INSTITUTO NACIONAL AUTÒNOMO DE INVESTIGACIONES AGROPECUARIAS

FLORIDA A&M UNIVERSITY

V CURSO-TALLER SOBRE

"IDENTIFICACION TAXONOMICA DE INSECTOS INMADUROS Y ORDENES MENORES"

Recopilación de claves

Dr. Wills Flowers

Estación Experimental Tropical Pichilingue

Sección Entomología

Quevedo – Ecuador

2008

PRESENTACIÓN

El presente documento contiene una recopilación de claves taxonómicas relacionadas al reconocimiento de las formas inmaduras de algunas familias de insectos de importancia económica, correspondientes a los órdenes lepidóptera, coleóptera, díptera, neuróptera, entre otros; que en forma oportuna y apropiada han sido tomadas de varias fuentes literarias con fines estrictamente didáctico, con la esperanza de que sirvan como instrumentos de consulta para los participantes de este quinto curso-taller organizado por la Sección de Entomología de la EET-Pichilingue en concordancia con el Dr. Wills Flowers, profesor de la Florida A&M University de los Estados Unidos de Norte América.

Indudablemente, este curso-taller será la respuesta a la necesidad sentida de contar con una fuente de información confiable y bien organizada para la identificación taxonómica de algunos insectos, en especial, cuando se trata de reconocer larvas que causan daños económicos a los cultivos, las mismas que por su condición de vida, pasan por grandes modificaciones en cuanto a formas, tamaños, colores, hábitos y alimentación; a veces, sin la percepción de distinguir sus partes principales como la región de la cabeza, tórax y el abdomen. Por todo esto, se ha preparado este curso, dando la facilidad al participante para que maneje las claves y descripciones de los caracteres taxonómicos, ilustrados y descritos en el idioma inglés y español.

Una vez más, la Sección de Entomología de la EET-Pichilingue del INIAP, hace un reconocimiento especial al distinguido Dr. Wills Flowers, por su valiosa contribución científica, impartiendo sus conocimientos a más de un centenar de profesionales ecuatorianos en estos cinco cursos-talleres dictados en esta Unidad; y al apoyo participativo de las diferentes instituciones nacionales representadas por privilegiados colegas de las provincias del Guayas, Los Ríos, Manabí, Esmeraldas, Pichincha, Cotopaxi, Azuay, El Oro y Galápagos, que cada día se están capacitando para mejorar los diversos sistemas de producción agrícola sostenible, especialmente en lo relacionado al manejo integrado de plagas en los cultivos importantes de su entorno.

A todos ustedes muchas gracias por su colaboración y les deseo los mejores éxitos en este curso ofrecido.

Ing. Raúl Quijije Pinargote

Responsable Sección Entomología

CONTENIDO

CLAVE DE LOS ÓRDENES DE INSECTOS INMADUROS Y OTROS ARTRÓPODOS:

PAUROPODA	HYMENOPTERA	MANTOIDEA
ACARINA	TRICHOPTERA	BLATTODEA
DIPLOPODA	MEGALOPTERA	GRYLLOBLATTODEA
PROTURA	RAPHIDIODEA	ISOPTERA
COLLEMBOLA	NEUROPTERA	PHASMATODEA
DIPLURA	COLEOPTERA	DERMAPTERA
ARCHAEOGNATHA	STREPSIPTERA	ARANEAE
THYSANURA	SIPHONAPTERA	SCORPIONIDA
SIPHONAPTERA	ODONATA	RICINULEIDA
DIPTERA	PLECOPTERA	SCHIZOMIDA
HEMIPTERA	EPHEMEROPTERA	UROPYGIDA
MALLOPHAGA	THYSANOPTERA	SOLIFUGAE
ANOPLURA	PSOCOPTERA	AMBLYPYGIDA
HOMOPTERA	ZORAPTERA	PSEUDOSCORPIONIDA
LEPIDOPTERA	EMBIOPTERA	PHALANGIDA
MECOPTERA	ORTHOPTERA	

CLAVE PARA IDENTIFICAR LARVAS DE FAMILIAS DEL <u>ORDEN LEPIDOPTERA</u>:

Familias	MICROPTERYGIDAE	HELIODINIDAE	PTEROPHORIDAE
	CASTNIIDAE	HEPIALIDAE	NOTODONTIDAE
	COLEOPHORIDAE	YPONOMEUTIDAE	LYMANTRIIDAE
	LIMACODIDAE	CARPOSINIDAE	ETHMIIDAE
	INCURVARIIDAE	THYRIDIDAE	LASIOCAMPIDAE
	GELECHIIDAE	PSYCHIDAE	NYMPHALIDAE
	ERIOCRANIIDAE	PHALONIIDAE	SATURNIIDAE
	GRACILARIIDAE	OECOPHORIDAE	SPHINGIDAE
	TISCHERIDAE	GLYPHIPTERIGIDAE	BOMBYCIDAE
	PYRALIDAE	BLASTOBASIDAE	HESPERIIDAE
	LYONETIIDAE	NOCTUIDAE	LYCAENIDAE
	COSSIDAE	THYATIRIDAE	PAPILIONIDAE
	AEGERIIDAE	ARCTIIDAE	PIERIDAE
	COLEOPHORIDAE	GEOMETRIDAE	DANAIDAE
	TINEIDAE	SATYRIDAE	

CLAVE PARA IDENTIFICAR LARVAS DE FAMILIAS DEL <u>ORDEN COLEOPTERA</u>:

Familias	CUPESIDAE	RHIPICERIDAE	ENDOMYCHIDAE
	MICROMALTHIDAE	BUPRESTIDAE	COCCINELDAE
	GYRINIDAE	THROSCIDAE	MELANDRYIDAE
	RYSODIDAE	EUCNEMIDAE	SCRAPTIDAE
	HALIPLIDAE	ELATERIDAE	BYTURIDAE
	CARABIDAE	CEBRIONIDAE	ANTHICIDAE
	HYGROBIIDAE	RHIPICERIDAE	EURYSTETHIDAE
	NOTERIDAE	BRACHYPSECTIDAE	BOTHRIDERIDAE
	DYTISCIDAE	CANTHARIDAE	MYCETOPHAGIDAE
	AMPHIZOIDAE	LAMPYRIDAE	OEDEMERIDAE
	HYDROPHILIDAE	PHENGODIDAE	CEPHALOIDAE
	PTILIIDAE	LYCIDAE	TENEBRIONIDAE

LEPTINIDAE	DERMESTIDAE	PEDILIDAE
SILPHIDAE	CLERIDAE	PYTHIDAE
STAPHYLINIDAE	MELYRIDAE	PYROCHROIDAE
PLATYPSYLLIDAE	CISIDAE	OTHNIIDAE
SCAPHIDIIDAE,	OSTOMIDAE	ALLECULIDAE
(= STAPHYLINIDAE)	CUCUJIDAE	NILIONIDAE
SCYMAENIDAE	COLYDIIDAE	LAGRIIDAE
PSELAPHIDAE,	CERAMBYCIDAE	HISTERIDAE
(= STAPHYLINIDAE)	LATHRIDIIDAE	MORDELLIDAE
MELOIDAE	DERODONTIDAE	PTINIDAE
RHIPIPHORIDAE	MONOTOMIDAE	ANOBIIDAE
LUCANIDAE	RHIZOPHAGIDAE	BOSTRICHIDAE
PASSALIDAE	LANGURIIDAE	LYCTIDAE
SCARABAEIDAE	EROTYLIDAE	CHRYSOMELIDAE
TROGIDAE	CRYPTOPHAGIDAE	ORSODACNIDAE
DASCILLIDAE	CUCUJIDAE	BRENTIDAE
HETEROCERIDAE	CORYLOPHIDAE	AGLYCYDERIDAE
HELODIDAE	PHALACRIDAE	CURCULIONIDAE
BYRRHIDAE	NITIDULIDAE	DRYOPTHORIDAE
PTILODACTYLIDAE	SPHINDIDAE	PLATYSTOMIDAE
CHELONARIIDAE	MURMIDIIDAE	LYMEXYLIDAE
DRYOPIDAE		

CLAVE PARA IDENTIFICAR LARVAS DE FAMILIAS DEL ORDEN DIPTERA:

Suborden ORTHORRAPHA / Infraorden NEMATOCERA

Familias	TIPULIDAE	DIXIDAE
	PSYCHODIDAE	CERATOPOGONIDAE
	BLEPHAROCERIDAE	CHIRONOMIDAE
	CULICIDAE	SIMULIIDAE

Suborden ORTHORRAPHA / Infraorden BRACHYCERA

Familias	STRATIOMYDAE	DOLICHOPODIDAE
	TABNIDAE	MUSCIDAE
	EMPIDIDAE	

CLAVE PARA IDENTIFICAR LARVAS DE FAMILIAS DEL ORDEN NEUROPTERA:

Familias	RAPHIDIDAE	NEMOPTERIDAE
	SIALIDAE	CONIOPTERYGIDAE
	CORYDALIDAE	CHRYSOPIDAE
	OSMYLIDAE	HEMEROBIIDAE
	SISYRIDAE	ASCALAPHIDAE
	MANTISPIDAE	MYRMELEONTIDAE

GLOSARIO

Clave a los órdenes de insectos inmaduros y otros artrópodos

traducido de Hill, Stehr & Enns

Atajos: vayan a los números si el siguiente es la verdad.

0-3 pares de patas segmentadas 1
4 pares o más de patas segmentadas 76
Insectos ectoparásitos en mamíferos, aves, o abejas 11
Larvas de insectos holometábolos (y algunos Hemiptera) con:
Patas torácicas con 2 segmentos o más 17
Patas torácicas ausentes o con y par pequeño 36
Ninfas y insectos adultos sin alas o con alas cortas 54
Artrópoda afuera de Insecta 76
Arañas 77

1. **Patas torácicas:** 0-3 pares 2
1' **Patas torácicas:** 4 pares o más 76
2(1). **Patas torácicas:** presentes en 2 segmentos o más, generalmente con segmentos obvios 3
2' **Patas torácicas:** ausentes o 1 par pequeño 36
3(2) **Antenas:** con rama ..... **PAUROPODA**
3' **Antenas:** sin rama o ausente 4
4(3) **Cabeza:** a menudo evidente
Segmentación del cuerpo: generalmente evidente
Abdomen: se distingue
Patas: presente o ausente
Antenas: presente o ausente
Tamaño: muy pequeño a grande 5
4' **Cabeza**: no evidente, reducida a un capitulum (Fig. 3,2, 3.3)
Segmentación del cuerpo: no evidente
Abdomen: parte de un cuerpo compacto y oval
Patas: 3 pares
Antenas: ausentes
Tamaño: diminuto ..... (larvas de primer instar) **ACARINA**
5(4) **Patas segmentadas:** en segmentos 1, 2, 3 tras de la cabeza 6
5' **Patas segmentadas:** en segmentos 2, 3, 4, tras de la cabeza; primer segmento sin patas, .. modificado con un collum. (Fig. 3.4) (larvas de primer instar de milpiés) **DIPLOPODA**
6(5) **Antenas:** ausentes
Patas delanteras: no para andar; funcionan como antenas
Abdomen: pares de styli en el envés de los 3 primeros segmentos
Tamaño: menos de 2 mm.(Fig. 3.5) ..... **PROTURA**
6' **Antenas:** 1 par, aunque a veces muy reducidas
Patas delanteras: para andar o agarrar, a veces reducidas
Abdomen: styli ausentes, o en otros que los primeros 3 segmentos
Tamaño: a menudo más que 2 mm 7
7(6) **Abdomen:** con un tubo ventral (collophore)(Fig. 3.6) en segmento 1, a menudo con una . apéndice bifurcada (fúrcula) para brincar en segmento 4 o 5 (Fig. 3.8); 6 segmentos ..... **COLLEMBOLA**
7' **Abdomen:** collophore y fúrcula ausentes; más que 6 segmentos 8
8(7) **Abdomen:** 2 o más segmentos con estiletes ventral (Fig. 3.9); apéndices terminales presentes 9
8' **Abdomen:** estiletes ventral ausentes: apéndices terminales presentes o ausentes 11

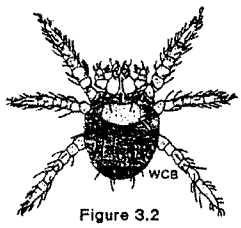
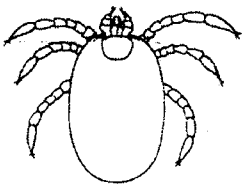


Figure 3.2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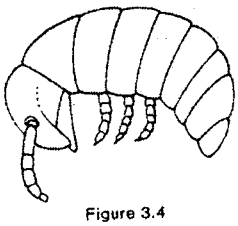
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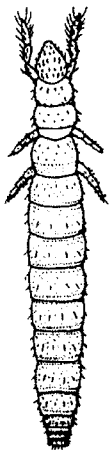
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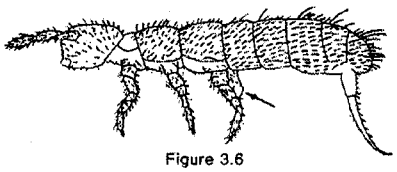
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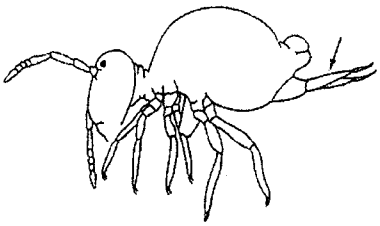
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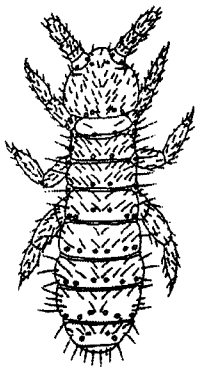


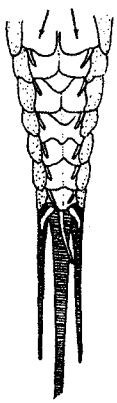
Figure 3.7

9(8) **Abdomen:** 2 apéndices terminales (cerci) que puede aparecer a pinzas (Fig. 3.10) o ..... filamentosas (Fig. 3.11); estiletes ventral en segmentos 1-7 o 2-7
Tarsos: 1 segmento
Ojos compuestos: ausentes
Cuerpo: sin escamas o manchas, blanco ..... **DIPLURA**

9' **Abdomen:** 3 apéndices terminales (cerci y filamento caudal); estiletes ventral en ..... segmentos 2-9 o 7-9, o8,9
Tarsos: 2 a 4 segmentos
Ojos compuestos: presentes
Cuerpo: con escamas, muchas veces con manchas 10

10(9) **Cuerpo:** algo cilíndrico
Tórax: arqueado
Ojos compuestos: grandes, generalmente tocando
Estiletes abdominales: en segmentos 2-9 (Fig. 3.12) ..... **ARCHAEOGNATHA**

10' **Cuerpo:** algo aplastado
Tórax: recto
Ojos compuestos: pequeños o ausentes
Estiletes abdominales: variable (Fig. 3.13) ..... **THYSANURA**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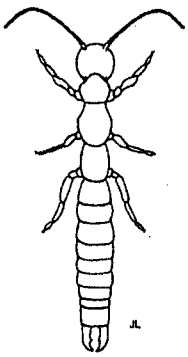
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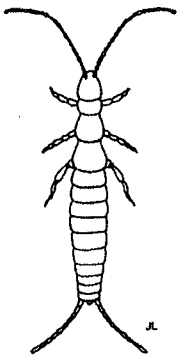
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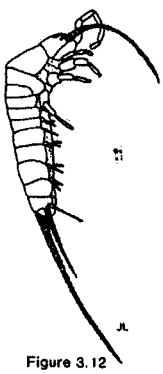
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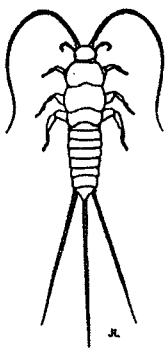
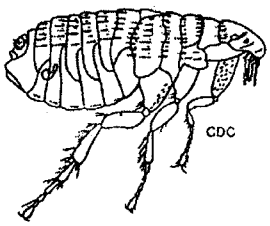


Figure 3.13

11(8) **Hábitat:** ectoparásitos en aves, mamíferos, o abejas, generalmente encontrado en el huésped.
Cuerpo: fuertemente aplastado dorsalmente o lateralmente 12
11' **Hábitat:** no son parásitos
Cuerpo: generalmente no aplastado 16
12(11) **Tarsos:** 5 segmentos
Antenas: cortas, generalmente escondidas 13
12' **Tarsos:** 1-4 segmentos
Antenas: variables 14
13(12) **Cuerpo:** aplastado lateralmente
Patas: extendidas hacia abajo
Comportamiento: generalmente brincando (pulgas)..... (Fig. 3.14) **SIPHONAPTERA**
13' **Cuerpo:** aplastado dorsalmente
Patas: extendidas hacia al lado
Comportamiento: no brincan ..... (Fig. 3.15) unos pocos **DIPTERA**
14(12')**Tarsos:** 1 segmento
Antenas: más cortas que la cabeza ..... (piojos) 15
14' **Tarsos:** 3 segmentos
Antenas: más largas que la cabeza (Fig. 3:16, 3:16a) ..... **HEMIPTERA**
15(14) **Cabeza:** igual o más ancha que el protórax
Aparato bucal: mandíbulas
Hábitat: parasíticos en aves (2 uñas) o mamíferos (1 uña)(Fig. 3:17) **MALLOPHAGA**
15' **Cabeza:** más ancha que el protórax
Aparato bucal: chupador
Hábitat: parasíticos en mamíferos (1 uña grande)(Fig. 3:18) ..... **ANOPLURA**
16(11')**Ojos compuestos:** ausentes
Estuches: ausentes
Tarsos: 1 segmento o ausente
Stemmata (ojos sencillos): a menudo presentes .....**larvas holometábolas** 17
16' **Ojos compuestos:** generalmente presentes, raramente reducidos o ausentes
Estuches: a menudo presentes, especialmente en larvas maduras
Tarsos: generalmente 2–5 segmentos (1 segmento en Ephemeroptera, ausentes en ..... Thysanoptera
Stemmata (ojos sencillos): ausentes .....
.....**larvas hemimetábolas y adultos sin alas INSECTA..** 54
17(16) **Aparato bucal:** para masticar; mandíbulas y palpos maxilarios o labiales presentes (en ... algunos, los mandíbulas son largas y modificadas para chupar, Fig. 3:19; o si son estiletes, son insectos acuáticos en esponjas de agua dulce (Fig. 3:20)
Hábitat: variable..... 18



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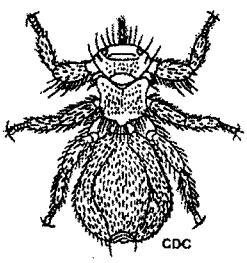

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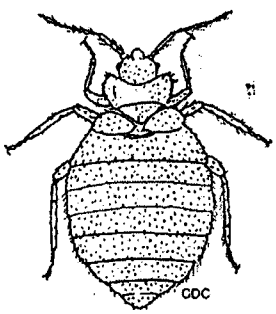

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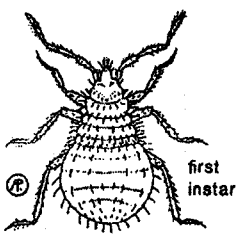


Figure 3.16a

17' **Aparato bucal:** para chupar, con estiletes saliendo del trasero de la cabeza (Fig. 3:21), ... palpos en el maxila y labio ausentes
Hábitat: en plantas..... (larvas de Coccoidea con patas) **HOMOPTERA**

18(17) **Abdomen:** con 2 o más pares de seudopatas blandas las cuales pueden llevar crochets .... (ganchos) o no 19

18' **Abdomen:** sin seudopata, o con un par terminal que lleva 1–3 ganchos; algunas larvas de Coleoptera tienen crochetes o espinas pero sin seudopatas o con tubérculos muy débiles ..... (Figs. 3:22, 23)23

19(18) **Cuerpo:** como un baboso, con tubérculos como jalea (Fig. 3:24)
Abdomen: crochets en segmentos 2 y 7 ..... (Dalceridae) **LEPIDOPTERA**

19' **Cuerpo:** variable, sin tubérculos como jalea
Abdomen: segmentos 2 y 7 sin crochets 20

20(19')**Propatas:** generalmente 2–5 pares en segmentos abdominales 3–6 y 10; si propatas ..... presentes también en 2 y 7, entonces esos segmentos sin crochets
Crochets: en filas o círculos, generalmente con ganchos, a veces como espinas
Cabeza: área adfrontal presente (Fig. 3:25)..... la mayoría de **LEPIDOPTERA**

20' **Propatas:** 6 pares o más
Crochets: ausentes, aunque propatas deben tener 1 o más uñas
Cabeza: área adfrontal ausente 21

21(20) **Cuerpo:** con 4 filas dobles de setas grandes, alargadas, ovaladas (Fig. 3:26)
Tamaño: hasta 5 mm ..... (unos pocos Micropterygidae)**LEPIDOPTERA**

21' **Cuerpo:** sin filas de setas grandes alargadas, u ovaladas
Tamaño: generalmente más que 5 mm..... 22

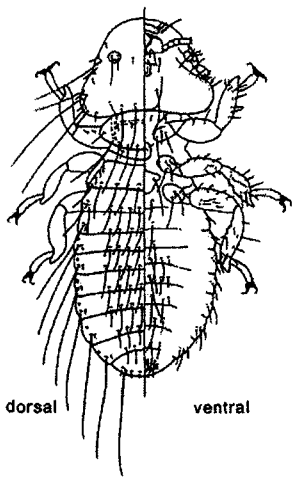
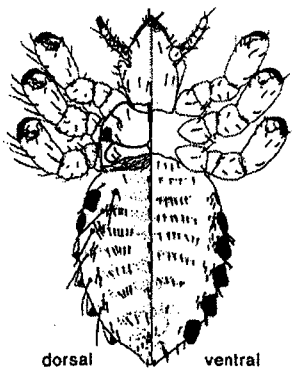


Figure 3.17



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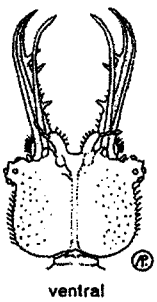

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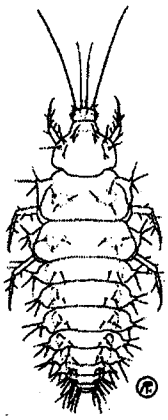
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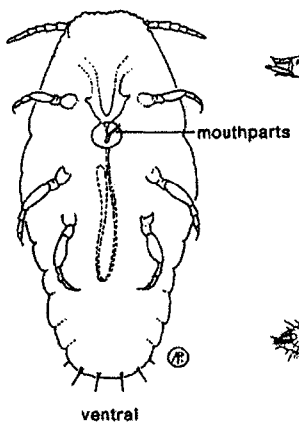

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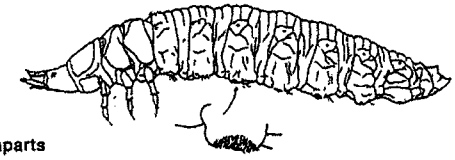
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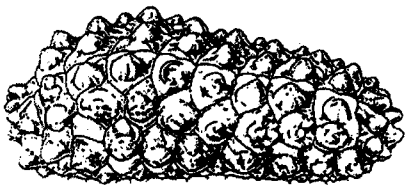


Figure 3.24


Figure 3.23

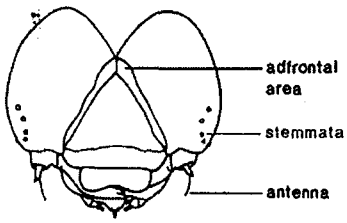


Figure 3.25

22(21')**Stemmata:** 7 pares o más; muchas veces, hasta 30 pares
Propatas: presentes en segmento abdominal 1; a menudo 8 pares
Abdomen: segmentos sin anillos secundarios; segmentos con espinas
Segmento terminal: frecuentemente expandido en un disco suctorial (Fig. 3: 27 .... **MECOPTERA**

22' **Stemmata:** 1 par
Propatas: ausente en segmento 1; generalmente 7 o 8 pares (6–10 pares posibles)
Abdomen: con anillos secundarios; raramente con espinas
Segmento terminal: disco ausente (Fig. 3:28)..... alguos **HYMENOPTERA**

23(18')**Cabeza:** hipognata (Fig. 3:29) 24

23' **Cabeza:** prognata (Fig. 3:30).....28

24(23) **Forma del cuerpo:** como un baboso
Stemmata laterales: generalmente 6, en un semicírculo (Fig. 3:25)
Áreas adfrontales: presentes (como en Fig. 3:25)
Antenas: saliendo de una área triangular o en forma de U adyacente al base de los ..... mandíbulas..... unos pocos **LEPIDOPTERA**

24' **Forma del cuerpo:** variable pero no como babosos
Stemmata laterales: 0–6 pares, no en un semicírculo
Áreas adfrontales: ausentes
Antenas: saliendo del cráneo; si adyacente al base del mandíbulo, sale de una área circular 25

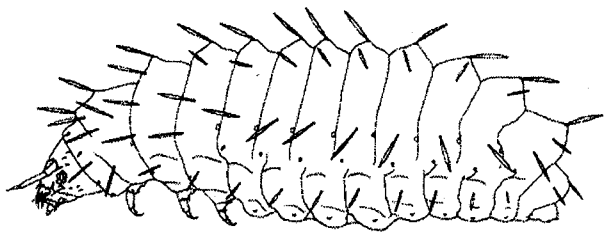
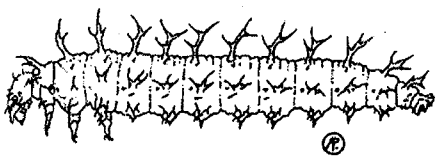


Figure 3.26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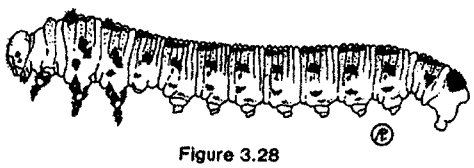
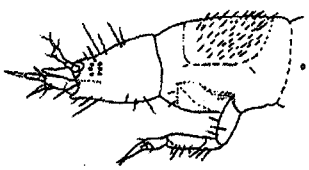


Figure 3.28


Figure 3.29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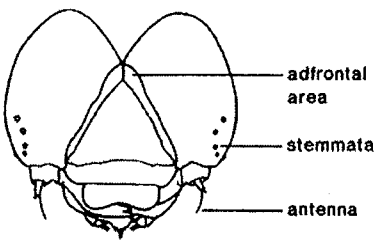

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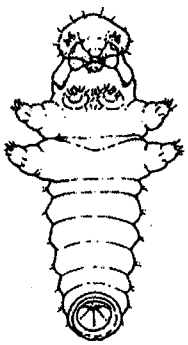


Figure 3.31


Figure 3.32

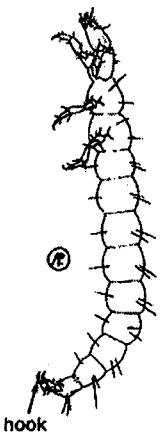


Figure 3.33

25(24')**Patas torácicas:** patas delanteras cortas, dirigidas hacia abajo; otras patas más grandes, .. dirigidas hacia el lado (Fig. 3:31)
Stemmata: con 3 pares o ningunas
Branquias: ausentes ..... unos pcos **MECOPTERA**

25' **Patas torácicas:** 3 pares semejantes en forma
Stemmata: hasta 6 pares
Branquias: presentes o ausentes.....26

26(25')**Segmento terminal:** generalmente con 1 par de propatas con 1–3 uñas
Tarsos: 1 uña
Cuerpo: a menudo con branquias, frecuentemente en una caseta
Hábitat: acuáticos, unos poco en áreas terrestres mojadas (Fig. 3:32, 33) .... **TRICHOPTERA**

26' **Segmento terminal:** sin propatas con uñas
Tarsos: 1, 2, o 0 uñas
Cuerpo: raramente con branquias o encerrado en una casita
Hábitat: terrestre o acuático 27

27(26')**Stemmata:** 1 par
Palpos labiales: 3 segmentos (a veces 2)
Patas torácicas: sin codos
Spiraculos torácicas: en protórax y mesotórax
Cuerpo: alargado, nunca bien escleritizado
Hábitat: nunca acuático (Figs. 3:34–36) ..... algunos **HYMENOPTERA**

27' **Stemmata:** 2–6 pares (unos pocos tienen 1 o 0 pares)
Palpos labiales: 1 o 2 segmentos
Patas torácicas: generalmente con codos entre los segmentos
Spiraculos torácicas: en protórax o en mesotórax (excepto en formas acuáticos)
Cuerpo: doblado en forma de C o U, a veces bien escleritizado
Hábitat: terrestre o acuático ..... algunos **COLEOPTERA**

28(23')**Cuerpo:** con 4 filas dobles de setas grandes, alargadas, ovaladas (Fig. 3:26)
Tamaño: hasta 5 mm .....(unos pocos Micropterygidae)**LEPIDOPTERA**

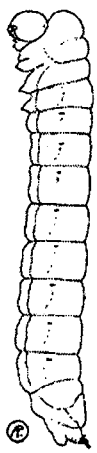
28' **Cuerpo:** sin filas de setas grandes alargadas, u ovaladas
Tamaño: generalmente más que 5 mm.....29

29(28')**Patas torácicas:** 1 uña, raramente ausentes.....34

29' **Patas torácicas:** 2 uñas.....30

30(29')**Aparato bucal:** labro y clípeo presentes y visibles; si el termino del abdomen llevara ..... ganchos, entonces con un *par* de propatas, cada uno con 2 ganchos 31

30' **Aparato bucal:** labro o clípeo ausentes o fusionados o escondidos; si el termino de abdomen .....
llevara ganchos, entonces si un *par* de propatas con 2 ganchos.....33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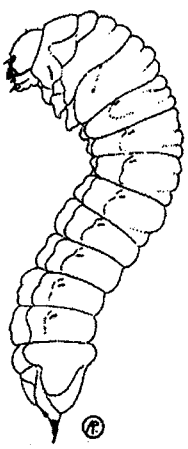
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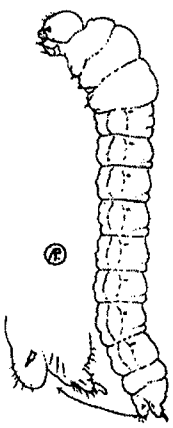
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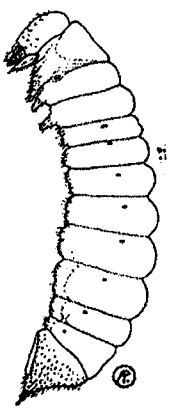


Figure 3.37

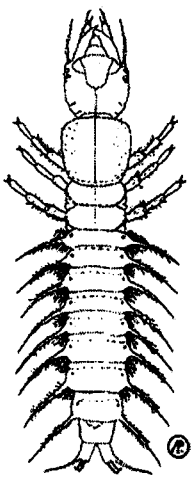
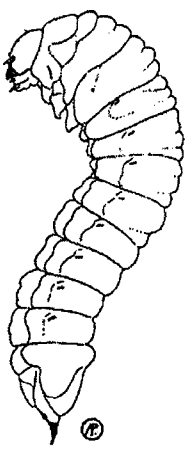


Figure 3.38

31(30)**Abdomen:** 7 o 8 pares de procesos laterales largos
Hábitat; acuático (Fig. 3:38, 39) ..... **MEGALOPTERA**
31' **Abdomen:** procesos laterales ausentes
Hábitat; terrestre.....32
32(31')**Palpos labiales:** 3 segmentos
Stemmata: 4–7
Abdomen: con 10 segmentos bien definidos (Fig. 3:40).....**RAPHIDIODEA**
32' **Palpos labiales:** no más que 2 segmentos
Stemmata: 0–6
Abdomen: no como arriba .....(Cupedidae y Micromalthidae) **COLEOPTERA**
33(30')**Palpos de la maxila:** ausentes
Mandíbulas y maxilas: unidos, formando mandíbulas chupadores
Hábitat: terrestre (Figs. 3:41, 42).....**NEUROPTERA**
33' **Palpos de la maxila:** presentes (Fig. 3:43)
Mandíbulas y maxilas: mandíbulo separado, puede tener una grieta para sangre, puede se usado para penetrar y chupar
Hábitat: terrestre o acuático ..... algunas larvas de **COLEOPTERA**
34(29)**Mandíbulas y maxilas:** modificados, largo y como una aguja
Uñas tarsales: 1
Branquias: dobladas abajo del ábdomen
Antenas: 5–16 segmentos
Hábitat: en esponjas de agua dulce (Fig. 3:20) ..... (Sisyridae)**NEUROPTERA**
34' **Mandíbulas y maxilas:** no muy modificados; mandíbulas mastican
Uñas tarsales: 1 o 2 (raramente ausentes)
Branquias: si presentes, no doblados
Antenas: variable
Hábitat: no asociados con esponjas.....35
34'' **Mandíbulas y maxilas:** mandibulos ausentes, maxilas presentes sólo como palpos
Uñas tarsales: ausentes
Branquias: ausentes
Antenas: al máximo como cerdas
Hábitat: terrestres, generalmente encontrados pegados a otros insectos .....
..... primer instar de **STREPSIPTERA**


Figure 3.34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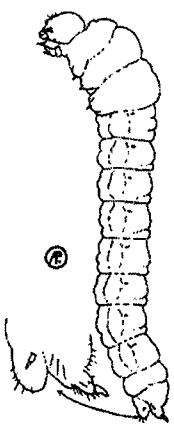
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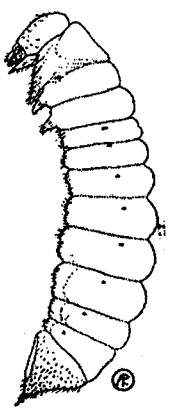
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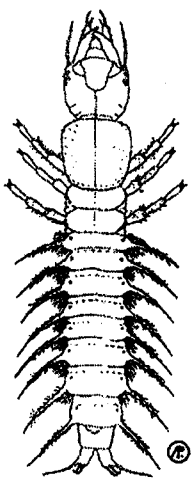


Figure 3.38

35(34')**Segmento terminal:** 1 par de propatas anales, cada una con 1–3 uñas
Patas torácicas: 5 segmentos, frecuentemente con subdivisiones
Espiráculos: ausentes
Branquias: generalmente presentes
Cuerpo: frecuentemente viviendo en una caseta
Antenas: inconspicuas, generalmente de 1 segmento ..... **TRICHOPTERA**

35' **Segmento terminal:** sin propatas con uñas
Patas torácicas: generalmente con 4 segmentos, raramente con 5
Espiráculos: presentes, o, si acuáticos, rudimentario o ausentes
Branquias: presentes o ausentes
Cuerpo: raramente viviendo en un caseta
Antenas: a menudo con 2 o más segmentos .....
.....la mayoría de larvas y algunos adultos **COLEOPTERA**

36(2') **Hábitat:** acuático ..... muchas larvas **DIPTERA**

36' **Hábitat:** terrestre.....37

37(36')**Cuerpo:** cubierto con cera, frecuentemente en forma de escamas
Aparato bucal: chupadores, saliendo del trasero de la cabeza
Hábitat: en plantas, inmoviles..... (Coccoidea en parte, Aleyrodoidea)**HOMOPTERA**

37' **no conforma con la descripción arriba**.....38

38(37')**Cápsula de la cabeza:** distinto, escleritizada completamente o en parte; puede ser metida en el tórax.....40

38' **Cápsula de la cabeza:** no distinto, no escleritizada ni pigmentada, al máximo las mandíbulas y estructuras de soporte escleritizadas, puede ser metida en el tórax 39

39(38')**Mandíbulas:** opuestas pero reducidas
Cuerpo: a menudo en forma de C, a menudo más ancho en la mitad
Espiráculos: 1–3 en tórax y 5–8 en abdomen
Propatas: ausentes, crochets nunca presentes
Hábitat: en cedulas o panales, o parásitos en plantas (Fig. 3;44-47) **HYMENOPTERA**

39' **Mandíbulas:** a menudo paralelas, reducidas a 1 o 2 ganchos metidas en la cabesza
Cuerpo: muy variable, pero raramente en forma de C
Espiráculos: a menudo en el protórax y el termino caudal, o ausentes
Propatas: puede ser presentes y puede tener crochets
Hábitat: variable pero no en panales o celdas (Fig. 3:48-55) ..... **DIPTERA**

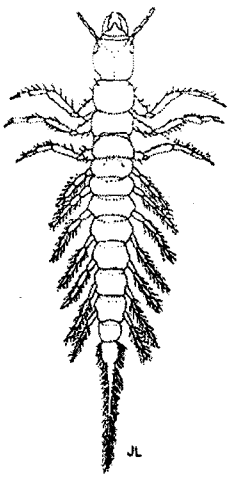


Figure 3.39

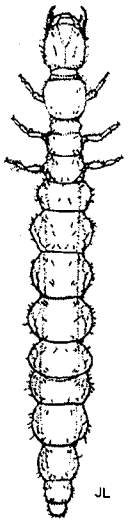


Figure 3.40

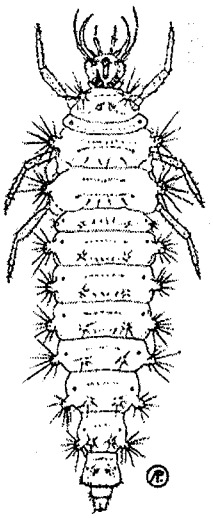
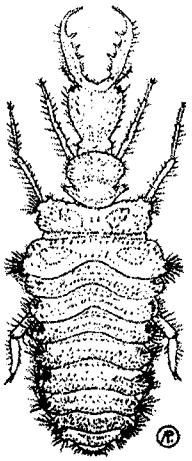


Figure 3.41



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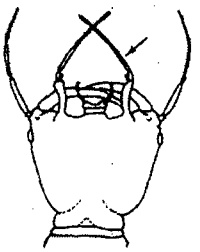


Figure 3.43

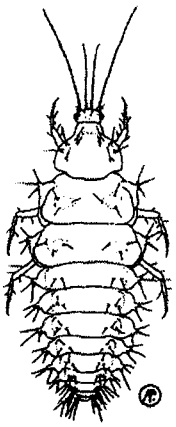


Figure 3.20

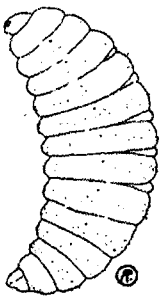


Figure 3.44

Figure 3.45

Figure 3.46

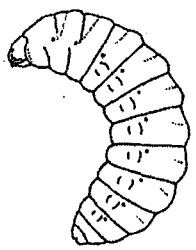


Figure 3.47

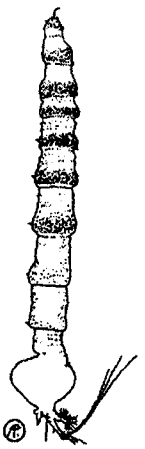


Figure 3.48

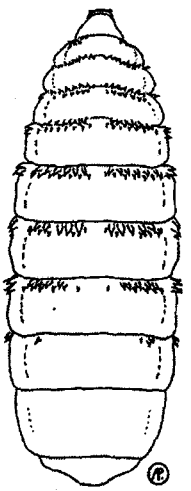


Figure 3.49

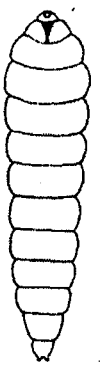


Figure 3.50

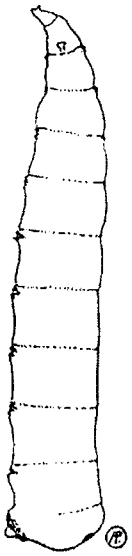


Figure 3.51

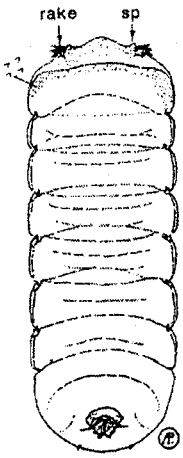
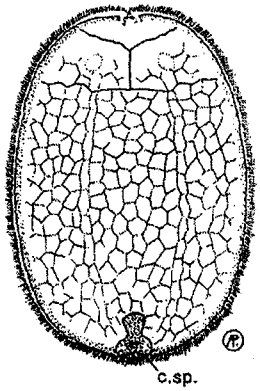


Figure 3.52



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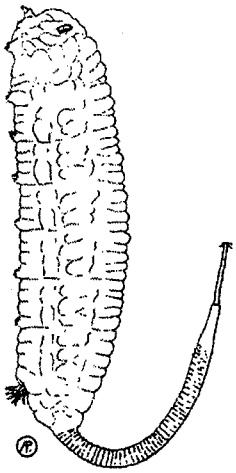

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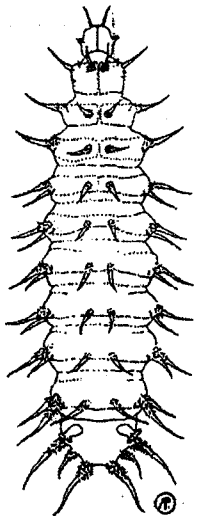


Figure 3.55

40(38)**Cápsula de la cabeza:** completa, distinta, pigmentada, puede ser parcialmente metida en el protórax.....41

40' **Cápsula de la cabeza:** incompleta, sin pigmentación, puede ser metida en el protórax..... 50

41(40) **Cuerpo:** cada segmento con 1–2 filas de setas
Segmento terminal: con 1 par de proyecciones anales
Hábitat: nidos de pájaros y mamíferos, detritos en casas ..... **SIPHONAPTERA**

41' **no conforma con la descripción arriba**.....42

42(41')**Cabeza:** fusionada con el protórax
Cuerpo: como una bolsa sin pigmento, segmentación indistinta
Hábitat: parasíticos en otros insectos.....adultos hembras **STREPSIPTERA**

42' **no conforma con la descripción arriba**.....43

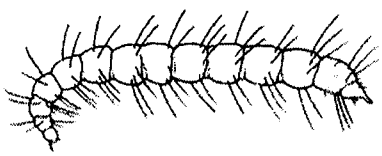


Figure 3.56

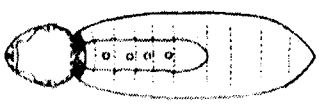


Figure 3.57

43(42')Cabeza: hipognata (Fig. 3:29) 46

43' Cabeza: prognata (Fig. 3:30) 44

Figure 3.29

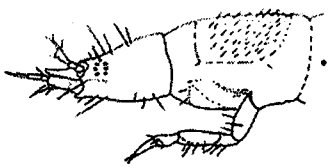


Figure 3.30

44(43) **Propatas:** frecuentemente presentes, pero sólo en segmentos 3–6 y 10
Labio: spinneret central presente
Áreas adfrontales: evidente
Stemmata: 1–6 pares, a menudo en un semicírculo; a veces con sólo un par
Muesca epicranial: muchas veces honda
Antenas: saliendo de una área triangular o en forma de U adyacente al base de los ..... mandíbulas.....algunos **LEPIDOPTERA**

44' **Propatas:** ausentes en segmentos 3–6 y 10, o si presentes en otros segmentos también
Labio: spinneret ausente
Áreas adfrontales: nunca presentes
Stemmata: ausentes, o nunca en un semicírculo
Muesca epicranial: poca honda o no evidente
Antenas: saliendo del cráneo; si adyacente al base del mandíbula, sale de una área circular 45

45(44') **Aparato bucal:** Mandíbulas evidentes
Espiráculos: 1 par en el mesotórax y 8 pares en el abdomen
Cuerpo: variable, como Figs. 3:58-60
Suturas epicraniales: en forma de "Y"
Protórax: a veces 2 o más veces más largo y más ancho que el meso- y metatórax, nunca con un propata. Figs. 3:58-60..... algunos **COLEOPTERA**

45' **Aparato bucal:** ganchos verticales, o mandíbulas difíciles de ver
Espiráculos: generalmente 1 par en el protórax y un par en el termino del abdomen
Cuerpo: generalmente alargado, tal vez con bultos en algunas partes de cuerpo
Suturas epicraniales: raramente en forma de "Y", o como Fig. 3:64
Protórax: el mismo largura y anchura que el mesotórax o metatórax, o más delgado, puede llevar un propata (Fig. 3:62-67)..... muchas larvas de **DIPTERA**

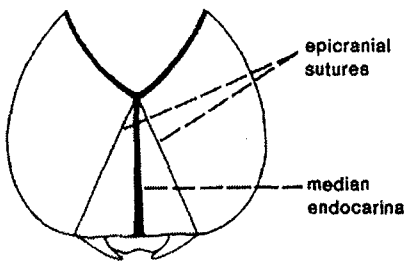


Figure 3.57a

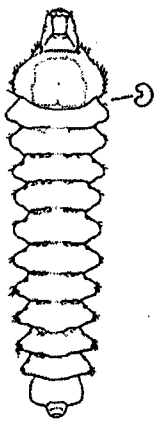


Figure 3.58

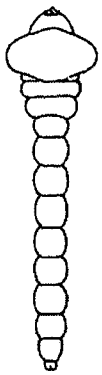
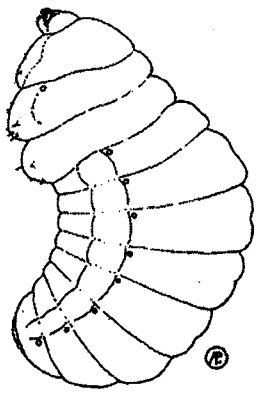


Figure 3.59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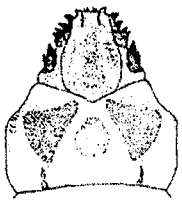
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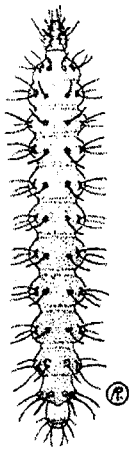


Figure 3.62

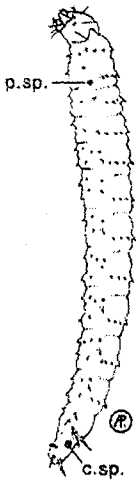
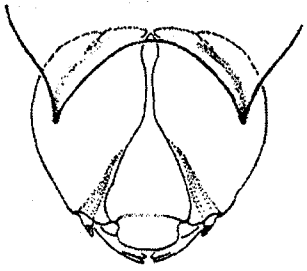


Figure 3.63


Figure 3.64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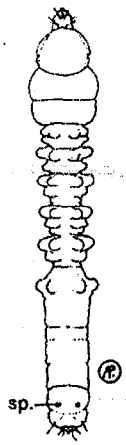


Figure 3.65


Figure 3.66

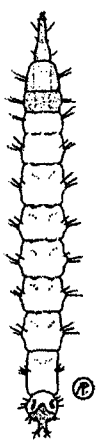
45'' **Aparato bucal:** opuestos pero puede ser muy modificado
Espiráculos: 1 par en protórax (nunca en mesotórax), 8 pares en el abdomen
Cuerpo: alargado, aplastado
Suturas epicraniales: no en forma de "Y"
Protórax: igual a meso- y metatórax, nunca con propata Fig. 3:38 ..... **LEPIDOPTERA**

46(43) **Espiráculos torácicos:** 1par en protórax o mesotórax
Abertura de espiráculos: bifora, como Fig. 3:69-71
Segmentos del cuerpo: con anillos transversales fuertes
Aparato bucal: bien desarrollado
Cuerpo: en forma de C o U (Fig. 3:72 ..... picudos y escolytidos **COLEOPTERA**

46' **Espiráculos torácicos:** 0-3 pares; si 1 pare, espiráculos grandes o espuelas en el abdomen
Abertura de espiráculos: single o con 3 aberturas
Segmentos del cuerpo: sin anillos
Aparato bucal: a veces reducido, palpo maxilar non distinto
Cuerpo: encorvado o no 47

47(46') **Cuerpo:** bien escleritizado. marrón, como en Fig. 3:73 ..... **COLEOPTERA**

47' **Cuerpo:** no muy escleritizado, no como Fig. 3:73 48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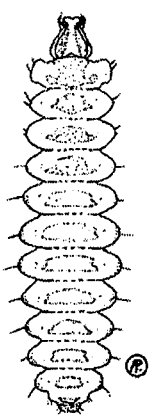
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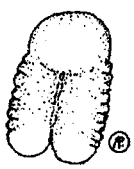
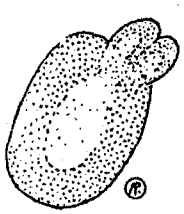


Figure 3.69


Figure 3.70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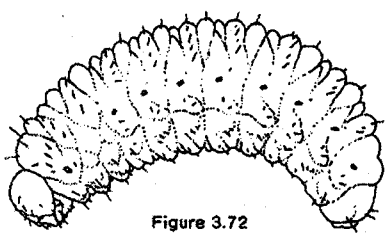


Figure 3.72

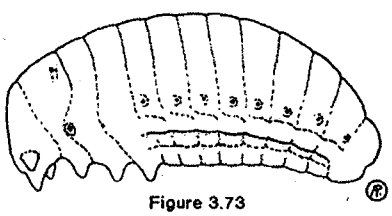


Figure 3.73

48(47')**Labio:** con un spinneret cónical
Antenas: saliendo de una área triangular o en forma de U adyacente al base de los ..... mandíbulas
Propatas: si hay, con crochets
Área adfrontal: presente, a menudo inconspicua .....pocos **LEPIDOPTERA**
48' **Labio:** spinneret cónico ausente
Antenas: saliendo del cráneo; si adyacente al base del mandíbula, sale de una área circular
Propatas: si hay, sin crochets
Área adfrontal: ausente 49
49(48')**Mandíbulas:** opuestas, débilmente escleritizadas
Espiráculos: generalmente 2 pares en el tórax y 8 pares en el abdomen
Hábitat: en celdas construidas por adultos, parasíticos, o en plantas **HYMENOPTERA**
49' **Mandíbulas:** a menudo opuestas, o ganchos verticales, o cepillas
Espiráculos: 1 par o ninguno en el protórax, menos que 8 pares en el abdomen, el último par más grande
Hábitat: varios, frecuentemente en áreas mojadas, o en materiales podridos, o parasíticos en animales .....algunos **DIPTERA**
50(40')**Aparato bucal:** bien desarrollado, mandíbulas opuestas, labro y labio evidentes
Antenas: distintas, generalmente con más que un segmento..... **COLEOPTERA**
50' **Aparato bucal:** (a) mandíbulas reducidas o débilmente escleritizadas **O**
(b) mandíbulas reducidas a 1 o 2 ganchos, **O**
(c) mandíbulas escleritizadas pero muy metidas en el protórax
Antenas: ausente o no evidente, raramente 1 o 2 segmentos 51
51(50')**Proesterno:** con un esclerito como una ancla Fig. 3:50
Color: cuando vivo, amarillo, naranjo, o rojo
Cuerpo: en forma de huso, parece que hay 13 segmentos trás de una cabeza minúscula
Tamaño: menos que 4 mm. .....Cecidomyiidae **DIPTERA**
51' **Proesterno:** ancla ausente
Color: cuando vivo, blancuzco
Cuerpo: a veces en forma de C o U, generalmente con menos que 13 segmentos
Tamaño: a menudo más que 4 mm 52
52(51')**Mandíbulas:** parcialmente o completamente metidas en el protórax, y reducidas a 1 o 2 . ganchos paralelos, o reducidas a mandíbulas opuestas
Maxilas: variables, frecuentemente ausentes, o a veces ganchos Fig. 3:74 .... **DIPTERA**
52' **Mandíbulas:** opuestas y reducidas pero no metidas en el protórax
Maxilas: generalmente evidentes pero reducidas 53
53(52')**Maxilas:** reducidas a protuberancias carnosas, sin setas o estructuras
Palpos maxilares: reducidos a discos o protuberancias cónicos
Antenas: si presentes, parecen a ojos Fig. 3:75
Spinneret: puede ser distinto
Abdomen: generalmente sin anillos (hormigas Fig. 3:76, abejas Fig. 3:47, avispas Fig. 3:46, parasitoides y avispas de agallas Fig. 3:44) ..... **HYMENOPTERA**
53' **Maxilas:** puede ser pequeña pero con segmentos distintos
Palpos maxilares: generalmente con 2 o 3 segmentos o cabeza como Fig. 3:61
Antenas: presentes, cerca de los mandíbulas
Spinneret: ausente
Abdomen: a menudo 3 anillos o más en cada segmento..... **COLEOPTERA**
54(16')**Labio:** prolongable, al descansar, doblado en si abajo de la cabeza
Hábitat: acuático Fig. 3:77. 3:78.....libélulas, helecópteros **ODONATA**
54' **Labio:** no prolongable
Hábitat: acuático o terrestre 55

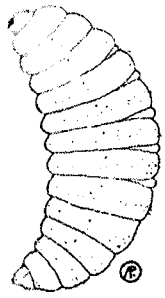


Figure 3.44

Figure 3.46

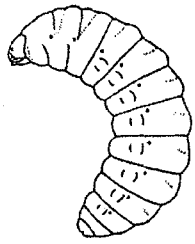


Figure 3.47

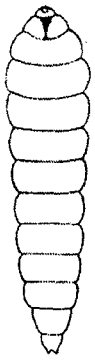


Figure 3.50

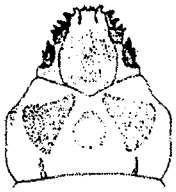


Figure 3.61

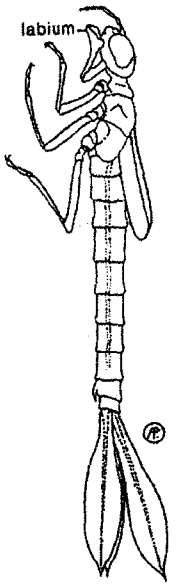
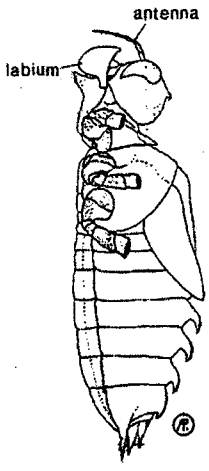


