LARVAE OF COLEOPTERA
Reprinted from Entomologica Americana
Date of Issue: November 14, 1931

No. 2, pp. 81-160 (pls. 1-36 and explanations)
Date of Issue: December 7, 1931

No. 3, pp. 161-256 (pls. 37-84 and explanations)
Date of Issue: December 9, 1931

No. 4, pp. 257-351 (pls. 84-125 and explanations)
Date of Issue: December 21, 1931
AN ILLUSTRATED SYNOPSIS
of
THE PRINCIPAL LARVAL FORMS
of
THE ORDER COLEOPTERA

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Published by the
Brooklyn Entomological Society
Brooklyn, N. Y.
1931
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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: Adephaga
Suborder 3: Polyphaga

According to the views commonly held by entomologists, only two major divisions of Coleoptera, the Adephaga 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 Cucupidae 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 Cucupidae 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 Adephaga 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 Adephaga 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

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, Sidalis, 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 Staphylinoidae (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 inmaterial.

The primitive type of the Polyphaga is found in its most characteristic and original form in the series Staphylinoidae 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 Byrrhoidae (p. 43) represents a second distinct polyphagous type which, while primitive, is in some respects less primitive than the larva of the primitive Staphylinoidae. 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 Cucujoidae and the Staphylinoidae there can be no doubt. Rather isolated as the series Byrrhoidae 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 Byrrhoidae, supposedly through heteroecerid 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-
dactylidæ; 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 Cantharоidea and very likely a minor part of the Elateroidea have come; and from the dascillid family Dascillidae, the series Scarabaeoidea (p. 51) descends according to their larval forms through scarabaeoid families like the Trogidae and the Lucanidae.

With the eleroid 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 eleroid assemblage of families and series, attaching itself to the eleroid family Melyridae (p. 55), but there are on the other hand some reasons for considering the possibility that it might be related to the Cantharoida.

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 Cucujoida, 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. 4254-56), 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.
LARVAL FORMS OF COLEOPTERA

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 tarsi and one or two distinct claws; 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; 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.3

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 cecindelid genera (p. 18).

5 Several larvae as the staphylinid genera Philonthus and Bleddius, 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.
SERIES OR SUPERFAMILIES

The *Archostemata* includes one family series: A. Cupesoidea.
The *Adrpha* includes three family series: B. Caraboidea; C. Gyrinoidea; and D. Panssoidea.
The *Polyphaga* includes eighteen family series: E. Staphylinoidea; F. Hydrophilaloidea; G. Cenjioidea; H. Byrrhoidea; I. Dasculoidea; J. Dryopoidea; K. Caunteroidea; L. Elateroidea; M. Scarabaeoidea; N. Cleroidea; O. Meloidea; P. Mordeloidea; Q. Cerambycoidea; R. Bostrichoidea; S. Chrysomoidea; T. Platystomoidea; U. Curenionoidea; and V. Lyrmexyloidea.

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 claws present\(^6\) ......................................................... 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 absent\(^7\) ......................................................... 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) ......................................... *Gyrinoidea* (p. 24)

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\(^6\) 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.
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, 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 absent .......................................................... *Meloidea* (p. 58)

No hypermetamorphosis; 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 characters ................................................................................................................... 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, Seydmaenidae, 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 lamyrid 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 cribiform 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 cribiform and all lateral, or not cribiform 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 structures 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 Platyctemoidea 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) _12_

11. Maxillary articulating area either large or indistinct; when indistinct, mandible with mola, except in Catogenidae, Epilachninae and Lamiinae. _13_

Maxillary articulating area absent, or very small, or concealed by mentum, not large and cushioned; mandible without molar part. _14_

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 eercambyoid 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, Smiceripidae, 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).
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 cribiform; 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 labidomorph type; head capsule with deep subfacial sinus for reception of ventral mouthparts) ................. Elateroidea proper (p. 50-12)

Frontal sutures absent, except in Brachypsectridae and Lampyridae; both with piercing mandibles. (Mandible of the biting labidomorph type, or of the subulate type adapted for piercing and sucking; subfacial sinus present or absent\(^{16}\))

Cantharoida (p. 46)

\(^{15}\) Eurypogon, a type intermediate between the Dryopoidea and the elateroid family Cebrionidae, has no gills or appendices (pl. 69).

\(^{16}\) Sometimes with pseudocribriform spirales (pl. 78).
18. Ventral mouthparts retracted. (Mandibular molar part usually present) *Cucuoidea* (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

Hypopharyngeal sclerome present; mandible of the masticomorphotype with veritable molar structure. (Mentum and submentum well separated; head nutant)

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)

Ninth abdominal tergum without a pair of urogomphi or an unpaired spine

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; epieranial suture present and long, or absent through complete fusion of epieranial 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 tarsus, except in *Caenocara* where legs are vestigial, two-jointed, and soft) (pl. 101)

Tenth abdominal segment in front of anus without a pair of soft, oval lobes separated by a longitudinal groove

22. Hypopharyngeal bracon absent. (Frons usually distinct with converging frontal sutures; usually with distinct, four- or five-jointed, mentum and submentum, and gular area into a large common subfacial region (pls. 31, 32–34).

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 *Lyctus*, 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.)

\textit{Chrysomeloidea} (p. 63) and \textit{Disteniinae}

Hypopharyngeal bracon present. (Without jointed legs, except in Brenthidae where they are vestigial; mentum connected completely with maxillary stipites, except in Brenthidae; mala simple) \textit{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 \textit{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.

\textit{Lymexyloidea}\(^{20}\) (p. 67)

\(^{19}\) Legs are weak or vestigial without a tarsungular joint in the older larvae of Bruchidae 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 Oedemeridae and Calopidae, 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.)

Micromalthidae (pl. 2 A–J)

B. CARABOIDEA

Key to Families

1. Labial palpi latent; prementum and ligual fused into an unpaired anteriorly bilobed piece. (Retracted ventral mouthparts; one claw.)

Rhysodidae (pl. 3 A–J)

Labial palpi distinct and jointed

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)

4. Tenth abdominal segment developed as a pygopod for locomotory purpose

5. Tenth abdominal segment not developed as a pygopod


22a Peyerimhoff, P. de, Rev. d’Ent. vol. 22, 1903, pp. 80–84, one plate.
LARVAL FORMS OF COLEOPTERA

4. Two or three pairs of hooks present on tergum of fifth abdominal segment ........................................... \textit{Cinclinelidae}^{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 ........................................ \textit{Carabidae}^{23} (pl. 4 F–I)
Terminal setae of tarsus much longer than claws; retinaculum bicuspidate ........................................ \textit{Omocephalidae} (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 \textit{Haliplidae-Haliplinae} (pl. 5 F–H)
Spiracles all absent; branchial prolongations present; ninth and tenth abdominal segments fused into a bifurcate, terminal segment ........................................ \textit{Haliplidae-Peltodytinae}

7. Head nutant; mandible falcate and simple; eighth abdominal spiracle absent. (Gills present below anterior part of body.) \textit{Hygrobiidae (Hygrobius)} (pl. 5 I, J, M)
Head prorect; mandible not simple; eighth abdominal spiracle terminal. (Gills rarely present) ................................................................. 8

8. Mandible with distinct retinaculum, inner margin neither sulcate nor tubular; legs fossorial \textit{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; gula\textsuperscript{24} present, subquadrate or triangular; gular suture double or anteriorly bifurcate ........................................ \textit{Dytiscidae}\textsuperscript{25} (pl. 6 A–H)
Prothoracic presternum transverse, narrow, and band-shaped; gula absent; gular suture median and simple. \textit{Amphizoidae} (pl. 7 A–H)

\section*{B.I. CICINDELIDAE}

\textbf{Key to Main Types of Larvae}

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

\textsuperscript{22b} Key to the main types of cicindelid larvae on pages 17–18.
\textsuperscript{23} Key to subfamilies of Carabidae on pages 18–23.
\textsuperscript{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.
\textsuperscript{25} Key to subfamilies of Dytiscidae on pages 23–24.
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, Ctenostaoma, 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 Loricerinae, 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 Loricerinae, 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 Cychrinae are closely related both
to the Carabinae and to the Chlaeniiinae, and between this latter subfamily and the Licininae 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 Dyschirinae, 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 bembidini 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, Amariniae, 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 1) 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 Amariniae 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)\(^{26}\)

   Ligula with setae

2. Tenth abdominal segment with two protrusile prominences carrying a series of scansional hooks; with a single exception, claws having a round or tooth-shaped enlargement at base.

   Dromiinae (Dromius, Demetrias, Euproctus, Calleida, Philophuga, Pilochionus, Cynindis, and Onota)

\(^{26}\)Brachinus jaunthinipennis 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 seapularis 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 scansional hooks; claws normal ...

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. Mandible multiserrate in front of retinaculum; nasale not projecting but armed with a transverse series of several sharp teeth of the same size; two claws of equal size; urogomphi immovable. Odacanthinae (Odacantha, Leptotrotachalus, and Cussonia (?)

Combination of the four characters different ...

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. 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 (Galvita)

Prementum without lateral setae. (Urogomphi not jointed, finely nodose) Nebriinae (Notiophilus, Pelophila, 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) Loricerinae (Loricera)

Dorsal shield of ninth abdominal segment distinct; ligula with a pair of setae; mandible without appendices and with inner corner projecting ...

8. Urogomphi fixed, short, strong, and pointed; prementum without lateral setae; stipes maxillaris subquadrate, depressed ...

9. Urogomphi different; prementum with lateral setae; stipes different ...

10. 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 Culosaicma, minute in most species of Carabus)

Carabinae (Culosoma, Carabus, Damaster, and Procerus)

20
LARVAL FORMS OF COLEOPTERA

Retinaculum with posterior margin serrate; urogomphi conical and simple; labial palpus with apical joint securniform. (Head small, body broad and oval)

*Cyprinae* (*Cyclus*, *Maronites*, and *Sphaeroderus*)

10. Two claws of equal size ...........................................11
One claw .................................................................13
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 conical ..........................................................12
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*)

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 *Anopthalmus*, none.)

*Bembidiinae* (*Asaphidion*, *Bembidion*, *Cilicenus*, *Tachys*, *Tachyta*, *Anopthalmus*, and *Trechus*)

Galea with proximal joint longer than the distal one ..........14

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

21
LARVAL FORMS OF COLEOPTERA

14. Lacinia present. (Ocelli absent; urogomphi jointed, with basal joint very long, the five distal joints small.)

\textit{Sphodrinae} (\textit{Sphodrus})\textsuperscript{29}

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.)

\textit{Broscinae} (\textit{Broscus})

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 \textit{Dyschirius}, or fairly long, with parallel sides, and united at base, in \textit{Clivina}. (Six ocelli or none.)

\textit{Dyschirininae} (\textit{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 \textit{Pasimachus}, or nodose and straight, in \textit{Scarites}) ........................................... \textit{Scaritinae} (\textit{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 \textit{Elaphrus}, or thick, cylindrical, and beset with numerous setae, in \textit{Blethisa}; four anal prominences. (Nasale extended into a short horn; with or without lacinia.)

\textit{Elaphrinae} (\textit{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 .......... \textit{Patrobatinae} (\textit{Patrobus})\textsuperscript{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 \textit{Sphodrop-}

\textsuperscript{29} This subfamily differs considerably from the Pterostichinae in which, according to the characters of the imagines, its only genus, \textit{Sphodrus}, has been placed between \textit{Pterostichus} and \textit{Laemostenus}, but it approaches, together with the \textit{Broscinae}, the great and well-defined bembidiiine association.

\textsuperscript{30} See explanatory remarks on page 19.
LARVAL FORMS OF COLEOPTERA

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* (*Hyphyrurus*, 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, Hybinus, 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 (Hydraticus and Dytiscus) (pl. 6 A. F, H)
   Head anteriorly dentate; ligula long; urogomphi absent.
   Cybistrinac

C. Gyrinoidea

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

D. Paussoida

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
LARVAL FORMS OF COLEOPTERA

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 Staphylinoidae (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, Sphaeriidae, and Sphaeritidae are either completely unknown or are at least not present in the United States National Museum. The Histeridae
has been included in our Hydrophiloidae (p. 31) and the Corylphidae placed in the Cucujoidae near the Phalacridae (p. 36) and Smicripidae (p. 36). The Micropeplidae is listed in the Staphylinoidae 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
   Limneciidae (Ochethebius, Hydrea, and Limnecius) (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
   Hydroscaphidae (pl. 9 A–F)
   Spiracles present; no balloonlike appendices; antenna three-jointed ................................................ 4
4. Apex of mandible multiserrate; urogomphi short, one-jointed
   Ptiliidae (Nossidium) (pl. 10 F–L)
   Apex of mandible bifid or trifid; urogomphi two-jointed, last joint often multiannuate...................... 5
5. Mandible with vestigial retinaculum (r).
   Leptinidae (pl. 10 A–E)
   Mandible with distinct retinaculum (r), or prostheca (Im),
   or both ........................................................................................................ 6
6. Asperities on molar structure covering entire ventral surface, irregularly arranged; paraglossae as long as ligula.
   Anisotomidae-Liodinæ 87 (pl. 11 A, B)
   Asperities on molar structure arranged in fine transverse (often few) rows; paraglossae absent or shorter than ligula.
   Anisotomidae - Cholevinæ 87 (pl. 11 C–M)
7. Mala and stipes fused ................................................................................................................ 8
   Mala jointlike, movable ............................................................................................................... 23

31 Except in Aphaobius, belonging to the Anisotomidae-Cholevinæ but very similar to the Leptinidae. (L. Weber, Allg. Ztsch. 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.)
   Platypyllidae (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) ..................................................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 base ........................................17

^32 The mala is crowned in several species of Bledius and in Symtonium 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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*Oxyteline association:*

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

*Staphylinidae-Piestinae* (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)  

17. Mandibles apically more or less widened, bifid or trifid, sometimes asymmetrical; number of ocelli on each side, three, one, or none

*Staphylinidae-Oxytelinae* (Blédius with termitiform body and three ocelli, Platystethus and Aploederus 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* (Gyrophaena with eighth abdominal segment terminally produced into a glandular process, Microgotta, Mascochara, 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

(Lepus and Silus with mandibles suddenly enlarged at base, Atheta, and many other genera)

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

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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-
Omaline association:

19. Maxillary mala fanglike, smooth, and as long as entire head. (Three or six ocelli on each side).

   *Staphylinidae-Proteininae (Proteinus and Megarthus)*\(^2\) (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 subtrapezoidal ................. *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 Omaliinae 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 bivittata* 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. Tidsskrift, 1929, pp. 133–170, four plates.)

