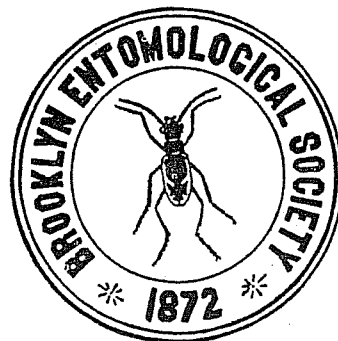


# ENTOMOLOGICA AMERICANA

A JOURNAL OF ENTOMOLOGY.

Volume XI (New Series)  
1930-1931



351 M.

PUBLICATION COMMITTEE

J. R. DE LA TORRE-BUENO Editor

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G. P. ENGELHARDT

PUBLISHED QUARTERLY BY THE  
BROOKLYN ENTOMOLOGICAL SOCIETY

22 East Garfield Street  
Merrick, New York

1931

Reprint Edition. 1953

Yan Vitor  
Bislerum 59  
17000 P...

ex: coll. K. Harker

ENTOMOLOGICA AMERICANA

Vol. XI (n. s.)

CONTENTS

Plates 1-125

An Illustrated Synopsis of the Principal Larval Forms of the  
Order Coleoptera, ADAM G. BÖVING and F. C. CRAIGHEAD .. 1

*Parabucania* 12  
: 51-55 <sup>map.</sup>  
: 260-263 <sup>ref. to</sup> *ab.*

# ENTOMOLOGICA AMERICANA

VOL. XI (n. s.)

JUNE, 1930

No. 1

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

BY ADAM G. BÖVING,

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AND

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ENTOMOLOGY

\* 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.

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

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

The third distinct polyphagous larval type that is more primitive than the byrrhoid type and shows closer affinity with the staphylinoid leptinid association is found as mentioned in the series Cucujoidea, notably in the families Lathridiidae (p. 33), Derodontidae (p. 33), Silvanidae (p. 34), and Endomychidae (p. 38). Most of the cucujoid families are plainly derived from this type; a few, however, not so plainly, such as the larvae of the family Oedemeridae (p. 40), and the whole tenebrionid association (p. 42<sup>54-56</sup>), which only indirectly can be traced to the primitive cucujoid larvae through rather advanced cucujoid types like the larvae of the Colydiidae or the Melandryidae.

## SUBORDERS

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

- A. *Archostemata*. Legs six-jointed with distinct tarsus and one or two distinct claws;<sup>3</sup> 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;<sup>4</sup> 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.<sup>5</sup>

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

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

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

SERIES OR SUPERFAMILIES

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

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

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

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

KEY TO SERIES

1. Leg six-jointed with tarsus distinct and one or two distinct, movable claws present<sup>6</sup> ..... 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<sup>7</sup> ..... 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)

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

<sup>7</sup> 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)
5. Eighth abdominal segment not glandular and not discoidal ..... 5  
 Urogomphi jointed,<sup>8</sup> 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<sup>9</sup> ..... *Meloidea* (p. 58)  
 No hypermetamorphosis;<sup>10</sup> 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<sup>11</sup> ..... 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

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

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

<sup>10</sup> *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.

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

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

C. GYRINOIDEA

KEY TO FAMILIES AND SUBFAMILIES

1. Head subcircular with collum narrow and distinct; mandible falcate without retinaculum  
*Gyrinidae-Enhydrini* (*Dineutes*) (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. PAUSSOIDEA

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

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

FAMILY

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

E. STAPHYLINOIDEA

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

From the four primitive staphylinoid families are directly derived the Scaphidiidae, the Platypyllidae, 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 Platypyllidae from the Silphidae or Scaphidiidae. The larvae of the small families Brathinidae, Clambidae, Clavigeridae, Sphaeridae, and Sphaeritidae are either completely unknown or are at least not present in the United States National Museum. The Histeridae

has been included in our Hydrophiloidea (p. 31) and the Corylophidae placed in the Cucujoidea 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 ..... *Limnebiidae* (*Ochthebius*, *Hydraena*, and *Limnebius*) (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 multiannulate ..... 5
- 5. Mandible with vestigial retinaculum (r). *Leptinidae* (pl. 10 A-E)
  - Mandible with distinct retinaculum (r), or prosthema (lm),<sup>31</sup> or both ..... 6
- 6. Asperities on molar structure covering entire ventral surface, irregularly arranged; paraglossae as long as ligula. *Anisotomidae-Liodinae*<sup>37</sup> (pl. 11 A, B)
  - Asperities on molar structure arranged in fine transverse (often few) rows; paraglossae absent or shorter than ligula. *Anisotomidae - Choleviniae*<sup>37</sup> (pl. 11 C-M)
- 7. Mala and stipes fused ..... 8
  - Mala jointlike, movable ..... 23

<sup>31</sup> Except in *Aphaobius*, belonging to the Anisotomidae-Choleviniae but very similar to the Leptinidae. (L. Weber, Allg. Ztsch. f. Ent. vol. 7, 1902).

