

Det Kongelige Danske Videnskabernes Selskab

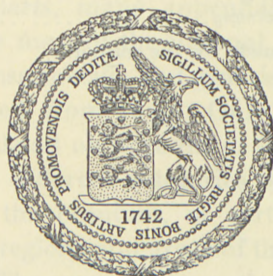
Biologiske Meddelelser, bind **22**, nr. 2

Dan. Biol. Medd. **22**, no. 2 (1954)

MATURE LARVAE
OF THE BEETLE-FAMILY
ANOBIIDAE

BY

ADAM G. BÖVING



København

i kommission hos Ejnar Munksgaard

1954

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The drawings have been made by the author.

The present work is dedicated
to
Doctor R. E. SNODGRASS
Outstanding Investigator of the Anatomy of Arthropods.
Author, Teacher and Illustrator.
Upright and noble in his dealing with
other men of science.

Preface.

This paper has been prepared for the purpose of presenting the results of an anatomical analysis and taxonomic investigation of the mature larvae of the species belonging to the beetle-family Anobiidae, which are kept in the collection of immature Coleoptera in the U. S. National Museum. It is by no means intended or planned to be a monograph about the anobiid larvae on the whole.

The general taxonomic characterization and the special descriptions of the larvae are considered the core of the study, and the aim of the anatomical dissections, observations and comparisons has been primarily to procure reliable systematic characters to separate the different forms and, in addition, to arrive at a terminology based on a rational comparative anatomical evaluation of the general organization of the body and its special appendages.

It is principally the exterior of the body which has been studied, its cranial parts, many appendages, and the areas of the body-trunk, while most of the internal organization has been little considered because specific and generic taxonomic characters could not be obtained from them. Only the musculature has been investigated in detail on account of the intimate connection which exists between different categories of muscles and certain component parts of the cranium, or certain sulci which limit and define important regions and areas of the trunk, or the various elements of the leg. The muscles have therefore both indicative and corroborating qualities when it comes to defining the exterior body parts.

The taxonomically important feeding apparatus includes both external and internal elements, and the appendicular organs, the

epipharyngeal and hypopharyngeal structures and the alimentary canal have been thoroughly studied.

The taxonomic part of the paper has been elaborated exclusively from my own dissections of material before me. Supplementary information has not been found in the literature, and reference to previous taxonomic papers on the subject has therefore been deemed unnecessary¹. The actual data given in the comparative anatomical part are likewise brought out by examinations of my own dissections but in the search for the location of single muscles and muscle-associations and what they might mean for the interpretation of the fundamental anatomical organization, I have constantly consulted and been guided by information obtained from publications by VOSS², KORSCHOLT³, SNODGRASS⁴, ANDERSON⁵, and DORSEY⁶.

Preliminary studies of the anobiid larvae were made from time to time when I was in charge of the collection of immature stages of Coleoptera in the U. S. National Museum but I began first to occupy myself continuously with the group after my retirement from official work in 1945. From then on I did all my research in a small laboratory in my home, which is located in a quiet and more or less remote part of the city. On account of some heart- and sight-difficulties I did not often risk the trip downtown to the Museum in the heavy traffic of the city center, and it would not have been easy for me to have continued my

¹ Attention should, however, be called to the very useful, weighty paper by E. A. PARKIN on the larvae of eight wood-boring European Anobiidae (Bull. Ent. Res., vol. XXIV, pp. 33-68, 1933) in which, besides excellent descriptions of the eight larvae, several items not considered in the present contribution have been dealt with, f. inst. the technique of preparing the larval material, the economic importance and the various shapes of the excremental pellets. It also contains an annotated list of literature on anobiid larvae.

² VOSS, F.: Über den Thorax von *Gryllus domesticus*; Zeitschr. wiss. Zool., vol. 78, pp. 258-521, 1904, and vol. 78, pp. 645-759, 1905.

³ KORSCHOLT, E.: Bearbeitung einheimischer Tiere; *Dytiscus marginalis*, Leipzig, 1924.

⁴ SNODGRASS, R. E.:

a) Principles of Insect Morphology, New York, 1935.

b) The insect cranium and "The epicranial suture", Smithsonian Misc. Coll., vol. 107, 1947.

c) A textbook of Arthropod Anatomy, Comstock Publishing Association, Ithaca, New York, 1952.

⁵ ANDERSON, Wm. H.: A comparative study of the Labium of coleopterous larvae, Smithsonian Misc. Coll., vol. 95, 1937.

⁶ DORSEY, C. K.: The musculature of the Labrum, Labium and pharyngeal region of adult and immature Coleoptera, Smithsonian Misc. Coll., vol. 103, 1943.

contact with it without the unceasing help of my successor, Dr. WM. H. ANDERSON. He brought me the books and larval specimens I needed, went over essential parts of my manuscript giving me the benefit of his criticism and suggestions, he even dissected and mounted some rare or difficult to handle material which I hesitated to tackle myself.

The authorities of the "Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture" and of the "Smithsonian Institution" have always shown me the greatest consideration. I am very grateful to the two representatives, Mr. C. F. W. MUESEBECK from "the Bureau" and Dr. E. A. CHAPIN from "the Smithsonian", with whom I had most to do, for their unflagging interest and cooperation.

I wish to acknowledge with thanks the gift of larvae from Denmark, which my old friend, the late Mr. J. P. KRYGER, had sent me, and which now are included in the collection of the Museum, and I wish also to express my gratitude to Mr. R. A. CROWSON of the University of Glasgow who most graciously has presented me with larvae, pupae and imagines of the species *Ochina ptinoides* Marsh., from Ivy in Scotland; this material has likewise been incorporated in the collection of the Museum.

To the members of the "Kongelige Danske Videnskabernes Selskab" ("Royal Danish Academy of Sciences and Letters") who have consented to do me the honour of printing my paper in the series "Biologiske Meddelelser" (bibliographic abbreviation: Dan. Biol. Medd.) of their publications, I am respectfully obliged.

ADAM G. BÖVING
221 Rock Creek Church Road
Washington, D. C.
U. S. A.

Introduction.

It is evident from what was emphasized in the beginning of the preface that a discussion cannot be undertaken in this paper about so wide-ranging a problem as the morphological and taxonomic position of the superfamily Bostrichoidea to which the family Anobiidae belongs. In fact, in the present state of our knowledge, the best that can be done concerning the classification of the larvae of the Bostrichoidea is to give them a preliminary place in the beetle order that merely reflects the current opinions of the majority of competent taxonomists.

On the other hand, the superfamily Bostrichoidea is in itself, regardless of its uncertain position in the order, one of the best defined family-groups in the system, at least according to the larval forms. These larvae possess namely, together with other fundamental characters, the unique one of being equipped in front of anus with the so-called nates, a buttockslike, double-folded and elongate elevation that bears between the folds a sclerotized ribbonlike prolongation of the ventral wall-part of rectum (Pl. 1 and Pl. 11, figs. 1-4).

The taxonomic arrangement of the families which are included in the well-defined superfamily is, however, less settled as, at least, the validity of the family *Ptinidae* is questionable according to the characters of the larvae which are so closely related to the larvae of the Anobiidae that they can be separated from the latter only by the two specific, but weak, characters that the first thoracic spiracle is located laterally close to the anterior margin of prothorax in the known ptinid larvae but not in the anobiid larvae and that their buttockslike anal cushion is somewhat asymmetrical in the known ptinid larvae, symmetrical in all anobiid larvae. But, in addition to this couple of special characters, the ptinid larvae can be separated from the anobiid

larvae by a combination of characters derived from a set of features, each found in one or other of the anobiid larvae but never combined in any member of this family in the way they are in all ptinid larvae. The characters which constitute the combination are the following: Frontal cleavage lines always absent, mandible with only a single apical tooth and the rather short subapical margin produced posteriorly into a toothshaped process, marginal brush absent, lacinia vestigial, only represented by a strong spine, the prodorsal areas of the body trunk and sides of ninth abdominal segment hairy and never armed with hook shaped asperities, pretarsus provided with arolium and a single seta¹.

Leaving the family Ptinidae and the question of its doubtful taxonomic position out of consideration, the larvae of the family Anobiidae, as generally conceived, constitute a very well-marked group of genera and species which readily can be recognized by the combination of the following characters²:

1) The *mandibles* are, normally, dentate, at least with two apical teeth and never possess a veritable mola which grinds against an anvil-like hypopharyngeal sclerotization.

2) A single *ocellus* equipped with a convex, round cornea is located on each side in many species.

3) The *mesothoracic spiracle* has moved forward into prothorax but not as far as to near the anterior margin of prothorax.

4) The *body trunk* is more or less curved, soft and, subcircular in cross-section, and the thoracic and abdominal segments are, as a rule, of nearly equal thickness; each segment has no more than two distinct dorsal transverse folds.

5) *Legs* are always present.

¹ Compare: HALL, D.W. and HOWE, R.W.:—

A revised key to the larvae of the Ptinidae associated with store products (Bull. Ent. Research, vol. 44, part 1, April 1953). In this paper the authors refer to some previous articles on the subject and notably to an important contribution by S. M. MANTON with an introduction by H. E. HINTON (Bull. Ent. Research, vol. 35, 1945, pp. 341-365) in which is given a list of characters for the determination of the larvae of Ptinidae. Included in the list as distinctive features are the different setal arrangements on the adoral side of tibio-tarsus. These items may have potential value also in the classification of the anobiid larvae but I have not paid attention to them in the present study, possibly underestimating their significance.

² A detailed taxonomic family characterization will be found on pages 57-61.

6) The *spiracles* are annular but often peculiarly aberrant; airsacs from main tracheal branches are lacking.

An anatomical analysis and comparison of the external and internal structural elements of the bodies of the different genera and species reveal an unexpectedly great variation in the development of many of their organs compared with the standard types displayed in the majority of the larval forms of the family. Thus, the head which usually is hypognathous and protracted is well-nigh prognathous and retracted in a few genera (Pl. 44, figs. 2, 10). The epipharynx and the mandibles are adapted to participate jointly in grinding the spores in the fungivorous genera. In these the usual spines on the sidemargins of epipharynx have disappeared and a molalike enlargement has been developed on the dorsal subapical margin of each mandible (Pl. 48, figs. 3, 4-6, 17). In some genera the maxillary lobes are represented by a lacinia and a galea of equally large size (Pl. 32, fig. 5), in others the lacinia is much the smaller (Pl. 14, fig. 4), and in a few genera almost vestigial (Pl. 16, fig. 5). Generally the lobes sweep the masticated food from the sides of hypopharynx into the preoral cibarium but in the genus *Caenocara* the inner, adoral edge of each lacinia is expanded and hard and grinds the spores of the fungus in which the larva lives against one of two sclerotizations at the base of hypopharynx (Pl. 49, figs. 1, 10, 15). In the majority of the larval forms most of the segments carry asperities on their anterior dorsal folds and a patch of similar asperities on the sides of the ninth abdominal segment (Pl. 1), but in the larvae of a single genus additional asperities are found on most of the tergal epipleural areas and on the tenth abdominal segment (Pl. 50, fig. 20). On the other hand, in several genera the body is completely without asperities (Pl. 41, fig. 6). In the majority of the larvae the legs are not strong but developed normally and each leg has five distinct articles and a single claw. But in several species the claw is lacking and has been substituted by a soft pretarsal bladder (Pl. 45, figs. 8, 14), and in some of the fungivorous larvae the legs as a whole are much reduced (Pl. 49, figs. 3, 19, 20). The fundamentally annular spiracles are transformed in several genera in the most changing and complicated ways unlike anything observed in the larvae

of other coleopterous families (Pls. 15, fig. 8; 35, figs. 6-8; 36, figs. 6-8).

As in any other living larvae, the form and structures of the anobiid larvae undergo a series of changes during the successive periods of their existence but these changes are small, judging from the occasions in which a species is known in all its stages, and, with exception of the first instar, the different instars, always living under the same conditions, are pretty well recognized by the taxonomic characters by which the larger, fully developed larva is determined. For this reason it is assumed to be sufficient to deal exclusively with the mature larvae in the present paper.

The variations from the common anatomical pattern of the nerve-system, the tracheal system and the circulatory apparatus in all members of the anobiid family are so insignificant that no taxonomic characters for the identification of the genera and species can be obtained from them, and no study of these systems has therefore been undertaken, as previously mentioned in the preface.

CHAPTER I

Anatomy.

Division 1. External and Internal Structures of Head Capsule, Ocelli and Antennae.

The head is protracted and hypognathous and the plane of the foramen magnum almost perpendicular on the horizontal midplane of thorax in most anobiid larvae (Pl. 1). But in a few forms, as *Cryptorama minutum* Lec. (Pl. 44, fig. 10), it is quite retracted, almost prognathous, and the plane of foramen magnum is oblique to the posterior part of the cranial roof or vertex (Pl. 2, Vx, fig. 1). Foramen magnum opens widely into the neck-region and is limited posteriorly and laterally by the postoccipital sulcus (Pl. 2, pos, fig. 1) which on each side terminates anteriorly with the long pit (Pl. 2, pt, fig. 1) of the posterior tentorial arm. Posteriorly and laterally the inner wall of the sulcus is deeply inflected in its entire length forming a large endoskeletal apophysis (Pl. 2, PoR, fig. 1) which gradually continues into the bases of the posterior tentorial arms. These proceed from each side to the middle of the head where they meet, fuse and form a broad, transverse tentorial bar or bridge (Pl. 2, Tnt, fig. 1). The anterior tentorial arms are reduced to a pair of membranous, blindly ending, distally obtuse, short projections from the anterior margin of the bridge. They do, however, supply sufficient space for the attachment of the strong maxillary ventral adductor muscles of stipes and cardo (Pl. 6, Tnt, fig. 1). Dorsal tentorial arms are not developed, and there is no sclerotized hypostomal bridge in any anobiid larva.

The open space which is framed by the shelllike postoccipital apophyses (Pl. 2, PoR, fig. 1) and the tentorial bridge (Pl. 2, Tnt, fig. 1) is approximately oval and about half as long and half as wide as the foramen magnum. The cranium is generally suboval,

not fully as broad as long, broadest at the middle but can be subglobose as in *Lasioderma serricorne* F. (Pl. 43, fig. 19) and *Anobium punctatum* Deg. (Pl. 26, fig. 8) or shaped as a round, flattened door-knob, as in *Oligomerus sericans* Melsh. and *Ptilinus basalis* Lec. (Pl. 50, fig. 20) or be elongate suboval with the sides converging strongly behind the middle in a few forms, as *Ptilineurus marmoratus* Reitter (Pl. 50, fig. 2) and the above mentioned *Cryptorama minutum* Lec. (Pl. 44, fig. 2).

The dorsal and lateral parts of the cranial roof form a capsule with continuous wall in most of the larvae, because they lack frontal cleavage lines (= frontal sutures, auct.) and, therefore, a distinct frons well separated from the parietalia (= epicranial halves, auct.). Only in a few larvae, notably *Ernobius mollis* L., *Ernobius abietis* F., and some other species of this genus (Pl. 19, fig. 3; Pl. 20, figs. 2 and 10; Pl. 21, figs. 2 and 9) and in an undetermined larva in an orchid from Mexico, apparently related to genus *Lasioderma*, (Pl. 43, fig. 6) do the frontal lines (Frl) occur, terminating anteriorly outside of the antennal fossae. A distinct midcranial epicranial sulcus (= coronal suture, auct.) is the external groove corresponding to a well-developed internal ridge (Pl. 2, EpicR, fig. 1) which extends from the foramen magnum to about the middle of the cranium where it often ends at a little dimple in the surface. In cross-section the ridge is shaped as an inverted Y and serves as the attachment place for bundles of mandibular muscle fibers. From the inside of the terminal impression of the epicranial sulcus some fibers of the posteriorly converging labral depressor muscles (Pl. 3, #3 and Pl. 5, fig. 1, #3) originate. The anterior foramen of the cranial capsule is braced by a continuous, usually distinct, strong and well-pigmented facial frame composed of a single epistoma (Pl. 2, Est, fig. 2) and paired pleurostomata (Pl. 2, Pst, fig. 2) and hypostomata (Pl. 2, Hst, fig. 2). Epistoma, morphologically a clypeal derivative between the upper mandibular articulations (Pl. 2, Cat, fig. 1), is separated from the anteclypeus (Pl. 3, Acl, and Pl. 4, Acl, fig. 1) by a transverse anteclypeal sulcus (Pl. 4, Acls, figs. 1, 8) which has a deep inflexion giving rise to an internal ridge to which the base of the anteclypeus is fastened. In several species a transverse row of setae is found on epistoma along the anteclypeal sulcus, numbering, on each side, from two as in

Microanobium sp. (Pl. 46, fig. 4) to many as in *Catorama tabaci* (Pl. 39, fig. 1). The cups of the setae are generally close to the sulcus but from each of them a fine canal can be traced internally through the solid body of the epistoma toward its posterior margin (Pl. 2, scn, fig. 2). The pleurostomata are located between the upper and lower processes with the mandibular articulations (Pl. 2, Cat and Anap, fig. 2). Each pleurostoma is strongly arched around the outer base of the mandible and bears the antenna (Pl. 2, Ant, fig. 2) and a single ocellus (Pl. 2, O, fig. 2). The hypostomata, extending posteriorly from the cups for the lower mandibular condyles, are somewhat weaker and paler at their terminal inner ends than are the other parts of the cranial frame, but these weaker parts are recognizable by small, quite dark sockets (Pl. 2 and Pl. 6, Hst, fig. 1) for the articulations of the maxillary cardines. The posterior boundary line of submentum (Pl. 2, Smt, fig. 1) at the base of labium lies, generally speaking, between and slightly behind these sockets.

In many species, for instance *Catorama tabaci* Guér. (Pl. 39, fig. 1) and *Eucrada humeralis* Melsh. (Pl. 15, fig. 1) the cranial wall behind the mouth frame appears as a rugose, darkly pigmented field often pitted with many round deepenings, each with a seta at the bottom, and in *Ernobius mollis* L. (Pl. 19, fig. 3), and the other species of the genus *Ernobius* which have frontal cleavage-lines, the whole clypeo-frontal region is dark and rather smooth. In *Cryptorama minutum* Lec. a single pointed projection is found in the pigmented field half-way between the anteclypeal sulcus and the terminal impression of the epicranial sulcus (Pl. 44, figs. 1 and 2). A similar projection occurs also in *Holcobius haleakalae* Perk. (Pl. 32, fig. 1) although the two species have no close relationship. In contrast to the condition in the species just described the cranium behind the sclerotized epistoma is entirely smooth and slightly or not pigmented in many other larvae, for instance *Petalium seriatum* Fall (Pl. 42, fig. 11), *Priobium tricolor* Oliv. (Pl. 35, fig. 1) and *Xeranobium macrum* Fall (Pl. 33, fig. 1).

The cranial region behind the epistomal frame, whether pigmented or not, belongs to a common clypeo-frontal unit whose component clypeal and frontal elements are completely fused. Laterally the fronto-clypeal region is, as mentioned, rarely

separated from the parietal parts of the cranium because the frontal lines are lacking in most of the larvae, and transversely the region is not divided by a fronto-clypeal sulcus as the case is in many other larvae. However, the clypeal component contains and is identified by the clypeal dilator muscles of the cibarium (Pl. 3, #5, #6, #7) which are attached to the under-surface of the wall and run anterior to the connecting branches of the frontal ganglion (Pl. 3, FrGng); and the frontal component lies posteriorly to these muscles and extends to the anterior end of the epicranial sulcus. In most anobiid larvae the cranium is provided with many, often very long, soft setae but in a few the number is quite limited. The upper and lower projections with articular surfaces for the mandibles are present and strong in all anobiid larvae. Each of the upper projections, named the catapophyses (Pl. 2, Cat, figs. 1 and 2)¹ is more or less flattened and rounded in outline and marked off from the antennal fossa by a narrow groove in the undersurface of the frame, and also marked off from epistoma by a similar, but wider, inward bent groove (Pl. 2, fig. 2). The inner adoral surface of the catapophysis is smooth, but the outer surface varies in the different species and may be rugulose, or punctured, or setae-bearing, or smooth without setae. The outer groove is indicated externally, often by a series of about five (Pl. 38, figs. 1 and 10), sometimes only by one or two setae and in some species none occur.

The lower articular projection (Pl. 2, Anap, figs. 1 and 2) for the mandible, which may be called "the anapophysis," is sub-cylindrical with a hemispherical cup or fossa on top. In most species the outer surface is smooth, but in some granulose or rugose or strigate (Pl. 50, fig. 3), and in the genus *Dorcatoma* a rounded, subconical, rugose projection occurs under the articulating fossa (Pl. 48, figs. 11 and 15).

The antennae (Pl. 2, Ant, fig. 2) and eyes (Pl. 2, O, fig. 2) are, as mentioned, located in the pleurostomata between the upper and lower mandibular articulations, the antennae nearer the catapophyses and the ocelli nearer the anapophyses. The antennae (Pl. 4, figs. 3, 4, 5, 6), are inserted in funnel-shaped sockets (or fossae) and protected ventrally by a subtriangular casing (Pl. 4,

¹ The term catapophysis has been proposed by WM. H. ANDERSON, Proc. Ent. Soc. Wash., vol. 48, 1947.

fig. 5) which usually is thin but sometimes, as in *Coelostethus* (Pl. 22, fig. 2), heavily sclerotized and higher than the catapophsis. In many species, for instance *Ernobius mollis* L. (Pl. 19, fig. 2), each antenna has two distinct articles and a basal membrane which possibly could be interpreted as including elements of a basal article because it often bears two or one large sensilla placodea and because the two distinct antennal articles evidently are homologous with the apical and the second articles of the plainly three-articulated antenna of the larvae of the closely related Bostrichidae family. (See WM. H. ANDERSON, 1939; with a picture of the antenna of *Lichenophanes bicornis*.) Of the two distinct articles of *Ernobius mollis* L., the one implanted in the basal membrane is drum-shaped with a broad, well-sclerotized cylindrical barrel-part and terminally covered by a soft membrane. The membrane carries exteriorly one large, ovate sensory papilla, a long sensory hair, a few sensory pores and minute setae and, interiorly toward the sagittal midline of the head, the apical antennal article. The latter is also drum-shaped but not wider than the sensory papilla and about as long as wide. Terminally it is covered, like the first article, with a soft membrane in which two sensory setae are seated. In other species the first article is also barrel-shaped and long, as in *Ptilinus basalis* Lec. (Pl. 4, fig. 6) but very low in other species such as *Ozognathus cornutus* Lec. (Pl. 4, fig. 4) and *Lasioderma serricorne* F. (Pl. 43, fig. 13), the apical article, however, is always low in these larvae and the sclerotization at their bases incomplete or absent. Both articles bear the usual hairs and punctures. Finally in the genus *Anobium* (Pl. 26, fig. 1), genus *Vrilletta* (Pl. 4, fig. 5) and many others, the antenna is reduced to a simple, undifferentiated, completely membranous, dome-shaped elevation but it carries, nevertheless, the ovate, sometimes conical papilla, the regular sensory setae and punctures besides large sensilla placodea (Pl. 4, S.plac, fig. 5). A remarkable development of the tactile papilla is found in *Nevermannia* (Pl. 28, fig. 10), *Dorcatoma dresdensis* Herbst (Pl. 4, fig. 3), *Eutylistus intermedius* Lec. (Pl. 47, fig. 1) and related dorcatomoid forms. In these larvae the papilla is not ovate, or short and conical, but sausage-shaped or elongate oval. Two small bundles of muscle-fibers, a depressor and a levator, have

been observed inserted at the base of the antenna and attached on the cranial wall (Pl. 4, fig. 3 and Pl. 19, fig. 2).

Some anobiid larvae appear to have a well-developed, simple, lateral ocellus on each side of the head, provided with a strongly arched, clear cornea and a great amount of black pigment, except in the termitophilous *Nevermannia* in which cornea is flattened and the black pigment seemingly lacking. In other anobiid larvae no ocelli can be detected.

Division 2. Labrum and Anteclypeus.

Labrum (Pl. 4, Lm, fig. 1) and *Anteclypeus* (Pl. 4, Acl, fig. 1) are two separate parts of a flat lobe whose outer surface in anobiid larvae is approximately on the level with the dorsal surface of the head, while the inner surface gradually slopes down posteriorly to the entrance of pharynx (Pl. 3, Phy). The outer or dorsal surface of anteclypeus is, on the whole, a naked, smooth, uniform, membranous connecting feature separated from the clypeo-frontal region by a distinct anteclypeal sulcus (Pl. 4, Acls, figs. 1 and 8)¹. However, in many larvae the posterior anteclypeal margin is enforced by a narrow sclerotized transverse band which expands at each end into a small pigmented plate (Pl. 4, Aclp, fig. 1) with well-developed setae, varying in number and lengths according to species. In some larvae the band is lacking but the plates with setae are present, and in *Eutylistus intermedius* Lec. (Pl. 4, fig. 8) two long setae are found on each side at the base of anteclypeus but there are no sclerotized band or plates. A different development is, on the other hand, met with in *Coelostethus notatus* Say (Pl. 22, fig. 2) where the whole anteclypeus is heavily sclerotized and set with deeply impressed punctures. Posteriorly, in each corner, a group of about ten fairly long setae is present as customary in many of the other larvae of the family. *Trypopytis* (Pl. 24, fig. 3) [and the doubtful *Hadrobregmus carinatus* Say (Pl. 23, fig. 2)] are also provided with a posterior anteclypeal covering but it is much smaller than in *Coelostethus*.

The labrum (Pl. 4, Lm, fig. 1) is moveably connected with

¹ Probably not identical with an "epistomal sulcus" which is understood to be located to the rear of clypeus, or the rear of postclypeus when clypeus is divided into ante- and postclypeus.

clypeus (i. e. postclypeus) by the normally membranous anteclypeus. Proximally it is prolonged into a pair of tormae (Pl. 2, torma, fig. 1: and Pl. 5, figs. 1 and 3) which extend back under anteclypeus and carry the strong labral depressor muscles (Pl. 3, #3 and Pl. 5, fig. 1, #3) from the anterior end of the ridge of the epicranial sulcus. There are a few small labral compressor muscles (Pl. 3, #1). The outline of labrum varies in the different larval forms from subrectangular with rounded corners and the width greater than the length (Pl. 4, fig. 1) to subcircular (Pl. 4, fig. 10) and to longer than wide with a strongly arched front margin (Pl. 4, fig. 11). The subrectangular type is the most common, sometimes showing a slightly concave anterior emargination, and differing in the relation between width and length. It is for instance comparatively broad in *Catorama* (Pl. 39, fig. 1), *Ernobius* (Pl. 19, fig. 3) and related genera but more narrow in *Anobium* (Pl. 26, fig. 3), *Hadrobregmus* and *Ptilinus* (Pl. 50, fig. 15). The subcircular type is found notably in *Nicobium* (Pl. 33, figs. 10 and 11), *Trichodesma* (Pl. 34, figs. 2 and 3) and related genera, in *Oligomerus* (Pl. 31, figs. 12 and 14) and *Ptilineurus marmoratus* Reitter (Pl. 50, figs. 1 and 2) from Japan. The elongate type is characteristic of many, but not all, of the fungivorous larvae and occurs for instance in *Eutylistus* (Pl. 47, figs. 4 and 12) and *Dorcatoma* (Pl. 48, figs. 14 and 15). However, in the genus *Caenocara* the labrum varies from subcircular as in *Caenocara oculata* Say (Pl. 49, figs. 11 and 13) to broadly heart-shaped in *Caenocara bovista* Hoffm. (Pl. 4, fig. 2 and Pl. 49, fig. 2). The labral surface is well sclerotized, shieldlike, commonly covered with rather numerous moderately long setae, and in larvae with subcircular labrum with particularly numerous, long and fine ones. Only a few setae are found in *Microanobium* (Pl. 4, fig. 9), namely, three long and one short on each side; one or two setae on each side are found in most of the fungivorous genera as in *Dorcatoma* and *Eutylistus* (Pl. 4, fig. 8).

In many larval forms but particularly distinct in *Ernobius mollis* L. (Pl. 5, Mark, fig. 1) and *Microbregma emarginatum* Duft., (Pl. 27, figs. 1 and 3) a pair of pyriform or oval wartlike thickenings occur on the other side of the labral shield at its anterior margin on each side of the sagittal line, and from each of the thickenings a weak and colorless, frayed strand, the

beginning of a labral rod, appears to originate, continuing its course through the inner space of labrum toward the terminal anterior part of one of the tormae with which it finally combines to a joint feature (Pl. 27, fig. 3). In many larvae similar, but usually less distinct, labral marks and labral rods have been found, and it would seem plausible to expect that structural elements, homologous with the described items, would occur in all anobiid larvae, but this seems not to be the case.

Division 3. Epipharynx, Hypopharynx, Preoral Cibarium and Pertinent Muscles.

Epipharynx (Pl. 2, Ephy, fig. 1), the inner surface of the combined labrum, anteclypeal and postclypeal regions which form the upper and facial surface, appears as a continuous membrane extending, as mentioned, from the anterior and lateral margins of labrum to the entrance of pharynx. It contains, however, two clearly distinguishable parts corresponding to the two main component parts of the upper surface. The anterior part (Pl. 3, LmEphy, and Pl. 5, LmEphy, fig. 1) lies beneath labrum and anteclypeus ending at a transverse low ridge between the terminal tips of the tormae, and the posterior part (Pl. 3, ClpEphy, and Pl. 5, ClpEphy, fig. 1), corresponding to the clypeal region, extends from this ridge to where pharynx begins at a transverse fold between the lateral angles of the pharyngeal orifice (Pl. 5, Mouth, fig. 1). With reference to their location in relation to the labrum with anteclypeus and the clypeus, the anterior part of epipharynx will be termed the labral epipharyngeal area (LmEphy) and the posterior part the clypeal epipharyngeal area (ClpEphy).

The labral epipharyngeal area comprises a complex of several regions which on the whole correspond to the epipharyngeal regions of scarabaeid larvae as they have been defined and named by BÖVING¹ and RITCHER² and the same terms will therefore be applied to the homologous regions, structural details and setal arrangements of the anobiid larvae. In the following de-

¹ BÖVING, ADAM G.: Description of the larva of *Plectris aliena* Chapin and explanation of new terms applied to the epipharynx and raster. Proc. Ent. Soc. Wash., vol. 38, pp. 169-185, 1936.

² RITCHER, P. O.: a) Coprinae of Eastern North America, Kentucky Agric. Exp. Station, University of Kentucky, Lexington; Bull. 477, pp. 1-23, June, 1945. b) North American Cetoniinae, ibidem, Bull. 476, pp. 1-39, June 1945.

scription of the labral epipharyngeal region the one found in *Ernobius mollis* L. has been chosen as a convenient general type to start with. In this larva two pairs of small, simple, coryphal setae are present inside the middle of the anterior margin of epipharynx (Pl. 5, Co, fig. 1) but in other larvae similar but several setae are found in this region and in *Ptilineurus marmoratus* Reitt. (Pl. 4, fig. 10) a great number of small but hook-shaped setae occurs, and in many of the fungivorous dorcatomoid larvae (Pl. 4, Co, fig. 11) the region is strongly sclerotized and armed with robust toothlike setae. However, in most anobiid larvae the region merges with and becomes an integral part of the combined acroparial and acanthoparial marginal arrangement of spiny setae (Pl. 4, Acr, and A, fig. 7). In *Ernobius mollis*, and most of the anobiid larvae, a naked gymnoparial region (Pl. 4, G, fig. 7) lies on each side between the acanthoparial setae and the chaetoparial setae (Pl. 4, C, fig. 7) which in *Ernobius mollis* as in most of the other larvae extend back to the anterior end of the torma on the same side. The chaetoparial setae correspond to a region which exterio-laterally borders the central hairless region of pedium (Pl. 4, P, fig. 7). The posterior part of the labral epipharynx lies between the paired labral rods plus tormal features, and extends back to the transverse line separating it from the clypeal epipharyngeal area. It (Pl. 4, Cri, fig. 7) is homologous with the crepidal region of scarabaeid larvae which essentially has a sense function, is velvety pubescent, and often provided with sensory pores¹. The general pattern of the described labro-epipharyngeal area is repeated in the majority of the larvae but is obscured or completely eliminated in larvae with subcircular labrum in which the entire or almost entire labro-epipharyngeal surface is covered with long, uniform setae (Pl. 4, fig. 12). Neither are V- or Y-shaped rod-plus-tormal features found in these larvae but only short, curved and cornuiform tormae. Simple, non-combined tormal sclerites are also found in *Petalium* (Pl. 42, fig. 12) and in *Cryptorama* (Pl. 4, fig. 7) where they are straight, rather long and slender, and in *Eutylistus* (Pl. 4, fig. 11) and other

¹ It is noteworthy that the posterior ends of the tormae bend strongly toward each other in many anobiid larvae (Pl. 4, figs. 2 and 12), carrying the labral depressor muscles with them. This corresponds to what is found in scarabaeid larvae where the sagittally fused tormae form a bowed transverse sclerite to which the muscle-fibers of the labral adductor muscle are attached.

fungivorous larvae in which they are straight but very long, pointed and robust. Acanthoparial setae are not developed in the latter larvae and their gymnoparial regions are usually large. In many of the anobiid species the chaetoparial setae are arranged in a single oblique series of six on each side (Pl. 4, fig. 7), in others as in *Ernobius mollis* (Pl. 5, fig. 1) in a small patch and in *Ptilineurus* (Pl. 4, fig. 10) in a large patch. A distinct crepidal region is lacking in *Caenocara* (Pl. 4, fig. 2). The backwards-slanting clypeo-epipharynx (Pl. 3, ClpEphy; and Pl. 5, fig. 1), lined with a smooth, shining intima, forms the hindwall of the cibarium (Pl. 3, Cb) and has the three pairs of upwards-extended muscles (Pl. 3, #5, #6, #7) to raise it. A sheet of circular and longitudinal muscle fibers covers the epithelium of the intima exteriorly.

The hypopharyngeal area (Pl. 3, Hphy, and Pl. 5, Hphy, figs. 2, 5) occupies the median upper part of the lower portion of the head. It is well developed, fleshy, somewhat pyriform and widest anteriorly. It rests upon labium above prementum (Pl. 3, Prmt) and lies behind the often large dorsal part of ligula (Pl. 3, Lig, and Pl. 5, figs. 2, 5) with which it is fused anteriorly. Salivary labial glands are absent. Posteriorly the hypopharyngeal area reaches back to the beginning of pharynx (Pl. 3, Phy, and Pl. 5, Phy, figs. 2, 5). On each of its lateral walls a suspensorial bar (= *fultura*, auct.) is lodged (Pl. 3, Su, and Pl. 5, fig. 2) which extends from the base of hypopharynx near where the latter joins the ligula and goes to the entrance of pharynx (Pl. 5, Mouth, figs. 2-5). It consists of a shoe-shaped part and a rod that stretches obliquely upward (Pl. 3, Su). A branched muscle, the retractor of the angle of the pharyngeal mouth opening (Pl. 3, #10) arises from the dorsal end of the bar and is inserted on the inner surface of the posterior region of the frontal area behind the frontal ganglion (Fr.Gng). Another muscle runs between the base of hypopharynx at the bar and the tentorial bridge (Pl. 3, #19). The adoral surface of hypopharynx is completely membranous in all of the investigated larvae of the family, except in genus *Eutylistus* (Pl. 47, figs. 3, 6, 9) in which the distal part has become conical and sclerotized, and in *Caenocara bovistae* Hoffm. and *Caenocara oculata* Say (Pl. 49, figs. 1, 10, 15). In these two latter larvae it is the proximal end of each of the suspensorial bars

which has been enlarged to a strong, rounded, well-sclerotized swelling (Su) on the upper surface of hypopharynx, and together the two swellings form a bilobed inculus, or anvil, against which the inner margins of the lacineas (Pl. 49, Lc, figs. 1 and 10) can grind effectively because they, too, are swollen and strongly sclerotized.

Medially the longitudinal adoral surface of hypopharynx may become somewhat concave, and in many larvae, for instance in *Xyletobius walsinghami* Perkins (Pl. 5, fig. 2), is furnished with long, threadlike hairs and a few sensorial pores. Above the shoe-shaped part of the suspensorium the border of hypopharynx is fringed on each side with fine short setae from the curved paragnathal lobe (= superlingual lobe, auct. = maxillula, auct.) (Pl. 5, Slin, fig. 2).

Division 4. Appendages of Head with Muscles and Gland.

Section 4 a. Mandibles.

The mandible (Pl. 5, Md, fig. 4) is proximally full and heavy from the subquadrangular base as high up as on the level with an archshaped, bristle-bearing thickening (arch.elv) in the subapical dorsal margin of the mouthpart. Distally it is more compressed with a convex aboral outer surface and concave adoral inner surface. It is implanted in membrane at the cibarium and is strongly attached to the cranium by two large, freely projecting articulating processes at its base. Its length, width and depth measure about equal. It has no typical mola acting against a hypopharyngeal sclerotization and, contrary to what is the case in the bostrichid larvae in which the entire distal edge is simple, toothless and gouged, it is dentate or pointed in all anobiid larvae, except in *Catorama gracilis* Fall (Pl. 13, fig. 6), in an undetermined closely related larva, and possibly in the *Eucrada* larva (Pl. 15, fig. 3) in which it is quite similar to the distal edge of a bostrichid mandible. The number of the teeth is never more than four but often less. Two apical teeth are usually present and often claw-shaped, and only in a few larvae as *Gastrallus laevigatus* (Pl. 40, figs. 3 and 5) is the second apical tooth absent. The subapical dorsal margin of the distal part of the mandible is more variable than the apical. Thus, in many larvae (Pl. 5, fig. 4 and Pl. 31,

figs. 4, 13) no subapical teeth are present but the edge is low, approximately straight and scraperlike with only a short projection above the arched marginal elevation. In other larvae the edge may be humplike (Pl. 45, fig. 12), or form a pseudomola with a broad, multistriate surface which grinds against the epipharynx (Pl. 47, figs. 10, 10*). In *Hedobia imperialis* (Pl. 16, fig. 3), *Microbregmum emarginatum* (Pl. 27, fig. 4) and *Ernobius champlaini* (Pl. 27, fig. 10) the subapical part of the edge is produced into a single third tooth, and in *Utobium* (Pl. 14, fig. 3), the typical *Ernobius* larvae (Pl. 19, figs. 4, 5) and some other species there are both a third and a fourth tooth.

Adorally the inner concave surface of the mandible is raised, at least from under the two apical teeth, into longitudinal keels which at the ends form a wall around oblong cavities (Pl. 22, fig. 5 and Pl. 43, figs. 1, 12). In some cases, notably in *Nevermannia dorcatomoides* (Pl. 28, fig. 11), the dental keels arise into elongate, flat enlargements. Below the adoral cavities the rest of the inner surface is rather convex all the way to the basal margin. This margin itself is often reinforced by a ribbon-shaped sclerotization (Pl. 22, fig. 5).

The convex exterior side of the mandible is generally smooth. It is adorned by a series of setae (Pl. 5, fig. 4) often from under a small, straight or curved wall located either near the basal margin of the side, or in the middle of the side or, as in *Caenocara bovistae* (Pl. 49, fig. 8) nearer its apex. Another and smaller group of, sometimes bifurcate, setae is usually found at a considerable distance in front of the first, but sometimes close to it (Pl. 5, fig. 4). In a few species, notably *Vrilletta blaisdelli* (Pl. 34, fig. 12) each seta of the first group sits on top of a dome-shaped, small elevation, and in *Caenocara bovistae* (Pl. 49, fig. 8) the region has been developed into a thin-skinned, rather large, transverse elevation with a spray of fine, very long, curved hairs. In several species a single ovate setula (sl), possibly a sense organ, occurs in the space between the proximal and distal setae. The ventral condyle is globe-shaped but the dorsal pivot which fits into the inner surface of the catapophysis is horseshoe shaped and smooth (Pl. 5, fig. 4). From the exterior corner of the basal rim of the mandible between the two articulations a projection extends downward. To this the mandibular abductor (= "retractor")

muscle is attached, coming from the lateral part of the cranium. From the interior basal corner a similar feature projects with which the tendon of the adductor (= "protractor") muscle is connected (Pl. 5, fig. 4). The muscle is very strong and consists of various bundles of muscle fibers which originate from the dorsal and lateral regions of the cranium. The motion of the mandible is regulated by the positions of the articulations and produced by the actions of the adductor and abductor muscles. The end of each mandible is moved in a curve obliquely outward by the abductor muscle and obliquely inward by the adductor muscle. The mandibular edge between the apical teeth and the brush-bearing, arched elevation passes below the lateral part of the labral epipharyngeal area. And this marginal edge may in several larvae, among them larvae with a pseudomolar feature (Pl. 47, figs. 4, 12) act against a large and somewhat hollow gymnoparial region outside of which the acanthoparial setae are lacking. The mandibular first and second apical teeth often wear out by use (Pl. 18, figs. 4, 6), and in *Caenocara bovistae* the apical part and the membranous pad with the long hairs break off early and give place to a lower, new, smooth, and curved margin (Pl. 49, fig. 8). The different shapes of the mandibles of the various species are useful in the classification. Thus, as mentioned above in another connection, most of the larvae of the genus *Ernobius* (Pl. 19 to Pl. 21) have four well-developed teeth but *Ernobius champlaini* (Pl. 27, fig. 10) has only three distinct teeth and *Ernobius marginicollis* (Pl. 45, fig. 4) has but two teeth and the subapical part of the edge has been transformed to a low, long edge; *Xeranobium macrum* (Pl. 33, fig. 4) has two apical teeth and a rounded, compressed, strong, subapical edge, and the fungivorous *Dorcatoma-Eutylistus-Caenocara* species (Pls. 47, 48, 49) have strong pseudomolar structures.

A large gland on each side opens in the membrane in which the mandible is imbedded right behind the inside of the catapophysis and the corresponding dorsal mandibular pivot (Pl. 5, fig. 3).

Section 4 b. Maxillae.

The maxillae (Pl. 6, Mx, figs. 1 and 3 and Pl. 19, fig. 7) are located latero-ventrally to the cranium (Pl. 24, fig. 1; Pl. 29, fig. 4)

with the adoral surfaces of the maxillary lobes facing hypopharynx, usually in a position vertical to the horizontal upper side of the hypopharynx.

Cardo (Cd) and stipes (St) are well developed and movable toward each other in the transverse hinge (Pl. 6, Hng, fig. 3) between the anterior margin of cardo (Pl. 6, Cd III, fig. 3) and the posterior margin of stipes. In outline the scutiform cardo is subtrapeziform with the inner ventrolateral (Cd II) and outer dorsolateral (Cd IV) margins subparallel. The dorsolateral margin ends with an articular process (Pl. 6, a**, fig. 1) which fits into the small maxillary articular sclerite of hypostoma (Hst), and the ventrolateral margin (Cd II) terminates posteriorly with a projection on which a dorsocranial muscle (I) is inserted. The rather short posterior margin (Cd I) is located between the piece with the articulating process (a**) and the insertion place for the dorsally directed muscle to the cranium (I). Across the inner concave bottom of cardo a strong ridge (r) extends obliquely from the middle of the dorsolateral wall to the corner between the ventrolateral (Cd II) and the anterior (Cd III) margins of cardo. A groove (Pl. 6, r, fig. 3) in the exterior surface of the wall corresponds to the ridge (r, fig. 1).

The stipes (Pl. 6, st, fig. 3) is subrectangular, as wide as the anterior margin of cardo and about twice as long as wide. Dorsolaterally the wall is weakly sclerotized and its membranous margin (Pl. 29, D-LMg, fig. 4, and Pl. 19, fig. 7) attached to the strong frame of hypostoma (Hst). The ventrolateral wall of stipes (Pl. 19, V-LMg, fig. 7) is more strongly sclerotized and pigmented than the dorsolateral part and is usually provided immediately inside the thin lateroventral margin with a long and strong bar (Pl. 6, q, fig. 3 and Pl. 19, q, fig. 6) which anteriorly bends upward to the dorsal margin of stipes ending in a somewhat conelike process (Pl. 6, *, figs. 1 and 3). The margin of the ventrolateral wall of stipes joins the soft and pale membrane of the cushioned maxillary articulating area (Pl. 6, Mxamb, fig. 3) which itself joins the membranous submentum (Pl. 6, Smt, fig. 3). Stipes carries in most larvae long and moderately long setae which vary in number according to the genus. Cardo, on the other hand, has usually only a few or no setae.

The lacinia (Pl. 6, Lc, fig. 1) extends from the inside of the

distal part of stipes, and the galea (Pl. 6, Ga, fig. 1) sits on top of stipes together with the maxillary palpus (Pl. 6, Plp, fig. 1) implanted outside the galea and slightly posterior to it. In some larvae as *Nicobium* (Pl. 33, fig. 15) *Dorcatoma* (Pl. 48, figs. 8, 16), *Caenocara* (Pl. 49, fig. 1) and *Ptilinus* (Pl. 50, fig. 24) a transverse armlike sclerotization (Lc-Ga arm) occurs at the base of the adoral surfaces of lacinia and galea extending from the proximal end of the lacinial margin remote from galea to the galeal margin near the palpus. The lacinial margin near galea has a sclerotized edging the proximal end of which articulates with the distal part of the stipital bar (Pl. 6, q, fig. 3) below the top of its conical projection, and the proximal end of the galeal margin toward lacinia articulates with the top of the conical projection (*). The opposite margin of galea has also a sclerotized edging which is particularly strong where it faces the basal article of the palpus. Framed posteriorly by the adoral transverse arm, a soft-skinned region occurs which frequently, as in *Dorcatoma* (Pl. 48, fig. 16) may carry an abundance of very long, fine and soft hairs. The galea is always well developed while lacinia is distinctly smaller in the majority of the genera and even vestigial as in *Hedobia* (Pl. 16, figs. 4, 5) and *Microanobium* (Pl. 46, fig. 8). It is only in the genera *Nicobium* (Pl. 33, fig. 15), *Trichodesma* (Pl. 34, fig. 5), *Oligomerus* (Pl. 31, fig. 17), *Dorcatoma*, with its closely related forms (Pl. 48, fig. 8), and in a few other larvae as the species *Xyletinus fucatus* L., and *Xyletinus mucoreus* Lec. (Pl. 31, fig. 3), that it is as large as galea or at least approximately as large. In genera like *Lasioderma* (Pl. 43, fig. 15), *Catorama* (Pl. 36, fig. 5), *Anobium* (Pl. 26, fig. 10) and many other larvae it is, on the other hand, only half as large or still smaller than galea. In larvae with a small lacinia some, as *Utobium elegans* Horn (Pl. 14, figs. 4, 5), *Ernobius abietis* F. (Pl. 20, fig. 4) and *Gastrallus* (Pl. 40, fig. 4), possess one or a few strong spines on the end of the lobe in addition to the normal lacinial setae on both the inner and the outer side.

The special development of the posteriorly-facing, heavily-sclerotized, inner margin of lacinia in *Caenocara bovistae* Hoffm., and *Caenocara oculata* Say, which previously has been mentioned under the discussion of the hypopharynx, p. 19, l. 36, may properly be recalled here, and attention should also be called to a horizontal

splitting of the anterior marginal part of the galea which is found in the genus *Caenocara* (Pl. 49, figs. 1, 10). The galea extends about as far forward as the middle of the distal article of the maxillary palpus. It is flat with round outline, usually as wide as long but in a few larvae, as *Gastrallus laevigatus* Oliv. (Pl. 40, fig. 4), only half as wide as long. The distal margin of the lobe is armed with particularly strong setae and the outside and inside are covered, at least partly, with setae which are stiffer and stronger on the outside than on the inside. The lacinia is similarly equipped, as indicated above. Both lobes can be pressed against the sides of the upper part of ligula and of hypopharynx by special muscles (Pl. 6, fga and flcs, fig. 1) whether the stipes is moving forward or obliquely backward.

The maxillary palpus (Pl. 6, Plp, fig. 1) is well developed and can be moved as an entity; but its single articles can also move independently. It consists of either two, three or four articles. An incomplete ring-shaped sclerotization is developed on the bases of the proximal, the second and eventually, in larvae with four articles, of the third article; the terminal article is completely but thinly sclerotized. Three articles occur in most genera, two in *Cryptorama minutum* (Pl. 44, figs. 5, 6) and four are present in the genera *Trichodesma* (Pl. 34, fig. 5), *Nicobium* (Pl. 33, fig. 15), *Microbregma* (Pl. 27, fig. 5) and *Eucrada* (Pl. 15, fig. 4). The terminal article has fine and very short sensory hairs and papillae on the top, and a longitudinal impression into which a setalike rod is imbedded is found exteriorly on the dorsal side (Pl. 19, fig. 7). The function of this organ is probably of sensorial nature.

The two subdivisions of the maxilla, the cardo and the stipes as well as the lobes and the maxillary palpus can perform a number of motions either independently or jointly and a reasonable idea about these movements can be obtained from a study both of the places where the muscles are inserted and attached, and of how the different special articulations are arranged.

The muscle which runs from the end of the ventrolateral marginal process of cardo (Pl. 6, I, fig. 1) to the posterior part of the frontoparietal region of the cranium is the only retractor muscle of the maxilla and probably produces, besides the retraction of the mouthpart, an additional function by assisting in regulating other movements as the rolling of the whole maxilla

toward a side of the hypopharynx. From the hollow inside of cardo and its transverse ridge numerous fibers unite into a strong ventral adductor muscle of cardo (Pl. 6, adcd, fig. 1). It is attached to one of the small anterior tentorial arms (Pl. 6, Tnt, fig. 1). A similar collection of many muscle-fibers constitutes the strong ventral adductor muscles of stipes (Pl. 6, adst, fig. 1). They are inserted principally on the longitudinal ventrolateral bar (q) of stipes and are attached, like the ventral adductor muscles of cardo, to one of the anterior tentorial arms. With the tip of cardo (a**) anchored to the hypostoma (Hst), a simultaneous contraction of the strong ventral adductor muscles of cardo and stipes will straighten the two pieces from the angular position in which they were bent, and thereby push the whole maxilla forward, including the lobes and the palpus. The pressing of the lobes against hypopharynx is, as said above, performed by contraction of two adducting flexor muscles. One, the stipital flexor muscle of lacinia (flcs) is attached to the posterior part of the stipital wall and inserted on the proximal part of lacinia. The other, the stipital flexor muscle of galea (fga) is, like the corresponding lacinial muscle, entirely intrastipital, is also attached to the posterior part of the stipital wall and is inserted on the proximal part of galea. The two muscles of lacinia and galea lie often close together and may fuse into a single muscle. Coinciding with the pressure exercised by the lobes against hypopharynx the lobes perform a backwards- directed sweeping along the sides of hypopharynx when stipes and cardo move backward and outward into the position of a bent knee. This movement is probably caused mainly by an increase of the blood-pressure when the labial sections are drawn together, but is aided by the contraction of the cranial flexor muscle of lacinia (flcc). The muscle is inserted in the lobe close to the stipital lacinial flexor muscle but diverges from it in a dorsal direction and is, as mentioned previously, attached to the back of the cranium.

The movement of the entire palpus is accomplished by alternating contractions of a depressor (dplp) and a levator muscle (lplp). Both are intrastipital and attached with the flexor of galea (fga) and the flexor of lacinia (flcs) in the posterior region of stipes. Tiny, single muscles may or may not be found running from the base of one palpal article to the base of the next.

The maxillary articulating region (Pl. 6, Mxamb, fig. 3), intermediate between the ventrolateral margin of cardo (Cd II), the posterior ventral corner of stipes and the submentum (Smt), is softskinned, fleshy, and usually carries setae.

Section 4 c. Labium.

The labium (Lb) lies ventrally between the maxillae. The postlabial region, or submentum (Pl. 3, Smt; Pl. 6, Smt, figs. 2, 3), is sessile, rather large and fleshy, trapezoidal in outline, wider posteriorly and usually bearing about ten setae on each side. It is connected, as just stated, laterally with the maxillary articulating membrane and is posteriorly contiguous with the cervical membrane of the neck. Anteriorly the submentum is separated from the prelabium by a transverse infolding, the labial sulcus (Pl. 6, Lbs, fig. 2) which contains and is determined by the anterior points of insertion of the subparallel, ventral, median labial retractor muscles (Pl. 3, #22 and Pl. 6, rst, #22, fig. 3) from the posterior margin of submentum.

The prelabial region is divided into the two labial areas here termed the mesomentum (Pl. 3, Msmt, and Pl. 6, Msmt, fig. 2) (= mentum, auct.) and the prementum (Pl. 3, Prmt and Pl. 6, Prmt, fig. 2) with its ligula (Pl. 3, Lig, and Pl. 6, Lig, fig. 2) and labial palpi (Pl. 6, Lbplp, fig. 2). Mesomentum is, like submentum, trapezoidal in outline and wider behind than in front but somewhat shorter and narrower than submentum. It is fleshy, as the submentum, without sclerites, and bears the same number of about ten setae on each side. Anteriorly it is limited by a transverse, in most larvae arched and narrow, sclerite on the hindmargin of prementum (Pl. 6, PrmtScl, fig. 2), and on this sclerite a pair of ventral labial adductor muscles (Pl. 3, #21, and Pl. 6, vadlb, fig. 3) are inserted sagittally, each muscle composed of two bundles of muscle-fibers. These muscles diverge posteriorly, run quite horizontally through mesomentum and submentum and are attached posteriorly on the tentorial bar (Pl. 3, Tent). Anterolaterally to the distal point of insertion of these ventral adductor muscles, a pair of dorsal labial adductor muscles (Pl. 3, #20, and Pl. 6, dadlb, #20, fig. 3) is inserted a short distance behind the bases of the labial palpi where the ligula

meets the hypopharynx. They run, like the ventral adductor muscles, through mesomentum and submentum but are sub-parallel and, sloping in a ventral direction, cross and pass below the ventral adductor muscles. They are attached, apparently to the middle of the tentorial bar, or possibly to the internal surface of the base of submentum very close to the bar.

The transverse premental sclerite which, as said above, is arched, narrow and somewhat expanded sagittally in almost all of the anobiid larvae, is strong, elongate and triangular with apex directed backward in the genus *Ptilinus* (Pl. 50, fig. 19).

Ligula (Pl. 3, Lig, and Pl. 6, Lig, fig. 2) is ventrally rather short and conical, dorsally contiguous posteriorly with the hypopharynx (Pl. 5, Lig, fig. 2) in front of the paragnatha (Slin) (= superlinguae, auct. = maxillulae, auct.). In most genera the conical lobe and the dorsal part in front of hypopharynx are set with numerous, pointed, often stiff, setae, and prementum at the bases of the labial palpi may carry a marginal group of long setae.

Each of the labial palpi (Pl. 6, Lbplp, fig. 2) consists of two well-developed articles which generally are slightly smaller than the two distal articles of the maxillary palpus. The terminal article has numerous minute hairs at the end and one or a few sensory papillae like the terminal article of the maxillary palpus but there is no rod-shaped organ on the dorsal side; as a rule a sensory pore is present but no setae. A single seta is found on the proximal article in several of the larvae; some have more than one and in others like *Ernobius mollis* the article is dorsally furnished with a patch of setulae (Pl. 6, fig. 3). Two small muscles, one a levator, (Pl. 3, # 24, and Pl. 6, levplp. # 24, fig. 3), one a depressor (Pl. 3, # 23, and Pl. 6, dep.plp, # 23, fig. 3) are inserted on the base of the proximal article and attached posteriorly to the premental sclerite; they are difficult to discover in many cases.

The movements of the whole labium accompany the protraction and retractions of the maxillae and the movements of the prelabial region may assist the upward, forward and backward motions of hypopharynx. It is evident that the forward motion of the free part of labium must be produced exclusively by added bloodpressure as there are no labial protractor muscles.

A distinct *gular area* or a median gular sulcus do not occur

between the neck and the posterior margin of submentum, the latter determined by the places for attachment of the labial retractor muscles (Pl. 6, rst, # 22, fig. 3).

Divisivon 5. Exterior of Neck and Body Trunk.

The *neck or cervical region* is smooth, flexible and shaped like a flat ring which is divided by a median constriction into two parts, an anterior, connected with the hindmargin of the head, and a posterior, connected with the anterior margin of prothorax. The region is short in the anobiid larvae, largest in the few genera with semiretracted heads as *Ptilineurus* and *Cryptorama* (Pl. 44, fig. 10), and its anterior and posterior parts are folded together and hidden under the overlapping anterior margin of prothorax when the head is withdrawn.

The trunk of the body is membranous, soft and pale whitish, usually subcylindrical, of nearly equal thickness throughout, and curved. Only rarely are the larvae elongate, slender and not strongly curved as in *Petalium* (Pl. 42, fig. 16) and *Catorama vestitum* (Pl. 41, fig. 6), or the thoracic part considerably larger than the abdominal as in *Xyltobius* and *Cryptorama*. There are no plate-shaped sclerites, the separation of the segments is obvious and the subdivisions of the principal regions more distinct by segmental grooves than in many other coleopterous larvae in which they are obscured by large sclerites, and there are no urogomphi or similar structures in any of the larvae, except in the first larval stage which is known in a few species. In the inside of the body wall the grooves have usually low ridges but nowhere are these raised to strongly-projecting phragmata, conspicuous apodemes or apophyses. Thus, there are no strong pleural ridges and the pleural apophyses (Pl. 9, PlA, fig. 3) are short, the furcae (= sternal apophyses, auct.) (Pl. 9, furc, fig. 3) are absent and no medioventral apodemal processes, usually named spinae, extend from the spinasternal areas (Pl. 7, Ss, fig. 4; Pl. 8 and Pl. 9, spin, fig. 3) of pro- and mesothorax. Minor upper and lower nodal swellings may project from the upper and lower junctions (Pl. 9, ujc and ljc, fig. 3) of the intersegmental conjunctivae.

The different segmental areas are furnished with setae in all

anobiid larvae, but to a varied degree. In some species all areas are covered profusely with long, soft hairs, as in *Nicobium*, *Gastrallus*, *Trichodesma*, *Lasioderma* and *Ptilineurus*. In most species only some of the segmental areas are well supplied with setae, usually of moderate lengths, and in some of the fungivorous larvae as *Caenocara* (Pl. 49, fig. 4) and *Eutylistus*, the setae are sparse on all the areas and lacking on some of them.

In the majority of the anobiid larvae the prodorsal tergal areas (Pl. 7, PrD, fig. 4) of metathorax and a number of the abdominal segments, varying according to species, are armed with a few or with a single row or a patch of hook-shaped asperities. In a few species, as *Catorama gracilis* Fall and *Utobium elegans* Horn (Pl. 14, fig. 6) asperities are also found on mesothorax, but on the contrary, asperities are completely lacking in several species as in *Catorama vestitum* Fall., *Ozognathus cornutus* Lec. (Pl. 42, fig. 3), *Petalium seriatum* Fall. (Pl. 42, fig. 16), *Microanobium* sp. from China (Pl. 46, fig. 1), *Neogastrallus librinocens* Fisher and *Lasioderma serricorne* F. Aberrantly the asperities are minute, some obtuse others with flat scraperlike top in *Nevermannia dorcatomoides*. With the exception of the genera *Platybregmus* (Pl. 25, fig. 6) and *Anobium* (Pl. 26, fig. 8), all the larvae which possess prodorsal asperities on some of the body segments have also asperities on the lateral tergal regions of the ninth abdominal segments, but prodorsal asperities are always absent on this segment.

A great number of asperities is found on most of the epipleural tergal areas (EPI) of a single genus, *Ptilinus* (Pl. 50, fig. 20), in addition to numerous prodorsal asperities on most of the segments and a large patch on the sides of the ninth abdominal segment. Asperities on the tenth abdominal segments are rarely present but occur in the larvae of *Xestobium rufovillosum* (Pl. 17, fig. 7), *Ernobius mollis* and some other species of the genus *Ernobius*, in *Eucrada humeralis*, *Hedobia imperialis*, *Ochina ptilinoides* (Pl. 18, fig. 13 and 14) and a few more larvae. In *Nicobium castaneum* strong, short, but not hook-shaped asperities are present on this last abdominal segment.

The tergal areas of prothorax are fused together to a great extent and cannot be clearly homologized with the areas of the more typical segments.

In meso- and metathorax the composing elements of the two lateral tergal areas, the paradorsal area (= alar area, auct.) (Pl. 7, ParD, fig. 4), including the spiracular area (Pl. 7, SpA, fig. 4) and the epipleural (Pl. 7, Epi, fig. 4) area are in the main united and adapted to accomodate within them the pupal wing-pads. All the three thoracic segments are furthermore somewhat modified in keeping with the presence and functions of the legs. For these reasons the thoracic areas cannot be so precisely identified and defined as the areas of the more simple and typical first to seventh abdominal segments. Even on the somewhat reduced eight abdominal segment the single areas are quite determinable, and only the ninth and tenth abdominal segments are radically changed, the ninth for the purpose of being able to perform special locomotory motions, and the tenth with its nates (see p. 54, J) for aiding the final elimination of the dry excrements.

The tergal region with its areas is separated in *all segments* from the combined pleural and sternal regions by a longitudinal dorsopleural sulcus (Pl. 7a-a) which dorsally above pleurum extends throughout the entire length of the body from one segment to the next between the lower junctions (Pl. 7, ljc) of the intersegmental conjunctivae (Pl. 7, IMB). In front of each segment a marginal lip is inflected from the intersegmental conjunctiva, and to these low phragmata the segmental longitudinal dorsal muscle-bands (Pl. 8, #1a+2, and Pl. 10, #A1a+A2) are attached, indicating the beginning and the end of each segment.

The intersegmental conjunctivae in a hasty view appear exteriorly merely as ring-formed grooves between the segments but on the inside their generally simple and continuous walls are interrupted on each side by the upper and lower junctions (Pl. 10, ujc and ljc). These junctions are limited spaces located where the ends of some of the sulci which delimitate different areas approach or join the conjunctiva and are of particular importance as terminological landmarks. The upper junction lies at the ventral tip of the subtriangular half of the prodorsal area (Pl. 7, PrD, fig. 4) where the anterior end of the epipleural sulcus (Pl. 10, EPIs) of the segment and the posterior end of the same sulcus of the preceding segment approach the conjunctiva.

The lower junction (Pl. 10, ljc) is located where the con-

junctiva crosses the dorsopleural sulcus (Pl. 10a-a), and from this junction the externally rather indistinct anterior and posterior sternal sulci (Pl. 10, ASts and PSts) pertaining to two succeeding segments extend obliquely down in opposite directions. The intersegmental conjunctival ring is simple and quite regular between the abdominal segments but in front of the mesothoracic spiracular area (Pl. 7, SpA, fig. 4) and, less pronounced, in front of the metathoracic spiracular area it is somewhat indistinct and curved forward. Between metathorax and the first abdominal segment it is fashioned as between the abdominal segments.

The tergal region of a *typical abdominal segment* is divided into two dorsal and three lateral areas. The dorsal areas are the prodorsal (Pl. 7, PrD, fig. 4) and postdorsal (Pl. 7, PsD, fig. 4) areas, both mediodorsal and partly laterodorsal. The areas are separated by the oblique prodorsal sulcus (Pl. 10, PrDs). The lateral areas comprise the paradorsal (Pl. 7, ParD), the spiracular (Pl. 10, SpA) and the epipleural (Pl. 7, EPI) tergal areas. The paradorsal and postdorsal areas are fused and the boundary between them only qualified by an imaginary line located approximately outside the longitudinal paradorsal muscle (Pl. 10, Alb) (see: Abdominal muscles p. 40, l. 17) and well above the spiracle. Ventrally the paradorsal area is separated from the epipleural area by the curved epipleural sulcus (Pl. 10, EPIs) below the spiracle. The spiracular area (Pl. 10, SpA) is small, indistinct, located in front of the paradorsal area and contains the spiracle. The epipleural area (Pl. 10, EPI) lies above the dorsopleural sulcus (a-a). More or less centrally it is raised into an often profusely setose lobe and in front of the lobe a triangular small section is present. Behind the lobe lies a similar but larger section the posterior epipleural triangle (Pl. 10, EpT) the apex of which extends up to the rear of the paradorsal area. The pleural and sternal regions below the dorsopleural sulcus (a-a) consist in each segment of a pleural area (= "hypopleurum," auct.) (Pl. 7, Pl) with a lobelike elevation and a ventral boundary marked by a longitudinal pleuroventral sulcus (Pl. 7, b-b), and below the pleural area, of three sternal areas, namely the basisternal area (Pl. 7, BSt), the pedal area (Pl. 7, PdA) and the sternellar area (Pl. 7, Stl). The latter three areas are separated by the oblique anterior (Pl. 10, ASts) and posterior (Pl. 10, PSts) sternal sulci. In each

typical abdominal segment the two sulci converge, and consequently the anterior basisternal, the median pedal and the posterior sternellar areas are more or less distinctly subtriangular, the basisternal and the sternellar areas vaguely right-angled with apices toward the dorsopleural sulcus and the pedal area vaguely isosceles triangular with the apical part directed toward the mid-ventral sagittal line.

In the *meso- and metathoracic segments* an oblique linear depression, the paradorsal line (Pl. 7, ParDL) is found between the postdorsal and paradorsal tergal areas. It has apparently no corresponding ridge on the inside but is a constant feature lacking in the abdominal segments and constitutes a rather indistinct dorsal indication of the meso- and metathoracic paradorsal areas.

The distinct separation between the paradorsal and epipleural tergal areas of the typical abdominal segments is, on the other hand, not found in the meso- and metathoracic segments and the two areas have, as mentioned previously, to a considerable degree been combined into a single large composite area eventually covering a pupal wingpad. To be sure, a curved line corresponding to the distinct epipleural sulcus (Pl. 7 and Pl. 10, EPIs) in the abdominal segments below the spiracles is also present here but it is indistinct and shallow, and no muscle is attached to it corresponding to muscle 13b-b in the abdominal segments. The epipleural component of the unified area has also changed from what its abdominal counterpart looks like, for the lobed part has moved forward and downward. In many larvae this can be recognized readily by the position of a dense patch of setae lowered from the position of the corresponding patch on the lobes of the abdominal segments (Pl. 1 and Pl. 7, fig. 4). The anterior epipleural triangular section is insignificant, but the posterior (Pl. 7, EPT, fig. 4) is as large as in the abdominal segments.

Ventral to the dorsopleural sulcus (a-a) the thoracic pleurum is located and characterized by a large, round subcoxal division which consists of an anterior (Pl. 7, Sex', fig. 4) and a posterior (Pl. 7, Sex'') crescent-shaped lobe. The anterior lobe carries the episternal part (Pl. 7, Eps) and the posterior, the epimeral part (Pl. 7, Epm) of a poorly developed pleural sclerite. A pleural sulcus (Pl. 7, Pls) with a low pleural ridge on the inside separates

the episternal and epimeral parts and bears an articulating condyle (Pl. 9, c, figs. 1 and 2) which fits into a fossa or cup in the upper corner of the ovate, ring-shaped, sclerotized base of coxa. Adjacent to the base of coxa a lip-shaped fold, the meron (Pl. 7, m, fig. 4), is separated from the epimeral lobe, and a similar fold is separated from the episternal lobe on the opposite side.

The sternal region is divided by a transverse sternocostal line (Pl. 8, Stco) between the infracoxal furca-spots (Pl. 7, furc) into an anterior area, the basisternal area (Pl. 7, BSt) and a posterior one, the sternellar area (Pl. 7, Stl). Presternal sections are not found in anobiid larvae.

The composition of the prothoracic pleural and sternal regions with their areas and subdivisions deviates little from that of the same regions in meso- and metathorax, but the *prothoracic* tergal areas were as mentioned fused or obliterated to such an extent that any homology is obscured and indefinite between the prothoracic tergal elements and the meso- and metathoracic tergal areas.