\(^2\) 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 *Lathrinaeum* belonging to the Omaliiinae. (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-Thinopininae (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, Othis with none. Quedius in many species with club-shaped or capitate setae, Staphylinus, Philonthus, and other genera.)

Ocelli, five or six ........................................................................................................ 25

**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 Eu- micrus) (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 (Unio 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.
LARVAL FORMS OF COLEOPTERA

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 Staphylinoida according to the form of their maxillary palpigers 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 spiral terminal, sometimes poorly developed; usually with a terminal breathing pocket; occasionally with gills) ........................................... 3

2. Cardo fused with stipes; one ocellus (Epierus) 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 Epierus, 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) ...... ........  Histeridae⁴¹ (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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LARVAL FORMS OF COLEOPTERA

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.

*Spercheiidae* (*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* (*Hydrous, 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 I–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* (*Chactarthria, Coclostoma = Cyctonotum, Cereyon, etc.*) (pls. 23 C–F, I–P and 24 A–T)

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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, 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

Maxillary mala entire, sometimes bilobed anteriorly

3. Second antennal joint more than four times as long as the basal joint Lathridiidae, minor part (Enallia) (pl. 25 K, L)

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

4. Spiracles annular, not on tubes; urogomphi not distinct

Eucinetidae (pl. 26 A–H)

Spiracles biforous, on tubes; urogomphi strong

Derodontidae (pl. 27 A–H)

5. Mala falciform

Mala obtuse, or with inner margin irregularly jagged

6. Spiracles biforous

Spiracles annular

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)

Spiracles not on tubes; urogomphi terminally pointed and simple, or urogomphi absent. (Usually without paramedian processes)

8. Labial palpus one-jointed. (Tergal plates armed with series of chitinous tubercles with a small, fan shaped hair on the top) Monotomidae (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

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

The genus Smicrips, usually placed in the Monotomidae, constitutes a separate family, Smicripidae (p. 362), near the Phalaracridae 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** (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** (pl. 30 A–J)

Antenna with three well-developed normal segments ................................................................. Silvanidae-Telephaninae** (pl. 30 K–O)

13. Tenth abdominal segment long and conical

Cucujidae-Brontinae (= Hyliotinae)** (pl. 31 L)

Tenth abdominal segment short and wart-shaped ........................................................................ 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 Deretaphris, 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** (pl. 33 A–H)

Different development of some, or all, of the four characters

16. Maxillae appearing protracted in front of the mandibular

**The family Languriidae is usually considered as a subfamily of the Erotylidae. See also footnote**.

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articulations by a complete or partial elimination of the cardines 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 elyopeus 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) Laemophloeidae (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) Catogenidae (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, Dedrophagus, and Psammoecus),
b. Cucujidae-Cucujinae (including the genera Cucujus, Pediacus, and Platisus),
c. Prostomidae (including the genera Prostomis and Dryocora),
d. Laemophloeidae (including the genera Prostomini, Nartheicus, Lathropus, Laemophloeus, Dysmerus, Hemipeplus, Inopephis, 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. (Submentum-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.
(Submentum-gular plate present and distinct) Smicripidae43 (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 subcylin-

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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drical, without uncus on middle of inner margin; adhesive tarsungular hair present and twice as long as tarsungulus itself. (Palpiger large, somewhat jointlike; labrum fused with clypens; urogomphi reduced to a pair of wart-shaped tubercles) ...................................... Nitidulidae - Meligethinae\textsuperscript{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 tarsungular 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 tarsungular 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)\textsuperscript{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\textsuperscript{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\textsuperscript{49} (pl. 41 F, H-M)

Mentum not well developed, often fused with submentum, only free apically .......................................................... 28

28. Mandible with large, multiterbulate or multiterininate molar structure; cardo proper distinct and subtriangular. (Body

\textsuperscript{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).

\textsuperscript{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 Sup. Agr. Portici, vol. 4, 1910, pp. 221-227; 13 figures referring to the larva).
LARVAL FORMS OF COLEOPTERA

often with numerous fan-shaped, spinulose, or otherwise uncommonly formed, small hairs; juxta-cardo present) 29
Mandible without large, multituberculate or multiarinate molar structure ................................................. 31

29. Body cheloniform, similar to that 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* (pl. 27 I–L)

Body different. (Maxillary mala with or without a terminal brush)

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* (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* (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; juxta-cardo absent; with or without lacenia mandibulae; three ocelli present on each side of head, except in the blind termitophilous larva of *Ortalisites rubidus* Gorham, from Barro Colorado island, Canal Zone, Panama)

*Coccinellidae - Coccinellinae* (pls. 37 H–L and 38 A–T)

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 lacenia 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 Staphylinoidea.

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

Evoleytidae50 (pl. 41 A–E, G)

34. Mentum and submentum not fused

Daenidae50 (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) ..................... Melandryidae50 (pl. 43 A–Z, AE)

35. Body terminating in a deciduous ovate appendix

Scraptidae50 (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

Byturidae51 (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 - Anaspidae51 (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 Daenidae, the genus Scraptia which forms a separate family, Scraptidae, 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

39
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. Mandible without molar structure. (Larva parasitic and physogastric)  
*Bothrioderidae*  
(pl. 44 F–N)  
Mandible with molar structure  
40. Larva elongate, cylindrical or subcylindrical, or more fusiform.  
(Body well chitinized or fleshy; urogomphi present and corniform, or absent)  
Larva elongate and strongly depressed with parallel sides.  
(Body smooth and shining; urogomphi always present and often of very distinctive shape)  
41. Cardo simple  
42. Cardo divided into two parts  
43. 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, *Monocodini*)  
(pl. 49 A–M)  
Hypopharynx with a sclerome at base; mandible asymmetrical  
44. 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  
45. Urogomphi present  
Urogomphi absent. (Paired ambulatorial warts usually well-developed dorsally and ventrally on anterior body segments; mandibles asymmetrical)  
*Oedemeridae–Oedemerinae* (pl. 51 A–F)  
46. 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.
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)

Cephaloidae (pl. 52 J-L, X, O)

Submentum and gula fleshy. (Urogomphi corniform, strongly chitinized and curved upward)

Zopheridae (Zopherus, Zopherodes, Phelopsis and Phloeodes) 52a (pl. 52 F-I, M)

48. Urogomphi simple, corniform, and curved upward; spiracles annular-biforous .......... Synchroidae (Synchroa) 50 (pl. 52 A-E)

Urogomphi with a branch at base; spiracles annular

Pedilidae (Eurygenins) (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 (Rhinosimus) 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 ............. Pyrochroidae (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,
52. Ninth abdominal segment dorsally with a continuous row of small dark tubercles on the urogomphi and on the space between them. (Each urogomphus with or without a toothlike spine on insideside) *Pythiidae* (pl. 54 I–O)

Ninth abdominal segment without a continuous row of tubercles; only with two small tubercles proximally on dorsal side of each urogomphus. (Each urogomphus with a large, toothlike spine medianly on insideside) *Othniidae* (= Elacatidae) (pl. 47 J–R)

53. Antenna contiguous to mouth frame. (Prothoracic legs frequently larger and thicker than those of meso- and metathorax, prothoracic coxae usually contiguous) 54

Antenna inserted some distance in from mouth frame. (Prothoracic legs not larger and thicker than the other legs, and coxae not contiguous) 56

54. Back of mandible opposite the cutting edge with sharp margin; opposite the mola, excavate and without a spinose-setose elevation. (Hypopharyngeal selerome tricuspidate with median portion bifid and strongly projecting; ninth abdominal segment without urogomphi, except in *Omophlus protus* Kirsch, from Russia) 55

Back of mandible not as described above. (Hypopharyngeal selerome variable in form; ninth abdominal segment with or without urogomphi) *Tenebrionidae* (pls. 57 A–U and 58 A–K)

55. Ventro-lateral suture distinct

*Alleculidae–Alleculinae* (pl. 56 A–L)

Ventro-lateral suture absent... *Alleculidae–Omophilinae* (pl. 56 M, N)

56. Molar part of mandible with the grinding surface transversely multicarinate; antenna short and two-jointed, second joint dome shaped and almost completely membranous

*Nilionidae* (pl. 59 A–M)

Molar part of mandible with the grinding surface either smooth, or bearing obtuse tubercles; antenna elongate and two- or three-jointed, second joint usually elevate, distal joint minute and dome-shaped, or absent. (Presternum large and triangular; with or without strong, straight, pointed urogomphi) *Lagriidae* (including the heterotarsine genera *Amaedus, Paratenetus* and *Lyprops*) (pl. 60 A–P)

1931, pp. 103–113; 2 plates) as the type of a separate family Boridae, thus substantiating the view of Thomson who in 1859 established this family on adult characters.
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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 Staphylinioidea 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 cribiform. (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-
LARVAL FORMS OF COLEOPTERA

larval 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

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)

*Heteroceridae* (pl. 64 A–M)

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

*Nosodendrae* (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 Ptilodactylidae); 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.

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Achytares 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 divertacles. (Gills lacking) \(^{56}\) Eurypgonidae\(^{56}\) (pl. 69 \(I-S\))

4. Lateral expansions of eighth abdominal segment present

\(P\)sephenidae - \(E\)ubrianacinae\(^{57}\) (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)

\(P\)sephenidae - \(P\)sepheninae \(P\) (pl. 70 \(F, H-P\))

5. Nine pairs of spiracles present, all projecting and either cribiform, 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) \(^{58}\) Chelonariidae (pl. 71 \(A-J\))

Spiracles present in a number varying from one to nine pairs, either annuliform or regularly biforous, never sinuous. \(^{6}\) 6

6. Five ocelli on each side. (Body subcylindrical; mandible apically bidentate; ninth abdominal tergite terminally emarginate) \(^{58}\) \(D\)ryopidae-Larinae \(L\)ara (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)

\(D\)ryopidae-Pelonominae \(P\)elonomus, \(H\)elichus, and \(P\)sephenoides \(P\) (pls. 70 \(Q-V\), 72 \(J-K\), 73 \(F-O\))

\(D\)ead exserted and visible from above; ninth abdominal segment subconical, often distally furcate. (Mandibles terminal-

\(^{56}\) According to the characters of the imagines, the Ptilolactylidae, including \(A\)chytaresus and \(P\)tilolactyla, and the Eurypgonidae, including \(E\)urypgon, are usually placed in the series Dascilloidea.

\(^{57}\) The subfamily Eubrianacinae, based on the genus \(E\)ubrianax, 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 Blair 59 (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)


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 dascilloid is here disregarded.

60 Drilus has polymorphic metamorphosis, the last instar of this snail-eating larva being maggotlike with a white, soft body and
3. Epiceranial halves meeting ventrally forming a transverse bridge

Epicranial halves not meeting ventrally. (Subfacial sinus incomplete or not present; tenth abdominal segment bearing retractorile appendices)

4. Nasale long, spatulate, distally with median emargination; ventral epiceranial bridge narrow and band-shaped; cardo absent; body segments with dorsal shields

*Homolidae*

Nasale short; ventral epiceranial 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)

5. Mandible entirely without retinaculum; mandibular canal almost closed longitudinally, and distally having an oval opening. (Anterior margin of nasale projecting, substriangular, 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. Maxilla without free, jointlike galea; anterior nasal margin multi-serrate without a median grainlike tooth visible from above

*Cantharidae-Chauliognathinae* (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

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).


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), foetommetamorphosis 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.

47
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 medially with a longitudinal series of short, densely set setae. (Retinaculum 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; retinaculum present, but very small in a few forms as *Photinus*; luminous organs usually present; saclike gills from sides of first to eighth abdominal segments present in some aquatic Lampyrid larvae)

*Lampyridae* (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; retinaculum 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)


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
   Rhipiceridae (Zenoa) (pl. 79 A–H)

   Spiracles cribiform; 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, Thrincopugini)

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

49
Larval Forms of Coleoptera

Head capsule and mouthparts slightly reduced or entirely normal ........................................................................ 8

7. Legs short but with normal joints

*Throscidae*65 (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 ... *Cebriionidae* (including former family *Plastoecridae*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 eleft 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)


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 bima-
rous 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 with-
out urogomphi; tenth abdominal segment small, not pro-
duced, 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 re-
duced 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 (Nicagns) 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 some-
what curved; left mandible either with four (Platyceirus) 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).
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 semicircular, ventral anal lobe laterally grooved and much broader than dorsal Geotrupidae

7. Lacinia and galea separate

8. Stridulating organs absent (pl. 87 X)

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) raster 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 acqualis 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; raster with a single transverse row of spatulate setae; spiracles cribriform; claw normal; antenna four-jointed

Acanthoceridae (Cloeotus)

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)

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)

Scarabaeidae-Coprinae, part one (Onthophagus)

Legs distinctly or indistinctly three-jointed

13. Coxa, femur, and tibia distinct and all of the same length; tibia conical and ending bluntly; no claw

Scarabaeidae-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).
Coxa distinct, femur and tibia apparently fused but forming an angle with each other; claw minute (no terminal seta)

 Scarabaeidae - Coprinae, part three (Copris)

14. Raster with a longitudinal series of strong, simply pointed or tricuspidate spines on each side of middle line

 Scarabaeidae - Aphodiinae, part one (Aphodius ruipes 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 - Gla phyri nae (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)

 Anus transverse, not angulate (pl. 88 C). (Mandibular stridulating area oval and formed by transverse striae; absent in Valgus)

17. Raster with two longitudinal rows of pointed setae

 Scarabaeidae - Melolonthinae - Melolonthini

Raster without two longitudinal rows of pointed setae

18. Raster with transversely arranged setae

19. Raster with setae placed without order

20. Setae arranged in a transverse mustachelike patch

 Scarabaeidae - Sericinae (pl. 88 H-L, N)

21. With large patch of closely set asperities on each side of raster

 Scarabaeidae - Macrodactylinae - Dichelonyeini

Without patch of asperities on each side of raster

 Scarabaeidae - Macrodactylinae - Hopliini (Macrodactylus 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


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 (Trichirotinus, Trichius, Trigonoptastes, 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 (Gymnelini and Cetonini) (pl. 87 Z)
LARVAL FORMS OF COLEOPTERA

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

Scarabaeidae - Cetoniinae, part two, (Cremastocheilini and Osmotherini: the latter tribe usually placed in the Trichinae)

N. CLEROIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Frontal sutures present ................................................................. 2
   Frontal sutures absent. (Apex of mandible with two or more teeth; endoparasitic, physogastric larvae) ........................................ 16
2. Lacina distally armed with one or more spurs. (Body covered with long or short barbed hairs) ................................................... 3
   Lacina without spurs ........................................................................ 4
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 ............................... Ciidae⁶⁸ (pl. 92 K-R)
   Antenna with sensory appendix shorter than distal joints, or absent .............................................................................................. 7

⁶⁸ 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-
7. Prothorax with well-separated presternal plates and with a well-defined lanceolate median sternal plate
   Ostomatidae-Tenebrioninae (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-Hydnoocerininae (pl. 95 B-II)

Frons posteriorly angulate ...................................................... 9

9. Epieranial suture well developed
   Cleridae-Thaneserinae (pl. 95 V)

Epieranial 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 (Necrobis and Koryneters)

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.

