A CLASSIFICATION OF THE LARVAE OF TENTHREDINOIDEA

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Table of Contents

Page

I. Introduction..... 1

II. Morphology..... 11

III. Taxonomy..... 41

Historical..... 41

Classification

Tenthredinoidea, definition of..... 44

Tenthredinoidea, keys to the families of..... 46

Xyelidae..... 48

Pamphiliidae..... 53

Blasticotomidae..... 61

Tenthredinidae..... 62

Tenthredinidae, key to the subfamilies of 63

Diprioninae..... 69

Emphytinae..... 75

Selandriinae..... 87

Dolerinae..... 92

Phyllotominae..... 97

Lycaotinae..... 104

Tenthredininae..... 105

Cimbicinae..... 112

Hoplocampinae..... 117

Dineurinae..... 121

Monocteninae..... 123

Cladiinae..... 124

Nematinae..... 132

Blennocampinae..... 173

Fenusinae..... 181

Page

Scolioneurinae..... 184

Hylotominae..... 188

Schizocerinae..... 192

Acordulecerinae..... 194

Xiphydriidae..... 197

Siricidae..... 200

Megalodontidae..... 204

Cephidae..... 205

Oryssidae..... 211

IV. Phylogeny.

Statement of the problem..... 214

Evidences considered..... 217

General discussions of relationship of the different families..... 229

Genealogical tree representing the probable affinities of the members of the Tenthredinoidea..... 234

Summary and conclusions..... 234

V. Glossary..... 237

VI. Bibliography..... 245

VII. Plates..... I–XI

I. Introduction

That the cardinal principle of modern taxonomy is based on the fundamental facts of evolution and that the essential problem of classification is the phylogenetic relationship of organisms need no argument. In order to ascertain genetic affinities, it is not sufficient to investigate the morphological characters alone, but all other attributes, physiological and biological, must be considered. It is also evident that the immature stages of organisms should receive as thorough consideration as the adult if taxonomy of insects is to attain that degree of comparative perfection obtained in the classification of other organisms.

The systematic entomologists, dealing as they do with animals of such diversity and complexity morphologically and biologically, have from early times recognized, at least to some extent, the taxonomic significance and value of the developmental stages of insects. But the practical difficulties in obtaining necessary materials, accurately determined and adequate in quantity and ranges, have made the progress in this phase of insect taxonomy very tardy. A good start, however, has been made by recent workers as was pointed out by Brues (1919), and their results vindicate both the practicability and possibility of such investigations. There is moreover an urgent demand for such studies from economic entomologists who are constantly confronted by the problem of identifying the immature stages of economic species.

The present study is an attempt to deal with the larvae of the Tenthredinoidea from the standpoint of synoptic and, to some extent, genetic classification. The external anatomy of the larvae will be dealt with and the systematic significance of the morphological characters will be discussed in part two of this paper; the taxonomic

treatment of the families, subfamilies, genera, and species will constitute part three; and a discussion of the phylogengnetic relationship of the families so far as is possible with the data at had will form part four. No one appreciate the inadequacy of this study both in thoroughness and comprehensiveess more than the author, but it is hoped that he has opened a way for those who will advance the study of this highly interesting group of insects to a more satisfactory condition in the future.

The taxonomic literature dealing with the adults of the Tenthredinoidea is extensive. The historical development of the subject is interesting to the students of this group of insects but detailed account is out of place here. However, a brief statement of the history of the group is desirable.

Linnaeus in the fourth edition of the Systema Naturae(1744) established the order Hymenoptera under the name of Gymnoptera and applied to the order its present designation in the first edition of the Fauna Suecica. The name Piezata was proposed by Fabricius(1775) for the order but it is now obsolete. Latreille(1796), following Linnaeus, divided the order into two sections, Terebrantia and Aculeata. The first section included two groups, Phytophaga, which comprises the Tenthredinoidea, and the Entomophaga or parasitic Hymenoptera. The Ditrocha and Monotrocha of Hartig(1836) correspond approximately with the two sections of Latreille. Gerstaecker clearly recognized the Tenthredinoidea as an unique compact group and proposed in 1867 to divide the order Hymenoptera into two suborders. He used the name Symphyta for the Tenthredinoidea and Apocrita for the remainder of the order. The term Symphyta, thus, antedates Konow's (1890) subordinal name Chalastogastra. Various terms have been proposed for this group of Hymenoptera and the following are

coextensive with the superfamily name Tenthredinoidea as used in the present paper: Phytophaga, Sessiliventres, Securifera, Serrifera, Symphyta, and Chalastogastra. Rohwer and Cushuman(1917) proposed a third suborder of Hymenoptera, Idiogastra, for the family Oryssidae and placed it between the Chalastogastra and Clistogastra of Konow.

Early students of the Tenthredinoidea divided the superfamily into two groups, Phyllophaga for the Tenthredinidae or "Tenthredo" of Linnaeus and Xylophaga for the Siricidae or "Urocerus" of Geoffroy. With the exception of Stephens(1835) and Andre(1879) who recognized the additional families, Xiphydriidae and Cephidae respectively besides the two families mentioned above, the old system was followed for many years. With the progress in studies of the world fauna of this group of insects, modern writers have proposed many elaborate schemes of classification. Konow in 1890 suggested one family and three subfamilies and Dalla Torre(1894) catalogued one family divided into eighteen subfamilies, while Ashmead(1898) proposed fifteen families and twenty-seven subfamilies. Enslin(1911) criticized Konow's three divisions as unnatural and proposed four families, Oryssidae, Siricidae, Cephidae, and Tenthredinidae, thus reverting to a considerable extent to the scheme of the old school as represented by Cameron(1882) and others. The recent and more important systems are those proposed by Konow(1905), MacGillivray(1906), and Rohwer(1911). These systems, when compared(pl.), show a great discrepancy in the number and rank of the groups which formerly constituted the family Tenthredinidae as is indicated graphically. MacGillivray, whose classification is based on a thorough-going phylogenetic study of the wings, is of the opinion that the large complex of genera contained in this family are readily separable into a number of definite groups on structural differences and that they are best dealt with by considering them simply as sub-

families. In general, the systems of Konow and MacGillivray are, with the exceptions noted below, much more in accordance with each other in their essential features than either one of them with that of Rohwer. A comparison of these three schemes brings out various points of interest. As far as the major groups are concerned, (1) all are in agreement in associating Xiphydriidae with Siricidae; (2) Konow and Rohwer agree in assigning a closer position to their Siricidae and Siricoidea with their Lydidae and Megalodontoidea respectively, and also in associating Megalodontidae with Pamphiliidae, and again Xyelidae and Pamphiliidae with Cephidae; (3) Konow and MacGillivray agree in the relation of the Blasticotomidae to Xyelidae and Pamphiliidae; (4) Rohwer differs radically in his arrangement of the Blasticotomidae which is placed between the Argidae and Tenthredinidae in his superfamily Tenthredinoidea; and finally (5) Rohwer is unique in creating a third suborder of Hymenoptera, Idiogastra, for the Oryssidae. In respect to the arrangement of the subfamilies and tribes of the Tenthredinidae, as restricted by MacGillivray, the following points may be noted. The striking dissimilarity of these authorities in assigning different ranks to more or less related groups is well illustrated in their treatment of the Emphytinae, Selandrinae, and Lycaotinae. Konow's tribe Selandriades of the subfamily Tenthredinini corresponds to the three subfamilies of MacGillivray while according to Rohwer's scheme it embraces four subfamilies. In fact the Emphytinae finds its counterparts in these four subfamilies and is related to the Tenthredininae thru the tribe Allantini which together with the tribes Taxonini and Eriocampini constitutes Rohwer's subfamily Allantinae. The Emphytinae and Lycaotinae are also related, according to Rohwer, to the Blennocampinae thru his subfamily Empriinae which contains besides Empriini and

Lycaotini the tribe Blennocampini. MacGillivray and Rohwer agree in regard to the Cimbicinae to the extent that they both consider it a compact group. Konow differs radically from these writers by associating his tribe Syzygoniides with the Cimbicides and Abiides. In regard to Konow's Nematides and Lobocerotides, the three systems agree fairly closely. The affinities of the Blennocampinae, Fenusinae, and Scolioneurinae are recognized by MacGillivray and Konow. Rohwer and Konow agree, as all other systematists except MacGillivray, in treating the Diprioninae and Monocteninae as allied groups inseparable into subfamilies. Konow's subfamily Lophyrini, however, is a heterogeneous group and includes such widely separated groups as Acordulecerinae and Diprioninae.

The classification proposed by MacGillivray is based upon a critical investigation of an essential structure, the wing, and is a logical conclusion of the application of the taxonomic principles promulgated by Comstock(1893). This system of classification is adopted in the present paper for the writer believes that by judicious discrimination of the palingenetic attributes against the cenogenetic peculiarities, the characters manifested by immature insects may be interpreted as indicating the genetic affinities of the insects under consideration and that in this sense the immature stages of insects are of systematic importance. A classification based upon such larval characters should agree in essential points with that based upon the adult characters chosen for their phylogenetic value and, therefore, it is interesting to see whether MacGillivray's alary system is substantiated by a study of the larvae.

The immature stages of the Tenthredinoidea of more common occurance seem to have attracted the attention of naturalists from an early time. In Mouffet's Theatorum Insectorum(1634) the adult

saw-flies are refered to the group "Vespa" and what seems to be a Tremex to "Odonata", but no mention of the larvae is made. Goedart (1682) was the first naturalist to make observations on the larvae of a saw-fly. His records rendered in interesting archaic terms clearly indicate that what he had under observation were the larvae of Cimbex or Trichiosoma on Salix and Arge on Rosa. Madame Meriam(1730) confused saw-fly larvae with those of the Lepidoptera as may be seen on plates 22, 25, and 33. Swammerdam's(1737)figure 1, table XLIV refers to galls on the leaves and stems of Salix apparently made by Pontania or Euura. He also figured a larva with fifteen segments with prolegs on the abdominal segments 3-8 and 11. Frischs(1766) figured and recorded observations on the life history of about seven species. De Geer, as cited by Bergmann, according to Le Peletier, has seen a larva with twenty-two feet without anal prolegs. According to the same authority, Reaumur observed certain larvae with twenty-four feet, indicating a Xyelidan condition. Linnaeus(1758) recorded the food plants of twenty-two species of saw-flies out of the forty species of "Tenthredo" enumerated and spoke of the larvae in general as "Tenthredinis larvae pleraeque folia plantarum exedunt, polypodae, seu pedibus plus quam XVI communiter instructae". Following Linnaeus many students of the Tenthredinoidea contributed much to the knowledge of their immature stages, altho quite disproportionately to their contributions to that of the adults. Among those who have done much towards the progress either as original investigators or as compilers or both, the following are the more important: Andre, Briscke, Cameron, Costa, Dahlbom, Dalla Torre, Dufour, Dyar, Fallen, Hartig, Kaltenbach, Kirby, Klug, Konow, Latreille, Leach, Nemman, Oliver, Panzer, Le Peletier, Snellen von Vollenhoven, Spinola, Westwood, and Zaddach. Still, our knowledge of the immature stages of the Tenthredinoidea is

very meager in comparison to that of the adult. Of 2701 species of the Tenthredinoidea listed by Konow in 1905, the larvae of only 418 species or less than sixteen per cent of the the described species in the world were known to this authority and that mostly only thru literature. According to Dyar(1895)less than twenty-five per cent of the North American species have been recognized in the larval state. It is no exageration to state that the larvae of more than eighty per cent of the Nearctic species are yet to be described.

Our knowledge of physiology and morphology of the immature stages of the Tenthredinoides is exceedingly meager. The following list includes most of the important literature:Graber(1890)on the embryology of Arge berberides;Doncaster(1907) on the gametogenesis and fertilization in Nematus ribesi ;Buchner(1918) on the accessory chromosomes in Tenthredo, Allantus, Arge, and others;Frenzel(1886) on the epithelial regeneration of the alimentary canal of Cimbex larva; Biederman(1898) and Holz(1909)on the histology and physiology of the digestive cells in Nematus larva;Poletajew(1885)on the silk glands of Cimbex and Tenthredo larvae;Cholodkovsky(1897)on the blood and reflex bleeding in Cimbex larva;and MacGillivray(1913) on the general external anatomy of the larvae.

The biology of the Tenthredinoidea abounds in phenomena of great interest to experimental evolutionists and presents many problems of ecological importance. The list of papers dealing with the life history and habits, especially of economic species, is fairly extensive. Cameron(1882)has published an excellent summary of general biological and ecological observations. The biology of the Nearctic Tenthredinoidea has been discussed in detail by MacGillivray(1913). Since the biological and ecological studies of the Tenthredinoidea are beyond the scope of the present paper, readers are refered to the

last mentioned publication.

Materials.-The materials for this study comprises four collections which many be designated for the sake of convenience as Cornell, Maine, MacGillivray, and Yuasa collections. The writer has examined more than 2500 alcoholic specimens of larvae representing at least 350 species during the course of this study. He has also made partial observations on the life history and habits of numerous species in his attempts to breed during the last few years more than two hundred and fifty species at Ithaca, New York and Urbana, Illinois.

The Cornell collection consists of about forty species and belongs to the Cornell University. The specimens were collected mostly by Dr. MacGillivray and Mr. Chester Young in the vicinity of Ithaca, N.Y. They were in rather a poor state of preservation and proved useful only in checking up materials in other collections and also in comparing the descriptions of Young with his own material. This collection is designated by the letter C.

The Maine collection consists of about 200 species of which 75 species have been bred and identified by Dr. MacGillivray. The collection belongs to the Maine Agricultural Experiment Station and all the specimens which were in excellent condition were collected by Dr. MacGillivray with the assistance of Mr. Earl Shaw during the summer of 1913 in the vicinity of Orono, Maine. This collection together with the collecting and breeding records were placed in the writer's hands and they proved to be indispensable for the present study. The collection is designated by the letter M.

The MacGillivray collection consists of about thirty-five species collected and identified by Dr. MacGillivray together with larvae of some unidentified species. The specimens came from Ithaca, N.Y., Orono, Me., Onekama, Mich., Urbana, Ill., and a few other localities.

This collection is designated by the letter G.

The Yuasa collection consists of about two hundred thirty species including about 50 bred species. The majority of the specimens were collected and bred by the writer at Ithaca, N.Y. during the summer of 1917 and 1918. Some species were collected at Urbana, Ill., and others came from the different parts of The Unites States and Canada thru the generosity and courtesy of various entomologists. This collection contains also the cocoons of practically all the bred coccon-making species and eggs and pupae of a limited number of species. This collection is designated by the letter Y.

Identification of Specimens.-All bred materials in my collection and Maine and MacGillivray collections were identified by Dr. MacGillivray. Some of the specimens in other collections bore labels and when the larvae agreed satisfactorily with the published descriptions the identifications were accepted. In only a few cases, identification from the description of larvae alone has been depended upon.

Terminology and Nomenclature.-For the description of the external anatomy of the head and mouth-parts of the larvae the terms used in my paper (1920) dealing with the generalized insects has been used. New and other terms are defined in the glossary elsewhere in this paper. Taxonomic names and other points of nomenclature have been adopted from Rohwer (1911) and MacGillivray (1906).

Bibliography.-References to different taxonomic units are omitted. A complete bibliography on the transformation of the Nearctic Tenthredinoidea was prepared, but due to the limitation of space, it has been omitted. The important literature on the transformations and all references cited in this paper are listed in the bibliography.

Acknowledgement.-I am deeply indebted to various scientists and entomologists who have assisted me by donation of speciemens, by encouragement, and by criticism and suggestions. I am obliged to Director C.D.Wood ad Dr.Edith Patch of the Maine Agricultural Experiment Station, and Dr.J.Chester Bradley of the Cornell University, and Professor S.A.Forbes of the University of Illinois for the loan of specimens and for the privilege of examining the collection under their charge. I wish to thank Dr.J.G.Needham for the privilege of working in the entomological laboratories of the Cornell University during the summers spent at Ithace and Mr.S.A.Rohwer of he U.S.Bureau of Entomology, Washington, D.C. for his generous criticism and for donation of valuable reprints. I am also indebted for separates to Dr.W.E.Britton and Messers.H.E.Burke and William Middleton, and for donation of specimens to Messers.H.G.Crawford, Wm.Baerg, C.C.Hamilton, R.W.Harned, J.W.McColloch, J.R.Malloch, H.S.Smith, and H.B.Weiss, and to Drs.W.E.Britton, C.H.Kennedy, Edna Mosher, and Alvah Peterson, and for loan of rare specimens of Cephidae and Xiphydria to Dr.E.P.Felt.
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II. Morphological

The external anatomy of the larvae of the Tenthredinoidea has received but little attention from entomologists. The only important contribution on the subject is MacGillivray's study (1913) which deals with the anatomy and coloration as well as the biology of the larvae. The writer has made a comparative study of the external anatomy of representative larvae of the Nearctic Tenthredinoidea in order to find characters upon which analytic as well as synoptic classifications of the larvae might be based. Since MacGillivray has treated the general aspect of the anatomy, only the moreimportant structures and features will be discussed in the following pages.

The larvae of Tenthredinoidea are typically subcylindrical, eruciform, caterpillar-like, slightly flattened on the ventral sid aspect, and usually taper slightly caudad. In the leaf-miners the body is depressed. The body in its metamerism is well differentiated into a head and a series of thirteen somites which are more or less similar in structure. The segmentation is distinct, the first segments compose the thorax and are more distinguishable on account of their position, form, and more readily in podous larvae by the presence of three pairs of thoracic legs. The abdomen consists of the ten remaining visible segments and in polypodous larvae the presence of uropods gives a characteristic appaarance to the uromeres. The somites are usually subdivided by transverse depressions into annulets.

The head is typically subglobose in shape, more or less circular in frontal contour, strongly chitinized, and usually setigerous. The mouth is directed ventrad or slightly ventro-caudad.

In the leaf-miners it is directed cephalo-ventrad in Fenusinae or cephalad as in Phlebatrophia. The surface of the head may be polished and shiny as in Diprion, or roughened, verrucose, or granulate, and divided into minute irregular areas as in Pteronidea and Cimbicinae, or thinly coated in life with a waxy secretion as in many Emphytinae. It may be glabrous as in Metallus and Phlebatrophia, or microscopically and sparcely setiferous as in Tremex, or with a few scattering setae as in Phyllotominae, or with minute stiff peg-like setae as in Diprion, or with numerous promiscuously distributed short setae as in Dolerus, Tenthredininae, or with long setae as in Pteronidea, or with abundant conspicuous setae as in Monophadnoides and the Cladiinae. There is a tendency for the setae to be more numerous and longer on the ventral portion of the head. The number and location of the setae on the head vary with the individual, except the clypeal and labial setae. But the general characteristics of the setae such as relative abundance, manner of distribution, and kind of setae are constant within genera and subfamilies. The head may be pale, creamy white, or light brown in color which often in life appears as green or greenish white on account of the greenish blood showing thru the cuticle or may be blackish or brownish with or without distinct color markings. The darker color is due to deposition of colored pigments in the cuticle and is generally permanent in alcoholoc specimens. The color and coloration of the head is generally a constant specific character. There are, however, ontogenetic changes in these respects. The very young stages may be lighter in color and later stages darker or vice versa as in Cimbex or all stages except the last stage may be darker and the ultimate stage greenish as in

Pteronidea ribesii. The color markings may be diffuse in the young and become localized and definite in older stages as in Dolerus, or may vary from faint spots to general contiguous markings as in certain species of Strongylogaster. The more common markings are brownish spots on the dorsum of the vertex, on the front, and often caudad of the ocellarae. There may be a stripe along the epicranial stem and vertical furrose or dorsad of the ocellarae. When the head is darkly colored the clypeus is lighter colored than the other portions of the head.

The head is usually exposed but there is a tendency in the leaf-miners, wood-borers, and a few others to have the cephalic end of the prothorax produced into a broad fold on the dorsal and lateral aspects. This fold covers the caudal portion of the head as in Tremex, Metallus, and Caliroa.

The structures of the head will be discussed under two sections, one dealing with the fixed parts of the head or all the immovable parts of the head capsul, and the other dealing with the movable parts or the antennae and mouth-parts. The fixed parts of the head embrace: vertex, front, clypeus, labrum, occiput, and postgenae, together with their bounding sutures, ocellarae, and tentoria.

Epicranial Suture.--The inverted Y-shaped median suture of the head is the epicranial suture. The stem of the Y originates at the occipital foramen, extends cephalad dividing the vertex into two halves, and bifurcates on the cephalic aspect of the head. Each arm extends obliquely laterad for a short distance and then bends ventrad to the ventral margin of the head terminating near a precoila. The epicranial suture is present in all larvae except t those of the Xiphydriidae where it is in part indistinct and the

Siricidae and Oryssidae where it is obsolete. It is interesting to note that the most highly specialized genus of Tenthredinidae, Phlebatrophia, possesses this suture. The relative length of the stem and arms varies in different families and subfamilies. There is a depression near the bend of the arm as in Lygaeonematus which indicates the point of attachment for muscles, and should not be confused with the true tentorinae. Near the ventral end of each epicranial arm there is a thickening of the surface and a pit. This pit is a pretentorina and the thickened piece corresponds to the clypealia of the larvae of Corydalis. The pretentorina and clypealia are constant in position and universal in occurrence in the Tenthredinoidea. In the Siricidae the pretentorinae are distinct and sometimes mistaken for ocellarae. In ecdysis the head is split along the epicranial suture nearly to the ventral ends of the arms.

Vertex.--The large area on each side of the epicranial stem is one half of the vertex. It extends from the dorso-meson of the epicranium to the ventral margin of the head, laterad of the epicranial arm, and cephalad of the occipital suture, when this is present, and bears the ocellarae and antennariae. There is on the dorsal part of the vertex a distinct furrow which originates at the occipital foramen and extends cephalad for some distance onto the lateral aspect of the head. This is the vertical furrow and is peculiar to the larvae of the Tenthredinoidea. It is wanting only in the leaf-miners and wood-borers. The nature of this furrow is not known. There is a corresponding carina on the ental surface of the head and the major muscles of the retractor of the mandible are attached to the ental surface of the vertex ventrad

of the vertical furrow. The furrows usually converge at the cephalic end, but sometimes are subparallel to each other.

The Genae.--The portion of the vertex ventrad of an imaginary line drawn ventrad of each ocellaria parallel to the ventral margin of the head is the gena. The extent of the genae therefore varies according to the location of the ocellariae. The setae on the genae are sometimes longer than those elsewhere.

The Ocellariae.--The larvae of the Pamphiliidae, Xyelidae, Tenthredinidae, and Cephidae possess a pair of ocellariae, one on each side of the head. These organs of sight are remarkably uniform and constant in structure and location. With the exception of Phlebatrophia and the Cephidae, the ocellariae are usually clear, semiglobose or at least distinctly convex, and are located on or near the center of the ocularia which are usually circular and distinctly blackish. The ocellariae are located on the vertex dorsad of the antennarae in the Tenthredinidae and caudad of them in Pamphiliidae and Cephidae. In the Cephidae and Phlebatrophia the ocularia are obsolete and the ocellariae are indicated by pigmented granules showing thru the cuticle. The ocellariae are obsolete in the highly specialized families Ziphydriidae and its allies. The life habits are correlated with the degree of development and presence of the organs of sight.

Front.--The area bordered by the epicranial arms on the cephalic aspect of the head is the front. The ventral boundary is indicated by a transverse depression connecting the ventral ends of the epicranial arms. This depression is the fronto-clypeal suture. The depression is usually concave dorsad and often obsolete at each lateral end. The front is usually flattened or only slightly convex and bears scattered setae which vary in number and ar-

rangement in different genera and in arrangement in different individuals. The extent of the front is determined by the length of the epicranial arms. The front is usually subquadrate in shape, often wider than long but in some cases as in Caliroa it is much longer than wide. In the absence of the epicranial stem the lateral boundaries are indicated by the pretentorinae as in Tremex. Phlebatrophia is unique in possessing a distinct median longitudinal furrow on the dorsal half of the front.

Clypeus.--The area ventrad of the front is the clypeus. Its ventral boundary is the clypeo-labral suture and the lateral margins are free, oblique, and converge ventrad. The clypeus is usually much wider than long and is divided usually into postclypeus and preclypeus by a difference in color and by a transverse row of setae. The clypeal setae vary in number from one to four or five but are constant within a genus and often within a subfamily. Two is the most common number.

Labrum.--The small lobe attached to the ventral margin of the clypeus is the labrum. It is usually transverse and has a median emargination on the ventral margin. The median emargination is usually shallow and broad but occasionally very deep, as in Eriocampa and a few other Emphytinae. Dolerus is characterized by the distinct asymmetrical median emargination which makes the sinistral half of the labrum much smaller than the dextral. The cephalic margin is nearly smooth, and slightly oblique in Tremex. The labrum is very small in Xiphydriia. From two to several labral setae are borne on each side of the meson, those near the meson are usually smaller than the lateral ones. The number of labral setae as a rule are constant within a genus. There is a

row of setae which may be seen projecting from the ventral surface of the labrum which belong to the epipharynx. The labrum is often divided into halves by a distinct median longitudinal depression as in Caliroa, Endelomyia, and some Tenthredininae. This character is generic in some subfamilies and only specific in others.

Postgenae.--The area caudad of the lateral boundary of the vertex on the caudal aspect of the head is the postgena. The dorsal boundary is the vertical furrow and the mesal the occipital foramen. The ventral margin is concave and is connected with the labacoria. It is usually more or less flat and glabrous. The occipital suture is sometimes distinct as in Pteronidae.

The labrum in the Cimbicinae is unique in having a pair of longitudinal depressions, one on each half, which converge ventrad and bound a small median piece.

Tormae.--At each end of the clypeo-labral suture there is a chitinized rod which extends on the ventral surface to the epigusta. This is the torma, and is present in all Tenthredinidae.

Occiput.--The narrow area on the dorsal third of the occipital foramen between the vertical furrows is the occiput. The dorsal boundary is indistinct since the occiput merges with the vertex without any indication of a suture.

Maxillaria.--The very narrow chitinized sclerites which form a subcircular collar around the dorsal and lateral margins of the occipital foramen have been identified as the maxillariae. They are usually slightly developed and are continuous with the microcoria. The identity of these sclerites with the maxillariae of generalized adult insects is uncertain but they occupy the same position as the maxillariae and consequently have been homologous with

it.

The dorsal third of the maxillariae in the leaf-miners, Metallus, Phlebatrophia, and Fenusinae are strongly chitinized, distinctly concave, trough-like, and produced entad. Along this ental margin/a part of the muscles which control the movement of the head are attached.

Occipital Foramen.--The large opening in the caudal aspect of the head thru which the internal organs of the head are connected with those of the body is the occipital foramen. The ventral margin of the foramen is membranous and connected directly with the labacoria and microcoria.

Precoila.--The strongly chitinized acetabulum located on the ventro-mesal angle of the vertex and dorso-lateral angle of the clypeus is the precoila. The preartis of the mandible articulates at this point. The precoila is distinct in all Tenthredinoidea.

Mandibularia.--The small transverse whitish or light-colored area ventrad of the ventral margin of the head on the cephalo-lateral aspect is the mandibularia. It is usually only slightly chitinized and merges with the mandacoria without any indication of a suture. The extensacuta of the extensatendon of the mandible is usually distinct. The mandibulariae are very large, as in Xyclidae.

Postcoila.--The cup-shaped acetabulum on the latero-ventral angle of the postgena and caudal angle of the mandibularia is the postcoila where the postartis of the mandible articulates. The occipital suture when present originates in or near the postcoila. The postcoila is always present.

Paracoila.--There is a slight projection at the mesal end of

the caudo-ventral margin of the head where the cordo of the maxilla articulates. This is the paracoila. It is not very well developed but is present and discernible in nearly all tenthredinid larvae.

Odontoidea.--The lateral certical sclerite is articulated with the head capsule on the mesal margin of the postgena some distance ventrad of the origin of the vertical furrow. This point of articulation is the odontoidea and is rather indistinct in larvae of this group of insects.

Tentorium.--The tentorium is very simple in tenthredinid larvae. It consists of the metatentoria, corpotentoria and pretentoria. The supratentoria is apparently obsolete. The metatentorium is the strongly chitinized conspicuous ental bar extending into the head capsule from the ventro-mesal margin of each postgena. The two metatentoria fuse on the meson and form the bridge, corpotentorium, which give support to the caudo-ventral portion of the head. The position of each metatentorinae is indicated by a pit- or slit-like depression. The location of the pretentorinae has already been indicated. A strong ental arm much smaller than the metatentorium, extends ventro-mesad from each pretentoria into the head capsule and fuses with the corpotentorium near the middle of the latter. This bar is the pretentorium. In ecdysis the tentorium breaks in the middle of the corpotentorium freeing the mesal ends of the pretentoria and metatentoria. The tentorium in the Zyelidae and Pamphiliidae is similar to that of the Tenthredinidae in structure and location.

Antennae.--The antennae are present in the larvae of all Tenthredinoidea, but their structure, size, position, and number of segments vary in the different families and subfamilies. Each

is borne by a distinct antennaria which is located in the ventro-lateral portion of the vertex laterad of the epicranial arms near the ventral margin of the head. In the genelarized families they are located cephalad of the ocularia and in the specialized ventral of them. The antennariae are usually subcircular or sebquadrate. The antacoria is usually extensive, distinctly convex, and whitish in color. It is only occasionally narrow and confined to the periphery of the antennaria as in certain Nematinae. The antennae of the Pemphiliidae are setaceous, one half as long as the head is wide, with seven cylindrical segments. There is a circular sensorium on the ventral aspect of the distal portion of the second, third, and fifth segments. In Xyelidae, the segments are shorter but thicker, and vary in number from six to seven according to the genus. The antennae of the Tenthredinidae apparently represent a specialization from those of the Xyelidae. They are much shorter and vary in number of segments from one to five. The antennae vary in shape and are conical in the Emphytinae and other generalized subfamilies, with five ringlike segments or limpet-shaped with four more or less irregular incomplete, often partly fused segments in the Nematinae or flattened and fused into a single segment in the Schizocerinae, or button-like and one-segmented in Cimicinae and Fenusinae and Metallus or subconical or irregular as in some Nematinae and Phlebatrophia. When the antennae consist of five segments, they are usually cylindro-conical and remarkably uniform in shape. The antennal segments are usually strongly chitinized, more or less ringlike, are successively smaller in diameter, and the distal segment is conical or occasionally erect and leglike as in the Diprioninae. The segments sometimes do not form a complete ring but one side is reduced to a mere line

or

or entirely wanting as in some Nematinae; in such case, the segment is said to be incomplete. Sometimes fusion of all or some of the segments may take place. Certain segments sometimes are setigerous and also bear some sensoria. The number of segments is constant for a subfamily. The relative length and shape of the segments vary but are constant in species in some cases and in others in genera. The antennae of the Cephidae are small with four or five segments, while in Xiphydriidae, Siricidae, [illegible] there is a single segment and one in the Oryssidae. It is possible, therefore, to arrange the families of Tenthredinoidea in an ascending series according to the number and size of the segments of the antennae. The tenacity of the antennae is well illustrated in the Oryssidae which in spite of the extreme modification of other structures still retains a part of one-segmented antennae.

Mouth-parts.--The larvae of the Tenthredinoidea possess well-developed mandibulate mouth-parts. The mouth-parts include the mandibles, maxillae, labium, and are remarkably uniform and constant in structure in the different families. The modifications take place in the relative size of parts and number of segments of articulated parts.

Mandibles.--The mandibles are always present, and are typically thick, strongly chitinized, sharply dentate, the dextral dissimilar to the sinistral in number of and shape of dentes, and with one or two and occasionally more mandibular setae. The number and arrangement of dentes, the number of mandibular setae, and the relative size and shape of the mandibles are constant for certain genera. The mandible of the Schizocerinae are rather thin and flattened and in Phlebatrophia very thin and elongated with one

triangular bladelike dentis. In this character the larvae of this genus is more specialized than all other larvae including Cryssus.

Maxillae.--The maxillae are always present and typically consist of cardo, stipes, subgales, palphfer, palpus, galea, and lacinia. The cardo is usually more or less chitinized and is divided into a small subcardo and a larger triangular alacardo. The subcardo articulates with the head in the paracoila. On the lateral margin of the alacardo the large stipes is attached. The stipes is usually less chitinized than the cardo, submenbranous, convex on the lateral aspect, and attached to the lateral margin of the alacardo. The cephalic aspect is membranous and is continuous with the maxacoria. The caudal aspect along the mesal margin is strongly chitinized and is continuous with elongate triangular subgalea. The line of fusion is indicated by a distinct oblique chitinized ridge which extends from near the proximal end of the subgalea to the lateral angle of the lacinia. The latero-ventral angle of the stipes is often produced as a small triangular lobe as in the Tenthredininae. The palpifer is a more or less membranous, moundlike lobe attached to the distal end of the cephalic margin of the stipes, and often bears one or more setae. The palpus is borne by the palpifer and typically consists of four more or less conical segments. The relative size and shape of the segments vary and afford good characters for the spparation of genera and species. The galea is typically strongly chitinized, digitlike, conical or slightly curved mesad, bluntly pointed, unsegmented, and usually smaller than the palpus. The lacinia is located mesad of the galea and cephalo-ventrad of the subgalea. It is usually subtriangular, slightly flattened, lobelike, and

bears a row of setae on its oblique mesal margin. It is sometimes distinctly flattened, strongly chitinized, with a stiff row of setae as in the Emphytinae or rounded and with minute spinous setae as in Diprion or with a sharp triangular compressed seta in addition to ordinary row of setae as in Xyelidae. The galea and lacinia are always present except in Oryssus but are reduced in size in Tremex. It is interesting to note that in the leaf-miners the palpi are reduced but the galea are usually normal in size and larger than the palpi. In Oryssus the maxillae are fleshy lobes with all the component parts obsolete and with a brownish area in which a few sensory paillae are located (Rohwer and Cushman, 1917). The palpi are apparently two-segmented in Xiphyriidae and Siricidae.

Labium.--The labium consists typically of submentum, mentum, stipulae, palpifer, palpi, and totaglossa representing the fused glossae and paraglossae. The submentum and mentum is typically membranous, convex, with two or more setae, and very broad in the larvae of most species. In some cases as in the Diprioninae, part of the mentum is chitinized. In the leaf-miners such as Fenusa, Metallus, and Phlebatrophia, the mentum is strongly chitinized and flattened. There is a distinct median longitudinal depression in Metallus. The palpiger is practically wanting. The palpus is typically three-segmented. The relative size and structure of the segments vary but are usually constant for a subfamily or a genus. In Tremex and Phlebatrophia the palpi are apparently two-segmented and very minute, while in Oryssus they are obsolete. The stipulae are typically membranous, broad, sometimes bearing two setae, and fused with the mentum without any indication of a suture. The stipulae are flattened and chitinized in Metallus and Fenusinae.

The totaglossa is typically membranous, subglobose, or bluntly pointed, fused with the stipulae without any indication of a suture. It is readily identified on account of its median position and characteristic shape and structure. There is a slitlike opening of the silk-gland, sericos, on the meson near the caudo-ventral aspect of the totaglosa. The shape, size, and location of t the sericos vary but it is always present and chitinized. The cephalic or dorsal aspect of the totaglossa is strongly convex, membranous and sometimes bears a few minute setae and sensoriae.

Prepharynx.--The prepharynx of the larvae of Tenthredinoidea is very simple in structure and the boundaries of the parts than can be identified in the generalized insects (Yuasa, 1920) are obsolete. The propharynx consists of the epipharynx and epigusta. The epipharynx is membranous, is of the same size and shape as the labrum, and bears an oblique row of a few setae on each side slightly dorsad of the ventral margin. The epigusta is membranous and is supported on the lateral portion by the tormae. The ambipharynx is restricted and membranous. The parapharynx consists of the basipharynx and hypopharynx. The basipharynx is subglose or convex, often slightly chitinized on the sides, sometimes has a few minute setae and usually converges ventrad. The portion ventrad of the constriction is considered as belonging to the hypopharynx but is usually membranous and continuous with the cephalic surface of the totaglossa without any indication of differentiation. The laciniae fit in from both sides on the constricted part of the parapharynx. There is no great modifications in the prepharynx among different families.

Trunk.--The portion of the body caudad of the head is the

trunk and consists of thirteen segments which are connected to the head by means of the cervicoria. The first three segments compose the thorax and the remainder the abdomen.

Microcoria.--The membrane which connects the thorax with the head is rather broad and usually folded under the protruding cephalic end of the prothorax. There is a chitinized sclerite on each side which articulates with the head against the odontoidia at its cephalic end and with the epimeron and coxa at its caudal end. This is the cervical sclerite, is always present, and usually distinctly colored, brownish or blackish. The microcoria is continuous with the submentum on the ventral aspect and is often produced with meson into a small moundlike setiferous projection as in Strongylogaster.

Thorax.--The prothorax is usually constricted on the cephalic portion, the dorsal aspect is declivous, and the lateral aspect is produced. The dorsum is typically divided into two portions, a narrow cephalic and a wide caudal portion which in turn may be subdivided into two or more annulets. The first division is usually setiferous on the lateral aspect while the second portion is setiferous on the dorsal aspect. On the middle of the lateral aspect is a large spiracle. This is the mesospiracle which has migrated onto the prothorax. There is another setiferous area cephalo-ventrad of the spiracle. The prothoracic leg is attached to the latero-ventral margin of the segment, ventrad of the substigmatic setiferous area which is usually produced as a lobe, and which Crampton (1918) has designated as surcoxal plate. There is a small, usually strongly chitinized sclerite cephalad of the leg. This is the episternum epimeron or eupleuron of Crampton. The

dorsal and often the lateral aspects of the prothorax are sometimes chitinized and colored, forming shieldlike areas as in the Xyelidae and certain leaf-miners. The prosternum is usually membranous, subdivided into two or more annulets but sometimes it is flattened and strongly chitinized as in Metallus. There is usually a small pit or chitinized rot near the caudal part of the segment on the ventral aspect. This is the profurcellina and marks the caudal limit of the prosternum. The mesothorax and metathorax are more or less similar in structure. These segments are more or less ringlike, often the largest segments of the body, and are often distinctly annulate. The metaspiracles are located in the metacoria and are usually minute and functionless. The mesothorax and metathorax resemble the prothorax in other details. In the Fenusinae and Metallus the dorsum of the mesothorax and metathorax is provided with an ovoid fleshy, sucker-like, low protuberance on each side of the meson. Its function is not known.

Thoracic Legs.--The larvae of the Tenthredinoidea, with the exception of the Oryssidae, possess three pairs of thoracic legs. They are the most persistent of all the thoracic and abdominal appendages and as a rule are very similar in structure, indicating their common origin. A typical leg consists of five more or less well-chitinized segments, coxa, trochanter, femur, tibia, and a distal segment representing the fused tarsus and tarsal claw.

The coxa is usually the largest of all the segments, subconical, and articulated to the ventro-lateral margin of the segment. The cephalo-dorsal angle is strongly chitinized and articulates against the chitinized end of the episternum epimeron. There is a distinct oblique depression extending from this angle to the middle of the dorsao-distal margin of the coxa. The distal ends of the

coxa are usually chitinized and form ringlike thickening. The ventral haof of the coxa is more or less membranous. The trochanter is usually small and longer on the ventral than on the dorsal aspect. The femur is usually chlindrical and is often dilated at the distal end. Its ventro-distal portion is usually membranous and is sometimes produced, forming a pointed projection as in Dolerus and other related subfamilies. The tibia is subcylindrical, narrower in diameter at the distal than at the proximal end, and either longer, shorter, or subequal in length to the femur. The distal segment is typically very short and is clawlike. This claw represents a fusion of the tarsus and tarsalclaw. The claw is usually sharp and distinctly curved. The segments are usually setiferous and more or less membranous on the ventral aspect and at joints.

The general plan of structure of the legs is the same in the majority of the larvae but there are variations in the shape, size, arrangement of setae and in number of segments within the families and subfamilies. The variations usually consist in the suppression of the trochanter as in Phlebatrophia and Fenusinae or in the modification of the distal segment as in the Pamphiliidae and the Hylotominae or in the reduction of the entire structure to a fleshy, subconical, indistinctly segmented, clawless protuberance as in Phlebatrophia and certain highly specialized families. The absolute homology of the segments in a modified leg can not be established but when the number of segments is less than five, it is probable that the trochanter is the first one to disappear.

The Pamphillidae is distinct from all other Tenthredinoid larvae in the possession of setaceous legs with all segments, ex-

cept the distal, cylindrical. The distal segment is very slender, nonsetiferous, straight, and sharplu pointed without indication of a claw. The Xyelidae possess legs which are small but typical in structure and number of segments. It is quite possible to derive the normal tenthredinid legs from those of the Xyelidae. In the families of the Tenthredinidae, a series of modification of the legs is found, altho the majority of the subfamilies and genera are provided with typical five-segmented, well-developed legs. The Phyllotominae is characterized by very short, stubby, chitinized legs which consist of four segments, including the large strongly curved claws. Phlebatrophia is unique among the Tenthredinidae in having fleshy, rudimentary, clawless legs. The Fenusinae also possesses small four-segmented legs but, unlike the preceding subfamily, the segments are simple and ringlike and the claws are present and normal in form. The Hylotominae differs from other subfamilies in possessing apparently six-segmented legs; the distal portion consists of a distinctly separated tarsus and claws and bears an empodium-like fleshy lobe on the caudal portion of the claw. The minimum number of segments is found in the legs of the Schizocerinae where the mesothoracic and metathoracic legs consist of only three, simple, cylindrical segments while the prothoracic legs is composed of four. There is a well-developed, fleshy, subglobose lobe caudad of the claw. It is interesting to note that the gall-makers, Pontania, have essentially the same type of legs as the leaf-feeding Nematinae while the leaf-mining larvae of the Fenusinae, Schizocerinae, and others have modified legs. The highly specialized families, Cephidae, Xiphidriidae, and Siricidae, possess fleshy, indistinctly seg-

mented, rudimentary legs which are neverprovided with claws. The most specialized family, Oryssidae, is entirely apodous. The legs present therefore very good characters for differentiating the subfamilies and the families of the Tenthredinoidea. The phylogenetic significance of the thoracic legs is quite evident.

Abdomen.--The segments composing the abdomen, with the exception of the two caudal segments, are more or less similar in structure, ringlike, and usually subdivided into four to seven annulets. Segments 2-7 or 8 and 10 usually bear a pair of uropods on the ventral aspect. The first and ninth abdominal segments never possess the uropods except in the Xyelidae. The third abdominal segment is more typical than the other segments, is least modified and for this reason has been used as a type for description. In a typical larva this segment is subdivided into a number of annulets on the dorsum and latus dorsad of the stigmatal line. The latus ventrad of the stigmatal line is typically produced lobelike and setiferous, and is distinguishable into two areas, the substigmatal area and surpedal area, according to the location. These two areas, when produced distinctly lobelike, are designated as substigmatal lobe and surpedal lobe. The latter corresponds to the thoracic surcoxal plate of Crampton. The substigmatal and surpedal lobes sometimes fuse and extend the full length of the segment as an oblique fold as in wood-boring larvae and the Hylotominae. In the latter this lobe is conspicuously produced laterad making the segment distinctly flattened. The fused substigmatal and surpedal lobes are known as the lateral lobe. The uropods are located on the ventral aspect some distancefrom the meson. The sternum is subdivided into two or more annulets; its annulation is usually distinct but difficult to de-

termine on account of the presence of the uropods. The intersegmental coria is distinctly indicated on the venter. The segmentarion is distinct but the limits of the somites are not so readily determined. The cephalic limit of the segment is usually indicated by the distinct depression on the dorsal and lateral aspects and by the short ventro-lateral depression which terminates at the cephalic end of the substigmatal lobe. Thus the cephalic limit of a segment is not a straight line, but curbes caudo-ventrad cephaloventrad of the substigmatal lobe. The typical annulation and arrangement of setae, tubercles and gladdubae on the typical abdominal segment are indicated elsewhere (Fig.).

The ninth abdominal segment is readily distinguishable because of its location and shape, and by the absence of spiracles and uropods. It is typically smaller in size than the preceding segments, and tapers more or less caudad, and usually has one less annulet on the dorsum than the preceding segments. Its caudal limit is usually distinctly indicated as a deep depression. The tenth or the apparent ultimate segment is modified and differs from the other abdominal segments because of the presence of the anus, anal uropods, and other structures peculiar to this segment.