Even more modified than prothorax is the *ninth abdominal segment*, and it differs from the preceding segments not so much in size as in the general appearance. This is due, partly to the predominance of the tergal region in comparison with the insignificant pleurosternal region, and partly to the disappearance by fusion of all the tergal areas. Only by help of the lower junction of the intersegmental conjunctiva anterior to the segment is it possible to locate and follow a weak dorsopleural sulcus and thus define the tergal region. But in a very general way the places can, nevertheless, be pointed out which are equivalent to the well-characterized areas of the typical segments. It is evident that the simple smooth dorsal part of the ninth segment corresponds to a combination of the two ordinary pro- and postdorsal areas and that the large patch of hook-shaped asperities, usually present on each side of the segment, is not homologous with the pro-dorsal hooks. But judging from the presence of a series of vertical muscles attached to the dorsopleural sulcus and affixed above the hook-bearing part this could be considered as a combination of paradorsal and epipleural elements and the hooks consequently be paradorso-epipleural. They could, however, hardly be homologous with the particular patch of hooks which are found on the epipleural lobes in the genus *Ptilinus*.

The *tenth abdominal segment* carries a ventral bilobed, symmetrical, oval cushion termed "the nates"¹ in front of anus. In some of the larvae, for instance, *Ptilineurus marmoratus* Reitter from Japan and several species of the genus *Ernobius*, in *Hedobia imperialis* L., *Ochina ptinoides* March. and *Xestobium rufovillosum* Deg. the tenth segment is, as previously mentioned on p. 30, l. 30, armed with asperities.

Division 6. Muscles of Body-Trunk.

The Neck Musculature.

The principal dorsal and ventral longitudinal bands of the muscles of the body trunk pass through the neck and attach themselves in the posterior part of the cranium, but there are no intrinsic longitudinal cervical muscles. Cervical plates are not found, but short dorsal and ventral oblique muscles are present, homologous with the ones which move the plates up and down in the insects which possess plates. Minor muscles are also inserted in the cervical membrane coming from both the cranium and the anterior marginal regions of the tergum and the sternum of prothorax, probably to aid the infolding of the neck.

Thoracic and Abdominal Muscles.

The locomotion of the body is a comparatively minor function in the anobiid larvae just as in other curved and soft-bodied larvae. The legs are weak and, in the genus *Caenocara*, even minute, and sclerotizations, such as a prothoracic shield and pleural plates, are insignificant or entirely absent; strong internal apodemes and apophyses are lacking, as previously mentioned. But the prodorsal areas and the sides of the ninth abdominal segment, armed in several species with asperities, aid the larvae considerably in making their way in wood, or beans, or other material in which they live. Nevertheless, the ordinary locomotory muscles of the legs are all present, and the dorsal muscles which produce the movements of the asperate body-parts are not essentially different in distribution and development from the

¹ The morphological origin, the construction and the function of the nates will be treated separately in a special section (p. 54, J) of the chapter dealing with the structures of the alimentary canal.

dorsal muscles known in other coleopterous larvæ, including the curved larvæ with more than two dorsal folds and the well-sclerotized running and swimming larvæ. However, some of the special, supplementary muscles to the additional folds in some of the curved larvæ are not present in the anobiid larvæ and some of the muscles which occur in running and swimming larvæ have not been found, whether the muscles have been fused with other muscles or are obscured in the small anobiid larvæ, or are absent, as some peculiar transverse adductor coxæ muscles are which occur in the thoracic segments of several other larvæ. In these they start from a lower junction, run over the entire sternum, enter the coxa on the opposite side of the body and on the way through the segment cross their counterpart in the sagittal midline. The muscles are fairly strong where they occur, and it seems therefore noteworthy that they are completely absent here in the anobiid larvæ.

The whole assemblage of muscles in the body and the sulci and areas to which the muscles are attached belongs undoubtedly to two different anatomical categories but the two systems are intimately correlated; to special sulci and areas special muscles are fastened. Thus it becomes possible to distinguish anatomically and orismologically important sulci and areas from similar but occasional features with different or no muscle associations¹.

The arrangement of the sulci and areas is fairly uniform in mesothorax, metathorax and the majority of the abdominal segments and can consequently be considered in common. But in prothorax and the greatly modified ninth and tenth abdominal segments many areas are fused and significant muscles rearranged or reduced so much that an homologization with those present in the typical segments is uncertain or impossible. In prothorax, however, it is to a certain extent the special shape and size, anterior insertions on the head and the altered course of single

¹ In several of my papers published at different times I have interpreted and termed the dorsal areas of the scarabæid larvæ differently from the current opinion. However, Dr. Wm. H. ANDERSON has shown me that the pertinent musculature did not substantiate my view as the prothoracic dorsal sulcus, which I had considered to be the separating boundary line between the pro- and mesothoracic segments, was an occasional secondary feature without any determining muscle association. The terms designated by authors, as R. B. FRIEND, Wm. HAYES, P. O. RITCHER and F. H. BUTT, to the body areas of the scarabæid larvæ are correct according to the attachment of the determining musclebands and my own erroneous naming of same should be disregarded.

muscle-units which create the immediate, but not entirely correct impression that the pattern of the prothoracic muscle system has little in common with the arrangement of, even, the meso- and metathoracic musculature. Yet, several of the muscles are exclusively prothoracic and, on the other hand, some muscles which are common in the other body segments are lacking here. For these reasons the details of the prothoracic muscle-arrangement will be described separately.

The anterior and posterior margins of the mediodorsal part of each body segment are determined by internal dorsal longitudinal muscles (Pl. 8, #1a, and Pl. 10, #A1a) which run from the low phragma or ridge in front to the phragma lying behind the segment, except in prothorax, where the anterior insertions are on the postoccipital ridge (Pl. 2, pos, fig. 1). These internal longitudinal muscles are in most of the body segments arranged, sometimes quite indistinctly, in four flat, parallel bands, and underneath and crossing them is a layer of similar muscles (Pl. 8, #2, and Pl. 10, #A2). A distinct longitudinal band, termed the paradorsal muscle (Pl. 8, #1b, and Pl. 10, #A1b), runs between the upper junction in front of one segment to the upper junction behind it. It consists of but one layer of fibers. Exterior to all these segment-long muscles and close to the body wall are external mediodorsal and laterodorsal sectional muscles (Pl. 8, #3, and Pl. 10, #A3) which characterize and determine the prodorsal sulci. One set of these external dorsal muscles (Pl. 8, #3) extends from the anterior margin of the segment to its prodorsal sulcus (Pl. 10, PrDs) and another set (Pl. 8, #3', and Pl. 10, A3') from the sulcus goes to the conjunctiva behind the segment. The ends of the muscles of the set in front are often connected with the ends of the muscles of the posterior set where they are fastened to the sulcus. The imaginary line which, as described in the preceding chapter (p. 32, l. 20), forms the boundary between the postdorsal area and the paradorsal area in the abdominal and, to a certain degree, also in the thoracic segments, is determined by the paradorsal longitudinal muscle band (Pl. 8, #1b and Pl. 10, #A1b) over which the line is to be located on the outer surface of the body. The lateral section of each of those conjunctivae which limit a typical segment anteriorly and posteriorly is defined by a strong, upright tergopleural conjunctival muscle

(Pl. 8, #12c, and Pl. 10, #A12). This muscle is slightly intersegmental and located posteriorly in the thoracic segments, running from the anterior side of a lower junction to the posterior side of an upper junction, but it is segmental and placed anteriorly in the abdominal segments, except in the first one in which the muscle is absent.

In each of the thoracic segments a long, upright, lateral intersegmental muscle (Pl. 8, #11) lies between the upper junction and the postcoxal pleurosternal region at the furca spot and follows the somewhat shorter conjunctival muscle (12c) quite closely, but it is absent in the abdominal segments. In these there are, on the other hand, two strong oblique lateral muscles (Pl. 10, #A7a and A7b) which, supplementing the conjunctival muscle, extend from the lower end of it (A12) all the way through the segment in an upward posterior direction. Two, similarly supplementary muscles (12a and 12b), are found in thorax but here they extend from the lower end of each conjunctival muscle in an upward anterior direction. Both the latter and former sets of supplementary muscles belong to the same category of strong oblique and counterwise-running muscles (7d, A7c, A7d) which occupy the flanks of the body trunk both in thorax and the abdomen and may run through two or more segments and even continue into the ventral areas below the dorso-pleural sulcus (A7c). They are functionally essential for the purpose of forcing the tergal and pleurosternal elements together and accomodate the breathing and the shifting of blood pressure, but they have no particular orismological value because, speaking in general, they are unassociated with any of the sulci by which the different areas are determined. Of the sulci, which in the lateral part of the body limit the individual tergal areas, the distinct and curved epipleural sulcus in the abdominal segments (Pl. 10, EPIs) is characterized by the dorsal end of a vertical muscle (Pl. 10, #13bb) whose ventral end is affixed to the abdominal pleuroventral sulcus (Pl. 10, b-b). In meso- and metathorax where the paradorsal area (Pl. 7, ParD) and the lobe bearing part of the epipleural area (Pl. 7, EPI) are fused to form a composite area, no homologous muscle is inserted on the very vaguely-indicated epipleural sulcus (Pl. 7, EPIs). But to the sulcus which limits the posterior epipleural triangle (Pl. 7, EPT)

anteriorly, and which also is conspicuous in the abdominal segments, a fan-shaped group of small muscles (Pl. 8, #13) radiates from the lower junction and often spreads into the small anterior epipleural triangle of the next segment (compare Pl. 10, #13a and 13c). A thin muscle (Pl. 9, S) is fastened to the spiracle immediately under the peritrema on and around the so-called neck of the spiracle both in the thoracic and the abdominal segments (Pl. 10, #S) extending down in the direction of the dorsopleural sulcus (a-a) in the segment to which the spiracle belongs.

The anterior and posterior margins of the pleurosternal ventral part of a segment are determined, like the margins of the medio-dorsal part, by internal longitudinal segment-long muscles (Pl. 8, 4b, and Pl. 10, #A4b) between the conjunctiva in front and the conjunctiva behind. In meso- and metathorax additional strong, flat muscles (Pl. 8, #4a) form a horizontal band running between the sternocostal lines (Pl. 8, Stco) which are interposed between the furca-spots of each segment both in mesothorax and metathorax (Pl. 7, furc, fig. 4). An oblique diagonal muscle (Pl. 8, #4c) runs, furthermore, from the lower junction in front of mesothorax to the spina spot (Pl. 9, spin, fig. 3) behind the segment. It crosses a similar oblique diagonal muscle (Pl. 8, #4d) which runs contrawise and external to it from the lower junction behind to the spina spot in front. A muscle homologous with the latter is found in the metathoracic segment, but this muscle crosses internally an oblique, external muscle (Pl. 8, #4e) which runs in a posterior direction from the lower junction in front of the segment to near the sagittal line. Still, in the same segment, a short, oblique posterior muscle (Pl. 8, #4f) comes from the lower junction behind and extends to the furcal spot at the third leg.

In the abdomen the entire inner ventral surface of the body wall is covered by horizontal, flat muscle bands, and two vertical tergopleural muscles also occur in each segment. The horizontal muscles include both internal and external longitudinal muscles. The internal longitudinal muscles (Pl. 10, #A4b) run between subsequent conjunctivae, defining the ventral anterior and posterior margins of the segment. They form more or less distinct bands along the whole ventral region of the abdomen. A single band of likewise internal muscle fibers, but intersegmental (Pl. 10,

#A4a), is also found. The external muscles (Pl. 10, A4g) lying close to the integument are only a little shorter than the segment in which they occur. Of the two vertical tergopleural muscles, one has already been described as running from the abdominal pleuroventral sulcus (b-b) to the abdominal epipleural sulcus (Pl. 10, EPIs), thus determining both sulci, and the other (Pl. 10, #A10), which consists of a couple of bundles of long muscle fibers, extends from the dorsopleural sulcus (a-a) to the dorsal boundary region of the paradorsal area (Pl. 10, ParDl) covered here internally by the paradorsal longitudinal muscle band (Pl. 10, #A1b). It may correspond to some of the long upright bundles of tergopleural muscles in each of the thoracic segments which run from the pleural ridge (Pl. 8, #10c, 10d, 10f) to the weak paradorsal line, and this is the reason why the abdominal muscles in question are considered not simply as tergal muscles but as associated also with the pleurosternal regions.

With the exception of the latter bundle of muscle fibers, none of the many following muscles are represented by homologous muscles in the abdominal segments. They are all thoracic and directly or indirectly produce and regulate the movements of the legs, or support the features with which the legs are connected. A few thin postcoxal tergopleural muscles (Pl. 8, #10g and Pl. 9, #10g, fig. 1) come from the posterior marginal part of the fused paradorsal-epipleural areas and are fastened, one to or close to the epipleural ridge, and the others to epimeron and the adjacent pleurosternal membranous field. Attached to the pleural ridge a very small muscle (Pl. 9, #20, fig. 1 and Pl. 9, #20, fig. 3) goes to the lower junction in front of the ridge and another, somewhat larger (Pl. 9, #21) to the lower junction behind it. A small pleurocoxal muscle (Pl. 9, #18) connects the ridge with the opposite coxal margin at the furca-spot, and from the episternum and the side of the ridge small pleurocoxal muscles (Pl. 9, #19, figs. 1 and 3) go to the basal rim of coxa anterior to the coxal articulation. The long tergopleural muscles (Pl. 8 and Pl. 9, fig. 1, #10c, 10d, 10f), alluded to above (p. 40, l. 11) extend from the pleural ridge to the thoracic incomplete paradorsal line, and to the same category as these muscles a single tergopleural muscle (Pl. 8 and Pl. 9, fig. 1, #10b) probably belongs, but it is inserted in the membrane anterior to the coxal rim close to

the coxal articulation. Dorsally it is attached to near the middle of the anterior margin of the lateral tergal region. The long ascendant, dorsoventral promotor (Pl. 9, figs. 1 and 3, #14) and remotor (15) muscles of coxa, as well as the extracoxal depressor of trochanter (Pl. 9, figs. 1 and 3, Trm) are dorsally attached in the same horizontal level as the long tergopleural muscles from the pleural ridge. The ascendant promotor of coxa is single and affixed anteriorly somewhat above the middle of the coxal rim. The remotor muscle is double, V-shaped and inserted by a common single short tendon on the posterior side of coxa opposite to and nearer the sagittal middle line (Pl. 9, sagit, fig. 3) of the body than the promotor. The sternal anterior (Pl. 9, #16) and posterior (Pl. 9, #17) rotator muscles of coxa are inserted respectively on the anterior and posterior side of coxa, closer to the sagittal line than the ascendant promotor and remotor muscles. In mesothorax the anterior rotator runs to the prothoracic spina spot and in metathorax to the mesothoracic spina spot. In prothorax where an anterior rotator has not been found it may possibly be obscured by the segmental or the sternocostal ventral depressors of the head (Pl. 8, #4a, 4b). The posterior rotator muscles run to the spina spots behind or, referring to the rotator of the third leg, to the middle of the ventral part of the conjunctiva behind. Both the anterior and posterior rotators are either covered internally by or run closely parallel with the diagonal, oblique ventral muscles to the spina spots (Pl. 8, #4c, 4d).

With the exception of the just-described muscles of the legs which are almost identical in all thoracic segments, the pattern of the muscle system in prothorax is manifestly different from that of the two other thoracic segments because, as said before, (p. 36, l. 26) several of the principal muscles are considerably changed in shape and in places of insertion from the homologous ones in the other thoracic segments and because new muscles have been developed and others, present in meso- and metathorax, have disappeared.

The prothoracic muscle bands attenuate gradually forward and usually bend more or less strongly toward the cranium, either upward or downward. Only one of the principal bands, a dorsally located levator of the head (Pl. 8, #1*) is horizontal. It extends from the first phragma to the top of the cranium and

belongs evidently to the same category as the mediodorsal longitudinal internal muscles (1a) of the other segments. Two rotators of the head (Pl. 8, #2*) come from the posterior upper part of tergum and the conjunctival membrane immediately behind, and they run obliquely down to the upper part of the postoccipital apophysis. The muscles correspond possibly to the oblique ones, (Pl. 8, #2) which lie beneath the mediodorsal internal longitudinal bands in meso- and metathorax. External oblique prothoracic muscles (Pl. 8, #3*) from the first phragma, dorsally of its upper junction, extend upward to about the middle of the prothoracic roof. They are similar to and probably homologous with the mediodorsal, sectional external muscles (Pl. 8, #3) from the phragmata behind meso- and metathorax to the prodorsal sulci in front. Parallel with these muscles a long muscle (Pl. 8, #1**) attached at the upper junction runs upward to near the head. Three long muscles (Pl. 8, #7a, 7b, 8), which are depressors of the head, belong to the muscles which, unlike the just mentioned, are exclusively prothoracic. They are attached in the tergum approximately on the same level with the paradorsal longitudinal muscle bands (Pl. 8, #1b) in meso- and metathorax and continue obliquely downward to the lateral margin of the throat where they become inserted. Another special prothoracic muscle group (Pl. 8, #6) is a levator of the head. It consists of rather long but thin muscles which, lying close together, extend from near the posterior margin of acrosternum (Pl. 9, Acrst, fig. 3) and are inserted low in the lateral part of the postoccipital apophysis. Running counterwise of this bundle of muscles and crossing it in front of coxa, a second but shorter bundle of dorsoventral muscles comes from the acrosternal vicinity (Pl. 8, #9), and the single elements of the bundle are inserted on the ventral margin of tergum.

From the lower junction behind the segment two long and strong muscles come which, diverging from a common starting place, extend upward through the tergum. The upper branch (Pl. 8, #12b) becomes implanted in about the same horizontal level as the tergal motor muscles of the coxa, and the lower branch (Pl. 8, #12a) is fastened nearby but more ventrally in the anterior part of tergum.

The vertical tergopleural conjunctival muscle (Pl. 8, #12c).

formerly described, belongs apparently to the same unit, and the whole set may or may not be homologous with the muscles (marked 12a, 12b and 12c) which originate from the lower junction in the rear of both meso- and metathorax.

The forward attenuating horizontal ventral depressor of the head (Pl. 8, #4a*) from the prothoracic sternocostal line (Pl. 8, Steo) to the throat is evidently a continuation of the longitudinal ventral muscle bands between the meso- and metathoracic sternocostal lines. In a similar manner a second ventral depressor of the head (Pl. 8, #4b*) appears as an oblique prolongation of the ventral longitudinal muscles between the lower junctions of meso- and metathorax (Pl. 8, #4b). It originates also from a lower junction, in this case the lower junction of prothorax behind the leg, thus above and somewhat to the rear of the place where the first ventral depressor of the head is attached. In addition to the three long tergopleural muscles from the pleural ridge (Pl. 8, #10c, 10d, 10f) which the prothorax has in common with the other thoracic segments, a fourth muscle (Pl. 8, #10a) runs from the pleural ridge to the cervical membrane. Finally, two muscles issue from the first spinal spot and run obliquely forward to the base of the leg, one on top of the other. The one above (Pl. 8, #5) is inserted in the furcal spot and is a special prothoracic muscle but the other is a typical leg muscle, present in all thoracic segments, for it is the posterior sternal rotator of coxa (Pl. 9, #17, fig. 3), inserted, as noted above, on the posterior side of the basicoxal rim.

The musculature of the ninth and tenth segments will be discussed p. 55 K) in a following chapter about the alimentary canal and has already been referred to on p. 34, l. 33.

Division 7. Legs and Leg-Muscles.

The legs (Pl. 9, figs. 1 and 2) are present in all anobiid larvae. They are generally fairly well developed although their function as locomotory organs is limited to aiding the larvae either in moving inside their galleries in old furniture, old books and objects of similar nature or, according to the different habitats of the species, in changing of place within dry beans, puffballs etc. With the exception of the species of *Caenocara*, in which the

legs are either minute and indistinctly segmented or mere warts without claw (Pl. 49, figs. 3, 19, 20), all the anobiid genera and species have five segments in each leg as normally found in the polyphagous beetle-larvae. The trochanter (Tr) is distinctly separated from femur (Fm), tibia and tarsus united to one segment (Tb-Ta) and pretarsus (Ptar) always present though its terminal claw-shaped part (Dac) is absent in several of the species (Pl. 44, fig. 17, and Pl. 45, fig. 8). Coxa (Cox) is short and broad. Its proximal end is enforced by an annular basicoxal sclerotization which has a single articular cup hinged to the condyle (C) of the pleural ridge, and also bears a pair of small processes (Pl. 9, pr, fig. 2) which articulate with trochanter. The other segments of the leg are generally smooth, thinly sclerotized and pale. In two places only, apart from the claws, distinctly colored and fairly thick sclerotizations are found, one on the ventral broad side of trochanter where the proximal margin projects as a round, beaklike lobe which at each end of its base has a small articular socket for the coxal processes (pr) and the second on the dorsal side of tibia where the proximal margin is hardened to a semicircular expansion. Trochanter is shaped as a signet ring with the face turned ventrally. It joins the femur closely but is, as stated above, distinctly separated from it by a boundary line and contains also a short muscle (R) which is attached to the proximal end of femur. Femur and tibio-tarsus are either about of the same length, or femur is slightly the longer in some species, tibio-tarsus distinctly longer in others, but femur is always thicker than tibio-tarsus which gradually tapers from its proximal base to the distal end; and this is about as wide as the base of pretarsus. Pretarsus (Ptar) is characterized by a small unguitactor plate (Untr) at its proximal end and consists regularly of two parts, one a basal part armed with from two to many setae, and the other a claw. The claw (Dac) varies in shape and size according to genus and even to species as in the genus *Ernobius* (Pls. 19 to 21, 44, 45). It may be long, pointed and rather straight or awl-shaped, as in *Eucrada* (Pl. 15, fig. 7), *Hedobia* (Pl. 16, fig. 6), *Holcobius* (Pl. 32, fig. 4) and *Nicobium* (Pl. 33, fig. 12), with gradual transition in width and sclerotization toward the membranous basal part, which is armed with several setae. But in most of the other larvae the proximal membranous

part of pretarsus is distinctly set apart from the claw and carries only two setae. The claw may be short, strong and slightly curved downward or straight as in *Anobium* (Pl. 26, fig. 9) and *Platybregmus* (Pl. 25, fig. 9) or distinctly curved as in *Catorama tabaci* (Pl. 39, fig. 6), or it may be long and awl-shaped as in *Stegobium* (Pl. 28, fig. 9), or thin and spinelike as in *Cryptorama* (Pl. 44, fig. 9), *Eutylistus* (Pl. 47, fig. 16) and *Dorcatoma* (Pl. 48, fig. 18). Intermediate forms are frequently found between all of the types. In some of the larvae, for instance *Ernobius mollis* (Pl. 19, fig. 8) and *Catorama vestitum* (Pl. 41, fig. 10) a soft arolium (Ar) is found in continuation of the ventral side of the membranous part of pretarsus, and in several species as in *Ernobius marginicollis* (Pl. 45, fig. 8), *Neogastrallus librinocens* (Pl. 45, fig. 14) and *Microanobium* sp. a claw is completely absent. In these latter species pretarsus with two setae unites with arolium into an oval, soft bladder. A unique development of the legs is found in *Ptilineurus marmoratus* (Pl. 50, figs. 9 and 10), for while the three pairs of legs are similar in size and shape in all other anobiid larvae, the front legs differ in this species considerably from the second and third pairs. The latter are entirely normal legs of the type in which the claw is long and straight and the membranous basal part conical with many setae, but the legs of the first pair have a particularly strong and completely sclerotized basal pretarsal part, recognized by a distinct unguitractor plate, and carries numerous short, thick and ovate setae all over. The claw is very slender, awl-shaped and turned upward. With the exception of this strange pretarsus, the other segments of the first leg are generally proportioned and shaped as those of the second and third pairs, only a little more robust.

A noticeable change in shape and reduction in size from the common type of anobiid larval legs occurs in a small group of species related to the fungivorous genera *Eutylistus* and *Dorcatoma*, both of which, however, have normal legs. The group includes *Anitys rubens* Hoffm., *Caenocara bovistae* Hoffm. and *Caenocara oculata* Say. In *Anitys rubens* (Pl. 48, fig. 10) the legs have become short and thick; femur and tibio-tarsus being particularly reduced in length, but all the regular segments are present and pretarsus is distinct, has a membranous base armed with two setae and a long, awl-shaped claw. In *Caenocara bovistae*

Hoffm. (Pl. 49, fig. 3), the entire leg is membranous and soft, very short and thick and has a bristlelike claw; the single segments are only indicated and their setae are few. In *Caenocara oculata* Say (Pl. 49, figs. 19 and 20) the legs are vestigial and represent the last step in the retrograde development. They are reduced to mere warts with the segmentation almost eliminated, the setae are few, and the claw is practically gone.

The muscles of the leg conform in general to the pattern in which they are arranged in other beetle larvae, but are in some of the larvae, particularly of the genus *Caenocara*, so reduced in number and development that most of them seemingly are absent. The many muscles from the wall of the thoracic segments to the bases of the legs, not always easy to distinguish individually, have been described previously (pp. 40, l. 17 to 41, l. 25) and, therefore, only the muscles located strictly within the legs will be dealt with here.

The main movement between coxa and trochanter is up and down around an imaginary quite horizontal axis between the anterior and posterior coxo-trochanteral small articulations (Pl. 9, pr, fig. 2). For the performance of the movement two groups of trochanteral muscles from the coxa to the proximal margin of trochanter oppose each other. The first group, the levator muscles of trochanter (Pl. 9, O, figs. 1 and 2) includes muscle-sets which are inserted close together on the dorsal, narrow side of trochanter and are attached to the hind side of coxa. The second group, the intracoxal depressor muscles of trochanter (Q) includes also separate sets of muscles. They are inserted jointly on the ventral beaklike process, and one of them is attached to the front side of the coxal wall near the pleural articulation of the leg, the others somewhat more distal from it. The long tergal depressor muscle of trochanter (Trm) which as previously described (p. 41, l. 4) arose in the tergal region is also inserted on the beak. In trochanter a single, short muscle (R) is affixed to its ventral broad face and inserted on the opposite proximal corner-part of femur. When contracted the muscle may aid in pressing the adjacent margins of trochanter and femur securely together. The femur (Fm) with little or no independent movement needs no strong levator and depressor muscles but many and strong tibio-tarsal muscles are attached to its wall. The tibio-tarsal levator muscle (S) is inserted

on the dorsal projection from the proximal margin of tibia and consists of two bundles of muscles both arising on the dorsal side of femur at the line separating it from trochanter. The tibio-tarsal depressor muscle (T) is inserted ventrally where tibia and femur meet; it consists also of two bundles of fibers but they form a somewhat stronger muscle than the levator. The weaker of the depressor bundles arise from about the same place on the wall of femur as the levator but the other, more ventral, bundle is attached to the broad face of trochanter. A long threadlike apodemal tendon (Tend, fig. 1) runs from the unguitactor plate (Untr) all the way into the femur through the tibio-tarsal segment, and on the proximal half of this tendon two bundles of long depressor muscles of pretarsus (U) are inserted coming from the proximal part of the dorsal side of femur, and, more distally, two much shorter and weaker bundles are inserted coming from the tibial part of the segment. All of these pretarsal depressor muscles cooperate as a flexor of the claw, but levator muscles to raise the claw do not exist.

Division 8. Spiracles.

The spiracles (Sp) of the anobiid larvae are all found on the sides of the body in the laterally-located spiracular areas of tergum. The first thoracic spiracle has its place in the rear of prothorax somewhat more ventral than the abdominal spiracles which follow in a horizontal row, but it is, strictly speaking, a forward-moved mesothoracic spiracle as its spiracular muscle (Pl. 9, S) shows. The second thoracic spiracle is reduced to a minute, dark dot in or close to the conjunctiva between meso- and metathorax and at the level with the first thoracic spiracle. The spiracles in each of the succeeding eight abdominal segments are well developed even if they are somewhat, and in a few species much, smaller than the first thoracic. The first abdominal spiracle may occasionally be noticeable larger than the rest in the abdomen but usually they are all of equal size. When the spiracles have special extensions from the rim, the common rule is that these extensions point forward toward the head in thorax and backward toward the anus in the abdomen. The spiracles vary greatly in appearance in the different members of the family and, yet,

can all be considered either as typical annular spiracles or as manifold variations of this principal type. They have a wide spiracular opening, set off from the body-skin by a distinct but thin marginal peritremal rim, and leading directly into a well-developed atrium. In its basic simpleness this annular type occurs in species as *Xeranobium macrum* Fall (Pl. 33, figs. 6 and 7), *Catorama punctatum* Lec. (Pl. 37, figs. 6–8), *Caenocara bovistae* Hoffm., (Pl. 49, figs. 5, 6) and others. However, in the majority of the species one or two or many closed or more often widely open and smooth spouts extend from the rim which consequently loses its regular annular appearance. An annular spiracle with a single spout has occasionally been observed also in larvae of other families, for instance in the curculionoid *Platypus compositus* Say and *Proterhinus anthracias* Perkins and has even been given the special name of uniforous or unicameral spiracle. In anobiid larvae, however, this variation of the annular type is common and found for instance in *Hedobia imperialis* L. (Pl. 16, figs. 7–9), *Ernobius abietis* F. (Pl. 20, figs. 5 and 6) and other species of *Ernobius*, in *Ozognathus cornutus* Lec. (Pl. 42, figs. 6–8), *Stegobium panicum* L. (Pl. 28, figs. 3–6), and *Catorama herbarium* Gorb. (Pl. 38, figs. 7–9). In species as *Anobium punctatum* Deg. (Pl. 26, figs. 5–7), and *Gastrallus laevigatus* Oliv. (Pl. 40, figs. 7 and 8) the spout is long and sausagelike. Spiracles with two well separated spouts are found at least in the thorax of several species as *Catorama tabaci* Guér. (Pl. 39, figs. 7 and 9), *Anobium gibbicollis* Lec. (Pl. 26, fig. 11), *Oligomerus sericans* Melsh. (Pl. 31, fig. 15) and others. Spiracles with from three to numerous spouts occur in *Trypopytis sericeus* Say (Pl. 24, figs. 7–9) and *Eucrada humeralis* Melsh. (Pl. 15, figs. 8–10). In several species an extraordinary development of the annular spiracle has taken place, appearing in a very characteristic way in *Cryptorama minutum* Lec. (Pl. 44, figs. 7 and 8) and *Eutylistus intermedius* Lec. (Pl. 47, figs. 7 and 8) in which one part of the rim forms a loop away from the entrance to the spiracular trachea which is two or more times longer than the opposite part, and also in *Catorama nigritulum* Lec. (Pl. 36, figs. 6–8) and *Eutylistus facilis* Fall (Pl. 47, figs. 14 and 15) in which the circumference of the entire annular rim has been greatly extended. That part of the wall of the atrium which is nearest the rim follows the extension of the

rim and forms a horizontal floor flush with the surface of the body. Generally the floor retains the appearance, common to the inside of an atrium in many insects, being laid with a covering of a multitude of minute, pointed swellings, but here interspersed with many suboval and irregularly ring-shaped, clear spots or arranged as a mosaic of geometrical figures. These spiracles resemble superficially the cribriform type and have mistakenly been so named. As the last offshoot of the polymorphic spiracular development in the anobiid larvae the remarkable looking spiracles of *Priobium tricolor* Oliv. (Pl. 35, figs. 6-8) will be mentioned. Its features can morphologically be derived from those found in species like *Eucrada humeralis* Melsh. (Pl. 15) in which a part of the otherwise straight rim is convoluted into a series of low loops and curves. However, in *Priobium tricolor* the rim has only a single extension but the latter is long and from its margin obtuse, open branches crop out whose edges roll in over the floor of the structure. The floor itself is a prolongation from the wall of the atrium and like the atrium provided with numerous fine pointed projections. It might be suggested that the marginal flexions of this strange spiracle constitutes a stage in the development of the common bicameral spiracular type and if that is the case it would make a good point in favor of the much discussed claim that the airtubes at least of the typical bicameral spiracle have open linear fissures on top and are not to be regarded as wholly closed outshoots from the sidewall of the atrium.

Division 9. Organ of Ingestion and Nates.

The organ of ingestion of the anobiid larvae (Pl. 12) is divisible into the following sections: A - The preoral cibarial cavity (Cb); B - the pharynx (Phy); C - the oesophagus (Oe); D - the ingluvies (or "crop") (Cr); E - the proventriculus (Pvent), and the cardiac valve; F - the ventriculus (Vent); G - the pyloric section (Pyl); H - the anterior intestine (AInt); I - the posterior intestine with two subdivisions, namely the rectal sac (rsc) and the rectum proper (Rect); J - the nates (or "anal cushion") (Nat) and; K - anus (An).

A - The preoral cibarial cavity (Cb) is well developed, with the posterior part built as a pump to convey, together with

pharynx, the masticated solid food in the anterior part of the cavity into the subsequent sections. The roof is formed by the labro-epipharyngeal region (Pl. 3, LmEphy, Pl. 4, and Pl. 5, fig. 1), anteriorly armed with strong, curved setae or, in some species, long, soft bristlelike hairs, and posteriorly covered with minute, densely set papillae and, often sensory pores. The floor is represented by the fleshy upper surface of hypopharynx (Hphy), and the hind wall by the clypeo-epipharyngeal region (Pl. 3, ClpEphy and Pl. 5, fig. 1) which slants back to the entrance to Pharynx (Phy) and is lined with a smooth, shiny and elastic intima. The mandibles and maxillae are within the cibarium, bounding it laterally (Pl. 24, fig. 1). When functioning the cavity is alternately dilated and compressed. In dilation (Pl. 3) the labrum together with the labro-epipharyngeal region is raised, the hypopharynx is lowered and the clypeo-epipharyngeal hind-wall pulled upward. The raising of labrum is done mainly by the increase of the blood pressure; the lowering of hypopharynx, on the other hand, is performed by the contraction of the muscle (Pl. 3, #19) which arises on the tentorial bridge and is inserted laterally on the base of hypopharynx, and the pulling back and up of the hindwall (Pl. 3, ClpEphy) is done by the contraction of the three dorsal dilator muscles on each side of the cibarium (Pl. 3, #5, 6 and 7) which are inserted in a longitudinal row, one behind the other, at the lateral margin of the hindwall. At the same time when the dilation of the cibarial wall takes place, the mandibles rotate outwards with their bases raised and separated from each other, and the maxillae are thrust out to the sides. The compression of the cibarial cavity results from opposite movements of the same component parts. The labrum with the labro-epipharyngeal region is bent downward by contraction of the muscles from torma to the inside of the posterior part of frons (Pl. 3, #3), the hypopharynx is raised by contraction of the muscle (Pl. 3, #10) of the hypopharyngeal suspensorial bar (Pl. 3, Su) to the frons immediately lateral of the place where the dorsal dilator of pharynx (Pl. 3, #9) is attached, and the clypeo-epipharyngeal hindwall of the cibarium is bulged into the cavity by the elasticity of the wall after relaxation of the dorsal dilator muscles (Pl. 3, #5, 6, 7). Simultaneously the mandibles and maxillae return to their closed positions. The salivarium,

usually associated in other insects with the cibarium both in position and function, is here reduced to an inconspicuous concavity in the skin between the hypopharynx and the labial wall above prementum, and salivary (or "labial") glands and a duct are absent as they supposedly are in all coleopterous larvae and imagines.

B - The entrance to pharynx from the cavity of the cibarium is marked by the place of insertion on the dorsal wall (immediately behind the pharyngeal opening) of the muscle (Pl. 3, #9) which arises on frons and lies posterior to one of the paired connectives of the frontal ganglion. Pharynx (Pl. 3, Phy) is about twice as long as the hindwall of the cibarium and has anteriorly the shape of a flat tube; posteriorly it is more circular in cross section. The dorsal wall of the anterior part is convex toward the lumen of pharynx and covered by a boat-shaped posteriorly tapering portion of intima which is smooth, shiny and elastic like the cibarial hindwall. The ventral wall is softer. The pumping action which started in the posterior part of the cibarium in order to transmit the food into the digestive system proceeds in the pharynx and is accomplished by dilating and compressing the section alternately. To dilate it the dorsal and ventral walls are drawn in opposite directions. The dorsal wall is lifted by the dorsal dilator muscle (Pl. 3, #9) to the anterior region of pharynx and by the group of dorsal dilator muscles (Pl. 3, #11) which arise from the posterior part of frons immediately lateral of where the depressor muscles of labrum arise; and the ventral wall is lowered partly by the midventral group of dilatores of pharynx (Pl. 3, #30) which extend from the anterior part of pharynx to the tentorium (Pl. 3, Tnt) and partly by the lateral group of dilators (Pl. 3, #31) which, inserted in the wider posterior part of pharynx, comes from the inside of each parietale (= "epicranial half"). The compression of pharynx, following the dilation of it, is performed by increasing the convexity of the elastic intima of the dorsal wall, pressing it against the opposite ventral wall which moves upwards at the same time. And the compression is performed by the layer of small transverse and oblique muscles (Pl. 3, #12) which spreads over the wall.

C - The oesophagus (Pl. 3, Oe, and Pl. 12) begins immediately, and without any essential histological and anatomical changes,

behind the last group of the dilator muscles of pharynx (Pl. 3, #31). It is about as long as the first thoracic segment, is straight, tube-shaped, and circular in cross section; posteriorly it enlarges gradually and continues into the crop (Pl. 12, Cr). The wall is extensible and has, as typical in insects, six longitudinal main folds, and the intima is set with colorless, hairlike filaments especially on top of the folds. Around the epithelium of the wall is a sheath of longitudinal (Pl. 3, lmcl) and circular (Pl. 3, cmcl) muscles. The longitudinal muscles lie mainly in the folds of the epithelium and the circular muscles cover them on the outside. Besides these muscles, which perform the important peristaltic movements of the oesophagus, no other group of muscles is found inserted on and radiating away from the wall of the oesophagus, and the latter differs in this respect distinctly from the pharynx.

D – The crop (or “ingluvies”) (Pl. 12, Cr) is usually well developed in the anobiid larvae and has an average length corresponding to the combined lengths of the meso- and meta-thoracic segments, but in some species as *Dorcatoma dresdensis* it is barely as long as one of the segments. It is round, mostly ovate or pyriform, posteriorly abruptly constricted anterior to the narrow proventriculus (Pl. 12, P.vent). The intima (Pl. 7, Int) is well developed, elastic, and provided with hairlike filaments (Pl. 7, Fil). These are pointing forward and arranged in several longitudinal, collateral rows. Between the rows the wall space is moreover densely set with minute, rounded granulae (Pl. 7, Grl) with asperate tops which are directed posteriorly. The epithelial cells of the crop are covered by a sheath of longitudinal muscle-fibers (Pl. 7, lmcl) and outside of them by circular muscles (Pl. 21, cmcl) arranged in many transverse bands.

E – The proventriculus (Pl. 12, P.vent) which narrows the alimentary canal between the crop and the large ventriculus (Pl. 12, Vent) is short in anobiid larvae. Posteriorly it is invaginated into the lumen of the ventriculus forming the funnel-shaped cardiac valve (Pl. 12, Cardv) in the initial region of the ventriculus. Its intima differs from the intima of the crop in that the usual six longitudinal main folds of the stomadaeum are very well developed here while they are weak in the crop. At the hind end the folds are swollen into six rather soft lobes which lie

against each other and thus are able to hold back the food in the crop when required and also to prevent regurgitation from the ventriculus. The epithelial cells are almost as large as those of the crop and the covering sheath of muscles is thick.

F – The ventriculus (or “stomach”) (Pl. 12, Vent) is long, generally tube-shaped and circular in transverse section, but anteriorly bladderlike in most of the species. It extends parallel with and close to the curved dorsal outline of the body from the cardiac valve (Cardv) to the end of the ninth abdominal segment where it forms a loop. From here it ascends along the venter of the ninth, eighth and part of the seventh abdominal segments, and, bending toward the inside of the tergum of the eighth abdominal segment, ends near where the malpighian tubules enter the pyloric region (Pl. 12, Pyl) of the intestine. Large gastric coeca (Pl. 12, Gla) open into ventriculus immediately behind the cardiac valve. They are arranged in paired clusters and contain bacteria, supposedly to aid the digestion.¹ The wall of ventriculus is soft and fragile, and this section of the digestive system is therefore difficult to dissect and remove unbroken. The epithelial cells are large but not lined with a distinct, continuous sclerotized intima as in the foregoing and most of the subsequent sections of the alimentary canal, and the surrounding layer of muscles has also a different character, being weak and prevalently composed of longitudinal muscle-fibers lying outside the poorly developed circular ones.

Peritrophic sacs enveloping the food appear to be present (Pl. 11, Peritrs, fig. 5).

G – Following ventriculus is a distinct but short pyloric region (Pl. 12, Pyl) which is separated from ventriculus by a pyloric valve. The swollen bases of six malpighian tubules (Pl. 7, Mal, figs. 1 and 3) open into the pyloric region immediately behind the valve, and a circular layer of muscles behind the bases of the malpighian tubules marks the posterior boundary, separating it from the subsequent anterior intestinal section (Pl. 12, A.Int). The six long malpighian tubules (Pl. 12, Mal), present in anobiid larvae, wind through the entire interior of the larva but do not end freely in the cavity, the terminal parts being gathered together

¹ Compare: PHYLLIS GARDINER: Morphology and biology of *Ernobius mollis* L. Trans. Ent. Soc. London, vol. 104, pp. 1–24, 1953.

and enclosed in a membrane (Pl. 12, malse) which adheres to the side of the rectal sac (Pl. 12, rsc) throughout the whole length of the sac. The membrane forms a ribbon-shaped sheath with a bulblike posterior swelling, and an elongate thickening, a so-called rectal pad (Pl. 12, rpd) is seen inside the membrane.

H – The anterior intestine (Pl. 12, AInt) beyond the pyloric region extends to the place where the malpighian tubules enter into the ribbon-shaped sheath on the rectal sac. It has a thin intima, without longitudinal folds, is provided with only weak circular muscle-fibers, and appears in the anobiid larvae as a uniform ensemble which is not divided into an anterior ilium and posterior colon.

I – The two parts of the posterior intestine, the so-called rectal sac (Pl. 12, rsc) and rectum proper (Pl. 12, Rect) are almost of equal lengths. Like the anterior intestine, the rectal sac has a thin intima, weak circular muscle-fibers and can be dilated considerably. It is bent as a letter U and fits into the curve between the sac-shaped and tubular portions of the ventriculus. The rectal sac can be recognized by the membranous sheath (Pl. 12, malse) with the malpighian tubules which is present on the side of the wall along its entire inner curvature. The rectum proper (Pl. 12, Rect) is straight, rather stiff, has a strong intima with six distinct longitudinal folds and a well-developed muscular covering composed of a continuous series of rings of circular fibers with less conspicuous longitudinal fibers on the outside. Many strands of dilatory muscles, the so-called suspensorial muscles of proctodeum, (Pl. 11, spöms) radiate from the rectal wall to the skin of the body and attach themselves here.

J – The nates (Pl. 11, figs. 1–4 and Pl. 12, Nat) or anal cushion is located on the underside of the curved end of the body below the terminal part of rectum proper. It consists of a tongue-shaped prolongation of the ventral side of rectum (Pl. 11, figs. 1 and 4) flexed over and imbedded in the surface of an elongate, oval, bilobed, symmetrical, padlike elevation of the skin of the last abdominal segment, and could perhaps be interpreted as an enlarged lower anal lip. When raised by increase of the blood pressure the elevation becomes blisterlike with the rectal prolongation resting on top of it (Pl. 11, fig. 2). But under lessened blood pressure and contraction of the many thin suspen-

sorial muscle fibers (Pl. 11, spoms) which radiate right and left from the rail to the base of the tenth segment (Pl. 11, fig. 1) the upper eversible part of the elevation (Pl. 11, cv, figs. 2 and 3) is invaginated into the basal not eversible (inev) part. Together the two parts form a case with the rail at the bottom covered from each side by the double wall, only with a longitudinal opening left sagittally (Pl. 11, open, fig. 3). The rectal prolongation (Pl. 11, rail, fig. 1) is suboval, varying somewhat in length according to species. It forms an angle with rectum proper of about 90° (Pl. 11, fig. 4), is well sclerotized, smooth and shiny being a direct continuation of the rectal intima. A pair of thickenings (Pl. 11, rail, figs. 1 to 5) on the lateral borders of the rail are homologous with the thickening on the right and left ventral rectal folds (Pl. 11, v.rectf, fig. 4). Opposite anus the rail is linked to a strongly sclerotized bow (Pl. 11, Bow, fig. 1) which supports some longitudinal sternal muscles (Pl. 11, stmsc, fig. 1) of the ninth abdominal segment. These diverge to the right and left, and are fairly strong. The unchanged simple dorsal anal lip is short and fleshy. The integument on its inside is a continuation of the dorsal side of the wall of rectum proper but is without any folds corresponding to the dorsal folds of the rectum.

K - Anus (Pl. 11, An, figs. 1, 4 and 5) is a transverse slit when firmly closed coinciding with the invagination of the nates but becomes a wide, round aperture during the period of the elimination of the excrements. This opening of anus and the elimination are undoubtedly produced, as in other coleopterous larvae, by contraction of the numerous thin so-called suspensorial dilator-muscles (spoms) from the rectal wall to the inside of the body-wall in combination with the intestinal peristaltic movements. However, it appears probable that in anobiid larvae a lifting of the rectal prolongation on top of the inflated cushion will protract the coalescent end of the rectum and drag it somewhat outward, a motion which a contraction of the diverging muscles from the bow-shaped symphysis will support by fixing the distal end of the rail at the same time the proximal end moves in an outward curve.

CHAPTER II

Taxonomy.

The preceding anatomical research was undertaken, as stated in the introduction, not only to study the structural differences found in the available larval material for suitable taxonomic characters to separate the various forms but also for the purpose of investigating the true morphological nature of the component elements of the body in order to decide on a rational terminology to be used in the technical descriptions. Thereafter the present chapter could then be outlined and was divided into the following sections: 1) A brief taxonomic account of the general exterior appearance of a typical anobiid larva, 2) a family characterization, 3) precursory remarks about the segregation of the larvae into groups, 4) a key to species, 5) descriptions of species, 6) an alphabetically arranged list of the described species.

Division 10. General Taxonomic Description of the Exterior Appearance of an Anobiid Larva.

(See Plate 1).

Mature larvae of the family small to moderately large varying in length from about three mm. to fifteen mm. according to the different species.

Head usually protracted and hypognathous, suborbicular to oval, rarely much longer than wide.

Body-trunk more or less curved, subcylindrical in cross-section, equally thick throughout in the majority of the larvae. Skin pliable, not sclerotized, pale-whitish and generally abundantly hairy. Various prodorsal areas armed with hookshaped asperities in most of the larvae.

Ninth abdominal segment well developed, obtusely rounded at the end and lacking urogomphi¹, laterally with asperities in the majority of species.

Tenth abdominal segment small, with a pair of symmetrical, soft, longitudinal, oval lobes, separated sagittally by a sclerotized groove in front of anus.

Legs present in all larvae and provided with a distinct claw in the majority of the larvae. Vestigial legs only in the genus *Caenocara*.

Division 11. Taxonomic Family-Characterization.

Cranium uniformly pale yellowish with darker epistoma, pleurostoma and hypostoma, often with a pigmented field behind epistoma; exceptionally with dark cranium variegated by light patches (*Lasioderma*) or with completely pigmented cranium and lighter setal cups. Pigmented field behind epistoma varying according to species both in extent and texture, armed in a few species with a small process sagittally at the anterior end of the epicranial sulcus. Frontal cleavage lines present only in a few forms, notably in some species of *Ernobius*. Epicranial sulcus distinct, usually half as long as cranium. Catapophyses varying in size, shape and texture of surface. Epistoma usually with setae, arranged differently and present in different numbers according to species. Main surface of cranium normally bearing evenly scattered, short to long setae.

A single, rather conspicuous *ocellus* with strongly arched cornea often present and located in a smooth or rough or conically protruding part of pleurostoma near fossa for the ventral mandibular condyle.

Antenna placed in pleurostoma close to the catapophysis, protected ventrally by a thin-walled shield projecting from the cranial frame. Number of antennal articles varying from two well developed, cylindrical articles borne by a membranous, dome-shaped base, to two short articles, to no articles at all. A sensory papilla, usually suboval, rarely sausage-shaped, pre-

¹ Ninth abdominal segment in first-stage larvae terminating with a single pointed, hard projection, not found in the larvae of the other stages.

sent on top of the proximal article and exterior to the distal article; minute sensory hairs present in the end of both articles. Tactile papilla and other sensorial organs borne by the base when articles are absent.

Anteclypeus well developed, attached to underside of clypeal epistomal margin between the catapophyses, without pigmentation, but often provided with a small, setae-bearing plate at each end of the anteclypeal sulcus. Exceptionally, in *Coelostethus* and a few other larvae, a great posterior part of anteclypeus, or the entire anteclypeus, darkly sclerotized.

Labrum hard and well pigmented, with an outline varying from subtrapezoidal and transverse to subcircular or to elongate pyriform. Each torma and labral rod either forming together a Y- or V-shaped structure or fused entirely to a simple stalk. A pair of dark marks often found on the labral surface. Labrum usually bearing an abundance of setae but in some larvae only a moderate number, and, in a very limited group of genera, as few as two or three setae on each side.

Epipharynx divided into a labral epipharynx and a clypeal epipharynx. *Labral epipharynx* located below labrum and extended to a transverse border line between the posterior ends of tormae. *Clypeal epipharynx* reaching from the border line to the entrance of pharynx. Labral epipharynx by itself divided into an anterior and posterior subdivision. Anterior subdivision, ending at an imaginary line between the anterior ends of tormae, armed (1) with numerous *acanthoparial* setae either of cultriform shape or slender, circular in cross section and very pointed, (2) with *chaetoparial* setae arranged in many different ways but practically always present and (3) *coryphal* setae, seldom strong, often lacking, and large only in *Dorcatoma*-like larvae; in the latter tooth-shaped and attached to a plate. *Pedium* often well developed, rarely lacking. *Posterior subdivision* of labral epipharynx, the so-called crepidal field, located between the tormae, always softskinned, set with minute papillae and frequently with some sensory pores.

Hypopharyngeal bracon absent.

Hypopharynx lacking a sclerite at base except in genus *Caenocara* in which the upper ends of the suspensorial bars are swollen and hard.

Mandible adorally concave, aborally convex; dorsal articulation horse-shoe-shaped, large and flat, ventral articular ball globular and strong. *Marginal brush* of stiff setae located where the adoral and aboral sides meet above the protractor muscle of the mandible, present in most larvae, and indicating the posterior beginning of the distal part of the mandible. *Distal part of mandible* (1) *apically* projecting into two distinct teeth, except in a few forms with vestigial second tooth or with simple, rounded margin, (2) *subapically with dorsal margin* built in various ways, being either produced into two teeth, or into one tooth, or into a long wall extending from base of second apical tooth to the marginal brush, the wall low and straight in some larvae, convex in outline in others, often projecting above the brush into a more or less tooth-shaped corner, or transformed into a broad, strong pseudomola with grinding surface. Aboral side of mandible furnished with proximal setae in various numbers and of different lengths and with distal, sometimes bifurcate, or very long and soft setae gathered in a small group; occasionally, with a single ovate setula.

Mandibular glands present, paired, each with opening at base of mandible.

Maxilla with cardo as a rule about half as large as stipes or smaller but almost as large as stipes in a few genera. Setae usually few or absent on cardo, long and moderately long on stipes, and present in various number, always most numerous in the indistinctly limited distal stipital region which corresponds to palpiger in other larvae. *Lacinia* differing much in size, setal arrangement and presence of spines. Genus *Caenocara* with swollen hard inner lacinial margin fitted for masticating spores of puffball against the hypopharyngeal sclerite. *Galea* always comparatively large, with rounded outline; marginal setae strong, moderately long and often cultriform. Adoral and aboral sides of both lobes with many setae, stronger and stiffer on aboral side, softer and thinner on adoral side. Particularly long and fine, hairlike setae present in some larvae issuing from a membranous adoral region at a bridgelike bar between the lacinial margin away from galea and the margin of galea adjacent to the proximal article of palpus. *Maxillary palpus* usually consisting of three articles, but of four in several species and only of two in *Cryptorama minutum* Lec.

Apical article always without setae and provided dorsally and externally with a rod imbedded in a niche in the wall; subapical article usually with two setae and a pore; proximal article with a varying number of setae approximately equal to the number on the distal part of stipes; an extra article, occasionally present between the proximal and subapical articles, carrying few setae.

Maxillary articulating area generally narrow and indistinct.

Submentum and *mesomentum* (= *mentum*, auct.) separated by the transverse *labial sulcus*. Both subdivisions large and fleshy and carrying a group of setae on each side, setae present in about same number on both submentum and mesomentum. *Prementum* membranous, limited posteriorly by a narrow, arched or, in *Ptilinus*, triangular sclerotization. *Proximal article of labial palpus* usually with one, sometimes with several setae or setulae; *distal article* without setae but with minute sensory papillae and a pore. *Ligula* rather short and obtusely conical between palpi, dorsally enlarged in front of hypopharynx in several species.

Gular region and *gular sulcus* absent.

Body-trunk with areas distributed and developed essentially as in other curved larvae. Dorsum of each segment, except, the dorsally simple prothorax and the last three abdominal segments, divided by a transverse groove, the *prodorsal sulcus*, into a *prodorsal* and *postdorsal area*.

Prothorax, generally isomorphic in all the anobiid larvae, and therefore, offering no characters of taxonomic value, except, in a few genera with considerably larger prothoracic than abdominal segments; sometimes provided with an oblique linear groove on each side.

Prodorsal areas of meso- and metathorax with or without hook-shaped asperities, mesothorax ordinarily without.

Asperities present or absent on prodorsal areas of first to eighth abdominal segments, on sides of ninth abdominal segment and on the tenth abdominal segment; present on the epipleural lobes of genus *Ptilinus*.

First thoracic spiracle located laterally in posterior part of prothorax; second thoracic spiracle vestigial; eight pairs of abdominal spiracles always present, all located laterally. Thoracic spiracle much larger than abdominal spiracles in several species, but more often of about the same size. All spiracles annular,

varying much in details, being simple without airtubes, or having from one to many open or apparently closed, non-annulated airtubes or, possessing a pseudocribrate plate with atrial surface texture.

Legs with sessile coxa and usually distinct trochanter, femur, tibio-tarsus and pretarsus. *Pretarsus* consisting of a membranous or, in *Ptilineurus marmoratus* Reitt., sclerotized proximal part, and ordinarily a claw. Claw lacking in several species, and membranous part of pretarsus combined with arolium changed in these into a bladder. Membranous part characterized in most species by having two or more setae. Claw-forming part varying in length, strength and form according to species and genus. *Arolium* present in several larvae but more often absent. Segments of legs barely separated, lacking distinct claw as well as arolium and a bladder in the vestigial, subconical, completely membranous leg of the genus *Caenocara*.

Ingluvies or *crop* varying in size according to genus, but varying little in general shape.

Airsacs from main tracheal branches not found.

Malpighian tubes six in number.

Hypometamorphosis unknown in the family.

Division 12. Precursory Remarks about Segregation of Larvae into Groups.

The majority of the known anobiid larvae lend themselves to a taxonomic grouping which conforms pretty well with the current classification of the imagines as far as the sequence in which they are listed in the leading catalogues is concerned and therefore supposedly reflects the natural interrelationship of the species and genera. But a significant minority of the larvae cannot be included in the same genera and tribes in which their imagines usually are placed. Thus the tribe Dorcatomini of REITTER¹ includes the genera *Catorama*, *Dorcatoma* and *Caenocara*, and to these LENG² has added the American genera *Petalium*, *Protheca* and *Eutylistus*; but, according to the larvae, the genus

¹ L.V. HEYDEN, E. REITTER, I. WEISE: *Catalogus Coleopterorum Europae*, 1906, edit EDMUND REITTER, PASKAU editio secunda pp. 427-433.

² CHARLES W. LENG: *Catalogue of the Coleoptera of America north of Mexico*, 1920, Mont Vernon, N.Y., JOHN D. SHERMAN jr., pp. 241-244.

Catorama and the genera *Petalium* and *Protheca* are only distantly related to the larvae of *Dorcatoma*, *Eutylistus* and *Caenocara* which together form a natural group.

In addition to other similar cases in which it has been found that the imagines and their larvae cannot be placed in the same tribe, different taxonomic perplexities have to be contended with as when certain larval species cannot be included in the same genera in which the imagines are placed. Thus the larva of *Ernobius marginicollis* Lec. is fundamentally different from the larvae of the other species of the genus *Ernobius* and, likewise, the larva of *Catorama vestitum* Fall cannot be classified as a *Catorama* larva because it is entirely without asperities and comes very close to the larva of *Ozognathus cornutus* Lec. in this respect as well as in almost all other characters, and *Catorama gracilis* Fall occupies a remarkably isolated position in the family. Such lack of conformity in the taxonomic arrangement of the imagines and the corresponding larvae may arise from some inadequacy of the characters used in the grouping of the imagines but in some cases can also be due to the fact that the available determined material of the larvae is too scanty for a full understanding of their true interrelationship. Less than one fifth of the circa 235 North American species and about one third of the genera listed by LENG are known in the larval stages.

For these reasons no premature attempt shall be made in this paper to segregate the larvae into new genera or to create new tribes, and in the following key and descriptions the commonly known generic and specific names of the reared imagines will be kept and used in the identification of the larvae.

The different larval species have, however, been arranged in the key and the succeeding series of descriptions in a sequence which as far as possible will reflect the natural relationship between them. Unfortunately not always with much success, for, to mention a few examples, the casual grouping together of all the larvae with a terminal bladder instead of a claw is evidently artificial and, therefore, phylogenetically irrelevant; and so is the convenient lumping together of the miscellaneous larvae without asperities on the body trunk. It is also noteworthy that the larvae of the *Dorcatoma*-group and the species *Ptilineurus marmoratus* Reitter and the genus *Ptilinus*, readily recognized in themselves

are mutually very different and each strikingly isolated taxonomically.

On the other hand, the great bulk of the anobiid larvae presents a homogeneous association of interrelated forms which, nevertheless, are separable, in most cases easily, into the following seven subdivisions.

The *first subdivision* includes the larvae of the genera *Hedobia* and *Eucrada* whose imagines constitute the tribe Hedobiini in the current classification, but it includes also the larva of *Utobium* and perhaps the aberrant larva of *Catorama gracilis* Fall. It is a diversified group but apparently quite natural.

The *second subdivision* includes besides *Xestobium rufovillosum* Deg. and *Ochina ptinoides* Marsh., the majority of the species of genus *Ernobius*. It is readily characterized by the presence of asperities on the tenth (= "anal") abdominal segment, and in the here-placed *Ernobius* species also by the presence of distinct frontal cleavage lines.

The *third subdivision* includes *Coelostethus*, *Trypopytus* and, according to reared larvae, possibly but doubtfully *Hadrobregmus carinatus* Say¹ in which anteclypeus is completely or half-way covered by a plate.

The *fourth subdivision* includes *Platybregmus* which resembles *Vrilletta* more than it resembles *Anobium*, and the genus *Anobium*, in both of which the lateral asperities on ninth abdominal segment are lacking.

The *fifth subdivision* includes *Microbregma emarginatum* Dufts. and *Ernobius champlaini* Fisher; both forms, in other characters quite heterogeneous, have tridentate mandibles.

The *sixth subdivision* includes *Trichodesma*, *Nicobium*, *Xeranobium*, *Holcobius*, *Oligomerus*, *Xyletinus fucatus* L., and *Xyletinus* sp. (which, according to reared imago, is either *Xyletinus mucoreus* Lec. or a very close species) in all of which the maxillary lacinia is as large or almost as large as galea and epipharynx to a great extent or completely covered with long, centripetal chaetoparal setae. As a minor part the subdivision contains also *Xyletinus peltatus* Harris and *Xyletobius walsinghami* Perkins

¹ A mistaken identification of the larva of this species may have happened by associating a reared imago with all the larval specimens in a material which accidentally was mixed.

plus *Xyletobius sykesi* Perkins and conditionally *Hadrobregmus umbrosus* Fall plus *Hadrobregmus thomsoni* Kraatz, in which lacinia is distinctly smaller than galea and the chaetoparial setae less numerous, even if usually arranged in patches of up to ten or more on each side. The species *Xyletinus peltatus* Harris and the genus *Xyletobius* mark, in fact, a gradual transition from the larvae of the major part of this sixth subdivision in which the other two species of *Xyletinus*, viz. *X. fucatus* L. and *X. mucoreus* Lec., unquestionably belong, to the larval type of the large seventh subdivision; the principal difference between them and this subdivision being a contrasting number of prodorsal asperities on the fifth and sixth abdominal segments (cp. key couplet 29).

The seventh subdivision includes the genera *Vrilletta*, *Priobium*, *Protheca*, *Catorama*, *Stegobium* and *Nevermannia* in which lacinia is distinctly smaller than galea, each side of epipharynx usually provided only with a single oblique row of chaetoparial setae and the prodorsal area of the seventh abdominal segment furnished with only a small number of asperities ranging from 15 or a few more to much less or none at all.

Division 13. Key to Species.

1. Either (61, first alternative) with proximal pretarsal part of prothoracic leg long, sclerotized and beset with numerous ovate setae, or, (61, second alternative) with epipleural areas of most segments of body trunk armed with hook-shaped asperities and with a premental sclerite formed as a triangular plate..... 61
 - Proximal pretarsal part of prothoracic leg usually much shorter than tibio-tarsus and membranous, without ovate setae, and epipleural areas lacking asperities..... 2
- 2(1). Mandible with grinding, broad and long pseudomola. (Outer surface of labrum usually with a single transverse series of, altogether, four or six long, stiff setae; coryphal setae often strong and claw-shaped.) 56
 - Mandible without grinding, broad and long pseudomola. (Surface of labrum with numerous, moderately long setae except in *Microanobium*; coryphal setae small when present.)..... 3
- 3(2). Leg terminating with a balloon-shaped bladder; two pretarsal setae proximally; claw absent..... 53
 - Leg with distinct claw, no bladder..... 4
- 4(3). Prodorsal asperities absent 47

Prodorsal asperities present on most segments..... 5

5(4). Second thoracic segment with a large patch of ten or more asperities on each side of prodorsal area..... 6

Second thoracic segment with a few, or, usually with no prodorsal asperities 7

6(5). 8th abd. segment with fifteen or more asperities on each side; mandible without teeth but with a simple, gouge-shaped apical edge..... 1. *Catorama gracilis* Fall

8th abd. segment without asperities; mandible with two apical teeth and two subapical teeth. 2. *Utobium elegans* Horn

7(5). Spiracles with numerous short airtubes on one side of peritremata; maxillary palpus with four articles. (Distal part of mandible apparently with simple terminal edge, without distinct teeth.) 3. *Eucrada humeralis* Melsh.

Characters different..... 8

8(7). Lacinia maxillaris vestigial, represented by a single strong spine and a few setae. (Pretarsus almost as long as tibiotarsus, membranous part longer than the straight thin, very pointed claw and provided with at least three setae.)

4. *Hedobia imperialis* L.

Lacinia of varying size according to different species but always present and distinct..... 9

9(8). Anal (tenth abdominal) segment armed with hook-shaped asperities; frontal cleavage lines present or absent..... 10

Anal (tenth abdominal) segment without asperities; frontal cleavage lines always absent..... 16

10(9). Cranium without frontal lines..... 11

Cranium with frontal lines 12

11(10). Chaetoparial setae about ten in two rows on each side; tormae short and clubshaped, loosely connected with labral rods 5. *Xestobium rufovillosum* Deg.

Chaetoparial setae four (or five) in one oblique row on each side; tormae long, straight, terminally pointed, labral rods insignificant..... 6. *Ochina ptinoides* Marsh.

12(10). Epipharynx with about twenty short and moderately long, slender chaetoparial setae on each side; prodorsal asperities about forty five on third thoracic segment and about thirty on sixth abdominal segment. (Spiracles with one short airtube.) 7. *Ernobius mollis* L.

Epipharynx with less than fifteen chaetoparial setae on each side; prodorsal asperities twenty five or fewer on third thoracic segment and less than twenty on sixth abdominal segment 13

13(12). Six chaetoparial setae in a regular curved series on each side. (Spiracles with one short airtube.) 8. *Ernobius abietis* F.

More than six chaetoparial setae present on each side of epipharynx..... 14

- 14(13). Spiracles without airtubes; chaetoparial setae on each side about fourteen; chaetoparial setae from right and left side intermingled into a median patch in posterior half of epipharynx..... 9. *Ernobius* sp.
(ex spruce cones from Canada)
Spiracles with at least one well-developed airtube; chaetoparial setae on each side numbering from eight to fourteen; chaetoparial setae from right and left side of epipharynx not intermingled into a median patch posteriorly..... 15
- 15(14). Thoracic spiracle with one airtube; chaetoparial setae numbering fourteen on each side.
10. *Ernobius granulatus* Lec.
Thoracic spiracle with one distinct and one small airtube; chaetoparial setae numbering about eight on each side.
11. *Ernobius punctulatus* Lec.¹
- 16(9). Anteclypeus covered either completely or on its posterior half by a single large plate..... 17
Anteclypeus either without a plate or with a small, setae-bearing plate at each end of the anteclypeal sulcus..... 20
- 17(16). Anteclypeus completely covered by a strongly pigmented and deeply pitted plate 12. *Coelostethus notatus* Say
Anteclypeus with posterior plate shorter than anteclypeus. 18
- 18(17). Abdominal spiracles with vestigial or no airtubes. (Number of asperities generally around fifty on each side of main abdominal segments.) 13. ?*Hadrobregmus carinatus* Say
(probably wrong determination. See footnote p. 96)
Abdominal spiracles with distinct airtubes 19
- 19(18). Abdominal spiracles with short airtube; number of asperities generally more than seventy on each side of main abdominal segments..... 14. *Trypopityus sericeus* Say
Abdominal spiracles with larger airtubes; number of asperities generally around thirty on each side of main abdominal segments..... 15. *Trypopityus punctatus* Lec.
- 20(16). Lateral asperities absent on ninth abdominal segment.... 21
Lateral asperities present on ninth abdominal segment... 24
- 21(20). Epipharynx with a patch of chaetoparial setae on each side; acroparial and acanthoparial setae recurved over the margin of epipharynx; labral rods and tormae fused together into short, curved, robust features (compare identical epipharyngeal and other structures in genus *Vrilletta* (Pl. 34, figs. 8-17) which, however, has hook-shaped asperities on ninth abdominal segment.) 16. *Platybregmus canadensis* Fisher

¹ Some larvae in the U.S.N.M. collection are labelled: "*Ernobius pallitarsis* Fall, in *Pinus lambertiana*; the city "Misteltoe" in Oregon, 7.XII.1917." No information is available about how the identification was obtained or by whom. But the larvae appear identical in all taxonomic characters with the larval species *Ernobius punctulatus* Lec.