56
Paired ambulatorial ampullae absent; cardo with extensive sclerome

Cleridae-Clerinae (Opilo, Trichodes, Thanassimus, Enoclerus, Placopterinus) (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, Charissa, Cregya) (pl. 95 O)

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

Bothriideridae(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 Laemophlocus 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 Laemophlocus, 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 eucujoid 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 Subfamilies

1. Gula well-developed; maxillae inserted considerable at a distance in from anterior margin of prothorax; labial palpi two-jointed
   Gular area short; maxillae extending posteriorly to near the anterior margin of prothorax; 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)

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 sub-parallel 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) Meloidea-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. 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) Meloidea-Meloinae (pl. 96 J, K, M, P, Q)

(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, Coleydiidae and Monoeididae (auct.). The Monoedidae are not recognized as a family on the larval characters, but placed as a genus in the family Coleydiidae.)

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.

58
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; spiralce 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-shaped 73

Tetraonycidiae (Based on Tetraonyx quadrimaculatus) (pl. 97 A–D)

Several ocelli placed closely together on each side of head; spiralce 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 Horiiniae are usually placed as a tribe of the subfamily Zonitinae.

73 According to the imagines, Tetraonyx is usually placed in the subfamily Lyttiniae. 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, Tetraonycidiae, is deemed advisable.

74 The first instar of Rhizostylops, 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 *Rhinolomus* 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 *Borus* 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 Languridae. 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 piceipennis)* (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
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.

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 Opimus ........................................ 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

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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–L)

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. BOSTRICHIOIDEA

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 Anobiurn, 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

Bostriichidae77 (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

Psoidae78 (pl. 102 A–E)

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

78 The family Psoidae includes the following genera, usually placed in the Bostriichidae: Stephanopachys (Saalas, U., Die Fichtenkäfer Finnland, part 2, 1923, pp. 179 and 700, figs. 115–120), Rhizopertha, Dinoderus, and Dinoderopsis (Lesne, P., Les coléoptères Bostrychides de l’Afrique tropical française, Paris, 1924, pp. 47 and 77), Polycaon, and Psoa.
LARVAL FORMS OF COLEOPTERA

Last abdominal spiracle much larger than the others
*Lycidae (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, escutcheonlike 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 escutcheon (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 escutcheonlike sclerome. (Labial palpi present, except in a few Haltieinae 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 eight 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
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,\textsuperscript{79} from fine particles of wood glued together with the excrement of the larva and with resin from the host tree) Labrum well-developed and free \textsuperscript{7}

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-Chlamydirinae (pl. 107 G, H)

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;\textsuperscript{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

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

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

\textsuperscript{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).

\textsuperscript{80} Very rarely two-jointed, as in Sphaeroderma (pl. 114 N).
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 II–M)

13. With a combination of the three following characters: Epiceranial 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\(^1\) (pl. 110 A–M)

With a different combination of the three characters ................................ 14

14. Epiceranial 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\(^2\)

(Diabrotica, Cerotoma, Phyllobrotica, and Exosoma lusitanica) (pl. 111 A–M)

Different combination. (Spiracles always annular)

Galerucidae - Halticinae\(^3\) (pls. 112 A–R, 113 A–X, 114 A–O)

\(^1\) 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.

\(^2\) 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, Systenini, and Psylliodini than with the subfamily Galerucinae, as here conceived.

\(^3\) 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 Sphaeroderma (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) .......................... *Proterhinidae* (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)
LARVAL FORMS OF COLEOPTERA

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
(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, bilabiata. Calendridae (pl. 123 F–II)

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

V. LYMEXYLOIDEA

The systematic position of this series has been discussed in a footnote. 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.

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

   *Lymexylidae - L. m. c. y. l. i. n. a. e*

   *(Melittomma and Atracotocerus)* *(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) .......... *L. m. c. y. l. i. n. a. e - Hylecoetinae* *(Hylecoetus)* *(pl. 124 H, L)*
LARVAL FORMS OF COLEOPTERA

LITERATURE

(References only to publications containing keys, tables or conspectus for general determination to families or major systematic groups of coleopterous larvae)


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86 Larval stage unknown, or not examined by the present authors.

87 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 Cholevinæ as follows:

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

Bathysciinae (Leptoderus, Pholecon, Orytus, Aphaobius, etc.)

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

(d) Hatch, Melville H.: Studies of the carrion beetles of Minnesota; 1927, Tech. Bull. No. 48, University of Minnesota, Agric. Exp. St. (With keys to the larvae)
**LARVAL FORMS OF COLEOPTERA**

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*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: St. 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 agriculture" (Proc. Poltava Agricultural Experiment Station, Entomological Division, vol. XV, 1927; No. 61, pp. 1–49, with 41 figures) (Entirely in Russian)
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<td>Platypodidae</td>
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<td>Lymexyliinae</td>
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<td>Hylecoetinae</td>
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<td>(Telegeusidae) (=</td>
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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 (= pase, 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 "scansorial 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 mouthpiece 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 air-tubes).

c, cardo (with jca, pc, sca; pls. 40 T, 89 G*).

c1, claw (or "ungulus") from distal end of tarsus.

cly, clypeus.

cn, canal or suture in the mandible or in other buccal structures.

c0, membrane between head and prothorax.

col, collum (necklike constriction of head around the occipital foramen).

crs, cribiform spiracle (spiracle provided with a sievelike plate).

ex, coxa.

cxl, coxal lobe (= parasternum, an abdominal, usually triangular area extending from hypopleuron toward the sagittal line of sternum; often separating laterally eusternum and sternellum).

da, dorsal articulation of mandible (= mandibular fossa).

dis, dististipites (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).

cm, 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.

def, femur.

def, 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).

hc, hypopharyngeal sclerome.

hp, hypopleurum (a term introduced by A. D. Hopkins for the lateral area immediately below the ventro-lateral
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, juxtaecardo (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, pre-mentum, ligula and labial palpi).
lg, leg.
lí, 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).
lí, labial stipes (see: pm, prementum).
lí, median line on the free surface of the airtubes of the biforous spiracle.
ml. 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).
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.

oc, 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, parascutal 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 (= Is 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, lacinia 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 mandibulæ.
LARVAL FORMS OF COLEOPTERA

s, seta.
sc, scutum.
sea, subbeardo (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.
sp, 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 "daetypodite" 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 "cer-
cus" or "pseudocercus").
ve, ventral condyle of mandible.
vf, fossa in anterior end of hypostoma for the ventral articula-
tion 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;
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, scensorial wart (="tuber scensorium" Schiödte).

*, jointlike appendix of galea (=bl, bladelike 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. " " : Bucceal structures, hypopharynx, brachion, 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.
LARVAL FORMS OF COLEOPTERA

Plate 2

*Micromalthidae*


B. " " : Right maxilla. Ventral view.

C. " " : Head. Ventral view.

D. " " : Right mandible. Ventral view.

E. " " : Hypopharyngeal sclerome, hypopharyngeal bracoon, and ligula. Dorsal view.

F. " " : Hypopharyngeal sclerome, hypopharyngeal bracoon, 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.

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LARVAL FORMS OF COLEOPTERA

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.
Plate 4

*Cicindelidae, Carabidae*

B. Amblycheila cylindriformis Say: Part of head. Dorsal view.
C. Cicindela limbalis Klug: Leg.
D. Amblycheila cylindriformis: Part of head. Ventral view.
F. Laemostenus terricola Herbst (Denmark): Anterior part of larva. Ventral view.
I. Glyptus sculptilis Brullé (Sierra Leone): Larva. Lateral view.
LARVAL FORMS OF COLEOPTERA

PLATE 5

Omphronidae, Haliplidae, Hygrobiidae, Noteridae

   : Leg.
   : Labium. Ventral view.
   : Anterior part of head. Ventral view.
   : Anterior part of head. Dorsal view.

B. " "
C. " "
D. " "
E. " "

F. Haliplus confinis Steph. (Denmark): Third leg.
G. " "
H. " "


J. " "

K. Noterus clavicornis Deg.
   (= N. sparsus Marsh.) (Denmark): Right mandible. Ventral view.
   : Antenna.
   : Head. Dorsal view.
   : Ventral mouthparts. Ventral view.
   : End of body. Ventral view.

L. " "
M. Hygrobia tarda
N. Noterus clavicornis

O. " "
P. " "
LARVAL FORMS OF COLEOPTERA

Plate 6

Dytiscidae, Gyrinidae

A. Hydaticus transversalis Pontopp. (Denmark): Head. Ventral view.
B. Hyphydrus ovatus L. (Denmark): Head. Ventral view.
E. Dineutes americanus Say: Leg.
I. Dineutes americanus: Mandible.
J. “ “ : Maxilla.

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LARVAL FORMS OF COLEOPTERA

Plate 7

Amphizoidae, 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 kannegieteri 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

Limnibiidae

A. Ochthebius impressus Marsh. (Denmark) : Head. Dorsal view.*
B. " "
C. " "
D. " "
E. " "
F. " "
G. Limnebius papposus Muls. (Denmark) : Larva. Dorsal view.
H. " "
I. " "
J. Limnebius sp. (Denmark) : Larva. Lateral view.
K. Limnebius papposus : Mandible.
L. " "

* Special abbreviations applied.
**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.

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A-F Hydroscapha
LARVAL FORMS OF COLEOPTERA

Plate 10

Leptinidae, Ptiliidae

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. **“**

E. Adelops hirtus Tellk.

F. **“**

G. Prionochaeta opaca Say

H. Adelops hirtus

I. Prionochaeta opaca

J. **“**

K. **“**

L. **“**

M. **“**

: Ligula, paraglossa, maxillula, hypopharynx, and hypopharyngeal bracon.

: Tip of maxilla.

: Head. Dorsal view.

: Right mandible. Ventral view.

: Right mandible. Ventral view.

: Right mandible. Ventral view.

: Labium and ventral buccal structures. Lateral view.

: Larva. Lateral view.

: Ligula, maxillula, hypopharynx, and hypopharyngeal bracon.
Plate 12

*Scaphidiidae, Platypsyllidae*

A. Scaphisoma convexum Say: Ligula and paraglossa. Buccal view.

B. " " " : Head. Dorsal view.

C. " " " : Head. Ventral view.

D. " " " : Right mandible. Ventral view.

E. Platypsyllus castoris 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.


K. Platypsyllus castoris: Head of mature larva. Ventral view.

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Plate 13

Silphidae-Silphinae

A. Silpha (noveboracensis Forst.?) : Prothorax. Ventral view. 
B. " " : Labium and hypopharynx. Lateral 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.
Plate 14

*Staphylinidae-Piestinae,
Staphylinidae-Aleocharinae*

<table>
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<tr>
<th>Letter</th>
<th>Species/Description</th>
<th>Description</th>
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<tr>
<td>A.</td>
<td>Gyrophaena sp.</td>
<td>Head. Dorsal view.</td>
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<tr>
<td>B.</td>
<td>Piestus pygmaeus Casteln. (Brazil)</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>C.</td>
<td>“”</td>
<td>Larva. Lateral view.</td>
</tr>
<tr>
<td>E.</td>
<td>Piestus pygmaeus</td>
<td>Hypopharyngeal structures. Dorsal view.</td>
</tr>
<tr>
<td>F.</td>
<td>“”</td>
<td>Head. Ventral view.</td>
</tr>
<tr>
<td>G.</td>
<td>Gyrophaena sp.</td>
<td>Diagram illustrating abdominal scleromes.</td>
</tr>
<tr>
<td>H.</td>
<td>Piestus pygmaeus</td>
<td>Diagram illustrating abdominal scleromes.</td>
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</table>
Plate 15

*Staphylinidae-Oxytelinae,*  
*Staphylinidae-Tachyporinae,*  
*Staphylinidae-Thinopininiae,*  
*Staphylinidae-Paederinae*

A. *Paederus riparius* L. (Denmark) : Diagram illustrating abdominal scleromes.  
B. *Thinopinus pictus* Lee. : Diagram illustrating abdominal scleromes.  
C. *Tachinus fumipennis* Say : Diagram illustrating abdominal scleromes.  
D. *Oxytelus insignitus* Grav. : Diagram illustrating abdominal scleromes.  
E. *Tachinus fumipennis*  
F. *Paederus riparius*  
G. *Oxytelus insignitus*  
H. "  
I. *Tachinus fumipennis*  
J. "  
K. "  
L. *Oxytelus insignitus*  

: Head. Ventral view.  
: Larva. Dorsal view.  
: Head. Lateral view.  
: Head. Ventral view.  
: Head. Lateral view.  
: Head. Dorsal view.  
: Posterior end of abdomen. Lateral view.  
: Head. Dorsal view.
Plate 16

*Staphylinidae-Alcobarinae* (F–I),
*Staphylinidae-Proteininae* (J–M),
*Seydemaenidae* (A–E)

A. Eumicrus 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.
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Plate 17

Staphylinidae-Omaliinae,
Staphylinidae-Steninae

A. Stenus sp. : Head. Ventral view.
B. Omalium rivulare Payk. (Denmark) : Head. Ventral view.
E. Stenus sp. : Head. Lateral view.
F. Omalium rivulare : Diagram illustrating abdominal scleromes.
G. " " : Larva. Lateral view.
Plate 18

Staphylinidae-Thinopininae,
Staphylinidae-Paederinae

A. Thinopinus pictus Lee. : Hypopharynx.
B. Paederus riparius L. (Denmark) : Hypopharynx.
C. " " : Head. 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.
PLATE 19

Seydmaenidae (A–D). Pselaphidae (E–J)
A. Seydmaenidae (Plummers Isl., Maryland): Head. Ventral view.
   B. " "
   C. " "
   D. " "
   E. Batrisodes monstrosus Lee.
   F. Euplectus confluentes Lee.
   G. Batrisodes monstrosus
   H. " "
   I. " "
   J. Euplectus confluentes

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PLATE 20

*Histeridae*

A. Platysoma sp. : Right mandible. Dorsal view.
C. " " : Head. Dorsal view.
D. " " : Ventral mouthparts. Ventral view.
E. Teretrius sp. : Tibia and tarsungulus.
F. " " : Ventral mouthparts. Ventral view.
G. " " : Head. Dorsal view.
H. " " : Right mandible. Dorsal view.
J. " " : Ventral mouthparts with muscles (Diagram).