Figure 3.77



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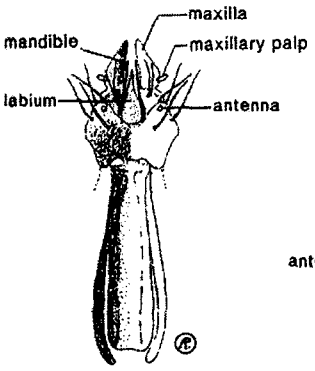


Figure 3.74

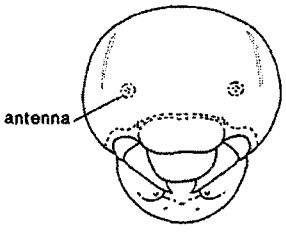


Figure 3.75

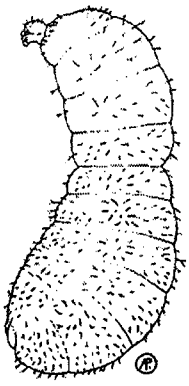


Figure 3.76

55(54')**Branquias:** presentes (ausentes en algunas larvas de Plecoptera semejantes a Fig. 3:79)
Hábitat: acuático
Cercos: largos, con muchos segmentos 56

55' **Branquias:** ausentes
Hábitat: terrestres o acuático
Cercos: variable, pero ausente o sin muchos segmentos si es acuático 57

56(55) **Uñas tarsales:** 2
Tarsos; con más que 1 segmento
Filamentos terminales: 2
Branquias: en el abdomen, como dedos, también puede estar en la cabeza, Fig. 3:79 .... **PLECOPTERA**

56' **Uñas tarsales:** 1
Tarsos; 1 segmento
Filamentos terminales: la mayoría con 3 (algunos con 2)
Branquias: en el abdomen, lateralmente o dorsalmente Fig. 3:80 .....-81
..... **EPHEMEROPTERA**

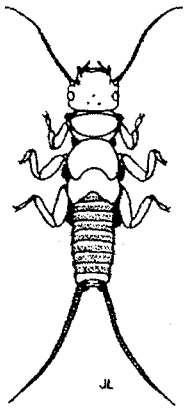


Figure 3.79

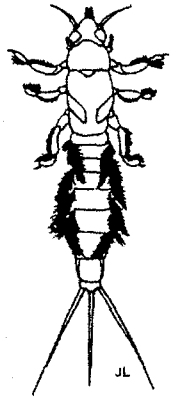


Figure 3.80

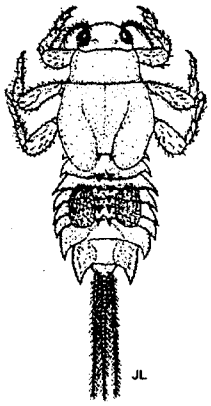


Figure 3.81

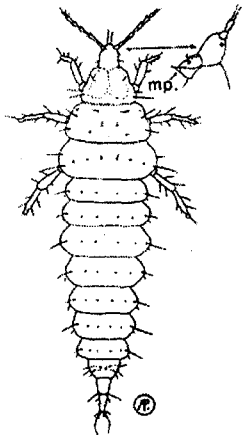


Figure 3.82

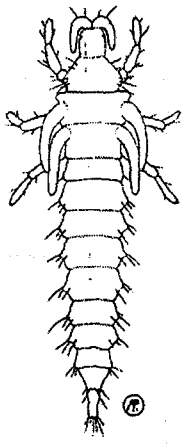


Figure 3.83

57(55')**Cuerpo:** fuertemente constreñido entre tórax y abdomen
Antenas: generalmente de 12 o 13 segmentos, a menudo con un codo ..... adultos sin alas de **HYMENOPTERA**

57' **Cuerpo:** sin construcción entre tórax y abdomen
Antenas: nunca con codo, generalmente con más o menos que 12 – 13 segmentos..... 58

58(57')**Tórax:** Mesotórax generalmente mucho más grande que pro- y metatórax
Halteres: puede ser presentes en la última parte del tórax .. adultos sin alas **DIPTERA**

58' **Tórax:** protórax y/o metatórax distintos
Halteres: ausentes 59

59(58')**Cuerpo:** densamente cubierto con escamas o pelos
Aparato bucal: un probóscide arrollado
Antenas: largas, con muchos segmentos .....hembras adultos sin alas **LEPIDOPERA**

59' **Cuerpo:** sin cubierto denso de escamas o pelos
Aparato bucal: nunca con un probóscide
Antenas: variable 60

60(59')**Aparato bucal:** con un pico triangular para penetrar y chupar 61

60' **Aparato bucal:** siempre con mandíbulas para masticar, si hay un pico, entonces hay ..... mandíbulas en el termino del pico 63

61(60) **Patas:** con o sin uñas, terminado en una vejiga
Pico: sin segmentos, en forma de cono, con palpos ..... Fig. 3:82, 3:83 **THYSANOPTERA**

61' **Patas:** con 2 uñas (raramente 1), vejiga ausente
Pico: triangular y sin palpos, generalmente como un pico o aguja 62

62(61')**Pico:** sale del frente de la cabeza
Pronoto: generalmente prominente
Tarsos: generalmente con 3 segmentos
Hábitat: acuático o terrestre ..... Figs. 3:843:87 **HEMIPTERA**

62' **Pico:** aparentemente sale del trasero de la cabeza
Pronoto: no prominente (excepto en Membracidae)
Tarsos: 1–3 segmentos
Hábitat: terrestres ..... Figs. 3:883:91 **'HOMOPTERA'**

63(60')**Cabeza:** generalmente con un bulto ensanchado en frente de las antenas
Pronoto: generalmente inconspicuo
Tarsos: 2 o 3 segmentos con un par de uñas
Cercos: ausentes ..... Fig. 3.92 **PSOCOPTERA**

63' **Cabeza:** sin bulto conspicuo
Pronoto: conspicuo, igual o más grande que el mesonoto
Tarsos: 1–5 segmentos con o sin uñas
Cercos: frecuentemente presentes 64

64(63')**Cercos:** 1 segmento, a veces con una espina
Tarsos: 2 segmentos

Antenas: 9 segmentos como cuentas
Hábitat: debajo de corteza, en aserrín ..... Fig. 3.94, 3.95 **ZORAPTERA**

64' **Cercos:** ausentes o, si presentes, frecuentemente con 2 segmentos o más, sin espina
Tarsos: generalmente con 3 a 5 segmentos
Antenas: variable
Hábitat: variable 65

65(64') **Tarsos delanteros:** con el segmentos basal ensanchado ..... Fig. 3.96 **EMBIOPTERA**

65' **Tarsos delanteros:** segmento basal no ensanchado 66

66(65') **Patas traseras:** fémur engrosado para brincar ..... Fig. 3.97-98 **ORTHOPTERA**

66' **Patas traseras:** fémur no engrosado 67

67(66') **Cabeza:** alargada en un pico como un tronco, Fig. 3.99 ..... **MECOPTERA**

67' **Cabeza:** no alargada en un pico como un tronco 68

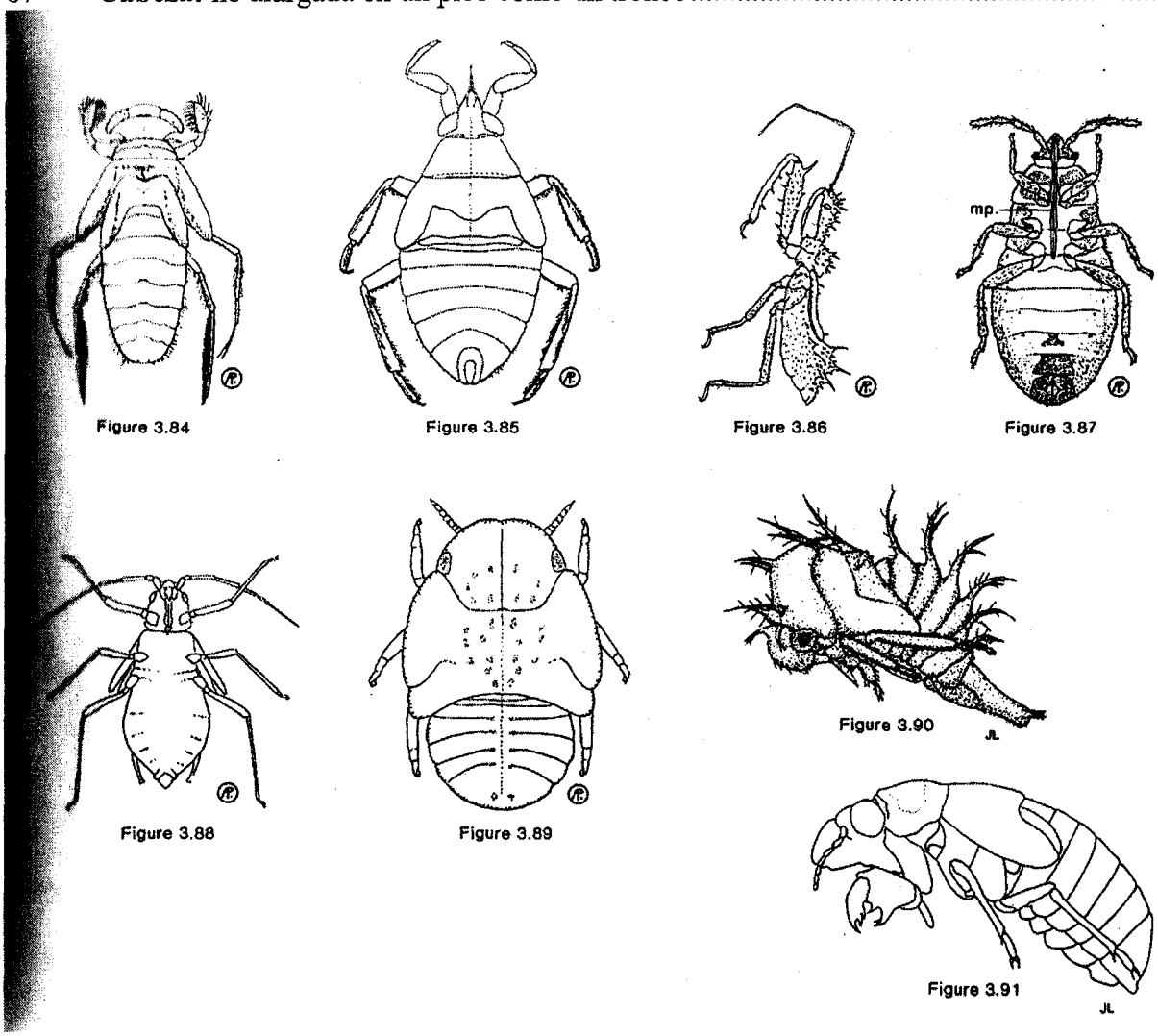


Figure 3.84 Figure 3.85 Figure 3.86 Figure 3.87
Figure 3.88 Figure 3.89 Figure 3.90 Figure 3.91

68(67') **Protórax:** muy alargado, mucho más largo que el mesotórax
Patas delanteras: modificadas para agarrar presa Fig.3.100 ..... **MANTOIDEA**

68' **Protórax:** no muy alargado
Patas delanteras: no modificadas para agarrar presa 69

69(68') **Abdomen:** sin un par de apéndices terminales
Antenas: a menudo con 11 o menos segmentos ..... **COLEOPTERA**

69' **Abdomen:** con un par de cercos, y a veces con un ovipositor
Antenas: a menudo con más de 11 segmentos 70

70(69') **Cercos:** 4 segmentos o más 71

70' **Cercos:** 1–3 segmentos 73

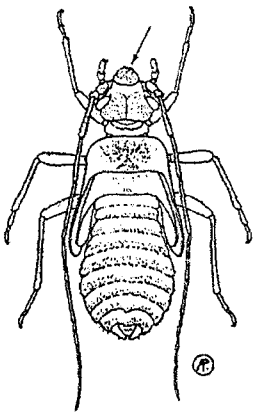
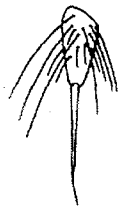


Figure 3.92



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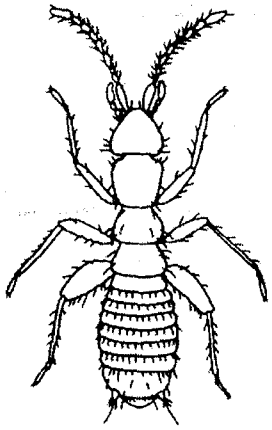


Figure 3.94

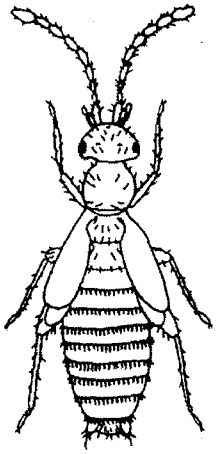


Figure 3.95

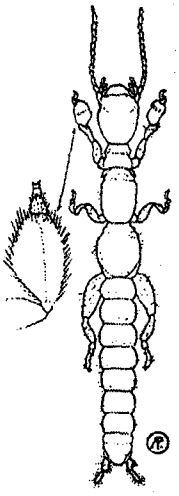


Figure 3.96

71(70) **Cabeza;** hipognato o sesgada posteriormente
Pronoto: como un escudo, generalmente cubriendo parte de la cabeza
Cuerpo: aplastado y oval ..... Fig. 3.101 **BLATTODEA**

71' **Cabeza;** prognato
Pronoto: no como un escudo y no cubriendo la cabeza
Cuerpo: cilíndrico y más alargado 72

72(71') **Tarsos:** 5 segmentos
Antenas: filiformas
Pronoto: cuadrado
Abdomen: hembras con un ovipositor prominente con forma de una espada
Cercos: de 8 o 9 segmentos, la mitad de la largura del abdomen ..... Fig. 3.102
..... **GRYLLOBLATTODEA**

72' **Tarsos:** 4 segmentos (un quinto indistinto puede ser presente)
Antenas: moniliforma (como cuentas)
Pronoto: raramente cuadrado
Abdomen: hembras carecen un ovipositor
Cercos: cortos, 4 a 8 segmentos ..... Fig. 3.103 **ISOPTERA**

73(70') **Antenas:** 11 o más, raramente 10 o 9 segmentos, a menudo con una maza en el termino
Abdomen: 6 o 7 (raramente 8) segmentos, tarsos con 5 segmentos..... **COLEOPTERA**

73' **Antenas:** a menudo con más que 11 segmentos
Abdomen: 9–11 segmentos (si 6 o 7, tarsos con 3 segmentos 74

74(73') **Tarsos:** 5 segmentos distintos
Cuerpo: como un palo ..... Fig. 3.104 **PHASMATODEA**
Tarsos: 2–4 segmentos (un quinto indistinto puede ser presente)
Cuerpo: no como un palo 75

75(74') **Apéndices terminales:** muy pequeños, 1 a3 segmentos, divergentes
Tarsos: 4 segmentos
Cuerpo: pálido o blanco ..... Fig. 3.105 **ISOPTERA**

75' **Apéndices terminales:** 1 segmento, parece como pinzas en ninfas maduras
Tarsos: 3 segmentos, o 2
Cuerpo: pardo oscuro o negro ..... Fig. 3.106 **DERMAPTERA**

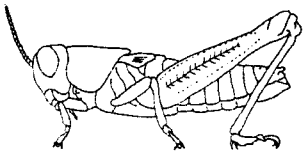


Figure 3.97

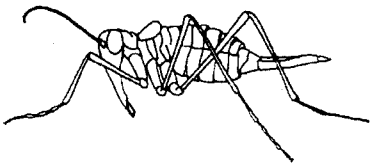


Figure 3.99

Figure 3.101


Figure 3.102

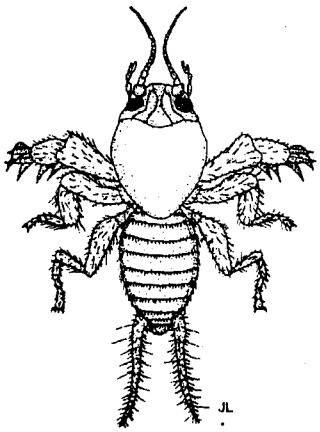


Figure 3.98

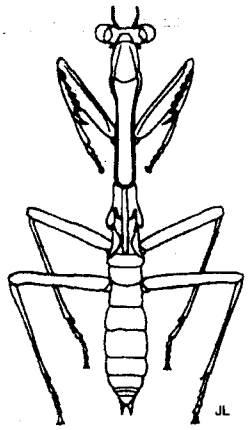


Figure 3.100

76(1') **Antenas:** con ramas, Fig. 3.107 ..... **PAUROPODA**
76' **Antenas:** sin ramas o ausentes 77
77(76') **Antenas:** ausentes, aunque otros apéndices se pueden usar como antenas
Patas segmentadas o apéndices como patas: 4 pares ..... Clase **ARACHNIDA** 78
77' **Antenas:** presentes
Patas segmentadas: 5 pares o más 88
78(77) **Opìstoma ("abdomen")** segmentación ausente
Órgano de hilar ventral: presente (si ausente, cuerpo minuto) 79
78' **Opístoma:** segmentación distinto
Órgano de hilar ventral: ausente 80

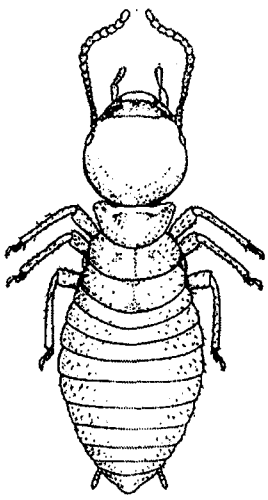
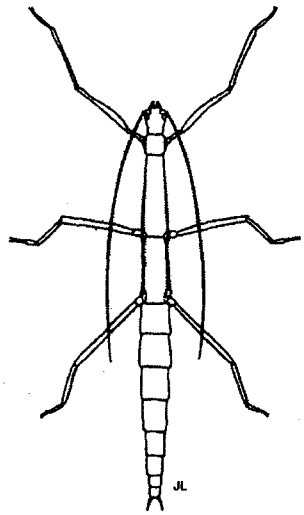


Figure 3.103



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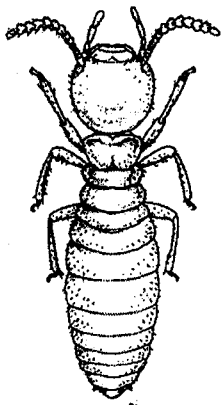


Figure 3.105

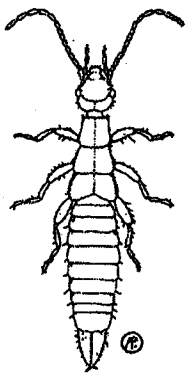


Figure 3.106

79(78) **Opístoma:** unida con el prosoma (resto del cuerpo) por un pecíolo delgado
Órgano de hilar: presente bajo del ano (Fig. 3.108)
Chelíceras: uña singular con dúcto de veneno ..... araña; Orden **ARANEAE**
79' **Opístoma:** anchamente fusionada con el prosoma
Órgano de hilar: ausente

Chelíceras: con pinzas ..... Fig. 3.109–112 Orden **ACARINA**

80(78')**Opístoma ("abdomen")** terminando en un apéndice como un látigo o una cola 81

80' **Opístoma:** sin apéndice 85

81(80) **Opístoma:** con una cola larga y gruesa con una uña venenosa en el termino; con un órgano como un peine en el segundo segmento ventral, Fig. 3.113 ..... Orden **SCORPIONIDA**

81' **Opístoma:** sin un picadura terminal, órganos como peines ausentes 82

82(81')**Prosoma ("cefalotórax"):** con un alerón móvil escondiendo el aparato bucal en la cara .. Fig.3.114 ..... Orden **RICINULEIDA**

82' **Prosoma:** alerón movil ausente 83

84(83') **Opístoma:** con una cola corta de 1–4 segmentos

Ojos: ausentes

Tamaño del adulto: menos que 10 mm. Fig. 3.116 ..... Orden **SCHIZOMIDA**

84' **Opístoma:** con una cola larga de muchos segmentos

Ojos: presentes

Tamaño del adulto: más que 50 mm. Fig. 3.117 ..... Orden **UROPYGIDA**

85(80')**Chelíceras:** masivas, dirigidas hacia adelante

Prosoma: 2 o 3 segmentos posteriores no fusionados, Fig. 3.118.. Orden **SOLIFUGAE**

85' **Chelíceras:** no masivas

Prosoma: todos segmentos fusionados 86

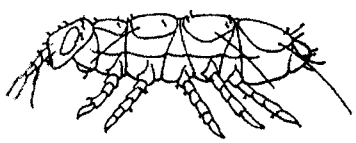


Figure 3.107

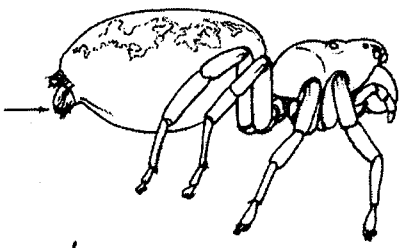


Figure 3.108

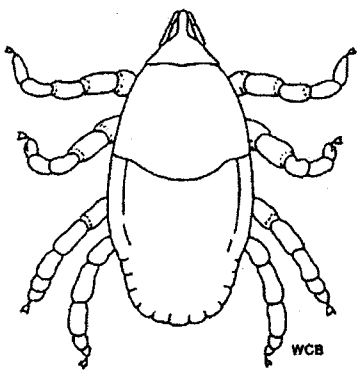


Figure 3.109

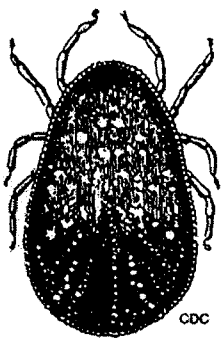


Figure 3.110

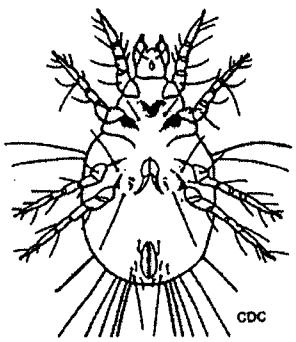


Figure 3.111

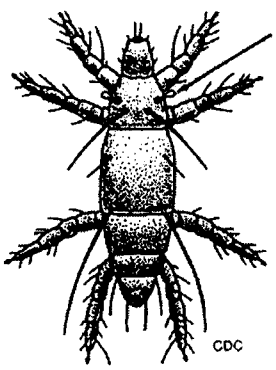


Figure 3.112

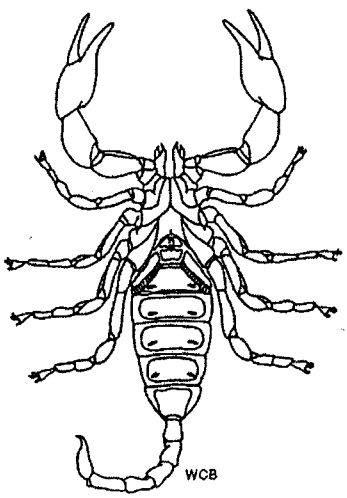


Figure 3.113

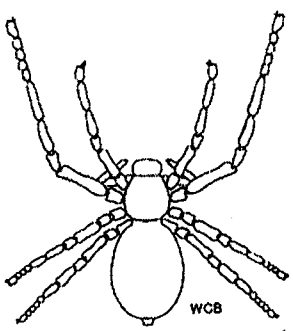


Figure 3.114

86(85')**Opístoma:** con unión delgada con el prosoma

Patas I: largas, delgadas, como antenas, Fig. 3.119 ..... Orden **AMBLYPYGIDA**

86' **Opístoma:** con unión ancha con el prosoma

Patas I: semejantes a las otras patas 87

87(86') **Pedipalpos:** como tenazas, largos y pesados
Ojos: ausentes o con 1 o 2 pares en el margen anterolateral
Cuerpo: aplastado, más largo que ancho, Fig. 3.120 Orden **PSEUDOSCORPIONIDA**

87' **Pedipalpos:** como patas, con uñas, pero más cortos que las patas
Ojos: 1 par, a menudo colocados en el centro en un oculario (fáciles de ver)
Cuerpo: redondeado, oval, Fig. 3.121 ..... Orden **PHALANGIDA**

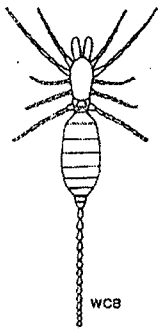


Figure 3.115

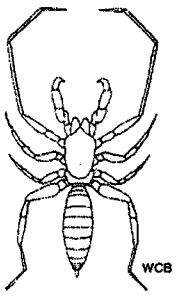


Figure 3.116

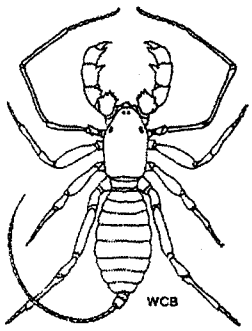


Figure 3.117

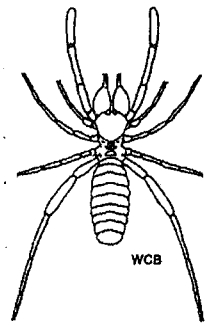


Figure 3.118

88(77') **Apéndices: (excepto ellos de la cabeza)** 6 o 7 pares de patas ambulantes seguidas por 5 . pares de placas pequeñas (pleopodos) y 1 par de patas biremadas como colas (uropodos) isópodos, Fig. 3.122; amfipodos, Fig. 3.123; y decapodos, Fig. 3.124 .... Clase **CRUSTACEA**

88' **Apéndices:** todos, o todos excepto el primer par, como patas ambulatorias, distribuidos .. igualmente a lo largo del cuerpo 89

89(88') **Patas I:** modificadas como grande pero cortas comillos venenosos
Patas: con 1 uña, 15 pares (nacen con 7 pares), o 21 o más pares de patas, Fig. 3.125, 126 ..... Clase **CHILOPODA**

89' **Patas I:** no son comillos
Patas: con 1 o 2 uñas, 4 pares o más (a menudo más que 30) 90

90(89') **Segmentos del cuerpo:** después de segmento 3, parece que tiene 2 pares de patas en cada segmento
Patas: con 1 uña, adulto tiene 13 o más pares (nacen con 3 o 4)
Color: raramente blanco
Tamaño: a menudo más que 10 mm. Fig. 3.127 ..... Clase **DIPLOPODA**

90' **Segmentos del cuerpo:** no fusionados en pares, con 1 par de patas cada segmento
Patas: con 2 uñas, adulto tiene 11 o 12 pares (nacen con 6)
Color: generalmente blanco
Tamaño: raramente más que 10 mm. Fig. 3.128 ..... Clase **SYMPHYLA**

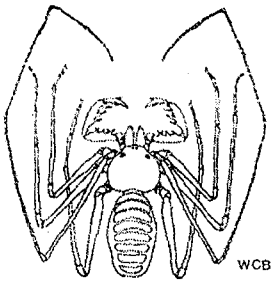


Figure 3.119

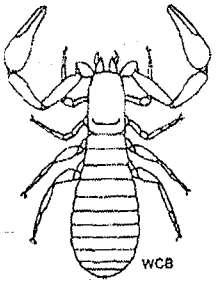


Figure 3.120

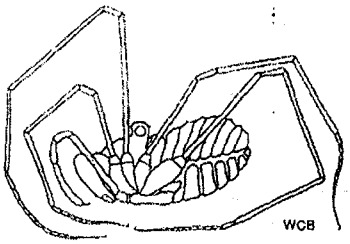


Figure 3.121

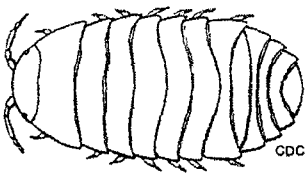


Figure 3.122

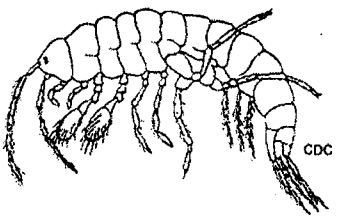


Figure 3.123

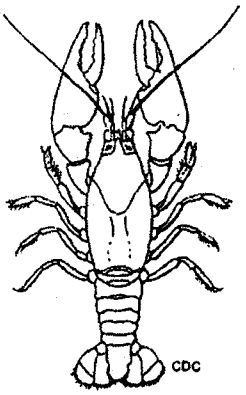


Figure 3.124

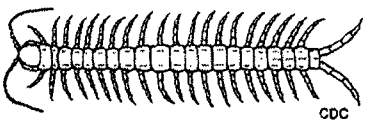


Figure 3.125

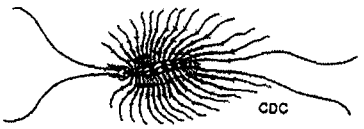


Figure 3.126

Figure 3.127


Figure 3.128

ORDER LEPIDOPTERA

Key to the LARVAE of the more important families

1a. Thoracic legs present and segmented. 2

1b. Thoracic legs absent or reduced to fleshy swellings. 7

2a. Body with large, ovate scales, arranged in a double row on each side. Fig. 412. .....Family MICROPTERYGIDAE

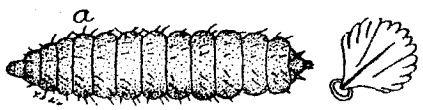


Fig. 412. a, Micropteryx sp.; b, a scale.

The larvae of *Micropteryx* live on wet moss and are characterized by the presence of 8 pairs of segmented abdominal prolegs. The larvae of *Sabatinca* occur among liverworts.

ORDEN LEPIDOPTERA

Clave a las LARVAS de las familias más importantes

1a. Patas torácicas presentes y segmentadas.....2

1b. Patas torácicas ausentes o reducidas a bultos carnosos 7

2a. Cuerpo con escamas grandes y ovales, arregladas en una fila doble en cada lado. Fig. 412..... Fam. MICROPTERYGIDAE

2b. Body with setae only. 3

3a. Prolegs rudimentary or wanting; crochets absent. 4

3b. Prolegs at least indicated by rudimentary crochets. Fig. 413. 12

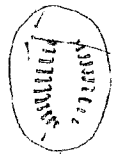


Fig. 413. Crochets.

4a. Front extending upwards to vertex; small species. Fig. 414. .....Family COLEOPHORIDAE

Fig. 414. Coleophora malivorella Riley.

This family contains about 1,000 described species. The caterpillars are known as leaf miners and case bearers. They feed on leaves, flowers, fruits and seeds of various plants. Some systematists make this group a subfamily of the TINEIDAE.

4b. Front not extending to vertex. Fig. 415. 5

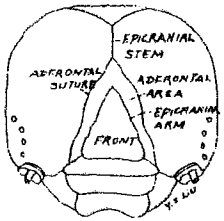


Fig. 415. Cephalic aspect of head.

5a. Head retracted; body often with spines or secondary hairs; primary setae obsolete; body with obscure incisures and usually with conspicuous pits. Fig. 416. .....Family LIMACODIDAE

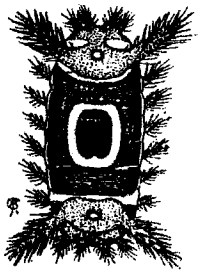


Fig. 416. Saddle-backed slug caterpillar, Sabine stimulea Clemens.

About 850 species are described. The larvae are slug-like and known as slug-caterpillars. The body bears tubercles and stinging or poisonous hairs. They feed on various plants.

2b. Cuerpo con sólo setas 3

3a. Propatas rudimentarias o ausentes, crochetes ausentes.....4

3b. Propatas con al menos crochetes rudimentarios. Fig. 413 12

3c. Propatas con crochetes y espinas..... Fam. CASTNIIDAE

4a. Frente extendido arriba a vértice; especies pequeñas. Fig. 414 ....Fam. COLEOPHORIDAE

4b. Frente no extendido a vértice. Fig. 415 5

5a. Cabeza retractada; cuerpo frecuentemente con espinas o pelos segundarios; setas primarias obsoletas; cuerpo a menudo con huecos conspicuos. Fig. 416.....Fam. LIMACODIDAE

5b. Head exposed; body with primary setae and strong incisures....6

6a. Setae iv and v distant on abdominal segments; prolegs present. Fig. 417. .....*(Tegeticula)* Family INCURVARIIDAE

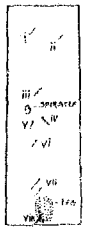


Fig. 417. Setal map of an abdominal segment.

About 300 species have been described. The caterpillars of the Adelinae are case-bearers and are known as fairy moths, while that of the Proxodoxinae are borers in seeds and stems of Yucca and other Liliaceae. As used here this includes McDunnough's superfamily INCURVAROIDEA.

6b. Setae iv and v adjacent; prolegs absent. Fig. 418. .....A few GELECHIIDAE

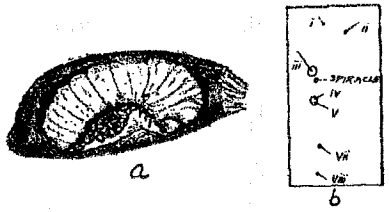


Fig. 418. a, **Sitotroga cerealella** Oliv.; b, setal map of an abdominal segment.

The members of this large family vary rather widely in habits. Some are gall makers, others destructive to stored cereals and still others attack the fruit of living plants.

7a. Body spindle-shaped; head with closed front (separated from the vertex by the epicrania). Fig. 419. .....Family INCURVARIIDAE

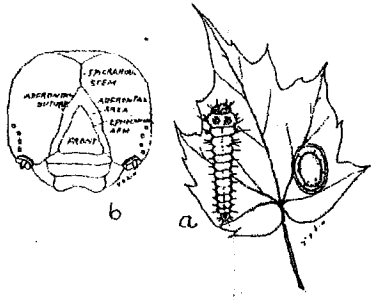


Fig. 419. a, Maple case bearer, **Paraclemensia acerifoliella** Fitch; b, cephalic aspect of head, showing the closed front.

The larvae are known as needle miners and leave a characteristic pattern in leaves. The adults are exceedingly small.

5b. Cabeza expuesta; cuerpo con setas primarias y segmentos distintos....6

6a. Setas iv y v distantes en segmentos abdominales; propatas presentes. Fig. 417.....Fam. INCURVARIIDAE

6b. Setas iv y v adyacentes; propatas ausentes. Fig. 418..... ..... unas pocas GELECHIIDAE

7a. Cuerpo en forma de huso; cabeza con frente separado del vértice por una epicrania. Fig. 419 .....Fam. INCURVARIIDAE

7b. Body cylindrical or flattened; if somewhat spindle-shaped, the front extends upwards to vertex. 8
8a. Head with 1 ocellus on each side, or none. 9
8b. Head with 6 ocelli on each side. 11
9a. Front triangular; ocellus at front.
Fig. 420. ..... Family ERIOCRANIIDAE

Fig. 420. Mnemonica auricyanea Wishm.

The caterpillars mine in leaves. The pupae possess toothed mandibles. They are closely related to the MICROPTERYGIDAE.

9b. Front quadrangular; ocellus lateral. 10
10a. Front widest at posterior end; body usually flattened; prolegs when present, on 3rd to 5th abdominal segments.
Fig. 421. ..... Family GRACILARIIDAE

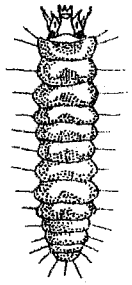


Fig. 421. Lithocolletis hamadryadella Clemens (round form larva).

The larvae are of two types: the young have a flat head, ocelli very small and variable in number. They are miners of leaves, bark, or fruits. The full-grown caterpillars are cylindrical, with normal head, prolegs well developed on the 3rd to 5th abdominal segments. They mine, or web, or skeletonize the leaves. The azalea leaf miner, *Gracilaria azaleella* Brants imported from Japan to the United States is a pest in green house.

10b. Front widest at anterior end; body cylindrical; prolegs on 2nd to 7th abdominal segments. Fig. 422. ..... Family NEPTICULIDAE

Fig. 422. Plum leaf-miner, Nepticula slingerlandella Kft.

They are called serpentine miners. The caterpillar is minute, about 2.5 to 10 mm. long. They mine in leaves and sometimes in fruits and bark. The mines are linear or serpentine. Certain species of *Ectoedemia* are gall makers. Pupation occurs in a cocoon in the soil.

7b. Cuerpo cilíndrico o aplastado; si en forma de huso, el frente se extiende hacia el vértice 8
8a. Cabeza con 1 ocelo en cada lado o ninguno 9
8b. Cabeza con 6 ocelos en cada lado 11
9a. Frente triangular; ocelo en frente. Fig. 420... Fam. ERIOCRANIIDAE

9b. Frente cuadrangular; ocelo lateral 10
10a. Frente lo más ancho en el termino posterior; cuerpo a menudo aplanado; propatas, si presentes, en los tercero a quinto segmentos abdominales. Fig. 421 ..... Fam. GRACILARIIDAE

10b. Frente a lo más ancho en el termino anterior; cuerpo cilíndrico; propatas en los segundo a septimo segmentos abdominales. Figl.422 . ..... Fam. NEPTICULIDAE

11a. Abdomen with rudimentary prolegs, bearing crochets on 3rd to 6th segments. Fig. 423. .....Family TISCHERIIDAE

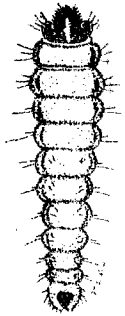


Fig. 423. Tischeria malifoliella Clemens.

The caterpillars make blotch mines in the leaves of oak. But *Tischeria malifoliella* Clemens makes trumpet leaf mines on apple.

11b. Abdomen without prolegs on 6th segment.
Family GRACILARIIDAE

12a. Body with tufted or secondary hairs: at least 2 setae on tubercle vi of 6th abdominal segment, or with additional setae on proleg. Fig. 424. 41

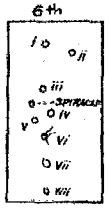


Fig. 424. - Setal map of 6th abdominal segment.

12b. Body without tufted or secondary hairs: tubercle vi with a single seta; tubercle vii with at most 3 setae, unless the proleg has a multiserial circle of crochets. Fig. 425. 13

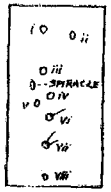


Fig. 425. Setal map of 6th abdominal segment.

13a. Without prolegs on 6th abdominal segment.
Family GRACILARIIDAE

11a. Abdomen con propatas rudimentarias, llevando crochetes en los tercero a sexto segmentos. Fig. 423..... Fam. TISCHERIDAE

11b. Abdomen sin propatas en el sexto segmentos..... ..... Fam. GRACILARIIDAE

12a. Cuerpo con pelos copetudos o segundarios; al menos 2 setas en tubérculo vi del sexto segmento abdominal, o con setas adicionales en la propata. Fig. 424..... 41

12b. Cuerpo sin pelos copetudos o segundarios; tubérculo vi con un sólo seta; tubérculo vii con a maximo 3 setas, al menos que la propata tenga un circo multiserial de crochetes. Fig. 425 13

13a. Sin propatas en el sexto segmento..... Fam. GRACILARIIDAE

13b. **With prolegs on 6th abdominal segment.** 14

14a. **Crochets of prolegs arranged in a circle or ellipse (sometimes incomplete), or in transverse bands. Fig. 426.** 15

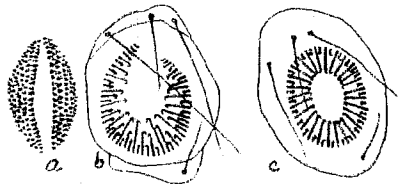


Fig. 426. Crochets: a, in transverse bands; b, in incomplete circle; c, in complete circle.

14b. **Crochets forming a single band (sometimes with a few vestigial ones in addition). Fig. 427.** 37

Fig. 427. Crochets in single band.

15a. **Prespiracular wart of prothorax with 2 setae. Fig. 428.** .....**Family PYRALIDIDAE**

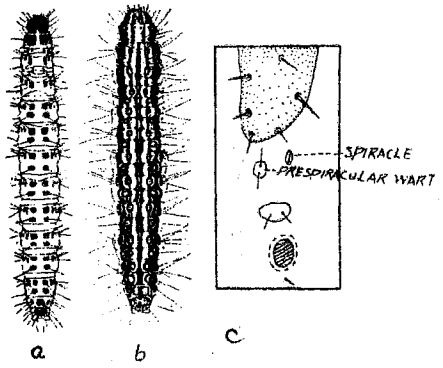


Fig. 428. a, Garden webworm, **Loxostege similaris** (Guen.); b, beet webworm, **Loxostege sticticalis** (L.); c, setal map of prothorax.

This family is the second largest of the order and about 10,000 species have been described. The larvae are largely phytophagous and some feed upon dried vegetable matter. The meal moth, *Pyralis farinalis* (L.) feeds on cereal and cereal products. The caterpillars of the subfamily Schoenobiinae are borers in water plants, while *Nymphula nymphaeta* (L.) and *N. stagnata* Donovan are semiaquatic species living in silk-lined sacs on water plants in Europe.

15b. **Prespiracular wart of prothorax with 3 setae. Fig. 429.** 16

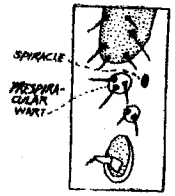


Fig. 429. Setal map of prothorax.

13b. Con propatas en el sexto segmento 14

14a. Crochetes de propatas arreglados en un circo o elipse (a veces no completo), o en franjas transversas. Fig. 426..... 15

14b. Crochetes formando una sóla franja (a veces con unas pocas rudimentarias adicionales). Fig. 427 37

15a. Verruga preespiracular de protórax con 3 setas. Fig. 428..... .....Fam. PYRALIDAE

15b. Verruga pre-espiracular con 3 setas. Fig. 429..... 16

16a. Crochets of prolegs arranged in 2 transverse bands. Fig. 430. 17

Fig. 430. Crochets in two bands.

16b. Crochets of prolegs arranged in a circle or ellipse, sometimes broadly interrupted. Fig. 431. 22

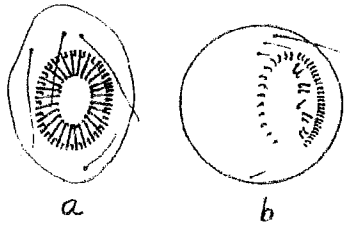


Fig. 431. Crochets: a, in complete circle; b, in incomplete circle.

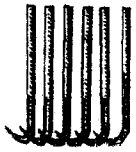


Fig. 432. Crochets in a single series.

17a. Prolegs with a single series of crochets, or with 2 bands formed of several series of alternate crochets. Fig. 432. .....Family INCURVARIIDAE

17b. Prolegs with 2 simple series of crochets. Fig. 433. 18

Fig. 433. Crochets in two series.

18a. Abdominal setae iv and v remote. Fig. 434. (Compare with Fig. 435). .....(*Bucculatrix*) Family LYONETIIDAE

Fig. 434. *Lyonetia speculella* Clemens.

The caterpillars frequent forested areas and orchards. They are mostly leaf miners. Those of *Bucculatrix* are first miners and later skeletonizers. Pupation takes place in a cocoon. The cocoon of *Bucculatrix* is ribbed and surrounded by a palisade of erect silken filaments.

16a. Crochetes de las propatas arreglados en 2 franjas transversales. Fig. 430 17

16b. Crochetes de las propatas arreglados en un circo o elipse, a veces con una interrupción ancha. Fig. 431 22

17a. Propatas con un serie individual de crochetes, o con 2 franjas de varios series de crochetes alterandose. Fig. 432..... Fam. INCURVARIIDAE

17b. Propatas con 2 sencillos series de crochetes. Fig. 433 18

18a. Setas abdominales iv y v remotas. Fig. 434 (compare con Fig. 435).. ..... Fam. LYONETIDAE

18b. Abdominal setae iv and v adjacent.
Fig. 435. 19

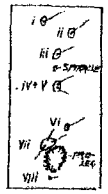


Fig. 435. Setal map of an abdominal segment.

19a. Crochets of anal prolegs arranged in 2 groups.
Fig. 436. ..... Family GELECHIIDAE

Fig. 436. Potato tuberworm, Gnorimoschema opercelella (Zeller).

The larvae pictured here is scattered very widely and does heavy damage to the fruit of tomatoes as well as to potato tubers. It attacks still other members of the nightshade family also.

19b. Crochets of anal prolegs in a single series. 20

20a. Front extending about one third way to vertex.
Fig. 437. ..... (Cossula) Family COSSIDAE

Fig. 437. Cossus liquiperda.

The common goat moth, *Cossus cossus* (L.) of Europe, is an example. The caterpillars bore into the trunks and limbs of broad-leaved deciduous trees and large shrubs. They make large tunnels in the trunk. The larvae of the carpenterworm, *Prionoxystus robiniae* (Peck) of America, make large galleries in trees which usually cause the death of the trees.

20b. Front extending at least two thirds way to vertex. 21

21a. Spiracles elliptical, normal in size: those of 8th abdominal segment located higher than the others.
Fig. 438. ..... Family AEGERIIDAE

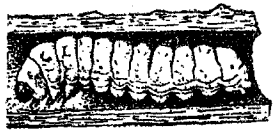


Fig. 438. Squash-vine borer, Melittia satyriniformis Hubner.

The caterpillars live as borers in roots, trunks and limbs of shrubs and trees and herbaceous plants. *Aegeria apiformis* (Clerck) is a common species which infests poplars and willows chiefly. The too well known squash borer belongs here.

18b. Setas abdominales iv y v adyacentes. Fig. 435 19

19a. Crochetes de las propatas anales arreglados en 2 grupos. Fig. 436.....
..... Fam. GELECHIIDAE

19b. Crochetes de las propatas anales en un serie sencillo..... 20

20a. Frente extendido una tercera parte de la distancia hacia el vértice. Fig. 437 ..... Fam. COSSIDAE

20b. Frente extendido al menos dos tercios de la distancia hacia el vértice
..... 21

21a. Espiráculos elípticos, normal en tamaño; ellos en el octavo segmento colocados más alto que los otros. Fig. 438 ..... Fam. AEGERIIDAE

21b. Spiracles circular, very small; the last pair about in line with others. .....Family COLEOPHORIDAE

22a. Abdominal setae iv and v remote, or v absent in a few small species. Fig. 439. 23

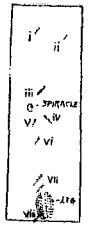


Fig. 439. Setal map of an abdominal segment.

22b. Abdominal setae iv and v adjacent, often on a common tubercle. Fig. 440. 27

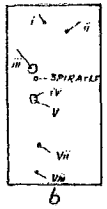


Fig. 440. Setal map of an abdominal segment.

23a. Prolegs with crochets arranged in a single complete ellipse. Fig. 441. 24

Fig. 441. Crochets in a single complete ellipse.

23b. Prolegs with crochets arranged in a broken ellipse, or with additional rudimentary series at the base of normal ones. Fig. 442. 26

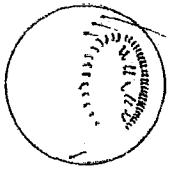


Fig. 442. Crochets in broken ellipse.

21b. Espiráculos circulares, muy pequeños; el último par alineado con los otros ..... Fam. COLEOPHORIDAE

22a. Setas abdominales iv y v remotas, o v ausente in unas pocas especies pequeñas. Fig. 439 23

22b. Setas abdominales iv y v adyacentes, a menudo en un tubérculo común. Fig. 440 27

23a. Propatas con crochetes arreglados en un elipse completo. Fig. 441.... 24

23b. Propatas con los crochetes arreglados en un elipse roto, o con series rudimentarios adicionales y la base de los normales. Fig. 442 26

24a. Prespiracular setae of prothorax about as far from its spiracle as from each other; abdominal seta i higher than ii.
Fig. 443. .....Family LYONETIIDAE

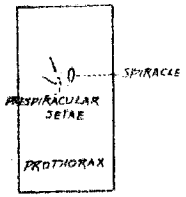


Fig. 443. Setal map of prothorax.

This small family of ribbed case bearers live as tiny leaf miners or skeletonizers. They are often flattened. The adults are usually brightly colored.

24b. Prespiracular setae of prothorax about twice as far from its spiracle as from each other.
Fig. 444. 25

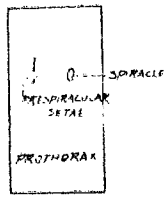


Fig. 444. Setal map of prothorax.

25a. Abdominal setae i much lower than ii.
Fig. 445. .....Family TINEIDAE

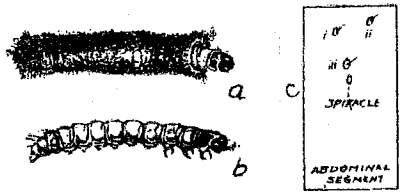


Fig. 445. Casemaking clothes moth, **Tinea pelionella** (L.): a, larva with case; b, larva; c, setal map of an abdominal segment.

The larvae of the case-making clothes moth, *Tinea pellionella* (L.), live in portable parchment-like cases. The webbing clothes moth, *Tineola biselliella* (Hummel), is characterized by its larvae making webs with particles on which they feed. Both feed on wool, hair, skin, feathers and other animal matter.

25b. Abdominal setae i not lower than ii.
Fig. 446. .....Family HELIODINIDAE

Fig. 446. Setal map of an abdominal segment.

The caterpillars are tiny either herbivorous or predacious. They feed on fruits and leaves and some mine in fruits. Some species are believed to be predators of mealybugs and scale-insects. They are known as "sun moths."

24a. Setas pre-espiráculares del protórax tan distantes del espiráculo como de entre sí; seta abdominal i más alto que ii. Fig. 443.....
.....Fam. LYONETIIDAE

24b. Setas pre-espiráculares del protórax dos veces la distancia del espiráculo que entre sí. Fig. 444..... 25

25a. Seta abdominal i mucho más baja que ii. Fig. 445.....
.....Fam. TINEIDAE

25b. Seta abdominal i no más baja que ii. Fig. 446.....
.....Fam. HELIODINIDAE

26a. Meso- and metathorax with seta ia in front of ib and well separated; abdominal seta iv above level of spiracle.
Fig. 447. ..... Family HEPIALIDAE

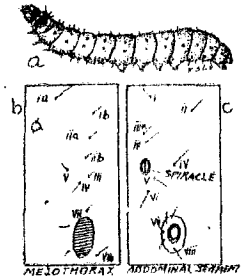


Fig. 447. a, **Hepialus humuli;** b, setal map of mesothorax; c, setal map of an abdominal segment.

The caterpillars are all plant borers including roots, stems, twigs of grasses, shrubs and trees. Some species are quite large and often somewhat wrinkled. Rather numerous hairs arise from tubercules. The larvae are usually dusky, whitish or tinged with yellow. The adults are narrow winged medium to large sized moths and are known as swifts.

26b. Meso- and metathorax with seta ia and ib closely associated; abdominal seta iv below level of spiracle.
Fig. 448. ..... Family YPONOMENTIDAE

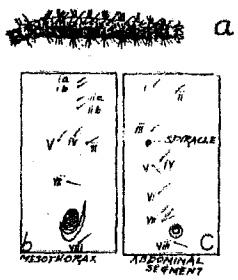


Fig. 448. a, Diamondback moth, **Plutella maculipennis** (Curt.); b, setal map of mesothorax; c, setal map of an abdominal segment.

The caterpillars are often found gregariously living in webs or mining in leaves, twigs and fruits. They are destructive to conifers and other trees. The species here pictured feeds on members of the mustard family. The small green caterpillars start as miners but presently feed on the surface of the plant.

26a. Meso- y metatórax con seta ia en frente de ib y bien separada; seta abdominal iv arriba el nivel del espiráculo. Fig. 447 ..... Fam. HEPIALIDAE

26b. Meso- y metatórax con seta ia y ib muy cerca; seta abdominal iv abajo del nivel del espiráculo. Fig. 448 ..... Fam. YPONOMEUTIDAE

27a. Last pair of abdominal spiracles placed dorsally and closer together on middle line. Fig. 449. .....Family CARPOSINIDAE

Fig. 449. Lateral aspect of 7th and 8th abdominal segments.

This family consists of about 100 described species. The caterpillars are fruit-borers. One species bores in peaches in Japan.

27b. Not as 27a. 28

28a. Mesothorax with 2 setae vii located above base of leg. Fig. 450. 29

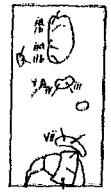


Fig. 450. Setal map of mesothorax.

28b. Mesothorax with 1 seta vii. 30

29a. Prothoracic spiracle with long axis vertical. .....Family THYRIDIDAE

The caterpillars of this family are concealed feeders.

29b. Prothoracic spiracle with long axis horizontal. Fig. 451. .....Family PSYCHIDAE

Fig. 451. **Thyridopteryx ephemeraeformis** Howorth.

The caterpillars are called bagworms because they make portable cases with leaves, twigs and other debris. They feed upon leaves, flowers, and even bark. Pupation occurs in the larval case in which the female may remain until the eggs are laid.

27a. Último par de espiráculos abdominales situado dorsalmente y más cerca entre sí en la línea media. Fig. 449..... Fam. CARPOSINIDAE

27b. No como arriba..... 28

28a. Mesotórax con 2 setas vii situado arriba de la base de la pata. Fig. 450 29

28b. Mesotórax con 1 seta vii 30

29a. Espiráculo protorácico con el eje largo vertical ....Fam. THYRIDIDAE

29b. Espiráculo protorácico con el eje largo horizontal. Fig. 451 ....Fam. PSYCHIDAE

30a. Setae ii of 9th abdominal segment closer together than on any other segments, frequently on the same plate. Fig. 452. 31

Fig. 452. Setal map of 9th abdominal segment.

