27 I-L)
- Body different. (Maxillary mala with or without a terminal brush) 30
30. Distal end of maxillary mala with a brush consisting of a few, about four, long, stiff, curved and pointed setae; mandible with distinct apical part *Endomychidae* - *Mycetaeinae*⁴⁹
(Pl. 39 A-G)
- Distal end of maxillary mala with a differently shaped, often large brush, or without a brush, or with a brush with few setae but then with a mandible without apical part.
- Endomychidae-Endomychinae*⁴⁹
(pls. 39 H-V, and 40 A-T)
31. Mandible with reduced, smooth, and usually condyliform molar (mola like?) structure; distinct hypopharyngeal sclerome present. (With or without cardo; juxtacardo absent; with or without lacinia mandibulae; three ocelli present on each side of head, except in the blind termitophilous larva of *Ortalistes rubidus* Gorham, from Barro Colorado island, Canal Zone, Panama)
- Coccinellidae-Coccinellinae* (pls.
37 H-L and 38 A-I)

⁴⁹ The larva of the different endomychid genera are remarkably distinct from each other, strongly emphasizing the compound character of the family. On the other hand, the family is closely linked both with the Lathridiidae and the Murmediidae, notably through the endomychid *Rhymbus*. The larva of this genus occupies a remarkable central position, approaching the specialized larvae of the major part of the lathridiid genera in the unique development of their mandibles, the primitive larva of the lathridiid genus *Eufallia* in having an almost separate lacinia and galea, and the Murmediidae in the possession of tufted pleural projections. Through this larva the Endomychidae and all of the families which are closely or more remotely related to them may be traced to primitive ancestors, in reality to near the leptinid association of the Staphylinioidea.

The larva of the Sphindidae, interpolated here before the endomychid association, represents unquestionably a simple, primitive cucujoid type, but its more precise systematic position is rather uncertain. (Compare pp. 109 and 110 in the paper by Peyerimhoff, quoted in footnote number 46).

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- Mandible without molar structure; hypopharyngeal sclerome weak or absent 32
32. Body armed with many long, often branched, setiferous dorsal and lateral processes 33
- Body without long setiferous dorsal and lateral processes 34
33. Three ocelli on each side; urogomphi absent; lacinia mandibulae absent *Coccinellidae-Epilachninae* (pl. 38 J-N)
- Five ocelli on each side; urogomphi well developed, often as long as body; lacinia mandibulae large
*Erotytidae*⁵⁰ (pl. 41 A-E, G)
34. Mentum and submentum not fused
*Dacnidae*⁵⁰ (pl. 42 A-T)
- Mentum and submentum fused. (Prementum, mentum, submentum, and gula with a common, hourglass-shaped plate toward which anterior part of hypostoma sends a bridge as in Staphylinini) *Melandryidae*⁵⁰ (pl. 43 A-Z, AE)
35. Body terminating in a deciduous ovate appendix
*Scaptidae*⁵⁰ (pl. 44 A-E)
- Body not so 36
36. Mandible with a taillike, hairy appendix or a fleshy, hairy lobe behind the base of mola. (Right and left mandibles only slightly different) 37
- Mandible without such appendix or lobe 38
37. Hypopharyngeal sclerome strong and ring-shaped; three large and two or three small ocelli present on each side of the head; appendix of mandible tail-shaped
*Byturidae*⁵¹ (pl. 45 A-N)
- Hypopharyngeal sclerome small and shaped like a cup on top of a large, slightly chitinized dome; one ocellus present on each side of head; appendix of mandible lobe-shaped
*Anthicidae - Euglenidae - Anaspidae*⁵¹ (pls. 46 A-W and 47 A-I)

⁵⁰ From the family Melandryidae are excluded the genera *Eustrophus* and *Penthe* which are placed in the family *Dacnidae*, the genus *Scaptia* which forms a separate family, Scaptidae, and the genus *Synchroa* which also forms a separate family, Synchroidae.

⁵¹ In *Anthicus heroicus* Casey the cup-shaped top of the hypopharynx is very thinly chitinized and is recognized only by careful examination. The genus *Anaspis*, usually considered as belonging to the Mordellidae, can by no character be distinguished from the Anthicidae; neither can the euglenid genus *Hylophilus* according to the larva of *Hylophilus populneus* Panzer which has been reared by E. C. Rosenberg in Denmark. The mandibles of the family

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38. Abdominal spiracles located in disklike scleromes. (Urogomphi branched, with the inner prong directed toward the sagittal line) *Eurystethidae* (= *Aegialitidae*) (pl. 48 A-F)
- Abdominal spiracles not located in disklike scleromes 39
39. Mandible without molar structure. (Larva parasitic and physogastric) *Bothrideridae* (*Devetaphrus* and *Bothrideres*) (pl. 44 F-N)
- Mandible with molar structure 40
40. Larva elongate, cylindrical or subcylindrical, or more fusiform. (Body well chitinized or fleshy; urogomphi present and corniform, or absent) 41
- Larva elongate and strongly depressed with parallel sides. (Body smooth and shining; urogomphi always present and often of very distinctive shape) 49
41. Cardo simple 42
- Cardo divided into two parts 44
42. Hypopharynx only slightly or not chitinized; mandibles symmetrical. (Mola of mandible depressed with a ventral grinding surface; presternum of prothorax subtriangular; often with a small pit between bases of urogomphi) *Colydiidae* (*Colydiini*, *Synchitini* and, probably, *Monoedini*) (pl. 49 A-M)
- Hypopharynx with a sclerome at base; mandible asymmetrical 43
43. Mola of mandible depressed, and with a grinding surface on the ventral side or on both the dorsal and ventral sides. (Presternum of prothorax usually elliptical and transverse) *Mycetophagidae* (pl. 50 A-T)
- Mola not depressed, and with a grinding surface facing the buccal cavity 53
44. Urogomphi present 45
- Urogomphi absent. (Paired ambulatorial warts usually well-developed dorsally and ventrally on anterior body segments; mandibles asymmetrical) *Oedemeridae-Oedemerinae* (pl. 51 A-F)
45. Ambulatorial warts present ventrally on second to fifth abdominal segments. (Mandibles symmetrical; urogomphi simple and curved upward, a pit present between their bases;

group Anthicidae and the mandibles and hypopharyngeal sclerome in the Byturidae are rather similar to the same structures of the Languridae (pl. 28 I, J, N) indicating close affinity between these families.

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- ninth abdominal segment ventrally with two to three points on each side; maxillary mala with terminal incision)
Oedemeridae - Calopodinae (pl. 51 G-M)
- Ambulatorial warts absent 46
46. Ninth abdominal venter simple, without conical points 47
 Ninth abdominal venter with a conical point on each side 48
47. Submentum and gula fused and heavily chitinized. (Urogomphi well-developed, but white and rather soft)
Cephaloidea (pl. 52 J-L, N, O)
- Submentum and gula fleshy. (Urogomphi corniform, strongly chitinized and curved upward)
Zopheridae (*Zopherus*, *Zopherodes*, *Phellopsis* and *Phloeodes*)^{52a} (pl. 52 F-I, M)
48. Urogomphi simple, corniform, and curved upward; spiracles annular-biforous *Synchroidea* (*Synchroa*)⁵⁰ (pl. 52 A-E)
- Urogomphi with a branch at base; spiracles annular
Pedilidae (*Eurygenius*) (pl. 53 A-H)
49. Venter of ninth abdominal segment with transverse row of asperities, or of small plates 50
 Venter of ninth abdominal segment not so armed. (Hypopharynx fleshy; each urogomphus broadly bifurcate; spiracle biforous) *Salpingidae* (*Rhinosisimus*)^{52b} (pl. 54 A-H)
50. Eighth abdominal segment at least twice as long as ninth, urogomphi excluded; a pair of pits in margin between urogomphi 51
 Eighth and ninth abdominal segments subequal, urogomphi excluded; a single pit present in margin between urogomphi. (Asperities of ninth abdominal venter in a broken arch) 52
51. Ninth abdominal venter bearing asperities arranged in a continuous arch *Pyrochroidea* (pl. 53 I-K and L-O)
- Ninth abdominal venter bearing small plates in place of asperities *Boridae* (*Boros unicolor*)⁵³ (pl. 48 G-K and 55 A-I)

^{52a} The genera of the family Zopheridae are usually placed in the tribes Zopherini and Nosodermini of the family Tenebrionidae.

^{52b} Usually considered as a separate subdivision of the family Pythidae.

⁵³ According to the characters of the imago the genus *Boros* has been placed either in the Tenebrionidae or in the Pythidae by most of the authors, but according to the characters of the larva it is considered by R. A. St. George (Proc. Ent. Soc. Wash., vol. 33,

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H. BYRRHOIDEA

The series contains only one family, the Byrrhidae. The genus *Nosodendron* is often placed in this family but belongs, according to the larval characters, in the subsequent series Dascilloidea, constituting a special family, Nosodendridae (p. 44).

KEY TO SUBFAMILIES

- 1. Distal half of the mandibular inner edge entire between the tip and a low tooth at the middle of the edge
Byrrhidae-Byrrhinae (pls. 61 A-K, 62 A-B, D-H)
- Distal half of the mandibular inner edge multidentate 2
- 2. Tenth abdominal segment with a pair of hooks
Byrrhidae-Amphicyrtinae (pl. 62 C, I-L)
- Tenth abdominal segment without hooks. (Labrum with anterior margin deeply emarginate sagittally)
Byrrhidae-Liooninae (pl. 62 M-R)

I. DASCILLOIDEA

This series does not conform with the series named Dascilloidea in the classification of the imagines but it has been considered expedient to retain the old serial name in the present tabulation of families which according to the larvae seem properly associated with the genus *Dascillus*. The larval characters of the Eucinetidae indicate that this family belongs in the series Cucujoidea (p. 33), or possibly in the leptinid association of the Staphyliinoidea near the family Ptiliidae (p. 26).

KEY TO FAMILIES AND SUBFAMILIES

- 1. Eighth abdominal segment of normal form and not terminal; ninth abdominal segment large; spiracles cribriform. (Nine pairs of spiracles always present and all lateral) 2
- Eighth abdominal segment large and terminal; ninth abdominal segment vestigial; spiracles annuliform or biforous. (Either with nine pairs of spiracles present and well developed, or with all vestigial except those on eighth abdominal segment; the latter large and close together below posterior end of eighth tergite) 3
- 2. Tenth abdominal segment almost obliterated and without soft, terminal prolongation; ocelli absent; antenna long; maxil-

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lary articulating area large and cushioned; hypopharyngeal scleromes asymmetrical, strong, and much differentiated

Dascillidae (*Dascillus*) (pl. 63 A-I)

Tenth abdominal segment well-developed, with soft, terminal, unpaired, two-jointed, and retractile prolongation (anus placed immediately below ninth abdominal tergite); five ocelli on each side; antenna short; maxillary articulating area rather small and indistinct; hypopharyngeal scleromes symmetrical, of moderate strength, and not very much differentiated *Heteroceridae*⁵⁴ (pl. 64 A-M)

3. Spiracles vestigial or absent, except an annuliform pair on eighth abdominal segment; three terminal tufts of gills retractile into a pocket without an operculum; antenna multiarticulate and very long; one large ocellus and one small ocellus on each side (Mandible dimorph)

Helodidae (pl. 65 A-H)

Spiracles all present and biforous; gills absent; antenna three-jointed and of moderate length; five ocelli on each side

*Nosodendridae*⁵⁵ (pl. 66 A-P)

J. DRYOPOIDEA

This series does not conform with the series named Dryopoidea in the classification of the imagines but it has been considered expedient to retain the old serial name in the present tabulation of several families which according to the larvae are associated with the genus *Dryops*.

KEY TO FAMILIES AND SUBFAMILIES

1. Terminal cloacal chamber and movable operculum absent ... 2
 Terminal cloacal chamber present and furnished with three tufts of retractile gills and with a movable operculum below ninth abdominal tergum 5
2. Body cylindrical; without ventral gills (except in an Asiatic larva probably belonging to the Ptilodaetyliidae); spiracles biforous 3
 Body flat, broadly oval, limpetlike; with five pairs of ventral gills freely exposed from second to sixth abdominal segments; spiracles annuliform 4
3. Antenna comparatively long; tenth abdominal segment with a pair of large lobes usually carrying spinose diverticles. (In

⁵⁴ The family Heteroceridae is usually placed, according to the characters of the imagines, in the series Dryopoidea.

⁵⁵ The taxonomic position of this family is much debated but, according to the characters of the imagines, it is usually placed in the series Byrrhoidea.

LARVAL FORMS OF COLEOPTERA

- Anchytarsus* with, and in *Ptilodactyla* without, gills from tenth abdominal segment) *Ptilodactylidae*⁵⁶ (pls. 67 A-J, 68 A-H, 69 A-H)
- Antenna short; tenth abdominal segment without diverticles. (Gills lacking) *Euryypogonidae*⁵⁶ (pl. 69 I-S)
4. Lateral expansions of eighth abdominal segment present
Psephenidae - *Eubrianacinae*⁵⁷
(pl. 70 A-E, G)
- Lateral expansions of eighth abdominal segment absent (Mandible dimorphic in the same species, either simple, rather short, and terminally truncate, or composed of a basal and a terminal, pointed portion)
Psephenidae - *Psepheninae* (pl. 70 F, H-P)
5. Nine pairs of spiracles present, all projecting and either cribriform, or biforous but of a deviating sinuous type. (One ocellus on each side; ninth abdominal segment conical, or subconical and terminally bifurcate; appendix from operculum short and broad) *Chelonariidae*⁵⁸ (pl. 71 A-J)
- Spiracles present in a number varying from one to nine pairs, either annuliform or regularly biforous, never sinuous 6
6. Five ocelli on each side. (Body subcylindrical; mandible apically bidentate; ninth abdominal tergite terminally emarginate) *Dryopidae-Larinae* (*Lara*) (pl. 72 A-I)
- One large ocellus on each side 7
7. Head concealed beneath prothoracic dorsal shield; ninth abdominal segment dorsally flattened, more or less semicircular, or subrectangular. (Mandibles either simple and terminally obtuse, or terminally tridentate, or composed of a basal and a terminal pointed portion)
Dryopidae-Pelonominae (*Pelonomus*, *Helichus*, and *Psephenoides*) (pls. 70 Q-V, 72 J-K, 73 F-O)
- Head exerted and visible from above; ninth abdominal segment subconical, often distally furcate. (Mandibles termi-
- ⁵⁶ According to the characters of the imagines, the *Ptilodactylidae*, including *Anchytarsus* and *Ptilodactyla*, and the *Euryypogonidae*, including *Euryypogon*, are usually placed in the series *Dascilloidea*.
- ⁵⁷ The subfamily *Eubrianacinae*, based on the genus *Eubrianax*, is usually placed in the *Dascilloidea*.
- ⁵⁸ The family *Chelonariidae* is usually placed in the series *Dascilloidea*.

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nally bidentate or tridentate, alternating in some dimorphic species with rather short and terminally truncate ones).....
Dryopidae - Helminae (*Dryops*,
Helmis, *Limnius*, *Ancyronyx*,
etc.) (pls. 71 K-Z, 73 A-E)

K. CANTHAROIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Ninth abdominal segment posteriorly with unpaired pointed prolongation, or paired urogomphi; body with featherlike or spinose processes. (Nasale posteriorly limited by a faint line; epicranial halves meeting ventrally; subfacial sinus of epicranium for the reception of the ventral mouthparts present; mandibles inserted well apart, falciform, canaliculate and without retinaculum; galea one-jointed) 2
- Ninth abdominal segment without unpaired posterior prolongation and without paired urogomphi; body without conspicuous processes 3
2. Frontal sutures present; cardo present; gular suture long; second antennal joint enlarged; ninth abdominal segment posteriorly tapering into a long, spinose prolongation; body dorsally with spinose warts, laterally with featherlike prolongations *Brachypsectridae* Blair⁵⁹ (pls. 74 A-F, 75 A)
- Frontal sutures absent; cardo absent or completely membranous; gular area very short; second antennal joint not enlarged; ninth abdominal segment with paired urogomphi; body with spinose, dorsal, or dorsal and lateral, prolongations. (Spiracles in small separate epipleural projections or plates) *Drilidae* (*Drilus* and *Silasia*)⁶⁰ (pls. 74, G-N, 75 B-E, 77 A)

⁵⁹ Blair, K. G., *Brachypsectra*, Lee.—The Solution of an Entomological Enigma, *Trans. Ent. Soc. London*, June 30, 1930, vol. 78, pp. 45-50, one plate.

The family *Brachypsectridae*, Blair, is considered a valid family according to the characters of the larva but, following H. S. Barber, it is here placed in the series *Cantharoidea*. It has close affinities to the larvae of *Drilus* and *Silasia*. The suggestion of Blair to join it with the *Elateroidea* has not been followed even if it unquestionably has close affinities with this latter series and particularly with the subfamily *Cardiophorinae*. In agreement with Blair, the usual conception of *Brachypsectra* as daseilloid is here disregarded.

⁶⁰ *Drilus* has polymorphic metamorphosis, the last instar of this snail-eating larva being maggotlike with a white, soft body and

LARVAL FORMS OF COLEOPTERA

3. Epicranial halves meeting ventrally forming a transverse bridge4
 Epicranial halves not meeting ventrally. (Subfacial sinus incomplete or not present; tenth abdominal segment bearing retractile appendices) 8
4. Nasale long, spatulate, distally with median emargination; ventral epicranial bridge narrow and band-shaped; cardo absent; body segments with dorsal shields⁶¹

Homolisiidae

Nasale short; ventral epicranial bridge broad, sagittally about half as long as cranium; cardo present; body segments fleshy, with velvety pubescence interspersed with fine setae. (Thoracic and most of abdominal segments with a pair of dorsal glands; subfacial sinus deep)⁶² 5

5. Mandible entirely without retinaculum; mandibular canal almost closed longitudinally, and distally having an oval opening. (Anterior margin of nasale projecting, subtriangular, but without median grainlike tooth between a pair of longitudinal grooves *Cantharidae-Malthinae* (pl. 77 B-G)

Mandible with a large retinaculum (except in *Podabrus*, where it is small and tuberculiform); mandibular canal open longitudinally and without a special distal opening 6

6. Maxilla without free, jointlike galea; anterior nasal margin multi-serrate without a median grainlike tooth visible from above *Cantharidae - Chauiognathinae* (pl. 78 A-I)

Maxilla with free, conical, one- or two-jointed galea; anterior nasal margin straight with a projecting median grainlike tooth between a pair of short longitudinal grooves 7

very reduced membranous antennae, mouthparts and legs. The characterization given above refers to the larval instars prior to the last one. See article by E. C. Rosenberg (Ent. Medd. Ser. 2, vol. 3, 1909, two plates).

⁶¹ Bertkau, P., Deut. Ent. Ztschr., 1891, pp. 37-42, one plate.

Verhoeff, K. W., Zur Kenntnis der Canthariden-Larven, Archiv für Naturgeschichte, vol. 89, A, Heft 1, 1923, pp. 110-137, one plate.

⁶² According to Verhoeff, K. W. (Zur Entwicklung, Morphologie und Biologie der Vorlarven und Larven der Canthariden, Archiv. für Naturgeschichte, vol. 83, A, Sept. 2, 1917, pp. 102-140, one plate), foetometamorphosis occurs in members of the family Cantharidae, two free-living foetal instars with vestigial antennae, mouthparts and legs appearing before the first real larval instar. This first instar itself differs only in minor characters, for instance in the proportional length of the joints of the antennae and the maxillary palpi, from the rest of the larval instars.

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7. Second antennal joint prolonged distally on the inner side into a cylindrical process carrying the apical joint; cylindrical process of second joint of about the same length or longer than basal portion of joint; sensory appendix large; inner margin of mandible without a longitudinal series of setae

Cantharidae-Malthodinae (pl. 77
I, K, L)

Second antennal joint without a distinct cylindrical process; inner margin of mandible ventrally and medianly with a longitudinal series of short, densely set setae. (Retinaeculum either with (in *Silis*) or without (in *Cantharis* and *Podabrus*) a small tooth posteriorly at base)

Cantharidae-Cantharinae (pl. 77
H, J, M-U)

8. Frontal sutures present; abdominal spiracles placed in the epipleural plates. (Mandibles separate at base, perforated by a longitudinal canal, and often associated proximally with an ear- or tooth-shaped hairy enlargement; retinaeculum present, but very small in a few forms as *Photinus*; luminous organs usually present; saelike gills from sides of first to eighth abdominal segments present in some aquatic Lampyrid larvae*Lampyridae*⁶³ (pls. 74 O-V, 75

F-H)

Frontal sutures absent; abdominal spiracles placed in the parascutal areas above the epipleura. (Mandibles either separate or meeting at base; retinaeculum absent)9

9. Stipes and mentum separate; cardo present; galea palplike and two-jointed; mandibles separate, perforated by a longitudinal canal; antenna three-jointed with apical joint and disk shaped appendix. (Luminous organs usually present)

Phengodidae (pls. 74 W-X, 75
I-K)

Stipes and mentum fused; cardo vestigial or absent; galea one-jointed; mandibles meeting sagittally at base; each mandible cleft from tip to base, with the inner part dagger-shaped and sliding into an open canal in outer part; antenna one- or two-jointed, distally covered with a large, dome-shaped appendix (*Caeniella* with inflated, tubular dorsal projections)...

Lycidae (pl. 76 A-K)

⁶³ Vogel, R., *Lampyris noctiluca* L., Ztschr. f. wiss. Zool., vol. 112, 1915, pp. 291-432, four plates, many figures in text.

Bugnion, E., *Phausis delarouzei* Duv. and *Luciola lucitanica* Charp., Mem. Suppl. au Riviera Scientifique, 1929, pp. 1-131, figs. 1-61.

Blair, K. G., Aquatic Lampyrid larva from S. Celebes, Trans. Ent. Soc. Lond., 1927, pp. 43-45, one figure.

LARVAL FORMS OF COLEOPTERA

L. ELATEROIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Labrum distinct. (Headcapsule and mouthparts neither reduced nor abnormal) 2
 Labrum and clypeus fused, forming a nasale immovably united with frons. (Spiracles biforous) 6
2. Spiracles biforous; ninth abdominal segment opercular; body cylindrical and strongly sclerotized; legs distinct
 Rhipicridae (*Zenoa*) (pl. 79 A-H)
 Spiracles cribriform; ninth abdominal segment well-developed and not opercular; body fleshy, with a dorsal and a ventral plate of the same shape, more or less covering a flattened and enlarged prothorax; legs absent or very much reduced. (Chordotonal organs often very distinctly indicated laterally on many of the segments by a deep auditory pit) 3
3. Prothorax only slightly broader or even slightly narrower than the first abdominal segments; larva either spindle-shaped (*Pachyschelus*), or wedge-shaped and with transverse anus (*Brachys* and the european *Trachys*). (Leaf miners)
 Buprestidae-Pachyschelinae (pl. 80 A-D)
 Prothorax distinctly broader than the first abdominal segments; larva clublike and somewhat flattened; anus a longitudinal slit 4
4. Tenth abdominal segment large, terminating with a pair of pointed and hard prolongations
 Buprestidae-Agrilinae (*Agrilus*, *Eupristocerus*) (pl. 80 E)
 Tenth abdominal segment rounded, often with a pair of soft warts but without strong, hard prolongations 5
5. Dorsal plate of prothorax with or without asperities, medianly marked with an inverted Y- or V-shaped groove
 Buprestidae-Buprestinae (*Chalcophorini*, *Buprestini*, *Chrysobothrini*) (pl. 80 F-K)
 Dorsal plate of prothorax without asperities and marked medianly with an I-shaped groove
 Buprestidae-Polycestinae (*Polycestini*, *Thrinopygini*)
6. Headcapsule and mouthparts very much reduced or extremely specialized. (Prothorax ventrally, or both dorsally and ventrally, with a pair of separate, rod-shaped, longitudinal scleromes often of a form suggesting a figure 7 or a letter T) 7

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- Headeapsule and mouthparts slightly reduced or entirely normal 8
7. Legs short but with normal joints
*Throscidae*⁶⁷ (pl. 81 A-D)
 Legs vestigial or absent *Melasidae* (= *Eucnemidae*) (pl. 81 H-Q)
8. Gular area well-developed and quadrangular 9
 Gular area small and indistinct, or represented only by a median, long or short gular suture 10
9. Larva strongly sclerotized; dorsal and ventral prothoracic scleromes united into a solid cylinder; cervical membrane very large and eversible forming a balloon-shaped sack below the head when raised *Cebrionidae* (including former family *Plastoceridae*⁶⁴) (pl. 79 I-P)
 Larva white and soft-skinned; dorsal and ventral prothoracic parts not forming a cylinder; cervical membrane not eversible. (Antenna and labial palpus one-jointed; legs small and three-jointed). (Parasitic in immature stages of cicadas) *Sandalidae*⁶⁵ (pl. 82 A-G)
10. Abdomen entirely soft-skinned; typical abdominal segments transversely divided into three, ring-shaped portions of almost equal length; median portion subglobular, bearing ampullae and spiracles. (Tenth abdominal segment with three digitate or palmate and retractile appendices; mandible deeply cleft into a dorsal, dentate, and a ventral, simple part) *Elateridae - Cardiophorinae* (pl. 83 A-O)
 Abdomen completely or partially sclerotized; abdominal segments not divided into three ring-shaped portions of almost equal length 11
11. Ninth abdominal segment in front of terminal urogomphi with a pair of dorsal, distantly placed, curved prongs with concavities facing either toward each other (*Drapetes*) or backward and downward (*Oestodes*). (Nasale bilobed; frons broadly attaining the occipital foramen)⁶⁶
Elateridae - Oestodinae (pl. 83 P-Y)

⁶⁴ Hyslop, J. A., Proc. Ent. Soc. Wash., vol. 25, 1923, pp. 156-160, one plate.

⁶⁵ The family is distinctly different from the family Rhipiceridae. Craighead, F. C., Proc. Ent. Soc. Wash., vol. 23, 1921, pp. 44-48, one plate.

Emden, F. von, 3 Wanderversammlung deutscher Entomologen in Giessen, 1929, p. 115.

⁶⁶ *Drapetes* is usually placed in the family Throscidae. An unidentified elateroid larva, found in a decayed red oak log from

LARVAL FORMS OF COLEOPTERA

- Ninth abdominal segment without dorsal prongs in front of urogomphi 12
12. Body dorsoventrally flattened; ninth abdominal tergite either with a pair of well-separated urogomphi or a single biramous process (pls. 84 G, 85 O); tenth abdominal segment more or less produced and often bearing hooks or other armature *Elateridae - Pyrophorinae* (pls. 84 A-S, 85 A-R, 86 A-E)
- Body more or less cylindrical; ninth abdominal tergite without urogomphi; tenth abdominal segment small, not produced, and never bearing armature *Elateridae - Elaterinae* (pl. 86 F-U)

M. SCARABAEOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Stridulating organs present on second and third pairs of legs (pl. 87 E, I); abdominal terga not plicate. (*Lacinia* and *galea* separate (pl. 87 B, F)) 2
- Stridulating organs absent, or present as teeth on dorsal inner margin of maxillary stipites, usually working against a granulate or striped area on ventral side of mandibles; (pl. 88 M, P) abdominal terga plicate. (*Lacinia* and *galea* separate or fused (pl. 87 V)) 7
2. Anus longitudinal between two large, oval, often sclerotized pads at end of body (pl. 87 J); third pair of legs normal 3
- Anus transverse; end of body different; third pair of legs reduced and much shorter than second pair 6
3. Dorsal shield of prothorax anteriorly on each side with a triangular, forwardly directed process *Lucanidae - Sinodendrinae* (pl. 87 I, J)
- Dorsal shield of prothorax without process 4
4. Left mandible in front of molar part with two (*Nicagus*) or three teeth (*Ceruchus*) *Lucanidae-Aesalinae* (pl. 87 K)
- Left mandible in front of molar part with four or five teeth 5
5. Tenth abdominal segment slightly hairy dorsally; claw somewhat curved; left mandible either with four (*Platycerus*) or five teeth (*Dorcus*) *Lucanidae-Dorcinae*
- Tenth abdominal segment hairy dorsally; claw strong and straight; left mandible with five teeth *Lucanidae - Lucaninae* (pl. 87 A-D)

North Carolina, probably belongs in or near the *Oestodinae* but it also possesses characters, present in the ventral mouthparts and the sternal region of prothorax, which approach it to the *Throscidae* (pl. 81 E-G).

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6. Mandible without ventral accessory condyle; antenna and maxillary palpus two-jointed; abdominal terga without numerous spines or hairs; dorsal and ventral anal lobes small, ventral lobe with a pair of elongate lanceolate pads
Passalidae (pl. 87 E-H)
- Mandible with accessory ventral condyle; (pl. 88 J) antenna and maxillary palpus more than two-jointed; abdominal terga with numerous spines or hairs; dorsal anal lobe semi-circular, ventral anal lobe laterally grooved and much broader than dorsal *Geotrupidae*
7. Lacinia and galea separate 8
 Lacinia and galea fused 16
8. Stridulating organs absent (pl. 87 X) 9
 At least maxillary stridulating teeth present (pl. 87 V) 10
9. Labrum sometimes anteriorly bilobed with a median emargination, usually subtriangular with rounded corners; anal lobes swollen, the dorsal entire, the ventral with median groove; (pl. 87 M, T) raster⁶⁷ without longitudinal or transverse series of setae; some species with biforous spiracles, as found in *Trox scaber* L. from Europe (pl. 87 Q, R) *Trox unistriatus* Beauvois and *Trox aequalis* Say, others with cribriform spiracles, as found in *Trox oligonus* Loomis (pl. 87 S); claw long and pointed, antenna with three joints, two normal and the terminal minute
Trogidae (pl. 87 L-T)
- Labrum with distinctly multiserrate anterior margin; anal lobes normal; raster⁶⁷ with a single transverse row of spatulate setae; spiracles cribriform; claw normal; antenna four-jointed *Acanthoceridae* (*Cleoetus*)
10. Dorsal and ventral anal lobes swollen. (Ventral lobe medianly divided by a longitudinal groove) 11
 Anal lobes not particularly swollen. (Anus transverse and straight, or V-shaped) 15
11. Legs incomplete, claws absent or minute on all legs; abdomen strongly humped dorsally 12
 Legs complete, with normal claws; abdomen not humped 14
12. Legs distinctly two-jointed (consisting of a long coxa and a still longer, strongly pointed joint with a terminal seta; terminal joint with shallow, annulate constrictions but not bent at the middle) *Scarabacidae-Coprinae, part one*
 (*Onthophagus*)
- Legs distinctly or indistinctly three-jointed 13
13. Coxa, femur, and tibia distinct and all of the same length; tibia conical and ending bluntly; no claw
Scarabacidae-Coprinae, part two
 (*Canthon*)

⁶⁷ The term "raster," meaning a rake, applies to a spinose area on the ventral side of the tenth abdominal segment (pl. 88 A, C, H).

LARVAL FORMS OF COLEOPTERA

- Coxa distinct, femur and tibia apparently fused but forming an angle with each other; claw minute (no terminal seta)
Scarabaeidae - Coprinae, part three (Coprins)
14. Raster with a longitudinal series of strong, simply pointed or triespicate spines on each side of middle line
Scarabaeidae - Aphodiinae, part one (Aphodius rufipes group)
- Raster without paramedian series of spines
Scarabaeidae - Aphodiinae, part two (Aphodius fossor group)
15. Claw very long and pointed, longer than tibia; head flat above; body woolly; anus transverse
Scarabaeidae - Glaphyrinae (Lichnanthe)
- Claw moderately long, shorter than tibia; head convex above; dorsal areas densely beset with short, strong, dark setae; anus angulate *Scarabaeidae-Pleocominae*
16. Anus obtusely or acutely angulate, usually V- or Y-shaped (pl. 88 H). (Mandibular stridulating area without distinct outline and formed by minute granulations (pl. 88 J); sometimes entirely absent)17
- Anus transverse, not angulate (pl. 88 C). (Mandibular stridulating area oval and formed by transverse striae; absent in *Valgus*)21
17. Raster with two longitudinal rows of pointed setae
Scarabaeidae - Melolonthinae-Melolonthini
- Raster without two longitudinal rows of pointed setae 18
18. Raster with transversely arranged setae 19
- Raster with setae placed without order 20
19. Setae arranged in a transverse mustachelike patch
Scarabaeidae - Melolonthinae-Diplotarini
- Setae spinelike, arranged in a single transverse, curved row
Scarabaeidae-Sericinae (pl. 88 H-L, N)
20. With large patch of closely set asperities on each side of raster
Scarabaeidae - Macroductylinae - Dichelonycini
- Without patch of asperities on each side of raster
Scarabaeidae - Macroductylinae - Hopliini (Macroductylus and Hoplia)
21. Epipharynx without a curved single row of small spines parallel with and behind the median part of the anterior

LARVAL FORMS OF COLEOPTERA

- margin of labrum. (Stridulating organs present, terga of ninth and tenth abdominal segments distinguishable; labrum usually asymmetrical and not trilobed) 22
- Epipharynx with a curved single row of small spines behind the median part of the anterior margin of labrum (pl. 87 Z) (except in *Valgus* which, however, has no stridulating organs). (Terga of ninth and tenth abdominal segments usually fused completely; labrum symmetrical, often trilobed) 24
22. Lateral margin of labrum on buccal side with a series of transverse striae (pl. 88 D) *Scarabaeidae-Rutelinae-Anomalini* (pl. 88 B-D, F, G)
- Lateral margin of labrum on buccal side without striae (pl. 87 U) 23
23. Stridulating teeth of maxillary stipes pointed and curved (pl. 87 V). (Distal joint of maxillary palpus usually without a setaceous sensory area) *Scarabaeidae-Rutelinae-Rutelini* (pls. 87 U, V, 88 A)
- Stridulating teeth of maxillary stipes truncate, as broad as long, not curved (pl. 88 M). (Distal joint of maxillary palpus often ending in a setaceous sensory area) *Scarabaeidae-Dynastinae* (pl. 88 E, M, O-R)
24. Anterior margin of labrum not distinctly trilobed, almost straight or slightly emarginate in the middle (pl. 87 W, Y); ninth and tenth abdominal terga separated; tarsungulus long and pointed 25
- Anterior margin of labrum distinctly trilobed (pl. 87 Z); ninth and tenth abdominal terga fused into a single dorsal unit; tarsungulus different 26
25. Raster present, with numerous, minute, dark spinulae between the longer setae; epipharynx with triangular callus and a curved transverse series of small spines behind the anterior margin of labrum (pl. 87 Y) *Scarabaeidae-Trichiinae (Trichiotinus, Trichius, Trigonopeltastes, Gnorimella)* (pl. 87 Y)
- Raster absent, end of abdomen with long, soft hairs; epipharynx without a triangular callus and without a curved series of spines behind the anterior margin of labrum. (Labrum strictly symmetrical, slightly emarginate in the middle) *Scarabaeidae-Valginae (Valgus)* (pl. 87 W, X)
26. Tarsungulus cylindrical, distally obtuse (except in *Euphoria*); raster with median pair of distinct, longitudinal series of spines *Scarabaeidae - Cetoniinae, part one (Gymnetini and Cetonini)* (pl. 87 Z)

LARVAL FORMS OF COLEOPTERA

Tarsungulus short, thick, conical; raster without a pair of longitudinal series of spines

Scarabaeidae - Cetoniinae, part two, (Cremastochelini and Osmodermini; the latter tribe usually placed in the Trichiinae)

N. CLEROIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Frontal sutures present2
 Frontal sutures absent. (Apex of mandible with two or more teeth; endoparasitic, physogastric larvae)16
2. Lacinia distally armed with one or more spurs. (Body covered with long or short barbed hairs)3
 Lacinia without spurs4
3. Paired urogomphi present; submentum and gular areas united; mandible with a stiff process and a hair brush at base
Dermestidae - Dermestinae (pl. 89 A-Q)
- Urogomphi absent; submentum and gular areas usually separated; mandible without spur and brush at base. (Larvae often with conspicuous hair tufts)
Dermestidae - Attageninae (pl. 90 A-Z)
4. Ventral mouthparts retracted. (Distance between posterior ends of cardines and occipital foramen usually shorter than frons)5
 Ventral mouthparts protracted. (Distance between ends of cardines and occipital foramen as long as frons)8
5. Mandible with a long, stiff prosthecal process near the middle or at the base of the inner margin. (Median epicranial suture well developed)*Melyridae* (pls. 91 A-N, 92 A-J)
- Mandible with a short or no prosthecal process. (Median epicranial suture usually not well developed, or entirely absent)6
6. Antenna with the sensory appendix longer than the distal joint. (Distal joint carrying a very long and strong terminal seta)*Ciidae*⁶⁵ (pl. 92 K-R)
- Antenna with sensory appendix shorter than distal joints, or absent7

⁶⁵ According to the characters of the imagines, the systematic position of this family is not clear, but usually it is placed in the series Bostrichoidea. In the larvae, the division of the mala into a lobe-like galea and a smaller lacinia hidden below the galea sug-

LARVAL FORMS OF COLEOPTERA

7. Prothorax with well-separated presternal plates and with a well-defined lanceolate median sternal plate
Ostomatidae-Tenebroidinae (pls. 93 A-Q, 94 A-I)
 Prothorax without well-defined presternal plates and without a median lanceolate sternal plate
Ostomatidae - Ostomatinae (pl. 93 D, 94 J-U)
8. Frons posteriorly with straight, transversal margin
Cleridae-Hydnoцерinae (pl. 95 B-H)
 Frons posteriorly angulate 9
9. Epicranial suture well developed
Cleridae-Thauroclerinae (pl. 95 V)
 Epicranial suture not well developed 10
10. Antenna with second joint larger than basal joint; ninth abdominal segment conical, bifid. (One ocellus)
Cleridae-Priocerinae (pl. 95 P)
 Antenna with second joint shorter than basal; ninth abdominal segment otherwise 11
11. All spiracles large and biforous; two ocelli present on each side. (Prothorax with separated presternal plates and a median sternal plate)*Cleridae-Korynetinae* (*Necrobia* and *Korynetes*)
 Anterior or all spiracles annuliform or pseudo-annuliform; never with two ocelli present on each side. (Prothorax with or without presternal plates and median sternal plate) 12
12. Ocelli one (*Monophylla*) or three (*Cymatodera* and *Tillus*)
Cleridae-Tillinae (pl. 95 K, N, R, X)
 Ocelli absent, or four, or five 13
13. Ocelli absent. (Body tumid; without ambulatorial ampullae)
Cleridae-Orthopleurinae (pl. 95 S)
 Ocelli four or five 14
14. Two or more of abdominal segments with paired protruding dorsal ambulatorial ampullae; cardo with narrow, band-like basal sclerome 15

gests bostrichoid relationship, but a similar division is also found in some of the Cleroidea; and the presence of long and converging frontal sutures, a distinct gular area, paired urogomphi, and the absence of paired oval lobes in front of anus speak strongly against a taxonomic position within the Bostrichoidea and for the association with the Cleroidea.

LARVAL FORMS OF COLEOPTERA

- Paired ambulatorial ampullae absent; cardo with extensive sclerome *Cleridae-Clerinae* (*Opilo*, *Trichodes*, *Thanasimus*, *Enoclerus*, *Placopterus*) (pl. 95 A, I, J, M, Q, T, U)
15. Ocelli five; more than two of abdominal segments with dorsal ambulatorial ampullae *Cleridae-Enopliinae* (*Neichnea*, *Phyllobaenus*, *Charieessa*, *Creggya*) (pl. 95 O)
- Ocelli four; only two abdominal segments with ambulatorial ampullae *Cleridae-Tarsosteninae* (pl. 95 L)
16. Antenna with sensory appendix absent; ventral mouthparts apparently protracted; ventral surface of head apparently formed by fusion of the gular region and the cranial capsule; hypostomata rod-shaped and diverging posteriorly from the fossae for the mandibles *Catogenidae*⁶⁹ (pl. 33 I, J, L, M, O)
- Antennae with sensory appendix present, dilated, and as long as distal and median joints together; ventral mouthparts retracted; gular area distinct, not fused with head capsule; hypostomata not rod-shaped, and not diverging, but curved toward each other..... *Bothrideridae*⁷⁰ (pl. 44 F-W)

⁶⁹ The family *Catogenidae*, composed of the genera *Scalidia* and *Catogenus*, is placed by most authors, and probably correctly, near genera as *Laemophloeus* and *Hemipeplus* in the series Cucujoidea. The characters defining the larvae as belonging to the series Cleroidea are probably not fundamental but result from adaptation to a parasitic life. The straight, pointed, rod-shaped hypostomata which diverge from the mandibular fossae in a posterior direction are similar to the ones found in *Laemophloeus*, *Hemipeplus*, and the Phalacridae, and this similarity indicates strongly that the large subfacial region between the rod-shaped hypostomata in the *Catogenidae* is homologous with the region between the rod-shaped hypostomata in the above-mentioned cucujoid larvae and particularly with the one in the Phalacridae. Thus the ventral surface of the head in the *Catogenidae* is probably formed by a fusion of the ventral sides of the cranial capsule, a pair of cardines, the submental region between them, and a gular area posteriorly. The family *Catogenidae* has therefore been tabulated also on page 35 in the series Cucujoidea.

⁷⁰ The relationship of this family is problematic. It has also been tabulated near the Colydiidae on page 40 in the series Cucujoidea where it most likely has its proper systematic place. However, the larvae are quite different from the larvae of the typical Colydiidae. Their head structures, at least, suggest cleroid affin-

LARVAL FORMS OF COLEOPTERA

O. MELOIDEA

KEY TO FAMILIES AND SUBFAMILIES⁷¹

1. Gula well-developed; maxillae inserted considerable at a distance in from anterior margin of prosternum; labial palpi two-jointed 2
 Gular area short; maxillae extending posteriorly to near the anterior margin of prosternum; labial palpi not jointed, reduced to warts, or entirely absent. (Antenna with terminal joint (tj pl. 97 D) long and slender, and distal sensory appendix (sj pl. 97 D, E) either long, slender and conical, or long and sausage-shaped 5
2. Head capsule subquadrate, with ocelli usually in anterior third; labrum small, visible from above; integument on ventral side of body thin. (All thoracic and abdominal spiracles usually of about the same size and sometimes very large; larva elongate, dorsoventrally flattened; mandible extending well beyond anterior margin of labrum; abdomen with subparallel sides or posteriorly attenuate; ninth abdominal segment terminally with one, rarely two pairs of long bristles). (Fifth instar coarctate, not enclosed in exuvium of previous instars; the free-living instars eating grasshoppers' eggs or carnivorous on bee larvae, rarely honey feeders; first instars not carried by bees) *Meloidae-Lyttinae* (pl. 96 A-I)
 Head capsule broadly oval (pl. 96 Q) or subtriangular (pl. 96 M) with ocelli in or behind its transverse middle line; labrum as a rule not visible from above; integument on ventral side of body firm. (First pair of abdominal spiracles usually larger than the others and as large as the mesothoracic). (Instars as a rule feeding on honey; first larval instar climbing flowers and carried by bees) 3
3. One ocellus on each side; ninth abdominal segment carrying terminally one or more pairs of long bristles (term. s. pl. 96 M); body elongate, dorsoventrally flattened with suboval or posteriorly attenuate abdomen. (Fifth larval instar coarctate, not enveloped in exuvia of preceding instars; sixth instar moving freely around) *Meloidae-Meloinae* (pl. 96 J, K, M, P, Q)

ities. (See Craighead, F. C., Proc. Ent. Soc. Wash., vol. 22, 1920, pp. 1-13, 2 plates. This paper contains a discussion of the taxonomic position of the Bothrideridae, Colydiidae and Monoedidae (auct.). The Monoedidae are not recognized as a family on the larval characters, but placed as a genus in the family Colydiidae.)

⁷¹ The key deals exclusively with the first larval instars of the series, except in a few cases in which it is definitely stated to which instars, different from the first, the references apply.

LARVAL FORMS OF COLEOPTERA

Two ocelli on each side (second ocellus small or even absent in species of *Horiinae*); ninth abdominal segment carrying terminally one pair of small bristles, or no bristles; body either fairly elongate with posteriorly attenuate abdomen, or more often, navicular. (Fifth larval instar enveloped in exuvia of the two preceding instars; sixth instar as well as pupa inside of case formed by the exuvia of the three preceding larval instars).....4

4. Spiracles of eighth abdominal segment placed normally

*Meloidae-Horiinae*⁷²

Spiracles of eighth abdominal segment placed terminally on hook- or wartlike projections (spw. pl. 96 N, O)

Meloidae-Nemognathinae (pl. 96 L, N, O, R, S)

5. One ocellus on each side of head; spiracle of first abdominal segment very large and placed on a laterally projecting, flat lobe (pl. 97 B and D); claw falciform, with a single bristle at base; labial palpi vestigial and wart-shaped⁷³

Tetraonycidae (Based on *Tetraonyx quadrimaculatus*) (pl. 97 A-D)

Several ocelli placed closely together on each side of head; spiracle of first abdominal segment normal and not placed on a projecting lateral lobe; claw rather short, at base with a large pulvillus (pon. pl. 97 F) and a very short, conical, thick seta; labial palpus absent. (Median dorsal suture absent on all body segments). (Either with the first larval instar carried by wasps and in all the feeding stages devouring wasp larvae in their cells, or parasitic on cockroaches)

*Rhipiphoridae*⁷⁴ (pl. 97 E-J)

⁷² According to the imagines, the *Horniinae* are usually placed as a tribe of the subfamily *Zonitinae*.

⁷³ According to the imagines, *Tetraonyx* is usually placed in the subfamily *Lyttninae*. According to the first instars reared from eggs laid by *Tetraonyx quadrimaculatus* Fab., this larva forms an intermediate type between the larvae of the family *Meloidae* and the family *Rhipiphoridae* but differs so distinctly from both of them that the creation of a new family, *Tetraonycidae*, is deemed advisable.

⁷⁴ The first instar of *Rhyzostylops*, described by F. Silvestri (Descrizione di un nuovo genere di *Rhipiphoridae*, Redia, vol. III, 1906, pp. 315-324, one plate) looks superficially like a *Stenus* larva, has long legs, said to be tipped by two extremely minute claws, several ocelli on each side of head, and is heavily bristled. It is considered by Silvestri as a very aberrant rhipiphorid larva, intermediate between the first instar of *Rhipidius* and the degenerate first instar of the *Strepsiptera*. Probably the *Strepsiptera* are to be classified in the *Coleoptera* and close to the *Rhipiphoridae*.

LARVAL FORMS OF COLEOPTERA

P. MORDELLOIDEA

In the Introduction to his Catalogue (p. 32) Leng proposed, with great hesitation however, a series Mordelloidea composed of the following groups: the Mordellidae-Mordellini, the Mordellidae-Anaspidini, the Anthicidae, the Euglenidae, the Eurystethidae (= Aegialitidae), the Pedilidae, the Pyrochroidae, the Pythidae (with the two genera *Salpingus* and *Rhinosimus* included), the Cephaloidea, the Oedemeridae, and, with proper reservation, the Meloidae and the Rhipiphoridae. Here only the Mordellidae-Mordellini with the main genera *Tomoxia*, *Mordella*, and *Mordellistena* have been retained in this series, and it is even questionable whether these really may constitute a series as their larvae seem rather closely related to the larvae of several of the melandryid genera. The Mordellidae-Anaspidini together with all of the above mentioned families from the Anthicidae to the Oedemeridae have been placed in the colydiid association of the Cucujoidea; and in this association are also placed the Othniidae with the genus *Othnius* and the Boridae with the genus *Boros* which are closely related to the Pyrochroidae and Pythidae. It is however, possible that the Anaspidinae, Anthicidae, and Euglenidae might better be associated with the Languriidae. The Rhipiphoridae and the Meloidae constitute, according to the larvae, a separate series, the Meloidea. (See also: Introduction p. 8, line 9).

KEY TO FAMILY

1. Body without dorsal ambulatorial warts; ninth abdominal segment terminating with a single, conical, truncate spine
Mordellidae, part one (*Tomoxia*,
Mordella, and the larva of
Mordellistena pieipennis) (pl.
98 A-E)
Body with dorsal ambulatorial warts; ninth abdominal segment with a pair of short, upward curved, pointed urogomphi *Mordellidae, part two* (*Mordellistena*) (pl. 98 F-J)

Q. CERAMBYCOIDEA

The series Cerambycoidea contains only one family, the Cerambycidae, which is divided into six subfamilies. Of these the subfamily Disteniinae should probably be given family rank because its larva, except in its general appearance, is very aberrant from the larval types of all of the other Cerambycidae. In fact the

LARVAL FORMS OF COLEOPTERA

Disteniinae might possibly with equal justification be placed in either of the two series, the Bostrichoidea or the Chrysomeloidea, both closely associated with the Cerambycoidea, rather than in the latter series. The larva of the Disteniinae differs from all other cerambycoid larvae in the development of the ventral structures of the head and chiefly in the lack of a distinct gula, but the presence of a short gula lying on top of the median part of a broad, well-defined hypostomal bridge and fused with it is just the essential character by which the larvae of the Cerambycoidea can be separated from the ones of the Bostrichoidea and Chrysomeloidea.⁷⁵

KEY TO SUBFAMILIES

1. Head oblong, sides parallel or converging behind. (Epistoma never projecting; tentorial cross-arm internal; epipleurum protuberant on several or all abdominal segments; legs usually absent) *Lamiinae* (pls. 99 I, J, 100 A)
 Head transverse, wider behind the middle 2
2. Epistoma projecting over clypeus, except in *Parandra*; frons projecting over epistoma, dentate or carinate, except in *Parandra*. (Tentorial cross-arm in the same plane as the hypostoma and forming a bridge behind it; legs present)
*Prioninae*⁷⁶ (pls. 99 A, B, 100 B-F)
 Neither epistoma nor frons projecting 3
3. Mandible with oblique, straight cutting edge, except in *Opsimus* 4
 Mandible with rounded, gougelike cutting edge (pl. 100 G). (Tentorial cross-arm in the same plane as hypostoma and forming a bridge behind it; clypeus filling space between dorsal articulations of mandibles; epipleurum protuberant only on last three abdominal segments; legs present or absent) *Cerambycinae* (pls. 99 E, F, 100 G)
4. Dorsal margins of epicranial halves partly fused behind frons. (Tentorial cross-arm internal; legs present)
Aseminae (pl. 99 C, D)
 Dorsal margins of epicranial halves separated behind frons . 5

⁷⁵ Craighead, F. C., North American Cerambycid Larvae, Canada Dept. Agr., Bul. 27, New Series, Technical, Ottawa, 1923, pp. 6, 26, and 99-101 with figures.

⁷⁶ Craighead, F. C., Larvae of Prioninae, U. S. Dept. Agr., Off. Sec., Report 107, 1915, pp. 1-24, eight plates.

LARVAL FORMS OF COLEOPTERA

5. Tentorial cross-arm internal. (Palpiger large, bearing lacinia and palpus; epipleurum protuberant on all abdominal segments; legs present) *Lepturinae* (pls. 99 G, H, 100 H-I)
- Tentorial cross-arm (tb pl. 100 M) in the same plane as the hypostoma, bridging the ventral surface of the head. (Larva very elongate and slender; legs present)
Disteniinae (pl. 100 M)

R. BOSTRICHIDEA

KEY TO FAMILIES

1. Head protracted; mandible dentate. (Terga hairy or not, often with rows or patches of asperities) 2
- Head retracted; mandible not dentate, usually with gouge-shaped distal end. (Terga without asperities) 3
2. Thoracic spiracle pushed forward to anterior margin of prothorax. (Spiracles bearing a single spoutlike prolongation (prl pl. 101 E); a small, often curved, transverse sclerome present at the end of a median groove between the longitudinally placed anal lobes (ats pl. 101 G); terga without asperities) *Ptinidae* (pl. 101 A, B, E)
- Thoracic spiracle not reaching anterior margin of prothorax. (Spiracles without single spoutlike prolongations, except in *Anobiium*, where they are large; with or without a small, transverse sclerome at the end of a longitudinal, median anal groove; straight, curved, or hook-shaped tergal asperities on all or some of the segments, except in *Ozognathus* and *Lasioderma*) *Anobiidae* (pl. 101 C, D, F-N, X, Ae, Oe)
3. Mandible without a dorsal, molarlike process; epipharynx without a large sclerome; lacinia mandibulae absent
*Bostrichidae*⁷⁷ (pl. 101 O-W, Y, Z)
- Mandible with a dorsal, molarlike process, grinding against a large sclerome in epipharynx; lacinia mandibulae present and fleshy 4
4. Abdominal spiracles subequal in size
*Psoidae*⁷⁸ (pl. 102 A-E)

⁷⁷ The family includes all the genera usually placed in the family Bostrichidae, except the genera which are here tabulated in the family Psoidae.

⁷⁸ The family Psoidae includes the following genera, usually placed in the Bostrichidae: *Stephanopachys* (Saalas, U., Die Fichtenkäfer Finlands, part 2, 1923, pp. 179 and 700, figs. 115-120), *Rhizopertha*, *Dinoderus*, and *Dinoderopsis* (Lesne, P., Les coléoptères Bostrychides de l'Afrique tropicale française, Paris, 1924, pp. 47 and 77), *Polycan*, and *Psoa*.

LARVAL FORMS OF COLEOPTERA

Last abdominal spiracle much larger than the others
Lyctidae (pl. 102 F-K)

S. CHRYSOMELOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Mandible simple, distally either with a broad, transverse, gougelike cutting edge, or with a simple apex 2
 Mandible dentate, distally with from two to five teeth 5
2. Prementum and mentum fused, bearing a common, median, escutecheonlike sclerome with a pair of light, circular areas anteriorly. (Labial palpi either (in Pachymerinae) rudimentary, one-jointed, and placed in the light, circular areas of the escutechon (pl. 103 D), or (in Bruchinae) completely absent; mandible short, strong, gouge-shaped, with rounded, distal edge; body curved and plump; legs vestigial except in the first larval instar (pl. 103 N). Ocelli three in Pachymerinae, one in Bruchinae)
Bruchidae (= *Mylabridae*) (pl. 103 A-N)
 Prementum and mentum without escutecheonlike sclerome. (Labial palpi present, except in a few Halticinae as *Dibolia* and *Sphaeroderma* (pl. 114 H, and N)) 3
3. Legs present and fully developed; body curved and plump. (Mandible with excavated inner side and single, pointed apex; prementum distinct and covered with an unpaired subtriangular sclerite; mentum distinct, free laterally; labial palpi inserted well apart) ... *Sagridae* (pl. 104 A-H)
 Legs absent; body straight. (Leaf miners with distinct ninth abdominal segment) 4
4. Prementum and mentum not fused; labial palpi inserted well apart at the base of ligula; mandible with excavated inner side and single, pointed apex
Orsodacnidae-Orsodacninae (pl. 105 A-E)
 Prementum, mentum, and submentum fused; labial palpi close together; ligula absent; mandible with transverse, approximately gouge-shaped, and slightly scalloped distal edge
Orsodacnidae-Zeugophorinae (pl. 105 F-H)
5. Spiracles of eighth abdominal segment biforous, terminal, and projecting like a pair of spurs. (Mentum free laterally and fused posteriorly with submentum; galea and lacinia adapted for sucking of plant juice; larva club-shaped and curved, feeding on submerged parts of fresh-water plants and swamp plants) *Donaciidae* (pl. 106 A-R)
 Spiracles of eighth abdominal segment not projecting like spurs 6

LARVAL FORMS OF COLEOPTERA

6. Labrum small, or indistinct and fused with frons and clypeus. (Legs very long, slender, and without pulvillus; abdomen swollen posteriorly, doubled back upon itself, and adapted for carrying a case made either from the excrement of the larva, or, in *Lamprosoma*,⁷⁹ from fine particles of wood glued together with the excrement of the larva and with resin from the host tree) 7
 Labrum well-developed and free 9
7. Tarsungulus short, strongly hamate, with a large heel. (Antenna two-jointed, with conical sensory appendix (sj pl. 107 G); third joint represented only by a strong seta)
Camptosomatidae - Chlamydiinae
 (pl. 107 G, H)
 Tarsungulus slender, somewhat curved and awl-shaped; heel absent or insignificant 8
8. Antenna two-jointed, with a broad, pillbox-shaped sensory appendix (sj pl. 107 A, B); third joint represented only by a seta *Camptosomatidae-Clytrinae* (pl. 107 A-F)
- Antenna three-jointed, with a conical sensory appendix; third joint seta-bearing and shorter than the appendix. (Frons almost circular in outline and flat)
Camptosomatidae-Cryptocephalinae and *Camptosomatidae-Lamprosominae*
9. Maxillary palpus three- or four-jointed, excluding palpiger;⁸⁰ eighth abdominal pair of spiracles present and laterally placed; eighth abdominal segment not terminal, its hind margin connected with the front margin of the ninth abdominal segment 10
 Maxillary palpus two-jointed or less; eighth abdominal pair of spiracles either present, but dorsally placed, or absent; eighth abdominal segment terminal with free hind margin 15
10. Tarsungulus long, slender, and without pulvillus; mandible compressed, with two to three distal teeth; epicranial suture long; ocelli absent. (Larva white; abdominal segments without dorsal scleromes and ventrally often with rounded, projecting lobes with many stiff setae)
Eumolpidae (pl. 108 A-M)
 Tarsungulus of moderate length, curved, and usually with pulvillus (pon pl. 109 M); mandible palmate, with four to five distal teeth; combination of a long epicranial suture and lack of ocelli not found 11

⁷⁹ The larva of *Lamprosoma bicolor* Kirby and its pointed, hood-shaped case are described by Carlos Moreira (Ann. Soc. Ent. France, vol. 82, 1913, pp. 743-745, one plate).

⁸⁰ Very rarely two-jointed, as in *Sphacroderma* (pl. 114 N).

LARVAL FORMS OF COLEOPTERA

11. More than one ocellus on each side of head, usually five or six ocelli; antenna three-jointed 12
 One ocellus on each side, or none; antenna two-jointed or less 13
12. First eight abdominal segments with a transverse, ventral region with ambulatory warts (pl. 109 G); anal opening dorsal; labial palpus one-jointed. (Spiracles annular or biforous; larva covered with excrement or slimy exudation)...
Crioceridae (pl. 109 A-G)
- First eight abdominal segments without any ambulatory warts; anal opening ventral and placed in the middle of the sucking disk of the tenth abdominal segment; labial palpus two-jointed *Chrysomelidae* (pl. 109 H-M)
13. With a combination of the three following characters: Epicranial suture well-developed or long; one ocellus on each side of head; dorsal region of each of first to seventh abdominal segments distinctly subdivided into two or three transverse areas (pl. 110 C and G)
*Galerucidae - Galerucinae*⁵¹ (pl. 110 A-M)
- With a different combination of the three characters 14
14. Epicranial suture present, but usually short; ocelli absent; dorsal region of each of first to seventh abdominal segments subdivided into three transverse areas. (Intersegmental membranes often large; spiracles annular, except in *Exosoma*, (pl. 111 M), where they are biforous)
*Galerucidae - Diabroticinae*⁵²
(Diabrotica, Cerotoma, Phyllobrotica, and Exosoma lusitanica) (pl. 111 A-M)
- Different combination. (Spiracles always annular)
*Galerucidae - Halticinae*⁵³ (pls. 112 A-R, 113 A-X, 114 A-O)

⁵¹ In the present subfamily Galerucinae are included all of the genera which usually are placed in the subfamily Galerucinae, with the exception of the ones tabulated in the following subfamily, Diabroticinae.

⁵² This subfamily, which probably includes more genera than the ones listed above, but whose larvae are unknown, is more closely connected with the Halticinae tribes, Crepidoderini, Chaetocnemini, Systemini, and Psylliodini than with the subfamily Galerucinae, as here conceived.

⁵³ The subfamily Halticinae includes genera with remotely related larvae such as *Blepharida*, (112 L, O, Q, R), *Oedionychis* (113 A-E), *Haltica* (112 A, B), *Psylliodes* (112 M, N), and *Sphacoderma* (114 I-O). When better studied, the classification of the entire family Galerucidae will unquestionably be changed.

LARVAL FORMS OF COLEOPTERA

15. Eighth pair of abdominal spiracles well-developed and dorsal, in some genera biforous, in others annular, eighth abdominal segment terminal, with free hind margin
Hispidae (pl. 115 A-K)
 Eighth pair of abdominal spiracles vestigial; tergum of eighth abdominal segment often provided with an upright fork bearing the cast skins or the excrement of the larva (pl. 116 G) *Cassididae* (pl. 116 A-I)

T. PLATYSTOMOIDEA

KEY TO SUBFAMILIES

1. Legs present, one-, two-, or three-jointed, always without a claw-shaped tarsungular joint. (Spiracles annular, uniforous, or biforous) *Platystomidae* - *Brachytarsinae* (pl. 117 A-K)
 Legs absent, semiglobular pedal lobes occupying their place. (Mesothoracic spiracle biforous (pl. 117 O, N); abdominal spiracles uniforous; body profusely covered with long hairs) *Platystomidae* - *Choraginae* (*Araccerus*) (pl. 117 L-Q)

U. CURCULIONOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Mentum-portion of fused subfacial region free laterally; legs present, but small, and usually two-jointed
Brenthidae (pl. 118 A-G)
 Mentum connected laterally with maxillary stipes; legs absent; pedal lobes, occupying their place, often bulging 2
 2. Head capsule elongate, broadening posteriorly, and with straight sides. (Head deeply retracted; spiracles uniforous with the mouthpiece equipped with a spoutlike prolongation (pl. 119 A) *Proterrhinidae* (pl. 119 A-H)
 Head capsule narrowing posteriorly, and with curved sides ... 3
 3. Abdominal hypopleurum subdivided into at least two lobes, one superposed upon the other 7
 Abdominal hypopleurum not subdivided 4
 4. Abdominal segments with no more than two transverse, dorsal plicae 5
 Abdominal segments with three or four transverse, dorsal plicae 6
 5. More than two ocelli on each side; head retracted; frons indistinct; mentum bearing a median, unpaired plate more or less completely fused with a subtriangular, unpaired plate borne by prementum; labial palpus distinctly two-jointed
Attelabidae - *Rhynchitinae* and
Attelabidae - *Attelabinae* (pl. 118 H-M)

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One ocellus on each side; head protracted; frons distinct; mentum without a plate and prementum without a subtriangular, unpaired plate; basal joint of labial palpus reduced or absent, distal joint distinct

Apionidae (not including *Cylas*)
pl. 120 A-D)

6. Spiracles on second to seventh abdominal segments not projecting and not placed dorsally

Curculionidae and *Scolytidae*⁸⁴
(pls. 120 E-G, 121 A-U, 123 A-E)

Spiracles on second to seventh abdominal segments projecting, hook-shaped, and placed dorsally. (Larva submerged, living between the leaves of rice)

Curculionidae - *Lissorhoptrinae*
(*Lissorhoptrus simplex*) (pl. 122 A-V)

7. Maxillary palpus two-jointed; spiracles either biforous with large, oval spiracular opening, or, in the single genus *Rhynchophorus*, bilabiate. *Calendridae* (pl. 123 F-H)

Maxillary palpus one-jointed with the dome-shaped, soft end covered with fine, short hairs; spiracles uniforous, with spoutlike prolongation from a ring-shaped mouthpiece. (Prothoracic tergum armed in the middle with a transverse ridge composed of a series of ring-shaped scleromes of different sizes) *Platypodidae*⁸⁵ (pl. 123 I-P)

V. LYMEXYLOIDEA

The systematic position of this series has been discussed in a footnote²⁰. It contains only the one family Lymexylidae which is

⁸⁴ The larvae of the Curculionidae and Scolytidae can not be separated. In most of the larvae of these two families, the body is whitish, fleshy, subcylindrical, more or less curved, without abdominal prolegs, and not clothed with long hair. However, in the leaf-mining genera *Orchestes* and *Prionomerus*, (pl. 120 E, F), the body is rather straight and either flat both on the dorsal and ventral side, or only flat ventrally but projecting laterally into broad, rounded processes on most of the segments (Trägårdh, Ivar, Arkiv for Zoologi, vol. 6, No. 7, 1910, pp. 1-22, English text, two plates); in the slimy larva of *Cionus solani* Fab. (pl. 120 G), which is free-living on the leaves of *Verbascum*, and in larvae of Hyperini paired prolegs are found on the underside of the abdominal segments; and in the hyperine species *Phelypera distigma* Boheman, from Guatemala, (pl. 121 U), the body is beset on the back with dark hairs as long or considerably longer than the width of the larva.

⁸⁵ Hubbard, H. G., The Ambrosia Beetles of the United States, U. S. Dept. Agr., Div. Ent., Bul. 7, New Series, 1897, pp. 14-16 with figures.

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distinguished by the same characters by which the series is defined and in addition by the following characters: Labrum elongate, conical, fitting into a groove on the dorsal side of the mandibles; molar structure of mandible present but rather indistinct; maxillary articulating area well-developed; maxillary palpus three-jointed, palpiger excluded; cardo bipartite; ligula large and broad; prothorax hood-shaped, somewhat swollen dorsally and ventrally; ninth abdominal segment terminal and heavily sclerotized; spiracles bilabiate.

KEY TO SUBFAMILIES

1. Ninth abdominal segment cylindrical, obliquely truncate posteriorly, armed with a raised rim and with rugosities or tubercles on the disk inside of the rim; abdominal epipleural lobes with a hard, tubercled or shagreened surface

Lymexyloidea - *Lymexylinae*
(*Melittomma* and *Atractocerus*) (pl. 124 A-G, J-K, M)

Ninth abdominal segment elongate conical, thorn-shaped, terminally with upward bent, bicuspidate apex; epipleural lobes glabrous. (First larval instar with a more disklike ninth abdominal segment)

Lymexyloidea - *Hylecoetinae*
(*Hylecoetus*) (pl. 124 H, L)

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^{s6} Larval stage unknown, or not examined by the present authors.

^{s7} See: (a) Peyerimhoff, P. de; Sur quelques larves de coléoptères cavernicoles;

1906, Bull. Soc. Ent. France, pp. 112–118. (With figures)

(b) Peyerimhoff, P. de: Deux types nouveaux de larves Silphidae;

1907, Ann. Soc. Ent. France; vol. 76, pp. 83–88. (With figures)

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(c) Jeannel, R.: Revision des Bathysciinae; 1911, Arch. Zool. expérimentale et générale; Ser. 5, vol. 7, pp. 1-641. (With many figures and extensive bibliography. On page 95 the author separates the larvae of the two subfamilies Bathysciinae and Cholevinae as follows:

Antenna inserted anteriorly, at the exterior margin of the mandible; apex of mandible enlarged.

Bathysciinae (*Leptoderus*, *Pholeuon*, *Oryotus*, *Aphaobius*, etc.)

— Antenna inserted posteriorly, at the transverse diameter of the head; apex of mandible attenuate and fine. . . . (Cholevinae)

(d) Hatch, Melville H.: Studies of the carrion beetles of Minnesota;

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^{s8} Modern systematists have divided the family into more than a score of subfamilies on the characters of the adults. Recent studies of the larvae seem to substantiate the correctness of this classification. Much work, however, is still needed before a separation of the larvae into subfamilies and tribes can be established. See: ¹St. George, R. A.: "Studies on the larvae of North American beetles of the subfamily Tenebrioninae" . . . (Proc. U. S. Nat.