K. Paromalus aequalis Say.: Leg.
L. Hister unicolor 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).
N. Hister unicolor : 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.
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.
E. " " : Larva. Ventral view.
F. Spercheus emarginatus : Leg.
G. " " : Mandible.
H. " " : Larva. Dorsal view.

I. Histeridae (British Guiana. Termitophilous larva of unknown genus collected by Dr. E. A. Emerson) : Larva. Lateral view.
A. Heloph.
B. Sper.
C. Sperch.
D. Heloph.
E. Heloph.
F. Sper.
G. Sper.
H. Spercheus
I. Histerid
### LARVAL FORMS OF COLEOPTERA

**Plate 22**

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

| B. Berosus signaticollis Charp. (Denmark) | Anterior part of head. Dorsal view. |
| C. Laccobius minutus L. (Denmark) | Head. Dorsal view. |
| E. Berosus spinosus Stev. (Denmark) | Larva. Dorsal view. |
| G. | End of body. Lateral view. |
| H. Laccobius minutus | Anterior part of body. Ventr al view. |
| I. | Larva. Lateral view. |
| J. Hydrobius fuscipes L. (Denmark) | Larva. Dorsal view. |
| K. | Head. Dorsal view. |
| L. Paracymus aeneus Germ. (Denmark) | Head. Ventr al view. |
| M. | Head. Dorsal view. |
| N. Helochares lividus Forster (Denmark) | First instar. Dorsal view. |
| P. | Head. Dorsal view. |
| Q. | Proleg. Ventr o-lateral view. |
| R. Philydrus sp. (Denmark) | Proleg. Ventr o-lateral view. |
| S. Enochrus melanocephalus | Larva. Dorsolateral view. |

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Plate 23

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

B. *Paracymus aeneus* Germ. (Denmark): Anterior part of larva. Dorsal view.
C. *Chaetartria seminulm* Herbst (Denmark): Larva. Lateral view.
D. " " : Larva. Dorsal view.
E. " " : Head. Dorsal view.
F. " " : Head. Ventral view.
H. " " : Leg.
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.
PLATE 23

A. Hydro.
B. Paracym.
C. Chae.
D. Chaetar.
E. Chae.
F. Chae.
G. Paracy.
H. Par.
I. Chae.
J. Chae.
K. Coelos.
L. Coelos.
M. Coelos.
N. Coelos.
O. Coelostoma
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. (Denmark): Spiracle of eighth abdominal 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.
S. Sphaeridium bipustulatum Labium. Ventral view.
T. Paracercyon flavipes Larva. Dorsal view.
U. " " Ventral mouthparts. Ventral view.

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A. Cartodere costulata Reit. : Anterior part of head. Ventral view.
B. " " : Mandible. Extero-dorsal view.
C. Melanophthalma chamaeropis Fall. : Mandible, labial palpi, hypopharynx.
D. Cartodere costulata : Mandible. Buccal view.
E. " " : Eighth and ninth abdominal segments. Dorsal view.
F. " "
G. Melanophthalma chamaeropis : Ocelli, antenna.
H. " " : Mandible. Ventral view.
L. " " : Head. Dorsal view.
M. Hesperobaenus n. sp. (Florida) : Tip of mala.
N. " " : Spiracle.
O. " " : Hypopharynx.
P. " " : Head. Ventral view.
Q. " " : Seventh, eighth, and ninth abdominal segments. Dorsal view.
R. " "
S. " "
T. " "
U. " "

Plate 25

Lathridiidae, Monotomidae
Plate 26

Eucinetidae

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.
Eucinetes (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 Beck. : 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.
LARVAL FORMS OF COLEOPTERA

PLATE 28

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

A. Rhizophagus grandis 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.
I. " " " : Right mandible. Ventral view.
J. " " " : Left mandible. Ventral view.
K. Pharaxonotha kirschi Reit.: Left mandible. Ventral view.
M. Pharaxonotha kirschi: Larva. Lateral view.
N. Languria angustata: Hypopharynx, maxilla.
P. " " " : Larva. Dorsal view.
Q. " " " : Hypopharynx, maxilla.

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Plate 29

Cryptophagidae

A. Cryptophagus saginatus Sturm. : Head. Ventral view.
B. " " : Antenna, ocelli. Lateral view.
C. " " : Epipharynx.
D. " " : Larva. Dorsal view.
E. " " : Mandible. Ventral view.
F. " " : Mandible. Exterior view.

G. Antherophagus sp. : Hypopharynx.
H. Cryptophagus saginatus : Spiracle.
I. Telmatophilus typhae 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. Henoticus germanicus Reit. (London; in jam) : Part of mandible.

Q. " " : Ventral view.
R. " " : Third abdominal spiracle.
S. " " : Anterior part of larva. Dorso-lateral view.
T. " " : Antenna.
U. " " : Ocelli. Lateral view.

End of body. Dorsal view.
PLATE 29

Cryptophagus

A.

C. Crypto. 

D. Cryp.

E. Cryp.

F. Cryp.

H. Cryp.

J. Telm.

K. Telm.

L. Telm.

M. Telm.

N. Telm.

O. Telm.

P. T. He.

Q. R. S. U. Henoticus

G. Antherophagus

B. Cr.

li pgm hx

ce
Plate 30

*Silvanidae-Silvaninac*,

*Silvanidae-Telephaninae*

A. Oryzaephilus surinamensis L.
B. Cathartius advena Waltl.
C. Oryzaephilus surinamensis

D. Coecidotrophus socialis Schwarz and Barber (British Guiana):
E. Oryzaephilus surinamensis
F. Coecidotrophus socialis

G. Nausibius clavicorns Kug.

H. Coecidotrophus socialis

I. " " "
J. " " "

K. Telephanus (pallidus Schauf.?)(On cane, Porto Rico, reared):
L. " " "
M. " " "
N. " " "
O. " " "

: Antenna.
: Head. Lateral view.
: Ventral mouthparts. Ventral view.
: Spiracle.
: Larva. Lateral view.
: Posterior part of left mandible; fil. pr, stiff chitinous filaments. Ventral view.
: Head and prothorax. Dorsolateral view.
: Anterior part of head. Dorsal view.
: Epipharynx.
: Maxilla, hypopharynx, maxillular area and glossa. (Special abbreviations.)
: Larva. Dorsal view.
: Head. Lateral view.
: End of abdomen. Lateral view.
: Mandible.
: 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. Telephanus.

L.
M.
N.
O.
LARVAL FORMS OF COLEOPTERA

Plate 31

Cucujidae-Cucujinae.
Cucujidae-Brontinae (L).
Lacmophlocidae (G–K)

A. Cucujus clavipes 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. Hemipeplus sp. (Cuba) : Left mandible. Dorsal view.
H. " : Epipharynx.
J. " : Ventral mouthparts. Ventral view.
J. * " : Hypopharynx.
K. " : Posterior end of abdomen; sp. spiracle. Ventral view.

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<table>
<thead>
<tr>
<th>Letter</th>
<th>Image Description</th>
<th>Additional Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Oliobrus aeneus F. (Denmark)</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Mandible. Dorsal view.</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Leg.</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>Ocelli. Lateral view.</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>Spiracle.</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Eighth and ninth abdominal segments. Dorsal view.</td>
</tr>
<tr>
<td>H</td>
<td>Laemophloeus biguttatus Say</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>K</td>
<td>Laemophloeus biguttatus</td>
<td>Mandible. Dorsal view.</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>Larva; thoracic and abdominal spiracles inset. Dorsal view.</td>
</tr>
<tr>
<td>M</td>
<td>Smicrips palmicola</td>
<td>Larva; annular thoracic spiracle inset. Lateral view.</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>O</td>
<td></td>
<td>Hypopharyngeal sclerome.</td>
</tr>
<tr>
<td>P</td>
<td>Laemophloeus biguttatus</td>
<td>Ninth abdominal segment. Dorsal view.</td>
</tr>
<tr>
<td>Q</td>
<td></td>
<td>End of leg.</td>
</tr>
</tbody>
</table>

Plate 32

Laemophloeidae, Phalacridae (A–G), Smicripidae

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PLATE 33

Prostomidae (A–H),
Catogenidae, Phalacridae

B. " "
D. Prostonis mandibularis
E. " "
F. " "
G. Dryocora howitti
H. " "
I. Scalidia linearis Lee.
J. " "
K. Phalacerus sp.
L. Scalidia linearis
M. " "
N. Phalacerus sp.
O. Scalidia linearis
P. Phalacerus sp.
Q. Phalacerus politus Melsh.
R. " "
S. " "
T. Phalacerus sp.

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LARVAL FORMS OF COLEOPTERA

PLATE 34

Corylophidae-Arthrolipinae
Corylophidae-Corylophinae

A. (Arthrolips sp., or possibly: Ortho- Larva; fo, glandular open-
   perus sp.)(?): ing or "foramen, Peyer-
imhoff." Dorsal view.

B. " " : Mandible.
C. " " : Head and prothorax. Vent-
       tral view.

D. Corylophodes marginicollis Lee. : Head; na, nasale. Ventral
   view.
E. Molamba lunata Lee. : Head; na, nasale. Ventral
   view.
F. Corylophodes marginicollis : Larva; fo, foramen. Dor-
   sal view.
G. Sacium sp. : Right side of posterior part
   of body. Dorsal view.
H. " " : Leg.
I. Molamba lunata : Larva; fo, foramen. Dor-
   sal view.

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LARVAL FORMS OF COLEOPTERA

Plate 35

_Nitidulidae-Nitidulinae_

_Nitidulidae-Prometopinae_

A. Glischrochilus obtusus Say : Head. Dorsal view.
B. " " : Head. Ventral view.
B. Epuracea sp. : Hypopharyngeal region.
C. Glischrochilus obtusus : Spiracle.
D. " " : Mandible.
E. " " : Leg.
F. " " : Prothorax and mesothorax.
G. Lobiooa insularis Cast. : Ventral view.
H. Glischrochilus obtusus : Mandible.
J. Unknown genus near Epuracea : Antenna and ventral mouth-
L. " " : Mandible (possibly worn apically). Ventral view.
M. " " : Larva. Mostly a ventro-lateral view.
      : Ninth abdominal segment.
      Dorsal view.
**Plate 36**

*Nitidulidae-Meligethinae*

*Nitidulidae-Cateretinae*

<table>
<thead>
<tr>
<th>A. Meligethes aeneus F. (Denmark)</th>
<th>: Head. Dorsal view.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. &quot; &quot;</td>
<td>: Leg.</td>
</tr>
<tr>
<td>C. &quot; &quot;</td>
<td>: Mandible. Ventral view.</td>
</tr>
<tr>
<td>D. &quot; &quot;</td>
<td>: Larva. Dorsal view.</td>
</tr>
<tr>
<td>E. &quot; &quot;</td>
<td>: Spiracle.</td>
</tr>
<tr>
<td>F. &quot; &quot;</td>
<td>: Antenna and ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>G. &quot; &quot;</td>
<td>: Eighth and ninth abdominal segments. Dorsal view.</td>
</tr>
<tr>
<td>H. &quot; &quot;</td>
<td>: Antenna.</td>
</tr>
<tr>
<td>I. &quot; &quot;</td>
<td>: Distal parts of maxilla and labium. Ventral view.</td>
</tr>
<tr>
<td>J. Heterostomus pulicarius L. (= Brachyp terus gravidus Ill.)</td>
<td>: Antenna, ocelli. Dorsal view.</td>
</tr>
<tr>
<td>K. &quot; &quot;</td>
<td>: Tip of maxilla.</td>
</tr>
<tr>
<td>L. &quot; &quot;</td>
<td>: Mandible.</td>
</tr>
<tr>
<td>M. &quot; &quot;</td>
<td>: Larva. Dorsal view.</td>
</tr>
<tr>
<td>N. &quot; &quot;</td>
<td>: Larva. Lateral view.</td>
</tr>
<tr>
<td>O. &quot; &quot;</td>
<td>: Distal end of leg.</td>
</tr>
<tr>
<td>P. &quot; &quot;</td>
<td>: Ventral mouthparts. Ventral view.</td>
</tr>
</tbody>
</table>
LARVAL FORMS OF COLEOPTERA

PLATE 37

Cybocephalidae,
Coccinellidae-Coccinellinae

A. Cybocephalus californicus 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. Hyperaspis signata Oliv. : Anterior part of larva.
I. " " : Mandible. Dorsal view.
J. " " : Head. Ventral view.
K. " " : Larva; fo, glandular opening, or "foramen" of Pey-erimhoff. Dorsal view.
L. " " : Head. Antero-dorsal view.
A. Cybocephalus

D. Cybo.

F. Cybocephalus

G. Cybo.

H. Hyperaspis

I. Hyperaspis

K. Hyperaspis

L. Hyperaspis
LARVAL FORMS OF COLEOPTERA

PLATE 38

_Coccinellidae-Coccinellinae,_
_Coccinellidae-Epilachninae_

A. Coccinella novemnotata 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.
K. " " " : Larva. Lateral view.
L. " " " : Mandible of first larval instar.
M. " " " : Mandible of last larval instar.
N. " " " : Hypopharynx, maxillulae, and glossa.
LARVAL FORMS OF COLEOPTERA

PLATE 39

Endomychidae-Mycetaceinae (A–G).
Endomychidae-Endomychinae (H–V)

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.

I. " " : Mesothoracic spiracle on ventral side of body.
J. " " : Distal end of maxillary mala. Ventral 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. Stenotarsus hispidus Hbst. : Mandible. Ventral view.
T. " " : Hypopharyngeal region.
U. Endomychus eucineus L. (Denmark) : Lateral part of head.
V. " biguttatus Say : Spiracle.

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Plate 40

Endomychidac-Endomyvhinae


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. Ventral view.

F. " " : Tip of maxillary mala. Dorsal view.


H. Lycoperdina succineta L. (Denmark) : 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. Facial view from base of mandible.