30a. Setas ii del noveno segmento abdominal más cercas que en cualquier otro segmento, frecuentemente en la misma placa. Fig. 452..... 31

30b. Setae ii of 9th abdominal segment as far apart as on other segments. Fig. 453. 32

Fig. 453. Setal map of 9th abdominal segment.

30b. Seta ii del noveno segmento tan distante que en los otros segmentos. Fig. 453 32

31a. Crochets of prolegs uniordinal; abdominal setae iv and v horizontally placed. Fig. 454. .....Family PHALONIIDAE

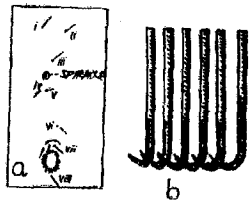


Fig. 454. a, Setal map of an abdominal segment; b, uniordinal crochets

The caterpillars bore in plants or feed in seeds. They and their adult moths are small.

31a. Crochetes de las propatas uni-ordinal; setas abdominales iv y v situadas horizontalmente. Fig. 454.....Fam. PHALONIIDAE

31b. Crochets of prolegs usually multiordinal; abdominal setae iv and v in a diagonal or vertical line.
Fig. 455. .....Family TORTRICIDAE

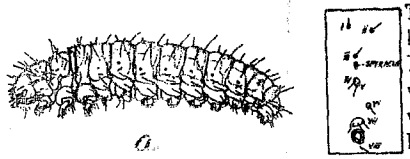


Fig. 455. a, Clover-seed caterpillar, **Laspeyresia interstinctana** Clemens; b, setal map of an abdominal segment.

The caterpillars are leaf rollers. They are destructive to many kinds of trees and other plants. The larvae when disturbed wriggle violently and may escape backwards from the nests of rolled leaves. The spruce budworm, *Archips fumiferana* (Clemens) and the fruit tree leaf roller, *Archips argyrospila* (Walker) are important pests.

32a. Abdominal setae i and ii close together.
Fig. 456. .....(*Schreckensteinia*) Family HELIODINIDAE

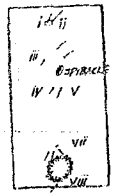


Fig. 456. Setal map of an abdominal segment.

The members of this genus of sun moths are plant feeders. All are of small size. The family is interesting in that a few species are apparently predacious on scale insects.

32b. Abdominal setae i and ii widely separated.
Fig. 457. 33

Fig. 457. Setal map of an abdominal segment.

31b. Corchetes de las propatas generalmente multi-ordinal; setas abdominales iv y v en una fila diagonal o vertical. Fig. 455.....
.....Fam. TORTRICIDAE

32a. Setas abdominales i y ii muy cerca. Fig. 456 .Fam. HELIODINIDAE

32b. Setas abdominales i y ii bien separadas. Fig. 457 33

33a. Front reaching less than half way to vertex: crochets triordinal. Fig. 458. .....Family COSSIDAE

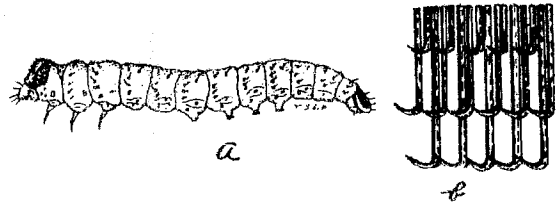


Fig. 458. a, Leopard moth, **Zeuzera pyrina** L.; b, triordinal crochets.

The caterpillars are mostly borers in the heartwood of various kinds of woody plants. The leopard moth, *Zeuzera pyrina* (L.), the larvae bore in the branches and stems of apple, beech, birch, cherry, currant, elm, maple, oak, pear, plum, walnut, etc. The life cycle needs two years to be completed.

33b. Front reaching more or less two thirds way to the vertex, and ending in an attenuate point: crochets uniordinal or biordinal: small species. Fig. 459. 34

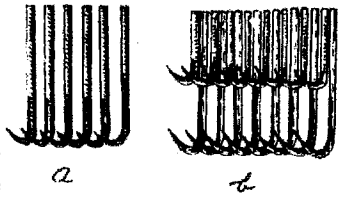


Fig. 459. Crochets: a, uniordinal; b, biordinal.

34a. Crochets of prolegs biordinal. Fig. 460. 35

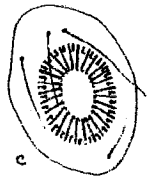


Fig. 460. Biordinal crochets.

34b. Crochets of prolegs uniordinal. Fig. 461. 36

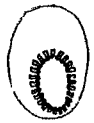


Fig. 461. Uniordinal crochets.

33a. Frente alcanzando menos que la mitad de la distancia a la vértice; corchetes triordinal. Fig. 458 .....Fam. COSSIDAE

33b. Frente alcanzando más o menos dos tercios de la distancia a la vértice, y terminando en un punto atenuado; crochetes uniordinal o biordinal; especies pequeñas. Fig. 459 34

34a. Crochetes de propatas biordinales. Fig. 460 35

34b. Crochetes de las propatas uniordinal. Fig. 461 36

35a. 3 ocelli arranged closely together, more widely separated from the other one, Fig. 462. .....Family OECOPHORIDAE

Single row of crochets on A10

Fig. 462. Depressaria heracliana De Geer.

The caterpillars usually live in webs or rolled leaves. One species is destructive to parsnips.

Crochets on A10 divided

35b. Ocelli evenly spaced. Fig. 463. .....Family GELECHIIDAE

Fig. 463. Pink bollworm, Pectinophora gossypiella (Saunders).

The larvae pictured here is a widely distributed and serious pest of cotton. It made its first appearance in our country in 1917.

36a. Setae iii on 8th abdominal segment usually placed just above and slightly before the spiracle. Fig. 464. .....Family GLYPHIPTERYGIDAE

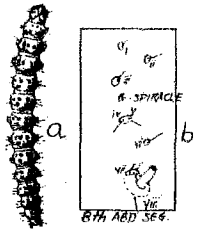


Fig. 464. a, Apple and thorn skeletonizer, Anthophila pariana (Clerck); b, setal map of 8th abdominal segment.

This family includes about 550 known species, largely oriental. The habits of the caterpillars are known as leaf rollers, leaf skeletonizers, leaf miners, stem borers and some live on webs.

36b. Setae iii on 8th abdominal segment usually placed above and behind the spiracle. Fig. 465. .....Family BLASTOBASIDAE

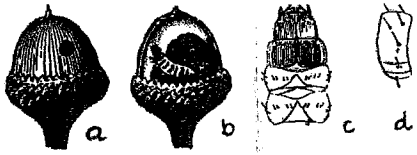


Fig. 465. Valentinia glandulella Riley: a, acorn with a hole; b, caterpillar in acorn; c, head and thorax; d, an abdominal segment.

Some larvae are known as borers in nuts, some scavengers, and some are predacious on scale-insects.

35a. 3 ocelos arreglados irregularmente; fila de crochetes en A10 no dividido ..... Fam. OECOPHORIDAE

35b. Ocelos regularmente espaciados; fila de crochetes en A10 dividida..... ..... Fam. GELECHIIDAE

36a. Setas iii en el octavo segmento generalmente situadas justo arriba y un poco antes del espiráculo. Fig. 464..... ..... Fam. GLYPHIPTERIGIDAE

36b. Setas iii en el octavo segmento abdominal generalmente arriba y trás del espiráculo. Fig. 465 ..... Fam. BLASTOBASIDAE

37a. Prespiracular wart on prothorax with 3 setae. Fig. 466. .....Family YPONOMEUTIDAE

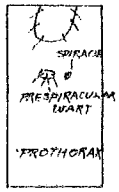


Fig. 466. Setal map of prothorax.

37b. Prespiracular wart on prothorax with 2 setae. 38

38a. Tubercle vii on meso- and metathorax with 2 setae. 39

38b. Tubercle vii on meso- and metathorax with 1 seta. Fig. 467. .....Family NOCTUIDAE

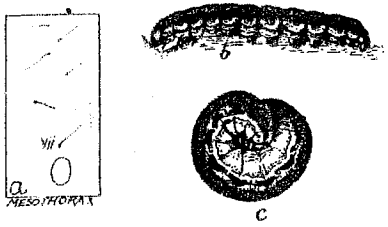


Fig. 467. a, Setal map of mesothorax; b, Tomato fruitworm, or corn earworm, **Heliothis armigera** (Hbn.); c, variegated cutworm, **Peridroma margaritosa** (Haworth). (U.S.D.A.)

About 20,000 species have been described. The caterpillars are commonly known as armyworms, cutworms, etc. Night is their usual feeding time, but when very numerous they often spread out during the day as well. Some feed on seeds and some are stem borers while the great majority are foliage feeders. They are notorious pests of agricultural crops. The corn earworm, *Heliothis armigera* (Hubner) is a cosmopolitan pest.

39a. Setae minute; tubercle reduced to obscure rings; head usually wide; prolegs reduced. Fig. 468. .....Family THYATIRIDAE

Fig. 468. Thyatira derasa.

The larvae of this small family are spanworms traveling like the geometrids. There are known as the beautiful mining moths, the "beauty" belonging to the adults. The naked caterpillars sometimes live gregariously in webs. They pupate in a cocoon.

39b. Setae heavy, almost always spinulose; with conspicuous tubercles. 40

40a. Tubercle iii of abdomen with 2 setae. Fig. 469. .....Subfamily Lithosiinae, ARCTIIDAE

Fig. 469. Ocnistis quadra.

The caterpillars possess tufted hairs which are much reduced in the last instar. This subfamily includes about 50 North American species. The caterpillars feed upon lichens.

37a. Verruga pre-espirácular en el protórax con 3 setas. Fig. 466.....Fam. YPONOMEUTIDAE

37b. Verruga pre-epirácular en el protórax con 2 setas.....38

38a. Tubérculo vii en el meso- y metatórax con 2 setas.....39

38b. Tubérculo vii en el meso- y metatórax con 1 seta. Figl. 467.....Fam. NOCTUIDAE

39a. Setas minutas; tubérculos reducidos y anillos débiles; cabeza generalmente ancha; propatas reducidas. Fig. 468.....Fam. THYATIRIDAE

39b. Setas gruesas, casi siempre espinulosas; con tubérculos conspicuos.....40

40a. Tubérculo iii del abdomen con 2 setas. Fig. 469.....Fam. ARCTIIDAE

40b. Tubercle iii of abdomen with 1 seta. Fig. 470. .....*(Utethesia)* Family ARCTIIDAE

Fig. 470. Fall webworm, Hyphantria cunea (Drury). (U.S.D.A.)

The caterpillars of this family are covered with dense tufted hairs often reddish-brown and black. When disturbed they often curl into a compact mass and are called woolly bears or hedge hog caterpillars. The cocoon are made of silk and the no-longer-needed body hairs. They feed upon a wide variety of plants. The fall webworm, *Hyphantria cunea* (Drury) lives gregariously in webs.

41a. Less than 4 pairs of abdominal prolegs; sometimes anal prolegs reduced. Fig. 471. .....Family GEOMETRIDAE

Fig. 471. **Paleacrita vernata Peck.**

About 2,000 species have been described. The caterpillars are called loopers, measuring worms, or spanworms because of their methods of locomotion. They feed chiefly on living plants but a few are able to subsist upon dry vegetable matter.

41b. 4 pairs of abdominal prolegs or more. 42

42a. Crochets on prolegs uniordinal. Fig. 472. 43

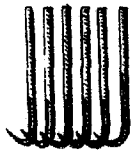


Fig. 472. Uniordinal crochets.

42b. Crochets on prolegs biordinal or triordinal. Fig. 473. 52

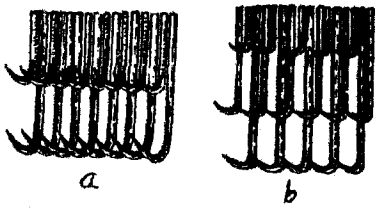


Fig. 473. a, Biordinal crochets; b, triordinal crochets.

43a. Warts rudimentary or absent, or obscured by secondary hairs...44

43b. At least wart vi (subventral) many haired and distinct; secondary hairs sparse or absent above prolegs. 49

40b. Tubérculo iii del abdomen con 1 seta. Fig. 470 ..... Fam. ARCTIIDAE

41a. Menos que 4 pares de propatas abdominales; a veces propatas anales reducidas. Fig. 471 ..... Fam. GEOMETRIDAE

41b. 4 pares o más de propatas abdominales 42

42a. Crochetes de las propatas uniordinales. Fig. 472 43

42b. Crochetes de la propatas biordinales o triordinales. Fig. 473 52

43a. Verrugas rudimentarias o ausentes, o bloqueado por los pelos secundarios 44

43b. Al menos verruga vi (subventral) distinto con muchos pelos; pelos secundarios escasos o ausentes arriba de las propatas 49

44a. Anal plate bifurcated; head roughly papillose; 3rd ocellus very large. Fig. 474. ..... **Family SATYRIDAE**

Fig. 474. Oeneis macounii Edw.

About 60 described species are recorded in North America. The caterpillars chiefly live on grasses and cereals. The rice butterfly, *Melanitis leda* (L.), is a pest of rice, barley, bamboo and sugar cane in Asia.

44b. Anal plate simple; head smoother; 3rd ocellus rarely much enlarged. **45**

45a. Spiracles elliptical, larger; prolegs short. **46**

45b. Spiracles circular, small; prolegs slender, more or less stem-like, with expanded planta. Fig. 475. ..... **Family PTEROPHORIDAE**

Fig. 475. Grape-vine plume, Oxyptilus periscelidactylus Fitch.

More than 350 species have been described. Most larvae are stem borers and leaf rollers. Some are of economic importance as pests of ornamental plants and agricultural crops. The adults are the plume moths so named because of their finely split wings.

46a. Body with dense secondary setae. Fig. 476. ..... **47**

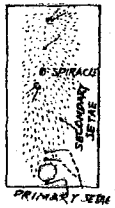


Fig. 476. A body segment showing the primary setae and secondary setae.

46b. Secondary setae very sparse or absent above prolegs; with simple setae or a few subprimaries. **48**

44a. Placa anal bifurcada; cabeza con papillas ásperas; tercio ocelo muy grande. Fig. 474 ..... Fam. SATYRIDAE

44b. Placa anal sencilla; cabeza más lisa; tercio ocelo no muy engrosado 45

45a. Espiráculos elípticos, más grande; propatas cortas..... 46

45b. Espiráculos circulares, pequeñas; propatas delgadas, como pedúnculos con plantas expandidas. Fig. 475..... Fam. PTEROPHORIDAE

46a. Cuerpo con setas secundarias densas. Fig. 476 47

46b. Setas secundarias escasas o ausentes arriba de las propatas 48

47a. Notch of labrum deep, with parallel sides; anal prolegs as large as others; with warts, more or less overshadowed by the secondary hairs. Fig. 477. ..... A few NOCTUIDAE

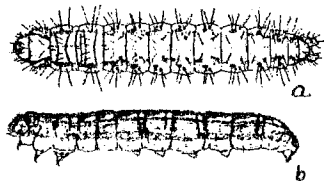


Fig. 477. a, Corn earworm **Heliothis armigera** (Hbn.); b, cutworm **Euxoa auxiliaris** Grote. (U.S.D.A.)

This family of owlet moths is an exceedingly important one, economically. Cutworms hide in the earth of gardens, cultivated fields, etc., by day and come out at night to cut off young plants at ground level. The corn earworm not only causes heavy loss by feeding at the tips of the maturing ears of corn but also tunnels into tomatoes.

47b. Notch of labrum acute, with convergent sides; anal prolegs much reduced and not used; warts rudimentary and dominated by a single hair *(Melalopha)* or absent *(Datana)*. Fig. 478. ..... Family NOTODONTIDAE

Fig. 478. Yellow-necked caterpillar, **Datana ministra** (Drury).

These caterpillars are gregarious, and pose often with the anterior and posterior ends raised into the air and attached only by median prolegs. They frequently possess dorsal humps or tubercles on the body and are often brightly colored. Their chief feed is the leaves of deciduous trees.

48a. Tubercle iv at about the same level on abdominal segments 6th, 7th and 8th. Fig. 479. ..... *(Doa)* Family LYMANTRIIDAE

Fig. 479. **Hemerocampa vetusta** Bdv.

This family includes many destructive species. The gypsy moth, *Porthetria dispar* (L.) and the brown-tail moth, *Nygmia phaeorrhoea* (Donovan) may occur in such large number as to completely overrun and defoliate large areas of trees.

48b. Tubercle iv of 7th abdominal segment much lower than on other segments; anal prolegs more or less reduced or modified. Fig. 480. ..... Most NOTODONTIDAE

Fig. 480. **Cerura vinula** (L.)

The caterpillar here pictured is a "puss moth". They never fail to attract attention. The backward projecting parts are anal tubes. This species feeds on the leaves of the willow family.

47a. Muesca de labro profundo con lados paralelos; propatas anales tan grandes que las otras; con verrugas sombreados por los pelos secundarios. Fig. 477 .....unas pocas NOCTUIDAE
.....

47b. Muesca de labro aguda con lados convergentes; propatas anales muy reducidas y no usadas; verrugas rudimentarias y dominadas por un sólo pelo, o ausentes. Fig. 478.....Fam. NOTODONTIDAE

48a. Tubérculo iv en más o menos el mismo nivel en segmentos 6, 7, y 8. Fig. 479 .....Fam. LYMANTRIIDAE

48b. Tubérculo iv del segmento 7 más bajo que en otros segmentos; propatas anales más o menos reducidas y modificadas. Fig. 480 .....
..... la mayoría de NOTODONTIDAE

49a. With eversible mid-dorsal glands on 2nd abdominal segment. Fig. 481. .....Family LYMANTRIIDAE

Fig. 481. Notolophus antique L. (U.S.D.A.)

The caterpillars of this comparatively small family are usually clothed with long hair-like scales which are often sting producing. They feed on the foliage of forest trees.

49b. No eversible mid-dorsal glands. 50

50a. Spiracles circular, small. .....Family PTEROPHORIDAE

50b. Spiracles elliptical, normal in size. 51

51a. Wart or seta iv much lower on 7th abdominal segment, or absent. Fig. 482. .....Family NOCTUIDAE

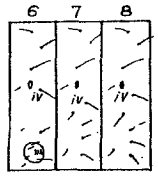


Fig. 482. Setal map of 6th, 7th and 8th abdominal segments.

51b. Wart or seta iv about the level on 7th abdominal segment as on the 6th and 8th. .....Family ARCTIIDAE

52a. Body without noticeable secondary hairs; with not more than 8 hairs on each proleg. .....(*Ethmia*) Family ETHMIIDAE

52b. Body with numerous secondary hairs, at least on the prolegs. .53

53a. Setae very irregular in length, some ten times as long as the others; with obscure warts, at least in the earlier stages; sometimes provided with scale-like hairs. Fig. 483. .....Family LASIOCAMPIDAE

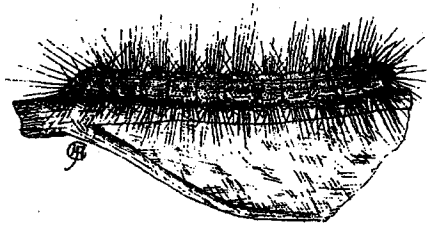


Fig. 483. *Malacosoma americana* Fab.

About 1,355 species have been scribed. The canterpillars possess long hairs and are brightly colored. They live in forested areas and orchards and feed on the foliages of various trees. The tent caterpillars, *Malacosoma* spp. occur in large numbers and lie in webs. The Syrian silkworm, *Pachypasa otus* Drury belonging here was reared for its silk by the Greeks and Romans.

49a. Con glándulas dorsales capaces de eversión en el segundo segmentos abdominal. Fig. 481 ..... Fam. LYMANTRIIDAE

49b. Sin glándulas dorsales capaces de eversión.....50

50a. Espiráculos circulares, pequeños .....Fam. PTEROPHORIDAE

51a. Verruga o seta iv mucho más bajo en el septimo segmento abdominal, o ausente. Fig. 482.....Fam. NOCTUIDAE

51b. Veruuga o seta iv en el mismo nivel en segmento 7 como en segmentos 6 y 8 ..... Fam. ARCTIIDAE

52a. Cuerpo sin pelos secundarios; no más que 8 pelos en cada propata..... .....Fam. ETHMIIDAE

52b. Cuerpo con pelos secundarios numerosos, por los menos en las propatas.....53

53a. Setas muy irregulares en largura, algunas 10 vices más larga como las otras; con verrugas debiles; a veces con pelos que parecen a escamas. Fog. 483..... Fam. LASIOCAMPIDAE

53b. Setae subequal or sometimes with setae and prominent warts and spines. 54

54a. 8th abdominal segment with a dorsal horn, or plate, or tubercle. 55

54b. 8th abdominal segment without a dorsal horn, or plate, or tubercle. 58

55a. Body with numerous branching spines or enlarged tubercles....56

55b. Body with at most 2 pairs of small spines on thorax. 57

56a. Head angulated or spined dorsally, or abdomen with several mid-dorsal spines; crochets of prolegs usually triordinal. Fig. 484. .....Family NYMPHALIDAE

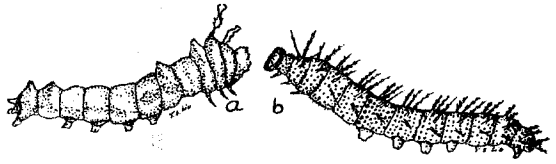


Fig. 484. a, **Basilarchia astyanax** Fab.; b, **Vanessa antiopa.**

About 4,000 species have been described. The caterpillars are usually spiny but some are naked. The chrysalises are suspended by the cremaster and the head is held downwards. They are often marked with silver or gold ornamentations. The adults are butterflies.

56b. Head rounded; crochets biordinal. Fig 485. .....Family SATURNIIDAE

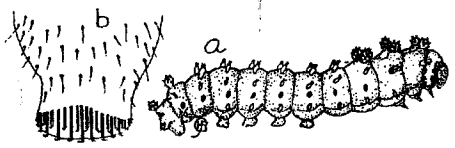


Fig. 485. a, **Samia cecropia** L.; b, a proleg with crochets.

The caterpillars chiefly feed on broad-leaved deciduous and evergreen trees. They are called giant or wild silkworms. No less than 30 species in oriental Asia are able to produce usable silk.

57a. Segments with 6 or 8 annulets; prolegs not widely separated. Fig. 486. .....Family SPHINGIDAE

Fig. 486. Tobacco hornworm, **Protoparce sexta** (Johanssen).

About 900 species have been described. The caterpillars are called hornworms because of the presence of a horn-like process on the 8th abdominal segment. Some larvae assume grotesque attitudes which are thought to be responsible for the name "sphinx moth" or "sphinx caterpillar".

53b. Setas subiguales o a veces con setas y verrugas y espinas prominentes. 54

54a. Octavo segmento abdominal con un cacho, placa, o tubérculo dorsal 55

54b. Octavo segmento sin cacho, placo o tubércculo.....58

55a. Cuerpo con espinas ramificadas numerosas o tubérculos ensanchados 56

55b. Cuerpo con al máximo 2 pares de espinas pequeñas en el tórax..... 57

56a. Cabeza angular o con espinas dorsales. o abdomen con algunas espinas dorsales; crochetes de las propatas triordinales. Fig. 484..... .....Fam. NYMPHALIDAE

56b. Cabeza redondeada; crochetes biordinales. Fig. 485..... .....Fam. SATURNIIDAE

57a. Segmentos con 6 o 8 ranuras; propatas no separadas anchamente. Fig. 486 .....Fam. SPHINGIDAE

57b. Segments with 2 or 3 obscure annulets; prolegs widely separated. Fig. 487. .....Family BOMBYCIDAE

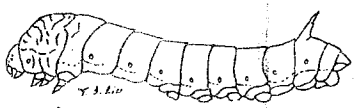


Fig. 487. Chinese silkworm, Bombyx mori L.

The Chinese silkworm, *Bombyx mori* L. is an important beneficial insect which has been domesticated for more than 2,000 years. It was estimated about 70 million pounds of raw silk are produced each year.

58a. Head elevated, triangular .....(*Lapara*) Family SPHINGIDAE

58b. Head not so. 59

59a. Crochets on prolegs forming an ellipse, at most narrowly interrupted. Fig. 488. .....Family HESPERIIDAE

Fig. 488. Epargyreus tityrus Fab.

About 3,000 species have been described. The head of the caterpillars is much larger than its prothorax which forms a narrow "neck" and makes them readily recognized. Its body is widest at middle and tapering toward both ends. They live exposed on plants or within rolled and webbed leaves. They feed chiefly on cereals and grasses. The adults are known as skippers.

59b. Crochets arranged in one band, occasionally interrupted, or rarely forming 2 separated bands. 60

60a. Bands of crochets on prolegs reduced or interrupted at middle and with a narrow spatulate, freshly lobe arising near the interruption. Fig. 489. .....Family LYCAENIDAE

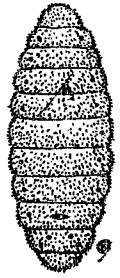


Fig. 489. Lycaenid larva.

The caterpillars are largely phytophagous and often found on leguminous plants. Some are predacious and feed on scale-insects and other homopterous nymphs. A few are myrmecophilous. The body is short and broad, slug-like and the head is smaller and narrower than the body.

60b. Prolegs with band of crochets continuous, without a fleshy lobe near the middle. 61

57b. Segmentos con 2 o 3 ranuras débiles; propatas anchamente separadas. Fig. 487 .....Fam. BOMBYCIDAE

58a. Cabeza elevada, triangular .....Fam. SPHINGIDAE

58b. Cabeza no es así.....59

59a. Crochetes en las propatas formando un elipse, poco interrumpido, Fig. 488 .....Fam. HESPERIIDAE

59b. Crochetes arreglado en una franja, a veces interrumpido, raramente formando 2 franjas separadas 60

60a. Franjas de los crochetes en las propatas reducidos o interrumpidos en medio de la fila con un lóbulo carnoso cerca. Fig. 489 ....Fam. LYCAENIDAE

60b. Propatas con franjas de crochetes continuos, sin un lóbulo carnoso cerca de la mitad.....61

61a. Dorsum of prothorax bearing an eversible, forked scent gland. When the gland is retracted a transverse groove is revealed: body not hairy or spiny, but sometimes with fleshy filaments. Fig. 490. .....Family PAPILIONIDAE

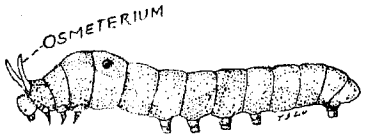


Fig. 490. **Papilio cresphontes** Cramer.

About 800 species have been described. The caterpillars feed on a number of plants, but chiefly on *Citrus* and Umbelliferae. The thorax of the larva is usually enlarged, and sometimes possesses two eyespots. A protrusible scent gland on the dorsum which is called *osmeterium*— is often present and is ejected when the caterpillar is disturbed. The adults are the swallowtail butterflies.

61b. Not as 61a. 62

62a. Head and body entirely without spines, high tubercles, or fleshy filaments. 63

62b. Body with spines, high tubercles, or fleshy filaments. 65

63a. Anal plate entire, rounded. 64

63b. Anal plate bifurcate at tip, bearing 2 distinct processes. .....Family SATYRIDAE

64a. Head apparently larger than prothorax. ..Family NYMPHALIDAE

64b. Head smaller than prothorax. Fig. 491. .....Family PIERIDAE

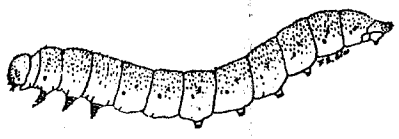


Fig. 491. **Cabbageworm, Pieris rapae** (L.)

About 1,000 species have been described. The caterpillars feed on many kinds of plants but are especially fond of cabbages and other cruciferous crops. The cabbage butterfly, *Pieris rapae* (L.) is a cosmopolitan species and the rape butterfly, *Pieris napi* (L.) is also common to both Europe and North America.

61a. Dorso del protórax con una glándula bifurcad y capaz de eversión. Cuando está erguida, se ve una ranura transversal; cuerpo no peludo ni espinoso pero a veces con filamentos carnosos. Fig. 490..... ..... Fam. PAPILIONIDAE

61b. No como 61a 62

62a. Cabeza y cuerpo completamente sin espinas, tubérculos altos o filamentos carnosos.....63

62b. Cuerpo con espinas tubérculos altos o filamentos carnosos 65

63a. Placa anal entero, redondeado 64

63b. Placa anal bifurcado en el termino, con 2 procesos distintos..... ..... Fam. SATYRIDAE

64a. Cabeza aparentemente más grande que el protórax..... .....Fam. NYMPHALIDAE

64b. Cabeza más pequeña que el protórax. Fig. 461.....Fam. PIERIDAE

65a. Mesothorax and sometimes several other segments bearing fleshy filaments. Fig. 492. .....Family DANAIDAE

Fig. 492. Danaus plexippus L.

The caterpillars chiefly feed on milkweeds. The monarch butterly, *Danaus plexippus* (L.) is nearly a cosmopolitan species. Its caterpillar is black and yellow. The chrysalis is pale green and iridescent.

65b. Body without fleshy filaments. .....Family NYMPHALIDAE

65a. Mesotórax y a veces otros segmentos con filamentos carnosos. Fig. 492 .....Fam. DANAIDAE

65b. Cuerpo sin filamentos carnosos.....Fam. NYMPHALIDAE

ORDER COLEOPTERA

(The key is mainly compiled from Boving and Craighead, 1931, and Van Emden, 1942.)

1a. Legs consisting of 5 segments (coxa, trochanter, femur, tibia and tarsus) and 1 or 2 distinct claws (except in instars of *Micromalthus* which are legless or have 2-segmented legs). Fig. 163.....2

Fig. 163. A leg.

COLEOPTERA

1ª. Patas tienen 5 segmentos (coxa, trócanter, fémur, tibio y tarso) y 1 o 2 uñas distintas, Fig. 163 2

1b. Legs consisting of 4 segments (coxa, trochanter, femur and tibiotarsus) and 1 claw; or less than 4 segments; or even vestigial or absent. Fig. 164...13

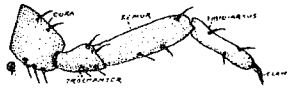


Fig. 164. A leg.

2a. Mandible with molar structure. Fig. 165. 3

The food habits of an insect possessing chewing mouth parts can usually be judged fairly accurately by the size and character of the mandibles. These structures are "first line" organs when it comes to securing food. It is interesting to note that insect jaws meet on a vertical plane instead of a horizontal one as with the mammals.

Fig. 165. A right mandible.

2b. Mandible without molar structure. Fig. 166. 4

Fig. 166. A left mandible.

3a. 9th abdominal segment extended terminally into a single, conical, straight process; ventrally with a simple, transverse, narrow sternal plate; legs short, conical; claws of subequal size. Fig. 167. .....Family CUPESIDAE

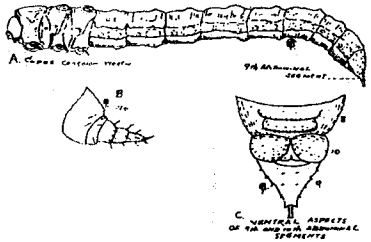


Fig. 167. a, **Cupes concolor** Westn.; b, a leg; c, ventral aspect of 9th and 10th abdominal segments.

A very small family ranging into both hemispheres, including Australia. The larva of Cupes is a wood borer, as are most of the other members of the family. They are medium sized borers, and may be found under bark.

1b. Patas tienen 4 segmentos (coxa, trócanter, fémur y tibiotarso) y 1 uña; o menos que 4 segmentos; o hasta rudimentario o ausente. Figl. 164.... 13

2a. Mandíbula con una muela, Fig. 165 3

2b. Mandíbula sin muela. Fig. 166 4

3a. Segmentos 9 del abdomen extendido hacia atrás en un solo proceso recto; parte ventral con una placa sencilla transversal; patas cortas, cónicas con uñas sub-iguales Fig. 167.....Familia CUPESIDAE

3b. 9th 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 2 claws of equal length.
Fig. 168. .....Family MICROMALTHIDAE

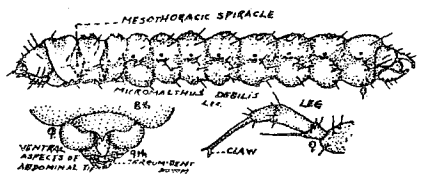


Fig. 168. Micromalthus debilis Lec.

It consists of a single North American species, *Micromalthus debilis* Lec. The biology of this insect is most remarkable. It combines in its life cycle 7 or 8 forms of larvae and exhibits both oviparous and ovoviviparous paedogenesis.

4a. Cardo very large; 2 pairs of gills on the tip of 9th abdominal segment. Fig. 169. .....Family GYRINIDAE

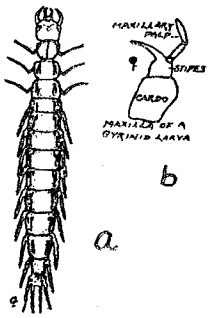


Fig. 169. a, Dineutes sp.; b, Maxilla of a gyrinid larva.

They are called whirligig beetles or surface swimmers. There are about 450 described species. The eggs are laid on objects in water. The larvae are aquatic and predacious. They pupate in flimsy cocoons attached to rocks, water plants, etc.

4b. Cardo of normal moderate size or small; never have 2 pairs of gills on the tip of 9th abdominal segment. Fig. 170. 5

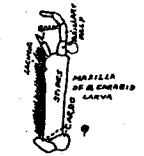


Fig. 170. Maxilla of a carabid larva.

3b. Segmento 9 del abdomen con el proceso terminal doblado hacia abajo y dirigido hacia un proceso semejante pero doblado hacia arriba de la placa esternal; pata (en instar en lo cual están completamente desarrollada) con un tarso largo y delgado con 2 uñas de largura igual . .....Fam. MICROMALTHIDAE

4a. Cardo (segmento basal de la maxila) muy grande; 2 pares de branquias en el termino del segmento 9 del abdomen. Fig. 169Fam. GYRINIDAE

4b. Cardo del tamaño normal o pequeño; nunca con 2 pares de branquias en el terminal del segmento 9 del abdomen. Fig. 170.....5

5a. Labial palpi latent; mentum and ligula fused into an unpaired anteriorly bilobed piece. Fig. 171. .....Family **RHYSODIDAE**

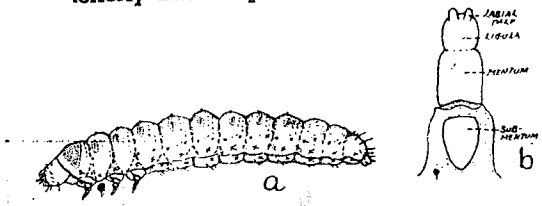


Fig. 171. a, Clinidium sculptile Newn.; b, Ventral aspect of labium.

Rather more than 100 species have been described. Nothing appears to be known about their metamorphoses. The larvae are probably predacious. Look for them under decaying bark.

5b. Labial palpi distinct and segmented. Fig. 172. 6

6a. 9th abdominal segment present; 8th abdominal segment never terminal. (See Fig. 174). 7

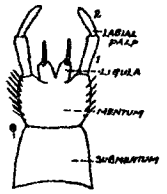


Fig. 172. Ventral aspect of labium.

6b. 9th abdominal segment rudimentary; 8th abdominal segment long, conical, appearing as the terminal segment of the body. (See Fig. 177). 10

7a. 10th abdominal segment developed as a pygopod for locomotory purpose. 8

7b. 10th abdominal segment not developed as a pygopod. Fig. 173. .....Family **HALIPLIDAE**

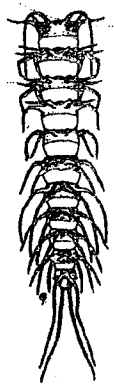


Fig. 173. Peltodytes sp.

They comprise about 100 widely distributed species. Their larvae possess segmentally arranged groups of freshy process and are aquatic insects. Larvae and adults live together among aquatic plants and may be collected readily by raking these plants out on to the shore.

5a. Palpo labial no distinto; mento y lígula fusionados en un solo estructura bilobulada. Fig. 171 .....Fam. RYSODIDAE

5b. Palpos labiales distintos y segmentados. Fig. 172.....6

6a. Segmentos abdominal 9 presente, segmento 8 nunca terminal (ver Fig. 174).....7

6b. Segmento abdominal 9 rudimentario; segmento 8 largo, cónico, parece que está el termino del cuerpo (ver Fig. 177).....10

7a. Segmento abdominal 10 desarrollado como un pygopod para locomoción 8

7b. Segmento abdominal 10 no desarrollado como un pygopod. Fig. 173 ... .Fam. HALIPLIDAE

8a. 2 or 3 pairs of hooks present on tergum of 5th abdominal segment. Fig. 174. .....Family CICINDELIDAE

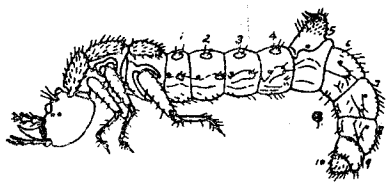


Fig. 174. **Megacephala carolina** (L.).

The family consists of about 2,000 species and their adults are called tiger beetles. The larvae live in vertical or slanting, cylindrical burrows often a foot or more deep in which they can move up and down by aid of the dorsal hooks of the fifth abdominal segment. They are predacious and found along the sandy banks of rivers and bodies of water, in wet meadows, and in damp partially shaded canyons.

8b. No hooks on 5th abdominal tergum. 9

9a. Terminal setae of tarsus much shorter than claws; retinaculum single or absent. Fig. 175. .....Family CARABIDAE

Fig. 175. **Harpalus viridiaeneus** Beauvois.

The family is very large, comprising around 21,000 described species. The larvae are carnivorous and living in the soil, grass, under debris or dead bark. Pupation takes place in a cell in the ground. They are elongate, usually flattened and grub-like, and often very active.

9b. Terminal setae of tarsus much longer than claws; retinaculum bicuspidate. Fig. 176. .....Family OMOPHRONIDAE

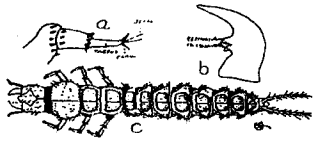


Fig. 176. a, leg of **Omophron**; b, Mandible of **Omophron**; c, **Omophron** sp.

The members of this small family live in the sand and debris along water courses. They are comparatively rare.

8a. 2 o 3 pares de ganchos en el tergo del segmento 5 del abdomen. Fig. 174. ..... Fam. CARABIDAE, Cicindelinae

8b. Tergo 5 del abdomen sin ganchos 9

9a. Setas terminales del tarso mucho más cortas que las uñas; retináculo (ver abajo) simple o ausente. Fig. 175..... Fam. CARABIDAE

9b. Setas terminales del tarso mucho más largas que las uñas; retináculo bicuspidado. Fig. 176..... Fam. CARABIDAE, Omorphroninae

10a. Head nutant; mandible falcate and simple; 8th abdominal spiracle absent. Fig. 178. .....Family HYGROBIIDAE

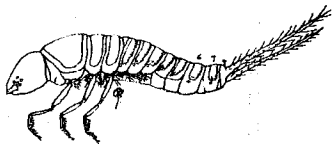


Fig. 177. **Hydrobia tarda** Herbst. (Redrawn from Boving and Craighead).

This is a small family comprising all aquatic species. They are found in the Eastern Hemisphere.

10b. Head porrect; mandible not simple; 8th adbominal spiracle terminal. (See Fig. 178). 11

11a. Mandible with distinct retinaculum, inner margin neither sulcate nor tubular; legs fossorial. Fig. 178. .....Subfamily Noterinae, DYTISCIDAE

Fig. 178. a, **Noterus** sp.; b, mandible.

The members of this small subfamily are rather minute in size. Their larvae must feed, of course, on tiny animal forms.

11b. Mandible without distinct retinaculum, inner margin either sulcate or tubular; legs ambulatory or natatory. (See Fig. 179). 12

12a. Prothoracic presternum large and subquadrate; gula present, subquadrate or triangular; gular suture double or anteriorly bifurcate. Fig. 179. .....Family DYTISCIDAE

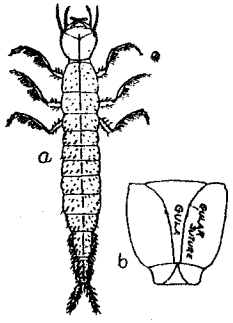


Fig. 179. a, **Dytiscus** sp.; b, Ventral aspect of head.

The family contains more than 2,000 species. Their adults are known as predacious diving beetles, water beetles and dytiscids. The larvae are predacious and feed upon many kinds of aquatic animals including mollusks, worms, tadpoles, salamanders and fishes. Because the hunting life, the larvae are sometimes called water tigers. Their pupae are terrestrial and pupation takes place above the water line.

10a. Cabeza hipognato; mandíbula simple; espiráculo ausente en segmento 8 del abdomen. Fig. 178 ..... Fam. HYGROBIIDAE

10b. Cabeza prognato; mandíbula no simple; espiráculo terminal en segmento 8. (ver. Fig. 178)..... 11

11a. Mandíbula con un retináculo distinto, margen interno ni con ranuras ni tubular; patas adaptadas para excavar. Fig. 178 .....Fam. NOTERIDAE

11b. Mandíbula sin retináculo, margen interno o con ranuras o tubular; patas para andar o nadar (ver Fig. 179) 12

12a. Pre-esterno del protórax grande y cuadrado; gula presente, ... subcuadrado o triangular; sutura de la gula doble o bifurcada anteriormente. Fig. 179.....Fam. DYTISCIDAE

12b. Prothoracic presternum transverse, narrow and band-shaped; gula absent; gular suture median and simple.
Fig. 180. .....Family AMPHIZOIDAE

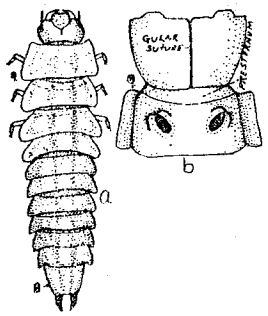


Fig. 180. a, Amphizoa sp.; b, Ventral aspect of head and prothorax.

The family consists of the single genus, *Amphizoa*, with only 3 aquatic species. They inhabit rocks and logs in fresh water streams along the Pacific coast of N. America and 1 species in Tibet.

13a. 8th abdominal segment glandular, discoidal and terminal.
Fig. 181. .....Family PAUSSIDAE

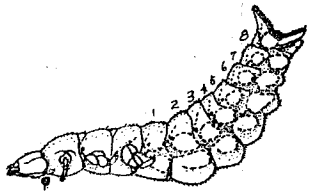


Fig. 181. Paussus kannegieteri Wasm.

More than 300 species are known. They are adapted to a myrmecophilous life. The metamorphoses of this family have received very little attention. Its known members are all exotic.

13b. 8th abdominal segment not glandular and not discoidal. 14

14a. Cerci segmented, individually movable. 15

14b. Cerci solid or absent. 28

15a. (a) Galea usually inserted on the palpifer; if absent, then the abdomen with only 8 distinct segments; or (b) galea less often inserted on stipes (to the outside of lacinia), but then the mandible serrate, the cerci 2-segmented, and the 10th abdominal segment almost always with a pair of recurved ventral hooks.
Fig. 182. 114

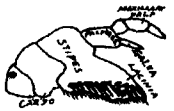


Fig. 182. Maxilla.

12b. Pre-esterno del protórax transverso, delgado; gula ausente; sutura de la gula simple y en el medio. Fig. 180..... Fam. AMPHIZOIDAE

13a.
Segmentos abdominal 8 con glándulas, como un disco y en el termino. Fig. 181 .....Fam. CARABIDAE, Paussinae

13b. Segmentos abdominal 8 sin glándulas y no como un disco 14

14a. Cercos segmentados, móviles individualmente 15

14b. Cercos sólidos o ausentes 28

15a. Galea a menudo sale del palpifer; si ausente, entonces el abdomen con solo 8 segmentos; o (b) galea a veces sale del stipes (afuera de la lacinia), pero entonces la mandíbula aserrada, los cercos con 2 segmentos, y segmento 10 del abdomen casi siempre con ganchos recorvados. Fig. 182 114

15b. Galea never inserted on the palpifer; often absent or fused with the lacinia; abdomen always with 9 to 10 distinct segments; if the mandible is serrate, the cerci absent or 1-segmented. Fig. 183. 16

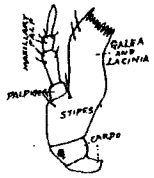


Fig. 183. Maxilla.

16a. Mandible with a usually large, asperate or tuberculate molar part. Fig. 184. 17

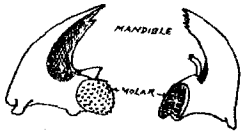


Fig. 184. Two mandibles.

16b. Mandible without asperate or tuberculate molar part, usually without molar part. 21

17a. 10th abdominal segment provided with a pair of recurved hooks. Fig. 185. ..... Subfamily Limnebiinae, HYDROPHILIDAE

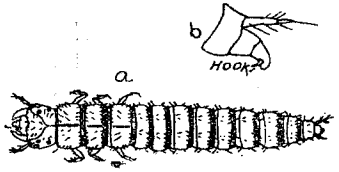


Fig. 185. a, Ochthebius mipressus; b, Tip of abdomen.

The members of this small subfamily are for the most part found on the Pacific coast, and are comparatively small in size.

17b. 10th abdominal segment without terminal hooks but sometimes with a pair of long setae. 18

18a. Spiracles absent; balloon-like appendices on prothorax, 1st and 8th abdominal segments; antenna very short and 2-segmented. Fig. 186. ..... Subfamily Hydroscaphinae, HYDROPHILIDAE

Fig. 186. Hydroscapha natans Lec.

It is a small subfamily, comprising only 4 or 5 species adapted for an aquatic life. They occur in running water, including hot springs. The one American species is found in our Southwest.

18b. Spiracles present; no balloon-like appendices; antenna 3-segmented. 19

15b. Gala nunca sale del palpifer; a menudo ausente o fusionada con la lacinia; abdomen siempre con 9 o 10 segmentos distintos; si la mandíbula aserrada, los cercos ausentes o con 1 segmento. Fig. 183 16

16a. Mandíbula con una muela grande, áspera, o tuberculosa. Fig. 184 ... 17

16b. Mandíbula sin muela áspera o tuberculosa; a menudo sin muela..... 21

17a. Segmento 10 del abdomen con un par de ganchos doblados. Fig. 185 ..... Fam. HYDROPHILIDAE, Limnebiinae

17b. Segmento 10 del abdomen sin ganchos terminales; a veces con un par de setas largas 18

18a, Espiráculos ausentes; apéndices como globos en el protórax y segmentos abdominales 1 y 8; antenas muy cortas con 2 segmentos. Fig. 186 ..... Fam. HYDORPHILIDAE, Hydroscaphinae

18b. Espiráculos presentes, sin apéndices como globos; antena con 3 segmentos 19

19a. Apex of mandible multiserrate; cerci short, 1-segmented. Fig. 187. ..... Family PTILIIDAE

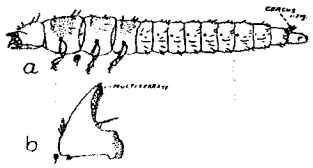


Fig. 187. a, **Nossidium americanum** Mots.; b, Mandible.

The larvae and adults of these 'feather-winged" beetles live in decaying wood, fungi and in ant's nests. They are very minute, some of the smallest known beetles belong to this family.

19b. Apex of mandible bifid or trifid; cerci 2-segmented, last segment often multiannulated. (See Fig. 188). 20

20a. Mandible with vestigial retinaculum. Fig. 188. ..... Family LEPTINIDAE

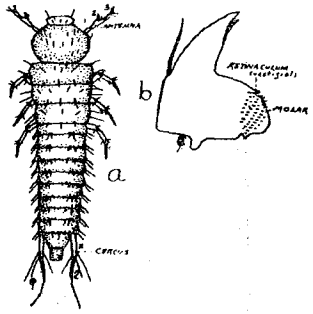


Fig. 188. a, **Leptinus testaceus** Mull; b, Mandible.

This is a very small family. Its habits are practically unknown but they have been found in rotten wood, in the nests of birds and of field mice.

20b. Mandible with distinct retinaculum or prostheca, or both. Fig. 189. ..... Subfamily Anistominae, SILPHIDAE

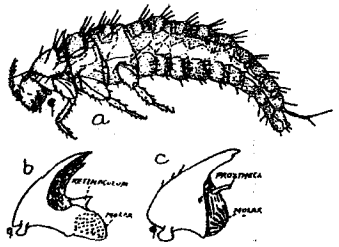


Fig. 189. a, **Prionochaeta opaca** Say; b, Mandible with retinaculum; c, Mandible with prostheca.

They are found among damp herbage, in fungi, under bark, etc. They are fairly abundant but their very small size results in their being rather poorly known.

19a. Ápice de la mandíbula multi-aserrada; cercos cortos, con 1 segmento. Fig. 187 ..... Fam. PTILIIDAE

19b. Ápice de la mandíbula bífida o trífida; cercos con 2 segmentos, último segmento a menudo con anillos (ver Fig. 188) 20

20a. Mandíbula con un retináculo rudimentario. Fig. 188 .... Fam. LEPTINIDAE

20b. Mandíbula con un retináculo distinto, o un prostéco o ambos. Fig. 189 ..... Fam. SILPHIDAE

21a. Mala (lacinia and galea) and stipes fused. Fig. 190. 22

Fig. 190. Maxilla

21b. Mala segment-like, movable. Fig. 191. ..Family STAPHYLINIDAE

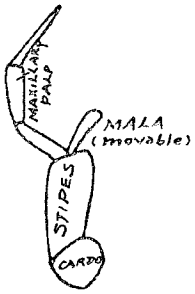


Fig. 191. Maxilla.

This is one of the largest family of insects and including more than 20,000 species. The adults are called rove beetles. The larvae are typically campodeiform and often closely resemble the Carabidae. The larvae of certain species are definitely known to be carnivorous and predacious. Certain larvae are pupal parasites of cyclorrhaphous Diptera and undergo hypermetamorphosis.

22a. Mandible with apex simple, recurved and bent away from the sagittal plane of the larva. Fig. 192. .....Family PLATYPSYLLIDAE

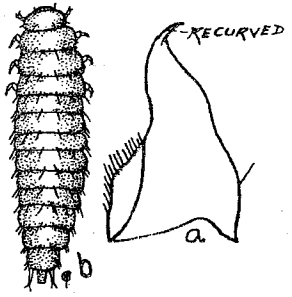


Fig. 192. a, Mandible; b, *Platypsyllus castoris* Rits.

The family consists of a single species, the beaver beetle, *Platypsyllus castoris* Rits., which is an ectoparasite of the beaver in Europe and America. The biology of the immature stages is not known.

22b. Mandible with apex differently shaped, never recurved. 23

23a. Galea present, often developed as a small, hairy lobe on top of lacinia. Fig. 193. ...24

23b. Galea and lacinia fused. 25

Fig. 193. Maxilla.

21a. Mala (lacinia y galea) y stipes fusionadas. Fig. 190 24

21b. Mala como un segmento, movible. Fig. 191. Fam. STAPHYLINIDAE

22a. Mandíbula con el ápice sencillo, recorvado y doblado hacia el lado lateral de la larva. Fig. 192 ..... Fam. PLATYPSYLLIDAE

22b. Mandíbula con el ápice diferente, nunca recorvado 23

23a. Galea presente, a menudo desarrollado como un lóbulo pequeño y peludo en la cumbre de la lacinia. Fig. 193 24

23b. Galea y lacinia fusionadas 25

24a. Lacinia with entire surface asperate; terminal segment of maxillary palpus subulate; ligula trilobed.
Fig. 194. .....Family SCAPHIDIIDAE

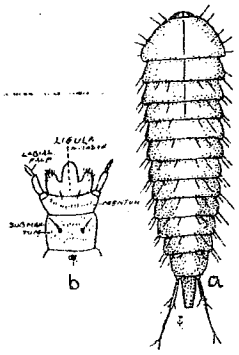


Fig. 194. a, **Scaphisoma convexum** Say; b, Ventral aspect of labium.

The members of this family are fungivorous or occur in rotting wood both as larvae and adults. Less than 100 species are known in North America although some species are very common.

24b. Lacinia not asperate, or only along posterior margin; terminal segment of maxillary palpus not subulate; ligula bilobed.
Fig. 195. .....Family SILPHIDAE

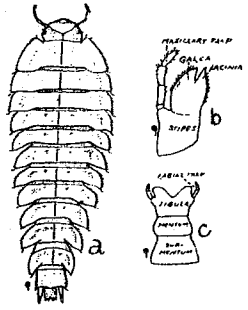


Fig. 195. a, **Silpha** sp.; b, Mandible; c, Labium.

The carrion beetles, burying beetles and sexton beetles are the common names of the adult members of this family which include about 1,600 described species. The eggs are laid in dead animal bodies and their larvae lead a saprozoic life, However, some are predacious and feeding upon snails or other insects; others are found among plants and fungi.

25a. Ligula either deeply bilobed anteriorly, or absent; labrum fused to become nasale.
Fig. 196. 26

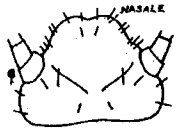


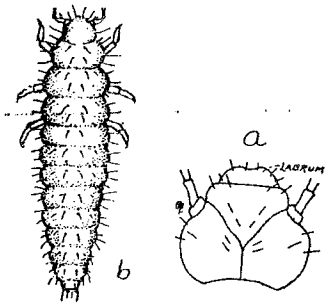
Fig. 196. Dorsal aspect of head.