Tenth Urotergite.--The tergum of the tenth abdominal segment is usually convex and often setiferous. It sometimes bears numerous spinous processes as in the Blennocampinae and Dimorphoteryx or a paired suranal protuberances as in certain general of Nematinae or a median suranal process as in the Cephidae and its allies. In these highly specialized families the tenth abdominal segment is produced cephalad and fits into the deep semicircular emargination

of the ninth segment. The tergum possesses a distinct, deep, median, longitudinal depression extending from the cephalic end of the tergum to the proximal end of the median suranal process. In the Xyelidae the tergum is produced distinctly hunchback-like on the meson of the cephalic third caudad of the deep, broad, transverse depression. The tergum is produced caudad in certain species of Pachynematus and forms a distinct caudal projection. In this genus the glandubae are very conspicuous. The size, convexity, number and arrangement of the spinous protuberances, caudal processes, and setae are helpful characters in recognizing different subfamilies and genera.

Suranal Lobe.--The membranous lobe of the Tenthredinidae which formsthe dorsal wall of the anal slit may represent the rudiment of the dorsal half of the telson or ultimate segment. It bears numerous setae of varying size and number, and is usually indistinguishably fused with the tergum of the tenth segment. In the larvae of Xiphydriidae and allies which possess a median suranal process, the lobe is distinct, more or less chitinized in part, usually separated from the tenth tergum by a ridge or by an oblique suture which extends from the chitinized depression dorsad of the suranal process to the lateral end of the anal slit. The area cephalad of this oblique suture is the pleurite of the tenth abdominal segment.

Subanal Lobe.--The membranous lobe which forms the ventral wall of the anal slit may represent the rudiment of the ventral half of the telson or ultimate segment. It is never distinctly chitinized, always indistinguishably fused with the tenth stermite, usually setiferous, and is rather restricted in extent. In the

Tenthredinidae the subanal lobe is strongly convex and extends to the anal uropods. If the subanal lobe represents a part of the telson and if the subanal appendages of the Pamphiliidae and Cephidae are the appendages of the ultimate segment, then the subanal lobe possesses a pair of genuine appendages. In the larvae of the Xyelidae there occur sometimes distinct, subglobose, setiferous swellings dorso-caudad of the postpedes. Their homology and function are unknown.

Tenth Rrite.--The sternum of the tenth abdominal segment is restricted in extent, more or less convex, and often glabrous. In the Xyelidae and Tenthredinidae the postpedes occupy the greater part of the caudal portion which is thereby produced subconically ventrad. This sternum is usually glabrous and more or less flattened in the apodous larvae. There are no annulations observable on this sternum.

Suranal Process.--In the boring larvae, the ultimate segment is provided with a strongly chitinized mesal suranal process on the suranal lobe. This process which has been variously designated by different writers is characteristic of the families Cephidae, Xiphydriidae, and Siricidae. The size, shape, number and arrangement of the dentiform tubercles and setae vary in different families but they are constant within species and often also within genera. It is undoubtedly an adaptive structure developed in connection with the boring habit of the larvae. It is interesting to note that in some of the gall-making larvae of Pontania and leaf-stem boring larvae of Caulocamphs, the tergum of the ultimate segment is produced on the caudo-meson and forms a distinct protuberance provided with chitinized points on its caudal end. The larvae of the Pamphiliidae also possess a minute hooklike process on the caudo-meson of the ultimate tergum.

caudo-meson of the ultimate tergum. The genetic connection of this hooklike tubercle and the distinct suranal process of highly specialized families is doubtful but it is not difficult to surmise a common origin for the suranal process of the Cephidae, Xiphydriidae, and Siricidae.

Caudal Protuberances.--In certain genera of the Nematinae and a few other genera of the Tenthredinidae, the tergum of the ultimate segment is provided with two or more protuberances which vary in size, shape, number, and position in different genera. A typical condition in nematid larvae is found in Pteronidea which possess a pair of conical, pointed, well-chitinized processes, one on each side, on the caudal margin of the tergum dorsad of the membranous suranal lobe. These processes are always two in number and more or less constant in position in nematid larvae but vary in size and shape although constant within species. They are conical, subconical, sharply or bluntly pointed, truncate, or distinctly swollen at the distal end as in Pteronidea trilineata. The tenth abdominal tergum of the spinous larvae of the Blennocampinae is provided with several symmetrically arranged, conspicuous, spinous processes ib tge caudal portion and in part along the caudal margin. The larvae of Dimorphopteryx is unique among the Emphytinae in the possession of four very distinct, sharply pointed, spinous protuberances along the caudal margin of the ultimate segment dorsad of the suranal lobe. In certain of the gall-making species of Pontania the caudal end of the tenth abdominal tergum is produced caudad and forms a median prominence which usually has two minute, strongly chitinized points close together on the meson. A similar protuberance is found in the larvae of Caulocampus acericaulis. In

the Siricidaethere occurs a pair of minute, sharply pointed, solid chitinous spines on the tergum of the ultimate segment, one of each side of the median longitudinal depression.

These protuberances have been variously designated. Crampton (1919) considers the paired protuberances and spines to be homologous with the cerci of Orthoptera and Ephemeridae. If they represent rudimentary cerci they must belong to the eleventh abdominal segment or the telson of embryologists since the true appendages of the tenth segment are transformed into the postpedes. But this homology is open to question because these protuberances are mere projections of the surface and not at all appendages. In a morphological sense and furthermore because in other larvae the number and position of the protuberances vary considerably. No one would suggest that the caudal tubercles and spinous processes of Dimorphopteryx, Blennocampa, Hypergyricus, Caulocampus, and others are homologous with the cerci of generalized insects. Yet, there is no reason to assume that the caudal tubercles of these larvae are different in origin, structure, and function, whatever that may be, from the suranal paired processes of the nematid larvae. These protuberances may or may not be related genetically at all with the suranal median process of the Cephidae and its allies. At any rate our present knowledge does not allow of any definite conclusion regarding the true nature or homology of these structures.

Subanal Appendages.--The larvae of the Pamphiliidae and Cephidae possess a pair of subanal appendages on the ultimate segment, one on each side, ventrad of the lateral ends of the anal slit. These appendages are long, setaceous, and three-segmented in the Pamphiliidae and are rudimentary, papilliform, and only indis-

tinctly segmented in the Cephidae. When the appendages are setaceous and long, the relative length and color of the segments differ in different species. In the Cephidae the appendages may or may not be provided with accompanying setae near the proximal end and these setae may or may not form a continuous group with the setae on the sternum.

That these structures are true appendages of the segment is indicated by the segmentation and by the fact that they are invariably articulated at the proximal end against the surface and not mere protuberances like the caudal processes of the tergum. Some embryologists consider these appendages to be homologous with the cerci of generalized insects and anal prolegs of the lepidopterous larvae and therefore to be the true appendages of the eleventh abdominal segment. For this reason they can not be homologous with the postpedes of other tenthredinoid larvae. Crampton (1919) designated them as arthrostyli on the ground that they are apparently homologous with his styli of the Ephemeridae and others. The homology and function of these appendages need further investigation. However, it is significant that long, distinctly segmented appendages should occur in the Pamphiliidae and rudimentary ones in the Cephidae.

Uropods.--The embryological data on the whole seem to support the view, as was pointed out by Korschelt and Heider (:291), that "the abdominal appendages of the caterpillars of the Lepidoptera and Hymenoptera are to be regarded as true limbs" and that "limb-rudiments first form on all or most of the abdominal segments, but that they very soon disappear on those segments which in the larvae have no limbs, while on the other segments they are trans-

formed into the functional prolegs." Graber (1890) has shown that the so-called anal prolegs of Hylotoma are the appendages belonging to the tenth or true penultimate abdominal segment. They are, therefore, not homologous with the anal prolegs of lepidopterous larvae which are the appendages of the ultimate segment.

The maximum number of uropods occurs in the Xyelidae where each of the abdominal segments is provided with a pair of uropods. The first and ninth pairs may be smaller than the others as in Odontophyes but they are always discernible. The number of uropods present in the Tenthridinidae varies from six to eight pairs. They areusually present on abdominal segments 2-7 and 10 or2-8 and 10, rarely 2-6 and 10. In the Fenusinae and Caulocampa the tenth pair is obsolete and in Metallus they are fused together forming a median protuberance. Uropods are entirely wanting in the other families of the Tenthredinoidea.

A typical uropoda is a fleshym subconical protuberance, narrowed toward the distal end and is usually subdivided into a larger but shorter proximal portion and a smaller but longer distal portion. Sometimes the distal end is dilated and turned mesad as in Diprion, or the cephalo-ventral angle is pointed as in Tenthredo. The uropods are well developed in most of the free living larvae but in the leaf-miners and fruit-borers they are reduced and smaller. They are very small in the Hylotominae and rudimentary in the Fenusinae and Schizocerinae, while they are obsolete in Phlebatrophia. The degree of development of the uropods is closely correlated with the habit of the larvae., The uropods are usually located on the middle of each lateral half of the sternum but occasionally are very close together near the meson as in Diprion.

The number of pairs of uropods present offers a convenient character for differentiating the subfamilies of the Tenthredinidae. The uropods often bear a small number of setae on the cephalic and lateral aspects. Setae are confined to the mesal aspect and in others they are entirely wanting. Lack of setae on the uropods is often a generic character and the number and arrangement of the setae is typical of the species.

Crampton (1919), with good reasons, proposed the substitute the term uropods for the long-used but misleading term prolegs. This term has been employed by the students of the Crustacea in designating the abdominal appendages, especially one of the posterior pairs of pleopods but since the abdominal legs of the insect larvae are true appendages (Packard, 1883) and since the use of the term prolegs is decidedly undesirable, Crampton's suggestion has been accepted in this paper.

Metamerism.--Graber (1890) has shown that the number of somites which compose the body of the larvae of Hylotoma is fourteen exclusive of the head. The first three somites belong to the thorax and the remaining eleven to the abdomen. The ultimate segment or the telson of the embryologgists is difficult to discern in larvae. It is probably represented by the suranal and subanal lobes of the larvae, but the boundary between this segment and the tenth somite is so obliterated and the ultimate segment which is originally much smaller than the preceding somites is in the larval stage so much more reduced that it is permissible and also convenient to speak of the abdomen as being composed of ten segments. For this reason the tenth abdominal somite which bears the so-called anal prolegs is designated as the ultimate segment in this paper. It is to be noted that Nelson (1915:111) considers

there are eleven segments and a teslon in the abdomen of the embryos of Hymenoptera. In all the larvae of the Tenthredinoidea examined, it is always possible to count ten abdominal segments. The body is usually distinctly segmented.

The exact limit of the somite is not so easy to determine. Entomologists seem to have paid but little or no attention to this point. Castle (1900) has made an excellent study of the metamerism of the Hirudinea. His conclusions are not directly applicable to the case of insect larvae but they are pregnant with important suggestions. He found that the natural and true limits of the somite coincide with the limits of the neuromere and that both reduction and increase in the number of rings which correspond to the annulets in the saw-fly larvae take place at the ends of the segment. The classical work of Lyonet (1762) and the recent study of Forbes (191) on the musclature of lepidopterous larvae indicates that the musclature offers a reliable criterion for determining the limits of the somite. From a careful examination of the musclature of various types of tenthredinoid larvae, the author has come to the conclusion that in these larvae the natural and accurate determination of the extent of the somites composing the body is best based upon the musclature. A detailed discussion of musclature is out of place here. It is sufficient to say that the majority of the longitudinal muscles including the dorsal, lateral, and ventralrretractor muscles originate on the cuticular fold which on the exterior is usually indicated by a deep depression. There are only a few muscles of importance crossing over this fold, that is, that are not attached to either the cephalic or caudal part of the coria. This cuticular fold, therefore, is con-

sidered as the cephalic limit of the somite and the annulets into which the somite is subdivided are numbered consecutively commencing from its cephalic end. To assume, a priori, the stigmatal annulet or the annulet which bears the spiracle to be the first annulet is arbitrary and inaccurate in as much as this annulet, according to the criterion of musclature, corresponds to any one of the first three annulets of the somite. The position of the stigmatal annulet is constant and definite within a genus or subfamily so long as the number of annulets of the somite is constant. Some of the annulets are usually setiferous and often also bear transverse rows of glandubae. The position of such setiferous annulets are constant within the genus or subfamily when the annulation is constant. The number of annulets on the ninth abdominal segment is always smaller than that of the preceding segments. Since the setiferous annulets are definite in their order, it is possible to determine which annulets are obsolete on the penultimate segment. The first annulet to be suppressed is a caudal one, and ordinarily it is only the caudal annulet that is missing. The number of annulets of the sternum is less than that of the tergum. The length of the annulets varies but their relative size is constant within a species. The primitive number of annulets of the abdominal segments is unknown. If the annulation of the generalized Tenthredinoidea is assumed to be representative of the primitive condition, then, four is the primitive number of annulets. In the specialized Tenthredinoidea the number varies from one to seven but five to seven is of the most common occurrence. The number becomes smaller in the highly specialized families being reduced to a single annulet in the Siricidae and Oryssidae.

Spiracles.--The spiracles are present on the prothorax and he the first eight abdominal segments in all Tenthredinoidea. The prothoracic pair is always the largest, the abdominal spiracles are usually uniform in size and shape except the last pair which are often larger than other abdominal spiracles. The spiracles are definite in location in regard to the annulets and are always situated on some one of the first three annulets of the segments. The stigmatal line is usually located slightly ventrad of the middle of the lateral aspect of the body, but sometimes it migrates v ventrad to the latero-ventral line as in Caliroa. The spiracles are usually very simple in structure, vertical in position, never circular in outline but narrowly ovate, rounded or pointed at both ends. The peritime os narrow but strongly chitinized and brownish or blackish. The labiae are narrow and the spiracular opening is usually closed and appears like a dark line. The peritime is sometimes distinctly thickened as in Hylotominae. There is often a semicircular or irregular, chitinized, colored area on each side of the spiracles as in certain nematid genera. These areas vary in size and shape but are constant within species and their presence usually within genera and often within a subfamily. When these areas are present, the spiracles are said to be winged.

The true prothoracic spiracles are wanting in all adult and larval insects. The spiracles found on the prothorax are the mesothoracic ones which have migrated from the mesocoria on to the thorax. The metathoracic pair is usually functionless, very small, and located in the metacoria, or obsolete. In the Cephidae and Siricidae, however, the metaspiracles are distinct, functional, and as large as the abdominal spiracles. It is difficult to explain

the rudimentary condition of this pair mf in the Xiphydriidae, since other characters indicate that they have a common origin with the Cephidae and Siricidae. It is possible to have one structure of the body modified faster, in the course of evolution, than the other structures.

III. Systematic

Strictly speaking no classification of the Tenthredinoidea based upon larval characters has been proposed. Attempts have been restricted to the characterization of the different subdivisions included in the superfamily. Among the earlier writers Le Peletier's(1823) work may be mentioned. After a brief general account of the larvae, he gave a list of eighteen divisions into which he grouped the species of the Tenthredinoidea and stated whether the larvae of each division were known or not and, if known, the number of thoracic and abdominal legs they possessed. It is interesting to note that he mentioned a group of larvae the body of which he characterized as "donky-form" (aselliform) which he was unable to place in any of his divisions. Dahlbom(1835) published careful descriptions and synopses of larvae of sixty-three species. A synoptic table for the larvae was compiled by Westwood(1840) from this work and was published with additions. The characters used are the number of abdominal legs and feeding habits of the larvae. Norton(1867) republished Westwood's table without additions. In the table given by Cameron(1882) the larvae of more than ninety-five species are included. The major groups are separated on the number of thoracic and abdominal legs present. These subdivisions are segregated on biological characters such as reflex bleeding, types of cocoons, and finally genera and species, when known, are separated on the coloration, setae, food plants, and feeding habits. In 1896 Dyar, the most prolific and the only important American writer on the larvae of the Tenthredinoidea, published "A recognition table for the known sawfly larvae of the North Atlantic States." The larvae of one hundred and twenty-six species including forty-one not specifically identified were considered in this synopsis. The characters used are the number and location of abdominal legs, types

of cocoon, feeding habits, food plants, and coloration. This last character was employed extensively in separating different species. The next attempt along this line was undertaken by Chester Young (1896) who took into consideration, for the first time, such structural characters as are found on the appendages of the head. Unfortunately this work remains unpublished, but it is on file as a baccalaureate thesis in the library of the Cornell University. Konwa (1901) summarized the taxonomic information concerning all the known larvae of European and American species, four hundred and eighteen in all, in the form of an analytical table. The presence or absence of abdominal legs, number of antennal segments, and modifications and appendages of the ultimate body segment were used in separating the families and subfamilies. The number and location of abdominal legs, food plants, types of cocoon, and coloration furnished the basis for the separation of tribes, genera and species. Recently Middleton (1915, 1917) has characterized the larvae of the genus Dimorphopteryx and of the family Cephidae. It must be noted that these writers were concerned only in the preparation of recognition tables for the separation of the particular species they had in hand, and, with the exception of Middleton, no attempt has been made to construct a synopsis of families genera, and species as such.

In the following pages, the author has attempted to define and describe the families, subfamilies, genera, and species on the larval characters as far as possible with the materials at hand. No attempt with a few exceptions, has been made to incorporate data from previous writers for the reason that the characters recorded by them were found in most cases of little or no value for the present purpose, not because they were inaccurate, altho that was true in many cases, but chiefly because they were not of specific significance. For

example Dyar's descriptions of species are usually very accurate and dependable but most of the characters noted excepting coloration proved to be often of family or subfamily significance. The definitions given here are correct for the materials actually studied but it is not surprising if they do not hold good in many cases when more materials become available for examination. It is obviously impossible to attain perfection in the face of so many missing links in the genera series of genera and species. These missing links will be filled up as rapidly as accurately identified materials become available, but it must be remembered that accurate and absolute identification is only possible, in the majority of cases, after carrying isolated specimens of the species thru to the adult stage from the larval stage.

The classification of the Tenthredinoidea proposed by MacGillivray in 1906 with later additions has been adopted in arranging and restricting the families, subfamilies, genera, and species. For generic synonymy, Rohwer's "Genotype of the Sawflies and Woodwasps" (1911) has been followed. All references to the bibliography of the different divisions and subdivisions have been omitted from this section.

Tenthredinoidea

Larvae with well-differentiated exposed head and trunk consisting of three thoracic and ten visible abdominal segments; spiracles always present on prothorax and first eight abdominal segments; antennae and chitinized dentate mandibles always present; ocellarae, when present, always one on each side of the head; thoracic legs, when present, always three pairs, a pair to each segment; uropods, when present always six pairs or more, never on first and nineth abdominal segments, and never with crochets; mouth-parts, when normal, with mandibles strongly chitinized with distinct dentes, dextral dentes dissimilar in number, shape, and arrangement from sinistral; maxillae with cardo, stipes, palpifer, palpi, galeae, and laciniae present, palpi typically with four segments, galea conical, digit-like, and lacinia usually flattened, cephalic margin with a fringe of setae; labium with submentum, mentum, palpi, stipulae, and totaglossa, palpi typically with three segments, totaglossa membranous bulbose, with a seracos on its meso-distal portion; general appearance caterpillar-like or grub-like; free leaf-feeders, leaf-miners, web-spinning leaf-rollers, wood and stem-borers, and parasitic larvae.

Free leaf-feeder, caterpillar-like, majority of the Tenthredinidae and Xyelidae; thorax with well developed, distinctly segmented legs, typically with five segments, coxa, trochanter, femur, tibia, and tarsal claw; abdomen typically with a pair of uropods on segments 2-7 or 2-8 and 10; ultimate segment sometimes with caudal protuberances but never with a distinct suranal process and subanal appendages; head typically semiglobose; antennae typically multi-segmented, segments one to five in number; ocellarae always present, usually located dorsad of antennariae; mouth-parts well developed and typical in structure; abdominal segments usually with five to seven annulets; some of

which bear transverse rows of setae and often some glandubae; head, thoracic legs, and anal area usually setiferous.

Leaf-miners,-a few subfamilies of the Tenthredinidae; body somewhat depressed, head sometimes distinctly depressed and mouth-parts directed cephalo-ventrad; thoracic legs small, modified, number of segments reduced to four or three, sometimes legs entirely fleshy, conical or mamma-like, without tarsal claws; abdomen with very small uropods or uropods nearly obsolete; mouth-parts sometimes modified, palpi with reduced number of segments; annulation sometimes obsolete.

Web-spining leaf-rollers, Pamphiliidae; thorax with setaceous segmented legs; abdomen without uropods; antennae long, setaceous, seven-segmented; mouth-parts normal; ultimate segment with a distinct subanal appendages and a minute hook-like caudal process on caudo-meson of tergum; ocellarae present.

Wood-borers and stem-borers, Siricidae, Xiphydriidae, and Cephidae: thorax with rudimentary legs, tarsal claws never present; abdomen without uropods, ultimate segment with a distinct suranal process or with a pair of subanal appendages; mouth-parts somewhat modified, palpi reduced in number of segments; ocellarae wanting; metaspiracles sometimes functional as large as abdominal ones.

Parasitic larvae, the Oryssidae: body grub-like, thoracic and abdominal legs wanting; mouth-parts modified, maxillary and labial palpi obsolete; ocellarae wanting; antennae one-segmented.

The larvae of the typical Tenthredinidae are readily differentiated from the larvae of other Entometabola by the presence of a pair of ocellarae and usually with six or more pairs of uropods none of which occur on first and ninth abdominal segments and are never provided with crochets. The characteristic mouth-parts include four-segmented maxillary palpi and three-segmented labial palpi.

The character of antennae, number of ocellarae, uropods, mouth-parts, especially palpi, and presence of thoracic legs distinguish the leaf-miners and wood-borers of the Tenthredinoidea from other leaf-miners and wood-borers, such as certain Lepidoptera, Coleoptera, and Diptera. The larvae of Hymenoptera other than Tenthredinoidea are also distinguishable from those of the latter because they are apodous, thoracic and abdominal legs being always wanting; mouth-parts vestigial, palpi, if present, papilliform, never distinctly segmented; ocellarae never present; and suranal process and subanal appendages wanting. The larvae of the Oryssidae are separable on the basis of the characters given in the definition of that family.

Families of Tenthredinoidea

a. Thoracic legs present, either normal in form or modified, if modified, setaceous or fleshy conical, if conical, head and body distinctly depressed; uropods either present or wanting.

b. Thoracic legs normal in form, not setaceous, rarely mamma-like; uropods usually present; subanal appendages wanting; antennae usually with less than seven segments.

c. Uropods present on all abdominal segments; antennae with six or seven segments----------Xyelidae.

cc. Uropods not present on all abdominal segments; antennae never with more than five segments---------- Tenthredinidae.

bb. Thoracic legs setaceous; uropods wanting; subanal appendages present, setaceous; antennae with seven segments, very long. ----------Pamphiliidae.

aa. Thoracic legs rudimentary, mamma-like, or wanting; if mamma-like, head and body never distinctly depressed; uropods wanting.

b. Thoracic legs present; ultimate segment with suranal process.

c. Subanal appendages present, vestigial, papilliform; ocellarae present; antennae with four and five segments. ----------Cephidae.

cc. Subanal appendages wanting; ocellarae wanting.

d. Antennae with three segments; metaspiracles functionless, very much smaller than abdominal spiracles ----------Xiphydriidae.

dd. Antennae with one segment; metaspiracle functional, as large as abdominal spiracles----------Siricidae.

bb. Thoracic legs wanting; suranal process and subanal appendages wanting.----------Oryssidae.

MacGillivray(1906) divided the superfamily Tenthredinoidea into nine families. They are the Xyeliidae, Pamphiliidae, Blasticotomidae, Tenthredinidae, Xiphydriidae, Siricidae, Megalodontidae, Cephidae, and Oryssidae. The first two families consitute the Generalized Tenthredinoidea and the last six the Specialized. Since the Blasticotomidae and Megalodontidae belong to the palearctic fauna and are not represented in North America, ~~(Since their larvae are unknown, they are not included in the table and are omitted from the general discussions.~~ they are omitted from the table.

Xyelidae

length 13-18 mm.;

Larvae of medium size; body caterpillar-like, subcylindrical, flattened on the ventral aspect, uniform in diameter thruout, except last two segments which are suddenly constricted, stout; segmentation and usually annulation distinct; cuticle smooth; tuberculate and setiferous but never slimy; color greenish, yellowish, whitish or brownish; tubercles when present brownish or blackish and setiferous; prothorax with a pair of eversible cervical glands in the cervacoria; head circular in frontal contour, moderately large, width usually more than one-half the dismeter of he thorax; mouth directed ventrad; head slightly overlaped by the prothorax, sparsely, if any, and inconspicuously setiferous; antenae long, conspicuous, with six and sometimes seven segments; ocularia about one-fifth the diameter of the antennaria and located caudo-dorsad of it, elevated, ocellarae very small; epicranial suture and vertical furrows present; mouth-parts normal in form; prothorax with a large, often colored, shield-like area on the dorsum and lateral aspects; legs comparatively very small, normal in form, all three pairs subequal in size to each other; uropods present on all abdominal segments including the first and ninth segments where they are sometimes reduced in size; typical segment with four annulets; spiracles on the second annulet; lateral lobe produced ventrad, modified into a triangular lobe laterad of uropod and resembles in form to it; ninth abdominal tergum with three anulets; tenth abdominal tergum constricted distinctly and transversely on its cephalic forth and with a distinct hump-like protuberance on the meson caudad of the cephalic constriction, concolorous with the head and setiferous tubercles; anal uropods and ventral or subanal lobes distinctly large, contiguous, forming a trilobate prominence on the meson of the tenth sternum; subanal lobe with a pair of setiferous protuberances dorsad of uropods.

insects single-brooded, solitary, chiefly exposed leaf-feeders, pupate in earthen cells in the ground.

The Xyelidae is a small family consisting of seven genera and of a limited number of species, most of which belong to the North American fauna. The adults are readily distinguished from all other Hymenoptera by the presence in the wings of the free part of the vein R_2. On venational characters, MacGillivray (1906) considers the members of this family to be the most generalized Hymenoptera known, having, "departed from the type of the wing assumed for the original progenitor of the Hymenoptera only in the loss of the free part of vein Cu_2." The genera, at the same time, possess many features of prominent progressive specializations which have proceeded in each case in a different sequence so that a linear arrangement of the genera does not express their true affinities.

Over twenty-five species have been reported from boreal America. Of this number, four species belonging to as many genera have been recognized in the larval state. Another unidentified species feeding on pecan is added in this paper. Dyar (1898) described the larvae of Megaxyela major and Xyela minor and gave a definition of the family based on characters found in these species. He pointed out that they are most nearly related to the Pamphiliidae. The larvae of Odontophyes aviingrata were described by the same author (1898). Konow (1901) overlooked Dyar's former paper and gave in his analytical table for the larvae Odontophyes aviingrata as the sole representative of the subfamily Xyelini. That Konow was unfamiliar with any xyelid larvae may be reasonably assumed from the fact that he classified them with those larvae which had no uropods and that he placed a question mark before the analytical item "ohne Afterborsten." The larvae of Pleuroneura, Paraxyela and Protoxyela are unknown. The described

larvae feed on the foliage of hickory, butternut, pecan, elm, and the staminate flowers of pine.

The material at hand is limited and does not permit to make a characterization of the genera. The following table will serve to separate the species:

a. Uropods present on all abdominal segment, those on the first and ninth segments sometimes rudimentary; thoracic legs normal in form; body tuberculate, tubercles concolorous with the head and setiferous; head creamy white or brownish or blackish; abdominal segments typically with four annulets, first annulet smooth, non-tuberculate, crescentwic and confined to the dorsal aspect, three following annulets convex, with transverse row of setiferous tubercles; not on staminate flowers of conifers.

b. Head dark colored, brownish or blackish; tenth abdominal tergum always and prothoracic and ninth abdominal terga usually with dark colored patches; tenth tergum brownish or blackish; subanal lobe with a pair of wart-like brown tubercles which bear blackish brown setae on the dorsal and lateral aspects, less densely on the ventral aspect; dorsal tubercles arranged typically as follows: the second and third annulets with four to five, the fourth annulet with two or three; the substigmatal and surpedal lobes each with a tubercle; the dorsal tubercles of the second annulet with one to three setae.

c. Tubercles of typical abdominal segment arranged as follows: the second and third annulets with four tubercles above the stigmatal line, each tubercle bears one seta; the fourth annulet with two tubercles, one on the stigmatal line with two setae, the other dorsad of the line with

one seta;on hickory and pecan.

d. Prothoracic tergum with a large,dark brown,median patch whose lateral margins converge to the cephalic margin where it is one-half as long as the caudal margin;the ninth abdominal tergum with a large,dark brownish,patch on each side of the meson,patches converging toward the caudal margin so that its caudal half is nearly confluent on the meson,with a pair of brownish tubercles between the cephalic half;tenth abdominal tergum almost completely dark brown in color; the first annulet of typical segment with the dorsal pair of tubercles quadrate,one-half as long as the annulet;abdomen with a brownish,cloudy,longitudinal, dorso-lateral line involving the dorsal pair of tubercles and extending usually from the second to the seventh abdominal segments;on hickory and pecan; Y-226,M- .....Megaxyela major Cres.

dd. Prothoracic tergum without a large,dark brownish,median patch,but with a pair of small blackish patches distinctly separated on the meson on the first and second annulets,the cephalic pair larger,triangular, and their apices directed laterad,the caudal pair subquadrate,further apart than the cephalic pair;the ninth abdominal tergum without a pair of large dark brownish patches but with two pairs of small blackish patches,distinctly separated on the meson,the cephalic pair smaller and slightly further apart than the caudal pair;tenth tergum blackish with its cephalic constricted portion pale or creamy white;first annulet of

of typical abdominal segment with the dorsal pair of tubercles subcircular, one-third as long as the annulet; abdomen without a brownish, cloudy, longitudinal, dorsomesal line; on pecan; Y-227.....Megaxyela sp. ?.

cc. Tubercles of typical abdominal segment arranged as follows: the second and third annulets with four to five tubercles above the stigmatal line, each tubercle bearing two setae; the fourth annulet with three tubercles, one on the stigmatal line and the other two dorsad of it, each tubercle with two setae; on hickory and butternut; Y-228.....
.....Odontophyes aviingrata Dyar.

bb. Head light in color, creamy white or pale brown; the prothoracic and the ninth and tenth abdominal terga without dark colored patches; tenth tergum light brown; subanal lobe with a pair of wart-like creamy white tubercles which bear long light brown setae uniformly distributed on all aspects; tubercles arranged as follows: the second and third annulets with four tubercles dorsad of the stigmatal line, the second tubercle dorsad of the ventral one sometimes rudimentary and often represented by a tiny single seta, the fourth annulet with two tubercles, one on the stigmatal line and the other dorsad of it, the lateral lobe divided into three lobes and each with one tubercle; the dorsal pair of tubercles of the first annulet with four to five setae; on Ulmus; ♀.....
.....Macroxyela? ferruginea Say.

aa. Uropods very small; thoracic legs rudimentary; body not tuberculate; head creamy white; abdominal segments typically with three annulets; on staminate flowers of pine (Dyar described no uropods).....Xyela minor Dyar.

Pamphiliidae

Larvae of midium size;body subcylindrical,slightly flattened on the ventral aspect;lateral lobe on the ventro-lateral margin dist distinct,moderately large;body slender to robust;segmentation and annulation distinct;cuticle microscopically setiferous,appearing smooth,often delicate,transparent;color usually greenish or creamy white;head semiglobose,prominent,as wide as thorax;color creamy or brownish or blackish;mouth directed ventrad;head completely exposed,sparcely setiferous;epicranial suture and vertical furrows present;antennae extremely long,setaceous,conspicuous,seven-segmented ocularia located ventro-laterad of antennariae;mouth-parts normal, seracos produced and prominent;prothorax with shield-like,usually brownish broad patches on the dorsal and lateral aspects;thoracic legs modified,setaceous,sharply pointed,segments cylindrical,distal segment very long slender,straight not curved;third abdominal segment with four annulets on dorsal and ventral aspects;spiracles on the second annulet;uropods wanting;eighth abdominal segment on the venter mesad of the lateral lobe with a fleshy protuberance resembling a uropod;ninth segment cylindrical,smaller than the preceeding;tenth segment depressed,rounded on the caudal margin,usually setiferous, sometimes conspicuously so,often with colored patches,always with a median hook near the caudal margin of the tergum;subanal lobe with a pair of setaceous,three-segmented,conspicuous,subanal appendages; insects one or two-brooded;spin silken web or rolls leaves for their nests;solitary or gregareous;pupate in the ground.

The Pamphiliidae is an easily circumscribed family of ~~the~~ eight or nine genera and allarg number of species which are peculiar to the northern hemisphere. The adults differ from all other Hymenoptera except the Xyelidae,in the preservation of the subcostal vein in the

hind wings. In this character it is more generalized than the Xyelidae altho it is more specialized than this family in other features of venation. Brischke and Zaddach(1865)discussed the immature stages and biology of eleven European species of the Pamphiliidae and pointed out that certain of their habits may be of taxonomic significance. The larvae of these species fall into two groups according to the type of nests they build. The first group contains those whose larvae build nests by tying the leaves of their food plants together with threads of silk and are either solitary as Lyda or gregareous as Cephaleia and Neurotoma. The second group consists of those whose larvae build nests by rolling the edge of the leaves of their food plant and live inside the tubes so formed as Pamphilius. Some of this latter group make portable nests out of detached pieces of leaves as Pamphilius inanitus on Rosa. The adults, however, are so closely related to each other that Rohwer(1911)considered such a subdivision impractical. Konow(1901), in his analytical table of the larvae, included sixteen species, representing four genera, but did not register any nearctic species. According to this writer(1905)the larvae of Lyda and Cephaleia feed on coniferous plants while those of Neurotoma and Pamphilius attack deciduous plants. Nothing is known concerning the biology of Anoplolyda. Dyar(1895) included in his table ten nearctic Pamphilids but, excepting Pamphilius ocreatus, all were unidentified and many were taken from descriptions given by Packard(1890).

Of about fifty-five nearctic species representing seven genera, Acantholyda, Itycorsia, Cephaleia, Caenolyda, Neurotoma, Pamphilius, and Anoplolyda, only five species have been identified in the larval stage. and the food plants of about six species recorded.

Four identified and several unidentified species have been

examined. It is not possible to define the genera with this limited material;the species studied can me separated as follows:

a. Subanal appendages with the second segment longer than or subequal to the third segment,never distinctly shorter;head usually darkly colored;tenth abdominal tergum with colored patches.

b. Subanal appendages with the second segment subequal in length to the third,all segments black;first segment longer than the distal two segments ~~put~~ together;head black;body olive green with yellowish lateral lobes;on spruce;Packard-35. .....Pamphilid sp.1.

bb. Subanal appendages with the second segment longer than third which is usually darker in color than the others;first segment longer or subequal to the distal two segments ~~put~~ together;head dark brown to green.

c. Head green;tenth abdominal tergum without colored patches; body green;subanal appendages with the second ~~segments~~ and third segment black;on Pinus strobus;Packard-83. ....Pamphilid sp.2.

cc. Head not green,usually brownish;tenth abdominal tergum with or without colored patches;body not greenish,sometimes reddish or olivaceous;subanal appendages usually with segments brownish;on Pinus and Abies.

d. Head brown to yellowish.

e. Head dark brown.

f. Head paler along epicranial arms;cerci with first segment subequal in length with others ~~put~~ together; all segments pale to light brown;length 25 mm.;

width of head, 3 mm.; body robust, large; following parts dark brown: head except along epicranial arms, prothoracic shields, thoracic surcoxal lobe, coxae, sterna between thoracic legs, cervical sclerites, markings on the tenth abdominal segment, caudal hook, and antennae; ocellarae black; caudal hook short and errect; tenth abdominal tergum with a pair of lateral patches, not connected along caudal margin; tenth abdominal sternum with a median brown patch, distinctly rounded on cephalic margin; subanal appendages light brown, first segment equal in length to other two ~~put~~ together, segment 2 longer than 3; thoracic legs with fifth segment as long as fourth, and third ~~put~~ together; antennae with formula: (2,5),3,6,1,(4,7); cuticle distinctly reticulate, each area brownish; three specimens in MacGillivray collection bearing label "Cephaleia sp. no. 839, ? Maine". (The identification is open to question, but, since these larvae are readily distinguished from the larvae of Pamphilius and Neurotoma by the characters used in the table ~~here~~, they may be considered tentatively at least as representing the genus Cephaleia.).....Cephaleia sp.1.

ff. Head not paler along epicranial arms, but uniformly brownish.

g. Head pitch-brown; body pinkish, reddish brown; on spruce; Packard-36.....Pamphilid sp.3.

gg. Head horn-brown; body horn brown, subanal appendages with first segment longer than other two ~~put~~ together

third segment brown;onPinus strobus;Packard-84.

.....Pamphilid sp.4.

ee. Head yellowish to brownish yellow;body pale brick-red, yellowish,each segment with a large reddish spot on the spiracular line;subanal appendages with first segment subequal in length to other two ~~put~~ together; all segments blackish;on Pinus strobus;Packard-85.

.. ..Pamphilid sp.5.

dd. Head pale red,with a black spot on the front;body reddish olive-green with purplish meso-dorsal line;on Austrian pine;closely related to Lyda campestris;Packard-82.

.....Pamphilid sp.6.

aaa. Subanal appendages with the second segment distinctly shorter than the third;head variously colored,blackish to pale;tenth abdominal tergum either with or without colored patches.

b. Tenth abdominal tergum with a colored patch on each side, median triangular patch between the cephalic ends of lateral patches wanting;lateral patches connected along the caudal margin of tergum;sternum with a large colored patch.

c. Head blackish or dark brownish,in younger specimens pale brown;subanal appendages with first segment longer than other two put together,third longer than second,all segments brown,the third darker;cervical sclerites pale brown,dorsal and lateral shields of prothorax pale to light brown,patches on the ultimate segment brownish; body with a pink dorsal line on the meson;antennae in mature specimens with formula,(2,3,5),1,7,(4,6);ocularium about one-third the diameter of antennaria;ocellarae small,eccentric,near the mesal margin of ocularium;

mouth-parts brownish;length 19 mm.;width of head, 1.9 mm.; on wild cherry;G .....Neurotoma fasciata Norton.

cc. Head lighter in color,yellowish,sometimes brownish yellow; subanal appendages with first segment subequal to other two ~~put~~ together,all segments black;following parts blackish:prothoracic shields,thoracic legs,markings on ultimate segment,subanal appendags,ocularia,thoracic sterna;the black markings of tenth abdominal tergum connected along the caudal margin;black marking of tenth sternum large,completely covering the sternum,and with its cephalic margin between the subanal appendages straight; antenae with formula,(3,5),2,1,7,(6,4);length 18 mm.; width of head, 1.7 mm.;on Plum;G .....Neurotoma inconspicua Norton.

bb. Tenth abdominal tergum either with a colored patch on each side and with a median triangular patch between the cephalic ends of the lateral patches always present,lateral patches sometimes not connected along the caudal margin of the tergum,sternum with a large colored patch,or the tergum without colored patches and the sternum either with a pair of small round spots or without markings.

c. Tenth abdominal tergum with two lateral and one mesal triangular patch and sternum with a large colored patch.

d. Head blackish;body greenish white;subanal appendages with the first segment longer than other two ~~put~~ together,all segments pale brown,the third sometimes darker;following parts blackish:head uniformly,antennae, prothoracic shields,thoracic lateral lobe,markings on

ultimate segment, suranal hook, cervical sclerites, and coxae; antennae with formula, (3,2),5, 1,7,(4,6); eighth uromere with a pair of marginal ventral glands accompanied by caudal portion of the lateral lobe, both pale brown; nests made by rolling edges of leaves cut across from the margin to the midrib; gregareous; in life body glossy, white, fleshy reddish tint diffused over the body; antennae and subanal appendages whitish; length 19 mm.; width of head, 1.9 mm.; on Cornus; Y-125.

....Pamphilius sp. 1.

dd. Head light brown, with a black spot on the apex of front; subanal appendages with the first segment subequal in length to other two ~~put~~ together, two proximal segments creamy, third deep brown; body whitish green; ocularia brown, a black spot at the origin of the epicranial arms; following parts brown: thoracic shields, cervical sclerites, and markings on the ultimate segment; tenth abdominal tergum with a median cephalic triangular patch between the lateral patches; subanal appendages with the first segment as long as other two ~~put~~ together, second segment longer than one-half the length of the third; thoracic legs pale or creamy white; antennae beyond the first segment deep brown, with formula, (2,3,5), 1,7,(4,6); length 1.9 mm.; width of head, 1.8 mm.; on Blackberry; G.....Pamphilius dentatus MacG.

cc. Tenth abdominal tergum without colored patches.

d. Tenth abdominal sternum without a pair of small colored patches.

e. Head uniformly pale brown; subanal appendages with the

first segment as long as other two ~~put~~ together, the second shorter than the third, all segments pale brown; ocularia large, about one-third the diameter of antennaria, black; following parts blackish brown: narrow prothoracic shields, cervical sclerites, and antennae; suranal hook brown without colored base; antennae with formula (2,3),5,1,7,(4,6); length 12 mm.; width of head, 1.5 mm.; host unknown; Y-163-3. (This species resembles closely P. persicus Macg.).....

.....Pamphilius sp.2.

ee. Head not uniformly pale brown, vertex brown, front with a brown spot; subanal appendages with the first segment as long as other two ~~put~~ together, distal two segments brownish; following parts brown: prothorcic shields, cervical sclerites, antennae, and suranal hook; legs pale brown, darker in young specimens; length 17 mm.; width of head 1.8 mm.; on Blackberry; M-69.

.....Pamphilius sp.3.

dd. Tenth abdominal sternum with a pair of small colored spots; head pale to light brown, front sometimes with a brown spot, usually without it; subanal appendages with the first segment subequal in length to other two ~~put~~ together, the second shorter than the third segment, all segments pale to brownish; ocularia and mandibles at distal end blackish brown; suranal hook brown with its base pale; antennae brown; tenth abdominal tergum without colored patches, sternum with small, brown, round spot on each side; length 16 mm.; width of head, 1.6 mm.; larvae solitary, leaf-edge rollers; on Cornus; M-

.....Pamphilius ocreatus Say.

Blasticotomidae

The Blasticotomidae contains a single genus and species, Blasticotoma filiceti Klug, which is confined to central and eastern Europe. It is an archaic type. The systematic position of this unique species has been considered differently by practically every writer who has studied it. MacGillivray (1906) has shown, however, that it is in certain of its characters closely allied to the Xyelidae and Pamphiliidae, while in others it approximates the Tenthredinidae and that, it is intermediate in posiiton between these two groups.

Because of its taxonomic position, it is highly desirable to know the characters of the larvae of this species but unfortunately the literature is void of informations in regard to the immature stages and this interesting study must await future discoveries.

Tenthredinidae

Larvae from very small to very large, length 10-40 mm.; caterpillar like, leaf-feeders, leaf-miners, or fruit-borers; body cylindrical, thorax usually largest in diameter, body tapering caudad, sometimes flattened on the ventral aspect, leaf-miners depressed; greenish or variously colored with or without distinct markings; smooth, glabrous, setiferous, tuberculate, or spinous; segmentation usually and annulation sometimes distinct; third abdominal segment with 6, 7, 5, 4, 3, or 2 annulets in the order of frequency; some of annulets usually setuferous and often with glandubae; thoracic legs always present, usually well developed, typically with five segments, sometimes with three, four, or apparently six segments but always with distinct tarsal claws; legs rarely rudimentary, fleshy, indistictly segmented and without tarsal claws; uropods present usually on abdominal segments 2-7 and 10 or 2-8 and 10, occasionally the seventh and tenth pair wanting, rarely all uropods obsolete; head typically semiglobose, setiferous, with or without distinct markings or uniformly brownish, blackish, or greenish; antennae always present, never with more than five segments; ocellarae always present, one on each side; maxillary and labial palpi typically with four and three segments respectively, never obsolete, rarely reduced in number of segments; clypeus usually with two or three setae on each side; mandibles usually with one to four setae; tenth abdominal tergum without suranal process and some times with caudal protuberances; subanal appendages never present; epicranial suture and vertical furrows usually present; metaspiracles functionless, obsolete, or very much smaller than abdominal spiracles; various glands sometimes present.