*Silphid association:*

- 8. Mandible with apex simple, recurved, and bent away from the sagittal plane of the larva. (Ligula rounded and entire.) *Platysyllidae* (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)<sup>32</sup> ..... 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*<sup>37</sup> (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*<sup>33</sup>
  - 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<sup>34</sup> ..... 17

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

<sup>33</sup> 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.

<sup>34</sup> 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.

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

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

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

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CONSPECTUS

		<u>ARCHOSTEMATA</u>	
SERIES		PAGE	PLATE
Cupesoidae	Cupesidae .....	16	1
	Micromalthidae .....	"	2
		<u>ADEPHAGA</u>	
Caraboidea	Rhysodidae .....	"	3
	Cicindelidae (Cicindelini, Tetrachini, Amblycheilini, Omini, Collyrini) ..	17	4
" "	Carabidae .....	17	—
	" Lebiinae (Lebiini and Brachinini) .....	19	—
"	" Dromiinae (=Pentagonicini) .....	"	—
"	" Odacanthinae .....	20	—
"	" Driptinae .....	"	—
"	" Nebriinae (Nebriini, Notiophilini) .....	"	—
"	" Loricerinae .....	"	—
"	" Carabinae .....	"	—
"	" Cychrinae .....	21	—
"	" Chlaeniinae .....	"	—
"	" Licininae (Licinini, Panagaeini) .....	"	—
"	" Bembidiinae (Bembidiini, Trechini) .....	"	—
"	" Sphodrinae ( <i>Sphodrus</i> ) ..	22	—
"	" Broscinae .....	"	—
"	" Dyschiriinae ( <i>Dyschirius</i> , <i>Clivina</i> ) .....	"	—
"	" Scaritinae (Scaritini, Pasimachini) .....	"	—
"	" Elaphrinae .....	"	—
"	" Patrobinae (=Pogoninae) ( <i>Patrobus</i> ) .....	"	—
"	" Pterostichinae (Platynini, Pterostichini) ..	23	4
"	" Amarinae (Amarini, Zabрини) .....	"	—

		PAGE	PLATE
Caraboidea	Harpalinae .....	23	—
	Glyptinae .....	19	4
"	(Pseudomorphidae) <sup>86</sup> .....	—	—
"	Omophronidae (Carabid subf. ?) ..	17	5
"	Haliplidae .....	—	—
"	" Haliplinae .....	17	5
"	" Peltodytinae .....	"	—
"	Hygrobiidae (=Pelobiidae) .....	17	5
"	Noteridae .....	17	5
"	Dytiscidae .....	17	—
"	" Hydroporinae .....	23	6
"	" Colymbetinae (Colymbetini, Laccophilini) ..	23	—
"	" Coptotominae .....	24	—
"	" Thermonectinae (Thermonectini, Eretini) ..	"	—
"	" Dytiscinae (Hydaticini, Dytiscini) .....	"	6
"	" Cybisterinae .....	"	—
"	Amphizoidae .....	17	7
Gyrinoidea	Gyrinidae (Enhydrini, Orectochilini, Gyrinini) .....	24	6
Paussoidea	Pausidae .....	24	7
		<u>POLYPHAGA</u>	
Staphylinoidae	Limnebiidae (Hydraenini, Limnebiini) .....	26	8
"	Hydroscaphidae .....	"	9
"	Leptinidae .....	"	10
"	Ptiliidae (=Trichopterygidae) .....	"	10
"	Anisotomidae (=Liodidae) .....	"	—
"	" Liodinae (Liodini, Agathidiini) <sup>87</sup> .....	26	11

<sup>86</sup> Larval stage unknown, or not examined by the present authors.  
<sup>87</sup> 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)