24a. Lacinia con superficie entera asperada; último segmento del palpo de la maxila atenuada; lígula con tres lóbulos. Fig. 194 .... Fam. SCAPHIDIIDAE (ahora STAPHYLINIDAE)

24b. Lacinia no asperada, o sólo en el borde posterior; segmento final del palpo máxilar no atenuada; lígula con dos lóbulos. Fig. 195 .... Fam. SILPHIDAE

25a. Lígula o bilobulada profundamente anteriormente, o ausente; labro fusionado y convertido en el nasale. Fig. 196 26

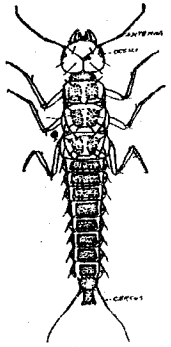
25b. Anterior margin of ligula entire; labrum distinct, often movable. Fig. 197. .....most STAPHYLINIDAE



The short elytra of the adult staphylinids result in the larva and adults often resembling each other rather closely. The many species range rather widely in size.

Fig. 197. a, Dorsal aspect of head; b, **Oligota oviformis** Casey.

26a. Cerci long and 2-segmented; antennae more than twice as long as head; ligula bilobed; 6 ocelli on each side. Fig. 198. .....Subfamily Steninae, STAPHYLINIDAE



The members of this subfamily are rather short and thick as compared with most staphylinids. They live in sand and debris at the edge of water courses and seem to be predacious.

Fig. 198. **Stenus** sp.

26b. Cerci absent or small and immovable; antennae not longer than head; ligula absent; less than 6 ocelli on each side, sometimes no ocelli. 27

25b. Margen anterior de lígula entero; labro distinto, muchas veces movible. Fig. 197.....la mayoría STAPHYLINIDAE

26a. Cercos largos y con 2 segmentos; antena más que 2 veces la largura de la cabeza; lígula bilobulado; 6 ocelos en cada lado. Fig. 198 ....Subfamilia Steninae. STAPHYLINIDAE

26b. Cercos ausentes o pequeños y no movibles; antena no más largo que la cabeza; lígula ausente; menos que 6 ocelos en cada lado, a veces no hay ocelos.....27

27a. Terga expanded laterally; body oval; antenna club-shaped. Fig. 199. .....Family SCYDMAENIDAE

Fig. 199. A scydmaenid larva.

It includes more than 1,200 species of small insects. They mostly occur in moss, under bark or in ants' nests. Scarcely anything appears to be known of the biology of the family.

27b. Terga not expanded; antenna not club-shaped. Fig. 200. .....Family PSELAPHIDAE

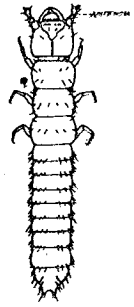


Fig. 200. Euplectus confluens Lec.

The species mostly live in ants' nests and the adult bears a resemblance to ants. The biology of the larvae is little known. More than 3,000 species have been described. Their size is small.

(28b)

28a. Hypermetamorphosis present; mandible without molar part; maxillary mala short, thick, almost vestigial; gular area present; cerci absent. Fig. 201. 29

Hypermetamorphosis is a condition that prevails among a relative small percentage of insect species. Some of the instars are radically different from each other in habits and form or in some cases additional instars occur between the full grown larva and the adult.

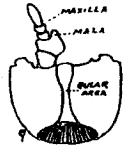


Fig. 201. Ventral aspect of head.

28b. No hypermetamorphosis; different combination of characters than in 28a. 31

27a, Tergos expandidos lateralmente; cuerpo oval; antenas en forma de mazas. Figl. 199.....Fam. SCYMAENIDAE

27b. Tergos no expandidos; antenas no en forma de maza. Fig. 200..... .....Fam. PSELAPHIDAE (ahora STAPHYLINIDAE)

28a

28a Hipermetamorfosis presente; mandíbula sin parte de muela; mala de la maxila corta, gruesa, casi rudimentaria; área gular presente; cercos ausentes. Fig. 201 29

28b

~~29a~~. Sin hipermetamorfosis; combinación de caracteres diferente que en 28a. 31

29a. Gula well developed; maxillae inserted at a considerable distance in from anterior margin of prosternum; labial palpi 2-segmented. Fig. 202. .....Family MELOIDAE

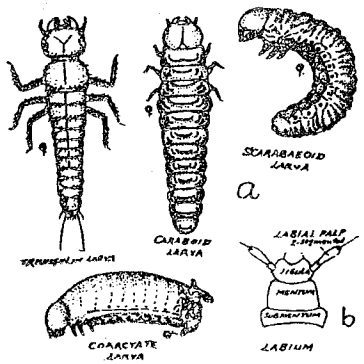


Fig. 202. a, Forms of meloid larvae; b, Ventral aspect of labium.

This family comprises no less than 2,500 species. The adults are called blister beetles. Eggs are laid in masses in the soil. The newly hatched larvae called triungulins or primary larvae, are campodeiform. They are active and feed on egg masses of other insects in the soil, or they may attach themselves to certain adult hosts and ride to the nests and feed upon the food or devour the young. Then they transform into scarabaeoid type of larvae, and some into still a third type of larvae. A prepupa stage is followed by the pupa and then the adult.

29b. Gula area short; maxillae extending posteriorly to near the anterior margin of prosternum; labial palpi not segmented, reduced to warts, or entirely absent. Fig. 203. 30

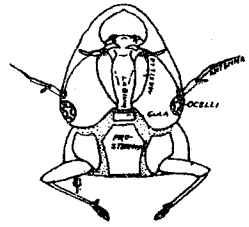


Fig. 203. Ventral aspect of head and prothorax of **Rhipiphorus solidaginis** Pierce.

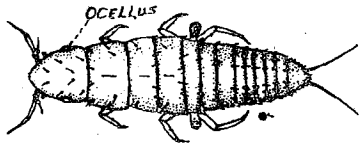


Fig. 204. **Tetraonyx quadrimaculata** F. 1st instar.

30a. 1 ocellus on each side of head.
Fig. 204. ..Genus *Tetraonyx*, MELOIDAE

The larvae of this genus seem so different from other Meloids that some systematists would errect a family (Tetraonycidae) for the few members of the genus.

29a. Gula bien desarrollada; maxilas distantes del margen anterior del prosterno; palpos labiales con 3 segmentos. Fig. 202 ....Fam. MELOIDAE

29b. Gula corta; maxila extendidas posteriormente a cerca del margen anterior del prosterno; palpos labiales muy pequeños o ausentes, no con segmentos. Fig. 203 30

30a. 1 ocelo en cada lado de la cabeza. Fig.204.....Fam. MELOIDAE

30b. Several ocelli placed together on each side of head. Fig. 205. ..... Family RHIPIPHORIDAE

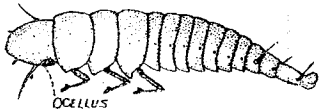


Fig. 205. Phipiphorus solidaginis Pierce.

The larvae of this family are of great interest on account of their parasitic habits. *Metaecus paradoxus* is a parasite in nests of *Vespa*, but the eggs are laid in old wood. The larva becomes an endoparasite and then changes to ectoparasite. Pupation takes place in the cell of the host.

31a. Mandible bearing an accessory ventral condyle: with either a free galea well separated from a distinct lacinia or with cribriform spiracles, or with both characters. Fig. 306. 32

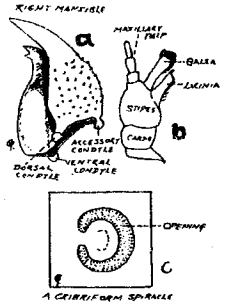


Fig. 206. a, A right mandible; b, A maxilla; c, A cribriform spiracle.

31b. Characters not so combined. 40

32a. Median epicranial suture present: 10th abdominal segment well developed, usually about as large or larger than the well developed 9th abdominal segment, sometimes fused with it dorsally, when shorter than 9th abdominal segment, then provided with a pair of large anal pads. 33

32b. Median epicranial suture absent: 10th abdominal segment much smaller than the well developed 9th abdominal segment and always without anal pads, or both 9th and 10th abdominal segments vestigial. 37

33a. Stridulating organ present on mesothoracic leg: abdominal terga not plicate. Fig. 207. 34

Fig. 207. A mesothoracic leg.

30b. Varios ocelos, arreglados juntos, en cada lado de la cabeza. Fig. 205 .. .. Fam. RHIPIPHORIDAE

31a. Mandíbula llevando un condile extra; con o una galea libre bien separada de una lacinia distinta, o con espiráculos en forma de C, o con ambas características. Fig. 306 32

31b. Sin la combinación de caracteres arriba 40

32a. Sutura epicranial presente; segmento 10 del abdomen bien desarrollado, a menudo tan grande o más que el segmento 9, a veces fusionado con el dorsalmente; si más corto que segmento 9 entonces el 10 tiene un par de grandes almojadillas 33

32b. Sutura epicranial ausente; segmento 10 del abdomen mucho más pequeño que 9 y siempre sin almojadillas; o ambos segmentos 9 y 10 son rudimentarios. 37

33a. Órgano par estridulaciones presente en la pata mesotoracica. Fig. 207 34

33b. Stridulating organ 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; abdominal terga plicate. Fig. 208. 35

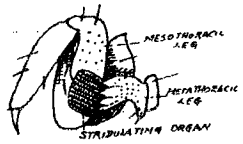


Fig. 208. A mesothoracic leg.

34a. Anus longitudinal between 2 large oval, often sclerotized pads at end of body; metathoracic legs normal. Fig. 209. .....Family LUCANIDAE

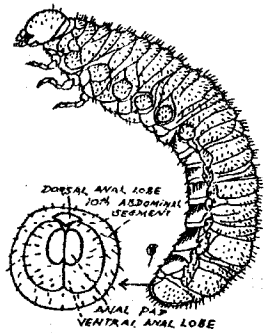


Fig. 209. **Sinodendron cylindricum.**

The family consists of around 900 species. The adults are called stag beetles. Their larvae live largely in decaying wood. The larval stage lasts 4 to 6 years to complete their development. Pupation takes place in a cell formed of gnawed wood fragments. Some species are very large.

34b. Anus transverse; end of body different; metathoracic legs reduced and much shorter than mesothoracic legs. Fig. 210. .....Family PASSALIDAE

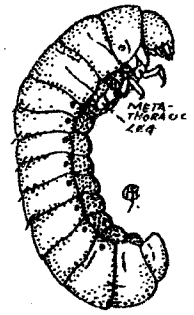


Fig. 210. **Passalus sp.**

About 300 species have been described. It was reported that the parent beetles stay with the larvae and chew wood into a condition suitable for their progeny. The metathoracic legs of the larvae are greatly modified and adapted to form an organ which works across a striated area on the mesocoxa, thus producing a squeaking noise.

33b. Órgano par estridulaciones ausente en la pata. Fig. 208 35

34a. Ano longitudinal entre 2 grandes almojadillas frecuentemente esclerotizadas en el termino del cuerpo. Patas traseras normales. Fig. 209 ..... Fam. LUCANIDAE

34b. Ano transverso; termino del cuerpo diferente; patas traseras reducidas. Fig. 210 ..... Fam. PASSALIDAE

35a. Lacinia and galea separate. Fig. 211. 36

Fig. 211. Maxilla.

35b. Lacinia and galea fused. Fig. 212. .....Family SCARABAEIDAE

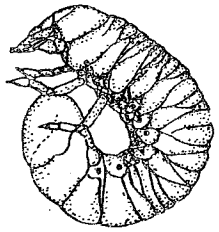


Fig. 212. Anomala lansenna Hayes & McColloch.

About 15,000 species are known in this very large family. The larvae are typically scarabaeoid type, living mostly in the soil and feeding upon plant tissues, but some forms are recorded as being myrmecophilous. The white grubs are best known larval pests while the Japanese beetle, June beetle and rose chafer are the serious adult pests. The world's largest beetles belong here, and of course the largest grubs.

One fairly large and widely represented group within this family, the Tumble bugs, are unique in their method of providing for their young. A pair of beetles make a large ball of mammalian dung which they roll, often for a considerable distance, and bury in an excavation which they prepare. An egg is laid in the ball and the grub makes its entire growth within the ball.

36a. Stridulating organs absent. Fig. 213. .....Family TROGIDAE

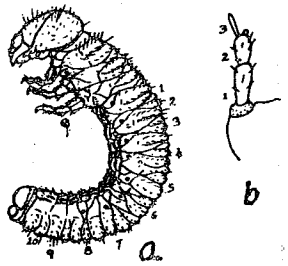


Fig. 213. a, Trox scaber L.; b, Antenna.

It is a small family composed of three genera and about 160 species. They mostly live in dried decomposing animal matter, and may be found in carrion.

35a. Lacinia y galea separadas. Fig. 211 36

35b. Lacinia y galea fusionadas. Fig. 212 .....Fam. SCARABAEIDAE

36a, Órganos estriduladoros ausentes. Fig. 213 ..... Fam. TROGIDAE

36b. At least mandibular stridulating teeth present.
Fig. 214. .....Family SCARABAEIDAE

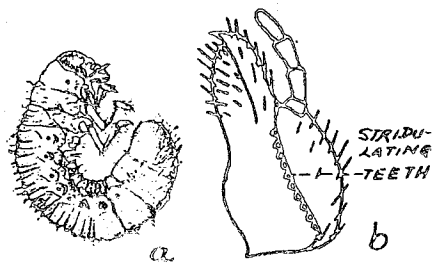


Fig. 214. a, White grub; b, Maxilla.

The larvae of many Scarabaeids live in dung or other decaying organic matter and are of little consequence except to act as scavengers. Many others feed on the roots of growing plants and are highly destructive.

37a. 8th abdominal segment of normal form and not terminal; 9th abdominal segment large. (See Fig. 215). 38

37b. 8th abdominal segment large and terminal; 9th abdominal segment vestigial. (See Fig. 217).....39

38a. 10th abdominal segment almost obliterated and without soft, terminal prolongation; ocelli absent.
Fig. 215. .....Family DASCILLIDAE

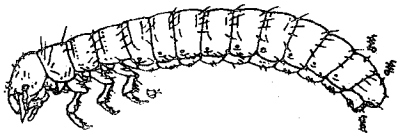


Fig. 215. Dascillus davidsoni Lec.

This is a group of small to medium terrestrial and aquatic beetles. The larvae have been found in pasture land. Some 500 species are known.

38b. 10th abdominal segment well developed, with soft terminal unpaired, 2-segmented and retractile prolongation; 5 ocelli on each side. Fig. 216. .....Family HETEROCERIDAE

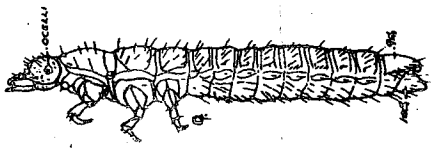


Fig. 216. Heterocerus ventralis Melsh.

The family is very widely distributed and about 100 species are known. The larvae live in galleries which they excavate in the mud bordering pools and streams.

36b. Al menos dientes estridulatorios presentes en la maxila. Fig. 214.....
.....Fam. SCARABAEIDAE

37a. Octavo segmento del abdomen de forma normal y no terminal; noveno segmento del abdomen grande. (Vea Fig. 215).....38

37b. Octavo segmento del abdomen grande y terminal; noveno segmento rudimentario (Vea Fig. 217).....39

38a. Décimo segmento del abdomen casi obliterado y sin prolongación terminal suave; ocelos ausentes. Fig. 215..... Fam. DASCILLIDAE

38b. Décimo segmento del abdomen bien desarrollado con una prolongación terminal de 2 segmentos; 5 ocelos en cada lado. Fig. 216
.....Fam. HETEROCERIDAE

39a. 3 terminal tufts of gills retractile into a pocket; antenna long and multisegmented; one large ocellus and one small ocellus on each side of head. Fig. 217. .....Family HELODIDAE

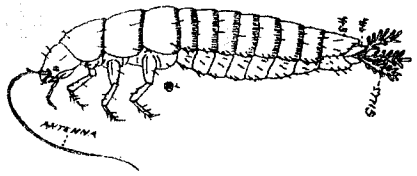


Fig. 217. **Prionocyphon discoideus** Say.

It is a small family. Their larvae are aquatic. They are all of small size.

39b. Gills absent; antenna 3-segmented; 5 ocelli on each side of head. Fig. 218. .....Subfamily Nosodendrinae, BYRRHIDAE

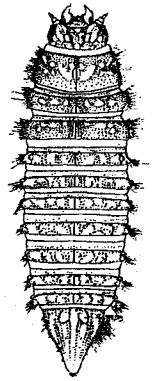


Fig. 218. **Nosodendron californicus** Horn.

The single genus *Nosodendron* contains 3 described species, 2 from North America and 1 from Europe. The larvae have been taken in fungi, under bark and around the flowing sap of trees. They are thought to be predators on dipterous larvae. No information concerning the pupae is available.

(31b)
40a. Gular region or median gular suture present or absent; when absent, with mandibles having mola or prostheca or extraordinary structures except a pseudomola. Fig. 219. 41

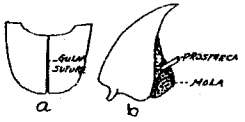


Fig. 219. a, Ventral aspect of head; b, Mandible.

40b. Gular region or gular suture absent; mandibles with pseudomola or no mola. 118

39a. Branquias de 3 mechones presentes, retractiles en una bolsa terminal; antenas largas con muchos segmentos; un ocelo grande y un pequeño en cada lado de la cabeza. Fig. 217 .....Fam. HELODIDAE

39b. Branquias ausentes; antena con 3 segmentos; 5 ocelos en cada lado de la cabeza. Fig. 218 ..... Fam. BYRRHIDAE

40a (31b.) Región gular o sutura mediana gular presente o ausente; cuando ausente, con mandíbulas con una mola o prosteca o estructuras extranordinarias (salvo un pseudomola).....41

40b. Región gular o sutura gular ausente; mandíbulas con pseudomola o sin mola 118

41a. Maxillary articulating area either large or indistinct; when indistinct, mandibles with mola (except in Catogenidae, Epilachninae and Lamiinae). Fig. 220. 42

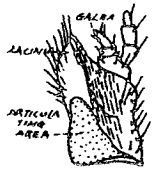


Fig. 220. Maxilla.

41b. Maxillary articulating area absent, or very small, or concealed by mentum, not large and cushioned; mandible without molar part. 43

42a. Maxillary mala divided into a well developed lacinia and a finger-shaped, 1 or 2-segmented galea; mandible without a distinct molar part but with a longitudinal series of hairs at the base. Fig. 221. .....Family BYRRHIDAE

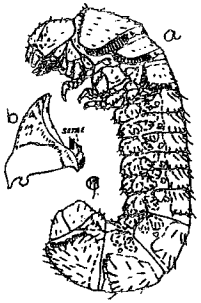


Fig. 221. a, Byrrhus fasciatus Forst.; b, Mandible.

The family has about 500 species. The adults are called pill beetles. Their life histories are in need of study. The larvae of *Byrrhus pilula* are found beneath turf or moss. The larvae of *Amphicyrta dentipes* are often injurious to wild and cultivated plants.

42b. Mala simple, or division either indicated by distal notch or present with lobe-like galea; mandibles with or without a molar part but without a longitudinal series of hairs at the base. 66

43a. Either with exposed gills below the entire abdomen, or with movable 10th abdominal segment usually covering retractile gills at the end of the body, or with mamillaeform appendices from the 10th abdominal segment; mandibles never perforate or deeply cleft. Fig. 222. 44

Fig. 223. Tip of abdomen.

43b. Gills or anal appendices usually absent; when present, then mandible either perforate or deeply cleft longitudinally. 48

44a. Movable 10th abdominal segment absent. 45

41a. Área de articulación de la maxila o grande o no distinto; cuando no distinto, mandíbulas con muela. Fig. 220 42

41
~~14~~b. Área de articulación de la maxila ausente o muy pequeño o escondida por el mentum, no grande; mandíbula sin muela.....43

42a. Mala de maxila dividida en una lacinia bien desarrollada y un gale de 1 o 2 segmentos y forma de un dedo; mandíbula sin molar pero con una fila de setas en la base. Fig. 221. ..... Fam. BYRRHIDAE

42b. Mala sencilla, o indicado solamente por una ranura, o presente con una galea como un lóbulo; mandíbula con o sin muela pero sin fila de setas 66

43a. O con branquias debajo el abdomen entero o con el décimo segmento abdominal movible cubriendo branquias retractiles al termino del cuerpo, o con apéndices de la forma de pezón en el décimo segmento; mandíbulas nunca perforadas o con ranuras grandes. Fig. 222 44

43b. Branquias o apéndices abdominales generalmente ausentes; si presentes, entonces mandíbula o perforada o con una ranura longitudinal 48

44a. Décimo segmento movible del abdomen ausente.....45

44b. Movable 10th abdominal segment present below 9th abdominal tergum. Fig. 223. 47

45a. Body cylindrical, without ventral gills. 46

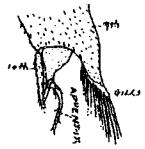


Fig. 222. Tip of abdomen.

45b. Body flat, broadly oval; with ventral gills freely exposed from 2nd to 6th abdominal segments. Fig. 224. .....Family PSEPHENIDAE

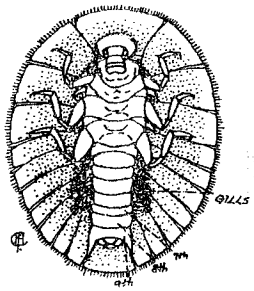


Fig. 224. Psephenus lecontei Lec.

The larvae are aquatic and attach to stones in swift-flowing streams, rapids, cascades and waterfalls. They are flattened and disc-like. Their pupae are submerged and firmly attached to stones.

46a. Antennae comparatively long; 10th abdominal segment with a pair of large lobes usually carrying spinose diverticles. Fig. 225. .....Subfamily Ptilodactylinae, HELODIDAE

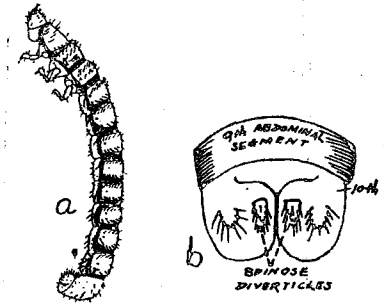


Fig. 225. a, Ptilodactyla serricollis Say; b, 9th and 10th abdominal segments.

The biology of this subfamily needs to be investigated. The larvae of *Ptilodactyla serricollis* Say are found in the damp soil of forests. Only a few species are known in North America. Some systematists believe that this subfamily belongs elsewhere or as a separate family.

44b. Décimo segmento movible del abdomen presente debajo del noveno tergo. Fig. 223.....47

45a. Cuerpo cilíndrico, sin branquias ventrales.....46

45b. Cuerpo aplanado, redondeado; con branquias ventrales en segmentos 2 a 6 del abdomen. Fig. 224.....Fam. PSEPHENIDAE

46a. Antenas relativamente largas; décimo segmento con un par de lóbulos grandes llevando protuberancias con espinas. Fig. 225.....
.....Fam. PTILODACTYLIDAE

46b. Antennae short; 10th abdominal segment without diverticles. Fig. 226. .....Genus *Eurypogon*, DASCILLIDAE

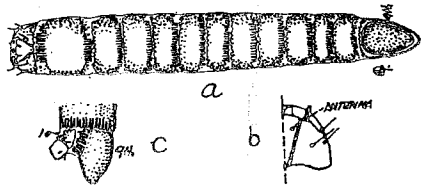


Fig. 226. a, Eurypogon niger Melsh; b, Half aspect of head; c, 9th and 10th abdominal segments.

Some 500 rather widely distributed species are known for this family. They are found in damp places and are small sized. The adults are dull colored and of rather soft texture.

47a. 8 pairs of abdominal spiracles, all projecting, either cribiform or biforous but of a deviating sinuous type. Fig. 227. .....Family CHELONARIIDAE

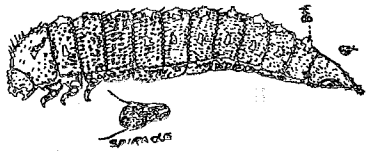


Fig. 227. Chelonarium sp.

Only one species of this small family is known in the United States.

47b. Abdominal spiracles vary from 1 to 8 pairs, either annuliform or regularly biforous, never sinuous. Fig. 228. .....Family DRYOPIDAE

Fig. 228. Helmis aeneus Muller.

The larvae of *Dryops* is stated to live in damp earth beneath stones. The larva of one species of *Psephenus* is said to resemble a trilobite except that its lateral margins are notched. More than 400 species are known. The adults are named "long-toed water beetles."

48a. 9th abdominal segment operculate, vertical and terminal. Fig. 229. .....Family RHIPICERIDAE

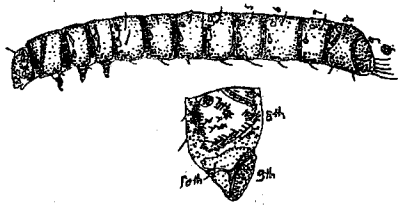


Fig. 229. Zenoa picea Beauv.

This small family of "cedar beetles" are dull colored and of medium to large size. Their life history is not well known.

46b. Antenas cortas; décimo segmento de abdomen sin protuberancias. Fig. 226 ..... Fam. DASCILLIDAE

47a. 8 pares de espiráculos abdominales, todos erguidos, o cribiformas o biforos, pero de un tipo sinuoso. Fig. 227 ..... Fam. CHELONARIIDAE

47b. 1 – 8 pares de espiráculos abdominales, o annuliformas o bíforos, nunca sinuosos. Fig. 228.....Fam. DRYOPIDAE

48a. (43b.) Noveno segmento del abdomen operculado, vertical y terminal. Fig. 229.....Fam. RHIPICERIDAE

48b. 9th abdominal segment otherwise. 49

49a. Spiracles cribiform; 10th abdominal segment terminal; prothorax large and more or less depressed, usually covered with a plate both dorsally and ventrally. Fig. 230. .....Family BUPRESTIDAE

Fig. 230. Western cedar borer, Trachykele blondeli Mars.

The flat-headed borers are a large family which consists of about 8,000 described species. The larvae are blind and legless but capable of excavating in all kinds of dry and moist wood. They live in the trunks, limbs and roots of trees. A few are leaf miners and gallmakers; some are highly destructive to fruit and forest trees.

49b. Not so. 50

50a. Labrum present. Fig. 231. 60

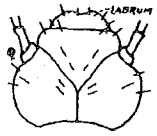


Fig. 231. Dorsal aspect of head.

50b. Labrum fused. Fig. 232. 51

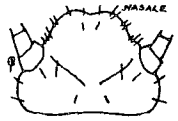


Fig. 232. Dorsal aspect of head.

51a. Frontal sutures present (except in Throscidae and Eucnemidae the head capsule and mouth parts are reduced or much specialized). 52

51b. Frontal sutures absent (except in Brachypsectrini and Lampyridae, both of which have piercing mandibles). 56

52a. Head capsule and mouth parts very much reduced or extremely specialized. (See Fig. 233). 53

52b. Head capsule and mouth parts slightly reduced or entirely normal. 54

48b. Noveno segmento de otra forma.....49

49a. Espiráculos cribiformas; décimo segmento terminal; protórax grande y más o menos deprimido, a menudo cubierto con una placa. Fig. 230..... .....Fam. BUPRESTIDAE

49b. No como arriba 50

50a. Labro presente. Fig. 231 60

50b. Labro fusionado. Fig. 232.....51

51a. Suturas del frente presentes (salvo en Throscidae y Eucnemidae, donde la cabeza y piezas bucales son muy reducidas o especializadas).....52

51b. Suturas del frente ausentes (salvo en Lampyridae y Brachypsectridae, ambos de las cuales tienen mandíbulas perforadoras).....56

52a. Cabeza y piezas bucales muy reducidas o especializadas (vea Fig. 233) 53

52b. Cabeza y piezas bucales poco reducidas o normases 54

53a. Legs short but with normal segments. Fig. 233. .....Family THROSCIDAE

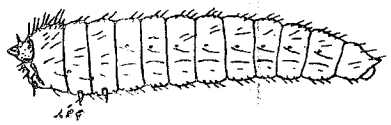


Fig. 233. Throscus sp.

The members of this small family are of small size and are known as "pseudo click beetles". The adults are found on flowers but not much is known about the habits of the larvae.

53b. Legs vestigial or absent. Fig. 234. .....Family EUCNEMIDAE

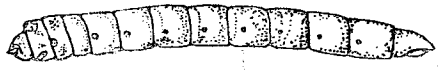


Fig. 234. Melasis rufipennis Horn.

Less than 100 species are known for North America. The larvae have the head parts enlarged and closely resemble the buprestid larvae. They bore in wood usually that is just beginning to decay and are fairly common.

54a. Gular area well developed and quadrate. Fig. 235. 55

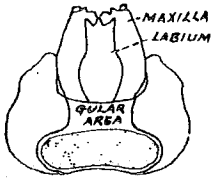


Fig. 235. Ventral aspect of head.

54b. Gular area small and indistinct, or represented only by a median gular suture. Fig. 236. .....Family ELATERIDAE

Fig. 236. A wireworm.

This family is a large one with about 8,000 known species. The larvae are called wireworms and are well known pests of farm and garden. They are mostly subterranean and phytophagous. Some are predacious upon white grubs and a number of species inhabit decaying wood and prey upon the xylophagous larvae.

53a. Patas cortas pero con segmentos normales. Fig. 233..... ..... Fam. THROSCIDAE

53b. Patas vestigiales o ausentes. Fig. 234..... Fam. EUCNEMIDAE

54a. Área de la gula bien desarrollada y cuadrada. Fig. 235.....55

54b. Área de la gula pequeña y no distinta, o hay sólo una sutura mediana. Fig. 236.....Fam. ELATERIDAE

55a. Larva strongly sclerotized; dorsal and ventral prothoracic sclerotes united into a solid cylinder; cervical membrane very large and eversible forming a balloon-shaped sack below the head when raised. Fig. 237. .....Family CEBRIONIDAE

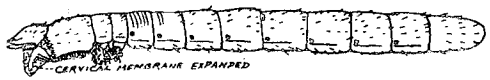


Fig 237. Cebrio antennatus Schfr.

This small family is related to the wire worms. As for the United States our species are southern or western.

55b. Larva white and soft-skinned; dorsal and ventral prothoracic parts not forming a cylinder; cervical membrane not eversible. Fig. 238. .....Genus *Sandalus*, RHIPICERIDAE

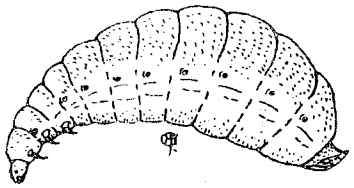


Fig. 238. Sandalus niger Knoch.

The information available regarding the habits of this genus is very limited. It is reported that a mature larva of *Sandalus niger* Knoch was taken from the nymph of a Cicada, having developed as a parasite.

56a. 9th abdominal segment with an unpaired pointed prolongation, or paired cerci; body with feather-like or spinose processes. Fig. 239. .....Group Brachypsecti, DASCILLIDAE

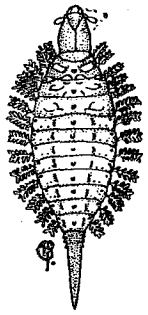


Fig. 239. Brachypsectra fulva Lec.

This group has but one known North American species.

This family of Soft-bodied Plant Beetles, has less than a thousand known species. The most frequent habitat is in proximity to water but only a comparatively small percentage of larvae and adults are aquatic as with the species here pictured.

56b. 9th abdominal segment without prolongation or cerci; body without conspicuous processes. 57

55a. Larva bien escleritizada; el protórax es un cilíndrico sólido; una bolsa membranosa que se puede echar por afuera debajo de la cabeza. Fig. 237 .....Fam. CEBRIONIDAE

55b. Larva blanda; protórax no como arriba. Fig. 238 ....Fam. RHIPICERIDAE

56a. Noveno segmento con una prolongación; cuerpo con proyecciones como flechas en los lados. Fig. 239.....Fam. BRACHYPSECTIDAE

56b. Noveno segmento sin prolongación; cuerpo sin proyecciones.....57

57a. Epicranial halves meeting ventrally forming a transverse bridge. Fig. 240. .....Family CANTHARIDAE

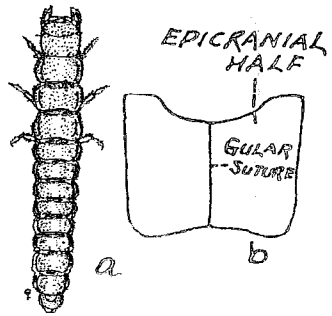


Fig. 240. a, Cantharis sp.; b, Ventral aspect of head (appendages omitted).

The family is composed of 1,300 described species. Their adults are commonly called soldier beetles. The eggs are deposited in masses in the soil. The newly hatched larvae of some species are feebly developed and are called "prolarvae". The larvae are primarily carnivorous and have a velvety appearance due to a covering of fine hairs. Pupation takes place in cells in the soil.

57b. Epicranial halves not meeting ventrally. 58

58a. Frontal sutures present. Fig. 241. .....Family LAMPYRIDAE

Fig. 241. Photinus sp.

There are about 2,000 described species. The adults are known as fireflies and glowworms. The eggs, larvae and pupae are also sometimes luminous. The larvae are predacious and feed upon small animals including earthworms, snails, crustaceans and insects. They are subterranean but several Asiatic species are reported to be aquatic. Pupation usually takes place in a soil cell beneath rubbish or on the surface in moist situations.

58b. Frontal sutures absent. 59

57a. Aspecto ventral del la cabeza como en Fig. 240.....
.....Fam. CANTHARIDAE

57b. Aspecto ventral de la cabeza sin sutura de la gula 58

58a. Suturas de la frente presentes. Fig. 241 .....Fam. LAMPYRIDAE

58b. Suturas de la frente ausentes.....59

59a. Antenna 3-segmented with apical segment and a disk-shaped appendix; stipes and mentum separate; cardo present; galea 2-segmented. Fig. 242. ..... Family PHENGODIDAE

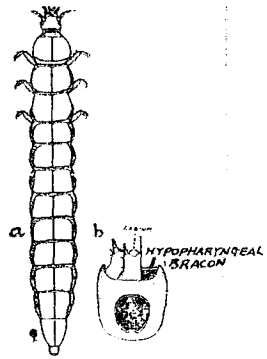


Fig. 242. a, **Phengodes** sp.; b, Ventral aspect of head.

It is reported that the species of *Phengodes* prey upon myriapods. Some larvae have light-producing organs, and are very attractive, sometimes displaying two or more colors of lights. The adult females of some species resemble the larvae.

59b. Antenna 1 or 2-segmented, distally covered with a large dome-shaped appendix; stipes and mentum fused; cardo vestigial or absent; galea 1-segmented. Fig. 243. ..... Family LYCIDAE

Fig. 243. **Calopteron reticulatum** F.

They are similar to the lampyrids to which they are related. The adults fly by day, and are not luminous. Less than 100 species are known for North America.

60a. Frontal sutures present. 61

60b. Frontal sutures absent. 65

61a. Lacinia distally armed with 1 or more spurs. larvas w/ hair Fig. 244. ..... Family DERMESTIDAE

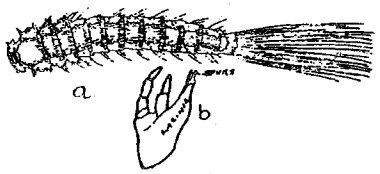


Fig. 244. a, Carpet beetle; b, Maxilla.

The family consists of about 550 described species. The larvae are covered with long or short hairs and feed upon dead animal and plant materials including skins, horn, hair, wool, tallow, cured meats, cheese, museum specimens and cereal products. Some very serious household pests belong to this family.

59a, Antenas con 3 segmentos; stipes y mentum separadas; cardo presente; galea con 2 segmentos. Fig. 242..... Fam. PHENGODIDAE

59b. Antenas con 1 o 2 segmentos; stipes y mentum fusionados; cardo rudimentario o ausente; galea con 1 segmento. Fig. 243..... ..... Fam. LYCIDAE

60a. Suturas del frente presentes 61

60b. Suturas del frente ausentes 65

61a, Lacinia con 1 o más espuelas den el ápice, larvas peludas. Fig. 244, ...Fam. DERMESTIDAE

61b. Lacinia without spurs. 62

62a. Ventral mouth parts deeply retracted: cardo much smaller than stipes. Fig. 245. 63

Fig. 245. Ventral aspect of the left half of head.

62b. Ventral mouth parts inserted in a rather shallow emargination of the front margin of the head; cardo at least as large as stipes. Fig. 246. .....Family CLERIDAE

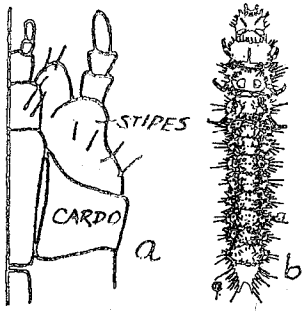


Fig. 246. a, Ventral half of the head; b, Cellimerus orcufer Chapin.

This family consists of about 2,500 described species. The larvae are predacious and may be found in the soil, frequently in the nests of bees and wasps above ground, and also in the burrows of woodboring insects. The adults are known as checkered beetles and are attractively marked and colored.

63a. Mandible with a long, stiff prosthecal process near the middle or at the base of the inner margin; epicranial suture well developed. Fig. 247. .....Family MELYRIDAE

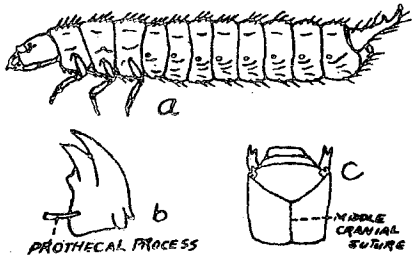


Fig. 247. a, Collops nigriceps Say; b, Mandible; c, Dorsal aspect of head.

At least some of the larvae of these soft winged flower beetles are predacious. Some species of adults are very common on green plants. Around 1,500 species have been described.

61b. Lacinia sin espuelas 62

62a. Piezas bucales ventral y retractadas profundamente; cardo mucho más pequeño que el stipes. Fig. 245.....63

62b. Piezas bucales no retractadas profundamente; cardo y stipes subiguales. Fig. 246.....Fam. CLERIDAE

63a. Mandíbula con una prosteca cerca de la mitad o en la base del margen interno; sutura epicranial bien desarrollada. Fig. 247. .... Fam. MELYRIDAE

63b Mandible with a short or no prothecal process; median epicranial suture usually not well developed, or entirely absent. 64

64a. Antenna with the sensory appendix longer than the distal segment. Fig. 248. .....Family CISIDAE

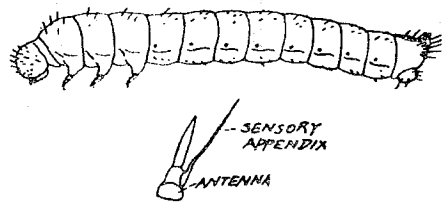


Fig. 248. Enneorthron sp.

This is a widely distributed family comprising probably over 300 species which are found in old wood or fungi. Some of the grubs eat paper and are known as "bookworms"; other species are pests where grain feed is stored.

64b. Antenna with the sensory appendix shorter than the distal segment or absent. Fig. 249. .....Family OSTOMIDAE

Fig. 249. Airora cylindrica Serv.

The well-known cadelle, *Tenebroides mauritanicus* L., feeds primarily upon grain and grain products, but sometimes also preys on other insects which live in the same medium. They are whitish grubs and noticably flattened.

65a. Antenna without sensory appendix; ventral mouth parts apparently protracted. Fig. 250. .....Family CUCUJIDAE

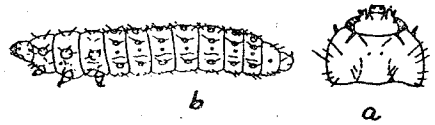


Fig. 250. a, Ventral aspect of head, showing the protracted mouth parts; b, Scaldis lineuris Lec.

This family of flat bark beetles contains less than 1,000 known species but they are so variable that the family appears at several places in our key.

65b. Antenna with dilated sensory appendix; ventral mouth parts retracted. Fig. 251. .....Group Bothriderini, COLYDIIDAE

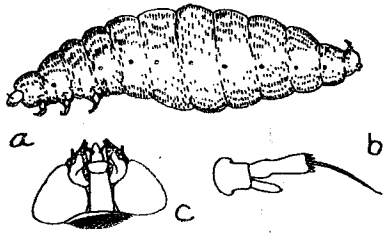


Fig. 251. a, Deratophrus oregonensis Horn; b, Antenna; c, Ventral aspect of head, showing the retracted mouth parts.

Some species of this group are phytophagous, some are predacious upon wood boring insects, and a few are parasitic. Look for them on leaves or under the bark of trees.

63b. Mandíbula con una prosteca corta o ninguna; sutura epicranial ausente o no bien desarrollada.....64

64a. Antena con el apéndice sensorio más largo que el segmento distal. Fig. 248 .....Fam. CISIDAE

64b. Antena con el apéndice sensorio más corto que el segmento distal, o ausente. Fig. 249.....Fam. OSTOMIDAE

65a. Antena sin apéndice sensorio; piezas bucales aparentemente erguidas. Fig. 250.....Fam. CUCUJIDAE

65b. Antena con un apéndice sensoria ensanchado; piezas bucales retractadas. Fig. 251.....Fam. COLYDIIDAE

(42b)
66a. Ventral mouth parts retracted. (See Fig. 251c). 67

66b. Ventral mouth parts protracted. (See Fig. 250). Fig. 252. .....Family CERAMBYCIDAE

Fig. 252. Roundheaded apple tree borer, **Saperda candida** Fab.

The family is about sixth in size in the order and contains about 20,000 described species. Because of the large thorax the larvae are called roundheaded borers. The eggs are laid on or in the host plants and the female beetle sometimes girdles a limb so that the larvae may feed on the dying wood. The larvae feed as borers on both living and dead plants, and are very destructive. Some of these larvae are known to live for many years.

67a. (a) The back of the mandible either with 2 long flagellate setae distally, and the body of the mandible partially fleshy or fully sclerotized; or (b) 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 sclerotized. Fig. 253. .....most LATHRIDIIDAE

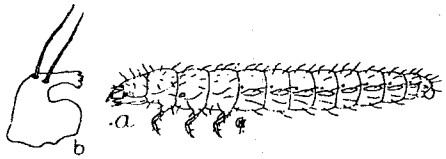


Fig. 253. a, **Cartodere costulata** Reit.; b, Mandible.

The members of this family number more than 700 species and are found in moss, decaying wood and fungi. A few have occured in herbaria, dried carcasses and in ants' nests.

67b. The back of the mandible without long flagellate setae distally, and the body of the mandible completely sclerotized. 68

68a. Maxillary mala with distinguishable lacinia and galea. Fig. 254. 69

Fig. 254. Maxilla.

68b. Maxillary mala entire, sometimes bilobed anteriorly. Fig. 255. 71

Fig. 255. Maxilla.

66a (42b) Piezas bucales retractadas (vea Fig. 251c).....67

66b. Piezas bucales erguidas (vea Fig. 250).Fig. 252..... .....Fam. CERAMBYCIDAE

67a. (a.) El trasero de la mandíbula o con 2 setas largas cercal del ápice y el cuerpo del mandíbula carnosa o escleritizado; o (b) el trasero de la mandíbula sin setas y el cuerpo de la mandíbula siempre carnosa, sólo con la base y termino escleritizados. Fig. 253..... .....la mayoría de LATHRIDIIDAE

67b. Mandíbula completamente escleritizada y sin setas largas 68

68a. Mala de la maxila con lacinia y galea visibles. Fig. 254 69

68b. Mala una sola unidad. Fig. 255.....71

69a. 2nd antennal segment more than 4 times as long as the basal segment. Fig. 256. .....Family LATHRIDIIDAE

Fig. 256. Dorsal aspect of head.

These "minute brown scavenger beetles" are very small. Some are pests in drugs and other commercial products. Both larvae and adults are so small that they often escape detection.

69b. 2nd antennal segment subcylindrical, 3 times or less, as long as the basal segment. 70

70a. Spiracles annular, not on tube; cerci not distinct. Fig. 257. .....Subfamily Eucinetinae, DASCILLIDAE

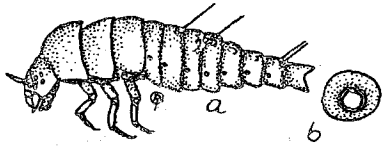


Fig. 257. a, Eucinetus sp.; b, A spiracle.

This subfamily contains only a few small beetles. Their larvae are not well known.

70b. Spiracles biforous, on tubes; cerci strong. Fig. 258. .....Family DERODONTIDAE

Fig. 258. a, Derodontus maculatus Melsh; b, A spiracle on tube.

The members of this small family live in fungi. They are known as the "Tooth necked" fungus beetles.

71a. Mala falciform. Fig. 259. 72

Fig. 259. Maxilla.

71b. Mala obtuse, or with inner margin irregularly toothed or notched. Fig. 260. 78

Fig. 260. Maxilla.

69a. Segundo segmento de la antena más que 4 veces más largo que el segmento basal. Fig. 256 ..... Fam. LATHRIDIIDAE

69b. Segundo segmento de la antena 3 veces o menos la largura del segmento basal.....70

70a. Espiráculos como anillos, no en un tubo; cercos no distintos. Fig. 257 ..... Fam. DASCILLIDAE

70b. Espiráculos biforos, en tubos, cercos fuertes. Fig. 258. .... Fam. DERODONTIDAE

71a. Mala en forma de un hoz. Fig. 259.....72

71b. Mala obtuso, o con margen interno con dientes o huecos irregulares. Fig. 260.....78

72a. Spiracles biforous. Fig. 261. 73

The spiracles, openings along the sides of the thorax and abdomen of both immature and adult insects which function in respiration take various forms and numbers in different species.

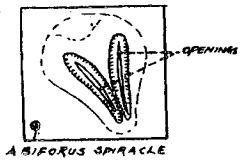


Fig. 261. A biforus spiracle.

72b. Spiracles annular. Fig. 262. 77

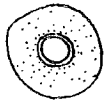


Fig. 262. An annular spiracle.

73a. Spiracles at least some borne on tubes; cerci terminating abruptly with 2 or 3 conical processes. (See Fig. 263). 74

73b. Spiracles not at all on tubes; cerci terminally pointed and simple, or cerci absent. (See Fig. 265). 75

Fig. 263. Nesperobaenus sp.

74a. Labial palpus 1-segmented. Fig. 263. ..Family MONOTOMIDAE

74b. Labial palpus 2-segmented. Fig. 264. .....Famly RHIZOPHAGIDAE

Fig. 264. Rhizophagus grandis Gyll.

Very little is known regarding the habits of the family. The larvae of *Rhizophagus* are predacious upon xylophagous insects. Less than 20 species are known for North America.

75a. Body cylindrical; mandible with 3 apical teeth. Fig. 265. .....Subfamily Languriinae, EROTYLIDAE

Fig. 265. Languria angustata Beauv.

This subfamily does not contain many American species, but a few of them are rather important as plant pests. The larvae are slim whitish "worms" which bore in the stems of clover and other plants.

72a. Espiráculos bíforos. Fig. 261 73

72b. Espiráculos como anillos. Fig. 262.....77

73a. Al menos algunos espiráculos en tubos; cercos terminando bruscamente con 2 o 3 proyecciones cónicos (vea Fig. 263) 74

73b. Espiráculos no en tubos; cercos apuntados y sencillos, o ausentes (vea Fig. 265 75

74a. Palpo del labio con 1 segmento. Fig. 263 ..... Fam. MONOTOMIDAE

74b. Palpo del labio con 2 segmentos. Fig. 264 .. Fam. RHIZOPHAGIDAE

75a. Cuerpo cilíndrico; mandíbula con 3 dientes apicales. Fig. 265 .... Fam. LANGURIIDAE

75b. Body fusiform; mandible with 2 apical teeth. 76

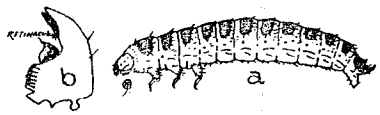


Fig. 266. a, **Pharaxonotha kirshi** Reit.; b, Mandible.

76a. Cutting edge of mandible behind the apical teeth with a single rounded projection; retinaculum short and broad. Fig. 266. .Subfamily Cladoxeninae, EROTYLIDAE

76b. Cutting edge of mandible behind the apical teeth multiserrate; retinaculum long and slender. Fig. 267. .....Family CRYPTOPHAGIDAE

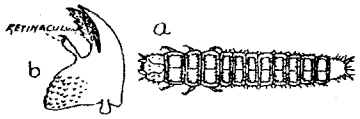


Fig. 267. a, **Cryptophagus saginatus** Sturm.; b, Mandible.

About 800 species are described. They are found on fungi and decaying organic matter. A few are found in the nests of ants and wasps where they are thought to be predators or scavengers.

77a. Cerci absent. Fig. 268. .....Group Silvanini, CUCUJIDAE

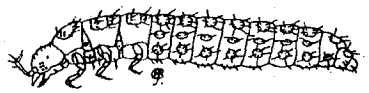


Fig. 268. Saw-toothed grain beetle, **Oryzaephilus surinamensis** (L.)

The genus *Silvanus* contains 55 known species. The larvae of some of the species are very destructive to stored grain products, dried fruit, etc. Their small size often permits them to get a good start before being detected.

77b. Cerci present. Fig. 269. .....Family CUCUJIDAE

Fig. 269. **Cucujus clavipes** Fab.

This family consists of about 1,000 species. The development of many species takes place in grain and grain products. A few are predacious upon wood-boring insects and also on termites.

78a. Mentum with only apex free, or small, or indistinct by fusion with other areas (except in Sphindidae, mentum free to base and distinct, but appearing together with a mandible provided with retinaculum and a 9th abdominal segment without cerci). Fig. 270. 79

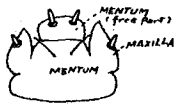


Fig. 270. Mentum and maxilla.

78b. Mentum with more than apex free, often free to base, always well developed and distinct. 93

75b. Cuerpo fusiforme; mandíbula con 2 dientes apicales.....76

76a. Fila de mandíbula tras de los dientes apicales con una sola proyección redondeada; retinaculo corto y ancho. Fig. 266.... Fam. EROTYLIDAE

76b. Fila de la mandíbula como una sierra; retinaculo largo y delgado.Fig. 267 .....Fam. CRYPTOPHAGIDAE

77a. Cercos ausentes. Fig. 268 ..... Silvanini CUCUJIDAE

77b. Cercos presentes. Fig. 269 .....Fam. CUCUJIDAE

78a. Mentum con sólo el ápice libre. Fig. 270 79

78b. Mentum con más que el ápice libre, siempre distinto 93

79a. 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.
Fig. 271. .....Genera *Prostomis* and *Dryocora*, CUCUJIDAE

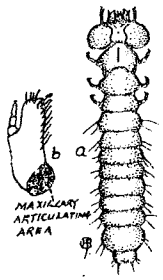


Fig. 271. a, Prostomis mandibularis Fab.; b, Maxilla.

Prostomis mandibularis, here figured is almost cosmopolitan in its distribution. The group is a relatively small one.

The family Cucujidae has about a thousand known species of rather widely diversified forms. Both the larvae and the adults are often serious pests of stored food products and as such have been distributed world wide. Many of the species live under the bark of trees, some being plant feeders and others feeding upon the small animal forms they find associated with them. The larvae are usually elongate and flattened.

79b. Different development of some, or all, of the 4 characters. 80

80a. Maxillae appearing protracted in front of the mandiblular articulations by a complete or partial elimination of the cardines.
Fig. 272. 81

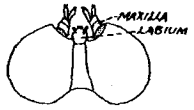


Fig. 272. Ventral aspect of head.

80b. Maxillae deeply retracted. Fig. 273. 85

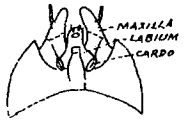


Fig. 273. Ventral aspect of head.

81a. Cerci present; terga without glandular openings. 82

79a. Cabeza ensanchada lateralmente, y mucho más ancha que el tórax; cardo de forma y posición normal. Fig. 271 .....dos géneros de CUCUJIDAE

79B. No como arriba 80

80a. Maxila aparentemente en frente de las bases de las mandíbulas. Fig. 272 81

80b. Maxila retractada profundamente. Fig. 273.....85

81a. Cercos presentes; tergos sin aberturas de glándulas.....82

81b. Cerci absent; terga with paired glandular openings.
Fig. 274. .....Family ORTHOPERIDAE

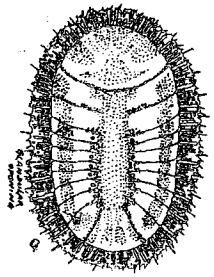


Fig. 274. Corylophodes marginicollis Lec.

These are the "fringe-winged fungus beetles". They are small but quite abundant. As the name indicates they live in fungi.

82a. 8th abdominal segment distinctly longer than 7th.
Fig. 275. .....Family CUCUJIDAE

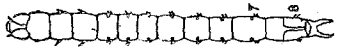


Fig. 275. Laemophloeus biguttatus Say.

The genus *Laemophloeus* contains more than 320 species which occur under bark and some are destructive to dried fruit and cereals.

82b. 8th abdominal segment about as long as seventh or shorter....83

83a. Larvae parasitic, having a swollen abdomen, slightly sclerotized; head and body white.
Fig. 276. .....Genera *Scalidia* and *Catogenus*, CUCUJIDAE

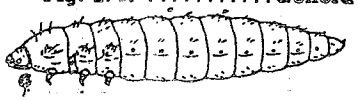


Fig. 276. Scalidia linearis Lec.

The species here pictured is found in our southern states. Only a few species of these two genera are known to America.

83b. Larvae not parasitic and abdomen not swollen; head and body normally sclerotized. 84

84a. Apical segment of labial palpus normal; hypostomal rods diverging posteriorly. Fig. 277. .....Family PHALACRIDAE

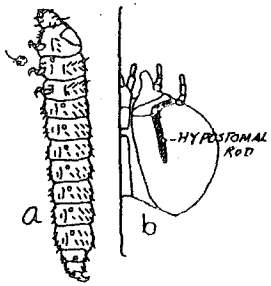


Fig. 277. a, Phalacrus sp.; b, Ventral aspect of a half head.