The Tenthredinidae contains twenty-four subfamilies of which five are not represented in the nearctic fauna. The subfamilies found in the United States and Canada are as follows: Diprioninae, Emphytinae,

Selandriinae, Dolerinae, Phyllotominae, Lycaotinae, Tenthredininae, Cimbicinae, Hoplocampinae, Dineurinae, Monocteninae, Cladiinae, Nematinae, Blennocampinae, Fenusinae, Scolioneurinae, Hylotominae, Schizocerinae, and Acordulecerinae. Of these, Lycaotinae, Dineurinae, and Monocteninae have not been available for study.

Subfamilies of Tenthredinidae

a. Thoracic legs normal in form, five-segmented; if modified, tarsal claws always present; uropods usually well developed.

b. Uropods present on abdominal segments 2-8 and 10; antennae elongate conical, usually with five segments.

c. Thoracic legs with five segments, normal in form.

d. Third abdominal segment on dorsum with six annulets.

e. Antennae conical, with five segments.

f. Labrum bilaterally symmetrical; legs with tibia shorter than femur, tarsal claws short, strongly curved.

g. Body rather slender, tapering caudad, without small distinct tubercles; tenth abdominal tergum without small tubercles, if caudal protuberances present, prothorax with two and mesothorax with one conspicuous dorsal protuberance; head never shiny, jet black, body never yellowish white.....
.....Emphytinae (in part).

gg. Body rather robust, uniform in diameter thruout, with small distint tubercles; tenth abdominal tergum with several small protuberances, if without, head shiny, jet black, body yellowish white.
.....Blennocampinae (in part).

ff. Labrum not bilaterally symmetrical but distinctly asymmetrical; legs with tibia longer than femur,

tarsal claws slender, only slightly curved.

.....Dolerinae.

ee. Antennae not conical, with three segments, the third segment erect and peg-like.....Diprioninae.

dd. Third abdominal segment on dorsum with more or less than six annulets.

e. Third abdominal segment on dorsum with seven annulets; body without conspicuous branched spines or tubercles.

f. Antennae conical, with five segments; labrum without secondary longitudinal sutures.

g. Uropods setiferous; clypeus with three setae on each side; mandible with two setae; labrum without a median longitudinal depression.

.....Selandriinae (in part).
Emphytinae (in part).

gg. Uropods glabrous; clypeus with two setae on each side; mandible with 1-4 setae; labrum with or without a median longitudinal depression.

h. Legs with tibia minute, distinctly shorter and smaller than femur; maxillae with stipes without ~~the~~ a cephalo-ventral triangular projection; mandibles with two setae; labrum without a median longitudinal depression.

.....Selandriinae (in part).

hh. Legs with tibia large, usually subequal to or longer than femur; maxillae with stipes with cephalo-ventral triangular projection; mandibles with 1, 2, or 3-4 setae; labrum with or without a median longitudinal depression, ~~if without~~,

mandibles with one seta...Tenthredininae.

ff. Antennae not conical, with one segment; labrum with secondary longitudinal sutures; small but distinct crescentiic glandubae dorsad of spiracles.....
.....Cimbicinae.

ee. Third abdominal segment on dorsum with five, rarely three to four, annulets; body with conspicuous branched spines or tubercles.....Blennocampinae(in part).

cc. Thoracic legs with four segments, modified; body with thorax sometimes conspicuously swollen, tad-pole-like; third abdominal segment with six annulets.....
.....Phyllotominae(in part).

bb. Uropods on abdominal segments 2-7 and 10, rarely on 2-7 or 2-6 and 10.

c. Thoracic legs with five segments, normal in form; uropods on abdominal segments 2-7 and either with or without the anal uropods.

d. Uropods on the ultimate segment present; either normal and separated or fused on the meson forming a single protuberance.

e. Anal uropods normal and separated.

f. Antennae with five segments; third abdominal segment with six annulets; tenth abdominal tergum with several caudal protuberances...Hoplocampinae(in part).
.....Hoplocampinae(in part).

ff. Antennae with four, rarely three, segments; third abdominal segment usually with less than six annulets; tenth abdominal tergum with or without caudal protuberances.

g. Abdominal segments 1-7 on ventro-meson with an eversible gland;body often with conspicuous numerous setae,setae arising from distinct tubercles;antennae with four segments.

h. Body with numerous conspicuous mutisetiferous tubercles,each tubercle bearing several long setae,some of which are distinctly longer than others;third abdominal segment with four annulets,annulet 1 with a transverse row of setae,annulets 2 and 3 with a transverse row of setiferous tubercles;tenth abdominal tergum never with caudal protuberances altho with numerous long setae;setae barbed.....
.....Cladiinae.

hh. Body without numerous conspicuous multisetiferous tubercles,if tubercles present,they do not bear several long setae some of which are distinctly longer than others;third abdominal segment with various number of annulets;tenth abdominal tergum sometimes with caudal protuberances.,,
.....Nematinae.

gg. Abdominal segments 1-7 on ventro-meson without an eversible gland;body never conspicuously setiferous;antennae with three or four segments;third abdominal segment with three or five annulets.

h. Antennae with four segments;third abdominal segment with five annulets;abdominal segments 2-4 and 8 or 2-5 and 8 without a postsubstigmatal sucker-like protuberance.....

.....Hoplocampinae(in part).

hh. Antennae with one segment ;third abdominal segment with three annulets;abdominal segments 2-4 and 8 or 2-5 and 8 with a postsubstigmatal sucker-like protuberance.....Acordulecerinae.

ee. Anal uropods united on the meson forming a single protuberance;antennae with one segment;third abdominal segment with two annulets;prothorax often with dorsal and ventral shields;vertical furrows wanting;head and body depressed,glabrous..Scolioneurinae.

dd. Uropods on ultimate segment wanting;vertical furrows wanting.

e. Antennae with three segments;third abdominal segment with four annulets,annulet 2 and 3 setiferous;tenth abdominal tergum with a caudo-mesal protuberance; body not depressed.....Hoplocampinae(in part).

ee. Antennae with 1-2 segments;third abdominal segment with two annulets,annulets glabrous;tenth abdominal tergum without a caudo-mesal protuberance;body depressed... .....Fenusinae.

cc. Thoracic legs with 3-4 or apparently 6 segments;uropods on abdominal segments 2-7 and 10 or 2-6 and 10,very small.

d. Mesothoracic and metathoracic legs with apparently six segments; prothoracic legs with apparently six segments;uropods on abdominal segments 2-7 and 10 and occasionally with a rudimentary eighth pair,or 2-6 and 10;body dilated laterad,lateral lobe produced and conspicuous,often with numerous setiferous tubercles.....Hylotominae.

dd. Mesothoracic and metathoracic legs with three segments; prothoracic legs with four segments; uropods on abdominal segments 2-7 and 10 with an occasional rudimentary eighth pair; body not dilated laterad, lateral lobe not produced and inconspicuous; body never with numerous setigerous tubercles but with minute protuberances.. .....Schizocerinae.

aa. Thoracic legs not normal in form but fleshy, indistinctly four-segmented, tarsal claws wanting; uropods vestigial on abdominal segments 2-8 and 10, ultimate pair united on the meson forming a single protuberance.....Phyllotominae (in part).

Diprioninae

length 18-25 mm.;

Larvae moderately large; body cylindrical, somewhat robust, tapering gradually caudad; segmentation and annulation distinct; third abdominal segment with six annulets, annulets 1, 2, and 4 with setae and glandubae; uropods on abdominal segments 2-8 and 10, close together on the meson; thoracic legs normal, well developed, with five segments; prothoracic legs distinctly smaller than other legs; color of body usually yellowish or greenish, with greenish, grayish, or brownish stripes or rows of black spots; antennae with three segments, segments 1 and 2 minute, flat, irregular, incomplete, segment 3 errect, peg-like, strongly chitinized; head and legs usually with spinous stiff setae; glandubae prominent and numerous; ventral glands wanting; spiracles not winged; cuticle microscopically spinulate; larvae feed on conifers.

The subfamily Diprioninae is represented in North America by two genera, Dipion and Neodiprion. The nearctic species formerly placed in the genus Diprion (Lophyrus) are placed by Rohwer (1918) in Neodiprion. Diprion simile Hartig of Europe has recently become established in The United States. With the exception of MacGillivray, systematists agree in associating the genus Monoctenus with Diprion and its allies.

The two genera studied can be separated as follows:

a. Body large, stout, longer than 24 mm.; markings mottled with dark brown and yellowish irregular spots, without brownish stripes or black spots; setae on head small, slender, those on genae similar to other setae, not spinous; head blackish .....Diprion Schrank.

aa. Body small, slender, usually shorter than 24 mm.; markings not mottled, but with brownish longitudinal stripes or rows of black spots; setae on head stiff, long spinous, those on genae

often very large and spinous.....Neodiprion Rohwer.

Neodiprion Rohwer

Larvae rather large;body slender,with longitudinal brownish stripes or rows of black spots along subdorsal,suprastigmatal,and sometimes substigmatal lines;head round in contour,cephalic and caudal margins parallel in profile;front flattened,subpentagonal,as high as wide;ocularia large;antennaria subequal in diameter to ocularia,thier own diameter apart;labrum semicircular,with small crescentric median emargination;mandibles sharply dentate,the dextral with four dentes and the sinistral with five;maxillary palpi large,four-segmented,segments 1-3 ring-like,successively diminishing in diameter; segment 4 suddenly and distinctly smaller than the preceeding segment, conical,bluntly pointed;galea chitinized,digit-like,smaller than palpi;lacinia thick,lobate,bearing a minute triangular blade-like seta on ventro-mesal angle,a stiff seta on dorso-mesal angle,and a row of three to five minute setae on the oblique cephalomesal margin; labial palpi normal,segment 2 usually longest,segment 3 conical,suddenly and distinctly smaller than preceding segment;totaglossa with dorso-cephalic depression on the meson and with several minute sensory pits;parapharynx distinct,linguiform,constricted dorsad of the middle by a pair of chitinized pieces;thoracic legs well developed, normal in form,usually blackish,segments strongly chitinized,coxae largest,trochanter ring-like,chitinized on the caudal two-third with a whirl of setae,distad of setae membranous,femur smaller than trochanter in diameter,entirely chitinized,wider than long on dorsal aspect,increasing in diameter distad,tibia subequal in length to femur but smaller in diameter,tarsal claws small,basal portion of claw undeveloped,all segments of leg membranous on the ventral aspect

prothoracic legs one-half the size of metalegs, mesolegs slightly smaller than the latter; third abdominal segment with annulation formula, 2, 1, (3, 4, 6), 5; spiracle on annulet 2, annulets 1, 2 and 4 with a transverse row of slender, cylindro-conical glandubae, annulet 2 with a few microscopic setae; substigmatal and surpedal lobes large, with several glandubae and a few setae; uropods well developed, distal surface incurved mesad, rather dilated, not pointed, distance between the pair at the base less than the length of uropod, venter with four annulets; tenth abdominal tergum gradually convex, with glandubae; anal setae numerous, small; spiracles elongate and oblong.

Species of Neodiprion

a. Head black, light grayish or brownish, never uniformly reddish brown or orange in color; body longitudinally striped or spotted.

b. Body with four longitudinal rows of black spots along subdorsal and suprastgmatal lines; tenth abdominal tergum with cephalic two-thirds entirely black; spots on each side of dorso-meson elongate, wider at cephalic end; spots on suprastigmatal line large, subquadrate; spots on prothorax obsolete; body yellowish white; length 22 mm.; on Pinus; Y-221, G-522, C-1, I-4101.....abbotti Leach.

bb. Body without four longitudinal rows of black spots along the subdorsal and suprastigmatal lines, but with longitudinal colored bands along each side of the dorso-meson; latus with longitudinal row of independent segmentally arranged blackish or brownish spots or with continuous brownish bands.

c. Body with a row of brownish spots along suprastigmatal lines; spots segmentally arranged, one on each segment, often

those on middle segments obsolete, sometimes all spots obsolete; tenth abdominal tergum with a pair of large blackish or brownish spots, spots sometimes contiguous on meson; subdorsal bands narrower than the distance between them; uropods marked faintly along pedal line when suprastigmatal spots are distinct; head black; length 23 mm.; on ;G-1686-2,-5.....Neodiprion sp.1.

cc. Body with broad longitudinal bands along suprastigmatal lines, instead of rows of segmentally arranged spots.

d. Substigmatal lines with broad brownish bands; head black; pedal lines also marked with brown; tenth abdominal tergum faintly marked; subdorsal bands much wider than the distance between them; these bands much lighter in color than those on latus; body dull greenish; length 21 mm.; on spruce; G-791.....abietis Harris.

dd. Substigmatal lines without brownish bands; head light brown, brown, or pale creamy yellow; subdorsal bands very narrow or very wide; pedal lines with or without bands.

e. Pedal lines with distinct brownish bands; tenth abdominal tergum unmarked except along caudal margin; subdorsal bands very much wider than the distance between them, lighter in color; head blackish, or brownish with brown marks on vertex and front, or pale brown; length 19 mm.; G-159.....Neodiprion sp.2.

ee. Pedal lines without distinct brownish bands; tenth abdominal tergum marked, entirely concolorous with head; subdorsal bands very narrow, usually narrower than the distance between them; head light brown or pale creamy white with vertex shaded grayish; length 19 mm.;

G-1686-3,-6,-7..... ..Neodiprion sp.3.

aa. Head reddish brown or orange;body spotted;subdorsal and suprastigmatal lines with black spots.

b. Substigmatal and pedal lines with black spots;spots on subdorsal lines tapering caudad,partly broken between annulets; spots along suprastigmatal lines large,subquadrate;spots on substigmatal lines smaller,sometimes very small but never obsolete;spots on pedal lines very small,sometimes obsolete; tenth abdominal tergum with a pair of large black spots,sometimes fusing on the meson;length 25-28 mm.;on ;G-1554,-1686-8,-503, C-cue-315,-Young-37.....lecontei Fitch.

bb. Substigmatal and pedal lines without black spots;spots on subdorsal lines small,often not distinctly tapering caudad; tenth abdominal tergum with a pair of large black spots; length 20 mm.;G-133.....Neodiprion sp.4.

Diprion Schrank

Only one species is represented in North American fauna. An examination of D.simile shows that this genus is not very different from the preceeding but may be separated from it by the characters of coloration and setae on the head and certain other minor points. It is not possible to characterize the geneus with the material at hand.

Diprion simile Hartig

Body robust,length 25 mm.;latus with a series of yellowish or whitish spots breaking up into a uniformly grayish brown background; dorso-meson with a narrow yellowish stripes bordered on each side by an equally narrow grayish brown band;dorso-lateral lines broadly yellowish,interrupted at each annulet by fine transverse lines;supra-

stigmatal lines with three yellow spots, sizes of spots increasing caudad; dorsad of these, three smaller spots with the middle one largest and subequal to cephalic spot of suprastigmatal lines; three spots on substigmatal lines, the middle one being the largest; pedal lines with a large spot on each segment; uropod with a brownish spot; tenth abdominal tergum and sternum marked with grayish; the tergum with a deep constriction dorsad of suranal lobe; head setae small, slender, hair-like, never spinous, stiff; setae on genae similar to those on front, never stiff and spinous; legs with femur sometimes longer than wide on the dorsal aspect; head black; body yellowish gray, mottled; G...

Emphytinae

Larvae small to moderately large, usually greenish, sometimes striped; body cylindrical, slender, tapering caudad; segmentation distinct, annulation fine, indistinct; third abdominal segment with usually six, rarely seven annulets, annulets 2 and 4 or 1, 3, 5 and rarely 1, 3 and 6 setiferous; head greenish or brownish, sometimes with spots on vertex and front; labrum with or without mesal longitudinal depression, with 4-5 setae on each side; clypeus with 2 or 3 setae on each side; mandibles with one, and rarely two, setae; uropods on abdominal segments 2-8 and 10, well developed, usually glabrous, sometimes setiferous; ventral glands wanting; glandubae small, conical on annulet 1 and 3 rarely on 2 and 4; tenth abdominal tergum usually setiferous but without paired caudal protuberances, rarely with conspicuous spines on the caudal margin, then prothorax and mesothorax on dorsum with two and one protuberances respectively; antennae elongate-conical, with five segments, segments ring-like; legs with femur subequal in length or slightly longer than tibia, normal, well developed; femur with its disto-ventral angle produced; mouth-parts normal in form; spiracles usually not winged; larvae leaf-feeders.

The Emphytinae is large subfamily embracing number of genera and numerous species. MacGillivray considers this the second subfamily of his generalized Tenthredinidae and places it between the Diprioninae and Selandriinae. The larvae of this subfamily are found readily and in general appearance and habitus resemble the larvae of the Selandriinae and Tenthredininae very closely but they can be separated by the number of annulets which in this subfamily with the exception of Hemitaxonus and Epitaxonus is six while in other two subfamilies it is seven. The two genera mentioned above

are distinguishable from all other genera of the Emphytinae by the number of the annulets which is seven instead of six and also by the setiferous uropods. In these respect these two genera resemble the Selandriinae and are difficult to separate from the latter. The genera and species studied are representative both in range and number to justify the definition of the subfamily given above. The definition and descriptions of these genera and species together with synoptic keys have been prepared but are reserved for publication elsewhere.

Selandriinae

Larvae small to fairly large, length 18-26 mm.; body cylindrical and gradually tapering caudad; segmentation and annulation distinct and fine; uropods on abdominal segments 2-8 and 10; third abdominal segment with seven annulets, annulets 1, 3, and 5 setiferous, 3 and 5 with glandubae; thoracic legs normal in form, tibia sometimes very small body uniformly greenish, without colored markings; head with or without brownish spots; antennae with five segments, long, conical; mouth-parts normal in form, well developed, palpi large; mandibles with two setae; clypeus with three, sometimes four setae on each side, rarely with two; stipes of maxillae with triangular cephalo-ventral projection; glandubae minute, stalked; spiracles not distinctly winged; uropods setiferous with about ten setae, rarely glabrous.

The Selandriinae includes a limited number of genera. On the basis of the venation this subfamily is placed next to the Emphytinae where practically all systematists have placed it. Rohwer's conception of this subfamily is somewhat different from that of MacGillivray and therefore differs from the latter in the disposition of some of the genera. For example, Hemitaxonus is assigned to the tribe Selandriini while MacGillivray placed it together with Epitaxonus in the Emphytinae. It may be said that these two genera are very closely related to the Selandriinae and differ from all other Emphytinae in the typical number of annulets.

Genera of Selandriinae

a. Thoracic legs with tibia normal in form, never conspicuously minute, usually subequal in length to femur; uropods setiferous; clypeus with three or four setae on each side.

b. Tenth abdominal tergum with brown spots; uropods usually with ten or more setae; clypeus usually with three and often four

setae on each side;labium deep brown,with four to six setae on each side;glandubae slightly longer than one-half the length of adjacent setae;spiracles not winged;larger larvae, length more than 24 mm.....Thrinax Konow.

bb. Tenth abdominal tergum not marked with brown spots;uropods usually with less than ten setae;clypeus with three and rarely with four setae on each side;labium pale brown or whitish with three to six setae;glandubae usually subequal in length to adjacent setae;spiracles faintly winged;smaller larvae;length less than 24 mm.....Strongylogaster Dahlbom.

aa. Thoracic legs with tibia reduced,very much smaller than femur; uropods glabrous;clypeus with two setae on each side..... .....Selandria Leach.

Thrinax Konow

Larvae large,long,length more than 24 mm.;body slender,finely annulate,uniformly greenish;head and tenth abdominal tergum with brown markings;thoracic legs normal,tibia and femur cylindrical, tapering caudad,subequal in length;uropods with about ten setae, distributed 4-5 on cephalic and lateral aspects and one on caudal; clypeus usually with three and often with four setae on each side; labrum deep brown,without median longitudinal depression,with four to six setae on each side;glandubae small,very short,slightly longer than one-half the length of adjacent setae;spiracles not winged; maxillary palpi with segments 2 and 4 subequal in length ;segment 4 longer than segment 3 of labial palpi;ninth abdominal tergum with six annulets,annulets 1,3,and 5 setiferous,annulet 6 a little shorter than the second.

Species of Thrinax

a. Head pale brown with vertex marked with brown on dorsum and caudad of ocellarae, front with a round brown spot contiguous to ventral apex of the dorsal marking on the vertex, frontal spot not reaching the fronto-clypeal suture; antennae, mouthparts, femur, tibia, and tarsal claw deep brown; tenth abdominal tergum with a pair of small brown spots; annulation formula, 1,(5,4,3),2,(6,7); antennae, 5,4,3,2,1; labial palpi with distal two segments subequal; legs with trochanter, femur, tibia in proportion of 12, 15, 16 respectively, tarsal claws with the proximal portion shorter than the distal narrow curved portion; length 26 mm.; width of head 2 mm.; on Fern; M-18.....
.....impressatus Provancher.

aa. Head pale brown with vertex marked with brown on dorsum and caudad of ocellarae, front with a subquadrate spot contiguous to the ventral apex of dorsal marking of the vertex, frontal spot reaching the front-clypeal suture; antennae, labrum, mouthparts, femur, tibia, and tarsal claw deep brown; tenth abdominal tergum with a pair of large brown spots; annulation, 1(5,4,3,2), (6,7); antennae 5,4,1,3,2; labial palpi with distal segment longer than the preceeding; legs with trochanter, femur, tibia in proportion of 12, 15, 16 respectively; tarsal claw with the proximal protion as long as the distal curved portion; length 25 mm.; width of head 2 mm.; on Fern; Y-20-3-1, -20-1.
..... pulatus MacGillivray.

Strongylogaster Dahlbom

Larvae small, length less than 24 mm.; body slender, finely annulate; unifromly green; head pale or light brown or sometimes with a few spots; tenth abdominal tergum never distinctly marked; uropods usually with less than ten setae; thoracic legs normal form, femur and tibia

subequal to each other or one longer than the other;labrum pale brown, whitish,with three to six setae on each side;glandubae usually subequal in length with adjacent setae;spiracles often faintly winged.

Species of Strongylogaster

a. Head with blackish brown markings,vertex with a pair of diverging spots over the vertical furrows directed toward ocellarae and a spot caudad of each ocellara;vertical markings sometimes faint,sometimes very distinct and large,merging into a continuous vertical marking;front never with spot;antennae, labrum,and mouth-parts light brown;tenth abdominal tergum usually without markings,rarely with a pair of faint spots; annulation 1,4,(2,3,5),(6,7);antennae 1,5,(2,3,4);maxillary palpi 2,(1,4),3;labial palpi with two distal segments equal in length to each other,shorter than distal segment of maxillary palpi;labrum with three or four setae on each side; mandible with two,rarely three,setae;legs with trochanter, femur,tibia in proportion of 10,10,12 respectively;uropods with about eight or nine setae,five on cephalic,3-4 on lateral and one on caudal aspect;glandubae long,slender,subequal in length to adjacent setae;spiracle not winged;length 18 mm.; width of head 1.8 mm.;on Pteris aquilina;Y-21.....
.....annulosus Norton.

aa. Head without blackish brown markings,uniformly pale brown.

b. Trochanter distinctly shorter than femur;labial palpi with distal segment as long as the preceeding segment;head uniformly pale,body including legs uniformly green without markings;annulation 1,(3,4,5),(6,7,2);antennae slender, 5,1,(4,3,2);maxillary palpi (2,1),(4,3),distal segment longer than that of labial palpi;labrum and clypeus with

four and three setae on each side respectively;uropods with about 6-8 setae,4-5 on cephalic,2-3 on lateralaspect;glandubae subequal in length to adjacent setae;spiracles with faint brown wings;thoracic legs with trochanter,femur,tibia in proportion of 8,13,15 respectively;length 19 mm.;width of head 1.6 mm.;on Pteris aquilina;Y-168-4.....tacitus Say.

bb. Trochanter not distinctly shorter than femur;labial palpi with distal segment shorter than the preceeding segment; head uniformly pale,rarely with a pair of faint spots on dorsal part of vertex;body uniformly green;legs distad of trochanter brownish;annulation 1,(5,4,3),(2,6,7);antennae slender,conical,(5,1),4,(2,3);maxillary palpi 2,(4,1),3, distal segment subequal to that of labial palpi;labrum and clypeus with four and three setae respectively on each side; legs with trochanter little shorter than femur,tibia usually nearly as long as femur;length 21-23 mm.;width of head 1.8mm;on Pteris aquilina;Y-18-1,M-32(in part),M-86. .....politus Provencher.

Selandria Leach

Larvae small,length less than 24 mm.;usually about 15 mm.;body slender,finely annulate;head pale;body green;tenth abdominal tergum unmarked;uropods glabrous;legs very short,with tibia conspicuously reduced in size,femur distinctly dilated at distal end,carrying diminitive tibia on dorsal margin;clypeus with two setae on each side;mandible with two setae;labrum with three setae on each side; glandubae very small;spiracle not winged.

Selandria flavipes Norton.

Legs with trochanter ring-like,femur dilated at distal end,with

ventro-mesal projection, only slightly narrower in diameter than trochanter; tibia very small, much smaller in diameter than femur, appearing as if surrounded by fleshy part of the latter, deep brown in color; trochanter, femur, tibia in proportion of 7, 11, 6 respectively; annulation, 1, 4, 2, (3, 5, 6, 7); antennae selnder, conical, 5, (1, 2, 4, 3); maxillary palpi (4, 1, 2), 3; labial palpi with distal segment subequal in length to each other, longer than distal segment of maxillary palpi; length 15 mm.; width of head 1.3 mm.; on Pteris aquilina; Y-168, M-70, C-S.f.

Dolerinae

Larvae moderately large, length 15-25 mm.; body slender, cylindrical tapering uniformly and gradually caudad, either uniformly greenish or brownish or dorsum colored darker than venter, never with bright and distinct patterns; segmentation and annulation distinct; third abdominal segment with six annulets, annulets 2 and 4 on dorsum setiferous and with glandubae; uropods on abdominal segments 2-8 and 10; thoracic legs well developed; head large, as wide as thorax or nearly so; vertical furrows distinct; antennae five-segmented, conical; labrum distinctly asymmetrical, dextral half larger than sinistral half; head, legs, uropods, tenth abdominal tergum, and sternum, moderately setiferous; glandubae present; spiracles not winged; cuticle distinctly, uniformly, microscopically, verrucose on the dorsum and latus between stigmatal lines; on monocotyledonous palnts.

The Dolerinae is a well-defined subfamily with a distinct habitus and is closely allied to the Emphytinae and Selandriinae. The most important adult character for differentiating the group from other subfamilies of the generalized Tenthredinidae is the coalescence of the cells R_4 and R_5 due to the atrophy of the free part of the vein R_5. The subfamily contains two genera, the old genus Dolerus and the recently described genus Loderus. Leach separated, under the name of Dosytheus, all those species having a certain antennal peculiarity and according to Stephen, also having bright colors on the abdomen. This differentiation was considered invalid by Hartig and his view was endorsed by Norton and Cameron. Norton described a species under the name of Dosytheus apricus var. albifrons which is now placed in the genus Loderus. The monobasic genus Pelmatopus of Hartig based on P. minutus is now considered as congeneric with Dolerus. Since the larvae of Loderus are unknown, the genus Dolerus

alone is considered here.

Dolerus Jurine

Head viewed from front circular in contour in mature specimens, epicranium semiglobose, front distinctly flattened; mouth-parts directed caudo-ventrad; antennaria never circular, with obtuse corners at the angles on their dorsal side; antennae with formula, 5, (3,4,2), 1, distal segment conical, apex less chitinized and obtusely rounded, never sharply pointed, segments 2-5 well chitinized, segment 1 narrow but distinctly larger in diameter than distal segments; front distinctly wider than high; labrum asymmetrical, dextral part always larger than sinistral or with pointed ventro-mesal angle; mandible very thick, large, dextral with four distadentes and one curved sharp proxadentis, sinistral with four distadentes and mesal surface deeply emarginate; parapharynx with apex dilated and chitinized; maxillary palpi, galea, lacinia and labial palpi normal in structure and well chitinized; thoracic legs with femur often produced papilla-like on its disto-ventral angle, tibia long, cylindrical, tapering uniformly distad, distinctly longer than femur, tarsal claw rather slender and straight; abdominal segments with six annulets, typical formula, (1,2), 3, 4, (5,6), 1=5+6; spiracles on annulet 2; annulets 2 and 4 with conical glandubae and tiny cylindrical truncate setae with large calices; tenth abdominal tergum semiglobose, anal setae numerous; ventral glands never present.

The genus Dolerus is represented in North America by more than thirty species but none of them have been identified in the immature stages until the writer obtained the adult of D. similis at Ithaca, N.Y. The larvae of this genus are easily obtained and readily identified because of the marked asymmetry of the labrum.

The following table will serve to separate the species studied:-

a. Head uniformly pale, creamy white or pale brown; body uniformly whitish or greenish, without distinct dorsal band.

b. Body with small black spots on each segment along supra-stigmatal and pedal lines; head pale brownish yellow; spots on ninth abdominal segment much smaller than preceeding ones; length 25 mm.; on wheat and grasses; Y-117-1-1, G-d-1. ..... Dolerus sp. 1.

bb. Body without small black spots on each segment along supra-stigmatal and pedal lines; head creamy white; length less than 25 mm.

c. Distance between antennaria and mandibularia subequal to distance between antennaria and ocularium; length 20 mm.; on Carex trichocarpa; Y-24-5-2, -145-1(?), -147. ..... Dolerus sp. 2.

cc. Distance between antennaria and mandibularia twice or more than twice the distance between antennaria and ocularium; length of prothoracic spiracles in relation to vertical diameter of antennaria variable; femur with or without disto-ventral projection; front with or without pale brown spot; length 18-20 mm.; on grasses, sedge, timothy; Y-29-11, -32-1, M-7, -H, 41-1, -63, -225..... Dolerus sp. 3.

aa. Head spotted, banded, or distinctly colored brown, black, or purple; body uniformly longitudinally banded or striped on dorsum, especially along dorso-lateral lines, rarely uniformly whitish or greenish.

b. Head with a distinct blackish semicircular band extending from gena to gena dorsad of front and involving ocellarae; body with a very fine brownish line along latero-dorsal lines, more distinct on caudal segments; thoracic legs uniformly

pale;length 15 mm.;on grasses;Y-41-1-1,-41-2,-41-3,-8.47(?), M-41,-235.....Dolerus sp.4.

bb. Head without distinct blackish semicircular band,but with spots or darkly colored areas;legs with femur and tibia and claws brown,not concolorous with coxa.

cc.Head pale brown,vertex with brown spots;body uniformly whitish or with light dorsal band.

d. Vertex with two small spots,one dorso-mesad of each vertical furrow,variable in size but never linear along the furrow;body uniformly whitish or creamy white;length 21 mm.;on Carpinus and Pteris aquilina(both doubtful); Y-74-1-1,M-82..... .....Dolerus sp.5.

dd. Vertex with one minute spot at the origin of epicranial stem;light brown spot along epicranial suture to ocellarae;body with dorsal band,lighter on dorso-meson and darker on suprastigmatal lines,more distinctly on caudal segments;length 15 mm.;on Equisetum arvense; Y-145-2.....Dolerus sp.6.

cc. Head brownish with purplish or brownish markings on vertex, only rarely light brown or yellowish,then vertical furrows with brownish streaks;body with distinct dorsal band.

d. Head deep puplish black with following parts whitish; proximal half of epicranial stem,vertical furrows,vertex caudad of ocularia to the middle of epicranial stem very narrowly,epicranial arms,clypeus,and labrum;dorsal band lighter on dorso-meson;pedal lines with broken row of grayish patches;legs with femora without disto-ventral projection;length 19 mm.;on Equisetum arvense; Y-146-1-2..... similis Norton.

dd. Head usually brownish or yellowish, vertex deeply brown, at least along vertical furrows; typically pale on vertex ventrad of vertical furrows and caudad of ocellae; front with or without brownish spot; tenth abdominal tergum on both sides usually more brownish than on meson; legs with femora without disto-ventral projection; length 20-23 mm.; on sedges; Y-28-1, -27-1-1, -30, 210-1-8.32(?)-1-1, M-7, -8, -9, -35, -64, -193, G-d-3.

:.....Dolerus sp.7.

Phyllotominae

Larvae small, length usually less than 15 mm.; body subcylindrical or depressed, without colored patterns; uropods on abdominal segments 2-8 and sometimes on the ultimate segment; third abdominal segment with two or six annulets; antennae with 3-4 or 5 segments; thoracic legs with four segments, short, stubby, with or without tarsal claws.

The Phyllotominae can be divided into two distinct tribes on the basis of the larval characters. The tribes are separated as follows:

a. Thoracic legs with tarsal claws; head normal in form, not depressed; third abdominal segment with six annulets; external feeders.....Phyllotomini.

aa. Thoracic legs without tarsal claws; head depressed; third abdominal segment with two annulets; leaf-miners .....Phlebatrophini.

Phyllotomini

Body subcylindrical, thorax distinctly swollen, sometimes distinctly tadpole-like, tapering caudad; segmentation and annulation indistinct, fine, subequal in length; third abdominal segment with six annulets, annulets 2 and 4 microscopically and sparsely setiferous or minutely tuberculate; tenth abdominal tergum with or without tubercles; thoracic legs as long as head is wide, subequal in size to each other, short, modified, with four segments, stubby, with distinct tarsal claws, coxa conical, femur cylindrical, as long as wide, tibia convex, wider than long, distal segment very minute with sharp incurved claw; uropods on abdominal segments 2-8 normal in form, glabrous, distal lobe with a minute point on its cephalo-ventral angle; ultimate segment with a pair of normal uropods or without any; head small, normal, not depressed,

sparsely setiferous, longer than wide, slightly pointed at dorsal apex; mouth directed slightly ventro-caudad; antennae with four or five segments, slender, elongate, conical, or subconical; mouth-parts normal in form; spiracles with or without wings; ventral glands wanting; prothoracic glands sometimes present; glandubae present, conical, tuberculate, or sessile; cuticle usually microscopically verrucose; larvae in life sometimes distinctly slimy; subgregareous; leaf-skeletonizers.

Phlebatrophini

Body distinctly depressed, venter flattened, thorax thickened, broadest on mesothorax, prothorax declivous cephalad, caudal segments distinctly tapering; segmentation and annulation distinct; third abdominal segment with two annulets, annulet 2 sparsely and inconspicuously setiferous; tenth abdominal tergum without tubercles; tenth sternum small; thoracic legs modified, fleshy, indistinctly four segmented, tapering to distal end, distal segments microscopic, mamma-like, without tarsal claws; uropods vestigial, located on abdominal segments 2-8 and 10, anal uropods united on the meson forming a single sucker-like protuberance; head distinctly depressed, pointed, subtriangular in contour, partly overlaped by protruding prothorax; mouth directed cephalad; vertical furrows obsolete; antennae with 3-4 segments, segments 1 and 2 large and conical, segments 3 and 4 subcylindrical and much smaller and narrower in diameter than proximal segments; mouth-parts modified, mandibles slender, sharply pointed, without dentes, blade-like; labium flattened and large; spiracles not winged; ventral and prothoracic glands wanting; glandubae obsolete; body not slimy; leaf-miners.

The Phyllotominae is a distinct group and includes five genera Phyllotoma, Eriocampoides, Caliroa, Endelomyia, and Phlebatrophia. In the nearctic region, the three last genera are represented by a limited

number of species. MacGillivray considered this family as one of the five generalized subfamilies of the Tenthredinidae quite apart from the Fenusinae and Scolioneurinae but Rohwer would associate them in his subfamily Messinae while Konow would include Hoplocampinae and Phyllotominae in his tribe Hoplocampides. The subfamily is divisible into two distinct groups according to the characters of the larvae. The remarkable specialization of structures due to the leaf-mining habit of the larva in one genus where specialization has proceeded much further than any of the other leaf-miners makes the disivion of the subfamily into two tribes desirable.

Genera of Phyllotominae

a. Body subcylindrical, not depressed; legs with tarsal claws; head normal in form, not depressed; free leaf-feeders .....Tribe Phyllotomini.

b. Body without minute tubercles, tadpole-like, slimy; glandubae sessile.....Caliroa Costa.

bb. Body with minute tubercles, not tadpole-like, not slimy; glandubae conical, tubercular.....Endelomyia Ashmead.

aa. Body depressed; legs without tarsal claws; head depressed; leaf-miners.....Tribe Phlebatrophini.

.....Phlebatrophia MacGillivray.

Endelomyia Ashmead

Larvae small, greenish yellow; body subcylindrical, apparently almost glabrous, not tadpole-like, thorax thickened, tapering caudad; third abdominal segment with six annulets, annulets 2 and 4 tuberculate; tenth abdominal tergum with eight to ten conical tubercles arranged approximately in three transverse rows; suranal and subanal lobes with several rather long, stiff setae; thoracic legs with

distinct tarsal claws;uropods on ultimate segment normal in form, separated;antennae with five segments,slender,elongate-conical; mandibles with dentes;spiracles not winged;stigmatal line normal in position,dorsad of the latero-ventral line;prothoracic glands wanting;glandubae conical,tuberculate;body not slimy.

Endelomyia aethiops Fabricius

Length 13 mm.;width of head,1.2 mm.;head light brown;mouth-parts, labrum,and tarsal claws deep brown;body greenish yellow to yellowish white;tubercles concolorous with body;typical tubercular formula on prothorax,3-6 on first annulet,2-3 on prosubstigmatal lobe,2-5 on annulet 2;third abdominal segment with 2 and 3 tubercles on annulets 2 and 4 respectively,1 on annulet 3 near the spiracle,1 each on substigmatal and purpedal lobe;annulation 1,2,3,4,(5,6);antennae 1,(2,3,4),5;maxillary palpi (1,2,3),4;labial palpi 1,2,or (1,2); subgregareous;on Rosa;Y-2,M-127.

Caliroa Costa

Larvae small,whitish;body distinctly tadpole-like;thorax conspicuously swollen,rounded on dorsum and flattened on venter;tapering distinctly caudad;third abdominal segment with six indistinct annulets, annulets 2 and 4 with a few glandubae;tenth abdominal tergum without tubercles;suranal and subanal lobes often with a number of stiff rather long setae;thoracic legs with distinct tarsal claws;uropods on ultimate segment obsolete,their position indicated by a small median swelling;antennae with four segments,rather thick,elongate, distal segment microscopic;mandibles with dentes;spiracles usually winged;stigmatal line abnormally low in position,coinciding with latero-ventral line;prothoracic glands present,large,triangular,fleshy, attached ~~to the~~ cephalo-mesad of prothoracic legs;glandubae sessile;

a. Anal setae not all of same type and length, longer ones arising from minute but distinct tubercles, and brown, apparently barbed, as long as labrum, curved at tips, ten to twelve in number, arranged in a transverse row on suranal and subanal lobe; spiracles distinctly winged, brown; clypeus light brown; head deep brown; thoracic legs and antennae deep brown; smaller setae on anal area normal in form, much shorter than the long barbed ones, scattered beyond the transverse rows; length of front, clypeus, labrum and width of labrum in proportion 23, 10, 8, 12 respectively; length of body 11 mm.; width of head 1. mm.; on cherry, plum, Crataegus; Y-209, M-260, -249, -115, C-551, -552.....cerasi Linnaeus.

aa. Anal setae all of same type and length, none arising from distinct tubercles and barbed, all of normal type, much shorter than labrum; spiracles usually not winged.

b. Head blackish, deep brown, or brownish; legs brownish in part not concolorous with body.

c. Head blackish or deep brownish.

d. Head black or dark brownish black; anal setae scattered, pale, subequal in length to each other, about three-fifths as long as labrum; prothoracic legs distinctly lighter in color than other legs which are brownish; spiracles of cephalic segments faintly winged; clypeus whitish; length of front, clypeus, labrum and width of labrum in proportion of 22, 9, 8, 11, respectively; length of body 10.5 mm.; width of head 1. mm.; on oak; M-157, -209, -245, G-553c, Y-mck.....Caliroa sp. 1.

dd. Head deep brown; anal setae scattered, subequal in length to each other; prothoracic legs lighter in color than

other legs;spiracles never winged;anal setae about one-third as long as labrum;clypeus pale brown; length of front,clypeus,labrum and width of labrum in proportion of 18,10,8,11;length of body 6 mm.;width of head .9 mm.;on wild cherry;C.....obsoleta Norton.

cc. Head brownish or light brown;all legs pale brownish;anal setae scattered and subequal in length to each other,about one-third as long as labrum;clypeus pale brown;length of front,clypeus,labrum,and width of labrum in proportion of 18,9,7,11;length of body 8 mm.;width of head 1. mm;on white oak and Crataegus;C-7,M-230.....
....quercus-alba Norton.

bb. Head pale brown or whitish;legs whitish concolorous with body;spiracles not winged;anal setae scattered,subequal in length to each other,about three-fifths as long as labrum; length of front,clypeus,labrum,and width of labrum in proportion of 21,9,7,10;length of body 10.5 mm.;width of head 1. mm.;Y-121,G-553c,M-143,-201,-231,-236,-242....
.....quercus-coccinea Dyar.

Phlebatrophia MacGillivray

Larvae very small,whitish;body distinctly depressed,tapering much caudad,broadest on mesothorax,prothorax declivous cephalad;lateral lobes somewhat prominent;tenth abdominal tergum convex,almost glabrous,about one-half as wide as mesothorax;suranal and subanal lobes semiglabrous;third abdominal segment with two annulets,caudal annulet about four times as long as the cephalic,microscopically and sparsely setiferous;thoracic legs fleshy,tarsal claws wanting;uropods rudimentary;ocularia protruding,located laterad of antennariae;epicranial

suture in part obsolete;spiracles not winged;stigmatal line normal in position;maxillary palpi with four segments,labial palpi with two segments;totaglossa roundly protruding;stipes elongate,subgalea long, slender,with distinct chitinized carinae;labrum flattened;mandibles slender,sharply pointed,without dentes,blade-like;leaf-miners.

Phlebatrophia mathesoni MacGillivray

Length 7 mm.;width of head 1 mm.;mesothorax 2.4 mm. wide;head light brown,mandibles and carinae of subgalea deep brown;maxillary palpi typically 2,1,3,4,distal segment very minute;antennae with proximal segment or segments larger in diameter and fleshy,conical, distal two segments together smaller and shorter than other two segments but longer than labial palpi;distal segment of labial palpi very minute;leaf-miners of birch;C and G.

Tenthredininae

Larvae of medium size to rather large; body cylindrical, slender, tapering uniformly and gradually caudad; segmentation and annulation distinct, fine; third abdominal segment with seven annulets, annulets 1, 3, and 5 setiferous and 3 and 5 with transverse row of glandubae; abdominal segments 2-8 and 10 with uropods; antennae with five segments slender, cylindro-conical; body uniformly greenish with dark dorsal band or with complicated colored patterns; tenth abdominal tergum convex, suranal ~~or~~ and caudal protuberances wanting; ninth abdominal tergum with six annulets, annulet 6 as long as annulet 2; thoracic legs normal, well developed, femur with ventro-distal, conical, membranous projection; clypeus with two setae on each side; labrum with 3-5 setae on each side, with or without a median longitudinal depression; maxillary palpi slender, normal; galea digit-like, large; lacinia flattened, with a row of 10-15 setae on the oblique, truncate, cephalic margin; stipes with a sharp triangular cephalo-ventral projection; labial palpi large, slender, with segment 2 longer than segment 1; mandible with 1, 2, or 3-4 setae; head variously marked, distinctly and densely setiferous; spiracles on third annulet, not winged; uropods glabrous; glandubae distinct, slender, elongate, cylindro-conical, and sometimes longer than adjacent setae; cuticle microscopically and densely spinulate; ventral glands wanting; larvae free leaf-feeders.

The Tenthredininae constitutes, according to MacGillivray, the second subfamily of the series of Specialized Tenthredinidae. Rohwer(1911) would divide the subfamily into two tribes, Perineurini and Tenthredinini, using the position of propodeal spiracles and shape of cephalic margin of scutellum as characters for differentiating them. The larvae resembles in many cases those of the Emphytinae.

Genera of Tenthredininae

a. Mandibles with more than one seta;labrum with median longitudinal depression;legs with dorsal aspect of femur usually not twice as long as trochanter,but often subequal to it.

b. Mandibles with two setae.....Macrophya Dahlbom.

bb. Mandibles with four,occasionally three,setae .....Tenthredo Linnaeus.

aa. Mandibles with a single seta;labrum without median longitudinal depression;legs with dorsal aspect of femur usually twice as long as trochanter.

b. Body with complexly patterned markings on the dorsum;distal segment of maxillary palpi longer than that of labial palpi;head nearly black.....Tenthredopsis Costa.

bb. Body without complexly patterned markings on the dorsum; distal segment of maxillary palpi longer than that of labial palpi;head pale or light brown.....Neopus MacGillivray.