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Mus., vol. 65, pp. 1-22, pls. 1-4, 1924) ²Oglobin, D. A., and Kolo-
bova, A. N.; "Tenebrionidae and their larvae injurious to agricul-
ture" (Proc. Poltava Agricultural Experiment Station, Entomol-
ogical Division, vol. XV, 1927; No. 61, pp. 1-49, with 41 figures)
(Entirely in Russian)

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ABBREVIATIONS USED ON THE FIGURES

- 1-10, first to tenth abdominal segments.
 a, arm of the spiracular closing apparatus.
 abs, annular-biforous type of spiracle (an apparently annular spiracle but provided with two small air-tubes).
 ac, accessory ventral condyle of mandible.
 al, anal lobe.
 alr, alar area (= pasc, parascutal area; a tergal area immediately above the epipleural area; in the abdominal segments usually carrying the spiracle).
 am, basal articulating membrane of antenna.
 amb, ambulatory wart (sometimes named "ampulla" or "sensorial wart").
 an, anus.
 ans, annular type of spiracle (ringlike with a simple opening and no accessory tubes or chamber).
 ant, antenna.
 ap, appendage of tenth abdominal segment.
 at, atrium of spiracle (a part between the spiracular mouth-piece and the trachea).
 b, bulla of spiracle.
 bls, bilabiate type of spiracle (an elongate, annular spiracle with a pair of projecting lips interior to the spiracular frame).
 bis, biforous type of spiracle (spiracle provided with a pair of distinct airtubes).
 c, cardo (with jca, pc, sca; pls. 40 T, 89 G*).
 cl, claw (or "ungulus") from distal end of tarsus.
 cly, clypeus.
 en, canal or sulcus in the mandible or in other buccal structures.
 co, membrane between head and prothorax.
 col, collum (necklike constriction of head around the occipital foramen).
 crs, cribriform spiracle (spiracle provided with a sievelike plate).
 ex, coxa.
 exl, coxal lobe (= parasternum, an abdominal, usually triangular area extending from hypopleurum toward the sagittal line of sternum; often separating laterally eusternum and sternellum).
 da, dorsal articulation of mandible (= mandibular fossa).
 dis, dististipes (an anterior portion of the maxillary stipes).
 dl, dorso-lateral suture (a frequently rather indistinct groove immediately below the spiracle-bearing parascutal area;

LARVAL FORMS OF COLEOPTERA

- in abdomen parallel with the ventro-lateral suture, in thorax more oblique).
- e, epidermis (= hypodermis).
- ecr, epicranium.
- eers, epicranial suture (median suture between the two epicranial halves and behind the posterior end of frons).
- em, epimeron.
- ep, epistomal margin (the anterior margin of the cranium between the two dorsal articular projections for the mandibular fossae).
- epp, epipleurum (term introduced by Hopkins for the lateral area immediately above the ventro-lateral suture and below the alar area; dorsally limited in thoracic segments by a normally oblique, in abdominal segments always horizontal dorso-lateral suture; pl. 95 Q).
- epr, epipharyngeal rod.
- eps, episternum.
- epx, epipharynx.
- est, eusternum (anterior sternal area in front of the suture between the furcal pits).
- f, frons.
- fe, femur.
- fl, flexor of the mandible.
- fs, frontal suture (paired suture between frons and one or other of epicranial halves; usually dividing the ring-shaped sclerome to which the antenna is attached).
- ga, galea.
- gl, glossa (dorsal surface of ligula).
- gld, gland.
- gs, gular suture (either a paired suture between gular plate and one or other of epicranial halves, or, when pregular plate is present, an unpaired, median longitudinal suture behind this plate and between the ventrally adjacent epicranial halves, or, when the gular area is entirely absent, an unpaired median longitudinal suture behind submentum and between the ventrally adjacent epicranial halves).
- gu, gula (area behind submentum, separated from this by a real or imaginary suture between posterior articulations of the two cardines).
- hb, hypopharyngeal bracon (a term introduced by A. D. Hopkins for a transverse brace between hypopharynx and the anterior part of the hypostomal margin).
- he, hypopharyngeal sclerome.
- hp, hypopleurum (a term introduced by A. D. Hopkins for the lateral area immediately below the ventro-lateral

LARVAL FORMS OF COLEOPTERA

- suture; in thorax usually carrying the two scleromes episternum, anterior to the articulation of the coxa, and epimeron, posterior to this articulation).
- hr, hypopharyngeal rod.
- hx, hypopharynx.
- hy, hypostomal margin (the ventral marginal thickening of each of the epicranial halves between the articulation of the ventral mandibular condyle and the ventral tentorial pit. tp; pls. 3 F, 31 F, 99, 107 B).
- is, intersegmental membrane.
- jea, juxtacardo (a separate part of cardo extending from cardo proper toward submentum).
- jx, juxta stipes (a separate part of stipes extending from stipes proper toward mentum).
- lab, labrum.
- lac&la, lacinia.
- lb, labium (the unit consisting of submentum, mentum, prementum, ligula and labial palpi).
- lg, leg.
- li, ligula and in some figures glossa.
- lm, lacinia mandibulae (= prostheca = lacinia mobilis, a fleshy or membranous process from the interior face of the mandible; see: r, retinaculum).
- lp, labial palpus (never more than two-jointed in coleopterous larvae).
- lpg, labial palpiger (in a few coleopterous larvae appearing as a free joint; see: pm, prementum).
- ls, labial stipes (see: pm, prementum).
- lt, median line on the free surface of the airtubes of the biforous spiracle.
- m, mentum (a labial area limited anteriorly by the posterior margin of the premental area and posteriorly by a transverse suture running approximately between the front margins of the maxillary cardines).
- ma, mala (a single maxillary lobe not differentiated into an outer lobe, or galea, and an inner lobe, or lacinia).
- md, mandible.
- mo, the molar or grinding structure of the mandible.
- mpf, maxillary palpiger.
- mst, mesothorax.
- mtt, metathorax.
- mx, maxilla.
- mxl, maxillula (= pgn).
- mxp, maxillary palpus.
- mxs, maxillary articulating area (between stipes maxillae and cardo maxillae, exteriorly, and mentum and submentum, interiorly).

LARVAL FORMS OF COLEOPTERA

- n, nasale (an anterior and median projection from frons, formed either by a fusion of frons, clypeus and labrum, or sometimes by frons and clypeus alone; in this latter case labrum is small and hidden below the nasal projection).
- o, ocellus.
- oe, oesophagus.
- of, occipital foramen.
- or, orifice of the spiracle.
- p, maxillary palpiger.
- pag, paragula (a paired, usually elongate, sclerome on either side of gula; found in ostomid, clerid and some other larvae).
- pase, paraseutal area (= alr, alar area).
- pc, precardo (anterior part of bipartite cardo).
- pg, pregula (an anterior part of the gular plate found in front of a median gular suture; present, for instance, in many hydrophiloid and staphylinoid larvae).
- pgl, paraglossa (paired lobe on either side of glossa (gl); not to be confused with the maxillulae (pgn; pl. 11, fig. E)).
- pgn, maxillula (= superlingua, a single or bidivided, lobe-shaped mouthpart on either side of the hypopharyngeal region).
- ph, pharynx.
- plb, pedal lobe (a fleshy, bumplike, non-segmented rudiment of a leg).
- pm, prementum (= ls plus lpg, term used by K. L. Henriksen for the area lying in front of mentum in coleopterous larvae and consisting of the fused labial stipites with the labial palpigera included but with the ligula and labial palpi excluded).
- po, pleurostomal margin (the lateral marginal thickening of each epicranial half between the dorsal and ventral mandibular articulations).
- pon, paronychial appendix (= pulvillus).
- pos, postscutellum.
- post, poststernellum.
- pr, prostheca (= lm, laecinia mandibulae).
- prt, prothorax.
- pse, prescutum.
- pst, presternum.
- pxs, proxistipes (a posterior portion of maxillary stipes).
- r, retinaculum (a hard, pointed, and tooth shaped process usually near or at the middle of the inner edge of the mandible; never jointed).
- re, retractor mandibulae.

LARVAL FORMS OF COLEOPTERA

- s, seta.
 sc, scutum.
 sca, subcardo (posterior part of bipartite cardo).
 scl, scutellum.
 scler, sclerome.
 sj, supplementary joint of antenna (= "tactile papilla" or "sensory appendix").
 sm, submentum (an unpaired median area lying approximately between the maxillary cardines on the underside of the head).
 sp, spiracle.
 srp, stridulatory plate.
 srt, stridulatory teeth.
 st, maxillary stipes.
 stl, sternellum.
 su, the sucking portion of the last abdominal segment.
 sty, stylus.
 t, tarsungulus (here regarded as a terminal joint of the leg formed by fusion of the tarsus and the claw; modern authors, however, maintain that in coleopterous larvae with legs having five or less joints this clawlike terminal structure which they call "pretarsus" or "dactylopodite" is a simple joint, that there is no claw ("ungulus"), and that tarsus is eliminated or united with tibia).
 ta, tentorial arm.
 tb, tentorial bridge (bridge within head between the posterior ends of the hypostomata).
 tg, tergum.
 ti, tibia.
 tp, ventral tentorial pit.
 tr, trochanter.
 tu, the usually fingershaped, paired airtubes of a biforous spiracle.
 u, uncus.
 ur, urogomphus (a process, usually paired, projecting from the posterior end of tergum of the ninth abdominal segment; may be jointed and movable by muscles, or unjointed and immovable; urogomphus is commonly known as "cercus" or "pseudocercus").
 vc, ventral condyle of mandible.
 vf, fossa in anterior end of hypostoma for the ventral articulation of the mandible.
 vl, ventro-lateral suture (or merely the "lateral suture" when a distinction between this important suture and the rather insignificant dorso-lateral suture is not necessary;

LARVAL FORMS OF COLEOPTERA

it is a continuous, longitudinal groove, in the thorax running immediately above the two scleromes episternum and epimeron or, when these are indistinct or absent, above the hypopleural area to which they belong, in the abdomen running above hypopleural area and between the pitlike impressions where the ventral and dorsal wedges of the intersegmental membranes meet when these are present).

vr, scansorial wart (= "tuber scansorium" Schiödte).

*, jointlike appendix of galea (= bl, bladlike appendix in Donaciidae; pls. 106 G and K, 110 I, 111 G).

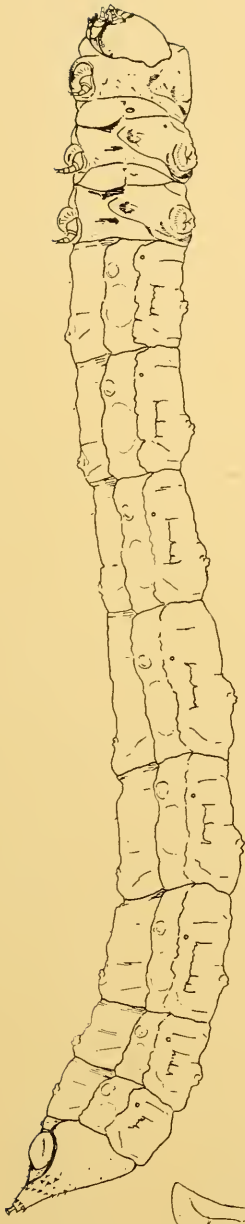
PLATES 1-125

LARVAL FORMS OF COLEOPTERA

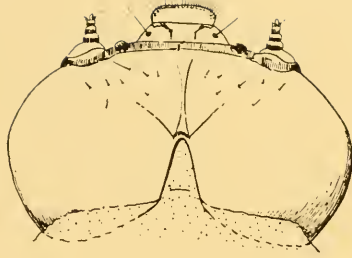
PLATE 1.

Cupesidae

- A. *Cupes concolor* Westw. : Head. Dorsal view.
B. " " : Right mandible. Inner face.
C. " " : Buccal structures, hypopharynx, bracon, tentorial arm, and maxilla. Dorsal view.
D. " " : Spiracle.
E. " " : Larva. Lateral view.
F. " " : Ninth and tenth abdominal segments. Ventral view.
G. " " : Head and prothorax. Ventral view.



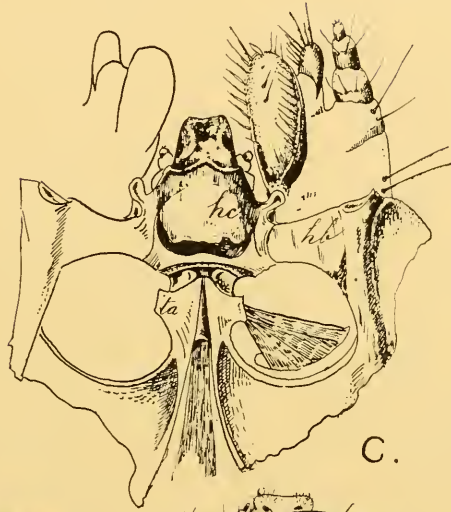
E.



A.



B.



C.



D.



G.



F.

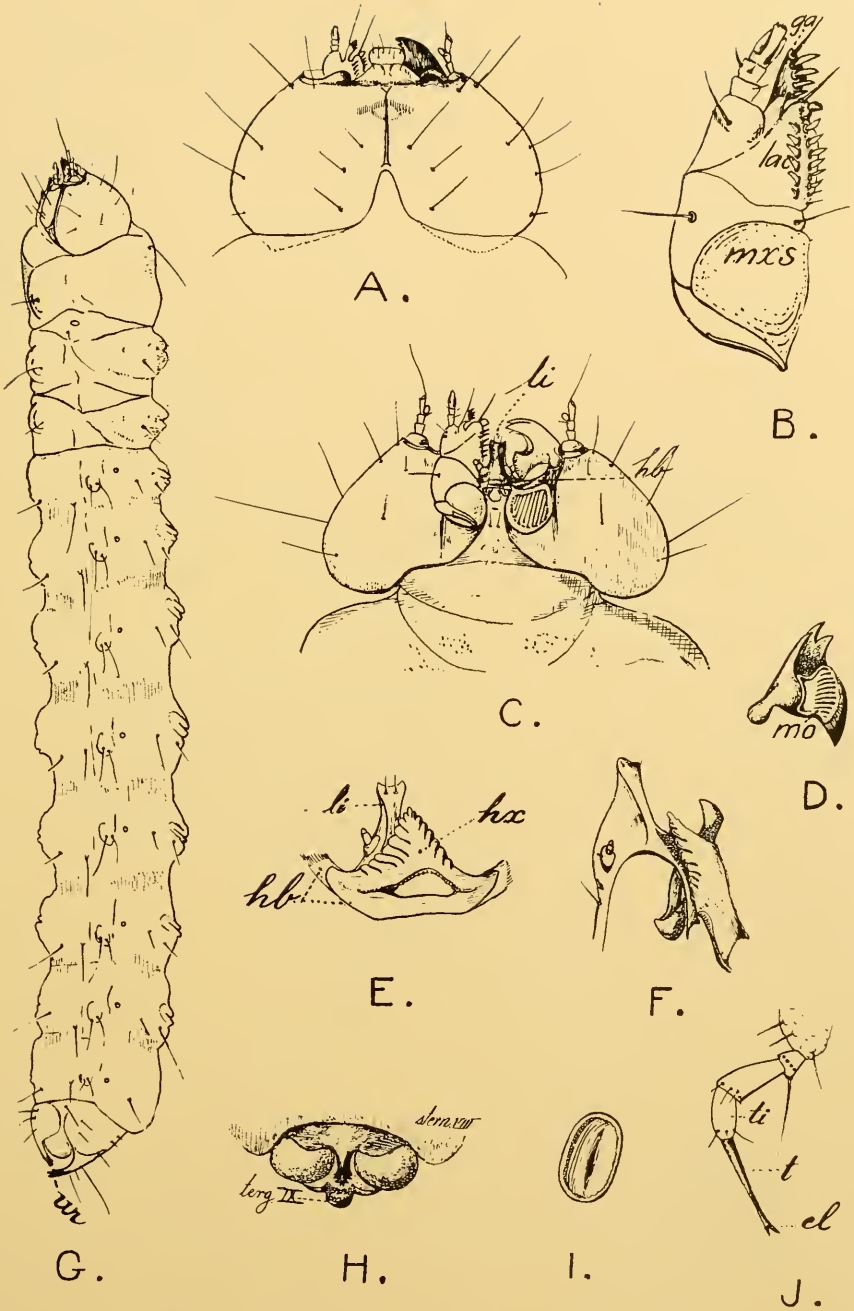
Cupes

LARVAL FORMS OF COLEOPTERA

PLATE 2

Micromalthidae

- | | | | | |
|----|----------------------|-------|---|---------------|
| A. | Micromalthus debilis | Lec.: | Legless larva; head. | Dorsal view. |
| B. | “ | “ | : Right maxilla. | Ventral view. |
| C. | “ | “ | : Head. | Ventral view. |
| D. | “ | “ | : Right mandible. | Ventral view. |
| E. | “ | “ | : Hypopharyngeal sclerome, hypopharyngeal bracon, and ligula. | Dorsal view. |
| F. | “ | “ | : Hypopharyngeal sclerome, hypopharyngeal bracon, and ligula. | Lateral view. |
| G. | “ | “ | : Larva. | Lateral view. |
| H. | “ | “ | : Tip of abdomen. | Ventral view. |
| I. | “ | “ | : Spiracle. | |
| J. | “ | “ | : First larval instar; leg with tibia, tarsus and two claws. | |

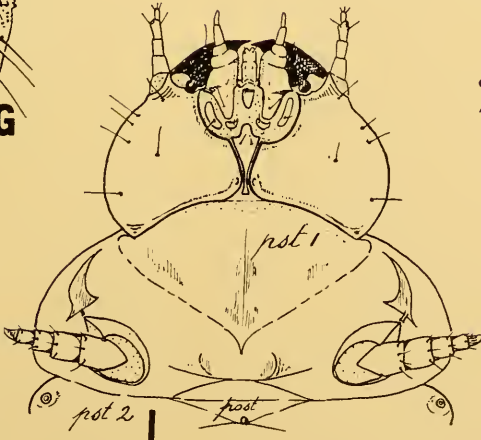
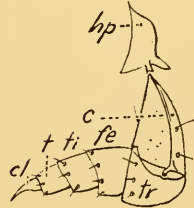
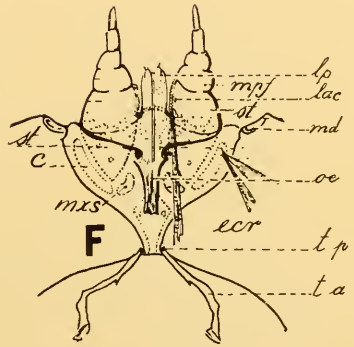
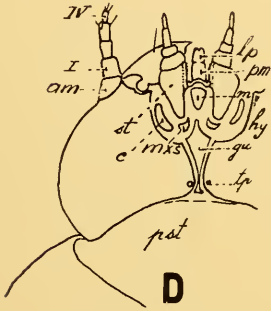
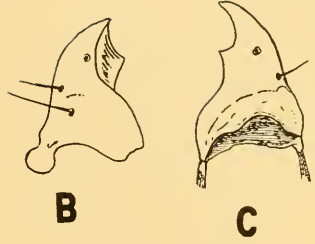
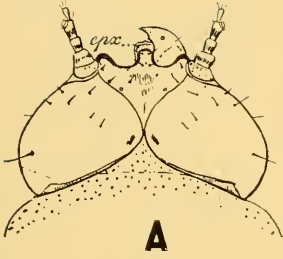


Micromalthus

PLATE 3

Rhysodidae

- | | | | | |
|----|-----------|-----------|--------|---|
| A. | Clinidium | sculptile | Newn.: | Head. Dorsal view. |
| B. | " | " | : | Right mandible. Ventral view. |
| C. | " | " | : | Right mandible. Dorsal view. |
| D. | " | " | : | Head; lp, read: li, ligula. Ventral view. |
| E. | " | " | : | Larva. Lateral view. |
| F. | " | " | : | Ventral mouthparts; lp, read: pgl, paraglossal(?). Dorsal view. |
| G. | " | " | : | Details of abdominal tergum. |
| H. | " | " | : | Leg and its attachment to hypopleurum. |
| I. | " | " | : | Head and prothorax. Ventral view. |
| J. | " | " | : | Spiracle with closing apparatus and spiracular trachea. |



Clinidium

LARVAL FORMS OF COLEOPTERA

PLATE 4

Cicindelidae, Carabidae

- A. (*Therates* sp.?) (In rotten wood. British Solomon Isl.): Larva.
Lateral view.
- B. *Amblycheila cylindriformis* Say: Part of head. Dorsal view.
- C. *Cicindela limbalis* Klug: Leg.
- D. *Amblycheila cylindriformis*: Part of head. Ventral view.
- E. *Omus californicus* Esch.: Abdominal segment. Lateral view.
- F. *Laemostenus terricola* Herbst (Denmark): Anterior part of
larva. Ventral view.
- G. " " " " : Anterior Part of
larva. Lateral view.
- H. " " " " : Larva. Dorsal view.
- I. *Glyptus sculptilis* Brullé (Sierra Leone): Larva. Lateral view.

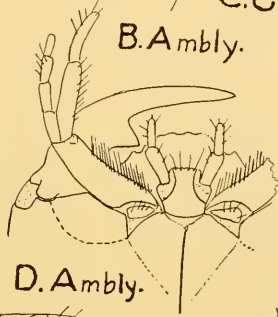


A. *Therates*

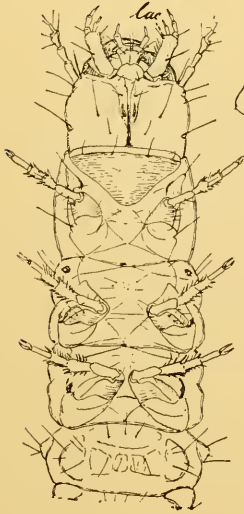


B. *Ambly.*

C. *Gicin.*



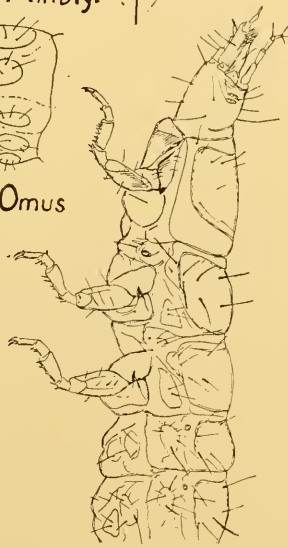
D. *Ambly.*



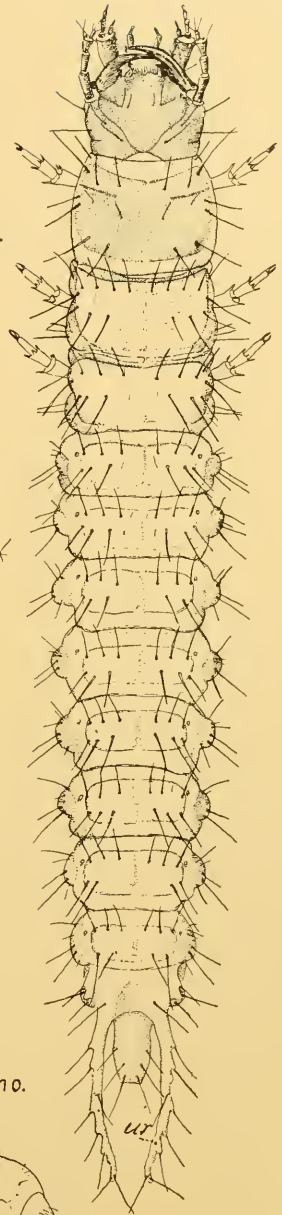
E. *Omus*



F. *Laemos.*



G. *Laemo.*



H. *Laemo.*



I. *Glyptus*

LARVAL FORMS OF COLEOPTERA

PLATE 5

Omophronidae, Haliplidae, Hygrobiidae, Noteridae

- A. *Omophron nitidum* Lec? (Texas) : Larva. Dorsal view.
- B. " " : Leg.
- C. " " : Labium. Ventral view.
- D. " " : Anterior part of head. Ventral view.
- E. " " : Anterior part of head. Dorsal view.
- F. *Haliplus confinis* Steph. (Denmark) : Third leg.
- G. " " : Larva. Dorsal view.
- H. " " : Head. Dorsal view.
- I. *Hygrobia tarda* Herbst. (Denmark) : End of body. Ventral view.
- J. " " : Larva. (Natural position of head more nutant; notice the very long eighth abdominal segment.)
- K. *Noterus clavicornis* Deg. (= *N. sparsus* Marsh.) (Denmark) : Right mandible. Ventral view.
- L. " " : Antenna.
- M. *Hygrobia tarda* : Head. Dorsal view.
- N. *Noterus clavicornis* : Ventral mouthparts. Ventral view.
- O. " " : End of body. Ventral view.
- P. " " : Larva. Lateral view.

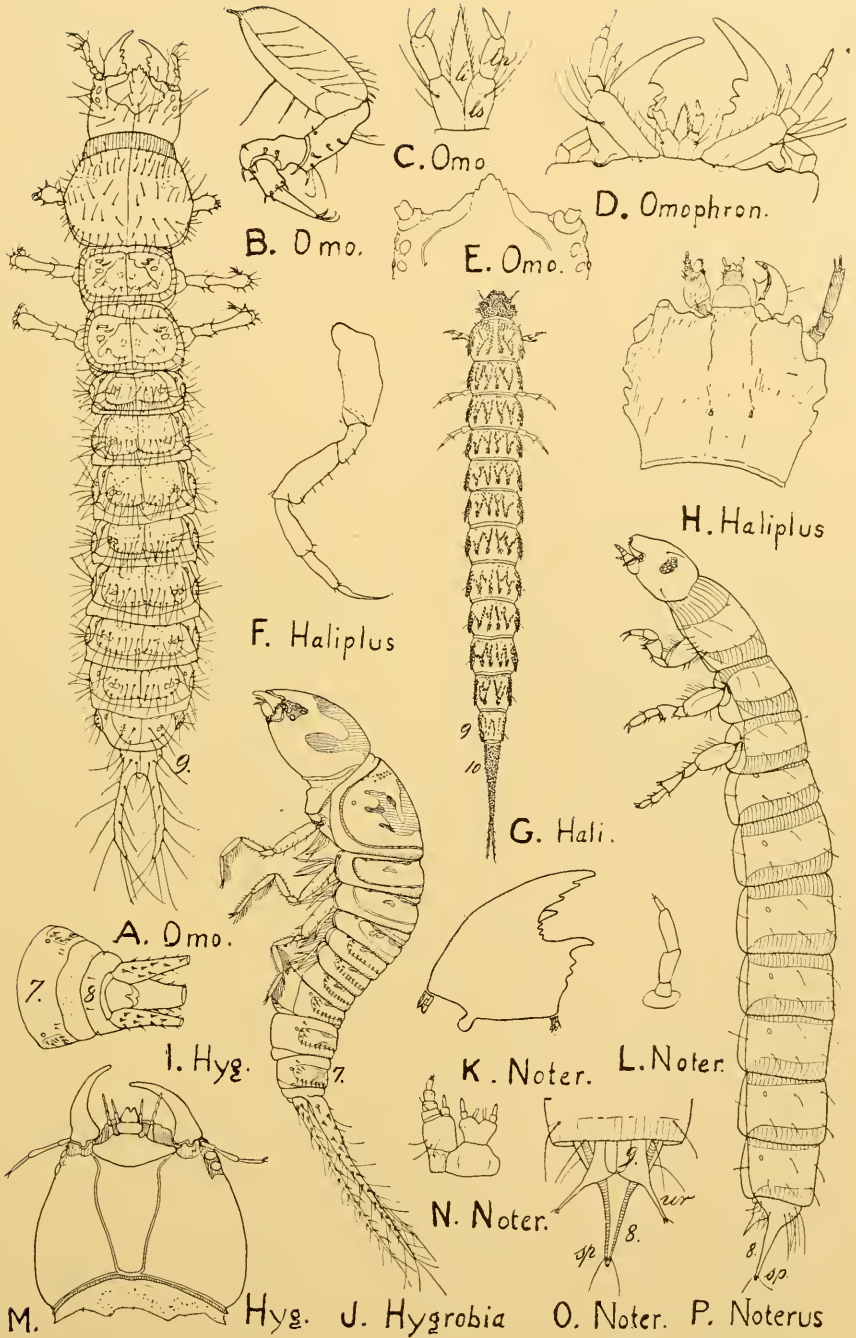


PLATE 6

Dytiscidae, Gyrinidae

- | | | |
|----|---|------------------------------------|
| A. | <i>Hydatieus transversalis</i> Pontopp. (Denmark) | : Head. Ventral view. |
| B. | <i>Hyphydrus ovatus</i> L. (Denmark) | : Head. Ventral view. |
| C. | “ “ | : Tip of eighth abdominal segment. |
| D. | “ “ | : Head. Lateral view. |
| E. | <i>Dineutes americanus</i> Say | : Leg. |
| F. | <i>Hydatieus transversalis</i> | : Larva. Dorsal view. |
| G. | <i>Hyphydrus ovatus</i> | : Larva. Dorsal view. |
| H. | <i>Hydatieus transversalis</i> | : End of abdomen. Lateral view. |
| I. | <i>Dineutes americanus</i> | : Mandible. |
| J. | “ “ | : Maxilla. |
| K. | “ “ | : Larva. Dorsal view. |
| L. | “ “ | : Antenna. |
| M. | “ “ | : Head. Ventral view. |

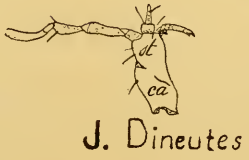
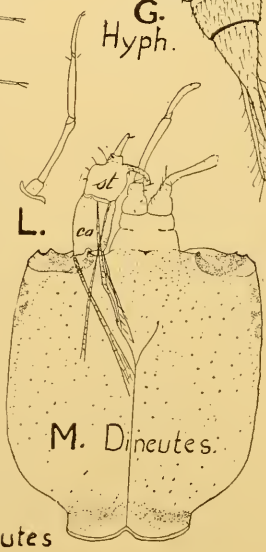
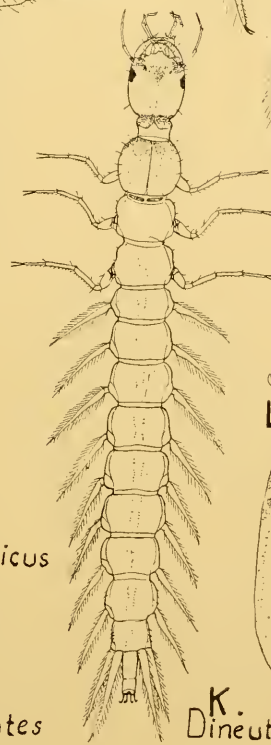
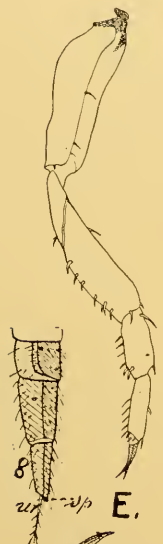
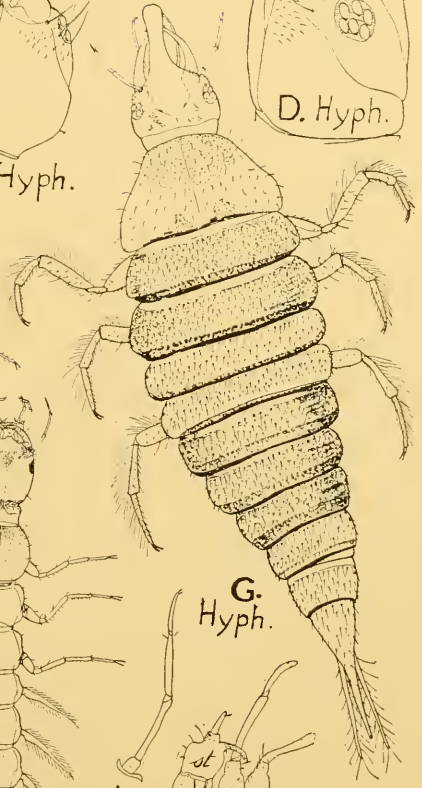
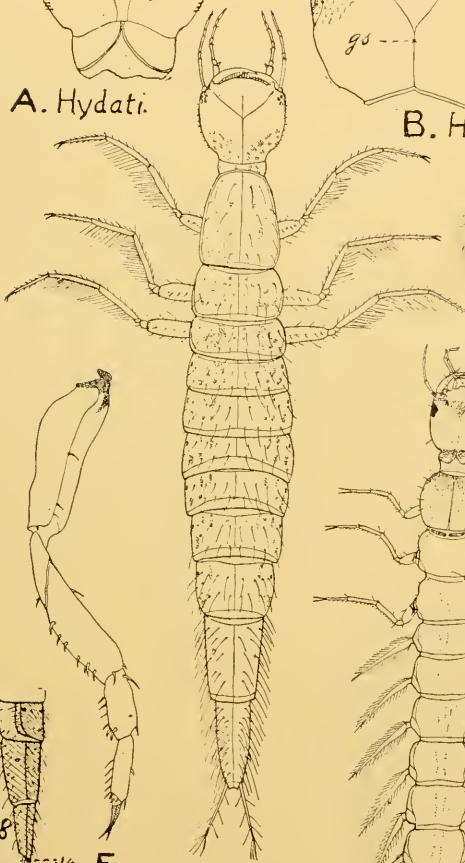
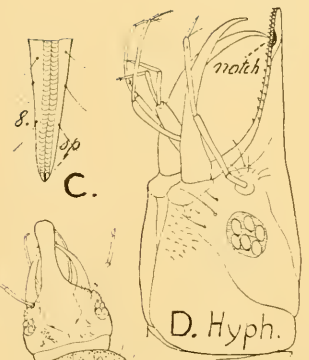
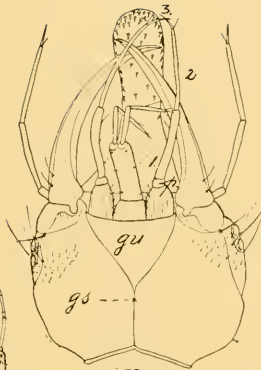
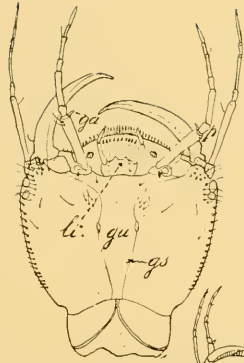


PLATE 7

Amphizoidea, Paussidae

- A. *Amphizoa lecontei* Matth.: Head. Ventral view.
 B. " " : Larva. Dorsal view.
 C. " " : Prothorax. Ventral view.
 D. " " : End of abdomen. Ventral view.
 E. " " : End of abdomen. Dorsal view.
 F. " " : Metathoracic leg.
 G. " " : Left mandible. Dorsal view.
 H. " " : Hypopharynx, etc. Dorsal view.
 I. *Paussus kanngieteri* Wasm. (Java): Head. Ventral view.
 J. " " : Right mandible. Dorsal view.
 K. " " : Head. Dorsal view.
 L. " " : Eighth abdominal segment. Dorsal view.
 M. " " : Larva. Lateral view.

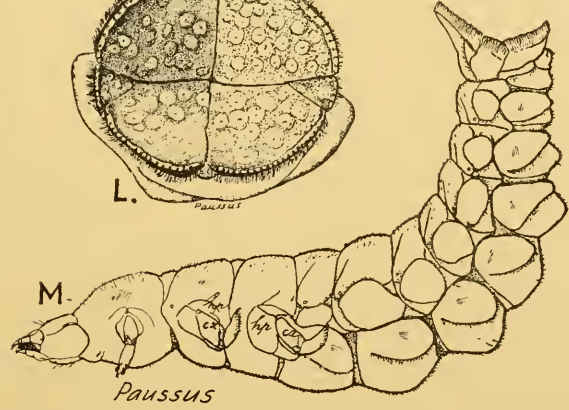
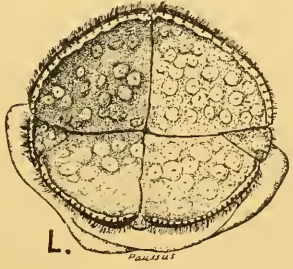
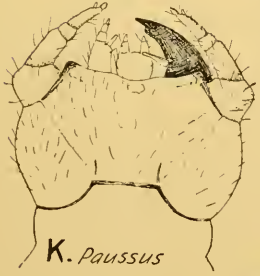
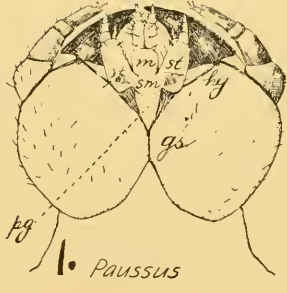
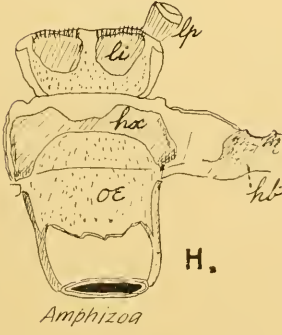
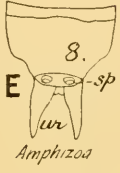
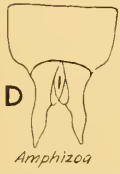
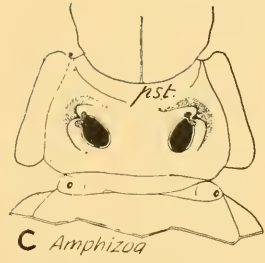
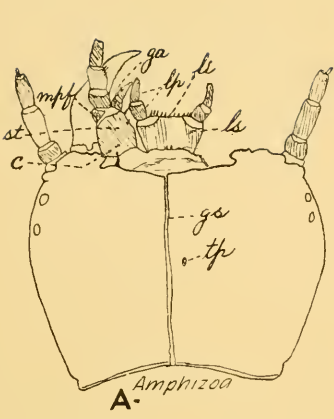
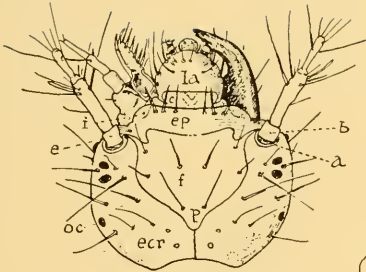


PLATE 8

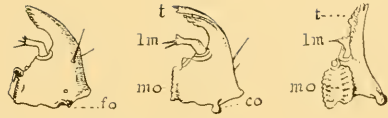
Limnebiidae

- | | | |
|----|---------------------------------------|---|
| A. | Ochthebius impressus Marsh. (Denmark) | : Head. Dorsal view.* |
| B. | “ “ | : Mandible. |
| C. | “ “ | : Leg. |
| D. | “ “ | : Head. Ventral view.* |
| E. | “ “ | : Larva. Ventral view. |
| F. | “ “ | : Larva. Dorsal view. |
| G. | Limnebius papposus Muls. (Denmark) | : Larva. Dorsal view. |
| H. | “ “ | : Head. Dorsal view. |
| I. | “ “ | : Spiracle. |
| J. | Limnebius sp. (Denmark) | : Larva. Lateral view. |
| K. | Limnebius papposus | : Mandible. |
| L. | “ “ | : Anterior part of body.
Lateral view. |

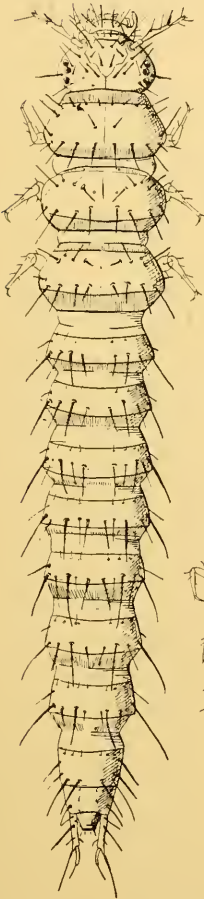
* Special abbreviations applied.



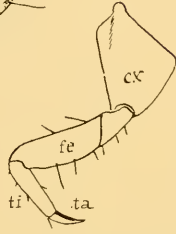
A. Ochthebius



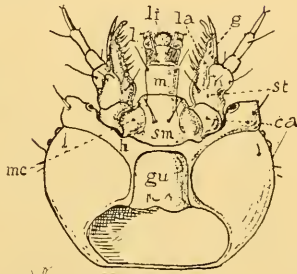
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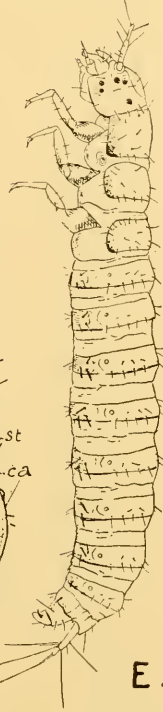
G. Limn.



C. Ochthebius



D. Ochth.



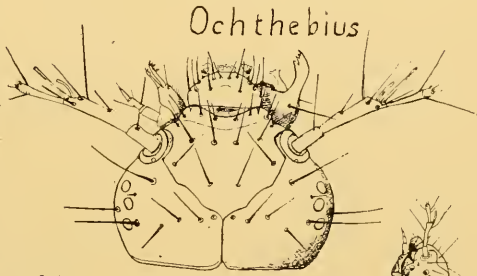
E.



F.



J.



H. Limnebius



K.



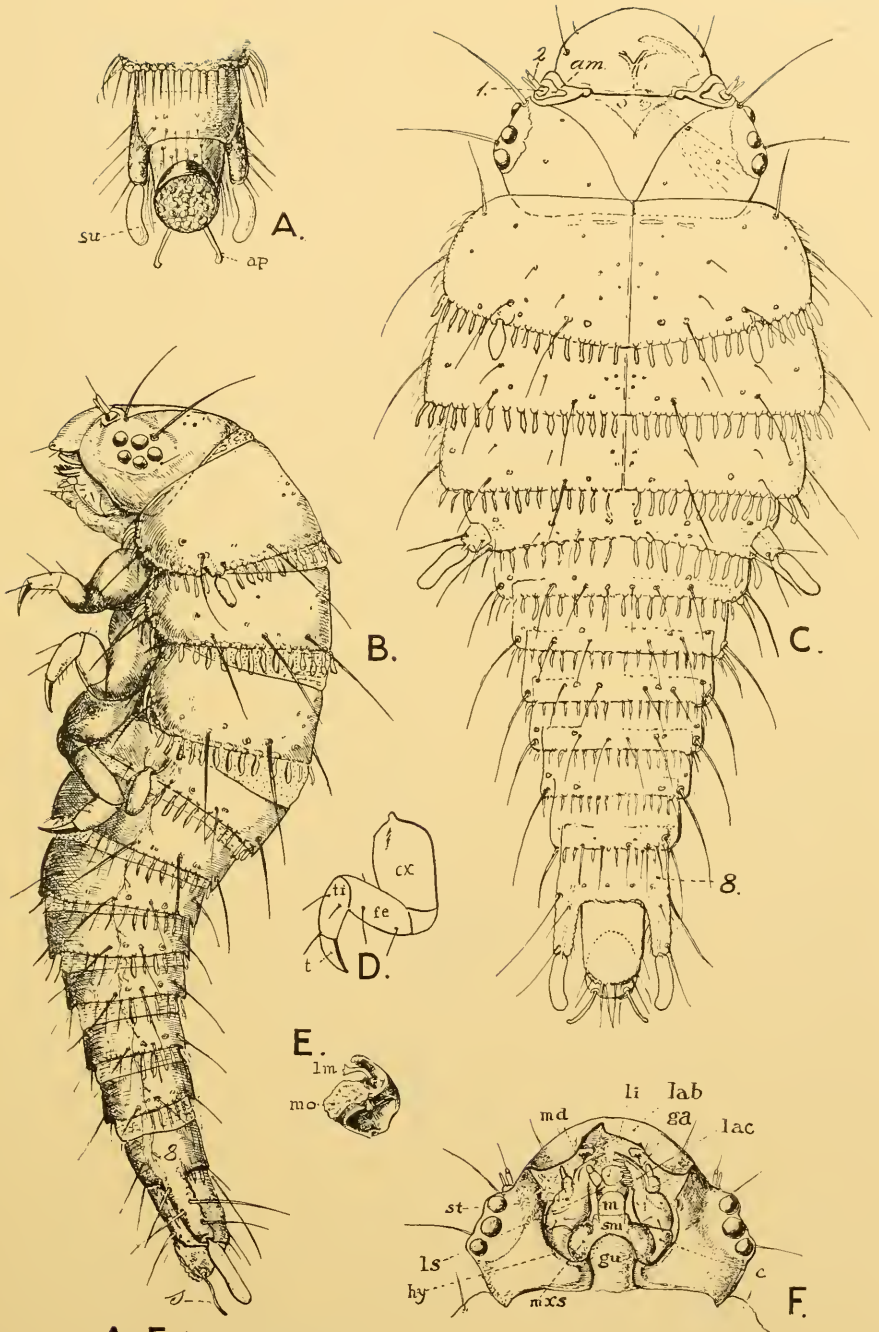
L.

Limnebius

PLATE 9

Hydroscaphidae

- A. *Hydroscapha natans* Lec.: Last abdominal segments. Ventral view.
B. “ “ : Larva. Lateral view.
C. “ “ : Larva. Dorsal view.
D. “ “ : Right leg of mesothorax.
E. “ “ : Left mandible. Ventral view.
F. “ “ : Head. Ventral view.



A-F *Hydroscapha*

PLATE 10

Leptinidae, Ptiliidae

- | | | |
|----|----------------------------|---|
| A. | Leptinus testaceus Müll. | : Larva. Dorsal view. |
| B. | “ “ | : Right mandible. Ventral view. |
| C. | “ “ | : Hypopharynx; pgn, paraglossa. |
| D. | “ “ | : Head. Dorsal view. |
| E. | “ “ | : Head. Ventral view. |
| F. | Nossidium americanum Mots. | : Right mandible. Ventral view. |
| G. | “ “ | : Leg. |
| H. | “ “ | : Antenna. |
| I. | “ “ | : Head. Ventral view. |
| J. | “ “ | : End of left maxilla. Ventral
view. |
| K. | “ “ | : Larva. Lateral view. |
| L. | “ “ | : Epipharynx. |

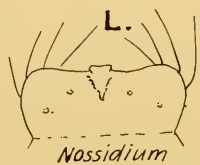
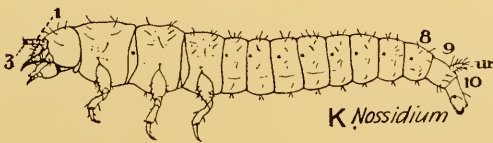
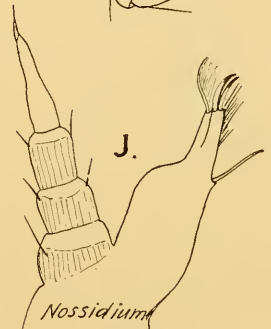
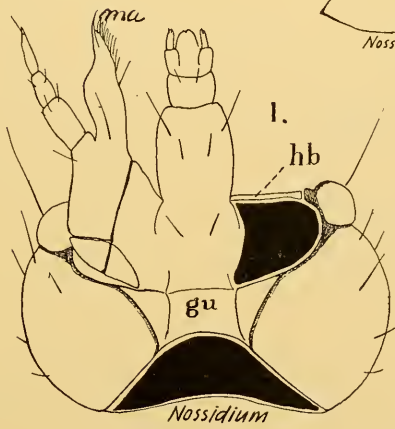
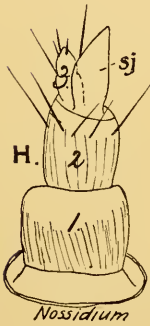
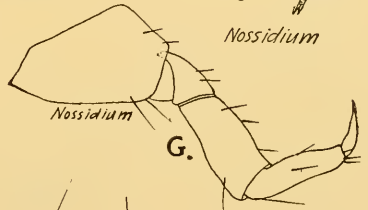
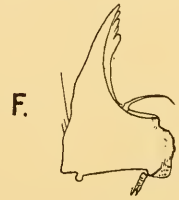
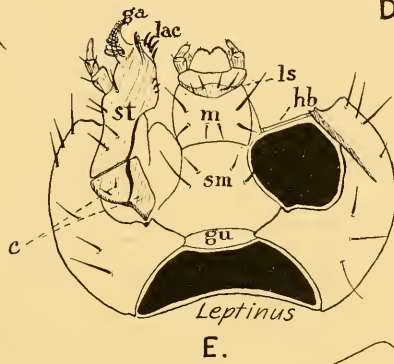
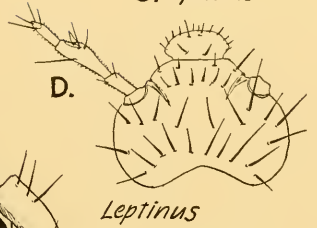
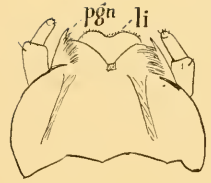
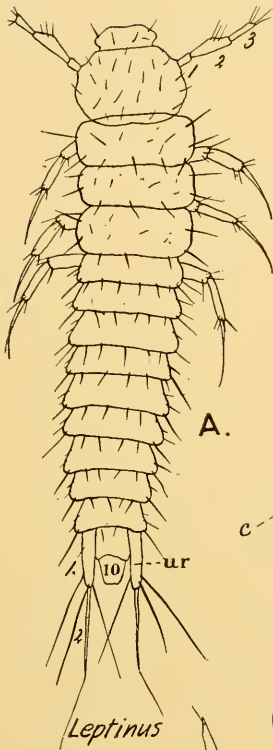


PLATE 11

Anisotomidae-Liodinae (A, B)

Anisotomidae-Cholevinae (C-M)

- A. *Liodes humeralis* F. (Denmark) : Right mandible. Ventral view.
- B. *Anisotoma glabra* Kugel. (Denmark) : Ligula and paraglossa.
- C. *Choleva* sp. (Denmark) : Antenna.
- D. " " : Right mandible. Ventral view.
- E. *Adelops hirtus* Tellk. : Ligula, paraglossa, maxillula, hypopharynx, and hypopharyngeal bracon.
- F. " " : Tip of maxilla.
- G. *Prionochaeta opaca* Say : Head. Dorsal view.
- H. *Adelops hirtus* : Right mandible. Ventral view.
- I. *Prionochaeta opaca* : Right mandible. Ventral view.
- J. " " : Head. Ventral view.
- K. " " : Labium and ventral buccal structures. Lateral view.
- L. " " : Larva. Lateral view.
- M. " " : Ligula, maxillula, hypopharynx, and hypopharyngeal bracon.

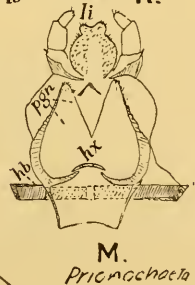
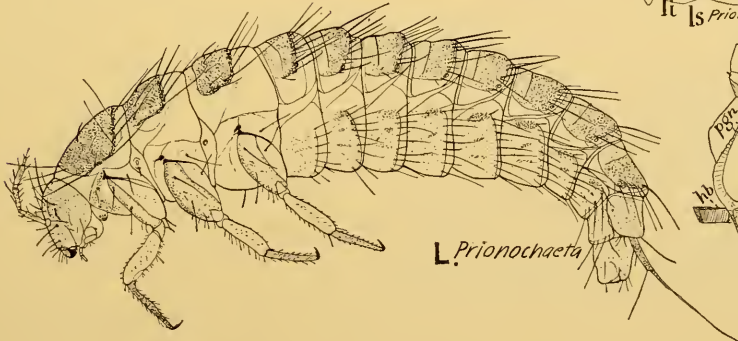
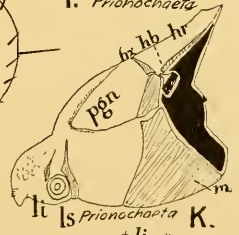
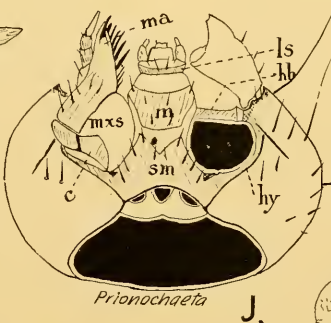
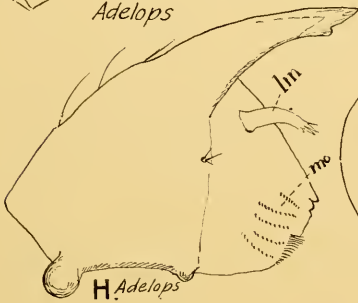
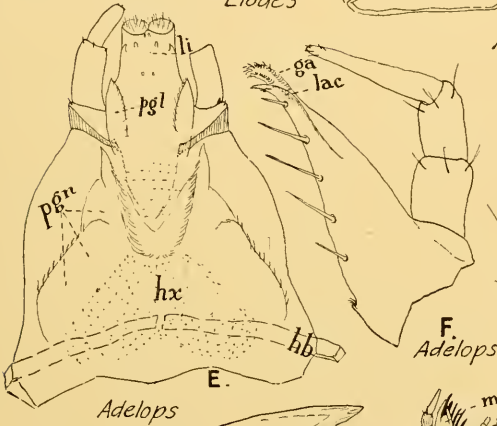
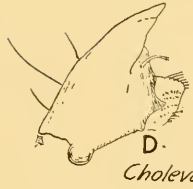
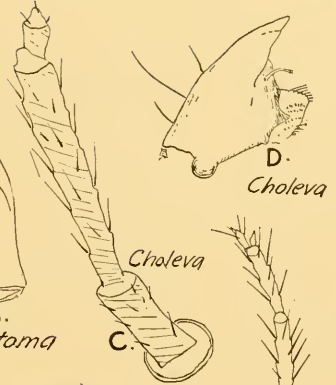
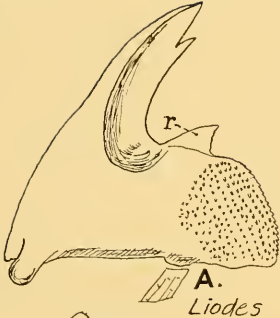


PLATE 12

Scaphidiidae, Platypsyllidae

- | | | | | |
|----|------------------------------|-------|-----------------------------------|---------------|
| A. | <i>Scaphisoma convexum</i> | Say | : Ligula and paraglossa. | Buccal view. |
| B. | “ | “ | : Head. | Dorsal view. |
| C. | “ | “ | : Head. | Ventral view. |
| D. | “ | “ | : Right mandible. | Ventral view. |
| E. | <i>Platypsyllus castoris</i> | Rits. | : Abdominal segment. | Dorsal view. |
| F. | “ | “ | : Mature larva. | Dorsal view. |
| G. | “ | “ | : Leg of first instar. | |
| H. | “ | “ | : Right mandible of mature larva. | Dorsal view. |
| I. | “ | “ | : Head of first instar. | Ventral view. |
| J. | <i>Scaphisoma convexum</i> | | : Larva. | Dorsal view. |
| K. | <i>Platypsyllus castoris</i> | | : Head of mature larva. | Ventral view. |

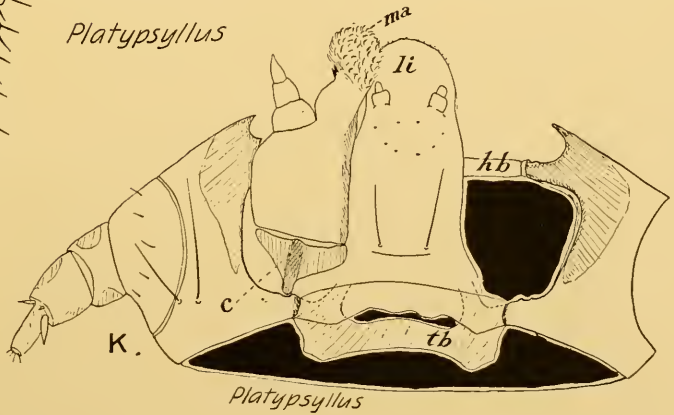
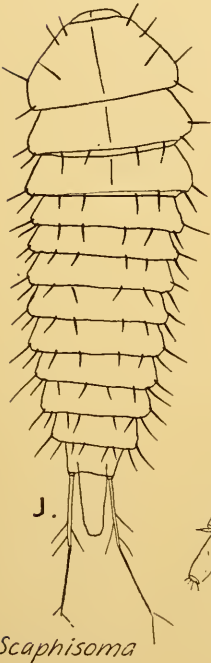
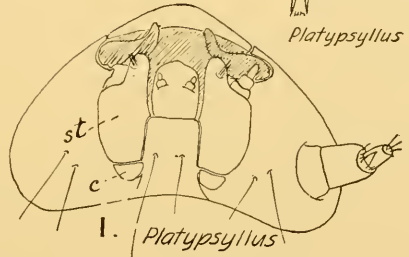
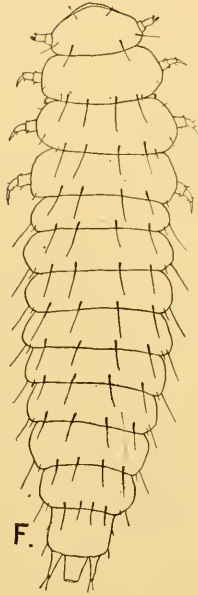
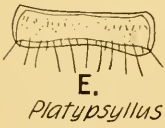
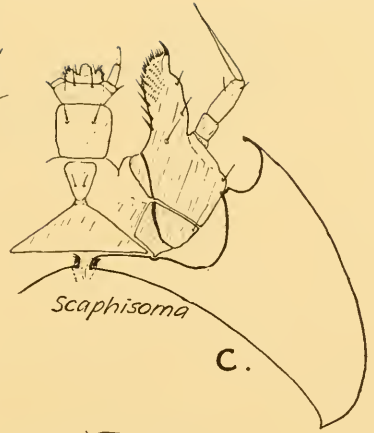
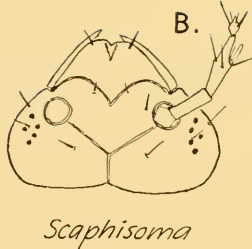
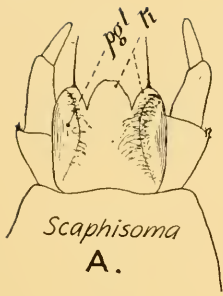
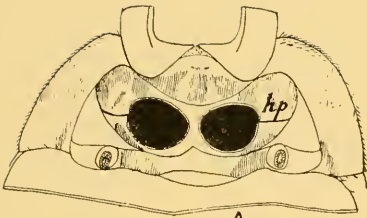


PLATE 13

Silphidae-Silphinae

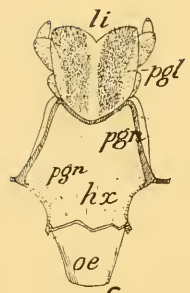
- | | | | |
|----|----------|--------------------------|--|
| A. | Silpha | (noveboracensis Forst.?) | : Prothorax. Ventral view. |
| B. | “ | “ | : Labium and hypopharynx.
Lateral view. |
| C. | “ | “ | : Hypopharyngeal structures.
Dorsal view. |
| D. | “ | “ | : Right mandible. Dorsal
view. |
| E. | “ | “ | : Head. Ventral view. |
| F. | “ | “ | : Larva. Dorsal view. |
| G. | “ | “ | : Left maxilla. Dorsal view. |
| H. | “ | “ | : Head. Dorsal view. |
| I. | “ | “ | : Tenth abdominal segment. |
| J. | Neerodes | littoralis L. (Denmark) | : Larva. Lateral view. |



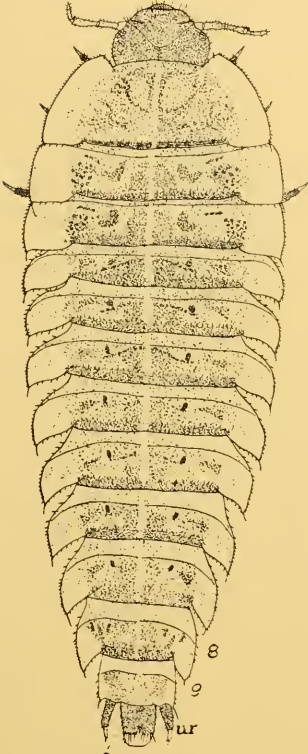
A. *Silpha*



B. *Silpha*



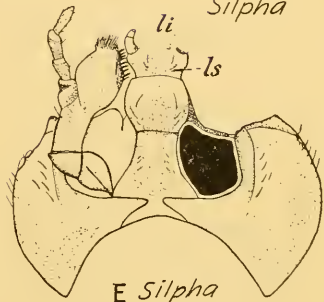
C. *Silpha*



F. *Silpha*



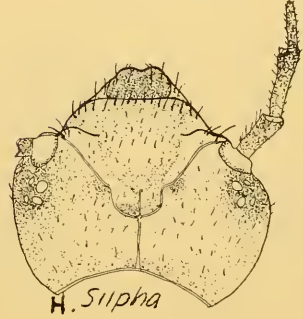
D. *Silpha*



E. *Silpha*



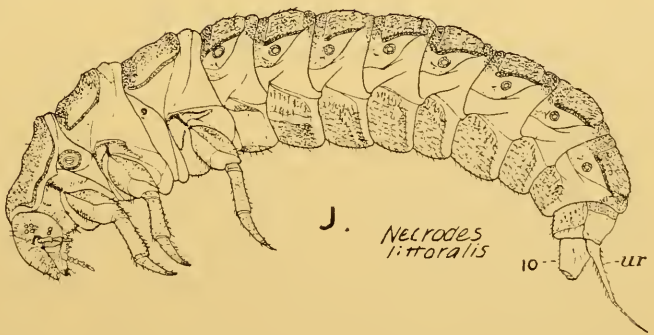
G. *Silpha*



H. *Silpha*



I. *Silpha*



J. *Necrodes littoralis*

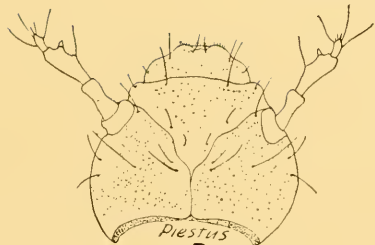
PLATE 14

Staphylinidae-Piestinae,
Staphylinidae-Aleocharinae

- | | |
|--|---|
| A. Gyrophaena sp. | : Head. Dorsal view. |
| B. <i>Piestus pygmaeus</i> Casteln. (Brazil) | : Head. Dorsal view. |
| C. " " | : Larva. Lateral view. |
| D. Gyrophaena sp. | : Head. Ventral view. |
| E. <i>Piestus pygmaeus</i> | : Hypopharyngeal structures. Dorsal view. |
| F. " " | : Head. Ventral view. |
| G. Gyrophaena sp. | : Diagram illustrating abdominal scleromes. |
| H. <i>Piestus pygmaeus</i> | : Diagram illustrating abdominal scleromes. |
| I. Gyrophaena sp. | : Larva. Lateral view. |



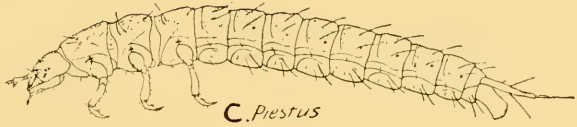
A.
Gyrophaena



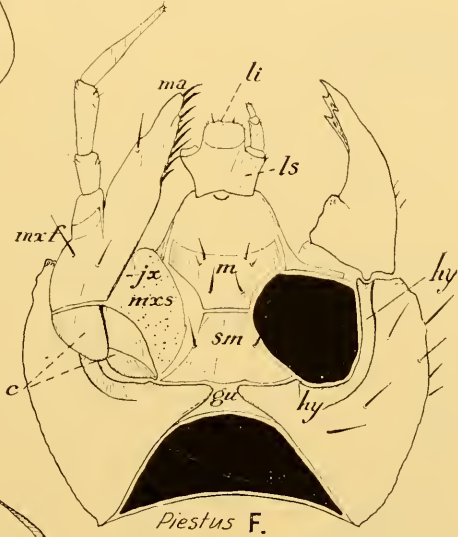
B.
Piestus



D.
Gyrophaena



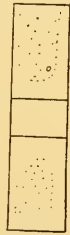
C. *Piestus*



F.
Piestus



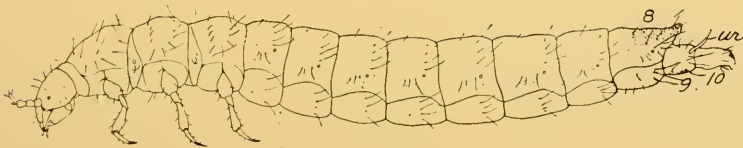
E. *Piestus*



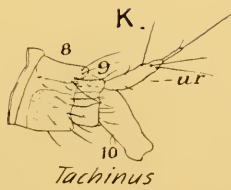
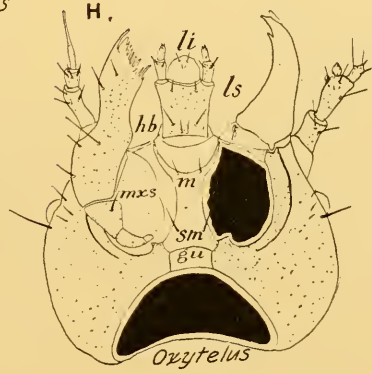
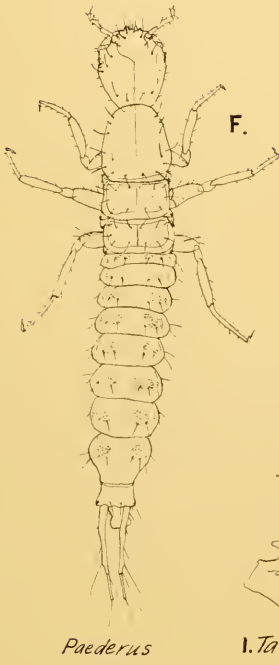
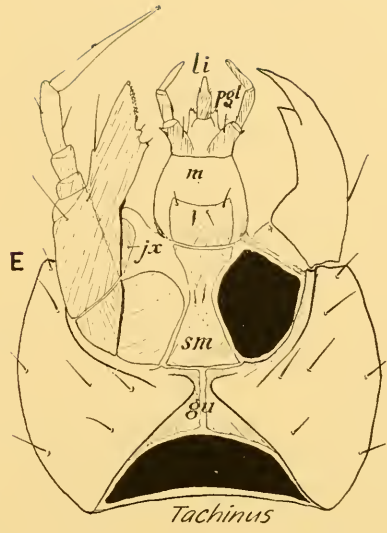
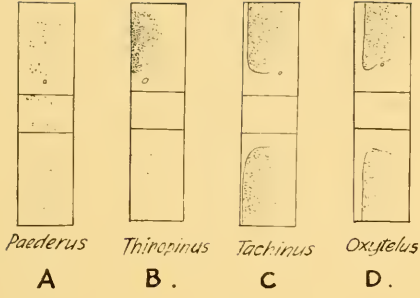
G.
Gyrophaena



H.
Piestus



I. *Gyrophaena*



LARVAL FORMS OF COLEOPTERA

PLATE 16

Staphylinidae-Aleocharinae (F-I),
Staphylinidae-Proteininae (J-M),
Scydmaenidae (A-E)

- A. *Eumierus longicollis* Csy. : Right mandible. Ventral view.
B. " " : Head. Ventral view.
C. " " : Spiracle.
D. " " : Larva. Dorsal view.
E. " " : Leg.
F. *Maseochara* sp. (Arizona) : Leg.
G. " " : Mature larva. Lateral view.
H. " " : Head. Dorsal view.
I. " " : Head. Ventral view.
J. *Proteinus atomarius* Er. : Head. Lateral view.
K. " " : Mesothoracic leg.
L. " " : Head. Ventral view.
M. " " : Larva. Dorsal view.