The larvae of *Olibrus* bore into stems and pupate underground. *Eustilbus apicalis* Melsh. is a predator upon the pea aphids. There are some 500 species of these "shining flower beetles".

81b. Cercos ausentes; tergos con aberturas de glándulas. Fig. 274.....
.....Fam. CORYLOPHIDAE

82a. Octavo segmento abdominal claramente más largo que el séptimo. Fig. 275. .....Fam. CUCUJIDAE

82b. Octavo segmento más corto que el séptimo, o más o menos igual ...83

83a. Larvas parasíticas con el abdomen ensanchado, cabeza y cuerpo blanco. Fig. 276 ..... 2 géneros de CUCUJIDAE

83b. Larvas no parasíticas y abdomen no ensanchado; cuerpo y cabeza con esclerítos normales 84

84a. Segmento ápical del palpo labio normal; barras hypostomales divergentes. Fig. 277 .....Fam. PHALACRIDAE

84b. Apical segment of labial palpus minute; hypostomal rods parallel. Fig. 278. .....Subfamily Smicripinae, MONOTOMIDAE

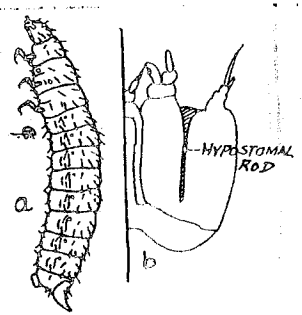


Fig. 278. a, Smicrips palmicola Lec.; b, Ventral aspect of a half head.

Only two species of this interesting subfamily are known for North America. They are southern in their range.

85a. Cardo (a) comparative small, narrow, often spindle-shaped and longitudinally directed; or (b) large, about as long or longer than stipes, triangular, and immovable, without posterior condyle. Fig. 279. .....Family NITIDULIDAE

Fig. 279. a, Glischrochilus obtusus Say; b, Ventral aspect of head.

The family comprises some 2,500 species. The larvae are mostly saprophagous. They are found in fruit and garbage dumps, in cereals, under bark of dead trees, in galleries of woodboring beetles and in ants' nests. Several genera are predacious upon aphids and scale-insects. Pupation takes place in a cell in the soil.

85b. Cardo (a) moderate size, subtriangular, much shorter than stipes and obliquely directed; or (b) fused with stipes to a large, movable structure with a posterior condyle. 86

86a. Mentum well developed and free to base. Fig. 280. .....Family SPHINDIDAE

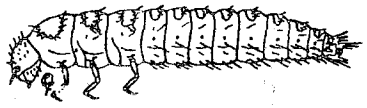


Fig. 280. Sphindus americanus Lec

Present day knowledge of this family is quite limited. The larvae are found under bark and in fungi. Only a few species are recorded for North America.

86b. Mentum not well developed, often fused with submentum, only free apically. Fig. 281. 87

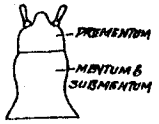


Fig. 281. Labium.

84b. Segmento apical del palpo labial minuto; barras del hipostomo paralelas. Fig. 278.....Fam. MONOTOMIDAE

85b. Cardo (a) relativamente pequeño, delgado; o (b) grande, triangular, no movible. Fig. 279.....Fam. NITIDULIDAE

85b. Cardo (a) de tamaño moderado, más o menos triangular, más corto que el stipes; o (b) fusionado con el stipes a una estructura grande y movible. 86

86a. Mentum bien desarrollado, libra hasta la base. Fig. 280 .....
.....Fam. SPHINDIDAE

86b. Mentum no bien desarrollado, frecuentemente fusionado con el submentum. Fig. 281 87

87a. Mandible with large, multituberculate or multicarinate molar structure; cardo proper distinct and subtriangular. Fig. 282. 88

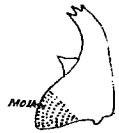


Fig. 282. Mandible.

87b. Mandible not so. 89

88a. Body shape similar to a scale-insect; along the sides with flat projections carrying spinulose setae. Fig. 283. .....Family MURMIDIIDAE

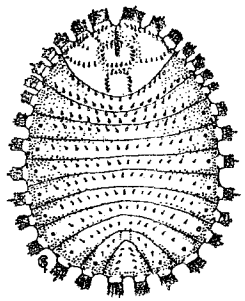


Fig. 283. Murmidius ovalis Beck.

The species here pictured is widely scattered in both hemispheres. Only a few other species are known for America.

88b. Body different. Fig. 284. .....Family ENDOMYCHIDAE

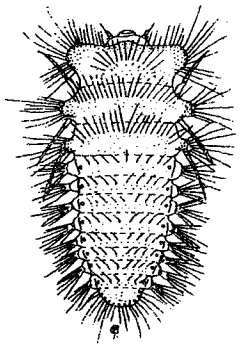


Fig. 284. Rhymbus ulkei Cr.

The family has about 950 known species. Their adults are commonly called fungus beetles. The larvae feed upon fungi, dead wood and vegetable refuse.

87a. Mandíbula con una grande muela multituberculada o multicarinada; cardo distinto y subtriangular. Fig. 282 88

87b, Mandíbula diferente.....89

88a. Forma de cuerpo semejante a una escama; proyecciones planas con setas a lo largo de los lados. Fig. 283 .....Fam. MURMIDIIDAE

88b. Cuerpo diferente. Fig, 284 ..... Fam. ENDOMYCHIDAE

89a. Mandible with reduced, smooth, and usually condyliform molar structure; distinct hypopharyngeal sclerome present.
Fig. 285. .....Subfamily Coccinellinae, COCCINELLIDAE

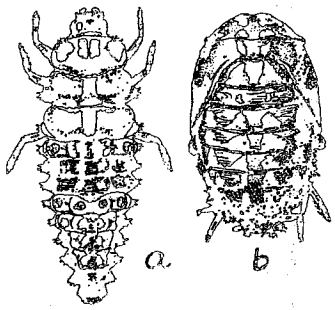


Fig. 285. Covergent lady beetle, Hippodamia convergens Guerin: a, pupa; b, larva. (U.S.D.A.)

The family is a fairly large one consisting of about 3,000 species. The adults are called ladybird beetles. Both the adults and the larvae have the same food habits. Among the few phytophagous species the genus *Ephilachna* are very serious pests of agricultural crops. Most of them are predacious and feed upon aphids, scale-insects, mites and other small insects. They have been utilized effectively in the biological control of crop pests. The larvae and adults may produce a kind of protective fluid from the joints of the legs.

89b. Mandible without molar structure; hypopharyngeal sclerome weak or absent. 90

90a. Body armed with many long, often branched, setiferous dorsal and lateral processes. 91

90b. Body without long setiferous dorsal and lateral processes. 92

91a. 3 ocelli on each side, cerci absent.
Fig. 286. .....Subfamily Epilachninae, COCCINELLIDAE

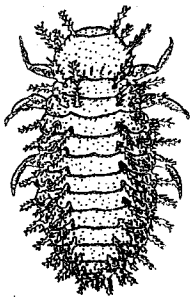


Fig. 286. Mexican bean beetle, Epilachna varivestis Mulsant.

The "black sheep" of this otherwise quite helpful family fall in this subfamily. Larvae and adults unite to destroy as many bean, squash and similar plants as possible.

89a. Mandíbula con una estructura reducida en la muela; en la superficie de plantas. Fig. 285.....Fam. COCCINELLIDAE

89b. Mandíbula sin estructura en la muela 90

90a. Cuerpo armado con muchas largas proyecciones dorsales y laterales... 91

90b. Cuerpo sin proyecciones dorsales y laterales 92

91a. 3 ocelos en cada lado; cercos ausentes. Fig. 286..... ..... Subfamilia Epilachninae, COCCINELLIDAE

91b. 5 ocelli on each side; cerci well developed.
Fig. 287. .....Family EROTYLIDAE

Fig. 287. Clover stem borer, **Languria mozardi** Latr.

It has about 2,600 described species. The larvae live in the soil, in stems of plants and on fungi. Some species are fairly large and many of the adults are brightly colored.

92a. Mentum and submentum distinct.
Fig. 288. .....Group Dacnini, EROTYLIDAE

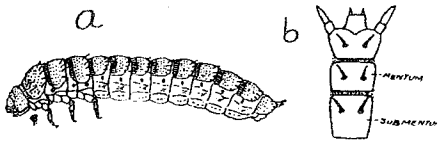


Fig. 288. a, **Penthe pimelia** Fab.; b. Labium.

The larvae have been found in herbaceous plants. They live in decaying wood and are of little importance economically.

92b. Mentum and submentum fused.
Fig. 289. .....Family MELANDRYIDAE

Fig. 289. a, **Melandrya striata** Say; b, Labium.

They occur in dry wood and fungi or sometimes under bark. The larvae are slender and cylindrical and may often be found with the adults.

93a. Body terminating in a deciduous ovate appendix.
Fig. 290. .....Group Scraptini, MELANDRYIDAE

Fig. 290. **Scraptia sericea** Melsh.

The species of *Scraptia* occur in rotten wood, fungi, etc. This is a small group with but two genera and only a few species in America.

93b. Not so. 94

94a. Mandible with a tail-like, hairy appendix or a fleshy, hairy lobe behind the base of mola.
Fig. 291. 95

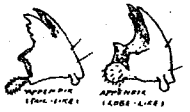


Fig. 291. Two mandibles.

94b. Mandible not so. 96

91b. 5 ocelos en cada lado, cercos bien desarrollados. Fig. 287 ..... Fam. EROTYLIDAE

92a. Mentum y submentum distintos. Fig. 288 ..... Fam. EROTYLIDAE

92b. Mentum y submentum fusionados. Fig. 289 ..... Fam. MELANDRYIDAE

93a.(78b.) Cuerpo terminando en un apéndice ovalado. Fig. 290 ..... Fam. SCRAPTIDAE

93b. No como arriba 94

94a. Mandíbula con un apéndice pelado o un lóbulo carnoso y pelado tras de la base de la muela. Fig. 291 95

94b. No como arriba 96

95a. 3 large and 2 or 3 small ocelli on each side of head; appendix of mandible tail-shaped.
Fig. 292. .....Subfamily Byturinae, DERMESTIDAE

Fig. 292. Byturus unicolor Say.

It includes a single genus *Byturus* with few species. Both adults and larvae are injurious to raspberries.

95b. 1 ocellus on each side of head; appendix of mandible lobe-like.
Fig. 293. .....Family ANTHICIDAE

Fig. 293. Anthicus heroicus Csy.

Well over 1,000 species of these rather small beetles have been described. They are widely scattered and often very numerous.

96a. Abdominal spiracles located in disk-like sclerites.
Fig. 294. .....Family EURYSTETHIDAE

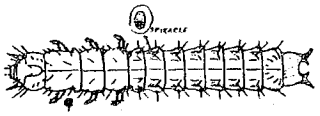


Fig. 294. Eurystethus californicus Melsh.

Only a few species are recorded in America for this family. All of them are on the west coast.

96b. Abdominal spiracles not located in disk-like sclerites. 97
97a. Mandible without molar structure; larvae parasitic with swollen abdomen. Fig. 295. .....Group Bothriderini, COLYDIIDAE

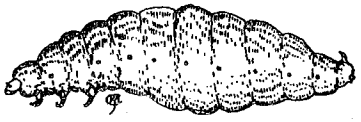


Fig. 295. Deratophrus oregonensis Horn.

The larvae of several species of *Bothrideres* have been noted to be ectoparasites or predators of other coleopterous larvae.

97b. Mandible with molar structure.
Fig. 296. 98

Fig. 296. Mandible.

95a. 3 grandes y 2 o 3 pequeños ocelos en cada lado de la cabeza; apéndice del la mandíbula en forma de cola. Fig. 292 .....Fam. BYTURIDAE

95b. 1 ocelo en cada lado de la cabeza; apéndice de la mandíbula en forma de lóbulo. Fig. 293 ..... Fam. ANTHICIDAE

96a. Espiráculos del abdomen en escleritos con forma de discos. Fig. 294.. .....Fam. EURYSTETHIDAE

96b. Espiráculos no en escleritos como discos.....97
97a. Mandíbula sin muela; larvas son parasíticas con abdómenes ensanchados. Fig. 295..... Fam. BOTHRIDERIDAE

97b. Mandíbula con una muela. Fig. 296 98

98a. Body elongate, cylindrical or subcylindrical, or more fusiform..99

98b. Body elongate and strongly depressed with parallel sides. 107

99a. Cardo simple. Fig. 297. 100

Fig. 297. Maxilla.

99b. Cardo divided into 2 parts. Fig. 298. 102

Fig. 298. Maxilla.

100a. Mandible symmetrical. Fig. 299. .....Family COLYDIIDAE

Fig. 299. Aulonium tuberculatum Lec.

Some species are known to feed upon decaying vegetable matter, a number of them are predacious upon larvae or pupae of several Cerambycidae.

100b. Mandible asymmetrical. 101

101a. Mola of mandible depressed, with a grinding surface on the ventral or dorsal side or both. Fig. 300. .....Family MYCETOPHAGIDAE

Fig. 300. a, Mycetophagus punctatus Say; b, Mandible.

The members of this family chiefly live in rotting wood or under bark, associated with fungi. The larvae of *Berginus maindroni* Grouv. are reported to feed upon lac and the lac insects in India.

101b. Mola not depressed. 111

102a. Cerci present. 103

102b. Cerci absent. .....Subfamily Oedemerinae, OEDEMERIDAE

Most of the members of this interesting family fall here. They are small to medium size. The known larvae live largely in decaying wood.

98a. Cuerpo alargado, cilíndrico o sub-cilíndrico 99
98b. Cuerpo alargado y fuertemente deprimido con lados paralelos 107

99a. Cardo sencillo. Fig. 297.....100

99b. Cardo dividido en 2 partes. Fig. 298 102

100a Mandíbula simétrica. Fig. 299 ..... Fam. COLYDIIDAE

100b. Mandíbula asimétrica 101

101a. Muela de mandíbula deprimida. Fig. 300 ..... Fam. MYCETOPHAGIDAE

101b. Muela no deprimida.....111

102a. Cercos presentes 103

102b. Cercos ausentes.....Fam. OEDEMERIDAE

103a. Ambulatorial warts present ventrally on 2nd to 5th abdominal segments. Fig. 301.....Subfamily Colopodinae, OEDEMERIDAE

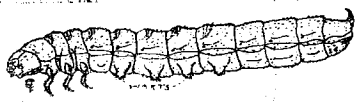


Fig. 301. Colopus angustus Lec.

The larvae have been found in old wood or under bark. It is a very small subfamily.

103b. Ambulatorial warts absent. 104

104a. 9th abdominal venter simple, without conical points. 105

104b. 9th abdominal venter with a conical point on each side. Fig. 302. 103

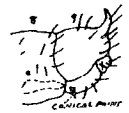


Fig. 302. 8th and 9th abdominal segments.

105a. Submentum and galea fused and heavily sclerotized. Fig. 303. .....Family CEPHALOIDAE

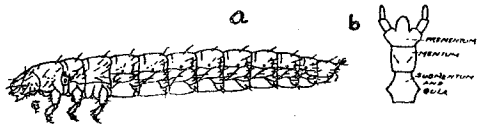


Fig. 303. a, Cephaloon lepturides Newn.; b, Labium.

Only a few genera and not many species are known for this small family. They are mostly western species.

105b. Submentum and galea fleshy. Fig. 304. .....Group Nosodermini, TENEBRIONIDAE

Fig. 304. Phellopsis obcordata Kby.

This is a small group of mostly western beetles although the species pictured is found in the East.

106a. Cerci simple, corniform and curved upward. Fig. 305. .....Group Sychroini, MELANDRYIDAE

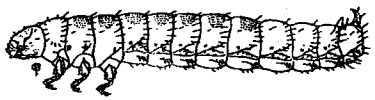


Fig. 305. Synchroa punctata Nwn.

The one North American species of this group is here pictured. The adult is brown and of medium size. Both adults and larvae live under dead bark of trees.

103a. Verrugas presentes en el lado ventral de segmentos 3 a 5 del abdomen. Fig. 301 .....Fam. OEDEMERIDAE

103b. Verrugas ausentes 104

104a. Vientre del noveno segmento del abdomen sencillo, sin puntos cónicos 105

104b. Vientre del noveno segmento del abdomen con un punto cónico en cada lado. Fig. 302.....106

105a. Submentum y galea fusionados y fuertemente escleritizados. Fig. 303 .....Fam. CEPHALOIDAE

105b. Submentum y galea carnosos. Fig. 304. .....Fam. TENEBRIONIDAE

106a. Cercos sencillos, como cachos, doblados hacia arriba. Fig. 305 ....Fam. MELANDRYIDAE

106b. Cerci with a branch at base. Fig. 306. .....Family PEDILIDAE

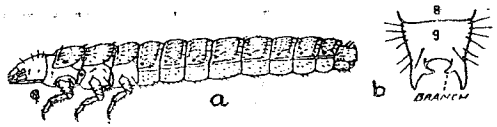


Fig. 306. a, **Eurygenius campanulatus** Lec.; b, 9th abdominal segment with cerci.

This is a small family of some 50 North American species. The one pictured is western. Members of the genus *Pedilus* are more frequent.

107a. Venter of 9th abdominal segment with transverse row of asperities, or small plates. Fig. 307. 108

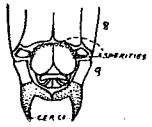


Fig. 307. Ventral aspect of 8th and 9th abdominal segments.

107b. Venter of 9th abdominal segment not so armed. Fig. 308. .....Family PYTHIDAE

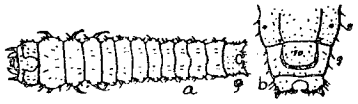


Fig. 308. a, **Rhinosimus ruficollis** L.; b, Ventral aspect of 8th and 9th abdominal segments.

This little family of bark beetles boasts less than 25 North American species. Adults and larvae are found under bark of pine trees and occasionally other species.

108a. 8th abdominal segment at least twice as long as 9th, cerci excluded: a pair of pits in margin between cerci. (See Figs. 309 and 310). 109

108b. 8th and 9th abdominal segments subequal, cerci excluded: a single pit present in margin between cerci. (See Figs. 311 and 312). 110

109a. 9th abdominal venter bearing asperities arranged in a continuous arch. Fig. 309. .....Family PYROCHROIDAE

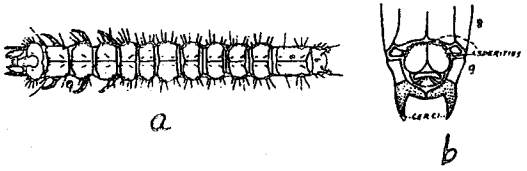


Fig. 309. **Neopyrochroa femorelis** Lec.; b, Ventral aspect of 8th and 9th abdominal segments.

The larvae are found under bark or in wood. Adults have areas of brilliant yellow or red and are known as "fire-colored beetles".

106b. Cercos con diente el la base. Fig. 306 .....Fam. PEDILIDAE

107a. Vientre del noveno segmento abdominal con una fila transversal de espinas o placas pequeñas. Fig. 307 108

107b. Vientre del noveno segmento abdominal no armado así. Fig. 308..... .....Fam. PYTHIDAE

108a. Octavo segmento al menos 2 veces tan largo que el noveno, cercos excluidos; un par de huecos en el margen entre los cercos (vea Fig. 309 y 310).....109

108b. Octavo y noveno segmentos sub-iguales, cercos excluidos; un sólo hueco en el margen entre los cercos (vea Figs. 311 y 312).....110

109a. Vientre del noveno segmento llevando espinitas arregladas en un arco continuo. Fig. 309..... Fam. PYROCHROIDAE

109b. 9th abdominal venter bearing small plates in place of asperities. Fig. 310. .....Genus *Boros*, TENEBRIONIDAE

Fig. 310. a, Boros unicolor Say; b, Ventral aspect of 8th and 9th abdominal segments.

The species pictured is a medium sized beetle, both adults and larvae being found under bark of dead pine trees. Some systematists wish to make a new family Boridae.

110a. 9th abdominal segment dorsally with a continuous row of small dark tubercles on the cerci and on the space between them. Fig. 311. .....Family PYTHIDAE

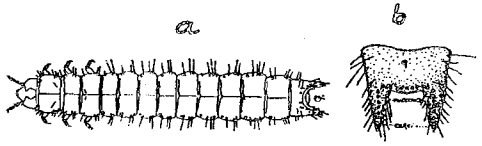


Fig. 311. a, Pytho niger Kby.; b, Dorsal aspect of 9th abdominal segment with cerci.

Look under bark for all stages of these small beetles. The species pictured ranges from Labrador through the New England states.

110b. 9th abdominal segment only with 2 small tubercles proximally on dorsal side of each cercus. Fig. 312. .....Family OTHNIIDAE

Fig. 312. Othnius umbrosus Lec.

The species pictured is found in the Middle West. This small family has only this one genus and but a few species.

111a. Antenna contiguous to mouth frame. Fig. 313. 112

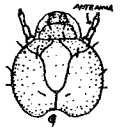


Fig. 313. Dorsal aspect of head.

111b. Antenna inserted some distance in from mouth frame. Fig. 314. 113

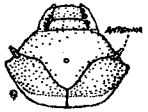


Fig. 314. Dorsal aspect of head.

109b. Vientre del noveno segmento llevando placas pequeñas. Fig. 310 .....Fam. TENEBRIONIDAE

110a. Noveno segmento tiene en su lado dorsal una fila continua de tubérculos pequeños y oscuros en los cercos y el espacio entre los mismos. Fig. 311 .....Fam. PYTHIDAE

110b. Cercos en el noveno segmento con sólo 2 tubérculos pequeños en el lado dorsal de cada uno. Fig. 312 .....Fam. OTHNIIDAE

111a. Antena contigua con las piezas bucales. Fig. 313.....112

111b. Antena sale de algún distancia de las piezas bucales. Fig. 314 113

112a. Back of mandible opposite the cutting edge with sharp margin; opposite the mola, excavate and without a spinose setose elevation. Fig. 315. .....Family ALLECULIDAE

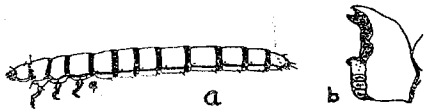


Fig. 315. a, Capnochroa fuliginosa Melsh; b, Mandible.

These are the "comb-clawed bark beetles". They are closely related to the tenebrionids. The larvae look like wireworms and live in rotten wood

112b. Back of mandible not as described above. Fig. 316. .....Family TENEBRIONIDAE

Fig. 316. Alobates pennsylvanica DeGeer.

One of the largest family of Coleoptera comprising more than 10,000 species. The larvae bear a close resemblance to those of the Elateridae, but the labrum is distinct. The majority of the species are scavengers, some feed upon grain or grain products and a few are found in association with bark and wood borers. The well-known mealworm, *Tenebrio molitor* L., and the confused flour beetle, *Tribolium confusum* Duval, are pests in mills and storehouses.

113a. Molar part of mandible with the grinding surface transversely multicarinate; antenna short and 2-segmented. Fig. 317. .....Family NILIONIDAE

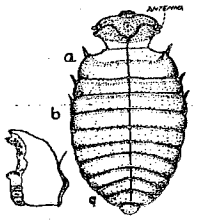


Fig. 317. a, Leiochrodes sp.; b, Mandible.

The members of this exotic family are found in South America.

113b. Molar part of mandible with the grinding surface either smooth, or bearing obtuse tubercles; antenna elongate and 2 or 3-segmented, distal segment minute or absent. Fig. 318. .....Family LAGRIIDAE

Fig. 318. a, Lagria sp.; b, Mandible.

This is still another family of bark beetles. The larva often feed on leaves. They are elongate and cylindrical.

112a. Lado externo de la mandíbula con un margen agudo; sin una elevación con setas y espinas en el lado opuesto de la muela. Fig. 315.. .....Fam. ALLECULIDAE

112b. Lado externo de la mandíbula no como arriba. Fig. 316..... .....Fam. TENEBRIONIDAE

113a. Muela de la mandíbula con costillas transversas; antena corta con 2 segmentos. Fig. 317..... Fam. NILIONIDAE

113b. Muela o lisa o con tubérculos; antena alargada con 2 o 3 segmentos. Fig. 318.....Fam. LAGRIIDAE

114a. 9 complete abdominal segments; 10th small. (See Fig. 319). 115

114b. 8 complete abdominal segments; 9th and 10th reduced. (See Fig. 321). 116

115a. No ocelli or but 1; cardo fused with stipes; coxae small and widely separated. Fig. 319. ..... Family HISTERIDAE

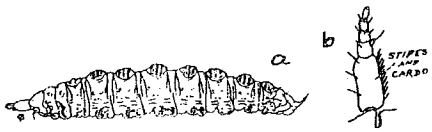


Fig. 319. a, Metalepta yucateca Mars.; b, Maxilla.

This family consists of about 3,000 known species. Many of the larvae are predacious upon coleopterous and dipterous larvae and a few species attack immature stages of Chrysomelidae and Lepidoptera. A number of them are myrmecophilous in habitat.

115b. 6 ocelli; cardo distinct; coxae large, approximate. Fig. 320. Subfamily Helophorinae, HYDROPHILIDAE

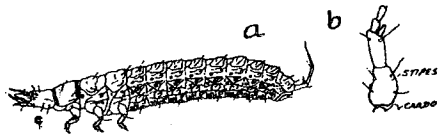


Fig. 320. a, Helophorus aquaticus L. (Redrawn from Boving & Craighead); b, Maxilla.

116a. Head elevated; antenna inserted farther from the lateral margin of the head than is the mandible. Fig. 321 ..... Family HYDROPHILIDAE

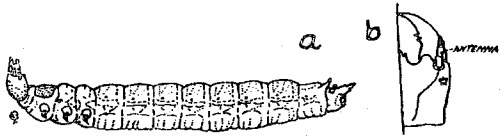


Fig. 321. a, Chaetarthria seminulum Herbst. (Redrawn from Boving & Craighead); b, Dorsal aspect of a half head.

This family comprises about 1,700 species. The eggs of several genera are enclosed in silken cases and attached to grass or floating objects, but *Helochares* and *Spercheus* fasten them on their own bodies. The larvae are chiefly vegetable scavengers, but a few species are predacious. The majority of species are aquatic or semiaquatic, but a number of the subfamily Sphaeridiinae are known to be terrestrial.

116b. Head slightly inclined; antenna inserted near the lateral margin of the head than is the mandible. 117

114a. Con nueve segmentos abdominales completos; décimo pequeño (vea Fig. 319)..... 115

114b. Con ocho segmentos completos; noveno y décimo reducidos (vea Fig. 321)..... 116

115a. Con 1 ocelo o sin ocelos; cardo y stipes fusionados; coxas pequeñas y bien separadas. Fig. 319 ..... Fam. HISTERIDAE

115b. 6 ocelos; cardo distinto; coxas grandes, juntas. Fig. 320 ..... Fam. HYDROPHILIDAE

116a. Cabeza elevada; antena metida más distante del margen lateral de la cabeza que la mandíbula. Fig. 321 ..... Fam. HYDROPHILIDAE

116b. Cabeza ligeramente inclinada; antena más cerca del margen lateral de la cabeza que la mandíbula..... 117

117a. Abdominal segments soft, with short conical gills; last 3 abdominal segments attenuate, not forming a breathing pocket. Fig. 322. .....Subfamily Spercheinae, HYDROPHILIDAE

Fig. 322. Spercheus emarginatus Schall. (Redrawn from Boving & Craighead)

The hydrophilids include many species of rather widely diversified forms and habits. The species of this subfamily are exotic.

117b. Abdominal segments with well developed plates; last 3 abdominal segments forming a breathing pocket. Fig. 323. .....Subfamily Hydrochinae, HYDROPHILIDAE

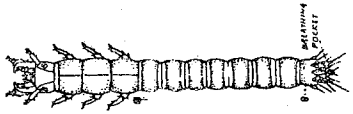


Fig. 323. Hydrochus squamifer Lec.

The members of this subfamily are small and in consequence frequently overlooked. The species pictured is known from the Great Lakes area.

118a. Hypopharyngeal sclerome absent; mandible without a real molar structure. 119

118b. Hypopharyngeal sclerome present; mandible with a definite molar structure. Fig. 324. 142

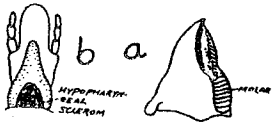


Fig. 324. a, Mandible; b, Dorsal aspect of labium

119a. 9th abdominal tergum armed with a pair of cerci or an unpaired spine. Fig. 325. .....Family MORDELLIDAE

Fig. 325. Tomoxia bidentata Say.

There are about 800 known species. Some larvae are found in termite nests and the burrows of stem and wood-boring insects. They are possibly predacious, but that has been questioned.

117a. Segmentos del abdomen con branquias cónicas y blandas; últimos 3 segmentos atenuados, no formando una bola de respiración. Fig. 322 ... .Fam. HYDROPHILIDAE

117b. Segmentos abdominales con placas; últimos 3 en forma de una bolsa para respiración. Fig. 323 .....Fam. HYDROPHILIDAE

118a.(40b) Esclerito hipofaringeal ausente; mandíbula sin una verdadera muela 119

118b. Esclerito hipofaringeal presente; mandíbula con una verdadera muela. Fig. 324 142

119a. Noveno tergo abdominal con un para de cercos o una espina. Fig. 325 .....Fam. MORDELLIDAE

119b. 9th abdominal tergum without a pair of cerci and without an unpaired spine. 120

120a. 10th 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. (See Figs. 326 and 330). 121

120b. 10th abdominal segment in front of anus without a pair of soft, oval lobes separated by a longitudinal groove. (See Fig. 333). 125

121a. Head protracted; mandible dentate. 122

121b. Head retracted; mandible not dentate. 123

122a. Thoracic spiracle pushed forward to the anterior margin of prothorax. Fig. 326. .....Family PTINIDAE

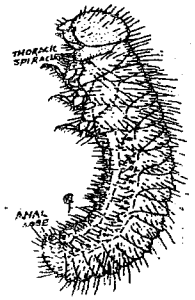


Fig. 326. Niptus sp.

About 550 species have been described. The larvae are scarabaeoid form and feed upon dead and dried animal and vegetable matter. The storehouse beetle, *Gibbium psylloides* (Czempinski), is a most destructive species to stored products. Several species are reported as inquilines in ants' nests.

122b. Thoracic spiracle not reaching anterior margin of prothorax. Fig. 327. .....Family ANOBIIDAE

Fig. 327. Nevermannia descatomoides Fisher. (Redrawn from Boving & Craighead)

There are around 1,200 described species. The larvae are scarabaeoid form, very small, and living in dead and usually well-seasoned hard woods. Many feed on animal and plant products. The furniture beetle, *Anobium striatum* Olivier, the cigarette beetle, *Lasioderma serricorne* (Fab.) and the drugstore beetle, *Stegobium paniceum* (L.) are serious pests.

119b. Noveno tergo sin un par de cercos o una espina.....120

120a. Décimo segmento con un par de cojines adelante del ano (vea Figs. 326 y 330).....121

120b. Décimo segmentos sin un par de cojines suaves adelante del ano (vea Fig. 333).....125

121a. Cabeza expuesta; mandíbula con dientes.....122

121b. Cabeza retractada; mandíbula sin dientes.....123

122a. Espiráculo del tórax empujado al margen anterior del protórax. Fig. 326 ..... Fam. PTINIDAE

122b. Espiráculo del tórax no alcanzando el margen anterior del protórax. Fig. 327.....Fam. ANOBIIDAE

123a. Mandible without a dorsal, molar-like process; epipharynx without a large sclerome; lacinia mandibulae absent. Fig. 328. .....Family BOSTRICHIDAE

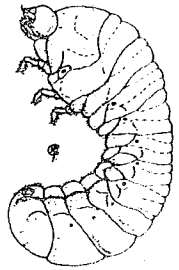


Fig. 328. Lead cable borer, Scobicia declivis (Lec.)

There are about 400 known species. They are known as branch and limb borers. The larvae are scarabaeoid in form, feed in dead wood and may be injurious to furniture and building materials. The very interesting lead cable borer, or short-circuit beetle, *Scobicia declivis* (Lec.) here shown, bores holes into the aerial lead telephone cables causing the linemen frequent trouble.

123b. Mandible with a dorsal, molar-like process, grinding against a large sclerome in epipharynx; lacinia mandibulae present and fleshy. Fig. 329. 124

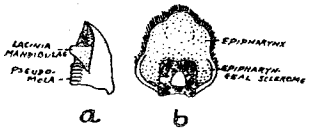


Fig. 329. a, Mandible; b, Epipharynx.

124a. Abdominal spiracles subequal in size. Group Psoini, LYCTIDAE

This small group lives in our western states.

124b. Last abdominal spiracle much larger than the others. Fig. 330. .....Family LYCTIDAE

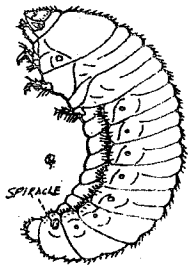


Fig. 330. Lyctus cavicollis Lec.

The family consists of 60 species and the adults are known as the powder post beetles. Their larvae scarabaeoid in form with 3- segmented legs, live in dead wood and are particularly destructive to furniture.

123a. Mandíbula sin un proyección dorsal como una muela; epifaringe sin un esclerito grande; lacinia mandibulae ausente. Fig. 328 .... Fam. BOSTRICHIDAE

123b. Mandíbula con un proyección dorsal como una muela; epifarnge con un esclerito grande; lacinia mandibulae presente y carinosa. Fig. 329 ... .124

124a. Espiráculos abdominales de tamaños iguales .....Fam. LYCTIDAE

124b. Último espiráculo más grande que los otros. Fig. 330 ....Fam. LYCTIDAE

125a. Hypopharyngeal bracon absent: usually with segmented legs. 126

125b. Hypopharyngeal bracon present: usually without segmented legs. Fig. 331. 136

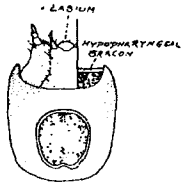


Fig. 331. Ventral aspect of head, showing the hypopharyngeal bracon.

126a. Mandible simple, distally either with a broad transverse gouge-like cutting edge, or with a simple apex. 127

126b. Mandible dentate, distally with from 2 to 5 teeth. Fig. 332. 129

Fig. 332. Mandible.

127a. Prementum and mentum fused, bearing a common median escutcheon-like sclerome with a pair of light, circular areas anteriorly. Fig. 333. ..... Family BRUCIDAE

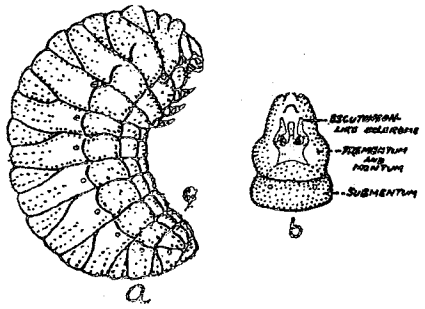


Fig. 333. a, Pea weevil, Bruchus pisorum (L.); b, Labium.

The members of this family number no less than 900 species and they are frequently known as pea and bean "weevils". Their larvae undergo a hypermetamorphosis in which the first instar is more or less carabiform with well-developed legs. The first molt occurs in the host and the body becomes eruciform and mostly apodous and blind. No less than 50 species are of economic importance.

127b. Prementum and mentum distinct, without escutcheon-like sclerome. 128

125a. Generalmente con patas segmentadas; bracon del hipofarynx ausente 126

125b. Generalmente sin patas segmentadas; bracon del hipofarynx presnete 136

126a. Mandíbula sencilla, con un punto ancho con fila para cortar, o un punto sencilla 127

126b. Mandíbula dentada, con 2–5 dientes en el ápice. Fig. 332 129

127a. Prementum y mentum fusionados, llevando un esclerito como un escudo. Fig. 333 ..... Fam. Bruchinae CHRYSOMELIDAE

127b. Prementum y mentum distintos, sin esclerito como un escudo 128

128a. Legs present and fully developed: body curved and plump.
Fig. 334. .....Subfamily Sagrinae*, CHRYSOMELIDAE

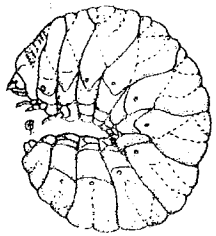


Fig. 334. Sagra femorata Joc.

The members of this small subfamily are the most primitive of all the leaf beetles.

128b. Legs absent; body straight.
Fig. 335. .....Subfamily Orsodacninae*, CHRYSOMELIDAE

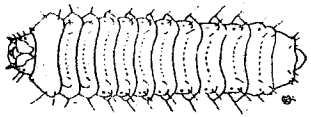


Fig. 335. Zeugophora scutellaris Suffr.

The adults feed on spring buds and are highly variable.

129a. Spiracles on 8th abdominal segment biforous, terminal, and projecting like a pair of spurs.
Fig. 336. .....Subfamily Donaciinae*, CHRYSOMELIDAE

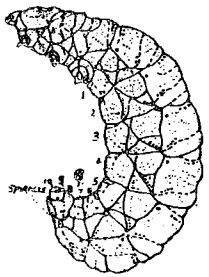


Fig. 336. Donacia sp.

The larvae are aquatic and feed on the roots or in the stems of aquatic plants. The pupae are enclosed in tough cocoons attached to roots of the host plants.

129b. Spiracles of 8th abdominal segment not projecting like spurs..130

* The family Chrysomelidae is such a large one that some Coleopterists have proposed splitting it up into a number of families. We have chosen to follow Leng and give these ten groups subfamily significance.

128a. Patas presentes y completamente desarrolladas; cuerpo corvado y gordo. Fig. 334.....Sagrinae CHRYSOMELIDAE

128b. Patas ausentes; cuerpo recto. Fig. 335.....Fam. ORSODACNIDAE

129a. Espiráculos del octavo segmento abdominal terminales, y como un par de espuelas. Fig. 336 ..... Subfam. Donaciinae CHRYSOMELIDAE

129b. Espiráculos del octavo segmento no como espuelas 130

130a. Labrum small, or indistinct and fused with front and clypeus. Fig. 337. .....Subfamily Clytrinae*, CHRYSOMELIDAE

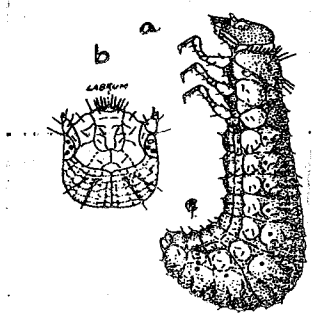


Fig. 337. a, Clytra quadripunctata L. (Redrawn from Boving & Craighead); b, Dorsal aspect of head.

The genus pictured is confined to the Eastern Hemisphere. It is represented in North America by the genus *Antipus*.

130b. Labrum well developed and free. 131

131a. Maxillary palpus 3 or 4-segmented (excluding palpifer); 8th abdominal spiracles present and laterally placed; 9th abdominal segment terminal. Fig. 338. 132

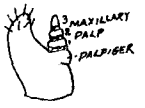


Fig. 338. Maxilla.

131b. Maxillary palpus 2-segmented or less; 8th abdominal spiracles if present, thus dorsally placed, or absent; 8th abdominal segment terminal with free hind margin. 135

132a. Tarsus long, slender, without pulvillus; mandible compressed, with 2 to 3 distal teeth. Fig. 339. .....Subfamily Eumolpinae*, CHRYSOMELIDAE

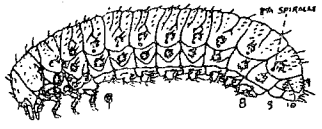


Fig. 339. Chrysochus auratus Fab.

This is a large and important subfamily. Its members are widely distributed and often highly economic.

132b. Tarsus of moderate length, curved, and usually with pulvillus; mandible palmate with 4 to 5 distal teeth. Fig. 340. 133

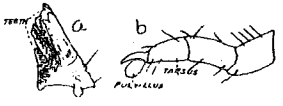


Fig. 340. a, Mandible; b, Leg.

130a. Labro pequeño o no distinto y fusionado con el frente y clípeo. Fig. 337 ..... Subfam. Cryptocephalinae CHRYSOMELIDAE

130b. Labro bien desarrollado y libre.....131

131a. Palpo maxilar con 3 o 4 segmentos; octavo segmento de abdomen con espiráculos laterales; noveno segmento terminal. Fig. 338.....132

131b. Palpo maxilar con 2 o menos segmentos; espiráculos del segmento 8, si son presentes, dorsales; octavo segmento terminal con margen trasero libre.....135

132a. Tarso largo y delgado, sin pulvilo; mandíbula comprimida con 2 o 3 dientes dístales. Fig. 339..... Subfam. Eumolpinae CHRYSOMELIDAE

132b. Tarso de longitud moderada, corvado y a menudo con pulvilo; mandíbula palmada con 4 a 5 dientes. Fig. 340.....133

133a. More than 1 ocellus on each side of head, usually 5 or 6 ocelli, antenna 3-segmented. 134

133b. 1 ocellus on each side, or none; antenna 2-segmented or less. Fig. 341. .....Subfamily Galerucinae*, CHRYSOMELIDAE

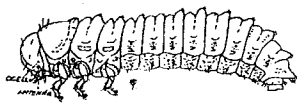


Fig. 341. Larger elm leaf beetle, **Monocesta coryli** (Say).

Their larval habits are varied, many feed openly on the parenchyma of leaves, others live in roots, and a number are leaf-miners. It is a large and important subfamily.

134a. First 8 abdominal segments with ambulatory warts on ventral region; anal opening dorsal; labial palpus 1-segmented. Fig. 342. .....Subfamily Crioceriinae*, CHRYSOMELIDAE

Fig. 342. Asparagus beetle, **Crioceris asparagi** (L.); b, Labium.

Their larvae are fleshy grubs which feed externally on the leaves. Some have the habit of concealing themselves with coverings of excrement. The asparagus beetle, *Crioceris asparagi* (L.) is familiar to growers of asparagus.

134b. First 8 abdominal segments without any ambulatory warts; anal opening ventral and placed in the middle of the sucking disk of the 10th abdominal segment; labial palpus 2-segmented. Fig. 343. .....Subfamily Chrysomelinae*, CHRYSOMELIDAE

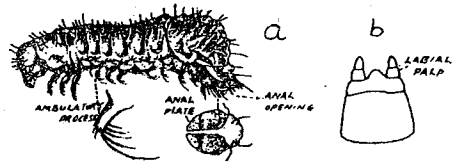


Fig. 343. a, **Myochrous denticolli** Say; b, Labium.

This family Chrysomelidae is one of the four largest of the order, comprising more than 25,000 species. The larvae feed on leaves, roots, or live in stems, in galls, in leaf mines, in ants' nests and some are aquatic species. They are most destructive insects to agricultural crops. This subfamily contains some common and very interesting species.

133a. Más que 1 ocelo en cada lado de la cabeza, a menudo 5 o 6 ocelos; antena de 3 segmentos 134

133b. 1 ocelo o ninguno en cada lado de la cabeza; antena con 2 o menos segmentos. Fig. 341 .....Subfam. Galerucinae CHRYSOMELIDAE

134a. Primer 8 segmentos abdominales con verrugas ambulatorias en la región ventral; ano con aberatura dorsal; palpo del labio con 1 segmento. Fig. 342.....Subfam. Crioncerinae CHRYSOMELIDAE

134b. Primer 8 segmentos abdominales sin verrgas; aberatura del ano ventral y en el medio de una ventosa del décimo segmentos; palpo del labio con 2 segmentos. Fig. 343 ....Subfam. Chrysomelinae CHRYSOMELIDAE

135a. 8th abdominal segment terminal, with free hind margin; 8th pair of abdominal spiracles well developed and dorsal. Fig. 344. .....Subfamily Hispinae*, CHRYSOMELIDAE

Fig. 344. **Chalepus ater** Weis.

The adults are usually wedge-shaped with engraved elytra. The larvae often feed on the surface of leaves or are leaf-miners. They often conceal themselves with a covering of excrement.

135b. Tergum of 8th abdominal segment often provided with an upright fork bearing the cast skins or the excrement of the larva; 8th pair of abdominal spiracles vestigial. Fig. 345. .....Subfamily Cassidinae*, CHRYSOMELIDAE

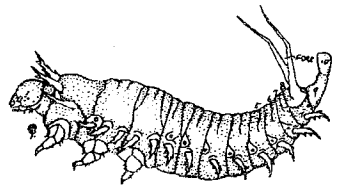


Fig. 345. **Cassida nebulosa** L.

It includes the tortoise beetles. In certain species the eggs are enclosed in an ootheca. The larvae often cover their bodies with excrement or cast skin for protection and are an odd-looking lot.

136a. Legs present, but small, and usually 2-segmented. Fig. 346. .....Family BRENTIDAE

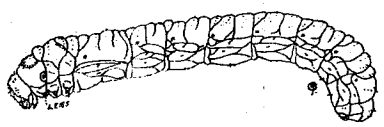


Fig. 346. **Eupsalis minuta** Drury.

Around 1,000 species have been described. The immature stages are passed in wood. The rostrum of the female is used for boring holes in which the eggs are laid. The larvae are elongate and slender and provided with thoracic legs.

136b. Legs absent, pedal lobes occupying their place. 137

137a. Head capsule elongate, broadening posteriorly, and with straight sides. Fig. 347. .....Family PROTERHINIDAE

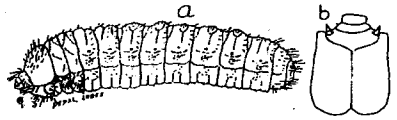


Fig. 347. a, **Proterhinus anthracias** Perkins; b, Dorsal aspect of head.

This is a very small family consisting of 2 genera. *Aglycyderes* occurs in the Canary Islands and New Zealand and *Protherhinus* inhabits the Hawaiian and other Pacific Islands.

135a. Octavo segmento terminal, con margen trasero libre; octavo par de espiráculos bien desarrollados y dorsales. Fig. 344..... ..... Tribu Hispini CHRYSOMELIDAE

135b. Tergo del octavo segmento abdominal a menudo con un tenedor erguido llevando pieles desechados o excremento de la larva; octavo par de espiráculos abdominales rudimentarias. Fig. 345..... ..... Tribu Cassidini CHRYSOMELIDAE

136a. Patas presentes pero pequeñas y generalmente con 2 segmentos. Fig. 346 ..... Fam. BRENTIDAE

136b. Patas ausentes, lóbulos pedales ocupando su lugar 137

137a. Cápsula de la cabeza alargada, más ancha posteriormente, y con lados rectos. Fig. 347 .....Fam. AGLYCYDERIDAE

137b. Head capsule narrowing posteriorly and with curved sides...138

138a. Abdominal hypopleuron subdivided into at least 2 lobes. (See Fig. 352). 141

138b. Abdominal hypopleuron not subdivided. 139

139a. Abdominal segments with no more than 2 transverse dorsal plicae. (See Fig. 350). 140

139b. Abdominal segments with 3 or 4 transverse dorsal plicae. Fig. 348 and 349. ..Families CURCULIONIDAE and SCOLYTIDAE

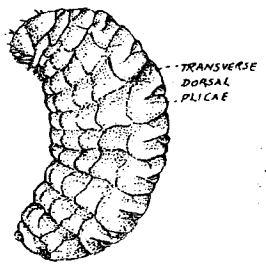


Fig. 348. Tychius picirostris (Fab.) (Cucurlionidae)

These two families are not separable by larval characters. The Curculionidae is probably the largest family of insects, it includes about 40,000 known species.

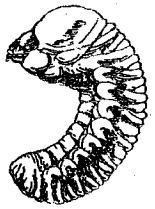


Fig. 349. Shothole borer, Scolytus rugulosus (Ratz.) (Scolytidae)

The larvae feed on roots, fruits, leaves, seeds and also live as borers and leaf miners. No truly aquatic forms are known although the larvae of many species live in the roots of plants growing in bogs and marshes. The female usually uses her snout to make a hole in the plant tissue into which the eggs are thrust.

The Scolytidae is also a large family comprising about 2,000 known species. The adults are called bark beetles or engraver beetles. Their larvae live in galleries in dead or healthy shrubs and trees. They attack all parts of the plants. In the United States alone the annual losses in destruction of timber has been estimated at about $100,000,000.

137b. Cápsula de la cabeza más delgada posteriormente y con lados corvados.....138

138a. Hipopleuron abdominal dividido en por lo menos 2 lóbulos (vea Fig. 352).....141

138b. Hipopleuron abdominal no dividido.....139

139a. Segmentos abdominales con no más que 2 ranuras transversas dorsales. (vea Figl 350) 140

139b. Segmentos abdominales con 3 o 4 ranuras transversas dorsales. Fig. 348 y 349 .....Fam. CURCULIONIDAE

(Scolytidae ahora es una subfamilia de Curculionidae)

140a. More than 2 ocelli on each side; head retracted.
Fig. 350. .....Subfamily Rhynchitinae, CURCULIONIDAE

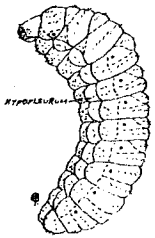


Fig. 350. Rhychites aeneus Boh.

The larvae of *Rhynchites* and *Attelabus* live in tunnels formed of rolled leaves constructed by the adults.

The larvae of the species pictured live in *Helianthus*. *R. bicolor*, a very common species, develops within the hips of wild and cultivated roses.

140b. 1 ocellus on each side; head protracted.
Fig. 351. .....Subfamily Apioninae, CURCULIONIDAE

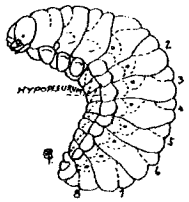


Fig. 351. Pine gall weevil, Podapion gallicola Riley.

This small subfamily is cosmopolitan in its distribution. The species here pictured makes galls on the scrub pine. The larvae of *Apion*, a rather large genus, live principally within the seeds of legumes and other plants. Some are gall makers.

141a. Maxillary palpus 2-segmented.
Fig. 352. .....Subfamily Calendrinae, CURCULIONIDAE

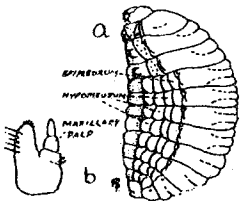


Fig. 352. a, Granary weevil, Sitophilus granarius (L.); b, Maxilla.

Many of our most destructive "bill-bug" larvae belong here. The larvae of the larger species bore into the stems of plants, principally corn and grasses while the smaller ones give their attention to seeds and grain.

140a Más que 2 ocelos en cada lado; cabeza retractado. Fig. 350 .....
.....Fam. CURCULIONIDAE

140b. 1 ocelo en cada lado; cabeza expuesta. Fig. 351 .....
.....Fam. BRENTIDAE

141a. Palpos maxilares con 2 segmentos. Fig. 352 .....
.....Fam. DRYOPTHORIDAE

141b. Maxillary palpus 1-segmented. Fig. 353. Family PLATYPODIDAE

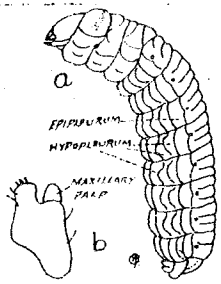


Fig. 353. a, **Platypus compositus** Say; b, Maxilla.

The eggs are laid in the primary galleries which are made by the adults. The larvae then make new tunnels. Often the burrows form definite patterns which are characteristic of the species. The ambrosia beetles live in dead wood and cultivate fungi to feed their young.

142a. Legs vestigial, without pointed tarsal segment, or absent; body curved, fleshy, and with dorsal transverse plicae; 10th abdominal segment small, in continuation of 9th. Fig. 354. .....Family PLATYSTOMIDAE

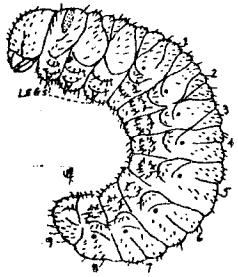


Fig. 354. **Euparius marmorius** Oliv.

Certain species of *Brachytarsus* are predacious upon scale-insects. The larvae of *B. niveovariegatus* Roel. attack the Chinese wax scale, *Ericerus pela* Chev.

142b. Legs normal, with strong tarsus; body elongate, cylindrical, covered with tergal shields; 10th abdominal segment well developed, asperate, and placed below base of large 9th segment. Fig. 355. ...Family LYMEXYLIDAE

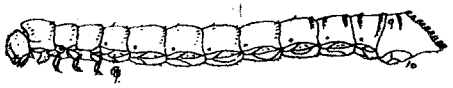


Fig. 355. Chestnut timberworm, **Melittomma sericeum** (Harris).

141b. Palpo maxilar con 1 segmentos. Fig. 353 ..... Fam. CURCULIONIDAE

142a. Patas rudimentarias, sin tarso, o ausentes; cuerpo corvado, carnoso y con ranuras trasversales dorsales; décimo segmento pequeño en continuación con el noveno. Fig. 354..... Fam. PLATYSTOMIDAE

142b. Patas normales, con tarsos fuertes; cuerpo alargado, cubierto con escudos dorsales; décimo segmentos abdominal bien desarrollado, colocado debajo de la base del grande noveno segmento. Fig. 355 ....Fam. LYMEXYLIDAE

Orden

Diptera[1]

Introducción

Los dípteros acuáticos constituyen uno de los Ordenes de insectos más complejos, más abundantes y más ampliamente distribuidos en todo el mundo. Su literatura a nivel mundial es tan abundante, que para analizarla con cierto grado de detalle, habría que hacerlo por familias, y en ciertos casos, por géneros.