- Epipharynx with an inwardly convex single series of six chaetoparial setae on each side; acanthoparial setae straight; numerous small coryphal setae; labral rods and tormae forming long, strong Y-shaped features 22
- 22(21). Abdominal spiracles with one long, curved airtube.
 17. *Anobium punctatum* Deg.
 Abdominal spiracles with a short airtube 23
- 23(22). First to sixth abdominal segments each with four or five irregular rows of prodorsal asperities.
 18. *Anobium gibbicollis* Lec.
 First to sixth abdominal segments each with two to three to four rows of prodorsal asperities. 19. *Anobium nitidum* Herbst
 also *Anobium pertinax* L.
- 24(20). Mandible with three teeth, terminally placed and distinctly distant from the marginal brush 25
- Mandible with two teeth apically and subapically either with smooth concave edge, or with subtriangularly projecting ledge 26
- 25(24). Maxillary palpus with four articles, seventh abdominal segment with few or no prodorsal asperities.
 20. *Microbregma emarginatum* Dufts.
 Maxillary palpus with three articles, seventh abdominal segment with about twelve prodorsal asperities.
 21. *Ernobius champlaini* Fisher
- 26(24). Lacinia distinctly smaller than galea; epipharynx with a single (or mainly single) row, or a narrow triangular patch of not more than fifteen chaetoparial setae on each side. . 27
- Lacinia as large or almost as large as galea; epipharynx with a broad patch of more than fifteen setae on each side, or, covered completely by curved, centripetal, rather soft hairs. (No arolium.) 32
- 27(26). With a series, on each side of six conspicuously short chaetoparial setae, series hardly reaching the middle of epipharynx; claw slender, pointed, somewhat curved and half as long as tibio-tarsus; abdominal prodorsal asperities distributed in double rows on some of the segments and in a single row on others 22. *Stegobium paniceum* L.
 (= *Sitodrepa panicea*)
 Different combination of characters 28
- 28(27). Adoral mandibular surface with projecting longitudinal carinae; prodorsal asperities minute and flattened on top, distributed in a single regular, transverse series of not more than ten on each of first to seventh abdominal segments; claw short. . 23. *Nevermannia dorcatomoides* Fisher
 (In termites nests, Costa Rica)
 Different combination of characters 29
- 29(28). Prodorsal asperities of fifth and sixth abdominal segments

- each numbering from at least thirty to many more on each side. (Arolium absent; tormae slender, as long as labrum.) 30
- Prodorsal asperities of fifth and sixth abdominal segments each numbering from a few to no more than twenty five on each side. (Arolium commonly present.) 38
- 30(29). Seventh abdominal segment with not more than twelve prodorsal asperities 24. *Hadrobregmus thomsoni* Kraatz
also 25. *Hadrobregmus umbrosus* Fall
(and perhaps *Hadrobregmus carinatus* Say)¹
- Seventh abdominal segment with twenty five or more prodorsal asperities 31
- 31(30). Spiracles pseudocribriform; chaetoparal setae in a long, subtriangular patch of about twelve on each side; short pigmented field present behind epistoma.
26. *Xyletobius walsinghami* Perkins
also *Xyletobius sykesii* Perkins
- Spiracles simple, annular with a single minute or no airtubes; chaetoparal setae in a single, regular, curved series of six setae on each side; pigmented field absent.
27. *Xyletinus pellatus* Harris
also *Xyletinus* sp.
- 32(26). Asperities present on sixth and seventh abdominal prodorsal areas; maxillary palpus three-articulate 33
- Asperities absent on sixth and seventh abdominal prodorsal areas; maxillary palpus four-articulate 37
- 33(32). Tormae long or short, narrowly conical and pointed; seventh abdominal prodorsal area with about fifteen or less asperities; membranous base of pretarsus with two setae 34
- Tormae long, either with upward ascending branches or sausage-shaped; seventh abdominal prodorsal area with about twenty five or many more asperities; membranous base of pretarsus with four of five setae 36
- 34(33). Sixth and seventh abdominal prodorsal areas with, respectively, about twenty five and twelve asperities; spiracles oval, without airtubes. (Tormae almost as long as sagittal length of epipharynx anterior to crepidal field.)
28. *Xyletinus* sp., near *mucoereus* Lec.
- Sixth and seventh abdominal prodorsal areas with, respectively, twelve or less and eight or less asperities; spiracles oval, with one or two short airtubes 35
- 35(34). Tormae almost as long as sagittal length of epipharynx anterior to crepidal field 29. *Xyletinus fucatus* Lec.
- Tormae about half as long as sagittal length of epipharynx anterior to crepidal field 30. *Oligomerus sericans* Melsh.
- 36(33). Field behind epistoma strongly pigmented and large, cen-

¹ See p. 63.

trally with a single, conical process; tormae long, robust, anteriorly irregularly branched, posteriorly curved toward each other, no labral rods; prodorsal asperities on third thoracic segment and subsequent seven abdominal segments in five or more series at the sagittal line of the body.

- 31. *Holcobius haleakalae* Perkins
- also *Holcobius glabricollis* Perkins
- and *Holcobius hawaiiensis* Perkins

Field behind epistoma not pigmented, no median cranial process; tormae sausage-shaped, about as long as sagittal length of epipharynx anterior to crepidal field; no labral rods; prodorsal asperities on third thoracic and subsequent seven abdominal segments in less than five series at the sagittal line of the body

- 37(32). Spiracles pseudocribriform. 32. *Xeranobium macrum* Fall
 - 33. *Nicobium castaneum* Oliv.
- Spiracles simple, annular, without airtubes.

- 34. *Trichodesma klagesi* Fall
- also 35. *Trichodesma gibbosa* Say

- 38(29). Chaetoparial setae anteriorly in a narrow patch of two irregular rows of setae and posteriorly in a longer, oblique single row on each side; pigmented field behind epistoma absent; tormae short, robust, strongly converging; no labral rods; marginal brush of mandible present. (Claw curved, moderately large.)

- 36. *Vrilletta convexa* Lec.
- also *Vrilletta blaisdelli* Fall
- and *Vrilletta* sp.

Different combination of characters. (Chaetoparial setae usually in a single row on each side; pigmented field present in some species; marginal brush often lacking.)

- 39(38). Abdominal spiracles with a single long, multibranched airtube. (Pigmented field not present; prodorsal asperities of third thoracic segment absent.) 37. *Priobium tricolor* Oliv.

- also *Priobium eichhoffi* Seidl.

Spiracles different. (Prodorsal asperities of third thoracic segment usually present.) 40 and 41

- 40(39). The larva of 38. *Protheca hispida* Lec. may be closely related to larvae of the genus *Catorama*. See description of single, imperfect larval skin p. 132.

- 41(39). Spiracles pseudocribriform; arolium absent. (Prodorsal areas of third to seventh abdominal segments with a single, regular row of ten or fewer asperities on each side.)

- 39. *Catorama nigrifulum* Lec.

Spiracles different; arolium present. 42

- 42(41). Annular spiracles simple, circular without airtubes. 43
- Annular spiracles with a single or two distinct airtubes. (Mandible without marginal brush.) 44

- 43(42). Seventh abdominal segment with an irregular, partly double

- row of about 12 asperities on each side. (Mandibular marginal brush present; epipharynx with numerous small coryphal setae anterior to an irregular, posteriorly diverging row of six long chaetoparial setae and some fine ordinary setae in space behind.) 40. *Catorama* sp. (from ivy together with imagines not determinable to species)
- Seventh abdominal segment without asperities. (Mandibular marginal brush absent; epipharynx with two pairs of minute coryphal setae and a regular, posteriorly converging row of six moderately long, curved chaetoparial setae.) 41. *Catorama punctatum* Lec.
- 44(42). Field behind epistoma poorly pigmented and indistinct. (Third thoracic segment with from about eight to less or no asperities on each side.) 45
- Field behind epistoma strongly pigmented. (Third thoracic segment with from about nine to more asperities on each side.) 46
- 45(44). Prodorsal asperities of each of first to fourth abdominal segments in a single straight row of about five asperities on each side 42. *Catorama* sp. near *C. conjunctum* Fall¹
- Prodorsal asperities of each of first to fourth abdominal segments in an irregular single or two rows of generally ten or more asperities on each side 43. *Catorama* sp.¹ probably *C. herbarium* Gorh. (= *C. mexicanum* Chev.)
- 46(44). Third thoracic segment on each side with about ten dorsal asperities generally arranged in a single row; first and second abdominal segments each with about twenty asperities in two irregular rows 44. *Catorama* sp. probably *C. inaequale* Fall¹
- Third thoracic segment on each side with about sixteen dorsal asperities in two irregular rows; first and second abdominal segments each with about twenty five asperities in two to three irregular rows . . . 45. *Catorama tabaci* Guér.¹ (= *C. impressifrons* Fall) also 46. *Catorama grande* Fall

¹ A great many larvae in the collection of U.S.N.M. are referable to the second alternative of couplet #42 but only the four larval forms listed in couplets #45 and #46 are associated with imagines (determined conditionally by W. S. FISHER). These four can be separated from each other by the characters given in the key, when considered without regard to the specimens not associated with imagines. But one group of these unidentified larvae is very close to one or the other of the two species listed in couplet #45 and another group is intermediate between the two species of couplet #46. In both cases it is impossible at present to know whether they are mere larval varieties of the named species or belong to closely related, generally recognized species. It may even become a problem to find out how to separate the larvae of the two categories defined in couplet #42 because some of the non-identified larvae tend to link them together.

- 47(4). Spiracles annular with a single or no airtubes..... 48
 Spiracles pseudocribiform 50
- 48(47). Mandible with one apical tooth; lacinia terminally with a single long, strong spine and a few stiff setae; galea half as wide as long..... 47. *Gastrallus* sp. (probably *G. laevigatus* Oliv.)
 Mandible with two apical teeth; lacinia terminally without spine and with about eight densely set stiff setae; galea as wide as long 49
- 49(48). Body elongate, not strongly curved, with all areas hairy, and epipleural area in particular provided with numerous long hairs; epistoma on anterior margin with a series of, altogether, sixteen long setae; anteclypeus at each end of anteclypeal sulcus with a small plate bearing five long setae. (Mandible without marginal brush.) 48. *Catorama vestitum* Fall
 Body short, thick and curved, with all areas sparsely furnished with hairs; epipleural areas each with about three hairs; anterior margin of epistoma with a series, of, altogether, six (or eight) long setae; anteclypeus without a setae-bearing plate or any setae at each end of the anteclypeal sulcus. (Mandible with a marginal brush.) 49. *Ozognathus cornutus* Lec.
- 50(47). Clypeofrontal region without distinct pigmented field behind epistoma (Body elongate, cylindrical and fairly straight.) 50. *Petalium seriatum* Fall
 Clypeofrontal region behind epistoma either dark and bearing posteriorly a conical process in the sagittal line, or, head-capsule provided with both a large pigmented field and additional pigmented spots on parietalia, or, entire head dark with light pits or pale yellowish 51
- 51(50). Frontal cleavage lines distinct; head capsule strongly sclerotized with setae all over, regularly arranged, in deep pits. (Cranium reddish brown.) 51. *Unknown genus near Lasioderma* (with orchids from Mexico)
 Frontal cleavage lines either incomplete or lacking; head capsule not particularly thick-walled and setae not set in regularly arranged deep pits..... 52
- 52(51). Head capsule protracted, almost orbicular, covered completely with long, fine setae and without a conical process sagittally; mandible with two apical teeth and a long sub-apical, somewhat concave edge; maxillary palpus with three articles; arolium present..... 52. *Lasioderma serricorne* F. (Cranium without frontal cleavage lines, particolored with longitudinal whitish bands.) 53. *Lasioderma* sp. (Cranium with incomplete frontal cleavage lines, uniformly brownish.)

- Head capsule retracted, elongate oval, naked posteriorly; a conical process present at end of pigmented field; distal part of mandible ending with three distinct teeth (two apical and one subapical); maxillary palpus with two articles; arolium absent 54. *Cryptorama minutum* Lec.
- 53(3). Prodorsal asperities present on most segments; antenna with two articles; spiracles ring-shaped, with one airtube. 54
All body segments without asperities; antenna without articles; spiracles ring-shaped, without airtubes. 55
- 54(53). Chaetoparial setae in a single, oblique row of five on each side; mandible with four teeth, and marginal brush present; lacinia with two strong curved and claw-shaped hooks and a few long, fine setae. . 55. *Genus and species unknown* (resembles genus *Ernobius* of the *Ernobius mollis* type)
- Chaetoparial setae numerous, in a patch on each side; mandible with two apical teeth and an elongate, subtriangular, low subapical wall; marginal brush lacking; lacinia with many straight, stiff terminal setae but no hooks.
56. *Ernobius marginicollis* Lec.
- 55(53). Chaetoparial setae numerous, irregularly distributed, long fine and curved; numerous hook-shaped, small coryphal setae; labrum covered with many setae; lacinia distinct, terminally with about five stiff setae.
57. *Neogastrallus librinocens* Fisher
- Chaetoparial setae in a single regular series of four thick, club-shaped, rather short setae on each side of epipharynx; a transverse row of, altogether, four short, thick coryphal setae; labrum on each side with only one short and three long setae; lacinia vestigial with one spine.
58. *Microanobium* sp. (from China)
- 56(2). Prodorsal areas of many segments with hook-shaped asperities; lacinia typical in shape and function; legs of normal build 57
Prodorsal areas without hook-shaped asperities but with straight, pointed spines, each on top of a tubercle, tubercles arranged in a single transverse row; lacinia with swollen strongly sclerotized inner margin grinding against a hypopharyngeal callosity; legs poorly developed, claw weak or lacking. 60
- 57(56). Chaetoparial setae in a single, longitudinal inwardly concave row; coryphal setae two, large, median, each fused exteriorly with a vestigial one. (Spiracles slightly pseudocribriform; laterally at ventral fossa for mandible with a flat, granulated field.) 59. *Eutylistus intermedius* Lec.
- Chaetoparial setae on each side arranged in an anterior patch of many setae and posteriorly in a single longitudinal row; coryphal setae at least four, large ones. 58

- 58(57). Pseudocribiform part of spiracles much larger than width of spiracular trachea. (With flat, granulated field at fossa for mandible.)..... 60. *Eutylistus facilis* Fall
Spiracles not pseudocribiform 59
- 59(58). Cranium ventrolaterally with flat, granulated field at fossa for mandible; spiracles regular, annular without air tubes; coryphal setae four altogether.... 61. *Anityls rubens* Hoffm.
Cranium ventrolaterally with a large, granulated, conical process at fossa for mandible; spiracles annular with a very short air tube; coryphal setae, altogether, six or more.
62. *Dorcatoma dresdensis* Herbst
also: 62* *Dorcatoma chrysolmelina* Sturm
- 60(56). Mandible apically with one distinct tooth and minute and indistinct second tooth; labrum broad, cordiform; chaetoparial setae in a single inwardly convex row, numbering about twenty five on each side; leg reduced but with a setalike, curved claw..... 63. *Caenocara bovistae* Hoffm.
(from Denmark)
also: *Caenocara* sp.
(from Maryland, U.S.A.)
- Mandible apically with two distinct teeth; outline of labrum two-thirds of a circle; chaetoparial setae in a single, straight, somewhat oblique row of about ten setae on each side; leg vestigial without distinct claw ... 64. *Caenocara oculata* Say
- 61(1). Proximal part of prothoracic pretarsus very long, sclerotized and set with many short, ovate setae; proximal part of meso- and metathoracic pretarsus fairly long with many straight and pointed setae; claw of first leg rather small, slender and upturned; epipharynx covered with long hair-like setae; epipleural area without asperities; premental sclerite weak and curved as a bow.
65. *Ptilineurus marmoratus* Reitter
- Proximal part of prothoracic pretarsus very short, carrying a single seta; proximal part of meso- and metathoracic pretarsus similar to the prothoracic; claw of first leg rather small, slender but straight to slightly curved downward; epipharynx on each half with a single, inwardly convex series of six chaetoparial setae; epipleural area of most segments with a patch of asperities; premental sclerite formed as an elongate, triangular plate.
66. *Ptilinus basalis* Lec.
(also: *P. ruficornis* Say,
P. juscus Geoffr.
and *P. pectinicornis* L.)

Division 14. Description of Species.

1. *Catorama gracilis* Fall.

Plate 13.

Described material labeled:

Catorama gracilis Fall., in fungus in bark of dead maple; University Park, Md. 27.VIII.1944, W. H. ANDERSON coll.; W. S. FISHER det. imago.

*Size of larva*¹: Small (c. 4 mm.).

Head capsule (Fig. 2) subcircular, slightly longer than broad, broadest at the middle, rounded posteriorly, without frontal lines; pigmented field behind epistoma about three times longer sagittally than epistoma; epistoma (fig. 1) provided in anterior margin with, altogether, about sixteen fairly long and rather short, straight setae behind the entire base of anteclypeus, and also with a few fairly long setae rearward; rest of cranium with some moderately long and many short, soft setae. Antenna (fig. 1) without articles, sensory organs born by dome-shaped membranous base. Anteclypeus (fig. 1) with a group of about six rather long setae on a thin plate at each end of anteclypeal sulcus, plates connected by a thinly sclerotized band. Labrum (figs. 1 and 2) transverse, about two and one half times as broad as long, anterior margin quite straight, anterior corners and the side margins rounded, surface densely set with short, fine setae and on the side margins with somewhat longer ones; paired dark marks absent. Epipharynx (fig. 3) naked with exception of about three minute setae in an oblique row on each side, probably corresponding to the chaetoparial setae in other larvae; tormae fairly long and straight, somewhat convergent; labral rods vestigial, reduced to a membranous little projection from the tormal stem

¹ W. H. ANDERSON: Larvae of some genera of Anthribidae, Annals Entomological Society of America, vol. XL, 1947, p. 490.

"No satisfactory way has been devised for measuring and expressing the size of the larvae. The over-all length of mature specimens of a given species will vary considerably depending upon the method of killing before preservation. General statements have been made, however, in an attempt to indicate the comparative sizes of the larvae; as small, moderately large, and large. The length of the larvae studied ranges from about 2.5 mm. . . . to about 15 mm."

The length of anobiid larvae ranges from:

small	about 2 mm. to 4 mm.
moderately large	5 mm. to 10 mm.
large	11 mm. to 15 mm.

at the posterior end of its anterior half; crepidal field broad, covered with soft papillae, apparently no pores. *Mandible* (fig. 6) not dentate, with a gouge-shaped distal end as in larvae of the Bostrichidae and the dermestid Attageninae; aboral surface with a proximal transversal group of about a dozen short setae, irregularly arranged, and a distal group of some minute setae. Maxillary lacinia (fig. 5) small, about one third as large as galea, armed with a thin spine and about five terminally placed, long, stiff setae; galea with rather slender, terete setae in the distal margin, and on the aboral surface with several setae; maxillary palpus with three articles, proximal article with about five setae ventrally, second article with one seta, apical article with a pore on ventral side and a sensory rod dorso-exteriorly; stipes with a moderate number of setae. Prementum proximally with simple, arched sclerite (fig. 7) and prementum, mesomentum and submentum with several setae.

Body trunk (fig. 4) curved; thoracic segment somewhat larger than the abdominal; asperities (fig. 11) conical, some slightly curved, others straight.

Number of asperities¹ on each side of:

Thoracic segment II	.....	15
" " III	.....	25
Abdominal segment 1	.....	30
" " 2	.....	30
" " 3	.....	32
" " 4	.....	33
" " 5	.....	30
" " 6	.....	25
" " 7	.....	22
" " 8	.....	20

9th abdominal segment with a large patch of about 70 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 8 and 9) small, annular with circular orifice

¹ In the descriptions of the present and the following species, the prodorsal asperities have as a rule been counted on a single specimen which was selected as typical of the larvae of the material on which the descriptions of the species are based. The recorded numbers of asperities should therefore be considered merely as guiding symbols, being only approximately, but not exactly, the numbers found in all specimens of the various species in the collection of the U.S.N.M.

and two very small and one vestigial airtubes; all spiracles of almost same size.

Leg (fig. 10) reduced in size; segments not sharply formed, length of pretarsus in proportion to length of tibio-tarsus as one to one and a half; claw longer than the membranous part of pretarsus and shaped like a slightly curved sting; no arolium.

2. *Utobium elegans* Horn

Plate 14,

Described material labeled:

- 1) *Utobium elegans* Horn, ex lodgepole pine killed by *Dendroctonus monticolae*, Sequoia Natl. Park, California, 2.XI.1933, H. H. KEIFER coll.
- 2) *Utobium elegans* Horn, in *Pinus contorta*, boring between bark and wood, Crater Lake, Or., Hopk. U. S. 1881, 3a.

Size of larva: Moderately large (c. 8 mm.).

Head capsule as broad as long, broadest at the middle, rounded posteriorly, without frontal lines, pigmented field (fig. 1) behind epistoma present, sagittally about twice as long as epistoma; epistoma (fig. 1) glabrous; cranium, including pigmented field covered with a moderate number of fairly long, rather dark setae. Antenna (fig. 1) with two distinct articles. Anteclypeus (fig. 1) with about five rather long setae at each end of anteclypeal sulcus and borne by a small plate. Labrum (fig. 1) with free margin semicircular and with numerous fine setae on anterior part of surface; paired marks present. Epipharynx (fig. 2) with two pairs of small coryphal setae, acroparial and acanthoparial setae long; chaetoparial setae fairly numerous, four to five of them on each side rather short, slightly curved and arranged in an inwardly convex, oblique row extending from anterior margin to near center of epipharynx, remainder of chaetoparial setae generally somewhat longer and straight, scattered in an irregular double row; labral rods long, straight and subparallel, not firmly united with short, strong, corniform tormae; crepidal field velvety pubescent without pores. *Mandible* (fig. 3) with four distinct, not widely separated teeth; setae of marginal brush dense and long; aboral mandibular surface with a proximal group of many setae, some very long; about five distal setae. Maxillary lacinia (figs.

4 and 5) small, terminally armed with one strong, thornlike spine and in addition with about four long and stiff and several finer setae; galea with a series of strong, cultriform setae on anterior margin, aboral and adoral surfaces with numerous setae; maxillary palpus with three articles, proximal article with a transverse series of about five long setae on both dorsal and ventral surfaces; distal part of stipes with about five long setae.

Body trunk curved, subcircular in cross-section, of nearly same thickness throughout.

Number of asperities on each side of:

Thoracic segment II (fig. 6).....	10	in two rows
" " III (fig. 6).....	29	in three rows
Abdominal segment 1.....	23	"
" " 2.....	24	"
" " 3.....	20	"
" " 4.....	16	"
" " 5.....	15	in two rows
" " 6.....	15	"
" " 7.....	5	in one row
" " 8.....	none	

9th abdominal segment with a patch of 35 lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (fig. 8) annular with oval peritrema, the thoracic and some of the abdominal spiracles with two very short air-tubes; thoracic spiracle about twice as long as the abdominal.

Leg (fig. 7) with pretarsus about half as long as tibia-tarsus; claw two-thirds the length of entire pretarsus, strong, sharp and curved; membranous proximal part of pretarsus with two setae; no arolium.

3. *Eucrada humeralis* Melsh.

Plate 15.

Described material labeled:

- 1) *Eucrada humeralis* Melsh., in *Quercus alba*, Springfield, Mass., Nov. 3. 1901; Dimmock #2048, inside of clear thin-walled oval cocoon.
- 2) *Eucrada humeralis* Melsh., in bark of oak, College Park, Md., 11.X.1942, W. H. ANDERSON coll.

Size of larva: Moderately large (c. 7 mm.).

Head capsule widest near the middle, oval posteriorly, without frontal lines; pigmented field behind epistoma sagittally about twice as long as epistoma; epistoma (fig. 1) armed with a transverse anterior, regular series of densely set, fairly long and fine, straight setae; rest of cranium, including pigmented field covered with numerous, mostly moderately long and straight setae in small pits. Antenna without articles; tactile papilla and sensory hairs on membranous base. Anteclypeus (fig. 1) with a group of about ten, rather long, straight setae at each end of anteclypeal sulcus, setae borne by a small sclerite. Labrum transverse oval with free margin almost semicircularly rounded; anterior part of surface with numerous fine setae; without paired marks. Epipharynx (fig. 2) with numerous small hook-shaped coryphal setae medianly and in front of chaetopariar setae; acropariar and acanthopariar setae long and densely set; chaetopariar setae rather short, filiform or slightly fan-shaped, numerous, and well dispersed in an inwardly slightly convex, broad longitudinal patch; tormae and labral rods forming together a pair of Y-shaped, strong, parallel features; crepidal field with a few minute setae. *Mandible* (fig. 3) (apparently not worn, similarly shaped in all examined specimens) without teeth, apical corner incorporated in the thick, crenulate and finely striate edge of the entire distal part of the mandible; setae of marginal brush short; proximal and distal groups of setae on aboral mandibular wall poorly developed. Maxillary lacinia (figs. 4 and 5) small, terminally armed with one strong spine and in addition bearing a few moderately long and short setae; dorsally many fine hairs; galea with fairly strong, curved, simple marginal setae, aboral surface with many rather stiff setae, and adorally numerous soft ones; maxillary palpus (fig. 4) with four articles, proximal article somewhat wider than long, next article about half as wide and half as long as proximal; subapical article and apical article subequal in length and approximately as long as proximal article, subapical article about half as wide as proximal, and apical about two thirds as wide as subapical; proximal article anteriorly with a transverse group of ten irregularly placed long and moderately long setae on the dorsal surface and about as many on the ventral surface; next article with two long setae and one or two

small ones; subapical article anteriorly with two setae; apical article without setae and dorsally with rod-shaped accessory organ; sensory pores present but few on all articles; stipes with numerous setae, particularly long on its distal part. Prementum with a broad group of moderately long setae in each anterior corner, meso- and submentum with numerous long lateral setae.

Body trunk curved, abdominal segments of nearly same thickness throughout, the thoracic segments somewhat thicker; asperities small, more conical than hook shaped.

Number of asperities on each side of:

Thoracic segment II	1 (or none)
" " III	40 in two to three rows
Abdominal segment 1	46
" " 2	45
" " 3	45
" " 4	43
" " 5	44
" " 6	45
" " 7	19 in two rows
" " 8	5

9th abdominal segment with a patch of very numerous asperities on each side laterally.

10th abdominal segment with about 10 asperities on each side.

Spiracles (figs. 8 and 9) annular with oval orifices and a great number of short open spout-shaped airtubes from one side of peritrema; airtubes directed toward the head on the thoracic spiracle, toward anus on the abdominal ones; latter, half as large as thoracic.

Leg (fig. 7) with pretarsus slender, conical and two-thirds as long as tibio-tarsus; claw one-third the length of the whole pretarsus, straight and not strong; proximal membranous part bearing five strong but rather short setae; no arolium.

4. *Hedobia imperialis* L.

Plate 16.

Described material labeled:

- 1) *Hedobia imperialis* L., in bark of ash and elm, near Copen-

hagen, Denmark, from coll. Zool. Mus. Copenhagen, F. MEINERT, 1890, #145.

Size of larva: Moderately large (c. 6 mm.).

Head capsule as broad as long, broadest at the middle, rounded posteriorly, without frontal lines; pigmented field behind epistoma (fig. 1) sagittally about twice as long as epistoma; epistoma (fig. 1) with a single transverse, regular series of about thirty four altogether, densely set, rather long and fine setae; rest of cranium, including pigmented field, covered with numerous moderately long and fine, straight setae. Antenna (fig. 1) without articles, ovate tactile papilla and sensory hairs borne by membranous base. Anteclypeus (fig. 1) with two rather long straight setae on each end of thinly sclerotized basal ribbon. Labrum (figs. 1) with almost semicircular free margin, anterior part of surface with numerous fine setae; without paired marks. Epipharynx (fig. 2) with numerous small obtuse, coryphal setae medianly in front of chaetoparial setae; acroparial and acanthoparial setae long, slender, slightly curved and densely set; chaetoparial setae long and filiform, well dispersed over most of the epipharyngeal surface; tormae and labral rods forming together a pair of Y-shaped, strong features; crepidal field broad with several small setae in the velvety pubescent surface. *Mandible* (fig. 3) with three teeth slightly projecting from the edge of the moderately wide distal part of the mandible; setae of marginal brush present, surrounded by distinct marginal elevation; aboral surface of mandible (probably) with proximal and distal setae (but broken off on material examined). Maxillary lacinia (figs. 4 and 5) vestigial, terminally armed with one strong spine and, in addition, furnished with a few long setae; galea (fig. 4) with narrow, long cultriform setae in the margin and dorsally and ventrally with numerous setae on the entire surface, stronger ventrally; long, soft, hairlike dorsally; maxillary palpus with three articles of about equal length, proximal article both dorsally and ventrally with a transverse series of about ten setae, next article both dorsally and ventrally with about five anterior setae, two behind them and in addition a few minute ones, apical article without setae, with dorsal rod-shaped accessory organ and a sensory pore; stipes with numerous setae, particularly long ones on its distal part. Prementum with a dense group of

setae in each anterior corner, meso- and submentum with numerous setae on each side.

Body trunk curved, abdominal segments of nearly same thickness throughout, the thoracic somewhat thicker; asperities rather flat, slightly curved, not sharp and not hook-shaped.

Number of asperities on each side of:

Thoracic segment II	3
" " III	25
Abdominal segment 1.....	40 in four to five rows
" " 2.....	45
" " 3.....	45
" " 4.....	48
" " 5.....	47
" " 6.....	35 in three to four rows
" " 7.....	18
" " 8.....	a few

9th abdominal segment with a patch of very numerous lateral asperities.

10th abdominal segment with a few asperities.

Spiracles (figs. 7 and 8) annular with broadly oval to circular orifices, each with a single short air tube directed toward the head on thoracic spiracle, toward anus on abdominal ones, the latter two-thirds as large as the thoracic.

Leg (fig. 6) with pretarsus slender and conical, somewhat more than two-thirds as long as tibio-tarsus; proximal membranous part about two-thirds as long as entire pretarsus, armed with six well-developed but rather short setae; claw thin, straight and setalike; no arolium.

5. *Xestobium rufovillosum* Deg.

Plate 17.

Described material labeled:

- 1) *Xestobium rufovillosum* Deg. (= *X. pulsator* Schall. = *X. teselatum* Oliv.) in oak stump, Dyrehaven near Copenhagen, Denmark, 1.IV.1915, J. P. KRYGER coll. et reared.
- 2) *Xestobium* sp. West Kingston, Rhode Island, Dr. A. E. STONE coll. et det.
- 3) *Xestobium rufovillosum* Deg. from floorbeams of house at

least 100 years old; Foxboro, Mass., Mrs. EGGLESTON coll.

Size of larva: Moderately large (c. 8 mm.).

Head capsule as broad as long, broadest at the middle, rounded posteriorly, without frontal lines; pigmented field behind epistoma absent (fig. 1); epistoma (fig. 1) with a single transverse series of densely set, altogether twelve setae, located between catapophyses; rest of cranium with moderately long, densely set setae all over the surface. Antenna (fig. 2) with two distinct articles. Anteclypeus (figs. 1 and 2) with a group of about ten long setae on a thin plate at each end of anteclypeal sulcus; plates connected with a thin, narrow, ribbonlike sclerotization. Labrum (figs. 2 and 3) transverse, suboval, nearly twice as broad as long, anterior part of surface covered with fine setae; paired dark marks merely indicated. Epipharynx (fig. 3) with several small curved and sharp coryphal setae medianly in front of chaetoparial setae; acroparial and acanthoparial setae long, slender, curved and densely set; chaetoparial setae numbering about ten on each side in an oblique, inwardly convex series extending from antero-exterior corner of epipharynx to near the sagittal line; anterior six of the chaetoparial setae in a double row, rest in a single row, all moderately long, some straight, others slightly curved, terminally obtuse; tormae (fig. 3) short, strong, terminally rounded, not connected with thin labral rods except by a membranous ligament; labral rods parallel; crepidal field broad with a series of, altogether, four sensory pores distributed between anterior bases of labral rods and with another irregularly arranged group of about eight pores in the posterior part of the velvety pubescent field. *Mandible* (figs. 4 and 5) with two apical teeth, each deeply hollowed adorally, followed by a subapical bicuspidate, strong tooth; marginal brush present; aboral mandibular surface with a proximal group of about ten fine, short setae in two parallel rows and a distal group of five similar setae in an oblique row. Maxillary lacinia (fig. 6) small, terminally armed with one strong spine and in addition with four stiff setae; dorsally many fine hairs; galea (fig. 6) with long cultriform setae in margin; dorsally and ventrally with numerous setae, stiff ventrally, soft and hair-like dorsally; maxillary palpus with three articles of approximately same length; proximal article ventrally with a group of

about ten long setae and dorsally with a similar number of setae; second article with two setae; apical article without setae; stipes with numerous long setae. Prementum with a group of about ten setae in each anterior corner and several smaller setae on rest of surface; meso- and submentum with many long setae, most numerous laterally.

Body trunk curved, segments generally of same thickness; asperities strong, hook-shaped.

Number of asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	46 in two and three rows
Abdominal segment 1	.....	63 in three and four rows
" " 2	.....	57
" " 3	.....	48 in two and three rows
" " 4	.....	43
" " 5	.....	41
" " 6	.....	42
" " 7	.....	13
" " 8	.....	2

9th abdominal segment with a patch of very numerous, vaguely estimated as one hundred, lateral asperities.

10th abdominal segment (fig. 7) with about ten asperities on each side.

Spiracles (figs. 9 and 10) annular with oval orifice and one very short air tube; thoracic spiracle about three times as large as the abdominal ones.

Leg (fig. 8) with pretarsus about one-third as long as tibio-tarsus; proximal membranous part about as long as wide, with two setae; claw about two-thirds the length of entire pretarsus, quite strong and somewhat curved; no arolium.

6. *Ochina ptinoides* Marsh.

Plate 18.

Described material labeled:

- 1) *Ochina ptinoides* in dead ivy stem, Dunblane, Perthshire, Scotland. March 1952, N.W. HUSSEY coll. (reared) (ROY A. CROWSON ded. 13.X.1952).

Size of larva: Moderately large (c. 6 mm.).

Head capsule (fig. 5) as broad as long, broadest at the middle, rounded posteriorly, without frontal lines; pigmented field behind epistoma (fig. 1) present but sagittally only about half as long as epistoma; epistoma naked; rest of cranium with moderately long and short, fairly densely set setae all over the surface (fig. 5). Antenna (fig. 2) with two distinct articles. Anteclypeus (fig. 1) with a group of about six rather long and short setae on a thin plate at each end of anteclypeal sulcus. Labrum (figs. 3 and 5) transverse, suboval, nearly twice as broad as long, surface densely set with fine setae; paired dark marks absent. Epipharynx (fig. 3) with several (about eight) minute coryphal setae medianly in front of chaetoparial setae; acanthoparial setae slender, long and pointed, somewhat curved, about five on each side; chaetoparial setae four or five on each side in an oblique, inwardly convex series extending from anterior-exterior margin of epipharynx to near the sagittal line at a point removed not more than one-third of the length of epipharynx from anterior margin to the beginning of tormae; chaetoparial setae moderately long, slightly curved and club-shaped; tormae rather long and strong, straight with irregular, rough surface and slightly converging; labral rods vestigial, reduced to a thin membrane projecting from the tormal stem at the posterior end of its anterior third part; crepidal field broad, with a few pores and covered with velvety papillae. *Mandible* (figs. 4 and 6) with two apical and two subapical teeth (teeth worn down on mandible, fig. 6); marginal brush with many well-developed stiff bristles; aboral mandibular surface with a proximal group of about ten short setae in two parallel rows and a distal group of about four similar, short setae. Maxillary lacinia (figs. 7 and 8) small, terminally armed with one strong spine and in addition five stiff, mostly somewhat curved setae; galea (figs. 7 and 8) with long, cultriform setae in margin; aboral surface with numerous, normal setae; adorally, posteriorly fused surfaces of lacinia and galea bearing a transverse group of many densely set, curved, well-developed setae (fig. 8); another smaller group of short, fine, soft setae present along the adoral marginal region at the palpus; maxillary palpus (fig. 8) with three articles, proximal article with three long setae ventrally, second article with two setae, apical article with a pore and dorso-exteriorly the usual sensory rod; stipes with a moderate

number of setae. Prementum, meso- and submentom with several setae.

Body trunk (fig. 13) curved; segments of same general thickness; asperities hook-shaped.

Number of asperities on each side of:

Thoracic segment II	none
" " III	23
Abdominal segment 1.....	20
" " 2.....	20
" " 3.....	18
" " 4.....	15
" " 5.....	15
" " 6.....	13
" " 7.....	5
" " 8.....	none

9th abdominal segment (fig. 14) with a patch of 14 lateral asperities.

10th abdominal segment (fig. 14) with 19 asperities on each side.

Spiracles (figs. 10 to 12) annular with oval orifice and one well-developed air tube; thoracic spiracle (fig. 10) about twice as long as the abdominal (figs. 11 and 12); air tubes of the thoracic and the anterior five abdominal spiracles about as long as the orifices of the spiracles are broad; air tubes of the posterior spiracles (fig. 12) about twice as long as the spiracular orifices are broad.

Leg (fig. 9) with pretarsus about one-third as long as tibiotarsus; proximal membranous part about as long as wide, with two short setae; claw about two-thirds the length of entire pretarsus, distinct but not particularly strong and somewhat curved; no arolium.

7. *Ernobius mollis* L.

Plate 19.

Described material labeled:

- 1) Sweden, intercepted at New York, 27.XI.1937.
- 2) Cincinnati, Ohio, 1.II.1932. White pine in bark and sapwood, C. F. SHIELDS coll., larvae associated with reared imagines.

3) Russia, N.Y. #42630, 8.V.1935. Pine from cargo crating of barrel staves.

4) France, N.Y. #82455, 7.VIII.1939. Pine wood used as cask.
Size of larva: Moderately large (c. 7 mm.).

Head capsule (fig. 3) subcircular, slightly broader than long, with complete frontal cleavage lines, anteriorly extending through cranial socket around antenna; clypeo-frons pigmented all over; parietals light colored; epistoma with finely rugose catapophyses and a row of, altogether, about twelve irregularly placed, small setae; cranium beset with numerous evenly distributed setae, many as long as labrum and anteclypeus together. Antenna (fig. 2) with two, rather short, sclerotized articles. Anteclypeus (fig. 3) with four well-developed setae at each end of anteclypeal sulcus. Labrum (fig. 3) transverse, suboval, approximately twice as wide as long; on anterior margin with a series of densely set, long setae and with an antero-lateral group of moderately long and thin setae on each side; paired marks elongate-oval and pale. Epipharynx (fig. 1) on each side with two small coryphal setae, one behind the other and a patch of from fifteen to twenty curved, moderately long and short chaetoperial setae; crepidal space between the labral rods covered with minute velvety pubescent projections and having a single pore on each side near base of torma; tormae (fig. 1) obtusely corniform and well sclerotized, labral rods slightly sclerotized, straight and parallel; each torma and labral rod connected by a thin ligament, thus forming a defective Y-shaped feature. *Mandible* (figs. 4 and 5) with two apical and two subapical teeth; marginal brush present above tendon of mandibular adductor muscle; proximal and distal groups of setae on the aboral surface of the mandible present but short (fig. 4). Maxillary lacinia (figs. 6 and 7) rather small, terminally armed with a single, moderately strong spine and bearing four or five setae about as long as the spine and, in addition, with numerous soft, fine hairs on the adoral dorsal surface (fig. 7); stipes with about twenty five setae of various sizes spread over the whole surface but particularly numerous at the distal end; maxillary palpus with three articles, proximal article with an anterior transverse group of about ten setae on ventral side and as many, but much smaller, dorsally. Prementum with about ten setae in each anterior corner and several

setae on remainder of surface; meso- and submentum each with ten or a few more long and moderately long setae on each side.

Number of prodorsal asperities¹ on each side of:

Thoracic segment II	.....	none
" " III	.....	42 to 47
Abdominal segment 1	.....	40 to 47
" " 2	.....	45 to 48
" " 3	.....	34 to 44
" " 4	.....	36 to 40
" " 5	.....	33 to 39
" " 6	.....	25 to 38
" " 7	.....	6 to 12
" " 8	.....	6 to 15

9th abdominal segment with a large patch of lateral asperities, vaguely estimated to 50 on each side.

10th abdominal segment with 10 to 14 asperities on each side.

Spiracles (figs. 9 and 10) annular with oval orifice and a single short air tube; thoracic spiracle (fig. 9) about twice as long as the abdominal ones (fig. 10), and with the air tube directed upward and toward the head, while the air tubes of the abdominal spiracles are directed upward and toward the end of the body.

Tibio-tarsus (fig. 8) two and one-half times longer than pretarsus; proximal membranous part of pretarsus as long as claw; membranous part with two setae; claw somewhat curved; arolium present.

8. *Ernobius abietis* F.

Plate 20.

Described material labeled:

- 1) Germany, N.Y. #82602, 17.VIII.1939. Spruce cone.
- 2) *Ernobius abietis* F. Suomi, Karjalohja, in cones of *Picea excelsa*, 1.IX.1915, U. SAALAS.

Size of larva: Moderately large (c. 6 mm.).

Head capsule (fig. 2) subcircular, slightly broader than long, with complete frontal lines anteriorly extending through the

¹ In the present record the extreme minor and major numbers have been given of asperities found in a great many examined specimens, because, an unusually abundant amount of larvae of this species are kept in the collection of U.S.N.M., thus demonstrating that the average number of asperities is fairly constant in the specimens of the same species.

cranial socket around the antenna; clypeo-frons and rest of cranium pigmented, with the exception of a fairly whitish subtriangular spot anteriorly on each parietal behind antenna; epistoma (fig. 2) with finely rugose catapophyses and a transverse continuous row of about six setae altogether. Clypeo-frons and rest of cranium set with numerous evenly distributed setae of moderate lengths. Antenna (fig. 2) without distinct, sclerotized articles; ovate tactile papilla and sensory hairs on membranous base. Anteclypeus (fig. 2) with a series of four setae at each end of anteclypeal sulcus. Labrum (fig. 2) transverse, suboval, anteriorly rounded, occasionally slightly concave sagittally; anterior margin with a series of densely set setae and with an antero-lateral group of rather long and thin setae on each side; paired marks faint or absent. Epipharynx (fig. 1) in middle of anterior margin with a series of several short hook-shaped coryphal setae, and on each side six short, strong, curved, obtuse chaetoparial setae arranged in an oblique inwardly curved regular series extending from antero-exterior corner of epipharynx to near its center; crepidal space between the labral rods covered with minute velvety pubescent projections and, on each side anteriorly, a few pores; well sclerotized robust tormae and membranous light colored labral rods forming imperfect Y-shaped features with tendonlike posterior extensions parallel with sagittal line. *Mandible* (fig. 3) with two apical and two subapical teeth; marginal brush, proximal and distal groups of setae on aboral mandibular surface well developed. Maxillary lacinia (fig. 4) rather small, terminally with a single moderately strong spine surrounded by five stiff setae about as long as the spine, and in addition, with other much finer setae especially on dorsal surface; stipes with many setae on the whole surface but particularly numerous and long at the distal end; maxillary palpus with three articles (fig. 4); proximal article with an anterior transverse series of about six setae on the ventral surface and a similar number of much finer setae dorsally. Prementum with several setae in each anterior corner; meso- and submentum, each with about ten long setae on each side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	23

Abdominal segment 1.....	40
" " 2.....	39
" " 3.....	39
" " 4.....	29
" " 5.....	28
" " 6.....	13
" " 7.....	9
" " 8.....	9

9th abdominal segment with a large patch of lateral asperities vaguely estimated as about 35 on each side.

10th abdominal segment with about 9 asperities on each side.

Spiracles (figs. 5 and 6) oval with a single air tube less than half as long as spiracular orifice; thoracic spiracle not fully three times as large as abdominal; air tube of thoracic spiracle directed obliquely upward and toward head, air tubes of abdominal spiracles directed obliquely upward and toward the end of body.

Tibio-tarsus (fig. 7) more than twice as long as pretarsus; proximal membranous part of pretarsus slightly longer than claw and provided with two setae; claw rather weak and short, slender and somewhat curved; small arolium present.

9. *Ernobius* sp.

Plate 20.

Described material labeled:

1) Canada, 42-11399, Boston #16306, 21.IX.1942, in spruce.

Size of larva: Moderately large (c. 6 mm.).

Head capsule with complete frontal cleavage lines (fig. 10), anteriorly extending through cranial socket around antenna; clypeo-frons and rest of cranium pigmented, except for a longitudinal fairly large, whitish spot anteriorly on each parietal and adjacent to frontal sulcus; epistoma (fig. 10) with smooth catapophyses and an irregular transverse series of, altogether, eight setae; clypeo-frons and rest of cranium set with numerous evenly distributed setae of different lengths. Antenna (fig. 10) with two indistinct articles. Anteclypeus (fig. 10) with a series of eight long setae at each end of anteclypeal sulcus. Labrum (fig. 10) transverse, suboval anterior margin densely set with fine setae, some straight others curved, and with an antero-lateral group of fairly long setae on each side; paired marks faint or absent.

Epipharynx (fig. 8) with two pairs of small coryphal setae, and on each side an oblique, inwardly curved series of about fourteen short, strong, slightly curved or straight chaetoparial setae arranged in a small group anteriorly; posteriorly combined with setae of the opposite series into a median patch; crepidal space with minute sensory papillae and two or three pores; well sclerotized robust tormae (fig. 8) and membranous, light colored labral rods forming imperfectly Y-shaped features with posterior extensions parallel with sagittal line. *Mandible* (fig. 9) with two apical and two subapical teeth; marginal brush well developed, proximal setae numerous and very long; distal setae about five, well developed, moderately long. Maxillary lacinia (fig. 15) rather small, terminally with a single moderately strong spine and many well developed, rather stiff setae as long as the spine and seated in a membranous region surrounded by a broad, well sclerotized basal ring; stipes at distal end with about ten long setae; maxillary palpus with three articles; proximal article with an anterior transverse group of about ten setae on each side. Prementum with about ten setae in each anterior corner, and meso- and submentum each with a similar number of setae.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
"	" III	15
Abdominal segment 1	.....	19
"	" 2	17
"	" 3	14
"	" 4	14
"	" 5	16
"	" 6	14
"	" 7	9
"	" 8	5

9th abdominal segment with a patch of lateral asperities vaguely estimated at 30 on each side.

10th abdominal segment with 5 asperities on each side.

Spiracles (figs. 12, 13 and 14) oval without any air tubes; thoracic spiracle (figs. 12 and 13) not more than one and one-half times as large as the abdominal ones (fig. 14).

Tibio-tarsus (fig. 11) about three times as long as pretarsus; proximal membranous part of pretarsus slightly longer than claw

and armed with two setae; claw rather weak and slightly curved; small arolium present.

(Note: A larva, not reared or determined by association with imago, and labeled: "British Columbia, San Francisco #22358, 46-20214, 29.XI.46, in *Picea* sp. cone," is identical with the above described larva in all characters, except in the number of the prodorsal asperities. These are on each side: II th.: none, III th.: 23, 1st abd. segm.: 24, 2nd abd. segm.: 27, 3rd abd. segm.: 22, 4th abd. segm.: 23, 5th abd. segm.: 22, 6th abd. segm.: 16, 7th abd. segm.: 16, 8th abd. segm.: 12, 9th abd. segm.: c. 30 lateral asperities, 10th abd. segm.: on each side 10 asperities.)

10. *Ernobius (granulatus* Lec.)?

Plate 21.

Described material labeled:

- 1) *Ernobius* sp. (probably *E. granulatus* Lec. A. G. B. det) Big Pine Key, Fla., Spec. Surv. #24083, 45-7967, 6.III.1945. Ex *Pinus caribaeae*, GRISWOLD coll.
- 2) Probably *Ernobius granulatus* Lec., A. G. B. det.; no association with adults. In dying tip of *Pinus palustris*. Starke, Florida, Marsh 1929, F. C. CRAIGHEAD coll.

Size of larva: Small (c. 4 mm.).

Head capsule subcircular with complete frontal lines anteriorly extending through cranial socket around antenna; clypeo-frons (fig. 2) and rest of cranium pigmented with exception of a broad, longitudinal subtriangular not pigmented spot anteriorly on each side of parietale adjacent to the frontal line; epistoma (fig. 2) with rugulose cataophyses and a transverse row of approximately, altogether, six setae, located in the posterior faint limiting line of epistoma; clypeo-frons and rest of cranium rather sparingly set with long setae but with many short setae between. Antenna (fig. 2) without articles, sensory organs borne by dome-shaped membranous base. Anteclypeus (fig. 2) with a series of five long and short setae at each end of anteclypeal sulcus. Labrum (fig. 2) transverse, suboval; paired marks indistinct or indiscernible; anterio-lateral margin with a series of densely set, fine, long, curved setae. Epipharynx (fig. 1) in the middle of anterior margin with a series of coryphal setae; on each side about fourteen short, strong, hook-shaped chaetoparial setae

in an oblique, irregular, subtriangular patch, about four setae wide in front, followed by a single row behind; crepidal area covered with minute sensory papillae and bearing one pair of pores anteriorly; well sclerotized tormae (fig. 1) and membranous, light colored labral rods forming imperfect Y-shaped features. *Mandible* (fig. 3) with two apical and two subapical teeth; marginal brush well developed; aboral surface with proximal and distal groups of long and moderately long setae. Maxillary lacinia (fig. 4) rather small, terminally with a single spine surrounded by about six stiff setae as long as the spine, in addition, with finer and curved setae on dorsal surface; stipes with about 6 long setae at distal end ventrally; maxillary palpus with three articles; proximal article ventrally with an anterior transverse series of three long and three short setae. Prementum with four or five setae in each anterior corner; meso- and submentum each with a number of long setae.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	16 to 23
Abdominal segment 1	.....	29 to 33
" " 2	.....	31
" " 3	.....	24 to 30
" " 4	.....	24 to 28
" " 5	.....	20 to 28
" " 6	.....	10 to 13
" " 7	.....	9 to 11
" " 8	.....	4 to 6

9th abdominal segment with a patch of lateral asperities vaguely estimated as about 40 on each side.

10th abdominal segment with about 12 asperities on each side.

Spiracles (figs. 5 and 6) circular with one air tube about half as long as spiracular orifice or somewhat longer; thoracic air tube (fig. 5) directed almost straight upward; abdominal ones (fig. 6) extending obliquely upward and toward the end of body; abdominal spiracles about one-third the size of the thoracic.

Tibio-tarsus (fig. 7) about three times as long as pretarsus; proximal membranous part of pretarsus slightly longer than claw and provided with two setae; claw rather weak, and somewhat curved; small arolium present.

11. *Ernobius punctulatus* Lec.

Plate 21.

Described material labeled:

- 1) *Ernobius punctulatus* Lec., Cathlamet, Washington State, Special Surv. #19853, 44-24138, 14.IX.1944, Douglas fir in cone scales, C.G. ANDERSON coll., W. S. FISHER det. the associated adults.
- 2) *Ernobius* sp. (probably *E. punctulatus* Lec.), Wisconsin, Hopk. U. S. 32807 ♀, 41-3900. Jack pine cones. A.G. BOVING det. larva.

Size of larva: Small to moderately large (4 to 5 mm.).

Head capsule subcircular, with complete frontal cleavage lines (fig. 9), anteriorly extending through cranial sockets around antennae; clypeo-frons and rest of cranium pigmented, with exception of a broad, longitudinal, not pigmented spot on the sides of parietalia and adjacent to the frontal lines; epistoma with catapophyses bearing very few setae; clypeo-frons and rest of cranium rather sparingly set with long setae but with several short setae between them. Antenna (fig. 9) with two very low articles bearing the ordinary sensory organs. Anteclypeus (fig. 9) with a series of about six short and long setae at each end of anteclypeal sulcus. Labrum (fig. 9) transverse, suboval, paired marks very pale; antero-lateral margin with a series of densely set fine, long, terminally curved setae on each side. Epipharynx (fig. 8) in middle of anterior margin with some short, hook-shaped coryphal setae; on each side about eight short, straight or slightly curved chaetoparial setae in an oblique inwardly convex, irregular series; crepidal area between the labral rods covered with minute soft projections and bearing anteriorly a pair of pores; well sclerotized tormae (fig. 8) and membranous light colored labral rods forming imperfect Y-shaped features. *Mandible* (fig. 10) with two apical and two subapical teeth; marginal brush present; aboral surface of mandible with proximal and distal groups of long setae. Maxillary lacinia (fig. 11) rather small, terminally with a single spine surrounded by about six stiff setae as long as the spine, and in addition, with much finer setae on dorsal surface; stipes with many setae on the whole surface but particularly with long, strong ones at distal end; maxillary palpus with three articles; proximal article with an

anterior transverse series of about six setae ventrally, and a similar number of finer setae dorsally. Prementum with four or five setae in each anterior corner; meso- and submentum each with about ten long setae on each side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	15
Abdominal segment 1	.....	30
" " 2	.....	30
" " 3	.....	33
" " 4	.....	25
" " 5	.....	22
" " 6	.....	18
" " 7	.....	8
" " 8	.....	9

9th abdominal segment with a patch of lateral asperities, vaguely estimated as about 40 on each side.

10th abdominal segment with about 10 asperities on each side.

Spiracles (figs. 13, 14) broadly oval with one air tube less than half as long as spiracular orifice; on thoracic spiracle with an additional second short air tube; both thoracic air tubes (fig. 13) directed toward the head, the single abdominal (fig. 14) toward the end of the body; abdominal spiracles about two-thirds the size of the thoracic one.

Tibio-tarsus (fig. 12) almost twice as long as pretarsus; proximal membranous part of pretarsus slightly longer than claw and provided with two setae; claw rather weak, short, slightly curved; small arolium present.

12. *Coelostethus notatus* Say.

Plate 22.

Described material labeled:

- 1) *Coelostethus notatus* Say, Jackson Isl. Md., 18.VIII.1914. In red rotten oak, SCHWARZ and BARBER coll. et det. (Note No. 134 ♀).
- 2) Amherst, Mass. 5.X.1944. In ash, chestnut and oak, also in pine-boards in cellar partitions, W. B. BECKER [received material from Mr. Ernst Watson's summer place at Monterey, Mass.].

3) Vienna, Va. 7.II.1937. In dry rotten standing pine, BRIDWELL coll. W. S. FISHER det. imagines.

Size of larva: Moderately large (c. 6 mm.).

Head capsule subcircular, without frontal cleavage lines; pigmented field (fig. 2) behind epistoma distinct, sagittally about three times as long as epistoma; epistoma (fig. 2) with some short, fine setae near the sagittal line, otherwise smooth, not pitted with round depressions; cranium with numerous evenly distributed fine, long, and moderately long setae. Antenna (fig. 2) with two distinct articles. Anteclypeus (fig. 2) with eight, mainly long setae at each end of anteclypeal sulcus, and covered completely with a pigmented, densely punctured sclerite. Labrum (fig. 2) transverse, suboval, about three times as wide as long; anterior margin and most of surface densely set with moderately long setae; paired marks not noticeable. Epipharynx (fig. 1) with, altogether, four small coryphal setae, and on each side an oblique, inwardly convex, single, regular row of six slender, curved, rather long chaetoparal setae; tormae (fig. 1) and labral rods forming strong Y-shaped, somewhat converging features; crepidal region between them covered with minute papillae and provided with a few irregularly placed pores. *Mandible* (figs. 3 and 5) with two apical strong, sharp teeth and two smaller, more obtuse subapical teeth; marginal brush present but with short bristles; aboral mandibular surface bearing a proximal series of about seven rather long setae and a distal group of about five similar setae. Maxillary lacinia (fig. 4) a little larger than half the size of galea, lacking any special robust spines but beset with about twelve strong, straight setae, each as long as one of the similar marginal setae of galea and, clustered adorally in a bundle behind, with many rather long but finer setae; maxillary palpus with three articles; proximal article with about seven long setae ventrally; distal part of stipes with a similar number of like setae. Prementum, meso- and submentum each with about ten setae on the sides.

Prothorax laterally with an oblique sulcus.

Number of prodorsal asperities on each side of:

Thoracic segment II	none
" " III	15
Abdominal segment 1	25

Abdominal segment	2	25
"	3	25
"	4	23
"	5	20
"	6	16
"	7	a few or none
"	8	none

9th abdominal segment with a patch of 15 to 20 lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (figs. 7, 8 and 9) annular, the thoracic (fig. 7) broadly oval with two minute air tubes facing the head and some small beadlike bubbles emerging from the peritremal frame; abdominal spiracles (figs. 8 and 9) circular with a single short air tube directed toward the end of body, (exceptionally one of the abdominal spiracles may be without air tube (fig. 9)); length of thoracic spiracle about three times longer than the diameter of an abdominal spiracle.

Tibio-tarsus (fig. 6) one and one-half times longer than pretarsus; proximal membranous part of pretarsus subconical about as long as wide, armed with two strong setae; claw very long and slender, spinelike, somewhat curved, three times longer than membranous part; arolium absent.

13. *Hadrobregmus carinatus* Say
(Identification doubtful, onus probandi).

Plate 23.

Described material labeled:

Hadrobregmus carinatus Say; in decaying roots of live hemlock, Black Pond, Fairfax, Va., March 24, 1920. F. C. CRAIGHEAD coll. et reared¹.

¹ The following description is based on the above mentioned material, labeled as collected and reared by F. C. CRAIGHEAD but without explanation about who made the determination of the imago. More and similar material of larvae but without determination are also in the collection of U. S. Natl. Mus. These larvae have an anteclypeal sclerite of the same shape as the larvae of genus *Trypopytys* and look on the whole like them. However, in the collection of the Museum another lot of larvae, also collected by F. C. CRAIGHEAD, is present which, too, is named *Hadrobregmus carinatus* but, differing from the former, have a simple anteclypeus without any sclerite, and in this and all other characters coincide with the larvae of *Hadrobregmus umbrosus* Fall and *Hadrobregmus thomsoni* Kraatz in *Picea excelsa* from Finland, collected and determined by Professor UUNIO SAALAS. It is therefore impossible to determine which of the larvae in the Museum are the true *H. carinatus* until new material will be available for rearing and determination.

Size of larva: Moderately large (c. 7 mm.).

Head capsule subcircular, slightly longer than broad, without frontal cleavage lines; pigmented field behind epistoma (fig. 2) distinct, sagittally about twice as long as epistoma, provided with many setae in small pits; epistoma (fig. 2) smooth, without setae; rest of cranium with numerous, evenly distributed, moderately long and short setae. Antenna (fig. 2) with two distinct articles. Anteclypeus (fig. 2) with about ten mostly moderately long, stiff setae at each end of the anteclypeal sulcus and with a pigmented, anteriorly convex, smooth, thick sclerite on the posterior half of anteclypeus. Labrum (fig. 2) transverse suboval, about twice as wide as long; anterior margin and much of surface behind the margin densely set with long and fairly long setae; paired marks faint. Epipharynx (fig. 1) with two pairs of small coryphal setae; on each side six long, slender, almost, straight chaetopariar setae in an oblique curved row; tormae and labral rods forming a pair of long, sclerotized, Y-shaped, straight features; crepidal region covered by minute sensory papillae and with some irregularly distributed pores. *Mandible* (fig. 3) with two strong apical teeth and two small almost confluent, subapical, obtuse projections; marginal brush lacking, bristles substituted by some minute granules; aboral mandibular surface bearing a proximal series of fairly long setae and a distal group of five similar setae. Maxillary lacinia (fig. 4) more than half as large as galea, lacking a robust spine but distally bearing a considerable number of strong, ensiform setae, each as long as one of the similar marginal setae of galea; dorsally with numerous long but finer and softer setae; maxillary palpus with three articles; proximal article with an irregular double series of about ten long setae anteriorly placed across the ventral surface; distal part of stipes with about same number of similar setae. Prementum, meso- and submentum each with about a dozen setae on each side.

Number of prodorsal asperities on each side of:

Thoracic segment II	none
" " III	41
Abdominal segment 1	48
" " 2	49
" " 3	47
" " 4	43
" " 5	44

Abdominal segment 6.....	51
" " 7.....	13
" " 8.....	13

9th abdominal segment with a patch of about 55 lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (figs. 5, 6, 7 and 8) simple annular; both thoracic and abdominal subcircular, without air tubes, or with very short or vestigial air tubes; orifice of thoracic spiracle (fig. 7) with a diameter about three times longer than the diameter of an abdominal spiracle (figs. 5, 6 and 8).

Pretarsus (fig. 10) about half as long as tibio-tarsus; proximal membranous part of pretarsus subconical, about as long as wide, armed with two setae; claw almost three times as long as proximal part, slender, slightly curved; arolium absent.

14. *Trypopitya sericeus* Say.

Plate 24.

Described material labeled:

- 1) *Trypopitya sericeus* Say, In hickory, Pennsylvania, Hopk. U. S. 10264 S.
- 2) *Trypopitya sericeus* Say. Ex fallen dead holly branch, Snow Hill, Md., larvae: 21.X.1949, adults out 1950, W. H. ANDERSON coll., reared, and det.

Size of larva: Moderately large (c. 8 mm.).

Head capsule subcircular, slightly longer than broad, without frontal cleavage lines; pigmented field (figs. 1 and 3) behind epistoma distinct, sagittally about two and one-half as long as epistoma, provided with a multitude of moderately long setae seated in small pits; epistoma (fig. 3) rather smooth, without setae; rest of cranium with numerous, evenly distributed, long and moderately long setae. Antenna (fig. 2) with two distinct articles. Anteclypeus (fig. 3) with eight mostly long, stiff setae at each end of anteclypeal sulcus and with a pigmented, in anterior outline convex, smooth, thick sclerite covering the posterior half of anteclypeus. Labrum (fig. 3) transverse, suboval, about three times as wide as long; anterior margin and most of surface densely set with fairly long setae, paired marks very faint but present.

Epipharynx (fig. 5) medially with a transverse row of, altogether, four small, club-shaped coryphal setae; on each side with six long, slender, slightly curved chaetoparial setae arranged in an arched, irregular, partly double row; tormae and labral rods forming a pair of long, sclerotized, Y-shaped, straight and somewhat converging features (fig. 5); crepidal region between them covered by minute sensory papillae with a few irregularly placed pores. *Mandible* (fig. 4) with two strong apical teeth and two small, almost confluent subapical projections; marginal brush lacking, bristles substituted by a few minute granules; aboral mandibular surface bearing a proximal series of fairly long setae and a distal group of five similar ones. Maxillary lacinia (fig. 6) somewhat more than half as large as galea, lacking a robust spine but terminally bearing about ten strong, ensiform setae, each as long as one of the similar marginal setae of galea; in addition, with many, as long and almost as strong setae behind them on the ventral surface and with numerous long, but fine and soft setae on the dorsal side; maxillary palpus with three articles; proximal article with about ten long setae in an irregular, double, transverse row on the ventral side; distal part of stipes with about same number of similar setae. Prementum, meso- and submentum (fig. 1) each with about a dozen setae on either side. Prothorax laterally with an oblique long, straight groove on each side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	50
Abdominal segment 1	.....	87
" " 2	.....	83
" " 3	.....	88
" " 4	.....	114
" " 5	.....	102
" " 6	.....	76
" " 7	.....	44
" " 8	.....	23

9th abdominal segment with c. 80 lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles annular, the thoracic (fig. 7) broadly oval with several winding air tubes, three distinct, a few additional small and simple; atrium projecting below the larger ones as a tongue-

shaped expansion; abdominal spiracles (figs. 8 and 9) subcircular with one or two quite regular, short air tubes, orifice of thoracic spiracle about three times as long as the diameter of an abdominal one.

Pretarsus (fig. 14) about half as long as tibio-tarsus; proximal membranous part of pretarsus subconical, about as long as wide, armed with two setae; claw almost three times as long as proximal part, slender and somewhat curved; arolium absent.

15. *Trypopyty punctatus* Lec.

Plate 24.

Described material labeled:

Trypopyty punctatus Lec. In decayed wood building timber, Los Angeles, Calif. 20.XI.1928, Dr. A.W. MERRILL, coll. et det.

Size of larvae: Moderately large (c. 8 mm.).

Characters of larva identical with those of *Trypopyty sericeus*, except, that the number of prodorsal asperities on the body segments is considerably less and the spiracles somewhat different.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	22
Abdominal segment 1	.....	28
" " 2	.....	31
" " 3	.....	31
" " 4	.....	29
" " 5	.....	27
" " 6	.....	22
" " 7	.....	17
" " 8	.....	11

9th abdominal segment with a patch of about 25 lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles annular, the thoracic (fig. 11) circular with three short and simple air tubes and vestiges of one or two more; abdominal spiracles (figs. 12 and 13) circular with two or three short, simple air tubes close together; orifice of thoracic spiracle not fully twice as long as the diameter of an abdominal spiracle.

16. *Platybregmus canadensis* Fisher.

Plate 25.

Described material labeled:

Platybregmus canadensis Fisher. Basswood-shelf in basement of farmhouse, So. Onondaga, N.Y. 17.VI.1950, I. B. SIMEONE coll., associated imago det. by W. S. FISHER.

Size of larva: Large (c. 12 mm.).

Head capsule subcircular, as broad as long, without frontal lines; pigmented field (fig. 1) behind epistoma absent (or indistinct and faint); epistoma (fig. 1) with some setae irregularly distributed on the surface and with a double row of about twelve densely set, moderately long setae on each side of anterior margin; rest of cranium with well-developed, fine setae, rather densely distributed. Antenna (fig. 1) without distinct articles; fossal ring around antennal base with some long setae. Anteclypeus (fig. 1) with six setae at each end of anteclypeal sulcus, attached to a small sclerite; corresponding sclerites connected with a very low, ribbon-shaped sclerotization. Labrum (fig. 1) suboval, about twice as wide as long; anterior margin and much of surface behind it densely set with fairly long setae; paired marks present. Epipharynx (fig. 2) with marginal acanthoparietal setae numerous and bent in over epipharyngeal surface; two pairs of minute coryphal setae present; on each side with a subtriangular patch of moderately long and short, slender, curved and pointed chaetoparietal setae anteriorly arranged in a group of about fifteen setae and posteriorly in a single row of about five setae extending to posterior end of torma; labral rods and tormae (fig. 2) united to short, robust, curved, V-shaped features. *Mandible* (fig. 3) with two apical teeth and two small, almost confluent, rounded subapical projections. Maxillary lacinia (fig. 4) about half as large as galea, without spine, covered terminally and ventrally with numerous straight, strong setae and with additional finer setae dorsally; galea (fig. 4) with marginal and ventral setae similar to the corresponding lacinial setae, dorsal setae very long and fine particularly in the region near palpus; maxillary palpus with three articles; proximal article ventrally with about fifteen rather fine and long, irregularly distributed setae; ventral side of stipes with a great number of similar setae all over. Prementum on

each side with fifteen or more long, fine setae, meso- and submentum each with at least twenty similar setae on either side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	30
Abdominal segment 1	.....	45
" " 2	.....	45
" " 3	.....	25
" " 4	.....	21
" " 5	.....	23
" " 6	.....	5
" " 7	.....	none
" " 8	.....	none

9th abdominal segment (fig. 6) without lateral asperities¹.

10th abdominal segment without asperities.

Spiracles (figs. 7 and 8) annular, oval, simple without air tubes; thoracic spiracle (fig. 7) only slightly larger than the abdominal ones (about as five to four).

Pretarsus (fig. 9) about half as long as tibio-tarsus; proximal membranous part subconical, about as long as wide, armed with two setae; claw same length as proximal part, almost straight, quite strong; segments of leg richly furnished with long setae; arolium absent.

17. *Anobium punctatum* Deg. (= *A. striatum* Oliv.).

Plate 26.

Described material labeled:

- 1) *Anobium striatum* Oliv. South Germany; [bought from] Dr. K. W. VERHOEFF; received 25.VIII.1922.
- 2) *Anobium punctatum* Deg., In twig of *Salix* sp. England, 19.I.1948; N.Y. #100389, 48-1259, imago det. by W. S. FISHER.
- 3) *Anobium punctatum* Deg. In *Laurus* sp. stem. France, 9.V.1939; N.Y. #81534.
- 4) *Anobium punctatum* Deg. In oak beams and spruce flooring, Middletown, R. I., 12.X.1944, Rau coll., Spl. Sur. #20412.
Size of larva: Moderately large (c. 6 mm.)