Tenthredopsis similutea Norton

Body on dorsum with complexly patterned purplish black markings extending to suprastigmatal lines;two lighter colored spots on dorsomeson,their apices directed cephalad,cephalic one much larger than caudal;a large spot with caudal emargination on latus and contiguous with mesal triangles;substigmatal lobe with faint,minute spots; otherwise ventral half of body including legs and uropods whitish; head purplish black excepting the following parts;white:genae including antennae and antennariae,lower fourth of front,vertexinarrowly laterad of vertical portion of epicranial arms,clypeus,labrum,and mouth-parts except tips of mandibles which are black;fronto-clypeal suture sometimes black;in young specimen,head grayish and body entirely whitish green;in life head and body coated with a waxy bloom;

annulation (3,5,1),(2,4),6,7;antennae 5,2,(1,3,4);maxillary palpi (4,2),3,1;labial palpi with distal segment twice as long as the preceeding segment,but subequal in length or shorter than distal segment of maxillary palpi;labrum usually with three setae on each side and without median longitudinal depression;mandible with one setae;legs with trochanter half as long as tibia,femur slightly longer than tibia;glandubae half as long as adjacent setae;length 18 mm.;width of head 1.8 mm.;on Thalictrum polygamum;Y-8,-92-1-1.

Neopus 14-punctatus Norton

Head pale creamy white with brown spots on dorso-meson of vertex, caudad of ocellarae,and on front,frontal spots much darker;body whitish green,dorsum with a grayish shade,bordered along suprastigmatal lines with narrow grayish bands,dorso-meson,especially on thorax, with fine double bands;venter including legs and uropods whitish; annulation (1,5,3),(2,4,6,7);antennae (5,1),2,(3,1);maxillary palpi 4,2,(3,1);labial palpi with distal segment one-fourth longer than preceeding segment,but subequal to distal segment of maxillary palpi; labrum with three setae on each side,median longitudinal depression wanting;mandible with single seta;legs with trochanter nearly half as long as femur,tibia equal in length to femur;glandubae more than one-half the length of adjacent setae;length of body 18 mm.;width of head 1.8 mm.;on Podophyllum peltatum;Y-205-1-1.

Tenthredo bilineata MacGillivray

Head whitish green with vertex brown dorsad of genae except narrow line along epicaranial stem,vertical furrows,and caudad and dorsad of ocularia;body on dorsum with series of triangular brownish markings;triangle with apex directed cephalad with minute deep brown spot at each basal angle,triangle divided on meson by a faint light line;suprastigmatal line with light brownish indefinite band;venter

including legs and uropods whitish;annulation (3,1,5),(7,6,2,4);antennae 5,(1,2,3,4);maxillary palpi (4,2),1,3;labial palpi with distal segment nearly twice as long as the preceeding segment,and shorter than distal segment of maxillary palpi;labrum with five setae on each side,with median logitudinal depression;mandibles with four setae;legs with trochanter nearly as long as femur,tibia longer than femur; glandubae conical,large,subequal in length to adjacent setae;length of body 21 mm.;width of head, 2.mm.;on Geranium maculatum;Y-175-2.

Macrophya Dahlbom

Body on dorsum with or without grayish band,latus sometimes with small black spots;head usually marked on vertex;antennae with segment 1 or 2 longest or all segments subequal in length;maxillary palpi usually with segments 2 and 4 subequal in length;mandible with two setae;labrum with three setae on each side,with median longitudinal depression;trochanter distinctly shorter than femur; head and body in life usually coated with a thin,whitish,waxy,bloom; dorsal vessel usually showing thru cuticle as dark fine line;setae microspopic;glandubae shorter or longer than adjacent setae;length 16-21 mm.

Species of Macrophya

a. Head pale brown,with or without a minute brown spot at the proximal end of epicranial stem;body on dorsum with light or pale grayish band,darker along suprastigmatal lines,band sometimes obsolete;venter whitish including legs and uropods; tenth abdominal segments unmarked;labial palpi with distal segment twice as long as the preceeding segment;glandubae very small,shorter than adjacent setae;setae microscopic; head and body coated with thin waxy bloom;on Prunus serotina; subgregareous.

b. Larger species, length 20 mm.; width of head, 1.9 mm.; annulation (1,5),3,(4,6,7),2; antennae (2,1),(3,4,5); maxillary palpi 2,(1,3,4); Y-126.....flicta MacGillivray.

bb. Smaller species, length 16 mm; width of head 1.8 mm.; annulation (5,1,3),4,6,2,7; antennae 2,(5,1,4),3; maxillary palpi (2,4),(3,1); Y-59-3-1.....fistula MacGillivray.

aa. Head with a large blackish spot on dorsal part of vertex, often with black spots caudad of ocellarae; body with distinct grayish dorsal band on latus, with rows of black spots; venter usually whitish; pedal line sometimes with fine gray markings.

b. Body entirely whitish; head on vertex usually with a dorsal spot, not expanding distad; without spots caudad of ocellarae.

c. Body with a row of small black spots along suprastigmatal lines, two spots to each segment, cephalic spot larger than caudal; tenth abdominal tergum unmarked; annulation (1,3,5) (4,7),(6,2); antennae (4,1),2,3; legs with femur more than twice as long as trochanter, tibia shorter than femur, coxa with grayish marking; glandubae longer than adjacent setae; length of body 22 mm.; width of head 2.3 mm.; on Sambucus; Y-8,-11.....tibiator Norton.

cc. Body without a row of small black spots along suprastigmatal lines, but yellowish spots on latus instead, which are obsolete in alcoholic specimens; annulation (3,5,1),(2,7, 4,6); antennae 1,(2,3,4,5); maxillary palpi (4,2),(1,3); labial palpi with distal segment only one-fourth longer than the preceeding segment; legs with trochanter slightly shorter than tibia, femur slightly longer than tibia; length of body 22 mm.; width of head, 2.2 mm.; on Sambucus racemosa; Y-8,11-2(?)-3.....~~smectica MacGillivray~~ epinota Say.

bb. Body not entirely whitish, dorsum with dark dorsal band; latus with one or more rows of distinct black spots; head on vertex with a dorsal spot expanding distad, broadly T-shaped, caudad of ocellarae with spots; tenth abdominal segments with a minute black spot on caudo-meson; venter lighter in color.

c. Body on latus with grayish band, darker in color than dorsal band and with only one row of distinct black spots; suprastigmatal lines with a row of distinct spots; dorso-lateral lines with a row of smaller inconspicuous spots; substigmatal line with very faint grayish spots, nearly obsolete; pedal lines with grayish linear markings; annulation 1,(3,5),(7,2,4),6; antennae (1,2,3,4,5); maxillary palpi (2,4),1,3; labial palpi with distal segment not quite twice as long as the preceeding segment; legs with femur twice as long as trochanter and slightly longer than tibia; length of body 19 mm.; width of head, 2 mm.; on Aster prenanthoides; Y-8.81(?).....lineata Norton.

cc. Body on latus with grayish band lighter in color than grayish purple dorsal band, and with three rows of distinct black spots; dorso-lateral and suprastigmatal lines with rows of small spots, two spots to each segment with caudal spot much smaller and sometimes nearly obsolete; spots on suprastigmatal lines largest; pedal line with a row of spots, two to each segment with cephalic spots smaller than caudal; head with black spots on vertex large sometimes coalesced covering entire vertex except genae, and vertical furrows; front with faint gray spot; annulation (3,5,1),(7,2,4,6); antennae 2,(1,5),(3,4);

maxillary palpi (4,2),(1,3);labial palpi with distal segment not quite twice as long as the preceeding segment; legs with trochanter longer than one-half the length of tibia,femur equal in length to tibia;length of body 21.5 mm.;width of head 2.1 mm.;on Solidago juncea and Rudbeckia laciniata;Y-160-2,-160-1.

.....pulchella Klug.

Cimbicinae

Body cylindrical, tapering uniformly caudad, apparently glabrous, prothorax narrowed; segmentation indistinct; annulation fine, 7, (2,3,4), (1,5,6), annulets 2,4, and 7 microscopically setiferous; legs normal in form, with five segments, femur slightly longer than tibia; uropods on abdominal segments 2-8 and 10, divided into two unequal lobes on the distal surface, few setae on the proxa-caudal aspect, but none on the cphalic aspect as viewed from side; tenth abdominal tergum without suranal or caudal protuberances; suranal and subanal lobes with several short setae; head large, rather thickly setiferous, normal in form; labrum subdivided by diverging depression into median lobe and two lateral lobes, sometimes asymmetrical; antennae with a single segment, mamma-like but chitinized; ventral glands wanting; glandubae microscopic or minute and stalked, sometimes distinct conical tubercles; spiracles distinctly winged; conspicuous spiracular glands located dorsad of each spiracles of abdominal segments 2-8; cuticle microscopically and densely spinnulate or verrucose; mouth-parts normal in form, maxillary and labial palpi rather slender, galea very thick, curved mesad at distal end, seracos large, distinctly chitinized, pear-shaped, U-shaped, or V-shaped; stipes with a distinct triangular projection on the dorsal or cephalic margin; body covered with waxy bloom in life; larvae ejecting yellowish fluid from spiracular glands when disturbed; free leaf-feeders, sometimes semigregareous.

The Cimbicinae is a small compact subfamily consisting of few genera and a limited number of species in the nearctic region. Systematists are in accord in the general conception of the group but Konow includes the Perginae in his subfamily Cimbicini. Cimbex americana with its several varieties is a well known representative of this subfamily.

Genera of Cimbicinae

a. Body in general whitish, without minute colored spots.

b. Dorsum of body with a black median stripe, .Cimbex Olivier.

bb. Dorsum of body without a black median stripe

.....Trichiosoma Leach.

aa. Body in general not whitish, but with minute colored spots.

.....Abia Leach.

Cimbex Olivier

Larvae very large, largest of all saw-flies; body whitish with a distinct dorso-medal black line; labrum distinctly asymmetrical, dextral larger than sinistral, median cephalic or ventral emargination distinct and deep; body with distinct minute warts or conical glandubae, cuticle microscopically verrucose; spiracular glands semicircular; seracos of labium pear-shaped with narrow neck dorsad or cephalad; lateral lobes small but prominent with several conical tubercles; maxillary palpi with 2,4,3,1; labial palpi 1,2; antennae, mound-like, wider than high.

Cimbex americana Leach

Length 50 mm.; head 5 mm. wide; head white, creamy, microscopically brownish verrucose; black median stripe on dorsum extending from prothorax to the middle of eighth abdominal segment; conical tubercles or glandubae on lateral lobes larger than elsewhere and 4-7 in number larvae solitary; on willow, elm, poplar, maple, alder, and linden; Y-68, -8, -182, M-99.

Trichiosoma Leach

Larvae very large, entirely white; labrum slightly asymmetrical, right side larger than sinistral, median ventral emargination deep but not reaching the median lobe; body not warty; glandubae microscopic, stalked, arising from very low swellings; cuticle microscopically

verrucose;spiracular glands semicircular;seracos of labium U-shaped, narrower on dorsal or cephalic end;lateral lobes not prominent,without conical tubercles;maxillary palpi 2,4,3,1;labial palpi 1,2; antennae conical,higher than wide.

Trichiosoma sp.

Length 38 mm.;width of head, 4 mm.;head creamy white,body whitish, solitary;on willow,poplar,alder,wild Cherry;M-78,-44.

Abia Leach

Larvae large,greenish or grayish green with minute colored spots; spots yellowish or blackish;labrum symmetrical,median ventral emargination only slightly indicated,broad;body without warts or tubercles; cuticle microscopically and densely spinulate;glandubae stalked and minute,not arising from swellings;spiracular glands semicircular; seracos of labium V-shaped,wider at dorsal or cephalic end;lateral lobes inconspicuous,with several glandubae;maxillary palpi (4,2)3,1; labial palpi with segments subequal to each other;antennae conical, usually as wide as high.

Species of Abia

a. Body with a broad dorso-mesal yellowish stripe between subdorsal lines;dorsum above suprastigmatal lines shaded brownish gray;head brownish gray except front,genae,clypeus, and labrum lighter;ocellarae white;body dorsad of suprastigmatal lines shaded grayish or brownish,venter pale whitish green;dorsum betwen subdorsal lines yellowish-white;body with four rows of minute black spots;mid-dorsal with a large spot on annulet 7 and a smaller spot on annulets 2 and 4;subdorsal with a large spot on annulet 7,with a bright yellow spot between two black spots mentioned above;suprastigmatal with a spot on annulets 2 and 4 and very small spot on annulet 7;

substigmatal with a spot at the ventral ends of annulets 3 and 4;a yellow spot caudad of each spiracle;length 26 mm.; width of head 2.7 mm.;on honeysuckle;semigregareous;Y-8.13.

.....americana Cresson.

aa. Body without a broad dorso-mesal yellowish stripe between subdorsal lines;dorsum above suprastigmatal lines not shaded brownish gray,but body generally greenish.

b. Pedal line without distinct more or less continuous smoky brownish gray band;black spots directly ventrad of spiracles ~~at least in part,always~~ never present;second annulet without minute but distinct spots dorsad of lateral large spots;head grayish brown except front,genae,clypeus,labrum lighter; ocellarae white;body grayish green all over,dorsum between subdorsal lines concolorous with other parts,the dorso-meson with a narrow yellowish line;five rows of minute black spots;meso-dorsal with a larger spot on annulet 7 and a smaller spot on annulets 2 and 4;subdorsal with a larger spot on annulet 7 and very minute and often obscure spot on annulet 2 and larger distinct often subdivided spot on annulet 4,the latter two nearer to meson than the regular subdorsal spots;lateral with a large spot between annulets 2 and 3;suprastigmatal with a smaller spot on annulets 4 and 7;substigmatal with a larger spot at the ventral end of annulets 3 and 4;a bright yellow spot between mesal and subdorsal black spots on annulet 7;length 28 mm.;width of head 2.8 mm.;on Triostem aurantiacum;Y-8.13-2,M-196.

.....,inflata Norton.

bb. Pedal line without distinct more or less continuous smoky brownish gray band;black spots directly ventrad of spiracles

always present, at least on majority of segments; one or two minute black spots on second annulet dorsad of large lateral spots always present; length 30 mm.; width of head 2.9 mm.; on honeysuckle; Y-104, G-583, both from Urbana, Ill.; larvae resemble A. inflata in markings and general appearance but differ as above.....Abia sp. 1.

Hoplocampinae

Laryaesmall;body cylindrical,slender;segmentation and annulation sometimes obsolete;third abdominal segment with four, or five, ~~or six~~ annulets,annulets 2 and 3 or 2 and 4 setiferous or all annulets glabrous;uropods present on abdominal segments 2-7 and 10,glabrous or setiferous,sometimes very rudimentary;ventral glands usually present on the meson of abdominal segments 1-7;body greenish or yellowish,striped or spotted or without any markings;tenth abdominal tergum with or without suranal or caudal protuberances,often more than two in number;antennae conical and with five segments or flattened and with four,sometimes apparently three,segments;larvae free leaf-feeders and borers in fruits or petioles of leaves.

The Hoplocampinae as defined by MacGillivray contains at present six genera,Marlattia,Hoplocampa,MacGillivrayella,Hemichroa,Craterocercus,and Caulocampus and represents,together with Dineurinae,a series in which the anal veins have been modified before the loss of the radial cross-vein. Formerly Rohwer(1910,1911 ,1911)considered Hoplocampa and MacGillivrayella as constituting a subfamily Hoplocampinae but later he (1918) abandoned the idea and united three genera with six other genera and subgenera to form the tribe Hemichroini of his subfamily Nematinae. With the exception of two genera Platycampus and Anoplonyx,Rohwer's tribe Hemichroini becomes coextensive with our Hoplocampinae. Cameron(1883) considered this subfamily as forming "a connecting link between the Selandrides and Nematina." There are reasons for indicating a close relation between this subfamily and Nematinae. Study of the larvae confirms the contention of Rohwer(1918)that the grouping of Caliroa and Phyllotoma with the Hoplocampinae as was done by Konow and Enslin is untenable.

It must be stated here that since only ~~two~~ three genera, each represented by a single species, were available for this study, the definition of the subfamily as given above is necessarily incomplete.

Genera of Hoplocampinae

a. Tenth abdominal tergum without caudal protuberances ..... Marlattia Ashmead.

aa. Tenth abdominal tergum with caudal protuberances.

b. Caudal protuberances more than two in number, uropods well developed, third abdominal segments with six annulets, free leaf-feeders..... Hemichroa Stephens.

bb. Caudal protuberances two in number, on caudal projection, uropods rudimentary, third abdominal segment with four annulets, leaf petiole-borer..... Caulocampus Rohwer.

Hemichroa Stephens

Larvae small, greenish; body slender, tapering uniformly caudad; third abdominal segment with ~~five~~ annulets, annulets 2 and 4 setiferous tenth abdominal tergum with several conical caudal protuberances on its caudal margin; antennae distinctly conical, with five segments, as long as the longest diameter of antennaria; antennal segment 1 crescentic, dorsal in position, extending nearly the entire length of antennaria, segment 2 complete or incomplete, reduced to mere line on cephalic aspect, segments 3 and 4 ring-like tho reduced in length on cephalic portion, segment 5 conical or peg-like, bluntly pointed at apex; thoracic legs with tibia subequal in length with femur; uropods glabrous; spiracles faintly winged; glandubae distinct and large; larvae free leaf-feeders.

Hemichroa dyari Rohwer.

Larvae, yellowish green; length 16 mm.; head blackish; body with

blackish dorso-lateral lines and interrupted blackish lines on substigmatal and pedal lines;tenth abdominal tergum with six to seven sur-conical protuberance,suffused with brown;pedal and substigmatal lobes with two setae and two glandubae;glandubae in diameter twice as large as anal setae;annulation(1,2,4)3,5;on Alder;Y-39-1-1,-8.73(?)-1, -8.73(?)-2,C-8.

Marlattia Ashmead

Larve small,greenish with or without stripes or spots;body cylindrical,tapering caudad;third abdominal segment with five annulets, annulets apparently glabrous;tenth abdominalsegment without caudal protuberances;antennae with four segments,flattened,segment 1 small, incomplete,segments 2 and 3 compelete but reduced to narrow line on cephalic aspect,segment 4 minute, mamma-like;head sparsely setiferous, setae increasing in length on the lower portion;thoracic legs normal in form,tibia subequal in length to femur;uropods with a few setae; spiracles minute,unwinged;glandubae microscopic.

Marlattia laricis Marlatt

Head pale yellowish,body greenish with faint subdorsal lines; third abdominal segment with five annulets,(1,2),4,3,5;uropods with three setae;suranal lobe with a few setae on caudo-ventral aspect; small larvae,length 10 mm;M-57.

Caulocampus Rohwer

Larvae very small;body subcylindrical,tapering at prothorax, constricted suddenly on the ultimate segment,not spotted or striped but whitish,sparsely and microscopically setiferous;third abdominal segment with four annulets,annulets 2 and 3 with very minute setae; thoracic legs minute with five segments,tibia longer than femur; abdominal segments 2-7 with rudimentary uropods represented by s.o spinulate swellings;tenth abdominal tergum much smaller in diameter

than preceeding segments, strongly converging caudad, caudal margin produced and chitinized, a pair of minute brownish caudal protuberances on the caudal margin of the projection; head small, sparsely and minutely setiferous; ocellarae represented by pigmented spots, distinct ring-like ocularia wanting; antennae apparently with three segments, conical, segments 1 and 2 incomplete, segment 3 slender, peg-like; mouth-parts normal and conspicuous tho small in size; spiracles not winged; glandubae obsolete; in young specimens abdominal segments 1-7 on dorsum with a pair of protuberances on annulet 2; larvae borer in leaf-petiole.

This genus is monotypic and unique in the reduction of uropods and ocellarae and in the possession of modified caudal projection on the ultimate segment with rudimentary caudal protuberances. In this this last character the larvae of this genus resemble those of certain species of Pontania. The modifications of the body are undoubtedly correlated to the boring habit of the larvae. MacGillivray considers this genus as without question belonging to the Cladiinae but Rohwer regards it as belonging to his tribe Hemichroini. It was dealt with under the Hoplocampinae here because the larvae associate themselves closer with those of this subfamily than with those of the Cladiinae.

Caulocampus acericaulis MacGillivray

Length 8 mm.; width of head .8 mm.; head light brown, body straw-yellow; resemble larvae of weevils in general appearance; mouth-parts normal in form; in young specimens, head yellowish and body whitish; annulation 2, 1, 3, 4; maxillary palpi 3, 2, 1, 4, segments brown, slender, galea digit-like, very small; thoracic legs with very small tibiae, tibia subequal in length to maxillary palpus; tenth abdominal tergum with many minute setae evenly and promiscuously scattered, not concentrated on subanal lobe; larvae borer into the petioles of maple leaves; Y; courtesy of Dr. W.E. Britton, New Haven, Conn.

Dineurinae

Larvae small;body subcylindrical,flattened on venter,or cylindrical,usually tapering toward the caudadl end,greenish or yellowish, often with dorsum darker,never with bright colored markings;glabrous or setiferous;head small,light greenish or yellowish,never with distinct markings;ocellarae blackish;mouth-parts usually brownish; thorax wider than the remainder of body,legs well-developed,caudal pairs larger than the cephalic pairs,directed laterad;segmentation distinct;annulation indistinct;uropods on abdominal segments 2-7 and 10,sometimes rudimentary;intersegmental coria often distinct and whitish;larvae feed on underside or upper side of leaves,eating the parenchyma layers only, or feed on edges of leaves or mine in the leaves;ultimate stage glabrous and yellowish;pupation in single-layered parchment-like cocoons in the groud;spme species with nauseating oder.

The Dineurinae as limited by MacGillivray contains three genera Dineura,Mesoneura,and Pseudodineura and includes not over twenty-five species which are mostly distributed in Europe and North America. This subfamily resembles in wing type the Hoplocampinae. Systematists do not agree in the exact position of the small European genus Pseudodineura. Konow would place Dineura in his tribe Nematides but both Mesoneura and Pseudodineura in his tribe Blennocampides. Rohwer on the other hand would associate Dineura and Mesoneura in his tribe Nematini and is not quite certain whether Pseudodineura also belongs to this tribe or not. Cameron who described the larvae of Pseudodineura parvulus under the name of Dineura despecta,altho aware of the differences of this sepcies and its allies from other species of Dineura,hesitated to agree with Thompson in associating them with Blennocampa. So far as the venation is concerned there is

no question of close relationship between Dineura and Pseudodineura.

The life history of the subfamily has been recorded by Girard, Cameron, Brischke and Zaddach. The larvae of the American species are unknown. The definition of the Dineurinae as given above is tentative as none of the European species have been available for study and it is based on descriptions and figures published by Cameron (1882) and Brischke and Zaddach (1883).

Pseudodineura is characterized in the larval stages by their leaf-mining habit and structural modifications due to this mode of life altho apparently not very striking as far as one may judge from published records. Since previous authors failed to study the structures of the head more carefully and since they are of most taxonimic importance and also on account of the discrepancy of the larval habits, it is not possible to pass judgement on the affinity of these three genera and particularly that of Pseudodineura.

Monocteninae

Larvae large, about 25 mm.; body cylindrical, tapering uniformly caudad; greenish; segmentation and annulation fine, distinct; third abdominal segment with six annulets; uropods on abdominal segments 2-8 and 10, well developed; resembles in general appearance to Diprioninae; free leaf-feeders.

The subfamily Monocteninae was established by MacGillivray(1906) for the genus Monoctenus which has been universally regarded as belonging to the subfamily Diprioninae or its equivalent. On the basis of the venation MacGillivray's opinion is justifiable and it is most interesting to know what larval characters would indicate in regard to the relationship between this genus and other genera ordinarily included in the Diprioninae. The type species of the genus Monoctenus was described by Marllatt(1887) together with notes on life history and description of immature stages. The larvae of this interesting species have been unavailable for study and the systematic position of this disputed subfamily remains unsettled.

Cladiinae

Larvae of smal to medium size;body rather falttened,wider than high,slightly tapering caudad;segmentation and annulation usually distinct;greenish or segmentally arranged spots or dorsum dark shaded;conspicuously hairly;third abdominal segments with four segments,annulets 1,2,and 3 setiferous,setae,especially on annulets 2 and 3,arising from wart-like tubercles,long,often curved,always microscopically barbed,never branched,some of the setae distinctly longer than others;annulet 4 narrow and glabrous;uropods present on abdominal segments 2-7 and 10,well developed,long,distal portion often dilated,appearing as if subdivided,often curved mesad,always with few setae;ventral glands small but always present on abdominal segments 1-7;tenth abdominal tergum without caudal protuberances but with many setae of varying length;thoracic legs spreading flat laterad femur with a ventro-distal projection,subequal in length to tibia; antennae with four segments,subconical,large;segment 1 complete or incomplete,segment 2 complete,thicker,dorsal or caudo-dorsal protion with clear spaces,segment 3 smaller and narrower than segment 2, segment 4 minute,conical;spiracles never winged;glandubae small or obsolete;seracos usually very wide,extending nearly the four-fifth of the width of the totaglossa;larvae external leaf-feeders.

The Cladiinae is a small subfamily and according to MacGillivray consists of six genera,Anoplonyx,Platycampus,Caulocampus,Priophorus, Cladius,and Trichiocampus. The first three genera are placed in the tribe Hemichroini of his subfamily Nematinae by Rohwer(1912,1918) who states that "the characters of both the adult and the larva point out subfamily difference between Caulocampus and Pristiphora" and that the former resembles superficially ~~to~~ Hoplocampa in all stages but is really related to Craterocercus. ~~The genus Caulo-~~

The difference of opinion is due to the different value placed by these two writers on the presence or absence of the radial cross-vein in differentiating the subfamilies. The genus Caulocampus has been discussed in connection with the Hoplocampinae because the larvae of this genus are so different from those of the Cladiinae both morphologically and biologically and because they are more naturally associated with the larvae of the Hoplocampinae. Anoplonyx is represented in the nearctic region by a single species. Platycampus includes four American species, two of which have been recognized in the immature stages. P. americana feeds on Populus and P. juniperi on Juniper. None of these larvae have been examined.

Genera of Cladiinae

a. Body spotted, with a row of blackish or brownish spots on subdorsal, supraspiracular, or subspiracular lines; setae usually recurved, exceedingly long, longest ones longer than one-half the height of the head; annulet 1 usually with one seta on each side of meson.....Trichiocampus Hartig.

aa. Body never spotted; setae usually straight, long, but the longest ones never distinctly longer than one-half the height of the head; annulet 1 always with more than one seta, usually with four to six.

b. Head with spots, usually with blackish patches on dorso-meson of vertex and caudad of each ocellara; body dorsad of spiracular lines usually shaded darker; body sometimes pinkish; postsupraspiracular tubercles usually with three setae never more than four setae.

.....Priophorus Dahlbom.

bb. Head never with spots, usually uniformly greenish; body dorsad of spiracular lines never shaded darker but concolorous

with venter;body never pinkish but greenish yellow or whitish; postsupraspiracular tubercles usually with six setae,never less than four setae.....Cladius Rossi.

Trichiocampus Hartig

Larvae small to moderately large,distinctly hairy,with segmentally arranged spots;body with a longitudinal row of blackish or brownish spots along subdorsal,supraspiracular,or subspiracular lines; annulet 4 shortest,annulet 1 usually with one and sometimes two setae on each half of body,annulet 2 with tubercles bearing 2-5 setae, annulet 3 with three warts,two dorsal ones bearing 4-5 setae and ventral one with 6-9 setae,postspiracular tubercle usually with two setae,subspiracular lobe with 8-9 setae,surpedal lobe with 6-10 setae; setae usually recurved,variable in length,longest setae nearly subequal in length to the height of head;warts or tubercles with setae of varying length,those on annulet 1 among the shortest.

Trichiocampus sp.1.

a. Body with three pairs of longitudinal rows of blackish or brownish segmentally arranged spots along subdorsal,supraspiracular,and subspiracular lines;tenth abdominal tergum not entirely black but white,except a pair of minute spots;head light brown with brownish spots,with following parts dark brown:dorso-meson of vertex,dorsal two-thirds of front,and vertex dorso-caudad of each ocellara including genae;preclypeus whitish,other parts paler including occiput between vertical furrows;a row of brownish spots from mesothoracic to ultimate segment along each side of dorso-meson;a row of larger spots along supraspiracular line from prothoracic to penultimate segments;another row of much smaller spots along

subspiracular lines from mesothoracic to eighth abdominal segment; mesothoracic and metathoracic subspiracular spots more than twice as large as supraspiracular spots of same segments; the former with white round areas around the proximal end of setae; prothoracic supraspiracular spots small and indistinct; tenth abdominal tergum white except a pair of minute spots; subdorsal spots not involving tubercles 2 and 3; supraspiracular spot involving tubercles 4 and 5; subspiracular spot on caudal half of subspiracular tubercle; maxillary palpi (2,3), 1,4; head in younger specimens blackish except near the mouth; and body without spots; in older specimens, supraspiracular spots appear first, then subspiracular begining with caudal segments, setae on tubercles may be one or two less than in mature specimens; on Populus; length of body 12 mm.; width of head 1.5-1.6 mm.; G-Onekama, and Orano.; on oak, length of body 13 mm., width of head 1.7 mm, M-207. (The latter resembles the former so closely and indistinguishable altho setae may be slightly fewer in number).

..... ~~Trichiocampus sp. 1.~~ *genticus* Macgillivray.

aa. Body with two pairs of longitudinal rows of blackish or brownish segmentally arranged spots along supraspiracular and subspiracular lines; tenth abdominal tergum entirely black; head blackish with paler areas.

b. Mesothoracic supraspiracular spot subequal in size to subspiracular spot; supraspiracular spots of abdominal segments not involving postsupraspiracular tubercles; prothoracic surpaspiracular spots minute and indistinct; preclypeus, labrum, and genae blackish; metathoracic subspiracular spots with minute but distinct whitish round areas at proximal

end of setae;head blackish,paler along vertical furrows, epicranial arms,and postclypeus;body with a row of blackish spots from methoracic to penultimate segment along supraspiracular and subspiracular lines;tenth abdominal tergum black;third abdominal segment with following setae map: 1,3,3,0,2,4,4,5-6,8-9,6-8;subspiracular spot involving few setae directly ventrad of spiracles;head in younger specimens entirely blackish and spots on subspiracular lines wanting;maxillary palpi (2,3),1,4;length of body 18 mm.;width of head 1.3 mm.;on Salix;Y-151-1-1,-151-1-3; M-100,-261. (The specimens in Maine collection are practically identical with my specimens except in the number of setae on subspiracular and surpedal lobes which may exceed the number given by one or two).....Trichiocampus sp.2.

bb. Mesothoracic supraspiracular spots not subequal to but distinctly larger ,twice or more, than subspiracular spots;supraspiracular spots of abdominal segments involving postsupraspiracular tubercles;prothoracic supraspiracular spots large and distinct;preclypeus,labrum and genae not blackish but paler brown;metathoracic subspiracular spots without minute but distinct whitish round areas at the proximal end of setae;head black,paler along vertical furrows,epicranial arms,clypeus,labrum,and genae;body with a row of blackish or brownish spots from prothorax to penultimate segment along supraspiracular and subspiracular lines; tenth abdominal tergum black;third abdominal segment with mesothoracic following setae map:2,2,3,1,2,4,4-5,7-8,8-9,9-10;supraspiracular spot more than twice as large as subspiracular spot;prothoracic supraspiracular spots moderately large

and distinct;subspiracular spot involving few setae in caudal portion of subspiracular tubercle;mesotharacic and metathoracic subspiracular spots without whitish round areas at the proximal end of setae;maxillary palpi usually 3,2,1,4;head in young speciemns pale brownish,with a row of very small supraspiracular spots;head in older larvae blackish,body spotted like mature specimens but spots smaller in size;on Populus;length of body 21-23 mm.;width of head 2-2.1 mm.;Y-172-1-1.....Trichiocampus sp.3.

Priophorus Dahlbom

Larvae small,hairy;body with dorsal half at least in part usually with grayish or olivacious shade;never with spots;annulet 1 with a transverse row of several setae;annulet 2 with two warts,each bearing 4-5 setae;annulet 3 with three warts,dorsal two bearing 5-6 setae each,ventral with 8-10 setae;postsupraspiracular wart usually with three setae;subspiracular lobe with 12-15 setae and surpedal lobe with 6-9 setae;setae usually more or less straight,usually of two different lengths,longer ones usually less than one-half the height of the head;warts bearing setae of two varying lengths;those on annulet 1 among the shortest setae.

Species of Priophorus

a. Front with a distinct blackish or fuscous spot;vertex with a dorso-mesal fuscous spot occupying nearly the entire space between vertical furrows;body never pinkish;but whitish; head caudad of ocellarae fuscous;body dorsad of spiracular lines from mesothorax to penultimate segment olivacious or grayish,color becoming diluted on caudal segments;third abdominal segment with following setal map:4-5,4,5,1,3,6,8,

12-13,8-9;maxillary palpi 2,(3,4),1;in younger specimens dorsal greyish shade confined to cephalic segments;on Hazel; length 15 mm.;width of head,1.5 mm.;M-109.

.....Priophyrus sp.1. (n.sp)

aa. Front without a distinct blackish or fuscous spot,but with a light or pale brown spot;vertex with a dorso-mesal,fuscous, or blackish spot,not occupying the entire space between vertical furrows;body sometimes pinkish;not on Hazel.

b. Head brown;vertex with blackish spot occupying about one-half the distance between vertical furrows;body pinkish;head with blackish spot caudad of ocellarae;dorsum of mesothorax to first abdominal segment shaded gray,prothorax whitish; third abdominal segment with setal map:5,4,4,1,3,5,5,10, 10-12,6-8;maxillary palpi 2,(3,4),1;in younger specimens body whitish;length 14 mm.;width of head 1.2 mm;on Salix; Y-154-1-2.....Priophyrus sp.2.

bb. Head pale brown;vertex on dorso-meson with blackish spot occupying two-thirds the distance between vertical furrows; spot also caudad of ocellarae;body not pinkish but whitish; body dorsad of spiracular lines from mesothorax to penultimate segment distinctly and uniformly olivaceous gray; third abdominal segment with following setal map:5-6,5,5, 1-2,3,6,6,10,15,8-9;maxillary palpi 2,3,(4,1);in younger specimens black spots on head larger and olivaceous shade on dorsum of body restricted to cephalic segments;length 16 mm.;width of head 1.6 mm;on Prunus virginicus;Y-138-3. (This species resembles P.solitaris according to Dyar's description but the latter feeds on Alnus).....

.....Priophorus sp.3.

Cladius Rossi

Larvae rather small;body slightly flattened,greenish or yellowish green;never with spots or shaded on dorsal half;annulet 1 with a transverse row of several setae,annulet 2 with two warts bearing 5-6 setae,annulet 3 with three warts,dorsal two bearing 6-7 setae,ventral with 10 setae;postsupraspiracular tubercles with 5-6 setae;subspiracular lobe with 14-17 setae,surpedal lobe with 10 setae;setae usually straight,usually of two lengths,longer ones less than one-half the height of head;setae on the annulet 1 among the shortest.

Cladius pectinicornis Fourcroy

Length 12-14 mm;head pale brownish or yellowish,microscopically verrucose with brownish spots;front touched with light brown;body hairy,uniformly greenish or greenish yellow;third abdominal segment with setal map:5-6,5,6,1,5-6,6,7,10,14-17,10;maxillary palpi (2,3,1), 4;on Rosa;Y-3,M-244.

Nematinae

Larvae small to moderately large; body cylindrical, slender, or abdomen increasing in diameter; segmentation and annulation usually distinct; third abdominal segment with 4, 5, or 6 annulets, annulets 1, 2, 3, or 1, 2, 4, or more, usually 2 and 4 setiferous; uropods present on abdominal segments 2-7 and 10, setiferous or sometimes glabrous; ventral glands present on the meson of abdominal segments 1-7; thoracic legs normal in form; body uniformly greenish, darker colored, striped, or spotted, tuberculate, setiferous, or smooth; antennae with four segments, conical, subconical, limpet-shaped, or flattened; antennal segments sometimes incomplete or in part fused together; tenth abdominal tergum with or without a pair of caudal protuberances; gland-urbae sometimes distinct, conspicuous, and stalked; spiracles winged or not winged; larvae free leaf-feeder, gall-makers, and leaf-rollers.

The Nematinae is a large subfamily of several genera and numerous species and is characterized by the coalescence of the cells 2d A and 3d A due to the atrophy of the 3d A anal vein. The absence of the radial cross-vein and the cell 1st 2d A distinguishes the adults of this subfamily from those of the Hoplocampinae and Cladiinae respectively. Rohwer (1912) who would unite the Nematinae and Hoplocampinae together with three genera of the Cladiinae into one subfamily, Nematinae, states that the subfamily contains two types of larvae and that ~~the~~ most of the aberrant larvae belong to his tribe Hemichroini. It is possible to point out that the Nematinae as defined by MacGillivray also contains two types of larvae which are separable on the presence or absence of the caudal protuberances on the ultimate segment. There are, however, other morphological and biological characters of the larvae which suggest that this subfamily contains a number of genera of wide diversity and that such genera as

Pteronidea and Pontania might preferably be subdivided into more genera.

Genera of Nematinae

a. Tenth abdominal tergum without caudal protuberances.

b. Antennae conical or subconical, antennal segments 2 and 3 always complete, segment 4 peg-like or conical, at least as long as wide at proximal end; third abdominal segment always with six annulets.

c. Annulet 2 and 4 glabrous; uropods glabrous; glandubae obsolete; thoracic legs with coxae in part always colored brownish. .....Nematus Panzer.

cc. Annulets 2 and 4 not glabrous; uropods usually not glabrous; glandubae usually not obsolete; thoracic legs with coxae usually in part not colored.

d. Antennae with segment 3 ring-like, its cephalic portion subequal in length to caudal portion, segment 2 compelete, its cephalic portion not reduced to a mere line; body increasing in diameter to abdominal segments 5-6; spiracles usually winged; uropods glabrous or with 2-4 or more setae as viewed from lateral aspect. ..... Pristiphora Latreille.

dd. Antennae with segment 3 not ring-like, its cephalic portion not subequal in length to caudal portion; segment 2 usually complete but its cephalic portion reduced to a mere line.

e. Body increasing in diameter to abdominal segments 5-6 but uniformly cylindrical; spiracles never winged; uropods with 1-2 setae as viewed from lateral aspect.....Diphadnus Hartig.

ee. Body not increasing in diameter to abdominal segments 5-6 but uniformly cylindrical;spiracles never winged; uropods with 1-2 setae as viewed from lateral aspect.

f. Thorax distinctly swollen;head pale brownish green; maxillary palpi with segment 2 as long on its lateral aspect as on its mesal aspect;legs with femur and tibia concolorous with body,whitish; body with dorsum not shaded bluish green.

....Pteronidea Rohwer(in part).

ff. Thorax never distinctly swollen;head not pale brownish green;but blackish;maxillary palpi with segment 2 not as long on its lateral aspect as on its mesal aspect but three times as long as mesal aspect;legs with femur and tibia not concolorous with body but blackish; body with dorsum shaded bluish green.....

....Lygaeonematus Konow.

bb. Antennae not conical or subconical,but flattened;antennal segments 2 and 3 not always compelete,segment 4 never peg-like or conical,never as long as wide at proximal end; third abdominal segment not always with six annulets.

c. Segment with four annulets,annulets 1,2,and 3 setiferous; gall-makers.....Pontania Costa (in part).

cc. Segment with more than four annulets,annulet 1 not setiferous;not gall-makers

d. Segments with five annulets,annulets 2 and 3 setiferous; antennae with all segments fused together;uropods with two setae as viewed from lateral aspect;body setae very long.....Micronematus Konow.

dd. Segments with five or six annulets;annulets 2 and 4 setiferous;antennae usually not with all segments fused together;uropods usually with much more than two setae as viewed from lateral aspect;setae on body not very long;glandubae usually conspicuous and stalked.

e. Segments with six annulets;uropods with 7-10 setae as viewd from lateral aspect;surpedal areas at least in part always marked with gray;latus of abdomen never with numerous brownish spots;tenth abdominal tergum someimes distinctly pointed and produced caudad and with many conspicuous glandubae near the caudal margin, larvae usually feeding on monocotyledonous plants. .....Pachynematus Konow.

ee. Segments with five annulets;uropods with 3-5 setae as viewed from lateral aspect;surpedal areas not marked with gray;latus of abdomen sometimes with numerous brownish spots;tenth abdominal tergum never distinctly pointed and produced caudad;larvae usually feeding upon willow.....Amauronematus Konow.

aa. Tenth abdominal tergum with a pair of caudal protuberances.

b. Gall-makers and leaf-rollers;segments with four annulets; annulets 1,2,and 3 setiferous;antennae flattened;body setae more than twice as long as spiracles;caudal protuberances normal in form and position or rudimentary or borne on a small caudo-mesal projection,if normal in form and position,the tergum with paired colored markings. .....Pontania Costa (in part).

bb. Free leaf-feeders;segments usually with five or six annulets, if four,annulets 2 and 4 usually setiferous;antennae

conical or flattened.

c. Antennae conical, segment 2 complete, segment 3 ring-like, its cephalic portion subequal in length to caudal portion; body on latus with eleven conspicuous blackish brown spots surpedal and subspiracular areas of abdominal segents 1-9 and venter between uropods of abdominal segments 2-8 similarly marked; spiracles not winged; caudal protuberances of the ultimate segment small, blunt, not longer than wide at proximal end; segments with five or six annulets, with annulets 2 and 3 or 2 and 4 setiferous.
.....Croesus Leach.

cc. Antennae conical or flattened; if conical, segment 3 not not ring-like but reduced in length on cephalic aspect; body not marked as in Croesus; spiracles winged or not winged; caudal protuberances of ultimate segment not blunt, minute, but usually much longer than wide at proximal end.

d. Segments apparently with five annulets; annulets 2 and 3 setiferous; antennae flattened with segment 3 compelete; body setae subequal in length to spiracles; smaller larvae, length 13-15 mm.....Amauronematus Konow. (in part)

dd. Segments with four or six annulets; annulets 2 and 4, rarely 1, 2, and 3, setiferous; antennae conical or flattened, segment 3 compelet or incomplete; body setae often longer than the length of abdominal spiracles; small to moderately large larvae, length 15-23 mm.
.....Pteronidea Rohwer (in part).

Diphadnus Hartig

Larvae small, greenish; body cylindrical, increasing in size to abdominal segments 5-6, tapering at each end; thorax not swollen; tenth abdominal tergum without a pair of caudal protuberances; third abdominal segment with six annulets, annulets 2 and 4 setiferous; spiracles distinctly and usually equally winged; head marked with black or brown streaks along epicranial stem and dorsad of ocellarae, somewhat compressed cephalo-caudad; labrum with median emargination broad and deep, and with median longitudinal depression; antennae distinctly conical, with four segments, segment 1 incomplete, segment 2 usually complete tho reduced to a mere line on cephalic part, segment 3 narrowed on cephalic part, segment 4 short, conical, or peg-like; anal uropods rather large; uropods setiferous, setae 4-6 in number as viewed from lateral aspect; glandubae sessile; cuticle microscopically spinulate; suranal and subanal lobes with numerous setae; larvae free leaf-feeders.

Diphadnus appendiculatus Hartig

Length 13 mm.; width of head 1.35 mm.; body green, venter glossy white; tenth abdominal tergum not marked; head greenish white, with blackish brown streak along epicranial stem except near the occiput and continuing to the dorsal two-thirds of front, vertex dorsad of each ocellara not white, reaching the epicranial suture; surface of head with minute brownish spots; following parts brown: mandibles at apices, antennae, cervical sclerites, coxae at proximal third, tarsal claws, and spiracles; setae minute with conspicuous calices, blackish; glandubae smaller at distal end than the calyx of seta; uropods on cephalic and lateral aspects with 4-6 setae and with a single ventral glanduba; annulation 1, (6,2), (3,5), 4; subspiracular lobe with 5-6 setae and without glandubae; surpedal lobe with about 4 setae and one subsessile glanduba; on Gooseberry; Y-158, -159, M-128.