Dentro de los trabajos de mayor interés para el trópico americano están los de Alexander (1912c, 1945k, 1976c). Van Duzee (1929, 1931c) reporta la familia Dolichopodidae para Centro y Suramérica. Brindle (1960) describió los géneros más representativos sobre la familia Tipulidae en América Tropical. Otros estudios para el Neotrópico pueden consultarse en (Byers, 1977; Cova-García y Sutil, 1975a; Duckhouse, 1973, 1974a; Hogue, 1971, 1973; Wirth, 1949). Hurlbert et al. (1981) presenta una amplia literatura sobre los dípteros para América Tropical.

Johannsen (1977) constituye un buen texto guía para quienes se inician en el estudio de los insectos acuáticos. Stone et al. (1983) presenta un catálogo de los insectos de Norte América y México.

En Colombia vale la pena mencionar los estudios de Barreto (1969) y Lewis y Lee-Potter (1964) sobre simúlidos; Welkerson (1979) sobre tabánidos y Wirth y Lee (1967) sobre ceratopogónidos.

El único reporte para Antioquia es el de Bedoya y Roldán (1984), quienes presentan una clave a nivel de género para esta región.

Biología

El orden Díptera se considera uno de los grupos de insectos más evolucionados, junto con Lepidóptera y Trichóptera.

Son insectos holometábolos. Usualmente, las hembras ponen los huevos bajo la superficie del agua, adheridos a rocas o vegetación flotante. La mayoría de las larvas pasan por tres o cuatro instars; el período de desarrollo larval puede ser de una semana como en Simuliidae o hasta de un año como en Tipulidae.

La característica más importante de las larvas de los dípteros es la ausencia de patas torácicas. El cuerpo está formado por tres segmentos torácicos y nueve abdominales, es blando y cubierto de cerdas, espinas apicales o corona de ganchos en prolongaciones que ayudan a la locomoción y adhesión al sustrato. La coloración es amarillenta, blanca o negra.

Respiran a través de la cutícula o mediante sifones aéreos; otros poseen agallas traqueales y otros, pigmentos respiratorios (hemoglobina) para sobrevivir en zonas escasas de oxígeno.

Ecología

Su habitat es muy variado; se encuentran en ríos, arroyos, quebradas, lagos a todas las profundidades, depósitos de agua en las brácteas de muchas plantas y en orificios de troncos viejos y aun en las costas marinas. Existen representantes de aguas muy limpias como la familia Simuliidae o contaminadas como Tipulidae y Chironomidae.

En cuanto a su alimentación, también es muy variada; unos son herbívoros en tanto que otros carnívoros.

Distribución geográfica

Los dípteros son cosmopolitas.

Taxonomía

Para su clasificación se tiene en cuenta la esclerotización de la cabeza, si ésta es o no retráctil, si las mandíbulas funcionan en un plano horizontal o vertical; si la cabeza está o no fusionada con el tórax y si el cuerpo es aplanado o cilíndrico, entre otras.

De 20 familias acuáticas, se reportan 13 para Antioquia (con 28 géneros) ubicadas dentro de los subórdenes Orthorrapha y Cyclorrapha.

1 Esta sección hace parte del trabajo: "Estudio de los Dípteros Acuáticos (Diptera) en diferentes pisos altitudinales en el Departamento de Antioquia" presentado por Inés Bedoya Ortiz como requisito para optar al título de Biólogo. Publicado en: Rev. Asoc. Col. Cien. Biol. 2(2): 113-134, 1984.

Clave para subórdenes e infraórdenes de dípteros acuáticos

1. Cabeza completamente capsulada, esclerotizada, diferenciada, libre o retráctil dentro del primer segmento torácico ..... SUBORDEN ORTHORRAPHA
   Cabeza vestigial no diferenciada, membranosa o aparentemente ausente ..... SUBORDEN CYCLORRAPHA
2. Cabeza no retráctil, bien desarrollada y las mandíbulas funcionan en un plano horizontal .... INFRAORDEN NEMATOCERA
   Cabeza retráctil y las mandíbulas funcionan en un plano vertical (hacia arriba y hacia abajo) .... INFRAORDEN BRACHYCERA

Clave para familias de Orthorrapha Nematocera

1. Cabeza, tórax y primer segmento abdominal fusionados formando una sola división del cuerpo, con una fila de discos succionadores situados ventralmente con la cual la larva se adhiere a la superficie de rocas (Fig. 141 a 144) ..... BLEPHAROCERIDAE
   Cabeza no fusionada con el tórax y primer segmento abdominal; discos ventrales ausentes 2
2. Cabeza no retráctil y disco espiracular en el último segmento abdominal (Fig. 134) ..... TIPULIDAE
   Cabeza retráctil, ausencia de disco espiracular 3
3. Prolongaciones ausentes, segmentos torácicos y abdominales subdivididos formando un anillo; larva anfipneústica (Fig. 139) ..... PSYCHODIDAE
   Segmentos del cuerpo no subdivididos, larva no anfipneústica 4
4. Segmentos torácicos fusionados y diferentes del resto del cuerpo, larva, metapneústica (Figs. 145 a 149) ..... CULICIDAE
   Tórax y abdomen no diferenciado, larva apneústica (Figs. 151 a 153) ..... CERATOPOGONIDAE
5. Prolongaciones presentes en segmentos anteriores y posteriormente con un disco adhesivo, larva apneústica (Fig. 155) ..... SIMULIIDAE
   Posteriormente sin disco adhesivo, larva metapneústica 6
6. Dos prolongaciones en primero y segundo segmento abdominales (Fig. 150) DIXIDAE
   Dos prolongaciones, una a nivel del protórax y otra en el último segmento abdominal, larva apneústica (Fig. 154) ..... CHIRONOMIDAE

Clave para familias de Orthorrapha-Brachycera

1. Cuerpo aplanado dorsoventralmente, tegumentos con depósitos de calcio; prolongaciones ausentes, larva antifipneústica (Fig. 156) ..... STRATIOMYIDAE
   Cuerpo cilíndrico y prolongaciones presentes; no presencia de depósitos de calcio en su tegumento 2
2. Prolongaciones cortas o pseudópodos en cada segmento, órganos respiratorios posteriores; en el último segmento abdominal termina en un sifón, larva antipneústica (Figs. 157 y 158) ..... TABANIDAE
   El último segmento abdominal termina diferente 3
3. El último segmento abdominal termina en dos largos apéndices; la larva es apneústica (Fig. 159) ..... EMPIDIDAE
   Disco espiracular caudal rodeado por varios lóbulos cortos, larva metapneústica (Fig. 161 y 162) ..... DOLICHOPODIDAE

Características para el suborden Cyclorrapha

El último segmento abdominal termina en un par de proyecciones cónicas retráctiles que contienen los espiráculos; larva anfipneústica (Figs. 163 a 165) ..... MUSCIDAE

Literatura citada

ALEXANDER, C.P. 1912c. A new tropical *Gonomyia* (Tipulidae, Dipt.). Entomol. News, 23: 418-420.

_____. 1945k. Records and descriptions of Tipulidae from Tropical America (Diptera). Part. VI. Entomol., 16: 373-393

_____. 1976c. New species of crane-flies from tropical America (Diptera: Tipulidae) III. J. Kansas Ent. Soc., 40: 373-381.

BARRETO, M.P. 1969. The species of black-flies found in Colõmbia (Diptera: Simuliidae). J. New York Ent. Soc., 77(1): 31-35.

BEDOYA, I. y G. Roldán, 1984. Estudio de los dipteros acuáticos (Diptera) en diferentes pisos altitudinales en el departamento de Antioquia. Rev. Asoc. Col. Cienc. Biol. 2(2): 113-134.
BRINDLE, A. 1960. The larvae and pupae of the British Tipulinae (Diptera, Tipulida). Trans. Soc. British Ent., 14: 63-114 (En Stuart H. Hurlbert op. cit.).
BYERS, G.W. 1977. Tipulidae, 259-265 (En Stuart H. Hurlbert op. cit.).
COVA-GARCIA, P. and Sutil, O. 1975a. Clave para larvas de anofelinos de Venezuela. Bol. Direcc. Malariol. Saneam. Ambient., 15: 6-24.
DUCKHOUSE, D.A. 1973. Family Psichodidae, In: Papasero (ed.). A catalogue of the diptera of the Americas, South of the United States. Fasc. 6A: 1: 29, Mus. Zool. Univ. Sao Paulo.
_____. 1974a. Redescription of the neotropicl Psichodidae (Diptera, Nematocera) described by Knab, Dyar and Coquillet, J. Ent. (B)., 42: 141-152.
HOGUE, C.L. 1971. Family Blephariceridae (Blepharoceridae), Fasc. 8: 1-12. In: Papasero (ed.). A catalogue of the diptera of the Americas, South of the United States. Mus. Zool. Univ. Sao Paulo.
_____. 1973. A taxonomic review of the genus *Maruina* (Diptera: Psychodidae). Natural History Museum. Los Angeles County. Science Bulletin, 17: 1-69.
HURLBERT, S.H. et al., 1981. Aquatic biota of tropical South America. Part. I. Arthropoda. San Diego State University, San Diego, California.
JOHANNSEN, O.A. 1977. Aquatic diptera. Entomological Reprint Specialists. Los Angeles, California.
LEWIS, D.J. and Lee-Potter, J.P. 1964. Simuliidae (Diptera) from the Sierra Nevada de Santa Marta, Colombia. Ann. Mag. Nat. Hist., 7(13): 60-95.
SNYDER, F.M. 1957. Notes and descriptions of some neotropical Muscidae (Diptera). Bull. Amer. Mus. Nat. Hist., 113: 437-490.
STONE, A. et al. 1983. A catalog of the Diptera of America North of Mexico. Washington, Smithsonian Institution, 1-1696.
VAN DUZEE, M.C. 1929. Tropical American Diptera of twowinged flies of the family Dolichopodidae from Central and South America. U.S. Nat. Mus. Proc., 74: 1-64. (en Stuart H. Hurlbert, op. cit.).
_____. 1931c. New South American species of Dolichopodidae. Amer. Mus. Nat. Hist., Amer. Mus. Novitates, 483: 1-26.
WELKERSON, R.C. 1979. Horse-flies (Diptera: Tabanidae) of the colombian departments of Chocó, Valle and Cauca. Cespedesia (Cali, Col.). 8(31-32): 87-435.
WIRTH, W.W. 1949. A revision of the clunionine midges with descriptions of a new genus and four species (Diptera: Tendipedidae). Calif. Univ. Pubs. Ent., 8: 151-182.
WIRTH, W.W. and Lee, V.H. 1967. New species of Culicoides from high altitudes in the Colombian Andes (Diptera: Ceratopogonidae). Proc. U.S. Nat. Mus., 124: 1-22.

TABLA 7. **Familias y géneros del orden Diptera encontrados en el Departamento de Antioquia. (Bedoya y Roldán, 1984).**

Familia	Género	Características morfológicas	Habitat
ORTORRAPHA-NEMATOCERA TIPULIDAE	*Limonia* Meigen 1800	6.8-8.0 mm; seg. Torácicos y abdominales cortos, manchados dorsales (Fig. 134).	Semiacuáticos en algas que crecen sobre piedras emergentes. *Indicadores: aguas mesotróficas.*
	Tipula Linnaeus 1758	13.0-15.0 mm; disco espiracular con seis lóbulos (Fig. 135).	Aguas lóticas y lénticas con fango y materia orgánica en descomposición. *Indicadores: aguas mesoeutróficas.*
	Molophilus Curtis 1833	10.0-15.0 mm; lóbulos dorsolaterales y ventrales divididos por manchas oscuras. (Fig. 136).	Aguas lóticas, en márgenes arenosos de arroyos. *Indicadores: aguas mesotróficas-eutróficas.*
	Hexatoma Latreille 1809	12.0-15.0 mm; lóbulos laterales del disco espiracular alargados, traspasados por cerdas endurecidas. (Fig. 137).	Aguas lóticas, en márgenes arenosos de arroyos. *Indicadores: aguas mesotróficas-eutróficas.*

TABLA 7. Familias y géneros del orden Diptera encontrados en el Departamento de Antioquia. (Bedoya y Roldán, 1984).

(Continuación)

Familia	Género	Características morfológicas	Habitat
PSYCHODIDAE	*Clognia* Enderlein 1937	5.0-8.0 mm; más o menos cilíndrico, abdomen termina en tubo respiratorio cónico. (Fig. 138).	Aguas lénticas, contaminadas y materia orgánica en descomposición. *Indicadores: aguas eutróficas.*
	Maruina Müller 1895	2.0-3.0 mm; cuerpo aplanado, discos succionadores en línea medio ventral. (Figs. 139-140).	Aguas lóticas y bien oxigenadas. *Indicadores: aguas oligotróficas.*
BLEPHAROCERIDAE	*Limonicola* Lutz 1928	7.0-8.0 mm; pseudópodo dorsal bien desarrollado y proyectado libremente del margen posterior. (Figs. 141 - 142 y 143).	Aguas lóticas, cascadas, aguas muy oxigenadas y limpias. *Indicadores: aguas oligotróficas.*
	Paltostoma Schiner 1866	7.0-8.0 mm; pseudópodo dorsal pequeño e insertado casi completamente en el margen posterior. (Fig. 144).	Aguas lóticas, cascadas, aguas muy oxigenadas y limpias. *Indicadores: aguas oligotróficas.*
CULICIDAE	*Anopheles* Meigen 1818	8.0-9.0 mm; octavo segmento abdominal sin sifón, abdomen termina en cámara respiratoria. (Fig. 145).	Charcas, pozos temporales, troncos con huecos, con materia orgánica y detritus. *Indicadores: aguas mesoeutróficas.*
	Culex Linnaeus 1758	8.0-9.0 mm; octavo segmento abdominal con sifón más largo que ancho. (Fig. 146).	Charcas, pozos temporales, troncos con huecos, con materia orgánica y detritus. *Indicadores: aguas mesoeutróficas.*
	Aedes Meigen 1818	5.0-6.0 mm; octavo segmento abdominal con sifón más ancho que largo. (fig. 147).	Charcas, pozos temporales, troncos con huecos, con materia orgánica y detritus. *Indicadores: aguas mesoeutróficas.*
	Uranotaenia Lynch Arribálzaga 1819a	4.5-5.0 mm; octavo segmento abdominal con sifón respiratorio y placa quitinosa y fila de dientes en el margen. (Fig. 148).	Charcas, pozos temporales, troncos con huecos, con materia orgánica y detritus. *Indicadores: aguas mesoeutróficas.*
	Aedeomyia	4.0-5.0 mm; octavo segmento abdominal con sifón con setas plumosas y sin placa quitinosa. (Fig. 149).	Charcas, pozos temporales, troncos con huecos, con materia orgánica y detritus. *Indicadores: aguas mesoeutróficas.*
DIXIDAE	*Dixella* Dyar y Shannon 1924b	4.0-8.0 mm; posee un par de prolongaciones ventrales en los primeros segmentos abdominales; segmentos quinto, sexto y séptimo con placas esclerotizadas ventrales; último segmento termina en cámara respiratoria. (Fig. 150).	Arroyos rocosos, ríos de corriente lenta, y charcas, lagos y pozos artificiales adheridos a vegetación o rocas. *Indicadores: aguas oligomesotróficas*
CERATOPOGONIDAE	*Atrichopogon* Kieffer 1906a	6.0-7.0 mm; cuerpo aplanado, proyecciones en protórax, procesos laterales a lo largo del cuerpo (Fig. 151).	Aguas lóticas, adheridos a rocas emergentes. *Indicadores: aguas oligosometróficas.*
	Probezzia Kieffer 1906a	12.0-14.0 mm; cuerpo cilíndrico, sin proyecciones en protórax, setas anales largas, cabeza dos veces más larga que ancha. (Fig. 153 c).	Aguas lénticas, charcas y lagos con material orgánico en descomposición. *Indicadores: mesoeutrófico.*

TABLA 7. Familias y géneros del orden Diptera encontrados en el Departamento de Antioquia. (Bedoya y Roldán, 1984).

(Continuación)

Familia	Género	Características morfológicas	Habitat
CERATOPOGONIDAE	*Alluaudomyia* Kieffer 1913d	12.0-14.0 mm; cabeza más larga que ancha, setas anales cortas. (Fig. 153e).	Aguas lénticas, charcas y lagos con material orgánico en descomposición. *Indicadores: mesoeutrófico.*
	Stilobezzia Kieffer 1911a	12.0-14.0 mm; cabeza tan ancha como larga, setas anales muy cortas, aparentemente ausentes. (Fig. 153a).	Aguas lénticas, charcas y lagos con material orgánico en descomposición. *Indicadores: mesoeutrófico.*
CHIRONOMIDAE Nota: es una familia muy extensa, difícil y poco conocida. Por lo tanto, sólo se considerarán tres Subfamilias:			Aguas lóticas y lénticas, en fango, arena y con abundante materia orgánica en descomposición. *Indicadores: aguas mesoeutróficas.*
ORTHOCLADINAE		Placa labial con un número impar de dientes; placa paralabial ausente; papila preanal corta. (Fig. 154d).	
TANYPODINAE		Placa labial con número par o impar de dientes, placa paralabial presente, papila preanal larga. (Figs. 154c y e).	
CHIRONOMINAE		Placa paralabial similar al anterior, segmentos del cuerpo sin cerdas. (Fig. 154b).	Igual al anterior.
SIMULIIDAE	*Simulium* Latreille 1802	3.0-15.0 mm; cabeza esclerotizada con manchas dorsales oscuras, propata torácica con pequeños dientes (Fig. 155).	Aguas corrientes muy oxigenadas, debajo de rocas y troncos. *Indicadores: aguas oligotróficas.*
ORTHORRAPHA-BRACHYCERA STRATIOMYIDAE	*Odontomyia* Meigen 1800	20-30 mm; cuerpo aplanado y espinoso, cámara respiratoria en extremo del abdomen con círculo de cerdas. (Fig. 156).	En márgenes de arroyos, charcas, pantanos y ciénagas sobre objetos flotantes o sumergidos. *Indicadores: mesoeutróficas.*
TABANIDAE	*Chrysops* Meigen 1800	20.0-22.0 mm; corte transversal del abdomen formado por tres pares de lóbulos, sifón alargado y ausencia de espina en el último segmento abdominal. (Fig. 157).	Aguas corrientes y estancadas con materia orgánica en descomposición. *Indicadores: aguas mesoeutróficas.*
	Tabanus Linnaeus 1758	35.0-40.0 mm; abdomen en corte transversal formado por cuatro pares de lóbulos; sifón corto y espina en último segmento abdominal. (Fig. 158).	Aguas corrientes y estancadas con materia orgánica en descomposición. *Indicadores: aguas mesoeutróficas.*
EMPIDIDAE	*Hemerodromia* Meigen 1822	4.0-5.0 mm; último segmento abdominal termina en tres prolongaciones, la central es bífida y con setas cortas. (Fig. 160).	Corrientes lentas en áreas marginales, adheridos a la vegetación. *Indicadores: aguas oligomesotróficas.*
	Chelifera Macquart 1823	5.0-6.0 mm; último segmento abdominal redondeado y bulboso con ocho segmentos. (Fig. 159).	Corrientes lentas en áreas marginales, adheridos a la vegetación. *Indicadores: aguas oligomesotróficas.*

TABLA 7. Familias y géneros del orden Diptera encontrados en el Departamento de Antioquia. (Bedoya y Roldán, 1984).

(Conclusión)

Familia	Género	Características morfológicas	Habitat
DOLICHOPODIDAE	*Aphrosylus* Haliday 1851	6.0-7.0 mm; disco espiracular formado por nueve lóbulos; placa anal formada por tres lóbulos. (Fig. 161).	Corrientes lentas en áreas marginales, adheridos a la vegetación. *Indicadores: aguas oligo-mesotróficas.*
	Rhaphium Meigen 1803	12.0-13.0 mm; disco espiracular formado por cuatro lóbulos; placa anal formada por dos lóbulos. (Fig. 162).	Corrientes lentas en áreas marginales, adheridos a la vegetación. *Indicadores: aguas oligo-mesotróficas.*
CYCLORRAPHA MUSCIDAE = ANTOMIIDAE	*Lispe* Lattreille 1796	10.0-12.0 mm; último segmento abdominal cónico con tubérculo espiraculares anales. (Fig. 163).	Márgenes de corrientes adheridos a superficies de rocas, con material orgánico en descomposición. *Indicadores: aguas oligo-mesotróficas.*
	Limnophora Robineau-Desvoidy 1830	14.0-15.0 mm; último segmento abdominal termina en dos prolongaciones provistas de espinas. (Figs. 164-165).	Márgenes de corrientes adheridos a superficies de rocas, con material orgánico en descomposición. *Indicadores: aguas oligo-mesotróficas.*

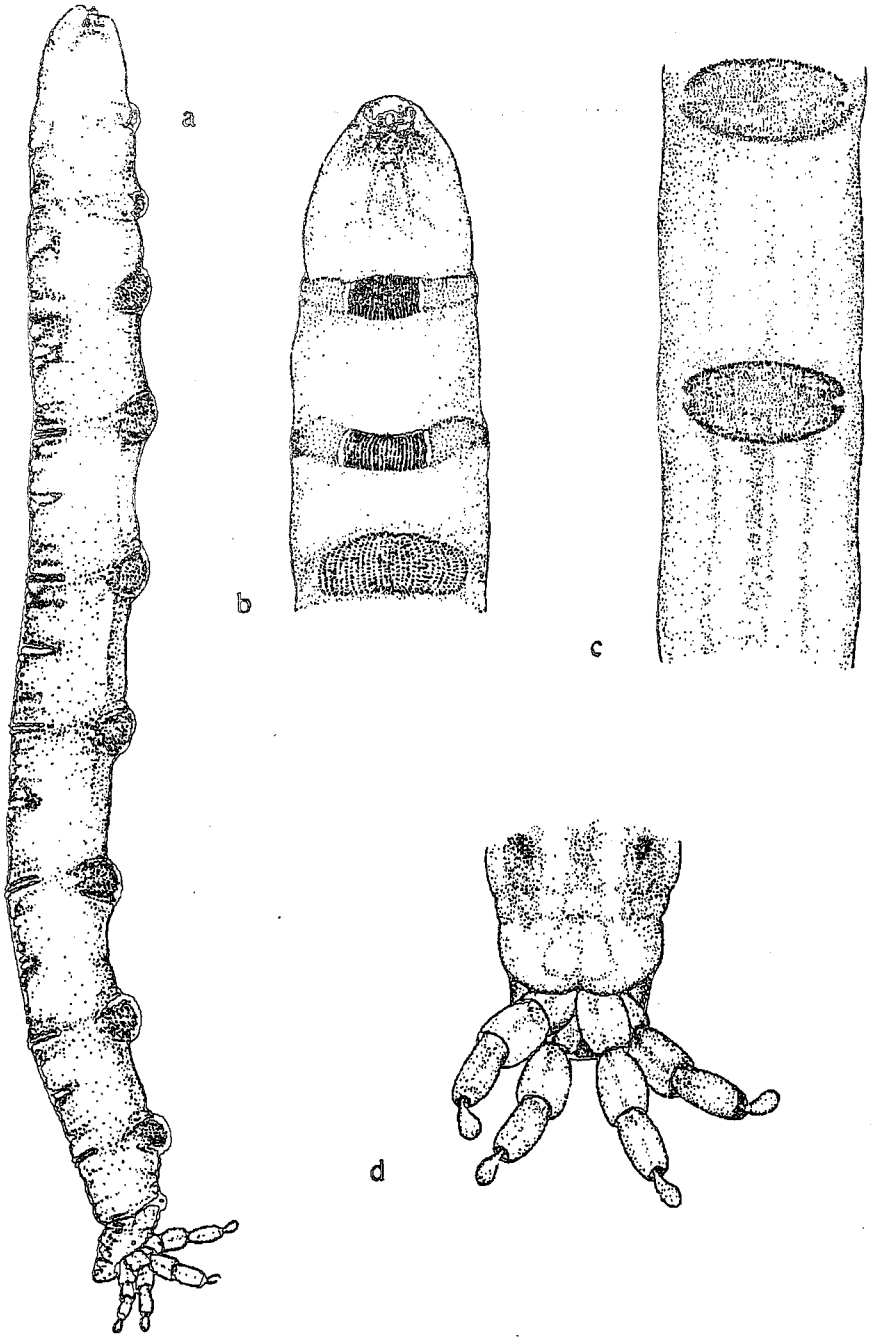


Fig. 134. Tipulidae: *Limonia* (*Geranomyia*) sp.
a. Vista lateral.
b. Segmentos toráxicos vistos ventralmente.
c. Segmentos abdominales ventrales.
d. Segmento caudal.

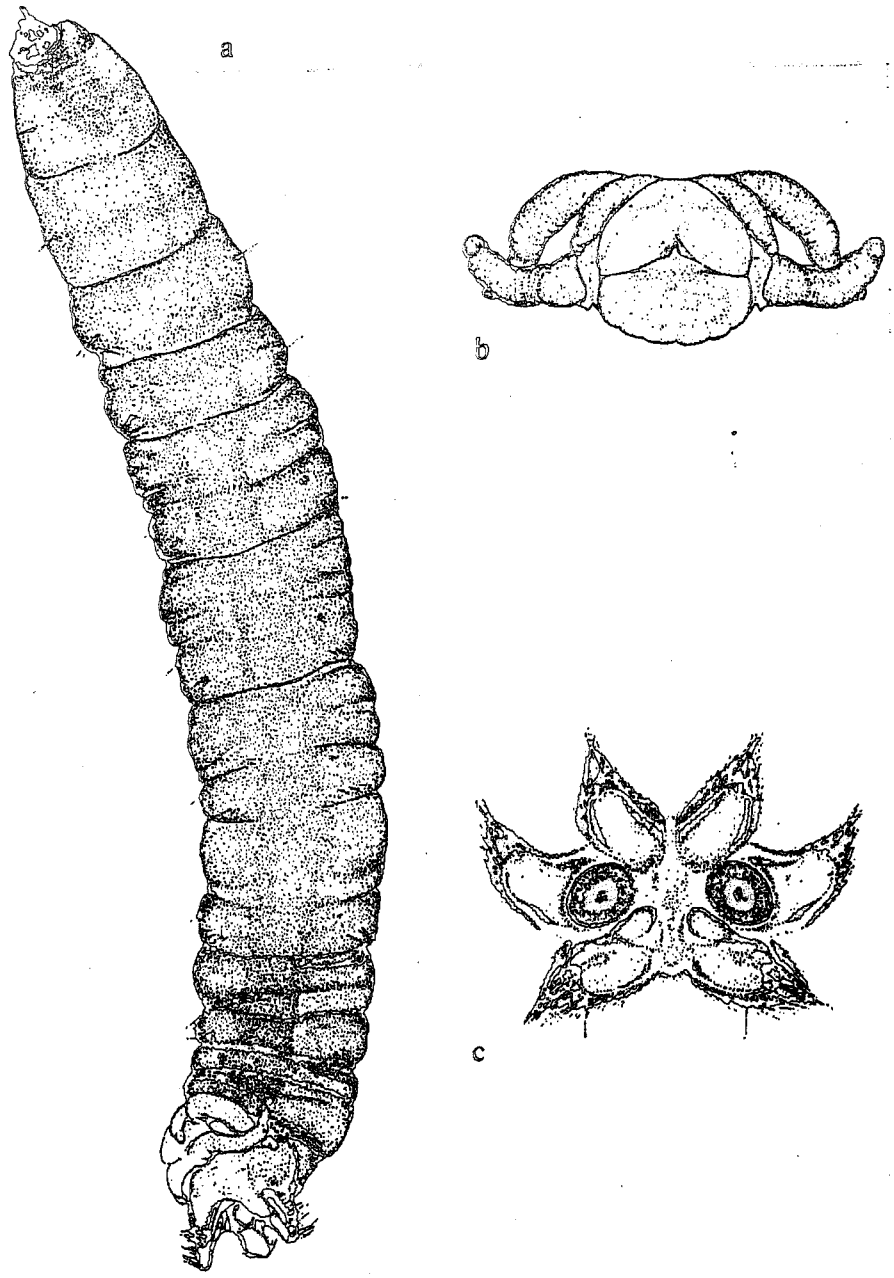


Fig. 135. Tipulidae: *Tipula* (*Bellardina*)sp.
a. Vista lateral.
b. Placa y agallas anales.
c. Disco espiracular.

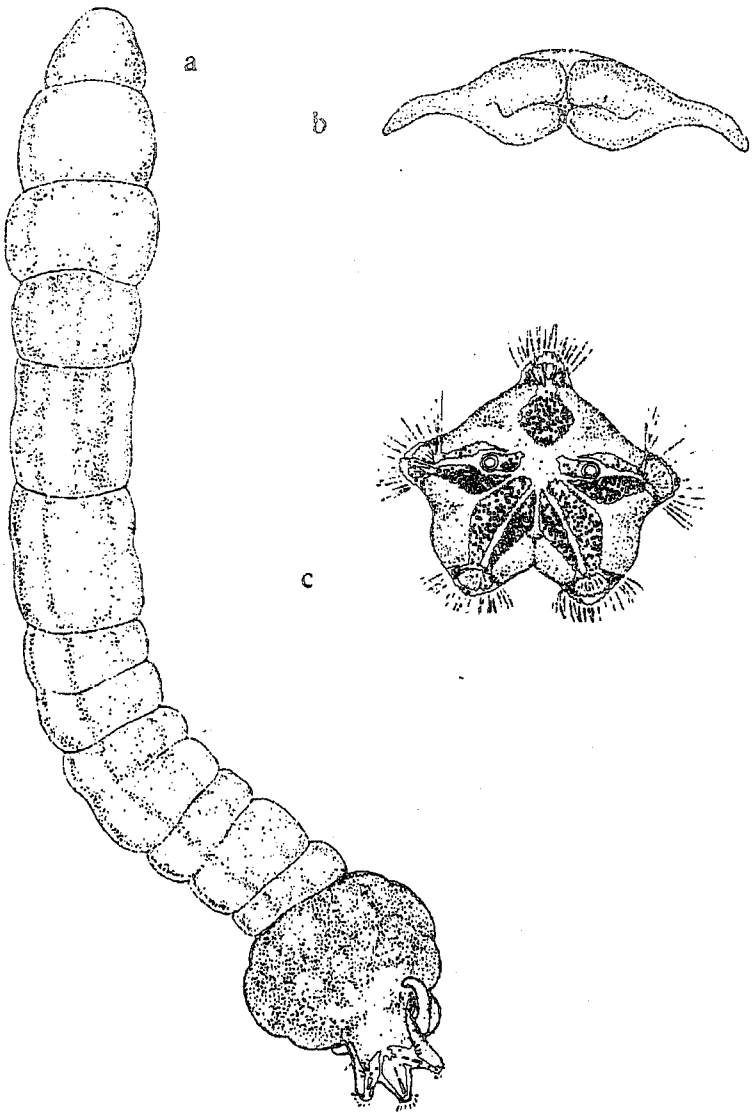
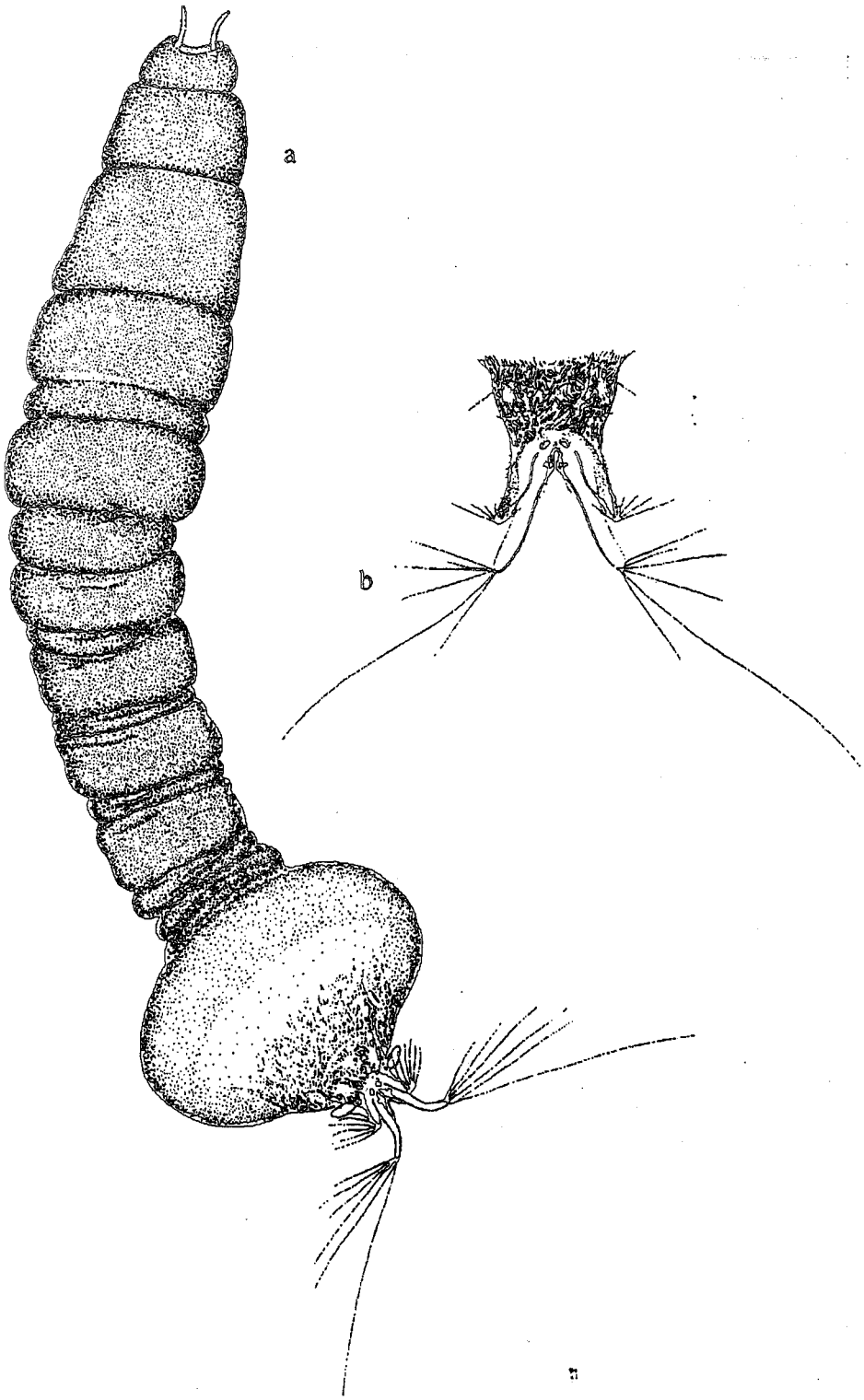


Fig. 136.
Tipulidae:
Molophilus sp.
a. Vista dorsal.
b. Placa anal.
c. Disco espiracular.

Fig. 137. Tipulidae: *Hexatoma* (*Eriocera*) sp. a. Vista dorsal. b. Disco espiracular.



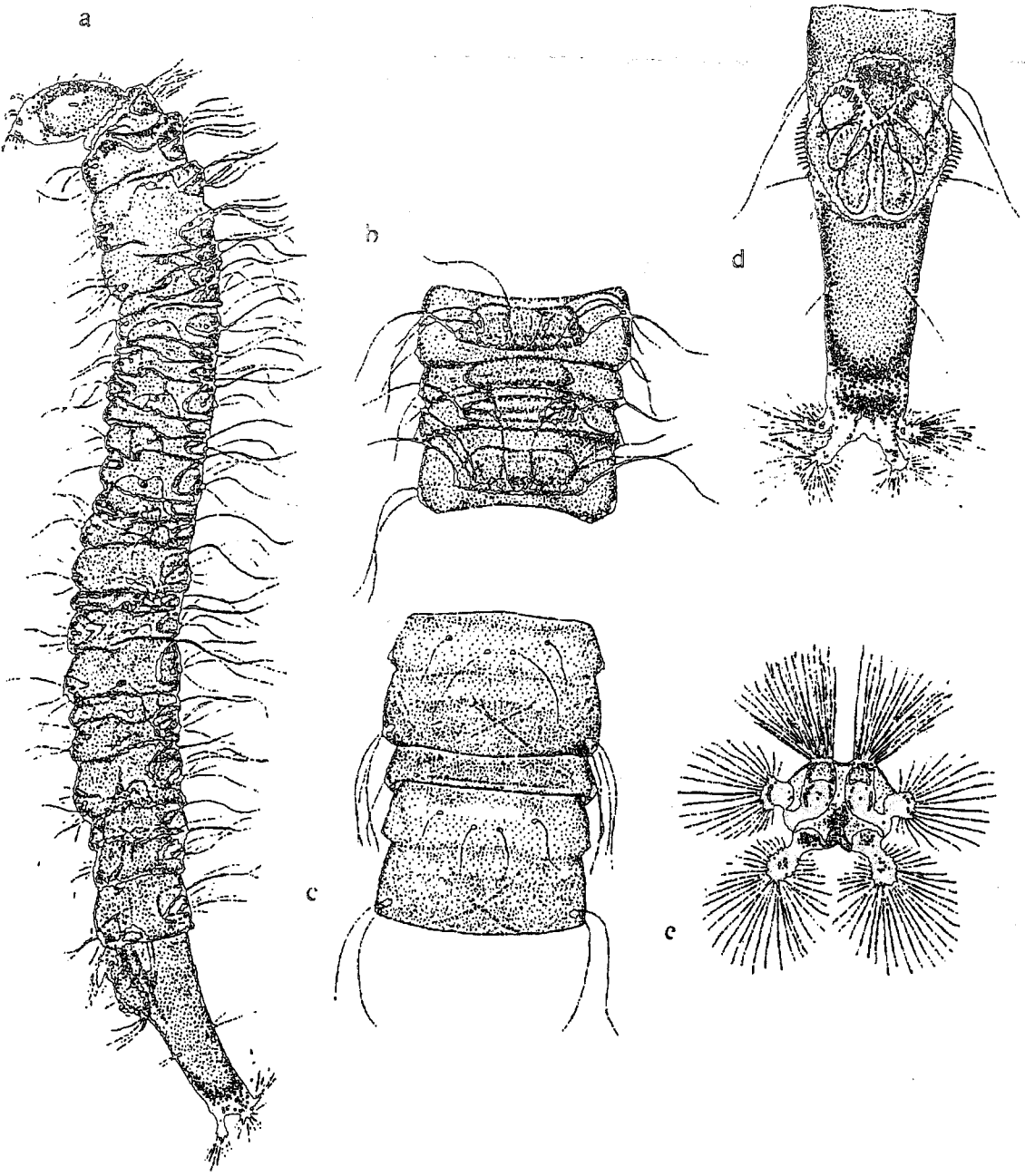
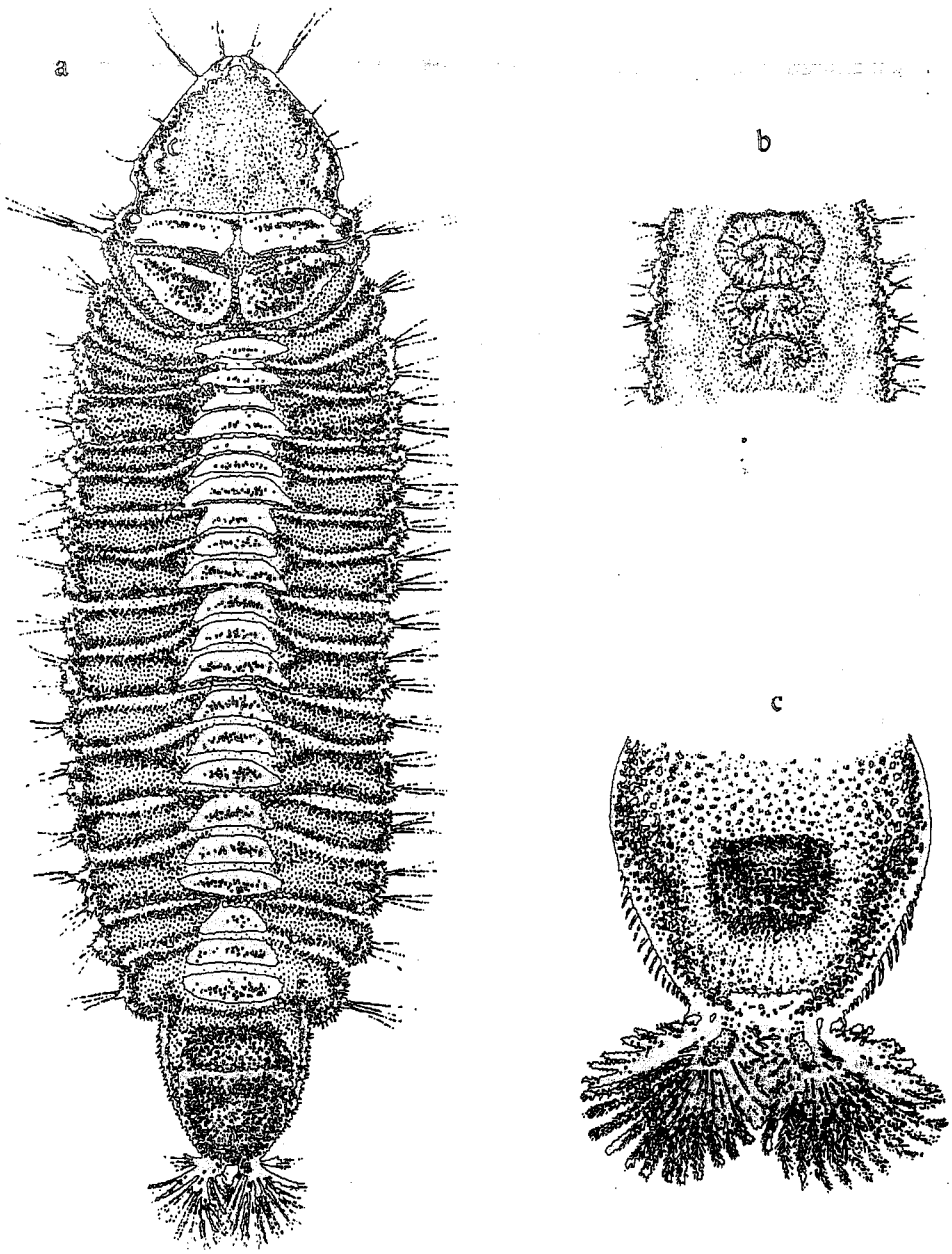


Fig. 138. Psychodidae: *Clognia albipunctatus*.
a. Vista lateral.
b. Aspecto dorsal.
c. Aspecto ventral.
d. Placa anal.
e. Disco espiracular.

Fig. 139.
Psychodidae:
Maruina (Maruina)
sp.
a. Vista dorsal.
b. Aspecto ventral.
c. Cámara
respiratoria.



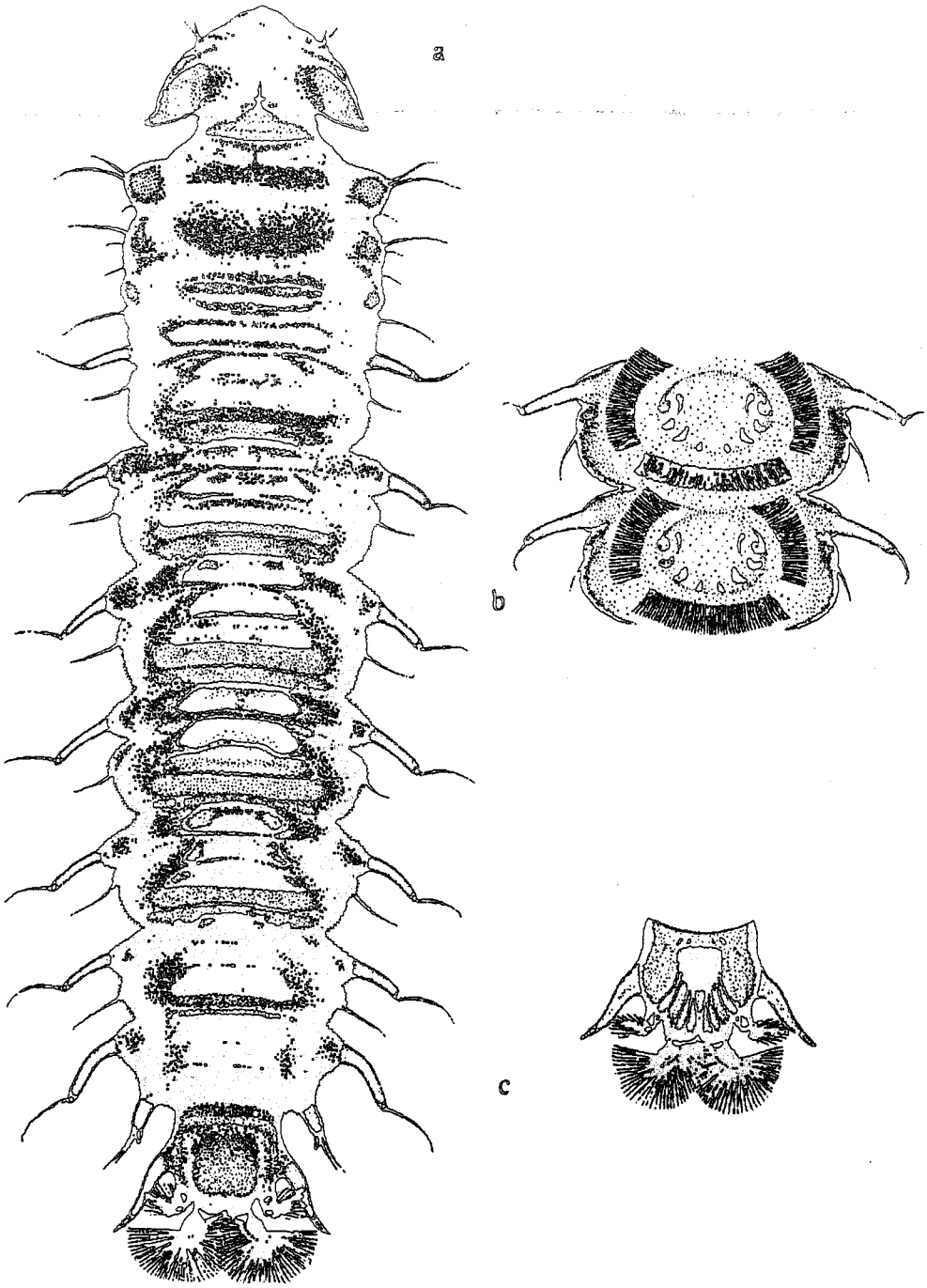
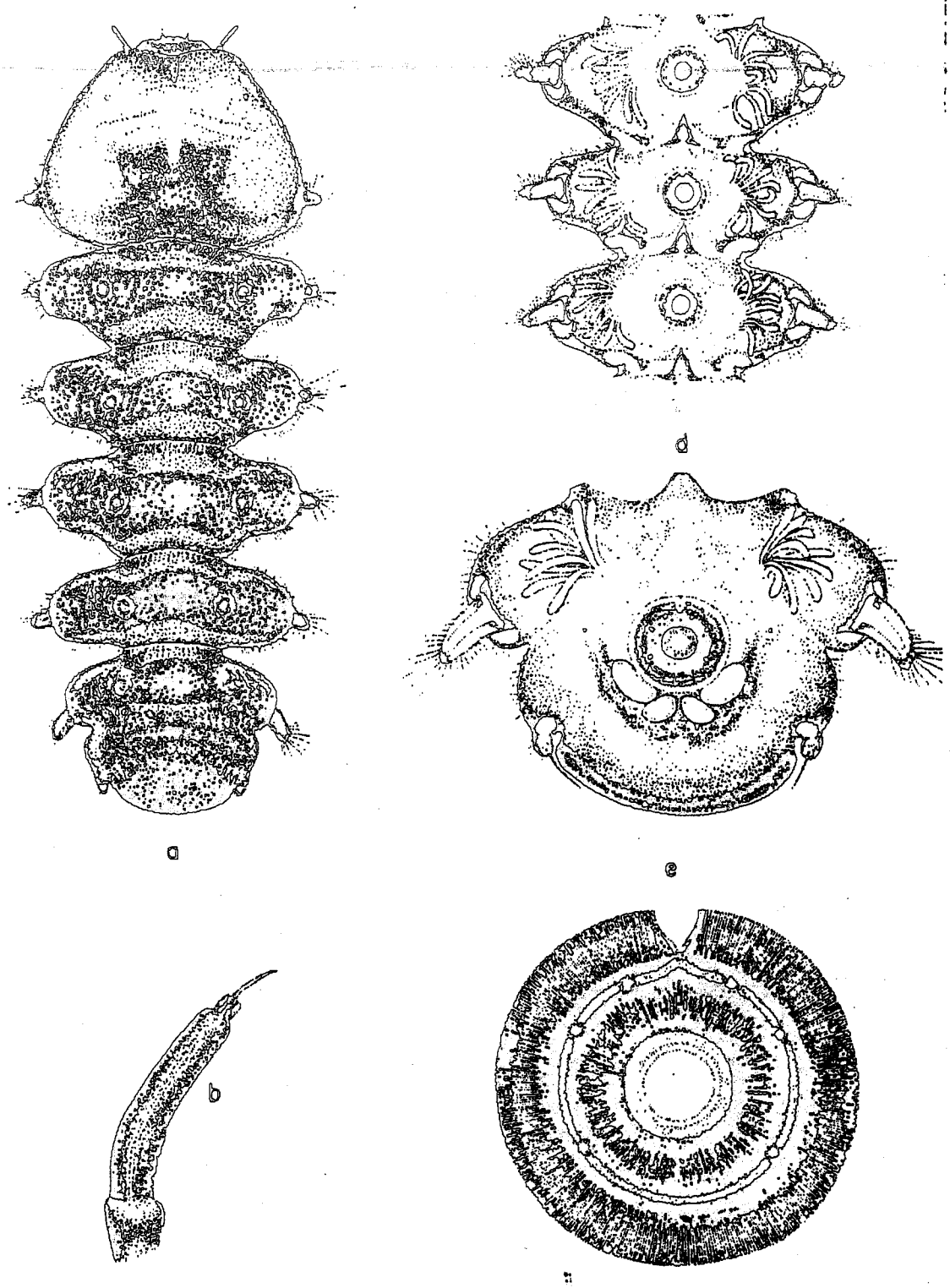


Fig. 140.
Psychodidae:
Maruina (*aculcina*)
sp.
a. Vista dorsal.
b. Aspecto ventral.
c. Cámara
respiratoria.

Fig. 141.
Blepharoceridae:
Limonicola sp.
a. Vista dorsal.
b. Antena.
c. Segmentos abdominales ventrales.
d. Segmento caudal.
e. Disco de adhesión.



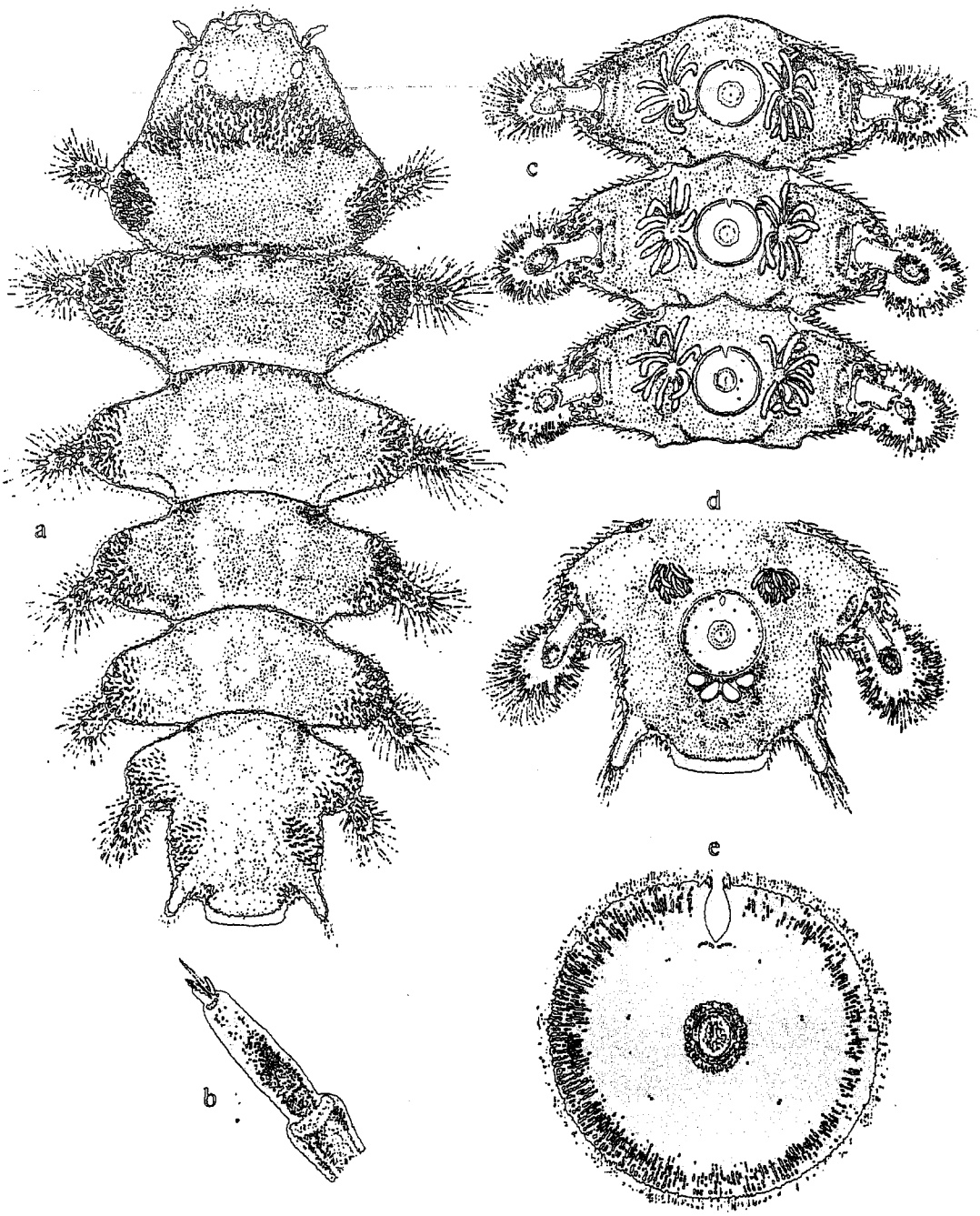


Fig. 142.
Blepharoceridae:
Limonicola sp_2.
a. Vista dorsal.
b. Antena.
c. Segmentos abdominales ventrales.
d. Segmento caudal.
e. Disco de adhesión.