SERIES		PAGE	PLATE
Staphylinoidae	Cholevinae (Catop- ini) <sup>87</sup> .....	26	11
	(“) (Bathysciinae) <sup>86, 87</sup> .....	—	—
	(“) (Coloninae) <sup>86</sup> .....	—	—
“	(Clambidae) <sup>86, 87</sup> .....	—	—
“	Platypsyllidae <sup>87</sup> .....	27	12
“	(Brathinidae) <sup>86</sup> .....	—	—
“	Scaphidiidae .....	27	12
“	(Sphaeritidae) <sup>86</sup> .....	—	—
“	(Sphaeriidae) <sup>86</sup> .....	—	—
“	Silphidae <sup>87</sup> .....	—	—
“	“ Necrophorinae .....	27	—
“	“ Silphinae .....	“	13
“	Staphylinidae		
“	“ Oxyoporinae .....	27	—
“	“ Piestinae .....	28	14
“	“ Syntomiinae .....	“	—
“	“ Oxytelinae .....	“	15
“	“ Aleocharinae .....	28	14, 16
“	“ Proteininae .....	29	16
“	“ Omaliinae .....	“	17
“	“ Tachyporinae .....	“	15
“	“ Habrocerinae (+ Phloeocharinae) .....	30	—

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

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

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

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

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1927, Tech. Bull. No. 48, University of Minnesota, Agric. Exp. St. (With keys to the larvae)

SERIES		PAGE	PLATE
Staphylinoidae	Steninae .....	30	17
	(Euaesthetinae) <sup>86</sup> .....	—	—
	Thinopiniinae .....	30	15, 18
“	Staphylininae (Quediini, Xantho- lini, Staphy- linini) .....	“	—
“	Paederinae .....	“	18
“	Pselaphidae .....	“	19
“	Scydmaenidae .....	“	16, 19
“	(Micropeplidae) <sup>86</sup> .....	31	—
Hydrophiloidea	Histeridae .....	31	20, 21
“	Helophoridae .....	32	21
“	Spercheidae .....	“	21
“	Hydrochidae .....	“	22
“	Hydrophilidae		
“	“ Berosinae .....	“	22
“	“ Hydrophilinae .....	“	22, 23
“	“ Hydrobiinae .....	“	22, 23
“	“ Sphaeridiinae (Chaetarthriini, Coelostomini, Sphaeridiini, Cer- cyonini) .....	“	23, 24
Cucujoidea	Eucinetidae (With relationship to Ptiliidae and Leptinidae) .....	33	26
“	Derodontidae .....	“	27
“	Monotomidae .....	“	25
“	Rhizophagidae .....	33	28
“	Languriidae (See: Anthicidae)		
“	“ Languriinae .....	34	28
“	“ Cladoxeninae .....	“	28
“	Cryptophagidae		
“	“ Cryptophaginae .....	“	29
“	“ Telmatophilinae .....	“	“
“	Silvanidae		
“	“ Silvaninae .....	“	30
“	“ Telephaninae .....	“	30
“	Cucujidae		
“	“ Brontinae .....	“	31
“	“ Cucujinae .....	“	31
“	Prostomidae .....	“	33
“	Catogenidae .....	35	33

PLATE 8

*Limnobiidae*

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

\* Special abbreviations applied.