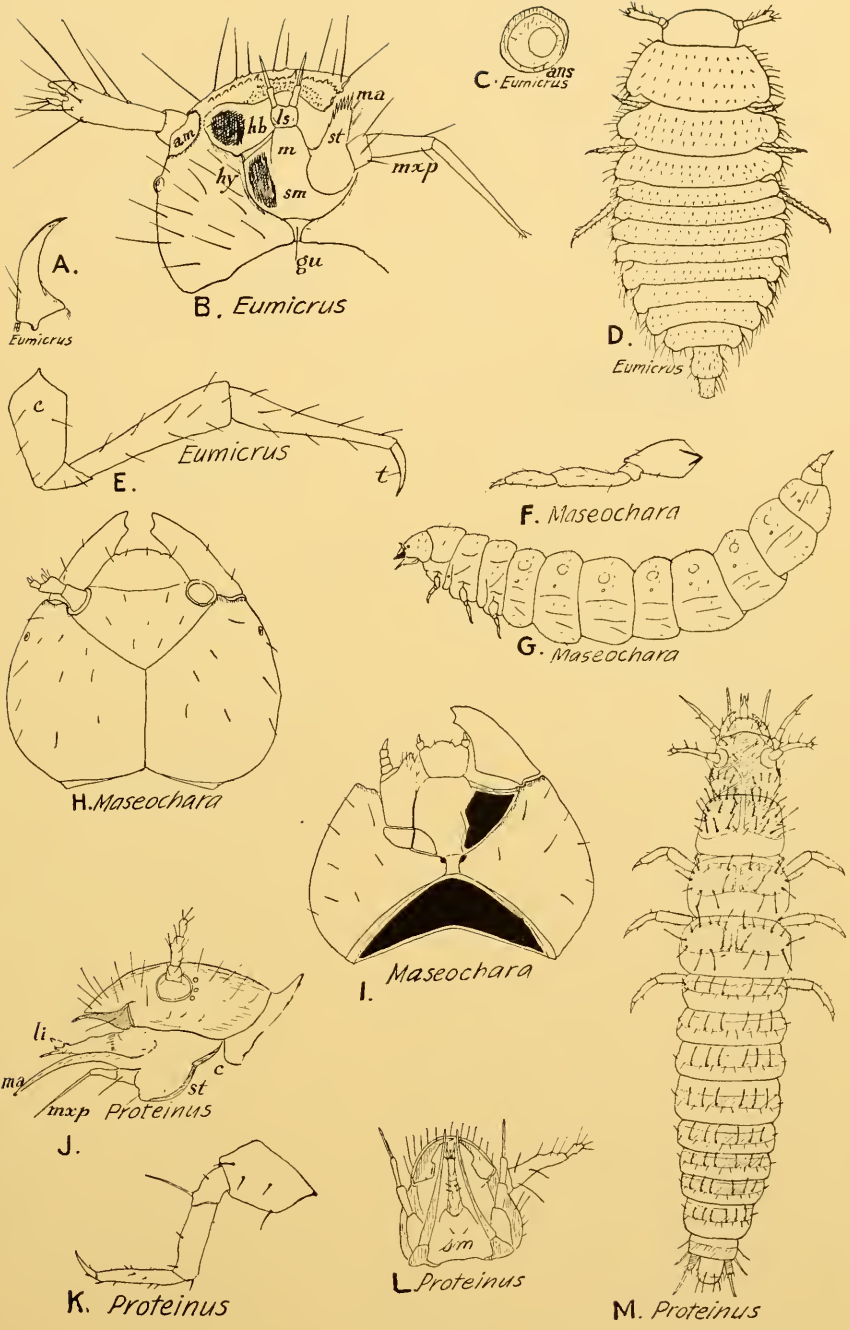
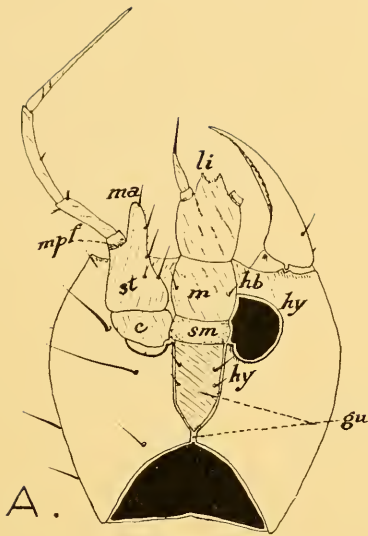


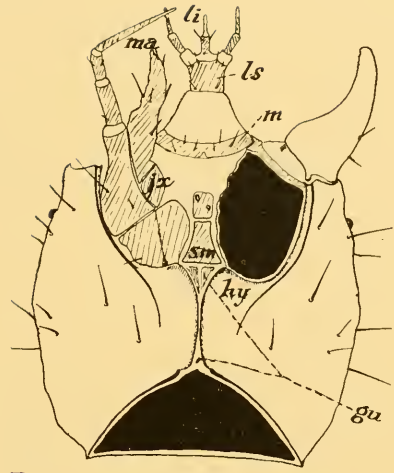
PLATE 17

Staphylinidae-Omaliiinae,
Staphylinidae-Steninae

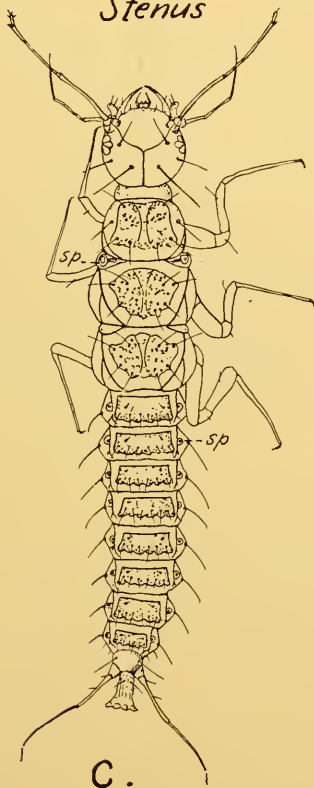
- A. *Stenus* sp. : Head. Ventral view.
B. *Omalium rivulare* Payk. (Denmark) : Head. Ventral view.
C. *Stenus* sp. : Larva. Dorsal view.
D. *Omalium rivulare* : Head. Dorsal view.
E. *Stenus* sp. : Head. Lateral view.
F. *Omalium rivulare* : Diagram illustrating abdominal scleromes.
G. “ “ : Larva. Lateral view.



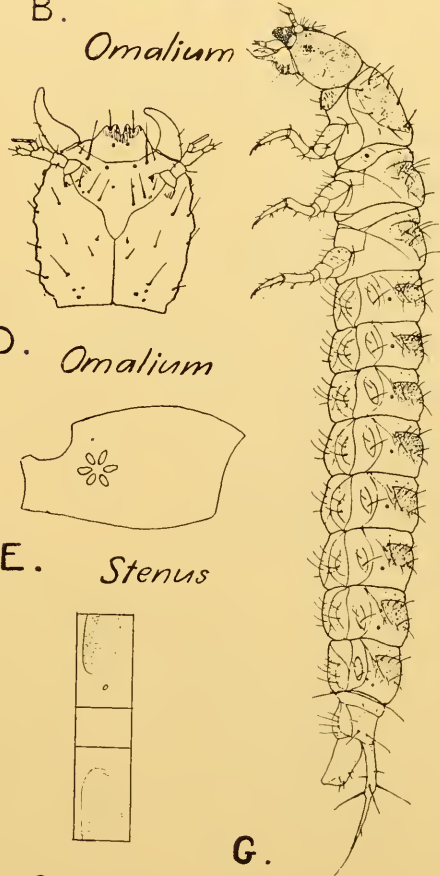
A. *Stenus*



B. *Omalium*



C. *Stenus*



D. *Omalium*



E. *Stenus*



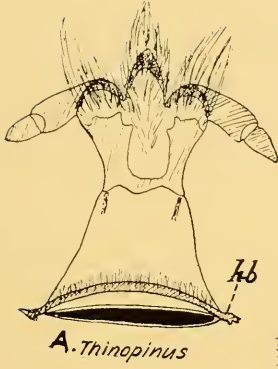
F. *Omalium*

G. *Omalium*

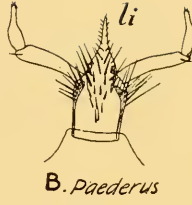
PLATE 18

Staphylinidae-Thinopininae,
Staphylinidae-Paederinae

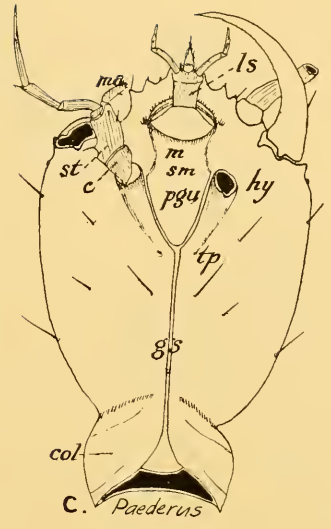
- | | | | | |
|----|-------------------|--------------|---|---|
| A. | Thinopinus pictus | Lee. | : | Hypopharynx. |
| B. | Paederus riparius | L. (Denmark) | : | Hypopharynx. |
| C. | “ | “ | : | Head. Ventral view. |
| D. | Thinopinus pictus | | : | Prothorax. Ventral view. |
| E. | “ | “ | : | Head. Dorsal view. |
| F. | Paederus riparius | | : | Head. Lateral view. |
| G. | Thinopinus pictus | | : | Diagram illustrating position
of antennae and mouth-
parts. |
| H. | “ | “ | : | Abdominal spiracle. |
| I. | “ | “ | : | Head. Ventral view. |
| J. | “ | “ | : | Head. Lateral view. |



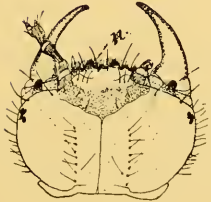
A. *Thinopinus*



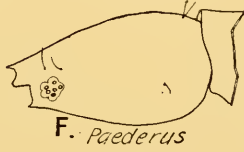
B. *Paederus*



C. *Paederus*



E. *Thinopinus*



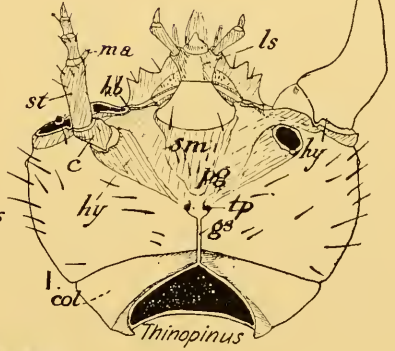
F. *Paederus*



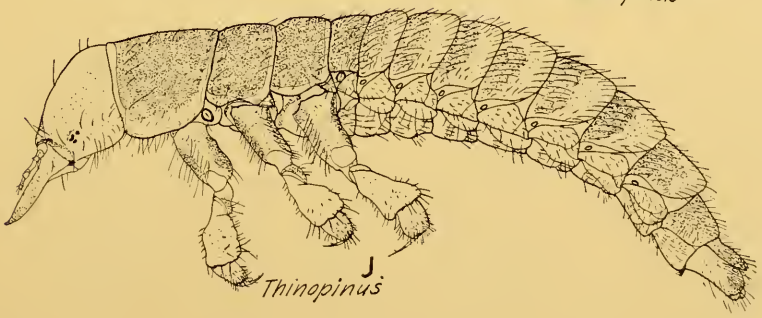
H. *Thinopinus*



G. *Thinopinus*



I. *Thinopinus*



J. *Thinopinus*

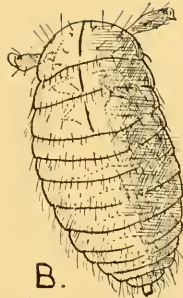
PLATE 19

Seydmaenidae (A-D). Pselaphidae (E-J)

- | | | |
|----|--|--------------------------------------|
| A. | Seydmaenidae (Plummers Isl., Maryland) | : Head. Ventral view. |
| B. | “ | : Larva. Dorsal view. |
| C. | “ | : Larva. Lateral view. |
| D. | “ | : Head. Dorsal view. |
| E. | <i>Batrisodes monstrosus</i> Lec. | : Head. Dorsal view. |
| F. | <i>Euplectus confluens</i> Lec. | : Head. Ventral view. |
| G. | <i>Batrisodes monstrosus</i> | : Larva. Ventral view. |
| H. | “ “ | : Ventral mouth-parts. Ventral view. |
| I. | “ “ | : Larva. Lateral view. |
| J. | <i>Euplectus confluens</i> | : Larva. Dorsal view. |



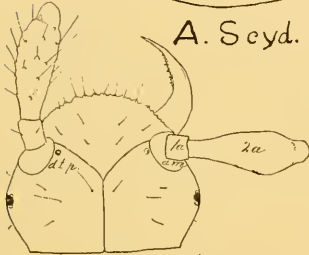
A. Seyd.



B. Seyd.



C. Seyd.



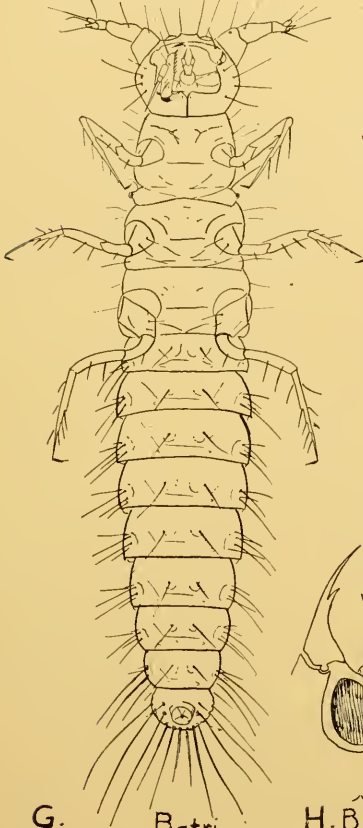
D. Seyd.



E. Batri.



F. Euplectus

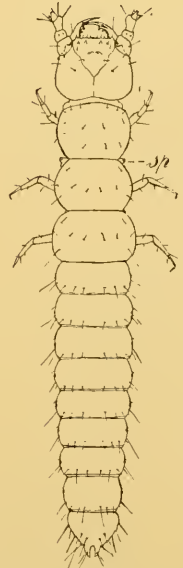


G. Batri.



H. Batri.

I. Batri.



J. Euplectus

PLATE 20

Histeridae

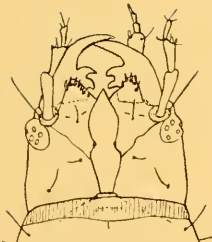
- | | |
|--|--|
| A. <i>Platysoma</i> sp. | : Right mandible. Dorsal view. |
| B. <i>Saprinus estriatus</i> Lec. | : Right mandible. Dorsal view. |
| C. " " | : Head. Dorsal view. |
| D. " " | : Ventral mouthparts. Ventral view. |
| E. <i>Teretrius</i> sp. | : Tibia and tarsungulus. |
| F. " " | : Ventral mouthparts. Ventral view. |
| G. " " | : Head. Dorsal view. |
| H. " " | : Right mandible. Dorsal view. |
| I. <i>Hololepta yucateca</i> Mars. | : Larva. Dorsal view. |
| J. " " | : Ventral mouthparts with muscles (Diagram). |
| K. <i>Paromalus aequalis</i> Say. | : Leg. |
| L. <i>Hister unicolor</i> L. (Denmark) | : Vertical longitudinal section of spiracle, closing apparatus, and the epidermal tissues which form these parts in the following larval stage. (Notice the barrel shaped layer of one of the tubes of the next spiracle). |
| M. <i>Hololepta yucateca</i> | : Thorax. Ventral view. |
| N. <i>Hister unicolor</i> | : Closing apparatus of spiracle. |
| O. " " | : Cross section of tubes of biforous spiracle. |
| P. " " | : Spiracle cut horizontally to show the inner lumen of tubes. |
| Q. " " | : Spiracle from above. |
| R. <i>Hololepta yucateca</i> | : Larva. Lateral view. |



PLATE 21

Histeridae, Helophoridae, Spercheidae

- A. *Helophorus aquaticus* L. (Denmark) : Head. Dorsal
view.
- B. *Spercheus emarginatus* Schall (Denmark) : Maxilla. Ventral
view.
- C. " " : Head. Ventral
view.
- D. *Helophorus aquaticus* : Larva. Ventral
view.
- E. " " : Larva. Ventral
view.
- F. *Spercheus emarginatus* : Leg.
- G. " " : Mandible.
- H. " " : Larva. Dorsal
view.
- I. *Histeridae* (British Guiana. Termitophil-
ous larva of unknown genus col-
lected by Dr. E. A. Emerson) : Larva. Lateral
view.



A. Heloph.



B. Sper.



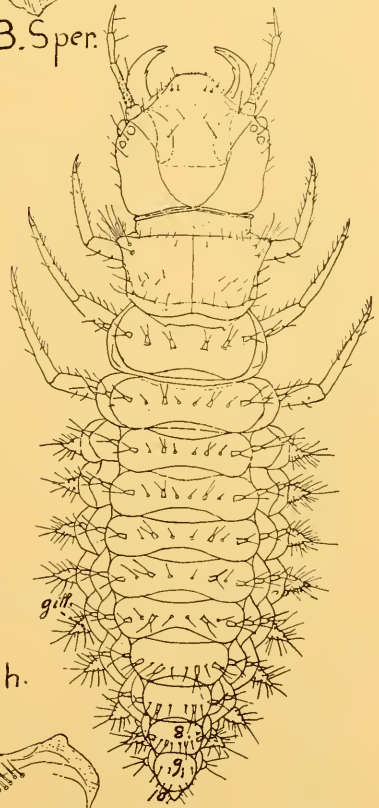
C. Sperch.



D. Heloph.



E. Heloph.



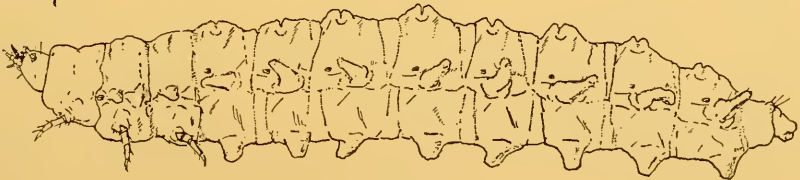
H. Spercheus



F. Sper.



G. Sper.

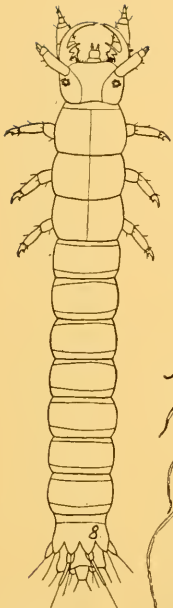


I. Histerid

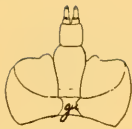
PLATE 22

Hydrochidae, Hydrophilidae-Berosinae,
Hydrophilidae-Hydrophilinae, Hydrophilidae-Hydrobiinae

- A. *Hydrochus squamifer* Lec. : Ventral mouthparts.
(After E. A. Richmond) Ventral view.
- B. *Berosus signaticollis* Charp. (Denmark) : Anterior part of
head. Dorsal
view.
- C. *Laccobius minutus* L. (Denmark) : Head. Dorsal view.
- D. *Hydrochus squamifer* : Larva. Dorsal view.
(After E. A. Richmond)
- E. *Berosus spinosus* Stev. (Denmark) : Larva. Dorsal view.
- F. *Hydrophilus caraboides* L. (Denmark) : Larva. Dorsal view.
- G. " " : End of body. Lateral
view.
- H. *Laccobius minutus* : Anterior part of
body. Ventral
view.
- I. " " : Larva. Lateral view.
- J. *Hydrobius fuscipes* L. (Denmark) : Larva. Dorsal view.
- K. " " : Head. Dorsal view.
- L. *Paracymus aeneus* Germ. (Denmark) : Head. Ventral view.
- M. " " : Head. Dorsal view.
- N. *Helochares lividus* Förster (Denmark) : First instar. Dorsal
view.
- O. *Enochrus melanocephalus* Od. (= E. bi- : End of body. Dorsal
color Payk.) (Denmark) view.
- P. " " : Head. Dorsal view.
- Q. " " : Proleg. Ventr o-
lateral view.
- R. *Philydrus* sp. (Denmark) : Proleg. Ventr o-
lateral view.
- S. *Enochrus melanocephalus* : Larva. Dorso-lateral
view.



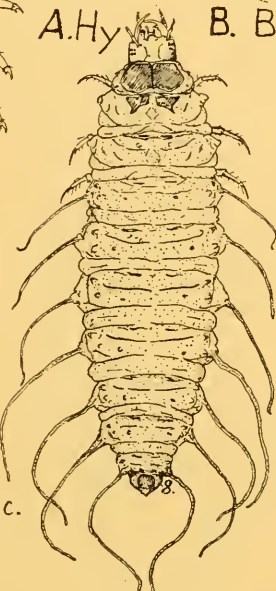
D. Hydroc.



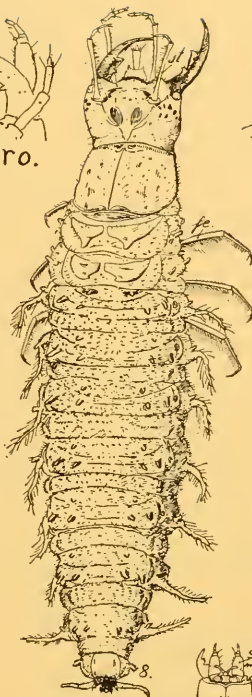
A. Hy.



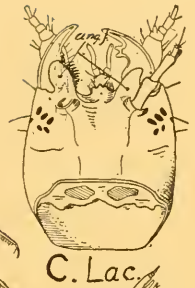
B. Bero.



E. Berosus



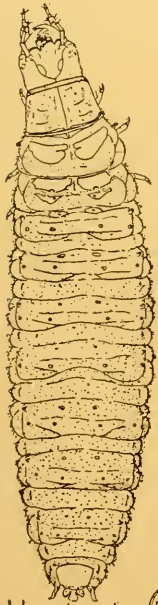
F. Hydroph



C. Lac.



I. Lac.



J. Hydrob.



G. Hydroph.



H. Lac.



L. Par.



M. Par.



N. Helo.



R. Enochrus



O. Enoch.



P. Enoch.



Q.

S.

LARVAL FORMS OF COLEOPTERA

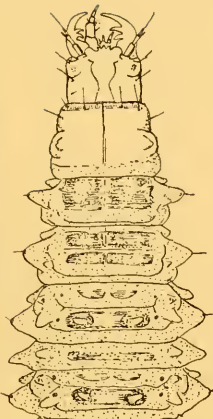
PLATE 23

Hydrophilidae-Hydrophilinae (A),
Hydrophilidae-Hydrobiinae (B, G, H),
Hydrophilidae-Sphaeridiinae (C-F, I-P)

- A. *Hydrous piceus* L. (Denmark) : Larva. Dorsal view.
 B. *Paracymus aeneus* Germ. (Denmark) : Anterior part of larva. Dorsal view.
 C. *Chaetartria seminulum* Herbst (Denmark) : Larva. Lateral view.
 D. " " : Larva. Dorsal view.
 E. " " : Head. Dorsal view.
 F. " " : Head. Ventral view.
 G. *Paracymus aeneus* : Posterior part of larva. Dorsal view.
 H. " " : Leg.
 I. *Chaetartria seminulum* : End of body. Dorsal view.
 J. " " : Leg.
 K. *Coelostoma orbiculare* F. (Denmark) : Anterior part of head. Dorsal view.
 L. " " : Head. Dorsal view.
 M. " " : Head. Ventral view.
 N. " " : Larva. Dorsal view.
 O. " " : Anterior part of larva. Lateral view.
 P. " " : Prothorax and mesothorax. Ventral view.



A Hydro.



B. Paracym.



C. Chae.



D. Chaetar.



E.



F. Chae.



G. Paracy.



H. Par.



I. Chae.



J. Chae.



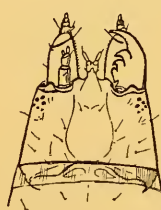
N. Coelos.



O. Coelostoma



K. Coelos.



L. Coelos.



M. Coelos.



P. Coelostoma.

PLATE 24.

Hydrophilidae-Sphaeridiinae

- A. Undetermined larva (*Cryptopleurum* (?), *Megasternum* (?), or *Cercyon* (?)) 3mm. long (Ireland) : Left mandible.
- B. " : Anterior part of head. Dorsal view.
- C. " : Right mandible.
- D. " : Larva. Ventral view.
- E. " : Ventral mouthparts. Ventral view.
- F. " : Larva. Dorsal view.
- G. *Sphaeridium bipustulatum* F. Spiracle of eighth abdominal (Denmark) : segment.
- H. " " : Leg.
- I. Undetermined larva (*Cryptopleurum*? etc. as above) : Legs and part of abdomen. view.
- J. *Sphaeridium bipustulatum* : Anterior part of head. Dorsal view.
- K. " " : Maxilla. Ventral view.
- L. *Paracercyon flavipes* Thunbg. (= *Cercyon analis* Payk.) (Denmark) : Right mandible.
- M. *Sphaeridium bipustulatum* : Larva. Ventral view.
- N. " " : Right mandible.
- O. " " : Left mandible.
- P. *Paracercyon flavipes* : Left mandible.
- Q. *Sphaeridium bipustulatum* : End of body. Dorsal view.
- R. *Sphaeridium scarabaeoides* L. (Denmark) : End of body. Dorsal view.
- S. *Sphaeridium bipustulatum* : Labium. Ventral view.
- T. *Paracercyon flavipes* : Larva. Dorsal view.
- U. " " : Ventral mouthparts. Ventral view.

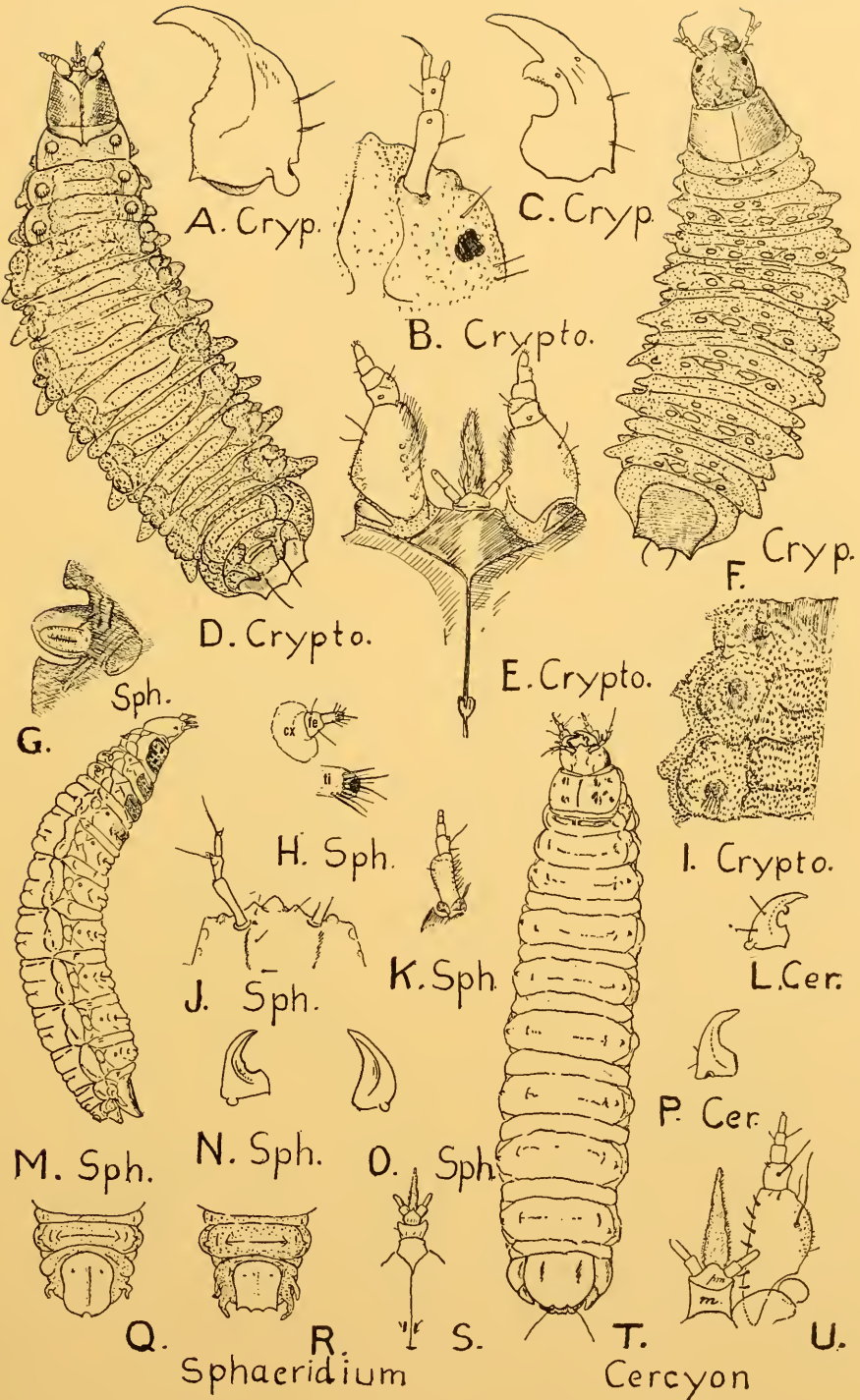
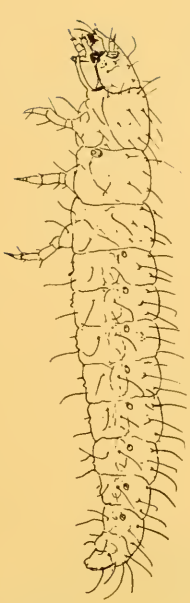


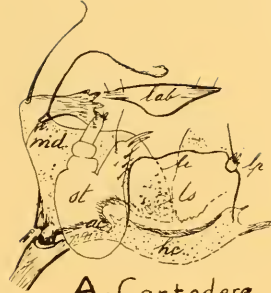
PLATE 25

Lathridiidae, Monotomidae

- | | | | | |
|----|---------------------------------------|-------|---|---|
| A. | <i>Cartodere costulata</i> | Reit. | : | Anterior part of head.
Ventral view. |
| B. | “ | “ | : | Mandible. Extero-dorsal
view. |
| C. | <i>Melanophthalma chamaeropsis</i> | Fall. | : | Mandible, labial palpi, hy-
popharynx. |
| D. | <i>Cartodere costulata</i> | | : | Mandible. Buccal view. |
| E. | “ | “ | : | Larva. Lateral view. |
| F. | “ | “ | : | Eighth and ninth abdomi-
nal segments. Dorsal
view. |
| G. | <i>Melanophthalma chamaeropsis</i> | | : | Ocelli, antenna. |
| H. | “ | “ | : | End of maxilla. |
| I. | <i>Corticaria dentigera</i> | Lee. | : | Mandible. Ventral view. |
| J. | Lathridiidae (genus?) | | : | Mandible. Dorsal view. |
| K. | <i>Eufallia seminiveus</i> | Mots. | : | Larva. Dorsal view. |
| L. | “ | “ | : | Head. Ventral view. |
| M. | <i>Hesperobaenus</i> n. sp. (Florida) | | : | Head. Dorsal view. |
| N. | “ | “ | : | Tip of mala. |
| O. | “ | “ | : | Spiracle. |
| P. | “ | “ | : | Hypopharynx. |
| Q. | “ | “ | : | Head. Ventral view. |
| R. | “ | “ | : | Seventh, eighth, and ninth
abdominal segments.
Dorsal view. |
| S. | “ | “ | : | Larva. Lateral view. |
| T. | “ | “ | : | Tip of leg. |
| U. | “ | “ | : | Mandible. |



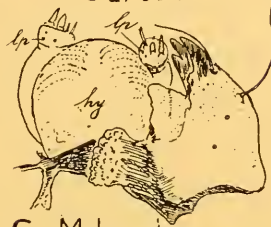
E. Cartodere



A. Cartodere



B. Car.



C. Melanoph.



D. Carta



F. Carto.



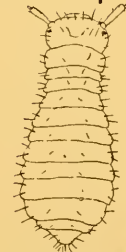
G. Melanophthalma



H. Melanoph.



I. Corticaria.



K. Eufall.



L. Eufallia.



J. Lathri.



M. Hes.



N. Hesp. O. Hesp.



Q. Hesperobaenus.



R. Hespero.



S. Hes.



P. Hespero.

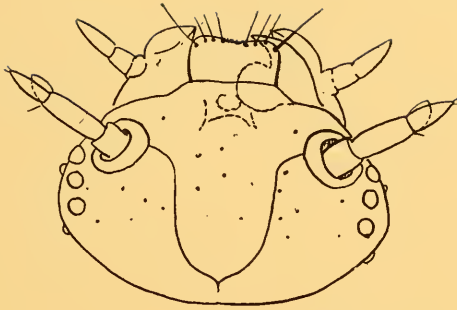


T. Hes. U. Hes.

PLATE 26

Eucinetidae

- | | | | | | |
|----|------------------|-----------------------|-----------|---|--|
| A. | <i>Eucinetus</i> | (<i>morio</i> Lec.?) | (Florida) | : | Head. Dorsal view. |
| B. | “ | “ | | : | Head. Ventral view. |
| C. | “ | “ | | : | Head. Lateral view. |
| D. | “ | “ | | : | Right mandible. Ventro-
basal view. |
| E. | “ | “ | | : | Larva; notice annular
spiracles. (From cast
skin on slide). Lateral
view. |
| F. | “ | “ | | : | Left mandible. Ventral
view. |
| G. | “ | “ | | : | Tip of maxilla. |
| H. | “ | “ | | : | Hypopharynx; pgn to the
right, read: pgl. |



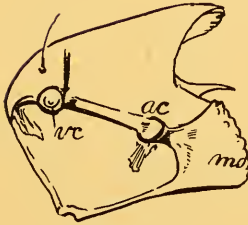
A.



B.



C.



D.



E.



F.



G.



H.

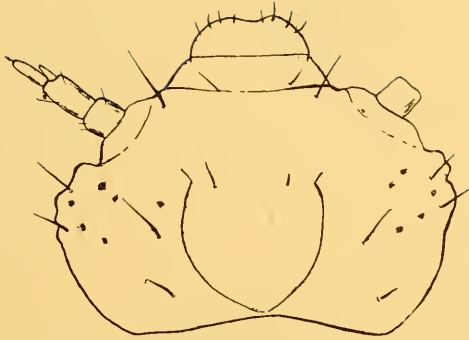
Ericinetus (morio) Lec?

PLATE 27

Derodontidae, Murmidiidae

- | | | | | |
|----|------------|-----------|-------------|---|
| A. | Derodontus | maculatus | Melsh. (?)* | : Head. Dorsal view. |
| B. | “ | “ | “ | : End of abdomen. Dorsal view. |
| C. | “ | “ | “ | : Abdominal biforous spiracle on process. |
| D. | “ | “ | “ | : Hypopharynx. |
| E. | “ | “ | “ | : Larva. Lateral view. |
| F. | “ | “ | “ | : Head. Ventral view. |
| G. | “ | “ | “ | : Leg. |
| H. | “ | “ | “ | : Left mandible. Ventral view. |
| I. | Murmidius | ovalis | Beek. | : Head. Ventral view. |
| J. | “ | “ | “ | : Hypopharyngeal structure. |
| K. | “ | “ | “ | : Left mandible. Ventral view. |
| L. | “ | “ | “ | : Larva. Dorsal view. |

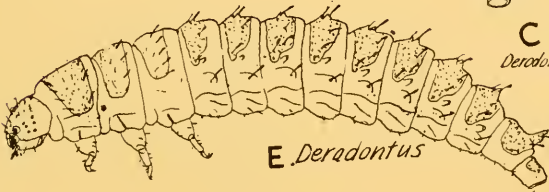
* Larva not reared but collected together with imago from slimy fungus below bark of dying tulip tree.



A. *Derodontus*



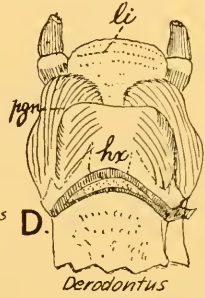
B. *Derodontus*



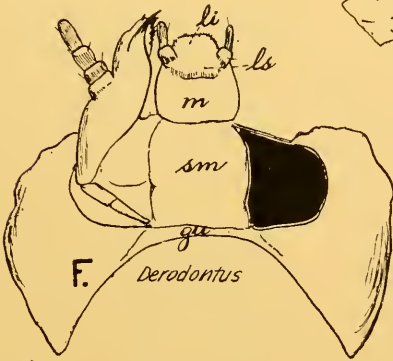
E. *Derodontus*



C. *Derodontus*



D. *Derodontus*



F. *Derodontus*



G. *Derodontus*



H. *Derodontus*



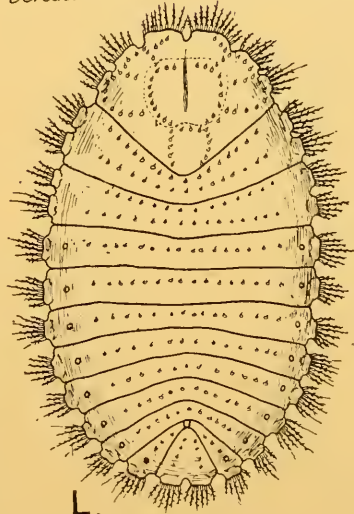
I. *Murmidius*



J. *Murmidius*



K. *Murmidius*



L. *Murmidius*

PLATE 28

Rhizophagidae, Languriidae-Languriinae

Languriidae-Cladoxeninae (K, M, O, Q)

- | | | |
|----|--|---|
| A. | <i>Rhizophagus grandis</i> Gyll. (Finland) | : Head. Ventral view. |
| B. | “ “ | : Head. Dorsal view. |
| C. | “ “ | : Ninth abdominal segment. Dorsal view. |
| D. | “ “ | : Mandible. |
| E. | “ “ | : Spiracle. Lateral view. |
| F. | “ “ | : Spiracle. Exterior view. |
| G. | “ “ | : Larva. Lateral view. |
| H. | <i>Languria angustata</i> Beauv. | : Head. Dorsal view. |
| I. | “ “ | : Right mandible. Ventral view. |
| J. | “ “ | : Left mandible. Ventral view. |
| K. | <i>Pharaxonotha kirschi</i> Reit. | : Left mandible. Ventral view. |
| L. | <i>Languria angustata</i> | : Larva. Lateral view. |
| M. | <i>Pharaxonotha kirschi</i> | : Larva. Lateral view. |
| N. | <i>Languria angustata</i> | : Hypopharynx, maxilla. |
| O. | <i>Pharaxonotha kirschi</i> | : Head. Dorsal view. |
| P. | “ “ | : Larva. Dorsal view. |
| Q. | “ “ | : Hypopharynx, maxilla. |

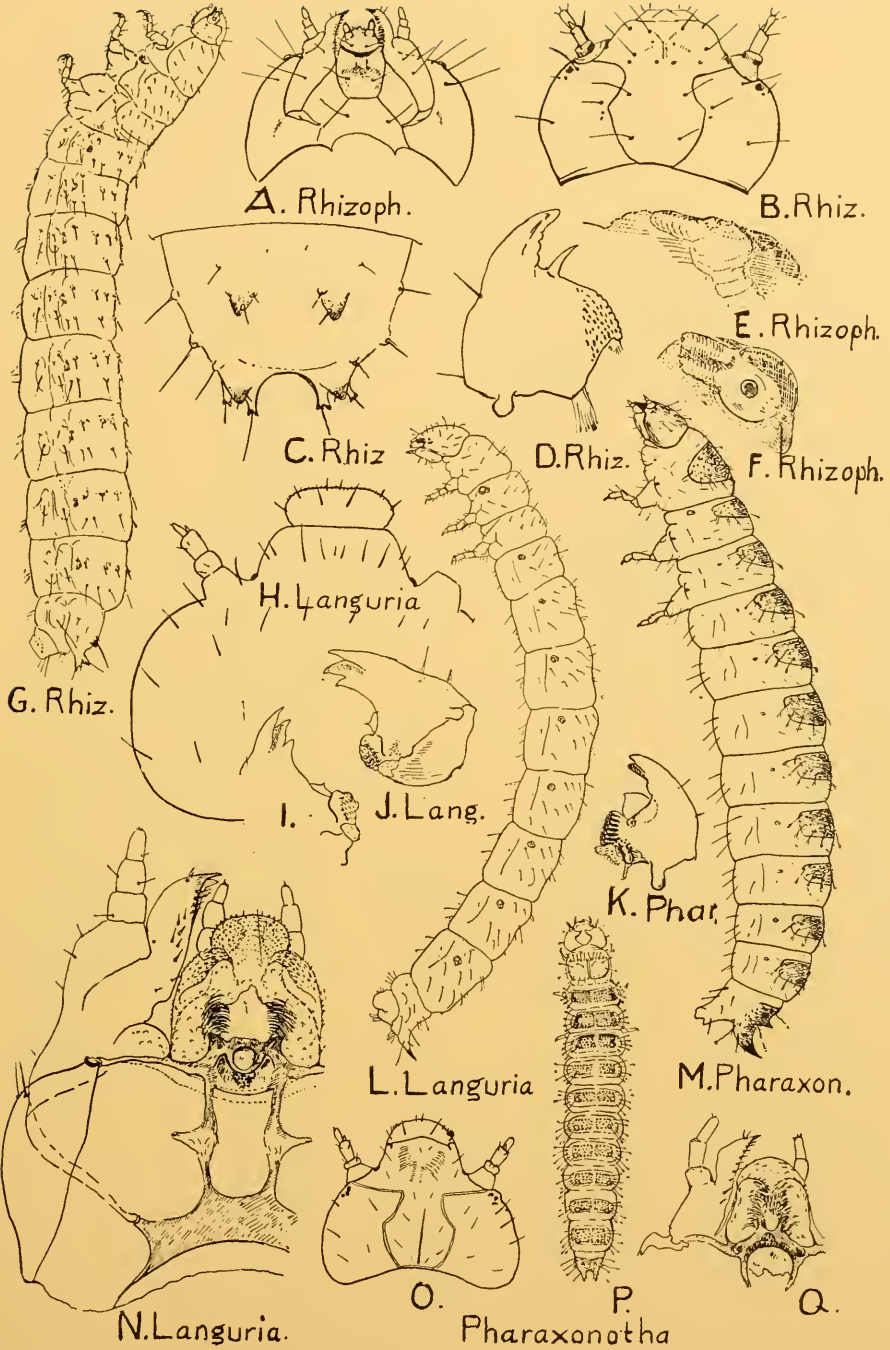
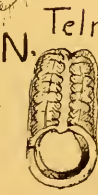
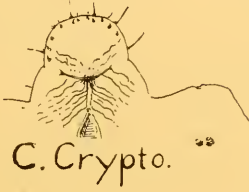
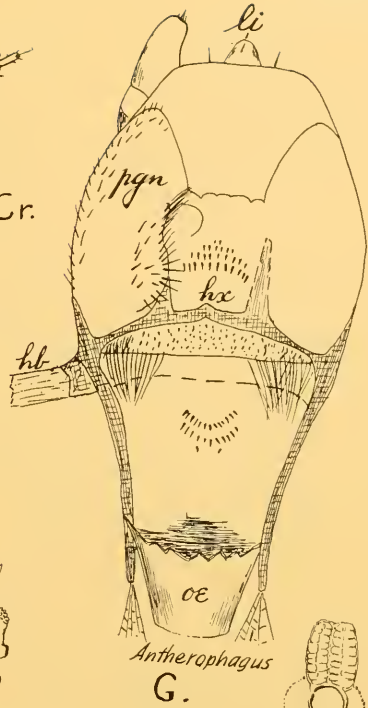
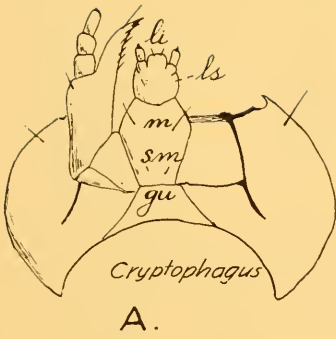


PLATE 29

Cryptophagidae

A.	<i>Cryptophagus saginatus</i> Sturm.	: Head. Ventral view.
B.	“ “	: Antenna, ocelli. Lateral view.
C.	“ “	: Epipharynx.
D.	“ “	: Larva. Dorsal view.
E.	“ “	: Mandible. Ventral view.
F.	“ “	: Mandible. Exterior view.
G.	<i>Antherophagus</i> sp.	: Hypopharynx.
H.	<i>Cryptophagus saginatus</i>	: Spiracle.
I.	<i>Telmatophilus typhae</i> Fall. (Denmark)	: Antenna, ocellus. Lateral view.
J.	“ “	: Mandible. Ventral view.
K.	“ “	: Thoracic spiracle.
L.	“ “	: Third abdominal spiracle.
M.	“ “	: Larva. Dorsal view.
N.	“ “	: End of abdomen. Lateral view.
O.	“ “	: Tip of mandible.
P.	<i>Henoticus germanicus</i> Reit. (London; in jam)	: Part of mandible. Ventral view.
Q.	“ “	: Third abdominal spiracle.
R.	“ “	: Anterior part of larva. Dorso-lateral view.
S.	“ “	: Antenna.
T.	“ “	: Ocelli. Lateral view.
U.	“ “	: End of body. Dorsal view.



Henoticus

LARVAL FORMS OF COLEOPTERA

PLATE 30

Silvanidae-Silvaninae,

Silvanidae-Telephaninae

- | | | | |
|----|--|---|---|
| A. | <i>Oryzaephilus surinamensis</i> L. | : | Antenna. |
| B. | <i>Cathartus advena</i> Waltl. | : | Head. Lateral view. |
| C. | <i>Oryzaephilus surinamensis</i> | : | Ventral mouthparts.
Ventral view. |
| D. | <i>Coccidotrophus socialis</i> Schwarz and
Barber (British Guiana) | : | Spiracle. |
| E. | <i>Oryzaephilus surinamensis</i> | : | Larva. Lateral view. |
| F. | <i>Coccidotrophus socialis</i> | : | Posterior part of left
mandible; fil. pr,
stiff chitinous fila-
ments. Ventral view. |
| G. | <i>Nausibius clavicornis</i> Kug. | : | Head and prothorax.
Dorso-lateral view. |
| H. | <i>Coccidotrophus socialis</i> | : | Anterior part of head.
Dorsal view. |
| I. | “ “ | : | Epipharynx. |
| J. | “ “ | : | Maxilla, hypopharynx,
maxillular area and
glossa. (Special ab-
breviations.) |
| K. | <i>Telephanus</i> (<i>pallidus</i> Schauf.?) (On
cane, Porto Rico, reared) | : | Larva. Dorsal view. |
| L. | “ “ | : | Head. Lateral view. |
| M. | “ “ | : | End of abdomen. Lat-
eral view. |
| N. | “ “ | : | Mandible. |
| O. | “ “ | : | Ventral mouthparts.
Buccal view. |



A. Oryzae.



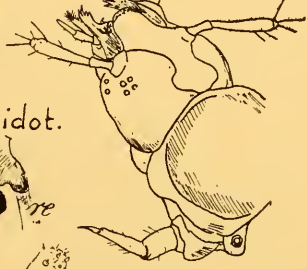
B. Cath.



C. Oryzaephilus



D. Coccidot.



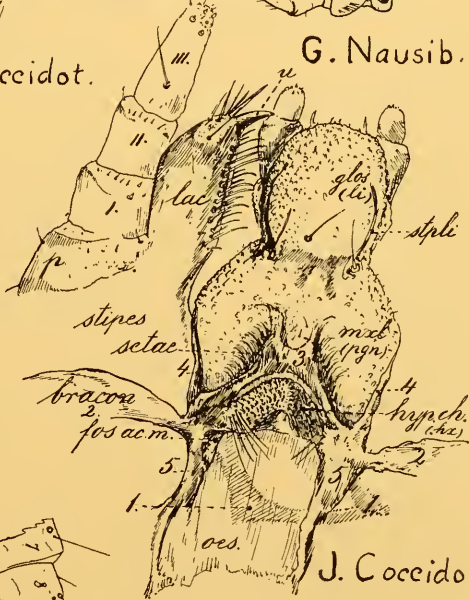
E. Ory.

F. Coccidot.

G. Nausib.



H. Coccidot



I. Coccidot.

J. Coccidot.



K.



L.



M.



N.



O.

Telephanus.

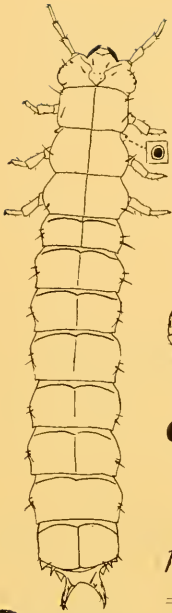
PLATE 31

Cucujidae-Cucujinae,

Cucujidae-Brontinae (L),

Laemphlocidae (G-K)

- | | | |
|-----|------------------------------|---|
| A. | <i>Cucujus clavipes</i> F. | : Right mandible. Ventral view. |
| B. | “ “ | : Head (Ocelli inset). Dorsal view. |
| C. | “ “ | : Prothorax. Ventral view. |
| D. | “ “ | : Larva. Dorsal view. |
| E. | “ “ | : Hypopharyngeal region. |
| F. | “ “ | : Head. Ventral view. |
| G. | <i>Hemipeplus</i> sp. (Cuba) | : Left mandible. Dorsal view. |
| H. | “ | : Epipharynx. |
| I. | “ | : Ocelli. Lateral view. |
| J. | “ | : Ventral mouthparts. Ventral view. |
| J.* | “ | : Hypopharynx. |
| K. | “ | : Posterior end of abdomen; sp. spiracle. Ventral view. |
| L. | <i>Brontes</i> sp. | : Posterior end of abdomen. Dorsal view. |



D. *Cucujus*



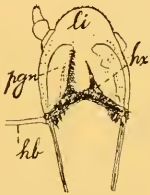
A. *Cucujus*



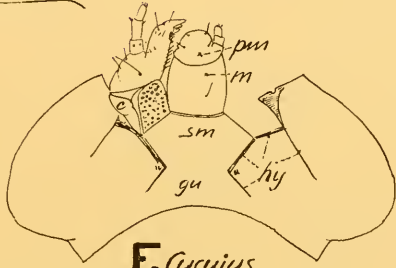
B. *Cucujus*



C. *Cucujus*



E. *Cucujus*



F. *Cucujus*



J*



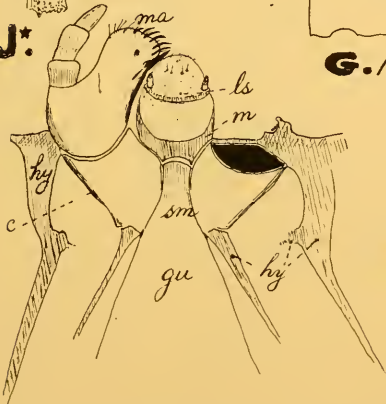
G. *Hemipeplus*



H. *Hemipeplus*



I. *Hemipeplus*



J. *Hemipeplus*



K. *Hemipeplus*



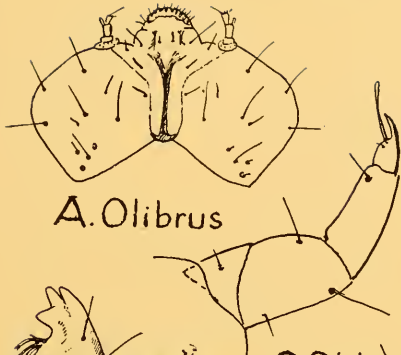
L. *Brontes*

PLATE 32

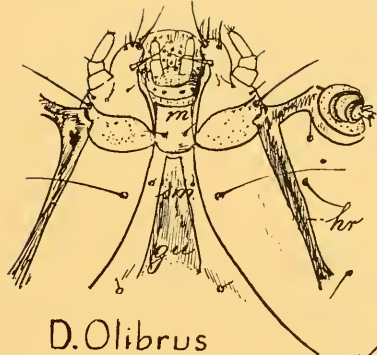
Laemophloeidae,

Phalacridae (A-G), Smicripidae

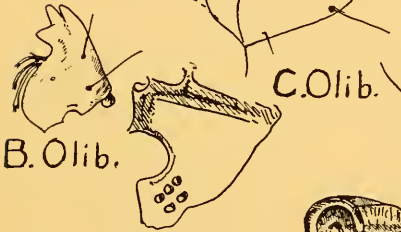
- A. *Olibrus aenens* F. (Denmark) : Head. Dorsal view.
 B. " " : Mandible. Dorsal view.
 C. " " : Leg.
 D. " " : Ventral mouthparts. Ventral view.
 E. " " : Ocelli. Lateral view.
 F. " " : Spiracle.
 G. " " : Eighth and ninth abdominal segments. Dorsal view.
 H. *Laemophloeus biguttatus* Say : Head. Dorsal view.
 I. " " : Ventral mouthparts. Ventral view.
 J. *Smicrips palmicola* Lec. (Florida) : Mandible. Ventral view.
 K. *Laemophloeus biguttatus* : Mandible. Dorsal view.
 L. " " : Larva; thoracic and abdominal spiracles inset. Dorsal view.
 M. *Smicrips palmicola* : Larva; annular thoracic spiracle inset. Lateral view.
 N. " " : Ventral mouthparts. Ventral view.
 O. " " : Hypopharyngeal sclerome.
 P. *Laemophloeus biguttatus* : Ninth abdominal segment. Dorsal view.
 Q. " " : End of leg.



A. Olibrus



D. Olibrus



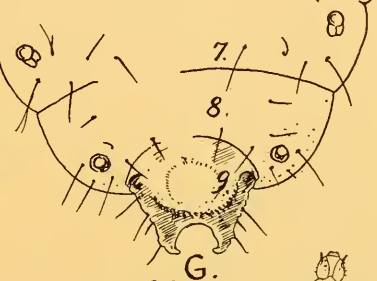
B. Olib.

C. Olib.

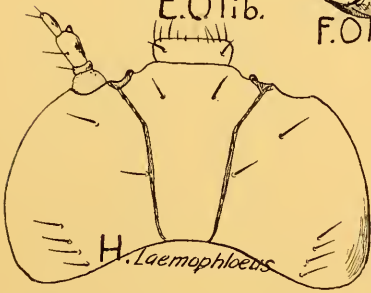


F. Olib.

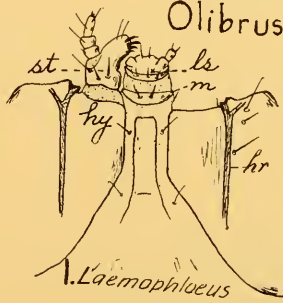
E. Olib.



G. Olibrus



H. Laemphloeus



I. Laemphloeus



M. Smicrips



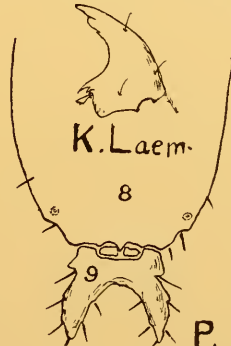
J. Smicrips



N. Smicrips

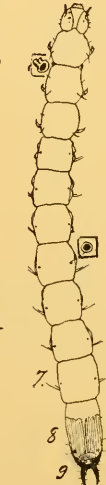


O.



K. Laem.

P. Laemphloeus



L.

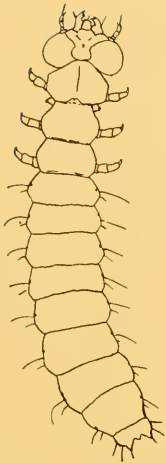


Q.

PLATE 33

Prostomidae (A-H),
Catogenidae, Phalacridae

- A. *Prostomis mandibularis* F. (Denmark) : End of abdomen. Ventral view.
- B. " " : Mandible.
- C. *Dryocora howitti* Pase. (New Zealand) : Ninth abdominal segment. Dorsal view.
- D. *Prostomis mandibularis* : Head and prothorax; thoracic spiracle inset. Ventral view.
- E. " " : Larva. Dorsal view.
- F. " " : Maxilla. Ventral view.
- G. *Dryocora howitti* : Head and prothorax. Dorsal view.
- H. " " : Maxilla.
- I. *Scalidia linearis* Lec. : Head. Dorsal view.
- J. " " : Mandible. Dorsal view.
- K. *Phalacrus* sp. : Hypopharyngeal region.
- L. *Scalidia linearis* : Head. Ventral view.
- M. " " : Leg.
- N. *Phalacrus* sp. : Larva. Lateral view.
- O. *Scalidia linearis* : Larva. Lateral view.
- P. *Phalacrus* sp. : Head. Ventral view.
- Q. *Phalacrus politus* Melsh. : Spiracle.
- R. " " : Sixth to ninth abdominal segments. Dorsal view.
- S. " " : Mandible. Dorsal view.
- T. *Phalacrus* sp. : Mandible. Ventral view.



A. Prostomis C. Dry.



D. Prostomis.

E. Prostomis

F. Pros.

G. Dryocora

H. Dryoc.



K. Phalacrus

I. Scalidia

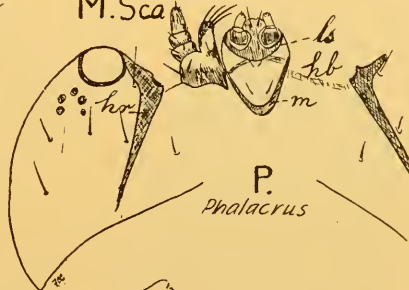
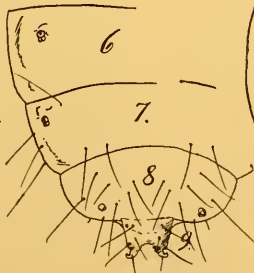
J. Scalidia



M. Sca

N. Pha

L. Scalidia



P. Phalacrus

O. Scal.



Q. Phalacrus

R. Phalacrus

S. Phalacrus T.

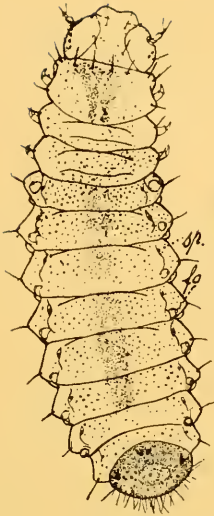
LARVAL FORMS OF COLEOPTERA

PLATE 34

Corylophidae-Arthrolipinae

Corylophidae-Corylophinae

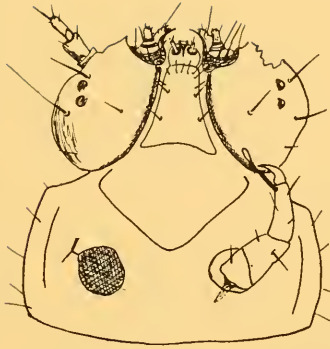
- A. (*Arthrolips* sp., or possibly: *Orthoperus* sp.) (?): Larva; fo, glandular opening or "foramen, Peyerimhoff." Dorsal view.
- B. " " : Mandible.
- C. " " : Head and prothorax. Ventral view.
- D. *Corylophodes marginicollis* Lec. : Head; na, nasale. Ventral view.
- E. *Molamba lunata* Lec. : Head; na, nasale. Ventral view.
- F. *Corylophodes marginicollis* : Larva; fo, foramen. Dorsal view.
- G. *Sacium* sp. : Right side of posterior part of body. Dorsal view.
- H. " " : Leg.
- I. *Molamba lunata* : Larva; fo, foramen. Dorsal view.



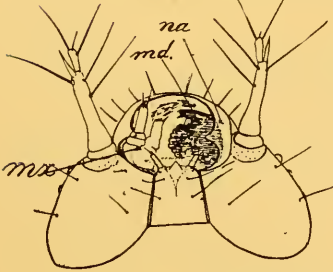
A. Arthrolips



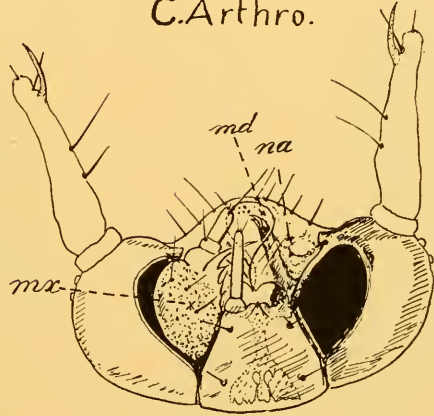
B. Arthro.



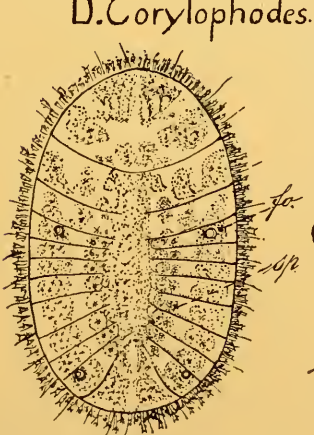
C. Arthro.



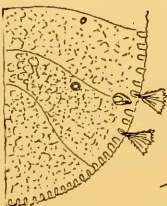
D. Corylophodes



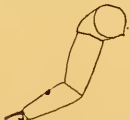
E. Molamba



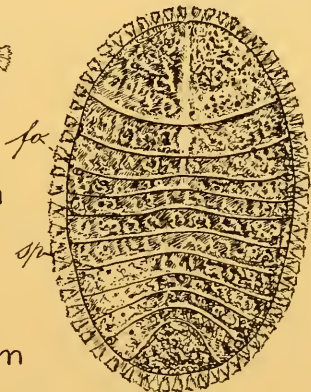
F. Corylophodes



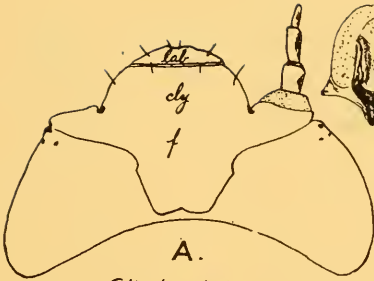
G. Sacium



H. Sacium



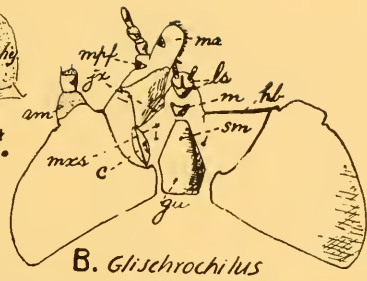
I. Molamba



A. *Glischrochilus*



B*



B. *Glischrochilus*



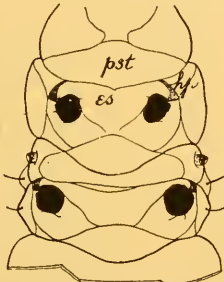
C. *Glischrochil.*



D. *Glischrochilus*



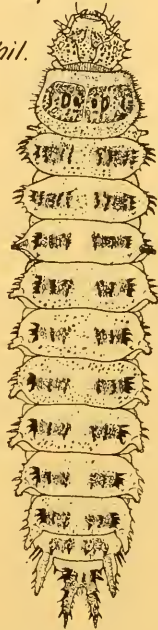
E. *Glischrochil.*



F. *Glischrochilus*



G. *Lobiopa.*

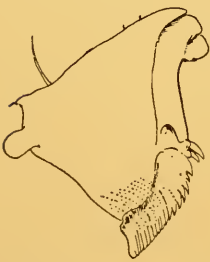


J. *Nitidulini*

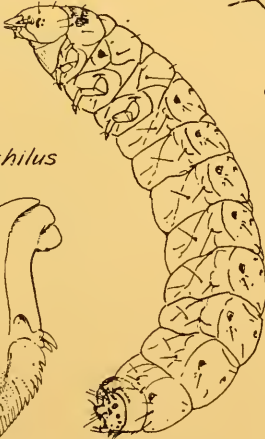


K. *Prometopia*

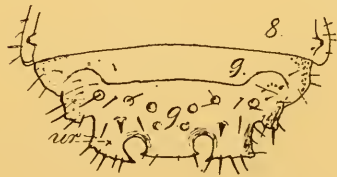
H. *Glischrochilus*



K. *Prometopia*



L. *Prometopia*



M. *Prometopia*

PLATE 36

Nitidulidae-Meligethinae

Nitidulidae-Cateretinae

- | | | | | | |
|----|--------------|------------|---|---|---|
| A. | Meligethes | aeneus | F. (Denmark) | : | Head. Dorsal view. |
| B. | " | " | | : | Leg. |
| C. | " | " | | : | Mandible. Ventral view. |
| D. | " | " | | : | Larva. Dorsal view. |
| E. | " | " | | : | Spiracle. |
| F. | " | " | | : | Antenna and ventral mouthparts. Ventral view. |
| G. | " | " | | : | Eighth and ninth abdominal segments. Dorsal view. |
| H. | " | " | | : | Antenna. |
| I. | " | " | | : | Distal parts of maxilla and labium. Ventral view. |
| J. | Heterostomus | pulicarius | L. (= Brachyp-
terus gravidus
Ill.) | : | Antenna, ocelli. Dorsal view. |
| K. | " | " | | : | Tip of mala. |
| L. | " | " | | : | Mandible. |
| M. | " | " | | : | Larva. Dorsal view. |
| N. | " | " | | : | Larva. Lateral view. |
| O. | " | " | | : | Distal end of leg. |
| P. | " | " | | : | Ventral mouthparts. Ventral view. |



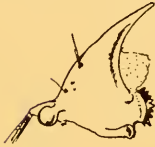
D. Meligethes



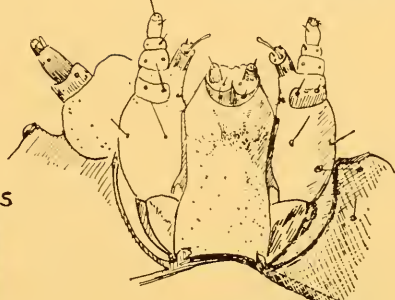
A. Meligethes



B. Meligethes



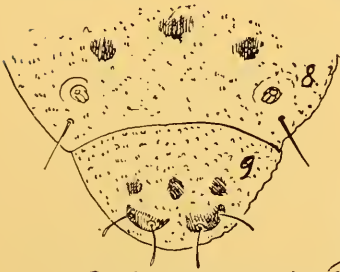
C. Meligethes



F. Melig.



E. Melig.



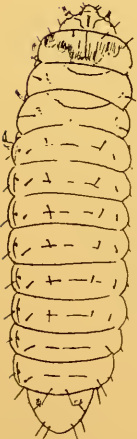
G. Meligethes



H. Meligethes



I. Meligethes



M. Brachypterus



N.