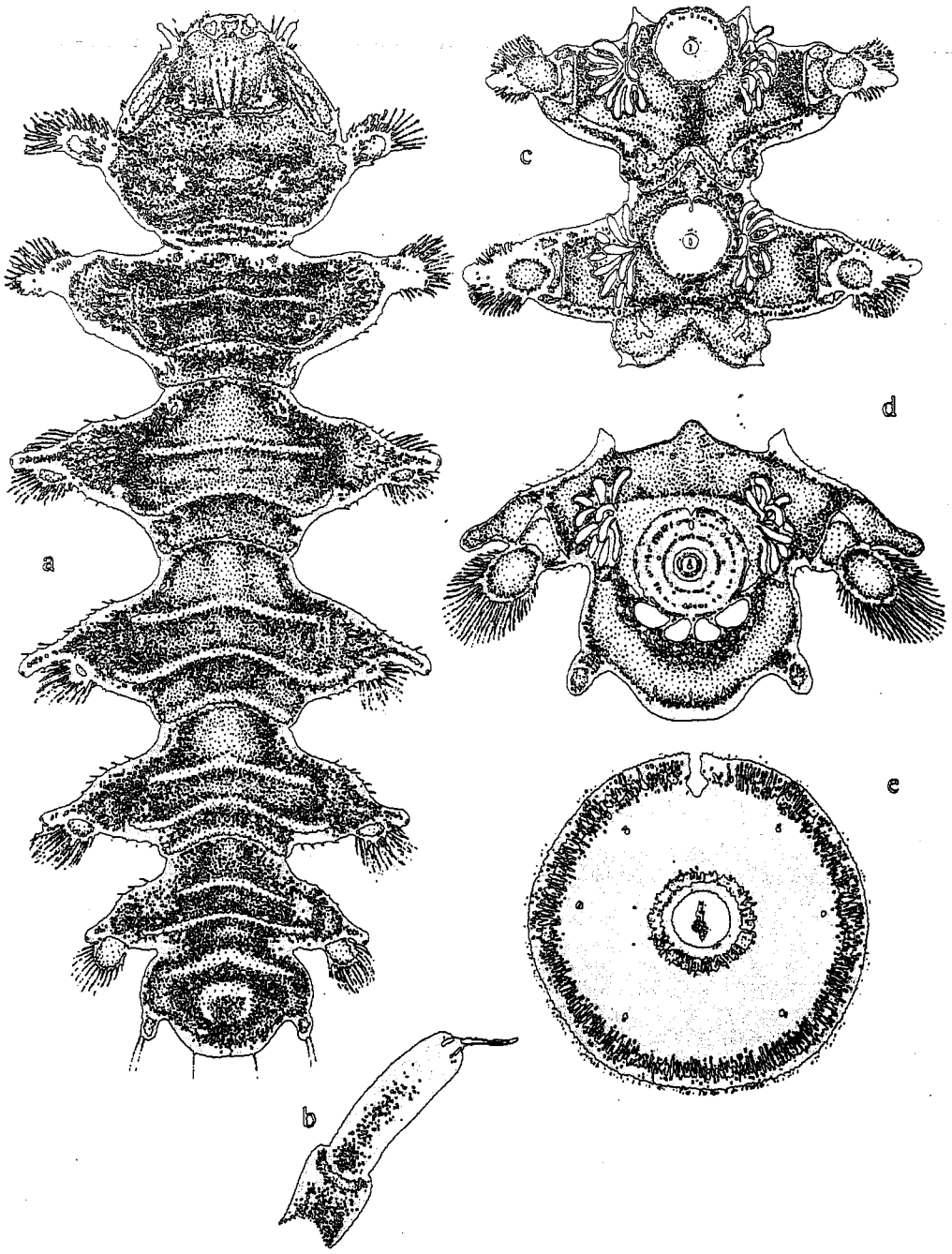


Fig. 143. Blepharoceridae: *Limonicola* sp_1.
a. Vista dorsal.
b. Antena.
c. Segmentos abdominales ventrales.
d. Segmento caudal.
e. Disco de adhesión.

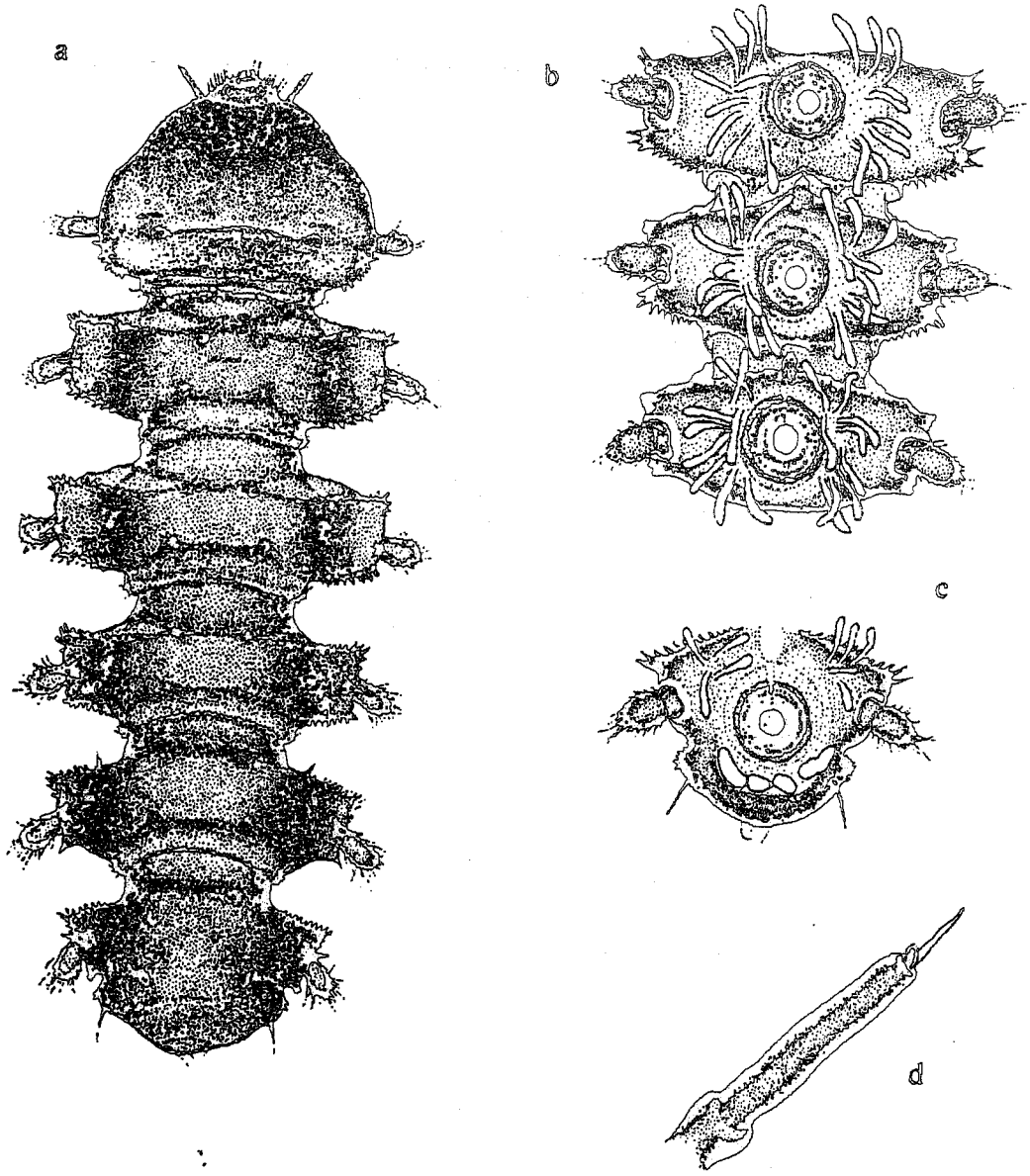


Fig. 144.
Blepharoceridae:
Paltostoma sp.
a. Vista dorsal.
b. Segmentos abdominales ventrales.
c. Segmento caudal.
d. Antena.

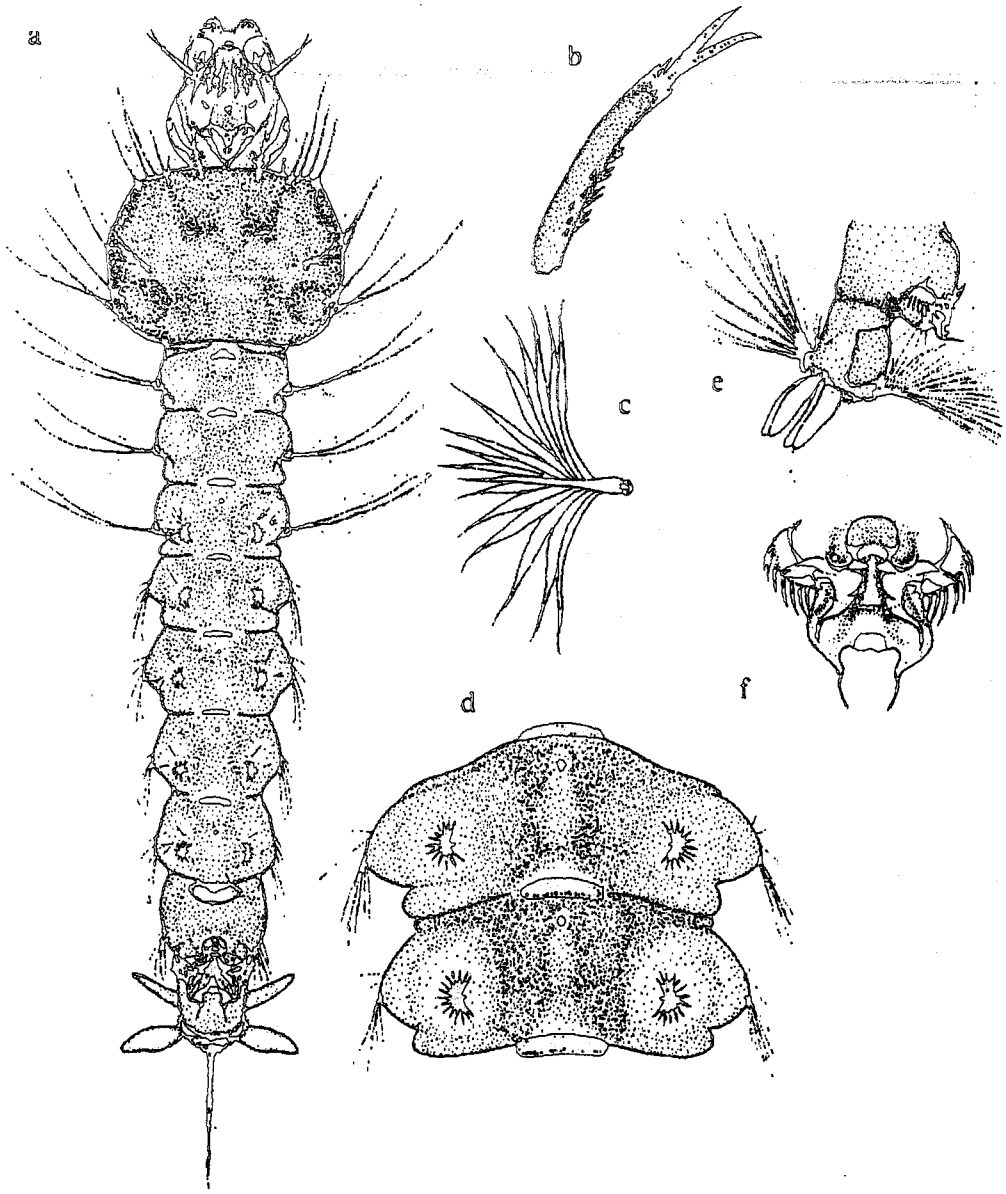


Fig. 145. Culicidae: *Anopheles* sp.
a. Vista dorsal.
b. Antena.
c. Penacho palmeado dorsal.
d. Segmentos abdominales, vistos dorsalmente.
e. Segmento caudal, visto lateralmente.
f. Disco espiracular.

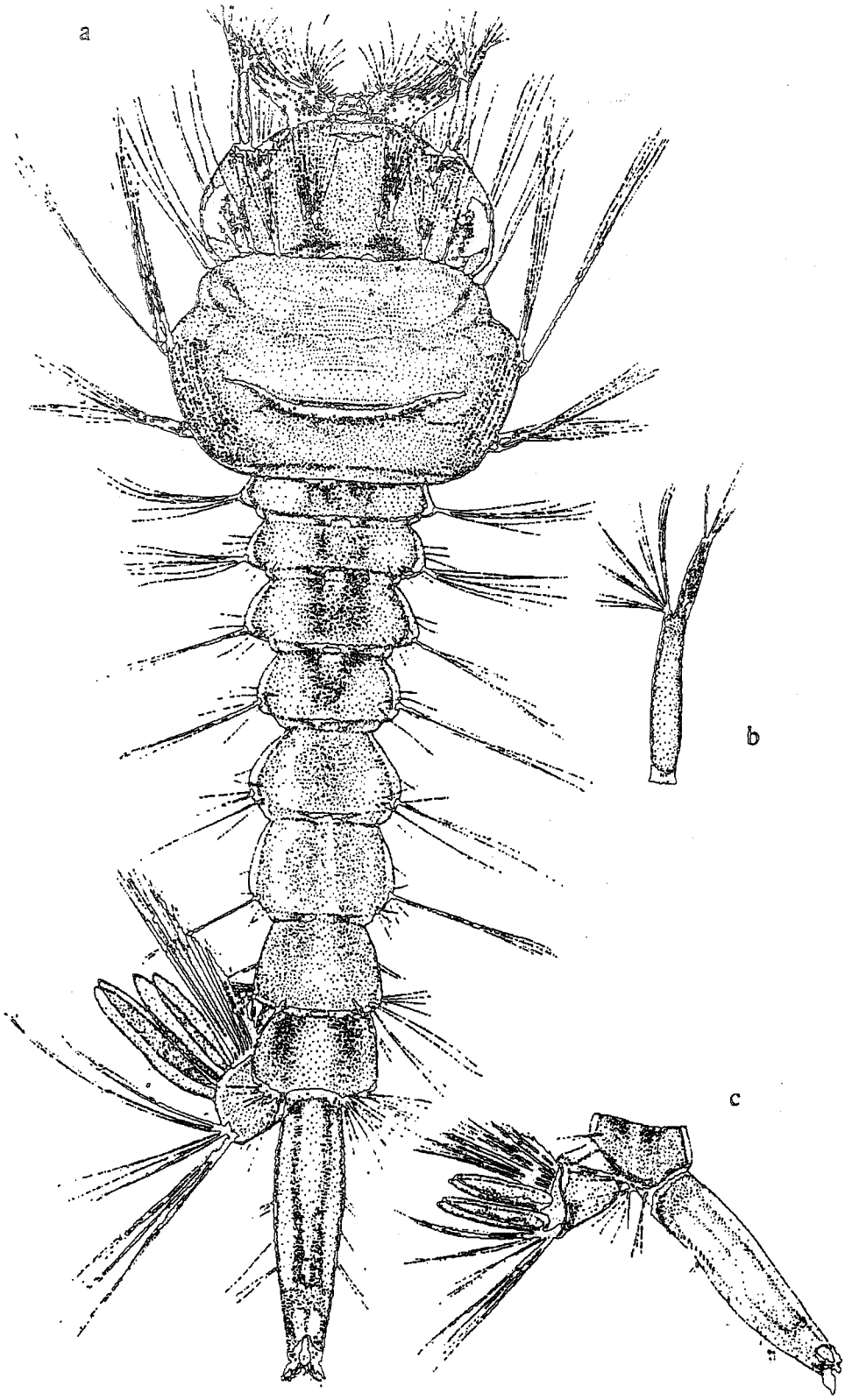
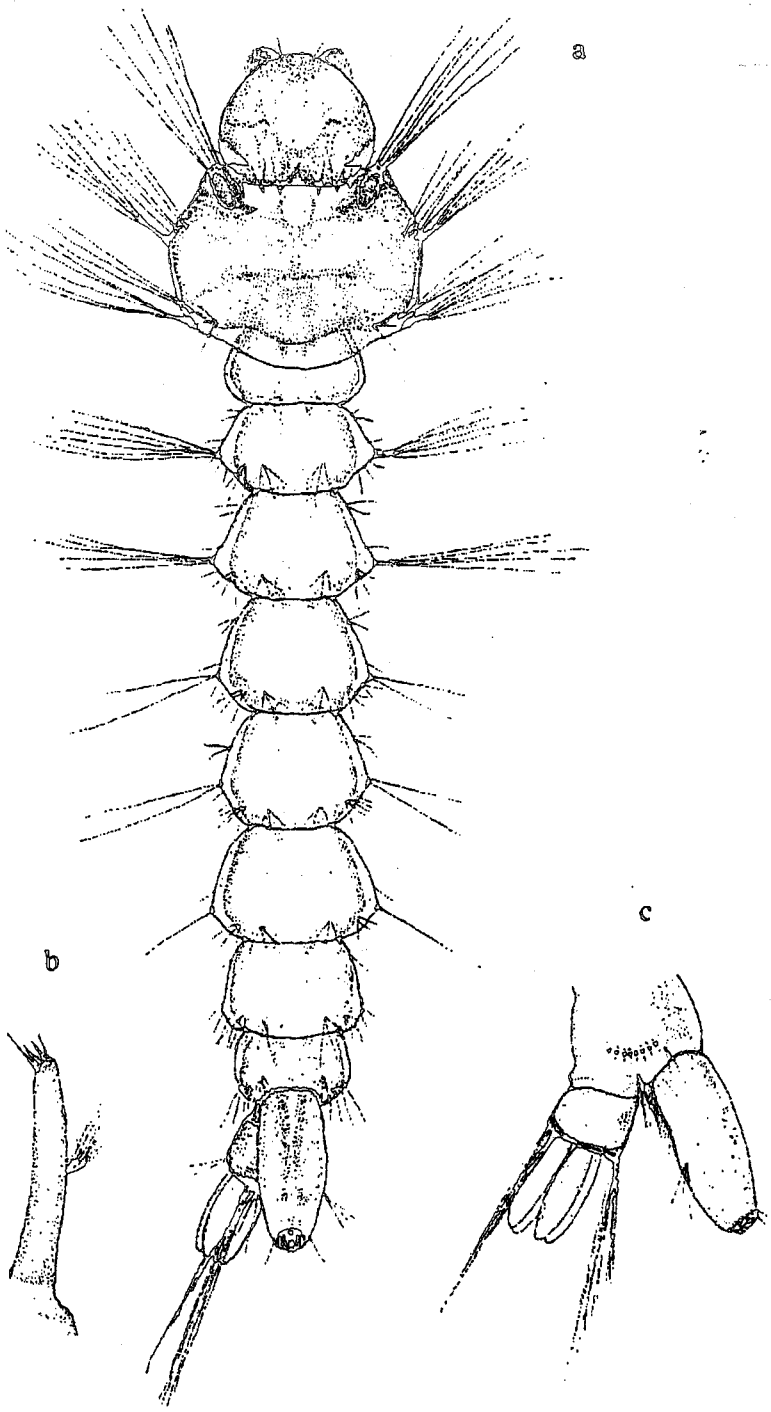


Fig. 146.
Culicidae:
Culex quinquefasciatus.
a. Vista dorsal.
b. Antena.
c. Segmento caudal.

Fig. 147.
Culicidae:
Aedes aegypti.
a. Vista lateral.
b. Antena.
c. Segmento caudal.



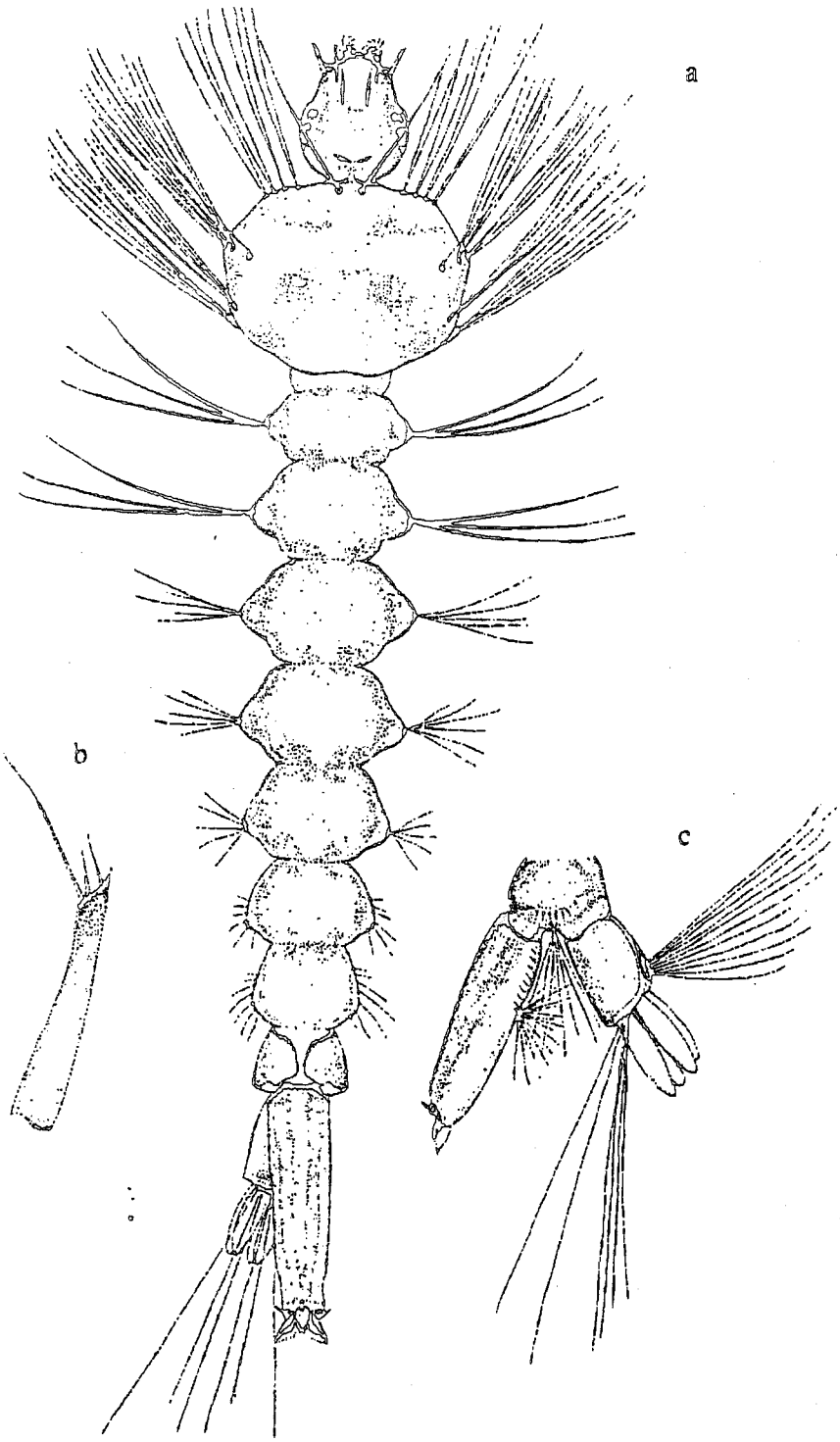
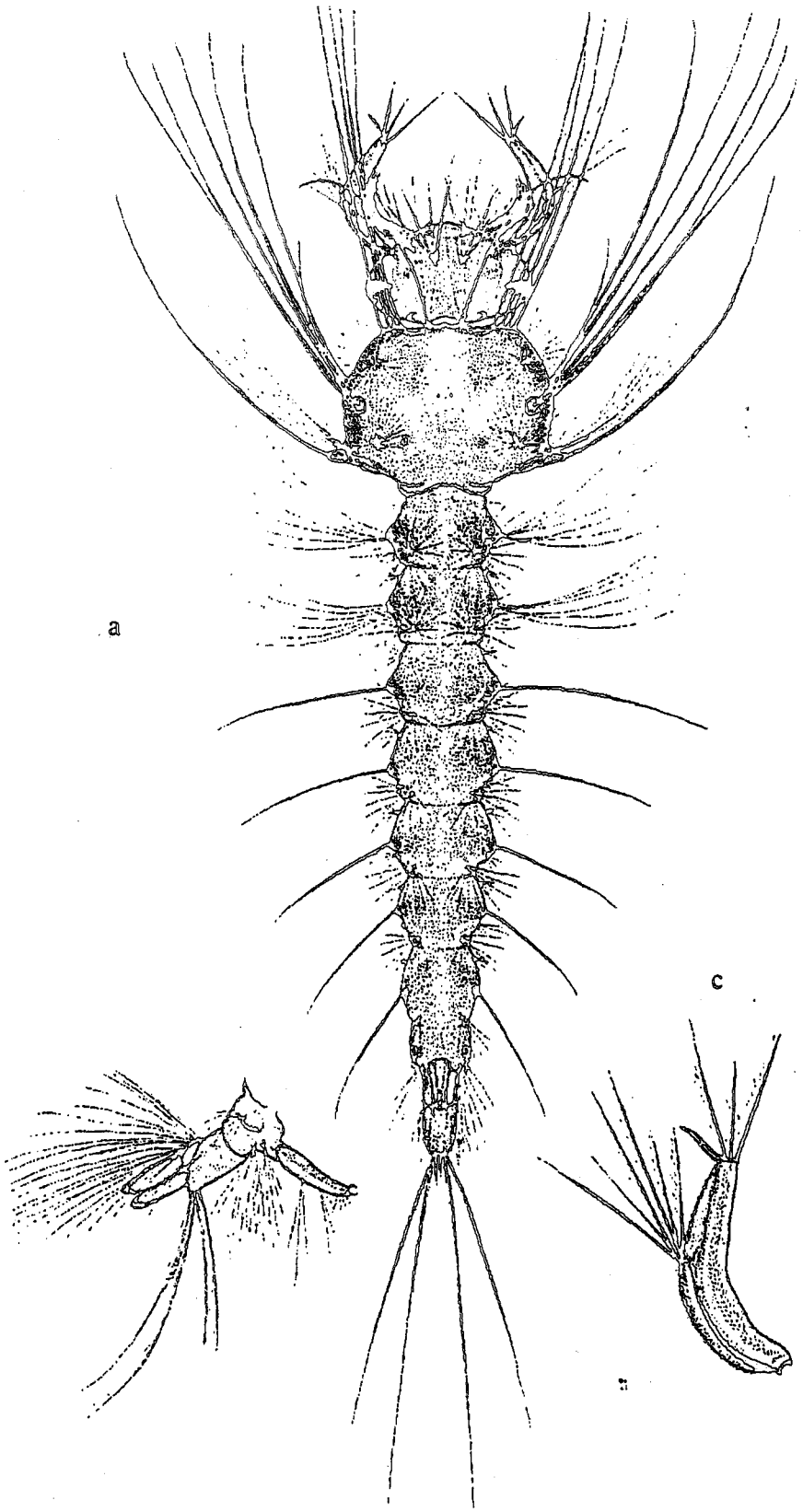


Fig. 146.
Culicidae:
Uranotaenia geometrica.
a. Vista dorsal.
b. Antena.
c. Segmento caudal.

Fig. 149.
Culicidae:
Aedeomyia squamipennis.
a. Vista dorsal.
b. Segmento caudal.
c. Antena.



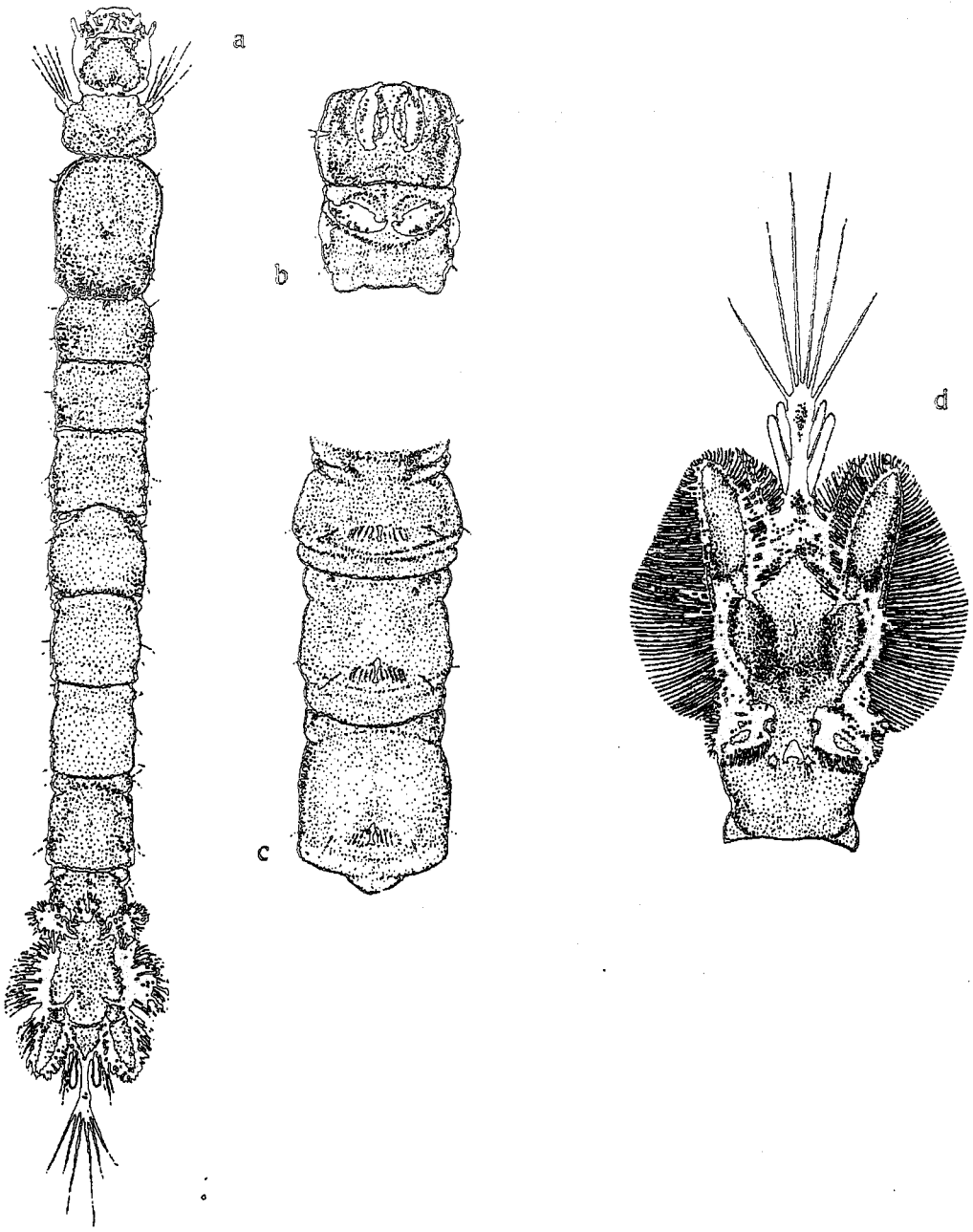


Fig. 150.
Dixidae:
Dixella sp.
a. Vista dorsal.
b. Proyecciones ventrales abdominales.
c. "Crochets" abdominales.
d. Aspecto dorsal y caudal de larva.

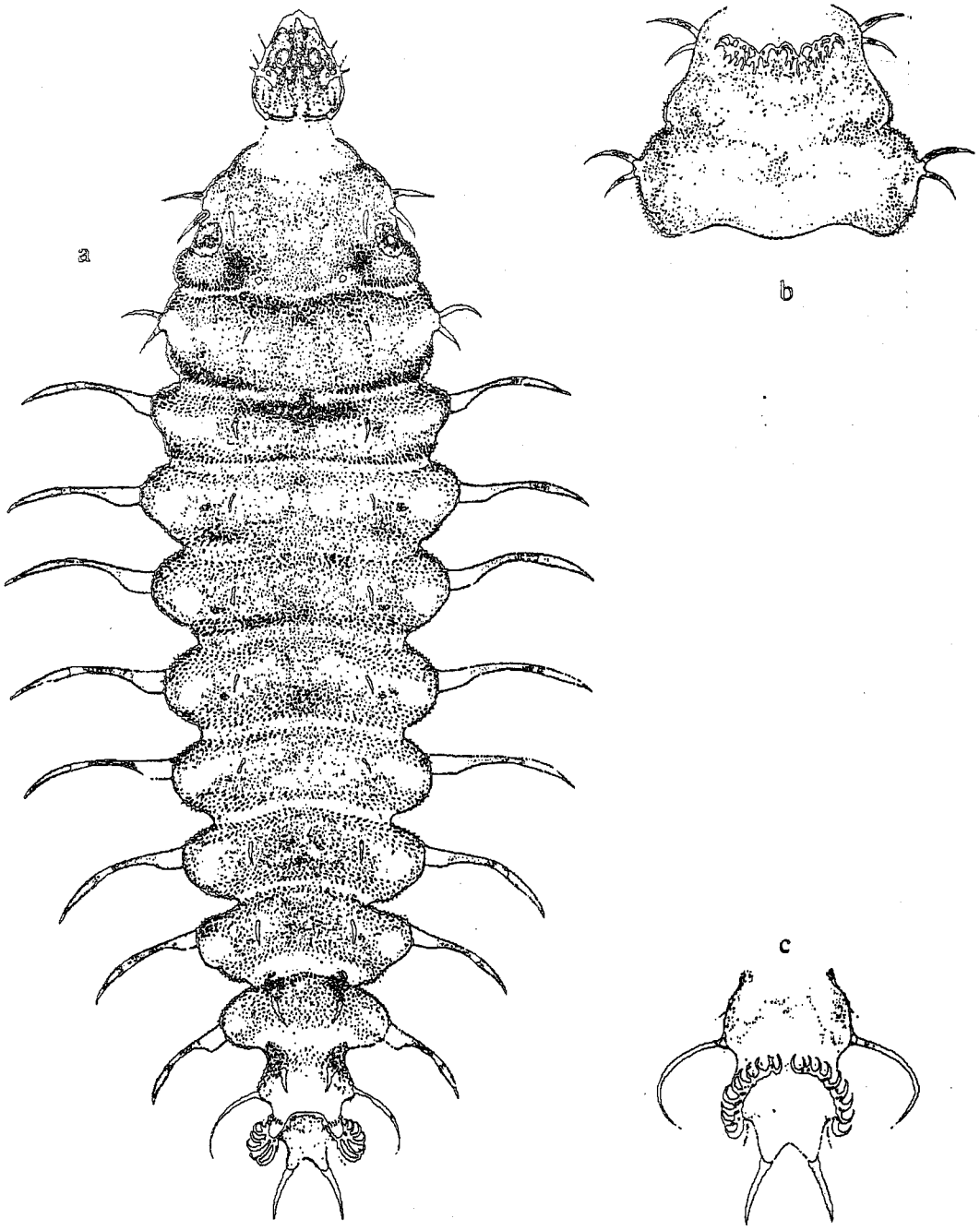


Fig. 151. Ceratopogonidae: *Atrichopogon* sp_1.
a. Vista dorsal.
b. Segmentos toráxicos ventrales.
c. Segmento caudal.

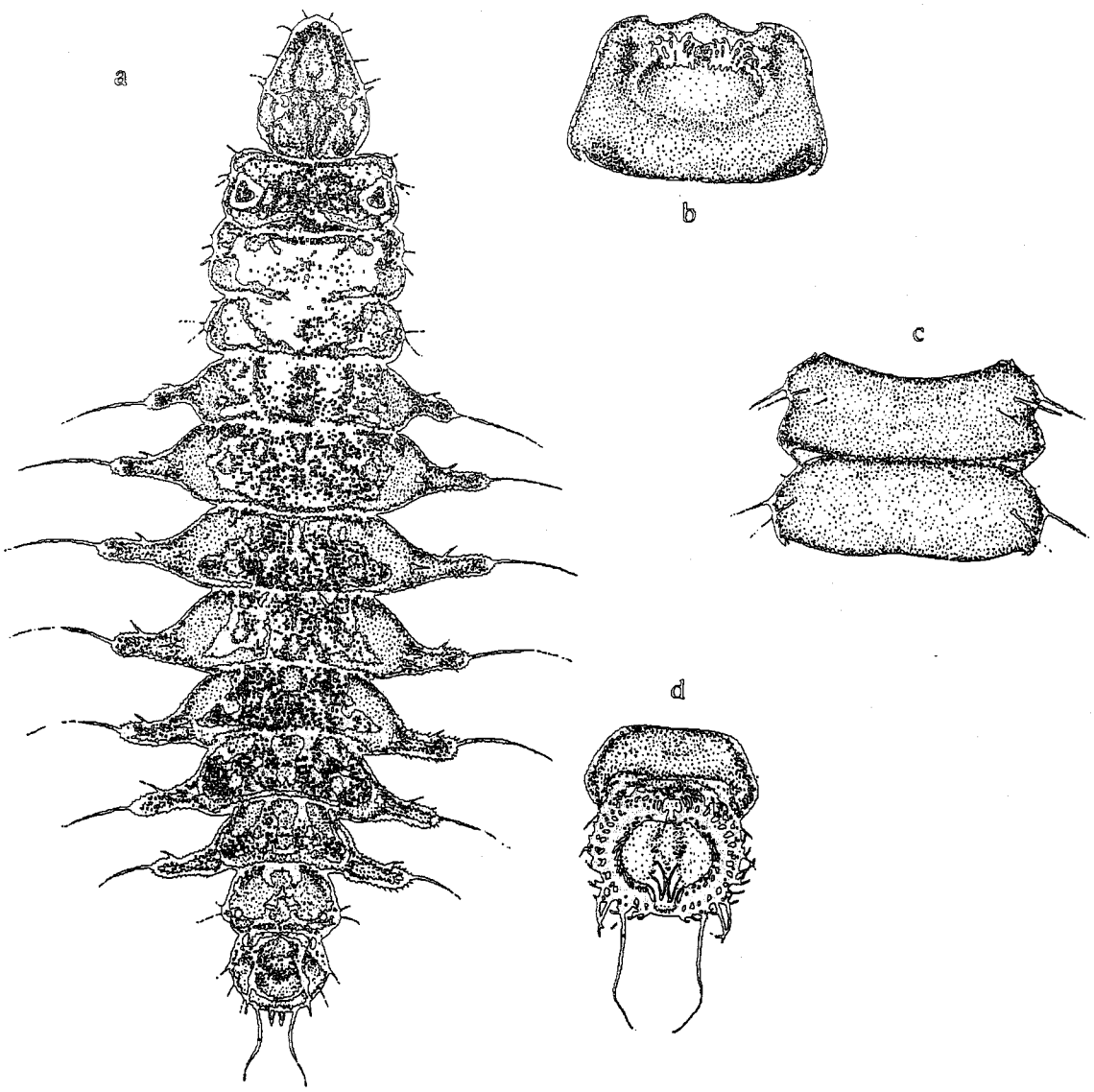


Fig. 152.
Ceratopogonidae:
Atrichopogon sp_2.
a. Vista dorsal.
b. Segmento toráxico ventral.
c. Segmentos abdominales ventrales.
d. Segmento caudal.

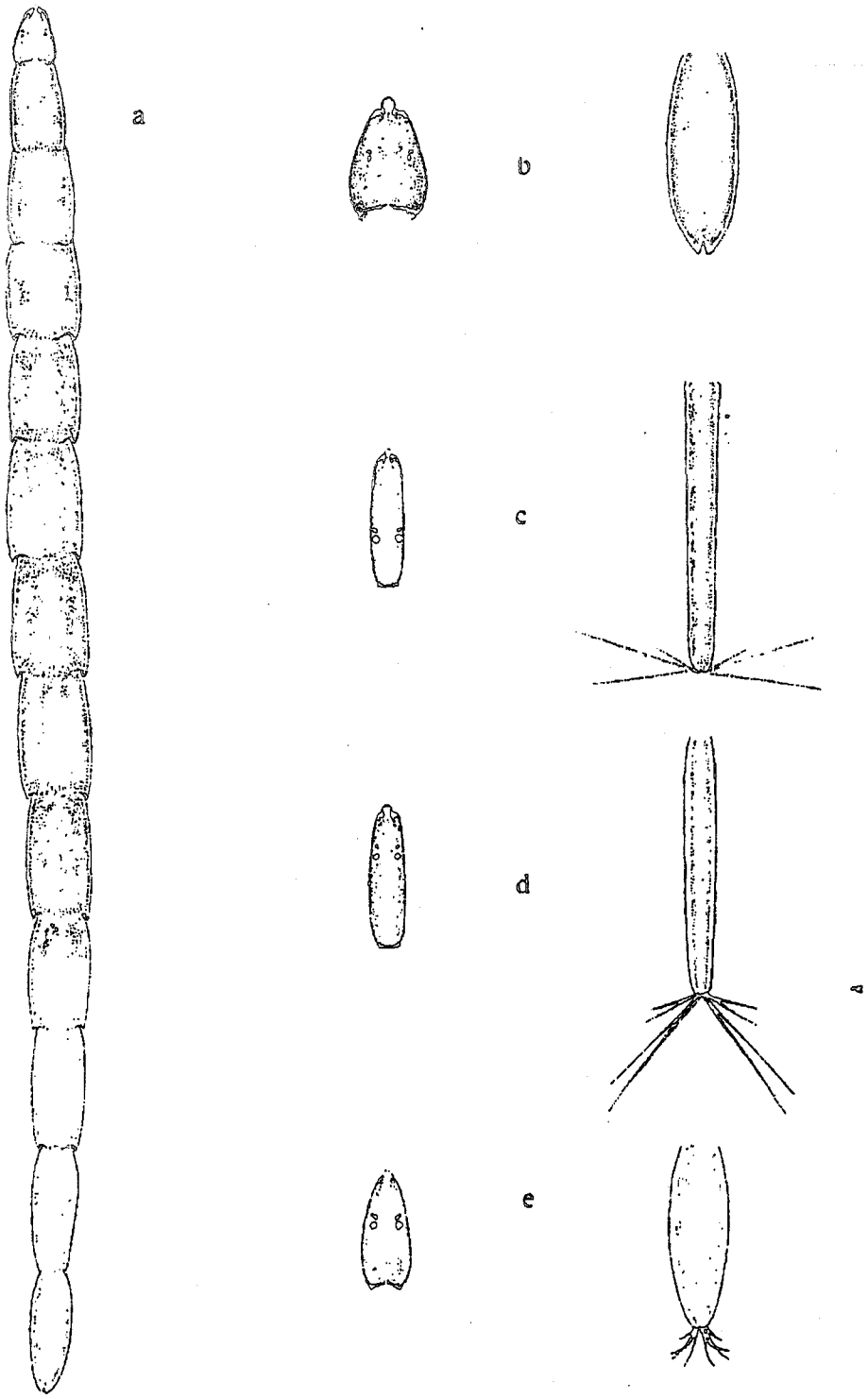


Fig. 153. Ceratopogonidae: *Stilobezzia* sp : a. Vista dorsal b. Cabeza y segmento caudal. *Probezzia* sp_1: c. Cabeza y segmento caudal. *Probezzia* sp_2: d. Cabeza y segmento caudal. *Alluaudomyia* sp: e. Cabeza y segmento caudal.

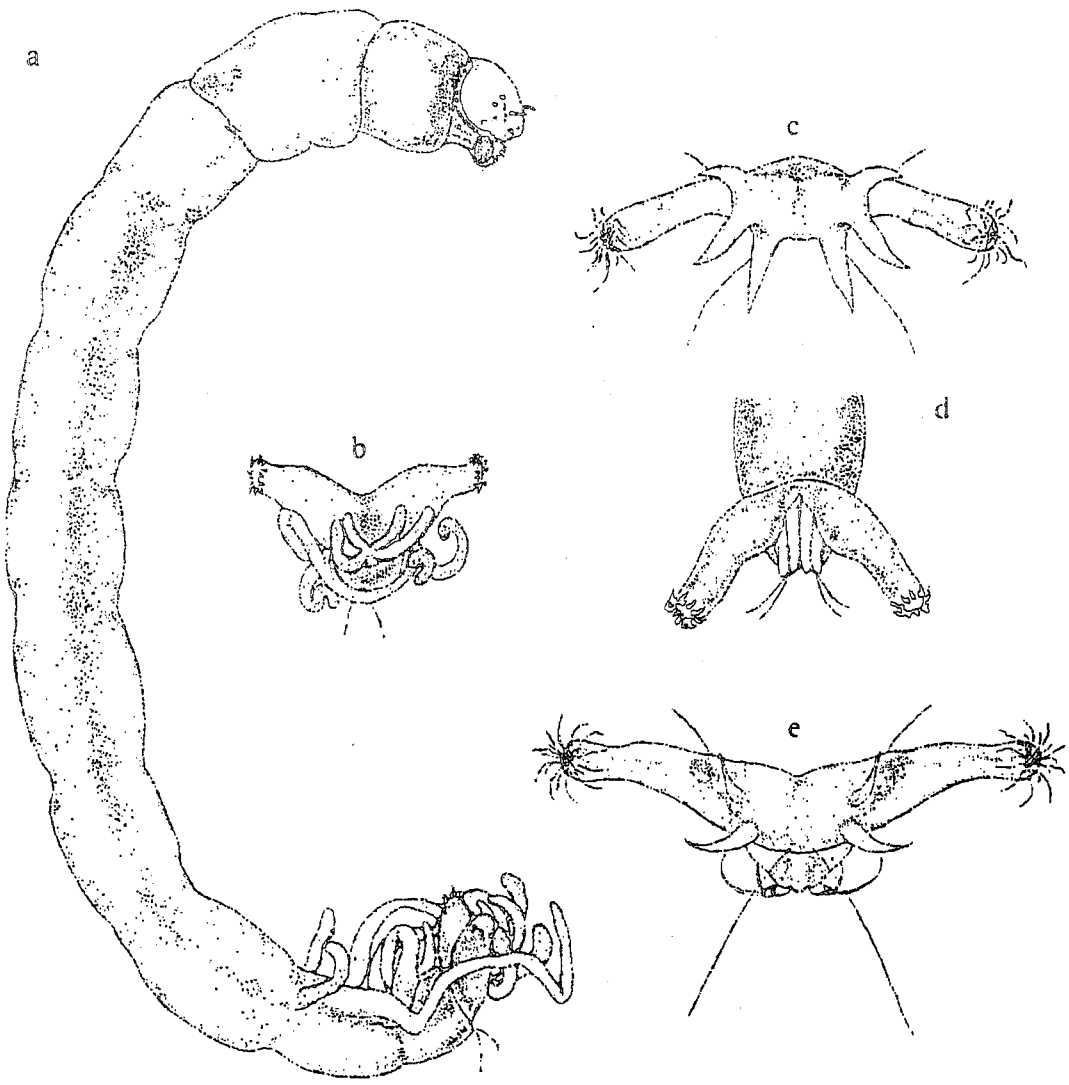
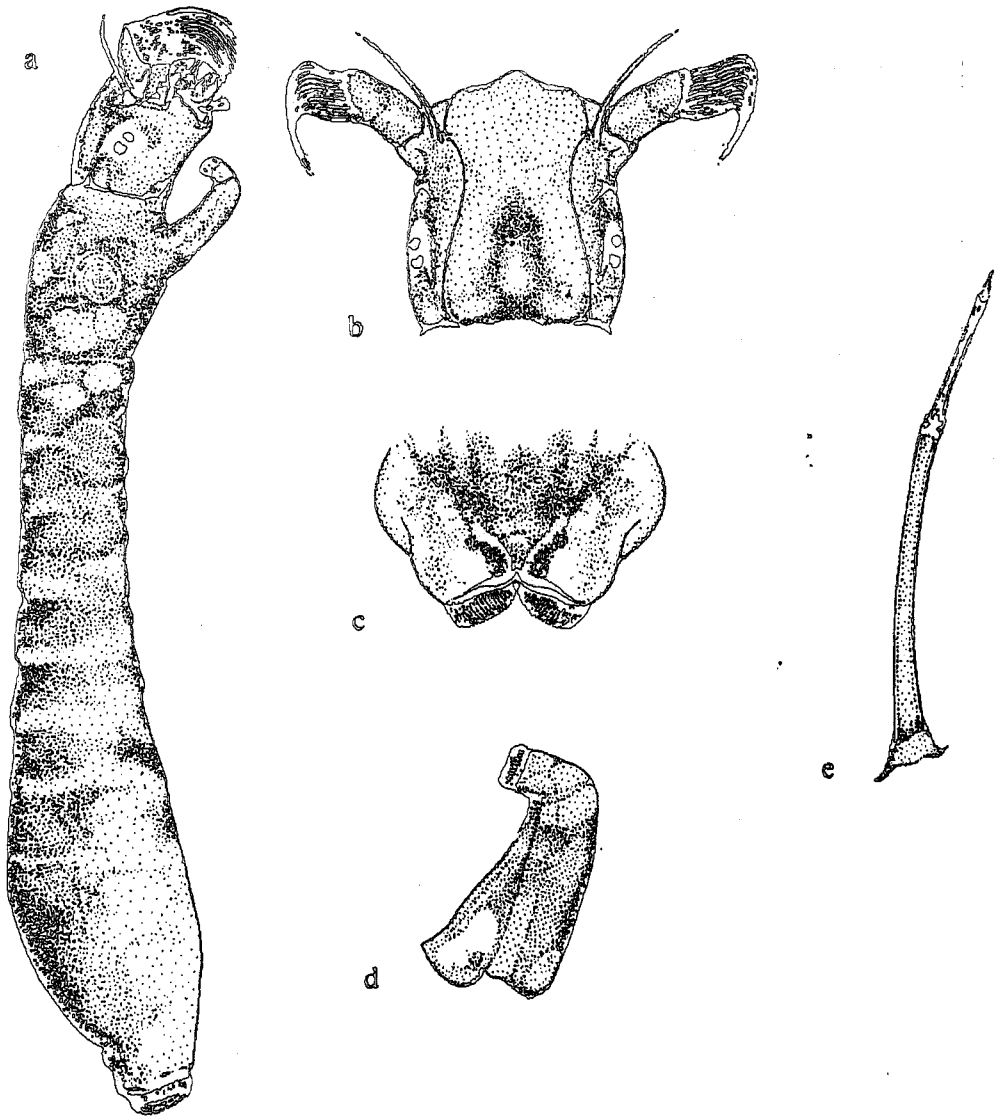


Fig. 154.
Chironomidae:
Diferenciación de
segmentos caudales.
a. Larva.
b. Subfamilia
Chironominae.
c. y e. Subfamilia
Tanypodinae.
d. Subfamilia
Orthocladinae.

Fig. 155.
Simuliidae:
Simulium sp.
a. Vista lateral.
b. Vista dorsal de la cabeza.
c. Segmento anal.
d. Propata protoráxica.
e. Antena.