¹ In other characters very similar to genus *Vrilletta* (Pl. 34, figs. 8 to 14).

Head capsule subcircular, slightly longer than broad, widest in the middle, without frontal lines; pigmented field (fig. 2) behind epistoma distinct; in sagittal line not much longer than epistoma, bearing three long and a few small setae on each side; epistoma (fig. 2) with a single seta on each side of sagittal line; rest of cranium with long and short setae distributed evenly over the whole surface. Antenna (fig. 1) without distinct articles, sensory organs borne by membranous basal membrane, ring-shaped sclerotization around antennal base with one very long seta. Anteclypeus (fig. 2) with two long, stiff setae at each end of anteclypeal sulcus, attached to a small plate. Labrum semi-circular, anterior margin and much of surface behind it set with setae; paired marks distinct. Epipharynx (fig. 3) with well-developed acanthoparial setae; a curved, double series of short hook-shaped coryphal setae inside of and parallel with anterior margin; six fairly robust, curved, obtuse chaetoparial setae arranged in a regular, convex arch; labral rods and tormae (fig. 3) forming long, sclerotized, distinctly Y-shaped features; crepidal region between them apparently without pores and setae. *Mandible* (fig. 4) with two rather short apical teeth and subapical edge developed into a distinct toothlike projection connected with a minute, pointed tip at marginal brush by a thin, in outline convex wall; a marginal brush, proximal and distal groups of setae present but rather inconspicuous. Maxillary lacinia (fig. 10) about one-third as large as galea, without spine but terminally with six stiff, strong setae of same length and shape as the marginal setae of galea; dorsally with almost as long but finer setae; maxillary palpus with three articles; proximal article with about six transversely placed, long ventral setae and a few additional short ones. Prementum, mesomentum and submentum each with about five long setae, often transversally arranged on each side, and in addition with a few fine setae scattered on the surface.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	30
Abdominal segment 1	.....	40
" " 2	.....	38
" " 3	.....	35
" " 4	.....	35

Abdominal segment 5	.....	20
" " 6	.....	20
" " 7	.....	15
" " 8	.....	none

9th abdominal segment without lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 5, 6 and 7) annular, oval; thoracic spiracular orifice (fig. 5) about twice as long as orifice of an abdominal spiracle (figs. 6 and 7); thoracic spiracle with a short, single, simple or heart shaped air tube, abdominal spiracles also with a single air tube but this is about as long as or longer than the orifice.

Segments of leg rather short; pretarsus (fig. 9) half as long as tibio-tarsus; proximal membranous part subconical, about as long as wide, armed with two setae; claw same length as proximal part, slightly curved, quite strong; arolium absent.

18. *Anobium gibbicollis* Lec.

Plate 26.

Described material labeled:

Anobium ("Hadrobregmus") *gibbicollis* Lec., In dead alder, Seattle, Wash. 12.IV.1942; E. I. SMITH coll., FISHER det. imagines, Seattle #10016 — 42-5350.

Size of larva: Moderately large.

Characters of larva identical with those of *Anobium punctatum* Deg., except, in having differently formed spiracles and a different number of prodorsal asperities.

Spiracles (figs. 11, 12, and 13) annular with very short air tubes; thoracic spiracle with two air tubes, abdominal spiracles with one air tube.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" III	.....	35
Abdominal segment 1	.....	74
" " 2	.....	76
" " 3	.....	67
" " 4	.....	57
" " 5	.....	48

Abdominal segment 6.....	46
" " 7.....	20
" " 8.....	none

9th abdominal segment without lateral asperities.
10th abdominal segment without asperities.

19. *Anobium nitidum* Herbst and *Anobium pertinax*
 Linnaeus (nec. F.)

Plate 26.

Described material labeled:

- 1) *Anobium nitidum* Herbst, In piece of branch of wood; grove at Dragør, Amager, Denmark, 16.II.1935, J. P. KRYGER leg. and reared.
- 2) *Anobium pertinax* L. Silver fir, Dyrehaven, Denmark, 23.XI.1938, J. P. KRYGER.

Size of larva: Moderately large (c. 6 mm.).

Characters of larva identical with those of *Anobium punctatum* Deg., except, having short spiracular tubes and a different number of prodorsal asperities; characters also identical with those of *Anobium gibbicollis* Lec., except, in that all of the spiracles have only one air tube and the prodorsal asperities are present in a different number.

Spiracles (figs. 15, 16, 17) annular with very short air tubes; thoracic spiracle (fig. 15) with one air tube (*A. nitidum*), or apparently none (*A. pertinax*); abdominal spiracles (figs. 16 and 17) with one air tube (both in *A. nitidum* and *A. pertinax*).

Number of prodorsal asperities on each side of:

Thoracic segment II ...	none (in <i>nitidum</i>) ...	none (in <i>pertinax</i>)
" " III	27	31
Abdominal segment 1....	40	50
" " 2....	40	54
" " 3....	28	30
" " 4....	28	31
" " 5....	22	27
" " 6....	20	20
" " 7....	14	11
" " 8..	none	none

9th abdominal segment without lateral asperities.
10th abdominal segment without asperities.

20. *Microbregma emarginatum* Dufts.

Plate 27.

Described material labeled:

Microbregma emarginatum (Dufts.). In bark of *Picea*, Gaspé-Quebec, Canada, 27.VIII.1921, F. C. CRAIGHEAD coll. and reared.

Size of larva: Moderately large (c. 7 mm.).

Head capsule subcircular without frontal lines; pigmented field (fig. 1) behind epistoma distinct, but sagittally not much longer than epistoma and provided with long setae; epistoma (fig. 1) bearing a few long setae in the middle of surface and a single row of about seven rather long setae on each side of anterior margin; rest of cranium with numerous long setae evenly distributed. Antenna (fig. 1) with two very low ring-shaped articles. Anteclypeus (fig. 1) with a ribbonlike sclerotization proximally at the anteclypeal sulcus and a sclerotization at each end of it bearing about five fairly long, fine, stiff setae. Labrum subovate (fig. 1), only one and one-half times wider than long; anterior margin and a great part of the surface densely set with fairly long setae; paired marks present. Epipharynx (fig. 3) with long acanthoparial setae and two pairs of small coryphal setae; on each side an inwardly convex, somewhat irregular row of six curved, strong, rather short chaetoparial setae and anterior to the crepidal region with a pair of straight, fine setae; tormae and labral rods (fig. 3) forming distinct, Y-shaped features; crepidal region covered with minute papillae and with, altogether, about ten, irregularly placed pores. *Mandible* (fig. 4) with fairly narrow distal part ending with three distinct teeth of nearly same shape and size, marginal brush well developed; aboral mandibular surface with a proximal and a distal group of setae. Maxillary lacinia (fig. 5) about half as large as galea, distally bearing four strong setae similar to the marginal setae of galea, no spine but ventrally with additional finer setae; maxillary palpus with four articles; proximal article with about seven long setae ventrally, and a transverse anterior series of much finer setae dorsally, next article without setae, subapical article with two setae, and apical article without setae but with accessory rod-shaped organ dorsally, a single pore, and terminally, minute sensory projections; distal part of stipes with about twelve long setae. Prementum,

meso- and submentum each with about ten setae on either side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	25
Abdominal segment 1	.....	30
" " 2	.....	38
" " 3	.....	42
" " 4	.....	47
" " 5	.....	30
" " 6	.....	16
" " 7	.....	none (or a few)
" " 8	.....	none

9th abdominal segment on each side with a patch of lateral asperities amounting to about 50.

10th abdominal segment without asperities.

Spiracles (fig. 6) annular, oval, about twice as long as wide, with one air tube half as long or less than half as long as length of spiracle.

Pretarsus (fig. 7) almost as long as tibio-tarsus; proximal membranous part of pretarsus subconical, about as long as wide, armed with one strong seta, about two-thirds as long as claw and one much shorter but robust; claw almost three times as long as membranous part, slender and slightly curved; arolium absent.

21. *Ernobius champlaini* Fisher.

Plate 27.

Described material labeled:

Waldo Canyon, Colo., Hopk. U. S. 10061, b, Dec. 1914, dead limbs of *Pinus flexilis*, A. B. CHAMPLAIN coll. and reared.

Size of larva: Small to moderately large (4 to 6 mm.).

Head capsule (fig. 9) subcircular, slightly longer than broad, broadest in the middle, sides convergent behind the middle, without frontal lines; pigmented field (fig. 9) behind epistoma absent; capsule light colored; epistoma without setae; cranium (fig. 9) set with numerous evenly distributed, mostly long setae. Antenna (fig. 9) without articles, sensory organs borne by membranous base. Anteclypeus (fig. 9) with four (or five) long setae

at each end of anteclypeal sulcus. Labrum (fig. 9) oval, twice as wide as long, on anterior margin with a multitude of fine, fairly long, curved setae; paired marks not found. Epipharynx (fig. 8) with densely set, long, fine, curved combined acroparial and acanthoparial setae; two pairs of small coryphal setae; on each side a subtriangular patch of chaetoparial setae with about seven setae grouped together anteriorly and five setae in a single, irregular row posteriorly; some chaetoparial setae long and others short, all slender, curved and pointed; crepidal space covered with minute sensory papillae and having a single pair of pores anteriorly located near base of each torma; tormae (fig. 8) rather short, well sclerotized and elongate conical; labral rods slightly sclerotized, long, straight and parallel; each torma and labral rod poorly connected, forming a defective Y-shaped feature. *Mandible* (fig. 10) with three teeth distally, namely two apical teeth and one subapical tooth; marginal brush, proximal and distal groups of setae on aboral mandibular surface all present but short. Maxillary lacinia (fig. 12) small, terminally with one rather short, moderately strong spine and three stiff setae longer than spine and placed close to it; in addition with seven fine, short setae on both dorsal and ventral surfaces; stipes with about ten long ventral setae and shorter setae dorsally; maxillary palpus with three approximately equal, long articles; proximal article ventrally with about ten long and moderately long setae, dorsally with about the same number of setae but fine and short; second article with two setae and one pore; distal article without setae. Prementum with about seven long and short setae in each anterior corner; meso- and submentum each with about ten, mostly long setae on each side.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	27
Abdominal segment 1	.....	30
" " 2	.....	30
" " 3	.....	24
" " 4	.....	22
" " 5	.....	24
" " 6	.....	25
" " 7	.....	12
" " 8	.....	none

9th abdominal segment with a patch of lateral asperities amounting to about 35.

10th abdominal segment with no asperities.

Spiracles (figs. 13 and 14) of moderate size, broadly oval and without air tubes, thoracic spiracle (fig. 13) a little shorter than the claw, abdominal spiracles (fig. 14) not much smaller than the thoracic.

Tibio-tarsus (fig. 11) about twice as long as pretarsus; proximal membranous part of pretarsus about half as long as the claw and carrying two setae; claw well developed, somewhat curved; arolium absent.

22. *Stegobium paniceum* L.

(= *Sitodrepa panicea* L.)

Plate 28.

Described material labeled:

- 1) *Stegobium paniceum* L., from *Crataegus* fruits from Erfurt, Germany, Inspection house, Wash. D. C. 4.V.1926, H.V. GOLDMAN.
- 2) *Stegobium paniceum* L., in thyme seed from New York State, N. York #34474, 20.I.1935.
- 3) *Stegobium paniceum*, in nutmeg seed, from Mexico; Laredo, Texas #36978, 45-13530.

Size of larva: Small (c. 4 mm.).

Head capsule somewhat longer than broad, widest slightly behind the middle, tapering gradually posteriorly, without frontal lines; pigmented field behind epistoma (fig. 1) quite distinct, sagittally about as long as epistoma; epistoma (fig. 1) with a transverse series of a total of about ten long, straight, rather fine setae in anterior margin and five or six long and stronger setae behind them; epistomal surface smooth; a group of about six setae at inner margin of antennal fossa; rest of cranium including pigmented field with long and short setae all over. Antenna (fig. 1) without articles, sensory elements borne by dome-shaped base. Anteclypeus (fig. 1) with a group of five long, straight, fine setae at each end of anteclypeal sulcus; not borne by a special small plate. Labrum (fig. 1) transverse, broadly oval, about twice as wide as long, with fairly long setae on anterior half of

surface; paired marks present. Epipharynx (fig. 2) with long, strong acanthoparial setae and on each side five short chaetoparial setae in a curved, regular row extending posteriorly only to the middle of the area; two pairs of coryphal small setae present anteriorly; tormae (fig. 2) and labral rods forming short, strong, V-shaped features; crepidal area with a few pores anteriorly. *Mandible* (fig. 7) with two apical teeth; subapical edge forming a triangularly projecting wall; marginal brush with short setae; on aboral surface with a proximal group of many long setae and a distal smaller group of similar setae. Maxillary lacinia (fig. 8) less than half as large as galea, lacking special spine but with about five, slightly curved, strong terminal setae similar to the marginal setae of galea; maxillary palpus with three articles; proximal article with about eight long, curved setae; stipes anteriorly with the same number of similar setae.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none	
" " III	.....	2	
Abdominal segment 1	.....	13	
" " 2	.....	12	in an irregular,
" " 3	.....	13	in some places
" " 4	.....	11	double but prevalently
" " 5	.....	10	single series
" " 6	.....	8	
" " 7	.....	6	in a single series
" " 8	.....	4	

9th abdominal segment on each side with a patch of about 20 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 3, 4, 5, and 6) small, circular, with an air tube generally at least as long as diameter of spiracular orifice; thoracic spiracle (fig. 3) half as long as pretarsus and its diameter about twice as long as the diameter of the abdominal ones (figs. 4, 5 and 6).

Leg (fig. 9) with pretarsus half as long as tibio-tarsus; membranous basal part of pretarsus subconical, a little longer than wide, armed with two moderately long setae; claw very long and slender, somewhat curved and almost three times as long as basal part; arolium absent.

23. *Nevermannia dorcatomoides* Fisher.

Plate 28.

Described material labeled:

- 1) *Nevermannia dorcatomoides* Fisher, in termites nest; Hamburg Farm, Costa Rica, NEVERMANN coll. et dedit., 27.VIII 1926.

Size of larva: Moderately large (c. 6 mm.).

Head capsule (fig. 10) about twice as long as broad, widest slightly behind middle, tapering gradually posteriorly; no frontal lines; pigmented field behind epistoma absent; epistoma (fig. 10) with a transverse series of, altogether, eight long setae in anterior margin close to anteclypeal sulcus; one long seta present at inner side of antennal fossa; rest of cranium with long and short setae distributed over entire surface. Antenna (fig. 10) without articles; sensory papilla subconical and at least as long as diameter of basal, dome-shaped membrane. Anteclypeus (fig. 10) without plate and without setae at each end of anteclypeal sulcus. Labrum (fig. 10) oval, fully twice as broad as long, with transverse series of, altogether, about ten long setae; paired marks absent. Epipharynx (fig. 12) with numerous long, straight acroparal and cultriform acanthoparal setae; on each side six short, strong cultriform chaetoparal setae in a regular, curved row extending posteriorly to the middle of the epipharyngeal area; weak labral rods and tormae forming V-shaped features; crepidal field velvety pubescent with a couple of pores. *Mandible* (figs. 11 and 13) with two very short, almost fused apical teeth; subapical part raised into a conspicuous, thin, triangular wall; adoral surface with high, longitudinal carina; marginal brush with many fine, well-developed setae; aboral mandibular surface with two (or a few more) long proximal and two long distal setae. Maxillary lacinia (fig. 15) about half as large as galea, lacking spine; latero-terminally with about six cultriform and strong setae and in addition a few longer and finer setae behind them; galea (fig. 15) ventrally with some long setae; maxillary palpus with three articles; proximal article with about five setae. Asperities (fig. 14) minute, some obtuse, others with flat, scraperlike top.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	6

Abdominal segment 1	8
" " 2	8
" " 3	8
" " 4	8 in single
" " 5	8 regular rows
" " 6	8
" " 7	3
" " 8	none

9th abdominal segment with four minute asperities in a single row on each side of body.

10th abdominal segment without asperities.

Spiracles (figs. 16 and 17) simple, ring-shaped, broadly oval to circular, without air tubes; diameter of thoracic spiracle (fig. 16) one and a half times as long as diameter of each abdominal spiracle (fig. 17).

Leg (fig. 18) with a reduced number of setae, but setae very long and fine; pretarsus about one-fourth as long as tibio-tarsus; basal membranous part about twice as wide as long, armed with two setae; claw short, but twice as long as membranous base, somewhat curved and quite robust; arolium absent.

24. *Hadrobregmus thomsoni* Kraatz¹

25. *Hadrobregmus umbrosus* Fall.¹

Plate 29.

Described material labeled:

- 1) *Anobium thomsoni* Kraatz; Suomi, Korpiselkä, in *Picea excelsa*, 7.VI.1913, UUNIO SAALAS coll. et det.
- 2) *Hadrobregmus umbrosus* Fall., in *Fagus*, Conn., U. S. A., F. C. CRAIGHEAD coll., Hopk. U. S. 10082 j.
- 3) *Hadrobregmus carinatus* Say, in *Quercus*, Conn., F. C. CRAIGHEAD coll., Hopk. U. S. 10082 h.

Size of larva: Moderately large (c. 7 mm.).

Head capsule slightly longer than broad, broadest before middle, sides convergent behind; pigmented field behind epistoma (fig. 1) present, but length sagittally less than that of epistoma; provided with a few fine setae but not pitted; epistoma (fig. 1)

¹ The larvae of *H. thomsoni* from Finland and *H. umbrosus* from U. S. A. are identical, even the number of asperities in the prodorsal areas differs only slightly and cannot be considered as a separating character. Concerning *Hadrobregmus carinatus* Say see: footnote to the description of this larva on p. 96.

fairly smooth and without setae; rest of cranium (fig. 4) with numerous, evenly distributed, moderately long and short setae. Antenna (fig. 4) with two distinct articles. Anteclypeus (fig. 4) simple, with five moderately long, stiff setae at each end of anteclypeal sulcus. Labrum (fig. 4) transverse, suboval, about twice as wide as long; anterior margin and much of surface behind it densely set with long and fairly long setae; paired marks present. Epipharynx (fig. 1) on each side with six slender, almost straight chaetoparial setae in a subtriangular, anteriorly wider group on each side, and near each torma a smaller additional seta; Tormae and labral rods (fig. 1) forming a pair of long, Y-shaped, straight features; crepidal region covered by minute papillae and with a few indistinct pores. *Mandible* (fig. 2) with two apical teeth and two small, rounded, almost confluent sub-apical projections; marginal brush well-developed in *H. thomsoni* but lacking (possibly broken off) in the two other species; aboral mandibular surface bearing a proximal series of fairly long setae and a distal group of five similar setae (fig. 4) (absent, probably broken off in *H. thomsoni*, fig. 2). Maxillary lacinia (fig. 3) about half as large as galea, lacking a robust spine but distally bearing a considerable number of strong, ensiform, slightly curved setae, each as long as one of the similar marginal setae of galea; in addition with some straight but weaker setae on ventral side behind the distal setae; dorsally with numerous fine, soft, and long setae; maxillary palpus with three articles; proximal article with an irregular series of about ten long setae on ventral side, and about the same number of similar setae on distal part of stipes. Prementum, meso- and submentum, each with about a dozen setae on either side.

Number of prodorsal asperities on each side of:

	<i>thomsoni</i>	<i>umbrosus</i>	<i>carinatus</i>
Thoracic segment II	none	none	none
" " III	21	26	23
Abdominal segment 1	38	41	31
" " 2	49	42	41
" " 3	47	50	50
" " 4	70	56	66
" " 5	98	109	90
" " 6	84	75	71
" " 7	8	9	11
" " 8	none	none	none

9th abdominal segment on each side with a patch of lateral asperities amounting to about 77 (*thomsoni*); about 77 (*umbrosus*); and about 80 (*carinatus*).

10th abdominal segment without asperities.

Spiracles (fig. 4) annular, both thoracic and abdominal broadly oval, without air tubes; orifice of thoracic spiracle more than twice as long as one of the abdominal spiracles.

Pretarsus (fig. 4) about half as long as tibio-tarsus; proximal membranous part of pretarsus subconical sometimes slightly swollen, about as wide as long, armed with two setae; claw almost three times longer than proximal part, slender, only a little curved; arolium absent.

26. *Xyletobius walsinghami* Perkins.¹

Plates 1 and 29.

Described material labeled:

Xyletobius walsinghami Perk., ex *Perrottetia*, Mt. Tantalus, Oahu, 7.VI.1930, O. H. SWEZEY coll. et det.

Size of larva: Moderately large to large (c. 10 mm.).

Head capsule circular, without frontal lines; pigmented field behind epistoma (fig. 5) present, sagittally almost twice as long as length of epistoma; epistoma (fig. 5) on each side with a transverse series of about seven long, stiff, closely-set setae; rest of cranium, including pigmented field, with numerous rather short, evenly distributed setae (Pl. 1). Antenna (fig. 5) without articles; sensory organs borne by dome-shaped membranous base. Anteclypeus (fig. 5) thin walled, with about seven stiff, rather long, fine setae borne by a small plate at each end of anteclypeal sulcus. Labrum (fig. 5) transverse, not fully twice as wide as long, with shallow, broad anterior emargination; anterior margin and half of surface behind it set with moderately long and rather short, fine setae; paired marks present. Epipharynx (fig. 6) with two pairs of coryphal setae; well-developed marginal acanthoparial setae; on each side a narrow, subtriangular, oblique patch of about thirteen chaetoparial setae; most of the anterior eight setae moderately long, straight and

¹ *Xyletobius sykesii* Perkins is characterized at the end of the description of *Xyletobius walsinghami*.

arranged in two irregular rows; posterior five setae very short, robust and in a single row; tormae (fig. 6) strongly sclerotized and straight, labral rods rather membranous and light colored, together forming indistinct Y-shaped features; crepidal area velvety pubescent with about twelve pores dispersed over entire surface. *Mandible* (fig. 9) with two apical teeth; subapical marginal edge forming an, in outline, approximately subtriangular ledge, followed by the enclosure around the marginal brush; setae of proximal group on aboral mandibular surface about six long ones, setae of distal group three, of moderate size. Maxillary lacinia half as large as galea, distally without spine but with about a dozen densely set, stiff setae of similar shape and length as the marginal setae of galea, and dorsally at base (fig. 7) with a tuft of about four long, fine hairs; maxillary palpus with three articles, proximal article ventrally with about ten setae and dorsally (fig. 7) with a few minute setae at base and about four long ones more anteriorly; distal part of stipes with about ten setae on ventral surface.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	100
Abdominal segment 1	.....	116
" " 2	.....	107
" " 3	.....	89
" " 4	.....	78
" " 5	.....	67
" " 6	.....	77
" " 7	.....	44
" " 8	.....	none

9th abdominal segment on each side with a patch of at least 70 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 8, 10, 11) pseudocribiform, broadly oval; thoracic spiracle (fig. 8) about twice as long as one of the abdominal (figs. 10 and 11).

Leg (Pl. 1 and Pl. 29, fig. 12) well provided with setae, especially at distal end of tibio-tarsus; pretarsus about one-third the length of tibio-tarsus; proximal membranous part and claw

of the same length; membranous part with six well-developed setae; claw rather short, narrow, conical and straight; arolium absent.

Addenda: 26. *Xyletobius sykesii* Perkins; ex *Xanthoxylum* (Hawaii)? O. H. SWEZEY coll. et det. (1 larva, 1 pupa, 1 reared imago). Differs from *X. walsinghami* by being much smaller and having approximately only half as many asperities on the segments.

Size of larva: Small (c. 3 mm.). Head circular.

27. *Xyletinus peltatus* Harris and *Xyletinus* sp.
(near *peltatus*).

Plate 30.

Described material labeled:

- 1) *Xyletinus peltatus* Harris; in pine wood, Griffin, Ga., 10.VIII.1937, TH. BISSELL coll., W. S. FISHER det. imago.
- 2) *Xyletinus peltatus* Harris; from infested pine joists in 40-year old house in McLean, Va., 6.XII.1938.
- 3) *Xyletinus peltatus* Harris; in shop timbers made of so-called Swamp Maple, Farmingdale, N. Jersey, Novbr. 1938.
- 4) *Xyletinus* sp. (near *peltatus* Harris); ex barn timbers, Tiffin, Ohio (letter 26.VIII.1941), T. H. PARKER coll., 41-14691, W. H. ANDERSON det.
- 5) *Xyletinus* sp. (near *peltatus* Harris) from wood of a book case, Thomasville, Ga., 20.IV.1938, B. V. TRAVIS coll.
- 6) *Xyletinus* sp. (near *peltatus* Harris); in pine sills, Atlanta, Ga., 3.V.1937 (with letter from State Entomologists's office, Atlanta, Ga.).

Size of larva: Moderately large (c. 6 mm.).

Head capsule somewhat longer than broad, widest in the middle, posteriorly oval, without frontal lines; pigmented field behind epistoma absent; epistoma (fig. 1) with transverse anterior series of, altogether, two long median setae and on each side two small setae; rest of cranium with numerous long and short, evenly distributed setae. Antenna (fig. 2) without articles; sensory organs borne by dome-shaped membranous base. Anteclypeus (fig. 1) thin walled with a single, long seta, borne by a small sclerite at each end of anteclypeal sulcus. Labrum (fig. 1) transverse, about

twice as wide as long, anterior half densely set with moderately fine setae; paired marks present. Epipharynx (fig. 3) with well-developed marginal acanthoparial setae, two pairs of small coryphal setae, and on each side an oblique, curved series of six rather short, robust chaetoparial setae; tormae and labral rods united into long, straight, somewhat Y-shaped features; crepidal area between tormae velvety pubescent with numerous larger and smaller pores. *Mandible* (fig. 4) with two apical teeth; sub-apical marginal edge forming a rather short and low, convex ledge, followed by a well-developed, oval enclosure around the marginal brush; aboral setae of proximal group about eight, rather long, of distal group three (or four) of moderate size. Maxillary lacinia (fig. 6) half as large as galea, distally without spine but with about a dozen long, stiff, strong setae, similar to the marginal setae of galea; maxillary palpus with three articles, proximal article ventrally with about seven well-developed, anteriorly placed setae in two irregular, transverse series; distal part of stipes with about same number of similar setae.

Number of prodorsal asperities (fig. 7) *on each side of:*

— *Xyletinus peltatus*.

1) Griffin, Ga. 2) McLean, Va. 3) Farmingdale, N. Jersey. —

Thoracic segment	II	none	none	none	
"	"	III	27	31	32
Abdominal segment	1	37	48	53	
"	"	2	31	47	51
"	"	3	33	47	47
"	"	4	37	42	43
"	"	5	35	39	38
"	"	6	33	41	44
"	"	7	43	38	36
"	"	8	none	none	none

— *Xyletinus sp. (near X. peltatus)* (fig. 11).

4) Tiffin, Ohio 5) Thomasville, Ga. 6) Atlanta, Ga. —

Thoracic segment	II	none	none	none	
"	"	III	48	42	41
Abdominal segment	1	86	64	66	
"	"	2	96	68	75
"	"	3	79	55	70

Abdominal segment	4	64	57	66
"	"	5	48	50
"	"	6	61	55
"	"	7	65	61
"	"	8	6	7
				9

9th abdominal segment on each side with a patch of at least 70 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 8, 9 and 10) oval with a single, minute air tube; thoracic spiracle (fig. 8) about twice as long as the abdominal ones (figs. 9 and 10).

Leg (fig. 5) well provided with setae, especially at the distal end of tibio-tarsus; pretarsus about one-fourth the length of tibio-tarsus, proximal membranous part and claw of same length, membranous part with three setae; claw rather short, narrow conical, and straight; arolium absent.

28. *Xyletinus fucatus* L. and

29. *Xyletinus* sp. (near *X. mucoreus* Lec.).

Plate 31.

Described material labeled:

- 1) *Xyletinus fucatus* L., in dead oak twigs, Westboro, Ont., Canada, 11.III.1921, F. C. CRAIGHEAD coll., reared and det. Dom. Can. Ent. Br. #15043 E.
- 2) *Xyletinus* sp. (perhaps *X. fucatus* L.), ex small dead branch, College Park, Md., 28.II.1942, W. H. ANDERSON coll. et det.
- 3) *Xyletinus* sp. (near *X. mucoreus* Lec.), in fallen dead holly branch, Snow Hill, Md., 21.X.1949 and 6.III.1950, W. H. ANDERSON coll. and reared, W. S. FISHER det. imago.

Size of larva: Moderately large (c. 7 mm.).

Head capsule subcircular, very little longer than broad, widest in the middle, sides slightly convergent posteriorly, without frontal lines; a pigmented field behind epistoma absent (fig. 1); epistoma with transverse series of, altogether, eight well-developed setae (fig. 1); rest of cranium bearing moderately long and short, evenly scattered setae. Antenna (fig. 1) without articles, sensory organs borne by dome-shaped, membranous base. Anteclypeus

(fig. 1) bearing a group of five long setae attached to a small plate at each end of anteclypeal sulcus. Labrum (fig. 1) semi-circular, anteriorly densely set with fine setae; paired marks present. Epipharynx (fig. 2) with numerous fine, rather short and recurved acanthoparial setae; anteriorly in front of paired marks with short, curved coryphal setae in two parallel, transverse series; chaetoparial setae numerous, well developed, awl-shaped, somewhat curved and assembled in a subtriangular patch on each side in front of tormae and also between the tormae; the latter setae short, arranged in a single, longitudinal, irregular series of about eight setae; tormae solid, straight, elongate conical; no distinct labral rods; crepidal area velvety pubescent with about a dozen pores scattered over the entire area. *Mandible* (fig. 4) with two apical teeth; subapical margin formed as a long, strong, subtriangular wall with cut-off top near marginal bristles; adoral surface swollen at base; marginal brush present; aboral surface with a double series of about twelve well-developed proximal setae and a small group of about four distal setae. Maxillary lacinia (fig. 3) almost as large as galea, terminally set with numerous strong, straight setae; galea similarly armed; dorsal surface of both lobes (fig. 3) furnished with many fine, short setae and proximally with some very long, soft and fine setae; maxillary palpus with three articles, proximal article ventrally with about seven long setae, dorsally with many short setae; distal part of stipes with many long setae.

Number of prodorsal asperities (fig. 9) on each side of:

Thoracic segment II	.....	none
" " III	.....	18
Abdominal segment 1	.....	18
" " 2	.....	14
" " 3	.....	10
" " 4	.....	9
" " 5	.....	7
" " 6	.....	8
" " 7	.....	5
" " 8	.....	none

9th abdominal segment on each side with a patch of 20 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 10 and 11) oval with a single, short air tube; thoracic spiracle (fig. 10) slightly less than twice as long as one of the abdominal spiracles (fig. 11).

Leg (fig. 7) with many long setae; pretarsus about one-third the length of tibio-tarsus, proximal membranous part only a little more than half as long as claw and bearing two long setae; claw slender, strong, pointed and slightly curved; arolium absent.

29. *Xyletinus* sp. (near *mucoerus* Lec.).

This species differs from *Xyletinus fucatus* L. only in having oval spiracles without any air tubes (figs. 5 and 6) and the following larger number of prodorsal asperities (fig. 8) on each side of:

Thoracic segment II.....	none
" " III.....	48
Abdominal segment 1.....	55
" " 2.....	46
" " 3.....	30
" " 4.....	30
" " 5.....	30
" " 6.....	25
" " 7.....	12
" " 8.....	none

9th abdominal segment on each side with a patch of 35 lateral asperities.

10th abdominal segment without asperities.

30. *Oligomerus sericans* Melsh.

Plate 31.

Described material labeled:

- 1) *Oligomerus sericans* Melsh., in chestnut, West Virginia, Hopk. U. S. #13807.
- 2) *Oligomerus sericans* Melsh., in end of twig of English Walnut, Salem, Oregon, 4.V.1944, Spl. Surv. #15441.

Size of larva: Moderately large (c. 8 mm.).

Head capsule a little longer than broad, widest slightly behind the middle, posteriorly somewhat convergent, without frontal

lines; a pigmented field behind epistoma absent (fig. 14); epistoma (fig. 14) with transverse series of, altogether, fourteen fine, well-developed setae and about four setae at each antennal fossa; rest of cranium bearing long and short, evenly scattered setae. Antenna (fig. 14) without articles; sensory organs on membranous base. Anteclypeus (fig. 14) with a group of six straight, long, fine setae borne by a small plate at each end of anteclypeal sulcus. Labrum (fig. 14) broadly oval, slightly wider than long, densely set with small setae on anterior half of surface; paired marks present. Epipharynx (fig. 12) with numerous fine, recurved acanthoparial setae; chaetoparial setae on each side anteriorly in a broad, longitudinal patch of numerous awl-shaped setae continued in an irregular posterior row of similar but shorter setae and extending behind tips of tormae; tormae solid, subconical, somewhat curved, strongly converging, and about one-third the length of epipharynx in front of crepidal area; crepidal area velvety pubescent with about ten pores irregularly distributed all over. *Mandible* (fig. 13) with two apical teeth; subapical marginal edge strong and fairly straight; adoral surface swollen at base; marginal brush present; aboral mandibular surface with a double series of about twelve well-developed proximal setae and a small group of about four distal setae. Maxillary lacinia (fig. 17) almost as large as galea, terminally densely set with numerous strong, stiff setae similar to the marginal setae of galea; ventral surfaces (fig. 17) of both lobes with strong, stiff setae; dorsal surfaces with fine, short setae and proximally with some very long, soft and hairlike setae; maxillary palpus with three articles; proximal article with about seven long setae; distal part of stipes with many similar setae.

Number of prodorsal asperities (fig. 19) on each side of:

Thoracic segment II	.....	none
" " III	.....	23
Abdominal segment 1	.....	26
" " 2	.....	22
" " 3	.....	17
" " 4	.....	18
" " 5	.....	15
" " 6	.....	10
" " 7	.....	8
" " 8	.....	none

9th abdominal segment on each side with a patch of 24 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 15 and 16) oval, with two very short air tubes on thoracic (fig. 15) and on a few of the abdominal spiracles (fig. 16), only a single short air tube on most abdominal spiracles; thoracic spiracle about twice as long as an abdominal one.

Leg (fig. 18) with many long setae; pretarsus about one-third the length of tibio-tarsus; proximal membranous part about as long as claw and bearing two long setae; claw slender, pointed and slightly curved; arolium absent.

31. *Holcobius haleakalae*, var. *chrysodytus* Perkins¹.

Plate 32.

Described material labeled:

- 1) *Holcobius haleakalae* var. *chrysodytus* Perkins, ex dead branch of *Acacia koa*, 1500 ft., Waipio, Oahu, 9.X.1929, O. H. SWEZEY coll. et det.

Size of larva: Large (c. 14 mm.).

Head capsule (fig. 1) subcircular, without frontal lines, pigmented field behind epistoma (fig. 1) very large, extending over more of cranial surface than half the distance from base of anteclypeus to distal end of epicranial sulcus; centrally armed with a single cone-shaped projection; epistoma (fig. 1) anteriorly with a transverse series of, altogether, sixteen fine, moderately long and straight setae; a group of several long and short setae present interiorly of antennal fossa; rest of cranium with long and fairly short setae scattered over the surface. Antenna (fig. 1) without distinct articles. Anteclypeus (fig. 1) with a group of six fairly long, straight setae on a small sclerotization at each end of anteclypeal sulcus. Labrum (fig. 1) almost circular, densely set with setae on anterior half of surface; paired marks distinct. Epipharynx (fig. 2) with numerous, fine, rather short and recurved

¹ Present in collection of U.S.N.M. are the larvae of the following species, reared and determined by O. H. SWEZEY, but not (or, "Holcobius sp.", only by a different size) to be separated from larvae of *H. haleakalae*: 1) *Holcobius glabricollis* Perk., ex *Acacia koa*, Mt. Tantalus, Oahu, 4.VII.1930, O. H. SWEZEY [large larvae]; 2) *H. hawaiiensis* Perk., ex *Suttonia kilauea*, Hawaii, 20.VII.1934, O. H. S. [large larvae]; 3) *Holcobius* sp., reared, imago in vial, ex Kukui-wood, Ukumohame Val., Maui, 29.VIII.1929, O. H. S. [moderately large, c. 6 mm].

acanthoparial setae; chaetoparial setae on each side numerous, fine, curved and awl-shaped, assembled in a dense patch in front of torma and continued parallel with the torma in a double and irregular row; tormae almost as long as sagittal line of epipharynx in front of crepidal area, forceful, anteriorly irregularly branched, posteriorly curved in an inside concave, semi-circular arch; no distinct labral rods; crepidal area with six, or a few more, pores, irregularly distributed. *Mandible* (fig. 3) with two apical teeth; subapical margin forming a low, somewhat bent, slightly granulated, strong wall; marginal brush present but setae short; a series of about twelve proximal setae and a few distal setae on aboral mandibular surface. Maxillary lacinia (fig. 5) as large as galea, terminally with a multitude of densely set, strong, straight setae similar to marginal setae of galea; ventral surfaces of both lobes with strong setae, dorsal surfaces with fine setae and proximally with some very long and soft hairs; maxillary palpus with three articles; proximal article ventrally with about seven long setae, and a similar number of long setae on distal end of stipes.

Number of prodorsal asperities (fig. 6) *on each side of:*

Thoracic segment II	5
" " III	99
Abdominal segment 1	118
" " 2	100
" " 3	84
" " 4	65
" " 5	52
" " 6	64
" " 7	93
" " 8	none

9th abdominal segment on each side with a patch of about 190 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 7 and 8) oval with a single small air tube; thoracic spiracle (fig. 7) about twice as long as an abdominal one (fig. 8).

Leg (fig. 4) with many long setae; pretarsus about half as long as tibio-tarsus; membranous part about as long as claw and carrying five setae; claw slender, pointed and slightly curved; no arolium.

32. *Xeranobium macrum* Fall.

Plate 33.

Described material labeled:

- 1) *Xeranobium macrum* Fall., in iodine bush *Spirostachys occidentalis* Walson, Los Banos, Calif., P. TING coll., 28.IX.1935; W. S. FISHER det. imago (16.VII.1937).

Size of larva: Moderately large (c. 7 mm.).

Head capsule subcircular, slightly longer than broad, widest in the middle, without frontal lines; pigmented field behind epistoma (fig. 1) absent; epistoma (fig. 1) with transverse series of, altogether, twelve fine, well-developed, straight setae in anterior margin, about six long, fine setae at inner outline of antennal fossa, and a few small setae in middle of epistoma; rest of cranium with fine, long and short setae over the entire surface. Antenna (fig. 1) without articles. Anteclypeus (fig. 1) with a group of about twelve long, fine setae seated at each end of anteclypeal sulcus on a small plate. Labrum (fig. 1) approximately circular, set with setae on anterior half of surface; paired marks present. Epipharynx (fig. 2) with a multitude of fine, recurved acanthoparietal setae; chaetoparietal setae on each side assembled in a broad, longitudinal patch of numerous awl-shaped setae and continued in two very irregular rows of short, some fan-shaped, others hook-shaped setae along inner line of tormae; tormae (fig. 2) long, quite slender, sausage-shaped, and somewhat S-bent; no labral rods; crepidal area velvety pubescent with about four pores irregularly placed. *Mandible* (fig. 4) with two apical teeth; subapical margin forming a humplike, thick wall with granulated surface; marginal brush not found; proximal aboral group of setae with ten very long setae, distal group with few and short setae. Maxillary lacinia (fig. 5) almost as large as galea, terminally with numerous strong, stiff setae similar to the slender cultriform marginal setae of galea; ventral surfaces of both lobes with many strong setae, dorsal surfaces covered with fine, short setae and proximally furnished with very long, soft hairs; maxillary palpus with three articles; proximal article ventrally with about four moderately long setae; distal part of stipes with a similar number of like setae.

Number of prodorsal asperities (fig. 3) on each side of:

Thoracic segment II	none
" " III	52
Abdominal segment 1	66
" " 2	53
" " 3	43
" " 4	38
" " 5	36
" " 6	33
" " 7	29
" " 8	none

9th abdominal segment on each side with a patch of about 65 lateral asperities.

10th abdominal segment without asperities.

Spiracles (figs. 6 and 7) oval, simple, without air tubes; thoracic spiracle (fig. 6) twice as long as one abdominal (fig. 7).

Leg (fig. 8) with many long setae; pretarsus about one-third the length of tibio-tarsus; proximal membranous part not fully as long as claw and bearing four setae; claw slender, pointed and slightly curved; arolium absent.

33. *Nicobium castaneum* Oliv.

Plate 33.

Described material labeled:

- 1) *Nicobium* sp. ex wood from packing case, Azores, New York, 14.III.1922, #953.
- 2) *Nicobium castaneum* Oliv. from flooring of house, Baton Rouge, Louisiana, 17.III.1931.
- 3) *Nicobium* sp., in box containing dried persimmon from Japan, Hawaii #3003.
- 4) *Nicobium castaneum* Oliv., in wood strip, trunk-enforcement, from Italy, New York #82224, Juni 1939.
- 5) *Nicobium castaneum* Oliv., in wooden box from New Caledonia, Australia, Boston ..16342, 7.X.1942.

Size of larva: Moderately large (c. 7 mm.).

Head capsule circular, without frontal lines; pigmented field behind epistoma (fig. 10) absent, epistoma (fig. 10) with a transverse group of, altogether, about twelve scattered, moderately long and short setae; about three long setae inside from antennal fossa; rest of cranium with long and short setae all over the

surface. Antenna (fig. 9) with two articles; proximal article a low ring. Anteclypeus (fig. 10) with a group of about ten well-developed, straight, fine setae at each end of anteclypeal sulcus, seated on a small plate; the two plates connected by a narrow, ribbon-shaped sclerotization. Labrum (fig. 10) transversally broadly oval, pigmented, set with long, fine, curved setae; paired marks absent. Epipharynx (fig. 11) with a multitude of recurved, fine marginal setae and almost completely covered by more or less curved, pointed, rather short chaetoparial setae; tormae short, subcylindrical, somewhat hooked terminally, no distinct labral rods; crepidal area with about ten sensory pores. *Mandible* (fig. 13) with two apical teeth and subapical margin forming a long, robust, fairly high, straight wall with fine longitudinal striae and minute granulae; marginal brush with short setae; a group of many long proximal setae and a row of five distal setae of moderate lengths on aboral mandibular surface. Maxillary lacinia (fig. 15) slightly larger than galea both lobes terminally covered with a multitude of densely set, strong, straight setae; adorally reinforced by sclerotized bar (Lc-Ga arm, fig. 15) and bearing many thin, soft setae; maxillary palpus with four articles; proximal article with many long, curved setae, next article with four much shorter setae, penultimate article with two setae and distal article without setae; stipes bearing numerous long, curved setae distally, ventro-lateral stipital bar (q, fig. 15) at the maxillary articulating area weakly sclerotized, except distally at the lobes.

*Number of prodorsal asperities on each side of:*¹

— 1) Azores 2) Louisiana 3) Japan 4) Italy 5) Australia. —

Thoracic segment II	none	none	none	none	none
" " III	3	2	none	4	4
Abdominal segment 1	27	30	23	28	37
" " 2	25	34	35	49	47
" " 3	28	35	42	50	45

¹ The number of prodorsal asperities varies more in the single larval specimens of this species than of other anobiid species. Several samples of different groups of larvae, determined as *Nicobium castaneum*, from many parts of the world have therefore been examined in order to discover whether more than one species might be listed under the same name. However, a positive result of the investigation was not obtained because the variations in the number of the prodorsal asperities appeared to fluctuate quite indiscriminately as shown in the following tabulations. It was also found that in the majority of the specimens all of the prodorsal asperities were not typically hook-shaped, but many reduced to either pointed or obtuse minute, dark granulae.

Abdominal segment	4	24	36	33	43	45
"	"	5 16	16	18	30	30
"	"	6 none	none	none	none	none
"	"	7 none	none	none	none	none
"	"	8 none	none	none	none	none

9th abdominal segment on each side with a patch of from 20 to 50 lateral asperities (roughly estimated).

10th abdominal segment without asperities.

Spiracles (figs. 14, 16 and 17) pseudocribiform, thoracic spiracle (fig. 14) about one and one-half as long as an abdominal (figs. 16 and 17).

Leg (fig. 12) with pretarsus half as long as slender tibio-tarsus; membranous basal part of pretarsus rather long, bearing eight setae; claw as long as basal part, straight, very slender and pointed; no arolium.

34. *Trichodesma klagesi* Fall and

35. *Trichodesma gibbosa* Say.

Plate 34.

Described material labeled:

- 1) *Trichodesma klagesi* Fall in *Benzoin* sp. (Fever bush), Lyme, Conn., 29.XII.1916, A. B. CHAMPLAIN coll. et det. (Hopk. U. S. #10083b).
- 2) *Trichodesma gibbosa* Say, in dead trunk of *Persea*, Nicholson, Miss., 9.II.1945, GORDON coll., (Spl. Surv. #23189).

Size of larva: Large (c. 11 mm.)

Head capsule subcircular, without frontal lines; pigmented field behind epistoma absent; epistoma (fig. 2) with a transverse group of, altogether, about sixteen scattered, moderately long and short setae, about four long setae inside from antennal fossa; rest of cranium with long and short setae over the whole surface. Antenna (fig. 1) with two articles; proximal article a low ring. Anteclypeus (fig. 2) with a group of about twenty-five well-developed, fine, setae on a small plate at each end of anteclypeal sulcus; the two plates connected with a transverse, low sclerotization. Labrum (fig. 2) almost circular, somewhat pointed anteriorly, pigmented, with numerous, rather strong and stiff setae; paired marks absent. Epipharynx (fig. 3) with a multitude

of somewhat recurved marginal setae and almost completely covered by more or less curved, pointed, generally fine, well-developed and short chaetoparal setae; tormae short, subcylindrical; no labral rods; crepidal area velvety pubescent with about ten sensory pores irregularly distributed over the whole field. *Mandible* (fig. 6) with two apical teeth and subapical margin forming a long, fairly high, subtriangular wall; marginal brush with short setae; proximal and distal groups of setae present on aboral surface. Maxillary lacinia (fig. 5) slightly broader distally than the more oval galea; both lobes densely set with strong, straight setae on terminal margins, and with long, strong, curved setae on aboral surfaces; adorally reinforced by sclerotizations and bearing many fine, soft setae; maxillary palpus with four articles; proximal article with many long, curved setae; next article with four much shorter setae; penultimate article with two setae and distal article without setae; stipes bearing numerous long, curved, strong setae; ventro-lateral stipital bar weakly sclerotized except distally at the lobes.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	3
Abdominal segment 1	.....	25
" " 2	.....	33
" " 3	.....	27
" " 4	.....	32
" " 5	.....	19
" " 6	.....	none
" " 7	.....	none
" " 8	.....	none

9th abdominal segment on each side with a patch of about 35 lateral asperities.

10th abdominal segment without asperities but with short, stiff, straight and pointed setae.

Spiracles annular, simple, oval, without air tubes; thoracic spiracle (fig. 7a) two and one-half times longer than one of the abdominal (fig. 7b).

Leg (fig. 4) with pretarsus half as long as slender tibio-tarsus; basal part of pretarsus rather long, bearing eight setae of different lengths; claw as long as membranous basal part, straight, very slender and pointed; no arolium.

35. *Trichodesma gibbosa* Say.

Large (c. 11 mm.), with subcircular head, appears identical with the larva of *Trichodesma klagesi* Fall.

36. *Vrilletta blaisdelli* Fall

Vrilletta sp.,

Vrilletta convexa Lec. and

Vrilletta expansa Lec.

Plate 34.

Described material labeled:

- 1) *Vrilletta blaisdelli* Fall, in live oak, Irvine Park, Calif., 15.XII.1943, PROLE and BYERS coll., Spl. Surv. #23594.
- 2) *Vrilletta* sp., under apple bark, Monterey County, Calif., 1944, ROMSAY and CAMERON coll., Spl. Surv. #23629 45-6916.
- 3) *Vrilletta convexa* Lec., in white alder, Ashland, Oregon, 2.V.1913, U. S. Hopk. #11074a, imago det. April 1944 by W. S. FISHER.
- 4) *Vrilletta expansa* Lec., Los Angeles, Calif., COQUILLET coll. et det.

Size of larva: Large (c. 11 mm.).

Head capsule circular, without frontal lines; pigmented field behind epistoma absent; epistoma (fig. 8) with transverse anterior series of, altogether, ten stiff, fine setae and a few or no setae behind; rest of cranium with numerous, evenly distributed, moderately long and short setae. Antennal triangular casing extending beyond catapophysis; antenna (fig. 8) without articles. Anteclypeus (fig. 8) thin walled with about six setae from a small sclerite at each end of anteclypeal sulcus. Labrum (fig. 8) transverse, suboval, about twice as wide as long, anterior margin with broad, shallow, concave curvature, densely set with moderately long, fine setae; paired marks present. Epipharynx (fig. 9) with numerous long, recurved acanthoparial setae; immediately behind them with a patch of hook-shaped, comparatively long coryphal setae; on each side with a long, oblique series of short, cultriform chaetoparial setae, anteriorly arranged in a small group of about five setae and posteriorly in a single row of about eight extending to proximal end of torma; crepidal field with about six pores; tormae short, robust, curved toward sagittal line; no labral rods. *Mandible* (fig. 12) with two short apical

teeth; subapical margin raised to a moderately high, subtriangular wall; aboral mandibular surface covered proximally with small granules; marginal brush well-developed, proximal aboral group of setae containing about twelve long setae, each setae in a pit on top of a little round elevation, distal aboral group with about four well-developed setae. Maxillary lacinia (fig. 10) about half as large as galea, distally without spine but with about twelve long, stiff, strong setae similar in shape to the marginal setae of galea; dorsal surface of both lacinia and galea, in addition to numerous fine, moderately long setae, with many proximally located, very long and fine hairs; maxillary palpus with three articles; proximal article bearing on ventral surface twelve long setae; distal part of stipes with about as many similar setae.

Number of prodorsal asperities on each side of:

		blaisdelli	sp.	expansa
Thoracic segment	II	none	none	none
"	III	17	20	19
Abdominal segment	1	21	21	24
"	2	21	22	20
"	3	16	17	16
"	4	13	15	15
"	5	13	14	14
"	6	13	15	21
"	7	9	11	15
"	8	none	none	none

9th abdominal segment on each side with the following number of lateral asperities: *blaisdelli*: 30; *sp.*: 32; *expansa*: 32.

10th abdominal segment without asperities.

Spiracles (figs. 13 and 14) broadly oval, with a single air tube of small size, resting in a thin-walled enlargement of peritrema; orifice of thoracic spiracle (fig. 13) about twice as long as orifice of an abdominal spiracle (fig. 14), thoracic air tube winding, abdominal air tubes straight.

Pretarsus about one-third of tibio-tarsus in length, proximal membranous part and claw equally long, membranous part with two setae; claw rather short, quite robust and curved; arolium as long as membranous part.

37*. *Priobium tricolor* Oliv.

Plate 35.

Described material labeled:

1) *Priobium tricolor* Oliv., in wood of oak, Dyrehaven, Denmark, ex Mus. Zool. Copenhagen, #145, MEINERT, 1890.

2) *Priobium tricolor* Oliv., Denmark, 23.VI.1936, J. P. KRYGER coll. and reared.

Size of larva: Moderately large (c. 7 mm.).

Head capsule slightly longer than broad, broadest before the middle, sides convergent behind the middle, without frontal lines, pigmented field behind epistoma absent; epistoma (fig. 1) anteriorly with a transverse, irregular series of, altogether, eight long setae; a few long setae present at innerside of antennal fossa and rest of cranium with rather long and short setae on the entire surface. Antenna (fig. 1) without distinct articles, sensory cone short. Anteclypeus (fig. 1) with three long, straight setae at each end of anteclypeal sulcus, not borne by any small plate. Labrum (fig. 1) with semicircular anterior margin; about as wide as long, with many long, fine, straight setae on each side; paired marks present. Epipharynx (fig. 2) anteriorly with numerous, recurved acanthoparial setae; behind them several rather short, hooked coryphal setae and on each side with an oblique series of five (or six) short, mostly ovate chaetoparial setae; labral rods and tormae forming robust, long, subparallel, Y-shaped features; crepidal field velvety pubescent without pores. *Mandible* (fig. 4) with two apical teeth, subapical margin raised into a strong, subtriangular wall with a short, toothlike process at the second apical tooth; marginal brush present; aboral surface with proximal and distal groups of four setae each. Maxillary lacinia (fig. 5) about half as large as galea, lacking spine, but terminally with many straight, slightly cultriform, stiff setae and some straight, rather stiff setae behind them; galea with similar setal arrangement; maxillary palpus with three articles; proximal article with six long setae on ventral side; distal part of stipes bearing same number of similar setae.

Number of prodorsal asperities on each side:

Thoracic segment II.....	none
" " III.....	none

Abdominal segment 1.....	22	} in one or two irregular rows
" " 2.....	25	
" " 3.....	20	
" " 4.....	18	
" " 5.....	17	} in one row
" " 6.....	16	
" " 7.....	9	
" " 8.....	none	

9th abdominal segment with about 30 lateral asperities on each side of body.

10th abdominal segment without asperities.

Spiracles (figs. 6, 7 and 8) almost circular, with a single, large air tube of T-shape on thoracic spiracle (fig. 6) and multibranched, single air tube on each abdominal spiracle (figs. 7 and 8).

Leg (fig. 3) with pretarsus only one-third or less as long as tibio-tarsus; proximal membranous part of pretarsus subconical, about as wide as long, armed with two setae; claw not longer than membranous part, rather robust and slightly curved; arolium small but distinct, a little longer and wider than membranous part.

37*. *Priobium eichhoffi* Seidl.

The larva of this species is identical in all characters with *P. tricolor*. Material in collection labeled: *Priobium eichhoffi* Seidl., Denmark; in dead moist branches on east shore of Fuur-sø; E. C. ROSENBERG coll. and reared; received from Mus. Copenhagen, March, 1915—through BÖVING.

Size of larva: c. 7 mm.

38. *Protheca hispida* Lec.

Plate 35.

Described material labeled:

- 1) *Protheca hispida* Lec., in *Liriodendron*, Virginia, Hopk. U.S. #10036, c (single, imperfect larval skin).

Size of larva: . . . ?

Head capsule without frontal lines, pigmented field behind epistoma present and sagittally about as long as epistoma (fig. 9); epistoma with a transverse series of, altogether, six long setae; rest of cranium, including pigmented field, with evenly scattered,

moderately long and short setae. Antenna (fig. 9) without articles, sensory cone about as high as membranous, dome-shaped base. Anteclypeus (fig. 9) with a group of three long setae at each end of anteclypeal sulcus; no supporting plates. Labrum (figs. 9 and 10) transverse, broadly oval, set with numerous setae, apparently no paired marks present. Epipharynx (fig. 10) with a multitude of moderately long acanthoparial setae; on each side six cultriform, rather short chaetoparial setae in a single, curved row; tormae and well-developed labral rods forming strong, moderately long, Y-shaped features. *Mandible* (fig. 11) with two apical teeth; subapical margin narrow, raised into a short, tooth-like process; marginal brush lacking, possibly rubbed off; aboral surface with proximal and distal fairly long setae. Maxillary lacinia (fig. 12) about half as large as galea, both lobes with long, curved marginal setae and well-developed straight setae on aboral surfaces; no lacinial spine; maxillary palpus with three articles; proximal article and distal end of stipes each with five long setae.

Prodorsal, hook-shaped asperities present, arranged at least in two rows (fig. 13), and a group of several lateral asperities distinguishable on skin of ninth abdominal segment (fig. 14). The exact number of prodorsal asperities on each segment cannot be determined from the single, crumbled cast skin on hand.

Spiracles (figs. 15 and 16) oval, simple, without air tubes.

Legs missing on partly mutilated cast skin.

39. *Catorama nigrifulum* Lec.

Plate 36.

Described material labeled:

- 1) *Catorama nigrifulum* Lec., ex dead wood, University Park, Md., 28.II.1943, W. H. ANDERSON coll., W. S. FISHER det. imago.
- 2) *Catorama nigrifulum* Lec., in wood of *Ulmus americana* L., growing at U. S. National Mus., Washington, D. C., 27.III. 1943, W. H. ANDERSON coll.
- 3) *Catorama nigrifulum* Lec., ex dead *Wisteria*, Ridgely, Md., 15.IX.1942, W. H. ANDERSON coll.
- 4) *Catorama nigrifulum* Lec., in dead Elm branch, Washington,

D. C. near U.S.N.M., 28.I.1945, W. H. ANDERSON coll. and det.

Size of larva: Small (c. 4 mm.).

Head capsule subcircular, without frontal lines, pigmented field behind epistoma (fig. 1) distinct, sagittally about twice as long as epistoma; epistoma (fig. 1) with long, straight, fine setae in anterior margin; cranium covered with short to moderately long setae on entire surface, including pigmented field. Antenna (fig. 1) without articles. Anteclypeus with three to four long, straight, fine setae from small plate at each end of anteclypeal sulcus. Labrum (fig. 1) almost three times as wide as long, anterior margin slightly concave medianly, densely set with fairly long, fine setae; paired marks present. Epipharynx (fig. 2) anteriorly with several short, curved coryphal setae; acanthoparial setae numerous, well developed, somewhat curved; chaetoparial setae on each side in a single, oblique, inwardly convex series of seven to eight, rather short, curved and pointed setae; tormae and labral rods forming Y-shaped, fairly long features; crepidal field velvety pubescent with a few pores. *Mandible* (fig. 4) with two broad and low apical teeth, subapical part of mandible raised into a low, somewhat arched wall between second apical tooth and arched elevation around marginal brush; marginal brush small, or in most specimens examined, absent; aboral surface of mandible with a series of about seven long proximal setae and three long distal setae. Maxillary lacinia (fig. 5) about half as large as galea, terminally armed with a group of about ten strong, cultriform setae, no spine, ventrally with well-developed, straight setae; maxillary palpus with three articles; proximal article with about six setae ventrally; distal part of stipes similarly armed.

Number of prodorsal asperities on each side of:

Thoracic segment II.....	none	
" " III.....	3	
Abdominal segment 1.....	11	} partly in two irregular rows
" " 2.....	8	
" " 3.....	6	} in one row
" " 4.....	6	
" " 5.....	4	
" " 6.....	3	
" " 7.....	1	
" " 8.....	none	

9th abdominal segment with a lateral patch on each side of about twelve asperities.

10th abdominal segment without asperities.

Spiracles (figs. 6, 7 and 8) pseudo-cribriform with large, oval, slightly irregular peritrema surrounding a flat atrium raised to near level of body-surface; thoracic (fig. 6) and abdominal spiracles (figs. 7 and 8) of about same size.

Leg with pretarsus about one-third as long as tibio-tarsus; proximal membranous part of pretarsus short, armed with two moderately long setae; claw curved and pointed, twice as long as basal part; arolium not present.

40. *Catorama* sp.

Plate 36.

Described material labeled:

- 1) (*Catorama* sp.)?, in stem of Ivy from residence of Mr. E. M. Funkhausen, Roanoke, Va., 10.IV.1933, W. S. FISHER det. imago.
- 2) Genus? ex English Ivy stem, Coatesville, Pa., 28.V.1948 S.W. BROMLEY coll., #48—7933 (one associated adult with sample of work pinned).

Size of larva: Small (c. 4 mm.).

Head capsule widest near middle, suboval, slightly longer than broad, without frontal lines; pigmented field behind epistoma sagittally a little longer than epistoma, heavy, distinctly set off posteriorly, with many moderately long setae in small pits; epistoma (fig. 9) anteriorly with transverse series of, altogether, ten long, fairly straight setae; cranium with a great number of short to moderately long setae. Antenna (fig. 9) without articles. Anteclypeus (fig. 9) lacking setae at each end of anteclypeal sulcus. Labrum about as wide as long, anterior margin semi-circular, densely set with fine setae; paired marks not visible. Epipharynx (fig. 10) anteriorly with several short, hook-shaped coryphal seta; acanthopariar setae numerous, well developed, somewhat curved; chaetopariar setae on each side in a single, irregular row of six; about four small setae scattered behind chaetopariar series of setae; tormae long, straight, strong, somewhat converging, labral rods indistinct; crepidal field velvety

pubescent, without pores. *Mandible* (fig. 12) with two short apical teeth, subapical part forming a low wall with somewhat arched outline between second apical tooth and a small projection near the arched elevation around the marginal brush; marginal brush with several, rather short setae; aborally a proximal series of about five short, fine setae and a small group of about four short distal setae. Maxillary lacinia (fig. 13) less than half as large as galea, terminally armed with approximately ten stiff, straight, strong setae, but no spine; galea of normal build and size with marginal setae strong and spatulate, adoral surface (fig. 13) with a group of very fine, long setae distally; maxillary palpus with three articles; proximal article with about five long setae on aboral surface; distal part of stipes with about seven long setae ventrally.

Number of prodorsal asperities on each side of:

Thoracic segment II.....	none	
" " III.....	17	
Abdominal segment 1.....	16	
" " 2.....	17	} in single, or partly double irregular rows
" " 3.....	15	
" " 4.....	15	
" " 5.....	16	
" " 6.....	17	
" " 7.....	12	
" " 8.....	none	

9th abdominal segment with a lateral patch on each side of about 16 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 14 and 15) simple, circular without air tubes; diameter of thoracic (fig. 14) peritreme one and one-half times as long as diameter of peritreme of an abdominal spiracle (fig. 15).

Leg (fig. 11) with pretarsus only a little more than one-third the length of tibio-tarsus; proximal part of pretarsus short, armed with two moderately long setae; claw small, slender, somewhat curved, pointed, about as long as proximal part; arolium well developed.

41. *Catorama punctatum* Lec.

Plate 37.

Described material labeled:

- 1) *Catorama punctatum* Lec., in grape vine, New Jersey (box 9, 188).

Size of larva: Moderately large (c. 6 mm.).

Head capsule suboval, widest near middle, somewhat longer than broad, without frontal lines; pigmented field behind epistoma (fig. 1) present but with posterior margin indistinct, sagittally about as long as epistoma, densely set with long, straight setae; epistoma (fig. 1) anteriorly with transverse series of, altogether, twelve long, straight setae; in the middle with one long seta on each side; cranium with a great number of short to long setae. Antenna (fig. 1) without articles, ventrally protected by a thin casing. Anteclypeus (fig. 1) with five long seta attached at each end of anteclypeal sulcus, not borne by a distinct little plate. Labrum (fig. 1) subrectangular with rounded anterior corners, slightly concave medially, many fine setae on surface; paired marks indistinct. Epipharynx (fig. 2) anteriorly with several straight, moderately long setae and two pair of very short coryphal setae; acanthoparial setae numerous, well developed, somewhat curved; chaetoparial setae six on each side, in an oblique, single series extending from anterior border to near the sagittal line posteriorly, slender, somewhat curved and pointed; tormae straight, labral rods reduced, united Y-shaped features barely indicated; crepidal field velvety pubescent, without pores. *Mandible* (fig. 3) with two short apical teeth, subapical part of mandible forming a low wall with fairly straight, slightly convex margin extending from near the top of second apical tooth to an obtuse projection near the elevation around the place where marginal brush usually occurs; marginal brush not found in specimens studied, aborally with a proximal series of about six setae and a distal group of three long setae. Maxillary lacinia (fig. 4) somewhat less than half as large as galea; terminally armed with about seven stiff, strong and long setae; no spine; maxillary palpus with three articles.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none	
" " III	.....	23	
Abdominal segment 1	.....	24	} in two somewhat irregular rows
" " 2	.....	23	
" " 3	.....	19	
" " 4	.....	17	
" " 5	.....	17	
" " 6	.....	11	
" " 7	.....	none	
" " 8	.....	none	

9th abdominal segment with a lateral patch on each side of about 30 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 6, 7 and 8) circular without air tubes; diameter of thoracic spiracle (fig. 6) one and one-half times as long as the diameter of an abdominal spiracle (figs. 7 and 8).

Leg (fig. 5) with pretarsus about one-third the length of tibiotarsus; proximal part of pretarsus short, armed with two moderately long setae; claw three times as long as proximal part, somewhat curved, slender, narrow at base and pointed; arolium distinct, about half as long as claw.

42. *Catorama* sp. (near *C. conjunctum* Fall).

Plate 37.

Described material labeled:

- 1) *Catorama* sp. (near *C. conjunctum* Fall); in gall in stem of white sage (*Artemisia ludoviciana*), Calexico, Calif., 15.XII. 1944, (—455028) C. G. ANDERSON coll., W. S. FISHER det. imago.

Size of larva: Moderately large (c. 6 mm.).

Head capsule subcircular, without frontal lines; pigmented field behind epistoma (fig. 9) somewhat longer sagittally than epistoma, indistinctly limited posteriorly and lightly colored, bearing many long setae; epistoma (fig. 9) anteriorly with transverse marginal series of long, fine, straight setae, totaling twelve; behind the series with several long setae scattered over the surface; rest of cranium with numerous moderately long to long setae. Antenna (fig. 9) without articles. Anteclypeus with six long,

straight setae borne by a small plate at each end of anteclypeal sulcus (fig. 9). Labrum (fig. 9) subrectangular with largely rounded corners; most of exposed part of surface covered with long, fine, curved and straight setae; paired marks visible but faint. Epipharynx (fig. 10) with two pairs of small coryphal setae anteriorly; acanthoparial setae numerous, well developed, somewhat curved; chaetoparial setae small and hook-shaped, on each side six in a single regular, oblique, inwardly convex series; tormae solid, simple, rather short and somewhat thorn-shaped; no epipharyngeal rods; crepidal field velvety pubescent with a few pores. Mandible (fig. 12) with short, distinct first apical tooth, second apical tooth almost fused with subapical part of mandible into a quite low, straight wall ending abruptly near the marginal arched elevation; marginal brush itself lacking, replaced by rugose surface; aborally with a proximal patch of several long, fine setae and a small distal group of about four moderately long setae. Maxillary lacinia (fig. 13) about half as large as galea, terminally armed with approximately ten stiff setae similar to the strong marginal setae of galea, but no spine; adorally from bases of lacinia and galea a group of very long and fine hairs present; maxillary palpus with three articles; proximal article with about five long and a few short setae; distal part of stipes with about seven long setae.

Number of prodorsal asperities (fig. 11) *on each side of:*

Thoracic segment II	.....	none	
" " III	.....	2 (1)	
Abdominal segment 1	.....	5	
" " 2	.....	5	} in single } regular } row
" " 3	.....	6	
" " 4	.....	4	
" " 5	.....	3	
" " 6	.....	1	
" " 7	.....	none	
" " 8	.....	none	

9th abdominal segment with a lateral patch on each side of about 8 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 14, 15 and 16) small, circular, with an air tube generally somewhat shorter than the spiracular diameter; thoracic

spiracle (fig. 14) twice to three times as large as an abdominal spiracle (figs. 15 and 16).

Leg (fig. 17) with pretarsus about one-third the length of tibio-tarsus; proximal membranous part of pretarsus very short, armed with two setae of moderate size; claw quite strong, hook-shaped and about three times as long as proximal part; arolium present, extending to middle of claw.

43. *Catorama* sp. (probably *C. herbarium* Gorham)

(= *C. mexicanum* Chev.—teste W. S. FISHER).

Plate 38.

Described material labeled:

- 1) *Catorama* sp., in seed husk of the palm *Livistona chinensis*, Key West, Florida, 11.IV.1945, O. D. LINK coll., Spec. Surv. # 24862, 45—8746, W. H. ANDERSON det., July 1945.
- 2) *Catorama* sp. (probably herbarium Gorh.) in partially decayed fruits of pear, El Paso, Texas, 28.VIII.1943, A.G.B., det.