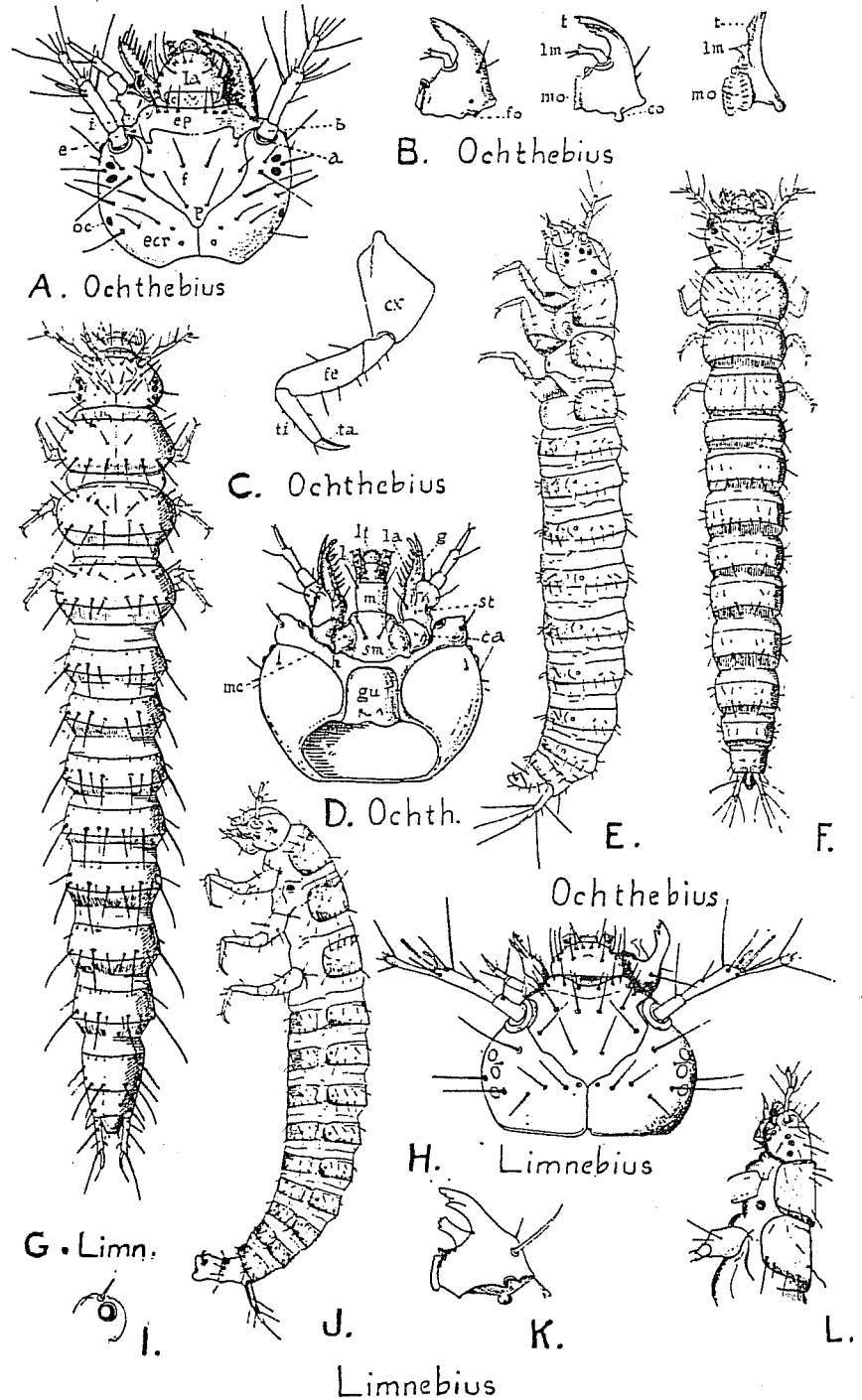
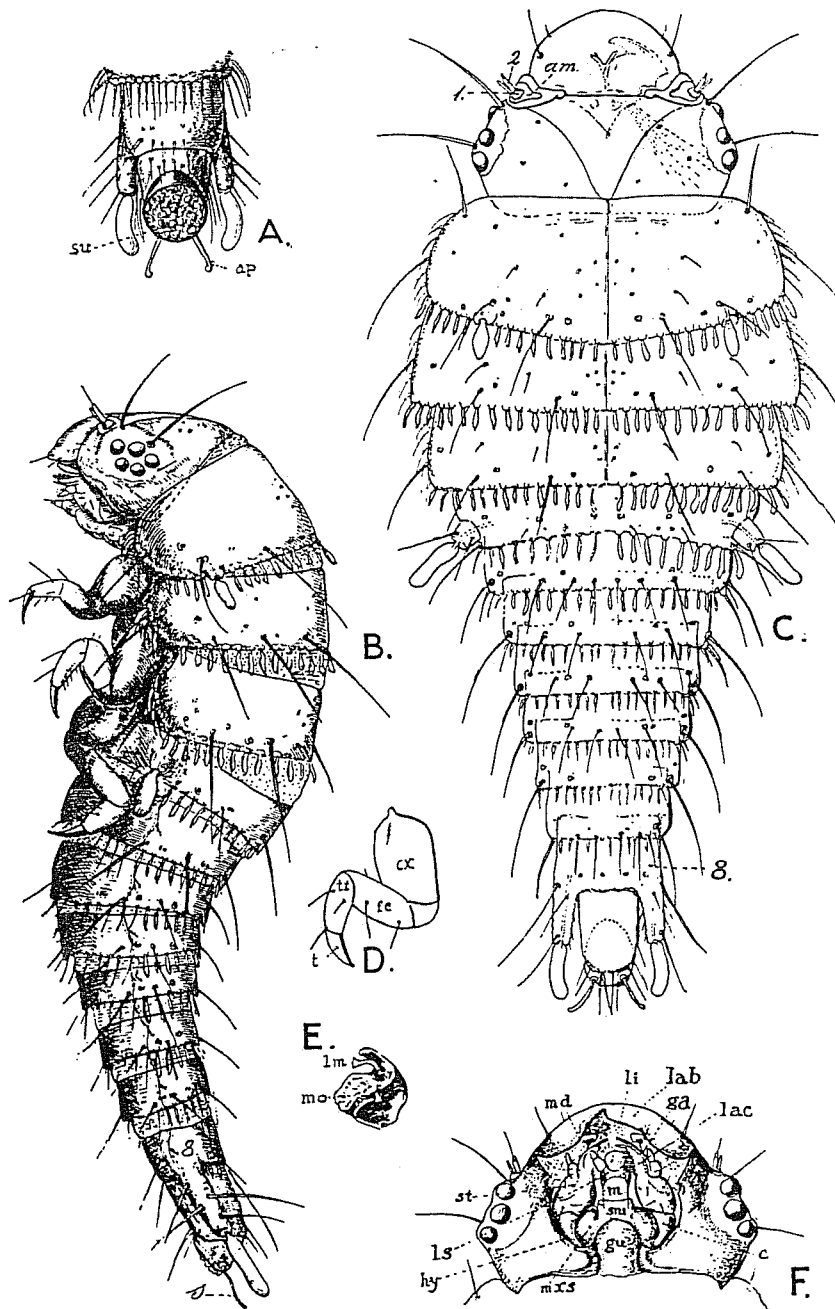