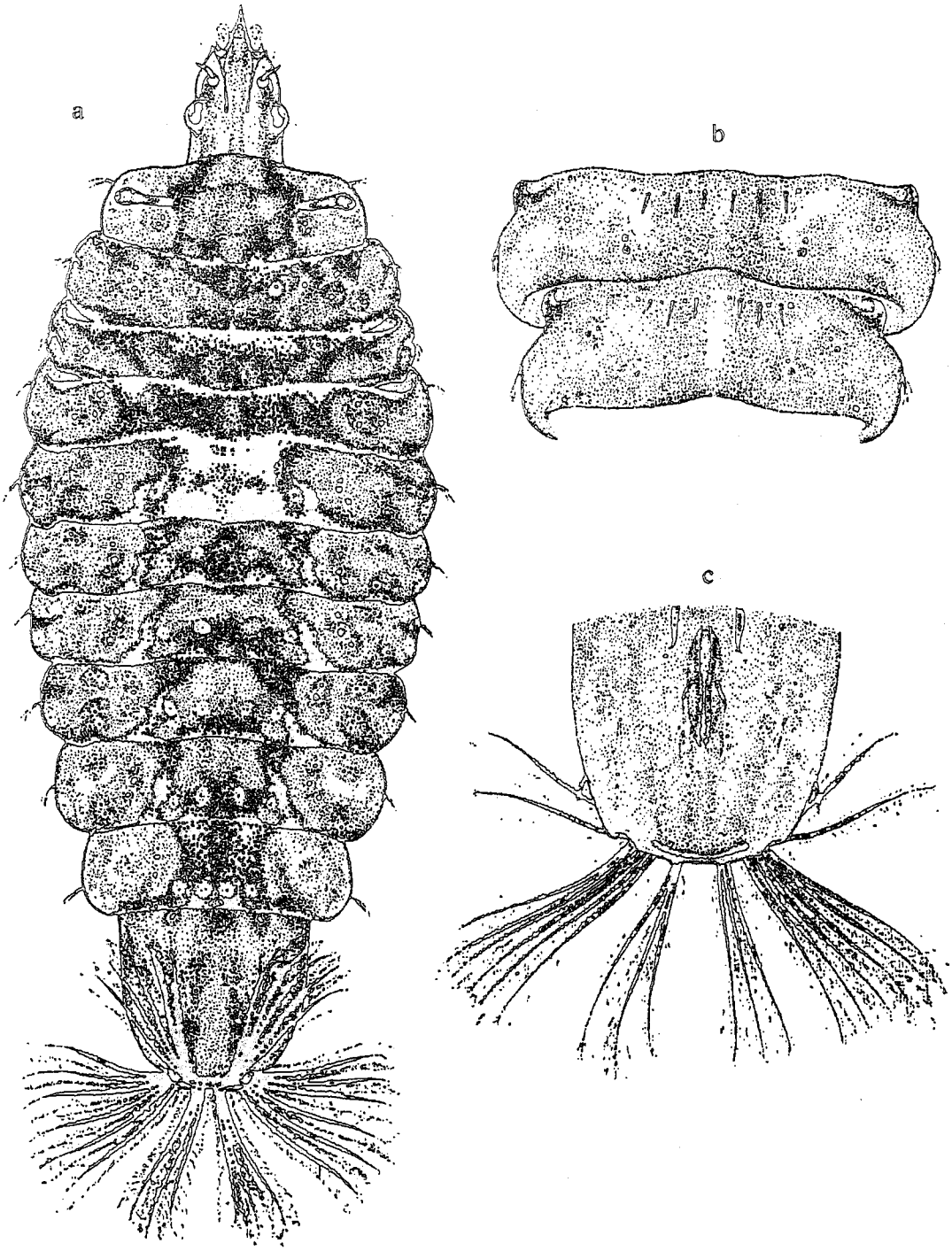
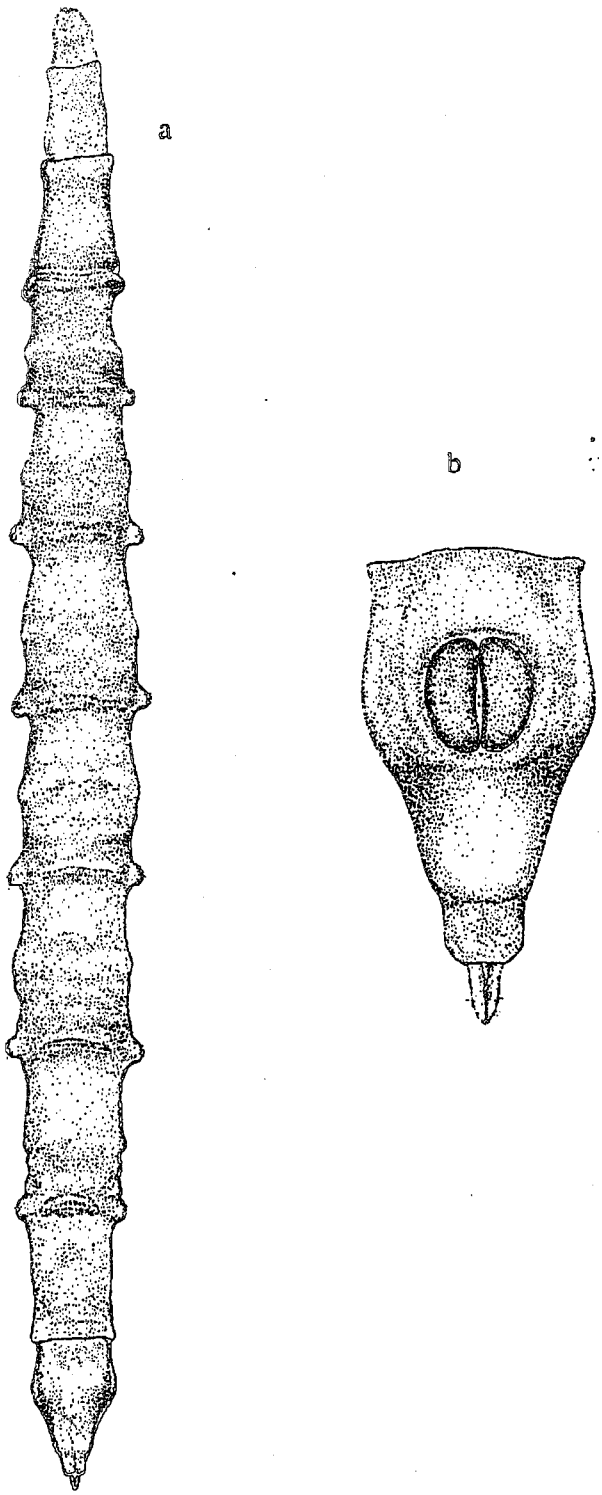


Fig. 156. Stratiomyidae: *Odontomyia* sp.
a. Vista dorsal.
b. Segmentos abdominales ventrales.
c. Cámara respiratoria.

Fig. 157.
Tabanidae:
Chrysops sp.
a. Aspecto dorsal.
b. Segmento terminal (placa anal y sifón).



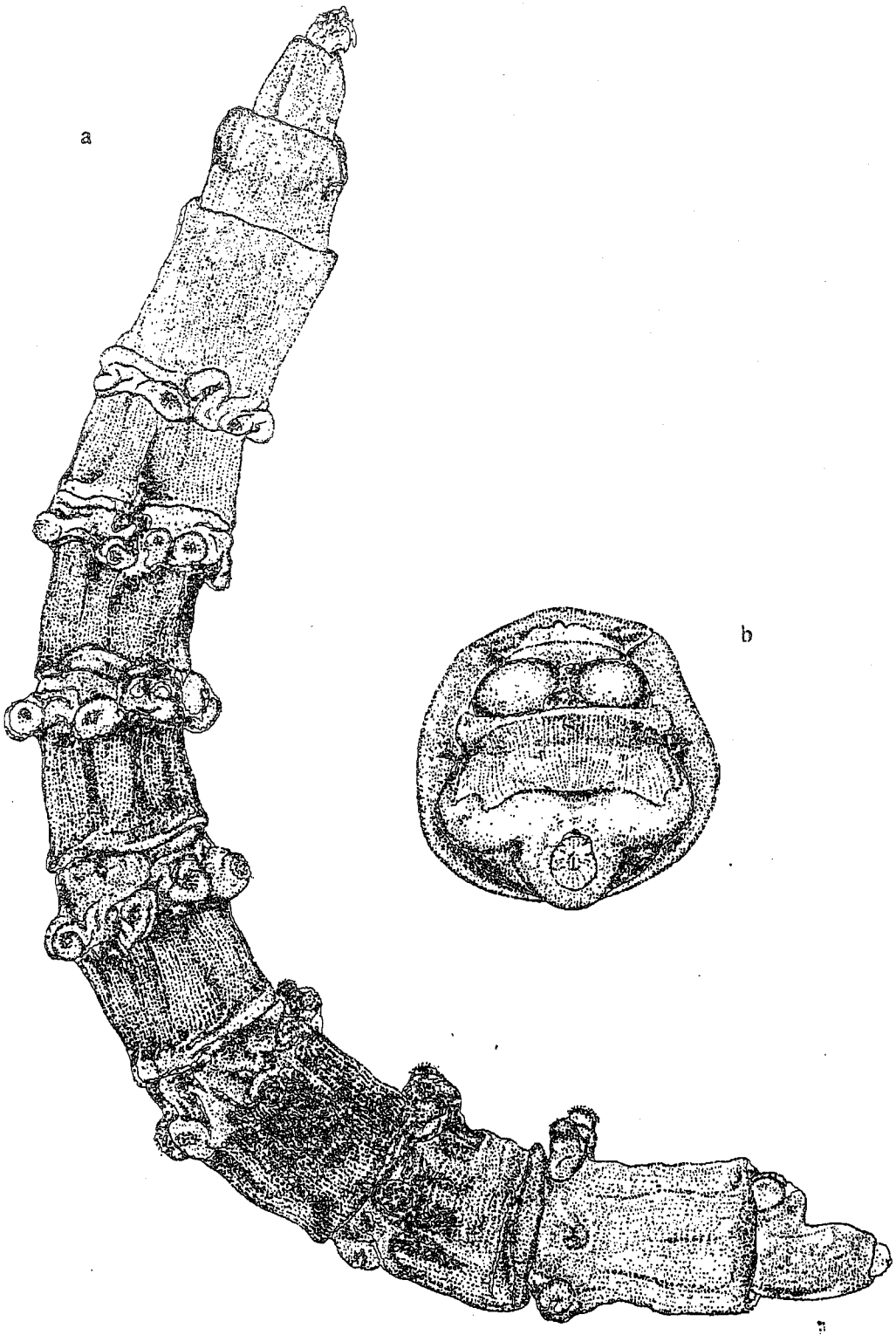
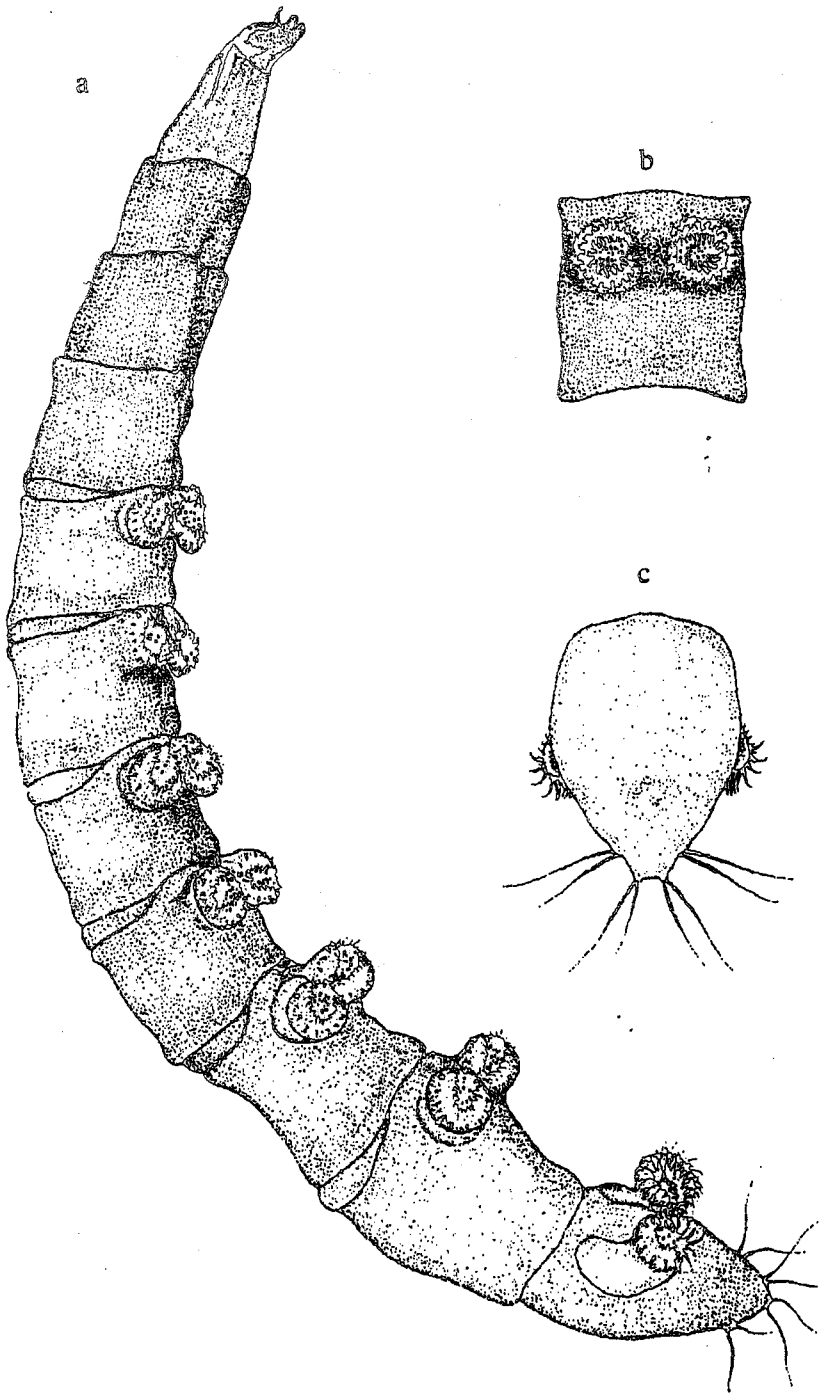


Fig. 150.
Tabanidae:
Tabanus sp.
a. Aspecto lateral.
b. Segmento terminal (placa anal y sifón).

Fig. 159. Empididae: *Chelifera* sp.
a. Vista lateral.
b. Segmento abdominal ventral.
c. Segmento caudal dorsal.



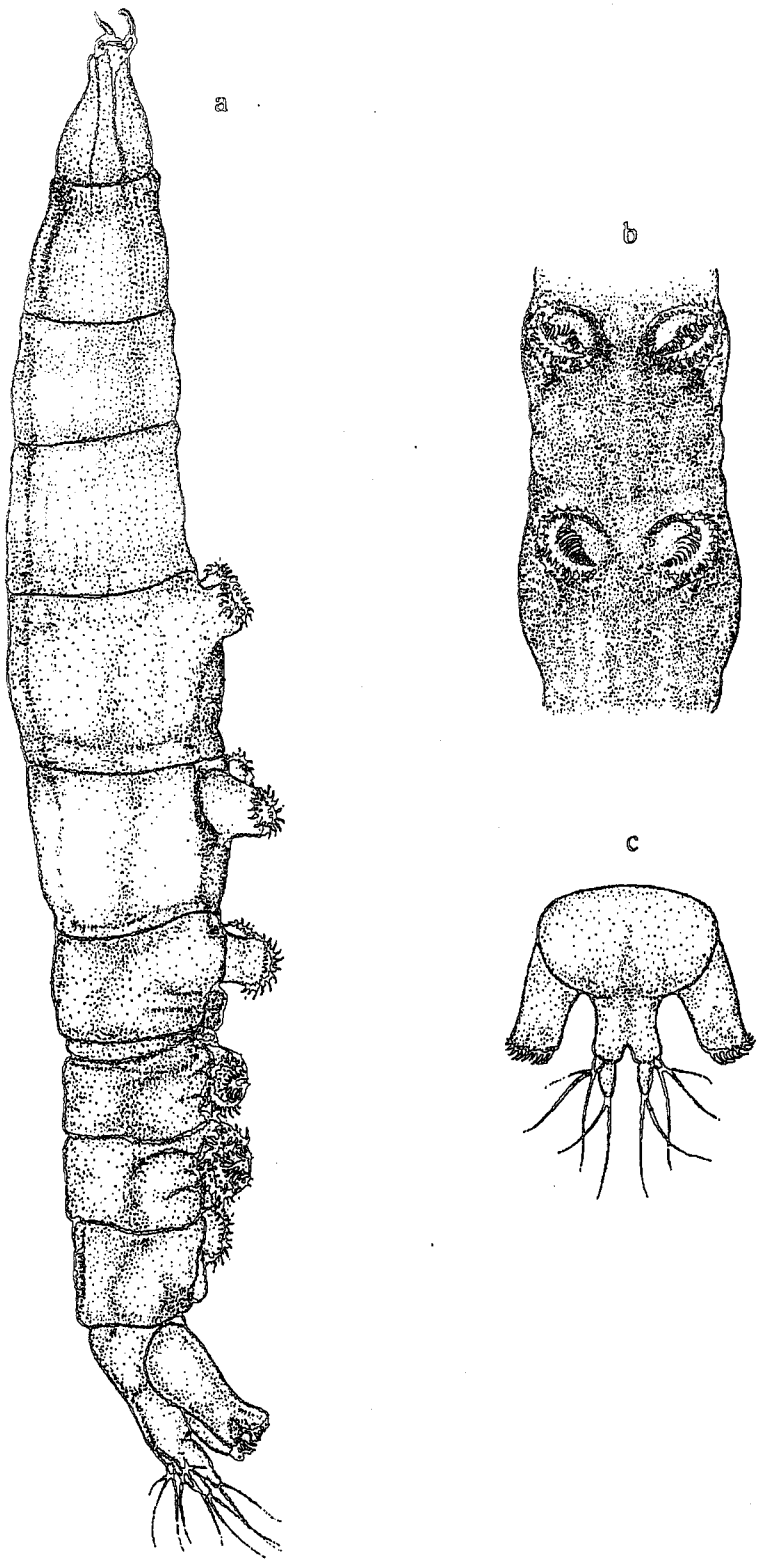
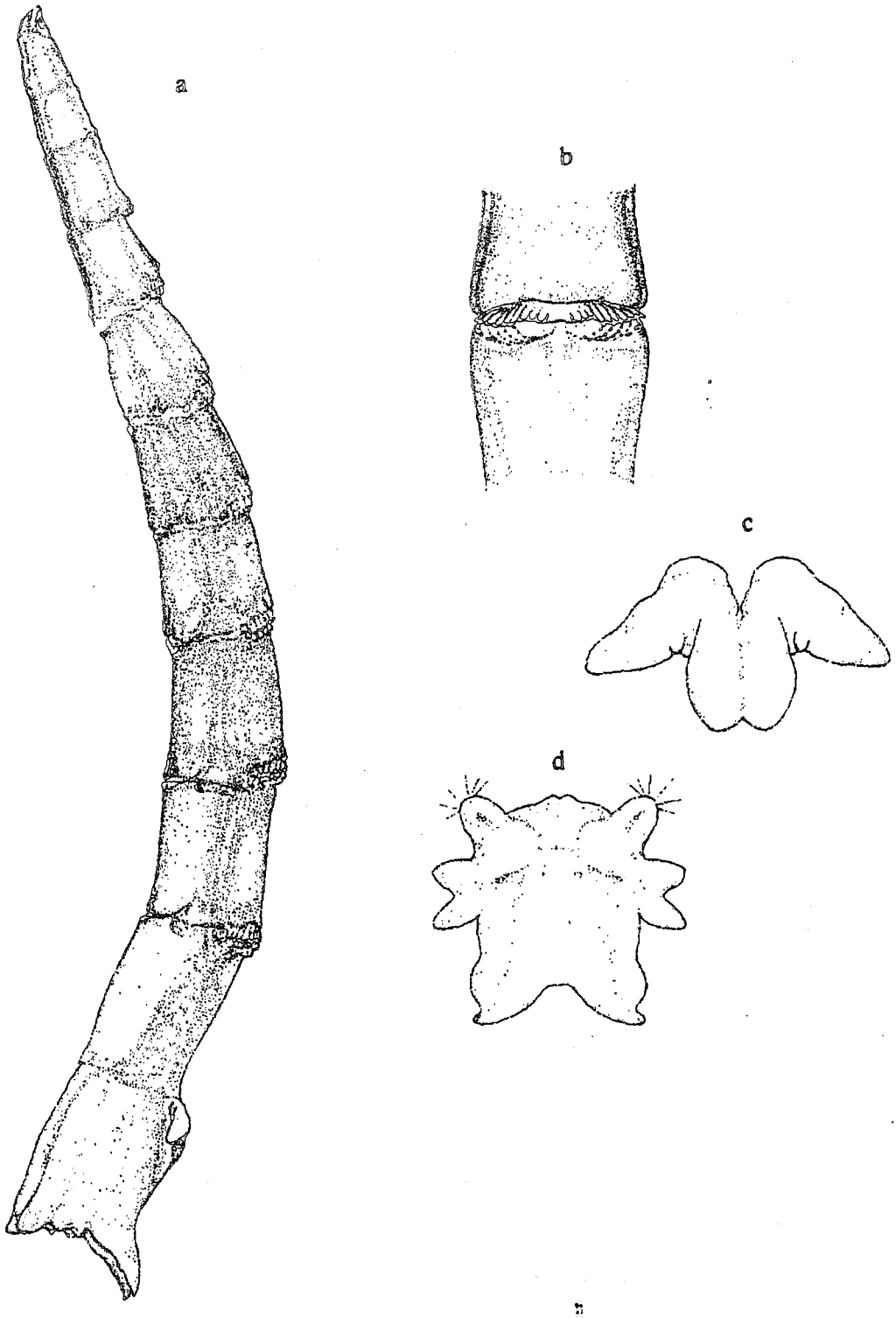


Fig. 160.
Empididae:
Hemerodromia sp.
a. Vista lateral.
b. Segmentos abdominales ventrales.
c. Segmento caudal dorsal.

Fig. 161.
Dolichopodidae:
Aphrosylus sp.
a. Vista lateral.
b. Segmento abdominal ventral.
c. Placa anal.
d. Disco espiracular.



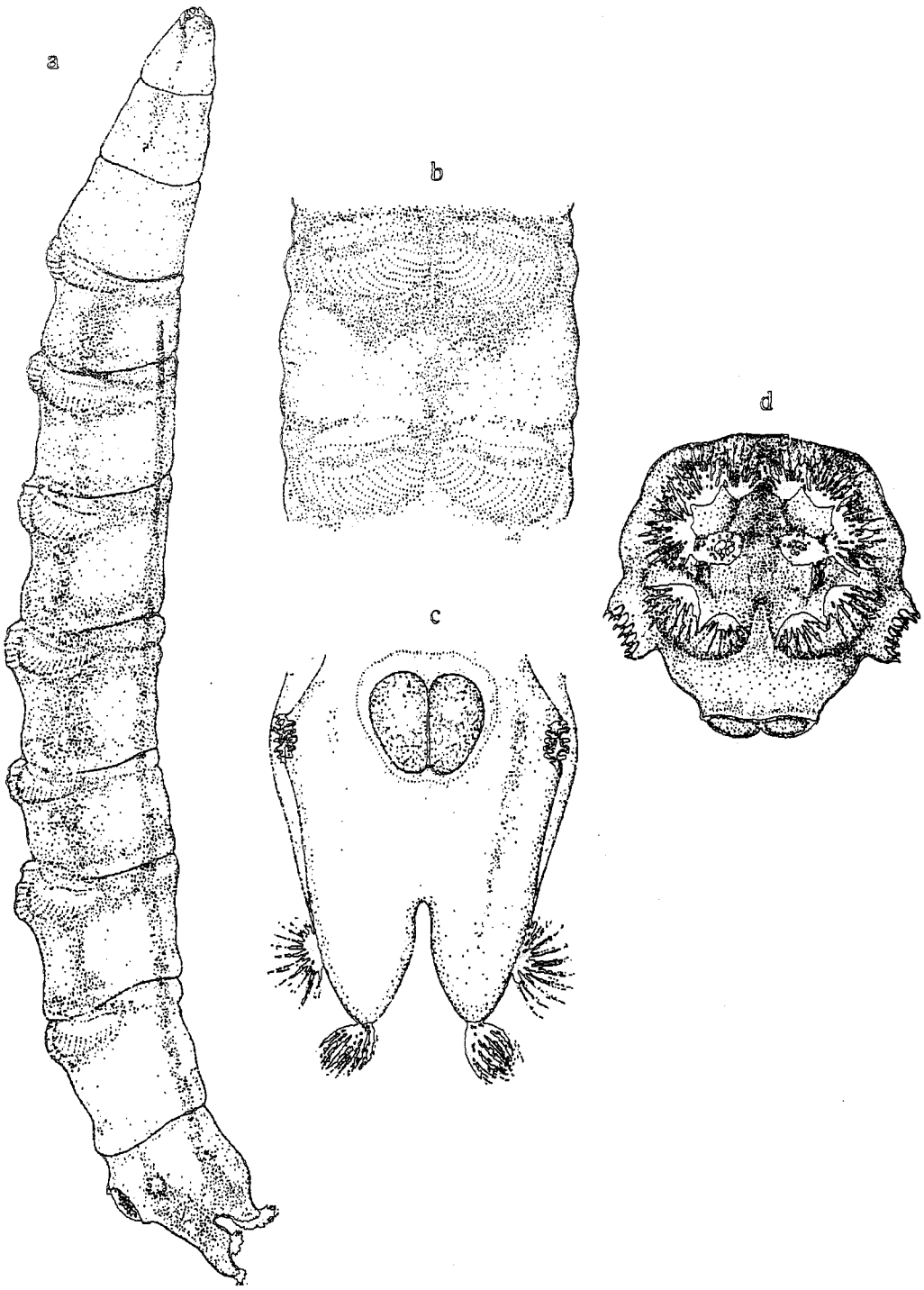
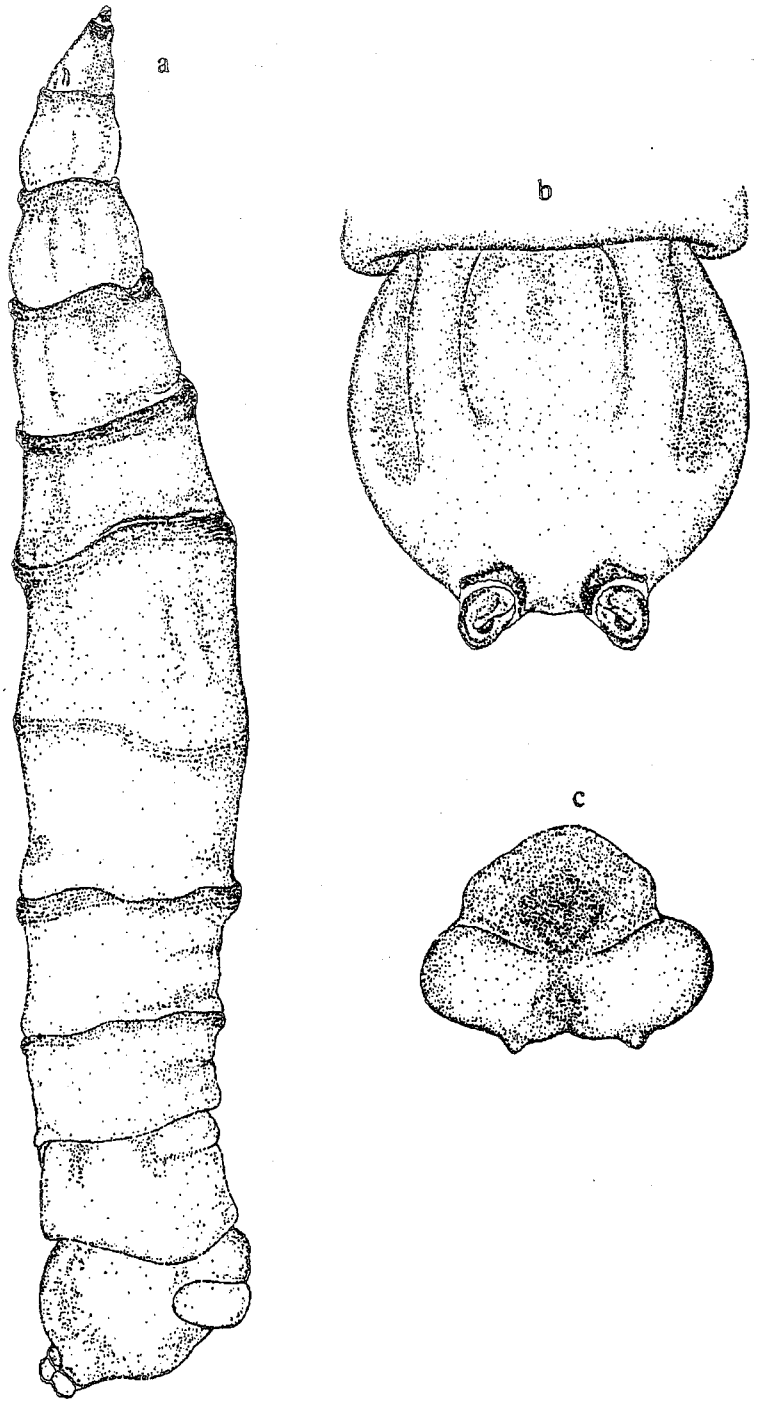


Fig. 162.
Dolichopodidae:
Rhaphium sp.
a. Vista lateral.
b. Segmentos toráxicos ventrales.
c. Segmento caudal ventral.
d. Disco espiracular.

Fig. 163.
Muscidae:
Lispe sp.
a. Aspecto lateral.
b. Segmento caudal dorsal.
c. Placa anal.



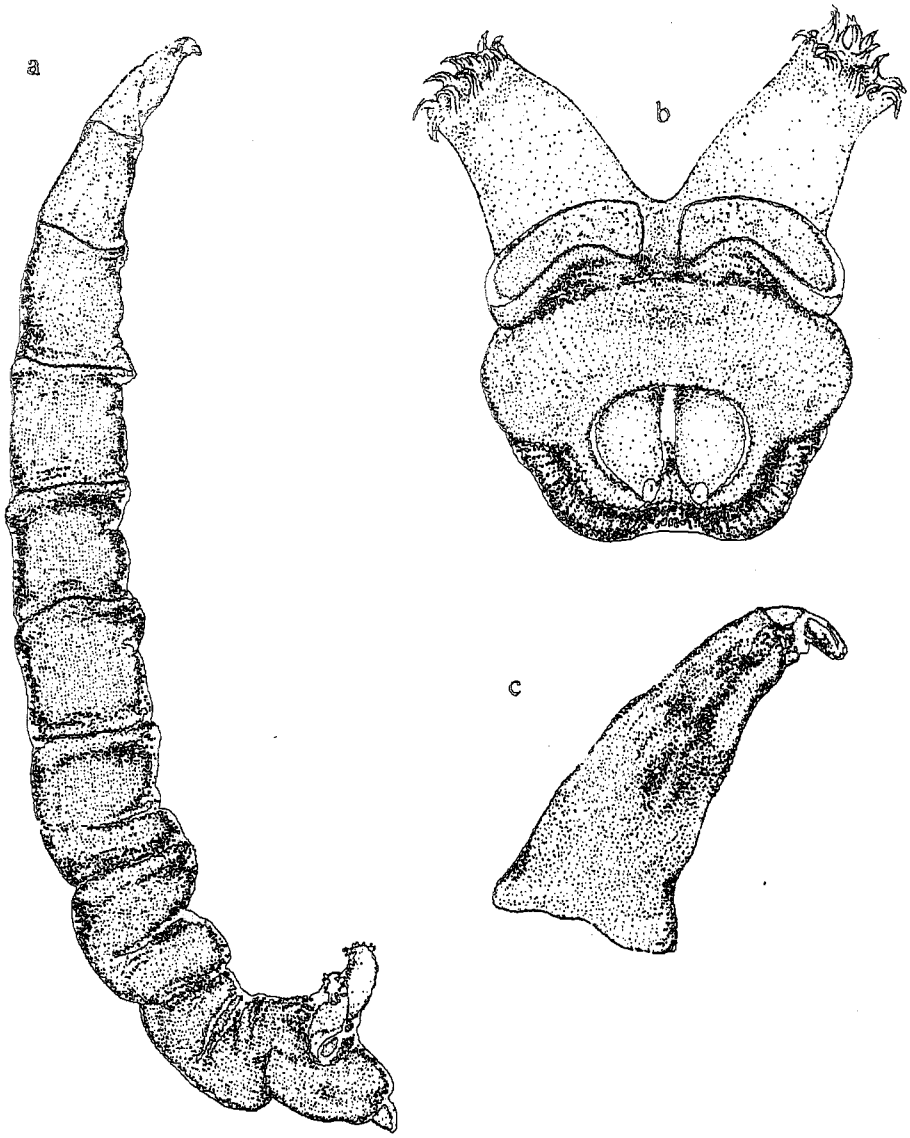
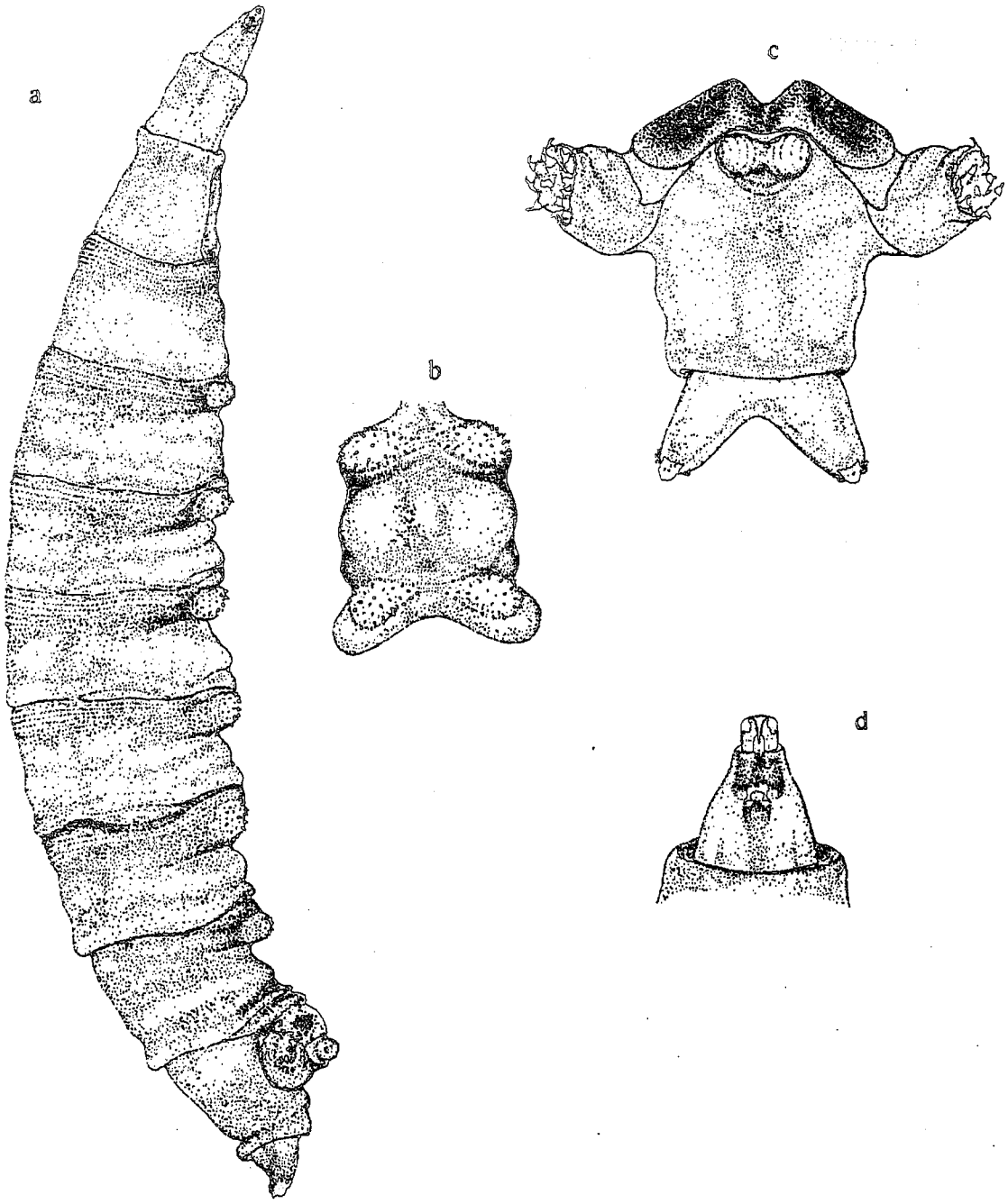


Fig. 164.
Muscidae:
Limnophora sp_1.
a. Vista lateral.
b. Segmento caudal ventral.
c. Cabeza.

Fig. 165.
Muscidae:
Limnophora sp$_2$.
a. vista lateral.
b. Segmentos abdominales ventrales.
c. Segmento caudal ventral.
d. Cabeza.



ORDER NEUOPTERA

1a. Mouth parts chewing type. Fig. 385. 2

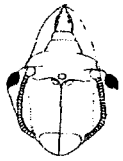


Fig. 385. Dorsal aspect of head.

1b. Mouth parts mandibulo-suctorial type. Fig. 386. 4

2a. Abdomen with lateral filaments (see Fig. 389). 3

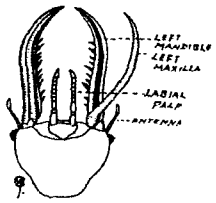


Fig. 386. Mandibulo-suctorial type mouth parts.

2b. Abdomen without lateral filaments. Fig. 387. .....Family RAPHIDIIDAE

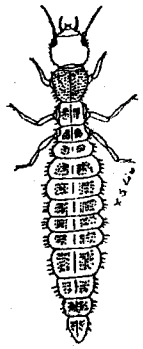


Fig. 387. Raphidia oblita Hagen.

There are 10 species described in the United States, and 12 species in Europe. *Raphidia hermandi* Navas is known in Japan. The adults are called snakeflies. The larvae are found under bark and they are common in California under loose bark of the eucalyptus. They are predacious and believed to be beneficial.

1a. Aparato bucal para morder. Fig. 385 2

1b. Aparato bucal con mandíbulas modificadas para chupar. Fig. 386.....4.

2a. Abdomen con filamentos laterales. Fig. 389. ..... **N.B. Orden MEGALOPTERA** 3

2b. Abdomen sin filamentos laterales, Fig. 387. ..... Fam. RAPHIDIDAE

3a. Tip of abdomen with a caudal filament; sides of body with 7 pairs of segmented filaments; without anal prolegs. Fig. 388. .....Family SIALIDAE

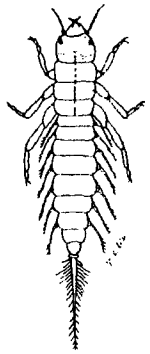


Fig. 388. Smoky alderfly, *Sialis infumata* Newman.

The larvae live in swiftly flowing streams adhering to the lower side of stones and also in trashy places filled with aquatic plants. The full-grown larva leaves the water and transforms in an earthen cell on the banks of the streams or lakes. Two or three weeks later the adult emerges. It is called an alderfly. The larvae are predacious and feed upon different kinds of small animals.

3b. Tip of abdomen without a caudal filament; sides of body with 8 pairs of unsegmented filaments; with a pair of hooked anal prolegs. Fig. 389. .....Subfamily Corydalinae, SIALIDAE

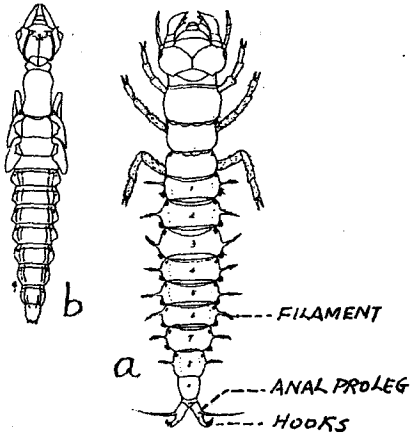


Fig. 389. **Corydalus cornutus** (L.): a, larva; b, pupa.

About 80 species of dobsonflies have been described. The larvae are found under stones in slow or swift water and are predacious on naiads of dragonflies, stoneflies and Mayflies. These larvae which are known as helgramites are much used for bait in fishing. They are rather readily caught by holding a net down stream below stones in rapids. When the stones are moved the helgramites swim or are washed into the net.

3a. Termino del abdomen con un filamento caudal; lados del cuerpo con 7 pares de filamentos segmentados; sin propatas anales. Fig. 388..... ..... Fam. SIALIDAE

3b. Termino de abdomen sin un filamentos; lados del cuerpo con 8 pares de filamentos segmentados; con un par de propatas anales con ganchos. Fig. 389.....Fam. CORYDALIDAE

4a. Aquatic or semiaquatic. **5**

4b. Terrestrial. **6**

5a. Mandibles and maxillae curved slightly upwards; without abdominal gills but with spiracles; larvae live under stones in or near water. Fig. 390. ..... **Family OSMYLIDAE**

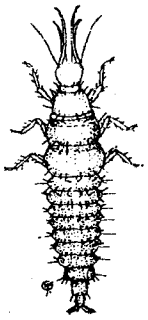


Fig. 390. **Osmylus chrysops** (L.)

There are about 50 described species but none have been found in North America. The larvae lurk under stones or about moss either in or near the water. Their food consists of dipterous larvae.

5b. Mandibles and maxillae curved outward; with abdominal gills; larvae live in water and feed on sponges. Fig. 391. ..... **Family SISYRIDAE**

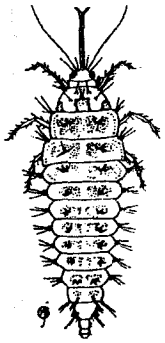


Fig. 391. **Sisyra umbrata** Ndm.

About 20 species have been described. The larvae feed upon fresh-water sponges. Accordingly the adults are called "spongilla-flies." They may be also found on bryozoans and algae. Pupation takes place in an oval loose double cocoon in soil or under stones. Eggs are laid in masses on objects standing in or overhanging fresh-water, and are sometimes covered by a silken web.

4a. Acuáticos o semiacuáticos 5

4b. Terrestres 6

5a. Mandíbulas y maxilas dobladas ligeramente hacia arriba; sin branquias abdominales: larvas viven bajo de piedras en o cerca de agua. Fig. 390 ..... Fam. OSMYLIDAE

5b. Mandíbulas y maxilas dobladas hacia el lado; con branquias abdominales; viven en agua, comen esponjas Fig. 391 ..... Fam. SISYRIDAE

6a. Abdomen more than two times longer than thorax; larvae with hypermetamorphosis. Fig. 392. .....Family MANTISPIDAE

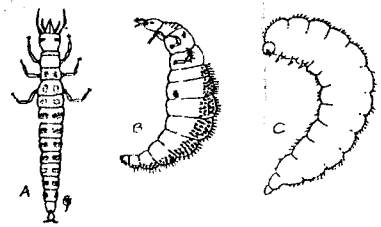


Fig. 392. **Mantispa styriaca** Poda: a, newly hatched; b, 1st instar fully fed; c, last instar.

The family consists of about 170 known species. The larvae are of two different forms: the first instar is thysanuriform with a squarish head; the second and later instars become robust and eruciform with a small head and weak legs. The fullgrown larvae spin cocoons and pupate within the last larval skin. The habits of larvae are parasitic on eggs of spiders and also in the nests of *Pilybia* wasps.

6b. Not as 6a. 7

7a. Pro- and mesothorax modified into a long and slender neck. Fig. 393. .....Family NEMOPTERIDAE

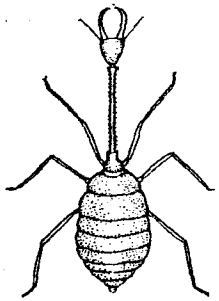


Fig. 393. **Pterocroce storeyi**, Withycombe.

The larvae are predacious and feed upon psocids and other small insects. They cover themselves with dust particles and are found in caves and buildings in semiarid regions and desert. Pupation occurs in a cocoon of silk and debris. They belong to the eastern hemisphere.

7b. Pro- and mesothorax normal. 8

6a. Abdomen más que dos veces más largo que tórax. Fig. 392. .....Fam. MANTISPIDAE

6b. No como en 6a. 7

7a. Pro- y mesotórax modificados en un cuello largo y delgado. Fig. 392 ... .Fam. NEMOPTERIDAE

7b. Pro- y mesotórax normal 8

8a. Antennae with long hairs; labial palps long and clavate, extended in front of head; mandibles and maxillae hid underneath the labrum (if long, straight and needle-like).
Fig. 394. .....Family CONIOPTERYGIDAE

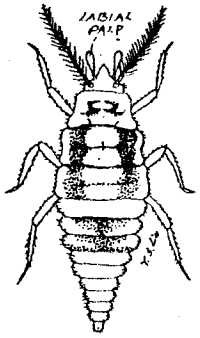


Fig. 394. **Parasemidalis flaviceps** Banks.

This family includes about 50 known species. The adults look like aphids. The structures of their larvae leads us to regard them as Neuroptera. The larvae feed upon aphids, scale-insects and the eggs of red-spiders. When full-grown they make a double cocoon in which pupation takes place.

8b. Not as 8a. 9

9a. Empodium trumpet-shaped. Fig. 395. .....Family CHRYSOPIDAE

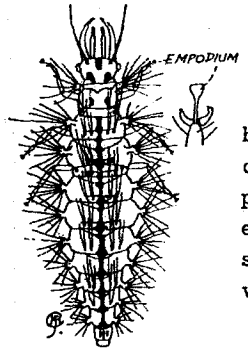


Fig. 395. Golden-eye lacewing, **Chrysopa oculata** Say.

Nearly 500 species of green lacewings have been described. Their larvae are known as aphid-lions and feed on aphids, mites, leaf-hoppers, scale-insects and other small insects. The eggs are laid singly or in group on long slender stalks. In some species the larvae are protected with trash or debris.

9b. Empodium not trumpet-shaped. 10

10a. Tarsi and tibia of hind leg fused into a single segment; mandible with teeth. 11

8a. Antenas con pelos largos; palpos labiales largos y con mazas, extendidos adelante de la cabeza; mandíbulas y maxilas escondidas bajo del labio. Fig. 394 .....Fam. CONIOPTERYGIDAE

8b. No como 8a.....9

9a. Empódio con forma de trompeta .....Fam. CHRYSOPIDAE

9b. Empódio no como una trompeta.....10

10a. Tibio y tarso de la pata trasera fusionados en un solo segmento; mandíbulas con dientes.....11

10b. Not as 10a. Fig. 396. .....Family HEMEROBIIDAE

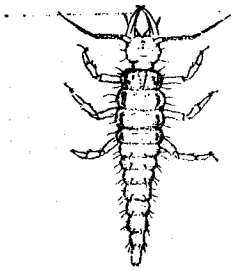


Fig. 396. **Hemerobius pacificus** Banks, 1st instar.

This family consists of about 220 known species. Their adults are called brown lacewings. The larvae resemble the aphid-lions but are smooth without tubercles. Only the 1st instar larvae possess trumpet-shaped empodia which becomes pad-like and greatly reduced in the later instars. They are predacious and feed on aphids, scale-insects, mealybugs, whiteflies, psyllids, etc. The eggs are devoid of pedicels.

11a. Sides of thorax and abdomen with projecting filaments; head dilated posteriorly. Fig. 397. .....Family ASCALAPHIDAE

Fig. 397. **Ululodes hyalina** Latr.

About 210 species have been described. The larvae resemble ant-lions in the form of the body, but they have a finger-like appendage on each side of the segment. They live in ambush on the surface of the ground, with the body more or less covered, and wait for small insect prey.

11b. Sides of thorax and abdomen without projecting filaments; head not dilated posteriorly. Fig. 398. .....Family MYRMELEONTIDAE

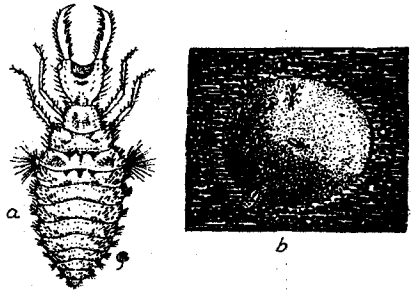


Fig. 398. a, Ant-lion, **Myreleon** sp.; b, A pitfall.

This family consists of about 650 described species. The larvae are known as ant-lions. They make pitfalls in sand to trap the ants and other wingless small animals. However, some species do not make pits but simply hide under sand or debris.

10b. No como 10a. Fig. 396 ..... Fam. HEMEROBIIDAE

11a. Lados del tórax y abdomen con filamentos sobresaliendose; cabeza dilatada posteriormente. Fig. 397 ..... Fam. ASCALAPHIDAE

11b. Lados del tórax y abdomen sin filamentos; cabeza no dilatada posteriormente. Fig. 398 ..... Fam. MYRMELEONTIDAE

GLOSARIO

Ampullae: Son expansiones o áreas ventrales carnosas similares a las seudopatas de lepidópteros, se presentan en la parte ventral del abdomen de algunos lepidópteros.

Asperites: Espinas subanales, encontradas en la fase ventral o lateral en los segmentos caudales, entre los coleópera pueden presentarse dorsalmente en todos los segmentos abdominales.

Botón: Area esclerotizada o cicatriz circular que marca el lugar donde se abre la tráquea en la superficie de la larva del primer estado larvario.

Carina: Cresta o quilla elevada, no necesariamente alta o aguda.

Carina bucal: Estructuras en forma de crestas que terminan en ganchos carnosos en el perístoma.

Cercos: Estructuras pares, filamentosas, generalmente multisegmentadas localizadas en el noveno segmento.

Cornículo: Es una chalaza sin seta.

Corchete (Crochete): Serie de ganchos esclerosados, en diferentes arreglos (hileras, círculos, etc.) encontrados en las pseudopatas de las larvas de los lepidópteros.

Cremaster: Espina terminal del abdomen de la pupa que le sirve para suspenderse o adherirse.

Chalaza: Tubérculo carnoso de la pared del cuerpo en el que nace una cerda.

Entrada espiracular: Uno de los pasajes que conducen a la tráquea espiracular principal.

Escleroma: Anillo esclerotizado de un segmento del cuerpo.

Escolo: Proyección de la pared del cuerpo en forma de tubérculo alargado y espinoso.

Espinarete: Orificio que se encuentra en el labio, presentado en la parte libre, en relación con la hipofaringe, a través del cual es expulsado el hilo de seda.

Espínula: Una espina en forma de gancho. En larvas de dípteros ellas están colocadas en filas irregulares las cuales forman bandas en la unión de los segmentos.

Espiráculo anular: Dícese de aquel espiráculo que puede ser circular o anuliforme, puede presentar una o dos cámaras; anular uniforo, anular biforo o anular multiforo.

Espiráculo bilabiado: Cuando un espiráculo oval o anular presenta un peritrema en forma de labio.

Espiráculo cribiforme: Cuando un espiráculo presenta orificios con aspecto general de criba.

Ganchos bucales: Estructuras secundarias, sólidas, cuticulares, en forma de garras, una a cada lado de la apertura atrial; son los substitutos de las mandíbulas en las larvas de dípteros.

Gibosidad: Procesos en forma de intumescencias dorsales.

Hipognato: Con las piezas bucales, particularmente las mandíbulas, dirigidas hacia abajo.

Imago: Es el insecto adulto.

Lateroserie: Línea externa de los corchetes de una elipse, cuando han desaparecido de sus extremos los corchetes.

Lóbulo: Cualquier proceso o excrecencia redonda, prominente en un margen o estructura.

Lóbulo anal: Organo de dos partes, redondeado, carnoso, que es la terminación del canal alimentario. Generalmente es visible, pero a veces está retraído y encogido dentro de la elevación anal que lo circunda.

Mesoserie: Línea interna de los corchetes de una elipse, cuando han desaparecido de sus extremos los corchetes.

Mesoserie heteroidea: Cuando los ganchos del centro de la mesoserie se presentan más desarrollados.

Mesoserie homoidea: Cuando todos los ganchos de la mesoserie son iguales.

Mola: Estructura fuertemente esclerosada en la base interna de algunas mandíbulas, está adaptada para triturar alimentos.

Nasale: Proyección mediana en el margen cefálico (de la frente; consiste de frente, clypeo y labro).

Neoténica: El insecto no tiene metamorfosis, el adulto mantiene la forma de la larva.

Ordinal: Se refiere al número de hileras producido en función de la variación del tamaño de los corchetes, uniordinales (cuando todos los ganchos se presentan del mismo tamaño), biordinales (cuando están arreglados en una única hilera alternada de ganchos de dos tamaños).

Osmeterio: Glándula odorífera eversible, en forma de "V", que existe en el tórax de los lepidópteros de la familia Papilionidae.

Papila: Proyección diminuta, suave y en forma de pezón.

Papíula: Tubérculo o estructura en forma de pústula, con una elevación central en forma de pezón.

Papillae: Proyección blanda pequeña que funciona como órgano de los sentidos, pueden encontrarse en los segmentos antenales uno y dos.

Peristoma: La orilla de la boca o el margen oral.

Peine anal: Proceso digitiforme localizado ventralmente en la parte media y final del ano.

Penelipse: Cuando la serie de ganchos forma más de un semicírculo y menos que un círculo.

Penelipse lateral: Cuando el círculo es incompleto y está abierto hacia el área mesal.

Penelipse mesal: Círculo incompleto, abierto hacia el margen lateral.

Penicilliun: Grupo de zetas en la fase interna de la mandíbula.

Peritrema: Placa esclerotizada que rodea la entrada espiracular.

Pinácula: Area más o menos plana donde nace una seta.

Planta o suela: Parte libre de las falsas patas (ventralmente), que funcionan como ventosas, donde se fijan los corchetes.

Plaqueta: Anillo alveolar esclerotizado en la base de la seta.

Plica: Pliegue, doblés o arruga sobre los segmentos del cuerpo.

Prognato: Con las piezas bucales, particularmente las mandíbulas, dirigidas hacia adelante.

Prosteca: Proyección esclerosada en forma de membrana franjeada, que cubre un área pequeña o grande de la proción mesal de la mandíbula.

Seudopatas: Patas generalmente carnosas, que tienen las larvas de ciertos insectos en algunos de los segmentos abdominales.

Pústula: Una protuberancia de la piel en forma de grano.

Raster: Aspecto ventral del segmento caudal de los Scarabaeidae, posee muchas setas de importancia sistemática.

Retináculo: Fase interna de las mandíbulas, con una proyección rígida en forma de diente situado en el medio del margen interno.

Serie: Término usado en la descripción de los corchetes, se refiere al número de hileras de ganchos. La mayoría son unisérial (una sola hilera), biserial (dos hileras) círculo multiseriado (tres o más hileras concéntricas).

Setas o cerdas (primarias, subprimarias y secundarias): Estructuras en forma de pelo encontradas en el cuerpo del insecto. Las primarias son las únicas que presentan distribución definida en la cabeza, tórax y abdomen; las subprimarias sólo aparecen en el segundo instar y se localizan en determinados puntos, las secundarias no se sitúan en posición constante.

Tubérculo: Protuberancia corta sobre el tegumento.

Tubitos: Pequeñas proyecciones en forma de tubo, en el ápice del espiráculo anterior. Cada tubito posee una abertura diminuta en forma de incisión en su extremidad.

Uncus: Gancho curvado sobre el margen interior distal de la lacinia o mola de la maxila

Urogomfos: Estructuras fijas no segmentadas localizadas en el noveno segmento.

Verruga: Grupo de setas finas que nace en una superficie elevada del tegumento.

Verrícula: Grupo de setas erectas que nace en una superficie plana del tegumento.