S. " " : Mandible. Ventral view.

T. " " : Maxilla and labium.
<table>
<thead>
<tr>
<th>Plate 41</th>
</tr>
</thead>
</table>

**Erotylidae, Sphindidae**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Cypherotylus aspersus Gorh.</td>
</tr>
<tr>
<td>B.</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td>Homoeotelus confusus Crotch. (Panama)</td>
</tr>
<tr>
<td>E.</td>
<td>Cypherotylus aspersus</td>
</tr>
<tr>
<td>F.</td>
<td>Sphindus americanus Lec.</td>
</tr>
<tr>
<td>G.</td>
<td>Cypherotylus aspersus</td>
</tr>
<tr>
<td>H.</td>
<td>Sphindus americanus</td>
</tr>
<tr>
<td>I.</td>
<td></td>
</tr>
<tr>
<td>J.</td>
<td></td>
</tr>
<tr>
<td>K.</td>
<td></td>
</tr>
<tr>
<td>L.</td>
<td></td>
</tr>
<tr>
<td>M.</td>
<td></td>
</tr>
</tbody>
</table>

- A. Cypherotylus aspersus Gorh.
- B. 
- C. 
- D. Homoeotelus confusus Crotch. (Panama)
- E. Cypherotylus aspersus
- F. Sphindus americanus Lec.
- G. Cypherotylus aspersus
- H. Sphindus americanus
- I. 
- J. 
- K. 
- L. 
- M. 

- Mandible. Ventral view.
- Mesothoracic spiracle.
- Head and prothorax. Ventral view.
- Larva. Lateral view.
- Hypopharyngeal region, tip of labium and dorsal side of maxilla.
- Spiracle.
- Head. Dorsal view.
- Leg.
- Hypopharyngeal region.
- Larva. Lateral view.
- Head. Ventral view.
- Mandible. Ventral view.
- Head. Dorsal view.
### Plate 42

**Dacnidae**

<table>
<thead>
<tr>
<th>Letter</th>
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<tbody>
<tr>
<td>A.</td>
<td>Megalodaene (fasciata F. ?)</td>
</tr>
<tr>
<td>B.</td>
<td>&quot;</td>
</tr>
<tr>
<td>C.</td>
<td>&quot;</td>
</tr>
<tr>
<td>D.</td>
<td>&quot;</td>
</tr>
<tr>
<td>E.</td>
<td>&quot;</td>
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<tr>
<td>F.</td>
<td>&quot;</td>
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<tr>
<td>G.</td>
<td>&quot;</td>
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<tr>
<td>H.</td>
<td>&quot;</td>
</tr>
<tr>
<td>I.</td>
<td>&quot;</td>
</tr>
<tr>
<td>J.</td>
<td>&quot;</td>
</tr>
<tr>
<td>K.</td>
<td>Penthe pimelia F.</td>
</tr>
<tr>
<td>L.</td>
<td>Tritoma unicolor Say</td>
</tr>
<tr>
<td>M.</td>
<td>&quot;</td>
</tr>
<tr>
<td>N.</td>
<td>Penthe pimelia</td>
</tr>
<tr>
<td>O.</td>
<td>&quot;</td>
</tr>
<tr>
<td>P.</td>
<td>&quot;</td>
</tr>
<tr>
<td>Q.</td>
<td>&quot;</td>
</tr>
<tr>
<td>R.</td>
<td>&quot;</td>
</tr>
<tr>
<td>S.</td>
<td>&quot;</td>
</tr>
<tr>
<td>T.</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

- **A. Megalodaene (fasciata F. ?):**
  - Head. Lateral view.
  - Mandible. Ventral view.
  - End of maxilla.
  - Spiracle.
  - Head. Dorsal view.
  - Head. Ventral view.
  - Larva. Lateral view.
  - Antenna.
  - Leg.
  - Hypopharynx and ligula. Lateral view.

- **K. Penthe pimelia F.:**
  - Hypopharynx and ligula. Lateral view.
  - Mandible. Ventral view.
  - Larva. Lateral view.
  - Mandible. Ventral view.
  - Antenna.
  - Distal end of mala. Dorsal view.
  - Larva. Lateral view.
  - Head. Dorsal view.
  - Head. Ventral view.
  - Spiracle.
Plate 43

*Melandryidae*

A. Osphya lutens Horn
B. " "
C. " "
D. " "
E. " "
F. Orchesia castanea Melsh.

G. " "
H. " "
I. " "
J. Serropalpus barbatus Schall.

K. Dircaea quadrimaculata Say
L. Serropalpus barbatus
M. Rushia longula Lee.

N. " "

O. Dircaea quadrimaculata
P. Enstrophinus bicolor F.

Q. Melandrya striata Say
R. Melandryidae (Genus not determined)

S. " "
T. " "

U. Melandrya striata:
V. " "
W. " "
X. " "
Y. " "
Z. " "
AE. " "

: Ventral mouthparts.
: Head. Ventral view.
: Leg.
: Mandible.
: Spiracle.
: Prementum, labial palpi and liga.
: Posterior end of body. Ventral view.
: Posterior end of body.
: Mala.
: Prementum, labial palpi and liga.
: Mala.
: Posterior end of body.
: Ninth abdominal segment. Lateral view.
: Antenna.
: Posterior end of abdomen. Lateral view.
: Leg.
: Mandible.
: Spiracle.
: Head. Dorsal view.
: Mandible. Dorsal view.
: Ventral mouthparts.
: Mala. Ventral view.
: Head. Ventral view.
: Antenna.
: Larva. Lateral view.
**Larval Forms of Coleoptera**

**Plate 44**

*Scraptiidae, Bothrideridae*

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Scraptia sericea Melsh.</td>
</tr>
<tr>
<td>B.</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>B.</td>
<td>Ventral mouthparts. Dorsal view.</td>
</tr>
<tr>
<td>C.</td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>D.</td>
<td>Mandible. Dorsal view.</td>
</tr>
<tr>
<td>E.</td>
<td>Posterior end of abdomen. Lateral view.</td>
</tr>
<tr>
<td>F.</td>
<td>Larva. Dorsal view.</td>
</tr>
<tr>
<td>G.</td>
<td>Distal part of leg.</td>
</tr>
<tr>
<td>H.</td>
<td>Anterior portion of ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>I.</td>
<td>Antenna.</td>
</tr>
<tr>
<td>J.</td>
<td>Mandible.</td>
</tr>
<tr>
<td>K.</td>
<td>Mandible.</td>
</tr>
<tr>
<td>L.</td>
<td>Spirecle.</td>
</tr>
<tr>
<td>M.</td>
<td>Head and thorax. Ventral view.</td>
</tr>
<tr>
<td>N.</td>
<td>Head. Ventral view.</td>
</tr>
<tr>
<td></td>
<td>Larva. Lateral view.</td>
</tr>
</tbody>
</table>

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Plate 45

Byturidae

A. Byturus unicolor Say
B. Byturus tomentosus F. (Denmark)

C. " "
D. " "
E. " "
F. " "
G. Byturus unicolor
H. Byturus tomentosus
I. Byturus unicolor
J. Byturus tomentosus
K. Byturus unicolor
L. Byturus tomentosus

M. " "

N. Byturus unicolor

: Larva. Lateral view.
: Anterior part of larva. Ventral view.
: Larva. Dorsal view.
: Antenna.
: Right mandible.
: Cranium. Dorsal view.
: Ocelli. Lateral view.
: Left mandible.
: Head. Ventral view.
: Hypopharyngeal region.
: Leg.
: Ninth and tenth abdominal segments. Lateral view.
: Ninth and tenth abdominal segments. Ventral view.
: Spiracle.
Byturus tomentosus
A. Anthicus heroicus Csý.
B. " "
C. Anthicus sp. (Denmark)
D. " "
E. " "
F. " "
G. " "
H. " "
I. " "
J. " "
K. Anthicus heroicus
L. Anthicus sp. (Denmark)
M. Anthicus heroicus

N. " "
O. Notoxus monoceros L. (Denmark)
P. " "
Q. " "
R. " "
S. " "
T. Meecyotarsus candidus Lee.
U. " "
V. " "
W. " "

Anthicidae

Plate 46

: Right mandible. Intero-ventral view.
: Left mandible; le, linear elevation. Ventral view.
: Spiracle.
: Spiracle. Longitudinal section.
: Head. Dorsal view.
: Posterior end of abdomen.
: Ninth and tenth abdominal segments. Ventral view.
: Hypopharyngeal region.
: Prothoracic leg.
: Ventral mouthparts.
: Larva. Lateral view.
: Larva. Dorsal view.
: Hypopharyngeal region and maxilla.
: Spiracle. Lateral section.
: Right mandible; le, linear elevation. Ventral view.
: Left mandible.
: Hypopharyngeal region and maxilla.
: Urogomphi. Ventral view.
: Mandible; le, linear elevation. Ventral view.
: Ninth and tenth abdominal segments. Lateral view.
: Ninth abdominal segment. Ventral view.
R. Nofoxus

S. Nofoxus

Plate 47

_Anaspidae, Othniidae_

A. Anaspis sp. : Prothorax and part of mesothorax. Ventral view.
B. Anaspis frontalis L. (Denmark) : Left mandible; le, linear elevation. Ventral view.
C. Anaspis sp. : Head. Dorsal view.
E. Anaspis 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.
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.
**Plate 48**

*Eurystethidae, Boridae*

A. *Eurystethus californicus* Melsh.

(= *Aegialites debilis Mann.*): **Spiracle surrounded by oval sclerome.**

B. **Head. Dorsal view.**

C. **Mandible. Ventral view.**

D. **Larva. Dorsal view.**

E. **Head. Ventral view.**

F. **Hypopharyngeal region.**

G. *Boros unicolor* Say

H. **Hypopharyngeal region.**

I. **Metathorax and first abdominal segment. Lateral view.**

J. **Leg.**

K. **Labrum. Dorsal view.**

**Epipharynx.**
LARVAL FORMS OF COLEOPTERA

Plate 49

Colydiidae

C. " " : Head. Ventral view.
D. Phloeonemus catenulatus Horn: Spiracle.
F. Phloeonemus catenulatus : Right mandible.
H. " " : Head. Ventral view.
J. " " : Spiracle.
K. " " : Larva. Lateral view.
L. " " : Right mandible.
M. Nematidium filiforme : Posterior end of abdomen. Lateral view.
Plate 50

*Mycetophagidae*

A. Mycetophagus punctatus Say : Larva. Lateral view.
B. " " : Head and prothorax. Ventral view.
D. " " : Third abdominal spiracle.
F. " " : Left mandible. Dorsal view.
G. " " : Right mandible. Dorsal view.
H. " " : Mesothoracic spiracle.
I. " " : Hypopharyngeal region.
J. " " : Head. Dorsal view.
L. Thrimolus duryi Csny. : Antenna.
N. Litargus connexus Geoffr. (Denmark) : Third abdominal spiracle.
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. Alloxacis dorsalis Melsh.: Anterior part of body; vr. verruca
scansoria or ambulatory wart (= tuber scansorium, Schrödte).

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.


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. scansional verruca; enlargement of the three hard
points of right abdominal segment shown separately in the cir-
cular inset. Lateral view.
Plate 52

*Synchroidae, Zopheridae* (F–I and M), *Cephaloidae*

A. Synchroa punctata Newn. : Larva. Lateral view.
B. " " : Spiracle.
C. " " : Head and prothorax. Ventral view.
D. " " : Hypopharyngeal region and maxilla.
D2. " " : Right mandible. Ventral view.
E. " " : Leg.
F. Phellopsis obcordata Kby. : Mandible.
G. " " : Head. Dorsal view.
H. " " : Head. Ventral view.
I. " " : Larva. Dorsal view.
K. " " : Mandible.
L. " " : Spiracle.
M. Phellopsis obcordata : Hypopharynx.
N. Cephaloon lepturides : Hypopharynx.
O. " " : Larva. Lateral view.
Plate 53

_Pedilidae (Eurygeniidae), Pyrochroidae_


B. " " : Mandible. Ventral view.
C. " " : Hypopharyngeal region.
D. " " : Ninth abdominal segment.

E. " " : Tibia and tarsungulus.
F. " " : Ninth and tenth abdominal segments. Ventral view.
G. " " : Maxilla. Ventral view.
H. " " : Larva. Later al view.
I. Neopyrochroa femoralis Lee.: 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 tarsus-gular.

C. " " : Hypopharynx, hypopharyngeal bracan, 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. Pythoniger Kby. : Spiracle.

J. " " : 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.
LARVAL FORMS OF COLEOPTERA

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.

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Boros unicolor.
Plate 56

Alleculidae-Alleculinae (A–L)
Alleculidae-Omophlineae (M–N)

B. " " : Prothorax and anterior part of mesothorax. Ventral view.
C. " " : Ventral mouthparts. Ventral view.
D. " " : Right mandible. Interodorsal view.
E. Mycetochara fraterna Say : Posterior end of abdomen. Lateral view.
I. " " : Leg.
J. " " : Hypopharyngeal region and maxilla.
K. " " : Head. Ventral view.
L. " " : Posterior end of abdomen; vl, ventro-lateral suture. Lateral view.
M. Cteniopus sulphureus L. (Denmark) : Posterior end of abdomen. Ventro-lateral view.
N. Omophilus proteus Kirsch (Russia) : Larva. Ventro-lateral view.
LARVAL FORMS OF COLEOPTERA

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.
- Ventral mouthparts. Ventral view.
C. " "
D. Eleodes suturalis
- Larva. Lateral view.
E. Hoplocephala ferruginea Lee.
- Hypopharyngeal region and anterior part of labium. Dorsal view.
F. " "
G. " "
H. " "
I. " "
J. " "
K. Gnathocerus cornutus F.
L. " "
M. " "
N. " "
O. Hypophloeus parallelus Melsh.
- Right mandible. Ventral view.
P. " "
Q. " "
R. " "
S. Meracantha contracta Beauv.
- Hypopharyngeal region.
T. Strongylium tenuicolle Say
- Seventh to ninth abdominal segments. Dorsal view.
U. " "
- Eighth and ninth abdominal segments. Dorsal view.
- Eighth and ninth abdominal segments. Lateral view.
LARVAL FORMS OF COLEOPTERA

Plate 58

Tenebrionidae

B. " " : Head. Ventral view.
C. " " : Mandible. Ventral view.
D. " " : Prothorax and mesothorax. Ventral view.
E. " " : Prothoracic leg.
F. " " : Labium, hypopharynx and brachion.
G. " " : Epipharynx.
H. " " : Abdominal spiracle.
I. " " : Left maxilla. Ventral view.
J. " " : Left maxilla. Dorsal view.
K. " " : Larva. Lateral view.

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Alobates
### 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. Ventral view.