PLATE 9

*Hydroscaphidae*

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



A-F *Hydroscapha*

PLATE 10

*Leptinidae, Ptiliidae*

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

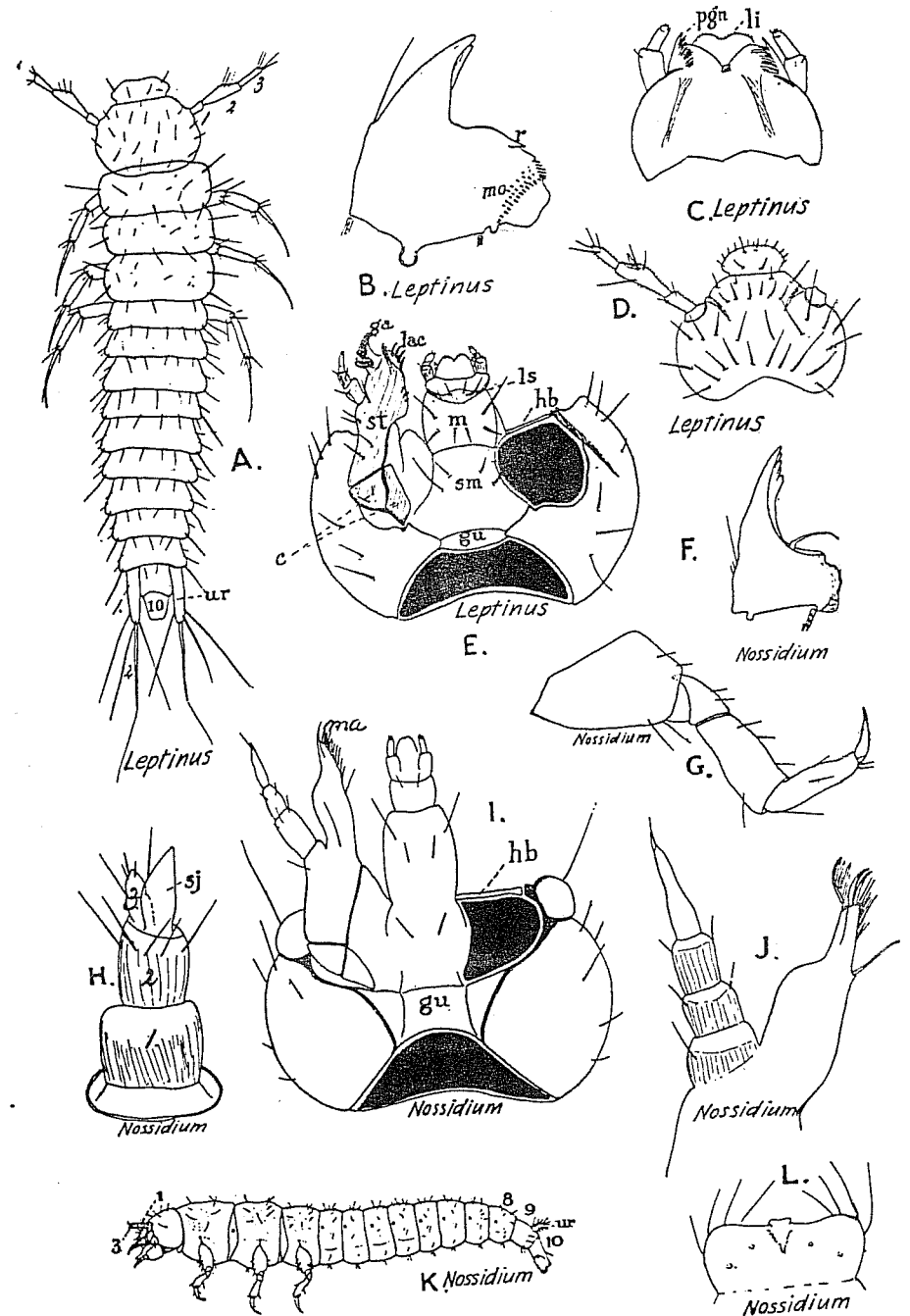


PLATE 11

*Anisotomidae-Liodinae* (A, B)  
*Anisotomidae-Cholevinae* (C-M)