Size of larva: Small (c. 4 mm.).

Head capsule widest near the middle, subcircular, posteriorly slightly oval, without frontal lines; pigmented field behind epistoma (fig. 1) sagittally somewhat longer than epistoma, indistinctly limited posteriorly, rather thinly pigmented and with many short to long setae; epistoma (fig. 1) anteriorly with transverse marginal series of long, fine, straight setae totaling about twelve, no setae behind them; rest of cranium with numerous moderately long to long setae. Antenna (fig. 1) without distinct articles; sensory appendage and projections borne by membranous dome-shaped base. Anteclypeus (fig. 1) with six long, straight setae borne by a small plate at each end of anteclypeal sulcus. Labrum (fig. 1) subrectangular with large rounded corners, most of exposed part of surface covered with long, fine, curved setae and shorter, more straight ones; paired marks not visible. Epipharynx (fig. 2) with short, coryphal setae anteriorly; acanthoparial setae numerous, strong, curved, in irregular, in places double, rows; chaetoparial setae short, hook-shaped, on each side in an oblique inwardly curved, regular row of six or seven; tormae moderately long and straight, no distinct labral

rods; crepidal field velvety pubescent with four anterior and two posterior pores. *Mandible* (fig. 4) with short, distinct first apical tooth, second apical tooth fused with subapical part of mandible into a quite low, straight wall with thin edge and ending with a toothlike projection near the arched marginal elevation; marginal brush lacking, replaced by small granules and wrinkles; aborally with a large proximal patch of long, fine setae and a small distal group of about four long setae. Maxillary lacinia (fig. 5) about half as large as galea, terminally armed with approximately ten stiff setae similar to the strong marginal setae of galea, but no spine; adorally (fig. 5) with weaker setae and, present at bases of both lacinia and galea, a bunch of very long, fine hairs; maxillary palpus with three articles; proximal article with five setae; distal part of stipes with about same number of long setae.

Number of prodorsal asperities (fig. 3) *on each side of:*

Thoracic segment II	none	
" " III	7	
Abdominal segment 1	16	} in two irregular rows
" " 3	16	
" " 3	14	
" " 4	12	
" " 5	10	} in one irregular row
" " 6	7	
" " 7	3	
" " 8	none	

9th abdominal segment with a lateral patch on each side of about 30 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 7, 8 and 9) small, circular with a single air tube; air tube of thoracic spiracle (fig. 7) a little shorter than diameter of peritreme, those of abdominal spiracles (figs. 8 and 9) almost twice as long as diameter of their peritremes; thoracic spiracle about three times as large as an abdominal spiracle (fig. 6).

Leg (fig. 6) with pretarsus about one-third the length of tibio-tarsus; proximal membranous part of pretarsus very short, armed with two setae of moderate sizes; claw quite strong, hook-shaped and about three times as long as proximal part; arolium present, extending to middle of claw.

44. *Catorama* sp. (probably *C. inaequale* Fall).

Plate 38.

Described material labeled:

- 1) *Catorama* sp. (probably *C. inaequale* Fall), imago det. by W. S. FISHER; in ebony bean; Mexico, 26.XII.1937, Brv., Tx., # 20779.
- 2) *Catorama* sp. (*C. inaequale* Fall?), in garlic bulb, Mexico, Brv., Tx., # 5463, c.
- 3) *Catorama* sp., in pod *Acacia farnesiana*, Brownsville, Tex., 21.IV.1945, HARRISON and FRASER collrs., Spec. Surv. # 25407, 45—8944.

Size of larva: Small (c. 4 mm.).

Head capsule widest near the middle, subcircular, posteriorly slightly oval, without frontal lines, pigmented field behind epistoma (fig. 10) sagittally at least three times longer than epistoma, strongly pigmented, with many moderately long to long setae evenly distributed over the entire surface; epistoma (fig. 10) anteriorly with transverse marginal series totaling twelve long, fine, straight setae; catapophysis rugose, bearing long setae, mostly at base behind antenna; rest of cranium with numerous, moderately long to long setae. Antenna without articles. Anteclypeus (fig. 10) with about ten long setae attached to a small sclerite at each end of anteclypeal sulcus. Labrum (fig. 10) subrectangular with largely rounded corners and slightly concave anterior margin; most of exposed part of surface covered with setae; paired marks visible but faint. Epipharynx (fig. 11) with two pairs of small coryphal setae anteriorly; acanthoparial setae well developed, slender and curved; chaetoparial setae hook-shaped, in an oblique, inwardly convex, somewhat irregular, single row of about ten setae; tormae quite short, well sclerotized, forming indistinct V or Y-shaped features with weak labral rods; crepidal field velvety pubescent, anteriorly with a somewhat irregular transverse series of four pores and posteriorly two pores. *Mandible* (fig. 13) with distinct first apical tooth, second apical tooth almost fused with subapical part of mandible into a quite low, straight, thinly edged wall ending with a toothlike process at the arched marginal elevation; marginal brush lacking, replaced by a rugose, somewhat striate surface; aborally with a proximal patch of several long setae and a small distal group of

four long, fine setae. Maxillary lacinia (fig. 14) about half as large as galea, terminally armed with about ten stiff setae, adorally (fig. 14) with fairly short, soft setae similar to those on galea, and from bases of both lacinia and galea with many very long and fine hairs; maxillary palpus with three articles; proximal article aborally with about ten long setae; distal part of stipes with about ten long setae.

Number of prodorsal asperities (fig. 12) on each side of:

Thoracic segment II	none	
" " III	11	
Abdominal segment 1	20	} in two irregular rows
" " 2	.....	21
" " 3	.....	18
" " 4	.....	16
" " 5	.....	12
" " 6	.....	10
" " 7	.....	3
" " 8	.....	none

9th abdominal segment on each side with a lateral patch of about 25 asperities.

10th abdominal segment without asperities.

Spiracles (figs. 16, 17 and 18) small, almost circular; thoracic spiracle (fig. 16) with a single short, rather broad air tube, abdominal spiracles (figs. 17 and 18) each with a single air tube about as long as diameter of peritrema.

Leg (fig. 15) with pretarsus about one-third the length of tibio-tarsus, proximal membranous part of pretarsus short, armed with two setae of moderate size; claw quite strong, hook-shaped and twice as long as proximal part; arolium present extending to middle of claw.

45. *Catorama tabaci* Guér.

(= *C. impressifrons* Fall, teste W. S. FISHER).

and

46. *Catorama grande* Fall.

Plate 39.

Described material labeled:

- 1) *Catorama tabaci* Guér. (= *C. impressifrons* Fall), imago det. by W. S. FISHER, in garlic bulbs, Mexico, Brv., Tex., 14.XI.1942, 42·14614.

- 2) *Catorama* sp. (near *tabaci*), on lettuce in baggage, Mexico, Brv., Tex., 6.VI.1938, #25052.
- 3) *Catorama tabac* Guér., in Poinciana seed, West Indies; New York #39968, 2.IV.1935.
- 4) *Catorama tabaci* Guér., in tobacco received at Key West, Fla., 16.XI.1912 by Ruy Lopez, probably from Cuba, H. S. BARBER det.
- 5) *Catorama grande* Fall, in flower stalk of *Yucca*, Langtry, Texas, 5.XI.1936, W. H. ANDERSON coll.

Size of larva: Moderately large (c. 7 to 10 mm.).

Head capsule (fig. 1) widest near the middle, subcircular, posteriorly slightly ovate, without frontal lines, pigmented field behind epistoma (fig. 1) sagittally about three times longer than epistoma, strongly pigmented, with many moderately long to long setae; epistoma (fig. 1) anteriorly with transverse marginal series totaling twelve or more, long, fine, straight setae; catapophysis rugose with long setae at base behind antenna; rest of cranium with numerous moderately long to long setae. Antenna (fig. 1) without articles. Anteclypeus (fig. 1) with about ten long setae attached to a small sclerite at each end of anteclypeal sulcus. Labrum (fig. 1) subrectangular with largely rounded corners and slightly concave anterior margin, most of exposed part of surface covered with setae; paired marks present but not distinct. Epipharynx (fig. 2) with comparatively long, hooklike coryphal setae anteriorly; acanthoparial setae rather long, slender and curved; chaetoparial setae in an oblique, inwardly convex, fairly regular single row of from eight to ten moderately long, pointed and curved setae; tormae rather short, well sclerotized, forming indistinctly Y-shaped features with weak labral rods; crepidal field velvety pubescent with four irregularly arranged pores in an anterior transverse series and two pores posteriorly. *Mandible* (fig. 3) with distinct first apical tooth, second apical tooth almost fused with subapical part of mandible into a rather low, straight, thin-edged wall which ends abruptly at the arched marginal elevation; marginal brush lacking, replaced by a rugose, somewhat striate surface; aborally with a proximal patch of several long setae and a small distal group of four long, fine setae. Maxillary lacinia (fig. 4) about half as large as galea; terminally armed with ten stiff, strong setae, about as long as lobe, and adorally

from bases of both lacinia and galea with many very fine and long hairs besides fairly short, soft setae on the whole surface; maxillary palpus with three articles; proximal article with about ten long setae ventrally (fig. 4); distal part of stipes also with ten similar, long setae.

Number of prodorsal asperities on each side of:

		tabaci	grande	
Thoracic segment II	none	none	
" " III	16	16	
Abdominal segment 1	30	28	} in two to three irregular rows
" " 2	.....	25	25
" " 3	.....	20	26
" " 4	.....	20	22
" " 5	.....	10	10
" " 6	.....	10	10
" " 7	.....	8	6
" " 8	.....	4	4

9th abdominal segment on each side with a lateral patch of from 40 (*tabaci*) to 45 (*grande*) asperities.

10th abdominal segment without asperities.

Spiracles (figs. 7, 8 and 9) circular to broadly oval; thoracic (figs. 7 and 9) with one short but distinct air tube and an additional indication of a second; abdominal spiracles (fig. 8) each with an air tube about half as long as diameter of peritreme.

Leg (fig. 6) with pretarsus about one-third the length of tibio-tarsus; proximal membranous part of pretarsus short, armed with two setae, one long, the other of moderate size; claw quite strong, hook-shaped and more than twice as long as proximal part; arolium present.

Note concerning the description of Catorama tabaci Guér, *Catorama grande* Fall and *Catorama inaequale* Fall.

The larvae of *Catorama tabaci* Guér. and *Catorama grande* Fall, determined according to reared imagines, are identical in all their specific characters, and in general the larvae of *Catorama tabaci* (**Catorama grande*) and *Catorama inaequale* Fall are very similar, but typical larval specimens of the two species can, nevertheless, be separated, especially, by the different average number of asperities on the prodorsal areas (Pl. 38, fig. 12; Pl. 39, fig. 5). However, a number of other larvae have been collected which form a gradual transition between the two species. Among these intermediate larval forms the most significant are some intercepted from Mexico in bulbs of garlic and, according to their

reared imagines, determined by Mr. W. S. FISHER as *Catorama* sp., near *Catorama tabaci* Guér. Generally considered, the whole group of these gradually modified larval forms seems to belong to a single, very unstable species with several subspecies and varieties.

47. *Gastrallus* sp., probably *G. laevigatus* Oliv.

Plate 40.

Described material labeled:

- 1) *Gastrallus* sp., probably *G. laevigatus* Oliv., (imago det. by W. S. FISHER) in seeds of *Callistemon lanceolatum* (related to *Eucalyptus*), from France; U. S. Seed house, 2.XII.1929.
- 2) *Gastrallus* sp., probably *G. laevigatus* Oliv., in thin clear cocoons in burlap around bales of stockfish from Norway; Dr. DON C. MOTE coll., 9.XI.1932, Portland, Oregon Ent. Dept.
- 3) *Gastrallus* sp., in beans from Twin Falls, Idaho, W. H. WHITE coll., 30.III.1944.
- 4) *Gastrallus* sp., in wall of house lined with fir lumber covered with heavy paper; Snohomish, State of Washington.
- 5) *Gastrallus* sp., "internal worms" passed from time to time, sent in by Dr. E. H. STRICKLAND, Edmonton, Alberta, Canada, 4.I.1939.

Size of larva: Small (3 to 4 mm.).

Head capsule subcircular, slightly broader than long, widest in the middle, without frontal lines; pigmented field behind epistoma (fig. 1) large, more than three times as long as sagittal length of epistoma, anteriorly rather light colored and set with few setae, rest of field well furnished with long and moderately long setae; epistoma (fig. 1) on each side of sagittal line with an oblique series of eight fine, straight and fairly long setae; cranium with quite a limited number of setae. Antenna (fig. 1) without articles. Anteclypeus (fig. 1) with a group of about five fine, fairly long setae on plate at each end of anteclypeal sulcus. Labrum (fig. 1) with semicircular free margin, with numerous setae and with indistinct or no paired marks, medio-posteriorly with three pores. Epipharynx (fig. 2) anteriorly with several short, hook-shaped coryphal setae; acanthoparial setae long, curved and slender; chaetoparial setae on each side in an oblique arched series of six robust, rather short and some-

what curved setae, a few minute additional setae scattered irregularly immediately behind them; tormae strong, straight, subparallel, combined with labral rods to form well-sclerotized, Y-shaped features; crepidal field velvety pubescent with fine, very pointed, small setae varying in number from two to five in different specimens. *Mandible* (figs. 3 and 5) with only a single apical tooth, second apical tooth obliterated; subapical part forming a strong wall with a generally straight, slightly convex, and a little serrated edge; wall terminating with a sharp, tooth-like projection near a weak, indistinct, arched marginal elevation; marginal brush lacking; aboral surface of mandible (fig. 3) with a large proximal group of about twelve long, strong setae and a distal group of about ten similar setae. Maxillary lacinia (fig. 4) small, carrying distally a well-sclerotized, somewhat gouged, strong spine as long as the lobe, also two long, stiff setae and a few additional short, fine setae; galea only half as wide as long; maxillary palpus with three articles; proximal article ventrally with about five long setae; distal part of stipes with about seven long setae.

Body trunk covered with long, soft, hairlike setae; asperities lacking completely.

Spiracles (figs. 7 and 8) circular with a single air tube; air tube of thoracic spiracle (fig. 7) shorter than diameter of peritrema, air tube of each abdominal spiracle (fig. 8) about as long as the peritremal diameter.

Leg (fig. 6) with pretarsus about one-third the length of tibiotarsus; proximal membranous part of pretarsus short, furnished with two fine, moderately long setae; claw well developed, curved, pointed and slender; arolium present, extending to near the middle of claw.

48. *Catorama vestitum* Fall.

Plate 41.

Described material labeled:

- 1) *Catorama vestitum* Fall (Imago in coll., det. by W. S. F.), in pith of dried Okra-Stalks, Calexico, Calif., 14.IV.1945, C. G. ANDERSON coll. (Spec. Surv. # 26594).
- 2) *Catorama* sp., near *vestitum* Fall (W. H. A. det. July 1945)

in grass stem, Blythe, Calif., 23.III.1945, C. G. ANDERSON and HANSON collrs. (Spec. Surv. # 24647).

Size of larva: Moderately large (c. 6 mm.).

Head capsule (fig. 6) about as broad as long, subcircular, without frontal lines; pigmented field behind epistoma (fig. 1) distinct, sagittally about as long as epistoma, bearing several long setae; epistoma (fig. 1) with transverse anterior series of, altogether, sixteen fairly long, fine, straight setae; cranium covered with densely set, long and moderately long setae. Antenna (fig. 1) without distinct articles. Anteclypeus (fig. 1) with five long, fine, straight setae from small plate at each end of anteclypeal sulcus. Labrum (fig. 1) almost three times as wide as long, anterior margin convex, surface densely set with setae; paired marks absent. Epipharynx (fig. 2) anteriorly with several short, curved coryphal setae; acanthopariar setae slender, long, more or less curved; chaetopariar setae on each side in a single, oblique, inwardly convex series of eight rather short, curved and pointed setae; tormae and labral rods forming rather long, Y-shaped features; crepidal field velvety pubescent, without pores. *Mandible* (fig. 3) with two sharp apical teeth; subapical part of mandible forming a slightly concave wall with thin edge impressed by numerous parallel, transverse, very fine lines and terminatio with a sharp toothlike process near arched marginal elevation; marginal brush absent; mandibular surface between dorsal articulation and marginal elevation granulate; aboral proximal setae numerous and long; distal setae, numbering about four, also long. Maxillary lacinia (fig. 4) less than half as large as galea, terminally with about ten densely set, long, stiff setae; also with smaller, but well developed, stiff setae on ventral surface and softer on dorsal surface; maxillary palpus with three articles; proximal article with about eight long setae ventrally; distal part of stipes similarly armed with about ten setae.

Body-trunk (fig. 6) elongate, not strongly curved, all areas set with many moderately long, fine setae; epipleural areas, in particular (fig. 5), provided with numerous very long ones; asperities lacking completely.

Spiracles (figs. 7, 8 and 9) simple, annular, each with a single, short air tube; thoracic spiracle (fig. 7) oval with peritrema not

fully twice as long as peritreme of an abdominal spiracle (figs. 8 and 9).

Leg (fig. 10) with pretarsus less than one-third as long as tibio-tarsus; proximal membranous part of pretarsus short, furnished with two moderately long setae; claw well developed, strongly curved and pointed; arolium present, extending to the middle of claw.

49. *Ozognathus cornutus* Lec.

Plate 42.

Described material labeled:

- 1) *Ozognathus cornutus* Lec., Imagines reared from dried terminal growth and flowers of Avocado and identified by Arnett, Los Angeles, Calif., Febr. 1950. Roy J. PENCE coll.
- 2) *Ozognathus* sp., in bark of pine lumber, Durango, Mexico, Brownsv., Tex. coll. 42—335, 29.X.1942.
- 3) *Ozognathus cornutus* Lec., Los Angeles, Calif., D. W. COQUILLET coll.

Size of larva: Small (c. 3 mm.).

Head capsule about as broad as long, subcircular, without frontal lines; pigmented field behind epistoma (fig. 1) distinct, sagittally slightly longer than epistoma, bearing a few, long setae; epistoma (fig. 1) with transverse anterior series of, altogether, eight fairly long, fine, straight setae; cranium with moderately dense, long and short setae. Antenna (fig. 1) without distinct articles. Anteclypeus without plate, and no setae at each end of anteclypeal sulcus. Labrum (fig. 1) about twice as wide as long, anterior margin convex, labral surface bearing comparatively few (on each side less than ten) long and short setae; paired marks absent. Epipharynx (fig. 4) anteriorly with several short, curved coryphal setae; acanthoparial setae slender, long, more or less curved; chaetoparial setae on each side in a single, oblique, inwardly convex series of six rather short, curved and pointed setae, a pair of minute setae between the bases of tormae; tormae well developed and pigmented; labral rods weak, joining tormae to form incomplete Y-shaped features; crepidal field velvety pubescent, without pores. *Mandible* (fig. 5) with two sharp apical

teeth; subapical part forming a slightly concave wall with a thin, transversally striate edge and terminating with a sharp, tooth-like process near arched marginal elevation; marginal brush present, surrounded by the elevation; mandibular surface between dorsal articulation and marginal elevation smooth; aboral proximal setae numerous and long, distal setae, numbering four, also long. Maxillary lacinia (fig. 2) less than half as large as galea, terminally with about ten, densely set, long, stiff setae, also with smaller setae on rest of both dorsal and ventral surfaces; at base both lacinia and galea furnished dorsally with very soft, curly hairs (fig. 2). Maxillary palpus with three articles, proximal article with about eight long setae on ventral surface; distal part of stipes similarly armed.

Body-trunk (fig. 3) thick, short and curved, body areas sparsely furnished with setae, epipleural areas (fig. 10) with only five or less setae; asperities lacking completely.

Spiracles (figs. 6, 7 and 8) simple, annular, with a single, minute air tube each; abdominal spiracle (figs. 7 and 8) remarkably small; thoracic spiracle three times larger than an abdominal.

Leg (fig. 9) with pretarsus less than one-third as long as tibiotarsus; proximal membranous part of pretarsus short, furnished with two setae, one short the other moderately long; claw well developed, curved and pointed; arolium present, extending to the middle of claw.

50. *Petalium seriatum* Fall.

Plate 42.

Described material labeled:

- 1) *Petalium seriatum* Fall, in *Juglans*, Virginia, Hopk. U. S. #10084 1 (reared imago in coll.).
- 2) *Petalium seriatum* Fall, ex small dead branch, College Park, Md., 28.II.1942, W. H. ANDERSON coll.
- 3) *Petalium seriatum* Fall, Hopk. U. S. #12605 x.

Size of larva: Small (c. 4 mm.).

Head capsule slightly longer than broad, broadest before the middle, sides convergent behind the middle; head slightly retracted (fig. 16), without frontal lines; pigmented field behind epistoma lacking or very feeble; epistoma (fig. 11) on each side

with a marginal series of four fine, straight and moderately long setae; cranium immediately behind epistoma with a single transverse series of about six moderately long setae on each side, rest of cranial surface anteriorly quite sparsely provided with scattered, fairly long setae, and posteriorly without setae (fig. 16). Antenna (fig. 11) without articles. Anteclypeus (fig. 11) with two long, fine, straight setae at each end of anteclypeal sulcus, but not borne by any plate. Labrum (fig. 11) with semicircular, free margin and set all over the surface with setae; no paired marks. Epipharynx (fig. 12) with several very short coryphal setae medio-anteriorly; acanthoparial setae few, long, curved and slender; chaetoparial setae, numbering six on each side, moderately strong, slightly curved, and arranged in an oblique row; tormae straight, conical, slender, moderately long and convergent; labral rods absent; crepidal field without pores. *Mandible* (figs. 14 and 15) with two apical teeth; subapical part of mandible forming a rather high, subtriangular wall terminating above the arched elevation around the marginal brush and having a thin, convex, small, projecting enlargement anteriorly; marginal brush well developed; aboral mandibular surface with a few, long proximal and distal setae. Maxillary lacinia (fig. 17) much reduced in size, not fully as long as distal article of maxillary palpus, armed with a single, fairly long, slightly pigmented spinelike seta and bearing in addition a few, fine, ordinary setae; galea of normal size, armed marginally with a row of about seven, slender, curved and sharply pointed setae, ventral surface with a few, long and small setae; maxillary palpus with three articles, proximal article ventrally with three setae; distal part of stipes with about five setae.

Body-trunk (fig. 16) elongate, cylindrical and almost straight, covered with quite a limited number of moderately long to long, fine, soft setae; asperities lacking completely.

Spiracles (fig. 18) pseudocribiform.

Leg (fig. 13) with short pretarsus, only about one-third as long as tibio-tarsus, proximal membranous part very short, armed with two small setae; claw rather narrow and curved; arolium present extending to near the middle of claw.

51. *Unknown genus possibly near Lasioderma.*

Plate 43.

Described material labeled:

- 1) Unknown genus, possibly near *Lasioderma*, single specimen with Orchid plants (A. G. B. det.), Mexico, intercepted at Brownsville, Texas, 4.IX.1946, (46·15196).

Size of larva: Small (c. 4 mm.).

Head capsule (fig. 6) subcircular, with distinct frontal lines, thickly sclerotized, uniformly dark all over; surface of cranium, epistoma included, set with regularly arranged long setae, each seta in a round, comparatively large pit; epistoma (fig. 6) indistinctly limited posteriorly, with anterior margin scalloped, provided with a transverse series of, altogether, about fourteen long, stiff setae. Antenna (fig. 6) without articles. Anteclypeus with a narrow, weakly sclerotized band adjacent to the anteclypeal sulcus, bearing two setae at each end. Labrum (fig. 6) subrectangular, about two and one-half times broader than long, sparsely set with short setae; paired marks apparently lacking. Epipharynx (fig. 2) anteriorly with some small, curved, obtuse coryphal setae; acanthoparial setae, about six on each side, inserted in anterior epipharyngeal margin, lacking laterally; chaetoparial setae on each side in a single, arched and oblique series of six setae, the three anterior of them slender, curved and pointed, the three posterior short, robust, curved, more or less fan-shaped; tormae moderately long, awl-shaped, rather straight and pointed, posteriorly convergent; no distinct labral rods. *Mandible* (figs. 1 and 3) with two apical teeth; subapical part of mandible forming a low, slightly concave, and comparatively short wall with serrated edge and terminating at a strong, long, convex marginal thickening; no marginal brush; aboral mandibular surface (fig. 3) with a proximal transverse series of six long setae and a distal small group of four long setae. Maxillary lacinia (fig. 9) somewhat less than half as large as galea, distally with a number (about five) moderately long and strong setae, no spine; maxillary palpus with three articles; proximal article ventrally (fig. 9) with about six setae; distal part of stipes with same number of well-developed setae.

Body-trunk robust and curved, densely covered with long, fine setae, asperities lacking completely.

Spiracles (figs. 4, 5, 7 and 8) pseudocribriform with a comparatively small, ill-defined cribrate field; thoracic spiracular peritrema (fig. 4) about two and a half times as long as abdominal peritremata (figs. 5, 7 and 8).

Leg (fig. 10) with pretarsus about one-third as long as tibiotarsus; proximal membranous part short, only half as long as wide, armed with two short setae; claw weak, slender, curved and sharp; arolium well-developed, extending beyond tip of claw.

52. *Lasioderma serricorne* F.

Plate 43.

Described material labeled:

- 1) *Lasioderma serricorne* F., from tobacco, Harpers Ferry, West Va., 8.II.1914, F. C. CRAIGHEAD coll.
- 2) *Lasioderma serricorne* F., in dried Chamomile flowers, Italy. 11.VIII.1939, N. York # 82493.

Size of larva: Moderately large (c. 6 mm.).

Head capsule (fig. 19) subcircular, without frontal lines, but on each side with a light-colored band limiting a dark clypeo-frontal field; each parietal light with one dark spot parallel with epicranial sulcus and a similar dark spot in the middle of the parietal wall; epistoma (fig. 19) with a transverse anterior series of, altogether, about sixteen fine, straight and moderately long setae; some setae present on each catapophysis; cranium behind epistoma with densely set, long and short, soft setae all over, each seta placed in a minute pit. Antenna (fig. 13) without articles. Anteclypeus without setae and without a small sclerite at each end of anteclypeal sulcus. Labrum (fig. 19) subrectangular with broadly rounded corners, about twice as broad as long, densely set with setae; paired marks indicated, but small and indistinct. Epipharynx (fig. 11) anteriorly with some small, straight coryphal setae; acanthoparal setae long, curved and slender; chaetoparal setae on each side six, the two anterior rather slender and moderately long, the four posterior short, robust and curved, together forming an oblique, arched, single series; tormae short and

strong; labral rods and tormae united posteriorly into V-shaped features; crepidal field without pores. *Mandible* (figs. 12 and 14) with two, rather short apical teeth, subapical part of mandible forming a wall with serrated, almost straight edge terminating with a toothlike projection above the marginal arched elevation around a distinct but small brush; aboral mandibular surface (fig. 14) with a proximal group of seven long, curved setae and a bunch of four, rather long distal setae. Maxillary lacinia (fig. 15) somewhat less than half as large as galea, distally with a number (about five) of moderately long and stiff setae and laterally a small number of smaller, similar setae; no spine; maxillary palpus with three articles, proximal article ventrally with about six setae, distal part of stipes with the same number of well-developed setae.

Body-trunk quite robust and strongly curved, densely covered with long, fine, mostly curved setae; asperities lacking completely.

Spiracles (figs. 18, 20 and 21) pseudocribriform with comparatively narrow cribrate field.

Leg (fig. 17) with pretarsus about one-third as long as tibiotarsus; proximal membranous part short, armed with two moderately long setae; claw curved and sharp; arolium present, extending somewhat beyond the middle of the claw.

53. *Lasioderma* sp.

Plate 43.

Described larva labeled:

Lasioderma sp., in *Eragrostis curvula* seeds, coll. D. C., 27.VI. 1939, 39—11866 (Single larva, not reared).

Head capsule (fig. 16 (*L. sp.*)) subcircular with faint indication of incomplete frontal lines, uniformly colored light brownish; epistoma (fig. 16) with a transverse anterior series of, altogether, about twelve fine, straight, moderately long setae, about seven long setae on each catapophysis; cranium behind epistoma densely set with from short to long setae. Anteclypeus (fig. 16) with a minute sclerite bearing two long setae at each end of anteclypeal sulcus. Epipharynx (fig. 22) anteriorly with several minute coryphal setae; acanthoparial setae long and curved;

chaetopariar setae on each side about twelve, fairly short, curved and pointed, arranged in an oblique, arched, irregular double series; tormae and labral rods forming rather strong Y-shaped features. Other characters as in *Lasioderma serricorne* F.

54. *Cryptorama minutum* Lec.

Plate 44.

Described material labeled:

- 1) *Cryptorama minutum* Lec. (imago det. by W. S. FISHER), in dry mesquite wood, Mexico, intercepted Brownsville, Texas, 14.X.1939, (39·16766).
- 2) *Cryptorama minutum* Lec. (10 larvae); in mesquite twigs, local, Brownsville, Tex., 14.III.1944, G. F. CALLAGHAN coll. (44—12042).

Size of larva: Small (c. 4 mm.).

Head capsule (fig. 2) about twice as long as broad, sides nearly straight before and convergent behind the middle, partly retracted, without frontal lines; pigmented field behind epistoma (fig. 1) well developed, sagittally about twice as long as epistoma, armed at posterior end of field with a single, conical projection and bearing an irregular series of long setae along the hind margin; epistoma (fig. 1) with a transverse anterior series of, altogether, ten long, strong setae; non-pigmented part of head capsule in front of anterior end of epicranial sulcus (fig. 2) provided with several, very short to long setae, scattered irregularly over the surface; behind anterior end of sulcus without setae. Antenna (fig. 1) without articles. Anteclypeus (fig. 1) thin walled, apparently without setae-bearing plate and without setae. Labrum (figs. 1 and 2) semicircular, densely set with setae; paired marks indicated but insignificant. Epipharynx (fig. 3) anteriorly with a group of small, stubby coryphal setae; acanthopariar setae long, curved and slender; chaetopariar setae on each side six, short and somewhat fan-shaped, in a regular, single, oblique series; tormae slender, straight, somewhat convergent; no distinct labral rods; crepidal field without pores. *Mandible* (fig. 4) ending distally with three teeth, namely: apically two teeth and subapically a toothlike large projection at the end of a very short wall above large, elongate, marginal arched elevation; small marginal

brush present; aboral mandibular surface with a few long proximal setae and about three similar distal setae. Maxillary lacinia (figs. 5 and 6) about one-third the size of galea, distally with about ten closely set, long and stiff setae, no spine; dorsally and ventrally with minor setae; maxillary palpus with two distinct articles, the subapical article absent, represented only by a single seta on a minute wartlike projection at base of distal article; proximal article ventrally with about four long and a few smaller setae; distal part of stipes with about the same number of similar setae.

Body-trunk (fig. 10) robust and curved, with thoracic segments much larger than abdominal segments; body setae inconspicuous, except on the epipleural areas, the sternal areas and ninth abdominal segment; asperities lacking.

Spiracles (figs. 7, 7* and 8) pseudocribriform with large cribrate field.

Leg (fig. 9) with pretarsus about half as long as tibio-tarsus; proximal membranous part of pretarsus small, about as long as wide, with two setae; claw slender and somewhat curved; arolium absent.

55. *Unknown genus and species, perhaps Ernobius sp.*

Plate 44.

Described material labeled:

- 1) Unknown larva, perhaps genus *Ernobius*, in spruce buds at tip of stem; from Norway, intercepted N. York, 10.VIII.1936 (N. Y. # 62610); one specimen; not reared.

Size of larva: Moderately large (c. 7 mm.).

Head capsule (fig. 11) orbicular, no definite, sharp frontal lines but clypeo-frontal region limited by a non-pigmented, narrow, uneven, and oblique stripe on each side; anteriorly confluent, with a likewise non-pigmented, large spot on parietale; rest of cranium pigmented; epistoma (fig. 11) not distinct; entire surface of cranium set with moderately numerous, well-developed setae, each usually as long as labrum and anteclypeus combined. Antenna (fig. 11) with two articles. Anteclypeus (fig. 11) with three long setae at each end of anteclypeal sulcus. Labrum (fig. 11) transverse, somewhat less than twice as broad as long,

outline gently rounded; surface with straight, fine, small setae both anteriorly and on each side; paired marks not visible. Epipharynx (fig. 12) with two pairs of minute coryphal setae; comparatively few, slender and moderately long acanthoparial setae and on each side an oblique, inwardly convex series of four, fairly short, slender, curved and pointed chaetoparial setae; tormae and labral rods forming Y-shaped features; crepidal area with two minute pores. *Mandible* (figs. 13 and 15) with two apical and two subapical teeth; marginal brush present; on aboral surface with four proximal setae and apparently only one distal seta. Maxillary lacinia (fig. 16) rather small, terminally with two strong, pointed, claw-shaped spines, several fine, short and two long, stiff setae behind them; maxillary palpus with three articles; proximal article with three long setae; distal part of stipes with a few more similar setae.

Number of prodorsal asperities (fig. 14) *on each side of:*

Thoracic segment II	.....	none
" " III	.....	2
Abdominal segment 1	.....	9
" " 2	.....	7
" " 3	.....	6
" " 4	.....	7
" " 5	.....	5
" " 6	.....	none
" " 7	.....	none
" " 8	.....	none

9th abdominal segment with a patch of six lateral asperities on each side.

10th abdominal segment with two asperities on each side.

Spiracles (figs. 18 and 19) circular, each with one air tube; air tube almost as long as diameter of peritrema on the thoracic spiracle (fig. 18), twice as long on the abdominal spiracles (fig. 19).

Leg (fig. 17) with membranous part of pretarsus somewhat longer than broad, carrying two minute setae; no claw; arolium elongate, balloon-shaped, twice as long as membranous part.

56. *Ernobius marginicollis* Lec.

Plate 45.

Described material labeled:

- 1) San Francisco, Calif., Sand dunes, 10.VII.1934. In rotten dry lupine wood, P. TING coll. & det., confirmed by FISHER (Larva: 10.VII.1934, imagines emerged 24.V.1935, 26.V.1935, 31.V.1935; pupae taken out of remaining wood by P. TING).
- 2) *Ernobius marginicollis* Lec. (A. G. B. det.), Washington State, 8.XII.1943. In *Ribes sanguineum* stalk. WILBUR coll., Spl. Surv. # 7348.

Size of larva: Moderately large (c. 7 mm.).

Head capsule oval, slightly longer than broad, broadest in the middle, without frontal lines; pigmented field behind epistoma (fig. 1) indistinctly limited posteriorly, sagittally about twice as long as epistoma; epistoma (fig. 1) anteriorly on each side with a transverse row of, altogether, six moderately long setae; cranium with many evenly distributed, mostly fine setae, each as long as labrum and anteclypeus together. Antenna (fig. 1) with two distinct articles. Anteclypeus (fig. 1) with a small sclerite bearing a group of about ten moderately long to long setae at each end of anteclypeal sulcus. Labrum (fig. 1) transverse suboval, approximately twice as wide as long; anterior margin with a series of numerous, densely set, fine, curved setae and on each side behind them with a group of rather short, thin setae; paired marks distinct. Epipharynx (fig. 2) on each side with recurved, soft acanthoparial setae and a long, inwardly concave row of numerous, irregularly arranged, slender and curved chaetoparial setae; tormae strong, short, sausage-like; labral rods not present; crepidal space covered with minute papillae, but no pores. *Mandible* (fig. 4) with two apical teeth; subapical part of mandible low and subtriangular, with a long, straight distal edge equipped with a row of minute, grainlike elevations; marginal brush lacking; aboral surface (fig. 4) bearing a proximal series of about ten long setae and a distal group of about five shorter setae. Maxillary lacinia (fig. 5) about half as large as galea, distally carryinè about a dozen long, stiff, straight setae, clustered in a bundle, and behind them several additional but much weaker setae; no spine; maxillary palpus with three articles, proximal article

ventrally with three or four long setae; distal part of stipes with a similar number of long setae. Prementum with a transverse series of about eight short setae on each side, meso- and submentum each with a similar number of much longer setae.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	20
Abdominal segment 1	.....	21
" " 2	.....	15
" " 3	.....	11
" " 4	.....	11
" " 5	.....	11
" " 6	.....	9
" " 7	.....	none
" " 8	.....	none

9th abdominal segment (fig. 3) with a patch of about twenty-four lateral asperities on each side.

10th abdominal segment (fig. 3) without asperities.

Spiracles (figs. 6, 7 and 9) circular, each with one air tube about half as long as diameter of peritreme or, in some of the abdominal spiracles (fig. 7), as long as the peritremal diameter; thoracic spiracle (fig. 5) including air tube not fully as long as distal article of maxillary palpus; diameter of abdominal spiracles (figs. 7 and 9) about two-thirds as long as thoracic spiracle.

Leg (fig. 8) with pretarsus less than one-fourth as long as tibio-tarsus; membranous part of pretarsus with two setae, forming together with arolium an elongate balloon-shaped feature; claw absent.

57. *Neogastrallus librinocens* Fisher

Plate 45.

Described material labeled:

- 1) *Neogastrallus librinocens* Fisher, larvae, associated with imagines, attacking books, Notre Dame Seminary, New Orleans, Louisiana, 28.VII.1939.

Size of larva: Small to moderately long (c. 5 mm.).

Head capsule oval, slightly longer than broad, broadest near the middle, without frontal lines; pigmented field behind epistoma lacking; epistoma (fig. 10) on each side of sagittal body line with

a transverse series of about ten fairly long setae anteriorly, and another transverse series with fewer setae posteriorly; rest of cranium with a limited number of mostly short setae. Antenna (fig. 10) without articles; sensory organs borne by dome-shaped membranous base. Anteclypeus (fig. 10) apparently without setae. Labrum (fig. 10) with semicircular free margin, surface densely set with setae; paired marks absent. Epipharynx (fig. 11) anteriorly with several short, hook-shaped coryphal setae in two transverse series; acanthoparial setae slender, almost straight and pointed; chaetoparial setae on each side numerous, long, fine, somewhat curved and arranged in a subtriangular patch; tormae solid, straight and corniform; labral rods not developed; crepidal field without pores. *Mandible* (figs. 12 and 17) apically with first tooth distinct, second tooth indistinct and fused with long sub-apical part of mandible into a large, convex wall, overhanging the adoral surface (fig. 17); marginal brush well developed; aboral surface with two long proximal and no distal setae. Maxillary lacinia (fig. 13) much smaller than galea, terminally with six moderately long and stiff setae and a few minute setae behind; galea with well-developed more or less dagger-shaped marginal setae, and parallel with them, ventrally a series of short, ovate setae; maxillary palpus with three articles; proximal article ventrally with five setae; distal part of stipes with a similar number.

Body-trunk curved, covered with fine setae; prodorsal and lateral asperities lacking.

Spiracles (figs. 15 and 16) somewhat irregularly ring-shaped, no air tubes; thoracic spiracle (fig. 15) considerably larger than abdominal spiracles (fig. 16).

Leg (fig. 14) comparatively short, with pretarsus about one-third as long as tibio-tarsus; proximal membranous part small with two setae; claw lacking; proximal part and arolium fused into a balloon-shaped feature.

58. *Microanobium* sp.

Plate 46.

Described material labeled:

- 1) *Microanobium* sp. (= *Microsternus* sp.), (imago det. by W.S.

FISHER) in bark of dried wood stump from China; intercepted Hawaii, 6.III.1933 (Hawaii # 541).

Size of larva: Small (3 to 4 mm.).

Head capsule oval, about as long as broad, without frontal lines; pigmented field behind epistoma (fig. 4) small, quite light, sagittally somewhat longer than epistoma; epistoma (fig. 4) on each side with two well-developed setae; cranium, including pigmented field, with a moderate number of fine, short to quite long setae scattered over the whole surface. Antenna (fig. 4) without articles; sensory organs on membranous dome-shaped base. Anteclypeus (fig. 4) without plate and no setae at each end of anteclypeal sulcus. Labrum (fig. 4) with free margin semicircular, and three long setae on each side of surface; a pair of minute fine setae anteriorly; no paired marks. Epipharynx (fig. 7) with a transverse series of, altogether, four club-shaped, short coryphal setae near middle of front margin; acanthoparial setae lacking; chaetoparial setae on each side four, club-shaped, rather small, in an oblique series; labral rods and tormae united into strong V-shaped features; crepidal field quite narrow, with a pair of pores. *Mandible* (fig. 6) with first apical tooth distinct, second apical tooth entirely fused with subapical part of mandible into a convex, fairly high wall ending with a low conical projection; marginal brush well developed; aboral mandibular surface with a single long seta proximally and two small distal setae. Maxillary lacinia (fig. 8) almost vestigial carrying a single straight, pointed spine terminally and two minute setae; galea of normal size, with dagger-shaped marginal setae much shorter than lacinial spine; ventral surface with two small setae; dorsal galeal surface bearing a fringe of very long, soft hairs; maxillary palpus with three articles; proximal article with two long setae; distal part of stipes with three long and a short seta.

Body-trunk (fig. 1) subcylindrical and curved, set with a moderate number of fine, soft setae on all areas; no asperities present.

Spiracles (figs. 2 and 3) circular, without air tubes.

Leg (fig. 5) with very short pretarsal membranous part carrying two small setae; claw absent; arolium comparatively large and balloon-shaped.

59. *Eutylistus intermedius* Lec.

Plate 47.

Described material labeled:

- 1) *Eutylistus intermedius* Lec., in *Fomes fomentarius*, White Heath, Ill., 29.II.1932, H. H. ROSS coll. et det.
- 2) *Eutylistus intermedius* Lec., ex *Fomes* sp., Landley, Va., 29.X.1939, W. H. ANDERSON coll. (Div. Ins. Id. # 01—39 c.l.).
- 3) *Eutylistus* sp. (*intermedius* Lec.?), in fungus, Rosslyn, Va., 24.IV.1913, R. C. SHANNON coll. (A.G.B. det.).

Size of larva: Small (c. 4 mm.).

Head capsule oval, about as long as broad, without frontal lines; pigmented field behind epistoma (fig. 1) about twice as long as epistoma, rather pale and indistinctly limited behind; epistoma (fig. 1) densely pitted; with, altogether, five straight setae in a transverse series and a single long seta at base of each catapophysis; ventro-laterally at base of fossa for mandible (fig. 2) with surface flat and granulated; cranial surface, including pigmented field, with a moderate number of short to long, fine setae. Antenna (fig. 1) without articles; tactile papilla long and sausage-shaped. Anteclypeus (fig. 1) with two well-developed, straight setae at each end of anteclypeal sulcus, not borne by any plate. Labrum (fig. 1) elongate pyriform, armed with a median transverse series of, altogether, four straight, well-developed setae and bearing some small, lanceolate, flat, transparent setae in anterior margin; no dark marks. Epipharynx (fig. 4) with a heavily sclerotized, single, triangular coryphal plate bearing a pair of strong, curved, sagittally adjacent, tooth-like setae with a rudimentary, somewhat similar seta on each side, partly fused with them; four long, recurved acroparial setae on each side of coryphal plate; no acanthoparial setae; chaetoparial setae numerous, cultriform, rather small, on each side arranged in a single, longitudinal, inwardly concave series; pedium large, slightly scabroseous; tormae strong, straight, elongate, subconical, fairly close together; no labral rods; crepidal field quite narrow, without pores. *Mandible* (figs. 10, 10*) apically with two teeth and a long, broad subapical mandibular wall, forming a grinding pseudomola (fig. 10*) with a series of about twenty crescent-

shaped, downward-turned, parallel grooves alternating with granulated crests; marginal brush lacking, but oval arched marginal wall large and heavily sclerotized; aboral surface of mandible (fig. 10) proximally with a row of about five long setae and distally with two long setae. Maxillary lacinia (fig. 6) as large as galea; on adoral side (fig. 9) bases of the two lobes reinforced by an armlike sclerotization (LcGa.arm) extending from posterior end of the lacinial edge farthest from galea to the galeal edge adjacent to proximal article of palpus; distal to armlike bar with a membranous pad carrying a profuse number of very long, soft, fine hairs; marginal setae of lacinia and galea strong and cultriform; aboral (fig. 5) and adoral (fig. 9) surfaces of both lobes with setae of usual shape; maxillary palpus with three articles; proximal article carrying five setae on the outside. Hypopharynx (figs. 3, 6) ending distally with an arrowlike projection (x) on top of its large anterior face above ligula (Lig); the latter with a wartlike swelling armed with sharp setae.

Body-trunk (fig. 11) subcylindrical and curved.

Number of prodorsal asperities (fig. 11) on each side of:

Thoracic segment II	.....	none
" " III	.....	3
Abdominal segment 1	.....	11
" " 2	.....	10
" " 3	.....	7
" " 4	.....	7
" " 5	.....	4
" " 6	.....	none
" " 7	.....	none
" " 8	.....	none

9th abdominal segment with a patch of about twelve lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (figs. 7, 8) pseudocribriform with a small, in some of the abdominal spiracles (fig. 8) exiguous, cribrate field.

Leg with short pretarsal membranous part about as long as broad, carrying two setae; claw slender, somewhat curved and setalike, half as long as tibio-tarsus; arolium absent.

60. *Etylistus facilis* Fall.

Plate 47.

Described material labeled:

- 1) *Etylistus facilis* Fall, Victoria, Texas, E. A. SCHWARZ coll. et det.

Size of larva: Small (c. 4 mm.).

Differing from *Etylistus intermedius* Lec. only by characters pertaining to pigmented field behind epistoma, epistoma itself, epipharynx and spiracles.

Pigmented field behind epistoma insignificant or entirely absent; epistoma (fig. 13) smooth with an irregular transverse series of, altogether, twelve setae. Anteclypeal setae absent. Epipharynx (fig. 12) with two pairs of well-developed, toothlike coryphal setae borne by triangular plate; apparently no recurved acroparial setae; acanthoparial setae absent; chaetoparial setae numerous, short, somewhat curved and slender, on each side arranged in a large anterior patch followed by a single, longitudinal row of setae.

Spiracles (figs. 14, 15) pseudocribriform with a large cribrate field, four or five times longer than diameter of spiracular trachea.

61. *Anitys rubens* Hoffm.

Plate 48.

Described material labeled:

- 1) *Anitys rubens* Hoffm. (= *Dorcatoma rubens* Hoffm.), ex coll. Zool. Mus., Copenhagen, Denmark (in exchange from F. MEINERT 1890 #148).
- 2) *Anitys rubens* Hoffm., in red moulded oak, Dyrehaven near Copenhagen, 6.I.1935, J. P. KRYGER coll. and reared.

Size of larva: Moderately large (c. 6 mm.).

Head capsule oval, slightly longer than broad, without frontal lines; pigmented field behind epistoma (fig. 2) small, indistinct; epistoma (fig. 2) smooth, except with rugose catapophyses, with, altogether, seven setae, in a single, transverse row and one long seta externally at base of each catapophysis; flat and granulated surface ventro-laterally at fossa for mandibular condyle (fig. 1); cranium with a moderate number of fine setae. Antenna (fig. 2)

without articles; tactile papilla of medium size and ovate. Anteclypeus (fig. 2) with one long seta at each end of anteclypeal sulcus, not borne by a plate. Labrum (fig. 2) pyriform, armed with a median transverse series of, altogether, four straight, well-developed setae and bearing some small, lanceolate, flat setae in anterior margin; no paired dark marks. Epipharynx (fig. 3) with a sclerotized, subtriangular coryphal plate bearing four strong, claw-shaped setae; acroparial setae numerous, long and recurved; no acanthoparial setae; chaetoparial setae numerous, cultriform, somewhat curved, pointed and small; on each side in a large anterior patch followed by a single, longitudinal, rather straight row of many setae; pedium large and subtriangular, with slightly granulose surface; tormae strong, straight, elongate subconical and almost adjacent; no labral rods; crepidal field obliterated. *Mandible* (figs. 4, 5, 6) apically with two strong teeth and a broad, long, thick subapical wall forming a grinding pseudomola; marginal brush lacking but marginal elevation (fig. 5), usually surrounding it, heavily sclerotized; aboral surface of mandible (figs. 5, 6) proximally with an irregular row of about fifteen moderately long setae, and distally with a group of about five similar setae. Maxillary lacinia (fig. 8) as large as galea, on adoral side (fig. 8) bases of both lobes supported by a bar between inner marginal edge of lacinia and galeal edge adjacent to proximal article of palpus; lobes with a common, soft-skinned pad covered by a profusion of very long, fine, soft hairs situated in front of the bar; margins of both lobes armed with slender, cultriform, rather short setae; aboral and adoral surfaces of both lobes with a moderate number of setae; maxillary palpus with three articles; proximal article carrying five setae. Hypopharynx ending in an arrowlike projection placed over anterior large wall (compare Pl. 47, fig. 3).

Body-trunk subcylindrical and curved.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none
" " III	.....	5
Abdominal segment 1	.....	9
" " 2	.....	8
" " 3	.....	10
" " 4	.....	9

Abdominal segment	5	8
" "	6	4
" "	7	none
" "	8	none

9th abdominal segment with a patch of about fifteen lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (fig. 7) simple, annular, without air tubes.

Leg (figs. 9, 10) with short pretarsal membranous part about as long as broad, carrying two setae; claw slender, a little curved and setalike, half as long as the comparatively short tibio-tarsus; arolium absent.

62. *Dorcatoma dresdensis* Herbst.

Plate 48.

Described material labeled:

- 1) *Dorcatoma dresdensis* Hbst., ex woody fungus, Cummington, Mass., 24.XI.1939, A. B. GURNEY & W. H. ANDERSON coll., W. S. FISHER det. imago (Div. Ins. Id. # 87—39).
- 2) *Dorcatoma dresdensis* Hbst., Patuxent Game Preserve, Md., 17.IX.1944, W. H. ANDERSON coll.
- 3) *Dorcatoma dresdensis* Hbst., in woody fungus, Crab Lake, Wisc., H. S. BARBER coll. 1907—1908.
- 4) *Dorcatoma dresdensis* Hbst., ex *Fistulina hepatica* on *Quercus*, Fuglsang, Lolland, Denmark, 27.III.1945, reared 25.IV.1945, J. P. KRYGER, coll.

Size of larva: Moderately large (c. 5 mm.).

Head capsule subcircular, about as long as broad, without frontal lines; pigmented field behind epistoma rather pale and indistinct, not sharply set off from posterior part of large, rugose epistoma (fig. 15); epistoma with, altogether, about sixteen long, evenly distributed setae, each in a small pit; ventro-laterally at fossa for mandibular condyle with a large, granulated, conical process (figs. 11, 13); rest of cranium with a moderate number of setae. Antenna (figs. 12, 15) without articles, tactile papilla sausage-like. Anteclypeus with one long seta at each end of anteclypeal sulcus (fig. 15), seta borne by an insignificant sclerotiza-

tion. Labrum (fig. 15) pyriform, armed with a median, transverse row of, altogether, six long setae and bearing some small, flat, lanceolate, transparent setae in anterior margin; no paired dark marks. Epipharynx (fig. 14) with a heavily sclerotized, oblong, transverse coryphal plate bearing a row of four well-developed, curved, toothlike setae and two quite similar but smaller setae on each side of them; acroparial setae numerous, strong and recurved; no acanthoparial setae; chaetoparial setae numerous, short, somewhat curved, on each side in a large anterior patch followed by a single, longitudinal, slightly inwardly concave row of setae; pedium large, suboval, with slightly granulose surface; tormae strong, subconical, about one-third as long as rest of epipharynx, terminally as far apart from each other as length of one torma; no distinct labral rods; crepidal field fairly wide, with two minute setae. *Mandible* (fig. 17) apically with two strong teeth followed by a broad, long, thick subapical wall which forms a grinding pseudomola; no marginal brush; aboral surface of mandible proximally with an irregular row of approximately eight moderately long setae and distally with a small group of about four similar setae. Maxillary lacinia (fig. 16) as large as galea; on adoral side bases of both lobes enforced by a bar between the inner marginal edge of lacinia and the outer galeal edge adjacent to the proximal article of palpus; lobes with a common soft-skinned pad, covered with very long and soft hairs, situated in front of bar; margins of both lobes armed with slender, cultriform setae; aboral and adoral surfaces of both lobes with a moderate number of ordinary setae; maxillary palpus with three articles; proximal article carrying five setae.

Body-trunk subcylindrical and curved.

Number of prodorsal asperities on each side of:

Thoracic segment II	.....	none	
" " III	.....	5	
Abdominal segment 1	.....	10	
" " 2	.....	8	} in two transverse rows
" " 3	.....	9	
" " 4	.....	7	
" " 5	.....	8	
" " 6	.....	4	
" " 7	.....	none	
" " 8	.....	none	

9th abdominal segment with a patch of about fifteen lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (figs. 19, 20, 21) annular with a single, very short air tube; thoracic spiracle (fig. 19) much larger than abdominal spiracles (fig. 21).

Leg (fig. 18) with short pretarsal membranous part about as long as broad, carrying two setae; claw slender, slightly curved, setalike and half as long as tibio-tarsus; arolium absent.

62*. *Dorcatoma chrysomelina* Sturm.

Described material labeled:

- 1) *Dorcatoma chrysomelina* Sturm, from *Quercus ruber*, Turku, Suomi, 11.VII.1918, UUNIO SAALAS coll. et det.
- 2) *Dorcatoma chrysomelina* Sturm, fungus on *Quercus*, Knuthenborg, Denmark, Larva—July 1947, imago out 12.IV.1948, J. P. KRYGER, coll. and reared.

Size of larva: Small (c. 4 mm.) to moderately large (c. 5 mm.).

Larva identical in all characters and in size with *Dorcatoma dresdensis* Hbst., except in the number of the prodorsal asperities.

Number of prodorsal asperities on each side of:

Thoracic segment II	none	
" " III	6	
Abdominal segment 1	19	} in two and in some places three transverse rows
" " 2	.....	19
" " 3	.....	18
" " 4	.....	17
" " 5	.....	14
" " 6	.....	4
" " 7	.....	none
" " 8	.....	none

9th abdominal segment with a patch of about twenty lateral asperities on each side.

10th abdominal segment without asperities.

62**. Preserved in collection of U.S.N.M. is the larva of
Dorcatoma flavicornis F.

Fortunens Indelukke, near Copenhagen, Denmark, larvae
and one pupa, 10.V.1940, J. P. KRYGER coll. et det.

Size of larva: c. 4 mm.

63. *Caenocara bovistae* Hoffm.

Plate 49.

Described material labeled:

- 1) *Caenocara bovistae* Hoffm., in *Bovista* sp. (reared), Vester Fælled, Copenhagen, Denmark, larva: 10.XI.1895; pupa: 23.XII.1895; imago: out 5.I.1895, E. ROSENBERG coll.
- 2) *Caenocara* sp. (probably *C. bovistae* Hoffm., ex *Lycoperdon*, Greenbelt, Md., 27.X.1940, W. H. ANDERSON coll.

Size of larva: Small (c. 3 mm.).

Head capsule subcircular, about as long as broad, without frontal lines, pigmented field behind epistoma present but pale and indistinct; epistoma with low catapophyses, epistomal setae absent; ventro-laterally at fossa for mandibular condyle without process or granulations; pigmented field and rest of cranium with a moderate number of setae. Antenna without articles, tactile papilla of normal, moderate size and shape. Anteclypeus with one small seta at each end of anteclypeal sulcus. Labrum cordiform (fig. 2), armed with a median, transverse row of, altogether, four moderately long setae, and in the concave anterior margin with four moderately long, stiff setae in a transverse row; no paired dark marks. Epipharynx (fig. 2) with a transverse coryphal plate bearing a row of, altogether, four well-developed, somewhat curved, toothlike setae; acroparial setae reduced to one in each anterior corner; acanthoparial setae lacking; chaetoparial setae numerous, short, slightly curved and pointed, arranged in an inwardly convex, long row on each side, reaching from anterior epipharyngeal corner to posterior end of tormae; pedium narrow; tormae and labral rods fused into converging, pointed, flat, elongate triangular features with a globular, dark ball anteriorly on exterior side; crepidal field between tormae occupied by the posterior half of the two rows of chaetoparial setae. *Man-*

dible (figs. 7, 8) apically with a distinct first tooth and a minute second; and subapically with a broad, grinding pseudomola; marginal brush absent; aboral mandibular surface (fig. 8) with a profusion of long, fine, soft setae in a row from under a low, thin-walled, transverse ridge at the base of anterior part of mandible. (Eventually this part, including the long setae, breaks off along a weak line posterior to the ridge.) Maxillary lacinia (fig. 1) about as large as galea; adorally basal padlike region of both lobes set with numerous soft hairs; distal margins of lobes armed with short, pointed setae; lacinia (Lc) overhanging upper surface of hypopharynx (Hphy); inner lacinial margin heavily sclerotized working against the equally heavily sclerotized, enlarged upper end of each lateral hypopharyngeal bar (Su); galea with a single series of strong, cultriform setae on the adoral surface, seated in a furrow parallel with and considerably behind the anterior margin of the lobe; maxillary palpus with three articles; proximal article with one or two setae.

Body-trunk (fig. 4) curved, subcircular in cross section, somewhat thicker behind the middle than anteriorly and posteriorly; prodorsal areas of most segments carrying on either side two or three tubercles each with one straight seta on top (figs. 4, 9); asperities lacking.

Spiracles (figs. 5, 6) circular, simple, without air tubes.

Leg (fig. 3) very short, tibio-tarsus thick and conical; membranous part of pretarsus vestigial; claw tiny, somewhat curved; no arolium.

64. *Caenocara oculata* Say.

Plate 49.

Described material labeled:

- 1) *Caenocara oculata* Say (imago det. by W. S. FISHER), in puffballs, Greenbelt, Md., 28.IX.1941, W. H. ANDERSON coll.
- 2) *Caenocara oculata* Say, ex fresh puffballs, College Park, Md., 21.VII.1942, W. H. ANDERSON coll.
- 3) *Caenocara oculata* Say, in puffball, Falls Church, Va., August 1920.

Size of larva: Small (c. 3 mm.).

Head capsule subcircular, about as long as broad, without frontal lines; pigmented field behind epistoma (fig. 11) present but pale; catapophyses low; epistomal setae absent; without a ventro-lateral process or granulations at the fossa for mandibular condyle; pigmented field (fig. 11) and rest of cranium with a moderate number of setae. Antenna without articles; tactile papilla of normal shape and moderate size. Anteclypeus (fig. 11) with one seta at each end of a sclerotized band in front of anteclypeal sulcus. Labrum (fig. 11) with outline as three quarters of a circle, surface armed medially with a transverse series of, altogether, four moderately long setae; in addition bearing four closely set, stiff setae in a row on the middle of the anterior part of the margin; no paired dark marks. Epipharynx (fig. 13) with a transverse row of, altogether, four well-developed, toothlike coryphal setae and on each side some short acroparial setae; acanthoparial setae lacking; chaetoparial setae short and pointed, in a single, slightly inwardly concave series of about ten setae on each side; pedium rather large; tormae and labral rods fused into converging, posteriorly united, flat, elongate features with a globular projection anteriorly; crepidal field not present. *Mandible* (fig. 18) with two marginally crenulated apical teeth and subapically a broad, long pseudomola; marginal brush absent; aboral mandibular surface with numerous long, straight setae in a row inserted under cover of a low transverse ridge at base of anterior part of mandible. Maxillary lacinia (figs. 10, 14, 15) slightly smaller than galea; both lobes provided adorally with many fine hairs from a soft membranous pad anterior to the bar at the bases of the lobes; distally, margins of lobes armed with stiff short setae (fig. 15); lacinia overhanging upper surface of hypopharynx (fig. 10); inner lacinial margin heavily sclerotized, working against an equally heavy sclerite of hypopharynx (Su) at the entrance to pharynx; the hypopharyngeal sclerite being an element of the enlarged and transformed ends of the lateral hypopharyngeal bars; galea on adoral side (fig. 10) with a series of numerous setae lodged in a transverse convex groove in some distance behind anterior margin of lobe; maxillary palpus with three articles; proximal article with two ventral setae; distal end of stipes with a few more, similar setae.

Body-trunk curved, subcircular in cross-section, thicker some-

what behind middle of trunk than anteriorly and posteriorly; prodorsal areas without asperities; but most of the body segments bear two or three tubercles with a strong seta on top (fig. 12).

Spiracles (figs. 16, 17) circular, simple without air tubes; diameter of thoracic spiracle (fig. 16) about twice as long as diameters of abdominal spiracles (fig. 17).

Leg (figs. 19, 20) very short, thick and conical; segments not distinct; terminally with two long setae; claw vestigial or apparently lacking in some specimens.

65. *Ptilineurus marmoratus* Reitter.

Plate 50.

Described material labeled:

1) *Ptilineurus marmoratus* Reitter, Japan.

Size of larva: Large (c. 11 mm.).

Head capsule (fig. 2) somewhat longer than broad, broadest before the middle, sides convergent behind the middle, without frontal lines; pigmented field behind epistoma not present; epistoma smooth, with numerous long and fine setae densely set in a transverse row in the anterior margin (fig. 2) latero-ventrally at fossa behind ocellus with a longitudinal, narrow, ridged region like a file (fig. 3); cranial surface densely covered with short and long, fine setae, except, posteriorly on each side of epicranial sulcus. Antenna without articles; tactile papilla short and ovate. Anteclypeus (fig. 2) with a considerable number of long, fine setae at each end of anteclypeal sulcus and attached to a narrow, transverse, ribbon-shaped thinly sclerotized plate on posterior anteclypeal margin. Labrum (fig. 2) with semicircular free margin and distally with many short and moderately long setae; no paired dark marks. Epipharynx (fig. 1) with a median patch of about twenty very short, robust, hook-shaped coryphal setae; acroparial and acanthoparial setae forming a continuous fringe of moderately long and long, straight and curved setae; chaetoparial setae mostly long and hairlike covering the whole epipleural surface, except, a narrow pedial sagittal region; tormae and labial rod forming a V-shaped feature; crepidal field without pores. *Mandible* (figs. 4 and 5) apically with two teeth, both low, the first with gouge-shaped edge, the second smaller and sub-

triangular; subapical part of mandible short, almost of same size and shape as second apical tooth; marginal elevation well developed around distinct marginal brush; aboral surface (fig. 4) with a proximal group of about eight fairly short setae and three long distal setae. Maxillary lacinia (fig. 8) much smaller than galea, distally armed with three strong, pointed spines and for the rest provided with many weak, straight setae; galea with strong, cultriform marginal setae and dorsally and ventrally with numerous smaller setae; maxillary palpus with four articles; proximal article with five long ventral setae, next article with one seta and penultimate article with two setae; stipes densely furnished with long setae.

Body-trunk curved, subcircular in cross section, of nearly same thickness throughout. Asperities hook-shaped.

Number of asperities on each side of:

Thoracic segment II	25	} in three or more transverse rows
" " III	25	
Abdominal segment 1	20	
" " 2	25	
" " 3	35	
" " 4	35	
" " 5	35	
" " 6	15		} in two transverse rows
" " 7	12	
" " 8	10	

9th abdominal segment with a patch of very numerous lateral asperities on each side.

10th abdominal segment with about 25 rather fine and only slightly curved asperities.

Spiracles (figs. 6, 7, 7*) annular, without air tube; oval; thoracic spiracle (fig. 6) about twice as long as abdominal spiracles (figs. 7, 7*).

Leg of prothorax (fig. 9) a little stronger than legs of meso- and metathorax (fig. 10); proximal parts of pretarsi of all the thoracic legs approximately as long as their tibio-tarsi, well sclerotized and furnished with a multitude of setae, ovate on prothoracic pretarsus, straight and pointed on meso- and metathoracic pretarsi; claw of prothoracic leg (fig. 9) somewhat curved with forward-turned concavity and about one-fourth as long as

proximal part of pretarsus; claw of a mesothoracic and a metathoracic leg (fig. 10) rather straight and about one-third as long as proximal part; arolium absent.

66. *Ptilinus basalis* Lec.

Plate 50.

Described material labeled:

- 1) *Ptilinus basalis* Lec., in Laurel from Calif., 6.II.1919, Hopk. U. S. #15280 d; reared imago.

Also examined are:

- 2) *Ptilinus ruficornis* Say (imago det. by E. A. SCHWARZ) removed from powder-posted cotton-wood—*Populus deltoides* March., Worthington, Minn. and Menasha, Wisc., 28.VI. 1923, Watten's Paper Co.
- 3) *Ptilinus fuscus* Geoffr. (det. REITTER) bought from Reitter, Paskau, Europe, 1922 (no data).
- 4) *Ptilinus pectinicornis* L., ex Mus. Zool., Copenhagen, Denmark, in exchange from F. MEINERT, 1890 (#146).
- 5) *Ptilinus pectinicornis* L., ex wood of *Populus* sp. from Italy, intercepted 26.I.1948 by M. H. SARTOR; N.Y. #101946; 48—6328. Imago in coll. U.S.N.M.; det. by ARNETT.

Size of larva: Moderately large (c. 7 mm.).

Head capsule widest near the middle, oval posteriorly, somewhat longer than wide, without frontal lines; pigmented field behind epistoma poorly developed; epistoma (fig. 15) with long wavy fine furrows on its entire surface, without setae; latero-ventrally quite smooth (fig. 11) at fossa for mandibular condyle; pigmented field and rest of cranium with many short and fine setae. No ocellus. Antenna (fig. 15) with two articles; tactile papilla ovate and short; cylindrical fossa containing antenna wide, with diameter about as long as sagittal length of epistoma. Anteclypeus (fig. 15) with three small setae at each end of anteclypeal sulcus. Labrum (fig. 15) with free margin approximately semicircular, antero-laterally with a patch of small setae on each side; paired dark marks present at anterior ends of labral rods. Epipharynx (fig. 12) with two pairs of minute coryphal setae and a fringe of fine setae on anterior margin; no acanthoparial setae; chaetoparial setae slender, fairly long, six present on each side in an

inwardly convex single row; tormae well developed forming together with labral rods a pair of Y-shaped features; crepidal field with several (about seven) sensory pores. *Mandible* (fig. 16) apically with a short, obtuse tooth, second apical tooth completely amalgamated with subapical part of mandible into a large, thick wall with convex outline; marginal brush present but short; aboral surface with a single, long seta. Maxillary lacinia (fig. 19) somewhat smaller than galea, distally with several straight, strong setae, adorally (fig. 24) with a longitudinal single series of about seven well-developed setae in margin toward galea; centrally a few long setae; galea with a series of cultriform setae in anterior margin, adorally (fig. 24) with several long setae anteriorly, and an oblique, single series of well-developed setae behind; at base of both lobes another series of similar setae; aborally surfaces (fig. 19) of both lobes with many setae; maxillary palpus with three articles; proximal article ventrally with four setae; stipes with several moderately long setae. Labium (fig. 19) with several fine setae on submentum and mesomentum; prementum with a large, triangular, arrow-shaped, well sclerotized plate posteriorly; distal part and ligula covered with short, strong setae.

Body-trunk (fig. 20) curved; subcircular in cross-section, thoracic segments somewhat thicker than abdominal segments; asperities not hook-shaped but short, conical and minute (figs. 13, 14), present both on most prodorsal areas on lateral areas of ninth abdominal segment and on most of the epipleural areas.

Number of asperities on each side of:

		prodorsal	epipleural
Thoracic segment II	.....	10	none
" "	III	.....	15
Abdominal segment 1	.....	numerous	numerous
" "	2	.....	numerous
" "	3	.....	numerous
" "	4	.....	numerous
" "	5	.....	numerous
" "	6	.....	numerous
" "	7	.....	25
" "	8	.....	20
			none

9th abdominal segment with a patch of numerous lateral asperities on each side.