Pristiphora Latreille

Larvae small, greenish; body cylindrical, usually slightly enlarged at abdominal segments 5-6, tapering at each end; thorax not swollen; tenth abdominal tergum without the paired caudal protuberances; third abdominal tergum with six annulets, annulets 2 ad 4 microscopically setiferous, setae sometimes obsolete; annulet 1 always longest and annulet 3 or 4 always the shortest; spiracles usually winged, caudal wing usually much smaller than cephalic; head marked usually with blackish or brownish streak along epicranial stem, surface with minute brown spots; labrum with distinct mesal emargination and longitudinal depression; antennae conical or limpet-shaped, usually with four distinct segment; segment 1 always minute, incomplete, on caudal side, segment 2 compelete, but usually narrower on cephalic side, segment 3 uniform in length, segment 4 short, conical; anal uropods rather conspicuous; uropods usually glabrous and with a single ventral glanduba; if setiferous, setae microscopic, 2-4 in number as viewed from side; gladubae sessile or stalked; cuticle microscopically spinulate, suranal and subanal lobes with numerous setae; tenth abdominal tergum as seen from side notched dorsad of suranal lobe; free leaf-feeders.

Species of Pristiphora

a. Uropods setiferous; antennae always conical; head always with a brownish streak dorsad of each ocellara; spiracles always with cephalic wing distinctly larger than caudal wing; setae with calices surrounded by minute brownish areas; glandubae always sessile, sometimes microscopic, never more than one-half the diameter of calices of setae.

b. Glandubae minute but distinct, about one-third as large as calices of setae or microscopic in smaller specimens; annulation 1, (5,6), 2, 3, 4; subspiracular area with 3-4 setae sur pedal area with 3-4 setae; uropods with 2-4 setae as viewed

from side;head light brownish green,marked with fuscous streaks on both sides of entire length of epicranial stem, front with dorsal two-third light brown;following parts light brown:labrum,antennae,mandibles,cervical sclerites, tarsal claws,and spiracles;body greenish,caudal segments pinkish or bluish,dorsal vessel dark green with distinct fine white line on each side;on Salix;Y-143-2-2,-155,M-96. Length.14.mm,.....murtfeldtiae Marlatt.

bb. Glandubae microscopic,difficult to detect.

c. Second annulet of abdominal segments always longer than either fifth or sixth annulet;uropods with about two setae as viewed from side;subspiracular areas with 4-5 setae,surpedal areas with 4 setae;annulation 1,(5,6),2, 4,3;on Birch;M-24.....Pristiphora sp.1.

cc. Second annulet of abdominal segments always shorter than either annulet 5 or 6;uropods with 1-2 or 2-4 setae as viewed from side;subspiracular areas with four setae;on Alder or Willow.

d. Uropods with 1-2 setae as viewed from side;annulation 1,2,(4,5,6),3;surpedal area with 3-5 setae;body green, cylindrical;head pale brownish green,marked with brown streak along entire length of epicranial stem and dorsal two-thirds of front and vertex narrowly dorsad of each ocellara;following parts brown:antennae,labrum, mandibles,maxillary palpi,cervical sclerites,tarsal claws,and spiracles;antennae conical,segment 4 short, conical;spiracle with cephalic wings distinctly longer than caudal;setae without brown areas surrounding calices;glandubae minute,sessile,microscopic;M-74.

.....Pristiphora sp.2.

dd. Annulation 1,2,6,5,4,3;uropods with 2-4 setae as viewed from side;surpedal areas with 3-5 setae;on wooly willow M-90.....Pristiphora sp.3.

aa. Uropods glabrous;antennae conical or limpet-shaped;head with or without a dark streak dorsad of each ocellara;spiracles winged or not winged,if winged,wings subequal in size;or cephalic wings larger than caudal;setae usually with calices surrounded by minute but distinct brownish areas;glandubae sessile or stalked,sometimes microscopic.

b. Head distinctly and uniformly brownish;spiracles indistinctly winged;all setae ventrad of subdorsal lines with calices surrounded by minute brownish areas;antennae conical; glandubae subequal to calices in diameter;annulation 1,5,6, 2,3,4;on Birch;M-132.....Pristiphora sp.4.

bb. Head never distinctly and uniformly brownish.

c. Body on dorso-meson from prothorax to fifth abdominal segment with a distinct blackish line;spiracles winged, cephalic wings usually larger than caudal;all setae ventrad of subdorsal lines with calices surrounded by minute brownish areas;antennae conical;glandubae minute, about one-half as large as calices in diameter;head with diantinct line along epicranial stem;vertex without a dark streak dorsad of each ocellara;annulation 1,2,(5,3, 4,6) or 1,2,(3,4,5,6);on Prunus;M-128.....
.....Pristiphora sp.5.

cc. Body on dorso-meson from prothorax to fifth abdominal segment without a distinct blackish line.

d. Head entirely pale or light brown;vertex without dark

streak along epicranial stem;antennae distinctly conical;spiracles winged,wings subequal in size;all setae with calices never surrounded by distinct brownish areas;glandubae probably obsolete,microscopic; annulation 1,5,6,2,3,4;on oak;M-20.....
.....Pristiphora sp.6.

dd. Head never entirely pale or light brown;vertex always with a dark streak along epicranial stem,sometimes indistinct but never entirely wanting.

e. Spiracles winged;all setae ventrad of spiracular lines with calices surrounded by distinct minute brownish areas;antennae always conical;vertex with or wihtout a dark streak dorsad of each ocellara.

f. Spiracles with cephalic wings always larger than caudal;glandubae always sessile;glandos microscopic, difficult to detect;all setae on latus dorsad of spiracular lines with calices surrounded or not surrounded by distinct brownish areas.

g. All setae on latus dorsad of spiracular lines with calices surrounded by brownish areas;vertex dorsad of each ocellara with a brownish streak; annulation 1,(5,6),2,4,3;body green;head marked as in P.bivittata;length of body 12-13 mm.; on Salix;M-72.....synchophanta Walsh.

gg. All setae on latus dorsad of spiracular lines with calices not surrounded by brownish areas; vertex dorsad of each ocellara without a brownish streak;annulation 1,(2,5,6),4,3;body enlarged on abdominal segment 5-6;greenish,dorsal vessel

dark green with white line on each side;head greenish with brownish streaks along entire length of epicranial stem,expanding on the dorsal half of front;vertex uniformly pale;following parts brown:labrum,mandibles,antennae,cervical sclerites,tarsal claws,and spiracles;antennae conical,segment 4 elongate,conical;on Spirea latifolia and S.tomentosa;M-4.

.....Pristiphora sp.7.

ff. Spiracles with wings subequal in size;glandubae stalked;glandos subequal in diameter to calices; all setae on latus dorsad of spiracular lines with calices not surrounded by distinct brownish areas.

gg. Vertex with a distinct dark streak dorsad of each ocellara;annulation 1,2,(5,6),4,3;length 16-17 mm.;dody cylindrical increasing in size to abdominal segments 5-6,green,dorsal vessel dark green with white fine line on each side of it; head green,slightly brownish,with fuscous streaks following parts light brown:dorsal two-thirds of front,labrum,maxillary palpi and galea,labial palpi,and cervical sclerites;following parts brown:antennae,mandibles,spiracles,glandubae, and setae;antennae conical,distinctly with four setae,segment 4 conical;spiracles with wings; ventral glands in size subequal to uropods; glandos in diameter subequal to or larger than calices of setae;setae located on dorsum very

minute;on Spirea;Y,M-14,-88.

.....bivittata Norton.

gg. Vertex without a distinct dark streak dorsad of each ocellara;annulation 1,2,6,5,3,4;on Potentilla;M-101..... Pristiphora sp.8.

ee. Spiracles not winged;all setae ventrad of spiracular lines with calices never surrounded by distinct minute brownish areas;antennae limpet-shaped,segments indistinguishably fused;vertex always with a brown streak dorsad of each ocellara;glandubae sessile; glandos microscopic,difficult to detect;annulation 1,(2,5,6),(3,4);length 12-13 mm.;body green,with broad dark green dorsal vessel bordered on each side by a fine white line;head greensih brown;setae stiff, comparatively long,without brown areas surrounding calices;on Geum canadensis;Y-212.

.....Pristiphora sp.9.

Lygaeonematus Konow

Larvae moderately large, length 18-20 mm.; body cylindrical, tapering uniformly and slightly caudad; thorax not swollen; abdomen never swollen; dorsum grayish green and venter pale; head shiny black, only slightly narrower than thorax; antennae conical, distinctly with four segments, segment 1 minute, ~~minute~~, incomplete, and with single sensory pit, segments 2 and 3 narrower on cephalic part than on caudal part, segment 4 conical; labrum with mesal emargination shallow and broad; maxillae with galea larger than labial palpi; maxillary palpi with segment 2 three times as long on lateral marigin as on mesal; third abdominal segment with six annulets, annulet 1 largest, anulets 2 and 4 setiferous; uropods well developed, setiferous, with 1-2 setae and single ventral glanduba; glandubae sessile; glandos smaller than calix of seta; ventral glands subequal to or larger than uropods in size; spiracles not winged; tenth abdominal tergum as seen in profile not notched dorsad of suranal lobe and without caudal paired protuberances; setae usually arising from fleshy mound-like minute protuberances; cuticle microscopically spinulate; free leaf-feeder.

Lygaeonematus erichsoni Hartig

Length 18-20 mm.; body greenish gray dorsad of spiracular lines, ventrad of it opaque bluish white; somewhat shiny; head black; following parts fuscous to blackish: mouth-parts, cervical sclerites, femur, tibia, and claws; following parts grayish; surpedal areas, coxa, and trochanter in part, swellings between legs, and abdominal surpedal areas faintly; annulation 1,2,6,(3,5,4); glandos one-half as large in diameter as calices of adjcent setae; surpedal area on abdomen with 8-10 setae and two glandubae; subspiracular area with 6-7 setae, usually without glandubae; cuticle with distinct microscopic brownish spinulae; on Larch; Y-162, M-105, -165.

Pachynematus Konow

Larvae moderately large; length 15-23 mm.; body cylindrical, tapering uniformly and distinctly caudad; thorax rarely and abdomen never swollen; third abdominal segment with six annulets, annulets 2 and 4 setiferous, annulet 1 longest, annulet 4 usually shorest; tenth abdominal tergum without a pair of caudal protuberance, and without a notch dorsad of suranal lobe as seem in profile; the tergum sometimes produced distinctly caudad and pointed; suranal and subanal lobes with numerous setae; head brownish or greenish, sometimes with fuscous streak along epicranial stem, semiglobose, subequal in width to or only slightly narrower than thorax; labrum with median longitudinal depression, cephalic emargination shallow; maxillae with galea always larger than labial palpi, sometimes more than twice as large; antennae with four segments, flattened, never distinctly conical, segment 1 usually minute, incomplete, segments 2 and 3 with cephalic parts distinctly reduced to mere lines, sometimes all four segments fused; uropods always setiferous, with 8-11 setae on cephalic and lateral aspects and a single ventral glanduba; glandubae conspicuous, cylindro-conical, at least twice as long as wide at proximal end; spiracles usually not winged, if winged, rather indistinctly; setae stiff, brown, arising from fleshy mound-like minute tubercles; in younger specimens third abdominal segment with five annulets, annulet 1, 2, and 3 with stiff brown setae, glandubae obsolete; cuticle microscopically spinulate; larvae usually feed upon grasses.

The generic description given above is based upon two identified and several unidentified species. The known species can be separated as follow:-

a. Head with narrow fuscous or blackish streak along epicranial stem and vertical furrows; tenth abdominal tergum with a

broad fuscous streak on the meson and the caudal margin produced distinctly caudad and bluntly pointed, with many conspicuous glandubae; antennae with four segments fused together; annulation (2,1),6,(3,4,5); uropods with 7-9 setae on cephalic and 1 seta on lateral aspect; subspiracular lobe with 5-6 setae and 1-2 glandubae; surpedal lobe with 5-7 setae and 1-3 glandubae; body on dorso-lateral lines with narrow, fuscous, interrupted, longitudinal bands; head as wide as thorax; length 20 mm.; width of head, 2 mm.; on Carex; Y-150.

.....subalbatus Norton.

aa. Head without narrow blackish streak along epicranial stem and vertical furrows; tenth abdominal tergum without a broad fuscous streak on the meson, the caudal margin only slightly produced caudad, rounded; with many glandubae; antennae with four segments not fused together; annulation (1,2),6,(3,4,5); uropods with about ten setae on cephalic and one seta on lateral aspect; subspiracular lobe with about six setae and a single glanduba; surpedal lobe with six setae and three glandubae; head as wide as thorax; length of body 16 mm.; width of head 1.6 mm.; on Carex; Y-177.

.....repertus MacGillivray.

Nematus Panzer

Larvae small, length about 10 mm.; body cylindrical, uniform in diameter thruout the entire length, except at the caudal end, where it is tapering, dull green, apparently glabrous; annulation indistinct; third abdominal segment with six annulets, annulets glabrous, formula: 1,5,2,6,3,4; thoracic legs normal in form; coxa usually fuscous on proximal half; uropods small, dimishing in size gradually on the caudal segments, not setiferous; ventral glands subequal in size to uropods; tenth abdominal tergum without a pair of caudal protuberances, with a notch dorsad of suranal lobe as seen in profile, caudal margin truncate or slightly emarginate on the meson, not produced; suranal lobe with several minute setae on ventral aspect; subanal lobe with moderately numerous minute setae; abdomen with lateral lobes inconspicuously swollen; head circular in outline, rounded in profile on dorsal half, front flattened; ventral half of head with several longer and larger setae; dorsal half nearly glabrous or with microscopic setae; vertex usually with a fuscous streak caudad and dorsad of each ocellara; antennae four-segmented, subconical or sublimpet-shaped, sometimes in part fused; segment 1 minute, segments 2 and 3 reduced to mere line on cephalic aspect, segment 4 minute, subconical; mouth-parts and cervical sclerites fuscous to blackish; maxillary palpi with two distal segments distinctly smaller than segment 2, which is sometimes longer than all other segments together; galea larger than labial palpus; seracos distinct, circular; subspiracular and surpedal lobes with a few microscopic setae; glandubae probably microscopic, usually obsolete; spiracles usually winged; cuticle microscopically spinulate; free leaf-feeders.

Species of Nematus

a. Vertex with a fuscous streak caudad and dorsad of each ocellara; maxillary palpi with segment 2 shorter than all other segments together.

b. Vertex with fuscous streaks extending dorsad of vertical furrows; antennae with all segments fused and nearly completely filling antafossa; spiracles distinctly winged; tenth abdominal tergum with caudal margin shallowly emarginate on the meson; head with dorsal half entirely glabrous; length 11 mm.; on oak; M-21.....chloreus Norton.

bb. Vertex with fuscous streaks not extending dorsad of vertical furrows; antennae with all segments not distinct but not nearly completely filling antafossa; spiracles not distinctly winged; tenth abdominal tergum with caudal margin not emarginate on the meson; head with dorsal half not glabrous but sparsely setiferous; length 9 mm.; Y-133.
.....Nematus sp. 1.

aa. Vertex without a fuscous streak caudad and dorsad of each ocellara; maxillary palpi with segment 2 slightly longer than all other segments together; antennae with four distinct segments; spiracles winged; length 10.5 mm.; on oak; M-2.
.....Nematus sp. 2.

Croesus Leach

Larvae moderately large, body cylindrical, tapering caudad on abdominal segments 7-10 and also at cephalic end at prothorax; segmentation distinct; annulation indistinct; third abdominal segment with four or six annulets, annulets 2 and 3 setiferous; tenth abdominal tergum with a pair of low, conical, bluntly rounded, caudal protuberances, usually as wide as or wider than high; head flattened on front, rounded, shiny black; antennae distinctly conical with four segments; segment 1 incomplete, three times as long as wide, segments 2 and 3 usually complete and not reduced to mere lines on the cephalic aspect; segment 4 peg-like, bluntly pointed, longer than wide at proximal end; maxillary palpi with segment 1, 3 and 4 subequal in length, segment 2 twice as long as segment 1; uropods setiferous; spiracles not winged, indistinctly colored; glandubae subsessile or with a short stalk, very wide in diameter, more than three times the diameter of shaft of setae; maxacolia developed into a distinct triangular swelling dors-caudad of cardo, and covered with dark spinulae.

Croesus latitarsus Norton

Length 25 mm.; annulation 3, 2, 1, 4 or 2, 1, 5, 3, 4; uropods with 4-5 setae and single glanduba as viewed from side, no markings; tenth abdominal tergum with dark colored area contiguous with concolorous suranal protuberances; suranal and subanal lobes with numerous setae, increasing in length away from the anus; body yellowish green or brownish, with colored patches on subspiracular and surpedal areas and on subdorsal line from mesothorax to ninth abdominal segment; abdominal segments 2-8 on ventro-meson with a large colored patch; in younger stages body fuscous with little or no distinctly delimited colored patches; M-1, -26, -50, -51, -48.

Amauronematus Konow

Larvae small to moderately large;body cylindrical,often tapering distinctly caudad;latus with subspiracular and surpedal areas colored or with numerous,minute,colored spots;head blackish,brownish,or greenish;abdominal segment with five annulets,annulets 2 and 3 or 2 and 4 setiferous;tenth abdominal tergum with or without the caudal paired protuberances;body setae much longer or shorter than the length of spiracles;uropods with 2-3 or 3-5 setae as viewed from side; spiracles not winged;larvae free leaf-feeders.

The larval stages of five species of Amauronematus have been described by Dyar. Of these,larvae of luteotergum,dyari,oregonensis, and similis have not been available for study,but according to Dyar's descriptions,the last three apparently lack the caudal paired protuberances. I have a large number of larvae collected on willow by Dr.MacGillivray which also lack the paired caudal protuberances and probably belong to this genus. The species can be separated as follows:-

a. Tenth abdominal segment with the paired caudal protuberances.

b. Abdomen on ventro-meson with a row of blackish spots;the caudal paired protuberances and head blackish;gregareous; on Alder.....luteotergum Norton.

bb. Abdomen on ventro-meson without a row of blackish spots; paired caudal protuberances and head not blackish but pale; solitary;on Azalea... .....azaleae Marlatt.

aa. Tenth abdominal segment without the paired caudal protuberances

b. Mature and younger larvae both with antennae flattened and their segments fused in part,with no discernible or very limited antacoria;younger larvae(14 mm. or less) with annulets 1,2 and 4 setiferous;annulets 2 and 4 with trans-

verse row of warty protuberances bearing 2 or three stiff stout setae;older larvae(14 mm.or more)without numerous brownish spots on dorsum and latus and without brownish interrupted and diffuse dorso-mesal and dorso-lateral lines;on sweet fern;M-85.

.....Amauronematus sp.1.

bb. Mature larvae with antennae with all segments distinctly separated-with distinct antacoria;young larvae with antenna like those of preceeding species;younger larvae(14 mm.or less) with annulets 1,2,and 4 setiferous;annulets 2 and 4 without transverse row of warty protuberances bearing two or three stiff stout setae,but setae minute and arranged singly;older larvae(14 mm. or more)with numerous brownish spots on dorsum and latus and with brownish,interrupted, diffuse dorso-mesal and dorso-lateral lines;on willow;M-10.

.....virendus MacGillivray.

Another species which resembles the preceeding very closely and difficult to distinguish except the colored spots more or less darker and slightly more numerous;M-112.

.....vescus MacGillivray.

Micronematus Konow

Larvae small; body subcylindrical, tapering at both ends; mesothorax distinctly and metathorax slightly swollen; lateral lobes prominent and swollen; segmentation distinct; annulation indistinct; third abdominal segment with five annulets, annulets 2 and 3 setiferous; thoracic legs spreading laterad, normal in form; uropods setiferous, normal in form, except the anal pair reduced in size, one-half as large as the other pairs; tenth abdominal tergum without the paired caudal protuberances; head circular, smaller than thorax in width and height, front flattened; antennae apparently with four segments, flattened, all segmets fused together; ventral glands very large; setae sparse, very long; spiracles not winged; suranal and subanal lobes multisetiferous; glandubae subsessile; free leaf-feeders.

Konow in 1905 listed three species of Micronematus, abbreviatus, californicus, and monogyniae. The second species properly belongs to Diphadnus. Of the two remaing species, M. abbreviatus was recognized in the larbal stages a long time ago by Vollenhoven (1868). This genus is European and is represented in North America by a single species, Micronematus (Pachynematus) gregarius (Marlatt). That this species does not belong to Pachynematus can be readily seen from the structure and biological characters of the larvae as was suggested by Dyar (1897) in his original description of the immature stages. The fact that the larvae possess five annulets instead of six and that anal uropods are very much reduced in size and that they feed on willow instead of grasses would separate this species from all other known species of Pachynematus. On the other hand it has certain characters in common with Micronematus abbreviatus as recorded by Vollenhoven. Since this species can not be refered to Pachynematus or to any other known American genus, and since it has characters which are peculiar

to Micronematus, and since the adult, according to Ashmead(1898), would place it in this genus, this species is considered as belonging to Micronematus. If future study should prove this position untenable undesirable a new genus should be erected.

Micronematus gregarious (Marlatt)

Length 12 mm.; body shiny, transverse, yellowish white; alimentary canal showing thru as green tube; head pale testaceous, with a broad blackish band across the front between ocellarae and a narrow band dorsad of each ocellara to and along vertical furrow; mouth-parts, cervical sclerites, and legs except coriae brownish; abdominal segments 1-8 with postspiracular and subspiracular areas swollen, mound-like and tinted fuscous; abdominal segments 2-7 with colored postspiracular areas larger than subspiracular areas; those on segments 1 and 8 much smaller; thoracic segments with two colored patches obliatus, one larger and morerventrad than the other; uropods with about two setae on the cephalo-lateral aspect; ventral glands nearly three times as large as uropods; setae slender, at least twice as long as spiracles; spiracles not winged; subspiracular area with two setae and single glanduba, supedal area with 3-4 setae and single glanduba; larvae gregareous; on Salix; Y.

Pteronidea Rohwer

Larvae small to moderately large; greenish, often spotted or banded transversely or longitudinally; body cylindrical, slender, uniformly tapering caudad, rarely thorax conspicuously swollen; head and trunk setiferous, often tuberculate; head blackish, brownish, or greenish; antennae with four segments, sometimes with segments in part fused, conical, subconical, or flattened; third abdominal segment with 4-6 annulets, more commonly 5-6, annulets 2 and 4, rarely 1, 2, and 3 setiferous; tenth abdominal tergum with a pair of small but distinct suranal caudal protuberances, if without, body swollen on thorax, protuberances pointed, bluntly rounded, truncate, or swollen at distal end; uropods setiferous, setae few in number; spiracles winged or unwinged; glandubae subsessile or obsolete; leaf-feeders, sometimes gregareous.

The genus Pteronidea is rich in number of species. The author has examined a large number of specimens representing at least thirty species including much bred material and has prepared a synoptic table for differentiating them. The table and description of the larvae of these species are retained for future publication. It may be stated here that Pteronidea together with few allied genera is readily separated from all other Tenthredinidae by the presence of a pair of suranal caudal protuberances on the lateral portion of the caudal margin of the ultimate tergum: Pteronidea thoracica Harrington is unique in lacking the caudal paired protuberances but this species is easily distinguished by its characteristic somewhat elongate tadpole-like body and also by its white head and body and its spreading legs. The color and coloration together with the presence of setiferous tubercles and their arrangement are useful in separateing species.

Pontania Costa

Larvae small, whitish or greenish, usually 10-15 mm. in length; gall-makers or leaf-edge-rollers; body cylindrical, thorax usually not swollen; tenth abdominal tergum usually with a pair of suranal protuberances; when the paired caudal protuberances are normal in position near the lateral end of caudal margin of the segment, the tergum usually with paired blackish or brownish markings; caudal protuberances sometimes very minute and borne on the caudal margin of the produced mesal projection; spiracles winged or not winged; third abdominal segment with four annulets, annulets 1-3 setiferous; head usually dark brown or blackish in younger specimens and yellowish or pale brown in older specimens; labrum with mesal emargination shallow or obsolete; maxillary palpi with segment 2 longest of all the segments, usually subequal in length to segments 3 and 4 together; antennae with four segments, segments fused or separated, segments 1 and 2 usually incomplete and separate, segment 3 sometimes complete, often fused with segment 4; uropods setiferous, with four or more setae.

All Nematinae with gall-making or leaf-folding larvae belong to this genus. The differentetypes of galls are supposed to be specific and are considered of systematic value. Many species are indistinguishable in the immature stages except by the morphology of the galles they produce.

Species of Pontania

a. Gall-makers; tenth abdominal tergum with or without the paired caudal protuberances, if present, small, blunt, usually not longer than wide at proximal end; sometimes borne on caudal projection of suranal lobe; tergum without paired blackish or brownish markings; ninth abdominal tergum with distinct paired markings or trasnverse rows of minute spots.

out

b. Tenth abdominal tergum with paired caudal protuberances; tibia distinctly longer than femur; head brownish or yellowish with space between ocellarae across the front paler; Y-8-4-1,-8-4-3,-8-6-1,C-y67,M-212;on Salix ....pomum Walsh.

bb. Tenth abdominal tergum with paired caudal protuberances; tibia not distinctly longer than femur.

c. Suranal lobe not produced caudad forming a small mesal projection which bears rudimentary paired protuberances; the paired caudal protuberances small but normal in position near the lateral ends of the caudal margin; head blackish or blackish brown, space along epicranial suture paler; spiracles usually not winged; dorsum of segments not marked grayish transversely; on Salix ;Y-7-1,-7-4-1, -8.8,C-cu201,M-92.....hyalina Norton.

cc. Suranal lobe produced caudad forming a small mesal projection which bears rudimentary paired protuberances; head light brown with front and vertex dorsad of each ocellara darker; spiracles usually winged; dorsum of segments transversely marked with gray; antennae with segments 3 and 4 fused; labrum with mesal emargination obsolete.

d. Gall not transected by the leaf surface, but attached to one surface; point of attachment showing as discolored scar; greater part of gall free from the leaf; more than one galls may be adjacent; woolly small-leaved willow; M-148.... .....Pontania sp.1.

dd. Gall transected by leaf surface; usually only one gall on a leaf.

e. Gall involving the midrib;surface of gall irregularly constricted;sometimes more than one gall adjacent; M-226.....devincta MacGillivray.

ee. Gall not involving the midrib tho extending to it.

f. Long axis of gall parallel to midrib;leaf surface transecting the gall into subequal halves.

g. Gall kidney-shaped,surface strongly convex,about 14 mm. in length;M-213.....Pontania sp.2.

gg. Gall not kidney-shaped.

h. Gall bean-shaped,surface slightly convex;12-14 mm. in length;Y-191-1-1.....demessa MacGillivray.

hh. Gall bean-shaped,surface strongly convex;14-15 mm. in length;M-262.....Pontania sp.4.

ff. Long axis of gall transverse to midrib.

g. Gall transected by leaf surface into subequal semiglobose parts,surface not constricted by a furrow;M-211,-216.....Pontania sp.5.

gg. Gall transected by leaf surface into unequal parts; surface constricted by a furrow;M-93..... .....Pontania sp.6.

aa. Leaf-folders;tenth abdominal tergum always with the paired caudal protuberances,sharply pointed,normal in position and longer than wide at proximal end;tergum usually with paired blackish or brownish markings;ninth abdominal tergum with or without distinct paired markings or transverse rows of minute spots.

b. Tenth abdominal tergum without distinct paired blackish or brownish markings;head entirely yellowish;M-150... .....Pontania sp.7.

bb. Tenth abdominal tergum with distinct paired blackish or brownish markings.

c. Ninth abdominal tergum without any markings or spots; antennae with segment 3 sometimes incomplete.

d. Tenth abdominal tergum with markings extending entire length and dumbell-shaped;antennae with segments 2 and 3 usually complete.

e. Folded portion of leaf irregularly wrinkled; usually two edges ~~axxx~~ folded;M-175-[illegible]-31-1-1.....Pontania sp.8.

ee. Folded portion of leaf not irregularly wrinkled; usually one edge folded;Y-31-1-1,-8.46(?)-2-2. .....Pontania sp.9.

dd. Tenth abdominal tergum with markings not extending the entire length and not dumbell-shaped;antennae with segments 2 and 3 incomplete;folded portion of leaf irregularly wrinkled;often both edges folded; Y-139-1-1.....Pontania sp.10.

cc. Ninth abdominal tergum with some markings or spots; antennae with segment 3 usually complete.

d. Ninth abdominal tergum with two transverse rows of minute colored spots.

e. Tibia longer than femur;front concolorous with vertex;setae on abdominal tergum more than three times as long as spiracles;Y-166-1-1..... ....Pontania sp.11.

ee. Tibia subequal in length to femur;front not concolorous with vertex but darker;setae on abdominal terga less than three times as long as spiracles.

f. Head blackish;mature larvae in length 9 mm.;on Salix;Y-8.46(?)-1-2.....Pontania sp.12.

ff. Head brownish;mature larvae in length 11 mm.;on Populus;M-166.....Pontania sp.13.

dd. Ninth abdominal tergum without two transverse rows of minute colored spots.

ee. Ninth abdominal tergum with two pairs of transverse blackish or brownish markings,interrupted on meson; head brownish with area along epicranial suture distinctly clear and paler;Y-142-1.....derosa MacGillivray.

ee. Ninth abdominal tergum with one pair of transverse blackish or brownish markings,interrupted on meson; head blackish or brownish in younger specimens, yellowish or light brown in older specimens with area along epicranial suture not distinctly paler.

f. Tenth abdominal tergum with markings not reaching the paired caudal protuberances but broken on caudal half into minute spots;head yellowish with two minute brown spots on front;leaf-edge folder, folded edges not irregularly wrinkled;M-146. .....Pontania sp.14.

ff. Tenth abdominal tergum with markings reaching the paired caudal protuberances,not broken on caudal half into minute spots;head yellowish or brownish without two minute brown spots on front.

g. Ninth abdominal tergum with paired markings located on its cephalic half.

h. Ninth abdominal tergum with a transverse row of minute spots caudad of paired markings;leaf-edge-foleder;both edges often folded and folded portion irregularly wrinkled;M-145.... .. ..Pontania sp.15.

hh. Ninth bdominal tergum without a transverse row of minute spots caudad of paired markings.

i. Antennae with segment 3 incomplete; one edge folded,folded portion not irrgularly wrinkled;M-89,-147.....Pontania sp.16.

ii. Antennae with segment 3 complete;both edges of leaf folded,folded portion irregularly wrinkled;M-116,-144....Pontania sp.17.

gg. Ninth abdominal tergum with paired markings located on caudal half;antennae with segment 3 cpmplete;single edge-folder,folded portion not irregularly wrinkled;Y-8.46(?)-212(in part). .....Pontania sp.18.

Nematid genus 1.

Larvae small greenish;body cylindrical,tapering uniformly toward caudal end;segmentation distinct;annulation indistinct;third abdominal segment apparently with four annulets,annulets 1,2,and 3 setiferous; thoracic legs conspicuously long,nearly as long as thorax,slender, with trochanter longer than femur;uropods well developed,setiferous; tenth abdominal segment without the paired caudal protuberances;head circular,front flattened,smaller than thorax in width and height; antennae with four segments,segments small,incomplete,with large sensory(?) pits,segments sometimes fused in part;spiracles not winged.

This genus is represented by a single unidentified species collected by Chester Young on Salix at Ithaca, New York. The larva is unique in the character of the legs in that the trochanter is longer than the femur. That this species belongs to the Nematinae is unquestionable but it does not associate itself with any genus in particular except perhaps Pontania. It may represent an undescribed genus.

Species 1

Length 10.5 mm.;body greenish;head brownish with dorsal half of front dark fuscous;labrum semicircular with a slight mesal emargination;maxillary palpi with segment 1 nearly as long as segment 2 which is cylindrical and as wide at distal end as at proximal,segment 3 much smaller,segment 4 minute,peg-like,two distal segments curved mesad;galea conical,only slightly larger than labial palpi;thoracic legs with coxae subequal in length to tibiae,with trochanter slightly shorter than coxa,and as long on dorsal margin as on ventral,femur shorter than trochanter,cylindrical,three-fourths as wide as long, tarsal claws slightly curved;uropods with 1-2 setae near cephalic aspect;setae slender,not stiff,rather sparse;tenth abdominal tergum rounded on caudal margin,with few setae;subanal lobe with several setae;

abdominal segments with subspiracular areas with two setae and surpedal areas with a single seta;on Salix nigra;C-c.y.-77.

Blennocampinae

Larvae moderately large;body subcylindrical,sometimes rather robust,tapering uniformly caudad,venter more or less flattened,usually distinctly spinose;segmentation distinct;annulation indistinct; third abdominal segment with five or six annulets,rarely apparently with four;thorax sometimes thickened;thoracic legs well developed,no normal,tibia shorter than or subequal to femur;femur produced ventrodistad as pointed membranous projection;uropods on segments 2-8 and 10,normal in form,glabrous,subsegmented,distal lobe truncate on distal margin and often turned mesad;tenth abdominal segment usually with several spines arranged in a transverse row along caudal margin; suranal and subanal lobes with several setae;head small,sparsely setiferous,narrower than thorax,front slightly convex;antennae with five segments,slender,elongately conical;ventral glands wanting; glandubae sometimes present;spiracles rarely winged;spines often very long,furcate,with two,three or five branches,barbed,or represented by conical tubercles or sometimes reduced to short bifurcate tubercles;cuticle microscopically and densely spinulate;ultimate stage occurs,lose all setae and spines and become colorless and glabrous; free leaf-feeders;sometimes gregareous.

The Blennocampinae as restcicted by MacGillivray is a large subfamily rich in genera and species,and is related to Fenusinae and Scolioneurinae. This is in agreement with Konow's statement altho this author makes his tribe Blennocampides the third in his subfamily Tenthredinini. Rohwer would group the majority of the genera under consideration in his subfamily Empriinae,but take out the genera Phymatocera and Tomostethus from the subfamily and place them in a subfamily by themselves. This arrangement has an advantage in classifying the larvae because of the fact that the larvae of Tomos-

tethus lack the characteristic spines which readily distincguish the Blennocampinae from all other groups in the larval stages. The following table will separate the genera examined with two additional genera, Erythraspides and Periclista, whose diagnostic characters are taken from Dyar's paper (1898).

Genera of Blennocampinae

a. Body without spines; with six annulets, annulets 2 and 4 each with a transverse row of minute but stalked glandubae.

....Tomostethus Konow.

aa. Body with spines.

b. Third abdominal segment with distinct six annulets; spines usually unbranched but conical, if branched, very short and minute, tenth abdominal tergum with small conical unbranched spines.

cc. Body spines conical and not bifurcate, blackish.

d. Spiracles with distinct black wings

.....Monophadnus Hartig.

dd. Spiracles without distinct black wings.

....Hypergyricus MacG.

cc. Body spines not conical but bifurcate, blackish or whitish.

d. Spines whitish, tenth abdominal tergum not marked.

.....Blennocampa Hartig.

dd. Spines black, tenth abdominal tergum marked with black.

.....Erythraspides Ashmead.

bb. Third abdominal segment with five segments, rarely apparently four segments; spines in part usually bifurcate, long, never short and conical.

c. Tenth abdominal tergum with a mesal spine cephalad of caudal marginal row of spines; subdorsal spines of

prothorax with five branches;prothoracic spinal map: 5-2-1:5:1-2;third abdominal segment:2-2-2:0:3-2-2:2-1: 1-2;ultimate tergum 1-1-1:2:2.

.....Monophadnoides Ashmead.

cc. Tenth abdominal segment without a mesal spine cephalad of caudal marginal row of spines;subdorsal spines of prothorax with three branches at most.

d. Second annulet of third abdominal segment with three spines dorsad of spiracular lines;host plants not confined to Quercus species;prothoracic spinal map: 2-2-2:2-2:1-2;third abdominal segment 2-2-2:1:2-2-2: 2-1:1:1.....Isodictium Ashmead.

dd. Second annulet of third abdominal segment with two spines dorsad of spiracular lines;host plants confined to species of Quercus;otherwise resembling the preceeding genus.....Periclista Konow.

Tomostethus Konow

Larvae moderately large,rather robust,yellowish white;body subcylindrical,tapering little caudad,venter flattened,without spines, sparsely and microscopically setiferous;head black,shiny,much smaller than thorax;third abdominal segment with six annulets,annulets 2 and 4 each with a transeverse row of few stalked glandubae;tenth abdominal segment without spines,truncate on caudal margin;spiracles not winged but with a pair of faint ventral crescentic brown marks; antennae (5,4,3),2,1 in older larvae and 5,(4,3),2,1 in younger larvae;maxillary palpi 4,2,1,3,pointed,slender;labial palpi rather slender,(1,2);ultimate stage entirely whitish.

Tomostethus bardus Say

Length 18 mm.;width of head 1.9 mm.;body whitish with yellowish

tinge, in older specimens yellowish white; head shiny black with clypeus alone lighter in color; legs blackish brown; larvae gregareous; on Ash; G-2, Y-8.14.

Tomostethus multicinctus Rohwer

According to Sasscer's description (1911) the larvae of this species are indistinguishable from the preceeding species but the bred adults have been assigned to this species by Rohwer. Larvae have not been examined.

Blennocampa Hartig

Larve rather small, greenish; body subcylindrical, slender, tapering uniformly caudad; spines small, bifurcate, tubercle-like or conical; head very small, third abdominal segment with six annulets, annulets 2 and 4 spinose; tenth abdominal segment spinose, spines conical, unbranched, numerous, arranged in four rows, 1:1:1-1-1:1-1-1-1-1; typical prothoracic spinal map: 2-2-1-1-1:1-1-1:1:1-1; third abdominal segment, 2-2-1:1:2-2-1:1-1-1:1-1-1; antennae 5, (1,2,3,4); maxillaray palpi (2,3,4), 1, slender, pointed; labial palpi (1,2), subequal to two distal segments of maxillary palpi together; legs with femur longer than tibia; uropods normal in form, more or less rounded at distal end.

Blennocampa spiraeae Dyar

Length 16.5 mm.; width of head 1.2 mm.; body greenish; head pale brown; legs concolorous with body; ocellarae entirely black, tips of mandibles and tarsal claws brown; maxillary palpi with segment 4 and labial palpi with segment 2 deep brown; prothoracic formula of spines variable 2-2-1-1-1 or 2-3-1-1, or 2-1-1-1, etc; abdominal segment on surpedal lobe from 2-1 to 2-2 spines; tenth abdominal tergum with small, short, conical spines arranged in four rows as follows: two pair of spines on each side of meson, the lateral pairs sometimes with

additional spines, and the last and caudal row of five spines on each side of meson along the caudal margin of tergum, three lateral spines closer together; on Spiraea; M-28.

Erythraspides Ashmead

Larvae small inconspicuously spinose, greenish; third abdominal segment with five annulets, annulets 2 and 4 each with three minute bifurcate spines.

According to Dyar's table (1898) the larvae of Erythraspides pygmaeae is distinguished from those of Blennocampa spiraeae by the black head and spines of the former. Record is meager and without specimens no adequate diagnosis can be given.

Monophadnus Hartig

Larvae rather small, spotted; body rather robust, only slightly and uniformly tapering caudad; tubercles conical, small, blackish, not furcate; third abdominal segments with six annulets, annulets 2 and 4 tuberculate; tenth abdominal tergum with two rows ~~of number~~ of tubercles, some of which are bifurcate; prothoracic formula of spine: 1-1:1:1:1; third abdominal segment, 1-1-1:1:1-1-1:1:1; antennae 5, (4,3, 2), 1; maxillary palpi (4,2), 1,3; labial palpi (1,2); palpi rather thick and conical; spiracles with distinct black wings.

Monophadnus nubilipennis Norton

Length 14 mm.; width of head 1.3 mm.; head blackish brown; clypeus body dirty white
alone lighter, with yellowish tinge; legs grayish; on Hellebore; Y-42, -8.42.

Hypergyricus MacGillivray

Larvae rather large and robust, spotted; body subcylindrical, tapering but slightly and uniformly caudad; tuberculate, tubercles conical, short, stout, usually not furcate; third abdominal segment with six annulets, annulets 2 and 4 tuberculate; tenth abdominal segment with two rows of few tubercels; prothoracic spinal formula variable but with a single tubercle on supraspiracular area and two tubercles ventrad of it; third abdominal segment also with variable number of tubercles, only two on subspiracular area; tubercles not furcate; spiracles with faint ventral crescentic brown marks but without definite wings; antennae rather obtusely rounded, segments decreasing in diameter from proximal to distal but increasing in length; suranal and subanal lobes strongly convex, with numerous short recumbent setae; legs with femur distinctly longer than tibia; distal portion of femur dilated and produced ventro-mesad.

Species of Hypergyricus

a. Head black, genae, antennariae, ventral half of front and clypeus lighter in color; tubercles blackish; body whitish, faint grayish shade and yellowish tinge in older stages; legs grayish brown; antennae with segments 3 and 4 subequal in length; prothoracic with spines, 2-2:1:1:1; third abdominal segment, 1-1:0:1-1:1:1; latus of body with supraspiracular lines with broken band of grayish shade, marks distinct and square dorsad of each spiracle; on leaves and fruits of Smilacina racemosa; length 18 mm.; width of head 1.8 mm.;
Y-73,-29-10,-8.73,M-181.....fumipennis Norton.

aa. Head brownish yellow; length 17 mm.; width of head 1.9 mm.; spots on dorsum variable; body whitish with faint yellowish tinge; legs concolorous with body; supraspiracular lines without smoky black band; prothoracic spines, 1-1-1 or 1-1-1-1:1:1:1 or

3;third abdominal segment with 1-1;1:1-1-1:1:1;any of the dorsal tubercles may be wanting;otherwise similar to the preceeding species; Y.

Monophadnoides Ashmead

Larvae small,distinctly spinose,greenish;body subcylindrical, tapering caudad,rather slender;spines furcate with two,three,or more branches;third abdominal segment with five,apparently four,annulets, annulets 2 and 3 spinose;prothorax with spines,5-2-1:(5 or3):1:2, third abdominal segment,2-2-2:0:(3 or 2)-2-2:2-1:1-2;tenth abdominal tergum with a mesal furcate spine cephalad of caudal marginal row of spines;legs rather slender,femur slightly longer than tibia,not dilated at distal end;spiracles unwinged;maxillary palpi,(1,4),(2,3); labial palpi,(1,2);maxillary and labial palpi slender,pointed; antennae 5,(1,2,3,4),sharply pointed and slender;semigregareous.

Monophadnoides rubi Harris

Length 16 mm.;width of head 1.6 mm.;head pale brown/green,distinctly setiferous,spines whitish,branches sometimes light brown,length of longer branches subequal to the width of head as seen in profile; tenth abdominal tergum with a mesal spines with 2-3 branches,on the caudal third of the tergum cephalad of the marginal row of spines, sometimes another smaller unfurcate spine cephalad of the furcate mesal spine;marginal row of spines consists of,begining with mesal one,two single,one bifurcate and lower,and lateral single spines on each side of meson;on Rubus and also on Giant rag weed;Y-8.17,M-19,-183, G-562,500-3.

Isodyctium Ashmead

Larvae rather small,usually distinctly spinose;body subcylindrical,tapering caudad,rather slender;third abdominal segment with five annulets,annulets 2 and 4 spinose,sometimes apparently four-annulate

with annulets 2 and 3 spinose;spines furcate,usually with two to three braches,branches usually conspicuously long,sometimes small, short,but always sharply pointed at distal end;spiracles never winged, thoracic legs normal,femur subequal in length to or longer than tibia, head blackish or spotted on vertex and frontnor uniformly greenish; spines on prothorax,2-2-2-1:2-2:1:2;third abdominal segment 2-2-2:1:2 2-2-1:1:1;tenth abdominal segment with a marginal row of spines, usually four on each side of mesan.

Several species have been examined. None of the material has been identified altho the following larvaesmay belongstotI.subgregarium.

Isodyctium sp.1

Length 15.5 mm.;head 1.5 mm. wide;head marked on vertex and front with large confluent brownish spots,those on front sometimes separate body uniformly greenish;legs concolorous with body,femur subequal in length with tibia;spines blackish,very long and furcate,with large proximal end,those ventrad of spiracular lines whitish;those one-half as long as head is wide as seen in profile;prothorax with spines, 2-2-2-1:2-2:1:2;third abdominal segment 2-2-2:1:2-2-2:2-1:1-1; tenth abdominal tergum, 2-1:2:2,the mesal pair sometimes with furcate confluent bases;maxillary palpi (4,2),3,1;labial palpi,1,2;ultimate stage:entirely whitish,vertex pale brown,third abdominal segment with five distinct annulets,setiferous but not spinose;on Oak;M-6.