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

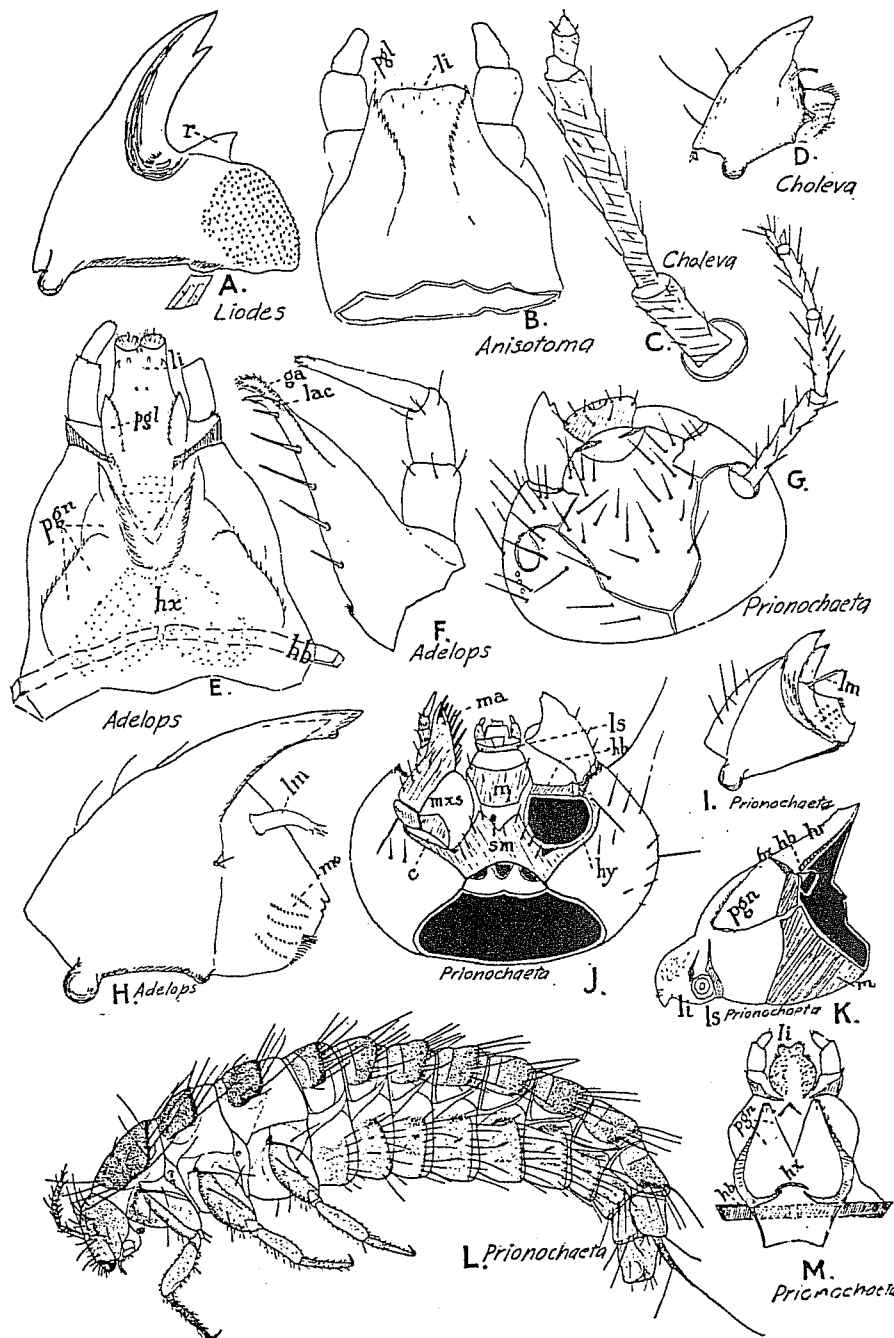


PLATE 12

*Scaphidiidae, Platypsyllidae*

- A. *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.  
 J. *Scaphisoma convexum* : Larva. Dorsal view.  
 K. *Platypsyllus castoris* : Head of mature larva. Ventral view.

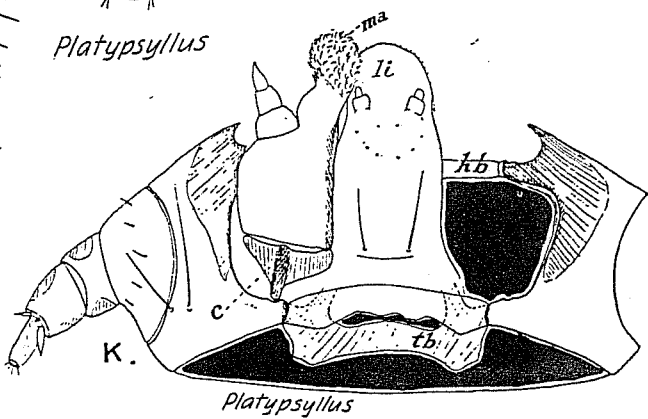
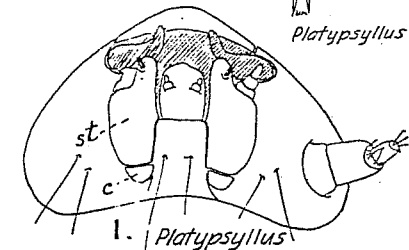