J. Bra.



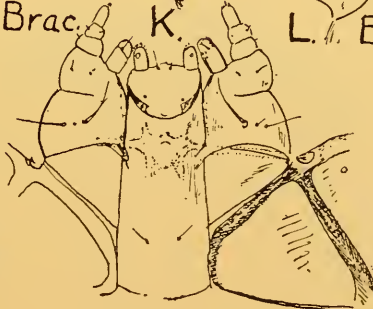
K.



L. Bra.



O.



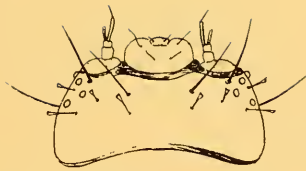
P. Brachypterus

PLATE 37

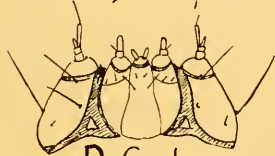
Cybocephalidae,

Coccinellidae-Coccinellinae

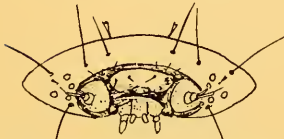
- | | | | | | |
|----|----------------------------------|-------|---|--|---------------------|
| A. | <i>Cybocephalus californicus</i> | Horn | : | Head. | Dorsal view. |
| B. | “ | “ | : | Antenna. | |
| C. | “ | “ | : | Mandible. | |
| D. | “ | “ | : | Head. | Ventral view. |
| E. | “ | “ | : | Distal end of leg. | |
| F. | “ | “ | : | Head. | Anterior view. |
| G. | “ | “ | : | Larva. | Dorsal view. |
| H. | <i>Hyperaspis signata</i> | Oliv. | : | Anterior part of larva. | Lateral view. |
| I. | “ | “ | : | Mandible. | Dorsal view. |
| J. | “ | “ | : | Head. | Ventral view. |
| K. | “ | “ | : | Larva; fo, glandular opening, or “foramen” of Peyerimhoff. | Dorsal view. |
| L. | “ | “ | : | Head. | Antero-dorsal view. |



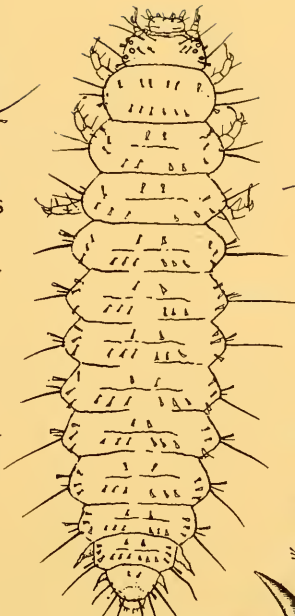
A. *Cybocephalus*



D. *Cybo.*



F. *Cybocephalus*



G. *Cybo.*



B.

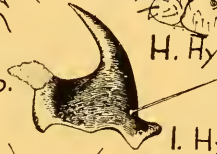
C. *Cybo.*



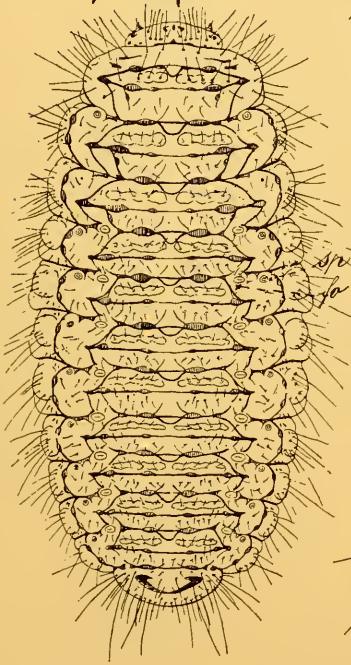
E. *Cy.*



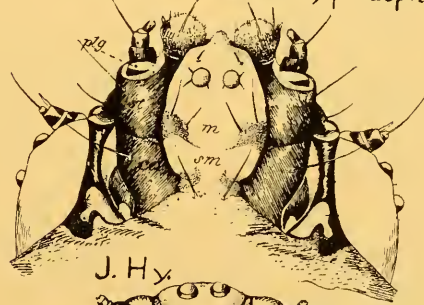
H. *Hyperaspis*



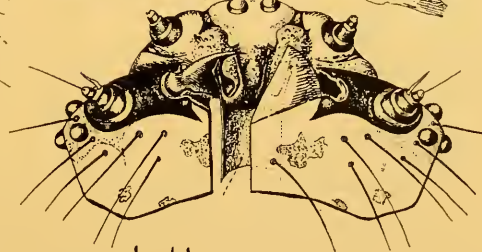
I. *Hyperaspis*



K. *Hyperaspis*



J. *Hy.*



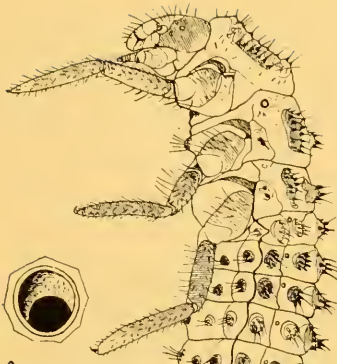
L. *Hyperaspis*

PLATE 38

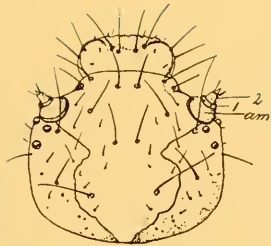
Coccinellidae-Coccinellinae,

Coccinellidae-Epilachninae

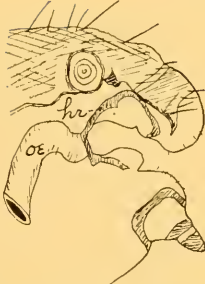
- | | | | |
|----|-------------------------------|-------|--|
| A. | <i>Coccinella novemnotata</i> | Hbst. | : Spiracle. |
| B. | “ | “ | : Head. Dorsal view. |
| C. | “ | “ | : Buccal structures; diagrammatic. Lateral view. |
| D. | “ | “ | : Mandible. Ventral view. (Compare: Plate 40, fig. B). |
| E. | “ | “ | : Larva. Lateral view. |
| F. | “ | “ | : Tibia and tarsungulus. |
| G. | “ | “ | : Hypopharyngeal bridge and bracon. |
| H. | “ | “ | : Head. Ventral view. |
| I. | “ | “ | : Prothorax and mesothorax. Ventral view. |
| J. | <i>Epilachna borealis</i> | F. | : Head. Dorsal view. |
| K. | “ | “ | : Larva. Lateral view. |
| L. | “ | “ | : Mandible of first larval instar. |
| M. | “ | “ | : Mandible of last larval instar. |
| N. | “ | “ | : Hypopharynx, maxillulae, and glossa. |



A. *Coccinella*



B. *Coccinella*



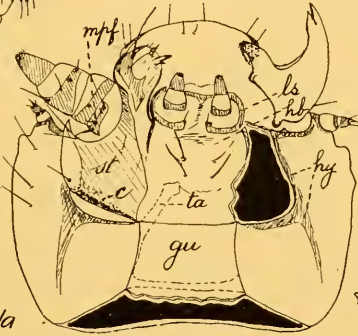
C. *Coccinella*



D. *Coccinella*



E. *Coccinella*



F. *Coccinella*



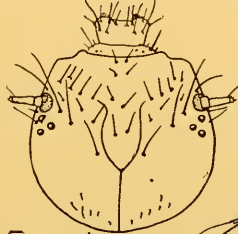
G. *Coccinella*



H. *Coccinella*



I. *Epilachna*



J. *Epilachna*



K. *Epilachna*



L. *Epilachna*



M. *Epilachna*

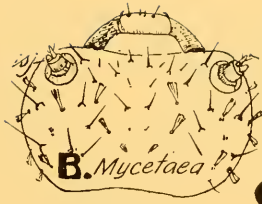
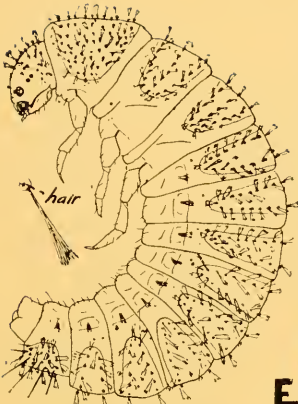
N. *Epilachna*

PLATE 39

Endomychidae-Mycetaeinae (A-G),

Endomychidae-Endomychinae (H-V)

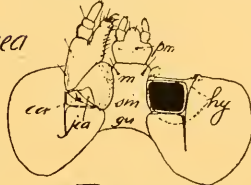
- | | | |
|----|---|--|
| A. | <i>Mycetaea hirta</i> Marsh. | : Outline of larva. Dorsal view. |
| B. | “ “ | : Head. Dorsal view. |
| C. | “ “ | : Distal end of maxillary mala. |
| D. | “ “ | : Larva. Lateral view. |
| E. | “ “ | : Mandible. Dorsal view. |
| F. | “ “ | : Head. Ventral view. |
| G. | “ “ | : Hypopharyngeal structures. |
| H. | <i>Amphix laevigatus</i> Gerst. (= <i>Corymalus castanicolor</i> Gorham) (Panama) | : Mandible. Dorsal view. |
| I. | “ “ | : Mesothoracic spiracle on ventral side of body. |
| J. | “ “ | : Distal end of maxillary mala. Ventral view. |
| K. | “ “ | : Larva. Dorsal view. |
| L. | <i>Aphorista vittata</i> F. | : Head. Dorsal view. |
| M. | “ “ | : Fan-shaped hair. |
| N. | “ “ | : Mandible. Dorsal view. |
| O. | “ “ | : Larva. Ventral view. |
| P. | “ “ | : Larva. Dorsal view. |
| Q. | “ “ | : Head. Ventral view. |
| R. | “ “ | : Hypopharyngeal structures. |
| S. | <i>Stenotarsus hispidus</i> Hbst. | : Mandible. Ventral view. |
| T. | “ “ | : Hypopharyngeal region. |
| U. | <i>Endomychus eoccineus</i> L. (Denmark) | : Lateral part of head. |
| V. | “ <i>biguttatus</i> Say | : Spiracle. |



A. Mycetaea

B. Mycetaea

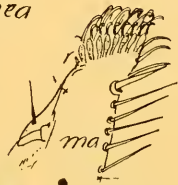
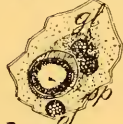
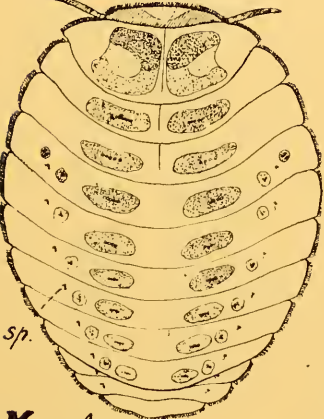
C. Mycet.



E. Mycetaea

F. Mycetaea

G. Myc.

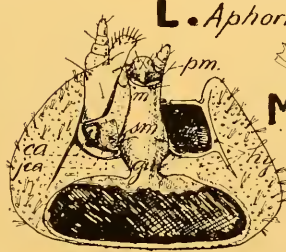
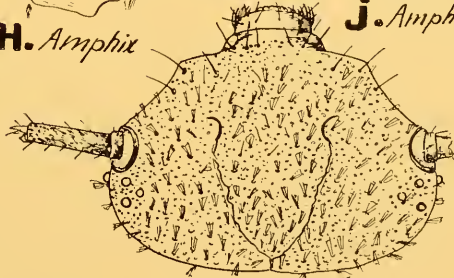


H. Amphix

I. Amphix

J. Amphix

K. Amphix



L. Aphorista

M. Aph.

N. Aph.

O. Aphorista

P. Aphor.

Q. Aphorista

R. Aphor.



S. Stenotarsus

T. Stenotars.

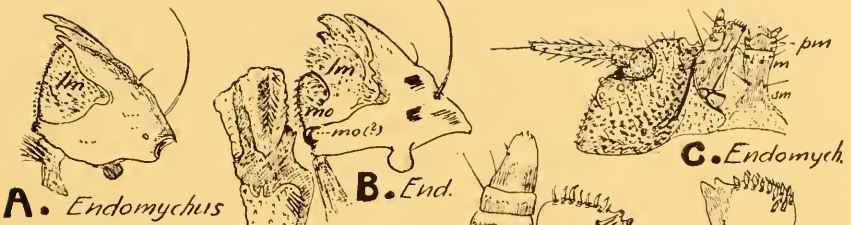
U. Endomychus

V. Endomychus

PLATE 40

Endomychidae-Endomychinae

- A. *Endomychus coccineus* L. (Den-
mark) : Mandible. Dorsal view.
- B. " " : Hypopharyngeal structures
and mandible; molar (?) part or possibly irregularly
placed accessory ventral
condyle (compare: plate 39,
figs. E and S, plate 40, fig.
J, and also plate 38, fig. D.)
- C. " " : Left and median part of head.
- D. " " : Posterior part of head.
- E. " " : Distal end of maxilla. Ven-
tral view.
- F. " " : Tip of maxillary mala. Dor-
sal view.
- G. *Lycoperdina ferruginea* Lec. : Head. Dorsal view.
- H. *Lycoperdina succineta* L. (Den-
mark) : Maxilla and tip of labium.
- I. " " : Hypopharyngeal region and
maxillary mala.
- J. " " : Epipharynx and mandible.
- K. *Rhymbus ulkei* Cr. : Larva. Dorsal view.
- L. " " : Larva. Ventro-lateral view.
- M. " " : Epipharynx.
- N. " " : Leg, except the coxa.
- O. " " : Head. Dorsal view.
- P. " " : Head. Lateral view.
- Q. " " : Spiracle.
- R. " " : Molar part of mandible. Fa-
cial view from base of man-
dible.
- S. " " : Mandible. Ventral view.
- T. " " : Maxilla and labium.



A. *Endomychus*

B. *End.*

C. *Endomych.*



D. *Endomychus*



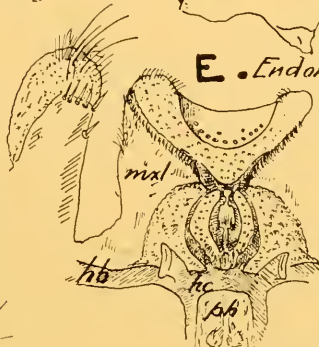
E. *Endomych*



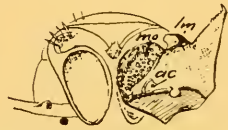
F. *Endom.*



G. *Lycoperdina*

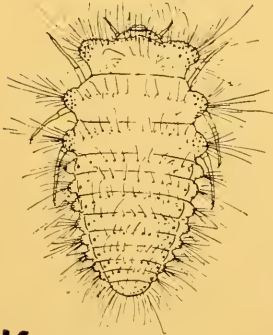


H. *Lycoperd.*

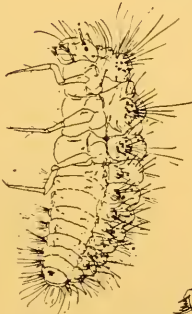


J. *Lycoperdina*

I. *Lycoperd.*



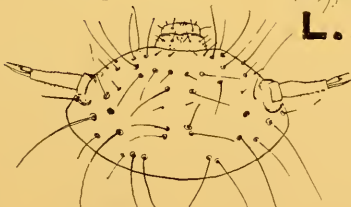
K. *Rhymbus*



L. *Rhy.*



M. *Rhy.*



N. *Rhymbus*



P. *Rhymbus*



O. *Rhymbus*



Q. *Rhymbus*



R. *Rhymb.*

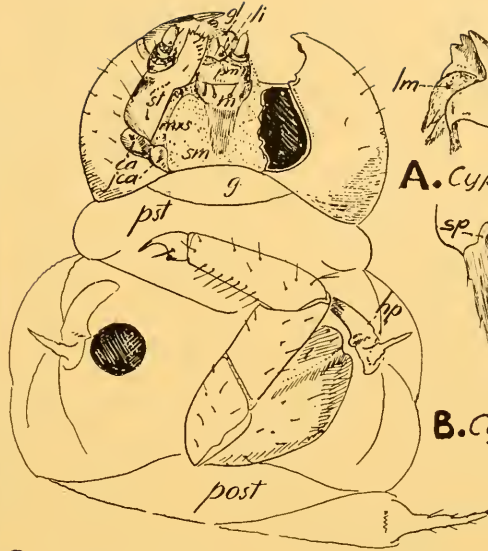
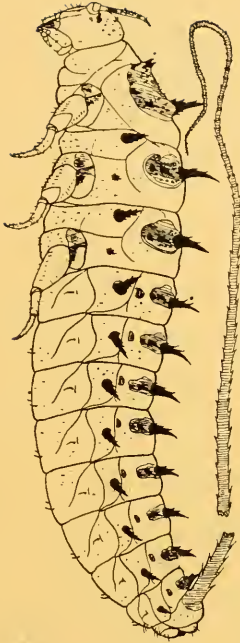
S. *Rhymb.*

T. *Rhymbus*

PLATE 41

Erotylidae, Sphindidae

- | | | | | |
|----|-----------------------|----------|---|--|
| A. | Cypherotylus aspersus | Gorh. | : | Mandible. Ventral view. |
| B. | “ | “ | : | Mesothoracic spiracle. |
| C. | “ | “ | : | Head and prothorax.
Ventral view. |
| D. | Homoeotelus confusus | Crotch. | : | Larva. Lateral view. |
| | | (Panama) | : | |
| E. | Cypherotylus aspersus | | : | Hypopharyngeal region,
tip of labium and dor-
sal side of maxilla. |
| F. | Sphindus americanus | Lec. | : | Spiracle. |
| G. | Cypherotylus aspersus | | : | Head. Dorsal view. |
| H. | Sphindus americanus | | : | Leg. |
| I. | “ | “ | : | Hypopharyngeal region. |
| J. | “ | “ | : | Larva. Lateral view. |
| K. | “ | “ | : | Head. Ventral view. |
| L. | “ | “ | : | Mandible. Ventral view. |
| M. | “ | “ | : | Head. Dorsal view. |



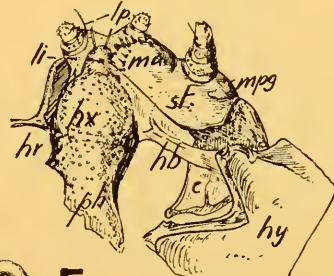
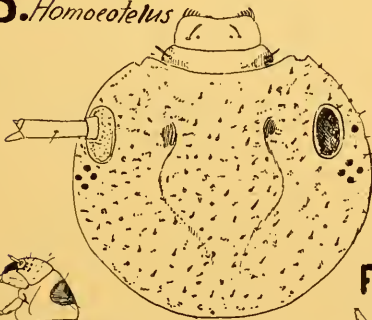
A. *Cyphero.*



B. *Cypher.*

C. *Cypherotylus*

D. *Homocotelus*



E. *Cypherotylus*

F. *Sphindus*



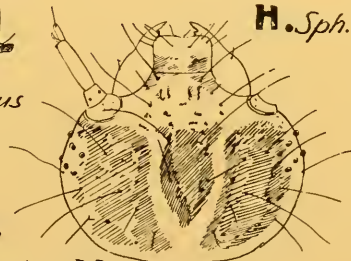
H. *Sph.*



G. *Cypherotylus*



I. *Sphindus*



J. *Sphindus*

K. *Sphindus*

L. *Sphin.*

M. *Sphindus*

PLATE 42

Dacnidae

- | | | | |
|----|-------------|-----------------|--|
| A. | Megalodaene | (fasciata F. ?) | : Head. Lateral view. |
| B. | " | " | : Mandible. Ventral view. |
| C. | " | " | : End of maxilla. |
| D. | " | " | : Spiracle. |
| E. | " | " | : Head. Dorsal view. |
| F. | " | " | : Head. Ventral view. |
| G. | " | " | : Larva. Lateral view. |
| H. | " | " | : Antenna. |
| I. | " | " | : Leg. |
| J. | " | " | : Hypopharynx and ligula. Lat-
eral view. |
| K. | Penthe | pimelia F. | : Hypopharynx and ligula. Lat-
eral view. |
| L. | Tritoma | unicolor Say | : Mandible. Ventral view. |
| M. | " | " | : Larva. Lateral view. |
| N. | Penthe | pimelia | : Mandible. Ventral view. |
| O. | " | " | : Antenna. |
| P. | " | " | : Distal end of mala. Dorsal view. |
| Q. | " | " | : Larva. Lateral view. |
| R. | " | " | : Head. Dorsal view. |
| S. | " | " | : Head. Ventral view. |
| T. | " | " | : Spiracle. |

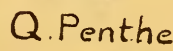
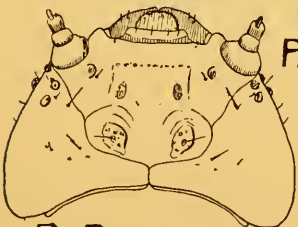
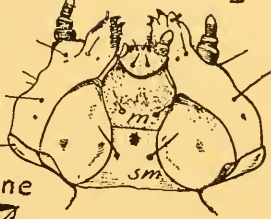
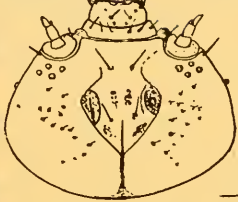
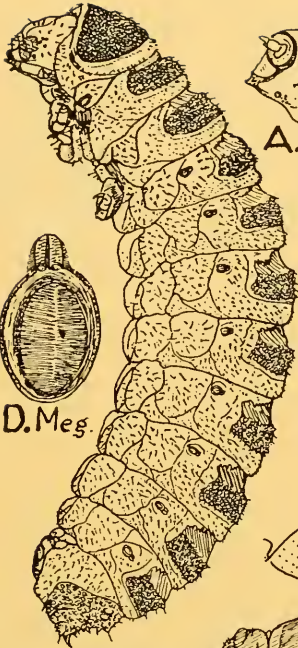


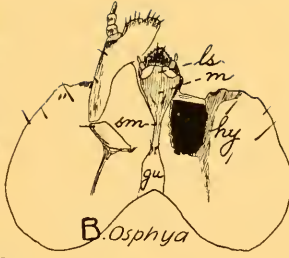
PLATE 43

Melandryidae

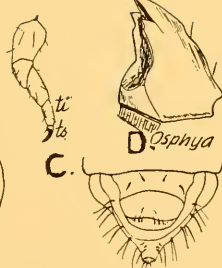
A. <i>Osphya luteus</i> Horn	: Ventral mouthparts.
B. " "	: Head. Ventral view.
C. " "	: Leg.
D. " "	: Mandible.
E. " "	: Spiracle.
F. <i>Orchesia castanea</i> Melsh.	: Prementum, labial palpi and ligula.
G. " "	: Posterior end of body. Ventral view.
H. " "	: Posterior end of body.
I. " "	: Mala.
J. <i>Serropalpus barbatus</i> Schall.	: Prementum, labial palpi and ligula.
K. <i>Dircaea quadrimaculata</i> Say	: Mala.
L. <i>Serropalpus barbatus</i>	: Posterior end of body.
M. <i>Rushia longula</i> Lec.	: Ninth abdominal segment. Dorsal view.
N. " "	: Ninth abdominal segment. Lateral view.
O. <i>Dircaea quadrimaculata</i>	: Antenna.
P. <i>Eustrophinus bicolor</i> F.	: Posterior end of abdomen. Lateral view.
Q. <i>Melandrya striata</i> Say	: Leg.
R. <i>Melandryidae</i> (Genus not determined)	: Ninth abdominal segment. Dorsal view.
S. " "	: Mandible.
T. " "	: Spiracle.
U. <i>Melandrya striata</i> :	Head. Dorsal view.
V. " "	: Mandible. Dorsal view.
W. " "	: Ventral mouthparts.
X. " "	: Mala. Ventral view.
Y. " "	: Head. Ventral view.
Z. " "	: Antenna.
AE. " "	: Larva. Lateral view.



A. Osphya



B. Osphya



C.

D. Osphya



E. Osphya



I. Orchesia



F. Orches



J. Serropal.



L. Serro



G. Osph



H. Osph.



O. Dircaea



K. Dircaea



P. Eustrop



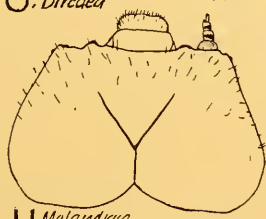
Q. Mel.



M. Rushia



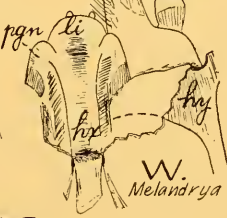
N. Rushia



U. Melandrya

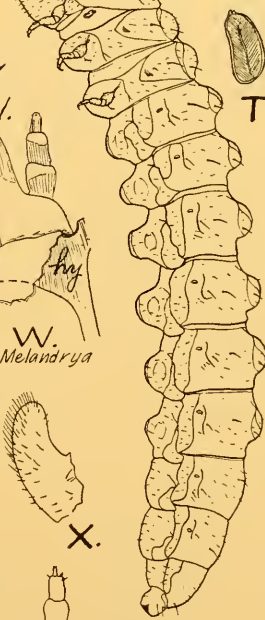


S. Mel.

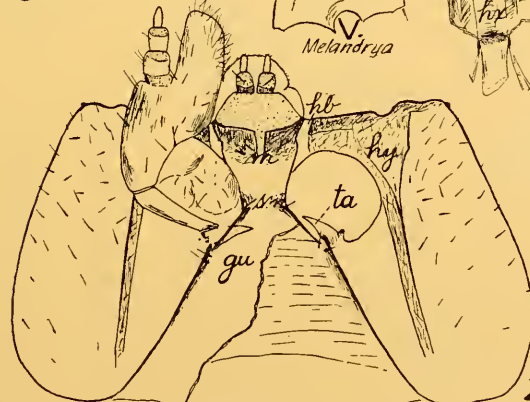


Melandrya

W. Melandrya



T



Y. Melandrya



X.



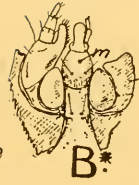
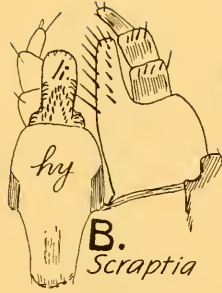
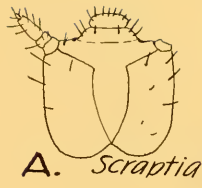
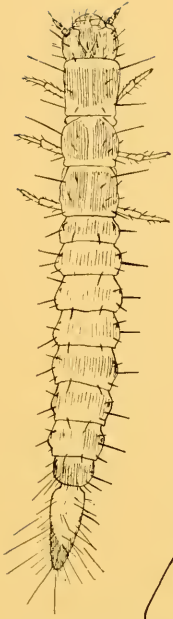
Z. Melandrya

AE. Melandrya

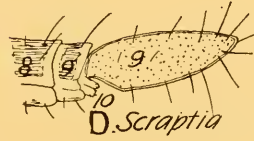
PLATE 44

Scraptiidae, Bothrideridae

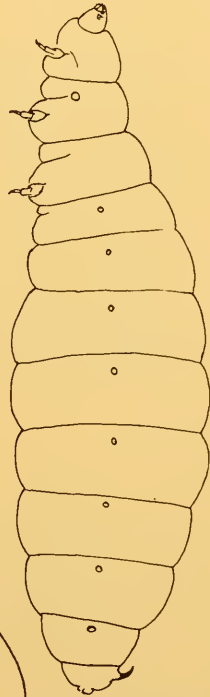
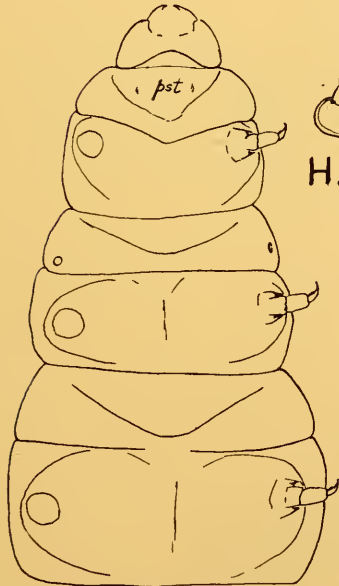
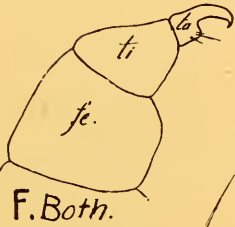
- | | | | | |
|-----|--------------------------------|--------|---|---|
| A. | <i>Scraptia sericea</i> | Melsh. | : | Head. Dorsal view. |
| B. | " | " | : | Ventral mouthparts. Dorsal view. |
| B.* | " | " | : | Ventral mouthparts. Ventral view. |
| C. | " | " | : | Mandible. Dorsal view. |
| D. | " | " | : | Posterior end of abdomen. Lateral view. |
| E. | " | " | : | Larva. Dorsal view. |
| F. | <i>Bothrideres geminatus</i> | Say | : | Distal part of leg. |
| G. | " | " | : | Anterior portion of ventral mouthparts. Ventral view. |
| H. | " | " | : | Antenna. |
| I. | " | " | : | Mandible. |
| J. | <i>Deretaphrus oregonensis</i> | Horn | : | Mandible. |
| K. | " | " | : | Spiracle. |
| L. | " | " | : | Head and thorax. Ventral view. |
| M. | " | " | : | Head. Ventral view. |
| N. | " | " | : | Larva. Lateral view. |



Scaptia



E. Scra.



N. Deretaph.

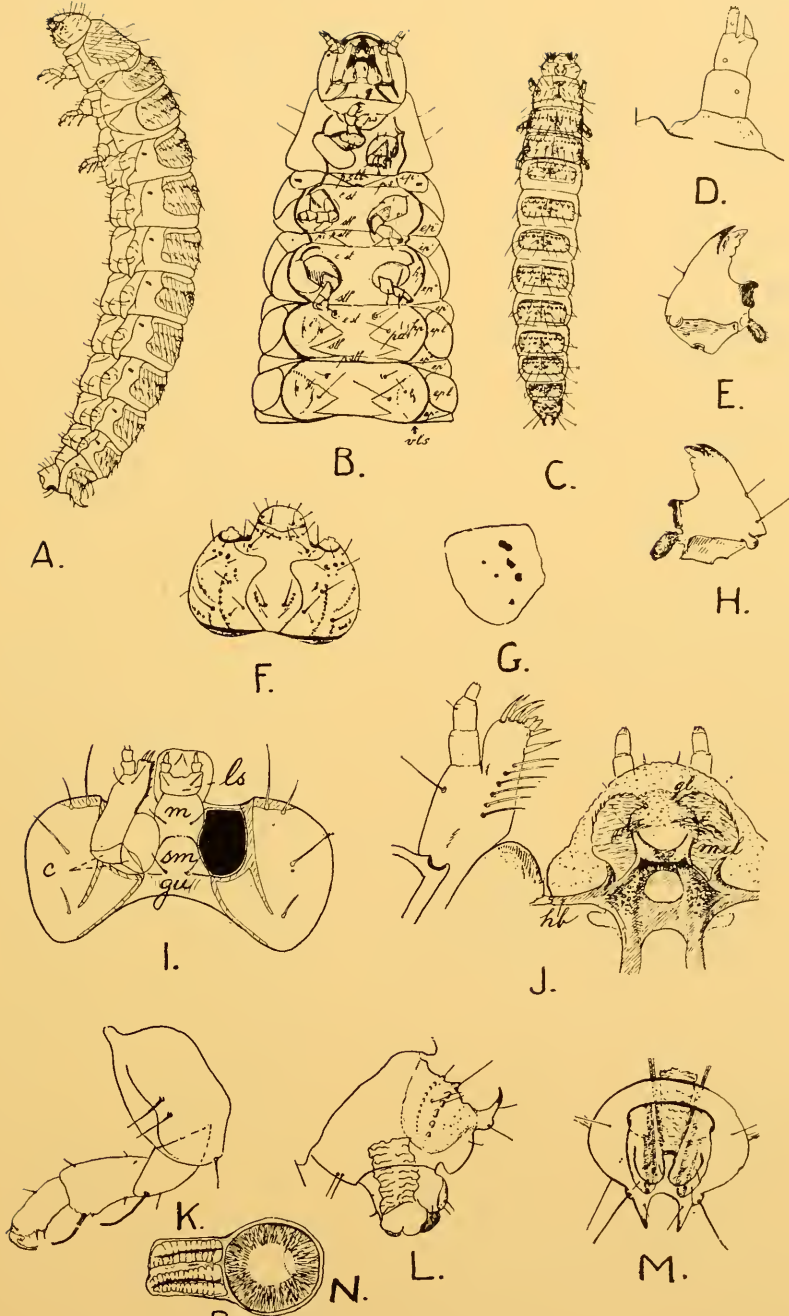
L. Deretaphrus

M. Deretaphrus

PLATE 45

Byturidae

- | | | | | |
|----|---------------------------|--------------|---|---|
| A. | <i>Byturus unicolor</i> | Say | : | Larva. Lateral view. |
| B. | <i>Byturus tomentosus</i> | F. (Denmark) | : | Anterior part of larva.
Ventral view. |
| C. | " | " | : | Larva. Dorsal view. |
| D. | " | " | : | Antenna. |
| E. | " | " | : | Right mandible. |
| F. | " | " | : | Cranium. Dorsal view. |
| G. | <i>Byturus unicolor</i> | | : | Ocelli. Lateral view. |
| H. | <i>Byturus tomentosus</i> | | : | Left mandible. |
| I. | <i>Byturus unicolor</i> | | : | Head. Ventral view. |
| J. | <i>Byturus tomentosus</i> | | : | Hypopharyngeal region. |
| K. | <i>Byturus unicolor</i> | | : | Leg. |
| L. | <i>Byturus tomentosus</i> | | : | Ninth and tenth abdominal segments. Lateral view. |
| M. | " | " | : | Ninth and tenth abdominal segments. Ventral view. |
| N. | <i>Byturus unicolor</i> | | : | Spiracle. |

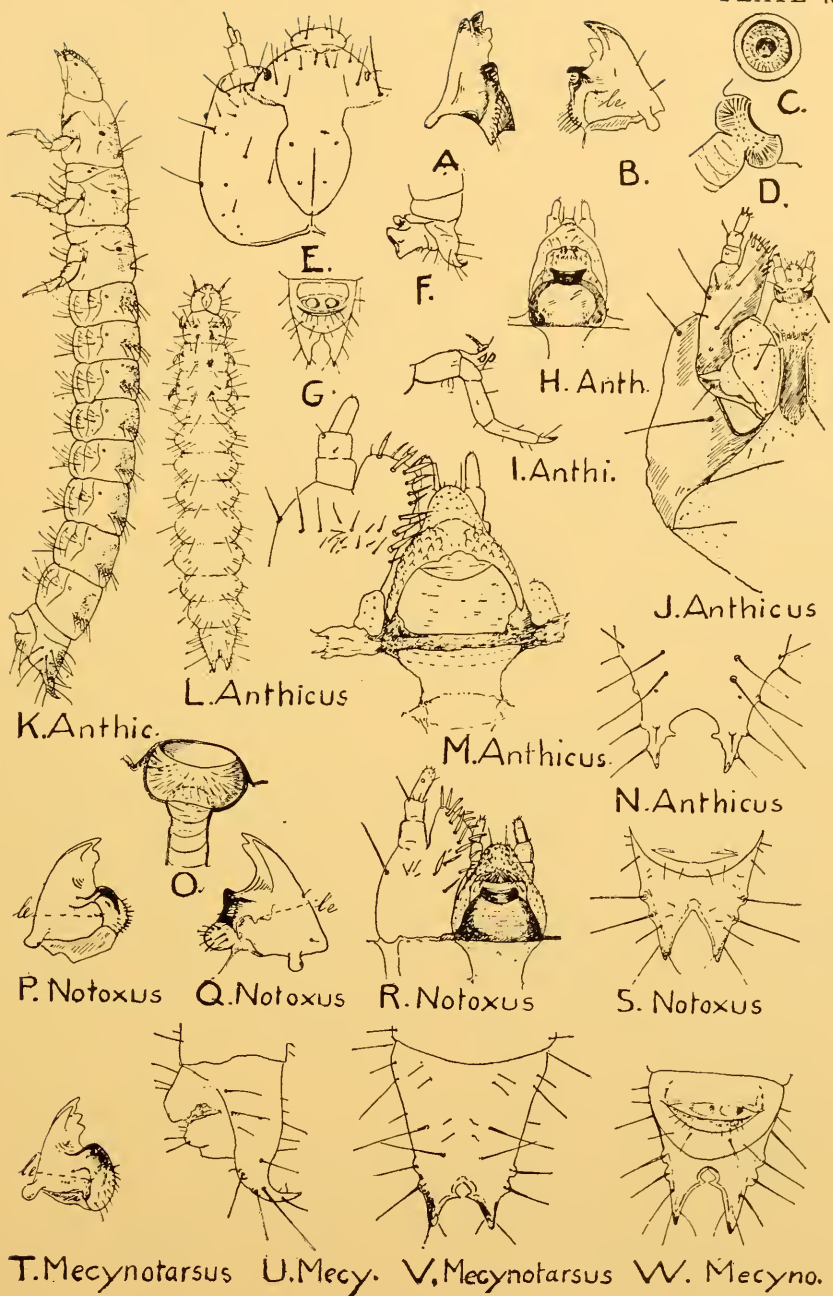


Byturus tomentosus

PLATE 46

Anthicidae

- | | | |
|----|---------------------------------------|---|
| A. | <i>Anthicus heroicus</i> Csy. | : Right mandible. Intero-ventral view. |
| B. | “ “ | : Left mandible; le, linear elevation. Ventral view. |
| C. | <i>Anthicus</i> sp. (Denmark) | : Spiracle. |
| D. | “ “ | : Spiracle. Longitudinal section. |
| E. | “ “ | : Head. Dorsal view. |
| F. | “ “ | : Posterior end of abdomen. |
| G. | “ “ | : Ninth and tenth abdominal segments. Ventral view. |
| H. | “ “ | : Hypopharyngeal region. |
| I. | “ “ | : Prothoracic leg. |
| J. | “ “ | : Ventral mouthparts. |
| K. | <i>Anthicus heroicus</i> | : Larva. Lateral view. |
| L. | <i>Anthicus</i> sp. (Denmark) | : Larva. Dorsal view. |
| M. | <i>Anthicus heroicus</i> | : Hypopharyngeal region and maxilla. |
| N. | “ “ | : Urogomphi. Dorsal view. |
| O. | <i>Notoxus monoceros</i> L. (Denmark) | : Spiracle. Lateral section. |
| P. | “ “ | : Right mandible; le, linear elevation. Ventral view. |
| Q. | “ “ | : Left mandible. |
| R. | “ “ | : Hypopharyngeal region and maxilla. |
| S. | “ “ | : Urogomphi. Ventral view. |
| T. | <i>Mecynotarsus candidus</i> Lec. | : Mandible; le, linear elevation. Ventral view. |
| U. | “ “ | : Ninth and tenth abdominal segments. Lateral view. |
| V. | “ “ | : Ninth abdominal segment. Dorsal view. |
| W. | “ “ | : Ninth abdominal segment. Ventral view. |



T. Mecynotarsus U. Mecy. V. Mecynotarsus W. Mecyno.

PLATE 47

Anaspidae, Othniidae

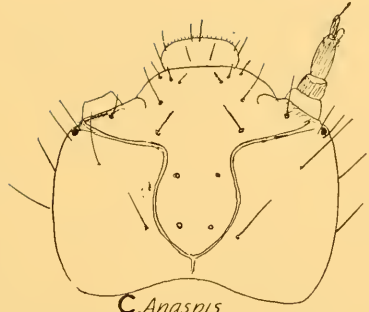
- | | |
|--|--|
| A. <i>Anaspis</i> sp. | : Prothorax and part of mesothorax. Ventral view. |
| B. <i>Anaspis frontalis</i> L. (Denmark) | : Left mandible; le, linear elevation. Ventral view. |
| C. <i>Anaspis</i> sp. | : Head. Dorsal view. |
| D. <i>Anaspis frontalis</i> | : Larva. Lateral view. |
| E. <i>Anaspis</i> sp. | : Spiracle. |
| F. " " | : Hypopharyngeal region. |
| G. " " | : Eighth and ninth abdominal segments. Dorsal view. |
| H. " " | : Distal part of maxilla. Ventral view. |
| I. " " | : Ventral mouthparts. Ventral view. |
| J. <i>Othnius umbrosus</i> Lec. | : Head. Dorsal view. |
| K. " " | : Spiracle (annular-biforous). |
| L. " " | : Prothorax and mesothorax. Ventral view. |
| M. " " | : Posterior end of abdomen. Ventral view. |
| N. " " | : Hypopharyngeal region. |
| O. " " | : Head. Ventral view. |
| P. " " | : Leg. |
| Q. " " | : Mandible. |
| R. " " | : Larva. Lateral view. |



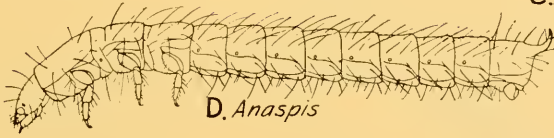
A. *Anaspis*



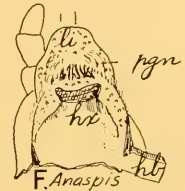
B. *Anaspis*



C. *Anaspis*



D. *Anaspis*



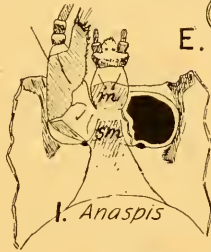
F. *Anaspis*



G. *Anaspis*



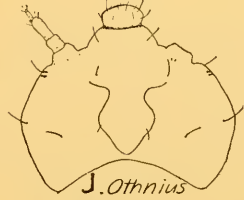
H. *Anaspis*



I. *Anaspis*



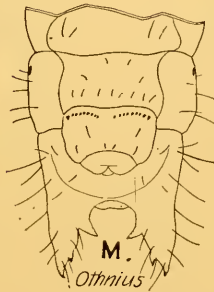
E. *Anaspis*



J. *Othnius*



L. *Othnius*



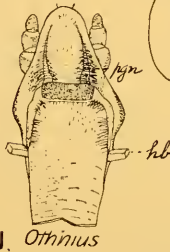
M. *Othnius*



K. *Othnius*



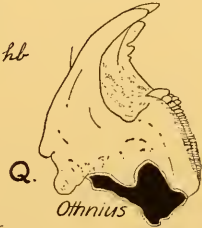
O. *Othnius*



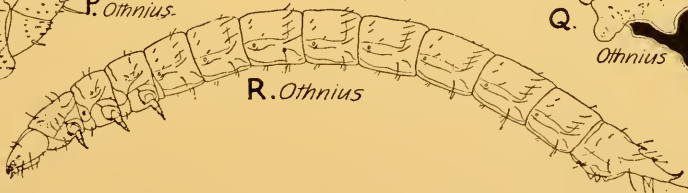
N. *Othnius*



P. *Othnius*



Q. *Othnius*

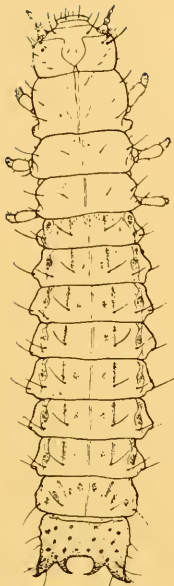


R. *Othnius*

PLATE 48

Eurystethidae, Boridae

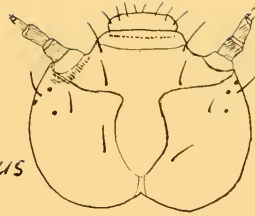
- A. *Eurystethus californicus* Melsh.
 (= *Aegialites debilis* Mann.) : Spiracle sur-
 rounded by oval
 sclerome.
- B. " " " : Head. Dorsal
 view.
- C. " " " : Mandible. Ven-
 tral view.
- D. " " " : Larva. Dorsal
 view.
- E. " " " : Head. Ventral
 view.
- F. " " " : Hypopharyngeal
 region.
- G. *Boros unicolor* Say : Hypopharyngeal
 region.
- H. " " : Metathorax and
 first abdominal
 segment. Lat-
 eral view.
- I. " " : Leg.
- J. " " : Labrum. Dorsal
 view.
- K. " " : Epipharynx.



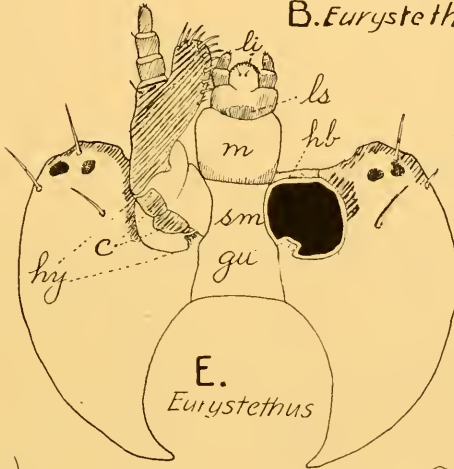
D. *Eurystethus*



A. *Eurystethus*



B. *Eurysteth.*



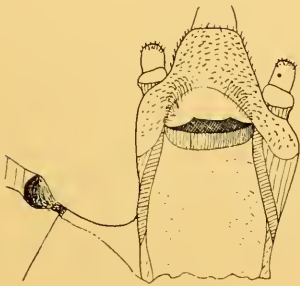
E. *Eurystethus*



C. *Euryst.*



F. *Eury.*



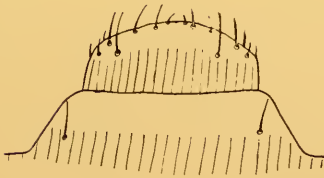
G. *Boros*



I. *Boros*



H. *Boros*



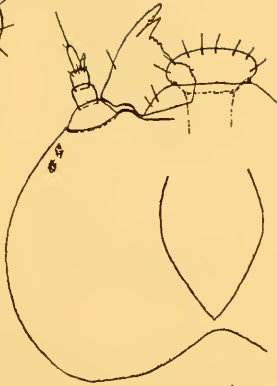
J. *Boros*



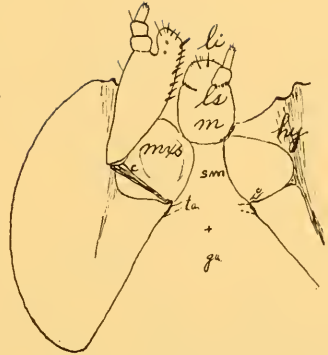
K. *Boros*



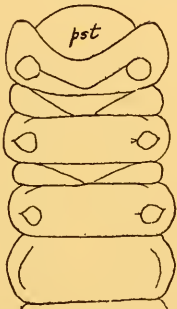
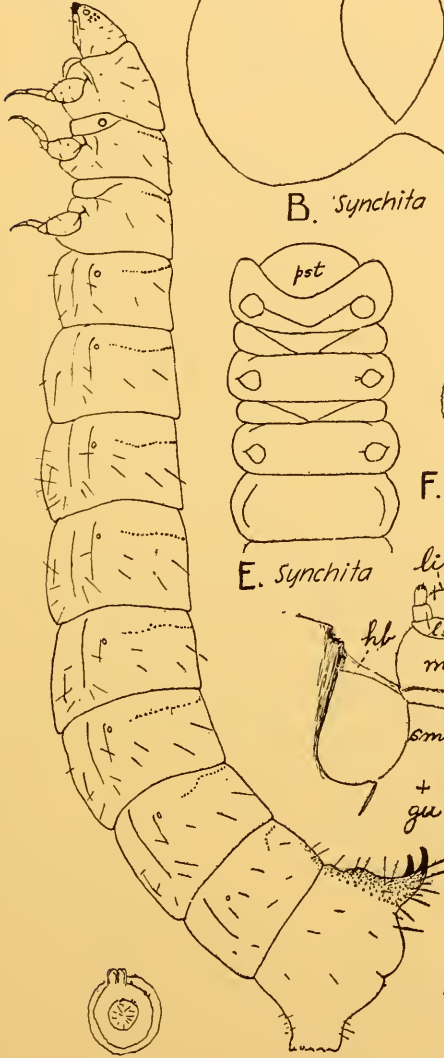
A. *Bitoma*



B. *Synchronita*



C. *Synchronita*



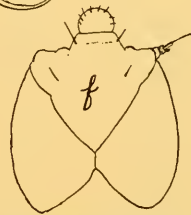
E. *Synchronita*



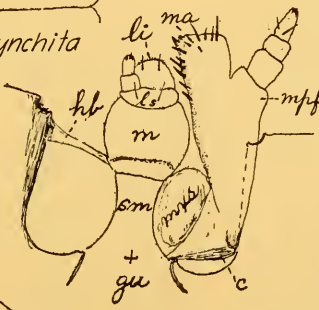
D. *Phloe.*



F. *Phloeonemus*



G. *Nematidium*



H. *Nematidium*



I. *Aulonium*



J. *Aulonium*



K. *Aulonium*



L. *Aulonium*

M. *Nematidium*

PLATE 50

Mycetophagidae

- A. *Mycetophagus punctatus* Say : Larva. Lateral view.
 B. " " : Head and prothorax. Ventral view.
 C. *Mycetophagus obsoletus* Melsh. : Ninth abdominal segment. Ventral view.
 D. " " : Third abdominal spiracle.
 E. *Typhaea funata* L. : Left mandible. Ventral view.
 F. " " : Left mandible. Dorsal view.
 G. " " : Right mandible. Dorsal view.
 H. " " : Mesothoracic spiracle.
 I. " " : Hypopharyngeal region.
 J. " " : Head. Dorsal view.
 K. " " : Larva. Dorsal view.
 L. *Thrimolus duryi* Csy. : Antenna.
 M. *Litargus sexpunctatus* Say : Posterior end of abdomen. Dorsal view.
 N. *Litargus connexus* Geoffr. (Denmark) : Third abdominal spiracle.
 O. *Alitargus balteatus* Lee. : Larva. Ventral view.
 P. *Thrimolus duryi* : Left mandible. Ventral view.
 Q. " " : Right mandible. Ventral view.
 R. " " : Spiracle.
 S. " " : Larva. Dorsal view.
 T. " " : Larva. Lateral view.

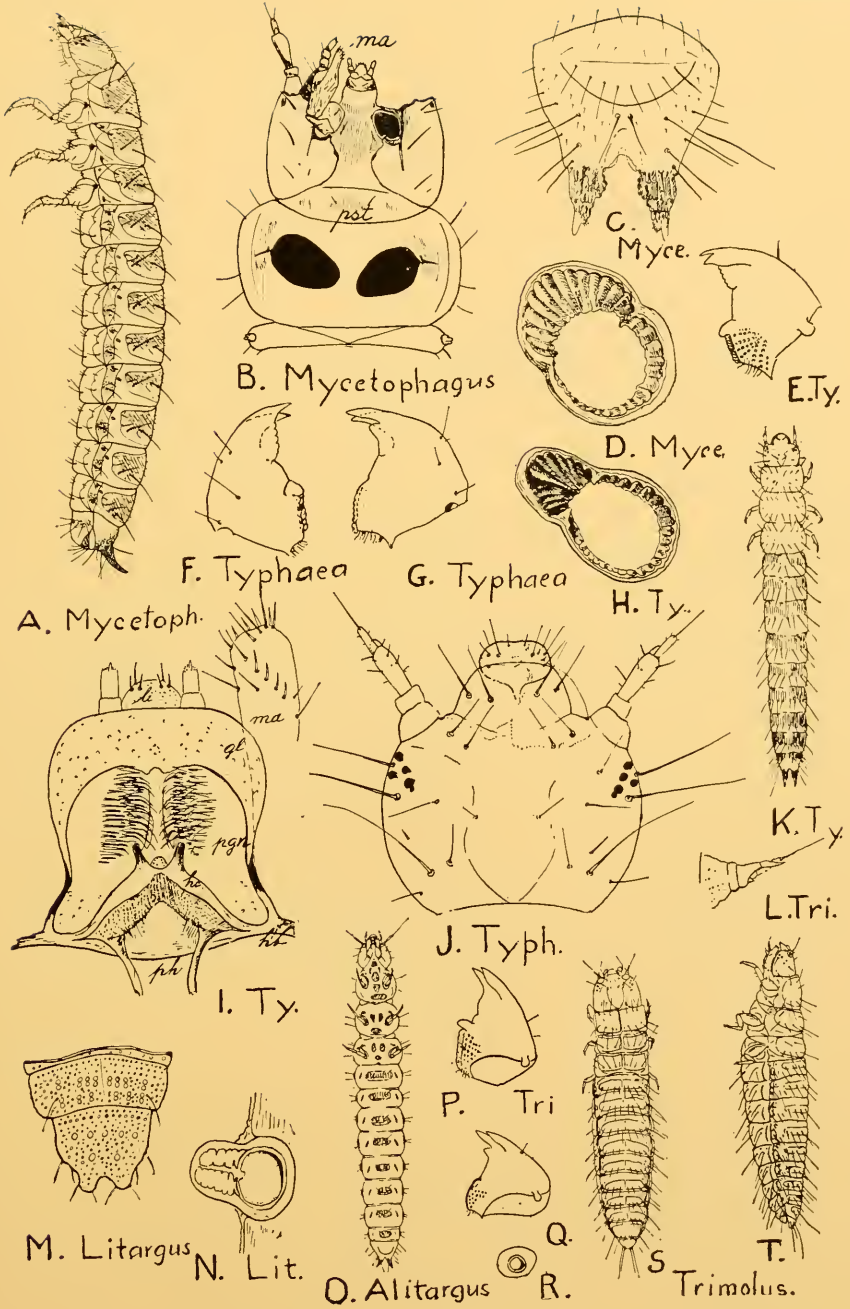
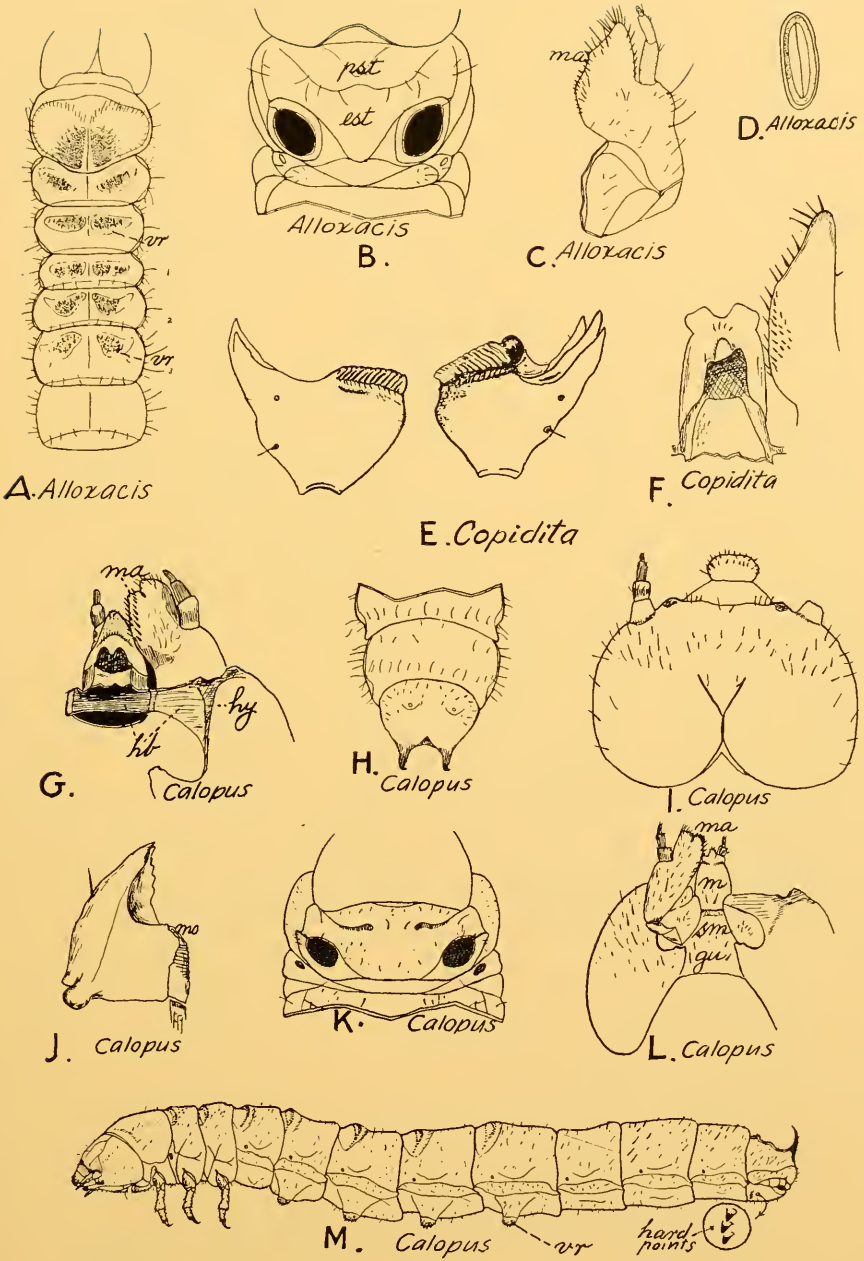


PLATE 51

Oedemeridae-Oedemerinae (A-F), *Oedemeridae-Calopodinae*

- A. *Alloxaxis dorsalis* Melsh.: Anterior part of body; vr, verruca scansoria or ambulatory wart (=tuber scansorium, Schiödte).
- B. " " : Prothorax. Ventral view.
- C. " " : Maxilla. Ventral view.
- D. " " : Spiracle.
- E. *Copidita thoracica* F. : Right and left mandibles. Dorsal view.
- F. " " : Hypopharyngeal region and mala.
- G. *Calopus angustus* Lec. : Hypopharyngeal region and maxilla. Dorsal view.
- H. " " : Eighth and ninth abdominal segments. Dorsal view.
- I. " " : Head. Dorsal view.
- J. " " : Right mandible.
- K. " " : Prothorax. Ventral view.
- L. " " : Head. Ventral view.
- M. " " : Larva; vr, scansorial verruca; enlargement of the three hard points of right abdominal segment shown separately in the circular inset. Lateral view.



LARVAL FORMS OF COLEOPTERA

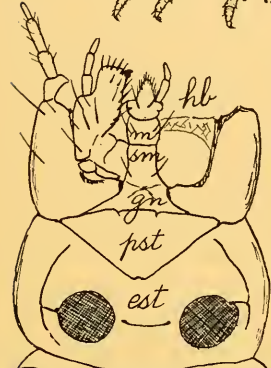
PLATE 52

Synchroïdæ, Zopheridæ (F-I and M), Cephaloidæ

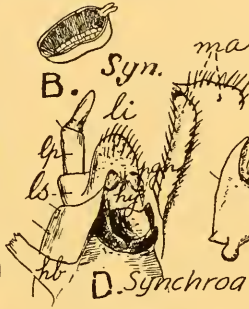
- | | | | |
|------------------|-----------------------------|-------|--------------------------------------|
| A. | <i>Synchroa punctata</i> | Newn. | : Larva. Lateral view. |
| B. | " | " | : Spiracle. |
| C. | " | " | : Head and prothorax. Ventral view. |
| D. | " | " | : Hypopharyngeal region and maxilla. |
| D ¹ . | " | " | : Left mandible. Dorsal view. |
| D ² . | " | " | : Right mandible. Ventral view. |
| E. | " | " | : Leg. |
| F. | <i>Phellopsis obeordata</i> | Kby. | : Mandible. |
| G. | " | " | : Head. Dorsal view. |
| H. | " | " | : Head. Ventral view. |
| I. | " | " | : Larva. Dorsal view. |
| J. | <i>Cephaloon lepturides</i> | Newn. | : Head. Ventral view. |
| K. | " | " | : Mandible. |
| L. | " | " | : Spiracle. |
| M. | <i>Phellopsis obeordata</i> | | : Hypopharynx. |
| N. | <i>Cephaloon lepturides</i> | | : Hypopharynx. |
| O. | " | " | : Larva. Lateral view. |



A. Synchronroa



C. Synchronroa



B. Syn. li

D. Synchronroa



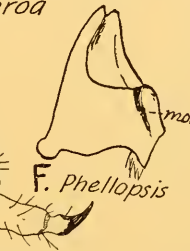
D1



D2



E. Synchronroa



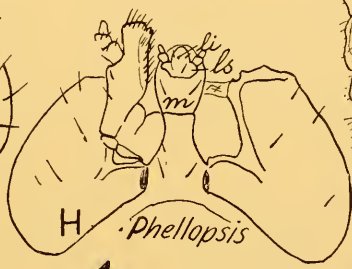
F. Phellopsis



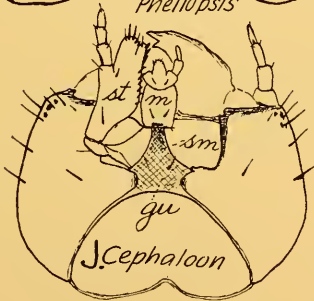
I. Phellopsis



G. Phellopsis



H. Phellopsis



J. Cephaloon



K. Cephal.

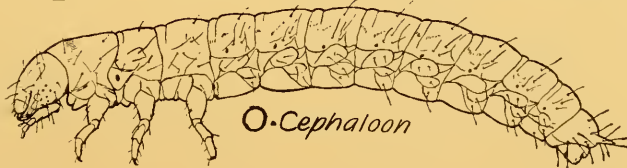


L. Cephal.

M. Phellopsis



N. Cephaloon



O. Cephaloon

PLATE 53

Pedilidae (Eurygeniidae), Pyrochroidae

- | | | |
|----|-------------------------------------|---|
| A. | <i>Eurygenius campanulatus</i> Lec. | : Labrum and antenna. Dorsal view. |
| B. | “ “ | : Mandible. Ventral view. |
| C. | “ “ | : Hypopharyngeal region. |
| D. | “ “ | : Ninth abdominal segment. Dorsal view. |
| E. | “ “ | : Tibia and tarsungulus. |
| F. | “ “ | : Ninth and tenth abdominal segments. Ventral view. |
| G. | “ “ | : Maxilla. Ventral view. |
| H. | “ “ | : Larva. Lateral view. |
| I. | <i>Neopyrochroa femoralis</i> Lec. | : Head. Dorsal view. |
| J. | “ “ | : Right mandible. Ventral and dorsal views. |
| K. | “ “ | : Spiracle. |
| L. | “ “ | : Larva. Dorsal view. |
| M. | “ “ | : Eighth, ninth and tenth abdominal segments. Ventral view. |
| N. | “ “ | : Leg. |
| O. | “ “ | : Head and prothorax. Ventral view. |

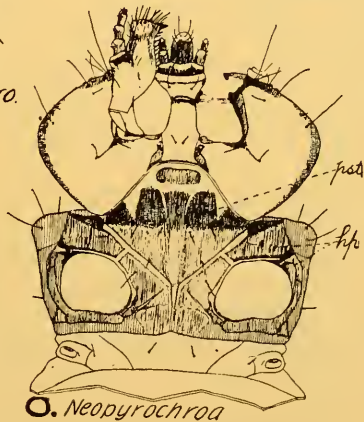
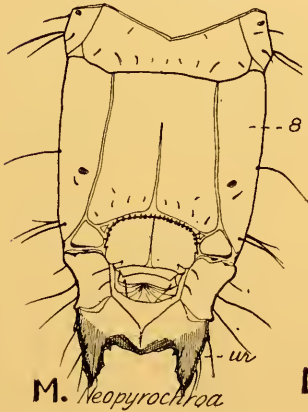
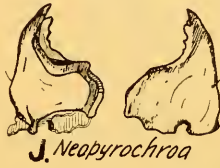
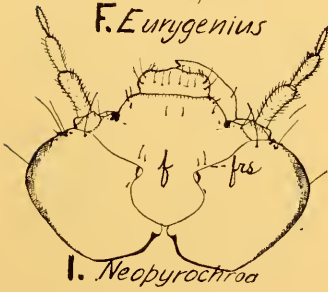
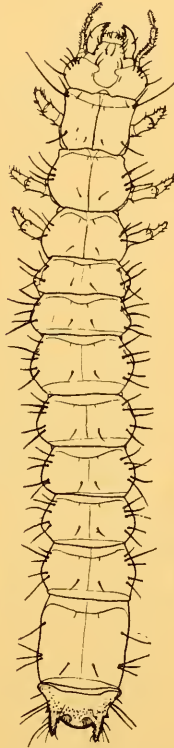
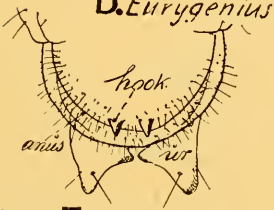
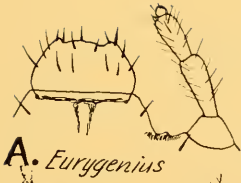


PLATE 54

Salpingidae (Rhinosimus), Pythidae

- | | | | | |
|----|------------|------------|----------------|--|
| A. | Rhinosimus | ruficollis | L. (Denmark) : | Right mandible. Ventral view. |
| B. | " | " | : | End of tibia, and tarsungulus. |
| C. | " | " | : | Hypopharynx, hypopharyngeal bracon, and maxilla. |
| D. | " | " | : | Spiracle. |
| E. | " | " | : | Left mandible. Ventral view. |
| F. | " | " | : | Larva. Dorsal view. |
| G. | " | " | : | Eighth, ninth, and tenth abdominal segments. Ventral view. |
| H. | " | " | : | Ventral mouthparts. Ventral view. |
| I. | Pytho | niger | Kby. | : |
| J. | " | " | : | Spiracle. |
| | | | : | Right mandible. Dorsal view. |
| K. | " | " | : | Head. Dorsal view. |
| L. | " | " | : | Left maxilla. Dorsal view. |
| M. | " | " | : | Posterior end of abdomen. Ventral view. |
| N. | " | " | : | Head. Ventral view. |
| O. | " | " | : | Hypopharyngeal region. |

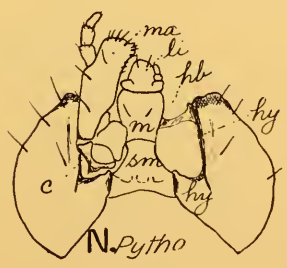
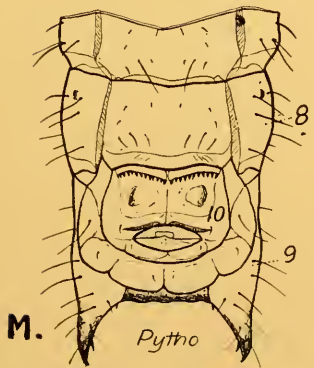
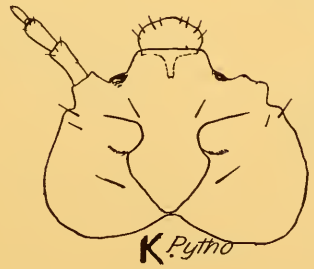
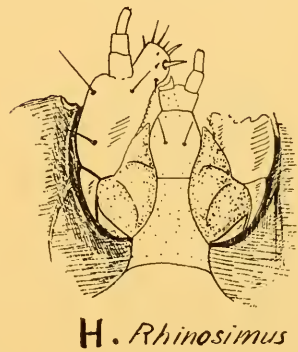
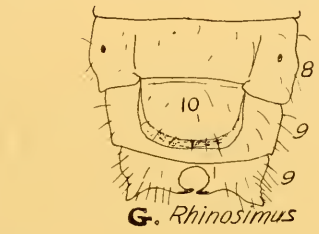
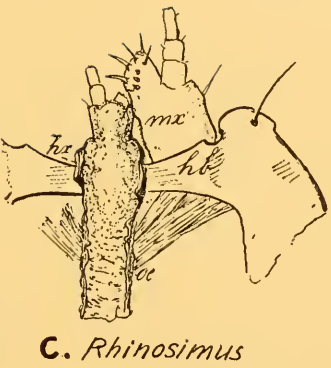
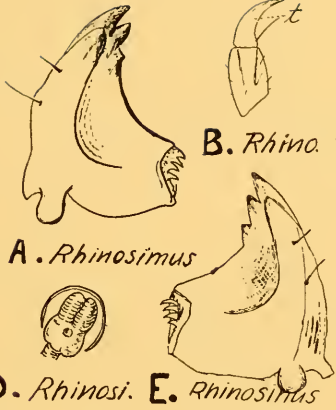
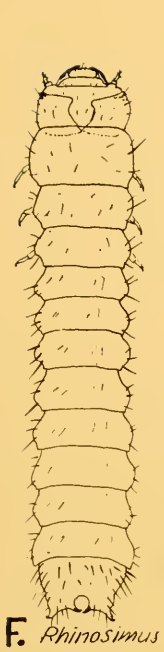
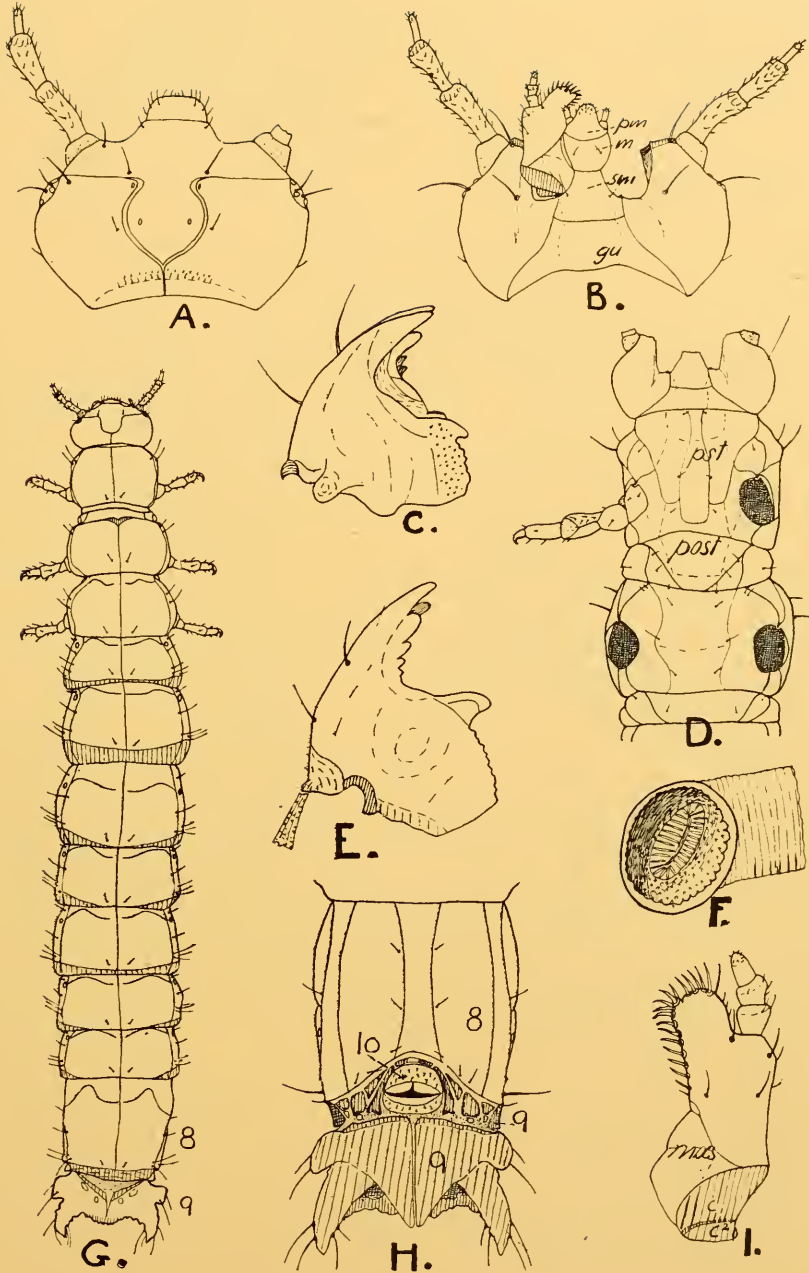


PLATE 55

Boridae

- | | | | |
|----|----------------|-----|---|
| A. | Boros unicolor | Say | : Head. Dorsal view. |
| B. | " | " | : Head. Ventral view. |
| C. | " | " | : Right mandible. Ventral view. |
| D. | " | " | : Prothorax and mesothorax. Ventral view. |
| E. | " | " | : Left mandible. Dorsal view. |
| F. | " | " | : Spiracle. |
| G. | " | " | : Larva. Dorsal view. |
| H. | " | " | : Eighth, ninth, and tenth abdominal segments. Ventral view. |
| I. | " | " | : Maxilla; C ¹ , anterior part of cardo; C ² , posterior part of cardo. Ventral view. |



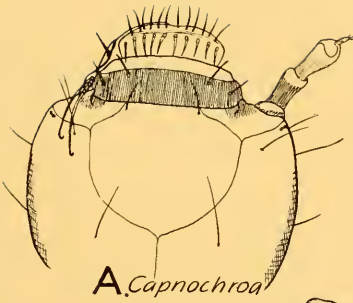
Boros unicolor.