Fenusinae

Larvae very small;body semicylindrical,venter flattened,depressed,tapering caudad,glabrous;segmentation distinct;annulation indistinct;third abdominal segment with either one or apparently 2-4 annulets;thorax slightly swollen,prothorax sometimes with dorsal and ventral shields;legs small,short,apparently with four segments,spreading cephalo-laterad;uropods on abdominal segments 2-8,vestigial,mere mound-like;anal uropods obsolete;tenth abdominal tergum glabrous without suranal processes or caudal protuberances,sometimes with small mesal projections;suranal and subanal lobes glabrous;head sparsely setiferous,depressed,subtriangular in outline,wedge-shaped in profile,narrower than thorax and overlapped on caudal third by prothorax;vertical furrows wanting;antennae apparently with single segment;antacoria large;ocellariae minute, located dorso-caudad of antennariae;ventral glands wanting;glandubae wanting;spiracles indistinctly winged;cuticle sometimes with microscopic but distinct chitinized dentes;larvae leaf-miners.

The Fenusinae is a small subfamily represented by four genera in the nearctic region. Systematists have always considered this group as closelt related to the Scolioneurinae and Blennocampinae. MacGillivray is the only one who would assign them subfamily rank. Konow listed three European species,dohrni,ulmi,and pumila,under the old generic name Caliosysphinga. The two former are now considered as types of distinct genera. They have been introduced into this country and are liable to do considerable damage at times. The genera studied are separable as follows:-

a. Caudal end of body rounded,without a mesal suranal protuberance; sternum of ninth abdominal segment with a pair of swellings covered with distinct microscopic dentes;tenth sternum

strongly convex, much shorter than ninth sternum.

.....Kaliofenusa MacGillivray

aa. Caudal end of body truncate, with a medal protuberance; sternum of ninth abdominal segment flattened, uniformly and microscopically spinulate; tenth sternum slightly convex, nearly as long as the ninth sternum.....Fenusa Leach.

Kaliofenusa MacGillivray

Larvae very small, greenish white; thorax broadest on mesothorax; declivous on dorsum from metathorax toward the head; head only slightly depressed, front convex; mouth-parts normal except labium which is flattened; mandibles rather thick in profile; dorsum and venter covered with minute, brownish, irregular, microscopic dentes, larger on the center of segment and uropods; caudal end of body rounded; tenth abdominal tergum without mesal protuberance; sternum of ninth sternum with a pair of microscopically dentate swellings; tenth sternum strongly convex, much shorter than ninth sternum.

Kaliofenusa ulmi Sundvall

Length 10 mm.; width of head .9 mm.; head light brown, legs brown, ocularia, mandibles, maxillary palpi, deep brown; sternum of ultimate segment with transverse depression in the caudal third distinct; leaf-miners on Ulmus, feeding on all tissues except upper and lower epidermis; Y-4-1, -4-2, -8.4.

Fenusa Leach

Larvae very small, greenish white; body comparatively uniform in width except at caudal end which tapers suddenly and distinctly; head strongly depressed; front flattened; mouth-parts protruding beyond the distal end of mandible; body uniformly and microscopically spinulate; no distinct localized microscopic dentes; caudal end of body truncate,

tenth abdominal tergum with a distinct conical protuberanse;sternum of ninth segment rather flattened,without microscopicaily dentate swellings;tenth sternum slightly convex,nearly as long as ninth sternum.

Fenusa dohrni Tischenbein

Length 10-11 mm.;width of head 1.1 mm.;head brown;prothorax with dorsal and ventral shields indicated;legs light brown,trochanter wanting,femur subequal in length to tibia;tibia with proximal end subequal in diameter with distal end of femur;tenth abdominal sternum transverse depression in caudal fourth indistinct;body often greenish due to green adipose tissues showing thru the cuticle;dorsal vessel showing thru as light colored line:leaf-miners of Alnus,feeding habit similar to those of Kaliofenus ulmi;Y-4.4,-43-1-2.

Scolioneurinae

Larvae very small; body semicylindrical, somewhat depressed, flattened on venter, broader on thorax, tapering caudad, glabrous, greenish, never with bright patterns; segmentation distinct; annulation indistinct, third abdominal segment with two annulets; uropods rudimentary, mere swellings, on abdominal segments 2-7, the anal pair adjacent on meson forming a single protuberance; thorax thickened, prothorax often with distinct dorsal and ventral shields; thoracic legs small, slender, distinctly five-segmented, directed laterad; head depressed, subtriangular, wedge-shaped in profile, narrower than thorax; mouth-parts flattened and protruding, labium large, with submentum and mentum strongly chitinized; antenna one-segmented; vertical furrows usually wanting; telson abbreviated, glabrous; spiracles usually winged; glandulae obsolete; ventral glands wanting; cuticle often with minute dentiform tubercles; leaf-miners.

The Scolineurinae is a small subfamily containing six genera, four of which are peculiar to the nearctic region. All six genera are represented in the North American fauna. Prior to the recognition of the subfamily by MacGillivrary, the species belonging to it have been refered to the genera, Fenusa and Blennocampa. Konow first segregated a species of Entodecta and later more of Scolioneura from Blennocampa placing them, together with Fenusa and its allies, in other genera of his tribe Blennocmpides. Rohwer would separate the genera of Scolioneurinae from those of the Blennocampinae but unite them with those of Fenusinae in the tribe Messini of his subfamily Messinae. The close affinity of Fenusinae and Scolioneurinae is evident from the fact that all known larvae of these subfamilies are leaf-miners and that they possess similar type of structural modifications. The definitions given above is based on observations on two American species of Metallus supplemented by writings of European students, Cameron,

Metallus Forbes

Small whitish or pale brownish larvae; body depressed, rather stout, mesothorax broadest; pleuron of each segment tuberculate; cuticle with microscopic irregular chitinized dentiform tubercles, those on center of dorsum and venter larger in size; head directed ventro-cephalad, much narrower than thorax, attached to the ventral part of prothorax; vertical furrows wanting; front twice as long as wide, labrum subtriangular, small; antennae mamma-like; ocelli inconspicuous, about one-fifth the diameter of the antennaria; mouthparts small but distinct, slightly modified; mandibular dentes sharp; maxillary palpi three-segmented, stipes elongated, galea digit-like, slightly curved mesad and subequal in size to palpi, lacinia thin, small, plate-like, labium comparatively large, flattened; labial palpi inconspicuous, apparently 2-segmented; ligula globose and protruding; thoracic legs with coxa large, stump-like, following segments smaller suddenly smaller and slender, trochanter ring-like, femur as long as wide, tibia longer than femur, cylindrical, chitinized, tapering gradually to distal end, tarsal claws broadly curved, sharp; mesothorax and metathorax with a dorsal membranous swelling each side of the meson; spiracles distinctly and semicircularly winged; telson small, convex; anal setae wanting; subanal lobe small, prominently convex.

The two species studied can be separated as follows:

a. Head brownish, not concolorus with body, epicranial suture very distinct; dorsal and ventral shields distinct and brown; dorsal shield transverse, covering dorsum of prothorax, proventral shield very large, occupying entire venter between ~~pro~~ prothoracic legs caudad of and continuous with brown

microcoria, mesoventral and metaventral shields small, transverse, triangular between legs; labium with submentum strongly chitinized, brown with dark carina on meson and along caudal margin, mentum brown, longer than wide; uropods with crescentric brownish band on cephalic aspect; length 11-12mm.; on Rubus ----rubi Forbes.

aa. Head pale or whitish, concolorous with body, at least not distinctly colored; dorsal and ventral shields obsolete, only rarely faintly indicated; labium with submentum broad and without dark median longitudinal carina, depression on meson rarely present, never dark and distinct; uropods without crescentric brownidh band on the cephalic aspect;length 10 mm.; on Rubus ---------bethunei MacGillivray.

The larvae of Metallus rubi were described by Forbes, but the original specimens are apparently lost. The description given here is based on specimens in the Cornell Collection. Fourty-three larvae of M. bethunei were examined thru the courtesy of Mr. H. G. Craw ford of Guelph, Canada.

Hylotominae

Larvae moderately large;body semicylindrical, venter flattened, distinctly wider than high, widest on abdominal segments 1-3, tapering caudad, caudal segments only one-half the width of widest segments;yellowish green, spotted or not;segmentation distinct;third abdominal segment with three annulets, all setiferous, often tuberculate;thoracic legs large, spreading laterad, apparently six-segmented inclusive of claws;claws sharply curved, large, distinctly separated by suture from fifth segment and with a large pulvillus-like swellings; uropods setigerous, on abdominal segments 2-6 and with rudimentary 7th pair or on 2-7 and 10 with rudimentary 8th pair; antennae one-segmented, either conical or button-like, if conical, uropods on abdominal segments 2-6 and 10; spiracles distinctly winged; glandubae obsolete; telson without suranal processes.

The Hylotominae in the adult stage is closely allied to the Schizocerinae, but in the larval stages their affinities, if extant, are not so manifest. The larve are peculiar in possessing six-segmented thoracic legs and in varying numbers of uropods. The shape and general appearance of the larvae are so characteristic that they alone are sufficiently reliable for identification in the field. Two genera are represented in the nearctic region, the genus Atomacera which includes only a few species, has not been studied.

Hylotoma Latreille

Head shiny black, brown or yellowish, or with a brown median streak; body with minute blackish tuberculate setigerous spots forming interrupted longitudinal rows along some or all of the subdorsal, latero-dorsal, suprastigmatal, substigmatal, and pedal lines; annulation usually 2,3,1; annulet 1 with few minute setae, annulets 2 and 3 with a transverse row of few stiff brown setae together with very

minute setae scattered around the larger setae; substigmatal tubercles obsolete; pedal area prominent, produced laterad, and oblique, extending entire length of segment; maxillary palpi normal, four-segmented, segment 1 flattened, with distinct mesal projection, segments 2 and 3 cylindrical, segment 4 minute, peg-like; labial palpi normal, three-segmented; uropods located close together near the meson, proximal portion chitinized, setigerous, distal portion small, membranous, non-setigerous, bluntly rounded, those on seventh or eighth abdominal segment lacking membranous distal portion.

The genus is divisible into two sections by the structure of antennae and number of uropods. Owing to the incompleteness of published records of larvae of this genus involving in some cases confusion in specific identification, it is not possible to determine many of the matrials in hand. The following table will separate the species represented in the collections studied.

a. Antennae distinctly conical or peg-like, twice as long as wide; uropods on abdominal segments 2-6 and 10, seventh segment with rudimentary pair; head always uniformly blackish, brownish, or yellowish; body always with numerous minute blackish spots arranged longitudinally along subdorsal, dorso-lateral, suprastigmatal and pedal lines.

b. Head always black, thoracics legs with all segments blackish; telson blackish.

c. Subtelson blackish; area between uropods with minute colored spots; area ventrad of pedal folds with minute spots; latus of each segment with few very minute secondary setiferous spots besides regular tuberculate spots; on Crataegus, Y-194-3,194-2; on Prunus?, Y-194-5. ----------Hylotoma Sp. 1.

cc. Subtelson unmarked, whitish; area between uropods without minute colored spots; area ventrad of pedal folds without minute spots

latus of each segment without minute secondary setiferous spots ; on Alnus; Y-194-4. ----------Hylotoma Sp. 2.

bb. Head not always blackish, but usually yellowish or brown; thoracic legs not with all segments blackish, segments distad of coxa usually brownish or brownish yellow; telson not always blackish.

c. Head blackish; telson yellowish; subanal lobe yellowish; spots between uropods numerous and brownish; latus of each segment with many very minute secondary stigerous spots; tuberculate spots of body yellowish with brown border; on oak; Y-214-1-2-- ----------Hylotoma Sp. 3.

cc. Head yellowish or reddish brown; telson blackish; subanal lobe whitish.

d. Area ventrad of pedal folds with many minute setigerous spots; area between uropods sometimes with spots; spots on body not uniformly blackish or brownish, but blackish in cephalic and also usually in caudal portion of the body, those in middle portion brownish or yellowish with brown border, sometimes spots all pale yellowish brown; head reddish or yellowish brown; on Crataegus----------H. scapularis Klug(222)

dd. Area ventrad of pedal fold without spots; area between uropods never with spots; spots on body uniformly blackish or brownish; head yellowish or yellowish brown; on Elm; C-C.U.668, Y-29-24. ----------Hylotoma Sp. 4.

aa. Antennae button-like, usually wider than long; uropods on abdominal segments 2-7 and 10, eighth segment with rudimentary pair; head blackish, brownish, or with a distinct median streak from occiput to front; body sometimes not spotted exept on each side of the meson on cephalic segments.

b. Head blackish or brownish; body distinctly and regulary spotted ; telsonsand subnal lobe usually blackish; thoracic legs

usually with coxae blackish or brownish and other segments brownish or grayish.

c. Telson and subanal lobe withish; all colored areas or spots of body brownish; area between uropods with few setigerous spots ; area ventrad of pedal fold with many setigerous spots;on Salix discolor; C-Young,no.61------Hylotoma Sp. 5.

cc. Telson and subanal lobe blackish or brownish;all colored areas or spots blackish or brownish;area between uropods usually without setigerous spots;area ventrad of depal fold with varying number of spots;on Prunus; Y-1946-1, G-Onekama,no,23; Maine 1915; C-C.U.656, C.U.sub.64. ---Hylotoma Sp. 6.

bb. Head yellowish or light brownish with brown streak ~~down~~ along epicranial stem;body not regularly and distinctly spotted except along dorse-meson in cephalic segments;telson never blackish or brownish;thoracic legs always concolorous with body;on azelea; Y-185-1-2 - - - - - - - - - - Hylotoma sp. 7.

Schizocerinae

Larvae small;body subcylindrical,flattened on venter,tapering caudad,mesothoracic and metathoracic segments somewhat swollen,prothoracic distinctly tapering cephalad;whitish or creamy white,never spotted or striped;segmentation and annulation indistinct;third abdominal segment with three annulets,all annulets provided with a transverse row of tubercles;spiracles on annulet 1;tenth abdominal tergum without suranal or caudal protuberances;uropods on abdominal segments 2-8 and 10,the venter of ninth segment with a pair of minute protuberances;thoracic legs modified,prothoracic legs apparently four-segmented,distal segment pad-like,tarsal claws wanting;mesothoracic and metathoracic legs apparently three-segmented,distal segment pad-like with a sharp claw on cephalic side;antennae apparently single-segmented,segment large with several clear spots;antennaria ventrad of slightly caudad of ocularium;spiracles winged;glandubae obsolete. In younger specimens uropods sometimes very indistinct; tubercles often indistinct;leaf-miners capable of external feeding under certain condition.

The Schizocerinae is represented in the nearctic region by a single genus Schizocerus and includes a limited number of species. Modern systematists have always associated this subfamily with the Hylotominae,the two being separated by the presence of absence of the free part of Sc_2 in the front wing. The larvae of this subfamily is unique in having thoracic legs and maxillary and labial palpi modified by reduction in the number of segments.and

Schizocerus Lapeletier

Larvae small,creamy whitish;head small,pale brown,higher than wide,sparsely and microscopically setiferous;annulation 1,2,3; annulets above spiracular lines with tubercles,2 on annulet 1,four on

second, and three on third; venter of annulet 1 with a row of tubercles a row of tubercles between uropods and surpedal area; subspiracular area not tuberculate or warty; tenth abdominal tergum small, only slightly convex, tuberculesalmost obsolete, with several stiff short setae on caudal margin; venter of ultimate segment with distinct anal uropods, subanal lobe with a pair of long and short tubercles on each latero-caudal margin; maxillary palpi apparently three-segmented, distal segment very minute, formula 2, 1, 3; labial palpi apparently two-segmented; mandibles as viewed from side narrow and slender; totaglossa of labium large ; spiracles winged, wings small, oblong; spiracular line dividing the latus into two subequal dorso-ventral halves.

Schizocerus sabriskiei Ashmead

Head pale brownish green, body whitish; head in younger specimens brownish, body with minute tubercles touched with brown; legs and venter between legs brownish; tubercles ventrad of surpedal area and dorsad of uropods usually three in number in mature larvae and two in younger larvae; mature specimen, length 13 mm.; width of head 1.3 mm.; on Portulaca; Y, G.

Schizocerus sp. 1.

Larvae indistinguishable from the preceeding species. Collected at Muncie, Ill., by Dr. Edna Mosher and adults bred by her.

ACORDULECERINAE

Body subcylindrical, venter flattened thorax distinctly swollen, tapering caudad, segmentation distinct, annulation indistinct, third abdominal sement with apparently three annulets, all annulets tuberculate setiferous setigerous; thoracic legs 5-segmented, spreading prothoracid legs one-half as large as methathorace; distal segment consisting of sharp, recurved claw, and caudal memberanous globose swelling; urpods rudimentary on abdominal segments 2-7 and 10, increasing in size from cephalic pair to sixth pair; telson truncatae, small, without suranal processes; antennae flattened apparently 1-segmented; abdominal segments 2-4 or 2-5 and 8 with crescentric sucker-like protuberances, one on each postsubstigmatal protuberance; ventral glands wanting; spiracles not winged; glandubae wanting.

The Acordulecerinae, according to MacGillivray (1906) is represented by a single genus, Acordulecera, on the American continents. Rohwer would divide the subfamily into two tribes, Acordulecerini and Conocoxini, the former including besides Acordulecera, Pantherix and possibly Thulea and the latter Conocoxa and Nithulea. A radically different arrangement is that of Konow who would consider Acordulecera as one of fourteen genera included in his tribe Lobocerotides which was one of four tribes constituting his subfamily Lophyrini. Konow seems to have been unfamiliar with the nearctic genus Acordulecera for he speaks of the larvae of Lophyrini as "mit 16 Abdominalbeinen; an Coniferen." - a characterization not at all applicable to the genus under consideration. The host plant of two species of Acordulecera have been recorded, and one species recognized in the larval stage. I have examined larvae of several unidentified species.

Acordulecera Say

Larvae very small, greenish, never spotted or striped; head usually brownish or pale; annulation 3, (2, 1); prothorax constricted; annulets with transverse row of slight tubercles, each bearing slender, peg-like setae; lateral lobes distinct; tenth abdominal tergum with several setae; suranal and subanal lobes with several setae; maxillary palpi rather slender, uniformly tapering distad; mandible thick; labial palpi small; ligula dilated, rounded; free-living leaf-feeders; gregareous.

Species of Acordulecera

a. Sucker-like protuberances on abdominal segments 2-5 and 8.

b. Head with vertex blackish brown, front distinctly lighter in color; legs whitish, concolorous with body; tibial tendon light brown; sucker-like protuberance with three setae around the margin; length 9.5 mm.; width of head 1.2 mm.; on butternut; Y-8.93(?)-2-2.

.....Acordulecera sp. 1.

bb. Head with vertex light brown, epicranial stem deep brown, front sometimes deep brown; in young specimens head entirely dark brown; legs brown; tibial tendon distinct, light brown; sucker-like protuberances with three marginal setae; length 11mm.; width of head, 1.3 mm.; on chestnut and butternut; Y-93, C-cu667.....Acordulecera sp. 2.

aa. Sucker-like protuberances on abdominal segments 2-4 and 8.

b. Sucker-like protuberances with three marginal setae; on oak.

c. Head light brown with epicranial stem deep brown or brownish with vertical furrows lighter in color; legs brownish; tibial tendon brown; length 9 mm; width of head 1.2 mm.; Y-131, -137, C-cu680, M-37.....Acordulecera sp. 3.

cc. Head yellowish or light brown with epicranial stem concolorous with body;tibial tendon only faintly indicated;length 7 mm.;width of head 1.1 mm.;M-239,M-243,C-y11.

.....dorsalis Say.

bb. Sucker-like protuberances with five marginal setae;on hickory; head deep brown,vertical furrows and epicranial arms lighter in color;legs whitish,concolorous with body;tibial tendon only slightly indicated;length 9 mm.;width of head 1.2 mm.; Y-144-5.....~~maculata~~ musta MacGillivray.

Larvae small;body subcylindrical, thorax and two caudal segments distinctly swollen;segmentation distinct;annulation obsolete;creamy white,no markings;glabrous;thoracic legs rudimentary, fleshy mamma-like, without tarsal claws;uropods wanting;ultimate segment with distinct suranal prong, without subanal appendages;ocellarae wanting; mouth-parts modified;maxillary palpi apparently two segmented;antennae apparently with three segments;metaspiracle functionless, very much smaller than abdominal spiracles;cuticle on dorsum smooth, on venter microscopically, sharply and densely spinullate;wood-borers; telson with deep meso-dorsal depression.

The Xiphydriidae contains four genera,Derecyrta, Brachyxiphus, Xiphydria, and Konowia, which may may be divided into two groups on hte prsence or absence of the radial cross-vein in the wings. Systematists have generally considered this group as a subfamily of the Siricidae but MacGillivary(1906) has elevated it to its present standing on their venational characters which he has proven to be the most generalized of the specialized Tenthredioidea. Rohwer(1911) would divide the family into two subfamilies, Xiphyriinae and Derecyrtinae, the latter being monobasic. Of the four genera, two are represented in the nearctic fauna.

In a recent synopsis of the nearctic woodwasps, Rohwer(1918) tabulates that "it is possible that it is procancheri Cresson". Rohwer suggests that the specimens which Ptten(1878) reared from Betula nigra and considered to be X. attenuata Norton does not belong to this species but is similar to an undescribed female bearing a Bradley manuscript name. Nothing is known concerning the immature stages of Konowia basalis Say. The larvae of Xiphydria are wood-borers and confine their attacks to dead and decaying wood of deciduous trees.

Eupopian species infest willows, poplar, elm, and brich and American species maple, hickory and birch. Know(1901) listed four siecies, Xiphydria prolongata, X. camalus, X. longicollis, and X. abdominalis in his table for the larvae of Tenthredinoidea.

Xiphydria Fallen.

Larvae small; Thorax distinctly swollen, metathorax being the largest segment of the body; abdorminal segments 1-8 cylindrical, subequal in diameter to each other; third abdorminal segment with single annulet; two caudal segments somewhat globose; pleural lobe moderately large, extending the entire length if the segment; suranal prong comraratively long, with dentiform tubercles near the base; tenth abdorminal sternum much smaller than the tergum; head and ultimate segment with long setae; head semiglobose, vertical furrows present; epicranial suture in part indistinct; antennariae distinct; antennae thr three-segmented, segments 1 and 2 ring-loke, segment 3 conical, longer but much narrower in diameter than the preceeding segments; labium very small, without median emargination; mandibles with distinct dentes; maxillae modified, palpi apparently with two segments, small, galea conical, smaller than palpi, lacinia fleshy tubercle-like, with several setae; labium with submentum and mentum large, convex, membranous, palpi apparently with three segments, small, median lobe large, flattened on venter, suboblong; spiracles large, oblique, not winged; glandubae wnating.

Xiphydria provencheri Cresson.

Length 12 mm.;width of head 1.6 mm.; body yellowish white; head creamy white; mouth-parts brownish; suranal process arising from large brownish suranal lobe strongly chitinized, deep brown, more than twice as long as wide at proximal end, distal two-thirds suddenly and distinctly smaller in diameter than proximal third, with two circular

rows of dentiform tubercles and setae in the proximal third and two distinct ventral dentiform tubercles in the distal third, one after the other, these without setae; on birch.

Described from a rare specimen collected at Saranac Inn, New York, Aug. 20, 1900, and generously loaned by Dr. E. P. Felt. The larvae bore into partly decayed heartwood of standing birch and make a gallery about 2.5 mm. in diameter. The burrows are invariably filled with the borings, except a short curved portion thru which the adult makes its way to the surface. A parasite, Pammegischia Xiphydriae A Ashmead, was reared by Dr. Felt from the larvae.

Dr. Felt(1906) also found another larva making moderately large cylindrical burrows in decaying birch and considered it as probably belonging to X. attenuata. He refers to the rearing of this species by Patton and suggests Rhyssa humida Say as its parasite. Since the idintity of Patton's specimen is questioned and since the adult was apparently not reared, it is not possible to identify the specimen under consideration. If it were really X. attenuata, then it should be known as X. abdominalis as proposed by Konow(1905) and Rohwer (1918).

Siricidae

Body cylindrical, uniform in diameter thuout telson; rubust;large 30-40 mm.;fleshy, plump;integument smooth, transparent;non-setaceous; light in color;head circular;half as high as thorax;mouth directed ventrad;mostly exposed, but slightly overlapped by prothorax;antennae inconspicuous,apparenly one-segmented;ocellarae wanting;epicranial suture wanting and vertical furrow indistinct;mouth-parts not normal in form;light in color;prothorax large;mesothorax and metathorax short in length in comparison with abdominal sements;legs rudimentary, mamma-like, subequal in size, borne on fleshy conical lobe;uropods wanting;typical segment with two indistinct annulets, pleural fold distinct but not prominent;tenth segment semiglobose in profile;tenth tergite distinctly depressed by a median furrow;suranal lobe on the meson with dark colored, chitinized, anal prong;anal appendages wanting;internal-feeder,bores in the trunk of deciduous and evergreen trees.

The Siricidae contains five genera and about fifty species most of which are confined to the Northern Hemisphere. The recognition of the fact that these insects constitute a well-circumscribed group dates back to the time of Linnaeus(1758) who described five species of Siricidae among those of his heterogeous genus Ichneumon, three of which have become the type of three modern genera. Systematists have universally agreed in considering this group worthy of family rank. The family falls into two natural divisions,Siricinae including three genera,Sirex,Uroceraus,and Xeris,and Tremecinae embracing two genera, Tremex and Terdon. The genus Xeris was associated with those genera conposing the Tremecinae both by Ashmead(1898) and Konow(1905) but Rohwer(1911) proposed a more natural arrangement by placing this genus in the Siricinae. Bradley(1913) definitely divided the two groups on the nimber of segments of labial palpi and in the retention of

cerci in the adults.

According to Bradley(1913) there are twenty species repeted from North America representing all the known genera. The specific characters of some common species, as Sirex nigricornis, Urocerus cressoni, and Thremex columba, are subject to a wide range of variation and several varieties have been described. So far as known the larvae of Siricinae are wood-borers attacking conifers and those of the Tremecinae deciduous trees. Tremex columba or three races of this species which infest maple,elm, apple, pear,beech,oak,and sycamore are the best known examples. The food plants of only three American species are known, including Sirex cyaneus and Urocerus albicornis. Larvae of the Siricinae have not been examined.

Tremex Jurine

Body cylindrical, slightly flattened ventrally;large;robust; whitish or creamy;setae microscopic, usually bare except on head and tenth abdominal segment;head semiglobose,slightly wider than high in cephalic aspect,semicircular profile, produced to the ventral half of the front, then suddenly truncated;pale brownish; mandibles and coilae deep brown;antenna apparently one-segmented, conical;antacoria partly chitinized and bears few small setae;ocellarae wanting,depression mesad of antennaria which is sometimes called the "eye" is a pretentorina;vertical furrows concealed by overhanging prothorax;clypeus small, light in color;labrum transverse,convex, thick,asymetrical, without median emargination, but with a notch at the right third of slightly oblique cephalic margin;mandibles strong;mandacuta distinct, brown;mandibularia narrow, inconspicuous;maxilla fleshy except subgalea;stipes large;palpi two-segmented, small; galea conical,brown, small, arising from broad shoulder which bears a few tiny setae on the lateral portion;lacinia round,lobe-like, bears three rows of brown setae, which decrease in length on cephalic or dorsal side;labium

compact;submentum narrow,transverse,membranous,mentum convex,lobe-like, deeply emerginate on cephalic margin,ligula round,fits in the emargination of mentum,palpi small,two-segmented,second segment much smaller than first segment,conical and brown, seracos large,transverse, distinct,crescentic;prothorax large, produced dorsad and cephalad,overlapping the caudal third of the head;mesothorax and metathoracic segments about one-half the length of abdominal segments except the first abdominal which is only little longer than the metathorax;thoracic legs rudimentary,mamma-like, shallow,tipped with tiny chitinized spot, borne on fleshy conical pedal lobe;cervical sclerites wanting; with transverse subtriangular lobes which meet on the meson in front of mediam lobe between and slightly cephalad of prothoracic legs. Metaspiracle as large as abdominal spiracle.

Abdomen the slightly and uniformly tapering to the acudal end, annulation indistinct on dorsum,apparently with one annulet,on the venter with two annulets; second annulet larger than first annulet; pleural fold and pedal lobe prominent,extending the entire length of segment as a united oblique elevation;spiracles large, brown; metaspiracle nearly as large as abdominal;nineth abdominal segment a little shorter than the eighth;tenth tergite convex,lateral area of suranal lobe broad, suranal prong prominent,deep brownish,strongly chitinized,compressed,with two pairs of small but distinct teeth.

The foregoing definition of the genus is based on one species, T. Columba.

Tremex columba Linnaeus

Length 40 mm.;width of head 4 mm.;ultimate segment with setae as follows;tergite near the caudal margin on each side of the median furrow with a small,brown,sharp,hook-like spine,with tiny setae which arises from large calices;ventral side of suranal lobe with such setae ;tenth sternite small;a small brown spot at the lateral end of anal slit;subnal lobe non-setaceous;subanal appendages wanting; I-8396; G-

The eggs of the pigeon tremex are oblong oval,pointed at both ends,about 1.2 mm. in length;oviposited singly but in limited area close to each other,so larvae appear sometimes subgregareous; oviposition takes place in early summer,female sometimes fail to withdraw ovipositor and dies in situ;larvae on hatching in the wood make a gallery and feed for probably one season;transformation takes place in the burrow;adults emerge thu circular hole,about 8 mm.in diameter. The larvae are parasitized by Thalessa lunator and Fabricius.

Felt(1906) suggests, as remedial measure against this insect, to cut and burn all trees badly infested. Keeping the trees in vigorous health is supposed to be sufficient to prevent the injury as the larvae work only in weakened or partly decaying wood.

Megalodontidae

Antennae long, conspicuous, miltisegmented, located above or near theocellarae; uropods wanting;last abdominal segment rounded, with a pair of bristle-like segmented subanal appendages; larvae feeds on herbaceous plants.

The Magalodontidae contains four genera, Rhipidioceros, Megalodontes, Melanopus, and Tristactus ~~are~~ about thirty-five species which are distributed in Europe, Asia and North Africa.Systematists have invariably associated this family with the Pamphiliidae but that this position is unnatural has been conclusively shown by MacGillivray. He has pointed out that it representes a line of specialization very similar to that found in the Siricidae and that altho it is more closely related to this family than to any, there is an abundance of characters for considering it as a distinct group.

Only one species, Meglodontes spissicornis(Klug), has been recognized in the larval stage. The larvae, according to Hiendlmayr (1878), are found on Lasperpitium latifolium L. in central Europe from the end of July to the beginning of August. In the younger stages, they are gregareous and live in a common nest but they spin individual web when half-grown. There is one generation a year.

This onteresting species was not available for study and the definition given above is abstructed from Konow(1901) and may be found by later studies of little value in defining the family. This family, so far as the recorded larval characters are concerned, seems to be closely associated with the Pamphiliidae in possessing the bristle-like cerci and long conspicuous antennae. Future observations, however, may possibly reveal more ~~and~~ important characters not given in brief synopsis of Konow.

Cephidae

Body cylindrical, sometimes slightly depressed, enlarged at thorax slightly and uniformly tapering caudad, slender or moderately stout; segmentation usually distinct; annulation sometimes indistinct; cuticle smooth or verrucose, microscopically and very sparsely setiferous; color generally pale or creamy white, never distinctly brightly marked; head circular in contour, semiglobose, moderately large, narrower than thorax, caudal portion concealed by prothorax, pale brown or concolorous with body, sparsely setiferous; mouth-parts directed ventrad, normal in form, brownish; antennae with four or five segments, conical; ocellariae small, without ocularia, less than one-fifth the diameter of antennaria and located latero-caudad of it; epicranial suture and vertical furrows present; mesothorax distinctly and metathorax somewhat with dorsal and lateral aspects swollen; thoracic legs vestigial, fleshy, mamma-like, indistinctly segmented, tarsal claws wanting; third abdominal segment with two or three annulets, sometimes indistinct, on venter with three annulets; uropods wanting, sometimes with slight swellings in normal position of uropods; lateral lobes prominent, extending the entire length of the segment; tergum of ultimate segment with mesal longitudinal broad depression and distinct suranal process; sternum of ultimate segment with a pair of minute, inconspicuous, vestigial, papilliform subanal appendages ventrad of the cephalic end of the anal slit; internal feeders, boring into the stem of monocotyledonous and herbaceous plants and bushes; pupation in tunnels in the host plants.

The Cephidae contains about fourteen genera and is moderately rich in number of species which are sometimes of intercontinental distribution. Nine genera are represented in North America. Practically all systematists have considered this group as a distinct

aggregate worthy of family rank. Rohwer(1911), however, has expressed the opinion that future studies may possibly make it advisable to unite this group with the Xyelidae and to treat each of them as subfamilies. There have so far no facts or reasons brought to light which call for such a step. On the other hand, MacGillivray's study has emphasized the fact that "so far as the wings are concerned, they are the most distinct of any group of the Tenthredinoidea, and are only indirectly related to any of the other families." They are generalized in the maner of the origin of media but are specialized in other features of the wings. On the basis of larval characters this family is related to the Pamphiliidae and is quite unrelated to the Xyelidae.

The systematic position of the osculant genus Syntexis is unsettled. In the original description, Rohwer(1915) stated that this genus has affinities with both the Cephidae and Xiphydriidae and on the basis of venation, it probably belongs to the latter as defined by MacGillivray. Certain features other than venation, however, led Rohwer to place it in the former. It is not safe to venture any opinion without careful examination of the larvae but the antennae and lack of papilliform subanal appendages in the larvae suggest close affinity with the Xiphydriidae.

At least six out of sixteen American species have been recognized in the larval stages and their host plants recorded. Janus integer and Cephus cinctus are economic pests. Konow's tribe Macrocephides includes the species the larvae of which bore into the pith of shrubs and woody twigs and his tribe Cephides embraces those whose larvae bore into the stalks of Graminaceae.

Descriptions and tables for distinguishing the larvae of five species representing four genera, Adirus, Janus, Cephus, and Hartigia

together with a definition of the groups on "characters common to all the genera studied and probably to the family" were published by Middleton(1917). He reserved for future discussion the question of systematic position of the Cephidae but pointed out the obvious affinity of this group with the Siricidae on one hand and the Pamphiliidae on the other.

Genera of Cephidae

a. Papilliform subanal appendages present on the ultimate segment.

b. Antennae with five segments;dentiform tubercles at the proximal end of the suranal process present,distal chitinized portion of suranal process depressed,oval in cross-section .... Janus Stephens.

bb. Antennae with four segments;dentiform tubercles at the proximal end of the suranal process wanting or present; distal chitinized portion of suranal process not depressed, circular in cross-section.

c. Suranal process proximad of distal cylindrical portion with strongly chitinized dentiform tubercles. .....Adirus Konow.

cc. Suranal process proximad of distal cylindrical portion without strongly chitinized dentiform tubercles.

d. Suranal process only a little longer than wide at the proximal end,with a single whorl of setae near the distal constriction of process... ... .Cephus Latreille.

dd. Suranal process more than twice as long as wide at the proximal end,with more than a single whorl of setae near the distal constriction of process. ....Hartigia Schiodte.

aa. Papilliform subanal appendages wanting on the ultimate segment.

. .....Syntexis Rohwer.

Should Cephus prove to possess five-segmented antennae as reported by Middleton, this genus can be readily separated from Janus by the fact that the former lacks dentiform tubercles around the base of the suranal process and the distal chitinized portion is circular in cross-section.

Janus Stephens

Antennae with five segments; segments 1 and 2 short, ring-like, segment 3 longer but half as wide in diameter as segment 1, segment 4 cylindrical, longer than wide, segment 5 elongate-conical, twice as long as wide, subequal in length or shorter than segment 4; suranal process short, strongly chitinized, nearly as long as wide at proximal end, dentiform tubercles with circular rows of stiff setae on the proximal half, distal half small, depressed, narrowly oblong in cross-section; subanal appendages peg-like, with a minute seta at the distal end, apparently segmented, without setae near the proximal end, lateral area of suranal lobe with 2-3 setae; mandibles with four dentes.

The two known species can be separated as follows:-

a. Subanal appendages distinctly two-segmented, segment 1 ring-like, much larger in diameter than segment 2; antennae with segment 5 about one-half as long as segment 4; bores in Salix, ...abbreviatus Say.

aa. Subanal appendages indistinctly two-segmented, segment subequal in diameter; antennae with segment 5 subequal in length or only slightly shorter than segment 4; bores in Current. .....integer Norton.

Adirus Konow

Antennae with four segments, segment 4 long, peg-like, nearly three times as long as wide, twice as long as segment 3, bluntly pointed; suranal process large, distal one-fourth strongly chitinized, suddenly narrowed and circular in cross-section; with chitinized dentiform tubercles; subanl appendages peg-like, fleshy, apparently unsegmented, with attending setae near the proximal end, these setae are separated from the remainder of the setae on the sternum; lateral area of suranal lobe with 20-28 setae.

Adirus trimaculatus Say

Middleton has described the larvae in detail. It bores in the stems of blackberry and rose. I have examined one mature and two young damaged specimens thru the coutesy of Dr. E.P. Felt, specimens from New York State Museum, labeled "a 2766" and "a 2261".

Cephus Latreille

Antennae with four, according to Middleton 5, segments, segment 4 less than twice as long as wide, abdominal segments 5-8 with ventral swellings corresponding in position to uropods; suranal process without chitinized dentiform tubercles with a single whorl of spinous setae proximad of distal constriction; subanal appendages papilla-like cylindrical, more than twice as long as wide, bluntly rounded at the distal end, with one or more setae near the proximal end; lateral area of suranal lobe with 7-15 setae; mandibles tridentate.

According to Rohwer (1917) only two species of this genus are known to occur in North America. They can be separated as follows:-

a. Subanal appendages with a single, rarely two, attending seta on the cephalic side; lateral area of suranal lobe typically with seven setae, introduced from Europe; bores in wheat.

.....pygmaeus Linnaeus.

aa. Subanal appendages with several attending setae; lateral area of suranal lobe with about 15 setae; only true nearctic species known; borers in stalks of Elymus, Agropyron, Phleum, and Wheat.

.....cinctus Norton.

Hartigia Schiödte

Antennae with four segments, segment 4 longer than segment 3, elongate, conical; suranal process twice as long as wide at proximal end, without dentiform tubercles, with several whorls of spinous setae; subanal appendages two-segmented, sometimes indistinctly, with attending setae separated from the remainder of setae on the sternum of ultimate segment; lateral area of suranal lobe with 15-20 setae.

Hartigia cressoni Kirby

The larvae of this species have been described in detail by Middleton. They bore in the stem of Rubus in California. The generic definition given above was based upon specimens obtained thru the courtesy of Mr. Harry S. Smith of Sacramento, Cal. and does not quite agree with that given by Middleton.

Oryssidae

Body eruciform, grub-like, subcylindrical, slightly depressed, swollen in the middle of the abdomen, tapering at each end; segmentation distinct; annulation obsolete; creamy white, without colored markings; spiracles on prothorax and first eight abdominal segments; thorax increasing in size caudad, thoracic legs obsolete; uropods wanting; fourth abdominal segment largest in diameter, size of segments decreasing rapidly caudad, last segment smallest; suranal process and subanal appendages wanting; head white, compressed cephalo-caudad, circular in frontal contour, narrower than thorax; antennae with a single segment, papilla-like; mandibles tridentate; maxillae and labium vestigial, fleshy, lobe-like, without palpi; ocellarae wanting; larvae parasitic on wood-boring larvae of Coleoptera; pupation in the pupal cells of the hosts.

The Oryssidae contain six genera and a limited number of species distributed thruout the world. The genus Oryssus alone is represented in the nearctic region. In former years the family has been associated with the Siricidae but recently writers are in accord in regarding it as an extremely specialized compact group. MacGillivray(1906) came to the conclusion that "so far as their wings are concerned the presence of the second anal cell in the front wings is the only structure that would place the genus Oryssus in the superfamily Tenthredinoidea." The group is not only highly specialized in the adult characters but a recent discovery of the parasitic habit of the larvae sets off these Hymenoptera from all other Tenthredinoidea as an unique class by themselves. In fact Rohwer and Cushman(1917) have gone so far as to propose a new suborder, Idiogastra, placing it " intermediate between the suborder Chalastogastra--where adult would place it--and the suborder Clistogastra--with which the larva

would ally it." Whether this arrangement is acceptable or not, the fact that this group is extremely well circumscribed and that it represents the summit of an extremely isolated line of specialization in the Tenthredinoidea can not be doubted.

Only one species, Oryssus occidentalis Cresson, has been recognized in the immature stages. The definitions given here have been based on the descriptions and figures of this species published by Rohwer and Cushman(1917). It is quite possible that future studies may prove them inadequate for the larvae of other genera and species yet to be discovered.

Oryssus Latrielle

Epicranial suture faint, arms obsolete; clypeus crescentic, narrow; fronto-clypeal and clypeo-labral sutures distinct; labrum more than twice as wide as long, with shallow mesal emargination; antennaria distinctly elevated, antacoria extensive, mound-like; antennae small, mamma-like; mandibles strongly chitinized, curved, narrow mesal dentis larger than lateral dentes, these subequal in size, sharp, maxillae fleshy, subtriangular, unsegmented lobes; annulation on dorsum indistinctly two, on venter one; lateral lobes distinct, extending the entire length of segments; spiracles visible from dorsal aspect; segments transversely raised and with a few minute tubercles.

Oryssus occidentalis Cresson

Color white with mandibles and chitinized ridges near mouth brown; head one-third as wide as the widest segment of the body, fourth abdominal segment; maxillae with minute brownish spots bearing about three sensory papillae; labium with about four stout setae on each side of meson; prothorax declivous toward the head, forming straight line with the latter in profile, subequal in length on dorsum with mesothorax; metathorax half as long as mesothorax; abdominal segments

in length in order of 8,(1,9),(2,7),(4,6),5,10 on dorsum,(6,7,8),5,1, 3,(2,4),9,10 on venter,8,7,4,(1,2,5,6),3,9,10 on latus;tenth abdominal segment one-fourth as wide and one-third as high as the fourth and sixth segment respectively;dorso-cephalic margin of mesothoracic and eighth abdominal segments distinctly and of metathoracic and abdominal segments 5,6,7,9,10 slightly convex,and of abdominal segment 2 and 3 concave;vento-cephalic margin of abdominal segments 1,6,7,8 distinctly and of 2 and 9 slightly concave,of 3,4,and 5 convex,of 1 and 6 with a distinct convex emargination on each side of meson; abdominal segments with the distance from spiracles to dorsal surface uniform in profile,and much shorter than the distance to the ventral surface,the latter variable and increasing caudad to the sixth segment and diminishing thereafter; "each thoracic and abdominal segment has dorsally at each side of the middle a low,transverse elevation surmounted by a transverse row of four or five short,stout,back pointing spines";setiferous elevations on abdominal segments 1-7 and 9 and metathorax near the caudal margin of the segments,those of prothoracic and mesothoracic and eighth abdominal segments in the middle;tenth abdominal segment with small pointed protuberances directed caudad;venter of segments with brownish spots in normal positions of legs;larvae parasitic on the larvae of Buprestis confluens Say,B.laeventris Leconta,and possibly other species of Buprestidae.

IV. Phylogenetic

A classification based on phylogeny is one of the essential concerns of philosophical taxonomy. In order to ascertain the genetic relationship of organisms synthetic as well as analytic consideration of evidence drawn from all the branches of biological sciences is imperative. The indissoluble relation of morphology, embryology, and paleontology to taxonomy is so manifest and familiar than no comments are needed. The time has come, however, when a critical examination of the phylogenetic significance and the taxonomic value of the physiological and biological attributes of animals must be made. Whatever evidence comparative physiology, biochemistry, and genetics may offer should be incorporated as far as possible with the data obtained in other more commonly exploited fields of research. Only in this way is it possible to arrive at the comprehensive, systematic and complete summation of knowledge of animals. This is the primary function of philosophical taxonomy and in this sense W.S.Jevons' saying that "science can extend only so far as the power of accurate classification extend," is true.

There are reasons to believe, however, that even to day morphology, still as of old, holds its supreme place in systematic investigations as it offers fundamental assistance in determining the genetic affinities of organisms. The success of such a study of phylogeny based on morphological evidence depends on the ability of the investigator to select the proper structures, to determine the direction and nature of changes undergone by these structures, and to draw legitimate conclusions by judicious interpretation from the facts observed. Data obtained from studies of the external anatomy of the larval stages of entometabolous insects are of necessity incomplete of themselves for determining the phylogeny of the group.