10th abdominal segment without asperities.

Spiracles (figs. 21, 22, 23) varying from oval to circular, simple, annular, without air tubes; thoracic spiracle (fig. 21) about twice as long as an abdominal spiracle; first abdominal spiracle (fig. 22) a little larger than the rest of the abdominal spiracles (fig. 23).

Leg (figs. 17, 18, 25) regularly built and of normal length; pretarsus with membranous proximal part about as long as broad, armed with a single short, strong seta (fig. 26); claw slender, pointed, very slightly curved, about one-third as long as tibio-tarsus; no arolium.

Note: The larvae of

66. *Ptilinus pectinicornis* L,

66. *Ptilinus ruficornis* Say, and

66. *Ptilinus fuscus* Geoff. are not specifically separable from

66. *Ptilinus basalis* Lec.

Explanation of Plates.

All figures pertain to mature anobiid larvae.

Agathidium uliginosum Perkins.

Spines (figs. 21, 22, 23) varying from oval to elongate, simple, pointed, without an apical tubercle (fig. 21) about twice as long as an abdominal spiracle. Spine (fig. 22) = 1/20th longer than the rest of the abdominal spiracles (fig. 23).

Leg (figs. 17, 18, 20) regularly built and of normal length, pretarsus with membranous distal part which is long and broad, armed with a single short, strong claw (fig. 20); claw slender, pointed, very slightly curved, about 1/10th as long as the tarsus, no unguitractor.

Note: The larva of

1. *Phylloxera* *pedunculata* ?

2. *Phylloxera* *sp.*

PLATE 1

External structures of the body of an anobiid larva.
(Xyletobius walsinghami Perkins).

1. Larva of *Xyletobius walsinghami* Perkins.



Xyletobius walsinghami Perkins.

PLATE 2

Fig. 1. Structures of head with ventral appendages removed;
posterior view.

Anap	anapophysis
Cat	catapophysis
Ephy	epipharynx
EpicrR	epicranial ridge
Hst	hypostoma
Oc	occiput
Poc	postocciput
PoR	postoccipital apophysis
pos	postoccipital sulcus
pt	pit of posterior tentorial arm
Smt	submentum
Tnt	tentorial bridge
Torma	torma
Vx	vertex

Fig. 2. Facial frame around the anterior cranial foramen.

Anap	anapophysis
Ant	antenna
Cat	catapophysis
Est	epistoma
Hst	hypostoma
O	ocellus
Pst	pleurostoma
scn	internal canal of epistomal seta

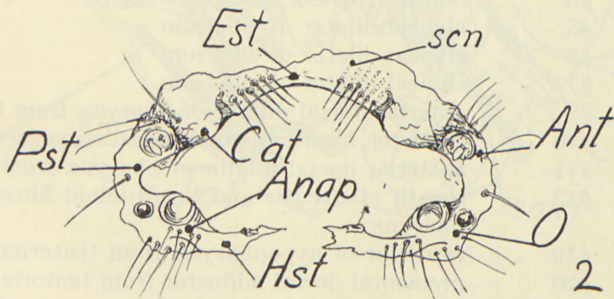
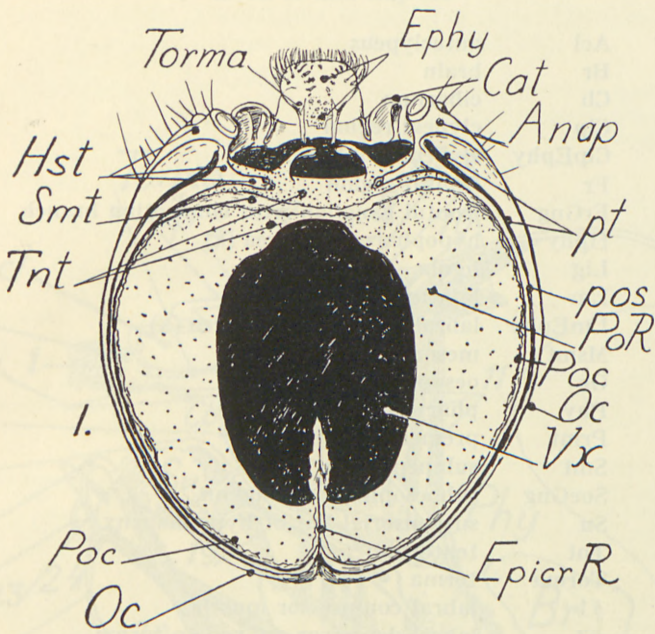


PLATE 3

Section of head showing muscles and structural details. View from inside of right half of head.

Acl	anteclypeus
Br	brain
Cb	cibarium
Clp	clypeal region
ClpEphy	clypeal epipharynx
Fr	frontal region
FrGng	frontal ganglion with connecting branch
Hphy	hypopharyngeal area (x)
Lig	ligula
Lm	labrum
LmEphy	labral epipharyngeal area (x)
Msm	mesomentum
Oe	oesophagus
Phy	pharynx
Prmt	prementum
Smt	submentum
SoeGng	suboesophageal ganglion
Su	suspensorial bar of hypopharynx
Tnt	tentorium
Torma	torma
#1	labral compressor muscle
#3	labral depressor adfixed to torma
#5	clypeal dilator of cibarium
#6	clypeal dilator of cibarium
#7	clypeal dilator of cibarium
#9	anterior dorsal dilator of pharynx from frons
#10	retractor from hypopharyngeal suspensorial bar
#11	posterior dorsal dilator of pharynx from frons
#12	sheath of circular and longitudinal fibers of pharynx
#19	retractor of hypopharynx from tentorium
#20	premental dorsal adductor from tentorium
#21	premental ventral adductor from tentorium
#22	mesomenta ventral median retractor from posterior margin of submentum
#23	levator of labial palpus
#24	depressor of labial palpus
#30	ventral dilator of pharynx from tentorium
#31	lateral dilator of pharynx from parietale

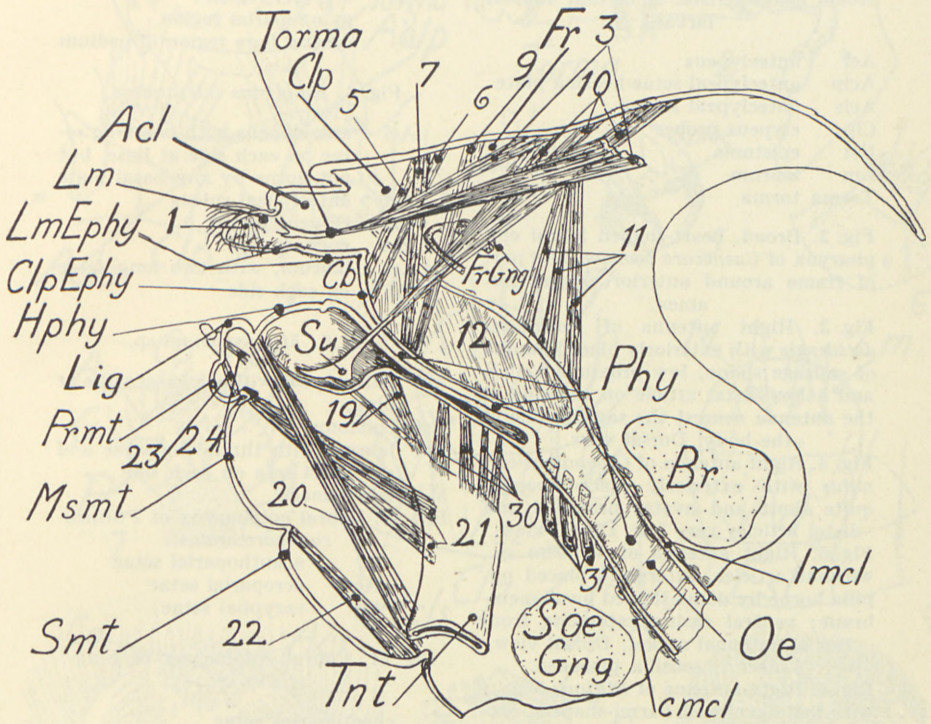


PLATE 4

Examples of epistoma, anteclypeus and labrum, labral epipharynx and antenna as developed in various species.

Fig. 1. Diagram illustrating the type of labral and anteclypeal parts and epistoma characteristic of certain anobiid larvae.

Acl anteclypeus
Aclp anteclypeal setae-bearing plate
Acls anteclypeal sulcus
Clp clypeus proper
Est epistoma
Lm labrum
Torma torma

Fig. 2. Broad, heart-shaped labral epipharynx of *Caenocara bovistae*, and part of frame around anterior cranial foramen.

Fig. 3. Right antenna of *Dorcatoma dresdensis* with exteriorly placed papilla of sausage shape; low proximal article and a low distal article on the side of the antenna nearest the sagittal line of the body. Dorsal view.

Fig. 4. Right antenna of *Ozognathus cornutus* with exteriorly placed papilla quite short and ovate; proximal and distal articles very low. Dorsal view.

Fig. 5. Right antenna of *Vrilletta* sp., without articles, externally placed papilla borne by dome-shaped basal membrane; ventral casing extending from rim of antennal socket. Dorsal view.
S.plac sensilla placodea.

Fig. 6. Right antenna of *Ptilinus basalis* with well-developed, barrel-shaped proximal article and low but distinct distal article inserted internally on top of proximal article; short and fine antennal muscle fibers originate from wall of cranium. Dorsal view.

Fig. 7. Labral epipharynx of *Cryptorama minutum*; torma simple not combined with labral rod.

A marginal acanthoparial region
Acr acroparial region

C chaetoparial region
Co corypha
Cri crepidal region
G gymnoparial region
P central bare region of pedium

Fig. 8. *Eutylistus intermedius*.

Acl anteclypeus with two long setae on each side at base, but not borne by any basal plate
Acls anteclypeal sulcus
Clp clypeus proper
Est epistoma
Lm labrum, with two long setae on each side

Fig. 9. *Microanobium* sp.

Acl anteclypeus without basal setae or plate
Est epistoma
Lm labrum with three long setae and one short seta on each side
M labral mark

Fig. 10. Labral epipharynx of *Ptilineurus marmoratus*.

A acanthoparial setae
Acr acroparial setae
Co coryphal setae

Fig. 11. Labral epipharynx of *Eutylistus* sp.

C chaetoparial setae
Co heavily sclerotized coryphal plate bearing, altogether, four strong toothlike setae
Cri crepidal region
G gymnoparial region
P pedium

Fig. 12. Labral epipharynx of *Nicobium castaneum*, sub-circular in outline, entire surface covered with long setae.

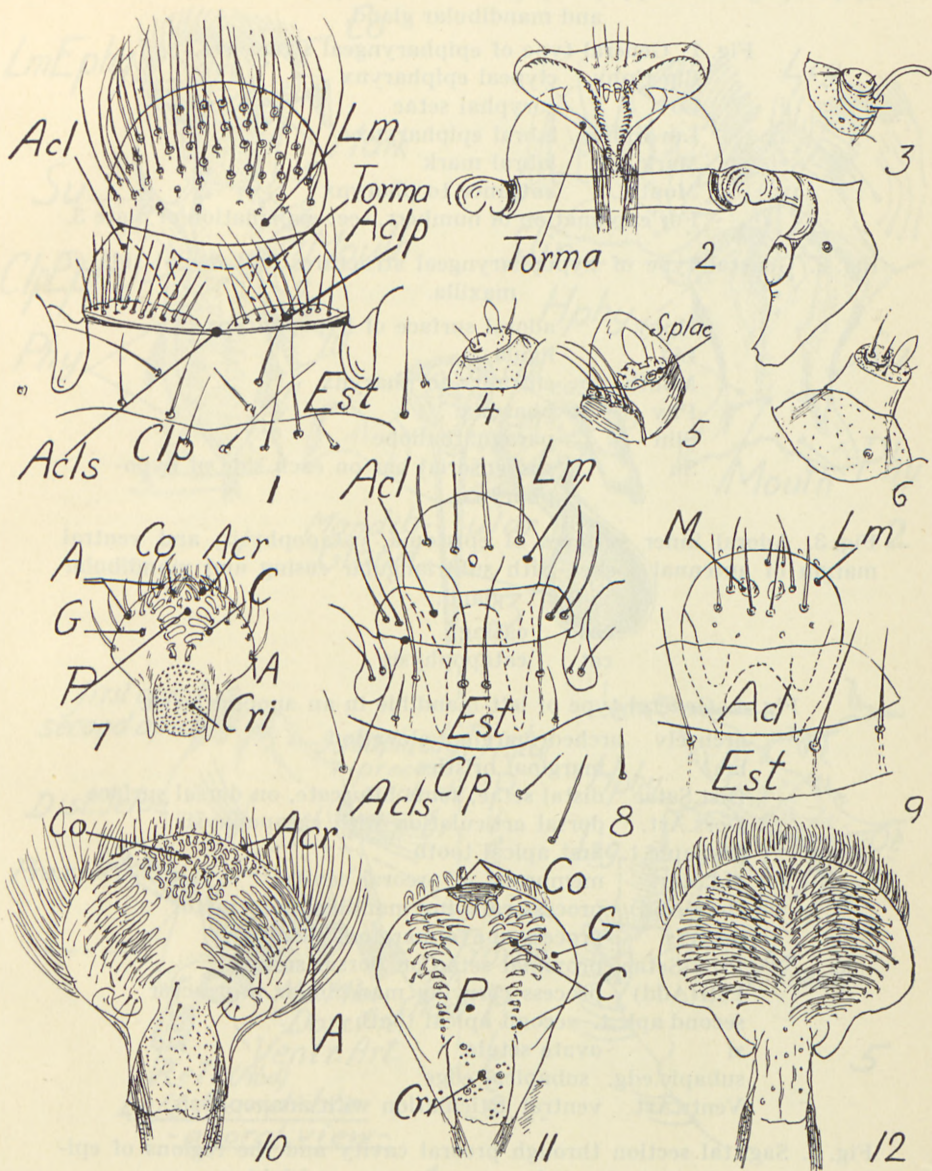


PLATE 5

Epipharyngeal and hypopharyngeal structures, preoral cavity, mandible and mandibular gland.

Fig. 1. General type of epipharyngeal structures.

Clp-Ephy	clypeal epipharynx
Co	coryphal setae
Lm-Ephy	labral epipharynx
Mark	labral mark
Mouth	entrance to pharynx

For explanation of numbers, see: explanation of plate 3.

Fig. 2. General type of hypopharyngeal structures and dorsal side of maxilla.

Hphy	adoral surface of hypopharynx
Lig	ligula
Mouth	entrance to pharynx
Phy	pharynx
Slin	paragnathalobe
Su	suspensorial bar on each side of hypopharynx

Fig. 3. Adoral inner surfaces of epistoma, catapophysis, and ventral margin of antennal socket with subtriangular casing and mandibular gland.

cas	casing
cat	catapophysis

Fig. 4. General type of left mandible in an anobiid larva.

arch elv	arched marginal elevation
br	marginal bristles
Dist.Setae	distal setae, some bifurcate, on dorsal surface
Dors.Art.	dorsal articulation with catapophysis
first apic.t.	first apical tooth
Md.Mbr.	membrane of preoral cavity
Retr(Abd)	process carrying mandibular retractor
process	process above marginal elevation
Prox-Setae	proximal setae on dorsal surface
Prtr(Add)	process carrying mandibular protractor
second apic.t.	second apical tooth
sl	ovate setula
subapic.edg.	subapical edge
Ventr.Art	ventral articulation with anapophysis

Fig. 5. Sagittal section through preoral cavity and the regions of epipharynx, hypopharynx, pharynx and labium.

Hphy	hypopharynx
Lig	ligula
Mouth	entrance to pharynx
Phy	pharynx
Oe	oesophagus

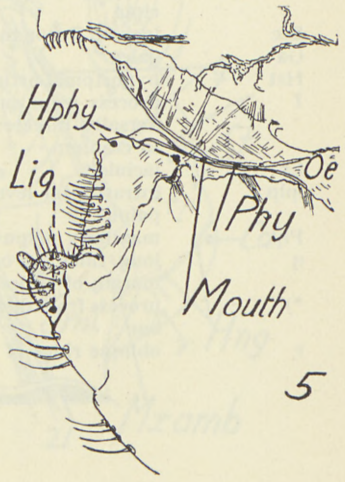
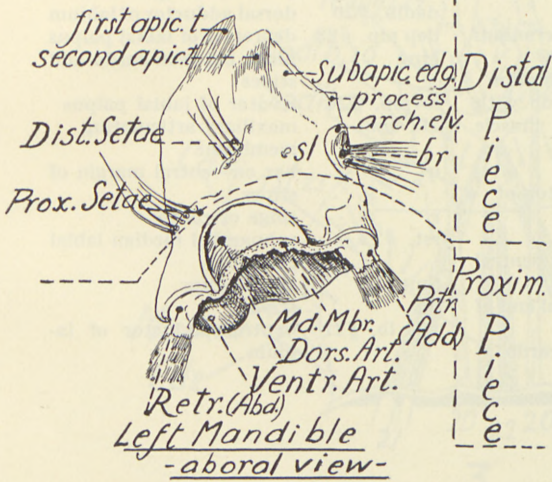
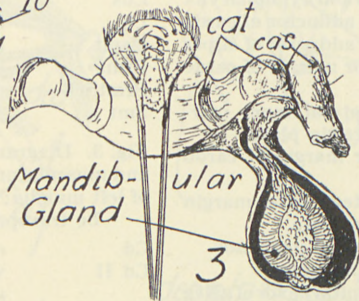
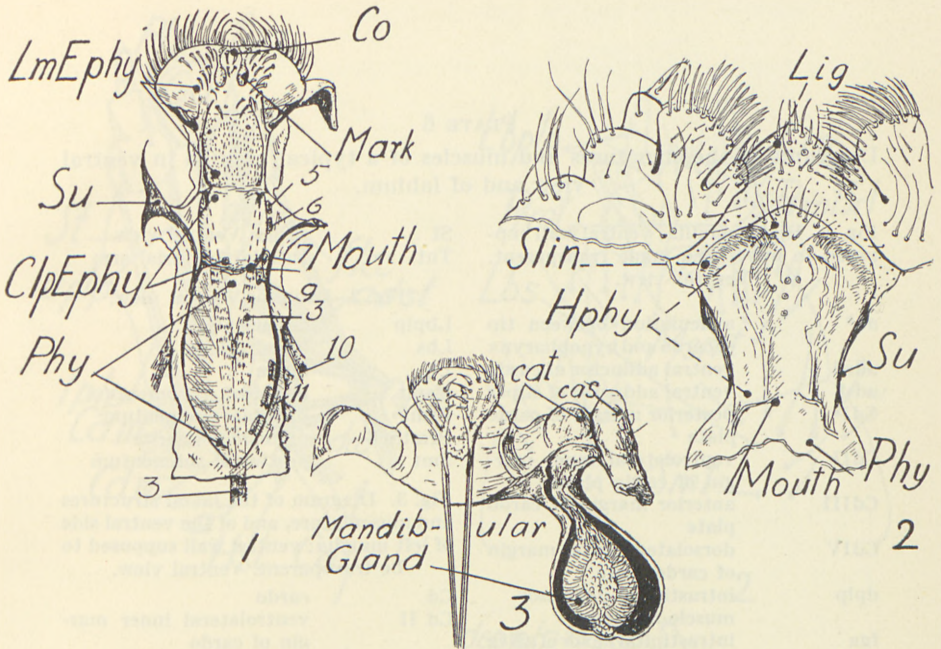


PLATE 6

Diagrams of the structures and muscles of a typical maxilla in ventral view and of labium.

Fig. 1. Right maxilla; ventral wall supposed to have been made transparent. Ventral view.

a**	articulation between tip of cardo and hypopharynx
aded	ventral adductor of cardo
adst	ventral adductor of stipes
CdI	posterior margin of cardo plate
CdII	ventrolateral inner margin of cardo plate
CdIII	anterior margin of cardo plate
CdIV	dorsolateral outer margin of cardo plate
dplp	inrastipital depressor muscle of palpus
fga	inrastipital flexor of galea
fles	inrastipital flexor of lacinia
flec	lacinial flexor to cranium
Ga	galea
Hst	hypostomal articulation
I	process from cardo with dorsally directed muscle to cranium
Lc	lacinia
lplp	inrastipital levator of palpus
Plp	maxillary palpus
q	long, thick bar on ventral margin of stipes
*)	process from distal end of bar
r	oblique ridge of cardo

St stipes. Ventral view
Tnt anterior tentorial arm

Fig. 2. Labium. Ventral view.

Lbplp	labial palpus
Lbs	labial sulcus
Lig	ligula
Msmt	prelabial mesomentum
Prmt	prelabial prementum
PrmtScl	premental sclerite
Smt	postlabial submentum

Fig. 3. Diagram of the labial structures and musculature, and of the ventral side of left maxilla; ventral wall supposed to be transparent. Ventral view.

Cd	cardo
Cd II	ventrolateral inner margin of cardo
Cd III	anterior margin of cardo
dadlb, #20	dorsal adductor of labium
dep plp, #23	depressor of labial palpus
Hng	hinge between cardo and stipes
levplp, #24	levator of labial palpus
Mx amb	maxillary articulating membrane
q	bar on ventral margin of stipes
r	ridge of cardo
rst, #22	subparallel median labial retractors
Smt	submentum
St	stipes
vad lb, #21	ventral adductor of labium

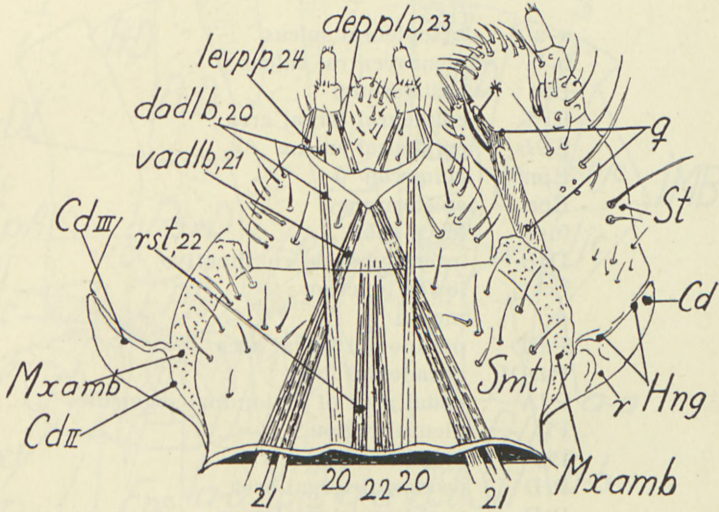
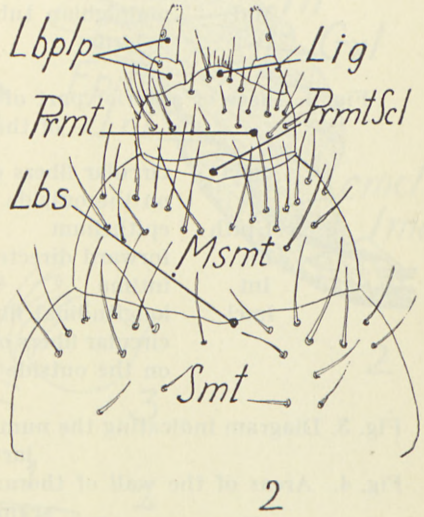
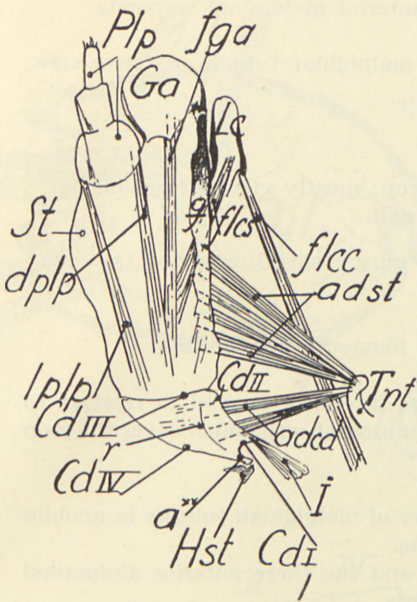


PLATE 7

Structures of the pyloric region with malpighian tubules; the crop; areas of thorax and the three anterior abdominal segments.

Fig. 1. Piece of pylorus with bases of malpighian tubules; exterior view.

Mal	malpighian tubule
Pyl	pylorus

Fig. 2. Piece of anterior part of crop; mostly viewed from inside of the wall.

cmcl	circular fibers of muscle sheath covering the crop on the outside
Epith	epithelium
Fil	forward directed filaments from intima
Int	intima
lmcl	longitudinal fibers interiorly located in relation to circular fibers of muscle sheath which cover the crop on the outside

Fig. 3. Diagram indicating the number of malpighian tubules in anobiid larvae.

Fig. 4. Areas of the wall of thorax and the three anterior abdominal segments.

a-a	dorsopleural sulcus
b-b	pleuroventral sulcus
BSt	basisternum
EPI	epipleural tergal area
EPIs	epipleural sulcus
Epm	epimeron
Eps	episternum
furc	furca spot
IMB	intersegmental conjunctiva
lje	lower junction
m	meron
ParD	paradorsal tergal area
ParDL	paradorsal line
PdA	pedal area of abdominal segment
Pl	pleural region
Pls	pleural sulcus
PrD	prodorsal tergal area
Psd	postdorsal tergal area
Scx'	anterior subcoxal lobe
Scx''	posterior subcoxal lobe
Sp	spiracle
SpA	spiracular area
Ss	spina spot
Stl	sternellar area
ujc	upper junction

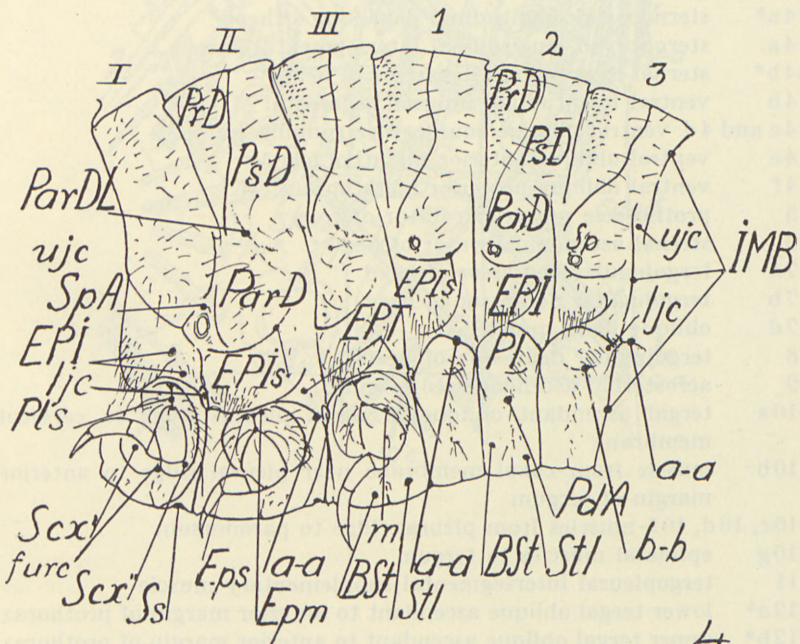
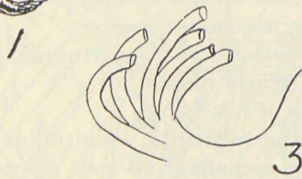
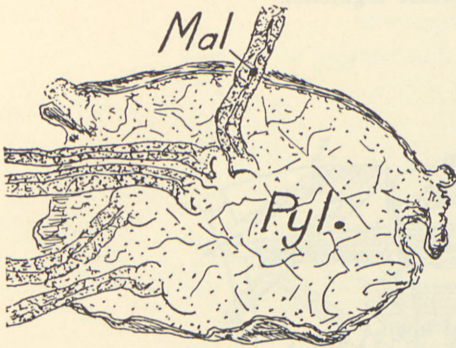


PLATE 8

Diagram of the ventral musculature and the musculature of the right half of the thoracic segments.

a-a	dorsopleural sulcus
Li	ligament
ljc	lower junction
m	meron
sagit	sagittal midline of sternum
Spin	spina spot
Stco	sternocostal line
I	prothorax
II	mesothorax
III	metathorax
#1*	tergal horizontal levator of head
#1**	tergal oblique ascendant muscle
#1a	internal segmental dorsal longitudinal muscle
#1b	paradorsal thoracic muscle
#2*	tergal rotator of head
#2	internal oblique segmental longitudinal dorsal M.
#3*	tergal oblique ascendant to roof of prothorax
#3 and 3'	external sectional dorsal muscles
#4a*	sternocostal longitudinal depressor of head
#4a	sternocostal longitudinal intersegmental muscle
#4b*	sternal longitudinal depressor of head
#4b	ventral longitudinal internal segmental M.
#4c and 4d	ventral oblique counterwise running spina M.
#4e	ventral oblique anterior metathoracic M.
#4f	ventral oblique posterior metathoracic M.
#5	prothoracic posterior rotator of coxa
#6	sternal ascendant levator of head
#7a	tergojugular depressor of head
#7b	tergojugular depressor of head
#7d	oblique flank muscle
#8	tergojugular depressor of head
#9	acrosternal ascendants to tergum
#10a	tergal ascendant oblique M. from pleural ridge to cervical membrane
#10b	muscle from coxal membrane near pleural ridge to anterior margin of tergum
#10c, 10d, 10f	muscles from pleural ridge to paradorsum
#10g	epimeral muscles to tergum
#11	tergopleural intersegmental supplementary muscle
#12a*	lower tergal oblique ascendant to anterior margin of prothorax
#12b*	upper tergal oblique ascendant to anterior margin of prothorax
#12a, 12b	oblique flank muscles in meso- and metathorax
#12c	thoracic conjunctival muscle
#13	epipleural fan-shaped bundle of muscle fibers

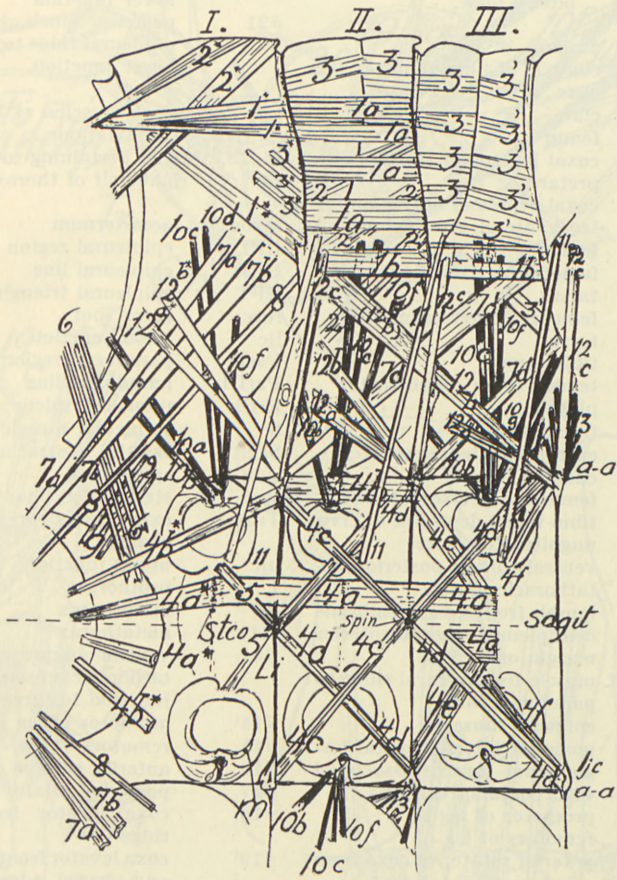


PLATE 9

Diagrams of the musculature of the legs.

Fig. 1. Typical muscles of the third leg; lateral view.

Ar	arolium
c	condyle of pleural ridge
Cox	coxa
Dac	claw
Fm	femur
O	coxal levator of trochanter
Ptar	pretarsus
Q	coxal depressor of trochanter
R	trochanteral reductor of femur
S	femoral levator of tibio-tarsus
T	femoral depressor of tibio-tarsus
Tb-Ta	tibio-tarsus
Tend	tendon from unguittractor plate
Tr	trochanter
Trm	extracoxal depressor of trochanter
U ^{1, 2}	femoral depressor of claw
U ^{3, 4}	tibio-tarsal depressor of claw
Untr	unguittractor plate
#4f	ventral oblique posterior metathoracic muscle
#10b	muscle from coxal membrane near pleural ridge to anterior margin of tergum
#10c, d, f	muscle from pleural ridge to paradorsal line
#10g	epimeral muscles
#11	posterior intersegmental tergo-pleural muscle associated with conjunctival M.
#14	promotor of leg
#15, 15'	remotors of leg
#16	anterior rotator of coxa from spina spot
#17	posterior rotator of coxa
#18	levator of coxa from pleural ridge
#19	levator of coxa from episternum and pleural ridge
#20	anterior anchoring muscle of

pleural ridge to preceding lower junction
 posterior anchoring muscle of pleural ridge to succeeding lower junction

Fig. 2. Typical muscles of leg. Dorsal view. (Abbreviations as of fig. 1).

Fig. 3. Muscles pertaining to the legs of right half of thorax.

#21	acrosternum
	EPI epipleural region
	EPIs epipleural line
	EPT epipleural triangle
	furc furca spot
	ljc lower junction
	ParD paradorsal region
	ParDL paradorsal line
	PrDs prodorsal sulcus
	S spiracular muscle
	Sagitt sagittal ventral midline
	spin spina spot
	stco sternocoxal line
	Trm extracoxal depressor of trochanter
	ujc upper junction
	I prothorax
	II mesothorax
	III metathorax
#4f	ventral oblique posterior metathoracic muscle from lower junction to furca spot
#14	promotor of leg
#15	remotors of leg
#16	anterior rotator of coxa
#17	posterior rotator of coxa
#18	coxa levator from pleural ridge
#19	coxa levator from episternum and pleural ridge
#20	anterior anchoring muscle of pleural ridge to preceding lower junction
#21	posterior anchoring muscle of pleural ridge to succeeding lower junction

PLATE 10

Diagram showing typical areas, sulci and musculature of right side of second, third and fourth abdominal segments. Inner view.

a—a	dorsopleural sulcus
ASts	anterior sternal sulcus
b—b	pleuroventral sulcus
EPI	epipleural tergal area
EPIs	epipleural sulcus
EPT	epipleural triangle
ljc	lower junction
ParD	paradorsal tergal area
ParDl	paradorsal upper boundary
PrDs	prodorsal sulcus
PSts	posterior sternal sulcus
S	spiracular muscle
SpA	spiracular tergal area
ujc	upper junction
2	second abdominal segment
3	third abdominal segment
4	fourth abdominal segment
#A1a	dorsal longitudinal internal segmental muscle
#A1b	longitudinal paradorsal muscle
#A2	dorsal oblique internal segmental muscles
#A3	prodorsal external muscles
#A3'	postdorsal external muscles
#A4a	ventral longitudinal intersegmental internal muscles
#A4b	ventral longitudinal segmental internal muscles
#A4g	ventral longitudinal external muscles
#A7a and #A7b	tergopleural oblique muscles supplemental to conjunctival muscle #A12
#A7c and #A7d	oblique counterwise running flank muscles
#A10	tergopleural muscles from middle of dorsopleural sulcus to paradorsal imaginary boundary line
#A12	abdominal conjunctival muscle
#A13a	posterior epipleural fan-shaped bundle of muscle fibers
#A13bb	muscle between pleuroventral sulcus and epipleural sulcus
#A13c	anterior epipleural fan-shaped bundle of muscle fibers

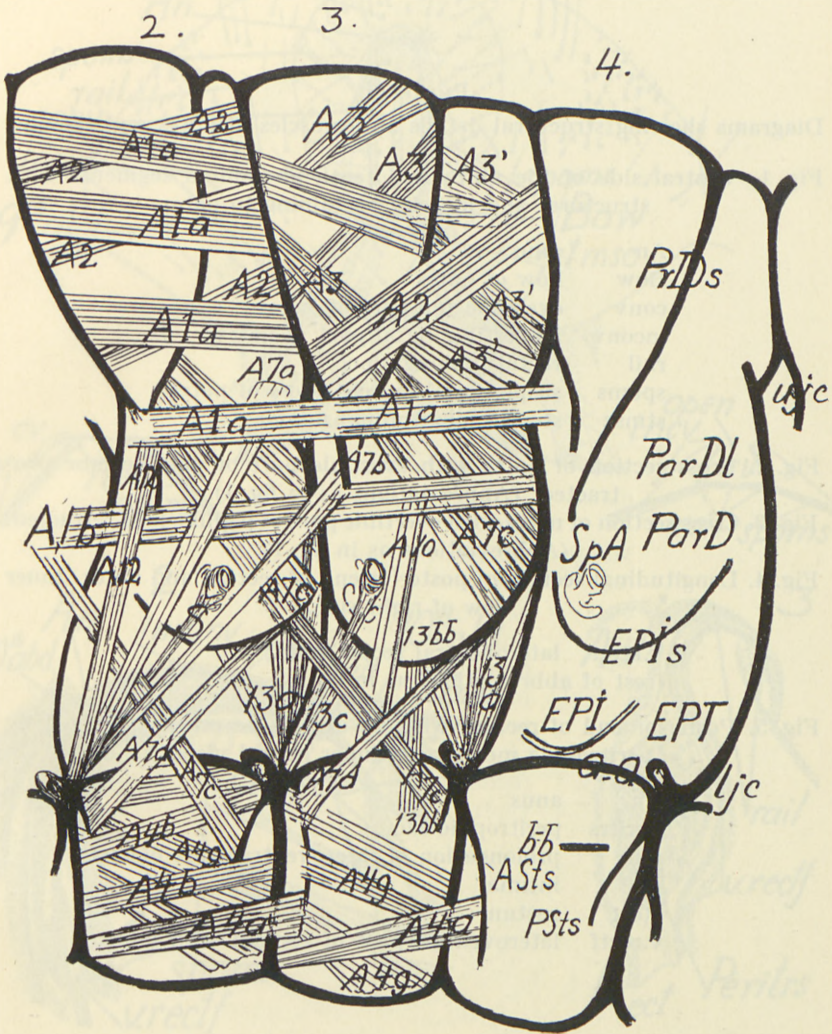


PLATE 11

Diagrams showing structural details and muscles of nates and rectum.

Fig. 1. Ventral side of the ninth and tenth abdominal segments with structures and muscles pertaining to nates.

An	anus
Bow	bow of nates
conv	evertible top-part of nates
inconv	inevertible basal part of nates
rail	rectal prolongation
spoms	suspensorial muscle fibers of nates
stmsc	sternal longitudinal muscles

Fig. 2. Cross section of nates with evertible part of padlike lobe protracted. (Abbreviations as in fig. 1).

Fig. 3. Cross section of nates with evertible part of padlike lobe retracted. (Abbreviations as in fig. 1).

Fig. 4. Longitudinal section of posterior end of rectum and nates. Inner view of right side.

v.rectf	lateroventral rectal fold (rest of abbreviations as in fig. 1)
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Fig. 5. Posterior end of rectum with an excrement mass enveloped by peritrophic membrane. Inner lateral view.

An	anus
Peritrs	peritrophic sac
rail	prolongation of lateroventral part of rectal intima
Rect	rectum
v.rectf	lateroventral part of rectum with fold

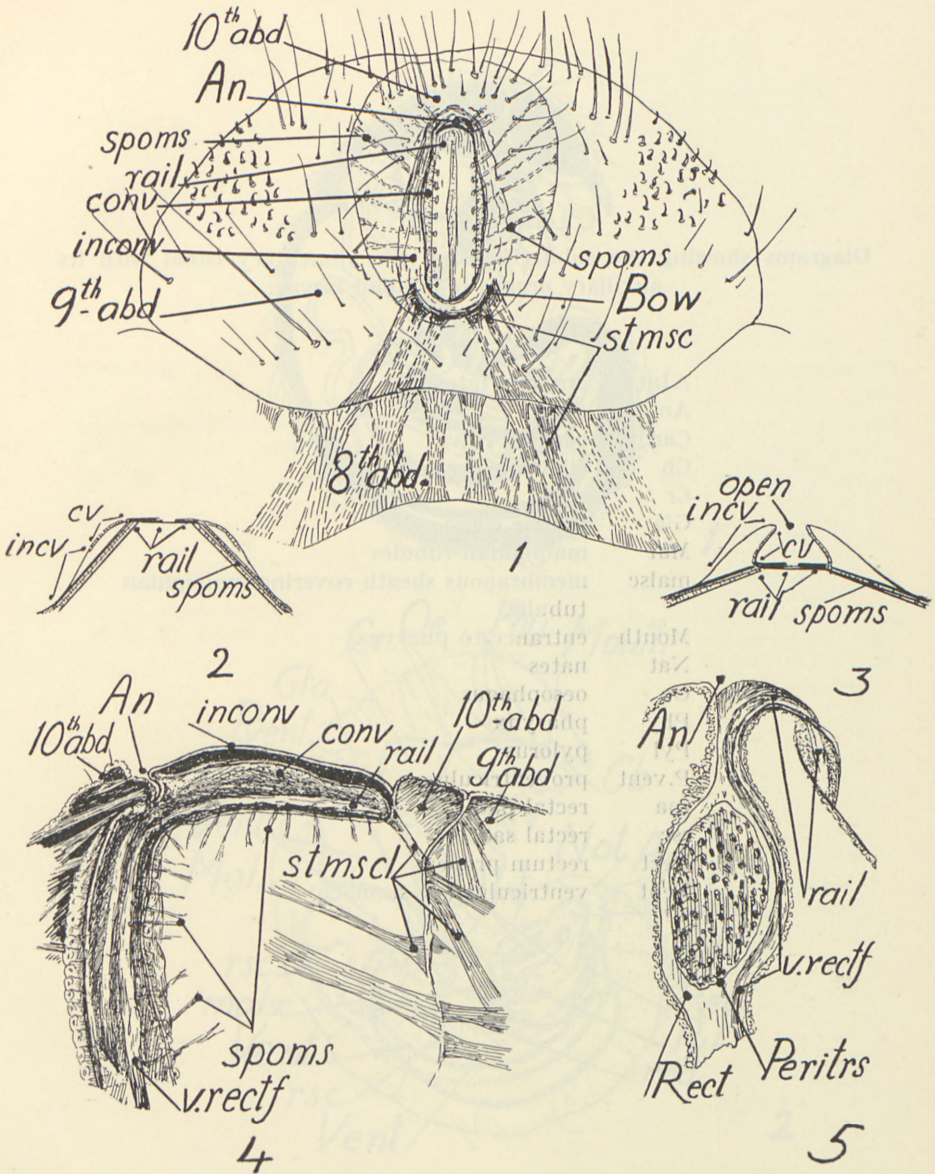
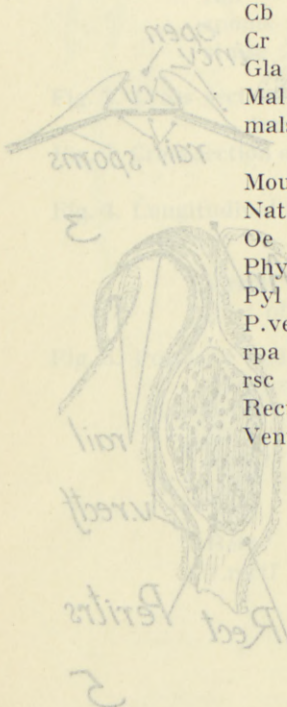


PLATE 12

Diagrams showing the subdivisions of the alimentary canal with its auxiliary organs in anobiid larvae.

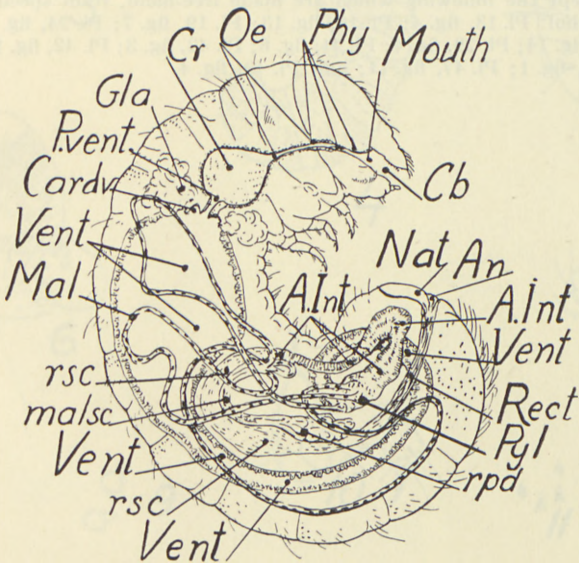
Figs. 1 and 2.

AInt	anterior intestine
An	anus
Cardv	cardiac valve
Cb	cibarium, preoral cavity
Cr	crop
Gla	gastric coeca
Mal	malpighian tubules
malsc	membranous sheath covering malpighian tubules
Mouth	entrance to pharynx
Nat	nates
Oe	oesophagus
Phy	pharynx
Pyl	pylorus
P.vent	proventriculus
rpa	rectal pad
rsc	rectal sac
Rect	rectum proper
Vent	ventriculus (= stomach)





1

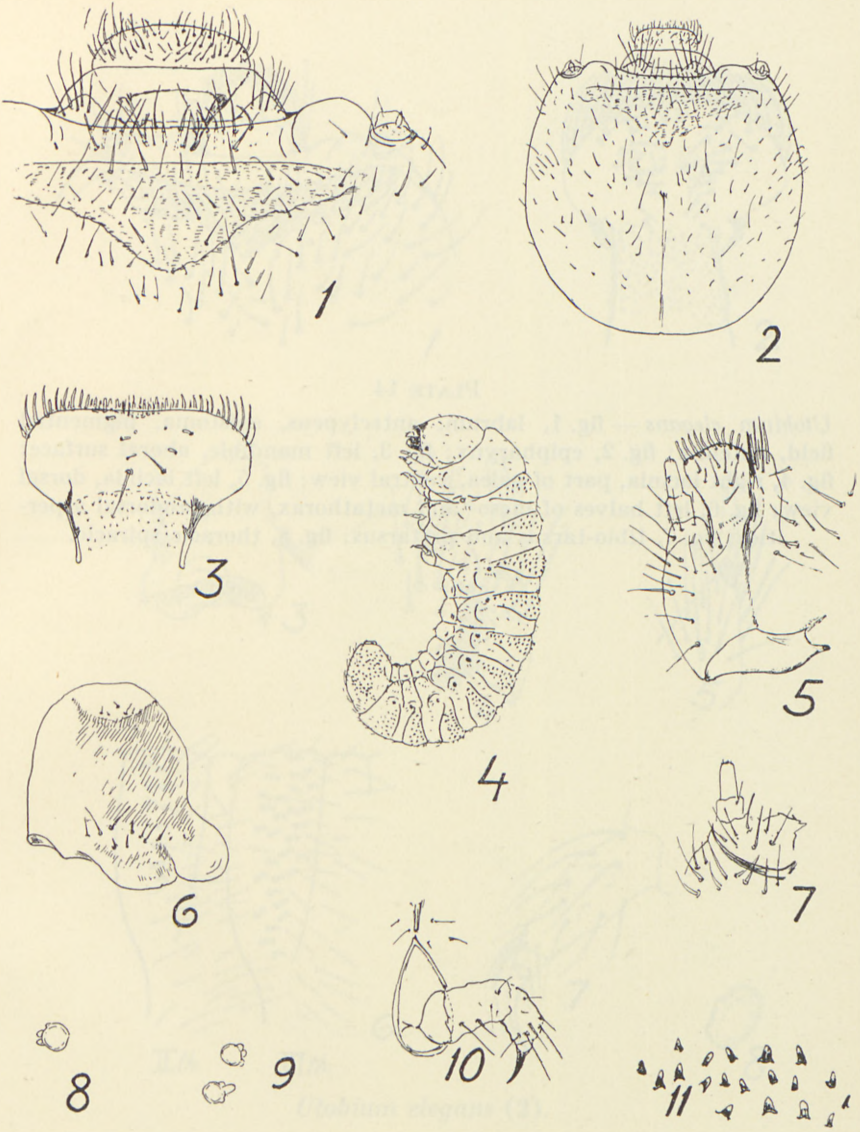


2

PLATE 13¹

Catorama gracilis — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, cranium, dorsal view; fig. 3, epipharynx; fig. 4, larva, left side; fig. 5, right maxilla, ventral view; fig. 6, right mandible, aboral surface; fig. 7, right half of prelabium, ventral view; fig. 8, thoracic spiracle; fig. 9, two abdominal spiracles; fig. 10, leg; fig. 11, asperities.

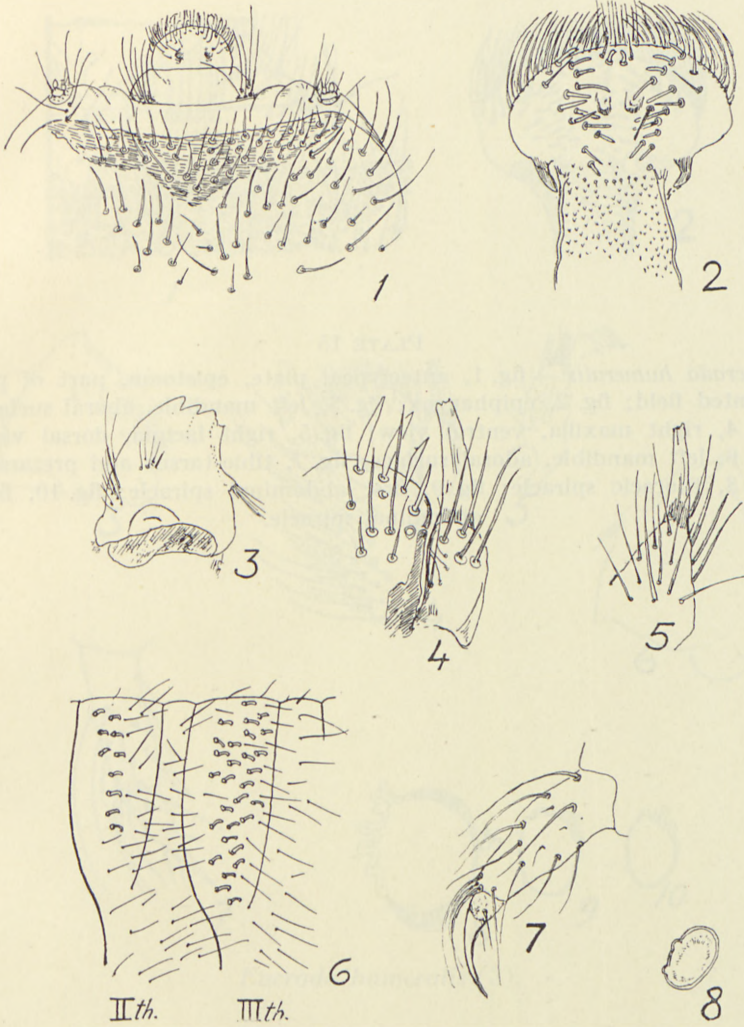
¹ All figures on plate 13 to 50 are drawn with camera lucida from structures on slides, except the following which are made free-hand, from specimens preserved in alcohol: Pl. 13, fig. 4; Pl. 18, fig. 13; Pl. 19, fig. 7; Pl. 24, fig. 1; Pl. 26, fig. 8; Pl. 26, fig. 14; Pl. 29, fig. 4; Pl. 41, fig. 6; Pl. 42, fig. 3; Pl. 42, fig. 16; Pl. 44, fig. 10; Pl. 46, fig. 1; Pl. 47, fig. 11; and Pl. 49, fig. 4.



Catorama gracilis (1).

PLATE 14

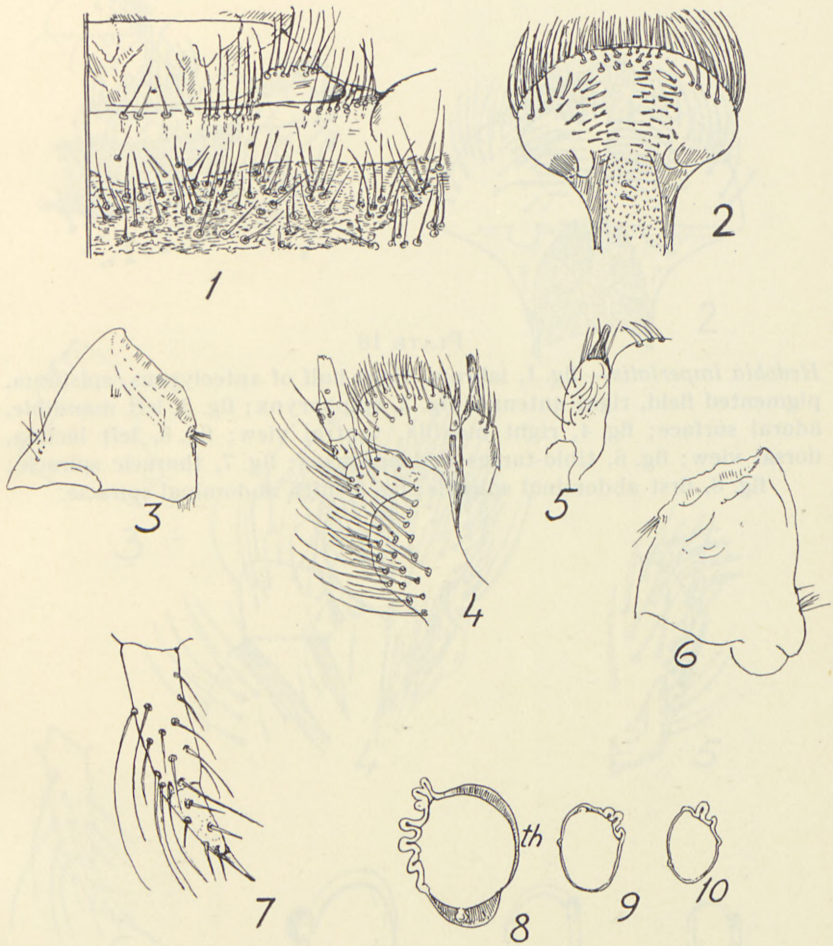
Utobium elegans — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, right lacinia, part of galea, ventral view; fig. 5, left lacinia, dorsal view; fig. 6, left halves of meso- and metathorax, with prodorsal asperities; fig. 7, tibio-tarsus and pretarsus; fig. 8, thoracic spiracle.



Utobium elegans (2).

PLATE 15

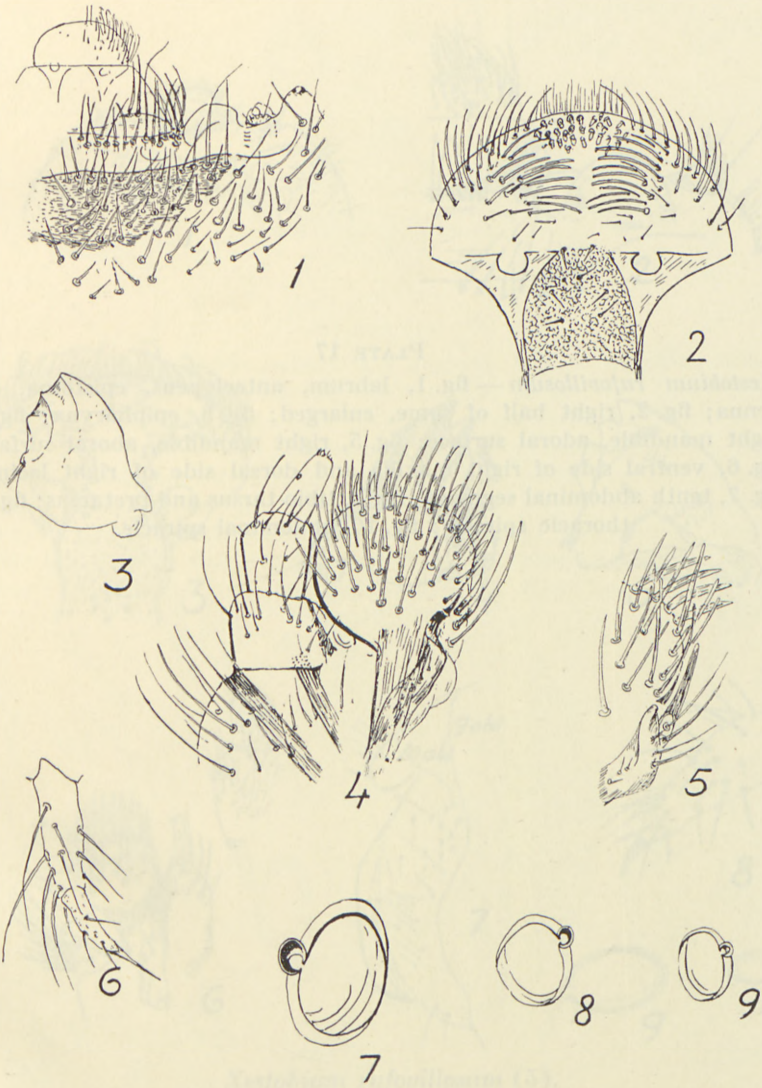
Eucrada humeralis — fig. 1, anteclypeal plate, epistoma, part of pigmented field; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, right maxilla, ventral view; fig. 5, right lacinia, dorsal view; fig. 6, left mandible, adoral surface; fig. 7, tibio-tarsus and pretarsus; fig. 8, thoracic spiracle; fig. 9, first abdominal spiracle; fig. 10, fifth abdominal spiracle.



Eucrada humeralis (3).

PLATE 16

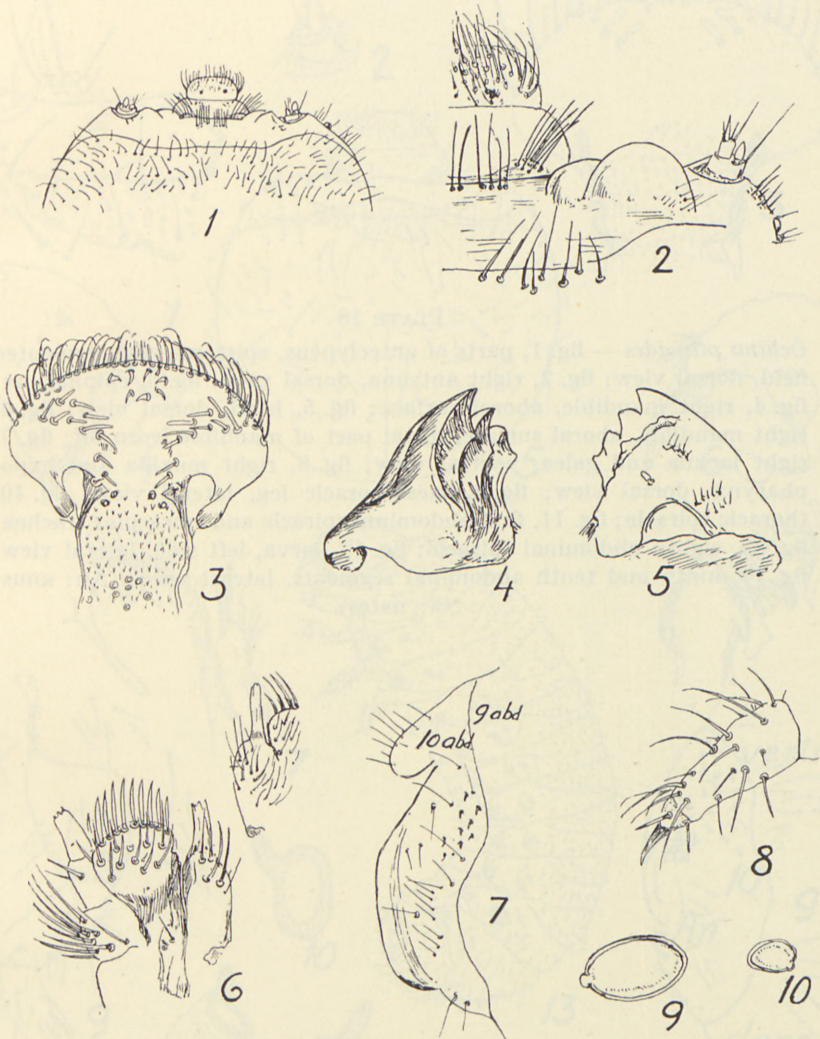
Hedobia imperialis—fig. 1, labrum, right half of anteclypeus, epistoma, pigmented field, right antenna; fig. 2, epipharynx; fig. 3, left mandible, adoral surface; fig. 4, right maxilla, ventral view; fig. 5, left lacinia, dorsal view; fig. 6, tibio-tarsus and pretarsus; fig. 7, thoracic spiracle; fig. 8, first abdominal spiracle; fig. 9, fifth abdominal spiracle.



Hedobia imperialis (4).

PLATE 17

Xestobium rufovillosum — fig. 1, labrum, anteclypeus, epistoma, antenna; fig. 2, right half of same, enlarged; fig. 3, epipharynx; fig. 4, right mandible, adoral surface; fig. 5, right mandible, aboral surface; fig. 6, ventral side of right maxilla and dorsal side of right lacinia; fig. 7, tenth abdominal segment; fig. 8, tibio-tarsus and pretarsus; fig. 9, thoracic spiracle; fig. 10, abdominal spiracle.

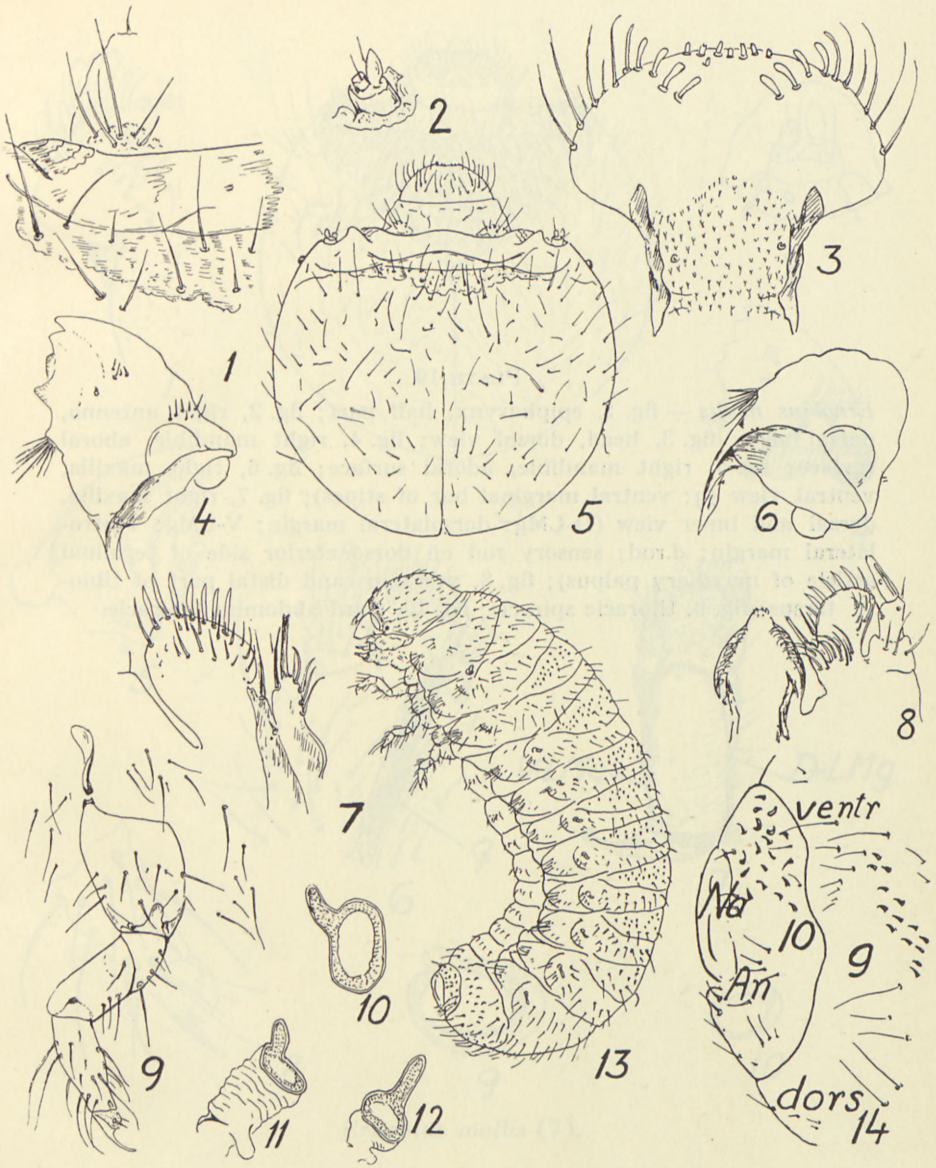


Xestobium rufovillosum (5).

PLATE 18

Ochina plinoides — fig. 1, parts of anteclypeus, epistoma and pigmented field, dorsal view; fig. 2, right antenna, dorsal view; fig. 3, epipharynx; fig. 4, right mandible, aboral surface; fig. 5, head, dorsal view; fig. 6, right mandible, aboral surface, distal part of mandible worn off; fig. 7, right lacinia and galea, ventral view; fig. 8, right maxilla and hypopharynx, dorsal view; fig. 9, mesothoracic leg, lateral view; fig. 10, thoracic spiracle; fig. 11, first abdominal spiracle and spiracular trachea; fig. 12, eighth abdominal spiracle; fig. 13, larva, left side, lateral view; fig. 14, ninth and tenth abdominal segments, lateral view; (An: anus;

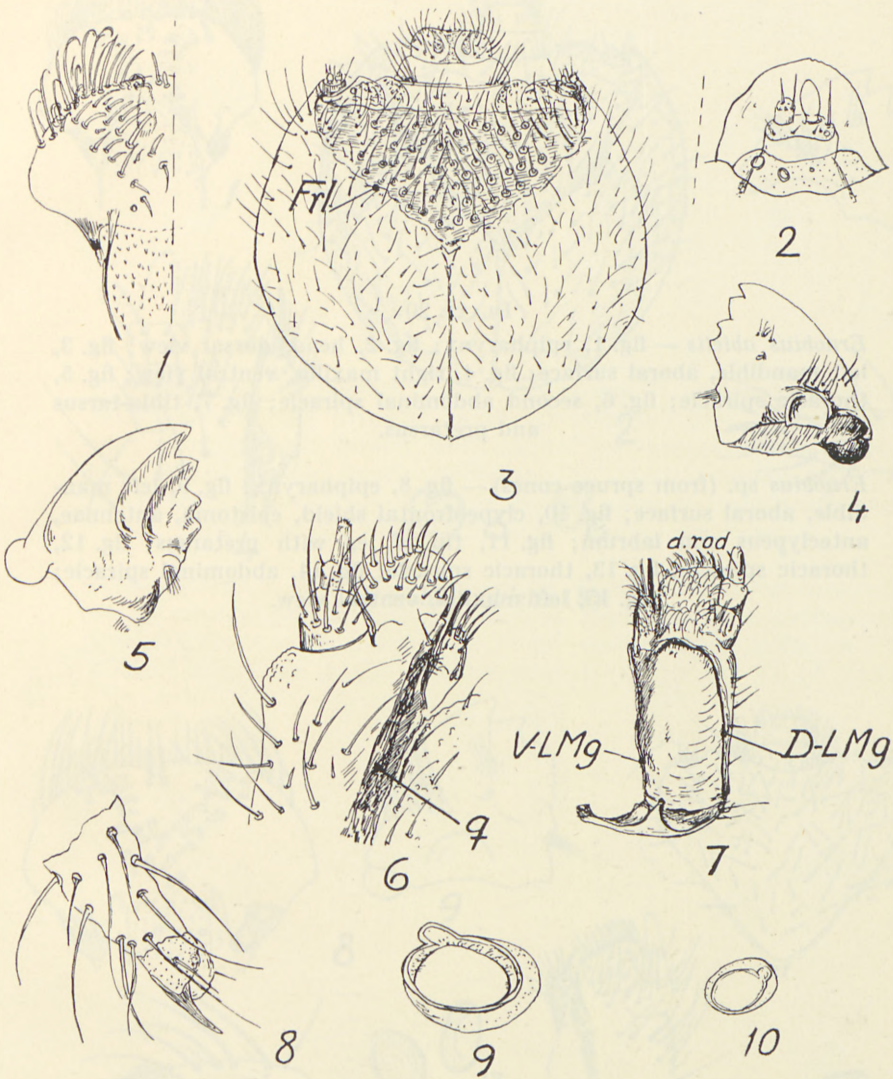
Na: nates).