PLATE 56

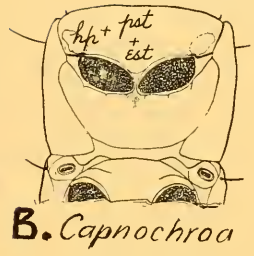
Alleculidae-Alleculinae (A-L)

Alleculidae-Omophlinae (M-N)

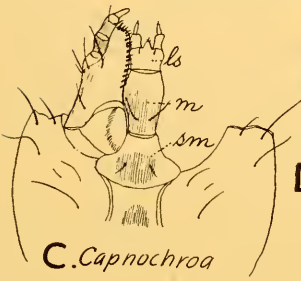
- | | | |
|----|--|--|
| A. | <i>Capnochroma fuliginosa</i> Melsh. | : Head. Dorsal view. |
| B. | “ “ | : Prothorax and anterior part of mesothorax. Ventral view. |
| C. | “ “ | : V e n t r a l mouthparts. Ventral view. |
| D. | “ “ | : Right mandible. Intero-dorsal view. |
| E. | <i>Mycetochara fraterna</i> Say | : Posterior end of abdomen. Lateral view. |
| F. | <i>Hymenorus pilosus</i> Melsh. | : Mandible. Ventral view. |
| G. | <i>Capnochroma fuliginosa</i> | : Larva. Lateral view. |
| H. | <i>Hymenorus pilosus</i> | : Head. Dorsal view. |
| I. | “ “ | : Leg. |
| J. | “ “ | : Hypopharyngeal region and maxilla. |
| K. | “ “ | : Head. Ventral view. |
| L. | “ “ | : Posterior end of abdomen; vl, ventro-lateral suture. Lateral view. |
| M. | <i>Cteniopus sulphureus</i> L. (Denmark) | : Posterior end of abdomen. Ventro-lateral view. |
| N. | <i>Omophilus proteus</i> Kirsch (Russia) | : L a r v a. Ventro-lateral view. |



A. *Capnochoa*



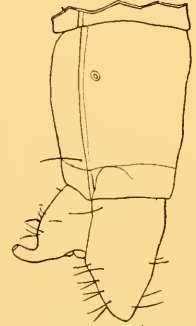
B. *Capnochoa*



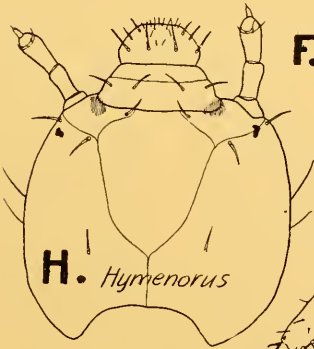
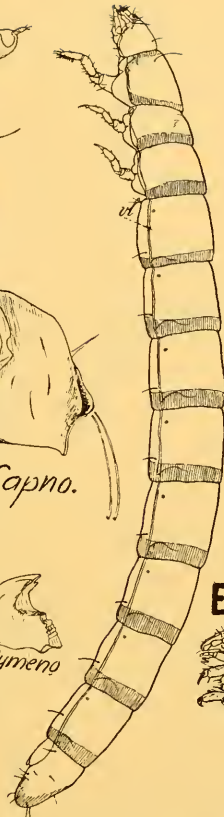
C. *Capnochoa*



D. *Capno.*



E. *Mycetochara*

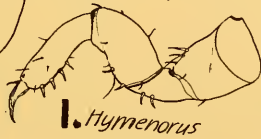


H. *Hymenorus*

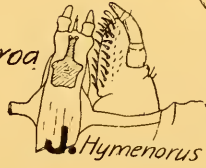


F. *Hymenorus*

G. *Capnochoa*



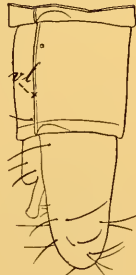
I. *Hymenorus*



J. *Hymenorus*

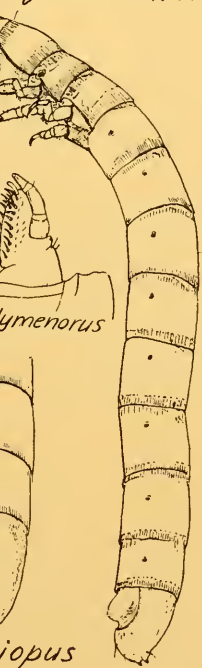


K. *Hymenorus*



L. *Hymenorus*

M. *Cteniopus*



N. *Omophlus*

PLATE 57

Tenebrionidae

- A. *Eleodes suturalis* Say : Ninth abdominal segment. Dorsal view.
- B. *Embaphion muricatum* Say : Right and left mandibles and hypopharyngeal sclerome. Dorsal view.
- C. " " : Ventral mouthparts. Ventral view.
- D. *Eleodes suturalis* : Larva. Lateral view.
- E. *Hoplocephala ferruginea* Lec. : Head. Dorsal view.
- F. " " : Hypopharyngeal region and anterior part of labium. Dorsal view.
- G. " " : Right mandible. Ventral view.
- H. " " : Antenna.
- I. " " : Right mandible. Dorsal view.
- J. " " : Head. Ventral view.
- K. *Gnathocerus cornutus* F. : Right mandible. Ventral view.
- L. " " : Antenna.
- M. " " : Hypopharyngeal region.
- N. " " : Posterior part of abdomen. Lateral view.
- O. *Hypophloeus parallelus* Melsh. : Right mandible. Ventral view.
- P. " " : Right mandible. Dorsal view.
- Q. " " : Antenna.
- R. " " : Hypopharyngeal region.
- S. *Meracantha contracta* Beauv. : Seventh to ninth abdominal segments. Dorsal view.
- T. *Strongylium tenuicolle* Say : Eighth and ninth abdominal segments. Dorsal view.
- U. " " : Eighth and ninth abdominal segments. Lateral view.

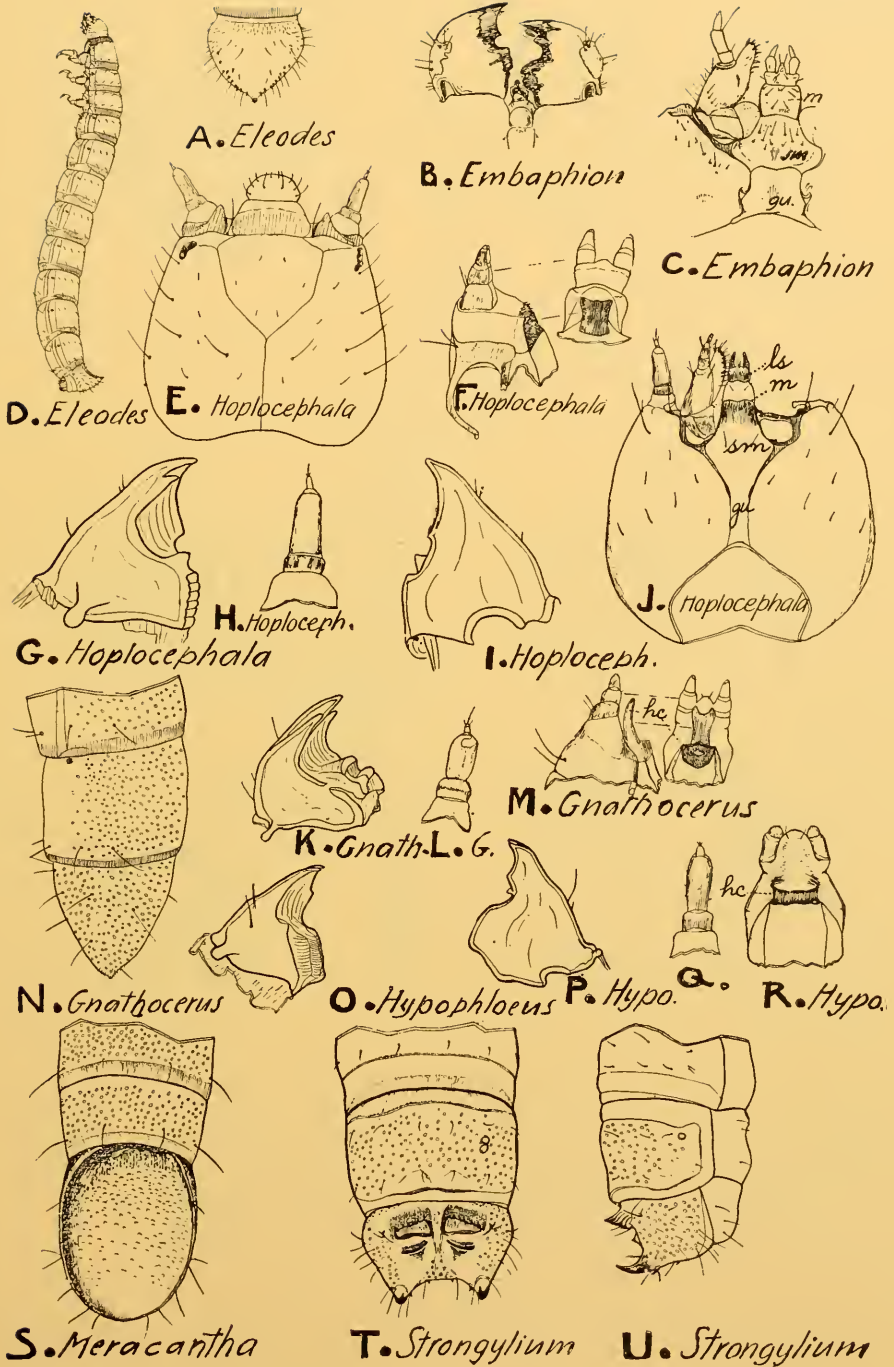
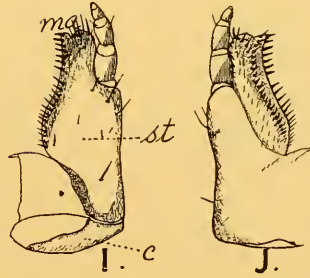
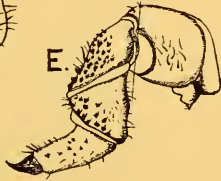
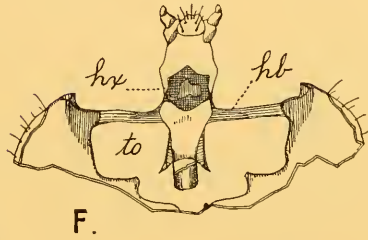
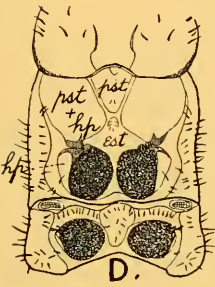
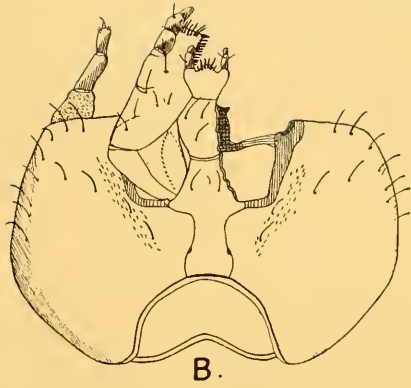
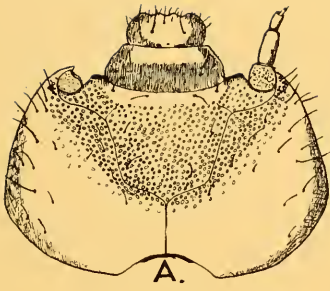


PLATE 58

Tenebrionidae

- | | | | |
|----|-------------------------------|------|--|
| A. | <i>Alobates pennsylvanica</i> | DeG. | : Head. Dorsal view. |
| B. | " | " | : Head. Ventral view. |
| C. | " | " | : Mandible. Ventral view. |
| D. | " | " | : Prothorax and mesothorax.
Ventral view. |
| E. | " | " | : Prothoracic leg. |
| F. | " | " | : Labium, hypopharynx and bra-
con. |
| G. | " | " | : Epipharynx. |
| H. | " | " | : Abdominal spiracle. |
| I. | " | " | : Left maxilla. Ventral view. |
| J. | " | " | : Left maxilla. Dorsal view. |
| K. | " | " | : Larva. Lateral view. |



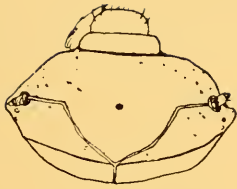
Alobates

LARVAL FORMS OF COLEOPTERA

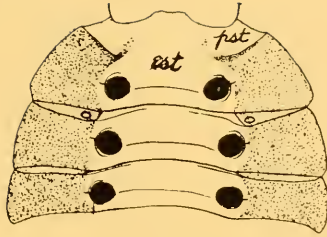
PLATE 59

Nilionidae

- | | | | |
|----|-----------------|--|---|
| A. | Leiochrodes sp. | (Larva with pupae
and imagines from
China) | : Head. Dorsal view. |
| B. | “ | “ | : Thorax. Ventral view. |
| C. | “ | “ | : Antenna. |
| D. | “ | “ | : Right mandible. Ventral
view. |
| E. | “ | “ | : Left mandible. Ventral
view. |
| F. | “ | “ | : Anterior end of labium.
Ventral view. |
| G. | “ | “ | : Maxilla. Ventral view. |
| H. | “ | “ | : Hypopharyngeal region;
gl. glossa. |
| I. | “ | “ | : Larva. Dorsal view. |
| J. | “ | “ | : Ventral mouthparts. Ven-
tral view. |
| K. | “ | “ | : Anterior end of labium
and hypopharyngeal
region. Lateral view. |
| L. | “ | “ | : Larva. Lateral view. |
| M. | “ | “ | : Leg. |



A.



B.



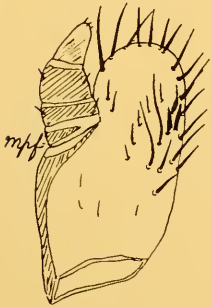
C.



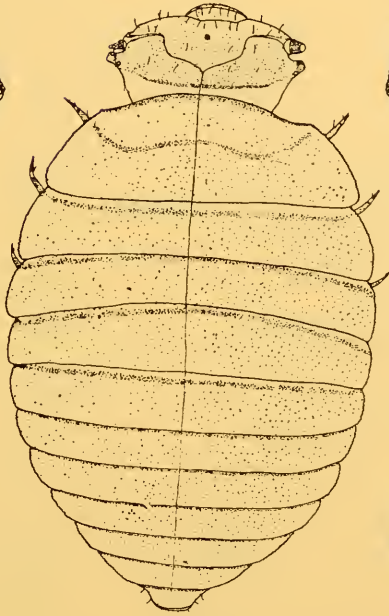
D.



E.



G.



I.



F.



H.



J.



K.



L.

Leiochrodes



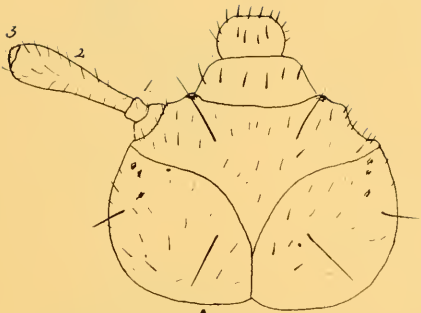
M.

LARVAL FORMS OF COLEOPTERA

PLATE 60

Lagriidae

- | | |
|---------------------------------------|---|
| A. <i>Anaedus brunneus</i> Ziegl. | : Head. Dorsal view. |
| B. " " | : Spiracle. |
| C. " " | : Ventral mouthparts. Dorsal view. |
| D. " " | : Leg. |
| E. " " | : Left mandible. Ventral view. |
| F. " " | : Right mandible. Dorsal view. |
| G. <i>Paratenetus punctatus</i> Spin. | : Antenna. |
| H. Not determined Lagriid (Panama) | : Antenna. |
| I. <i>Paratenetus punctatus</i> | : Anterior end of labium and hypopharynx. Lateral view. |
| J. <i>Arthromacra aenea</i> Say | : Anterior end of labium and hypopharynx. Lateral view. |
| K. " " | : Prothorax. Ventral view. |
| L. <i>Anaedus brunneus</i> | : Gland, covered by overlapping hairs; from tergal shield of an abdominal segment. Exterior view. |
| M. " " | : Abdominal gland with overlapping hairs removed. |
| N. <i>Arthromacra aenea</i> | : Eighth and ninth abdominal segments. Dorso-lateral view. |
| O. " " | : Ninth abdominal segment. Dorsal view. |
| P. <i>Lagria</i> sp. | : Larva. Lateral view. |



A. *Anaedus*



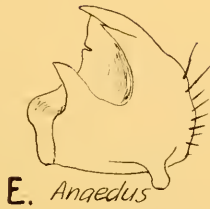
B. *Anaedus*



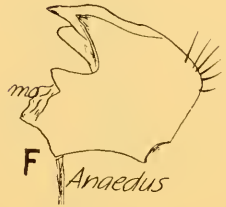
C. *Anaedus*



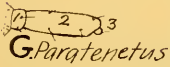
D. *Anaedus*



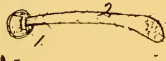
E. *Anaedus*



F. *Anaedus*



G. *Paratenetus*



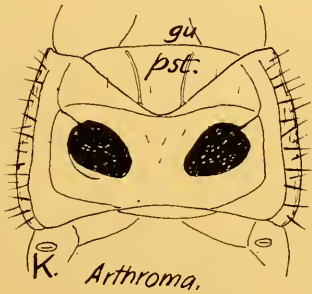
H. *Lagrid*



I. *Paratenetus*



J. *Arthroma*



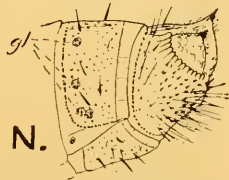
K. *Arthroma*



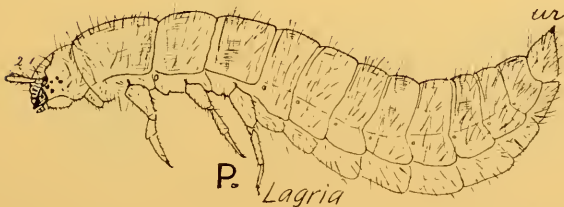
L. *Anaedus*



M. *Anaedus*



N. *Arthroma*



P. *Lagria*



O. *Arthroma*

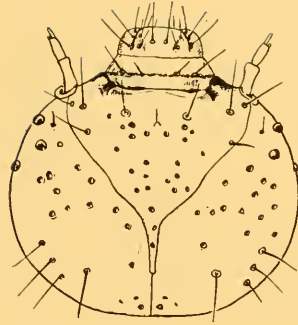
PLATE 61

Byrrhidae-Byrrhinae

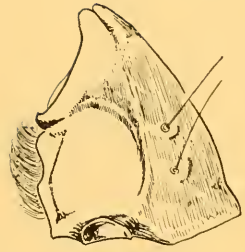
- A. *Byrrhus fasciatus* Forst. (Denmark): Right mandible; notice the lack of a lacinia mandibulae and the presence of a row of hairs exclusively at the base of the mandible. Ventral view.
- B. " " : Head. Dorsal view.
- C. " " : Right mandible. Dorsal view.
- D. " " : Head (partial). Ventral view.
- E. " " : Immerside of the ventral portion of the head; ne, ganglion. Dorsal view.
- F. " " : Portion of head showing epipharynx, antenna and the dorsal and ventral articulations of the mandible.
- G. " " : Antenna. Dorsal view.
- H. " " : Larva. Lateral view.
- I. " " : Left maxilla. Dorsal view.
- J. " " : Gula, submentum, mentum, prementum, labial palpiger, labial palpus, ligula, hypopharynx and other structures. Lateral view.
- K. " " : Left maxilla; a, maxillary articulating area. Ventral view.



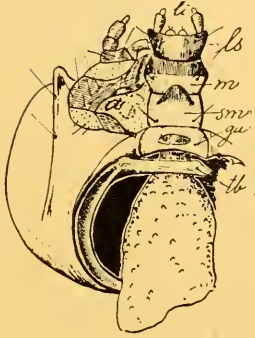
A.



B.



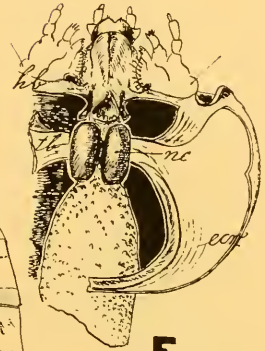
C.



D.



H.



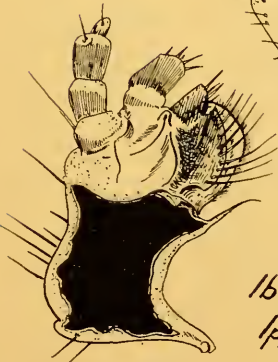
E.



F.



G.



I.



J.



K.

Byrrhus

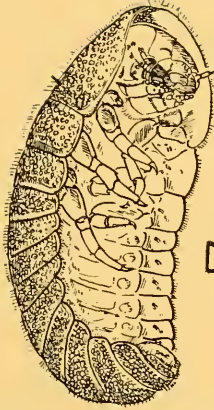
PLATE 62

Byrrhidac-Byrrhinae (A-B, D-H)

Byrrhidac-Amphicyrtinae (C, I-L)

Byrrhidac-Liooninae (M-R)

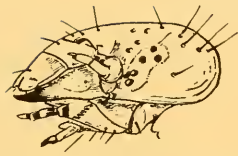
- A. *Cytilus sericeus* Forster
 (Denmark): Antenna.
- B. " " : Right maxilla. Ventral view.
- C. *Amphicyrta chrysomelina* Er.: Head. Lateral view.
- D. *Cytilus sericeus* : Left mandible. Dorsal view.
- E. " " : Spiracle.
- F. " " : Larva. Ventro-lateral view.
- G. " " : Tibia and tarsungulus.
- H. " " : Labial palpi.
- I. *Amphicyrta chrysomelina* : Left mandible. Ventral view.
- J. " " : Epipharyngeal, hypopharyngeal, labial and maxillary parts. Lateral view.
- K. " " : Ventral mouthparts.
- L. " " : Ninth and tenth abdominal segments; 9d, margin of dorsum of ninth abdominal segment; 9v, venter of ninth abdominal segment; 10d, margin of dorsum of tenth; 10v, venter of tenth; anus and anal hooks figured.
- M. *Lioon simplicipes* Mann. : Frons, clypeus, labrum and antenna. Dorsal view.
- N. " " : Left mandible. Ventral view.
- O. " " : Epipharyngeal, hypopharyngeal, labial and maxillary parts. Dorso-lateral view.
- P. " " : Spiracle.
- Q. " " : Ventral mouthparts.
- R. " " : Larva; gland, gland.



A. Cytil.



B. Cytilus



C. Amphicyrta



D. Cy.



E. Cy.



I. Am.



G. Cy.

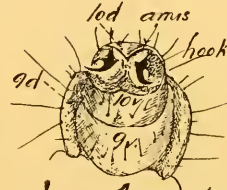


H. Cy.

F. Cytilus



J. Amphic. K. Amphicyrta



L. Amphic



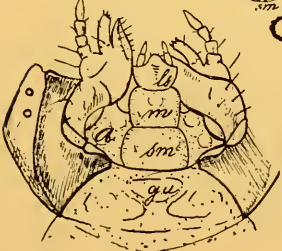
M. Lioon



N. Lioon



O. Lioon



P. Lioon

Q. Lioon

R. Lioon

PLATE 63

Dascillidae

- | | | |
|-----|--|--|
| A. | <i>Dascillus davidsoni</i> Lec. | : Head. Dorsal view. |
| B. | “ “ | : Left mandible. Facing the buccal cavity. |
| C. | “ “ | : Left mandible. Ventral view. |
| D. | “ “ | : Trochanter from inside. |
| E. | “ “ | : Split head showing clypeus, labrum, epipharynx, mandible, hypopharynx, and ventral mouthparts. |
| F. | “ “ | : Larva. Lateral view. |
| G. | “ “ | : Outline of ninth abdominal segment. Dorsal view. |
| G.* | <i>Dascillus cervinus</i> L. (Denmark) | : Tip of ninth abdominal segment. Dorsal view. |
| H. | <i>Dascillus davidsoni</i> | : Underside of head, ventral mouthparts, and anterior part of prothorax; hp, hypopleural lobe. Ventral view. |
| I. | “ “ | : First abdominal spiracle. |



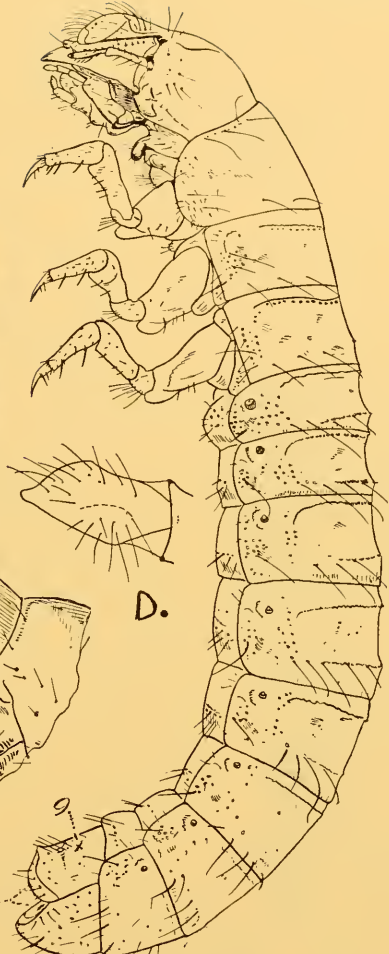
A.



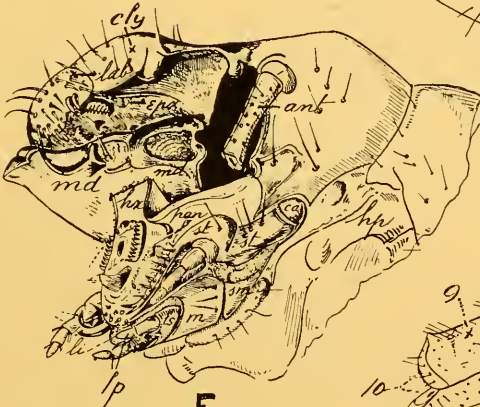
B.



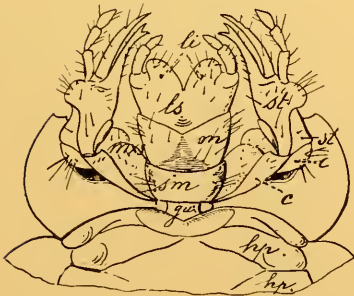
C.



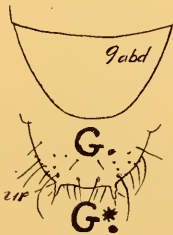
D.



E.



H.



G.

G*.



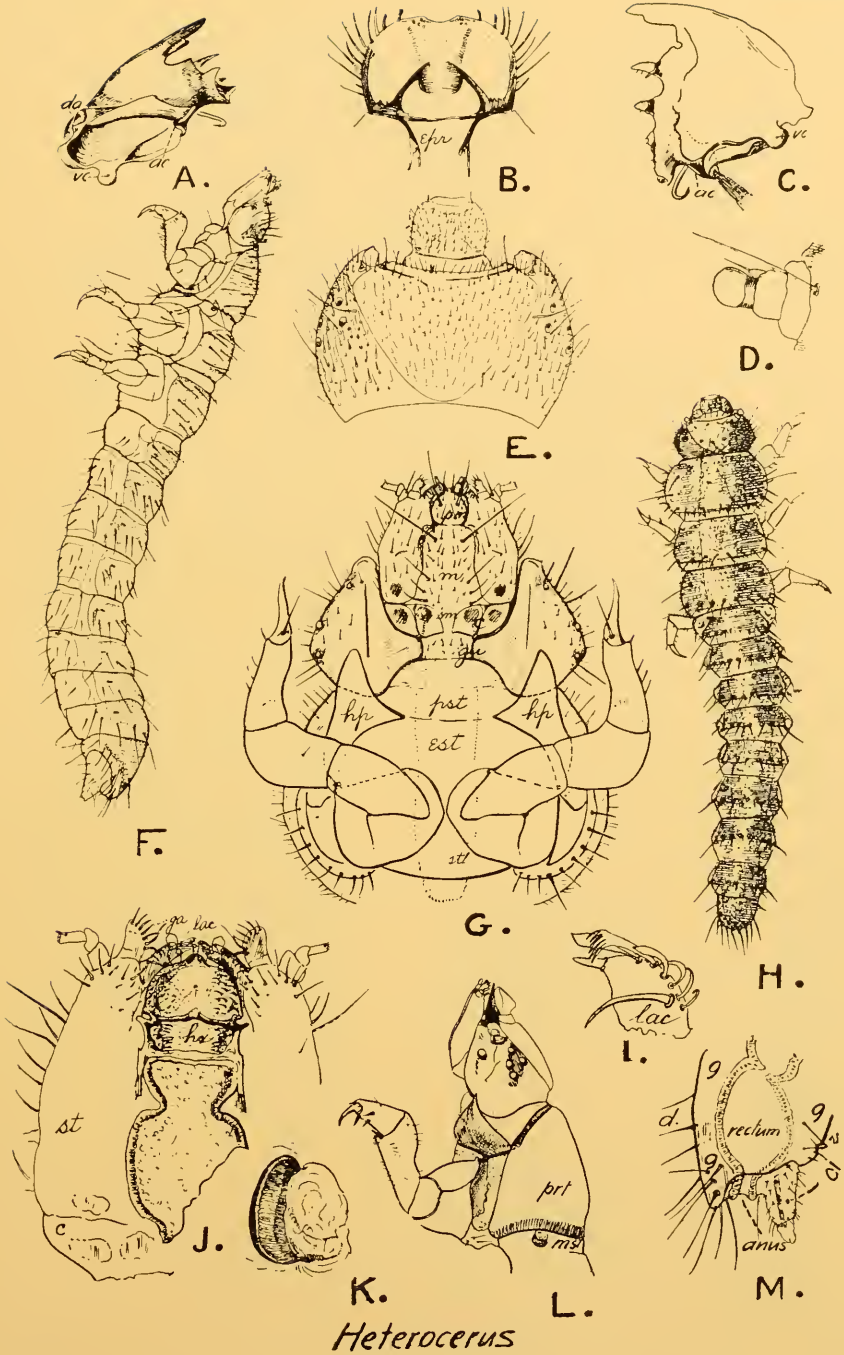
I.

Dascillus

PLATE 64

Heteroceridae

- | | | |
|----|-------------------------------|---|
| A. | Heterocerus ventralis Melsh.: | Left mandible showing dorsal and ventral articulations. |
| B. | “ “ | : Epipharynx. |
| C. | “ “ | : Left mandible. Ventral view. |
| D. | “ “ | : Antenna. |
| E. | “ “ | : Headcapsule. Dorsal view. |
| F. | “ “ | : Larva. Lateral view. |
| G. | “ “ | : Head and prothorax. Ventral view. |
| H. | “ “ | : Larva. Dorsal view. |
| I. | “ “ | : Tip of lacinia. Ventral view. |
| J. | “ “ | : Hypopharynx and maxilla. |
| K. | “ “ | : Spiracle of mesothorax. Exterior view. |
| L. | “ “ | : Head, prothorax, and anterior part of mesothorax with the spiracle. Lateral view. |
| M. | “ “ | : Sagittal section of end of abdomen; d, dorsal side; v. ventral side. |

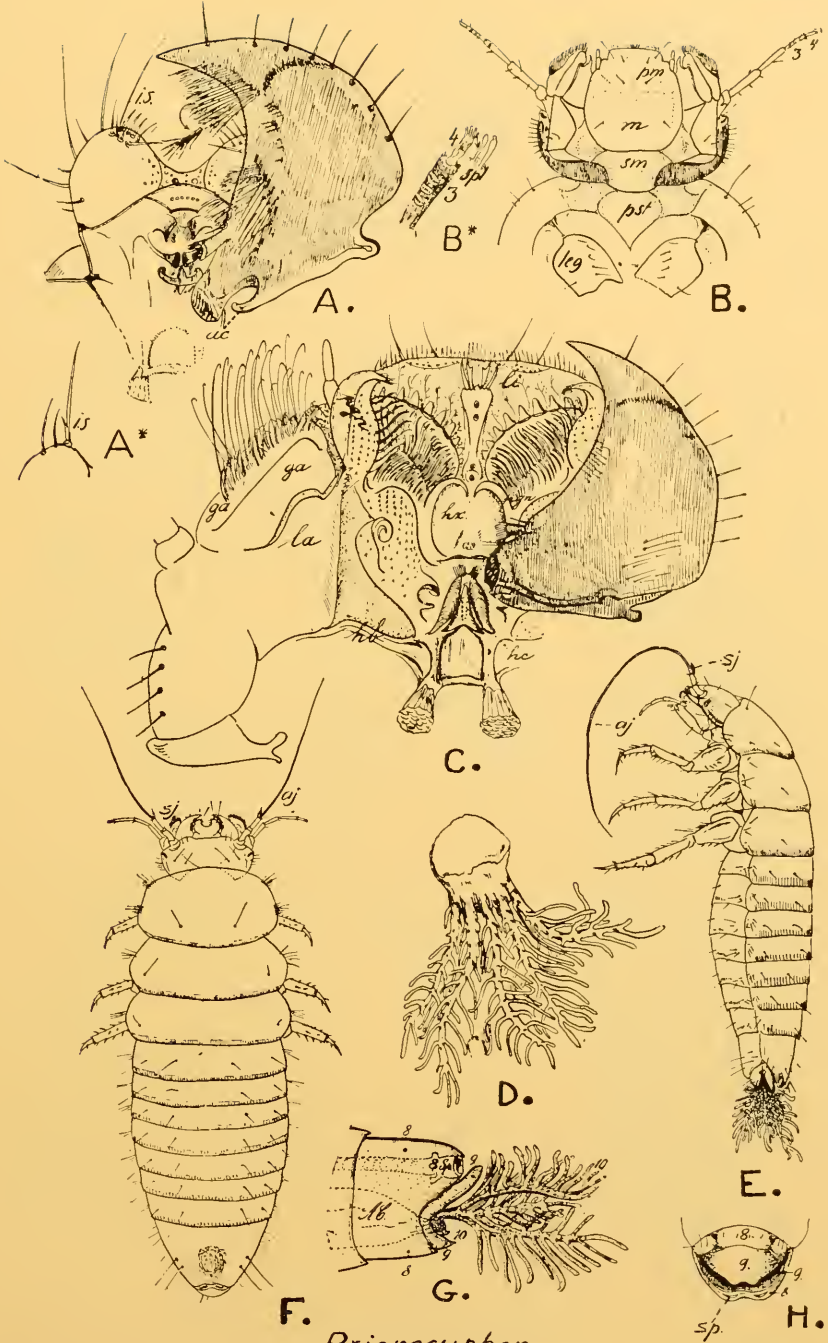


Heterocerus

PLATE 65

Helodidae

- A. *Prionocyphon discoideus* Say. : Mandible and epipharynx; i.s., not branched inner seta of the marginal front row of long epipharyngeal setae.
- A.* *Helodes marginata* F. (Denmark) : Epipharyngeal marginal setae; i.s., branched inner seta.
- B. *Prionocyphon discoideus* : Ventral mouthparts and part of prothorax.
- B.* " " : Apical and postapical joints of maxillary palpus; 3, subapical joint; 4, apical joint; spl, sensory papillae; notice the indication of a subdivision of the postapical joint.
- C. " " : Innerside of mouth with large maxillulae.
- D. " " : Tassels of gills.
- E. " " : Larva; aj, multiarticulated apical joint of antenna; sj, supplementary joint of antenna. Lateral view.
- F. " " : Larva; aj and sj as in figure E. Dorsal view.
- G. " " : End of abdomen; AC, alimentary canal with anus; 8 sp, spiracle of eighth abdominal segment. Diagram; lateral view.
- H. " " : End of abdomen. Ventral view.

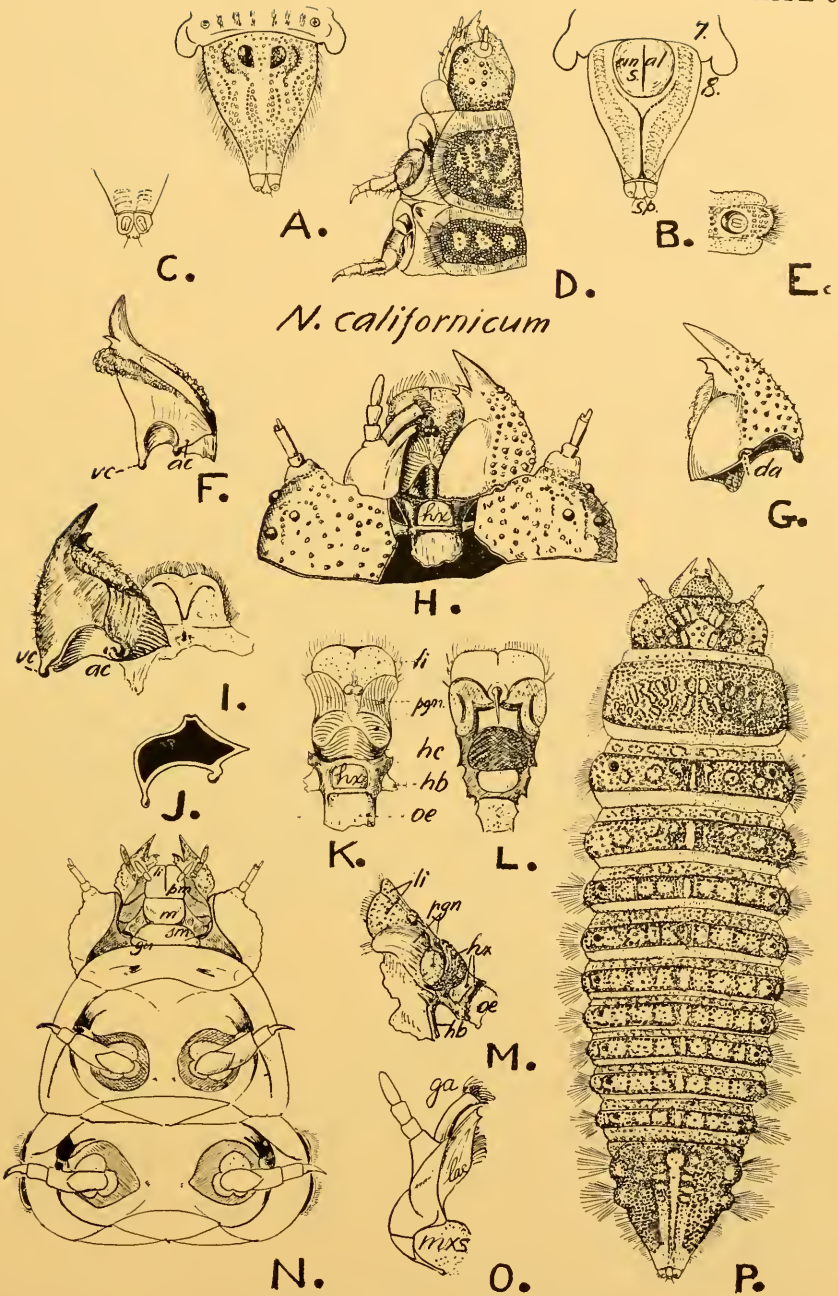


F. *Prionocyphon*

PLATE 66

Nosodendridae

- A. *Nosodendron californicum* Horn : End of abdomen. Dorsal view.
 B. " " : End of abdomen; anal s., anal segment. Ventral view.
 C. " " : Tip of eighth abdominal segment showing the terminal spiracles. Dorsal view.
 D. " " : Head, prothorax and mesothorax; notice the position of the mesothorax spiracle as compared with that of *Nosodendron unicolor* on figure P. Lateral view.
 E. " " : Third abdominal spiracle.
 F. *Nosodendron unicolor* Say : Right mandible. Oblique view.
 G. " " : Right mandible. Dorsal view.
 H. " " : Anterior part of head with buccal roof removed. Dorsal view.
 I. " " : Epipharynx and ventral surface of mandible.
 J. " " : Cross-section of base of mandible.
 K. " " : Glossa, maxillula, and hypopharynx. Dorsal view.
 L. " " : Inside of the integument of parts shown on figure K.
 M. " " : Glossa, maxillula, and hypopharynx. Lateral view.
 N. " " : Head, prothorax, and mesothorax. Ventral view.
 O. " " : Right maxilla. Ventral view.
 P. " " : Larva; notice position of mesothoracic spiracle. Dorsal view.



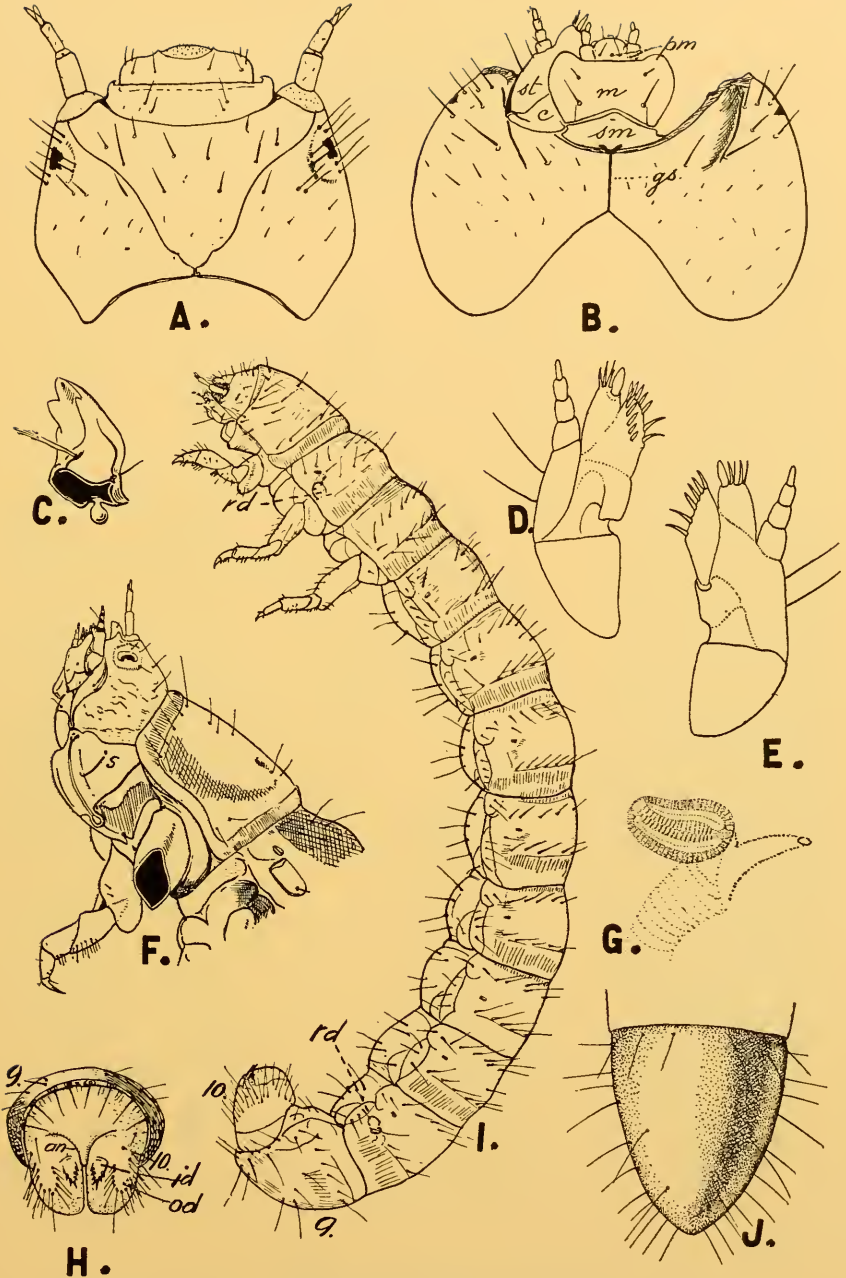
N. californicum

Nosodendron unicolor

PLATE 67

Ptilodaetylidae

- A. *Ptilodaetyla serricollis* Say: Head. Dorsal view.
 B. " " : Head. Ventral view.
 C. " " : Right mandible. Dorsal view.
 D. " " : Right maxilla. Dorsal view.
 E. " " : Right maxilla. Ventral view.
 F. " " : Anterior part of larva; j.s, dis-
 tended jugular skin; note retra-
 ctile diverticle. Lateral view.
 G. " " : Spiracle.
 H. " " : Tenth abdominal segment; an,
 anus; id, spinose inner diver-
 ticle; od, hairy outer diverticle.
 Dorsal view.
 I. " " : Larva; rd, retractile diverticle.
 Lateral view.
 J. " " : Ninth abdominal segment. Dorsal
 view.

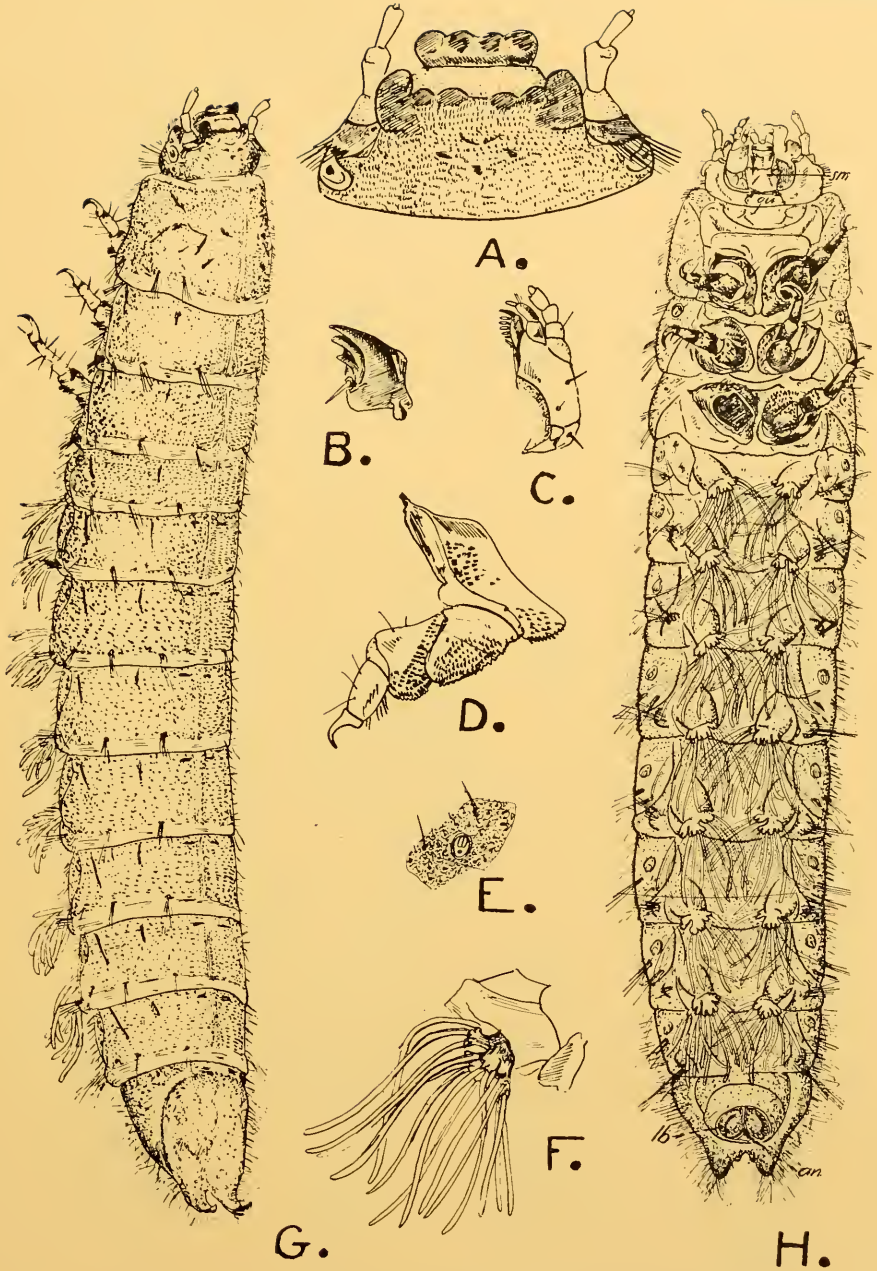


Ptilodactyla

PLATE 68

Ptilodactylidae

- A. Ptilodactylid larva from Asia.
 (Hang Chow): Anterior part of head. Dorsal
 view.
- B. " " : Left mandible. Ventral view.
- C. " " : Left maxilla. Ventral view.
- D. " " : Leg.
- E. " " : Spiracle.
- F. " " : Tassel of gill-threads.
- G. " " : Larva. Dorso-lateral view.
- H. " " : Larva; notice large submen-
 tum, distinct gular area and
 longitudinally grooved anal
 lobes without spiny diver-
 ticles or gills; an, anus; lb,
 lobe.



Asiatic Ptilodactylid Larva

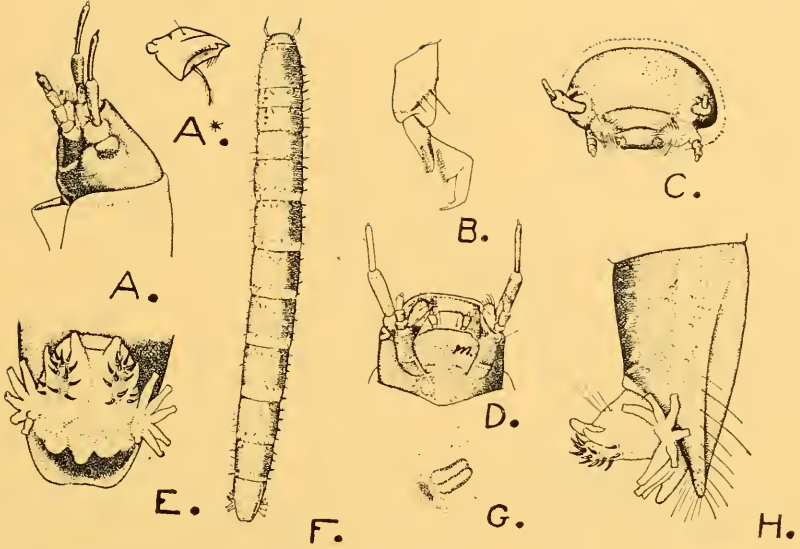
PLATE 69

Ptilodactylidae

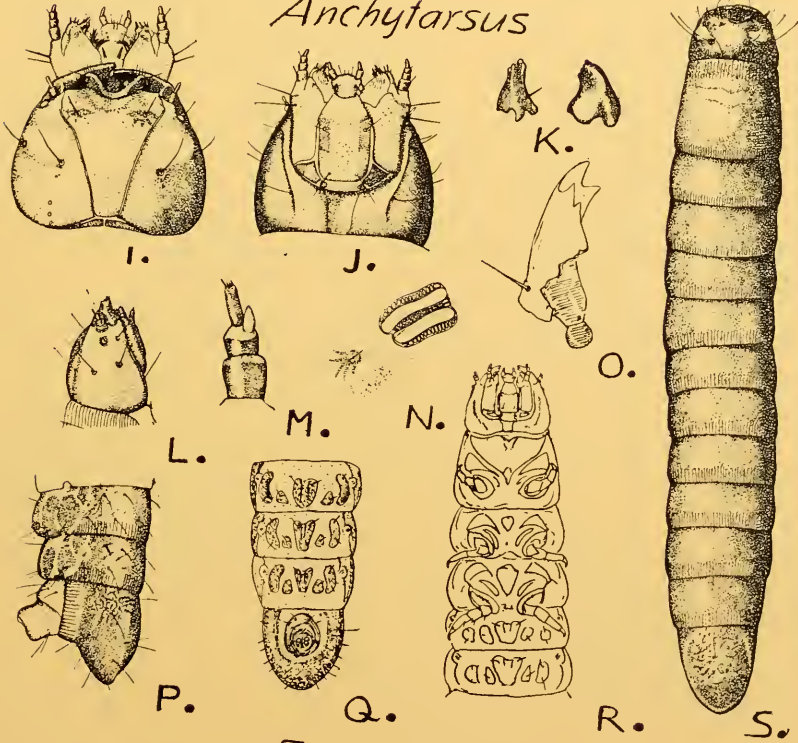
Eurypogonidae

(All the figures drawn by J. A. Hyslop, except figures
A*, O, Q and R)

- | | | | |
|-----|----------------------------|---------|---|
| A. | <i>Anchytarsus bicolor</i> | Melsh.: | Head. Lateral view. |
| A.* | “ | “ | : Right mandible; notice hairs
along the sides but not at the
base, and the presence of a
lacinia mandibulae; compare
<i>Byrrhidae</i> figured on plate 61. |
| B. | “ | “ | : Legs. |
| C. | “ | “ | : Head. Front view. |
| D. | “ | “ | : Head. Ventral view. |
| E. | “ | “ | : End of abdomen. Ventral view. |
| F. | “ | “ | : Larva. Dorsal view. |
| G. | “ | “ | : Spiracle. |
| H. | “ | “ | : End of abdomen. Lateral view. |
| I. | <i>Eurypogon niger</i> | Melsh.: | : Head; notice free labrum, no
nasale as in <i>Elateridae</i> . Dorsal
view. |
| J. | “ | “ | : Head. Ventral view. |
| K. | “ | “ | : Mandibles; worn apically. |
| L. | “ | “ | : Head. Lateral view. |
| M. | “ | “ | : Antenna. |
| N. | “ | “ | : Spiracle. |
| O. | “ | “ | : Tip of mandible; not worn. |
| P. | “ | “ | : End of abdomen. Lateral view. |
| Q. | “ | “ | : End of abdomen. Ventral view. |
| R. | “ | “ | : Larva. Dorsal view. |



Anchytarsus



Eurypogon

LARVAL FORMS OF COLEOPTERA

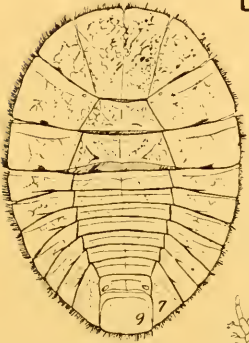
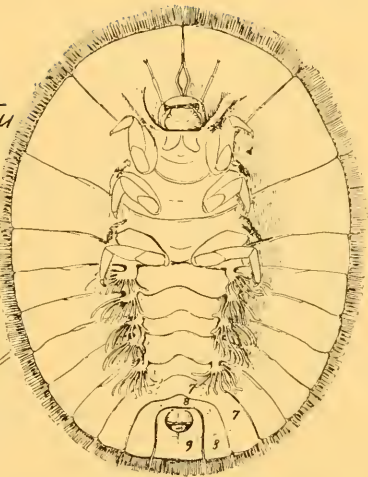
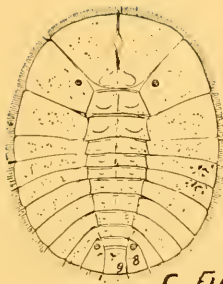
PLATE 70

Psephenidae-Eubryanacinae

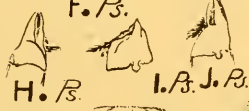
Psephenidae-Psepheninae

Dryopidae-Pelonominae (Q-V)

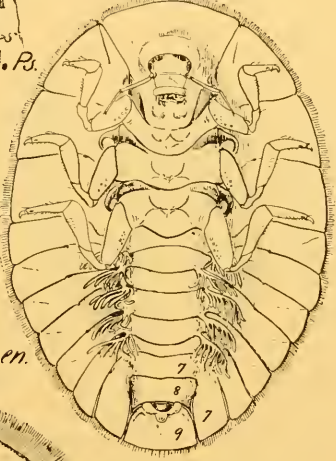
- | | | | | | |
|----|----------------------------|-------|---|--|----------------------|
| A. | <i>Eubrianax edwardsi</i> | Lec. | : | Left mandible. | Dorsal view. |
| B. | “ | “ | : | Left mandible. | Ventral view. |
| C. | “ | “ | : | Larva. | Dorsal view. |
| D. | “ | “ | : | Right maxilla. | Ventral view. |
| E. | “ | “ | : | Part of head. | Ventral view. |
| F. | <i>Psephenus lecontei</i> | Lec. | : | Head. | Dorsal view. |
| G. | <i>Eubrianax edwardsi</i> | | : | Larva. | Ventral view. |
| H. | <i>Psephenus lecontei</i> | | : | Left mandible, pointed type. | Oblique dorsal view. |
| I. | “ | “ | : | Left mandible, truncate type. | |
| J. | “ | “ | : | Left mandible, pointed type. | |
| K. | “ | “ | : | Larva. | Dorsal view. |
| L. | “ | “ | : | Right maxilla. | Ventral view. |
| M. | “ | “ | : | Epipharynx; o, eye from inside. | |
| N. | “ | “ | : | Head. | Ventral view. |
| O. | “ | “ | : | Maxilla and bottom of mouth cavity. | |
| P. | “ | “ | : | Larva. | Ventral view. |
| Q. | <i>Psephenoides gahani</i> | Champ | : | Head and prothorax. | |
| R. | “ | “ | : | Distal end of leg. | |
| S. | “ | “ | : | Larva. | Dorsal view. |
| T. | “ | “ | : | Sucking disks from underside of body; a, in face view; b, in lateral view. | |
| U. | “ | “ | : | Mandible, exterior face, and right antenna; D, dome-shaped tactile papilla; s, supplementary appendix; 1, 2, 3, the three antennal joints. | |
| V. | “ | “ | : | Posterior part of body. | Ventral view. |



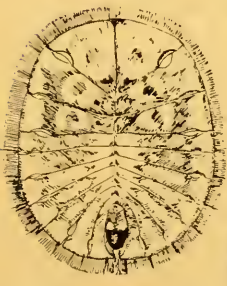
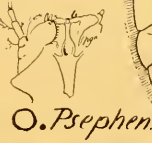
G. Eubrianax



K. Psephenus



N. Psephenus



P. Psephenus



Q. Psephenoi



R.

S. Psephenoides

T. Psephenoides U. Psephenoi

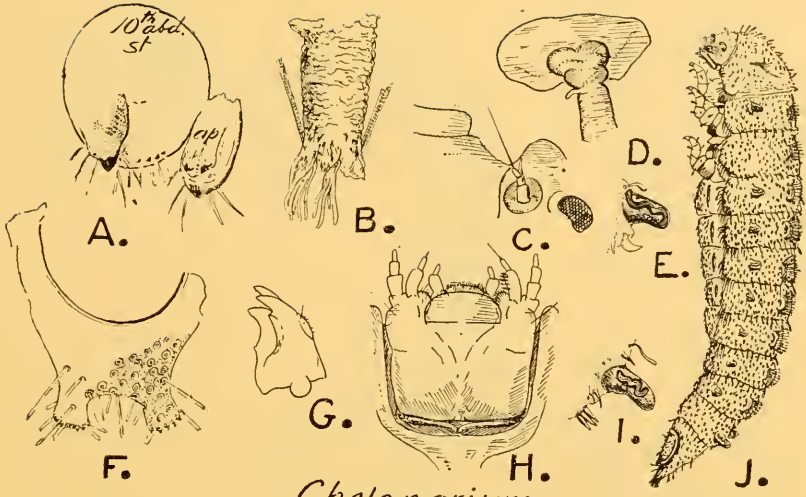
V.