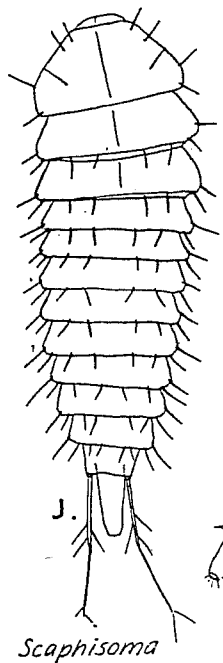
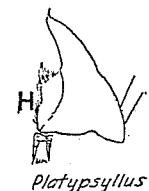
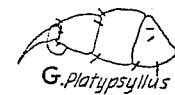
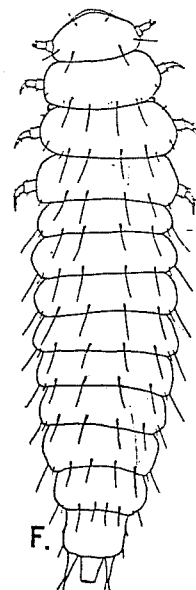
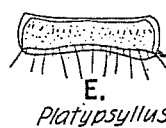
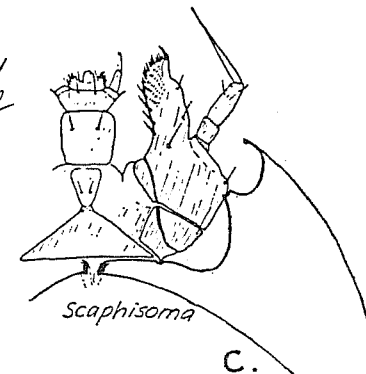
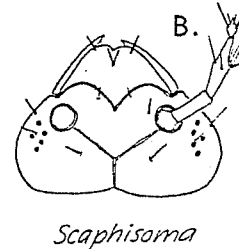
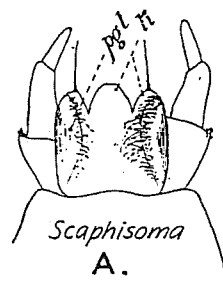
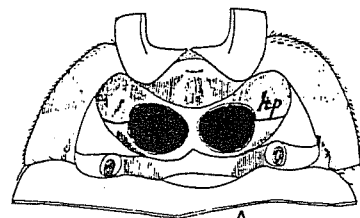