Yet, in the absence of other means of approach to the problem, they constitute essential facts significant enough to merit careful consideration.

The opinions of scientists in regard to the systematic importance of the characters based upon the immature stages of Entometabola have been divided. There are some who ascribe no importance whatsoever and neglect this phase of taxonomy entirely. There are others who recognize the importance of the larvae from the viewpoint of synoptic classification as they are primarily interested in the practical purpose of synoptic descriptions and keys. There are still others who believe in the intrinsic importance of the immature stages in the study of phylogeny. The reasonableness of the oft-repeated objection which was voiced by Comstock(1918) recently that the larvae of insects exhibit a cenogenetic development and, therefore, their ontogeny bears little or no relation to the phylogeny of the race must be admitted in regard to certain structures which are entirely too adaptive and modified by environmental factors in meeting the trophic requirements of particular species or genera. But admission of this fact is not incompatible with a belief in palingesis of other structures. Besides the warning that the cenogenetic peculiarities may be of value as distinguishing characters are of no phylogenetic significance and therefore they must be judiciously and discriminatly distinguished from more important palingenetic characters applies not only in the classification of the larvae but in taxonomy of the adults as well. This objection alone does not invalidate belief in the intrincic importance of the immature stages from the phylogenetic point of view. While the writer does not minimize the danger of a too confidential expectation of finding phylogenetic indices in the successive ontogenetic stages in entometabolous

insects, yet he is equally reluctant to give up entirely the hope in regard to the taxonomic value of the imature insects. The present study is a partial justification of his contention.

The students of the Tenthredinoidea have recognized the practical importance of the larvae in determining the systematic position of different taxonomic units. Norton(1867) stated that "Mr. Walsh has shown that in some species of Euura and Nematusabred by him, it was almost impossible to detect any difference in the imago, while the larvae varied greatly. Doubtless our opinion will be greatly modified by future discoveries." Cameron(1882)was of the opinion that the larvae are of great value in differentiating the tribes and subtribes altho they appear to be of little use in regard to the genera. MacGillivray(1913) goes further and states that "it was hoped from a study of the immature stages of the Tenthredinoidea that some information might be obtained as to the validity of the species based on obscure anatomical details." Rohwer also often used the characters of the larvae as collateral evidences in deciding the systematic position of certain subfamilies and genera.

Nothing definite is known in regard to the ancestors of the Hymenoptera beyond the probability that they have somehow arisen from a primitive type of some neuropteroid-like Palaeodictyptera. The order is considered to be one of the most highly specialized of all insects. Systematists are unanimous in regarding the Tenthredinoidea as the most generalized of the Hymenoptera. It is difficult, if not impossible, to conjecture the primitive larval type of the Tenthredinoidea. Judging, however, from what are universally considered to be generalized conditions in insects in general and in the Tenthredinoidea in particular, the probable ancestral type of the larvae may be characterized as follows: body cylindrical; segmenta-

tion distict;annulation indistinct with a few annulets;head exposed, subglobose,distinct from the trunk;thorax and abdomen more or less similar in structure excepting the three pairs of thoracic legs which are well developped and with five segments,tarsal claws distinct; abdomen with twelve segments including the telson;uropods present on abdominal segments 1-10;antennae long,with several segments;ocellarae present,one on each side of head;mouth-parts well developed,with segmented maxillary and labial palpi;tenth abdominal tergum without caudal protuberances or suranal process;eleventh abdominal sternum with a pair of segmented subanal appendages;with ten pairs of functional spiracles including metaspiracles;larvae free leaf-feeders.

There are,as was pointed out by Comstock(1893) two kinds of characters of phylogenetic importance. "First,charcters indicating difference in kind of specialization;and second,characters indicating difference in degree of specialization of the same kind. The former will indicate dicotomous divisions of line of descent;the latter merely indicate degrees of divergence from a primitive type."

In determining the probable genetic affinities of the families of the Tenthredinoidea,the following structures have been taken into consideration:thoracic legs,uropods,subanal appendages,ocellarae, antennae,mouth-parts,suranal process,and metathoracic spiracles. The list does not by any means exhaust the structures which might be employed for this purpose but it is believed that the structures listed offer the most reliable and essential basis for the determination of a phylogeny based upon larval characters. The significant changes in these structures are:addition or reduction of parts;difference in degrees of development of existing parts;and modifications in length,size,shape,and degree of chitinization of the parts. These modifications have been interpreted according to the

Comstockian principles quoted above.

The thoracic legs are one of the most persistent structures in the adult and larval stages of insects in general. Their absence is unquestionablly an indication of specialization by reduction. It is likewise reasonable to assume that any modification in the form or in number of segments from the typical, simple, cylindrical, five-segmented condition are signs of speciallization. The legs of the larvae of the Pamphiliidae approximate most closely to the primitive condition in the number, shape, and structure of the segments. The tarsal claw is straight and very slender. In the Xyelidae the legs assume a condition different from that of the Pamphiliidae. The differentiataion of segments in size and shape has proceeded further and the tarsal claws have become distinctly claw-like. The legs are very small in comparison to the size of the body. The Tenthredinidae present a series of conditions which illustrate well cases of modification both by reduction and addition. The typical, well developed, five-segmented legs undoubtedly represent the normal sequence in development from the condition found in the Xyelidae. The apparently six-segmented condition of the Hylotominae, four-segmented legs of the Fenusinae, and three-segmented condition of the Schizocerinae, together with the developemnt of distal fleshy lobes in the first and last subfamilies are cases of specialization. The fact that the specialization by reduction of segments has not proceeded at the same rate in the last two subfamilies is indicated by the difference in the structure of the segments. It is interesting to note that the prothoracic legs of the Schizocerinae still retain four segments in spite of the fact that in the two caudal pairs the number of segments has been reduced to three. The osculant genus Phlebatrophia is unique among all other Tenthredinidae in possessing the legs

modified to such an extent as to lose all resembrance to normal segmented legs. They have become mere fleshy, indistinctly segmented, clawless protuberances. In this character this genus resembles the highly specialized families such as the Cephidae and its allies. The Cephidae, Xiphydriidae, ad Siricidae represent another series of modifications in which the changes have resulted in fleshy, vestigial, entirely clawless legs with or without indication of segmentation. Judging from the size and degree of segmentation, the Xiphydriidae is more generalized than the Siricidae and more specialized than the Cephidae. The Oryssidae is entirely apodous and the fact that it is parasitic on the buprestid larvae leaves no doubt as to its extreme specialization.

The uropods are considered as true appendages of the abdominal segments. Their presence is highly significant from a phylogenetic point of view. The larvae of the Tenthredinoidea are divisible into two types according to the presence or absence of the uropods. The Xyelidae and Tenthredinidae represent one type with polypodous larvae and the other five families represent the other type with apodous larvae. In the first group the Xyelidae possess the maximum number or ten pairs of uropods while the Tenthredinidae are provided with six to eight pairs excepting certain specialized genera which possess very vestigial or no uropods. It has not been possible to determine the reason for the invariable absence of uropods upon the first and ninth uromeres in the Tenthredinidae. It may be that the same mechanical factors which have caused the fusion of anal uropods in boring larvae like Caulocampus are also responsible for this condition. The size and, to some extent, the structure and position of the uropods vary within the Tenthredinidae as in the Schizocerinae Hylotominae, and Fenusinae. It is interesting to note that the gall-

making genus, Pontania, retains normal uropods as well as thoracic legs while the leaf-miners have both thoracic and abdominal legs reduced in number and size of the segments. The small size and reduced number of segments are correlated with the well developed thoracic legs of the Hylotominae. In this subfamily the claws are very large, sharply curved, and provided with empodia-like distal structures, indicating a great adaptation for clinging to the leaves that is sufficeient to account for the reduction of the uropods. The Pamphiliidae and four ~~other~~ specialized families in the same line of development are entirely without uropods. It is highly desirable to determine whether this apodous condition signifies a common origin of all five families or not. Upon this question hinges much of the interpretation of the phylogeny of the Tenthredinoidea.

In characterizing the larvae of the hypothetical primodial Tenthredinoidea the abdomen was considered as if provided with the maximum number of appendages, including ten pairs of uropods and a pair of subanal appendages. This assumption is based upon the fundamental fact that the progenitor of insects having evolved from a typical arthropodan organism possessed the typically arthropodan character, abdominal appendages. This assumption is justifiable because, first, the possession of appendages on all of the abdominal segments is a fundamental arthropodan characteristic; second, the embryos of practically all insects exhibit at some time during ~~its~~ their development rudiments of abdominal appendages; third, appendages are present on all or some of the abdominal segments in the postembryonic stages of the Apterygota; fourth, the gonapophyses of the Exometabola represent the true abdominal appendages in this group of insects; fifth, the uropods and other appendages are present in the larvae of the Mecoptera, Lepidoptera, generalized Hymenoptera, and possibly some

others;thus indicating the wide occurance and fundamental continuity of ~~the~~ abdominal appendages in the Hexapoda. It is,therefore,not unreasonable to assume that the progenitor of ~~the~~ insects at least in some stage of its development possessed appendages on all of the abdominal segments. The same argument supports the contention that the ancestors of the Hymenoptera undoubtedly closely resembled the ancestors of insects. The larvae of the progenitor of the Hymenoptera for this reason,are considered as being provided with the maximum number or ten pairs of uropods,a pair on each of the first ten abdominal segmets and a pair of subanal appendages on the eleventh abdominal segment. If this assumption is true,the larvae of the Xyelidae,which possess ten pairs of uropods,must be considered as representing the most primitive condition found in the Hymenoptera. Graber(1890) has shown that in the larvae of Hylotoma the uropods arise from the embryonic limb rudiments and are directly transformed from them during the development and,therefore,the uropods are the true appendages of the abdomen homodynamous with the thoracic legs and homologous with the abdominal appendages of generalized insects. There is no reason for considering the uropods of the Xyelidae embryologically and morphologically different from those of Hylotoma. Therefore,the uropods of the Xyelidae must be the true appendages of the abdomen,and since the larvae of this family are provided with the maximum number of uropods,they must be considered as the most generalized of the Tenthredinoidea. The Tenthredinidae with six to eight pairs of uropods together with other morphological and biological characters is unquestionablly related to the Xyelidae and probably represents a line of evoloution fron a xyelid-like ancestral stock. Among the Tenthredinoidea with apodous larvae,the Pamphiliidae with a pair of segmented subanal appendages is undoubtedly the most

generalized of all five families. The origin of the Pamphiliidae is consequently an important question. For the reasons already stated in connection with the uropods, the progenitor of the Hymenoptera has been considered as possessing a pair of subanal appendages on the caudal segment of the body. In this character as well as all others the Pamphiliidae simulate the primitive condition most closely and, except for the uropods, this family ~~is~~ unquestionably represents the most generalized condition found in the Tenthredinoidea, including Xyelidae. The loss of uropods is just as difficult to explain in this case as the loss of subanal appendages in the case of the Xyelidae. These structures, the uropods and subanal appendages, must have been lost during the course of phylogeny since the progenitor undoubtedly possessed both of these structures and these two families, in spite of their generalized condition, must represent the end products of evolution in their particular lines. It is then natural and proper to assume that there have taken place two distinct lines of development from the ancestral type of the Hymenoptera. In the one, the specialization was in the suppression of the development of uropods as in the Pamphiliidae and the other in the suppression of the development of subanal appendages as in the Xyelidae. These two families, then, represent two independent lines of evolution and are ~~most~~ the most generalized families not only of the Tenthredinoidea but of the Hymenoptera. The question as to whether the Xyelidae is more generalized than the Pamphiliidae or vice versa must from the very nature of the case remain, at least for the present stage of the advancement of our knowledge, unanswered. There are, however, a few things that should be pointed out regaring this question. If the suppression of the development of uropods is considered of equal phylogenetic significance with the suppresion of the development of the subanal

appendages and if the head and its appendages of the two families alone are compared there is no doubt that the Pamphiliidae are more generalized than Xyelidae. But since the subanal appendages are true abdominal appendages homodynamous with the uropods and since it is natural to consider that the process of reduction has taken place gradually by gradual suppression of the appendages, it is not unreasonable to assume that the apodous condition found in the Pamphiliidae represent a much later stage of specialization than the condition of polypodous larvae of the Xyelidae. The biology of the Pamphiliidae also points out that this family is perhaps more specialized than the Xyelidae. However these considerations counterbalance each other and after all it is difficult to assign any definite position between the two families in regard to the degree of specialization. This somewhat drawn-out discussion leads to the conclusions that, first, the progenitor of the Hymenoptera possessed a pair of uropods on each of the first ten abdominal segments and a pair of segmented appendages on the eleventh segment; that, second, the progenitor gave rise to distinct stocks which resulted in the production of larvae with uropods in one case and with subanal appendages in the other; that, third, the Xyelidae represents the former line of evolution and the Pamphiliidae the latter; that, fourth, the question as to whether the Pamphiliidae is more generalized than the Xyelidae or vice versa is by its nature unanswerable. To the above conclusions it may be added that it is only natural and reasonable to consider the Tenthredinidae as representing the further evolution of the primitive stock from which the Xyelidae had evolved and the Cephidae, Xiphydriidae, Siricidae, and Oryssidae in turn as evolving from the original stock which gave rise to the Pamphiliidae.

The subanal appendages are present only in the Pamphiliidae and Cephidae. In the former they are rather long, setaceous, well developed, distinctly three-segmented, and in the latter they are minute vestigial, often fleshy, papilla-like, and indistinctly segmented. Since the embryonic history of these appendages has not been studied, the true nature of these structures is not known but there is but little doubt that they are true appendages. If they represent the appendages of the ultimate segment, as has been suggested by certain writers, and correspond to the so-called styli of generalized insects, then their presence is an indication of a primitive condition. There is hardly any question as to the common origin of the subanal appendages in the Pamphiliidae and Cephidae and if these structures represent what they are assumed to be, these two families must have a close affinity.

The ocellarae are present in the Pamphiliidae, Xyelidae, Tenthredinidae, and Cephidae. They are well developed and are usually accompanied by well defined ocularia in the first three families. In the Cephidae the ocellarae are vestigial and represented by localized pigmented granules and lack ocularia. It is significant that the ocellarae are unmodified in the gall-makers and leaf-miners of the family Tenthredinidae, except Phlebatrophia where they are reduced in size and the ocularia indistinct. The atrophy of the ocellarae is undoubtedly correlated with the mining habit of the larvae.

The antennae are present in all larvae of the Tenthredinoidea. Judging from the condition obtained in the generalized insects, it is reasonable to consider the antennae of the Pamphiliidae as representing the primitive ancestral type. They are long and setaceous in this family and with seven, slender, cylindrical, well-chitinized segments. The Xyelidae is closely related to the preceeding family

in the antennal characters altho a shortening of the length has taken place. In the Tenthredinidae the antennae undergo much modification both in the number and form of the segments. They may be conical, limpet-shaped, or flattened and th number of segments varies from five to one. The antennae of the Cephidae resemble those of the Xyelidae and some of the Tenthredinidae in shape and number of segments. The antennae undergo steady reduction in size and number of segments in the three remaining families, reaching the extreme of reduction in the Oryssidae where each is represented by a button-like swelling. The trend of specialization in the antennae is orthogenetic so far as the families are concerned but quite diverse in the subfamilies of the Tenthredinidae.

The mouth-parts which include the mandibles, maxillae, labium and ~~parapharynx~~, offer a fertile field for characters which are of interest from a systematic point of view. The mandibles, like the antennae, are the most persistent and ever-present structures in the head of all larvae of the Tenthredinoidea. The maxillary and labial palpi are typically four-and three-segmented respectively. The change is the reduction of size and number of segments. The Cephidae is normal in this respect but gradual change takes place in the Xiphydriidae and Siricidae while in the Oryssidae the change has proceeded so far as to completely obliterate the palpi. The palpi of Phlebatrophia resemble those of the specialized families. The families represent different stages of specialization and their relative systematic position can be indicated by the degree of changes in the mouth-parts.

The suranal process which is located on the meson of the suranal lobe is characteristic of the larvae of the Cephidae, Xiphydriidae, and Siricidae. It should not be confused with the caudal protuberan-

ces of certain Tenthredinidae as these two structures are entirely of different nature. There is a minute hook-like process on the caudo-meson of the tenth abdominal tergum of the Pamphiliidae. It should be noted that in certain larvae of Pontania and Caulocampus the caudal portion of the ultimate tergum is produced caudad as a blunt more or less strongly chitinized protuberance which undoubtedly serve the same function as the suranal process of the specialized families. These two structurel modifications of the caudal end of the body, however, are not homologous with each other. The suranal process is undoubtedly an adaptive structure which has risen in responce to the habit of the larvae and does not represent the true appendages of the segmet to which the suranal lobe belongs. For this reason the caudal process is of less significance phylogenetically than the subanal appendages of the Pamphiliidae and Cephidae.

The metathoracic spiracles of the larvae are either obsolete or vestigial in the majority of the Tenthredinoidea. The larvae of the Cephidae and Siricidae differ from all others in that the metaspiracles are functional and as large as the abdominal spiracles. It is important to ascertain the original condition of the metaspiracles in these families because upon the interpretation of their primitive condition depends their phylogenetic value and hence the relationship between these two families and also between them and other families. It is considered reasonable to assume that the progenitor of insects and hence the ancestor of the Hymenoptera possessed functional spiracles on all the segments of the body including the metathorax, and their metaspiracles must have been as large as the abdominal spiracles. The closed, minute, functionless metaspiracles found in the Pamphiliidae, Xyelidae, and others indicate a condition of atrophy rather than rudimentary condition, and so far as this

character is concerned the Cephidae and Siricidae represent the unmodified primitive condition, and some sort of relation between these two families must be assumed. But ~~the~~ on the basis of other characters, these two families can not be conceived of having evolved one from the other in a linear sequence, apart from and independent of, other families, they must have descended from a common stock which gave rise also to other families which exhibit vestigial metaspiracles. If this is true there must have taken place a series of dicotomous development whereby, starting with functional metaspiracles, one line of the development resulted in the loss of this primitive character in regard to the metaspiracles and the other line of evolution retained the original condition. By assuming four such successive dicotomy in the line of evolution, the origin and significance of the metaspiracles of the Cephidae and Siricidae can be reasonably explained. At each of the four successive dicotomous divisions which produced the pamphiliid-like progenitor and Xyelidae, Pamphiliidae and cephid-like progenitor, Cephidae and xiphydriid-like progenitor, and Xiphydriidae and Siricidae, one line of descent always carried the original character and the other line lost it until this pecuriality was sifted out and retained unmodified only in the Cephidae and Siricidae. In this way the metaspiracles are here considered to be the direct discendant of the primitive structures which remained unmodified thruout the course of evolution of these families. The two families are generalized in this respect and indicate a close genetic relation.

The morphological characters discussed are summarized in the following table:

Structure	Pamphiliidae	Cephidae	Xiphydriidae	Siricidae	Oryssidae	Xyelidae	Tenthredinidae
thoracic legs	5-segmented	fleshy	fleshy	fleshy	wanting	5-segmented	5-, 4-, 3-segmented
uropods	wanting	wanting	wanting	wanting	wanting	10 pairs	6-8 pairs
Subanal appendages	distinct long	vestigial	wanting	wanting	wanting	wanting	wanting
ocellarae	distinct	vestigial	wanting	wanting	wanting	distinct	distinct
antennae	7-segmented	5-, 4-segmented	3-segmented	1-segmented	1-segmented 1-seg-	7-, 6-segmented	5-, 1-segmented
Mouthparts	typical	typical	modified	modified	vestigial	typical	typical modified
suranal processes	wanting	distinct	distinct	distinct	wanting	wanting	wanting
metaspiracles	vestigial	functional	vestigial	functional	vestigial	vestigial	vestigial

The Pamphiliidae, with its long seven-segmented antennae, setaceous three-segmented subanal appendages, setaceous five-segmented thoracic legs, well-developed typical mouth-parts, together the absence of uropods, is unquestionablly one of the most generalized families of the Tenthredinoidea. This family differs from the hypothetical type only in the absence of the uropods and reduced metaspiracles.

The Xyelidae, with its fairly long, seven- and six-segmented, antennae, five-segmented thoracic legs, well-developed typical mouth-parts, together with the presence of ten pairs of uropods and absence of subanal appendages, is undoubtedly a very generalised family quite different from the preceeding . The only striking difference from the hypothetical type is the absence of the subanal appendages and functional metaspiracles.

The Tenthredinidae, with its one- to five-segmented antennae, well developed thoracic legs and six to eight pairs of uropods, together with the absence of the subanal appendages, is unquestionably related to the Xyelidae and if it has not been evolved directly from the latter, the two families must have arisen from a common stock. The Tenthredinidae is a phylogenetic complex in itself and some of the more specialized genera are further removed from the more generalized genera biologically as well as morphologically than the latter are from the Xyelidae or their xyelid-like ancestors.

The Cephidae, with its segmented antennae, vestigial subanal appedages, vestigial thoracic legs, normal mouth-parts, absence of uropods, presence of suranal process, vestigial ocellarae, and large functional metaspiracles, is considered an off-shoot of the ancestral stem from which the Pamphiliidae had previously evolved. The specialization is indicated by the vestigial condition of the ocellarae,

subanal appendages, and thoracic legs on one hand and the development of suranal process on the other. The presence of the functional metaspiracles is of phylogenetic importance. So far as the head characters are concerned, this family resembles the Tenthredinidae to a limited extent and in some of the generalized genera of the latter the thoracic legs and the caudal portion of the tenth abdominal segment undergoes some modifications which in a remote sense simulates the condition in the Cephidae. But since this family differs from the Tenthredinidae and resembles the Pamphiliidae in the absence of uropods and the presence of subanal appendages, it is considered more reasonable to ascribe a closer relationship to the Pamphiliidae than to the Tenthredinidae.

The Xiphydriidae, with its somewhat modified mouth-parts, three-segmented antennae, fleshy thoracic legs, suranal process, absence of uropods, its general shape of the body, and its biology, resembles the Cephidae but differs from it in the absence of subanal appendages, ocellarae and in the vestigial functionless metaspiracles. The absence of the subanal appendages may mean one of the two possibilities in regard to the origin of the Xiphydriidae. This family might have evolved from the cephid-like ancestor but had lost the subanal appendages by the completion of the process of atrophy which had already reduced the original distinctly segmented appendages similar to those of the Pamphiliidae to the vestigial papilliform appendages of the Cephidae. The two families under consideration might, on the other hand, had a common stem which possessed subanal appendages ocellarae, and vestigial metaspiracles. In the absence of positive support for the first possibility, it is more expedient to consider the second possibility as nearer to the true relationship of the two families, Xiphydriidae and Cephidae.

The Siricidae ,with its greatly reduced thoracic legs and mouth-parts together with other characters,is considered more specialized than the Xiphydriidae. The presence of the functional metaspiracles and its genetic significance have been already discussed. For the same reason which suggests a common stem for the Cephidae and Xiphydriidae,the Siricidae is consdiered to have arisen from a common stock which gave rise also to the Xiphydriidae. In the degree of specialization by reduction as well as by addition,this family exceeds the Xiphydriidae.

The Oryssidae,with its vestigial mouth-parts,absence of ocellarae,thoracic andsabdominal legs,subanal appendages,suranal process,caudal protuberances,and functional metaspiracles,together with its parasitic habit,is unquestionablly the most highly specialized family of the Tenthredinoidea. The morphological and biological characters are so different from other families that it is not easy to assertain the systematic position of the family. There are, however,certain considerations which suggest a possible relationship between this family and the Siricidae. Morphologically the oryssid larvae are more closely related to the apodous boring larvae of the Cephidae,Xiphydriidae,and Siricidae than to the polypodous free-living larvae of the Xyelidae and Tenthredinidae. The siricid-larvae are more closely related to those of the Oryssidae than those of the Cephidae and Xiphydriidae. The parasitic habit also suggests a closer relation to the wood-boring larvae since it is more plausible to imagine the possibility of a wood-boring larvae becoming parasitic on other wood-boring insect larvae under some unknown but not entirely unconcievable circumstances than to suppoe the development of a parasitic habit de novo in free-living leaf-feeders. Since the oryssid larvae are parasitic on the larvae of Buprestis

inhabiting the plants which are also infested by the larvae of the Siricidae, if any transformation of habit of the larvae has taken place, it is more natural to expect that the larvae of the Siricidae or some siricid-like insect becoming parasitic than any other tenthredinoid larvae. For these larvae it is considered reasonable to ascribe a common progenitors to the Siricidae and Oryssidae for the time being. It may be added that it is possible to assume an independent line of evolution for the Oryssidae apart from all other Tenthredinoidea, and consider this family as having no close relation to any of the modern families of the Tenthredinoidea. In that case, the Oryssidae must have arisen from the ancestral stock before the Pamphilliidae and Xyelidae took their origin. There is no evidence in support of such relation and since the relation is reasonablly explained by associating the Oryssidae with the Siricidae, the former is considered the most highly specialized family of the Tenthredinoidea with a common origin with the ancestor of the Siricidae.

The conclusions on the systematic position and relation of the different families of the Tenthredinoidea based exclusively on larval characters and derived entirely independent of the opinions of the specialists who have paid more attension to the adults are of neccessity not the final words on the subject. The true significance of such conclusions lies in their complemental and collateral value. It is interesting on this account to compare the writer's opinion with the conclusions of the modern authorities on this group of the Hymenoptera.

The relationship suggested here supports in the essential points the three more important systems of classification proposed by Konow(1905), MacGillivray(1906), and Rohwer(1911). MacGillivray

considered the Xyelidae the most primitive because of the venational character but recognized the Pamphiliidae as the most generalized fromhis study(1913) of the immature stages. Had he placed the Pamphiliidae before the Xyelidae and the Cephidae before the Xiphydriidae and Siricidae,his system would coincide exactly with the system based exclusively on the immature stages. Konow and Rohwer both associate the Cephidae with the Pamphiliidae and Xyelidae. This arrangement is partly supported if the affinity between the Pamphiliidae and Cephidae as suggested in this study is upheld. The genetic continuity of the Xyelidae and Tenthredinidae is clearly recognized by MacGillivray(1913). The true systematic position of the Tenthredinidae or its equivalent is difficult to express in linear arrangement. The important point to be noted is the fact that these authors and also Morice(1918) consider thesXyelidae and Tenthredinidae different and apart from the other families of the Tenthredinoidea The Oryssidae unquestionablly merits at least a separate family rank. In the absence of requisite knowledge of the larval characters of the Hymenoptera other than the Tenthredinoidea,it is not expedient to venture any opinion on the suggestion made by Rohwer and Cushman (1917) to establish a third suborder,Idiogastra,for the reception of the Oryssidae. Enslin(1911) differs from the authors already mentioned not only in his arrangemnent of the groups in a descending order but also in treating the Xyelidae and Pamphiliidae as subfamilies of his Tenthredinidae on a level with the Cimbicini,Lophyrini,and others. This study does not support his arrangements. Morice (1918) suggested that "the Lydini(=Pamphiliidae,Ensl.)may represent a primitive group of Tenthredinidae which had branched off from the main stock before it had developed certain characters",such as abdominal legs. Handrilsch(1908) considered the Siricidae as having

evolved from the osculant Juracic group, Pseudosiricidae. The antiquity of the Siricidae is accepted by Morice who expresses his idea of the relationship of the families of the Tenthredinoidea as follows: "We may suppose that the Siricidae are the earlier group, but whether the Tenthredinidae and Lydini had Siricid ancesters, or whether the Siricidae+Cephini+Oryssidae and Tenthredinidae+ Lydini are respectively earlier and later branches of a common stock are questions which must be left unanswered."

Summary

The larvae of the Tenthredinoidea have proved to be of great value in offering important evidence in regard to the probable phylogenetic relationship of the families included in this superfamily. The more significant conclusions reached in this study are summarized in the form of a synoptic table, as follows:

Families of Tenthredinoidea

Uropods present, thoracic legs present, well developed, distinctly segmented.

Uropods present on all abdominal segments.,.....Xyelidae

Uropods not present on all abdominal segments,.Tenthredinidae

Uropods wanting, thoracic legs present or wanting.

Thoracic legs present.

Thoracic legs and subanal appendages well-developed and distinctly segmented.....Pamphiliidae

Thoracic legs vestigial, indistinctly segmented.

Subanal appendages and ocellarae present.....Cephidae

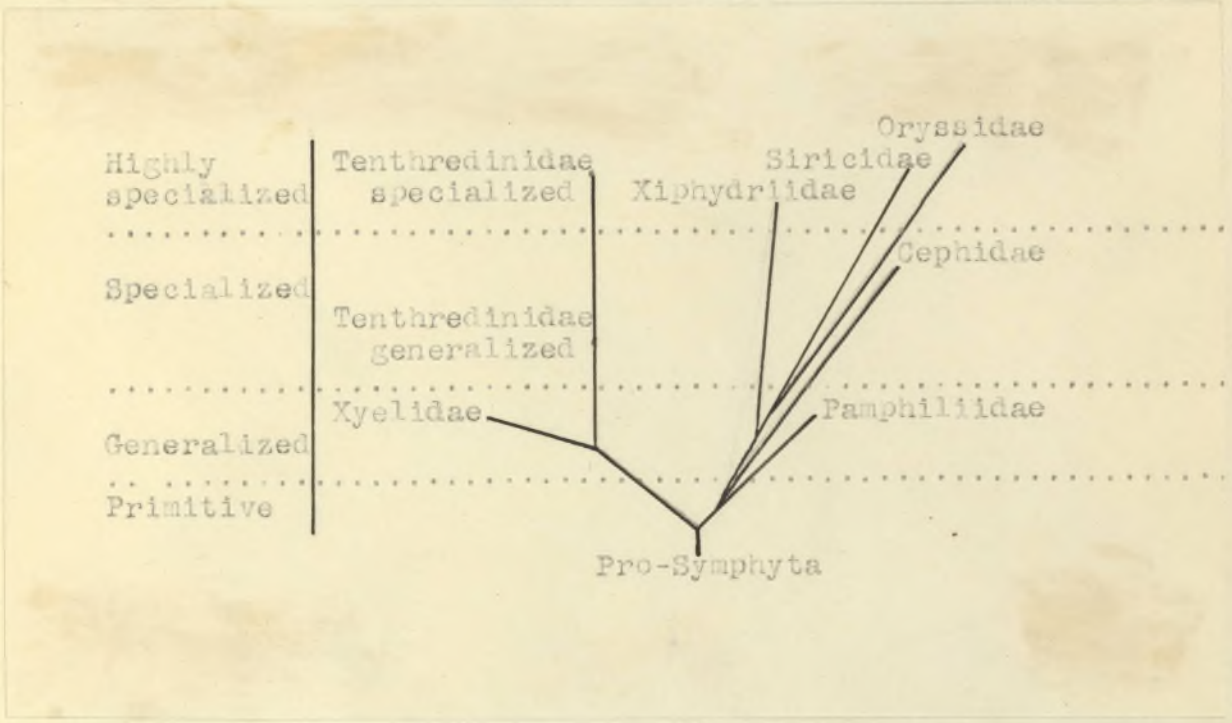
Subanal appendages and ocellarae wanting.

Metaspiracles vestigial, much smaller than abdominal spiracles.....Xiphydriidae

Metaspiracles functional, as large as abdominal spiracles .....Siricidae

Thoracic legs wanting.....Oryssidae

A synopsis such as the one given above is necessarily inadequate and somewhat misleading in indicating the affinities of the families. A better idea is gained by means of the customary phylogenetic tree altho such a scheme also has its limitations. In the following diagram the relation between the families of the Tenthredinoidea is shown. Here the relative vertical position is intended to represent approximately the degree of specialization and the affinities by the continuous lines.



The larvae of the Tenthredinoidea, thus, are divisible into two, possiblly three distinct groups. The first group includes the larvae characterized by the possession of both the thoracic and abdominal legs, absence of the subanal appendages, and suranal process, and is represented by the Xyelidae and Tenthredinidae. The second group

consists of the four families, Pamphiliidae, Cephidae, Xiphydriidae, and Siricidae and is characterized by the absence of abdominal legs, presence of the vestigial clawless thoracic legs in the last three families, and presence of either the subanal appendages or suranal process or both. The third group contains a single family, Oryssidae, and is characterized by the absence of both thoracic and abdominal legs, suranal process, subanal appendages, and segmented maxillary and labial palpi. This group is considered, for the reasons already given elsewhere, as an off-shoot of the second group and probably of the ancestoral stock from which the Siricidae took its origin. The Xyelidae and Pamphiliidae are undoubtedly the most primitive of the first and second groups respectively.

The Tenthredinoidea, therefore, is considered to have developed from a common ancestral stock along two distinct lines of evolution. The first line of development led to the evolution of the Xyelidae and Tenthredinidae and the second line produced the Pamphiliidae, Cephidae, Xiphydriidae, Siricidae, and Oryssidae.

Glossary

The list of words given below includes several new terms and are used in the sense defined here. For the general terminology "The Standard Dictionary" and Smith's "Glossary of Entomology" should be consulted. For the anatomical terms of the head and its appendages my paper(1920) should prove useful. The new terms are from two sources of my origination and from the unpublished terminology of Dr. Mayfield.

Anal setae,n. Setae on suranal and subanal lobes guarding the anus and quite often different in size or form from setae on other parts of the body.

Anal uropods,n. The uropods of tenth abdominal segment,so-called anal prolegs. They are not homologous with the anal prolegs of lepidopterous larvae.

Annulation,n. The state of being divided into annulets. In refering to the condition or relative size and length of annulets,this term is used with or without the word furmula.

Annulet,n. One of the small rings or ring-like sections into which a segment is divided by transverse constrictions produced by musclature.

Antacoria,n. The memberane which connects the antennaria with the scape of the antenna. When this membrane occupies comparatively wide space,it is spoken of as being extensive.

Antennaria,n. The ring-like thickening or sclerite surrounding the fossa or socket in which the antenna is located.

Apex,n. The pointed end of a sturcture. In connection of the front,it refers to the ordinarily pointed dorso-mesal angle of the front.

Basipharynx,n The caudal portion of the parapharynx caudad of and not including the salaviae.

Barbed, a. Having minute, more or less pointed projections from the surface. It is used in connection with certain setae as in the larvae of the Cladiinae.

Button-like, a. Used in connection with antennae or some protuberances which have the form of button, being semiglobose or subglobose and usually wider than high and with more or less circular contour.

Calyx ~~of A Seta~~, n. The minute ring-like base from which the shaft of a seta arises.

Caudal protuberances, n. The protuberances on the tenth abdominal tergum. Usually paired as in Pteronidea, sometimes conspicuous as in Dimorphopteryx, and arranged on or near the caudal margin of the tergum but sometimes in the cephalic part of the tergum as in certain blennocampid larvae.

Cervical glands, n. Paired eversible glands located in the latero-dorsal portion of the microcoria of the xyelid larvae.

Cervical sclerites, n. The chitinized sclerites located on the lateral aspect of the microcoria and articulating ~~at~~ the odontoidia on the cephalic end and at the dorsal apex of episternum-epimeron and coxa of the prothoracic leg.

Claws, n. Used in the same way as the tarsal claws.

Clypealia, n. The small sclerite near the ventral end of the epicranial arms dorsad of the precoila. It corresponds to the antecoxal piece of mandible of Comstock. It is found in the larvae of all Tenthredinoidea which retain distinct epicranial suture.

Clypeal Setae, n. The setae born on the clypeus near the supposed clypeal suture. The number and arrangement are constant.

Crochets, n. The curved hooks on the prolegs of lepidopterous larvae. They are never present in the saw-fly larvae.

Dentis, n. A tooth. ?

Dentiform,á. Having the shape of a tooth.

Direction,n. In designating the sequence of any appendages, the partsnearest to the body is designated as the proximal part and the part farthest from the body as the distal. The direction of numbering is from the proximal to the distal end. For example, when the antennae is three-segmented, segment 1 refers to the proximal segment and segment 3 the distal and the segment between the two is the segment 2. In the case of the body structure the center of the body is considered the proximal part. The use of terms, cephalic, caudal, lateral, and other terms derived from them are familiar enough.

Epicranial Suture,n. The most distinct and universal suture of the head and is readily identified because of its shape and position. It divides the vertex on the dorsal part of the head into lateral halves and bounds the front on three sides. The undivided dorsal protion of the suture is known as the epicranial stem and the arms of Y as the epicranial arms.

Formula,n. Used in a special sense to represent the arrangement of structures as in the case of tubercles and spines of the larvae of the Blennocampinae or the propontion in length or size of segments of segmented structures. For example, when the antennal formula is written as, 1,4,3,2, it means that the segments are in relative proportion in legth in the order named begining with the longest first, that is in this case, the segment 1 is longer than segment 4, segment3 is shorter than segment 4 but longer than segment 2. In the case of the annulets, the annulation formula would read something like, 1,2,5,6 4, indicating the annulet one or the cephalic one is the longest, annulet 2 the next in length and so on. When a parenthesis is used the parts included inlit are all of same length. The sign = is used to designate the fact that two parts are equal in size or length.

In the case of spines, the arrangement is known as map and is indicated by means of the sign : and ⁘ and the number of branches or parts by the numerals. They are too complicated to be stated here. See the diagrams.

Fuscous, n. Dark brown approaching to black.

Glandus, n. The distal ring-like opening of a glanduba.

Glanduba, n. The external portion of a cuticular gland. It is usually cylindro-conical and elevated for a short distance from the surface. In such case, the glanduba is said to be stalked as in Pachynematus. When the glanduba is very short, it is said to be subsessile and when it is practically at level with the surface it is said to be sessile as in Caliroa. Glandubae vary in size and shape but are characteristic of certain Tenthredinidae.

Glabrous, n. Without setae, smooth.

Hypopharynx, n. The distal protion of the parapharynx. In the tenthredinid larvae, this portion is fused withhthe totaglossa and is membranoous.

Labral setae, n. Setae on the labrum, usually three to six arranged in a row on each side. The number and arrangement are usually constant.

Lateral lobe, n. When the area ventrad of the spiracular line is produced more or less and forms mound-like lobe, it is known as the lateral lobe. It includes the subspiracular and surpedal areas or lobe.

Lines of Body, n. In order to facilitate description, it is convenient to designate certain position of the body in reference to the long axis of the body by a set of definite lines which are both mechanical and natural. The line on the dorso-meson is known as the dorso-mesal line, the one on the dorso-lateral part as the dorso-

lateral and a similar line on the ventro-latral as such. The line on the ventral aspect corresponding to the dorso-mesal line is the ventro-mesal line. The line connecting the spiracles is the spiracular line and the line dorsad of it the supraspiracular or suprastigmatal line and the one ventrad of the stigmatal line the substigmatal, and the line connecting the surpedal or pedal areas or lobes is the pedal line. The line on each side and close to the dorso-mesal line is known as the subdorsal. The supraspiracular line may coincide with the latero-dorsal and the pedal with the ventro-lateral line. When the spiracles are located very low on the latus the spiracular line may even appraoch the ventro-lateral line as in Caliroa.

Mandibular setae,n. Setae on the mandible. The number is constant.

Mandibularia,n. The small sclerite usually more or less membranous in the saw-fly larvae, located ventrad of the ventral margin of the vertex and connected with the mandibular membrane which belongs to the mandible. This piece corresponds to the trocantin of mandible of Comstock.

Map,n. The symbolic representation of the arrangement and type of setae, spines, and tubercles is spoken of as a map. See the term formula.

Microcoria,n. The neck membrane.

Metaspiracles,n. The spiracles of the metathorax.

Numbering of Parts,n. See the tern direction.

Obsolete,a. Atrophied.

Ocellara,n. The simple eye of entometabolous larvae.

Ocularium,n. The ring-like colored area surrounding an ocellara.

Papilliform,a. Papilla-like in form, usually not much chitinized.

Patch,n. An area more or less well defined by a difference in color or chitinization.

Pretentorina,n. The external marking of the invagination of a pretentorium. It is located dorsad of the ventral end of the epicranial suture.

Pretentorium,n. The so-called anterior arm of the tentorium.

Profurcellina,n. The external marking of the apophyses of the prothrax marking the caudal limit of the segment.

Prothoracic glands,n. The conspicuous glands located on the cephalic part of the prothorax cephalo-mesad of the legs in Caliroa.

Prothoracic shields,n. See shields.

Protuberance,n. Any elevation or protruding point of the surface of the body. It is used in a special sense in connection with the caudal protuberances of the tenth abdominal tergum.

Recumbent,a. Reclining.

Rudimentary,a. Being in incomplete state of development.

Seracos,n. The opening of the silk glands located on the meson of the totaglossa.

Setaceous,a. seta-like in shape,tapering gradually to a point. This term is never used as equivalent to setiferous or setigerous.

Setiferous,a. Provided with setae. Same as setigerous.

Setal map,n. See Map.

Spine,n. A sharply pointed more or less strongly chitinized protuberance.

Spinous,a. Provided with spines or spine-like in form.

Spiracular line,n. A line connecting the spiracles. See the term lines of Body.

Shields,n Chitinized plates or areas. Usually spoken of in connection with such areas on the dorsal,lateral and ventral aspects

of the prothorax. These shields are found in the Xyelidae and certain leaf-miners.

Suranal lobe,n. The membranous portion on the caudal part of the tenth abdominal segment on dorsal side of the anal region. It may represent the vestigial telson of the ebryologists.

Subanal lobe,n. The area corresponding to the preceeding on the ventral aspect and may represent the ventral half of the telson.

Suranal process,n. The strongly chitinized process on the mesion of the suranal lobe in the Cephidae and its allies. This term is used in reference to this particular structure only.

Surcoxal lobe,n. The lobe or area dorsad of the xosa of a thoracic leg and corresponds to Crampton's surcoxal plate(1918).

Subanal appendages,n. The segmented appendages of the subanal lobe located,one on each side,ventrad of the cephalic ends of the anal slit. They are often refered to as cerci,styli,or arthrostyli. They are characteristic of the Pamphiliidae and Cephidae.

Tibial tendon,n. The tendon of a tibia of the legs and used in differentiating species of the Acordulecerinae.

Tenth abdominal tergum,n. The tergum of the ultimate segment.

Testaceous,a. Brownish-yellow.

Totaglossa,n. The median membranous lobe of the labium representing the fused glossae and paraglossae. It is always membranous and carries the seracos in the Saw-fly larvae.

Tenth uropods,n. Same as the anal uropods and belong to the ultimate segment of the body.

Ultimate segment of the body,n. The last visible segment of the body and includes the tenth and either one or two following segments. The segmentation of the caudal segment is indistinguishable in the larvae.

Tarsal claws,n. The distal segment of the legs and represents the diminutive tarsus and claw fused together.

Uromere,n. Any one of the abdominal segments.

Uropods,n. Abdominal legs usually refered to as prolegs.

Ventral glands,n. A series of glands located on the ventro-mesaon of the abdominal segments 1-7 in the Nematinae and Cladiinae.

Verrucose,a. Having ~~irregular~~ elevated minute areas or spots.

Vertical furrows,n. A pair of distinct depressed furrows, one on each side, extending cephalad from the lateral end of the occiput on the lateral aspects of the head. These vertical furrows are peculiar to the saw-fly larvae.

Vestigial,a. Being in a state of ~~atrophied~~ condition.

Wings of spiracle,n. When the spiracle is provided with colored areas or pieces on its sides, the spiracle is said to be winged and the colored areas are known as wings.

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Plate I.

Lateral aspect of entire larva of different families.

Fig.1 Pamphilius sp. Y-125.

Fig.2 Megaxyela major.

Fig.3 Janus integer.

Fig.4 Xiphydria sp.

Fig.5 Tremex columba.

Fig.6 Oryssus occidentalis. After Rohwer and Cushman(1917)

Plate I.