PLATE 71

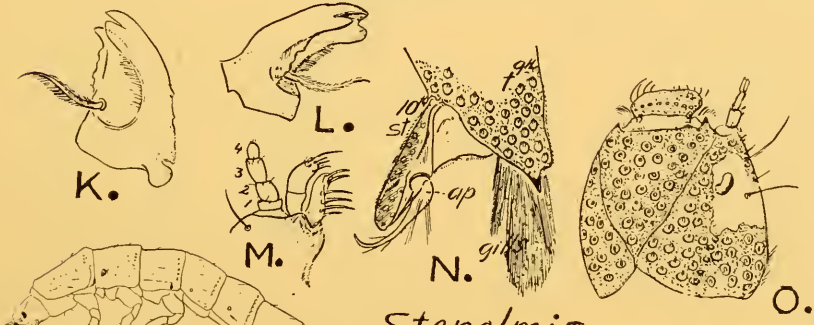
Chelonariidae

Dryopidae-Helminae (K-Z)

- | | | | |
|----|--------------------|--|--|
| A. | <i>Chelonarium</i> | sp. | : Operculum (= 10th abdominal sternum) with appendices; ap, right appendix dissected loose and turned over. Dorsal view. |
| B. | " | " | : Rectum and retractile gills. |
| C. | " | " | : Anterior part of head. |
| D. | " | " | : Spiracular trachea and spiracle. From within the body. |
| E. | " | " | : Spiracle of mesothorax. |
| F. | " | " | : End of ninth abd. segment. |
| G. | " | " | : Left mandible. Ventral view. |
| H. | " | " | : Ventral mouthparts. |
| I. | " | " | : Spiracle of eighth abdominal segment. |
| J. | " | " | : Larva. Lateral view. |
| K. | <i>Stenelmis</i> | <i>crenata</i> Say | : Left mandible. Ventral view. |
| L. | " | " | : Left mandible. Dorsal view. |
| M. | " | " | : Maxilla. |
| N. | " | " | : End of body. Sideview. |
| O. | " | " | : Head. Dorso-lateral view. |
| P. | <i>Ancyronyx</i> | <i>variegatus</i> Germar. | |
| | | (Determined by elimination and locality, not reared) | : Larva. Lateral view. |
| Q. | " | " | : Spiracle of mesothorax and of the first abdominal segment. |
| R. | " | " | : Head. Lateral view. |
| S. | " | " | : Leg. |
| T. | <i>Helmis</i> | <i>pusilla</i> Lec. | : Larva. Dorsal view. |
| U. | <i>Helmis</i> | <i>aeneus</i> Müller | : Larva. Dorsal view. |
| V. | <i>Dryops</i> | <i>auriculatus</i> Geoffr. | |
| | | (Denmark) | : Larva. Lateral view. |
| W. | " | " | : Leg. |
| X. | " | " | : Antenna. |
| Y. | " | " | : Maxilla. |
| Z. | " | " | : Inner face of left mandible. |



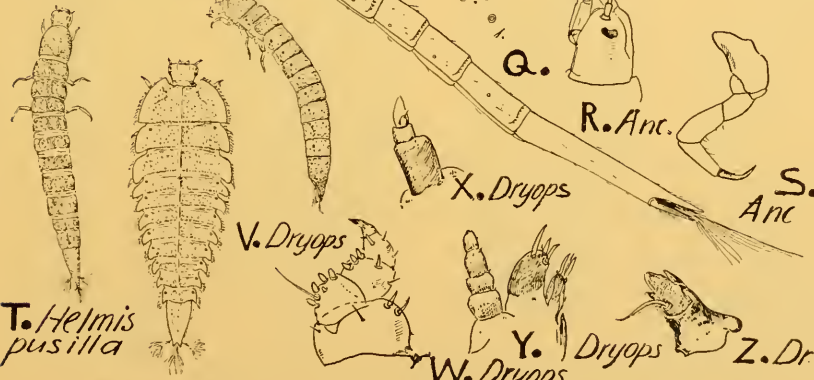
Chelonarium



Stenelmis



P. Ancyronyx



T. Helmis pusilla

U. Helmis aeneus

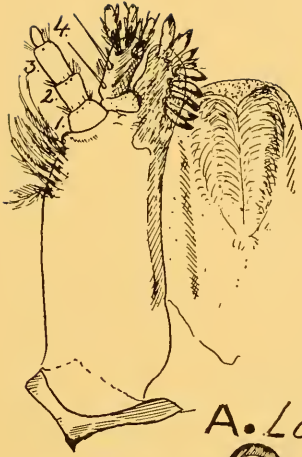
Dryops auriculatus

PLATE 72

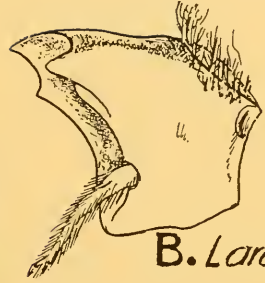
Dryopidae-Larinae

Dryopidae-Pelonominac

- | | | | | | |
|-----|---------------------------|-------|----------|--|---------------|
| A. | <i>Lara avara</i> | Lee. | : | Left maxilla. | Dorsal view. |
| B. | " | " | : | Right mandible. | Dorsal view. |
| C. | " | " | : | Spiracle. | |
| D. | " | " | : | Larva. | Lateral view. |
| E. | " | " | : | End of body; ap. appendix
from operculum; st. opercu-
lum. | Lateral view. |
| F. | " | " | : | Operculum with appendices. | Ventral view. |
| G. | " | " | : | Three tassels of gills, and the
appendices. | Inner view. |
| H. | " | " | : | Larva. | Dorsal view. |
| I. | " | " | : | Larva. | Ventral view. |
| J. | <i>Pelonomus palpalis</i> | Schw. | : | Larva. | Dorsal view. |
| | | | (Panama) | Maxilla. | Dorsal view. |
| J.* | " | " | : | Larva. | Ventral view. |
| K. | " | " | : | Mandible. | |
| K.* | " | " | : | | |



A. Lara



B. Lara



C.



10th st.

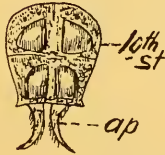
gills

ap

E. La.



D. Lara



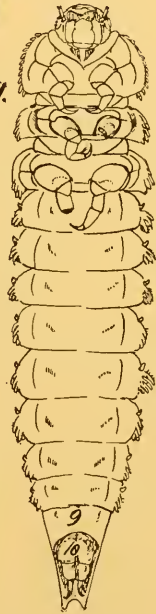
10th st

gills

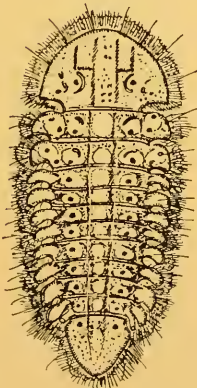
ap

F. Lara

G. Lara



H. Lara

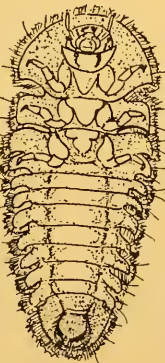


I. Lara



J*

J. Pelonomus



K. Pelonomus



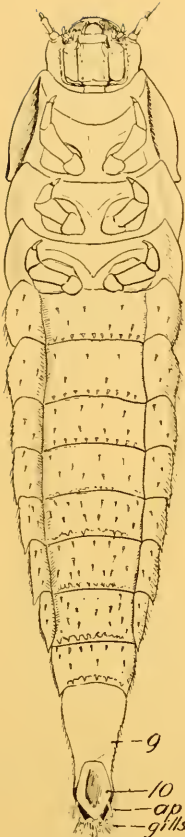
K*

PLATE 73

Dryopidae-Helminae (A-E),

Dryopidae-Pelonominae (F-O)

- A. *Limnius troglodytes* Gyll.
(Denmark) : Anterior part of head. Dorsal view.
- B. " " : Right mandible, old and worn apically. Dorsal view.
- C. " " : Ends of right maxilla and labium.
- D. " " : Left mandible. Ventral view.
- E. " " : Larva. Lateral view.
- F. *Helichus* sp. : Larva. Dorsal view.
- G. " " : Larva. Lateral view.
- H. " " : Left mandible. Ventral view.
- I. " " : Head. Dorsal view.
- J. " " : Parts of lacinia and galea. Dorsal view.
- K. " " : Leg.
- L. " " : Head. Ventral view.
- M. " " : End of abdomen with ninth abdominal segment and operculum removed. Ventral view.
- N. " " : Same as figure M. but with ninth abdominal tergite present. Ventral view.
- O. " " : End of abdomen. Ventral view.



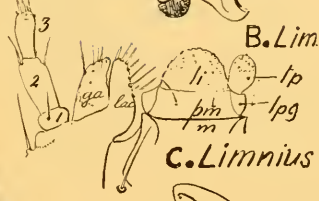
E. *Limnius*



A. *Limn.*



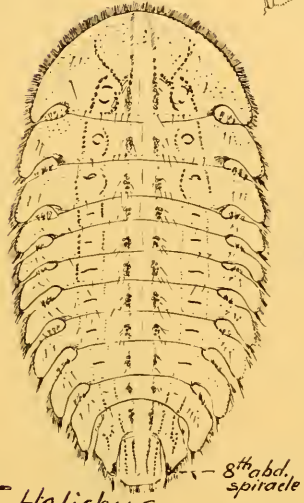
B. *Lim.*



C. *Limnius*



D. *Lim.*



F. *Helichus*



G. *Helich.*



H. *Hel.*



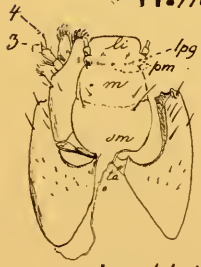
I. *Helich.*



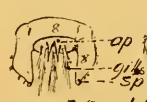
J. *Heli.*



K. *Helich.*



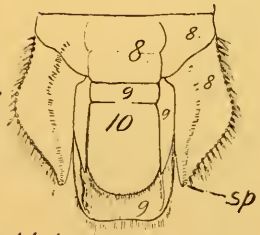
L. *Helichus*



M. *Heli.*



N. *Heli.*



O. *Helichus*

PLATE 74

Brachypsectridae, Drilidae,

Lampyridae (O-V), Phengodidae

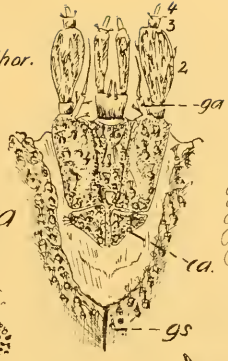
- A. *Brachypsectra fulva* Lec. : Fringes of mesothorax and metathorax. Dorsal view.
 B. " " : Leg and part of lateral fringe.
 C. " " : Larva. Dorsal view.
 D. " " : Fringes of first and second abd. segments. Dorsal view.
 E. " " : Spiracle and two glandular spots.
 F. " " : Ventral mouthparts.
 G. *Drilus concolor* Ahr., first larval instar (Denmark) : Mandible. Dorsal view.
 H. " " : Tarsungulus and appendix.
 I. *Silasia (unicolor* Guér. (?) (Gold Coast) : Tarsungulus (adhesive appendix probably lost by accident in specimen drawn).
 J. " " : Mouthparts. Lateral view.
 K. *Silasia (unicolor* (?) : Mouthparts. Dorsal view.
 L. *Drilus concolor* : Mesothoracic spiracle.
 M. *Silasia (unicolor* (?) : Mouthparts. Ventral view.
 N. *Drilus concolor* : Ventral mouthparts; mb. c. membranous cardo.
 O. *Lampyris noctiluca* L. (Denmark) : Larva. Lateral view.
 O.* " " : Anal appendices with rings of minute hooks.
 P. " " : Larva. Dorsal view.
 P.* " " : Luminous organs on ventral side of eighth abd. segment.
 Q. *Photinus pyralis* L. : Left mandible; r. retinaculum.
 R. " " : Head; fs, frontal suture.
 S. *Photuris pennsylvanica* DeG. : Head. Dorsal view.
 T. " " : Head. Ventral view.
 U. " " : Right mandible. Dorsal view.
 V. " " : Left mandible.
 W. *Phengodes laticollis* Lec. : End of larva. Lateral view.
 X. " " : Larva. Dorsal view.



A. *Brachysectra*



mesothor. -sp



ga

ra

gs



B. Br.



abd. -sp

sp

gla

C. *Brach*

D. *Brach.*

E. F. *Brach.*



I. *Sila.*



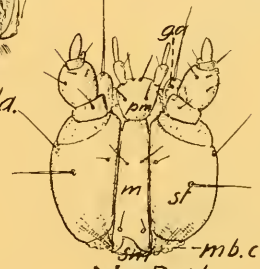
sm



K. *Sila.*



J. *Sila.*



N. *Drilus.*



G. *Dril.*

H. *Dril.*



L. *Dril.*

M. *Silasias*



O. *Lampyris*



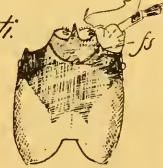
P. *Lampyris*

Q. *Photi.*

lumin. org



P. *Lp.*



R. *Photinus*



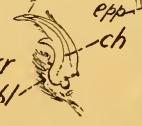
S. *Photuris*



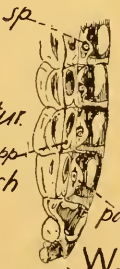
T. *Photuris*



U. *Photur.*



V. *Photur.*



W. *Phengodes*



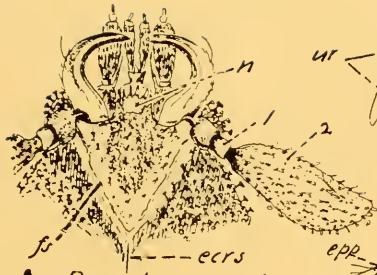
X.

PLATE 75

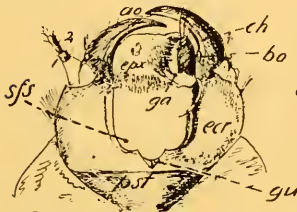
Brachypsectridae, Drilidae.

Lampyridae, Phengodidae

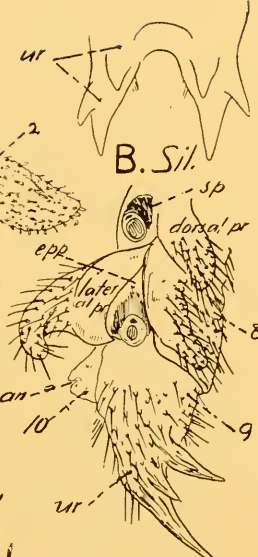
- A. *Brachypsectra fulva* Lec. : Head; eers, epicranial suture; fs, frontal suture.
- B. *Silasia* (unicolor Guér. (?))
(*Aburia*,
Gold Coast) : Urogomphi. Dorsal view.
- C. " " : Head and presternum; ao, apical opening of the mandibular canal; bo, basal opening of the canal; ch, mandibular canal; epx, epipharynx; ga, galea with rudiment of lacinia at base; gu, gular plate; sfs, subfacial sinus.
- D. " " : End of abdomen; an, anus; dorsal pr, dorsal spinose process; epp, epipleural plate; lateral pr, lateral spinose process; ur, urogomphus. Lateral view.
- E. *Drilus concolor* Ahr., first larval instar (Denmark) : Larva. Dorsal view.
- F. *Photuris pennsylvanica* DeG. : Larva. Dorsal view.
- G. " " : Larva; epp, epipleural plate.
- H. *Photinus pyralis* L. : Larva. Dorsal view.
- I. *Phengodes laticollis* Lec. : Head; hx, hypopharyngeal elements; n, nasale. Dorsal view.
- J. " " : Head; sd, sensory disk. Ventral view.
- K. " " : Distal end of leg.



A. *Brachypsectra*

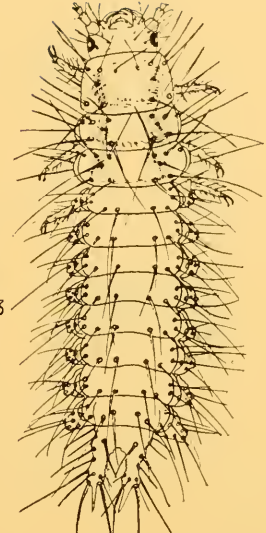


C. *Silasia*



B. *Sil.*

D. *Silasia*



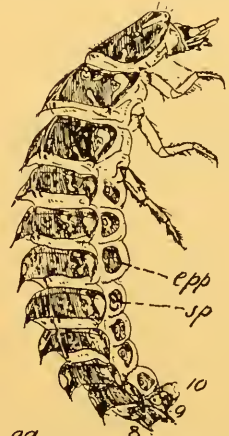
E. *Drilus*



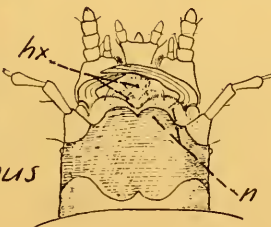
H. *Photinus*



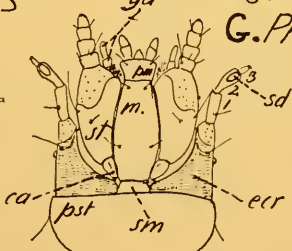
F. *Photuris*



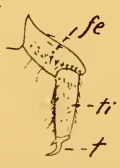
G. *Photuris*



I. *Phengodes*



J. *Phengodes*



K. *Phen.*

PLATE 76

Lycidae

- | | | | |
|----|----------------------------------|---|--|
| A. | <i>Eros humeralis</i> F. | : | Ventral mouthparts. Ventral view. |
| B. | “ “ | : | Right mandible showing separation into two portions. Ventral view. |
| C. | <i>Calopteron reticulatum</i> F. | : | Head. Ventral view. |
| D. | “ “ | : | Head. Dorsal view. |
| E. | “ “ | : | Diagrammatic illustration showing position of trophi. |
| F. | “ “ | : | Details of mandible. Dorsal view. |
| G. | “ “ | : | Thoracic segments. Ventral view. |
| H. | <i>Caeniella dimidiata</i> F. | : | Larva. Dorsal view. |
| I. | <i>Calopteron reticulatum</i> | : | Abdominal spiracle in parascutal area above epipleural plate. |
| J. | “ “ | : | Leg. |
| K. | “ “ | : | Larva. Lateral view. |

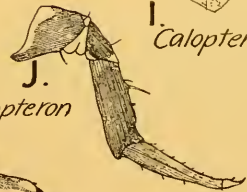
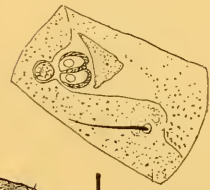
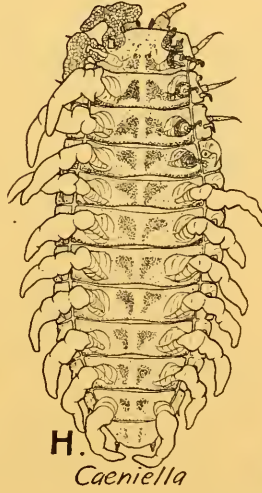
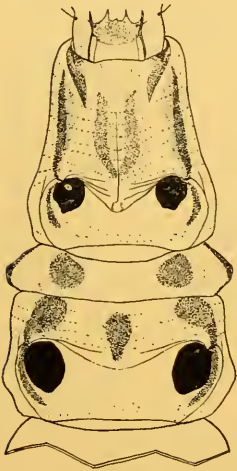
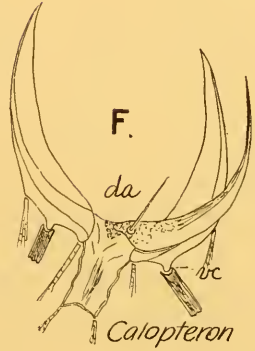
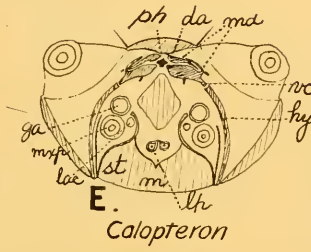
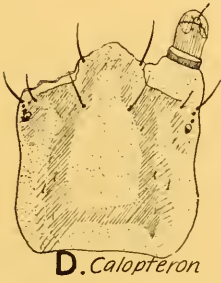
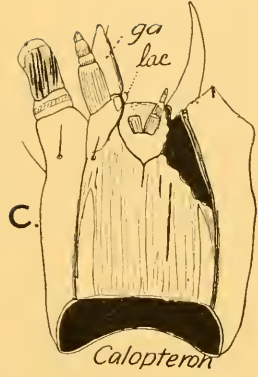
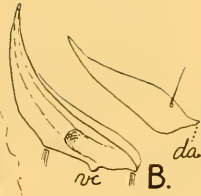
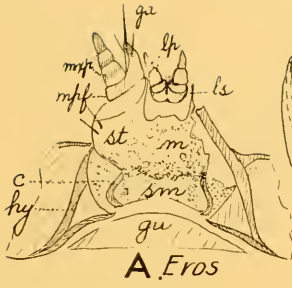
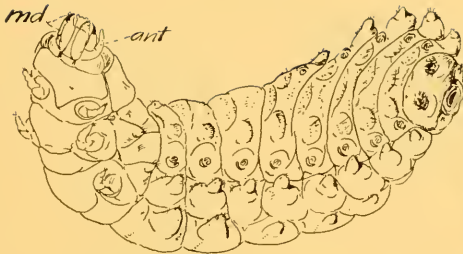


PLATE 77

Drilidae, Cantharidae-Malthinae,

Cantharidae-Malthodinae, Cantharidae-Cantharinae

- A. *Drilus concolor* Ahr. (Denmark): Last larval instar; mandible membranous, except tip. Larva twisted, fitting inside of snail-shell of *Helix*.
- B. *Malthinus flaveolus* Payk. (Germany): Left mandible. Ventral view.
- C. " " : Tibia and tarsungulus.
- D. " " : Epipharynx and half part of hypopharyngeal sclerome.
- E. " " : Larva. Dorsal view.
- F. " " : Ventral mouthparts. Dorsal view left; ventral view right.
- G. " " : Part of head; do, distal opening of mandibular canal; po, proximal opening.
- H. *Silis nitidula* F. (Europe) : Mandible. ls, longitudinal series of hairs. Ventral view.
- I. *Malthodes marginatus* Latr. (Denmark): Part of head. Ventral view.
- J. *Cantharis* sp. : Mandible and antenna.
- K. *Malthodes marginatus* : Larva. Dorsal view.
- L. " " : Ventral mouthparts. Ventral view.
- M. *Cantharis* sp. : Outline of head. Dorsal view.
- N. " " : Ventral mouthparts.
- O. *Rhagonycha fulva* Scop. (Denmark): Dorsal gland.
- P. " " : Metathorax and two abdominal segments. Dorsal view.
- Q. " " : First abdominal spiracle.
- R. *Podabrus tomentosus* Say : Mandible and antenna.
- S. " " : Mandible. Dorsal view.
- T. " " : Mandible. Buccal view.
- U. " " : Outline of head. Dorsal view.



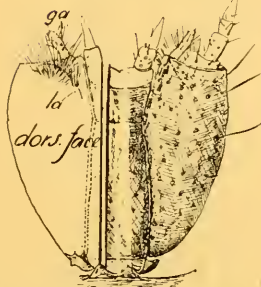
A. *Drilus*



B. *Malthinus*



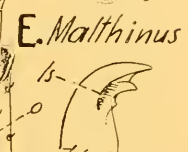
C.



F. *Malthinus*



D. *Malthin.*



E. *Malthinus*



G. *Malthinus*



H. *Silis*



L. *Malthodes*



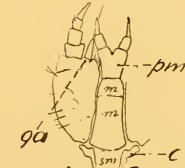
K. *Malthodes*



M. *Cantharis*



J. *Canth.*



N. *Canth.*



P. *Rhagonycha*



Q. *Rh.*



R.



S.



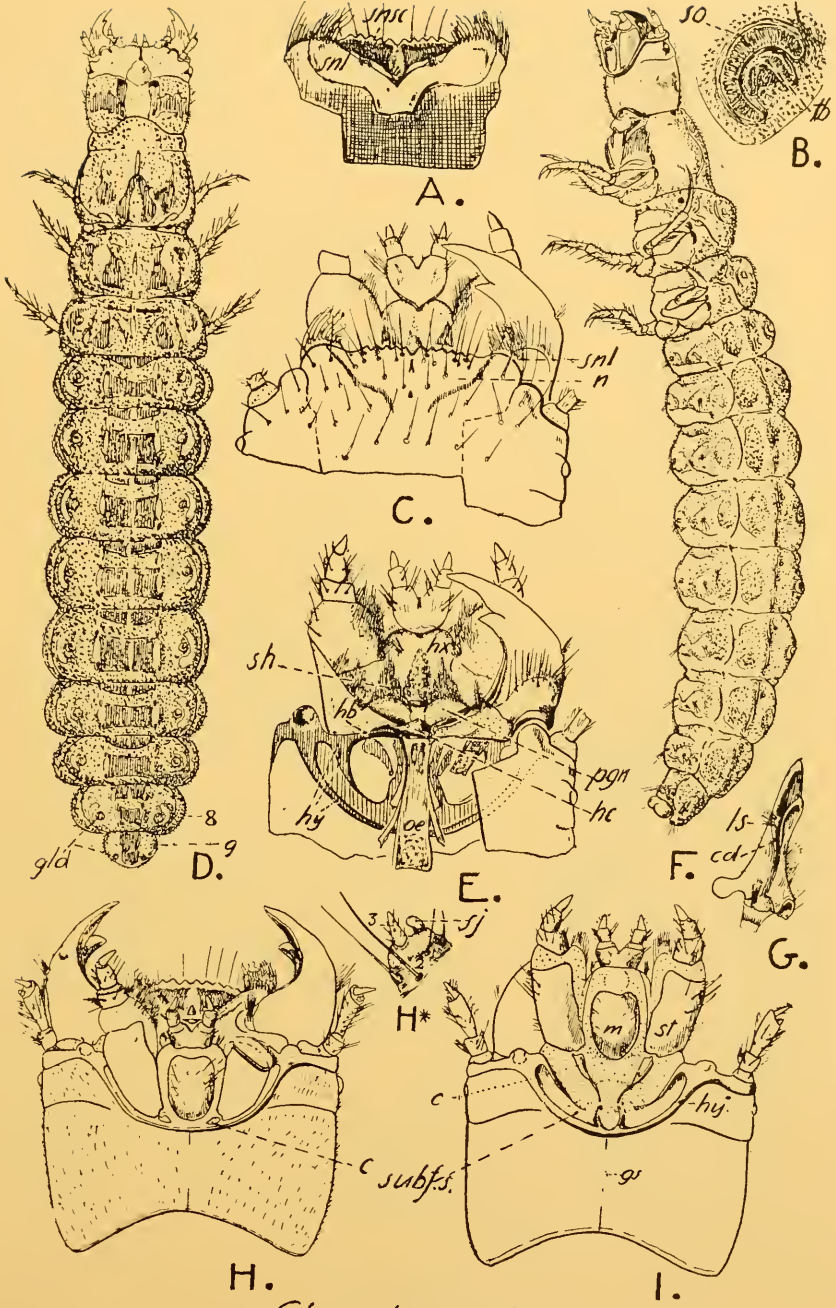
U.

T. *Podabrus*

PLATE 78

Cantharidae-Chauliognathinae

- A. *Chauliognathus scutellaris* Lec.: Subnasal region (uncertain whether labrum or epipharynx); snl, subnasal lobe; snsc, subnasal sclerite.
- B. “ “ : Mesothoracic spiracle; so, spiracular opening furnished with marginal hairs; tb, possibly the reduced airtubes.
- C. “ “ : Anterior part of head; n, nasale; snl, subnasal lobe. Dorsal view.
- D. “ “ : Larva. Dorsal view.
- E. “ “ : Head opened; hx, hypopharyngeal middle area with dark median triangular spot; hy, hypostome; sh, straining hairs from maxillulae. Dorsal view.
- F. “ “ : Larva. Ventro-lateral view.
- G. “ “ : Mandible; ed, main conduit for juice; ls, lateral series of fine hairs. Buccal view.
- H. “ “ : Underside of head; ventral mouthparts drawn back.
- II.* “ “ : Tip of antenna.
- I. “ “ : Underside of head; ventral mouthparts drawn forth; subf. s, subfacial sinus.

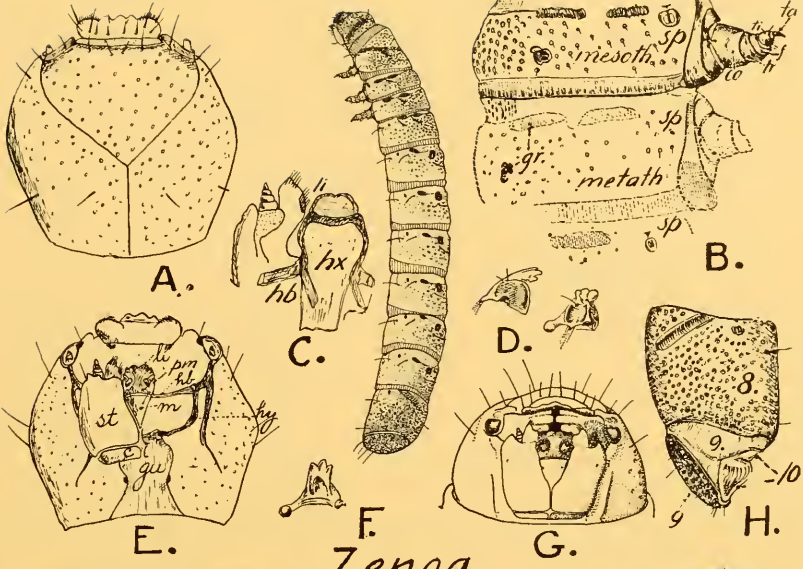


Chauliognathus

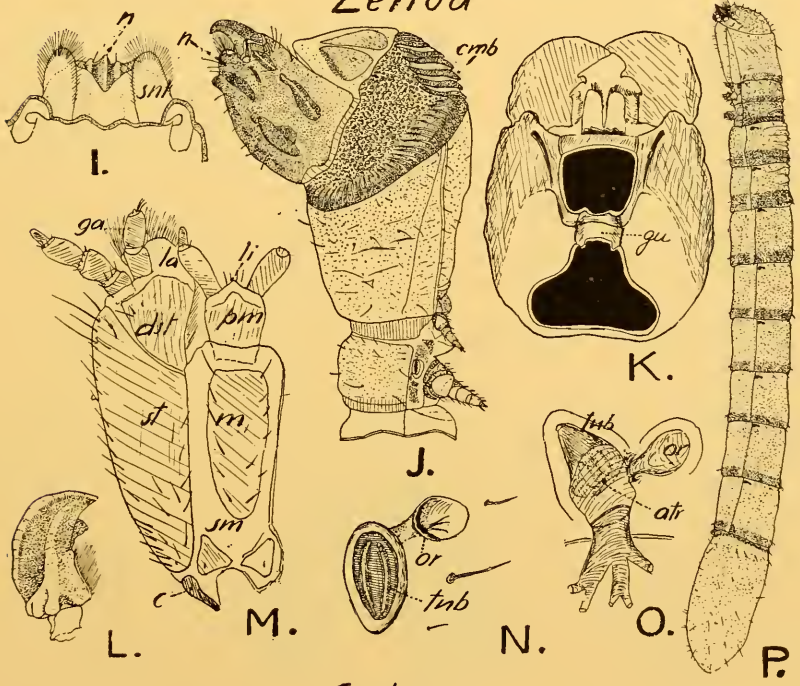
PLATE 79

Rhipiceridae, Cebriionidae

- | | | | | |
|----|--------------------------|--------|---|--|
| A. | <i>Zenoa picea</i> | Beauv. | : | Head. Dorsal view. |
| B. | “ | “ | : | Mesothorax, metathorax, and part of first abdominal segment; gr, groove. Lateral view. |
| C. | “ | “ | : | Ligula, hypopharynx and part of maxilla. Dorsal view. |
| D. | “ | “ | : | Left mandibles. Lateral view and exterior view. |
| E. | “ | “ | : | Head. Ventral view. |
| F. | “ | “ | : | Right mandible. Buccal view. |
| G. | “ | “ | : | Head. Ventro-frontal view. |
| H. | “ | “ | : | End of abdomen. Lateral view. |
| I. | <i>Cebrio antennatus</i> | Schfr. | : | Nasal region; sul, subnasal lobe. Ventral view. |
| J. | “ | “ | : | Head, prothorax, and mesothorax; cmb, cervical membrane expanded. Lateral view. |
| K. | “ | “ | : | Head. Ventral view. |
| L. | “ | “ | : | Right mandible. Ventral view. |
| M. | “ | “ | : | Maxilla and labial parts; dst, dististipes. Ventral view. |
| N. | “ | “ | : | Abdominal spiracle; or, spiracular opening; tub, airtubes. Exterior view. |
| O. | “ | “ | : | Abdominal spiracle; atr, atrium; or, opening; tub, airtube. Interior view. |
| P. | “ | “ | : | Larva. Lateral view. |



Zenoa



Cebrio

PLATE 80

Buprestidae-Pachyschelinae (A–D)

Buprestidae-Agrilinae (E),

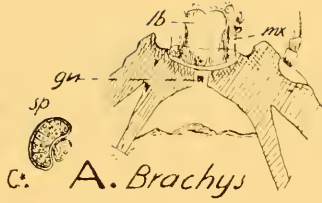
Buprestidae-Buprestinae (F–K)

- | | | |
|-----|---------------------------------------|---|
| A. | <i>Brachys ovatus</i> Web. | : Head; gu, gular plate; lb, undifferentiated labium; mx, maxilla. Ventral view. |
| B. | “ “ | : Head; oe, ocelli. Dorsal view. |
| C. | “ “ | : Larva. Dorsal view. |
| C.* | “ “ | : Spiracle enlarged. |
| D. | “ “ | : Dorsal side of head. Ventral view. |
| E. | <i>Agrilus politus</i> Say | : Larva. Dorsal view. |
| E.* | <i>Euchroma columbicum</i> Maumerh. | : Head, prothorax and anterior part of mesothorax; chor, chordotonal organ; sp, spiracle. (Figure copied from Schiödte).* |
| F. | <i>Chrysobothris octocola</i> Lee. | : Head and thorax. Ventral view. |
| G. | <i>Chrysobothris</i> sp. | : Abdominal spiracle. |
| H. | <i>Chalcophora virginiensis</i> Drury | : Right mandible. Ventral view. |
| I. | <i>Chrysobothris octocola</i> | : Larva. Dorsal view. |
| J. | <i>Chalcophora virginiensis</i> | : Head. Ventral view. |
| K. | “ “ | : Hypopharynx and maxilla. Buccal view. |

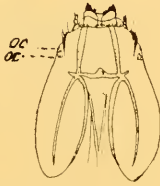
* Schiödte, J. C., De metamorphosi Eleutheratorum observationes; Naturhistorisk Tidsskrift, ser. III, vol. 6, 1869, p. 336, pl. I, fig. 4. (Schiödte is the first entomologist who has discovered and described the chordotonal organs in coleopterous larvae. He named them (l. c) “foveae auditoriae”).



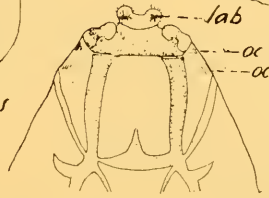
C. *Brachys*



A. *Brachys*



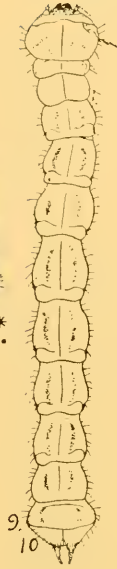
B. *Brachys*



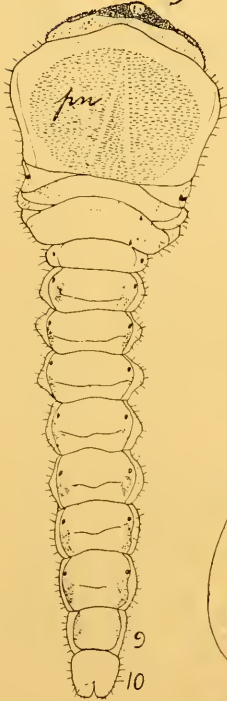
D. *Brachys*



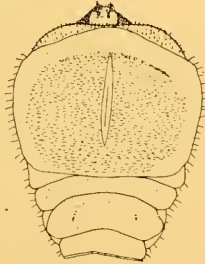
E.*



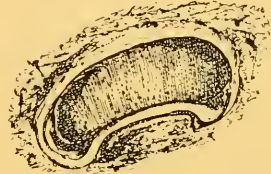
E. *Agrilus*



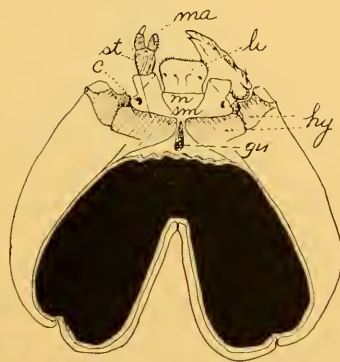
I. *Chrysobothris*



F. *Chrysobothris*



G. *Chrysobothris*



J. *Chalcophora*



H. *Chalcophora*

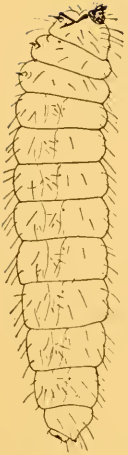


K. *Chalcophora*

PLATE 81

Throscidae (A-D), *Melasidae* (H-Q)

- A. *Throscus* sp. (possibly *Aulothroscus constrictor* Say) : Head. Dorsal view.
 B. " " : Head. Ventral view.
 C. " " : Larva. Lateral view.
 D. " " : Head and thorax. Ventral view.
 E. Unidentified larva combining characters of *Oestodinae* and *Throscidae*. (In decayed red oak from Bent Creek, Asheville, North Carolina) : Head and prothorax. Dorsal view.
 F. " " : End of abdomen. Lateral view.
 G. " " : Head and prothorax; st, sternellum. Ventral view.
 G.* " " : Right mandible. Ventral view.
 H. *Melasis rufipennis* Horn. : Antenna.
 I. " " : Left mandible. Ventral view.
 J. " " : Left mandible. Dorsal view.
 K. " " : Ventral mouthparts. Ventral view.
 L. " " : Head and thorax. Dorsal view.
 M. " " : Larva. Dorsal view.
 N. " " : Mesothoracic spiracle; duct, ductus from spiracular opening to the atrium of the spiracle; or, spiracular opening; peritr, peritrema; tu, airtube. Exterior view.
 O. " " : Head, prothorax, and mesothorax. Ventral view.
 P. " " : Larva. Lateral view.
 Q. *Palaeoxenus dohrni* Horn. : Larva. Ventral view.



C. *Throsacus*



A. *Throsacus*



B. *Throsacus*



D. *Throsacus*



E.

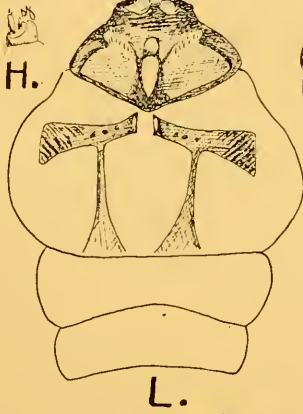


F.



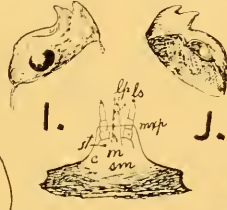
G.

(*Oestodinae?* *Throsacidae?*)



H.

L.

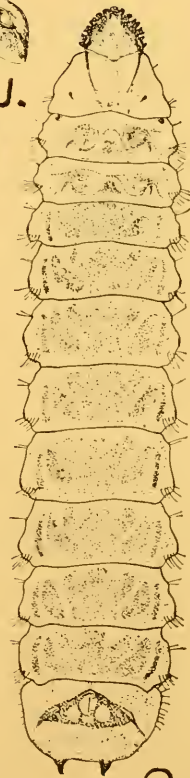


I.

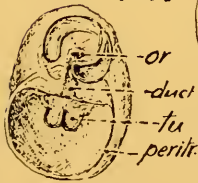


J.

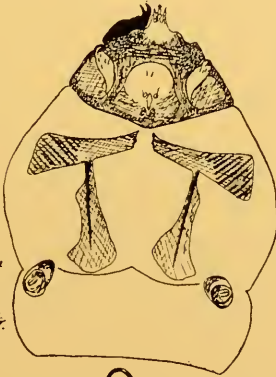
K.



Q. *Palaeoxemus*



N.



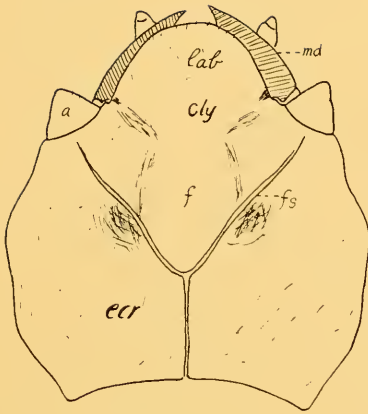
O. *Melasis*

P.

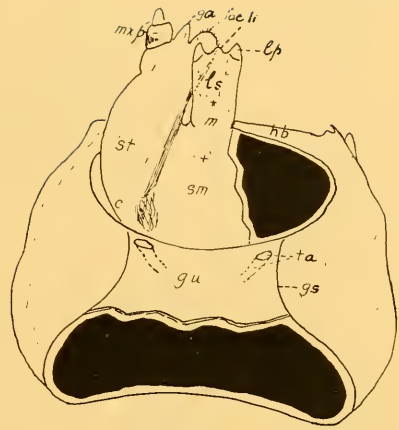
PLATE 82

Sandalidae

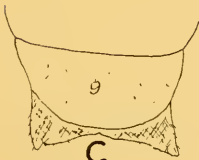
- | | | | | |
|----|----------------|-------|--------------------------------|---------------|
| A. | Sandalus niger | Knoch | : Head. Dorsal view. | |
| B. | “ | “ | : Head. Ventral view. | |
| C. | “ | “ | : Ninth abdominal segment. | Dorsal view. |
| D. | “ | “ | : Larva. Lateral view. | |
| E. | “ | “ | : Left mandible. Ventral view. | |
| F. | “ | “ | : Labrum and hypopharynx. | Lateral view. |
| G. | “ | “ | : Abdominal spiracle. | |
| H. | “ | “ | : Right leg. | |



A.



B.



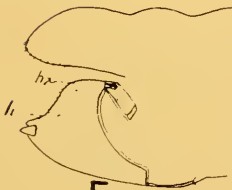
C.



D.



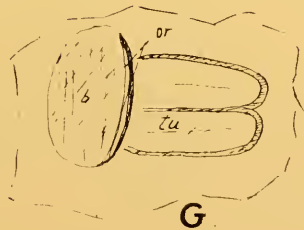
E.



F.



H.



G.

Sandalus

PLATE 83

Elateridae-Cardiophorinae (A-O).

Elateridae-Oestodinae (P-Y)

- A. *Horistonotus uhleri* Horn : Lateral wart; spiracle behind.
 B. " " : Part of head; mn, membranous margin of nasale; sen, sclerotized part. Dorsal view.
 C. " " : Anterior part of head; eph, epipharyngeal structures.
 D. " " : Mesothoracic leg and spiracle.
 E. *Cardiophorus ruficollis* L. (Denmark) : Head; sfs, subfacial sinus.
 F. *Horistonotus uhleri* : Larva. Dorsal view.
 G. " " : Fourth abdominal segment; aiscg, anterior intersegmental membrane; lam, lateral ambulatory papilla; piscg, posterior intersegmental membrane; sg, segment proper; vam, ventral ambulatory papilla. Ventral view.
 H. " " : End of abdomen; ra, retractile appendix. Ventral view.
 I. " " : Right mandible. Exterior view.
 J. " " : Left mandible. Buccal view.
 K. " " : Retractable appendices. Diagram.
 L. " " : End of abdomen.
 M. *Cardiophorus ruficollis* : Labium. Buccal view.
 N. " " : Left mandible. Buccal view.
 O. " " : Right maxilla. Ventral view.
 P. *Oestodes tenuicollis* Rand. : Right mandible. Ventral view.
 Q. " " : Right mandible and antenna.
 R. " " : Frons with nasale. Dorsal view.
 S. *Drapetes (geminatus Say?)* : Head. Dorsal view.
 T. *Oestodes tenuicollis* : Head. Buccal view.
 U. *Oestodes* sp. (Cuba) : Larva. Lateral view.
 V. *Oestodes tenuicollis* : End of abdomen. Lateral view.
 W. " " : Vertical prongs. Dorsal view.
 X. *Drapetes (geminatus?)* : Horizontal prongs. Dorsal view.
 Y. " " : Larva. Dorsal view.



LARVAL FORMS OF COLEOPTERA

PLATE 84 (Drawn by J. A. Hyslop)

Elateridae-Pyrophorinae

- A. *Hemirhipus fascicularis* F. : Head. Lateral view.
 B. " " : Antenna and mandible. Exterior view.
 C. " " : Left mandible. Ventral view.
 D. " " : Head. Ventral view.
 E. " " : Eighth, ninth and tenth abdominal segments; hk, hook on tenth segment.
 F. " " : Seventh abdominal segment. Ventral view.
 G. " " : Larva. Dorsal view.
 H. *Pyrophorus luminosus* Illig. : Mesothoracic spiracle. Lateral view.
 I. " " : Section of spiracle, showing opening, atrium and entrance to airtubes.
 J. " " : Mesothoracic spiracle; diagrammatic. Lateral view.
 K. " " : Spiracle. Exterior view.
 L. " " : Section of airtubes.
 M. " " : Spiracle. View from inside of body.
 N. *Chalcolepidius viridipilis* Say : Ventral mouthparts; cardo concealed. Ventral view.
 O. " " : Frons with nasale.
 P. " " : Left mandible. Dorsal view.
 Q. " " : Head; mandible removed. Lateral view.
 R. " " : Ninth abdominal segment.
 S. " " : Ninth and tenth abdominal segments; asp, asperites on each side of tenth abdominal segment; hk, pair of hooks at the end of tenth abdominal segment.

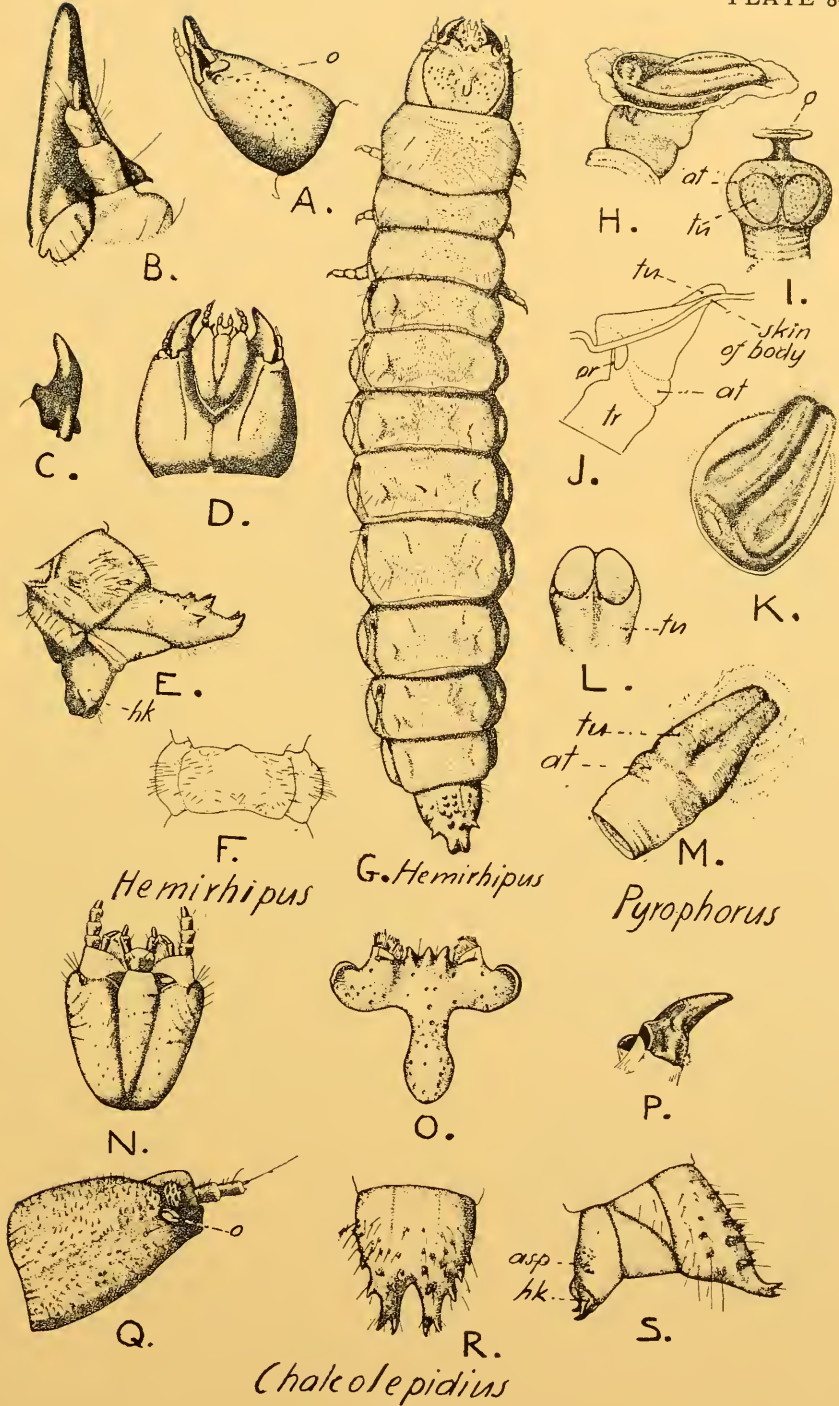
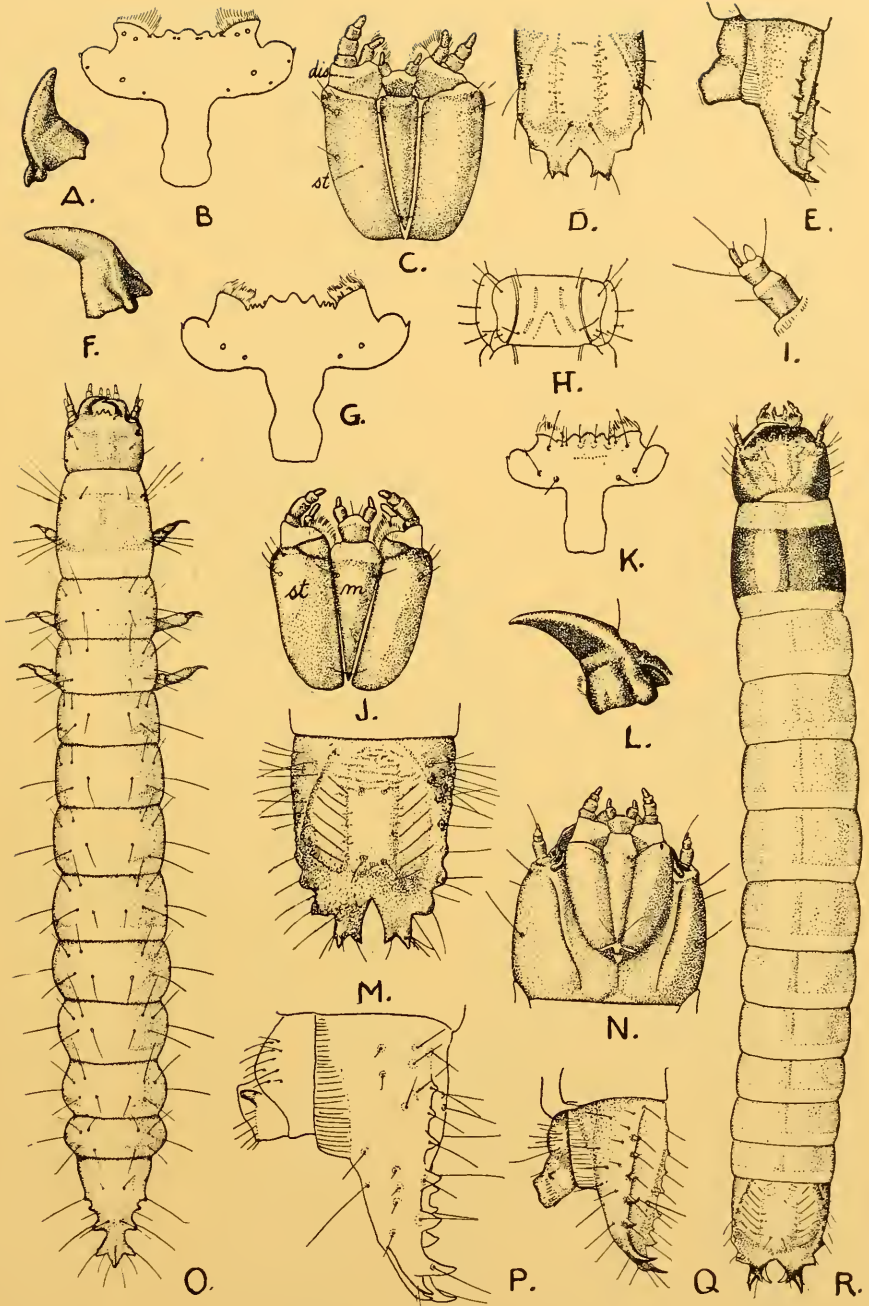


PLATE 85 (Drawn by J. A. Hyslop)

Elateridae-Pyrophorinae

- A. *Monoerepidius auritus* Hbst. : Right mandible. Ventral view.
 B. " " : Frons with nasale.
 C. " " : Ventral mouthparts; cardo concealed. dis, dististipes; st, proxistipes.
 D. " " : Ninth abdominal segment.
 E. " " : Ninth and tenth abdominal segments. Lateral view.
 F. *Monoerepidius lividus* DeG. : Left mandible. Ventral view.
 G. " " : Frons with nasale.
 H. " " : Seventh abdominal segment. Ventral view.
 I. *Monoerepidius vespertinus* F. : Left antenna.
 J. *Monoerepidius lividus* : Ventral mouthparts; cardo concealed; m, triangular mentum. Ventral view.
 K. *Monoerepidius vespertinus* : Frons with nasale.
 L. " " : Left mandible. Ventral view.
 M. *Monoerepidius lividus* : Ninth abdominal segment of last larval instar.
 N. *Monoerepidius vespertinus* : Head. Ventral view.
 O. *Monoerepidius lividus* : First larval instar; notice the form of the ninth abdominal segment. Dorsal view.
 P. " " : Ninth and tenth abdominal segments of last larval instar. Lateral view.
 Q. *Monoerepidius vespertinus* : Ninth and tenth abdominal segments of last larval instar. Lateral view.
 R. " " : Last larval instar.



Monocrepidius

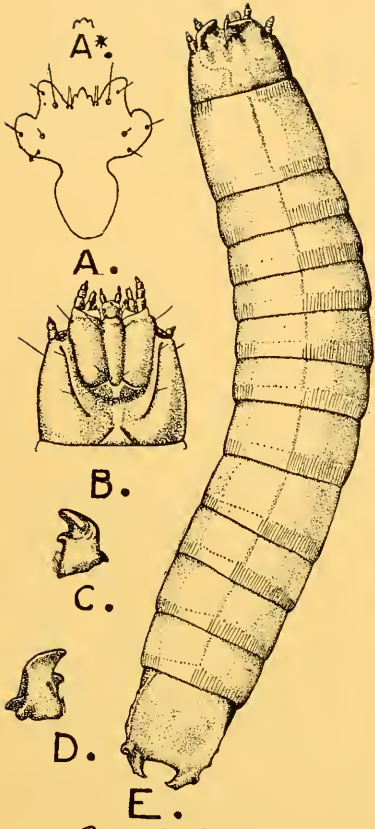
LARVAL FORMS OF COLEOPTERA

PLATE 86 (Drawn by J. A. Hyslop)

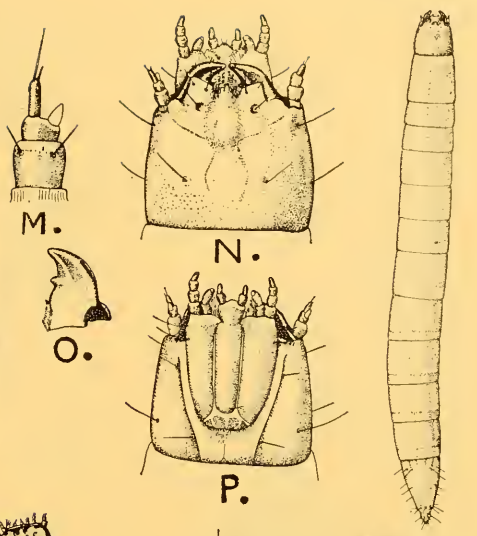
Elateridae-Pyrophorinae (A-E)

Elateridae-Elaterinae (F-U)

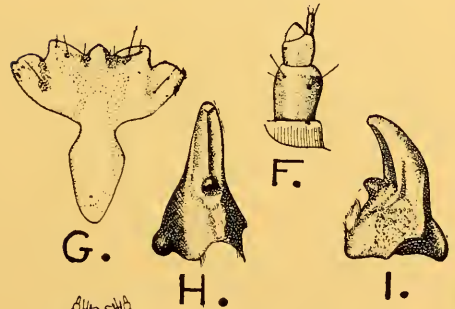
- A. *Cryptohypnus abbreviatus* Say: Frons with nasale.
 A.* “ “ “ : Worn tip of nasale.
 B. “ “ “ : Head. Ventral view.
 C. “ “ “ : Right mandible. Dorsal view.
 D. “ “ “ : Right mandible. Ventral view.
 E. “ “ “ : Larva. Dorsal view.
 F. *Elater rubricollis* Hbst. : Left antenna; notice one tactile papilla.
 G. “ “ “ : Frons with nasale.
 H. “ “ “ : Inner surface of right mandible.
 I. “ “ “ : Right mandible. Dorsal view.
 J. “ “ “ : Head. Ventral view.
 K. “ “ “ : Seventh abdominal segment. Ventral view.
 L. “ “ “ : Larva. Dorsal view.
 M. *Betarmon bigeminatus* Rand. : Right antenna; notice one tactile papilla.
 N. “ “ “ : Head. Dorsal view.
 O. “ “ “ : Right mandible. Dorsal view.
 P. “ “ “ : Head. Ventral view.
 Q. “ “ “ : Larva. Dorsal view.
 R. “ “ “ : Ninth and tenth abdominal segment. Ventral view.
 S. “ “ “ : Seventh abdominal segment. Ventral view.
 T. *Crigmus abruptus* Say : Left antenna; notice six tactile papillae.
 U. *Parallelostethus attenuatus* Say: Right antenna; notice numerous tactile papillae.



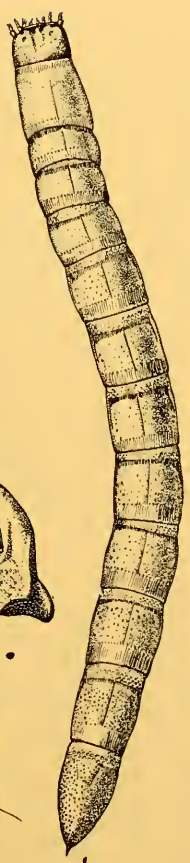
Cryptohypnus



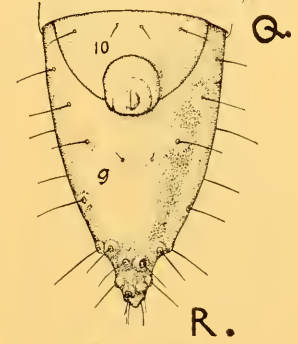
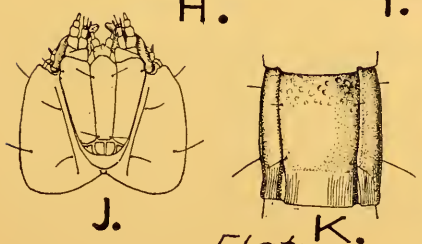
Betarmon



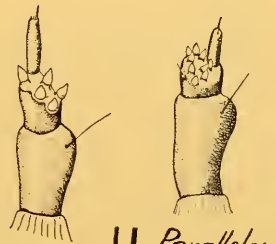
Elater



Elater



Crigmus



Parallelus

LARVAL FORMS OF COLEOPTERA

PLATE 87

Lucanidae-Sinodendrinae, Lucanidae-Aesalinae (K),
Lucanidae-Lucaninae, Passalidae, Trogidae,
Scarabacidae-Rutelinae-Rutilini (U, V),
Scarabacidae-Trichiinae (Y),
Scarabacidae-Valginae, Scarabacidae-Cetoniinae (Z)

- A. *Lucanus* sp. : Outline of head. Dorsal view.
 B. " " : Ventral view.
 C. " " : Section of spiracle on line indicated by arrow fig. D.
 D. " " : Mesothoracic spiracle.
 E. *Passalus cornutus* F. : Meso- and metathoracic legs.
 F. " " : Mouthparts. Dorsal view.
 G. " " : Right mandible. Buccal view.
 H. " " : Head. Ventral view.
 I. *Sinodendron rugosum* Mann. : Mesothoracic leg.
 J. " " : Tenth abd. segment; ap, anal pad; d.al, dorsal anal lobe; v.al, ventral anal lobe.
 K. *Ceruchus piceus* Web. : Tenth abd. segment; ap, anal
 L. *Trox scaber* L. (Denmark) : Right mandible. Buccal view.
 M. " " : Larva. Lateral view.
 N. " " : Mandibles. Ventral view.
 O. " " : Head. Ventral view.
 P. " " : Hypopharyngeal region.
 Q. " " : Biforous abdominal spiracle.
 R. " " : Section of biforous spiracle on line indicated in figure Q.
 S. *Trox oligonus* Loomis : Cribriform abdominal spiracle.
 T. " " : Tenth abdominal segment.
 U. *Pelidnota punctata* L. : Epipharynx; mp, median round patch of claw-shaped spines.
 V. " " : Maxilla; srt, stridulating teeth. Dorsal view.
 W. *Valgus canaliculatus* F. : Epipharynx.
 X. " " : Maxilla; notice the lack of stridulating teeth. Dorsal view.
 Y. *Trichiotinus piger* F. : Epipharynx.
 Z. *Osmoderma eremicola* Knoch : Epipharynx; ms, curved median series of small teeth.

PLATE 88

Scarabaeidae-Rutelinae-Rutelini (A),

Scarabaeidae-Rutelinae-Anomalini (B-D, F, G),

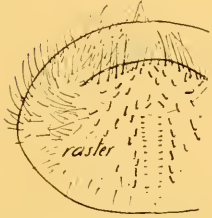
Scarabaeidae-Sericinae (H-L, N),

Scarabaeidae-Dynastinae (E, M, O-R)

- A. *Cotalpa lanigera* L. : End of body with raster.
Ventral view.
- B. *Popillia japonica* Newm. : Hypopharynx, maxilla.
- C. *Anomala orientalis* Waterh. : End of body with raster.
Ventral view.
- D. *Strigoderma arboricola* F. : Epipharynx.
- E. *Ligyrodes relictus* Say : Epipharynx.
- F. *Popillia japonica*. : End of body with raster.
- G. " " : Larva. Lateral view.
- H. *Aserica* (= *Autoserica*)
castanea Arrow : End of body with raster.
Ventral view.
- I. " " " : Larva. Lateral view.
- J. " " " : Right and left mandible.
- K. " " " : Maxilla and hypopharynx.
- L. " " " : Head. Dorsal view.
- M. *Anastrategus splendens* Beauv. : Right maxilla. Dorsal view.
- N. *Aserica castanea* : Mesothoracic and third abdominal spiracle; sppl. spiracular plate.
- O. *Anastrategus splendens* : Larva. Lateral view.
- P. *Dynastes tityus* L. : Left mandible; srp, stridulating plate. Ventral view.
- Q. *Anastrategus splendens* : Cribriform spiracle; b, bulla; sppl, spiracular plate; or, spiracular opening.
- R. " " " : Head; o, ocellus.



A. *Cotalpa*



C. *Anomala*



H. *Aserica*



L. *Aserica*



O. *Anastrategus*



B. *Popillia*



F.



D. *Strigoderma*



E. *Ligyrodes*



I. *Aserica*



M. *Anastrategus*



P. *Dynastes*



Q



G. *Popillia*

J. *Aserica*



K. *Aserica*

N
Aserica



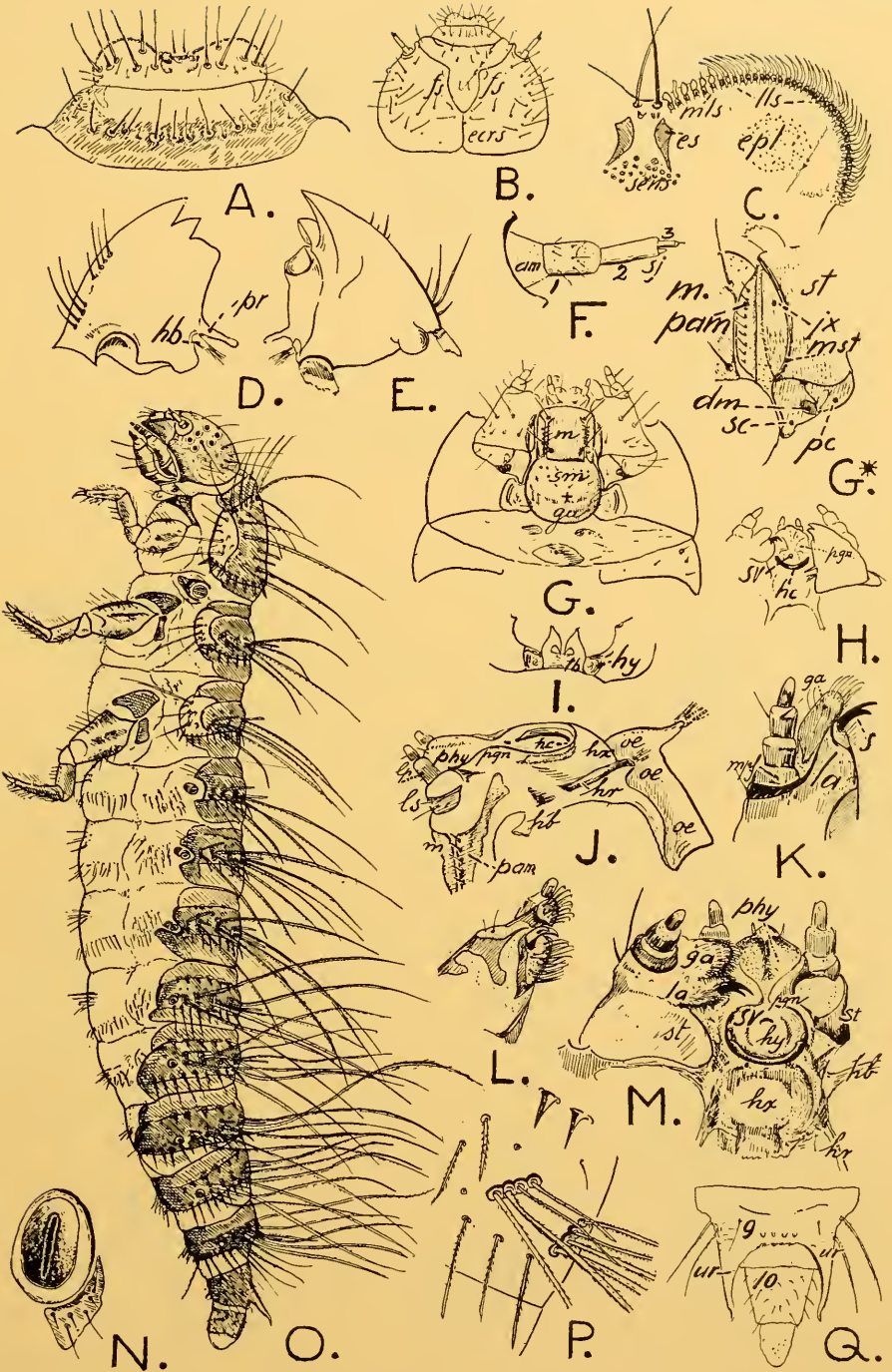
Anastrategus

R.

PLATE 89

Dermestidae-Dermestinae

- A. *Dermestes nidum* Arrow : Labrum and clypeus.
 B. " " : Head. Dorsal view.
 C. " " : Epipharynx; epl, epipharyngeal lobe; es, epipharyngeal sclerome; lls, lateral lobe-setae; mls, median lobe-setae; sens, sensory punctures.
 D. " " : Left mandible; hb, hair brush; pr, stiff process. Dorsal view.
 E. " " : Left mandible. Ventral view.
 F. " " : Antenna.
 G. " " : Ventral mouthparts. Ventral view.
 G.* " " : Details of figure G; dm, bifurcate sclerite at the dividing suture between subcardo and precardo; jx, juxtastipes; m, mentum; mst, sclerotized margin of stipes; pam, paramentum with longitudinal series of hairs.
 H. " " : Mandible, maxilla, and hypopharynx; sv, opening for salivary glands. Dorsal view.
 I. " " : Tentorium.
 J. " " : Labium, hypopharynx, and oesophagus; pam, paramentum; phy, glossa. Lateral view.
 K. " " : Maxilla; s, spur. Ventral view.
 L. " " : Maxilla. Buccal view.
 M. " " : Hypopharyngeal region and maxilla; sv, opening for salivary glands. Dorsal view.
 N. " " : Mesothoracic spiracle.
 O. " " : Larva. Lateral view.
 P. " " : Details of abdominal tergum.
 Q. " " : Ninth and tenth abdominal segments. Dorsal view.