Ochina ptinoides (6).

PLATE 19

Ernobius mollis — fig. 1, epipharynx, half part; fig. 2, right antenna, dorsal view; fig. 3, head, dorsal view; fig. 4, right mandible, aboral surface; fig. 5, right mandible, adoral surface; fig. 6, right maxilla, ventral view (q: ventral marginal bar of stipes); fig. 7, right maxilla, dorsal and inner view (D-LMg: dorsolateral margin; V-LMg: ventrolateral margin; d.rod: sensory rod on dorsoexterior side of terminal article of maxillary palpus); fig. 8, pretarsus and distal part of tibio-tarsus; fig. 9, thoracic spiracle; fig. 10, third abdominal spiracle.

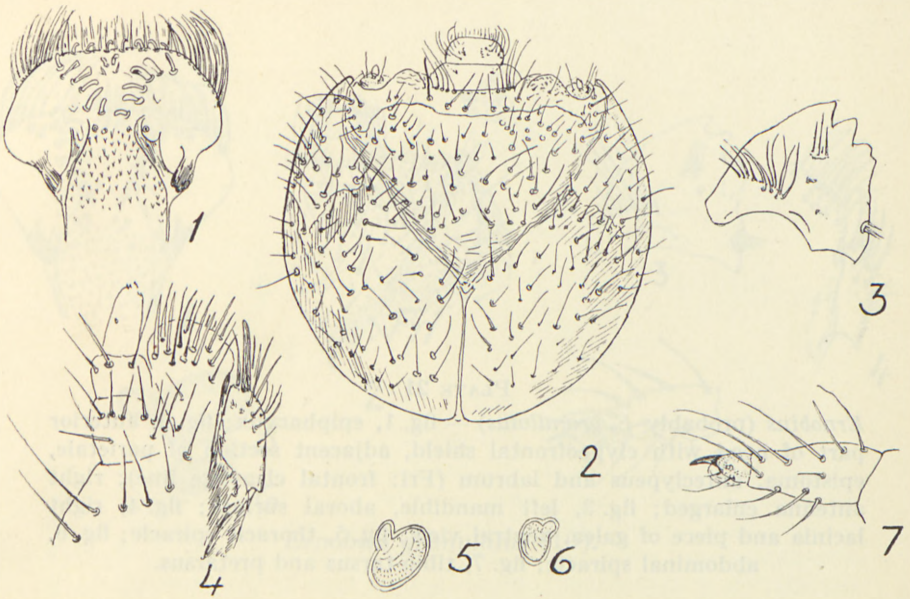


Ernobius mollis (7).

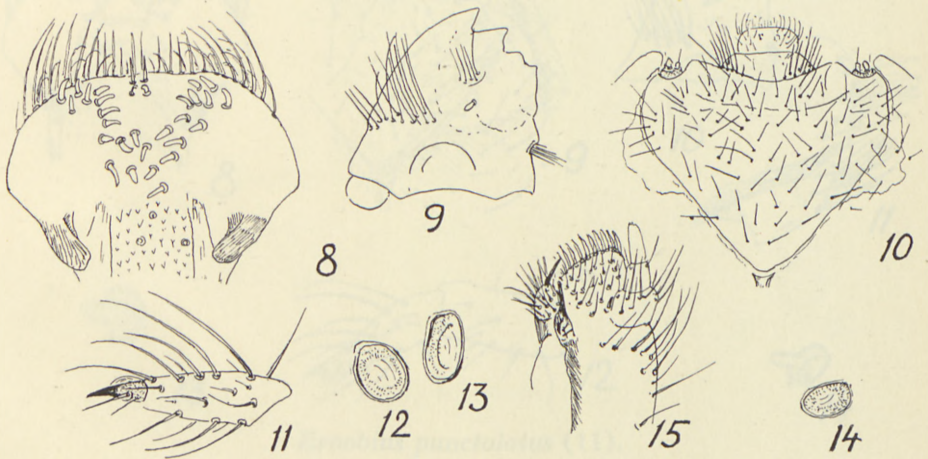
PLATE 20

Ernobius abietis — fig. 1, epipharynx; fig. 2, head, dorsal view; fig. 3, left mandible, aboral surface; fig. 4, right maxilla, ventral view; fig. 5, thoracic spiracle; fig. 6, second abdominal spiracle; fig. 7, tibio-tarsus and pretarsus.

Ernobius sp. (from spruce cones) — fig. 8, epipharynx; fig. 9, left mandible, aboral surface; fig. 10, clypeofrontal shield, epistoma, antennae, anteclypeus and labrum; fig. 11, tip of leg with pretarsus; fig. 12, thoracic spiracle; fig. 13, thoracic spiracle; fig. 14, abdominal spiracle; fig. 15, left maxilla, ventral view.



Ernobius abietis (8).

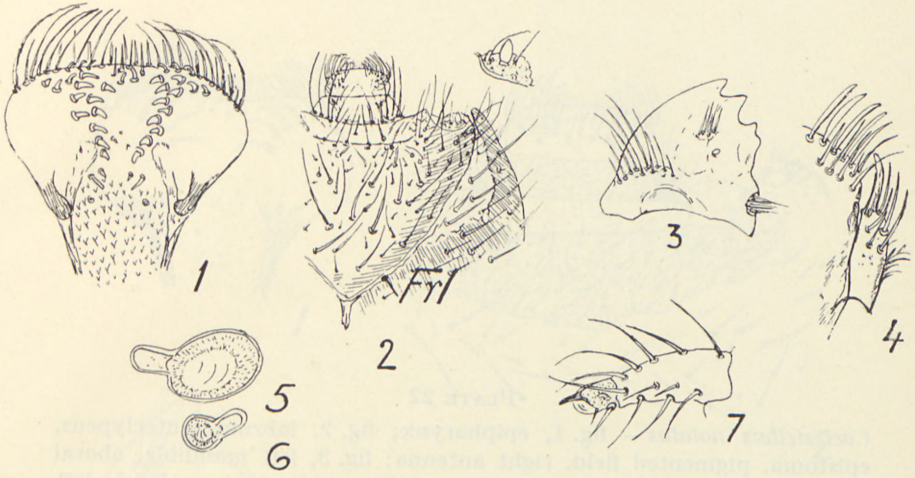


Ernobius sp.-ex spruce cone (9).

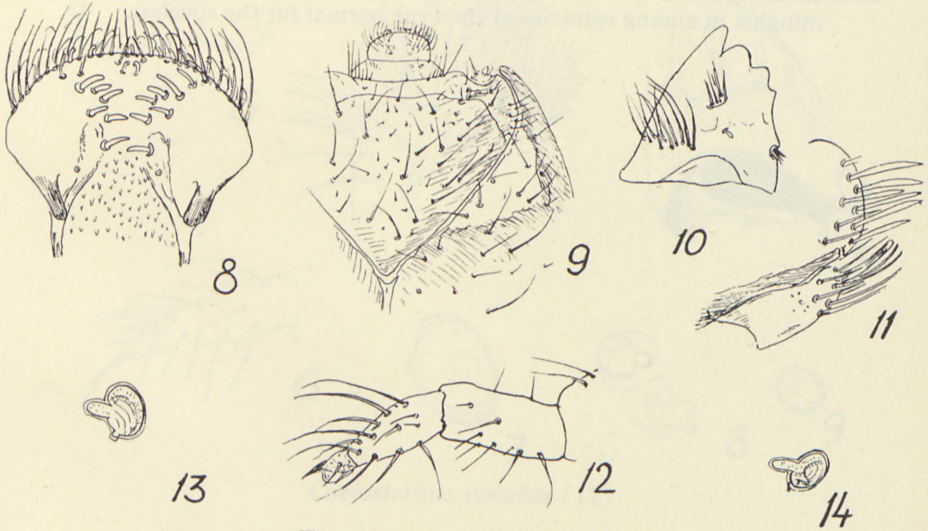
PLATE 21

Ernobius (probably *E. granulatus*) — fig. 1, epipharynx; fig. 2, anterior part of head with clypeofrontal shield, adjacent section of parietale, epistoma, anteclypeus and labrum (Frl: frontal cleavage line); right antenna enlarged; fig. 3, left mandible, aboral surface; fig. 4, right lacinia and piece of galea, ventral view; fig. 5, thoracic spiracle; fig. 6, abdominal spiracle; fig. 7, tibio-tarsus and pretarsus.

Ernobius punctulatus — fig. 8, epipharynx; fig. 9, piece of right parietale, clypeofrons, epistoma, right antenna, anteclypeus and labrum; fig. 10, left mandible, aboral surface; fig. 11, right lacinia, piece of galea, ventral view; fig. 12, leg; fig. 13, thoracic spiracle; fig. 14, abdominal spiracle.



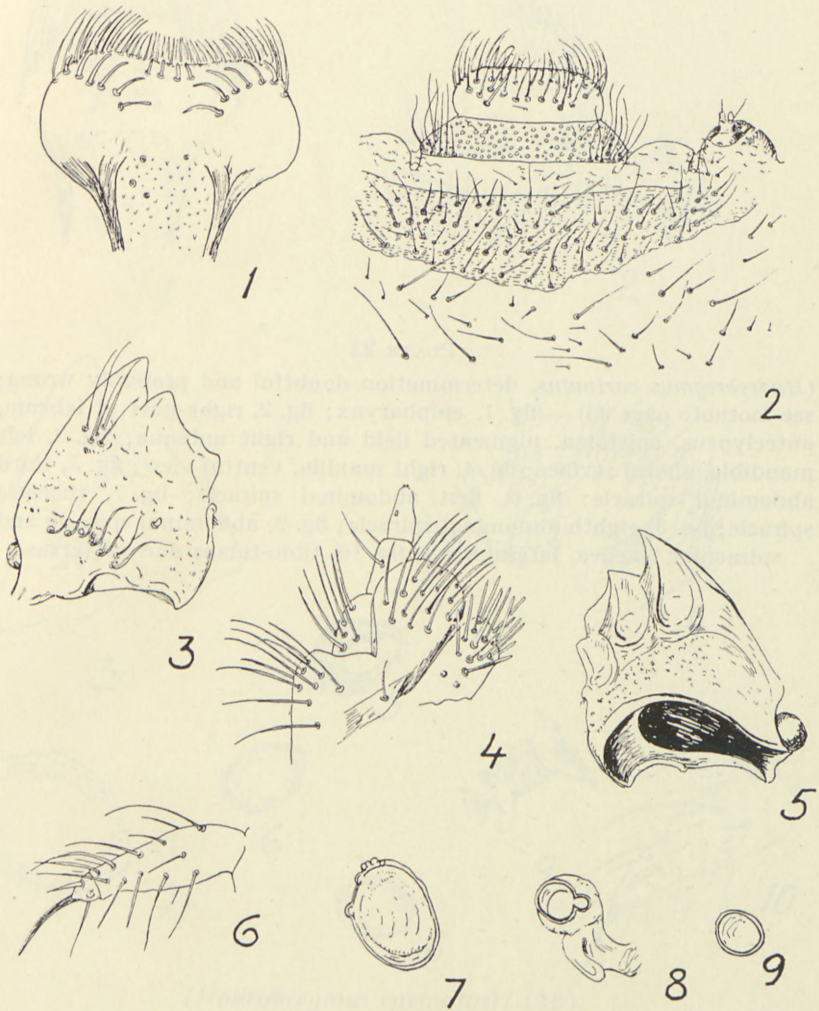
Ernobius granulatus (10).



Ernobius punctulatus (11).

PLATE 22

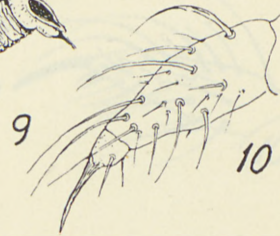
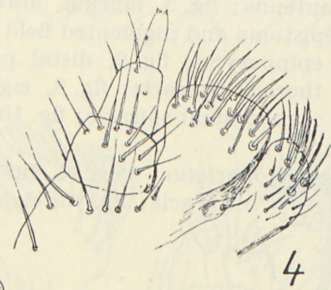
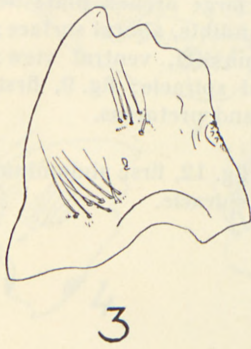
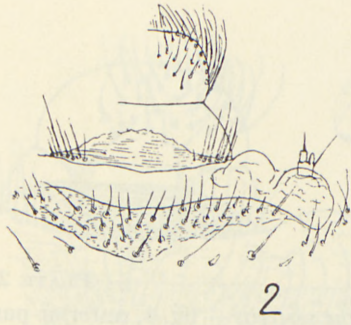
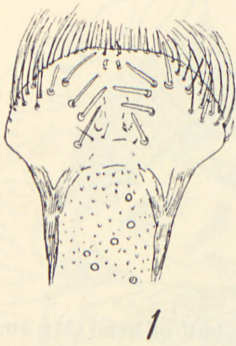
Coelostethus notatus — fig. 1, epipharynx; fig. 2, labrum, anteclypeus, epistoma, pigmented field, right antenna; fig. 3, left mandible, aboral surface; fig. 4, distal part of right maxilla, ventral view; fig. 5, left mandible, adoral view; fig. 6, tibio-tarsus and pretarsus; fig. 7, thoracic spiracle; fig. 8, abdominal spiracle (normal type in this species); fig. 9, abdominal spiracle (as it occasionally appears in some specimens, mingled in among spiracles of the type normal for the species).



Coelostethus notatus (12).

PLATE 23

(*Hadrobregmus carinatus*, determination doubtful and probably wrong; see footnote page 96) — fig. 1, epipharynx; fig. 2, right part of labrum, anteclypeus, epistoma, pigmented field and right antenna; fig. 3, left mandible, aboral surface; fig. 4, right maxilla, ventral view; fig. 5, third abdominal spiracle; fig. 6, first abdominal spiracle; fig. 7, thoracic spiracle; fig. 8, eighth abdominal spiracle; fig. 9, abdominal spiracle and spiracular trachea, lateral view; fig. 10, tibio-tarsus and pretarsus.

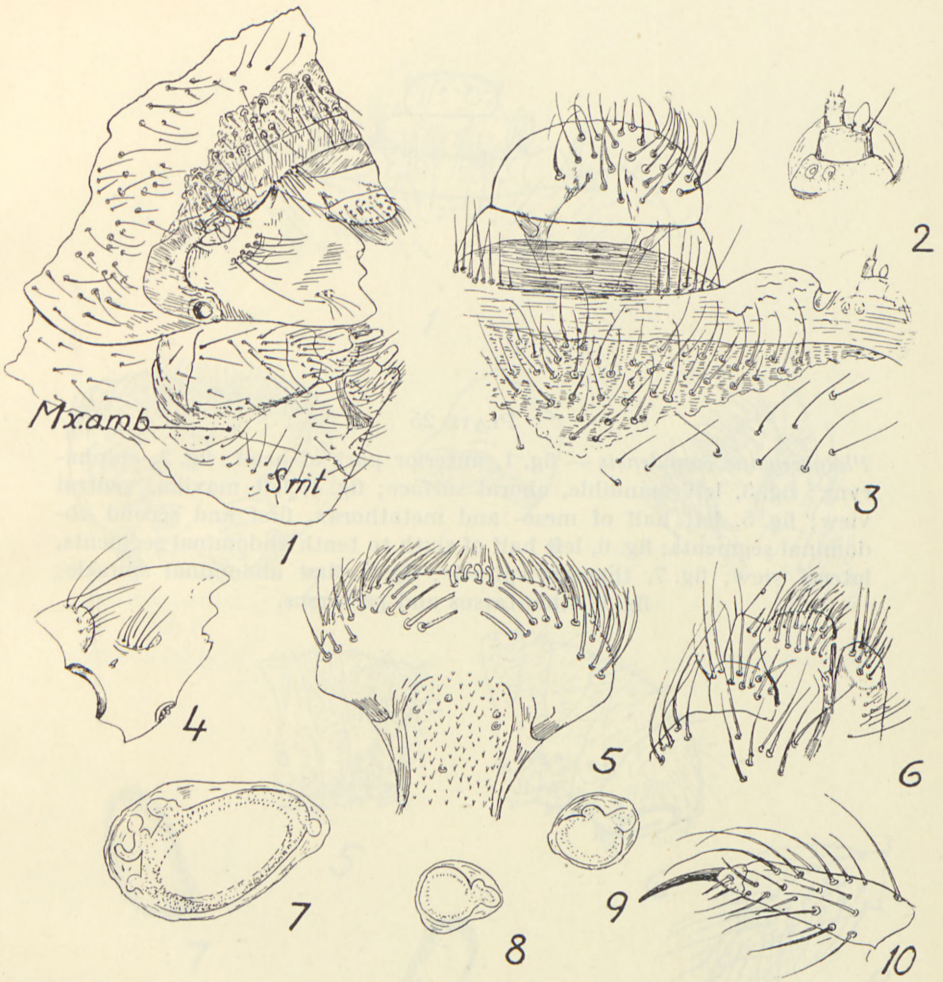


(*Hadrobregmus carinatus*)? (13).

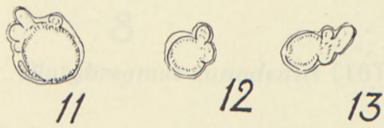
PLATE 24

Trypopyts sericeus—fig. 1, anterior part of right half of head (Mx amb: maxillary articulating membranous region; smt: submentum); fig. 2, right antenna; fig. 3, labrum, anteclypeus with large arched plate at base, epistoma and pigmented field; fig. 4, left mandible, aboral surface; fig. 5, epipharynx; fig. 6, distal part of right maxilla, ventral view; fig. 7, thoracic spiracle; fig. 8, eighth abdominal spiracle; fig. 9, first abdominal spiracle; fig. 10, tibio-tarsus and pretarsus.

Trypopyts punctatus — fig. 11, thoracic spiracle; fig. 12, first abdominal spiracle; fig. 13, eighth abdominal spiracle.



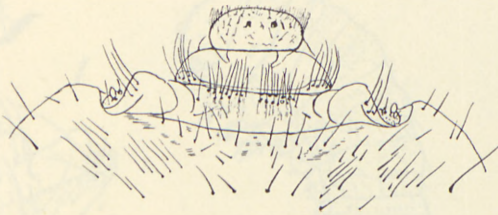
Trypopytis sericeus (14).



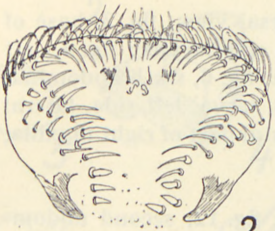
Trypopytis punctatus (15).

PLATE 25

Platybregmus canadensis — fig. 1, anterior part of head; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, left maxilla, ventral view; fig. 5, left half of meso- and metathorax, first and second abdominal segments; fig. 6, left half of sixth to tenth abdominal segments, lateral view; fig. 7, thoracic spiracle; fig. 8, first abdominal spiracle; fig. 9, tibio-tarsus and pretarsus.



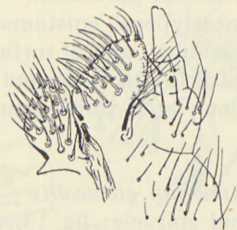
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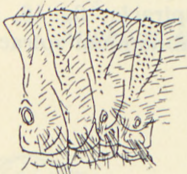
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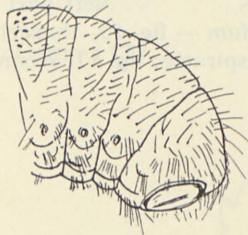
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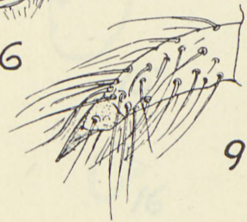
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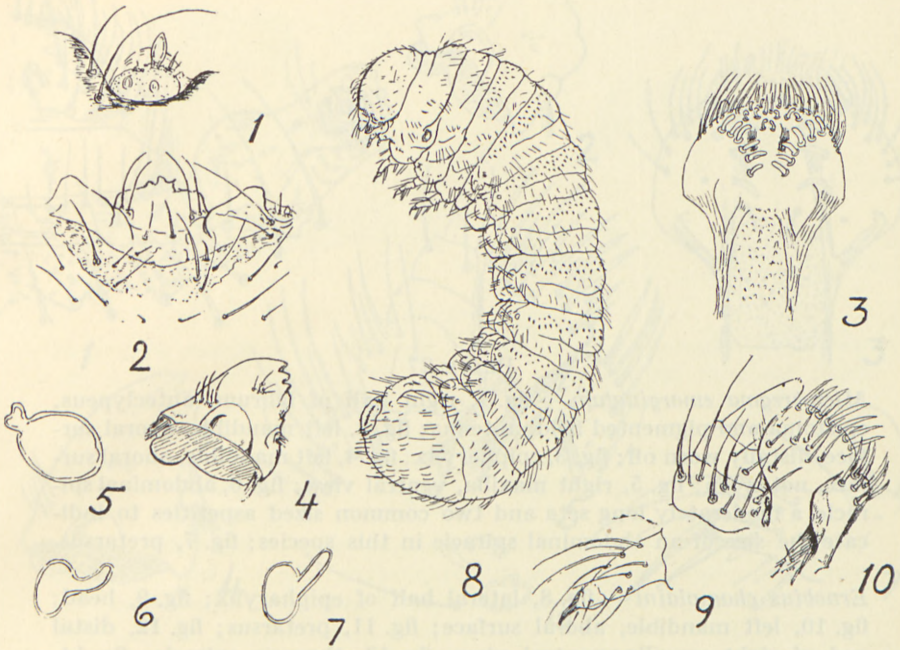
Platybregmus canadensis (16).

PLATE 26

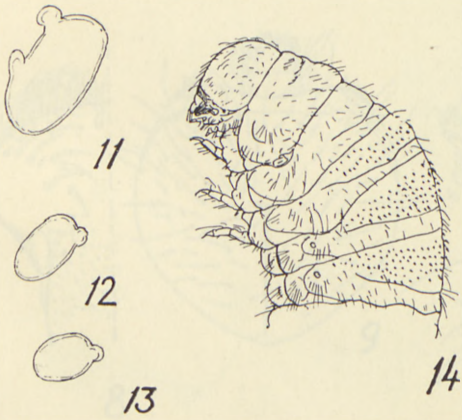
Anobium punctatum — fig. 1, right antenna, dorsal view; fig. 2, base of anteclypeus, epistoma, pigmented field; fig. 3, epipharynx; fig. 4, left mandible, aboral surface; fig. 5, thoracic spiracle; fig. 6, sixth abdominal spiracle; fig. 7, second abdominal spiracle; fig. 8, larva, left side, lateral view; fig. 9, tibio-tarsus and pretarsus; fig. 10, distal part of right maxilla, ventral view.

Anobium gibbicollis — fig. 11, thoracic spiracle; fig. 12, second abdominal spiracle; fig. 13, sixth abdominal spiracle; fig. 14, larva, anterior, left part of body.

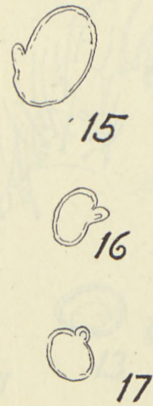
Anobium nitidum — fig. 15, thoracic spiracle; fig. 16, sixth abdominal spiracle; fig. 17, second abdominal spiracle.



Anobium punctatum (17).



Anobium gibbicollis (18).

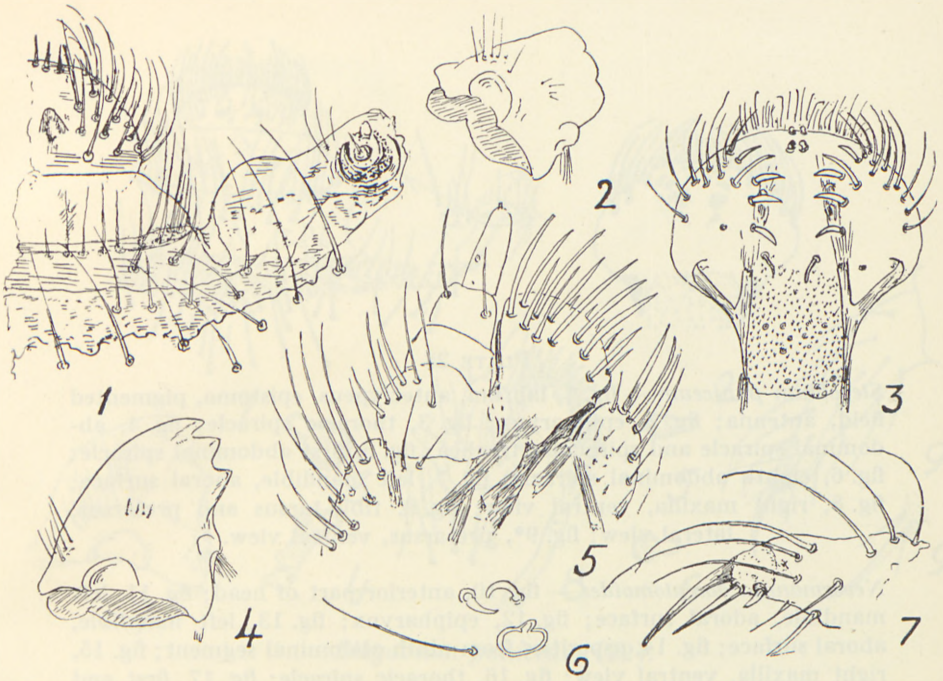


Anobium nitidum (19).

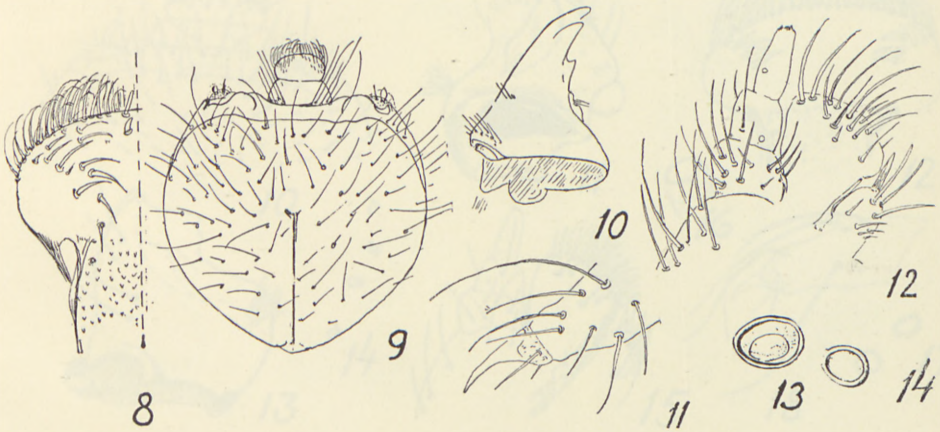
PLATE 27

Microbregma emarginatum — fig. 1, right half of labrum, anteclypeus, epistoma and pigmented field, antenna; fig. 2, left mandible, aboral surface, distally worn off; fig. 3, epipharynx; fig. 4, left mandible, aboral surface, not worn; fig. 5, right maxilla, ventral view; fig. 6, abdominal spiracle, a moderately long seta and two common sized asperities to indicate the size of an abdominal spiracle in this species; fig. 7, pretarsus.

Ernobius champlaini — fig. 8, lateral half of epipharynx; fig. 9, head; fig. 10, left mandible, aboral surface; fig. 11, pretarsus; fig. 12, distal end of right maxilla, ventral view; fig. 13, thoracic spiracle; fig. 14, abdominal spiracle.



Microbregma emarginatum (20).

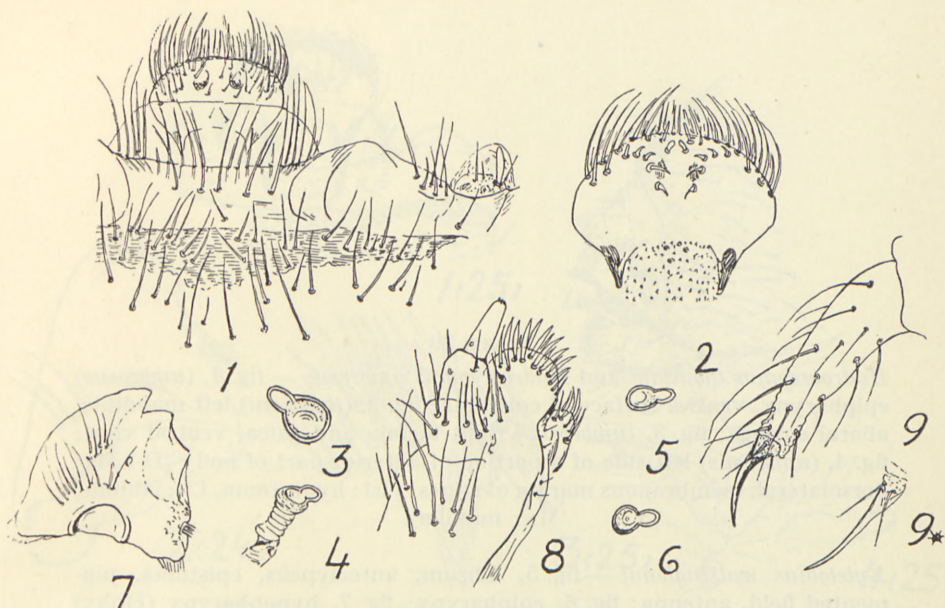


Ernobius champlaini (21).

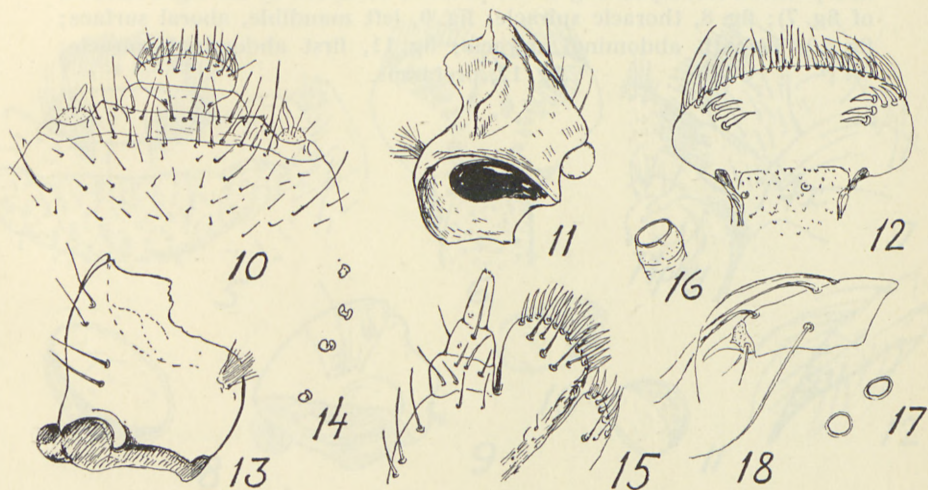
PLATE 28

Stegobium paniceum — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, epipharynx; fig. 3, thoracic spiracle; fig. 4, abdominal spiracle and spiracular trachea; fig. 5, first abdominal spiracle; fig. 6, eighth abdominal spiracle; fig. 7, left mandible, aboral surface; fig. 8, right maxilla, ventral view; fig. 9, tibio-tarsus and pretarsus, lateral view; fig. 9*, pretarsus, ventral view.

Nevermannia dorcatomoides — fig. 10, anterior part of head; fig. 11, left mandible, adoral surface; fig. 12, epipharynx; fig. 13, left mandible, aboral surface; fig. 14, asperities from ninth abdominal segment; fig. 15, right maxilla, ventral view; fig. 16, thoracic spiracle; fig. 17, first and seventh abdominal spiracles; fig. 18, tibio-tarsus and pretarsus.



Stegobium paniceum (22).



Nevermannia dorcatomoides (23).

PLATE 29

Hadrobregmus thomsoni and *Hadrobregmus umbrosus* — fig. 1, (*umbrosus*) epipharynx, ventral surface of epistoma; fig. 2, (*thomsoni*) left mandible, aboral surface; fig. 3, (*umbrosus*) right lacinia and galea, ventral view; fig. 4, (*umbrosus*) left side of a portion of anterior part of body (D-LMg: dorsolateral, membranous margin of stipes; Hst: hypostoma, Lb: labium; Mx: maxilla).

Xyletobius walsinghami — fig. 5, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 6, epipharynx; fig. 7, hypopharynx (Hphy) and right maxilla (Mx) showing ventral aboral surface of lobes (compare fig. 7 with fig. 4 on this same Plate 29, where a left maxilla is drawn in a position corresponding to the position occupied by the right maxilla of fig. 7); fig. 8, thoracic spiracle; fig. 9, left mandible, aboral surface; fig. 10, seventh abdominal spiracle; fig. 11, first abdominal spiracle; fig. 12, pretarsus.

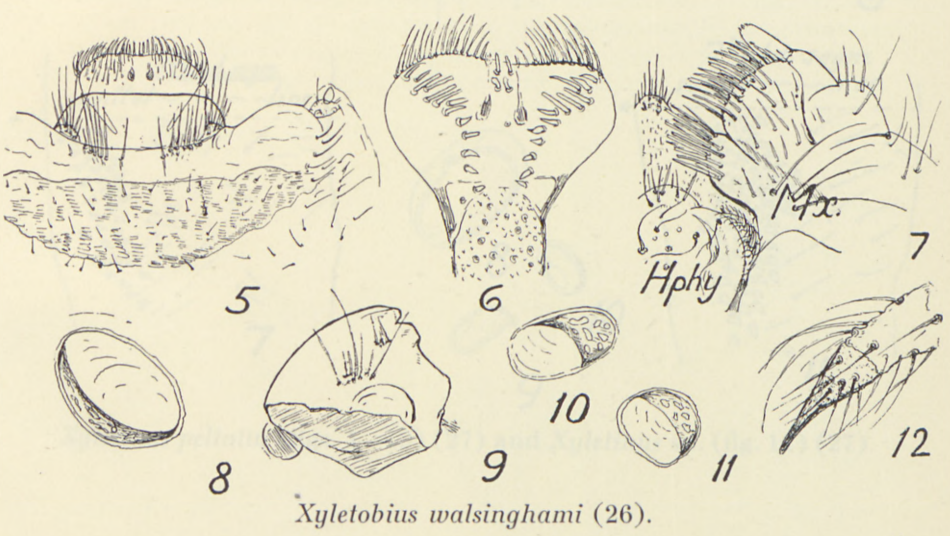
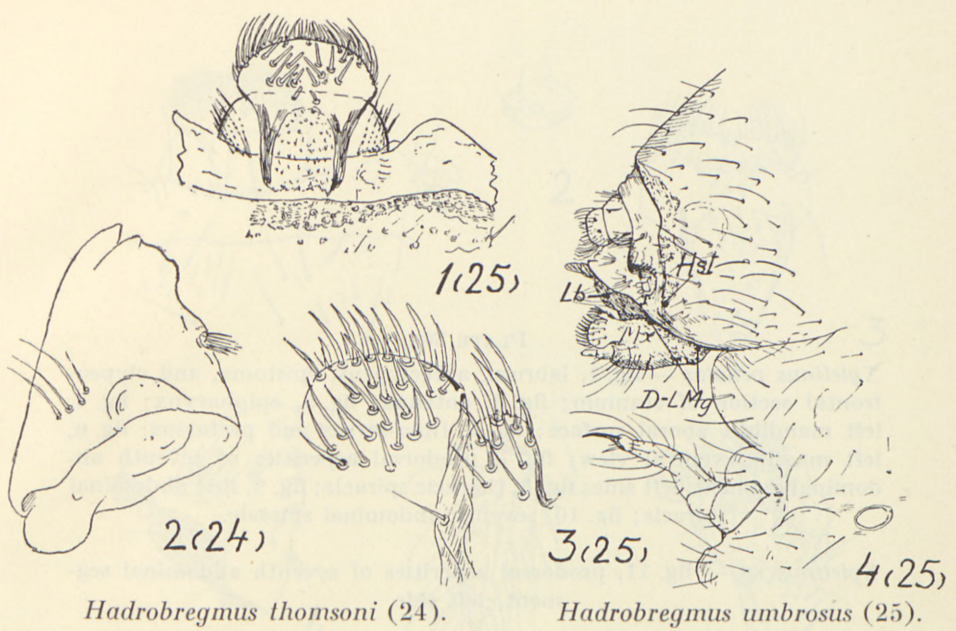
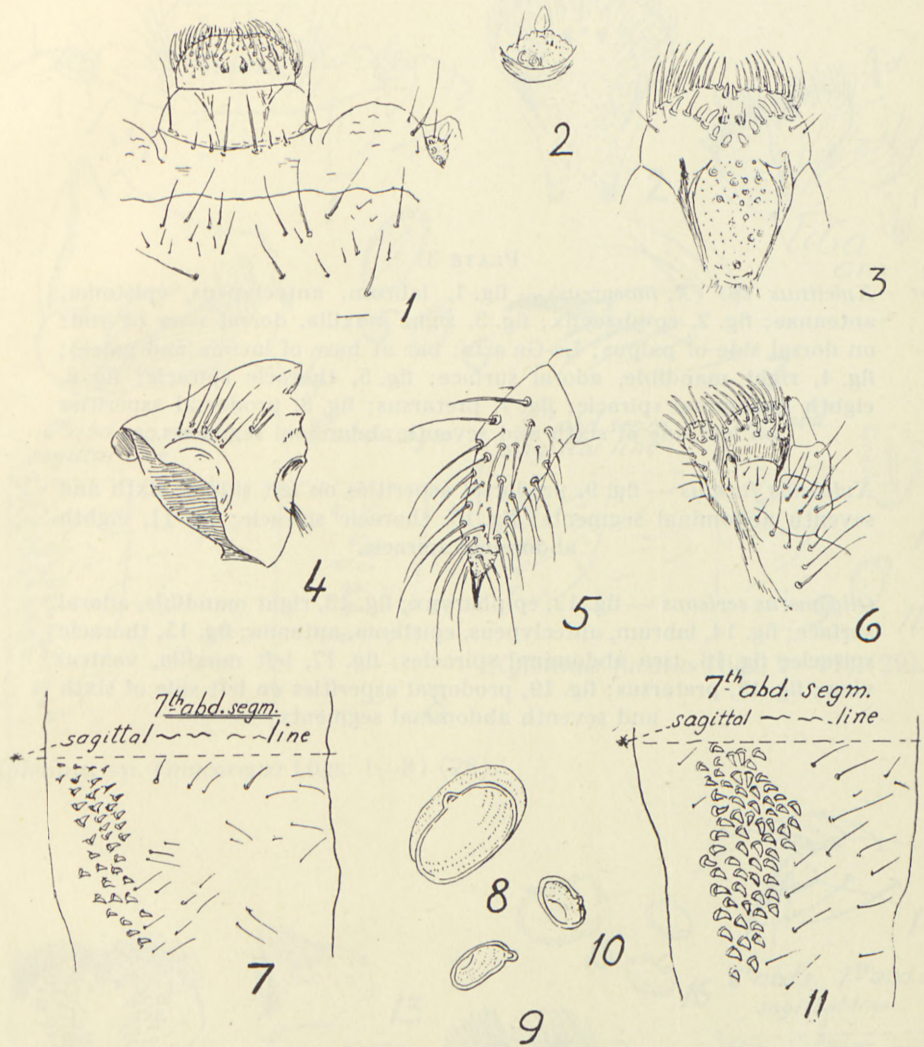


PLATE 30

Xyletinus peltatus — fig. 1, labrum, anteclypeus, epistoma, and clypeo-frontal section of cranium; fig. 2, antenna; fig. 3, epipharynx; fig. 4, left mandible, aboral surface; fig. 5, tibio-tarsus and pretarsus; fig. 6, left maxilla, ventral view; fig. 7, prodorsal asperities of seventh abdominal segment, left side; fig. 8, thoracic spiracle; fig. 9, first abdominal spiracle; fig. 10, seventh abdominal spiracle.

Xyletinus sp. — fig. 11, prodorsal asperities of seventh abdominal segment, left side.



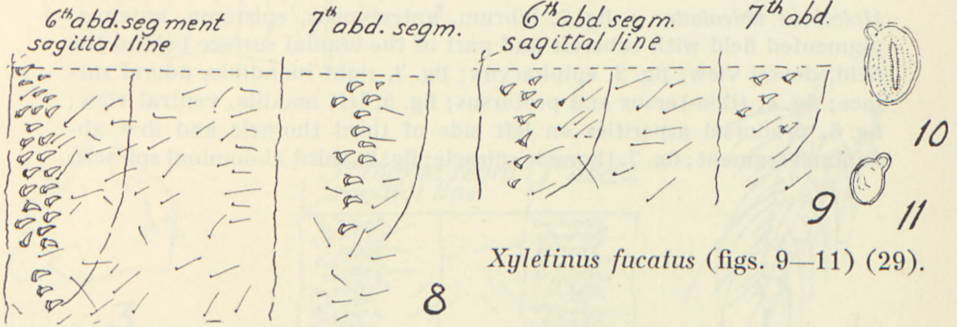
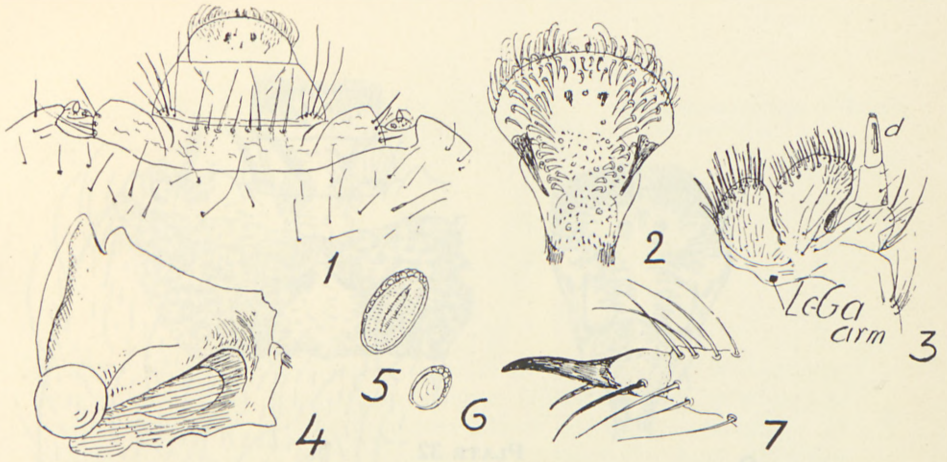
Xyletinus peltatus (figs. 1—10) (27) and *Xyletinus sp.* (fig. 11) (27).

PLATE 31

Xyletinus sp. (*X. mucoreus*) — fig. 1, labrum, anteclypeus, epistoma, antennae; fig. 2, epipharynx; fig. 3, right maxilla, dorsal view (d'-rod: on dorsal side of palpus; Lc-Ga arm: bar at base of lacinia and galea); fig. 4, right mandible, adoral surface; fig. 5, thoracic spiracle; fig. 6, eighth abdominal spiracle; fig. 7, pretarsus; fig. 8, prodorsal asperities on left side of sixth and seventh abdominal segments.

Xyletinus fucatus — fig. 9, prodorsal asperities on left side of sixth and seventh abdominal segments; fig. 10, thoracic spiracle; fig. 11, eighth abdominal spiracle.

Oligomerus sericans — fig. 12, epipharynx; fig. 13, right mandible, adoral surface; fig. 14, labrum, anteclypeus, epistoma, antenna; fig. 15, thoracic spiracle; fig. 16, two abdominal spiracles; fig. 17, left maxilla, ventral view; fig. 18, pretarsus; fig. 19, prodorsal asperities on left side of sixth and seventh abdominal segments.



Xyletinus fucatus (figs. 9—11) (29).

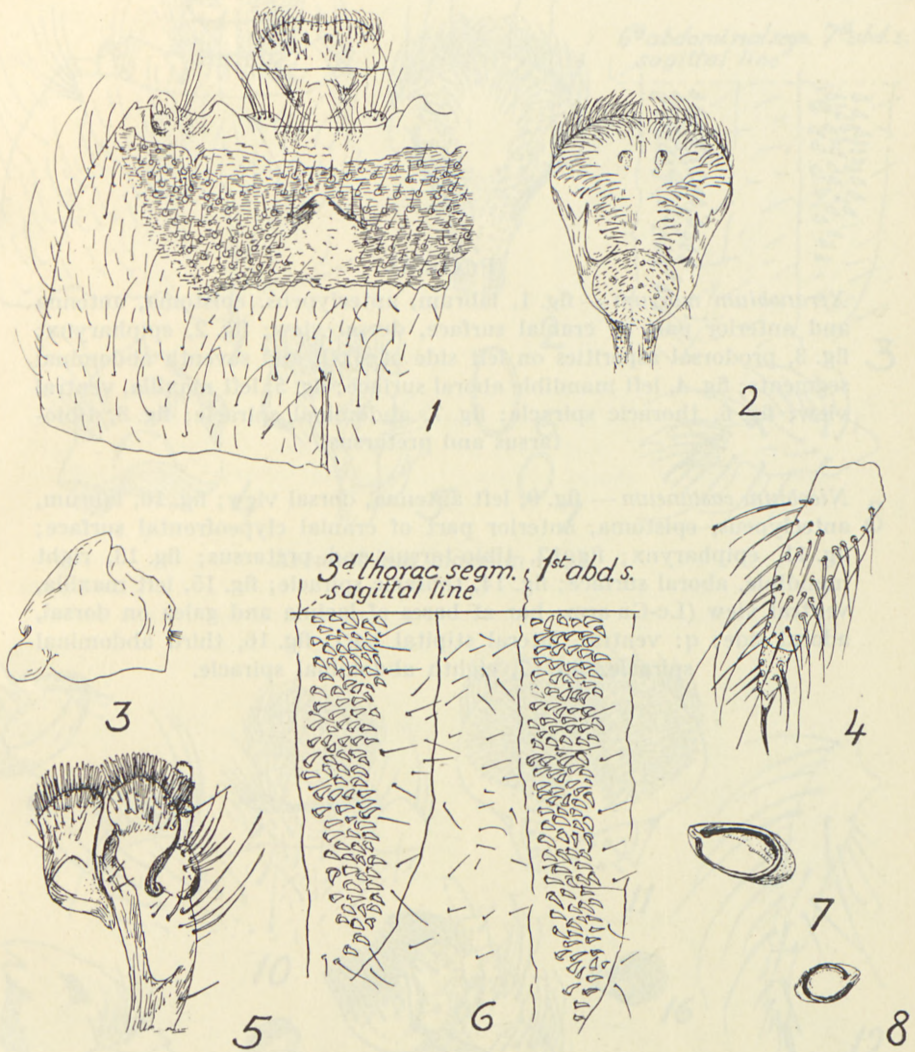
Xyletinus sp. (*mucoreus*) (figs. 1—8) (28).



Oligomerus sericans (30).

PLATE 32

Holcobius haleakalae — fig. 1, labrum, anteclypeus, epistoma, antenna, pigmented field with tubercle and part of the cranial surface behind the field, dorsal view; fig. 2, epipharynx; fig. 3, right mandible, adoral surface; fig. 4, tibio-tarsus and pretarsus; fig. 5, left maxilla, ventral view; fig. 6, prodorsal asperities on left side of third thoracic and first abdominal segment; fig. 7, thoracic spiracle; fig. 8, third abdominal spiracle.

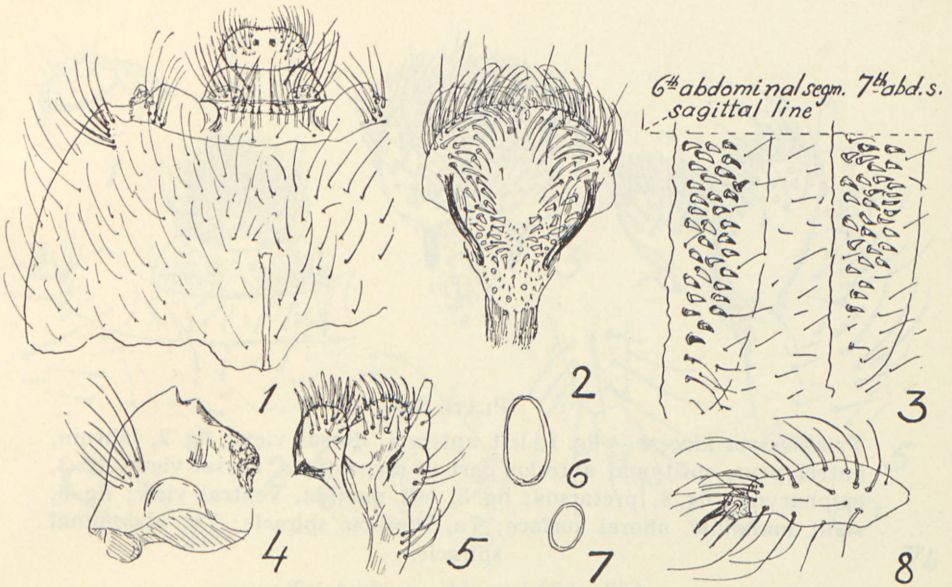


Holcobius haleakalae (31).

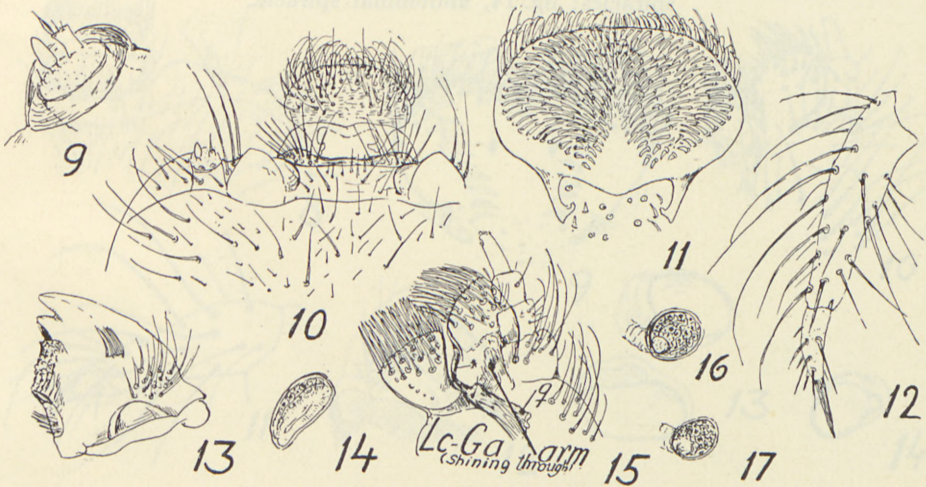
PLATE 33

Xeranobium macrum — fig. 1, labrum, anteclypeus, epistoma, antenna and anterior part of cranial surface, dorsal view; fig. 2, epipharynx; fig. 3, prodorsal asperities on left side of sixth and seventh abdominal segments; fig. 4, left mandible aboral surface; fig. 5, left maxilla, ventral view; fig. 6, thoracic spiracle; fig. 7, abdominal spiracle; fig. 8, tibio-tarsus and pretarsus.

Nicobium castaneum — fig. 9, left antenna, dorsal view; fig. 10, labrum, anteclypeus, epistoma, anterior part of cranial clypeofrontal surface; fig. 11, epipharynx; fig. 12, tibio-tarsus and pretarsus; fig. 13, right mandible, aboral surface; fig. 14, thoracic spiracle; fig. 15, left maxilla, ventral view (Lc-Ga arm: bar at bases of lacinia and galea on dorsal, adoral side; q: ventral, lateral stipital bar); fig. 16, third abdominal spiracle; fig. 17, eighth abdominal spiracle.



Xeranobium macrum (32).

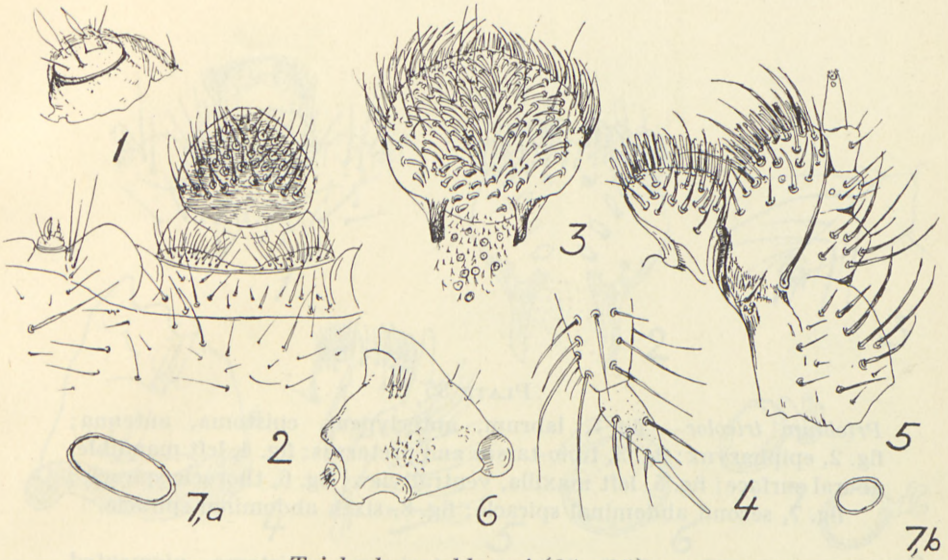


Nicobium castaneum (33).

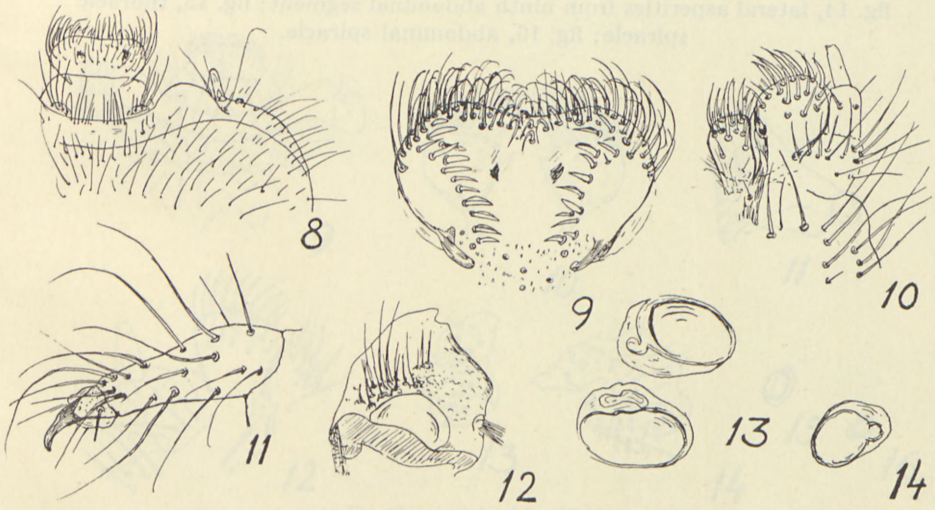
PLATE 34

Trichodesma klagesi — fig. 1, left antenna, dorsal view; fig. 2, labrum, anteclypeus, epistoma, anterior part of clypeofrons, dorsal view; fig. 3, epipharynx; fig. 4, pretarsus; fig. 5, left maxilla, ventral view; fig. 6, right mandible, aboral surface; 7a, thoracic spiracle; 7b, abdominal spiracle.

Vrilletta blaisdelli — fig. 8, labrum, anteclypeus, epistoma, antenna; fig. 9, epipharynx; fig. 10, left maxilla, ventral view; fig. 11, tibio-tarsus and pretarsus; fig. 12, left mandible, aboral surface; fig. 13, two thoracic spiracles; fig. 14, abdominal spiracle.



Trichodesma klagesi (34—35).

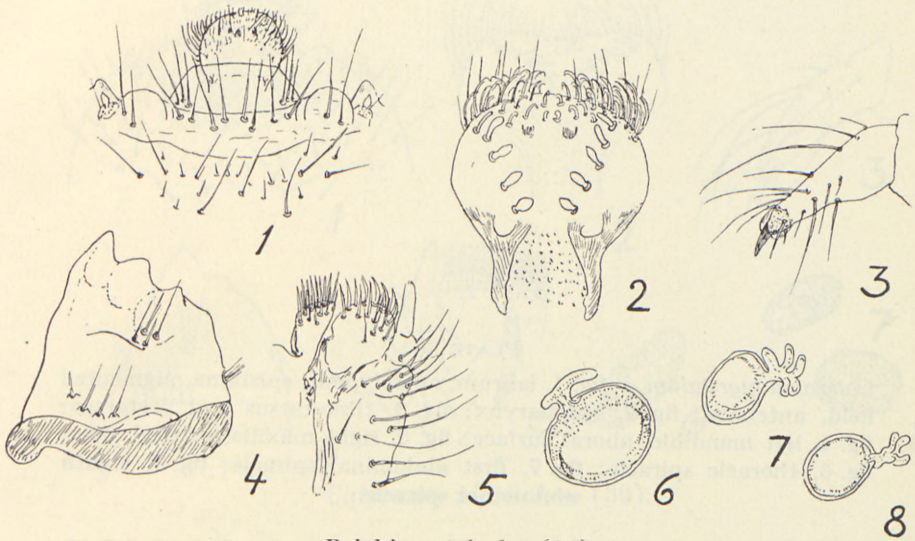


Vrilletta blaisdelli (36).

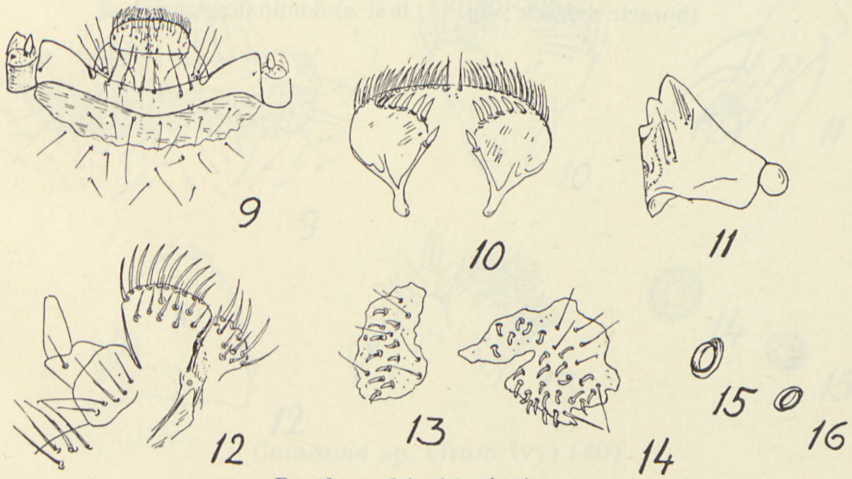
PLATE 35

Priobium tricolor — fig. 1, labrum, anteclypeus, epistoma, antenna; fig. 2, epipharynx; fig. 3, tibio-tarsus and pretarsus; fig. 4, left mandible, aboral surface; fig. 5, left maxilla, ventral view; fig. 6, thoracic spiracle; fig. 7, second abdominal spiracle; fig. 8, sixth abdominal spiracle.

Protheca hispida — fig. 9, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 10, epipharynx; fig. 11, right mandible, aboral surface; fig. 12, right maxilla, ventral view; fig. 13, prothoracic asperities; fig. 14, lateral asperities from ninth abdominal segment; fig. 15, thoracic spiracle; fig. 16, abdominal spiracle.



Priobium tricolor (37).

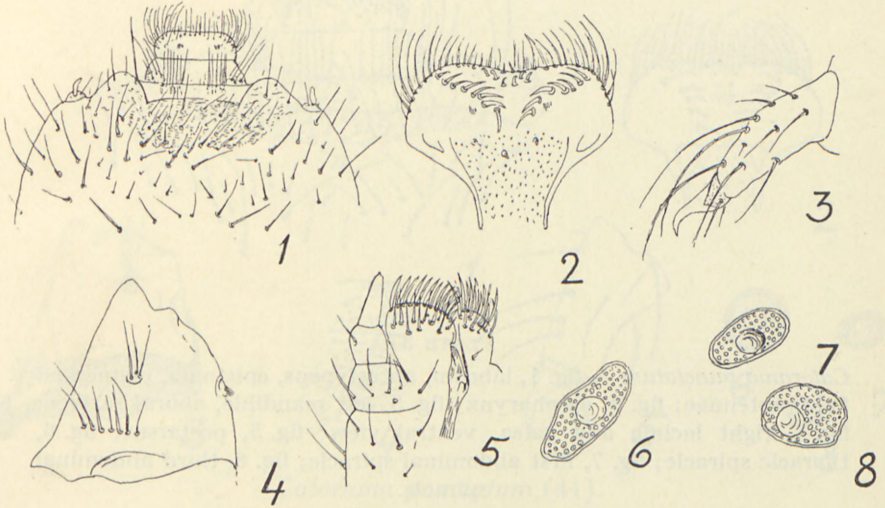


Protheca hispida (38).

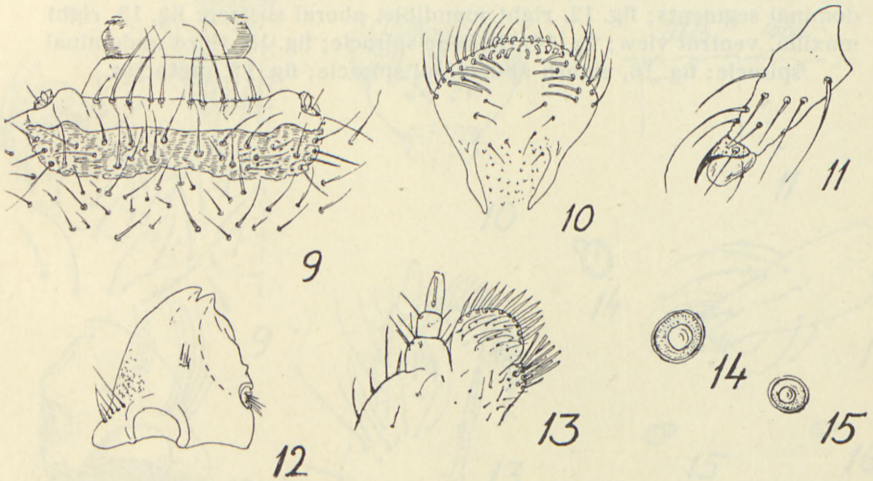
PLATE 36

Catorama nigrifulum — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 2, epipharynx; fig. 3, tibio-tarsus and pretarsus; fig. 4, left mandible, aboral surface; fig. 5, right maxilla, ventral view; fig. 6, thoracic spiracle; fig. 7, first abdominal spiracle; fig. 8, eighth abdominal spiracle.

Catorama sp. (ex ivy) — fig. 9, anteclypeus, epistoma, pigmented field, antenna; fig. 10, epipharynx; fig. 11, tibio-tarsus and pretarsus; fig. 12, left mandible, aboral surface; fig. 13, left maxilla, dorsal view; fig. 14, thoracic spiracle; fig. 15, first abdominal spiracle.



Catorama nigrifulum (39).

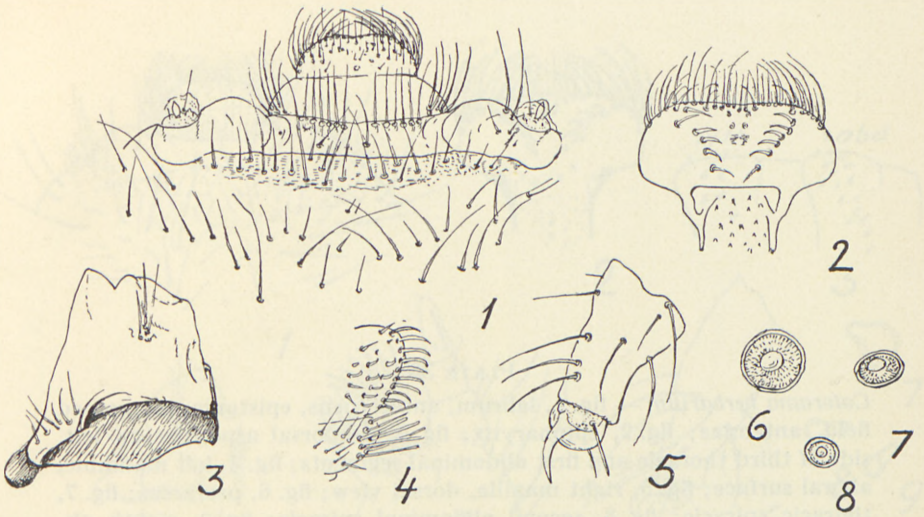


Catorama sp. (from ivy) (40).

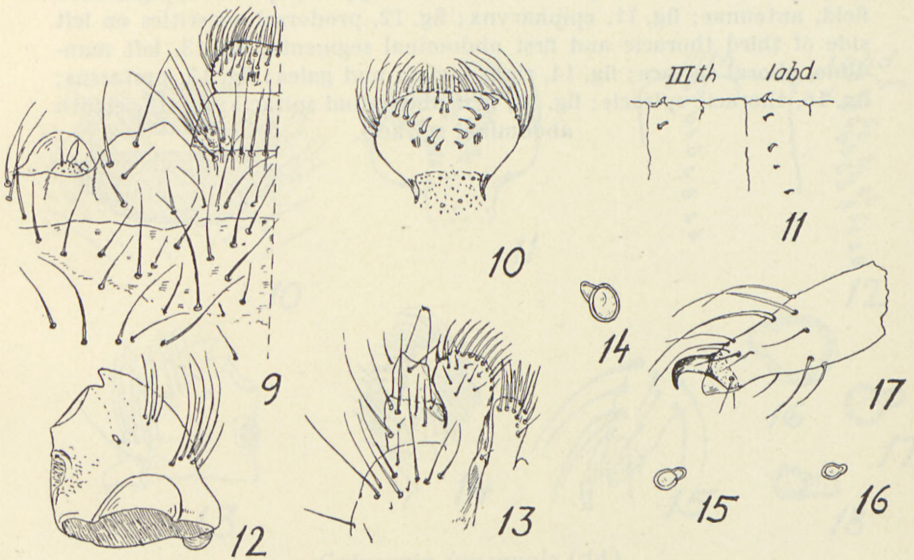
PLATE 37

Catorama punctatum — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, right lacinia and galea, ventral view; fig. 5, pretarsus; fig. 6, thoracic spiracle; fig. 7, first abdominal spiracle; fig. 8, third abdominal spiracle.

Catorama sp. (near *C. conjunctum*) — fig. 9, left half of labrum, anteclypeus, epistoma, pigmented field, left antenna; fig. 10, epipharynx; fig. 11, prodorsal asperities on left side of third thoracic and first abdominal segments; fig. 12, right mandible, aboral surface; fig. 13, right maxilla, ventral view; fig. 14, thoracic spiracle; fig. 15, third abdominal spiracle; fig. 16, eighth abdominal spiracle; fig. 17, pretarsus.



Catorama punctatum (41).