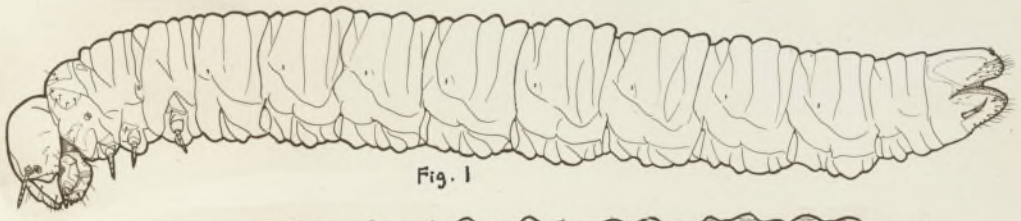


Fig. 1

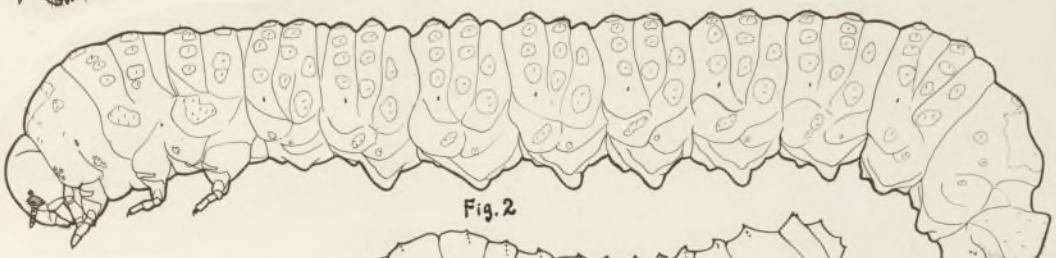


Fig. 2

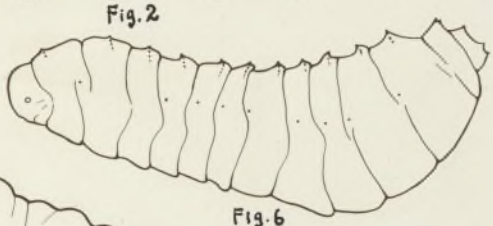


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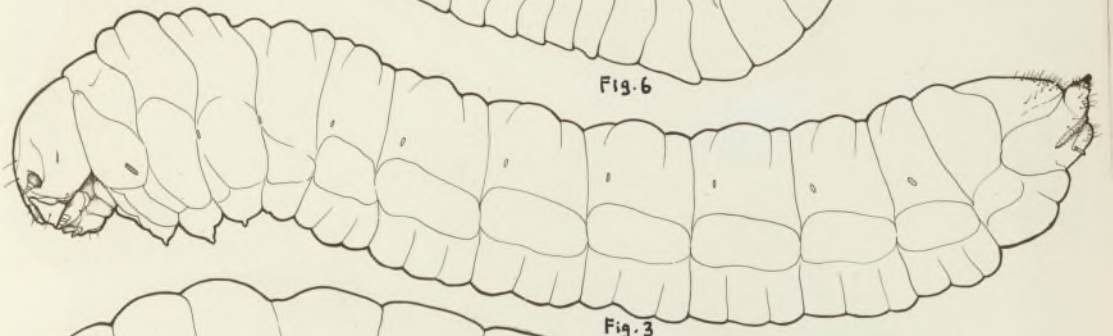


Fig. 3

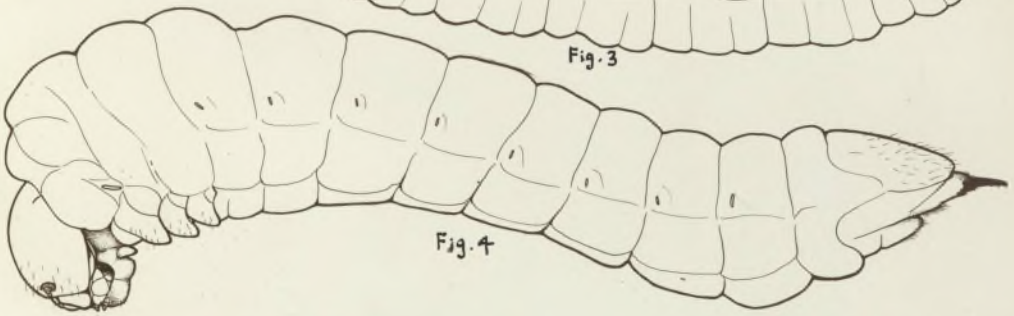


Fig. 4

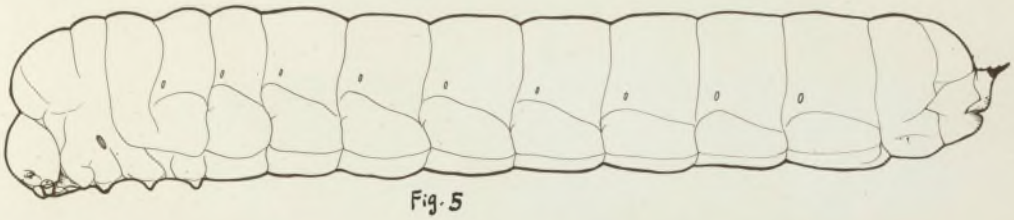


Fig. 5

Plate II.

Lateral aspect of entire larva of dofferent subfamilies of the Tenthredinidae.

Fig.7 Dolerus similis.----------Dolerinae.

Fig.8 Caliroa cerasi.-----------Phyllotominae.

Fig.9 Phlebatrophia mathesoni--Phyllotominae.

Fig.10 Tenthredo sp. ----Tenthredininae.

Fig.11 Abia sp. -----Cimbicinae.

Plate II.

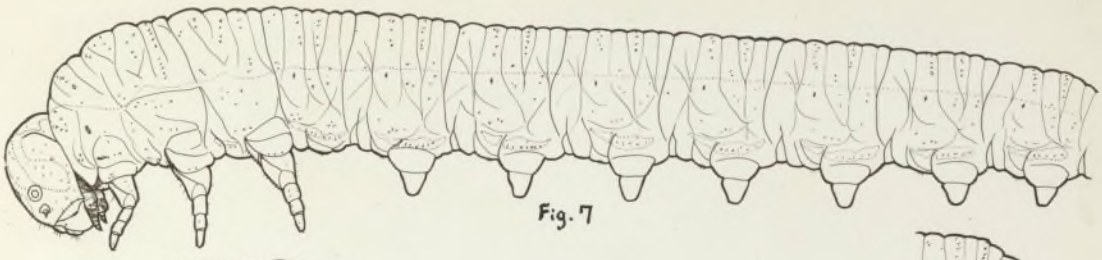


Fig. 7



Fig. 8

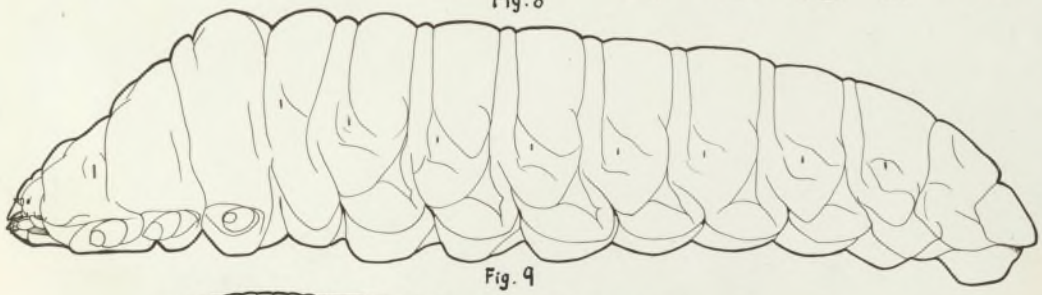


Fig. 9

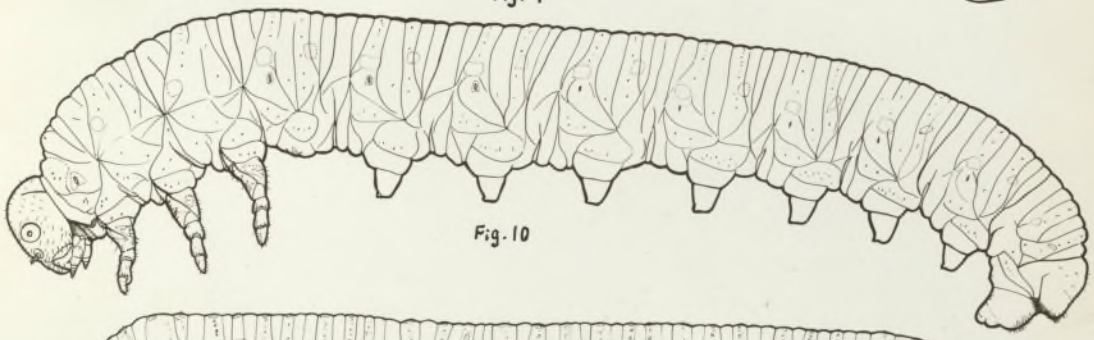


Fig. 10

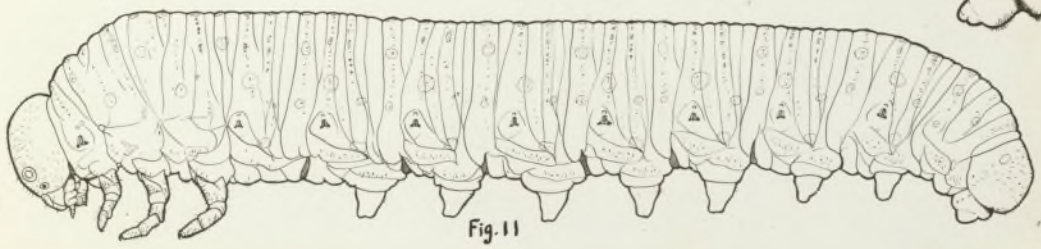


Fig. 11

Plate III.

Lateral aspect of the larvae of different subfamilies of the Tenthredinidae.

Fig. 12 Hoplocampinae-------Hemichroa americana.

Fig. 13 Cladiinae----------Cladius pectinicornis.

Fig. 14 Nematinae----------Pteronidea ribesi.

Fig. 15 Nematinae----------Pteronidea ventralis.

Fig. 16 Blennocampinae------Monophadnoides rubi.

Plate III.

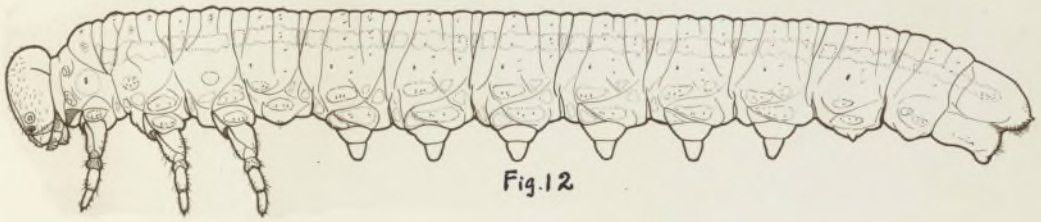


Fig. 12



Fig. 13



Fig. 14



Fig. 15



Fig. 16

Plate IV.

Lateral aspect of the larvae of different subfamilies of the Tenthredinidae.

Fig. 17 Fenusinae---------Kaliofenusa ulmi.

Fig. 18 Scolioneurinae----Metallus rubi.

Fig. 19 Hylotominae-------Hylotoma macleayi.

Fig. 20 Schizocerinae-----Schizocerus zabriskei.

Fig. 21 Acordulecerinae---Acordulecera sp.

Plate IV.

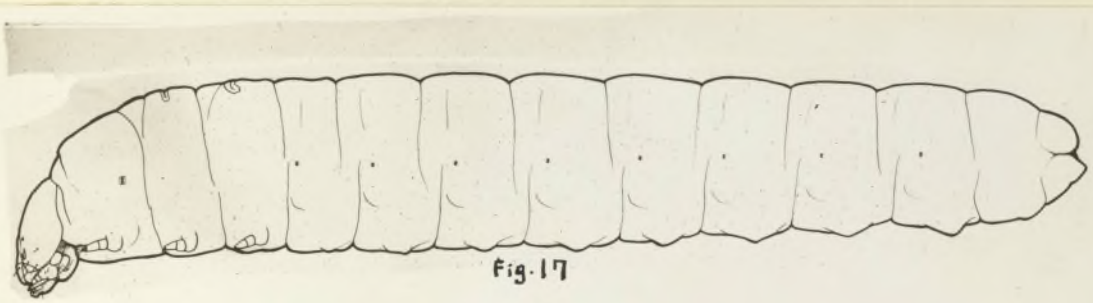


Fig. 17

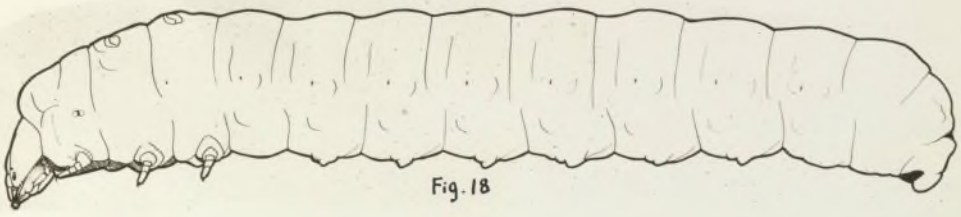


Fig. 18

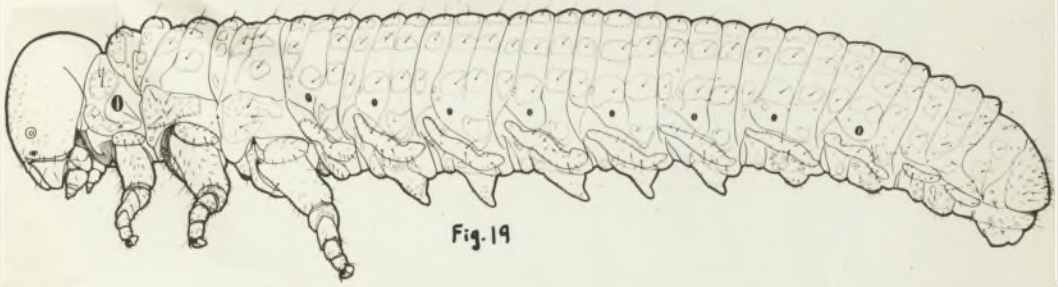


Fig. 19

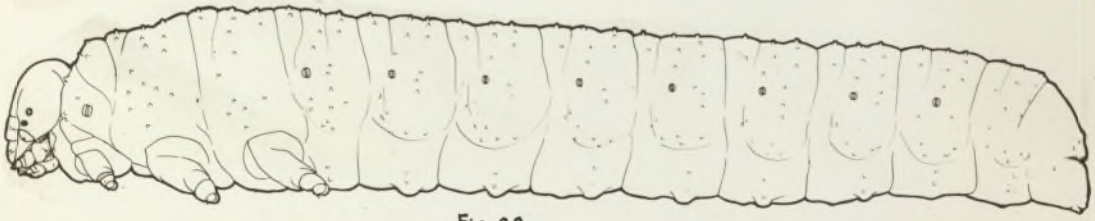


Fig. 20

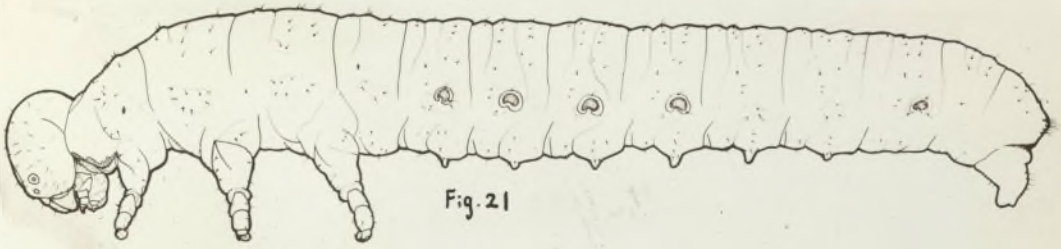


Fig. 21

Plate V.

Fig.22-34 Cephalic or dorsal aspect of the head.

Fig.36-37 Dorsal aspect of the cephalic end of the body.

Fig.40-51 Lateral aspect of the antenna.

Fig.22 Pamphilius sp.

Fig.23 Megaxyela major.

Fig.24 Neodiprion lecontei.

Fig.25 Endelomyia aethiops.

Fig.26 Macremphytus varianus.

Fig.27 Lygeomenatus erichsoni.

Fig.28 Dolerus similis.

Fig.29 Abia americana.

Fig.30 Metallus rubi.

Fig.31 Schizocerus zabriskei.

Fig.32 Kaliofenusa ulmi.

Fig.33 Pteronidea ribesi.

Fig.34 Phlebatrophia mathesoni.

Fig.35 Caliroa cerasi, ventral aspect.

Fig.36 Caliroa cerasi, dorsal aspect.

Fig.37 Endelomyia aethiops.

Fig.38 Tremex columba, mesospiracle.

Fig.39 Tremex columba, pretentorina.

Fig.40 Megaxyela major.

Fig.41 Thrinax impressatus.

Fig.42 Kaliofenusa ulmi

Fig.43 Pteronidea ribesi.

Fig.44 Adirus ? trimaculatus.

Fig.45 Janus integer.

Fig.46 Cephus pygmaeus.

Fig.47 Hartigia cressoni.

Fig.48 Tremex columba.

Fig.49 Schizocerus zabriskei.

Fig.50 Metallus rubi.

Fig.51 Phlebatrophia mathesoni.

Plate V.

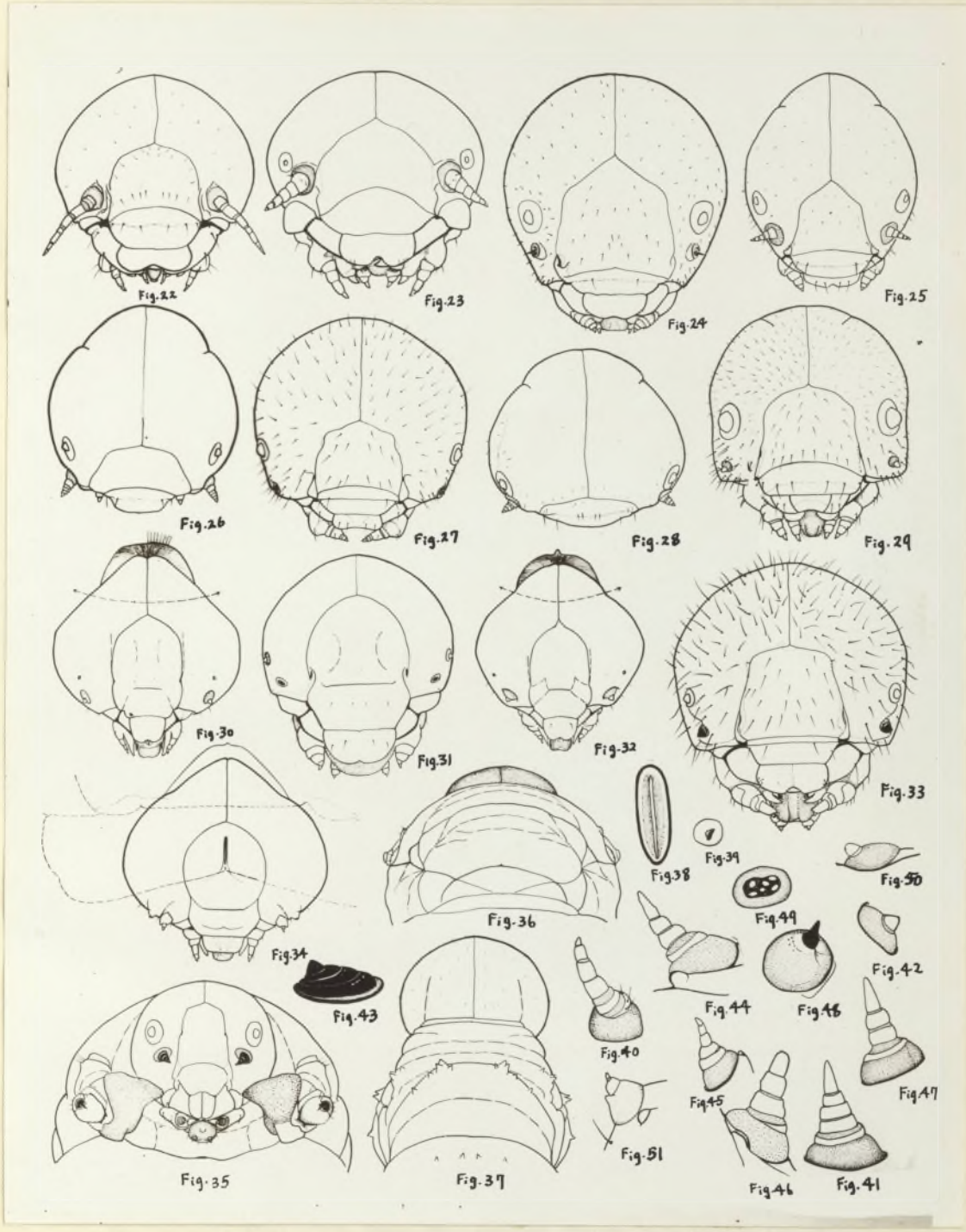

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Fig.46
Fig.41

Plate VI.

Figs.52-61,63 Lateral aspect of cephalic segments and head.

Fig.52 Pamphilius sp.

Fig.53 Megaxyela major.

Fig.54 Neodiprion lecontei.

Fig.55 Dolerus similis.

Fig.56 Macremphytus varianus.

Fig.57 Abia americana.

Fig.58 Caliroa cerasi.

Fig.59 Endelomyia aethiops.

Fig.60 Pteronidea ribesi.

Fig.61 Lygeomenatus erichsoni.

Fig.62 Abia americana, caudal aspect of the head.

Fig.63 Metallus rubi.

Fig.64 Xiphydria sp., ventral aspect.

Fig.65 Xiphydria sp., dorsal aspect of caudal end of the body.

Fig.66 Xiphydria sp., lateral aspect of caudal end of the body.

Plate VI.



Fig. 52



Fig. 53



Fig. 54



Fig. 55



Fig. 56



Fig. 57



Fig. 58



Fig. 59



Fig. 60



Fig. 61



Fig. 62



Fig. 63



Fig. 64



Fig. 65



Fig. 66

Plate VII.

Figs.67-79 Ventral aspect of the head and prothorax.

Fig.67 Pamphilius sp.

Fig.68 Megaxyela major.

Fig.69 Neodiprion lecontei.

Fig.70 Tremex columba.

Fig.71 Dolerus similis.

Fig.72 Macremphytus varianus.

Fig.73 Schizocerus zabriskei.

Fig.74 Phlebatrophia mathesoni.

Fig.75 Kaliofenusa ulmi.

Fig.76 Metallus rubi.

Fig.77 Janus integer.

Fig.78 Lygeonematus erichsoni.

Fig.79 Endelomyia aethiops.

Plate VII.



Fig. 67



Fig. 68



Fig. 69



Fig. 70

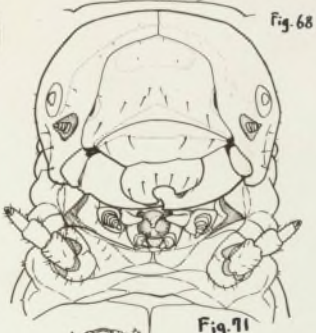


Fig. 71



Fig. 72

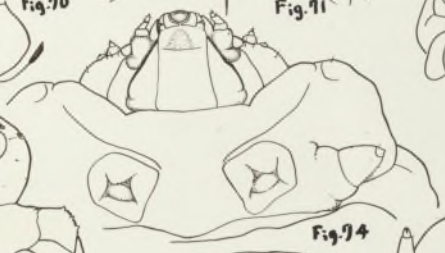


Fig. 74

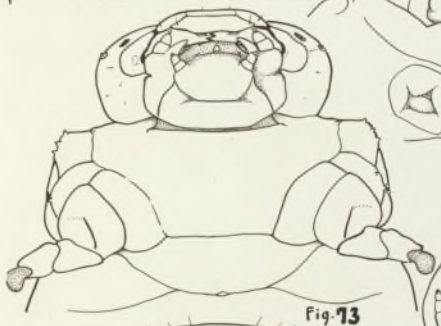


Fig. 73

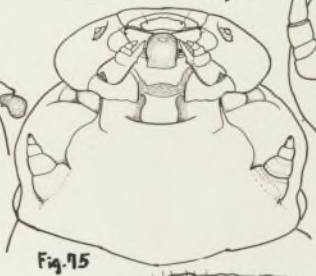


Fig. 75

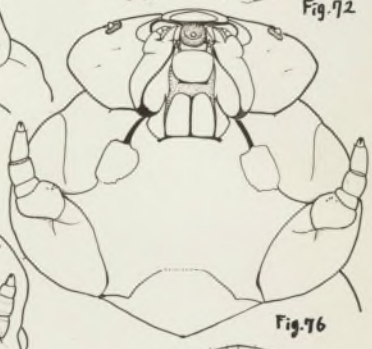


Fig. 76

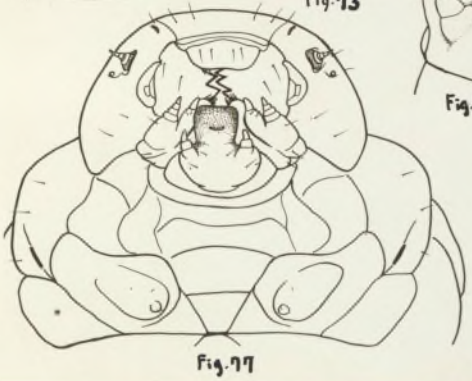


Fig. 77



Fig. 78



Fig. 79

Plate VIII.

Figs. 80-85 Dorsal aspect of the head and prothorax.

Figs. 86-89, 92-93 Lateral aspect of the third abdominal segment.

Figs. 90-91, 94-96 Ventral aspect of the third abdominal segment, showing the uropods.

Fig. 80 Pamphilius sp.

Fig. 81 Megaxyela major.

Fig. 82 Neodiprion lecontei.

Fig. 83 Dolerus similis.

Fig. 84 Macremphytus varianus.

Fig. 85 Monophadnoides rubi.

Fig. 86 Pamphilius sp.

Fig. 87 Neodiprion lecontei.

Fig. 88 Endelomyia aethiops.

Fig. 89 Dolerus similis.

Fig. 90 Pamphilius sp.

Fig. 91 Megaxyela major.

Fig. 92 Macremphytus varianus.

Fig. 93 Caliroa cerasi.

Fig. 94 Caliroa cerasi.

Fig. 95 Macremphytus varianus.

Fig. 96 Phlebatrophia mathesoni.

Plate VIII.

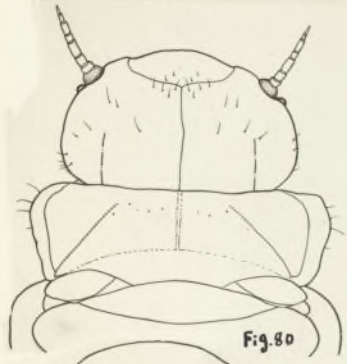


Fig. 80



Fig. 81

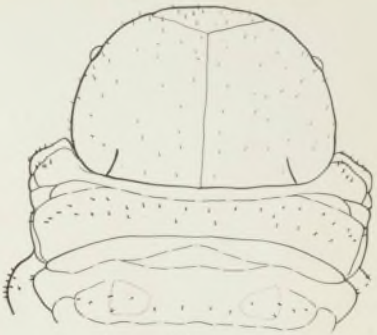


Fig. 82

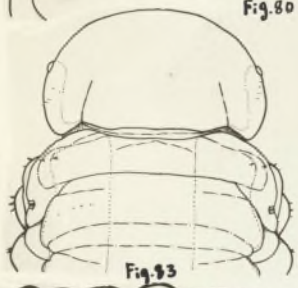


Fig. 83

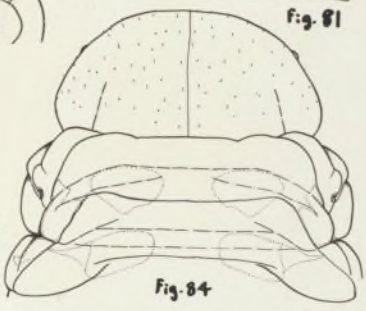


Fig. 84



Fig. 85



Fig. 86



Fig. 87

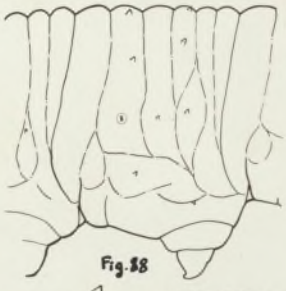


Fig. 88

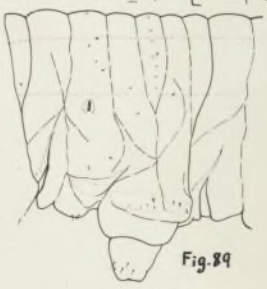


Fig. 89

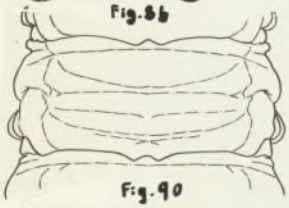


Fig. 90

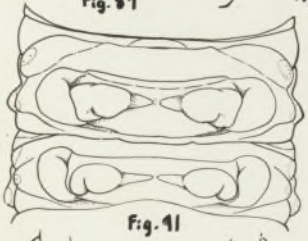


Fig. 91

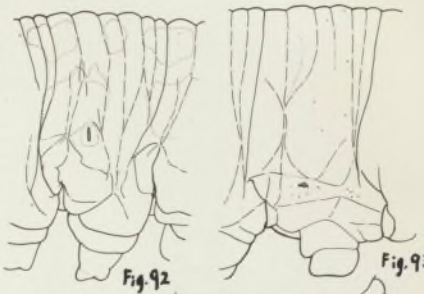


Fig. 92

Fig. 93

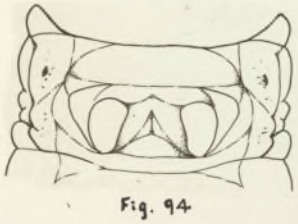


Fig. 94



Fig. 95

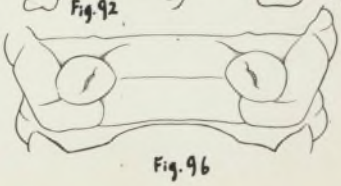


Fig. 96

Plate IX.

Figs. 97, 98, 99, 100, 101, Ventral aspect of the third abdominal segment.

Figs. 104-111. Lateral aspect of the caudal end of the body.

Figs. 102, 103, 113-116 Ventral aspect of the caudal end of the body, showing the anal uropods and suranal and subanal lobes.

Fig. 97 Dolerus similis.

Fig. 98 Neodiprion lecontei.

Fig. 99 Endelomyia aethiops.

Fig. 100 Metallus rubi.

Fig. 101 Kaliofenusa ulmi.

Fig. 102 Phlebatrophia mathesoni.

Fig. 103 Pamphilius sp.

Fig. 104 Metallus rubi.

Fig. 105 Macremphytus varianus.

Fig. 106 Neodiprion lecontei.

Fig. 107 Pamphilius sp.

Fig. 108 Caliroa cerasi.

Fig. 109 Dolerus similis.

Fig. 110 Endelomyia aethiops.

Fig. 111 Megaxyela major.

Fig. 112 Megaxyela major, lateral aspect of the third abdominal segment.

Fig. 113 Neodiprion lecontei.

Fig. 114 Macremphytus varianus.

Fig. 115 Dolerus similis.

Fig. 116 Megaxyela major.

Fig. 117 Caliroa cerasi.

Plate IX.

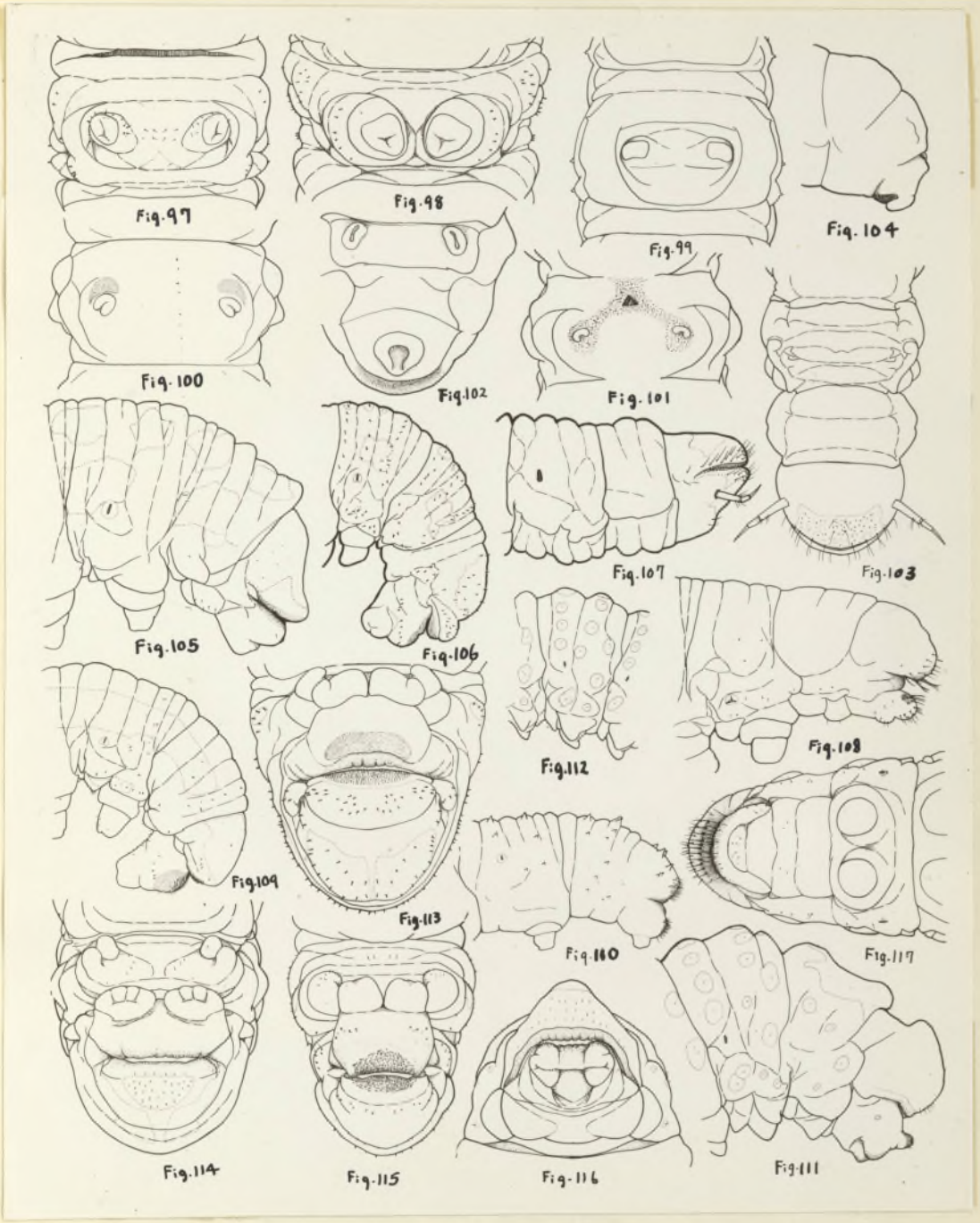

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Fig. 113
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Fig. 117
Fig. 114
Fig. 115
Fig. 116
Fig. 111

Plate X.

Figs. 118-120 Lateral aspect of the caudal end of the body.

Figs. 121-122 Ventral aspect of the caudal end of the body.

Figs. 123-124 Dorsal aspect of the caudal end of the body.

Figs. 125-130 The caudal process, lateral aspect, except Figs. 128-129 which are in dorsal aspect.

Figs. 131 -133, 157 lateral aspect of the subanal appendage.

Figs. 135-147 lateral aspect of the mesothoracic leg.

Fig. 118, 126, 133 Cephus pygmaeus.

Figs. 119, 125, 157, Adirus sp.

Figs. 120, 131, Hartigia cressoni.

Fig. 121 Kaliofenusa ulmi.

Fig. 122 Metallus rubi.

Figs. 123, 128, 127 Tanus integer.

Figs. 124, 129, 130 Tremex columba.

Fig. 134 Neodiprion lecontei, musculature of third abdominal segment, semidiagramatic.

Fig. 135 Pamphilius sp.

Fig. 136 Megaxyela major.

Fig. 137 Endelomyia aethiops.

Fig. 138 Dolerus similis.

Fig. 139 Neodiprion lecontei.

Fig. 140 Metallus rubi.

Fig. 141, 144 Pteronidea ribesi.

Fig. 142 Caliroa cerasi.

Fig. 143 Schizocerus zabriskei.

Fig. 146 Macremphytus varianus.

Fig. 147 Phlebatrophia mathesoni.

Fig. 148 Pteronidea ribesi, lateral aspect of third abdominal segment.

Fig. 149 Pteronidea ribesi, lateral aspect of the caudal end of the body.

Fig. 150 Pteronidea ribesi, ventral aspect of third abdominal segment.

Fig. 151 Pteronidea ribesi, dorsal aspect of the ultimate segment showing the paired caudal protuberances.

Fig. 152-156 Abia americana, silk-glands and seracos

Fig. 152 ventral aspect of the labium showing the palpi and totaglossa and seraco

Fig. 153 Caudal or ventral view of totaglossa showing the silk press.

Fig. 154 General form of the silk glands with accessory glands.

Fig. 155 Dorsal or cephalic view of the totaglossa and part of hypopharynx, also the cephalic accessory glands.

Fig. 156 Lateral aspect of the silk-press, common duct of the silk glands.

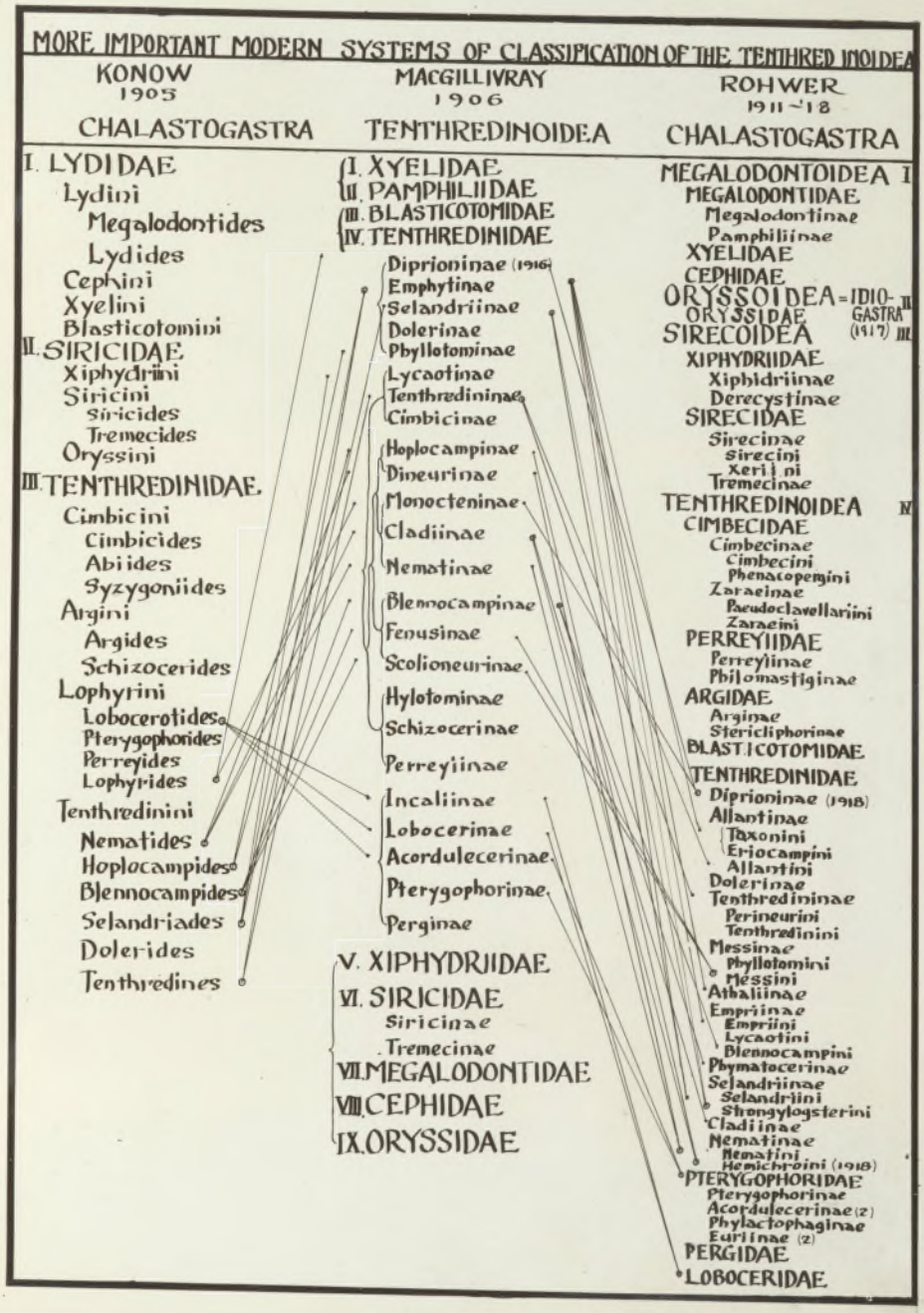
Plate X.


Fig.118
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Fig.156

Plate XI.

A comparison of more important modern systems of classification of the Tenthredinoidea. The relationship of different families ahd subfamilies isindicated by the lines. When the various groups in different systems correspond approximately in taxonomic contents no lines are drawn between these groups.

Plate XI.


MORE IMPORTANT MODERN SYSTEMS OF CLASSIFICATION OF THE TENTHREDINOIDEA
KONOW 1905
CHALASTOGASTRA
I. LYDIDAE
Lydini
Megalodontides
Lydides
Cephini
Xyelini
Blasticotomini
II. SIRICIDAE
Xiphydriini
Siricini
Siricides
Tremecides
Oryssini
III. TENTHREDINIDAE
Cimbicini
Cimbicides
Abiides
Syzygoniides
Argini
Argides
Schizocerides
Lophyrini
Loboceratides
Pterygophorides
Perreyides
Lophyrides
Tenthredinini
Nematides
Hoplocampides
Blennocampides
Selandriades
Dolerides
Tenthredines
MACGILLIVRAY 1906
TENTHREDINOIDEA
I. XYELIDAE
II. PAMPHILIIDAE
III. BLASTICOTOMIDAE
IV. TENTHREDINIDAE
Diprioninae (1916)
Emphytinae
Selandriinae
Dolerinae
Phyllotominae
Lycaotinae
Tenthredininae
Cimbicinae
Hoplocampinae
Dineurinae
Monocteninae
Cladiinae
Nematinae
Blennocampinae
Fenusinae
Scolioneurinae
Hylotominae
Schizocerinae
Perreyiinae
Incaliinae
Lobocerinae
Acordulecerinae
Pterygophorinae
Perginae
V. XIPHYDRIIDAE
VI. SIRICIDAE
Siricinae
Tremecinae
VII. MEGALODONTIDAE
VIII. CEPHIDAE
IX. ORYSSIDAE
ROHWER 1911–18
CHALASTOGASTRA
MEGALODONTOIDEA I
MEGALODONTIDAE
Megalodontinae
Pamphiliinae
XYELIDAE
CEPHIDAE
ORYSSOIDEA = IDIOGASTRA (1917) III
ORYSSIDAE
SIRECOIDEA II
XIPHYDRIIDAE
Xiphidriinae
Derecystinae
SIRECIDAE
Sirecinae
Sirecini
Xeriini
Tremecinae
TENTHREDINOIDEA IV
CIMBECIDAE
Cimbecinae
Cimbecini
Phenacopegini
Zaraeinae
Pseudoclavellariini
Zaraeini
PERREYIIDAE
Perreyiinae
Philomastiginae
ARGIDAE
Arginae
Stericliphorinae
BLASTICOTOMIDAE
TENTHREDINIDAE
Diprioninae (1918)
Allantinae
Taxonini
Eriocampini
Allantini
Dolerinae
Tenthredininae
Perineurini
Tenthredinini
Messinae
Phyllotomini
Messini
Athaliinae
Empriinae
Empriini
Lycaotini
Blennocampini
Phymatocerinae
Selandriinae
Selandriini
Strongylogasterini
Cladiinae
Nematinae
Nematini
Hemichroini (1918)
PTERYGOPHORIDAE
Pterygophorinae
Acordulecerinae (?)
Phylactophaginae
Eurinae (?)
PERGIDAE
LOBOCERIDAE

Vita

1890. Born in Tokio, Japan, on April 29th.

1908. Graduated from the Academic Department of Doshisha University, Kioto, Japan in March.

1908. Left Japan for The United States of America.

1911-1915 Attended the Kansas State Agricultural College.

1915. B.S. Kansas State Agricultural College.

1916. Entered the Graduate School of the University of Illinois.

1917. M.S. University of Illinois.