Dermestes

PLATE 90

Dermestidae-Attageninae

A.	<i>Thylodrias contractus</i> Mots.	: Head. Dorsal view.
B.	“ “	: Antenna.
C.	“ “	: Tip of labium.
D.	“ “	: Epipharynx.
E.	“ “	: Mandible.
F.	“ “	: Ventral mouthparts.
G.	“ “	: Tip of maxilla.
H.	“ “	: Larva.
I.	<i>Attagenus piceus</i> Oliv.	: Annular spiracle.
J.	“ “	: Labrum, clypeus, and antenna.
K.	“ “	: Right mandible.
L.	“ “	: Left front leg.
M.	“ “	: Ventral mouthparts.
N.	“ “	: Larva. Lateral view.
O.	<i>Ctesias serra</i> F. (Denmark)	: Tip of maxilla.
P.	<i>Trogoderma ornata</i> Say	: Larva. Dorsal view.
Q.	“ “	: Abdominal segments. Ventre-lateral view.
R.	<i>Ctesias serra</i>	: Ventral mouthparts.
S.	“ “	: Larva. Lateral view.
T.	<i>Anthrenus verbasci</i> L.	: Mandible. Exterior view.
U.	“ “	: Larva. Lateral view.
V.	“ “	: Distal end of tibia and tarsungulus.
W.	<i>Aspsectus hispidus</i> Melsh.	: Right mandible.
X.	“ “	: Tips of maxilla and labium, and hypopharynx. Dorsal view.
Y.	“ “	: Larva. Ventral view.
Z.	“ “	: Larva. Lateral view.
Z.*	“ “	: Three abdominal terga. Dorsal view.

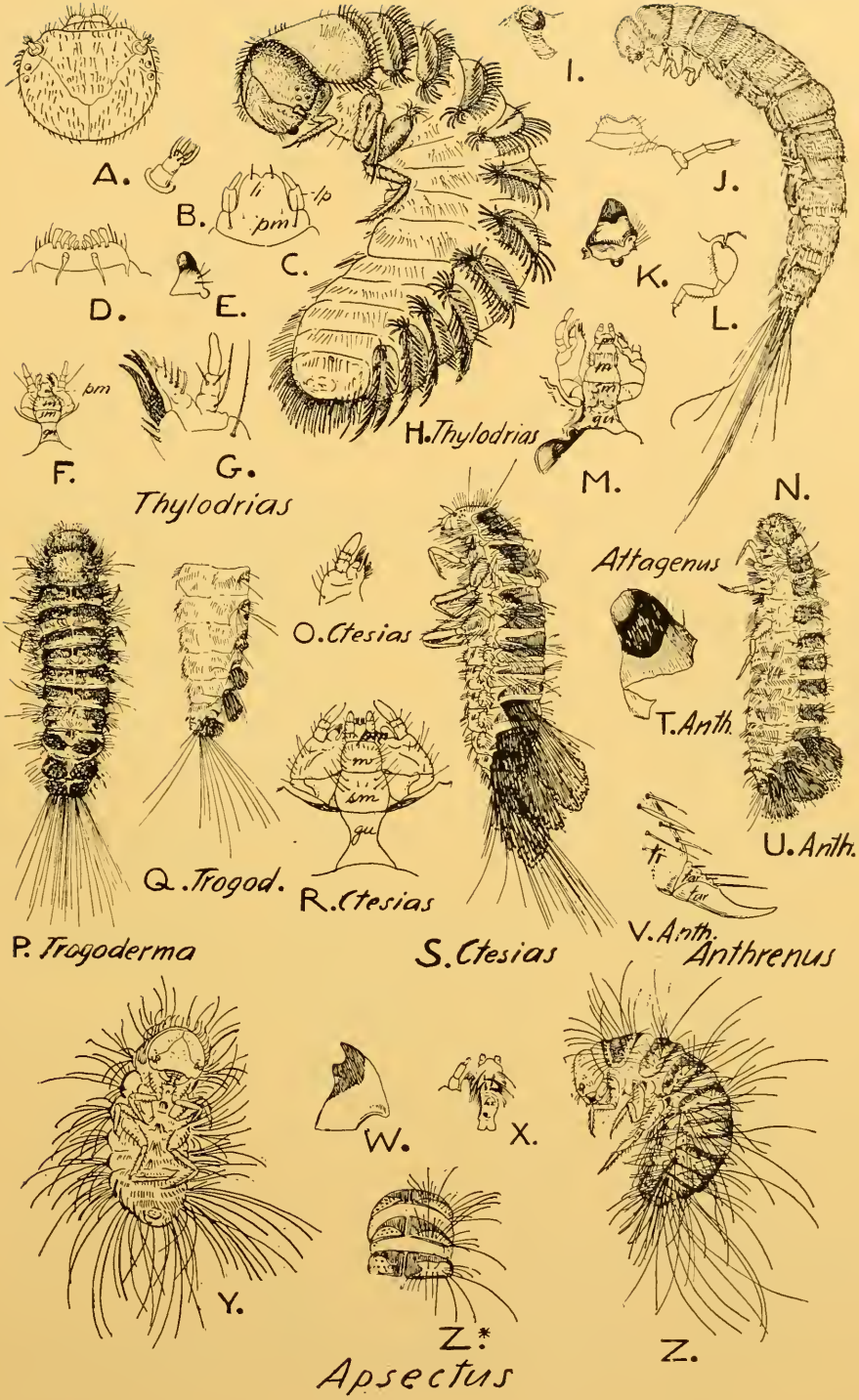


PLATE 91

Melyridae

- A. *Malachius bipustulatus* L.
 (Denmark) : Head and prothorax. Lat-
 eral view.
- B. “ “ : Left mandible; lm, lacinia
 mandibulae. Dorsal view.
- C. “ “ : Left mandible. Buccal view.
- D. “ “ : Left mandible. Ventral view.
- E. “ “ : Ventral mouthparts. Ven-
 tral view.
- F. “ “ : Dorsal side of head from
 within; ecrs, epicranial
 suture; fs, frontal suture.
- G. “ “ : Ninth and tenth abdominal
 segments. Ventral view.
- H. “ “ : Urogomphus. Lateral view.
- I. “ “ : Hypopharynx and ventral
 mouthparts. Dorsal view.
- J. “ “ : Larva. Dorsal view.
- K. *Malachius auritus* Lec. : Larva. Dorsal view.
- L. *Melyridae* (undetermined larva
 from Alaska) : Left mandible. Ventral view.
- M. “ “ : Head and prothorax. Ven-
 tral view.
- N. “ “ : Larva. Dorsal view.



A.

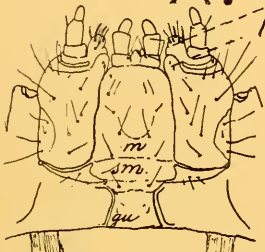


B.

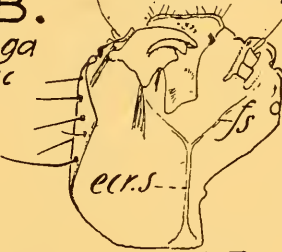


C.

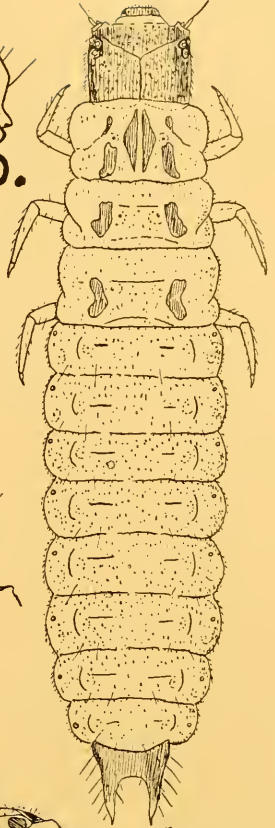
D.



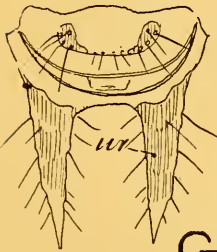
E.



F.



H. Malachius

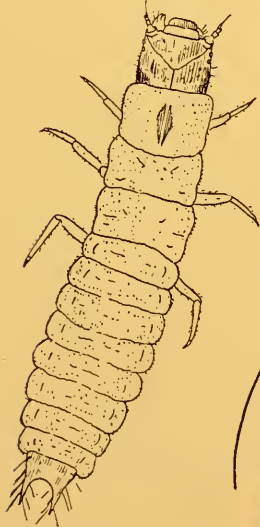


I.



G. Mal.

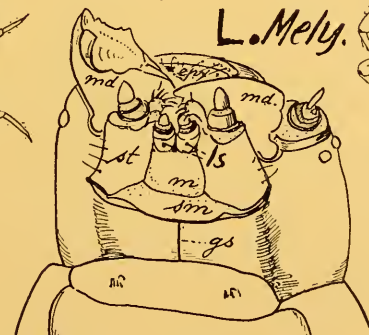
J. Mal.



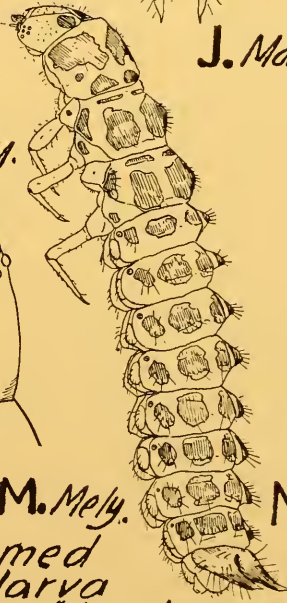
K. Malachius



L. Mely.



M. Mely.



N.

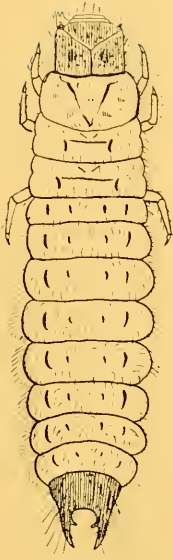
Unnamed melyrid larva from Alaska

PLATE 92

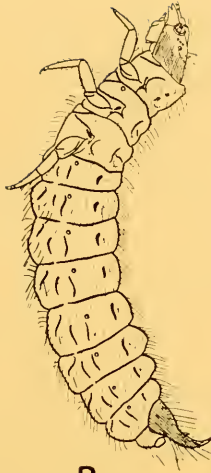
Melyridae (A-J)

Ciidae (K-R)

- | | | |
|-----|--|--|
| A. | <i>Collops nigriceps</i> Say | : Larva. Dorsal view. |
| B. | “ “ | : Larva. Lateral view. |
| C. | “ “ | : Larva. Ventral view. |
| D. | “ “ | : Left mandible. Ventral view. |
| E. | <i>Dasytes coeruleus</i> Deg. (Denmark) | : Left mandible. Ventral view. |
| F. | “ “ | : Tarsungulus. One lateral and one ventral view. |
| G. | “ “ | : Head. Ventral view. |
| H. | “ “ | : Annular spiracle. |
| I. | “ “ | : Larva. Dorso-lateral view. |
| J. | “ “ | : Ninth abdominal tergum. Dorsal view. |
| K. | <i>Cis fuscipes</i> Mellié | : Head. Ventral view. |
| L. | “ “ | : Leg. |
| M. | “ “ | : Annular spiracle. |
| N. | “ “ | : Right maxilla. Dorsal view. |
| O. | <i>Ennearthron</i> sp. (Hopk. U. S. 10086 t) | : Larva. Lateral view. |
| O.* | “ “ | : Outline of posterior part of ninth abdominal segment. Dorsal view. |
| P. | “ “ | : Left mandible. Ventral view. |
| Q. | “ “ | : Antenna. |
| R. | <i>Ennearthron thoracicorne</i> Ziegl. | : Head. Dorsal view. |



A.



B.



C.

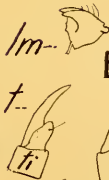
Collops



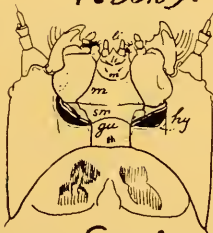
D. Collops



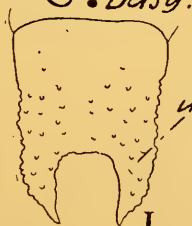
I. Dasytes



E. Dasy.



F. Dasy.



J. Dasy.



O. Ennearthron



K. Cis



L. ga lac

M.



R. fs eors

N. Cis

Q.

PLATE 93

Ostomidae-Tenebroidinae,
Ostomidae-Ostominae (D)

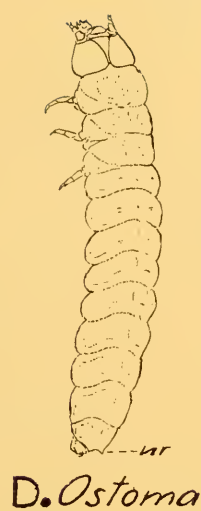
- A. *Airora cylindrica* Serv. : Left mandible; without lacinia
mandibulae. Dorsal view.
- B. *Corticotomus cylindricus* Lec. : Right mandible; lm, lacinia
mandibulae. Ventral view.
- C. *Airora cylindrica* : Part of head with ocellar group
and antenna. Lateral view.
- D. *Ostoma ferrugineum* L.
(Canada) : Larva. Dorso-lateral view.
- E. *Corticotomus cylindricus* : Larva; pst, presternal plate;
stpl, sternal plate.
- F. *Airora cylindrica* : Larva. Dorso-lateral view.
- G. " " : Head and prothorax; pst, pre-
sternal plate; stpl, sternal
plate; sp, annular spiracle.
- H. *Corticotomus cylindricus* : Ninth abdominal segment with
paired urogomphi.
- I. *Temnochila virescens* F. : Ninth abdominal segment with
one of the two urogomphi.
Lateral view.
- J. " " : Left mandible. Ventral view.
- K. " " : Dorsal (d) and ventral (v)
sclerites of thoracic segments.
- L. " " : Biforous spiracle.
- M. " " : Biforous spiracle and closing
apparatus.
- N. " " : Closing apparatus.
- O. *Tenebroides nanus* Melsh. : Ninth abdominal segment with
one of the two urogomphi.
Lateral view.
- P. " " : Right mandible. Dorsal view.
- Q. " " : Dorsal (d) and ventral (v)
sclerites of thoracic segments.



A. *Airora*

C. *Airora*

F. *Airora*

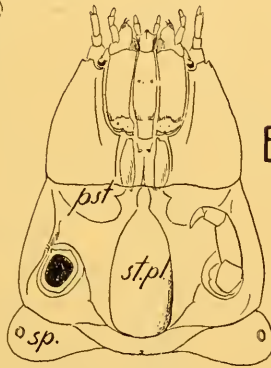


D. *Ostoma*

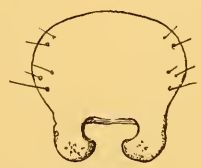


B. *cortic.*

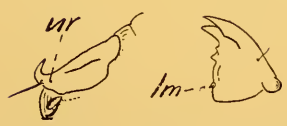
E. *Corticotomus*



G. *Airora*



H. *Corticotomus*



I. *Temnoch.*

J. *Temno.*

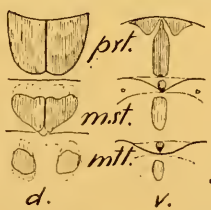


L. *Temno.*



O. *Teneb.*

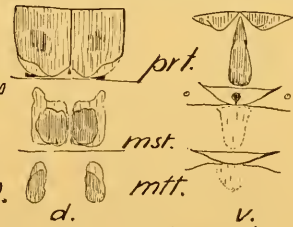
P. *Teneb.*



K. *Temnochila*



M. *Temno*



Q. *Tenebroides*



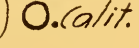
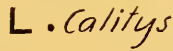
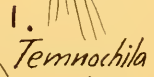
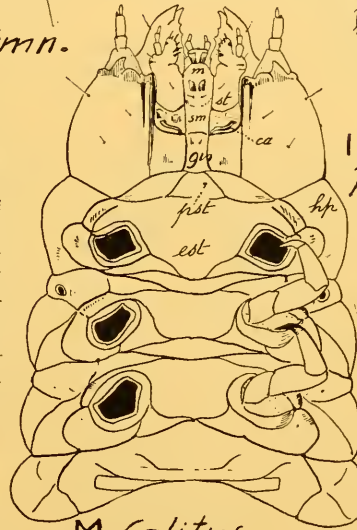
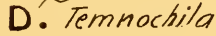
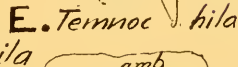
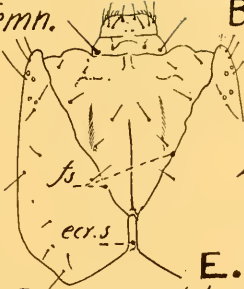
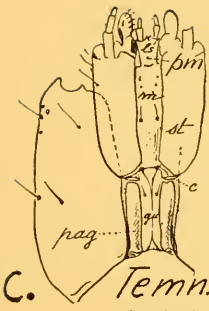
N. *Temno.*

PLATE 94

Ostomidae-Tenebroidinae (A-I),

Ostomidae-Ostominae (J-U)

A.	<i>Temnochila virescens</i> F.	:	Labrum.
B.	“ “	:	Epipharynx.
C.	“ “	:	Ventral mouthparts; pag, parangular plate; pm, prementum (fusion of the two stipites labii and the two palpigers).
D.	“ “	:	Head; fs, frontal sutures; ecrs, epicranial suture.
E.	“ “	:	Head and prothorax.
F.	“ “	:	Antenna, mouthparts and hypopharynx. Dorsal view.
G.	“ “	:	Ninth abdominal segment with urogomphi. Dorsal view.
H.	“ “	:	Abdominal segment; amb, ambulatory wart. Dorsal view.
I.	“ “	:	Larva. Ventro-lateral view.
J.	<i>Calitys scabra</i> Thumb.	:	Abdominal segment; amb, ambulatory wart. Dorsal view.
K.	“ “	:	Antenna, ventral mouthparts and hypopharynx; hb, hypopharyngeal bracon; pgn, maxillulae. Dorsal view.
L.	“ “	:	Larva. Dorsal view.
M.	“ “	:	Head, thorax and first abdominal segment. Ventral view.
N.	“ “	:	Left mandible. Ventral view.
O.	“ “	:	Left mandible. Buccal view.
P.	<i>Thymalus marginicollis</i> Chev.	:	Larva. Dorso-lateral view.
Q.	“ “	:	Head and prothorax.
R.	<i>Thymalus limbatus</i> F. (Denmark)	:	Leg.
S.	“ “	:	Right maxilla. Ventral view.
T.	“ “	:	Left mandible. Ventral view.
U.	“ “	:	Ninth abdominal segment with urogomphi. Dorsal view.



P. *Thymalus* Q. *Thymalus* S. *Thym.* U. *Thymalus*

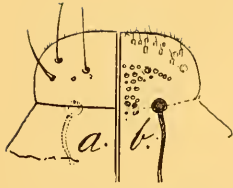
LARVAL FORMS OF COLEOPTERA

PLATE 95

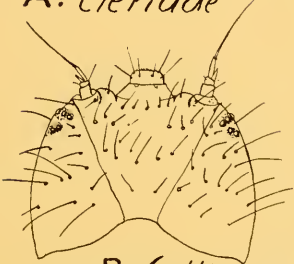
Cleridae-Hydnoceinae (B-M),

Cleridae-Clerinae (I, J, M, Q, T, U &c.)

- A. *Cleridae* : Labrum (a) and epipharynx (b).
- B. *Callimerus arcufer* Chapin : Head. Dorsal view.
- C. " " : Larva. Dorsal view.
- D. " " : Head and prothorax; ga, galea enlarged; pst, presternum; stpl, sternal plate.
- E. *Hydnocera verticalis* Say : Ninth abdominal segment.
- F. *Callimerus arcufer* : Spiracle with short airtubes.
- G. " " : Spiracle. Exterior view.
- H. " " : Tip of leg showing tarsungulus (t) and paronychial appendix (pou).
- I. *Enoclerus ichneumonaeus* F. : Biforous spiracles of thorax, third and eighth abdominal segments, showing different development of airtubes.
- J. *Enoclerus lecontei* Wolcott : Head. Dorsal view.
- K. *Monophylla terminata* Say : Head, showing one ocellus.
- L. *Tarsostenus univittatus* Rossi : Head with four ocelli.
- M. *Enoclerus lecontei* : Leg (without paronychial appendix).
- N. *Cymatodera morosa* Lee. : Annular spiracle.
- O. *Neichnea laticornis* Say : Ninth abdominal segment; no urogomphi. Dorsal view.
- P. *Priocera castanea* Newm. : Head with one ocellus on each side and projecting frons.
- Q. *Thanasimus formicarius* L.
(Denmark) : Larva. Lateral view.
- R. *Cymatodera inornata* Say : Ninth abdominal segment.
- S. *Orthopleura damicornis* F. : Head without ocelli.
- T. *Enoclerus lecontei* : Right mandible.
- U. " " : Ninth abdominal segment.
- V. *Thaneroclerus girodi* Chev. : Head with five ocelli on each side and an unpaired ventral bump. Lateral view.
- X. *Cymatodera morosa* : Head with three ocelli on each side. Lateral view.



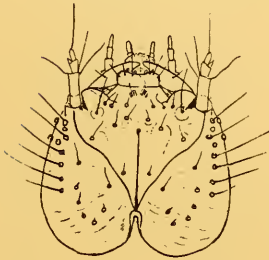
A. Cleridae



B. Callimerus



H. Callimerus



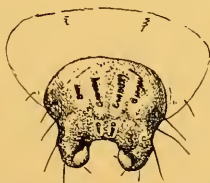
J. Enoclerus



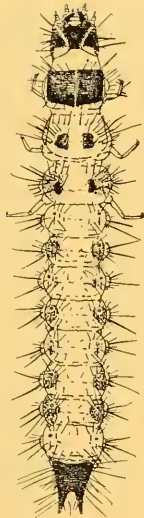
M. Enocl.



T. Enoclerus



U. Enoclerus



C. Callimerus



Q. Thana-Simus



D. Callimerus



E. Hydracura



F. Call. G.



I. Enoclerus



K. Menophylla

L. Tarsostenus



O. Tachra



P. Inocera



S. Orthoplerus

R. Gymalodora anomala



V. Thaneroclerus

X. Gymalodora morsa

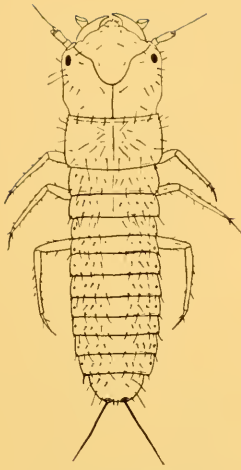
PLATE 96

Meloidae-Lyttinae (A-I),

Meloidae-Meloinae, (J-K, M, P, Q)

Meloidae-Zonitinae (L, N, O, R, S)

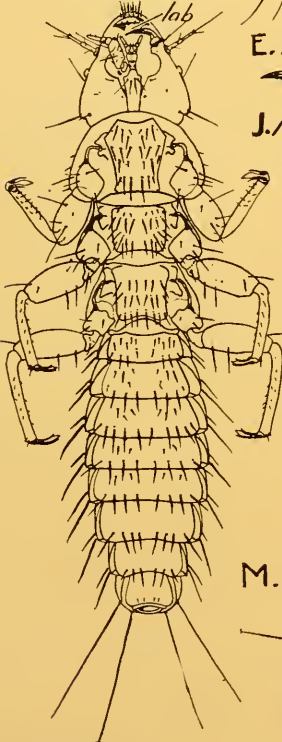
- A. *Macrobasis immaculata* Say; first instar : Larva. Dorsal view.
 B. *Epicauta vittata* F; first instar : Head. Dorsal view.
 C. *Macrobasis immaculata*; first instar : Head. Ventral view.
 D. " " " " : Tarsungulus and two setae on it.
 E. *Epicauta pennsylvanica* DeG.; first instar : Larva.
 F. *Epicauta vittata*; scarabaeoid instar : Mandible. Dorsal view.
 G. " " " " : Larva. Lateral view.
 H. " " " " : Head. Dorsal view.
 I. " " " " : Ventral mouthparts.
 J. *Meloe variegatus* Donovan. (Denmark); first instar : Mandible.
 K. *Meloe proscarabaeus* L. (Denmark); first instar : Tip of leg with spatulate tarsungulus (t) and two setae at its base.
 L. *Zonitis bilineata* Say; first instar : Head. Ventral view.
 M. *Meloe variegatus*; first instar : Larva; term.s, terminal setae of the abdomen. Dorsal view.
 N. *Trierania sanguinipennis* Say; first instar : End of abdomen; spw, wart carrying the eighth abdominal spiracle. Lateral view.
 O. *Zonitis bilineata*; first instar : Parts of seventh and eighth abdominal segments. Lateral view.
 P. *Meloe variegatus*; first instar : Larva. Ventral view.
 Q. *Meloe proscarabaeus*; first instar : Head; compare labrum in *Meloe variegatus*, figure P.
 R. *Zonitis bilineata*; first instar : Larva.
 S. " " " " : End of a leg.



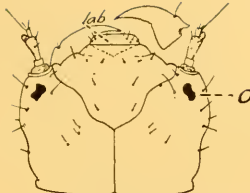
A. *Macrobasis*



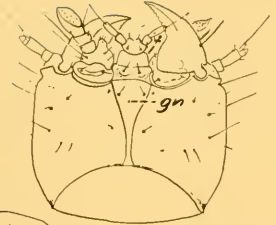
D. *Macrobasis*



P. *Meloe*



B. *Epicauta*



C. *Macrobasis*



F. *Epicaut.*



G. *Epicauta*



H. *Epicauta*



I. *Epicaut.*



E. *Epicauta*



J. *Meloe*



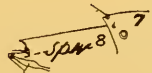
K. *Meloe*



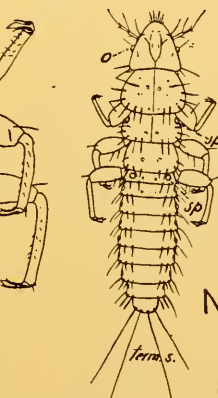
L. *Zonitis*



N. *Tricrania*



O. *Zonitis*



M. *Meloe*



R. *Zonitis*



Q. *Meloe*

S.

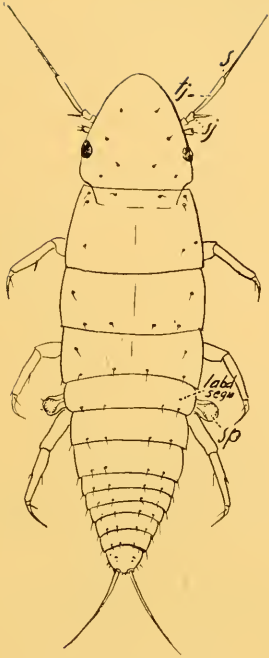
Zonitis

PLATE 97

Tetraonycidae.

Rhipiphoridae

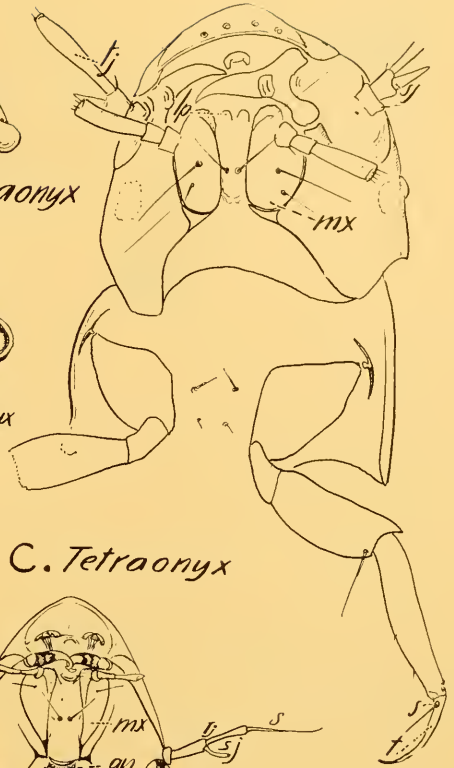
- A. *Tetraonyx quadrimaculata* F.;
 first instar: Left mandible. Ventral view.
- B. " " " " : Spiracle of first abdominal
 segment borne by a lateral
 projection from the seg-
 ment. Exterior view.
- C. " " " " : Head and prothorax; lp, la-
 bial palpus; s, single seta
 at base of tarsungulus; sj,
 tactile papilla of antenna;
 tj, terminal joint of an-
 tenna. Ventral view.
- D. " " " " : Larva. Dorsal view.
- E. *Rhipiphorus solidaginis* Pierce;
 first instar: Anterior part of larva; pon,
 paronychial appendix
 (= pulvillus). Ventral
 view.
- F. " " " " : Tip of a leg; pon, parony-
 chial appendix; s, short and
 thick seta at the base of
 tarsungulus. (Compare pl.
 96 S).
- G. " " " " : Larva. Dorso-lateral view.
- H. " " " " : Posterior end of tenth ab-
 dominal segment.
- I. *Rhipiphorus stylopidis* Newm.;
 last larval instar : Anterior part of larva.
 Fronto-ventral view.
- J. *Rhipiphorus stylopidis* Newm.;
 last larval instar : Larva. Lateral view.



A. *Tetraonyx*

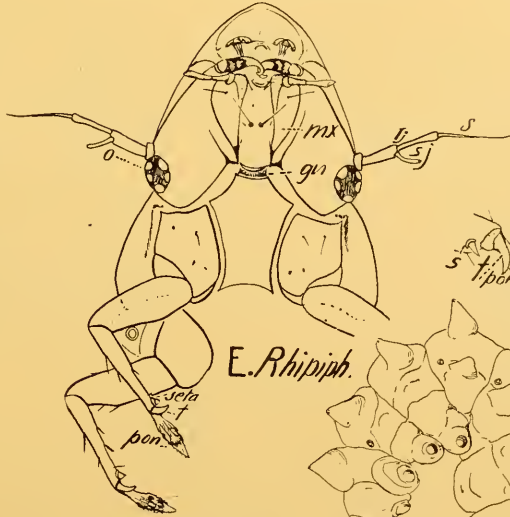


B. *Tetraonyx*



C. *Tetraonyx*

D. *Tetraonyx*



E. *Rhipiph.*



F. *Rhipiph*



G. *Rhipiph.*



H. *Rhipiph.*



I. *Rhipiphorus*

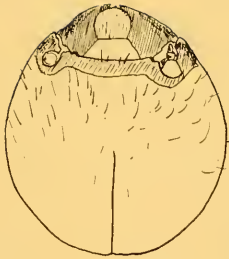


J. *Rhipiphorus*

PLATE 98

Mordellidae

- | | | | | | |
|----|---------------|-----------|---------------------|---|--|
| A. | Tomoxia | bidentata | Say | : | Head. Dorsal view. |
| B. | " | " | | : | Hypopharynx and bracon. |
| C. | " | " | | : | Head, prothorax and mesothoracic spiracles. Ventral view. |
| D. | " | " | | : | Larva. Lateral view. |
| E. | " | " | | : | Right mandible. Dorsal view. |
| F. | Mordellistena | sp. | (Hopk. U. S. 1009v) | : | Right mandible. Dorsal view. |
| G. | " | " | | : | Left maxilla. Ventral view. Dorsal view shows a rudimentary lacinia with long spiny hairs at the base of the large galea (comp. pl. 92, fig. N). |
| H. | " | " | | : | Annular spiracle. |
| I. | " | " | | : | Mesothoracic leg. |
| J. | " | " | | : | Larva. Lateral view. |



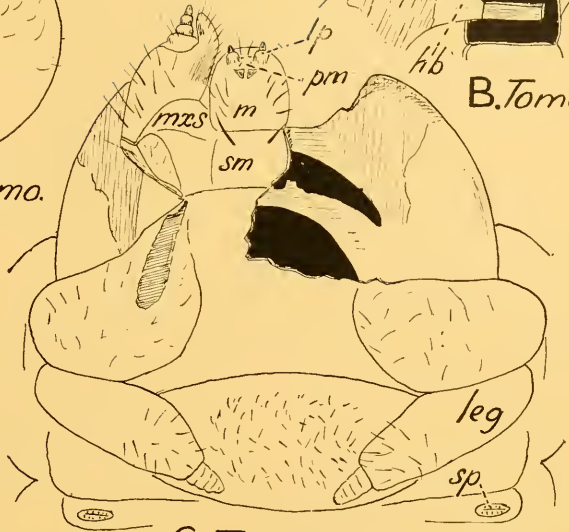
A. *Tomoxia*.



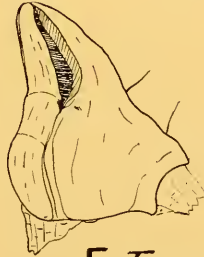
B. *Tomoxia*.



D. *Tomoxia*



C. *Tomoxia*



E. *Tomoxia*



J. *Mordellistena*



F. *Mordel.*



G. *Mordel.*



H. *Mordel.*



I. *Mordellistena*

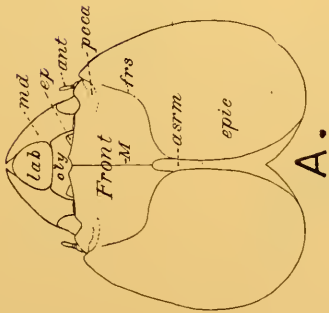
PLATE 99

Cerambycidae-Prioninae,
Cerambycidae-Aseminae,
Cerambycidae-Cerambycinae,
Cerambycidae-Lepturinae,
Cerambycidae-Lamiinae

(Diagrammatic illustration of the heads of subfamilies
of Cerambycidae)

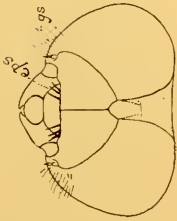
- A. Genus *Orthosoma* : Head; ant, antenna; asrm, attachment of superior retractor muscles of head; cly, clypeus; ep, epistoma; epic, epicranium; frs, frontal suture; lab, labrum; M, median line of head; md, mandible; peca, post-condylar carina. Dorsal view.
- B. “ “ : Head; c, cardo; epic, epicranium; gu, gula; hs, hypostomal suture; hy, hypostoma; lac, lacinia; li, ligula; lp, labial palpus; lst, stipites labii; m, mentum; md, mandible; mpalp, maxillary palpiger; mxp, maxillary palpus; mxsc, maxillary articulating area; occ.for, occipital foramen; sfsp, subfossal spine; sm, submentum; st, stipes maxillae; tb, tentorial bridge; vrm, attachment of ventral retractor muscles of head; I, occipital foramen pars minor; II, occipital foramen pars major. Ventral view.
- C. Genus *Asemum* : Head; eps, epistomal setae; gs, genal setae. Dorsal view.
- D. “ “ : Head; tp, tentorial pit; I and II, occipital foramen, pars minor and pars major united. Ventral view.
- E. Genus *Xylotreechus* : Head. Dorsal view.
- F. “ “ : Head. Ventral view.
- G. Genus *Rhagium* : Head; ar, antennal ring. Dorsal view.
- H. “ “ : Head. Ventral view.
- I. Genus *Graphisurus* : Head. Dorsal view.
- J. “ “ : Head. Ventral view.

Prioninae



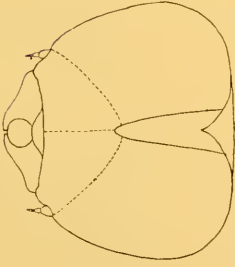
A.

Aseminae



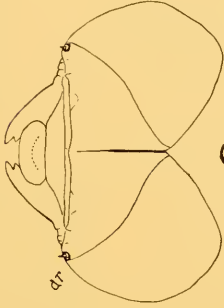
C.

Cerambycinae



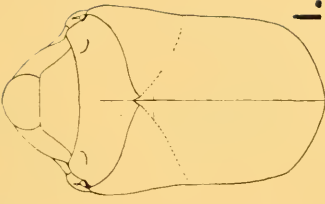
E.

Lepturinae

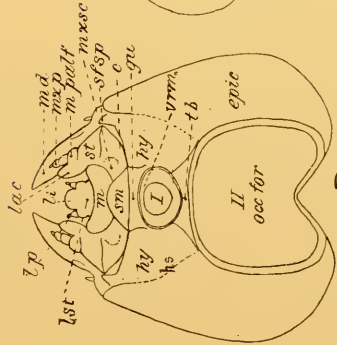


G.

Laminiae

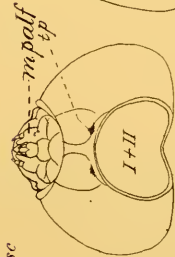


I.



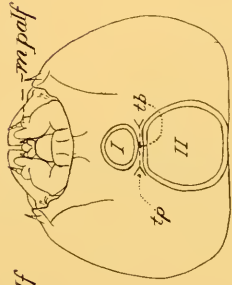
B.

Orthosoma



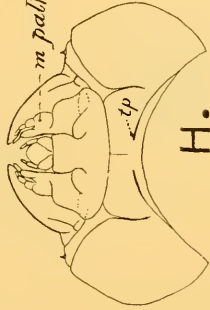
D.

Asemum



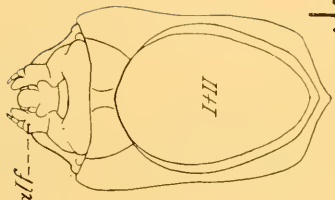
F.

Xylotrechus



H.

Rhaquium



J.

Graphisurus

PLATE 100

Cerambycidae-Lamiinae (A),
Cerambycidae-Prioninae (B-F),
Cerambycidae-Cerambycinae (G),
Cerambycidae-Lepturinae (H-L),
Cerambycidae-Disteniinae (M)

- A. Lamiinae : Head, mpf, maxillary palpiger; st, stipes. Ventral view.
- B. *Derobrachus* (= *Orthosoma*) *brunneus* Forst.: Spiracle.
- C. " " " : Labium. Lateral view.
- D. " " " : Head. Ventral view.
- E. " " " : Maxilla, ligula, hypopharynx. Dorsal view.
- F. " " " : Right mandible. Dorsal view.
- G. *Romaleum atomarium* Drury : Right mandible. Dorsal view.
- H. Undetermined lepturine larva (Siam) : Head. Ventral view.
- I. " " " : Leg.
- J. " " " : Abdominal segment. Dorsal view.
- K. " " " : Larva. Dorsal view.
 (Figure K drawn by J. A. Hyslop)
- L. Lepturine larva, more typical of the family than figure H.
- M. *Distenia undata* F. : Head. Ventral view.



A. *Lamiinae*



B. *Dera*



C. *Dera*



D. *Derobrachus*



E. *Derobrachus*

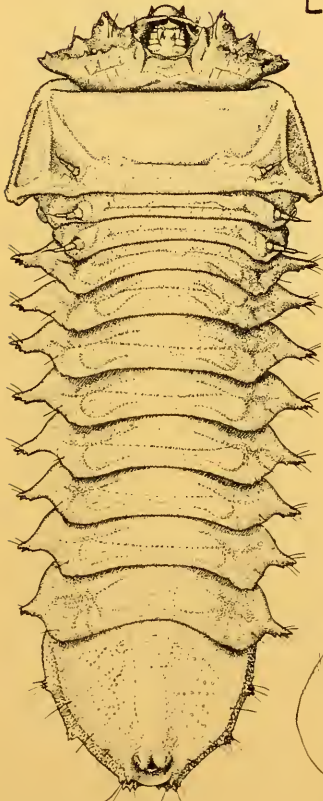


F. *Derobrachus*



Prioninae

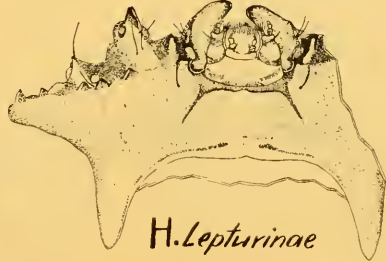
G. *Romaleum*
Cerambycinae



K. *Lepturinae*



I. *Leptur*



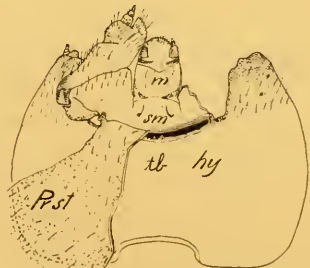
H. *Lepturinae*



J. *Lepturin.*



L. *Lepturinae*



M. *Disteniinae*

LARVAL FORMS OF COLEOPTERA

PLATE 101

Ptinidae (A, B and E),

Anobiidae (C, D, F-N, X, Ae and Oe),

Bostrichidae (O-W, Y, Z)

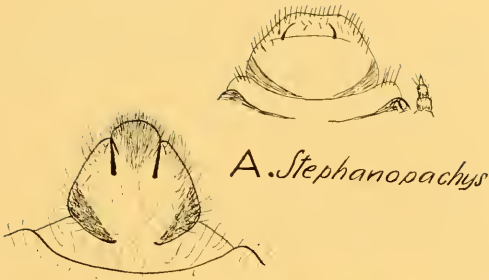
- A. *Niptus* sp. (Larvae, pupae and im-
agines in *Desfontinea ulcifolia* Chili): Larva; ats. anal trans-
verse sclerome.
- B. *Ptinus fur* L. : Ventral mouthparts.
- C. *Nevermannia doreatomoides* Fisher
(Costa Rica): Mesothoracic spiracle.
- D. " " " : Right mandible.
- E. *Ptinus fur* : Mesothoracic spiracle.
- F. *Nevermannia doreatomoides* : Head. Dorsal view.
- G. " " " : Anal pad.
- H. " " " : Larva. Lateral view.
- I. *Lasioderma serricorne* F. : Mandible.
- J. " " " : Epipharynx (eph); lab-
rum; clypeus, epis-
toma, and antenna.
- K. " " " : Head. Dorsal view.
- L. " " " : Ventral mouthparts.
- M. *Hedobia imperialis* L. (Denmark) : Left maxilla; ma, undi-
vided mala.
- N. *Trichodesma klagesi* Fall. : Left maxilla with mala
divided into lacinia
and galea.
- O. *Scobicia declivis* Lec., last instar : Epipharynx.
- P. " " " " : Longitudinal cut of in-
ner wall of mandible.
- Q. " " " first instar : Antenna, epipharynx
and mouthparts.
- R. " " " last instar : Left mandible.
- S. " " " " " : Head. Dorsal view.
- T. " " " first instar : Larva. Lateral view.
- U. " " " " " : Tip of ninth abdominal
segment. Dorsal view.
- V. " " " last instar : Prothoracic spiracle.
- W. " " " " " : Ventral mouthparts.
- X. *Caenocara oculata* Say : Left maxilla.
- Y. *Scobicia declivis*, last instar : Larva. Lateral view.
- Z. " " " " " : Right maxilla.
- Ae. *Caenocara oculata* : Right mandible.
- Oe. " " " " : Larva. Lateral view.

PLATE 102

Psoidae (A-E),

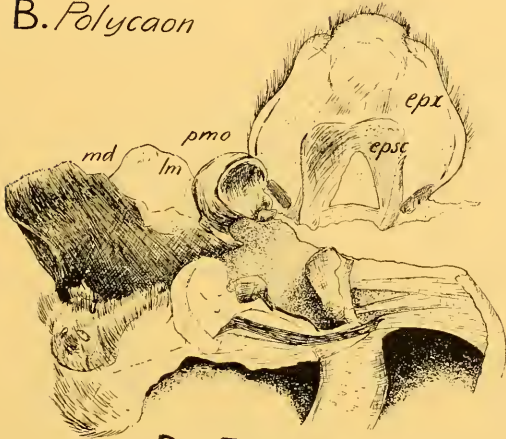
Lyctidae (F-K)

- A. *Stephanopachys pacificus* Csy.: Labrum, clypeus, and antenna.
 B. *Polycaon stouti* Lec. : Labrum and clypeus.
 C. " " : Head capsule. Ventral view.
 D. " " : Interior of buccal region; epse, epipharyngeal sclerome; epX, epipharynx; lm, lacinia mandibulae; md, mandible; pmo, pseudomola, a big molar-like process from dorsal side of mandible.
 E. " " : Ventral mouthparts.
 F. *Lyctus cavicollis* Lec. : Right mandible; lm, lacinia mandibulae; pmo, pseudomola. Dorsal view (left); buccal view (right).
 G. " " : Antenna.
 H. " " : Eighth abdominal spiracle (left figure); first abdominal spiracle (right figure).
 I. " " : Larva. Lateral view.
 J. *Lyctus cavicollis*, first instar : Ninth abdominal segment with a pair of small urogomphi. Dorso-lateral view.
 K. " " , mature larva: Head and ventral mouthparts.

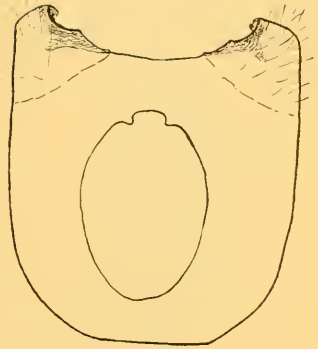


A. *Stephanopachys*

B. *Polycaon*



D. *Polycaon*



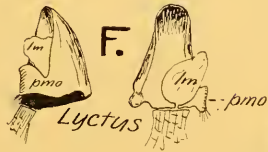
C. *Polycaon*



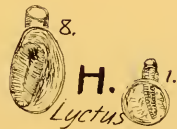
E. *Polycaon*



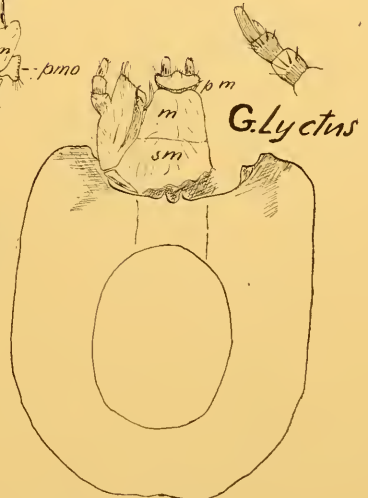
I. *Lyctus*



F. *Lyctus*



G. *Lyctus*



H. *Lyctus*



J. *Lyctus*

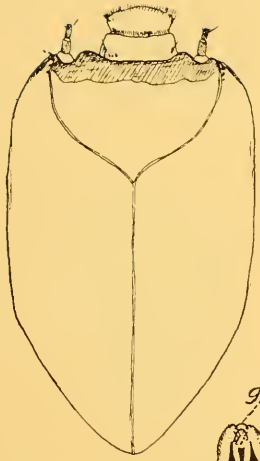


K. *Lyctus*

PLATE 103

Bruchidae (= *Mylabridae*)

- A. *Caryedon fuscus* (Goeze) (= *Bruchus*
or *Pachymerus gonagra* F.) (Phil-
ippine Isl.) : Ocelli and antenna.
- B. *Pachymerus nucleorum* F. (Brazil) : Right mandible.
- C. *Caryedon fuscus* : Head. Dorsal view.
- D. " " : Ventral mouthparts; gl.
glossa; li, ligula; lp,
labial palpus; pgl.
paraglossa; sm, sub-
mentum. Ventral
view.
- E. " " : Head. Ventral view.
- F. " " , first instar : Tibia and tarsus.
- G. *Pachymerus nucleorum* : Larva. Lateral view.
- H. *Bruchus* (= *Mylabris*) *obtectus* Say : Spiracle; atrium sepa-
rately to the right.
- I. " " : Labrum, elypeus and
epistoma.
- J. *Spermophagus hoffmanneggi* Gyll. : Anterior part of head.
Dorsal view.
- K. " " , first instar : Prothoracic dorsal X-
shaped plate in the
first bruchid instar
assisting it in enter-
ing the seeds of legu-
minous plants.
- L. " " , mature larva : Leg.
- M. " " , mature larva : Ventral mouthparts.
- N. " " , first instar : Leg.



C. *Pachymerus*



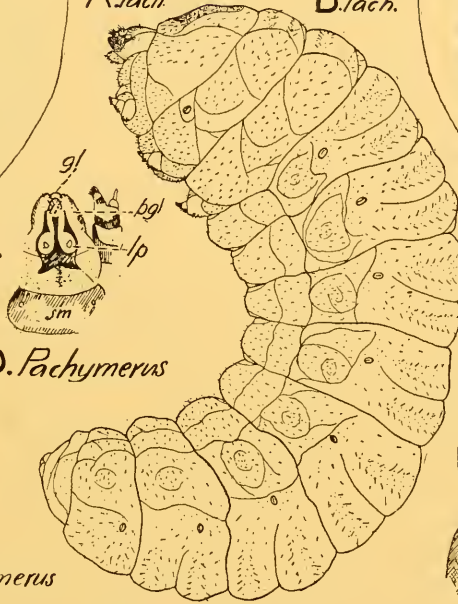
A. *Pach.*



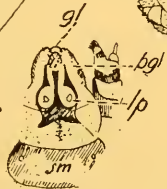
B. *Pach.*



E. *Pachymerus*



G. *Pachymerus*



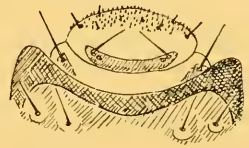
D. *Pachymerus*



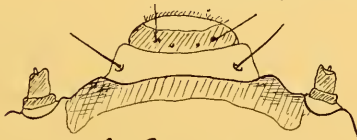
F. *Pachymerus*



H. *Bruchus*



I. *Bruchus*



J. *Spermophagus*



K. *Spermophagus*



L. *Spermoph.*



M. *Spermophagus*

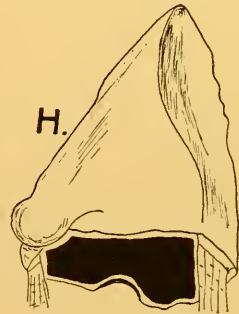
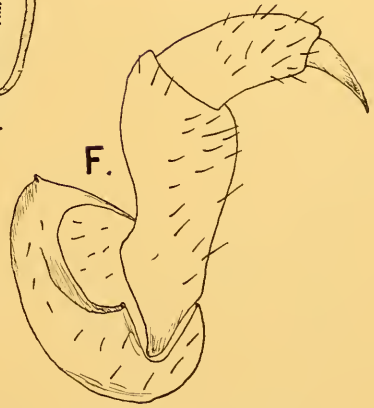
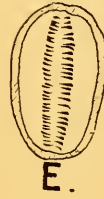
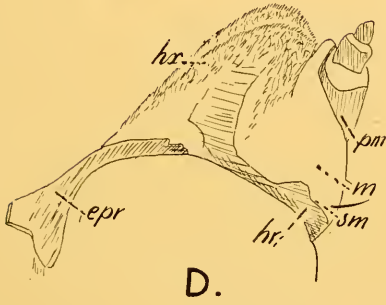
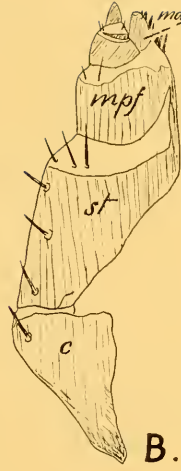
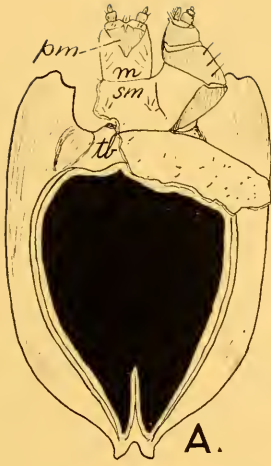


N. *Spermophagus*

PLATE 104

Sagridae

- | | | | |
|----|----------------------------|---|--|
| A. | <i>Sagra femorata</i> Jac. | | |
| | (Malleswar, Mysore State, | | |
| | India) | : | Head. Ventral view. |
| B. | <i>Sagra femorata</i> Jac. | : | Right maxilla. Ventral view. |
| C. | “ “ | : | Head. Dorsal view. |
| D. | “ “ | : | Hypopharynx and labium. Lat-
eral view. |
| E. | “ “ | : | Abdominal spiracle, bilabiate type. |
| F. | “ “ | : | Leg. |
| G. | “ “ | : | Larva. Lateral view. |
| H. | “ “ | : | Right mandible. Ventral view. |



Sagra

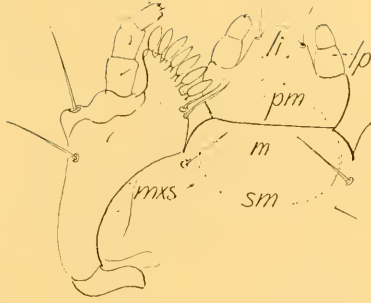
PLATE 105

Orsodacnidae-Orsodacninae,
Orsodacnidae-Zeugophorinae

- | | | | | |
|----|-------------------------------|---|---|--------------------------------------|
| A. | Orsodacne sp. | (Not reared;
determined by the method
of elimination and local-
ity) | : | Right mandible. Ventral view. |
| B. | Orsodacne sp. | | : | Ventral mouthparts. Ventral
view. |
| C. | “ | “ | : | Right mandible. Dorsal view. |
| D. | “ | “ | : | Head. Dorsal view. |
| E. | “ | “ | : | Larva. Lateral view. |
| F. | <i>Zeugophora scutellaris</i> | Suffr.: | : | Larva. Dorsal view. |
| G. | “ | “ | : | Head. Ventral view. |
| H. | “ | “ | : | Left mandible. Ventral view. |



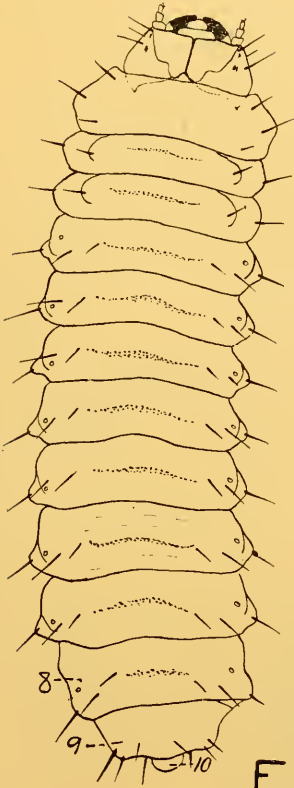
A. *Orsodacne*



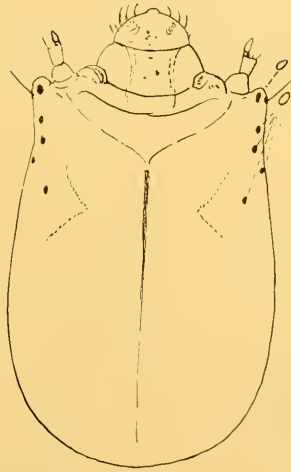
B. *Orsodacne*



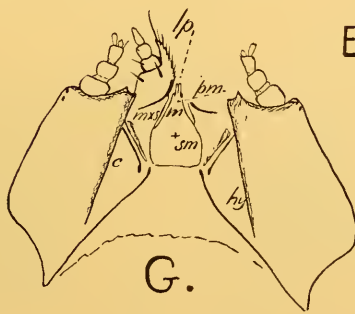
C. *Orsodacne*



D. *Orsodacne*



E. *Orsodacne*



F.

G.



H.

Zengophora

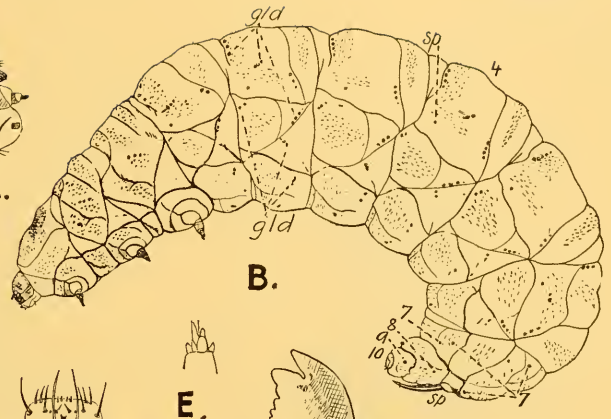
PLATE 106

Donaciidae

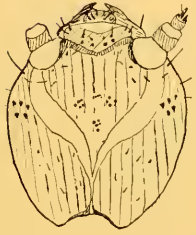
- A. *Donacia* sp. : Head. Lateral view.
 B. " " : Larva. Lateral view.
 C. " " : Head. Dorsal view.
 D. *Donacia marginata* Hoppe
 (Denmark) : Labrum, clypeus, epistoma.
 E. " " : Tip of antenna.
 F. " " : Right mandible. Dorsal view.
 G. *Plateumaris braccata* Scop.
 (Denmark) : Tip of maxilla. Dorsal view.
 H. *Donacia crassipes* F.
 (Denmark) : Distal part of maxilla; bl, blade;
 lac, lacinia; sty, stylus. Dorsal
 view. (Compare pl. 111 G;
 bl = *; sty = long seta).
 I. " " : Lacinia with stylus, and galea
 with blade. Ventral view.
 J. " " : Maxillary stipes with palpus.
 K. *Donacia marginata* : Mala; split open.
 L. *Donacia marginata* : Hook shaped eighth abdominal
 spiracle; showing opened tubes
 and atrium.
 M. " " : Hook shaped eighth abdominal
 spiracle; intact.
 N. " " : Longitudinal section of annular
 fourth abdominal spiracle and
 closing apparatus; ha, hard
 fold of closing apparatus
 against which soft fold from
 opposite wall of trachea is
 pressed when the closing muscle
 between the arms is contracted.
 O. *Donacia* sp. : Leg.
 P. " " : Ventral mouthparts.
 Q. " " : Cross-section of hook of eighth
 abdominal spiracle; bw, pro-
 longation from body wall.
 R. " " : Ventral mouthparts. Dorsal view.



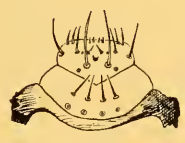
A.



B.



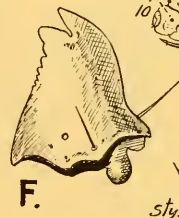
C.



D.



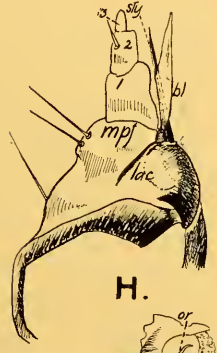
E.



F.



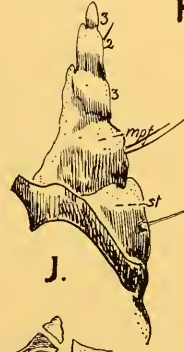
G.



H.



I.



J.



K.



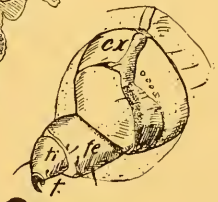
L.



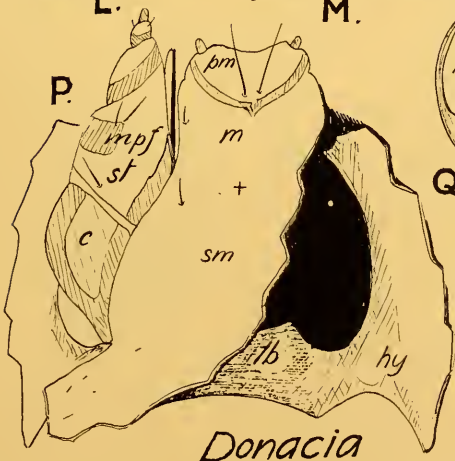
M.



N.



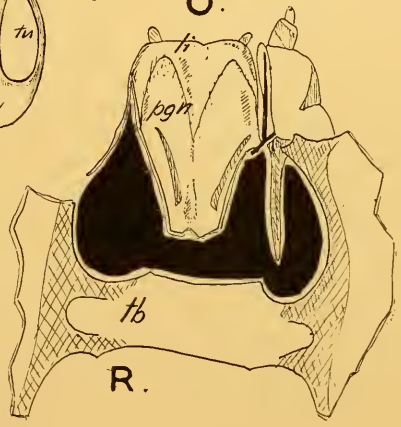
O.



P.



Q.



R.

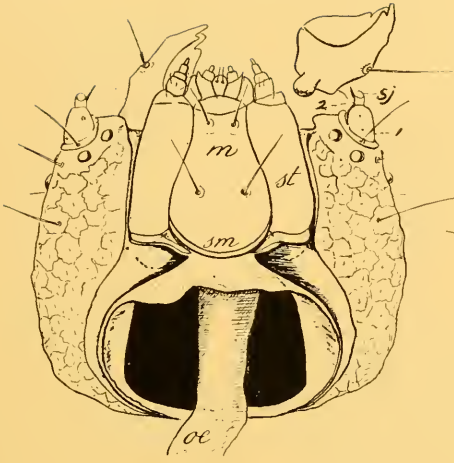
Donacia

PLATE 107

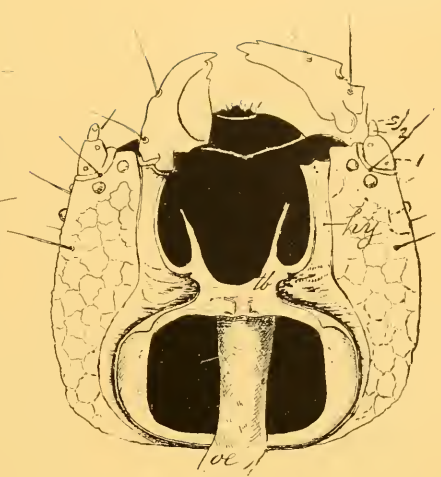
Camptosomatidae-Chlamydinae (G, H)

Camptosomatidae-Clytrinae (A-F)

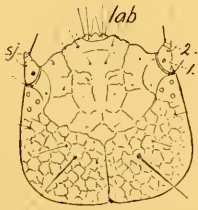
- A. *Clytra quadripunctata* L.
 (Denmark) : Head. Ventral view.
- B. " " : Head with ventral mouthparts removed. Ventral view.
- C. " " : Head; sj, pillbox shaped sensory appendix of antennal tip. Dorsal view.
- D. " " : Hypopharynx and ventral mouthparts. Lateral view.
- E. " " : Hypopharynx and ventral mouthparts. Dorsal view.
- F. " " : Larva. Lateral view.
- G. *Chlamys gibbosa* F. : Anterior portion of head; sj, conical sensory appendix of antenna. Dorsal view.
- H. " " : Head and prothorax. Lateral view.



A. Clytra



B. Clytra



C. Clytra



D. Clytra



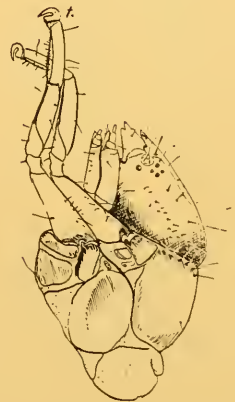
G. Chlamys



E. Clytra



F. Clytra

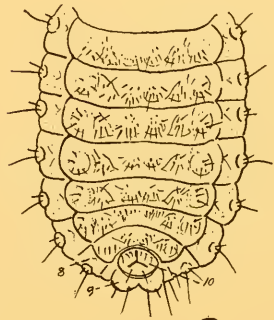
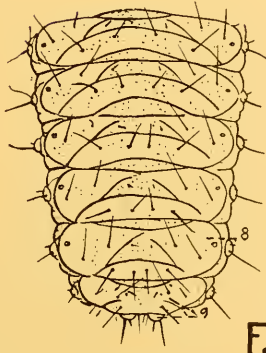
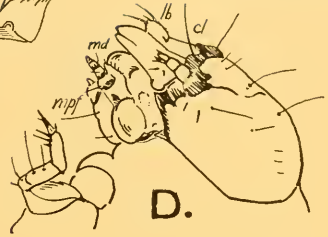
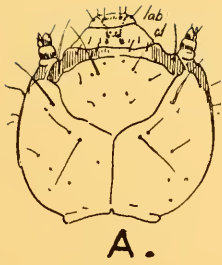


H. Chlamys

PLATE 108

Eumolpidae

- A. *Paria canella* F. : Head. Dorsal view.
 B. " " : Left mandible. Dorsal, ventral, and tilted for basi-dorsal view.
 C. " " : Ventral mouthparts. Ventral view.
 D. " " : Head and prothorax. Lateral view.
 E. " " : Larva. Lateral view.
 F. " " : Abdomen. Dorsal view.
 G. " " : Abdomen. Ventral view.
 H. *Chrysochus auratus* F. : Annular spiracle. Longitudinal section.
 I. " " : Annular spiracle. Exterior view.
 J. " " : Anterior portion of head; distal end of mandible removed to show epipharynx, hypopharynx, and maxillary mala.
 K. " " : Diagram of buccal structures; 1, membrane between maxilla and hypopharynx; 2, maxillary palpiger; 3, stipes; 4, hypopharynx; 5, prementum; 6, mentum; 7, body; 8, labrum; 9, elypeus; 10, place of the removed mandible; 11, antenna; 12, epiceranium.
 K.* " " : Mandible.
 L. " " : Larva. Lateral view.
 M. " " : End of abdomen. Ventral view.



Paria



I.



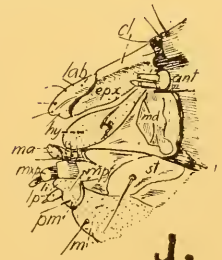
K.



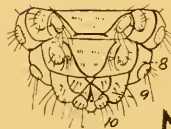
K*.



L.



J.



M.