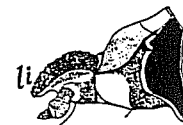
PLATE 13

*Silphidae-Silphinae*

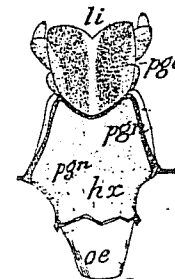
- A. *Silpha* (*noveboracensis* Forst.?): Prothorax. Ventral view.
- B. " " : Labium and hypopharynx. Lateral view.
- C. " " : Hypopharyngeal structures. Dorsal view.
- D. " " : Right mandible. Dorsal view.
- E. " " : Head. Ventral view.
- F. " " : Larva. Dorsal view.
- G. " " : Left maxilla. Dorsal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



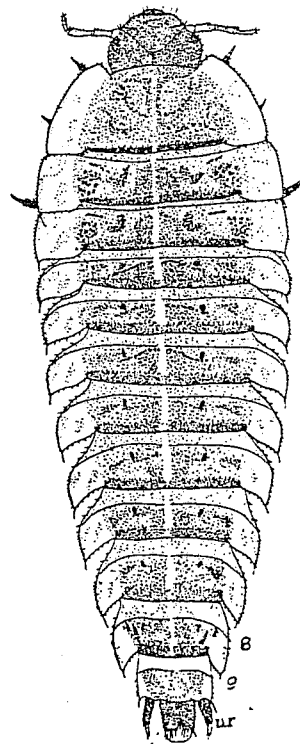
A. *Silpha*



B. *Silpha*



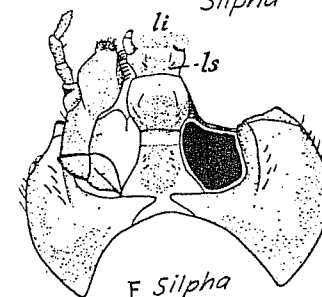
C. *Silpha*



F. *Silpha*



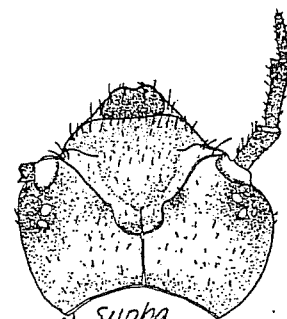
D. *Silpha*



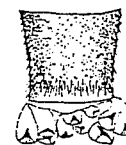
E. *Silpha*



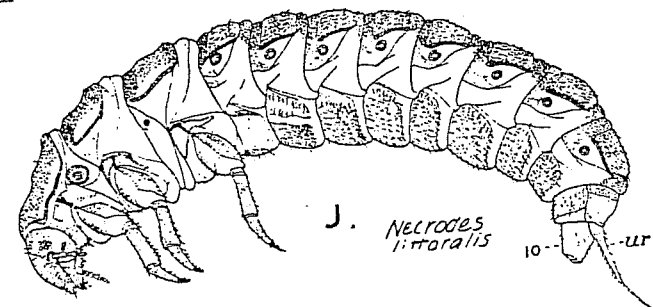
G. *Silpha*



H. *Silpha*



I. *Silpha*



J. *Necrodes littoralis*

PLATE 19

- Scydmaenidae (A-D). Pselaphidae (E-J)
- A. Scydmaenidae (Plummers Isl., Maryland): Head. Ventral view.  
 : Larva. Dorsal view.
- B. " : Larva. Lateral view.
- C. " : Head. Dorsal view.
- D. " : Head. Dorsal view.  
 : Head. Ventral view.
- E. *Batrisodes monstrosus* Lec. : Larva. Ventral view.
- F. *Euplectus confluens* Lec. : Ventral mouth-parts. Ventral view.
- G. " " : Larva. Lateral view.
- H. " " : Larva. Dorsal view.
- I. " " : Larva. Dorsal view.
- J. *Euplectus confluens* : Larva. Dorsal view.