K. " " : Anterior end of labium and hypopharyngeal region. Lateral view.

L. " " : Larva. Lateral view.

M. " " : Leg.

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Leirochrodes
Larval Forms of Coleoptera

Plate 60

Lagriidae

A. Anaedus brunnneus Zieg.
B. " "
C. " "
D. " "
E. " "
F. " "
G. Paratenetus punctatus Spin.
H. Not determined Lagriid (Panama)
I. Paratenetus punctatus

J. Arthromacra aenea Say
K. " "
L. Anaedus brunnneus

M. " "
N. Arthromacra aenea
O. " "
P. Lagria sp.

: Head. Dorsal view.
: Spiracle.
: Ventral mouthparts. Dorsal view.
: Leg.
: Left mandible. Ventral view.
: Right mandible. Dorsal view.
: Antenna.
: Anterior end of labium and hypopharynx. Lateral view.
: Prothorax. Ventral view.
: Gland, covered by overlapping hairs; from tergal shield of an abdominal segment. Exterior view.
: Abdominal gland with overlapping hairs removed.
: Eighth and ninth abdominal segments. Dorsolateral view.
: Larva. Lateral view.
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. " " : Innerside of the ventral portion of the head; nc. 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.
LARVAL FORMS OF COLEOPTERA

PLATE 62

Byrrhidac-Byrrhinae (A–B, D–H)
Byrrhidac-Amphicyrtinae (C, I–L)
Byrrhidac-Lioninae (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

J. " " : Left mandible. Ventral view.

K. " " : Epipharyngeal, hypopharyngeal, labial and maxillary parts. Lateral view.

L. " " : Ventral mouthparts.

M. Lion simplusipes Mann.

N. " " : 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.

O. " "

P. " " : Spiracle.

Q. " " : Ventral mouthparts.

R. " " : Larva; gld, gland.

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LARVAL FORMS OF COLEOPTERA

Plate 63

Dascillidae

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.® Dascillus cervinus L. (Denmark) : Tip of ninth abdominal segment. Dorsal view.
H. Dascillus davidsoni : Underside of head, ventral mouthparts, and anterior part of prothorax; hp, hypopleural lobe. Ventral view.
I. " " : First abdominal spiracle.
LARVAL FORMS OF COLEOPTERA

PLATE 64

_Heteroceridae_

A. Heterocerus ventralis Melsch.: 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.e., not branched inner seta of the marginal front row of long epipharyngeal setae.

A." Helodes marginata F. (Denmark): Epipharyngeal marginal setae; i.e., 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.

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Prionocyphon
LARVAL FORMS OF COLEOPTERA

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.
A. N. californicum

B. E.

C. F.

D. H. L.

E. G.

F. I. J.

G. K.

H. M.

I. N.

J. O.

K. P.

N. californicum

Nosodendron unicolor
LARVAL FORMS OF COLEOPTERA

Plate 67

Ptilodactylidae

A. Ptilodactyla 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, distended jugular skin; note retractile diverticle. Lateral view.
G. " " : Spiracle.
H. " " : Tenth abdominal segment; an, anus; id, spinose inner diverticle; od, hairy outer diverticle. Dorsal view.
I. " " : Larva; rd, retractile diverticle. Lateral view.
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 submentum, distinct gular area and longitudinally grooved anal lobes without spiny diverticles or gills; an, anus; lb, lobe.
Asiatic Ptilodactyliid Larva
LARVAL FORMS OF COLEOPTERA

Plate 69

Ptilodactylidae
Eurypogonidae

(All the figures drawn by J. A. Hyslop, except figures A*, Q, Q and R)
A. Anchytarsus bicolor 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 Byrrhidae 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. Eurypogon niger Melsh. : Head; notice free labrum. no nasale as in Elateridae. 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.

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Larval forms of Coleoptera

Plate 70

Psephenidae-Eubryanacinae
Psephenidae-Psepheninae
Dryopidae-Pelonominae (Q–V)

B. " " : Left mandible. Ventral view.
C. " " : Larva. Dorsal view.
D. " " : Right maxilla. Ventral view.
E. " " : Part of head. Ventral view.
H. Psephenus lecontei : Left mandible, pointed type.

I. " " : Left mandible, truncate type.
J. " " : Left mandible, pointed type.
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. Psephenoides gahani 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.

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LARVAL FORMS OF COLEOPTERA

Plate 71

Chelonariidae

Dryopidae-Helminae (K-Z)

A. Chelonarium sp. : Operculum (= 10th abdominal sternum) with appendices; ap, right appendix dissected loose and turned over. Dorsal view.
B. " " "
C. " " "
D. " " "
E. " " "
F. " " "
G. " " "
H. " " "
I. " " "
J. " " "
K. Stenelmis crenata Say : Rectum and retractile gills.
L. " " "
M. " " "
N. " " "
O. " " "
P. Ancyronyx variegatus Germar. : Anterior part of head.
(Q. Determined by elimination and locality, not reared) : Spiracle of mesothorax.
R. " " "
S. " " "
V. Dryops auriculatus Geoffr. : Left mandible. Ventral view.
(W. Denmark) : Spiracle of eighth abdominal segment.
X. " " "
Y. " " "
Z. " " "

: Spiracle of mesothorax.
: End of ninth abd. segment.
: Left mandible. Ventral view.
: Ventral mouthparts.
: Spiracle of eighth abdominal segment.
: Larva. Lateral view.
: Left mandible. Ventral view.
: Left mandible. Ventral view.
: Maxilla.
: End of body. Sideview.
: Head. Dorso-lateral view.
: Larva. Lateral view.
: Head. Lateral view.
: Leg.
: Leg.
: Antenna.
: Maxilla.
: Inner face of left mandible.
LARVAL FORMS OF COLEOPTERA

Plate 72

_Dryopidae-Larinae_

_Drypidae-Pelonominae_

B. " " " : Right mandible. Dorsal view.
C. " " " : Spiracle.
D. " " " : Larva. Lateral view.
E. " " " : End of body; ap. appendix from operculum; st. operculum. 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.* " " " : Maxilla. Dorsal view.
K. " " " : Larva. Ventral view.
K.* " " " : Mandible.

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LARVAL FORMS OF COLEOPTERA

Plate 73

* Dryopidae-Helminae (A–E),
  * Dryopidae-Pelonominae (F–O)

A. Limnius troglodytes Gyll.
   (Denmark): Anterior part of head. Dorsal view.
   : Right mandible, old and worn apically. Dorsal view.
   : Ends of right maxilla and labium.
   : Left mandible. Ventral view.
   : Larva. Lateral view.
   : Larva. Dorsal view.
   : Larva. Lateral view.
   : Larva. Ventral view.
   : Head. Dorsal view.
   : Parts of lacinia and galea. Dorsal view.
   : Leg.
   : Head. Ventral view.
   : End of abdomen with ninth abdominal segment and operculum removed. Ventral view.
   : Same as figure M, but with ninth abdominal tergite present. Ventral view.
   : End of abdomen. Ventral view.
Larval Forms of Coleoptera

Plate 74

*Brachypsectridae, Drilidae.*

*Lampyridae (O-V), Phengodidae*

A. Brachysectra fulva Lee.: 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.
L. Drilus concolor : Mesothoracic spiracle.
M. Silasia (unicolor (?) : Mouthparts. Ventral view.
N. Drilus concolor : Ventral mouthparts; mb. c. membranous cardio.
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.
T. " " " : Head. Ventral view.
U. " " " : Right mandible. Dorsal view.
V. " " " : Left mandible.
X. " " " : Larva. Dorsal view.
Plate 75

**Brachypsectridae, Drilidae.**

**Lampyridae, Phengodidae**

A. Brachypsectra fulva Lec. : Head; cers, epicranial suture; fs, frontal suture.


C. " " : Head and pre sternum; 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; dor sal 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.


G. " " : Larva; epp, epipleural plate.


I. Phengodes laticollis Lec. : Head; hx, hypopharyngeal elements; n, nasale. Dorsal view.

J. " " : Head; sd. sensory disk. Ventral view.

K. " " : Distal end of leg.

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LARVAL FORMS OF COLEOPTERA

Plate 76

*Lycidae*

B. " "
D. " "
E. " "
F. " "
G. " "
H. Caeniella dimidiata F.
I. Calopteron reticulatum : Abdominal spiracle in parascutal area above epipleural plate.
J. " "
K. " "

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LARVAL FORMS OF COLEOPTERA

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. " "

D. " "

E. " "

F. " "

G. " "


I. Malthodes marginatus Latr. (Denmark): Part of head. Ventral view.

J. Cantharis sp.

K. Malthodes marginatus

L. " "

M. Cantharis sp.

N. " "

O. Rhagonycha fulva Scop. (Denmark): Dorsal gland.

P. " "

Q. " "

R. Podabrus tomentosus Say

S. " "

T. " "

U. " "

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A. Chauliognathus scutellaris Lee.: Subnasal region (uncertain whether labrum or epipharynx); snl, subnasal lobe; ssnc, 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; cd, main conduit for juice; ls, lateral series of fine hairs. Buccal view.

H. " " : Underside of head; ventral mouthparts drawn back.

H.° " " : Tip of antenna.

I. " " : Underside of head; ventral mouthparts drawn forth; subf. s, subfacial sinus.
Plate 79

Rhipiceridae, Cebrionidae

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.
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.
PLATE 80

Buprestidae-Pachyschelinae (A–D)

Buprestidae-Agrilinae (E),

Buprestidae-Buprestinae (F–K)

A. Brachys ovatus Web.

B. " " "

C. " " "

D. " " "

E. Agrilus politus Say

E. Euchroma columbicum Mannerh.

F. Chrysobothris octocola Lee.

G. Chrysobothris sp.

H. Chalcophora virginiensis Drury

I. Chrysobothris octocola

J. Chalcophora virginiensis

K. " " "

: Head; gu, gular plate; lb, undifferentiated labium; mx, maxilla. Ventral view.

: Head; oc, ocelli. Dorsal view.

: Larva. Dorsal view.

: Ventral view.

: Larva. Dorsal view.

: Head, prothorax and anterior part of mesothorax; chor, chordotonal organ; sp, spiracle. (Figure copied from Schiödte).*

: Head and thorax. Ventral view.

: Abdominal spiracle.

: Right mandible. Ventral view.

: Larva. Dorsal view.

: Head. Ventral view.


*Schiodte, J. C., De metamorphosi Eleutheratorum observationes; Naturhistorisk Tidsskrift, ser. III, vol. 6, 1869, p. 336, pl. I, fig. 4. (Schiodte is the first entomologist who has discovered and described the chordotonal organs in coleopterous larvae. He named them (l. c) "foveae auditoriae").
Plate 81

*Thysciidae* (A–D), *Melasidae* (H–Q)

A. Thyscus sp. (possibly Aulonothyscus 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 Thysciidae. (In decayed red oak from Bent Creek, Asheville, North Carolina)

F. " " : Head and prothorax. Dorsal view.

G. " " : End of abdomen. Lateral view.

G. " " : Head and prothorax; st, sternel-lum. Ventral view.


I. " " : Antenna.

J. " " : Left mandible. Ventral view.

K. " " : Left mandible. Dorsal view.

L. " " : Ventral mouthparts. Ventral view.

M. " " : Head and thorax. Dorsal view.

N. " " : Larva. Dorsal view.

O. " " : Mesothoracic spiracle; duct. ductus from spiracular opening to the atrium of the spiracle; or, spiracular opening; peritr, peritrema; tu, airtube. Exterior view.

P. " " : Head, prothorax, and mesothorax. Ventral view.

Q. *Palaeoxenus dohrui* Horn. : Larva. Lateral view.

: Larva. Ventral view.

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Plate 82

*Sandalidae*

B. " " : Head. Ventral view.
D. " " : Larva. Lateral view.
E. " " : Left mandible. Ventral view.
F. " " : Labrum and hypopharynx. Lateral view.
G. " " : Abdominal spiracle.
H. " " : Right leg.
Sandalus
LARVAL FORMS OF COLEOPTERA

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.
G. " " : Fourth abdominal segment; aisg. anterior intersegmental membrane; lam, lateral ambulatory papilla; pisg, 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. " " : Retractile appendices. Diagram.
L. " " : End of abdomen.
N. " " : Left mandible. Buccal view.
O. " " : Right maxilla. Ventral view.
P. Oestodes tenuicollis Rand.: Right mandible. Ventral view.
Q. " " : Right mandible and antenna.
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.
X. Drapetes (geminatus?): Horizontal prongs. Dorsal view.
Y. " " : Larva. Dorsal view.

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Plate 84 (Drawn by J. A. Hyslop)

_Elateridae-Pyrophorinae_

D.  : Head. Ventral view.
E.  : Eighth, ninth and tenth abdominal segments; hk, hook on tenth segment.
F.  : Seventh abdominal segment. Ventral view.
I.  : Section of spiracle, showing opening, atrium and entrance to air tubes.
J.  : Mesothoracic spiracle; diagrammatic. Lateral view.
L.  : Section of air tubes.
N. Chaleolepidius viridipilis Say  : Ventral mouthparts; cardo concealed. Ventral view.
O.  : Frons with nasale.
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. Monocrepidius 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.
G. " " " : Frons with nasale.
H. " " " : Seventh abdominal segment. Ventral view.
I. Monocrepidius vespertinus F. : Left antenna.
J. Monocrepidius lividus : Ventral mouthparts; cardo concealed; m. triangular mentum. Ventral view.
K. Monocrepidius vespertinus : Frons with nasale.
L. " " " : Left mandible. Ventral view.
M. Monocrepidius lividus : Ninth abdominal segment of last larval instar.
N. Monocrepidius vespertinus : Head. Ventral view.
O. Monocrepidius 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. Monocrepidius 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 rubriceollis 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. Betaronon 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.
PLATE 86

Cryptohypnus

E

Betarmon

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

Elaters

Crigrinus

Parallelos
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. Bucal 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. Bucal view.
M. " " : Larva. Lateral view.
N. " " : Mandibles. Ventral view.
O. " " : Head. Ventral view.
P. " " : Hypopharyngeal region.
Q. " " : Biforons abdominal spiracle.
R. " " : Section of biforous spiracle on line indicated in figure Q.