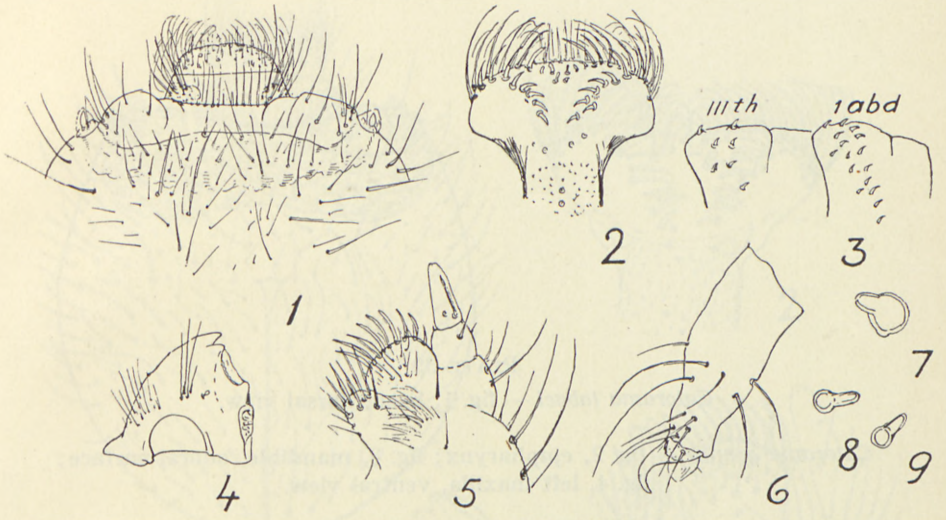


Catorama sp. (near *C. conjunctum*) (42).

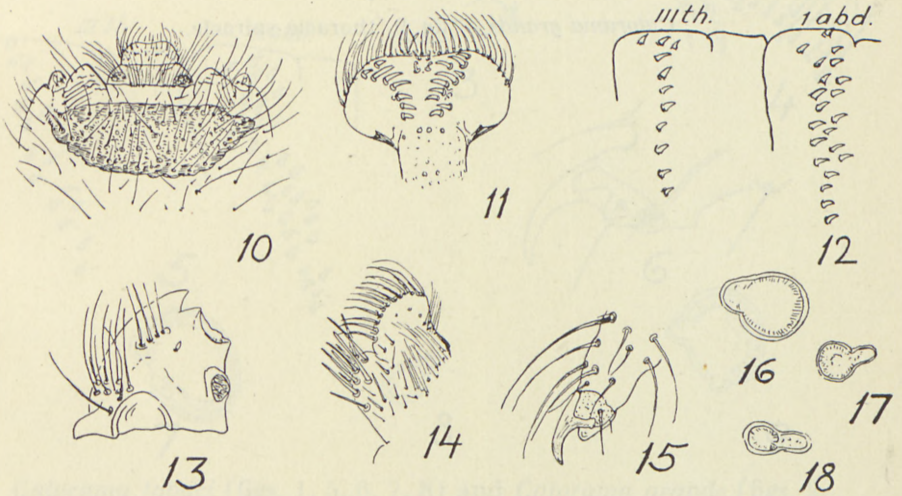
PLATE 38

Catorama herbarium — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 2, epipharynx; fig. 3, prodorsal asperities on left, side of third thoracic and first abdominal segments; fig. 4, left mandible, aboral surface; fig. 5, right maxilla, dorsal view; fig. 6, pretarsus; fig. 7, thoracic spiracle; fig. 8, second abdominal spiracle; fig. 9, eighth abdominal spiracle.

Catorama inaequale — fig. 10, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 11, epipharynx; fig. 12, prodorsal asperities on left side of third thoracic and first abdominal segments; fig. 13, left mandible, aboral surface; fig. 14, right lacinia and galea; fig. 15, pretarsus; fig. 16, thoracic spiracle; fig. 17, first abdominal spiracle; fig. 18, eighth abdominal spiracle.



Catorama herbarium (43).



Catorama inaequale (44).

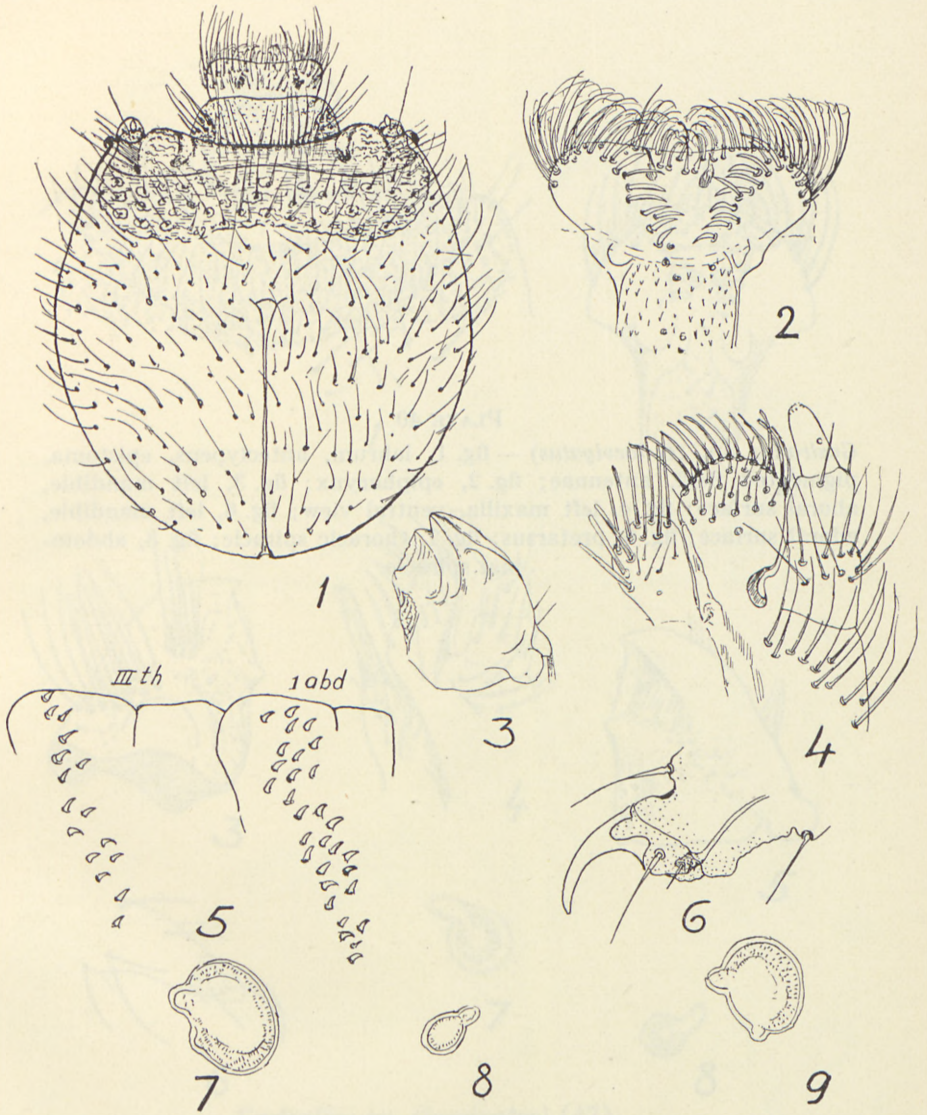
PLATE 39

Catorama tabaci — fig. 1, head, dorsal view.

Catorama grande — fig. 2, epipharynx; fig. 3, mandible, adoral surface;
fig. 4, left maxilla, ventral view.

Catorama tabaci — fig. 5, prodorsal asperities on left side of third thoracic
and first abdominal segments; fig. 6, pretarsus; fig. 7, thoracic spiracle;
fig. 8, abdominal spiracle.

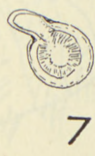
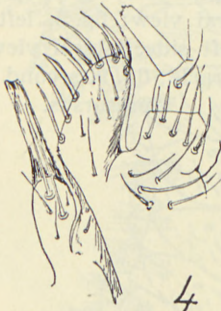
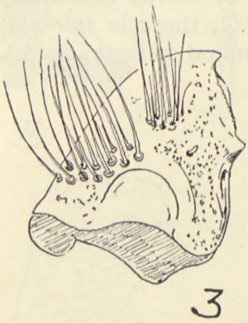
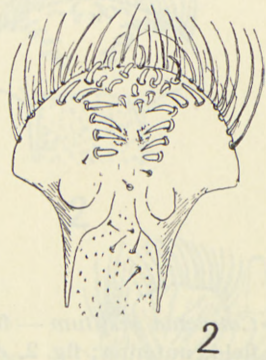
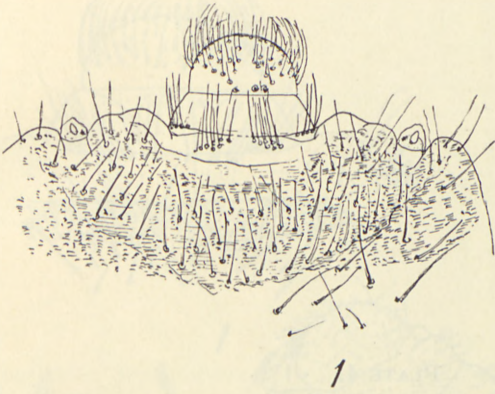
Catorama grande — fig. 9, thoracic spiracle.



Catorama tabaci (figs. 1, 5, 6, 7, 8) and *Catorama grande* (figs. 2, 3, 4, 9) (45).

PLATE 40

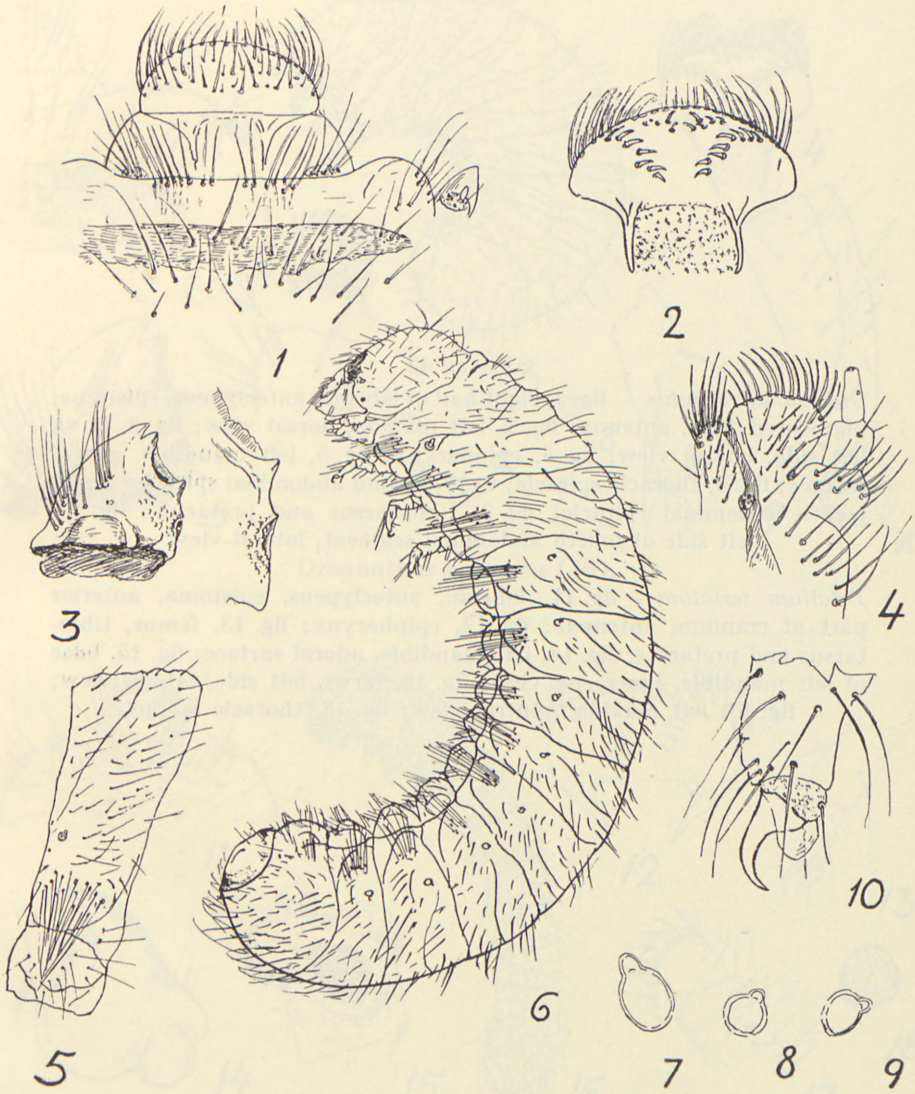
Gastrallus sp. (*G. laevigatus*) — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, left maxilla, ventral view; fig. 5, left mandible, adoral surface; fig. 6, pretarsus; fig. 7, thoracic spiracle; fig. 8, abdominal spiracle.



Gastrallus sp. (*laevigatus*) (47).

PLATE 41

Catorama vestitum — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, left maxilla, ventral view; fig. 5, left side of fourth abdominal segment; fig. 6, larva, left side, lateral view; fig. 7, thoracic spiracle; fig. 8, first abdominal spiracle; fig. 9, second abdominal spiracle; fig. 10, pretarsus.

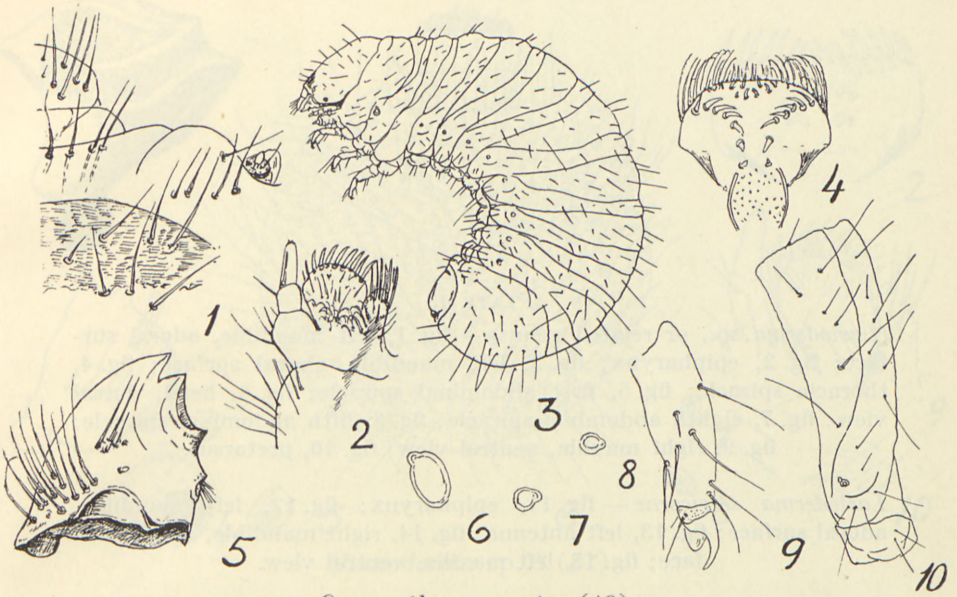


Catorama vestitum (48).

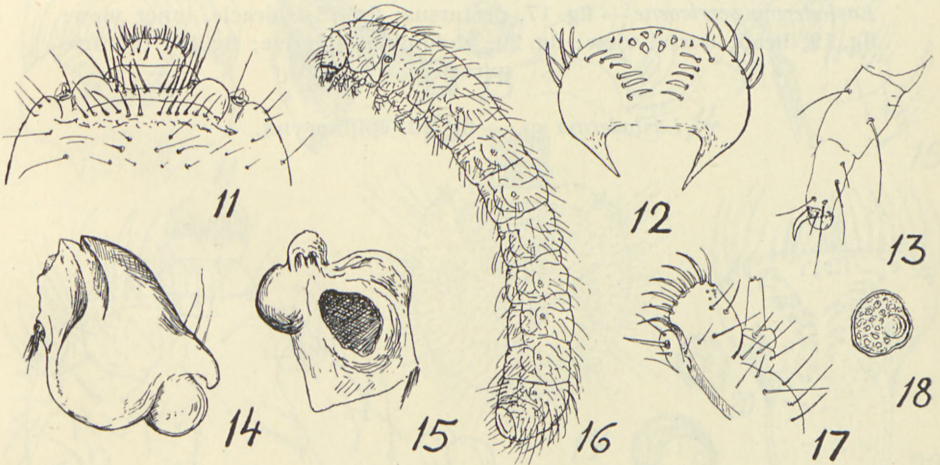
PLATE 42

Ozognathus cornutus — fig. 1, right half of labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, left maxilla, dorsal view; fig. 3, larva left side, lateral view; fig. 4, epipharynx; fig. 5, left mandible, aboral surface; fig. 6, thoracic spiracle; fig. 7, second abdominal spiracle; fig. 8, eighth abdominal spiracle; fig. 9, tibio-tarsus and pretarsus; fig. 10, left side of fourth abdominal segment, lateral view.

Petalium seriatum — fig. 11, labrum, anteclypeus, epistoma, anterior part of cranium, antennae; fig. 12, epipharynx; fig. 13, femur, tibio-tarsus and pretarsus; fig. 14, left mandible, adoral surface; fig. 15, base of left mandible, inner end view; fig. 16, larva, left side, lateral view; fig. 17, left maxilla, ventral view; fig. 18, thoracic spiracle.



Ozognathus cornutus (49).



Petalium serialum (50).

PLATE 43

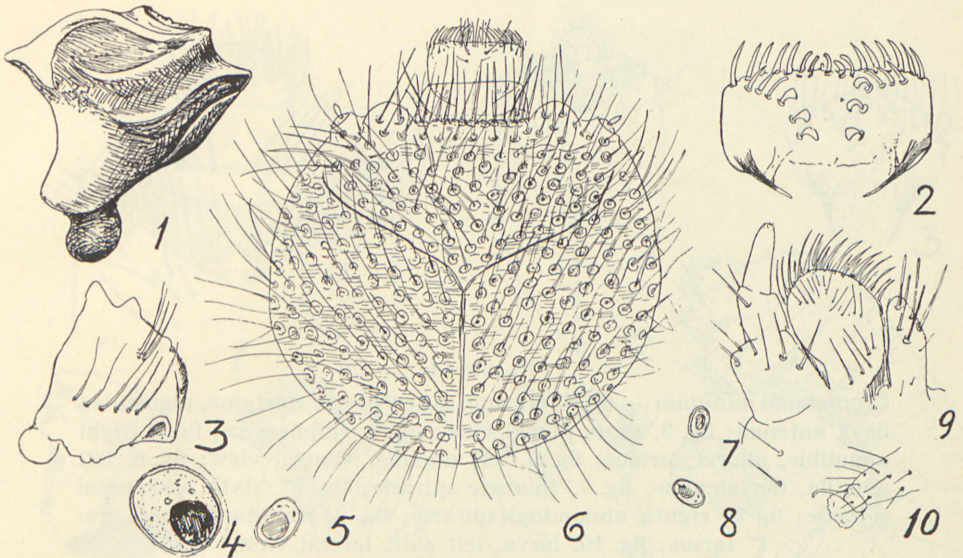
(*Lasioderma* sp., or related genus) — fig. 1, left mandible, adoral surface; fig. 2, epipharynx; fig. 3, left mandible, aboral surface; fig. 4, thoracic spiracle; fig. 5, first abdominal spiracle; fig. 6, head, dorsal view; fig. 7, eighth abdominal spiracle; fig. 8, fifth abdominal spiracle; fig. 9, right maxilla, ventral view; fig. 10, pretarsus.

Lasioderma serricorne — fig. 11, epipharynx; fig. 12, left mandible, adoral surface; fig. 13, left antenna; fig. 14, right mandible, aboral surface; fig. 15, left maxilla, ventral view.

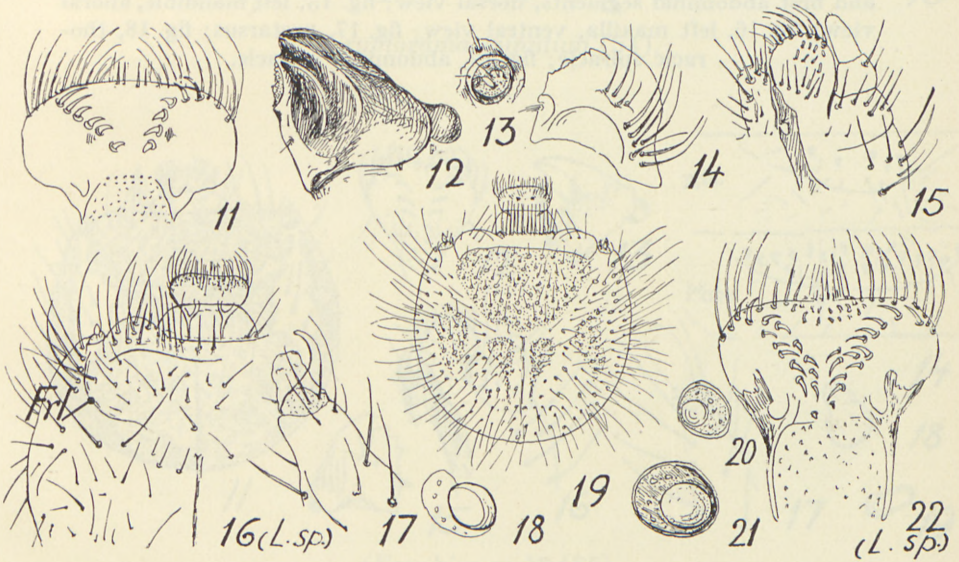
Lasioderma sp. — fig. 16, left anterior part of head (Frl: frontal cleavage line).

Lasioderma serricorne — fig. 17, pretarsus; fig. 18, spiracle, inner view; fig. 19, head, dorsal view; fig. 20, abdominal spiracle; fig. 21, thoracic spiracle.

Lasioderma sp. — fig. 22, epipharynx.



(*Lasioderma* sp.)? (51).



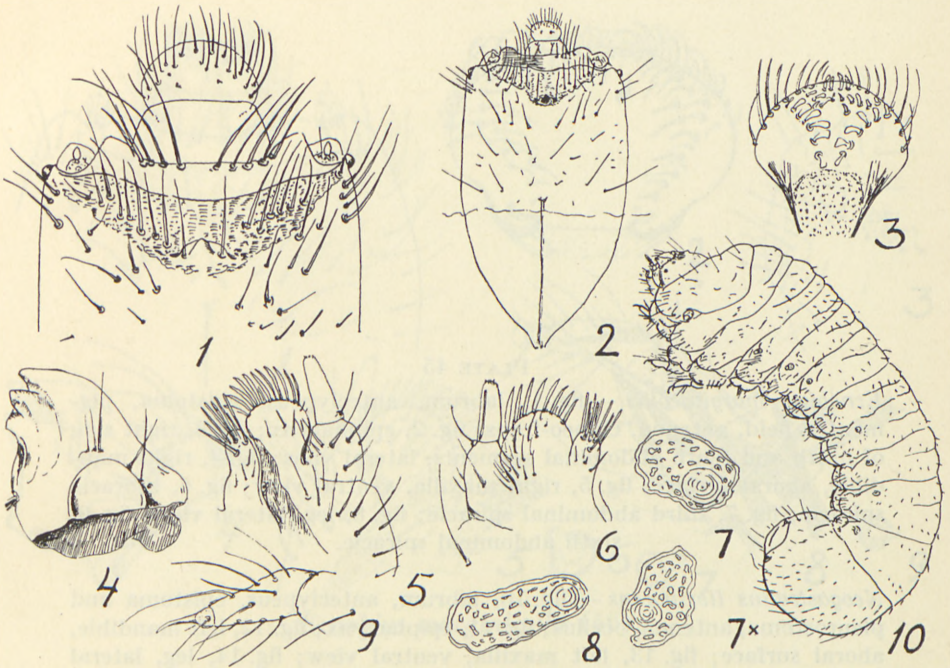
Lasioderma serricorne (52)

Lasioderma sp. (53).

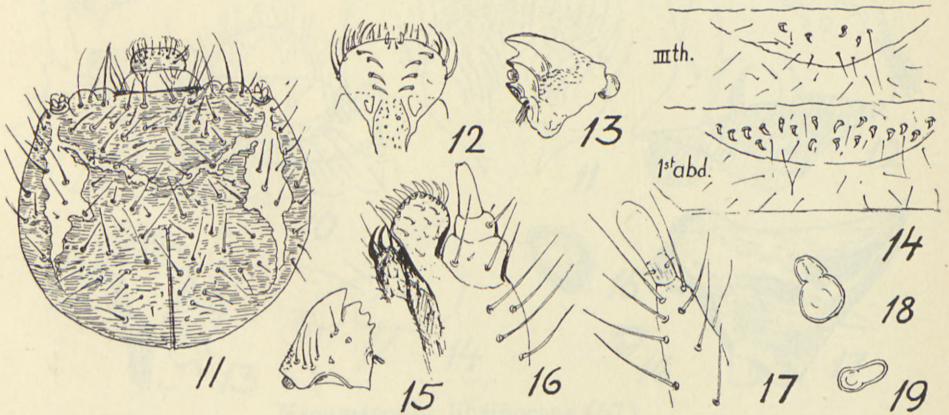
PLATE 44

Cryptorama minutum — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna; fig. 2, head, dorsal view; fig. 3, epipharynx; fig. 4, right mandible, aboral surface; fig. 5, left maxilla, ventral view; fig. 6, left maxilla, dorsal view; fig. 7, thoracic spiracle; fig. 7*, sixth abdominal spiracle; fig. 8, eighth abdominal spiracle; fig. 9, tibio-tarsus and pretarsus; fig. 10, larva, left side, lateral view.

(*Ernobius* sp.)? — fig. 11, head, dorsal view; fig. 12, epipharynx; fig. 13, left mandible, adoral surface; fig. 14, prodorsal asperities of third thoracic and first abdominal segments, dorsal view; fig. 15, left mandible, aboral view; fig. 16, left maxilla, ventral view; fig. 17, pretarsus; fig. 18, thoracic spiracle; fig. 19, abdominal spiracle.



Cryptorama minutum (54).

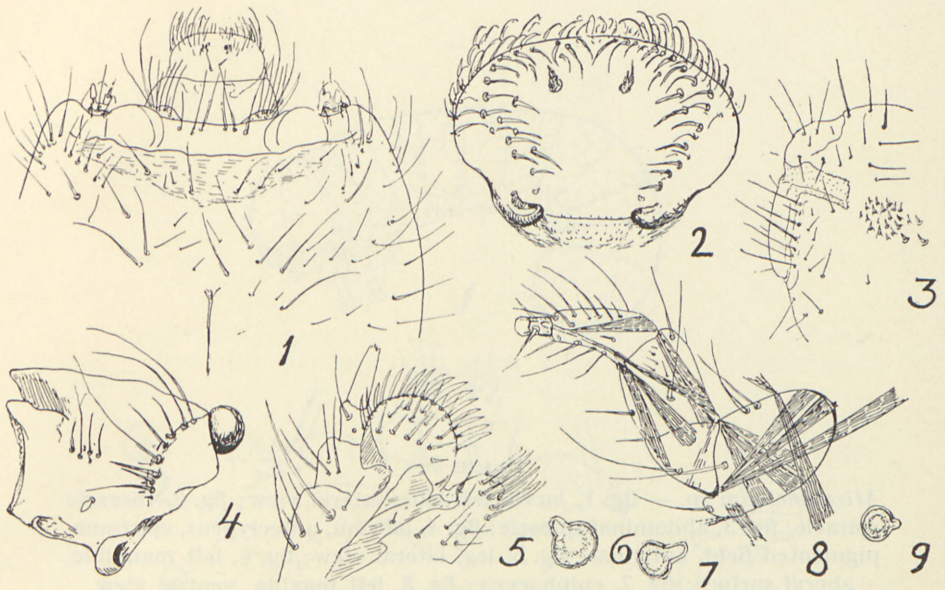


(Ernobius sp.)? (55).

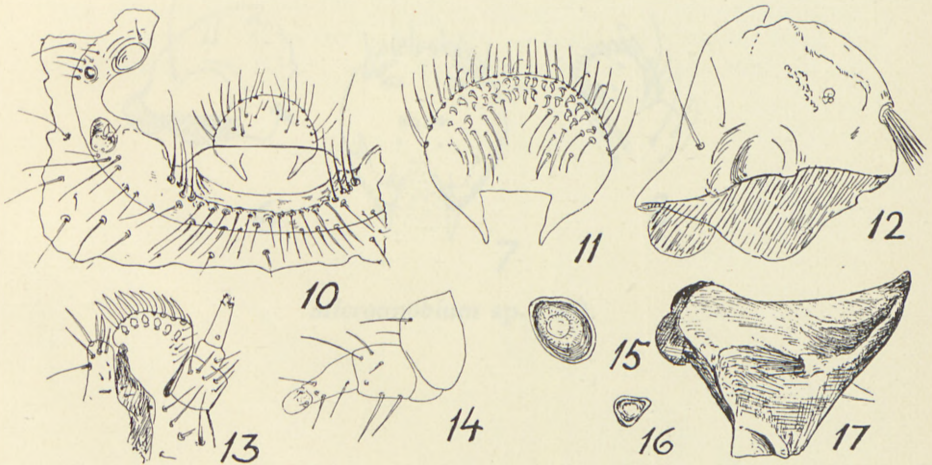
PLATE 45

Ernobius marginicollis — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antenna, clypeo-frons; fig. 2, epipharynx; fig. 3, right side of ninth and tenth abdominal segments, lateral view; fig. 4, right mandible, aboral surface; fig. 5, right maxilla, ventral view; fig. 6, thoracic spiracle; fig. 7, third abdominal spiracle; fig. 8, leg, lateral view; fig. 9, sixth abdominal spiracle.

Neogastrallus librinocens — fig. 10, labrum, anteclypeus, epistoma and pleurostoma, antenna, ocellus; fig. 11, epipharynx; fig. 12, left mandible, aboral surface; fig. 13, left maxilla, ventral view; fig. 14, leg, lateral view; fig. 15, thoracic spiracle; fig. 16, abdominal spiracle; fig. 17, right mandible, adoral and small part of aboral surfaces showing the scraper-shaped subapical margin.



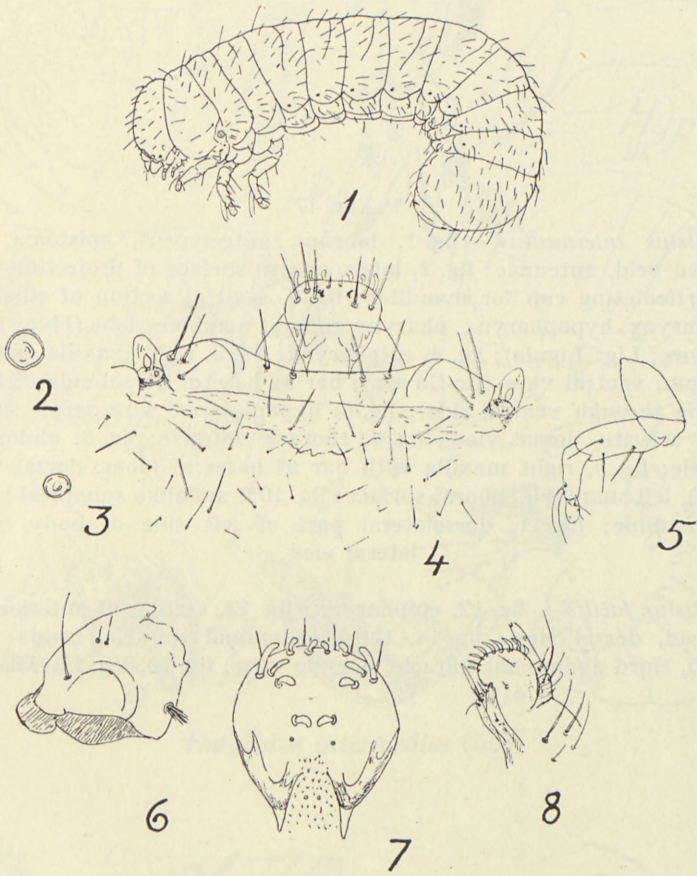
Ernobius marginicollis (56).



Neogastrallus librinocens (57).

PLATE 46

Microanobium sp. — fig. 1, larva, left side, lateral view; fig. 2, thoracic spiracle; fig. 3, abdominal spiracle; fig. 4, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 5, leg, lateral view; fig. 6, left mandible, aboral surface; fig. 7, epipharynx; fig. 8, left maxilla, ventral view.

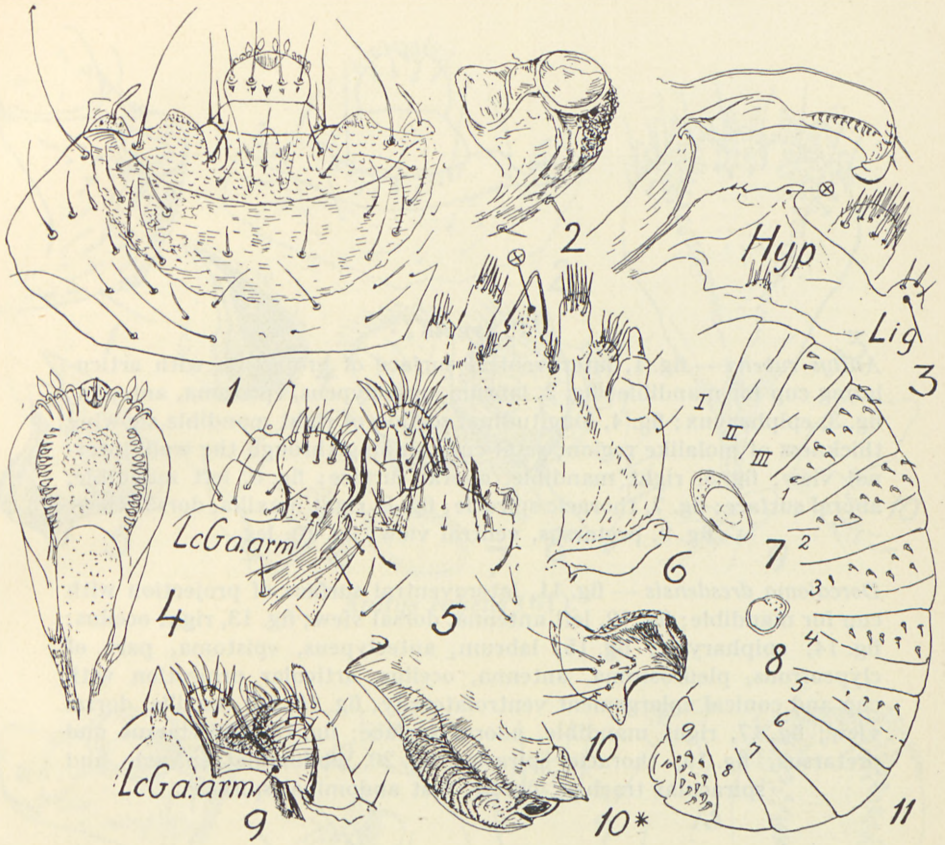


Microanobium sp. (58).

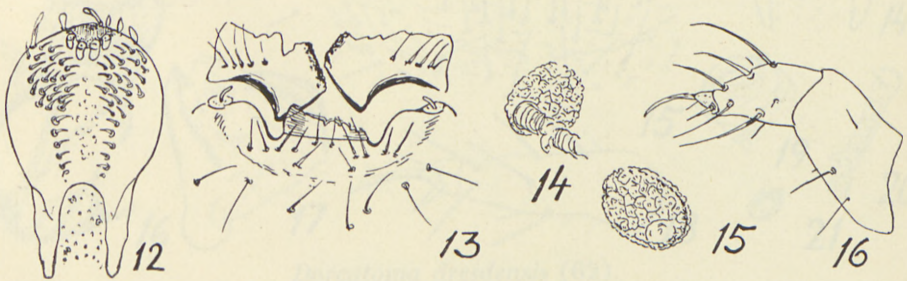
PLATE 47

Eutylistus intermedius — fig. 1, labrum, anteclypeus, epistoma, pigmented field, antennae; fig. 2, lateroventral surface of projection bearing articulating cup for mandible; fig. 3, sagittal section of cibarium, epipharynx, hypopharynx, pharynx and left maxillary lobe (Hyp: hypopharynx; Lig: Ligula); fig. 4, epipharynx; fig. 5, right maxilla and prementum, ventral view (Lc-Ga arm: bar at base of dorsal side of lobes, shining through ventral side); fig. 6, hypopharynx with arrow shaped distal sclerite, dorsal view; fig. 7, thoracic spiracle; fig. 8, abdominal spiracle; fig. 9, right maxilla with bar at bases of lobes, dorsal view; fig. 10, left mandible, aboral surface; fig. 10*, molalike subapical region of mandible; fig. 11, dorsolateral part of left side of body trunk, lateral view.

Eutylistus facilis — fig. 12, epipharynx; fig. 13, section of anterior part of head, dorsal view; fig. 14, third abdominal spiracle, inside view; fig. 15, third abdominal spiracle, outside view; fig. 16, leg, lateral view.



Eutylistus intermedius (59).

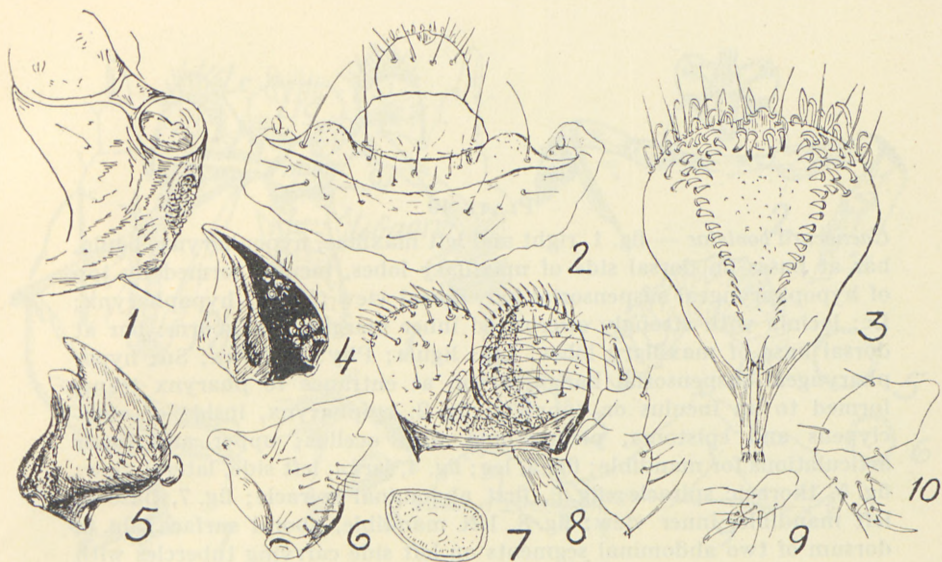


Eutylistus facilis (60).

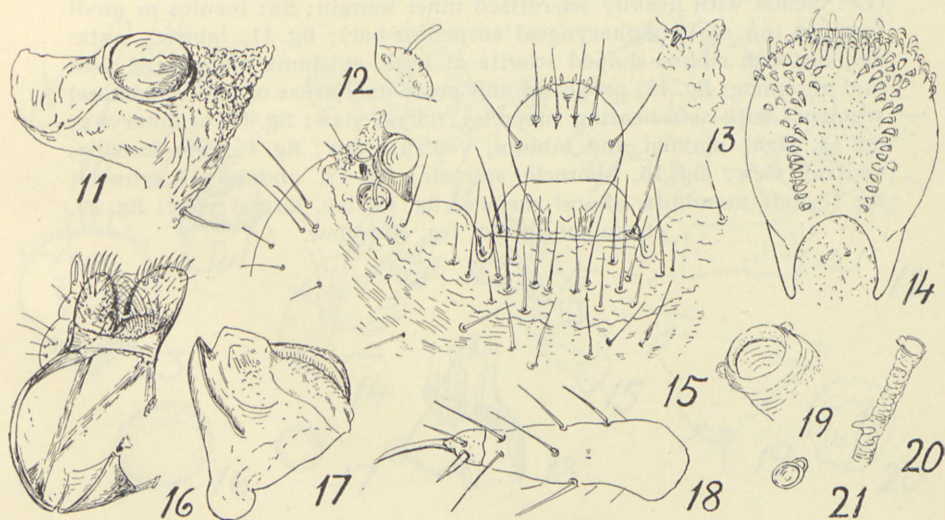
PLATE 48

Anitys rubens — fig. 1, lateroventral surface of projection with articulating cup for mandible; fig. 2, labrum, anteclypeus, epistoma, antenna; fig. 3, epipharynx; fig. 4, longitudinal section of right mandible showing thickness of molalike region; setal cups shining through the wall, internal view; fig. 5, right mandible, aboral surface; fig. 6, left mandible, aboral surface; fig. 7, thoracic spiracle; fig. 8, right maxilla, dorsal view; fig. 9, pretarsus, ventral view; fig. 10, leg.

Dorcatoma dresdensis — fig. 11, lateroventral surface of projection with cup for mandible; fig. 12, left antenna, dorsal view; fig. 13, right ocellus; fig. 14, epipharynx; fig. 15, labrum, anteclypeus, epistoma, part of clypeofrons, pleurostoma, antenna, ocellus, articular projection with cup and conical enlargement ventrolaterally; fig. 16, left maxilla, dorsal view; fig. 17, right mandible, adoral surface; fig. 18, tibio-tarsus and pretarsus; fig. 19, thoracic spiracle; fig. 20, abdominal spiracle and spiracular trachea; fig. 21, first abdominal spiracle.



Anitys rubens (61).

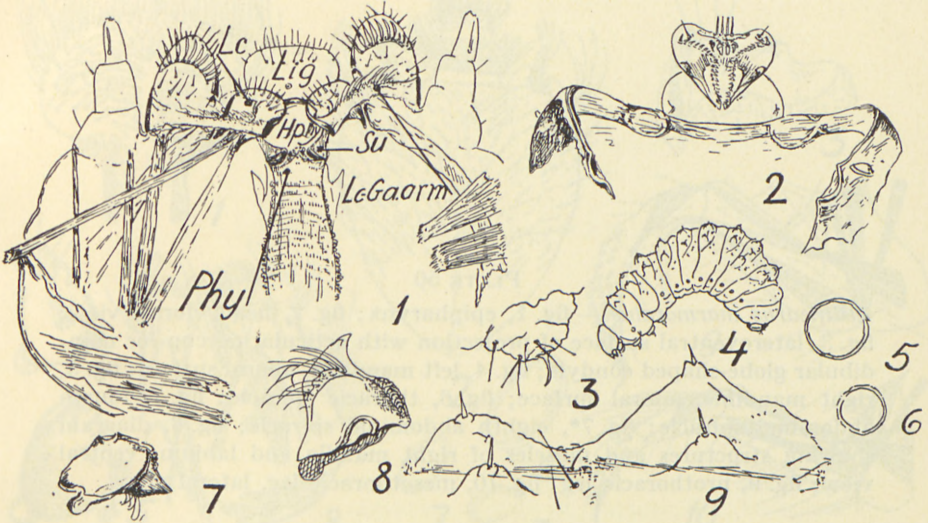


Dorcatoma dresdensis (62).

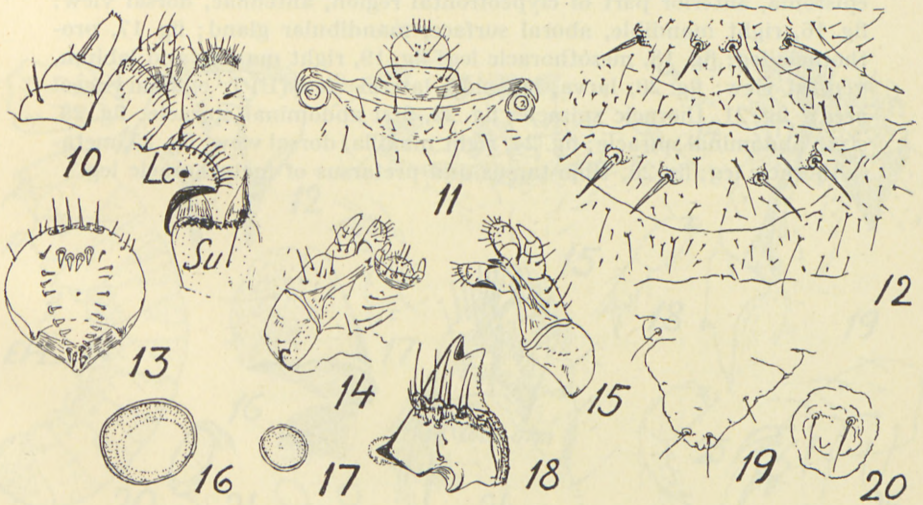
PLATE 49

Caenocara bovistae — fig. 1, right and left maxillae, hypopharynx, ligula, bar at bases on dorsal side of maxillary lobes, inculus formed by top of hypopharyngeal suspensorial bar, dorsal view (Hphy: hypopharynx; Lc: lacinia with strongly sclerotized inner margin; Lc-Ga arm: bar at dorsal base of maxillary lobes; Lig: ligula; Phy: pharynx; Su: hypopharyngeal suspensorial bar with top at entrance to pharynx transformed to an inculus or "anvil"); fig. 2, epipharynx, inside of anteclypeus and epistoma, pleurostoma with ocellus; upper and lower articulations for mandible; fig. 3, leg; fig. 4, larva, left side, lateral view; fig. 5, thoracic spiracle; fig. 6, first abdominal spiracle; fig. 7, base of left mandible, inner view; fig. 8, left mandible, aboral surface; fig. 9, dorsum of two abdominal segments on left side carrying tubercles with a single seta on top.

Caenocara oculata — fig. 10, left maxilla and hypopharynx, dorsal view (Lc: lacinia with heavily sclerotized inner margin; Su: inculus or anvil forming top of hypopharyngeal suspensor-bar); fig. 11, labrum, anteclypeus with ribbon-shaped sclerite at base, epistoma, pigmented field and antennae; fig. 12, prodorsal and postdorsal areas of two abdominal segments with seta-bearing tubercles, dorsal view; fig. 13, epipharynx; fig. 14, right maxilla and labium, ventral view; fig. 15, left maxilla, ventral view; fig. 16, thoracic spiracle; fig. 17, abdominal spiracle; fig. 18, left mandible, aboral surface; fig. 19, leg, lateral view; fig. 20, terminal part of leg, end view.



Caenocara bovistae (63).

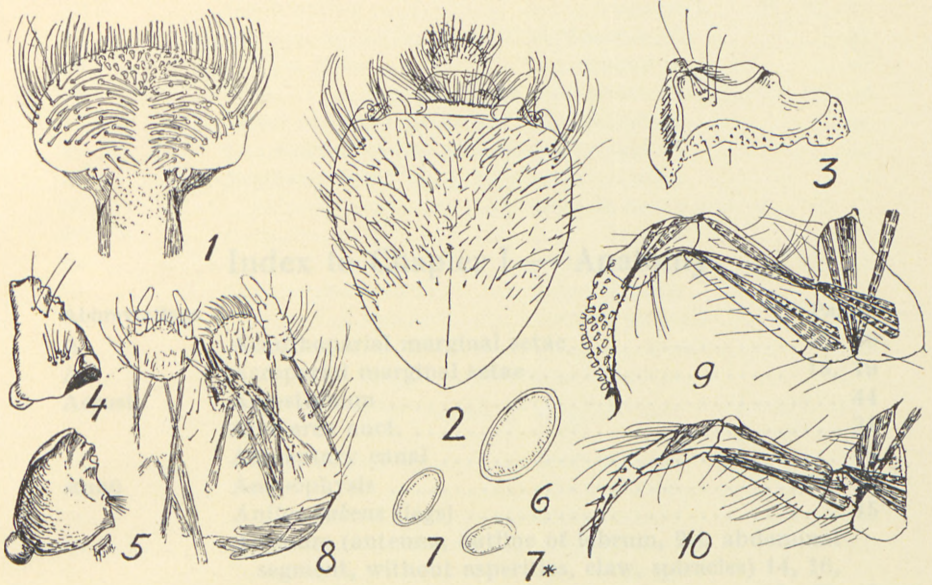


Caenocara oculata (64).

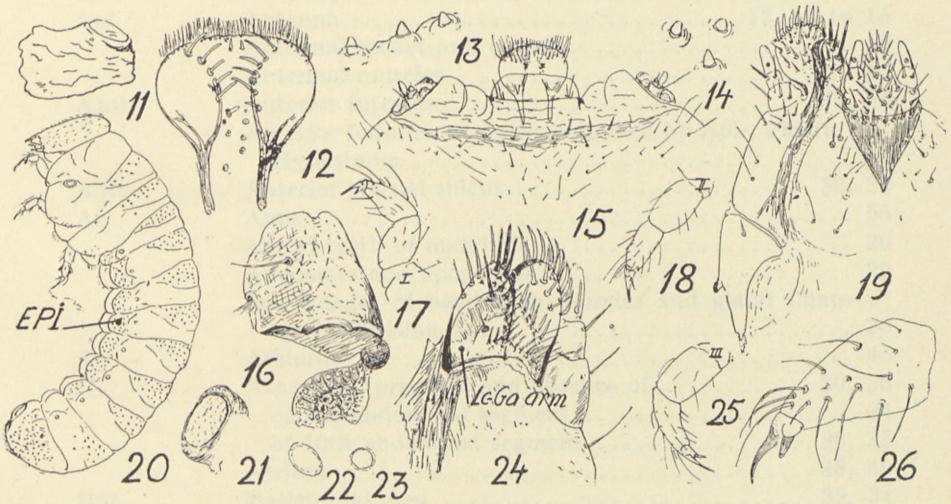
PLATE 50

Ptilineurus marmoratus — fig. 1, epipharynx; fig. 2, head, dorsal view; fig. 3, lateroventral surface of projection with articulating cup for mandibular globe-shaped condyle; fig. 4, left mandible, aboral surface; fig. 5, right mandible, adoral surface; fig. 6, thoracic spiracle; fig. 7, fourth abdominal spiracle; fig. 7*, eighth abdominal spiracle; fig. 8, diagram showing structures and muscles of right maxilla and labium, ventral view; fig. 9, prothoracic leg; fig. 10, mesothoracic leg, lateral view.

Ptilinus basalis — fig. 11, projection with articulating cup for mandibular globe-shaped condyle; fig. 12, epipharynx; fig. 13, prodorsal asperities; fig. 14, epipleural asperities; fig. 15, labrum, anteclypeus, epistoma, anterior part of clypeofrontal region, antennae, dorsal view; fig. 16, right mandible, aboral surface, mandibular gland; fig. 17, prothoracic leg; fig. 18, mesothoracic leg; fig. 19, right maxilla and labium, ventral view; fig. 20, larva, left side, lateral view (EPI: epipharyngeal area); fig. 21, thoracic spiracle; fig. 22, first abdominal spiracle; fig. 23, sixth abdominal spiracle; fig. 24, right maxilla, dorsal view; fig. 25, meta-thoracic leg; fig. 26, tibio-tarsus and pretarsus of metathoracic leg.



Piilineurus marmoratus (65).



Ptilinus basalis (66).

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Acr	Acroparial marginal setae..... 18, 19
Acrost	Acrosternum 44
	Alar area auct. 31
	Alimentary canal 49
Anap	Anapophysis 12, 13
	<i>Anitys rubens</i> (legs) 45
	<i>Anobium</i> (antenna, outline of labrum, 9th abdominal segment, without asperities, claw, spiracles) 14, 16, 30, 45, 48
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Acls	Anteclypeal sulcus 15
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	Antennal socket and casing 13
	Antennal muscles 14
AInt	Anterior intestine 49, 54
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ASts	Anterior sternal sulcus..... 32, 33
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Ar	Arolium 45
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	Bicameral spiracle 49
Bow	Bow of nates 55
Br	Brain..... Plate 3

Abbreviations

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	anterior margin of galea transversally split	25
	setae of body sparse	30
	legs of	35, 46
	muscles of legs	46
	spiracles of	48
Cardv	Cardiac valve	52
Cd	Cardo	23, 26
a**	articulating process	23, 26
Cd _I , Cd _{II} , Cd _{III} , Cd _{IV} }	four margins of cardo	23
r	ridge of cardo	23, 26
I	retractor of	25
aded	ventral adductor of	26
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	<i>gracilis</i> (mandible)	20
	<i>herbarium</i> (unicameral spiracle)	48
	<i>nigritulum</i> (pseudocribiform spiracle)	48
	<i>punctatum</i> (circular, simple spiracle)	48
	<i>tabaci</i> (spiracle with two separate spouts)	48
	<i>vestitum</i> (body fairly straight; asperities lacking; arolium present)	29, 45
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	Cervical muscles	35
	Cervical plates (absent)	35
C	Chaetoparial setae	18
Cb	Cibarial preoral cavity	49
#5, #6, #7	dilator muscles of	50
	functional motions of	50
Dac	Claw (= Dactylopodite)	44
Clp	Clypeus (proper), part of clypeofrontal region	12, 15
#5, #6, #7	Clypeal dilator of cibarium	19, 50
Clp-Ephy	Clypeal epipharynx	17, 19, 50
Gla	Coecca-gastric	5g
	<i>Coelostethus notatus</i>	
	antennal casing heavily sclerotized	14
	anteclypeus completely sclerotized	15
	Colon, not a separate posterior part of anterior intestine in anobiid larvae	54
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c	Coxal articulation with pleural ridge 44
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Cri	Crepidial area 18
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a-a	Dorsopleural sulcus 31, 32, 33
EpicrR	Epicranial ridge 11
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Epicrs	Epicranial sulcus 11
Epm	Epimeron 33
Ephy	Epipharynx
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A	marginal acanthoparial region 18
Acr	acroparial region 18
C	chaetoparial region 18
Co	coryphal region 18
Cri	crepidal area 18
G	gymnoparial region 18
P	pedium, central bare region 18
EPI	Epipleural area 32, 33
	epipleural lobes of thorax and abdomen 32, 33
	setae of epipleural lobes 33
EPIs	epipleural sulcus 31, 32, 33

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Eps	Episternum 34
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	Epistomal sulcus, not present in anobiid larvae . . . 15
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	First larval stage 29
	Foramen magnum (= "Occipital foramen") 10
	Foramen framed by postoccipital apophysis and tentorial bridge 10
	Foramen framed by epistoma, pleurostoma and hypostoma 11
Frl	Frontal cleavage line (= frontal suture auct. = diverging branches of epicranial suture auct.) . . . 11
	Fronto-clypeal = clypeofrontal region
	fronto-clypeal (= epistomal) sulcus lacking 13
Fr.Gng	Frontal ganglion with connectives 13, 19
Su	Fultura = suspensorial bar of hypopharynx 19
	Furca (= Sternal apophysis auct.) 29
fure	Furca-spot, infracoxal 34, 39
Ga	Galea 24
fga	flexor muscle of 25, 26
	<i>Gastrallus laevigatus</i>
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Hphy	Hypopharynx

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#19	retractor muscle of hypopharynx from tentorial bridge 19, 50
#10	retractor muscle of mouth from end of bar . . . 19, 50
	adoral surface of 19
Pl	Hypopleural area, auct. = Pleurum 32
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inev	Inevertible basal part of nates 55
Su	Inculus (= "anvil") 20
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Cr	Ingluvies ("crop") 49, 52
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AInt	Intestine, anterior 49, 54
	Intestine, posterior divided into
rsc	1) rectal sac with a membrane covering malpighian tubules and rectal pad (rpa) 54
Rect	2) rectum proper with suspensorial muscles (spoms), strong intima, and well-developed peristaltic muscles 54
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Fil-Gr1	Intima of crop with forward directed fine hairs and backward directed granulae 52
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ujc	upper 31
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Msmt	2) prelabial mesomentum 27
Prmt	3) prelabial prementum 27
Lbs	Labial sulcus 27
vadlb	Labial ventral adductor muscle (21) 27
rst	Labial ventral median retractor muscle(22) 27, 29
dadlb	Labial dorsal adductor muscle (20) 27
Lbplp	Labial palpus 28
dep plp	depressor of labial palpus (23) 28
lev plp	levator of labial palpus (24) 28

Abbreviations	Pages
Lm	Labrum 15
	outline of labrum 16
#3	Labral depressor muscles 11, 16, 50
#1	Labral compressor muscles 16
Mark	Labral markings 16
	Labral rod 17
LmEphy	Labral Epipharynx 17, 50
Lc	Lacinia maxillaris 23
	size in proportion to galea 24
	marginal sclerotizations 24
f.lcs	lacinial intrastipital flexor muscle 25, 26
f.lcc	lacinial flexor from cranial wall 26
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	antenna with two low articles 14
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Lig	Ligula 19, 27
lmcl	Longitudinal muscle fibers pertaining to alimentary
	canal 52, 53, 54
lje	Lower junction 31, 32, 34
Mal	Malpighian tubules 53
Malsc	membranous sheath covering malpighian tubules. 54
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	location of mandible 20, 50
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	abductor and adductor muscles of mandible 22
	movements of mandible 22, 50
	taxonomic qualifications 22
Gland	gland of mandible 22
Mx	Maxilla — Chapter I, section 4b 22
	location of maxilla 22, 50
	attachment to hypostoma and to labium 23
	description of maxillary parts 22 to 25
Lc-Ga arm	adoral bar of maxillary lobes 24
	muscles of maxillary parts 25

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Hng	transverse hinge 23
	Maxillary palpus see: Palpus maxillaris
Mxamb	Maxillary articulating region 23, 27
Slin	Maxillulae auct. = paragnaths 20, 28
	Medioventral apophysis (= spina) 29
m	Meron 34
Msmt	Mesomentum 27
rst	labial ventral median retractor inserted in posterior margin of mesomentum 27, 29
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#A1a, #A2	
#3, #A3	external, sectional, thoracic and abdominal muscles 37
#1b, #A1b	paradorsal thoracic and abdominal muscle 37
	<i>Conjunctival and associated with Conjunctival muscle</i>
#12c	thoracic conjunctival muscle 38, 43
#A12	abdominal conjunctival muscle 38
#11	upright posterior intersegmental tergo-pleural muscle of thorax 38
#12a, #12b	supplementary muscles to conjunctival muscle, running forward in thorax 38, 43
#A7a, #A7b	supplementary muscles to conjunctival muscle, run-

Abbreviations	Pages
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#A4a	internal, intersegmental abdominal muscle 40
#A4g	external, segmental abdominal muscle 40
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#16	extracoxal depressor of trochanter 41, 46
#17	anterior rotator of coxa from spina spot 41
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	<i>Intrinsic leg muscles</i>
O	coxal levators of trochanter 46
Q	coxal depressor of trochanter 46

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R	trochanteral reductor of femur 44, 46
S	femoral levator of tibio-tarsus 46
T	femoral depressor of tibio-tarsus 47
U	femoral and tibio-tarsal depressor of claw 47
<i>Special Prothoracic Muscles</i>	
1*	tergal horizontal levator of head 41
1**	tergal oblique ascendant muscle 42
2*	tergal rotator of head 42
3*	tergal oblique ascendants to roof of prothorax 42
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#6	sternal ascendants, levator of head 42
#9	acrosternal ascendants to tergum 42
#12b	upper tergal oblique ascendant from lower junction 42, 43
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#4a*	sternocostal longitudinal depressor of head 43
#4b*	sternal longitudinal depressor of head 43
#10a	tergal ascendant oblique muscle from pleural ridge 43
#5	prothoracic posterior rotator of coxa from spina-spot 43
Nat	Nates ("anal cushion") 35, 49, 54
rail	prolonged ventral side of rectum 55
incv-cv	elevation from body surface 55
spoms	suspensormuscle fibers of nates 55
Cvx	Neck 29
<i>Neogastrallus librinocens</i>	
	asperities lacking 30
	claw lacking 45
<i>Nevermannia dorcatomoides</i>	
	ocellus aberrant 15
	mandibular keels large 21
	asperities minute, obtuse or with flat scraperlike top 30
<i>Nicobium castaneum</i>	
	subcircular labrum 16
Lc-Ga arm	adoral arm of maxillary lobe present 24
	lacinia as large as galea 24
	maxillary palpus with four articles 25
	asperities on tenth abdominal segment straight 30
	claw straight, multisetose basal part of pretarsus large 44
	Ninth abdominal segment 34
	Nodal swellings 29
	Occipital foramen see: foramen magnum 10
<i>Ochina ptinoides</i>	
	asperities on tenth abdominal segment 30
O	Ocellus
	location of 13

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Oc	Occiput Plate 2
Oe	Oesophagus 49
#cmcl	circular peristaltic muscles of 52
#lmcl	longitudinal peristaltic muscles of 52
	<i>Oligomerus sericans</i>
	subcircular labrum 16
	lacinia as large as galea 24
	spiracle with two separated spouts 48
	Organ of ingestion — Chapter I, Division 9 49
	<i>Ozognathus cornutus</i>
	antenna with two low articles 14
	asperities lacking 30
	spiracle with single, short spout 48
Plp	Palpus maxillaris
	number of articles, setal arrangement, sensory rod. 25
#dplp	depressor of palpus 26
#lplp	levator of palpus 26
	small muscles of articles 26
ParD	Paradorsal area 32
ParDL	paradorsal line 33
#Alb	paradorsal longitudinal muscle 37
	Paradorsal-Epipleural area 33
Slin	Paragnath 20, 28
	Parietale
	not separated from clypeofrontal region in most
	species, frontal lines lacking 13
#31	dilator-muscles of pharynx from parietale 52
PdA	Pedal area 32
P	Pedium 18
cmcl-lmcl	Peristaltic muscle sheath of circular and longitudinal
	fibers
	on pharynx 52
	on oesophagus and crop 52
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	on ventriculus 53
	on pylorus 53
	on anterior intestine 54
	on rectal sac 54
	on rectum proper 54
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	extension of peritremal rim 48
Peritrs	Peritrophic sacs 53
	<i>Petalium seriatum</i>
	simple tormae 18
	body rather straight 29

Abbreviations	Pages
	asperities lacking 30
Phy	Pharynx 19, 51
#9	anterior dorsal dilator of pharynx from frons . . 50, 51
#11	posterior dorsal dilator of pharynx from frons . . . 51
#12	layer of transverse, oblique muscle fibers 51
#30	ventral dilator of pharynx from tentorium 51
#31	lateral dilator of pharynx from parietale 51
	Phragmata
	high phragmata lacking 29
	low phragmata bearing longitudinal muscles 31
	Pigmented field behind epistoma 12
pt	Pit of posterior tentorial arm 10
Aclp	Plate of anteclypeus 15
	<i>Platybregmus canadensis</i>
	ninth abdominal segment without asperities 30
	claw rather straight and strong 45
	<i>Platypus compositus</i> 48
PIA	Pleural apophysis short 29
C	condyle of pleural apophysis 34, 44
Pl	Pleural region (<i>Hypopleurum</i> auct.) 32
EpsEpm	Pleural sclerite 33
Pls	Pleural sulcus 33
	Pleurosternal region 31, 32
Pst	Pleurostoma 11, 12, 13
b-b	Pleuroventral sulcus 32
	Postclypeus 15
PsD	Postdorsal area 32
	Posterior intestine 49, 54
PSts	Posterior sternal sulcus 32
	Postlabium 27
Poc	Postocciput Plate 2, fig. 1
PoR	Postoccipital apophysis 10, 42
pos	Postoccipital sulcus 10, 37
	Preface 3
	Prelabium 27
Prmt	Prementum 19, 27
dadlb	labial dorsal adductor inserted exteriorly in prementum 27
PrmScl	Premental sclerite 27, 28
#vadlb	labial ventral adductor inserted on sclerite 27
Cb	Preoral cibarial cavity 8, 49
	(Presternal section absent) 34
Ptar	Pretarsus 44
	<i>Priobium tricolor</i>
	pigmented field behind epistoma lacking 12
	spiracles with a single multibranched spout 49

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PrD	Prodorsal area 31, 32
PrDS	Prodorsal sulcus 32
	Prognathous type of head..... 10
	<i>Proterhinus antracis</i> 48
	Prothoracic areas 30, 34
	Prothoracic musculature see: "Musculature of trunk and legs" 36
Pvent	Proventriculus 49, 52
Cardy	cardiac valve of proventriculus 52
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	Pseudomola 21, 22
	<i>Ptilineurus marmoratus</i>
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	numerous coryphal setae..... 18
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	neck of 29
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	legs 45
	<i>Ptilinus basalis</i>
Lc-Ga arm	adoral arm of maxillary lobes 24
PrmtScl	triangular premental sclerite 28
	epipleural asperities present 30, 34
	spiracles simple, ring shaped, without spouts or air tubes 48
Pyl	Pylorus 49, 53
	pyloric valve 53
Mal	malpighian tubules..... 53
v.rectf	Rectal lateroventral fold..... 55
rsc	Rectal sac 49, 54
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	labial 28
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	paragnathal 20
	pretarsal 44, 45
sl	Setula of mandible 21
Spin	Spinaspot in spinasternum 29, 39
Sp	Spiracles
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	position of 47
	simple, without air tubes 47
	with open spouts or closed air tubes 48
	pseudocribiform 49
	unicameral and multicameral 48
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S	Spiracular muscle from peritrema 39
	<i>Stegobium paniceum</i> (= <i>Sitodrepa panicea</i>)
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	spiracles small, thoracic somewhat larger than each of the eight abdominal; all unicameral 48
	Sternal apophysis (see: furca), absent 29
ASts + PSts	Sternal arterial and posterior sulci 32
stmsc	Sternal longitudinal muscles 55
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Stco	Sternocostal line 34
St	Stipes
DLMg	dorsolateral membranous margin 23
VLMg	ventrolateral margin 23
q	bar of ventrolateral margin 23, 26
adst	ventral adductor of stipes 26
	Subapical margin of mandible 20, 21, 22
Scx'	Subcoxal area with anterior lobe 33
Scx''	and posterior lobe 33
#10b	tergopleural muscle from membrane of anterior lobe

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	Sulci
AcIs	anteclypeal sulcus 15
EpicrS	coronal sulcus = epicranial sulcus 11
a-a	dorsopleural sulcus 31, 32
EpicrS	epicranial sulcus 11
EPIS	epipleural sulcus 31, 38
EPT	epipleural triangle sulcus 38
	(epistomal sulcus not present) 15
	(frontal suture auct. = frontal cleavage line)
Frl	frontal cleavage line 11
	(gular sulcus not present) 28
Lbs	labial sulcus 27
ParDL	paradorsal line 33
Pls	pleural sulcus 33
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adca + adst	ventral adductors of cardo and stipes adfixed to
	anterior tentorial arms 10
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Abbreviations	Pages
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Vx	Vertex 10 <i>Vrillella blaisdelli</i> antenna reduced to a completely membranous dome carrying sense organs, no articles 14 proximal mandibular setae on top of small round elevations 21 Wing pads 31

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Errata.

- | | | |
|------------------|------------------------|------------------------|
| p. 20, line 29: | for <i>C. gracilis</i> | read <i>C. gracile</i> |
| p. 28, line 13: | ” <i>paragnatha</i> | ” <i>paragnaths</i> |
| p. 29, line 19: | ” <i>Xyltobius</i> | ” <i>Xyletobius</i> |
| p. 30, line 12: | ” <i>C. gracilis</i> | ” <i>C. gracile</i> |
| p. 62, line 14: | ” | ” |
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| p. 65, line 8: | ” | ” |
| p. 74, line 2: | ” | ” |
| p. 74, line 5: | ” | ” |
| p. 74, line 32: | ” was | ” way |
| p. 100, line 23: | ” equal, | ” equally |
| p. 280, line 23: | ” <i>C. gracilis</i> | ” <i>C. gracile</i> |
| plate 13: | ” | ” |