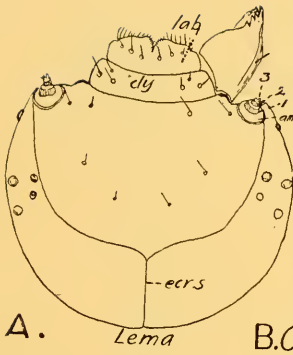
Chrysochus

PLATE 109

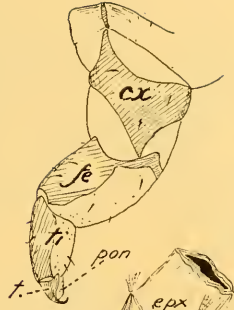
Crioceridae (A-G)

Chrysomelidae (H-M)

- | | | | |
|----|---------------------------------|---|---|
| A. | Lema sp. | | : Head. Dorsal view. |
| B. | <i>Crioceris asparagi</i> L. | | : Leg. |
| C. | “ | “ | : Thoracic biforous spiracle. |
| D. | “ | “ | : Buccal cavity with epipharynx above, and hypopharynx and the ventral mouthparts below. Anterior view. |
| E. | “ | “ | : Head capsule. Ventral view. |
| F. | “ | “ | : Ventral mouthparts. Ventral view. |
| G. | “ | “ | : Larva. Lateral view. |
| H. | <i>Gastroidea cyanea</i> Melsh. | | : Head. Dorsal view. |
| I. | “ | “ | : Head. Ventral view. |
| J. | “ | “ | : Left mandible. Ventral view. |
| K. | “ | “ | : Right maxilla. Ventral view. |
| L. | “ | “ | : Larva. Lateral view. |
| M. | “ | “ | : Leg. |



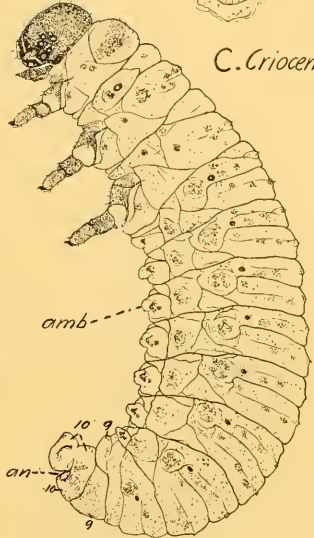
A. *Lema*



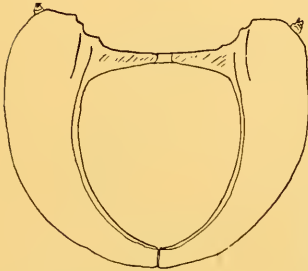
B. *Crioceris*



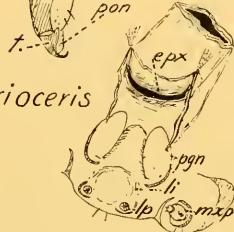
C. *Crioceris*



G. *Crioceris*



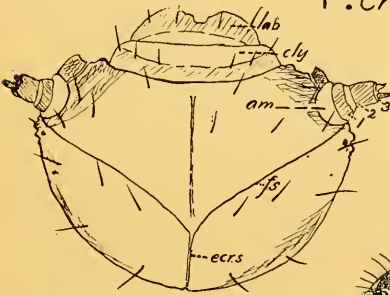
E. *Crioceris*



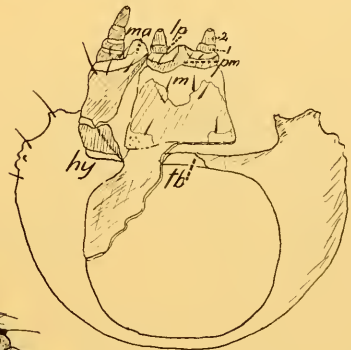
D. *Crioceris*



F. *Crioceris*



H. *Gastroidea*



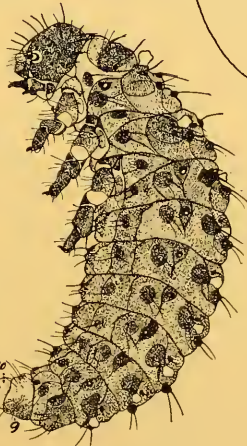
I. *Gastroidea*



K. *Gastroidea*



J. *Gastroidea*



L. *Gastroidea*

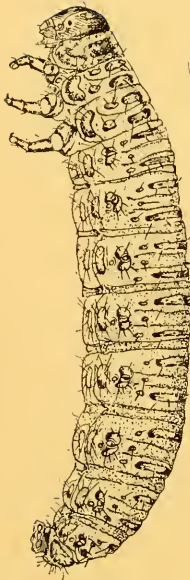


M. *Gastroidea*

PLATE 110

Galerucidae-Galerucinae

- A. *Galeruca tanacetii* L. (Denmark) : Head. Dorsal view.
 B. *Sermylissa halensis* L. (Denmark) : Left mandible. Ventral view.
 C. *Agelastica alni* L. (Denmark) : Larva. Lateral view.
 D. *Monoxia consputa* Lee. : Spiracle.
 E. *Agelastica alni* : Left mandible. Ventral view.
 F. *Galerucella luteola* Müller : Larva. Dorsal view.
 G. *Galeruca tanacetii* : Larva. Lateral view.
 H. *Monocesta coryli* Say : Antenna and ocellus.
 I. " " : Left figure, showing lacinia, galea and hypopharynx facing the buccal cavity; right figure, showing galea, mentum, and labium viewed from below.
 J. " " : Leg.
 K. " " : Left mandible. Ventral view.
 L. " " : Tenth abdominal segment from below, showing anus in center and six anal lobes.
 M. " " : Larva. Lateral view.

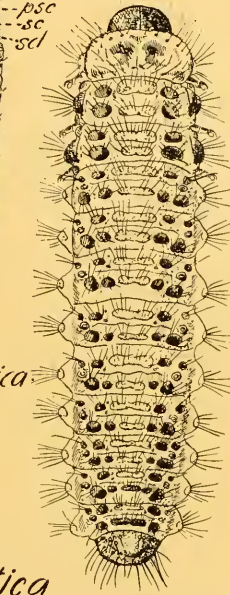


A. *Galeruca*



B. *Serris*

C. *Agelastica*



D. *Monoxia*

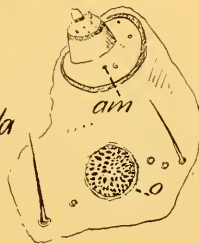


G. *Galeruca*

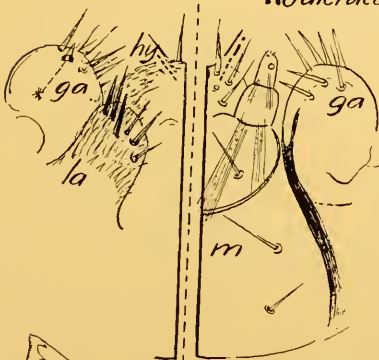


E. *Agelastica*

F. *Galerucella*



H. *Monocesta*



I. *Monocesta*



J. *Monocest.*



K. *Monocesta*



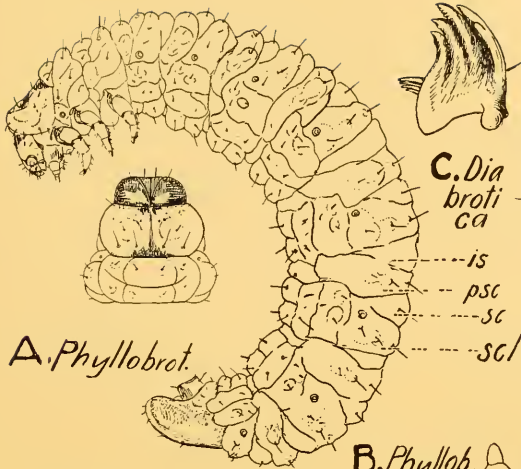
L. *Monocesta*

M. *Monocesta*

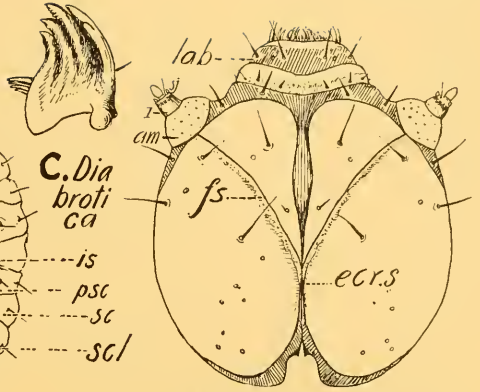
PLATE 111

Galerucidae-Diabroticinae

- A. *Phyllobrotica quadrimaculata* L.
 (Denmark): Head, prothorax and mesothorax. Dorsal view.
- B. “ “ : Larva. Lateral view.
- C. *Diabrotica duodecimpunctata* Fab. : Left mandible. Ventral view.
- D. “ “ : Head capsule. Dorsal view.
- E. *Phyllobrotica quadrimaculata* : End of abdomen. Dorsal view.
- F. *Diabrotica duodecimpunctata* : Pulvillus on posterior side of tarsungulus.
- G. “ “ : Ventral mouthparts. Dorsal view (left figure); ventral view (right figure).
- H. *Diabrotica longicornis* Say : End of abdomen. Dorsal view.
- I. *Diabrotica duodecimpunctata* : End of abdomen. Dorsal view.
- J. *Diabrotica vittata* F. : End of abdomen. Lateral view.
- K. *Diabrotica duodecimpunctata* : Anterior part of larva. Lateral view.
- L. *Diabrotica vittata* : End of abdomen. Dorsal view.
- M. *Exosoma lusitanica* L. (Marocco) : Anterior part of larva. Lateral view.



A. *Phyllobrot.*



C. *Diabrotica*

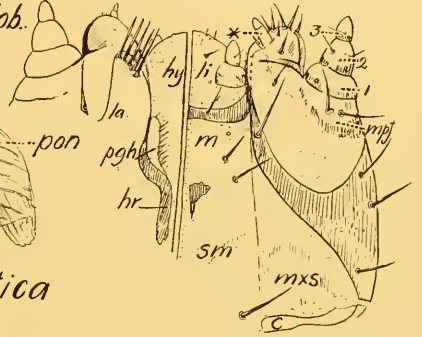
D. *Diabrotica*



E. *Phyllobrotica*



B. *Phyllob.*

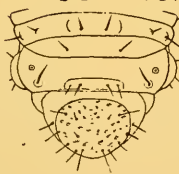


F. *Diabrotica*

G. *Diabrotica*



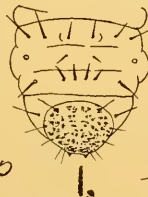
K. *Diabrotica*



H. *Diabrotica*



M. *Exosoma*



L. *Diabrotica*

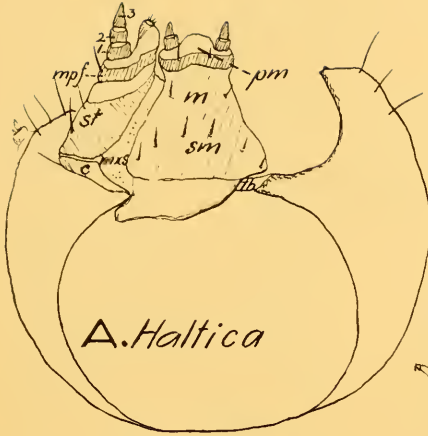


J. *Diabrotica*

PLATE 112

Galerucidae-Halticinae

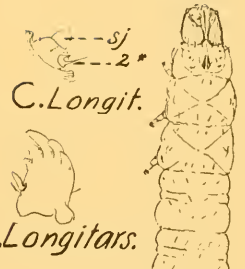
- A. *Haltica bimarginata* Say : Head. Ventral view.
 B. " " : Left maxilla.
 C. *Longitarsus menthaphagus* Gentner: Antenna.
 D. " " : Left mandible.
 E. " " : Peglike appendix of galea.
 F. " " : Distal end of maxilla.
 G. *Chaetocnema (denticulata* Ill.?) : Anterior part of larva.
 H. *Longitarsus menthaphagus* : Anterior part of larva.
 I. " " : Larva. Dorsal view.
 J. *Phyllotreta armoraciae* Koch
 (Denmark) : Anterior part of larva.
 K. *Chaetocnema (denticulata*?) : Larva. Dorsal view.
 L. *Blepharida rhois* Forst. : Spiracle.
 M. *Psylliodes chrysocephala* L. : Head. Dorsal view.
 N. " " : Larva. Lateral view.
 (Copy from figure by
 George H. Carpenter,
 1906).
 O. *Blepharida rhois* : Right maxilla.
 P. *Phyllotreta armoraciae* : Posterior end of body.
 Dorsal view.
 Q. *Blepharida rhois* : Mandible.
 R. " " : Larva; notice the dorsal
 position of anus as in
Crioceris (pl. 109G).
 R.* " " : Sucking disk; without an
 anal opening in the
 center.



A. *Haltica*



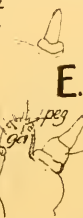
B. *Halt.*



C. *Longit.*



D. *Longitars.*



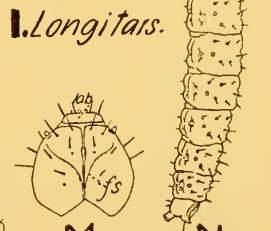
E. *Lon.*



F. *Long.*



H. *Longitarsus*



I. *Longitars.*



G. *Chaetocnema*



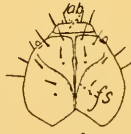
K. *Chaeto.*



L. *Blephar.*



M. *Psylliodes*



N.

J. *Phyll.*



P. *Phyllotreta*



Q. *Blepharida*



O. *Blep.*

R. *Blepharida*

R*.

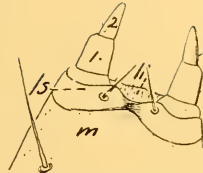
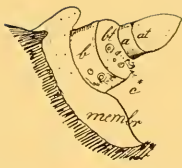
PLATE 113

Galerucidae-Halticinae

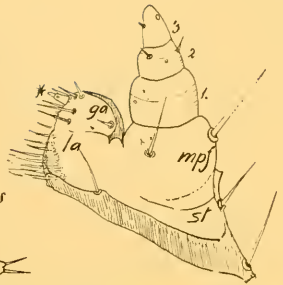
- A. *Oedionychis gibbitarsa* Say : Antenna; a, ring shaped sclerome at base of the tactile appendix; at, membranous part of tactile appendix; b, first antennal joint; c, rudiment of second joint.
- B. " " : Tip of labium.
- C. " " : Distal part of maxilla.
- D. " " : Eighth and ninth abdominal segments. Dorsal view.
- E. " " : Larva. Lateral view.
- F. " " : Mandible. Ventral view.
- G. " " : Last abdominal segments. Ventral view.
- H. *Disonycha xanthomelaena* Dalm. : End of body. Lateral view.
- I. *Phydanis bicolor* Horn. : Head. Dorsal view.
- J. *Mantura floridana* Cr. : Left mandible.
- K. " " : Tip of maxillary mala with peg indicating galea, lacinia absent.
- L. *Phydanis bicolor* : Eighth and ninth abdominal segments. Dorsal view.
- M. *Mantura floridana* : Tip of leg.
- N. *Phydanis bicolor* : Larva. Lateral view.
- O. *Mantura floridana* : Larva. Lateral view.
- P. " " : Ventral mouthparts.
- Q. " " : Larva. Dorsal view.
- R. *Argopistes scyrtoides* Lec. : Mandible. Buccal view.
- S. " " : Head. Dorsal view.
- T. " " : Thorax and first abdominal segment. Dorsal view.
- U. " " : Thorax and first abdominal segment. Ventral view.
- V. " " : End of body. Ventral view.
- X. " " : Ventral mouthparts.



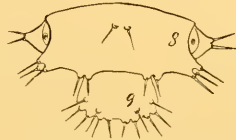
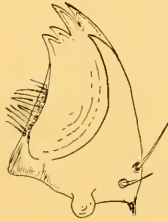
A. *Oedionychis*



B. *Oedionychis*

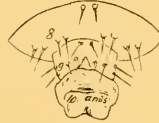


C. *Oedionychis*



D. *Oedionychis*

F. *Oedionychis*



G. *Oedionychis*



E. *Oedionychis*



L. *Phydanis*



M.

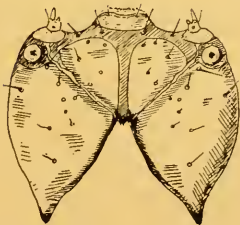
H. *Disonycha*

K. *Mant.*



G. *Mant.*

N. *Phydanis*



S. *Argopistes*



O. *Mantura*



R. *Argo*



U.

P. *Mantura*



V.



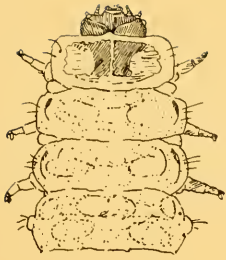
X. *Argopistes*

T. *Argopistes*

PLATE 114

Galerucidae-Halticinae

- A. *Dibolia cynoglossi* Koch
 (Denmark) : Antenna.
- B. " " : Anterior part of body. Dorsal view.
- C. " " : Left mandible. Ventral view.
- D. " " : Posterior end of body. Dorsal view.
- E. *Dibolia borealis* Chev. : Posterior end of body. Dorsal view.
- F. *Dibolia cynoglossi* : Anterior end of body. Ventral view.
- G. " " : Head. Dorsal view.
- H. *Dibolia borealis* : Head. Ventral view.
- I. *Sphaeroderma testaceum* F.
 (Denmark) : Head; notice shape of frons and large ocelli. Dorsal view.
- J. *Sphaeroderma testaceum* F. : Leg.
- K. " " : Antenna.
- L. " " : Larva. Dorsal view.
- M. " " : Left mandible. Ventral view.
- N. " " : Ventral mouthparts. Ventral view.
- O. " " : Mala maxillaris.



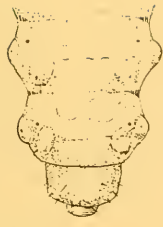
B. *Dibolia*



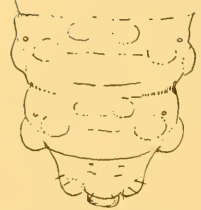
A. *Dibol.*



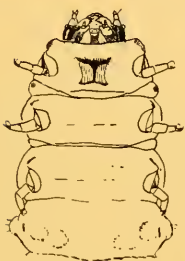
C. *Dibolia*



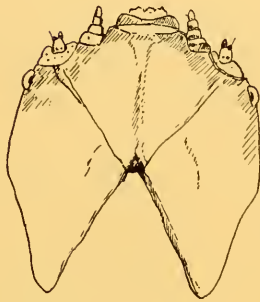
D. *Dibolia*



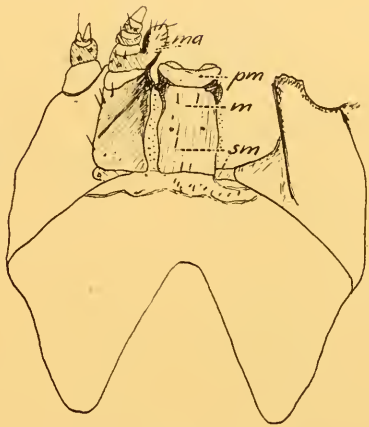
E. *Dibolia*



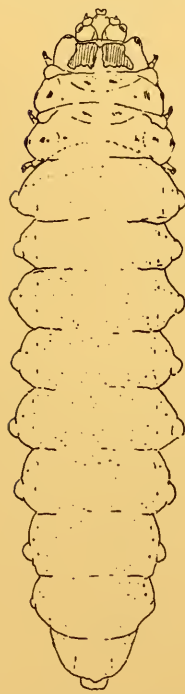
F. *Dibolia*



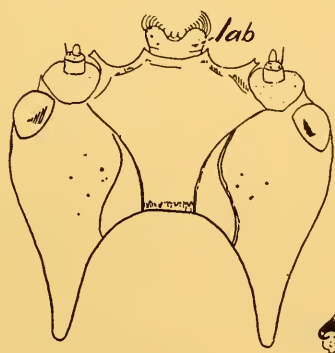
G. *Dibolia*



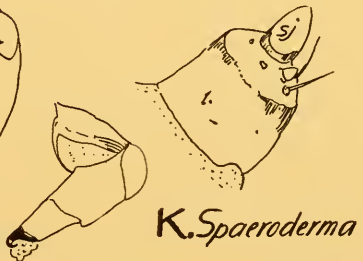
H. *Dibolia*



L. *Sphaeroderma*



I. *Sphaeroderma*



J. *Sphaeroderma*



M. *Sphaer.*



N. *Sphaer.*



O. *Sphaer.*

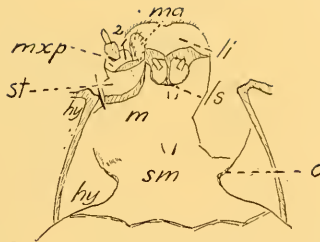
PLATE 115

Hispidae

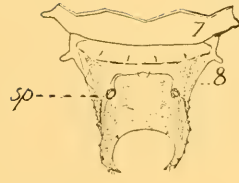
- A. *Bronthispa frogatti* Sharp
 (Solomon Isl.): Right mandible. Ventral view.
- B. " " : Ventral mouthparts. Ventral view.
- C. " " : Posterior end of abdomen. Dorsal view.
- D. *Chalepus ater* Weise : Eighth abdominal spiracle.
- E. *Bronthispa frogatti* : Head. Dorsal view.
- E.* " " : Ocelli. Lateral view.
- F. *Chalepus ater* : Mesothoracic leg.
- G. " " : Larva. Dorsal view.
- G.* " " : Ocelli. Lateral view.
- H. " " : Distal end of leg.
- I. *Octotoma plicatula* F. : Head. Dorsal view.
- I.* " " : Ocelli. Lateral view.
- J. *Areseus monoceros* Oliv.
 (Porto Bello, Panama): Larva. Dorsal view.
- K. *Octotoma plicatula* : Ventral mouthparts. Ventral view.



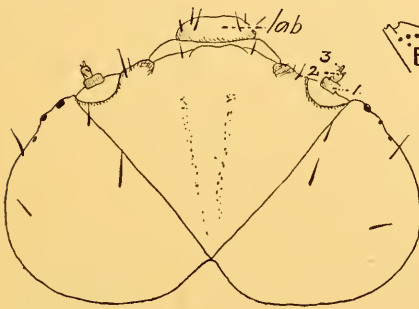
A. *Bronthispa*



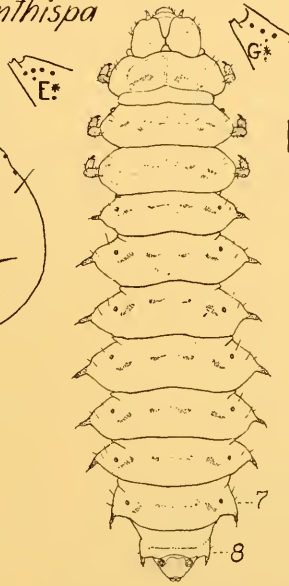
B. *Bronthispa*



C. *Bronthispa*



E. *Bronthispa*



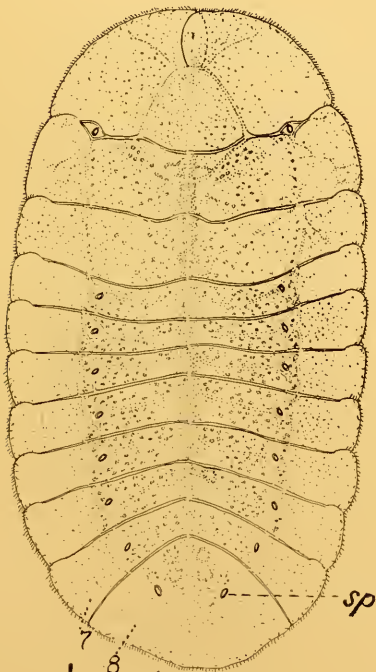
D. *Chalepus*



F. *Chalepus*

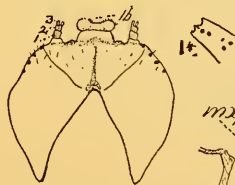


H. *Chalepus*

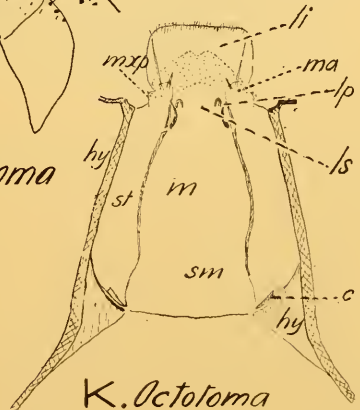


J. *Arescus*

G. *Chalepus*



I. *Octotoma*



K. *Octotoma*

PLATE 116

Cassididae

- A. *Eurypepla jamaicensis* L. : Head. Dorsal view.
 B. " " : Leg.
 C. " " : Right mandible. Ventral view.
 D. " " : Larva. Lateral view.
 E. " " : Spiracle.
 F. " " : Ventral mouthparts. Ventral view.
 G. *Cassida nebulosa* L. : Larva. Lateral view.
 H. *Porphyraspis cyanea* Say : Ball of excrement covering larva.
 I. " " : Detail of excrement strand.

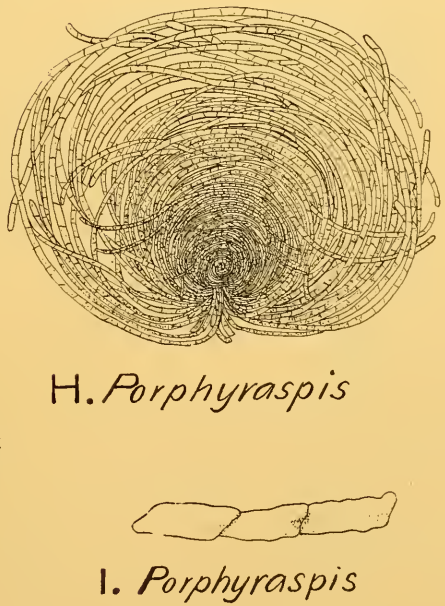
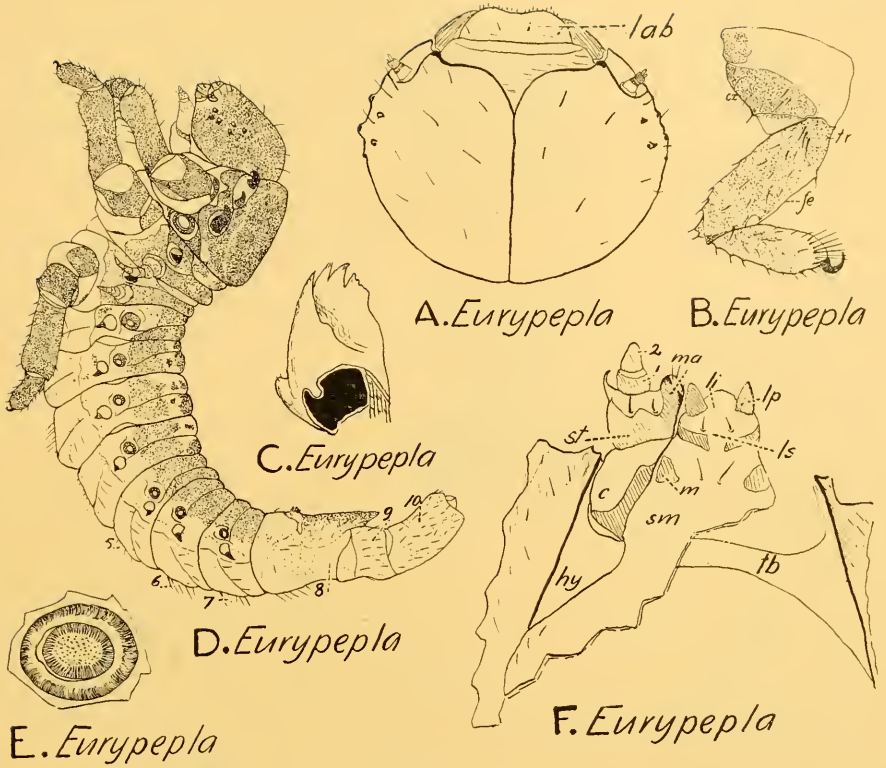
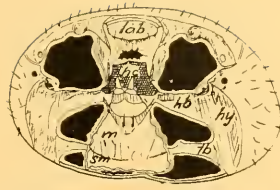


PLATE 117

Platystomidae-Brachytarsinae (A-K),

Platystomidae-Choraginae (L-Q)

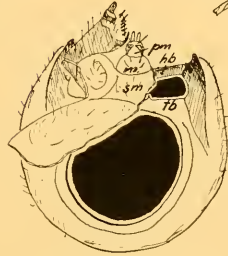
- A. *Euparius marmoreus* Oliv. : Head. Front view.
 B. " " : Abdominal spiracle.
 C. " " : Larva. Lateral view.
 D. " " : Head. Ventral view.
 E. " " : Epipharyngeal and hypopharyngeal regions. Lateral view.
 F. " " : Right mandible. Ventral view.
 G. " " : Right mandible. Dorsal view.
 H. *Brachytarsus limbatus* Say : Left mandible. Ventral view.
 I. *Eurymycter fasciatus* Oliv. : Antenna.
 J. " " : Distal end of maxilla.
 K. *Brachytarsus limbatus* : Right maxilla. Ventral view.
 L. *Araecerus fasciculatus* DeG. : Epipharynx.
 M. " " : Distal end of maxilla. Dorsal view.
 N. " " : Thoracic spiracle.
 O. " " : Larva; plb, pedal lobe. Lateral view.
 P. " " : Right mandible. Dorsal view.
 Q. " " : Antenna, ocellus, hypopharyngeal chitinization, labial palpus.



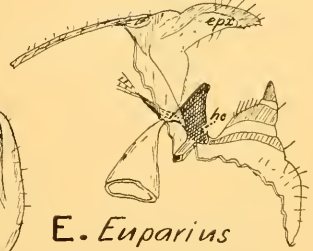
A. *Euparius*



B. *Euparius*

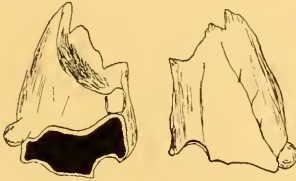


D. *Euparius*



E. *Euparius*

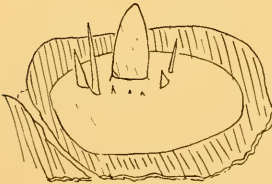
C. *Euparius*



F. *Euparius* G. *Euparius*



H. *Brachytarsus*



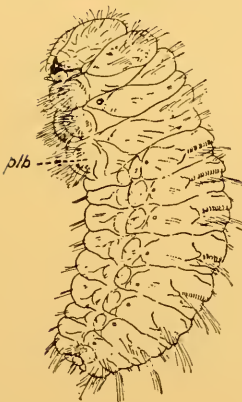
I. *Eurymycter*



J. *Eurymycter*



K. *Brachytarsus*



O. *Araecerus*



L. *Araecerus*



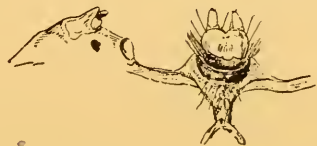
M. *Araecerus*



N. *Araecerus*



P. *Araecerus*



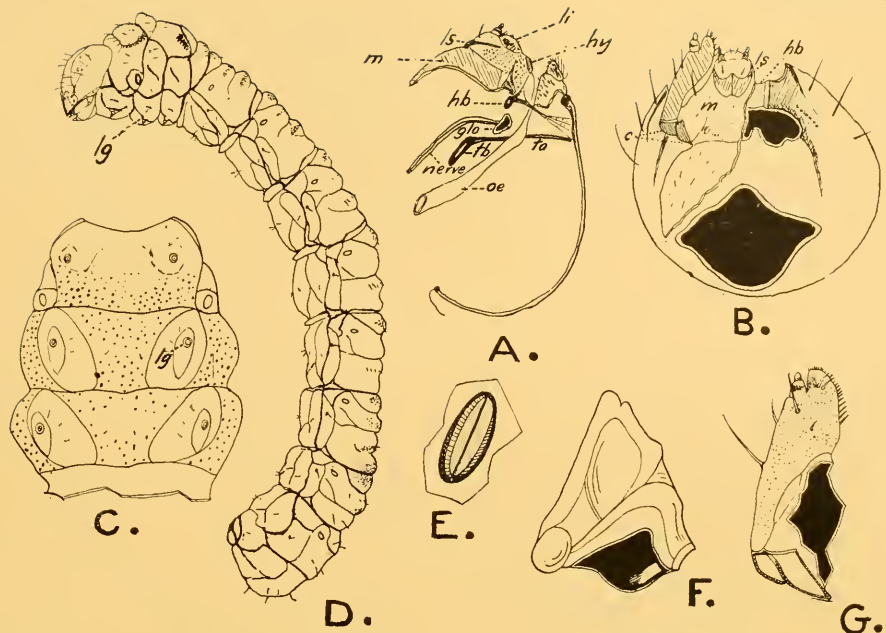
Q. *Araecerus*

PLATE 118

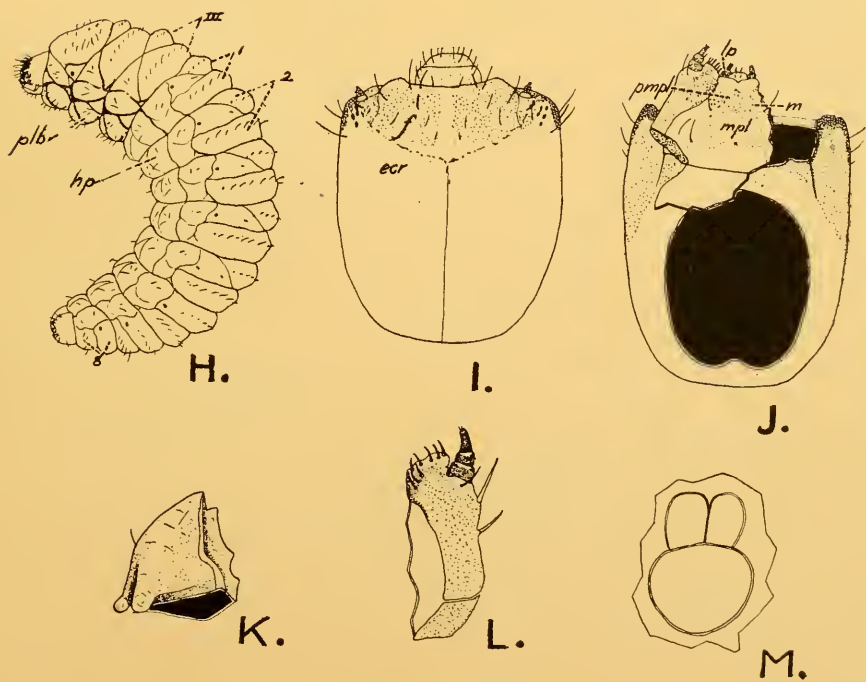
Brenthidae,

Attelabidae-Rhynchitinae

- | | | | |
|----|--------------------------|---|---|
| A. | <i>Eupsalis minuta</i> | Drury (changed
in Junk Col. Cat., 1927, by R.
Kleine to <i>Platysystrophus mi-
nutus</i> Drury) | : Diagrammatic section
through median region
of head. Sagittal cut. |
| B. | <i>Eupsalis minuta</i> | | : Head. Ventral view. |
| C. | " | " | : Thoracic segments. Ven-
tral view. |
| D. | " | " | : Larva. Lateral view. |
| E. | " | " | : Spiracle. |
| F. | " | " | : Right mandible. Ventral
view. |
| G. | " | " | : Right maxilla. Ventral
view. |
| H. | <i>Rhynchites aeneus</i> | Boh. | : Larva. Lateral view. |
| I. | " | " | : Head. Dorsal view. |
| J. | " | " | : Head. Ventral view. |
| K. | " | " | : Right mandible. Ventral
view. |
| L. | " | " | : Left maxilla. Ventral
view. |
| M. | " | " | : Spiracle (outline). |



Enpsalis

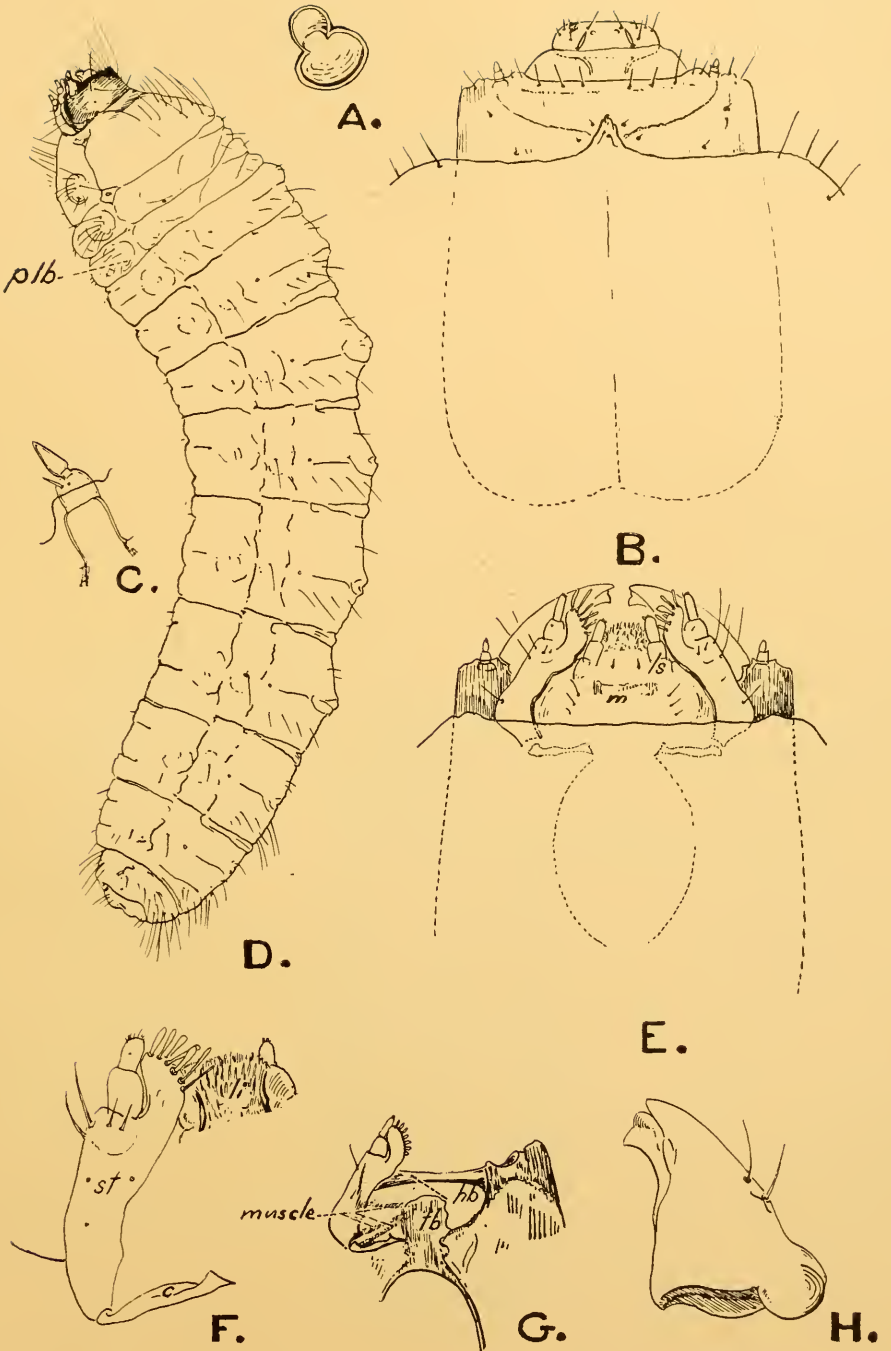


Rhynchites

PLATE 119

Proterhinidae

- | | | | | |
|----|-------------|------------|------------------|---|
| A. | Proterhinus | anthracias | Perkins | |
| | | | (Kauai; Hawaii): | Mesothoracic spiracle. |
| B. | " | " | | : Head. Dorsal view. |
| C. | " | " | | : Antenna. |
| D. | " | " | | : Larva. Lateral view. |
| E. | " | " | | : Head. Ventral view. |
| F. | " | " | | : Right maxilla. Ventral view. |
| G. | " | " | | : Hypopharyngeal bracon, tentorium and right maxilla. |
| H. | " | " | | : Left mandible. Ventral view. |



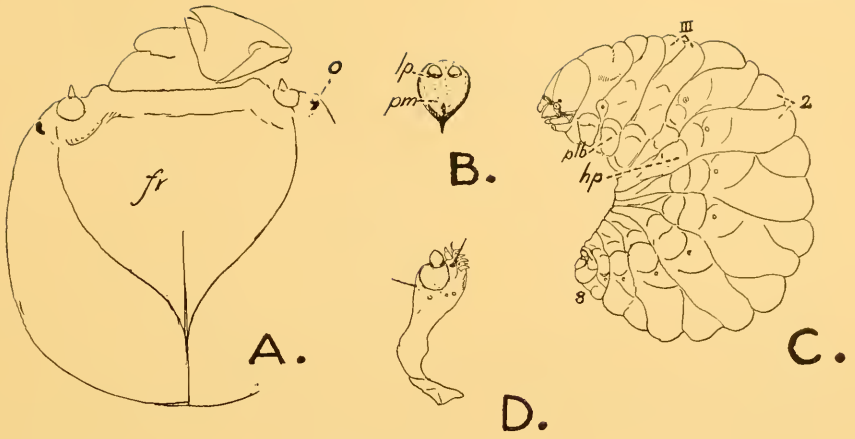
Proterhinus

PLATE 120

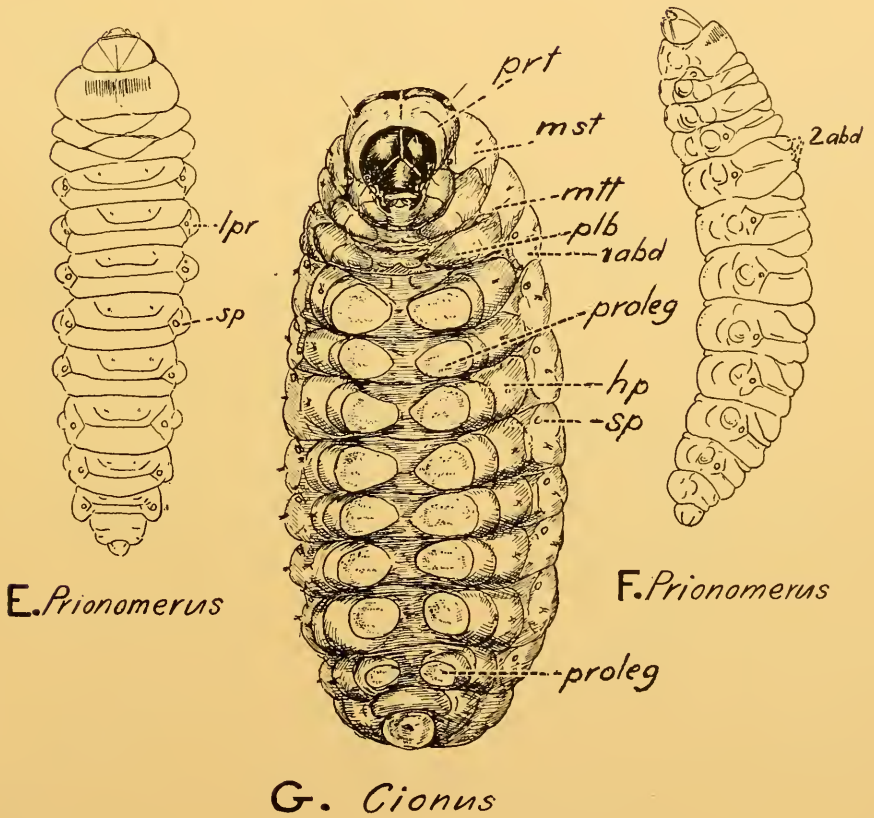
Apionidae (A-D),

Curculionidae-Curculioninae (E-G)

- A. *Podapion gallicola* Riley : Head. Dorsal view.
B. " " : Prementum with labial palpi.
C. " " : Larva. Lateral view.
D. " " : Right maxilla. Ventral view.
E. *Prionomerus calceatus* Say : Larva; lpr. lateral process.
Dorsal view.
F. " " : Larva. Lateral view.
G. *Cionus scrophulariae* L.
(Denmark) : Larva. Ventral view.



Podapion



E. Prionomerus

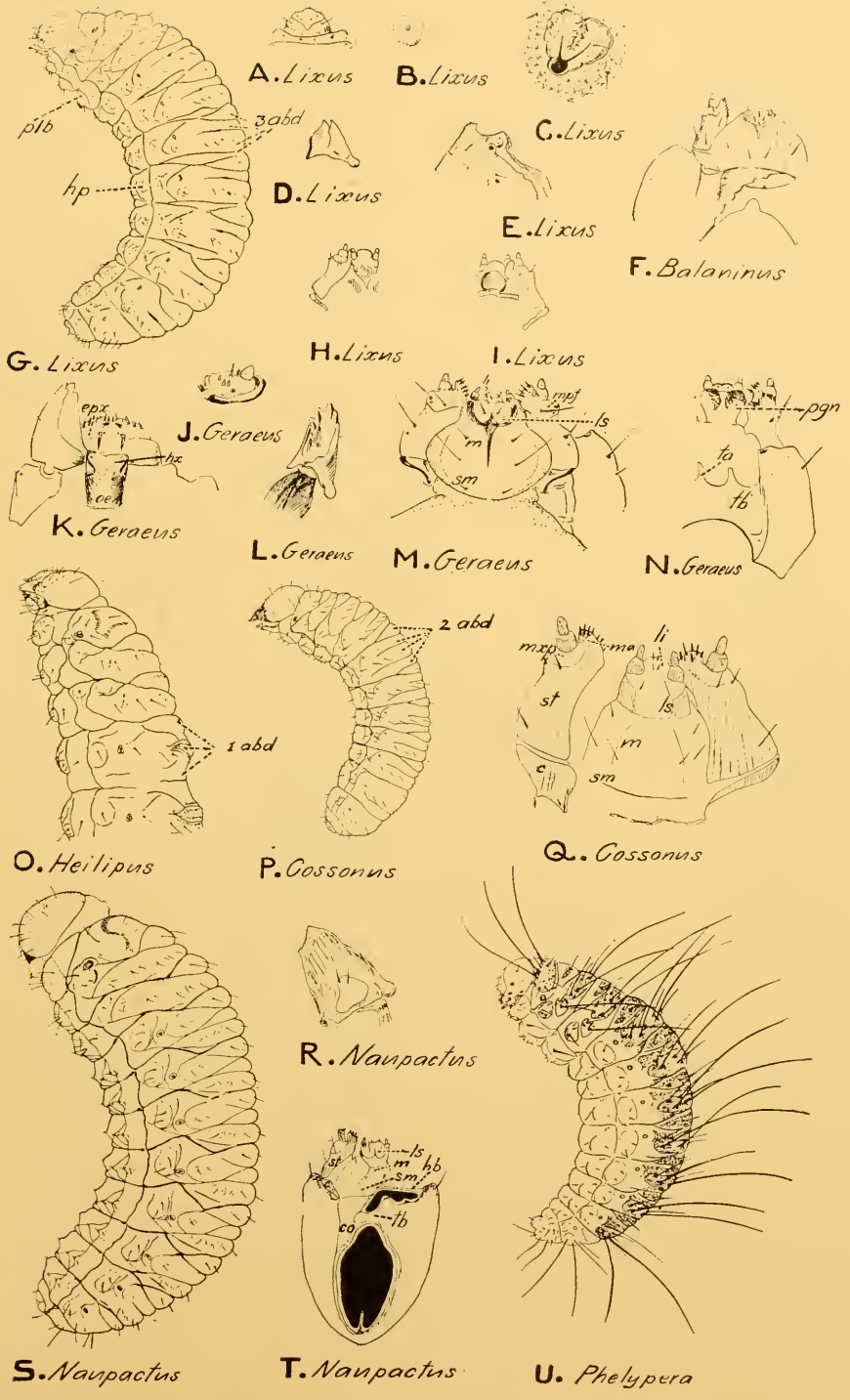
F. Prionomerus

G. Cionus

PLATE 121

Curculionidae

- A. *Lixus scrobicollis* Boh. : Labrum and clypeus.
 B. " " : Antenna.
 C. " " : Abdominal spiracle.
 D. " " : Left mandible. Ventral view.
 E. " " : Antenna and two ocelli.
 F. *Balaninus* sp. : Ventral mouthparts and tentorium. Ventral view.
 G. *Lixus scrobicollis* : Larva. Lateral view.
 H. " " : Ventral mouthparts. Ventral view.
 I. " " : Ventral mouthparts. Dorsal view.
 J. *Geraeus penicellus* Herbst. : Antenna.
 K. " " : Epipharynx, hypopharynx, mandible from below, and oesophagus.
 L. " " : Mandible. Buccal view.
 M. " " : Ventral mouthparts. Ventral view.
 N. " " : Ventral mouthparts and hypopharyngeal region.
 O. *Heilipus perseae* Barber
 (Panama, C. Z.) : Anterior part of larva. Lateral view.
 P. *Cossonus* sp. (Hopk. U. S.
 10079j) : Larva. Lateral view.
 Q. " " : Ventral mouthparts. Ventral view.
 R. *Nanpactus* sp. (Chili) : Right mandible. Exterior view.
 S. " " : Larva. Lateral view.
 T. " " : Head; eo, skin connecting head and prothorax. Ventral view.
 U. *Phelypera distigma* Boh.
 (Guatemala) : Larva. Lateral view.

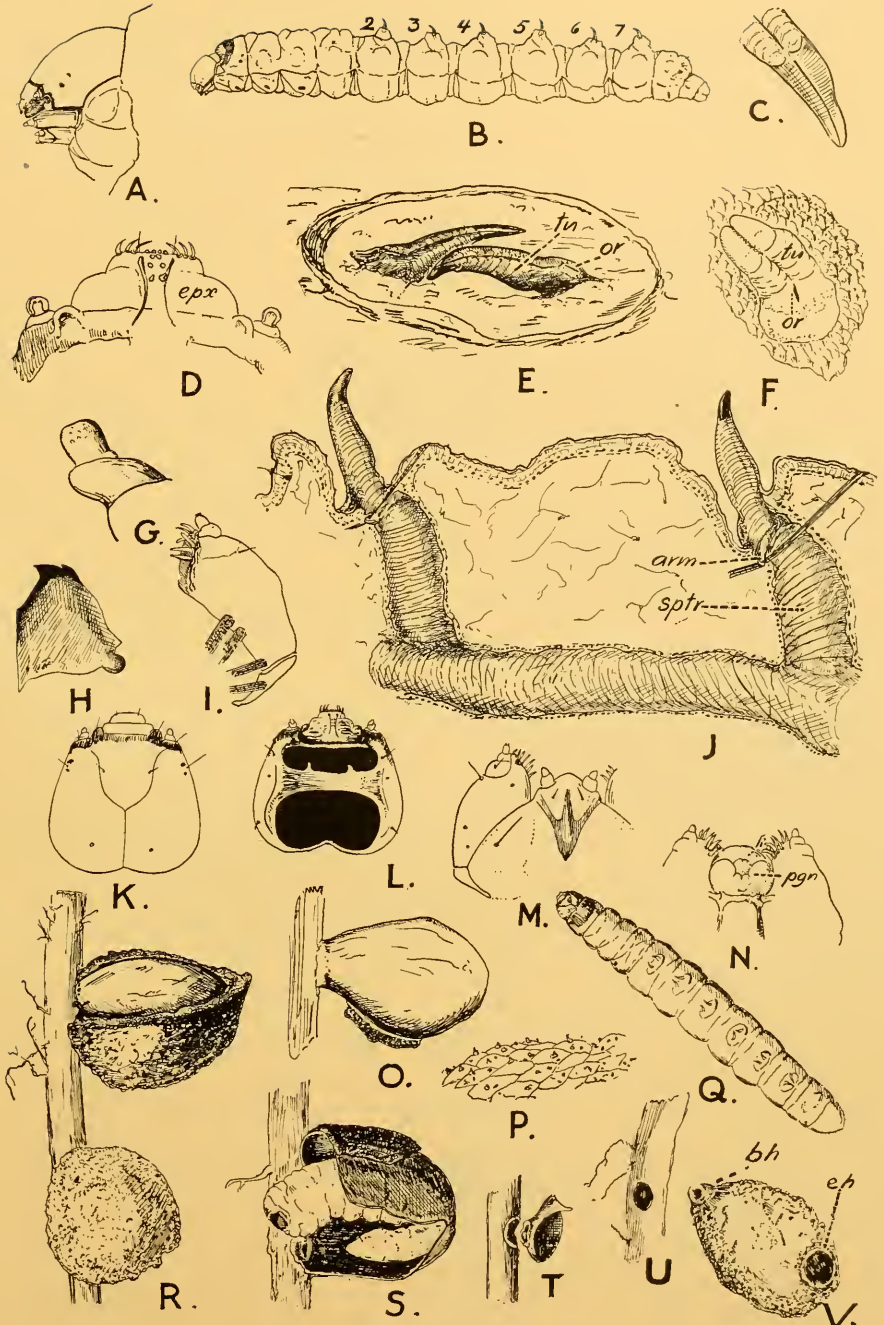


LARVAL FORMS OF COLEOPTERA

PLATE 122

Curculionidae-Lissorhoptrinae

- A. *Lissorhoptrus simplex* Say : Head. Lateral view.
 B. " " : Larva, showing a pair of hook-shaped spiracles on the back of second to seventh abdominal segments. Lateral view.
 C. " " : Apex of dorsal spiracular hook.
 D. " " : Epipharynx.
 E. " " : A pair of spiracular hooks. Dorsal view.
 F. " " : Eighth abdominal spiracle; not freely projecting.
 G. " " : Antenna.
 H. " " : Left mandible. Ventral view.
 I. " " : Right maxilla. Buccal view.
 J. " " : Spiracular hooks; tracheal branch to spiracle (sptr); tracheal stem and closing apparatus.
 K. " " : Head. Dorsal view.
 L. " " : Head. Ventral view.
 M. " " : Ventral mouthparts.
 N. " " : Hypopharyngeal region.
 O. " " : Cocoon with mud cover removed.
 P. " " : Epidermis from which the cocoon is exudated.
 Q. " " : Larva. Dorsal view.
 R. " " : Two cocoons; one with mud cover removed from upper half.
 S. " " : Cocoon opened to show the larva in position and completely clean after having exudated the cocoon; notice the breathing hole gnawn into the submerged rice stem.
 T. " " : Hole in stem and cocoon.
 U. " " : Hole on side of stem.
 V. " " : Cocoon showing breathing (bh) and emergence (eh) holes.



Lissorhoptrus

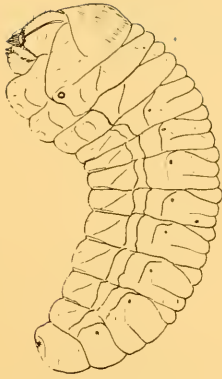
PLATE 123

Scolytidae (A-E),

Calendridae (F-H),

Platypodidae (I-P)

- A. *Scolytus muticus* Say : Larva. Lateral view.
 B. " " : Right mandible. Interior view.
 C. " " : Mesothoracic spiracle.
 D. " " : Head. Anterior view.
 E. *Dendroctonus valens* Lee. : Larva. Lateral view.
 F. *Sitophilus granarius* L.
 (= *Calendra granaria* L.)
 (Drawn by R. T. Cotton) : Hypopharyngeal region and
 ventral mouthparts. Buccal
 view.
 G. *Sitophilus granarius*
 (Drawn by R. T. Cotton) : Spiracle.
 H. *Sitophilus granarius* :
 (Drawn by R. T. Cotton) : Larva. Lateral view.
 I. *Platypus compositus* Say : Antenna.
 J. " " : Left mandible. Ventral view.
 K. " " : Larva. Lateral view.
 L. " " : Head. Dorsal view.
 M. " " : Mesothoracic spiracle.
 N. " " : Ventral mouthparts. Ventral
 view.
 O. " " : Head; mouthparts detached.
 Ventral view.
 P. " " : Right maxilla. Dorsal view.



A. *Scolytus*



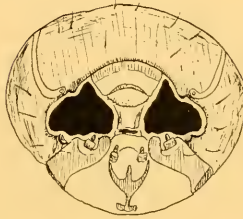
B. *Scolytus*



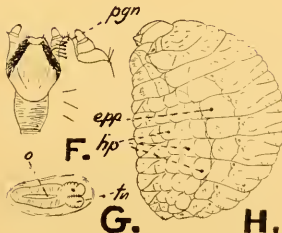
C. *Scolytus*



E. *Dendroctonus*



D. *Scolytus*



Sitophilus



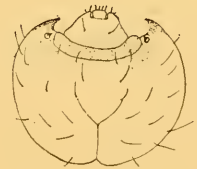
K. *Platypus*



I. *Platypus*



J. *Platypus*



L. *Platypus*



M. *Platypus*



N. *Platypus*



O. *Platypus*



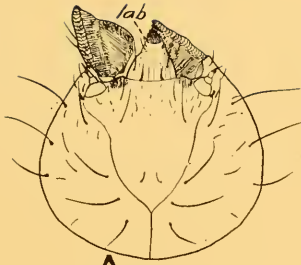
P. *Platypus*

PLATE 124

Lymexylidae-Lymexylinae,

Lymexylidae-Hylecoetinae (H. L)

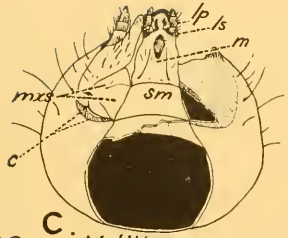
- | | | | | | |
|----|------------|----------|---------|---|-----------------|
| A. | Melittomma | sericeum | Harris: | Head. | Dorsal view. |
| B. | " | " | | : Abdominal spiracle. | |
| C. | " | " | | : Head. | Ventral view. |
| D. | " | " | | : Left maxilla. | Dorsal view. |
| E. | " | " | | : Hypopharyngeal region and
ventral mouthparts. | Dorsal
view. |
| F. | " | " | | : Right mandible. | Ventral view. |
| G. | " | " | | : Leg. | |
| H. | Hylecoetus | lugubris | Say | : Left maxilla. | Dorsal view. |
| I. | Melittomma | sericeum | | : Left maxilla. | Lateral view. |
| J. | " | " | | : Tibia and tarsungulus. | |
| K. | " | " | | : Prothorax and mesothorax.
Ventral view. | |
| L. | Hylecoetus | lugubris | | : Posterior end of abdomen; eppl,
epipleural lobe. | |
| M. | Melittomma | sericeum | | : Larva. | Lateral view. |



A. *Melittomma*



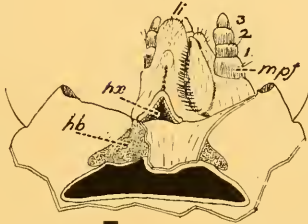
B. *Melittomma*



C. *Melittomma*



D. *Melittomma*



E. *Melittomma*



F. *Melittomma*



G. *Melittomma*



H. *Melittomma*



I. *Melittomma*



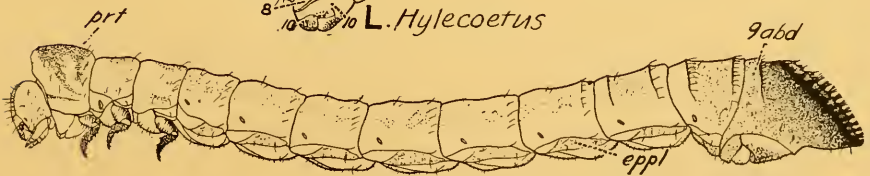
J. *Melittomma*



K. *Melittomma*

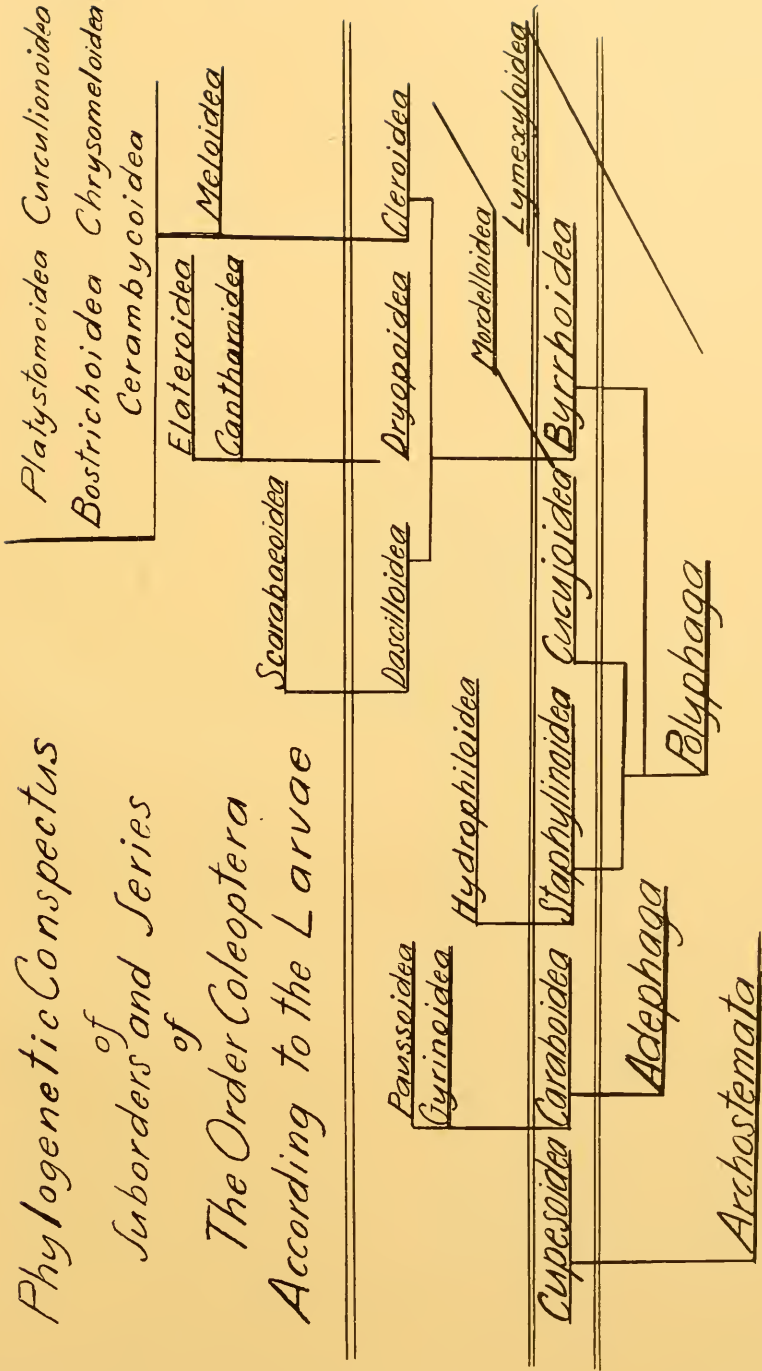


L. *Hylecoetus*



M. *Melittomma*

Phylogenetic Conspectus
of
Suborders and Series
of
The Order Coleoptera
According to the Larvae





LARVAL FORMS OF COLEOPTERA

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LIST OF ERRATA

(The changes should be made before using the book.)

Page 8, line 9. Insert before "the series Bostrichoidea": and from hypothetical cleroid ancestors or possibly directly from the Byrrhoidea may originate.

Page 8, line 27. For Melandryidae read: Synchronoidae.

Page 9, line 7. For paragnathal read: maxillular.

Page 11, line 5. For individually read: usually.

Page 11, footnote 8. Insert before "some": Hydroscapha.

Page 12, footnote 14. For the entire footnote as it stands read: The larvae of the Catogenidae (pl. 33) are readily distinguished by their physogastric body, the larvae of the Epilachninae (pl. 38) by long, branched dorsal and lateral spines and by multicuspitate mandibular apices in the mature larvae, and the larvae of the Lamiinae (pl. 100) by their elongate, fleshy body with short or no legs and by the presence of a broad, transverse bridge closing the headcapsule behind protracted ventral mouthparts.

Page 18, line 42. For Driptinae read: Dryptinae.

Page 20, section 6. For Driptinae read: Dryptinae.

Page 20, section 9. Insert after "simple": or with a small accessory process at base.

Page 21, line 4. For Maronetes read: Maronctus.

Page 24, line 12. Read: urogomphi almost absent
Cybisterinae.

Page 29, line 5. For Megarthus read: Megarthrus.

Page 36, section 22, second part. Omit: " , or large, elongate trapezoidal, movable, and with posterior condyle."

Page 38, line 9. For Murmediidae read: Murmidiidae.

Page 38, footnote 49. For Murmediidae read: Murmidiidae.

Page 39, section 37. For Anaspidae read: Anaspididae.

Page 47, section 4. For Homolisidae read: Homalisidae.

Page 47, section 5. For Malthinae read: Malthininae.

Page 54, section 26. For Cetonini read: Cetoniini.

Page 59, footnote 72. For Horniinae read: Horiinae.

Page 60, line 13. Insert after "melandryid genera": as well as to the Ciidae.

Page 61, section 3. For "clypeus filling space" read: clypeus never filling space.

Page 70. For Driptinae read: Dryptinae.

Page 76. For Malthinae read: Malthininae.

Page 124. Discard figure H on plate 19 as it does not show the serrations with which the mandible is armed on the dorsal and ventral margins of the inneredge.

Page 130, figures B and C. Insert after "head": ; ang. f. angulus frontalis.

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Page 138, figure B. Insert after "Head": ; a, articulating membrane of maxilla.

Page 180, line 2. For Anaspidae read: Anaspididae.

Page 200, figures K to N. For Gnathocerus cornutus F. read: *Uloa imberbis* Lec.

Page 227. Omit figures D and E. See figures by R. E. Blackwelder in Pan-Pacific Entomologist pp. 139-142, vol. 6, 1930.

Page 266, figure W. For Aspectus read: Apsectus.

ADDENDA

Page 15, footnote 20. For the entire footnote as it stands read: The systematic position of this series is uncertain. Its larval form approaches in important characters the larvae of the cucujoid family Oedemeridae but also appears to converge toward the larval form of the ancient suborder Archostemata. Giving serial rank to the group is in accord with the generally accepted views in regard to its phylogeny but from the larval form it could with equal rights be considered a mere family, Lymexylidae, of the series Cucujoidea. This latter classification can be expressed by altering and somewhat simplifying the parts of the keys relevant to the matter in the following way:

First alteration

Page 12. For section 10 as it stands read:

10. Distinct gula or gular structure present or absent; when absent, with mandibles possessing mola, or lacinia mandibulae, or retinaculum, or a long brush of hairs posteriorly on the inner margin, or extraordinary structures, except a pseudomola 11
Distinct gula or gular suture always absent, mandible either simple or possessing a pseudomola 20

Second alteration

Page 14. For section 18 as it stands read:

18. Ventral mouthparts as a rule retracted; when protracted¹⁷ possessing a mandible with either molar part, or retinaculum, or other appendices 19
Ventral mouthparts always protracted; mandible always simple without molar part, retinaculum or other appendices. (Head-capsule closed posteriorly by a broad, transverse bridge separating the subfacial region of head from ventral region of prothorax) 20

Cerambycoidea (p. 60)
(except cerambycoid subfamily *Disteniinae*, p. 15, line 4 and p. 62.)

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19. Maxillary mala simple or terminally slightly indented
Cucujoidea (p. 33)
Maxillary mala divided into a lacinia and a lobe-shaped
galea *Platystomoidea* (p. 66)

Third alteration

Page 15. Section 23 to be completely eliminated.

Fourth alteration

Page 40. For section 44 as it stands read :

44. Paired urogomphi present 45
Paired urogomphi absent 44b
44b. Ninth abdominal segment heavily sclerotized, either
cylindrical with obliquely truncate end (*Lymexy-*
linae), or elongate conical (*Hylecoetinae*)
Lymexylidae (pl. 124 A-M)
Ninth abdominal segment without sclerome
Oedemeridae-Oedemerinae (pl. 51 A-F)

Page 69. Insert :

- 1928: EMDEN, FRITZ VAN. Die Larve von *Phalacrus grossus*
Er. und Bemerkungen zum Larvensystem der *Clavi-*
cornia. Ent. Blätter, vol. 24, 1928, pp. 9-20.