S. Trox oligonus Loomis : Cribiform 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.
LARVAL FORMS OF COLEOPTERA

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.
B. Popillia japonica Newm.
C. Anomala orientalís Waterh.
D. Strigoderma arborícola F.
E. Ligyrodès relictus Say
F. Popillia japonica.
G. "
H. Aserica (= Autoscrica)
castanea Arrow
I. " " " "
J. " " " "
K. " " " "
L. " " " "
M. Anastrategus splendens Beauv.
N. Aserica castanea
O. Anastrategus splendens
P. Dynastes tityus L.
Q. Anastrategus splendens
R. " " "

: End of body with raster. Ventral view.
: Hypopharynx, maxilla.
: End of body with raster. Ventral view.
: Epipharynx.
: Epipharynx.
: End of body with raster.
: Larva. Lateral view.
: Larva. Lateral view.
: Right and left mandible.
: Maxilla and hypopharynx.
: Head. Dorval view.
: Right maxilla. Dorsal view.
: Mesothoracic and third abdominal spiracle; sppl. spiracular plate.
: Larva. Lateral view.
: Left mandible; srp, stridulating plate. Ventral view.
: Cribriform spiracle; b, bulla; sppl, spiracular plate; or, spiracular opening.
: Head; o, ocellus.

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<table>
<thead>
<tr>
<th>Image 0x0 to 399x604</th>
<th>A. Dermestes nidum Arrow</th>
<th>Labrum and clypeus.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>&quot; &quot; &quot;</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>C.</td>
<td>&quot; &quot; &quot;</td>
<td>Epipharynx; epl, epipharyngeal lobe; es, epipharyngeal selerome; lls, lateral lobe-setae; mls, median lobe-setae; sens, sensory punc- tures.</td>
</tr>
<tr>
<td>D.</td>
<td>&quot; &quot; &quot;</td>
<td>Left mandible; hb, hair brush; pr, stiff process. Dorsal view.</td>
</tr>
<tr>
<td>E.</td>
<td>&quot; &quot; &quot;</td>
<td>Left mandible. Ventral view.</td>
</tr>
<tr>
<td>F.</td>
<td>&quot; &quot; &quot;</td>
<td>Antenna.</td>
</tr>
<tr>
<td>G.</td>
<td>&quot; &quot; &quot;</td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>G.*</td>
<td>&quot; &quot; &quot;</td>
<td>Details of figure G; dm, bifurcate selerite at the dividing suture between subcardo and precardo; jx, juxtastipes; m, mentum; mst, sclerotized margin of stipes; pam, paramentum with longitudinal series of hairs.</td>
</tr>
<tr>
<td>H.</td>
<td>&quot; &quot; &quot;</td>
<td>Mandible, maxilla, and hypopharynx; sv, opening for salivary glands. Dorsal view.</td>
</tr>
<tr>
<td>I.</td>
<td>&quot; &quot; &quot;</td>
<td>Tentorium.</td>
</tr>
<tr>
<td>J.</td>
<td>&quot; &quot; &quot;</td>
<td>Labium, hypopharynx, and oesophagus; pam, paramentum; phy, glossa. Lateral view.</td>
</tr>
<tr>
<td>K.</td>
<td>&quot; &quot; &quot;</td>
<td>Maxilla; s, spur. Ventral view.</td>
</tr>
<tr>
<td>L.</td>
<td>&quot; &quot; &quot;</td>
<td>Maxilla. Buccal view.</td>
</tr>
<tr>
<td>M.</td>
<td>&quot; &quot; &quot;</td>
<td>Hypopharyngeal region and maxilla; sv, opening for salivary glands. Dorsal view.</td>
</tr>
<tr>
<td>N.</td>
<td>&quot; &quot; &quot;</td>
<td>Mesothoracic spiracle.</td>
</tr>
<tr>
<td>O.</td>
<td>&quot; &quot; &quot;</td>
<td>Larva. Lateral view.</td>
</tr>
<tr>
<td>P.</td>
<td>&quot; &quot; &quot;</td>
<td>Details of abdominal tergum.</td>
</tr>
<tr>
<td>Q.</td>
<td>&quot; &quot; &quot;</td>
<td>Ninth and tenth abdominal segments. Dorsal view.</td>
</tr>
</tbody>
</table>
### LARVAL FORMS OF COLEOPTERA

**Plate 90**

*Dermestidae-Attageninae*

<table>
<thead>
<tr>
<th>A.</th>
<th>Thylodrias contractus Mots.</th>
<th>: Head. Dorsal view.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>&quot; &quot;</td>
<td>: Antenna.</td>
</tr>
<tr>
<td>C.</td>
<td>&quot; &quot;</td>
<td>: Tip of labium.</td>
</tr>
<tr>
<td>D.</td>
<td>&quot; &quot;</td>
<td>: Epipharynx.</td>
</tr>
<tr>
<td>E.</td>
<td>&quot; &quot;</td>
<td>: Mandible.</td>
</tr>
<tr>
<td>F.</td>
<td>&quot; &quot;</td>
<td>: Ventral mouthparts.</td>
</tr>
<tr>
<td>G.</td>
<td>&quot; &quot;</td>
<td>: Tip of maxilla.</td>
</tr>
<tr>
<td>H.</td>
<td>&quot; &quot;</td>
<td>: Larva.</td>
</tr>
<tr>
<td>I.</td>
<td>Attagenus piceus Oliv.</td>
<td>: Annular spiracle.</td>
</tr>
<tr>
<td>J.</td>
<td>&quot; &quot;</td>
<td>: Labrum, clypeus, and antenna.</td>
</tr>
<tr>
<td>K.</td>
<td>&quot; &quot;</td>
<td>: Right mandible.</td>
</tr>
<tr>
<td>L.</td>
<td>&quot; &quot;</td>
<td>: Left front leg.</td>
</tr>
<tr>
<td>M.</td>
<td>&quot; &quot;</td>
<td>: Ventral mouthparts.</td>
</tr>
<tr>
<td>N.</td>
<td>&quot; &quot;</td>
<td>: Larva. Lateral view.</td>
</tr>
<tr>
<td>O.</td>
<td>Ctesias serra F. (Denmark)</td>
<td>: Tip of maxilla.</td>
</tr>
<tr>
<td>Q.</td>
<td>&quot; &quot;</td>
<td>: Abdominal segments.</td>
</tr>
<tr>
<td>R.</td>
<td>Ctesias serra</td>
<td>: Ventro-lateral view.</td>
</tr>
<tr>
<td>S.</td>
<td>&quot; &quot;</td>
<td>: Ventral mouthparts.</td>
</tr>
<tr>
<td>V.</td>
<td>&quot; &quot;</td>
<td>: Larva. Lateral view.</td>
</tr>
<tr>
<td>W.</td>
<td>Aspectus hispidus Melsh.</td>
<td>: Distal end of tibia and tarsungulus.</td>
</tr>
<tr>
<td>X.</td>
<td>&quot; &quot;</td>
<td>: Right mandible.</td>
</tr>
<tr>
<td>Y.</td>
<td>&quot; &quot;</td>
<td>: Tips of maxilla and labium, and hypopharynx. Dorsal view.</td>
</tr>
<tr>
<td>Z.</td>
<td>&quot; &quot;</td>
<td>: Larva. Ventral view.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>: Three abdominal terga. Dorsal view.</td>
</tr>
</tbody>
</table>

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Plate 91

Melyridae

A. Malachius bipustulatus L. (Denmark): Head and prothorax. Lateral view.

B. " " : Left mandible; lm, lacinia mandibulae. Dorsal view.

C. " " : Left mandible. Buccal view.

D. " " : Left mandible. Ventral view.

E. " " : Ventral mouthparts. Ventral view.

F. " " : Dorsal side of head from within; eers, epieranal suture; fs, frontal suture.

G. " " : Ninth and tenth abdominal segments. Ventral view.

H. " " : Urogomphus. Lateral view.


J. " " : Larva. Dorsal view.

K. Malachius auritus Lee.


M. " " : Head and prothorax. Ventral view.

N. " " : Larva. Dorsal view.
Larval Forms of Coleoptera

Plate 92

Melyridae (A–J)

Ciidae (K–R)

B. " " "
C. " " "
D. " " "

E. Dasytes coerulesc Deg. (Denmark): Left mandible. Ventral view.
F. " " "
G. " " "
H. " " "
I. " " "
J. " " "

K. Cis fuscipes Mellie: Larva. Dorsal view.
L. " " "
M. " " "
N. " " "

O. " " "

P. " " "

Q. " " "

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Plate 93

Ostomidae-Tenebroidinae,
Ostomidae-Ostominae (D)

A. Airora cylindrica Serv. : Left mandible; without lacinia mandibulae. Dorsal view.
B. Corticotomus cylindricus Lee. : 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, presternal 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) selerites 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) selerites of thoracic segments.
Plate 94

Ostomidae-Tenebroidinae (A–I).
Ostomidae-Ostominae (J–U)

A. Temnochila virescens F. : Labrum.
  B. " "  : Epipharynx.
  C. " "  : Ventral mouthparts; pgm, para-
                gular 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 hypo-
                pharynx. Dorsal view.
  G. " "  : Ninth abdominal segment with
                urogomphi. Dorsal view.
  H. " "  : Abdominal segment; amb, ambu-
                latory wart. Dorsal view.
  I. " "  : Larva. Ventro-lateral view.
J. Caltys scabra Thumb.  : Abdominal segment; amb, ambu-
  K. " "  : Antenna, ventral mouthparts
                and hypopharynx; lb, hypoph-
                ryngeal bracoon; pgm, max-
                illulae. Dorsal view.
  L. " "  : Larva. Dorsal view.
  M. " "  : Head, thorax and first abdomi-
                nal segment. Ventral view.
  N. " "  : Left mandible. Ventral view.
  O. " "  : Left mandible. Buccal view.
  Q. " "  : Head and prothorax.
R. Thymalus limbatus F. (Den-
  mark) : Leg.
  S. " "  : Right maxilla. Ventral view.
  T. " "  : Left mandible. Ventral view.
  U. " "  : Ninth abdominal segment with
                urogomphi. Dorsal view.
LARVAL FORMS OF COLEOPTERA

Plate 95

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

A. Cleridae
B. Callimerus arcufer Chapin
C. " "
D. " "

E. Hydnocera verticalis Say
F. Callimerus arcufer
G. " "
H. " "

I. Enoclerus ichnemoneus F.

J. Enoclerus lecontei Wolcott
K. Monophylla terminata Say
L. Tarsostenus univittatus Rossi
M. Enoclerus lecontei

N. Cymatodera morosa Lee.
O. Xeichnea laticornis Say

P. Priocera castanea Newm.

Q. Thanasimus formicarius L.

(Denmark) : Larva. Lateral view.

R. Cymatodera inornata Say
S. Orthopleura damieornis F.
T. Enoclerus lecontei
U. " "

V. Thaneroclerus girodi Chev.

X. Cymatodera morosa

: Labrum (a) and epipharynx (b).
: Head. Dorsal view.
: Larva. Dorsal view.
: Head and prothorax; ga, galea enlarged; pst, presternum; stpl, sternal plate.
: Ninth abdominal segment.
: Spiracle with short airtubes.
: Spiracle. Exterior view.
: Tip of leg showing tarsungulus (t) and paronychial appendage (pon).
: Biforous spiracles of thorax, third and eighth abdominal segments, showing different development of airtubes.
: Head. Dorsal view.
: Head, showing one ocellus.
: Head with four ocelli.

Ninth abdominal segment; no urogomphi. Dorsal view.
: Head with one ocellus on each side and projecting frons.

: Annular spiracle.
: Ninth abdominal segment.
: Head without ocelli.
: Right mandible.
: Ninth abdominal segment.

Head with five ocelli on each side and an unpaired ventral bump. Lateral view.
: Head with three ocelli on each side. Lateral view.

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LARVAL FORMS OF COLEOPTERA

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 Donov. (Denmark); first instar
   Mandible.
K. Meloe proscarabaeus L. (Denmark);
   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; terms, 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. Tetraonyx quadrimaculata F.;
   first instar: Left mandible. Ventral view.

B. " " " " : Spiracle of first abdominal segment borne by a lateral projection from the segment. Exterior view.

C. " " " " : Head and prothorax; lp, labial palpus; s, single seta at base of tarsungulus; sj, tactile papilla of antenna; tj, terminal joint of antenna. Ventral view.

D. " " " " : Larva. Dorsal view.

E. Rhipiphorus solidaginis Pierce;
   first instar: Anterior part of larva; pon, paronychial appendage (=pulvillus). Ventral view.

F. " " " " : Tip of a leg; pon, paronychial 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 abdominal segment.

I. Rhipiphorus stylopides Newm.;
   last larval instar: Anterior part of larva. Fronto-ventral view.

J. Rhipiphorus stylopides Newm.;
   last larval instar: Larva. Lateral view.
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.
LARVAL FORMS OF COLEOPTERA

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; mxse, maxillary articulating area; occ.for, occipital foramen; sfsp, subfossa 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 Xylotrechus : Head. Dorsal view.
F. " " : Head. Ventral view.
G. Genus Rhagium : Head; ar, antennal ring. Dorsal view.
H. " " : Head. Ventral view.
J. " " : Head. Ventral view.

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LARVAL FORMS OF COLEOPTERA

Plate 100

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

A. Lamiinae

B. Derobrachus (= Orthosoma) brunneus Forst.

C.

D.

E.

F.

G. Romaleum atomarium Drury

H. Undetermined lepturine larva (Siam)

I.

J.

K.

(Larva. Dorsal view.)

(Figure K drawn by J. A. Hyslop)

L. Lepturine larva, more typical of the family than figure II.

M. Distenia undata F.

: Head, mpf, maxillary palpiger; st, stipes. Ventral view.

: Spiracle.

: Labium. Lateral view.

: Head. Ventral view.

: Maxilla, ligula, hypopharynx. Dorsal view.

: Right mandible. Dorsal view.

: Right mandible. Dorsal view.

: Leg.


: Larva. Dorsal view.

: Head. Ventral view.
LARVAL FORMS OF COLEOPTERA

Plate 101

Ptinidae (A, B and E).
Anobiidae (C, D, F–N, X, Ae and Oe).
Bostriuchidae (O–W, Y, Z)

A. Niptus sp. (Larvae, pupae and imagines in Desfontinae ilicifolia Chili): Larva; ats. anal transverse sclerome.
B. Ptinus fur L.
D. " " " Right mandible.
E. Ptinus fur
F. Nevermannia dorecatomoides
G. " " " Anal pad.
H. " " " Larva. Lateral view.
I. Lasioderma serricorne F.
J. " " " Mandible.
K. " " " Epipharynx (eph); labrum; clypeus. epistoma, and antenna.
L. " " " Head. Dorsal view.
M. Hedobia imperialis L. (Denmark): Left maxilla; ma. undivided mala.
N. Trichodesma klagesi Fall.

O. Seobia declivis Lec., last instar
P. " " " First instar
Q. " " " Longitudinal cut of inner wall of mandible.
R. " " " Antenna. epipharynx and mouthparts.
S. " " " Head. Dorsal view.
T. " " " Larva. Lateral view.
U. " " " Tip of ninth abdominal segment. Dorsal view.
V. " " " Prothoracic spiracle.
W. " " " Ventral mouthparts.
X. Caenocara oculata Say
Y. Seobia declivis, last instar
Z. " " " " " " Left maxilla.
Ae. Caenocara oculata
OE. " " " Larva. Lateral view.
Plate 102

Psoidae (A–E),
Lyctidae (F–K)

A. Stephanopachys pacificus Cuv.: Labrum, clypeus, and antenna.
B. Polycarpon stouti Lee.: Labrum and clypeus.
C. " " "
D. " " "
E. " " "
F. Lyctus cavicollis Lee.: Right mandible; lm, lacinia mandibulae; pmo, pseudomola. Dorsal view (left); buccal view (right).
G. " " "
H. " " "
I. " " "
J. Lyctus cavicollis, first instar larva: Ninth abdominal segment with a pair of small urogomphi. Dorsal-lateral view.
K. " " " , mature larva: Head and ventral mouthparts.
Plate 103

Bruchidae (= Mylabridae)

A. Caryedon fuscos (Goeze) (= Bruchus or Pachymerus gonagra F.) (Philippine Isl.)
B. Pachymerus nucleorum F. (Brazil)
C. Caryedon fuscos
D. " "
E. " "
F. " " , first instar
G. Pachymerus nucleorum
H. Bruchus (= Mylabris) obtectus Say
I. " "
J. Spermophagus hoffmannaggi Gyll
K. " " , first instar
L. " " , mature larva
M. " " , mature larva
N. " " , first instar

Ocelli and antenna. Right mandible.
Head. Dorsal view.
Head. Ventral view.
Tibia and tarsus.
Larva. Lateral view.
Labrum, clypeus and epistoma.
Anterior part of head.
Dorsal view.
Prothoracic dorsal X-shaped plate in the first bruchid instar assisting it in entering the seeds of leguminous plants.
Leg.
Leg.
Leg.
PLATE 104

Sagridae

A. Sagra femorata Jac.
   (Malleswar, Mysore State, India)
B. Sagra femorata Jac.
   C. "  "  
D. "  "  
E. "  "  
F. "  "  
G. "  "  
H. "  "  

: Head. Ventral view.
: Right maxilla. Ventral view.
: Head. Dorsal view.
: Hypopharynx and labium. Lateral view.
: Abdominal spiracle, bilabiate type.
: Leg.
: Larva. Lateral view.
: Right mandible. Ventral view.
Sagra
PLATE 105

Orsodacnidae-Orsodacninae,
Orsodacnidae-Zeugophorinae

A. Orsodacne sp. (Not reared; determined by the method of elimination and locality) : Right mandible. Ventral view.
B. Orsodacne sp. : Ventral mouthparts. Ventral view.
C. " " : Right mandible. Dorsal view.
D. " " : Head. Dorsal view.
E. " " : Larva. Lateral view.
G. " " : Head. Ventral view.
H. " " : Left mandible. Ventral view.
A. *Orsodacne*

B. *Orsodacne*

C. *Orsodacne*

D. *Orsodacne*

E. *Orsodacne*

F. *Orsodacne*

G. *Orsodacne*

H. *Orsodacne*

**Zeugophora**
LARVAL FORMS OF COLEOPTERA

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
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.
P. " " : Leg.
Q. " " : Ventral mouthparts.
R. " " : Cross-section of hook of eighth abdominal spiracle; bw, prolongation from body wall.

: Ventral mouthparts. Dorsal view.
LARVAL FORMS OF COLEOPTERA

Plate 107

*Camptosomatidae-Chlamydiinae* (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.


H. " " : Head and prothorax. Lateral view.

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Plate 108

Eumolpidae


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.


G. " " : Abdomen. Ventral view.


J. " " : Anterior portion of head; distal end of mandible removed to show epi-pharynx, 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, elyphus; 10, place of the removed mandible; 11, antenna; 12, epimeranum.

K* " " : Mandible.

L. " " : Larva. Lateral view.

M. " " : End of abdomen. Ventral view.
LARVAL FORMS OF COLEOPTERA

Plate 109

Crioceridae (A–G)

Chrysomelidae (H–M)

A. Lema sp. : Head. Dorsal view.
B. Crioceris asparagi L. : Leg.
C. " " : Thoracic biforous spiracle.
D. " " : Bucal 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.
I. " " : Head. Ventral view.
J. " " : Left mandible. Ventral view.
K. " " : Right maxilla. Ventral view.
L. " " : Larva. Lateral view.
M. " " : Leg.
LARVAL FORMS OF COLEOPTERA

PLATE 110

Galerucidae-Galerucinae

A. Galeruca tanaceti L. (Denmark): Head. Dorsal view.
B. Sermylassa halensis L. (Denmark): Left mandible. Ventral view.

C. Agelastica alni L. (Denmark): Larva. Lateral view.
D. Monoxia consputa Lee.
F. Galerucella luteola Müller.
H. Monocesta coryli Say: Antenna and ocellus.
I. " " " Left figure, showing labella, 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. Sem.
C. Agelastica
D. Monoxia
E. Agelastica
F. Galerucella
G. Galeruca
H. Monocesta
I. Monocesta
J. Monocest
K. Monocesta
L. Monocesta
M. Monocesta
PLATE 111

Galerucidae-Diabroticinae

A. Phyllobrotica quadriraculata 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.


F. Diabrotica duodecimpunctata : Pulvillus on posterior side of tarsusgulus.

G. " " : Ventral mouthparts. Dorsal view (left figure); ventral view (right figure).


K. Diabrotica duodecimpunctata : Anterior part of larva. Lateral view.


M. Exosoma lusitanica L. (Marocco) : Anterior part of larva. Lateral view.
Plate 112

*Galerucidae-Halticinae*

A. Haltica bimarginata Say
B. 
C. Longitarsus menthaphagus Gentner
D. 
E. 
F. 
G. Chaetoecoma (denticulata Ill.?)
H. Longitarsus menthaphagus
I. 
J. Phyllotreta armoraciae Koch (Denmark)

K. Chaetoecoma (denticulata?)
L. Blepharida rhois Forst.
M. Psyliodes chrysocephala L.
N. 

O. Blepharida rhois
P. Phyllotreta armoraciae

Q. Blepharida rhois
R. 

R.°

A: Head. Ventral view.
B: Left maxilla.
C: Antenna.
D: Left mandible.
E: Peglike appendix of galea.
F: Distal end of maxilla.
G: Anterior part of larva.
H: Anterior part of larva.
I: Larva. Dorsal view.
J: Anterior part of larva.
L: Spiracle.
M: Head. Dorsal view.
N: Larva. Lateral view.

(Copy from figure by George H. Carpenter, 1906).

O: Right maxilla.
P: Posterior end of body. Dorsal view.
Q: Mandible.
R: Larva; notice the dorsal position of anus as in Crioceris (pl. 109G).
R°: Sucking disk; without an anal opening in the center.

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LARVAL FORMS OF COLEOPTERA

PLATE 113

Galerucidae-Halticinae

A. Oedionychis gibbitarsa Say: Antenna; a. ring shaped
sclerome at base of the
tactile appendix; at. mem-
branous part of tactile ap-
pendix; b. first antennal
joint; c. rudiment of sec-
ond joint.

B. " " "
C. " " "
D. " " "
E. " " "
F. " " "
G. " " "
H. Disonycha xanthomelaena Dalm.: End of body. Lateral view.
I. Phydanis bicolor Horn.
J. Mantura floridana Cr.
K. " " "

L. Phydanis bicolor

M. Mantura floridana
N. Phydanis bicolor
O. Mantura floridana
P. " " "
Q. " " "
R. Argopistes scyrtooides Lee.
S. " " "
T. " " "
U. " " "
V. " " "
X. " " "

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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.


F. Dibolia cynoglossi : Anterior end of body. Ventral view.

G. " " : Head. Dorsal 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.
PLATE 115

Hispidae

A. Bronthispa frogatti Sharp
   (Solomon Isl.): Right mandible. Ventral view.
B. " "
C. " "
D. Chalepus ater Weise
E. Bronthispa frogatti
E." "
F. Chalepus ater
G. " "
G." " "
H. " "
I. Octotoma plicatula F.
I." "
J. Arescns monoceros Oliv.
K. Octotoma plicatula
   : Ventral mouthparts. Ventral view.
**LARVAL FORMS OF COLEOPTERA**

**Plate 116**

*Cassididae*

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>&quot; &quot; : Leg.</td>
</tr>
<tr>
<td>C</td>
<td>&quot; &quot; : Right mandible. Ventral view.</td>
</tr>
<tr>
<td>D</td>
<td>&quot; &quot; : Larva. Lateral view.</td>
</tr>
<tr>
<td>E</td>
<td>&quot; &quot; : Spiracle.</td>
</tr>
<tr>
<td>F</td>
<td>&quot; &quot; : Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>H</td>
<td>Porphyraspis cyanea Say : Ball of excrement covering larva.</td>
</tr>
<tr>
<td>I</td>
<td>&quot; &quot; : Detail of excrement strand.</td>
</tr>
</tbody>
</table>

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LARVAL FORMS OF COLEOPTERA

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. Enymphycer fasiclatus Oliv.: Antenna.
J. " " : Distal end of maxilla.
K. Brachytarsus limbatus : Right maxilla. Ventral view.
L. Araecerus fasciulatus 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.
### Plate 118

*Brethidae,*

*Aтелabidae-Rhynchitinae*

A. *Eupsalis minuta* Drury (changed in Junk Col. Cat., 1927, by R. Kleine to *Platysystrophus minutus* Drury)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td><em>Eupsalis minuta</em></td>
</tr>
<tr>
<td>C.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>D.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>E.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>F.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>G.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>H.</td>
<td><em>Rhynchites aenens</em> Boh.</td>
</tr>
<tr>
<td>I.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>J.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>K.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>L.</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>M.</td>
<td>&quot; &quot;</td>
</tr>
</tbody>
</table>

: Diagrammatic section through median region of head. Sagittal cut.

: Head. Ventral view.

: Thoracic segments. Ventral view.

: Larva. Lateral view.

: Larva. Lateral view.

: Right mandible. Ventral view.

: Right maxilla. Ventral view.

: Larva. Lateral view.

: Head. Dorsal view.

: Head. Ventral view.

: Right mandible. Ventral view.

: Left maxilla. Ventral view.

: Spiracle (outline).
LARVAL FORMS OF COLEOPTERA

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 bracoon, tentorium and right maxilla.

H. " " " : Left mandible. Ventral view.

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LARVAL FORMS OF COLEOPTERA

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.

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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.
H. " " : Ventral mouthparts. Ventral view.
I. " " : Ventral mouthparts. Dorsal view.
J. Geraeus penicillus 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.
Q. " " : Ventral mouthparts. Ventral view.
R. Xaupauctus sp. (Chili) : Right mandible. Exterior view.
S. " " : Larva. Lateral view.
T. " " : Head; co, 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.
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 gnawed 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.
<table>
<thead>
<tr>
<th>Letter</th>
<th>Species</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><em>Scolytus muticus</em> Say</td>
<td>Larva. Lateral view.</td>
</tr>
<tr>
<td>B</td>
<td>&quot;</td>
<td>Right mandible. Interior view.</td>
</tr>
<tr>
<td>C</td>
<td>&quot;</td>
<td>Mesothoracic spiracle.</td>
</tr>
<tr>
<td>D</td>
<td>&quot;</td>
<td>Head. Anterior view.</td>
</tr>
<tr>
<td>F</td>
<td><em>Sitophilus granarius</em> L.</td>
<td>Hypopharyngeal region and ventral mouthparts. Bucal view.</td>
</tr>
<tr>
<td>G</td>
<td>&quot;</td>
<td>Spirecle.</td>
</tr>
<tr>
<td>H</td>
<td><em>Sitophilus granarius</em></td>
<td>Larva. Lateral view.</td>
</tr>
<tr>
<td>I</td>
<td><em>Platypus compositus</em> Say</td>
<td>Antenna.</td>
</tr>
<tr>
<td>J</td>
<td>&quot;</td>
<td>Left mandible. Ventral view.</td>
</tr>
<tr>
<td>K</td>
<td>&quot;</td>
<td>Larva. Lateral view.</td>
</tr>
<tr>
<td>L</td>
<td>&quot;</td>
<td>Head. Dorsal view.</td>
</tr>
<tr>
<td>M</td>
<td>&quot;</td>
<td>Mesothoracic spiracle.</td>
</tr>
<tr>
<td>N</td>
<td>&quot;</td>
<td>Ventral mouthparts. Ventral view.</td>
</tr>
<tr>
<td>O</td>
<td>&quot;</td>
<td>Head: mouthparts detached. Ventral view.</td>
</tr>
<tr>
<td>P</td>
<td>&quot;</td>
<td>Right maxilla. Dorsal view.</td>
</tr>
</tbody>
</table>
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.
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.
Phyllogenetic Conspectus of Suborders and Series of the Order Coleoptera According to the Larvae.
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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: Synchroidae.
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 (pi. 33) are readily distinguished by their physogastric body, the larvae of the Epilachninae (pl. 38) by long, branched dorsal and lateral spines and by multicuspidate mandibular apices in the mature larvae, and the larvae of the Lamiae (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 Maronettes read: Maronetus.
Page 24, line 12. Read: urogomphi almost absent

Cybisterinae.

Page 29, line 5. For Megarthrus 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: Murmidiiidae.
Page 38, footnote 49. For Murmediidae read: Murmidiiidae.
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 Cetoniini read: Cetoniini.
Page 59, footnote 72. For Horniae read: Horiiace.
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 X. For Gnathocerus cornutus F. read: Uloma imberbis Lec.
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 mandibulac, 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 protracted 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-capule closed posteriorly by a broad, transverse bridge separating the subfacial region of head from ventral region of prothorax) ....

Cerambycoidae (p. 60)
(except cerambycoid subfamily Diastelinae, p. 15, line 4 and p. 62.)
19. Maxillary mala simple or terminally slightly indentated
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
44. Paired urogomphi absent ......................................... 44b
44b. Ninth abdominal segment heavily sclerotized, either
cylindrical with obliquely truncate end (Lymexyliinae), or elongate conical (Hylecoetinae)
Lymexyliidae (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 Phalaenus grossus