

A REVIEW OF THE GENUS TORYMUS FOR OREGON AND CALIFORNIA

(HYMENOPTERA: CHALCIDOIDEA: TORYMIDAE)

by

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A REVIEW OF THE GENUS TORYMUS FOR OREGON AND CALIFORNIA

(HYMENOPTERA: CHALCIDOIDEA: TORYMIDAE)

PART I. INTRODUCTION

The purpose of this thesis has been to assemble and augment knowledge of the classification of the genus, Torymus. The intent has been to offer new methods for systematic studies which might be applied to the entire family, Torymidae. Another aim has been to present descriptions of the new species of Torymus which were collected during the last fifty years in California and Oregon. With these descriptions, a key has been prepared to all species known to occur in Oregon and California and the geographical distribution of those species known to inhabit portions of these states has been extended. This paper contains the descriptions of thirteen new species, five new distributional records, and descriptions of three new males. Also included are re-descriptions of other species with recorded distribution for California and Oregon. In each instance, the re-descriptions were prepared from type material or specimens which have been compared and determined as being conspecific with the type. Where re-description was impossible, the original description of the male or female has been used.

THE SUBFAMILY TORYMINAE

The subfamily Toryminae was erected by Ashmead in 1899 as his second subfamily under the family Chalcididae. Ashmead (3) listed seven genera and all except Torymus have been placed in synonymy or in other subfamilies. The Toryminae of Ashmead was subsequently raised to family rank and now includes twenty three genera and five subfamilies. At present there are four genera recognized in the subfamily, Allotorymus Huber, Torymus Dalman, Dinomorus Walker, and Physothorax Mayr (Peck 59).

The Toryminae, as it is now accepted, can be separated from the other four subfamilies in the family Torymidae by the following combination of characters: exserted ovipositor, two apical spurs on the hind tibia, posterior margin of the mesepimeron incised beyond the middle, secondary epimeral suture prominent, stigmal vein short to petiolate (rarely longer than the diameter of the stigmal knob).

PART III. MORPHOLOGY AND DESCRIPTION OF TORYMUS

(Figs. 1-9)

The following discussion is based on the overall aspect of the males and females except where specific reference is made to sexual characters or differences. The structures of Torymus are described with emphasis placed on new separating characters which heretofore have been overlooked or not previously considered of diagnostic value. Special reference is made to the structural variations between species.

The terms used in this section have been taken, for the most part, from Bucher (11). No reference has been made to the segment cephalad to the scape (basal segment of Bucher) for since it does not articulate with the scape the writer considers this structure as a part of the scape. The antennal sensory pit of Bucher is the sensilla placodea of Snodgrass (64) and in this paper the latter term has been used. Certain common terms such as axillae, have been used in preference to more technical terms, wherever possible, to avoid confusion.

HEAD (Fig. 1). As seen from the front, the head is strongly triangular to subcircular, depending upon the distance between the bases of the eyes and the oral cavity. (The head is wider than high to nearly as wide as high.) The sutures of the head consist of:

- 1) a prominent genal suture in all species, 2) a rather obscure clypeal suture, 3) a highly obscure to absent epicraneal suture, 4) a prominent occipital suture circumscribing the occiput, and 5) a postoccipital suture enclosing the occipital condyle, the

postocciput, and the gula. The sculpturing of the face is distinctive. The area below the antennal sockets may be: 1) lightly reticulate with irregularly placed setal sockets, 2) lightly punctured, or 3) variously wrinkled. The only areas which are ever without sculpturing of some kind are the genal areas and the scrobes. However, in many species, particularly in those of larger size, these areas have some form of light sculpturing. Carinae are found on the center of the front (median carina) and above the anterior margin of the mouth (clypeal carinae). The median carina begins just above the antennal sockets and extends from slightly below the antennal sockets to the basal attachment of the clypeus. The prominence of the median carina varies greatly. A pair of carinae and tentorial pits above the anterior margin of the mouth marks off the clypeal region. These carinae also vary in prominence and length. The apex of the clypeus in most species is entire, but in some species displays a rather ornate emargination.

The subcircular lateral ocelli are located at the margin of a prominently raised area on the vertex and tilt laterally at approximately a 60° angle to the horizontal plane. The median ocellus tilts forward from the same raised area on the vertex. The antennal sockets are located approximately at the center of the front and are separated by the median carina. The scrobes are very shallow to deep and extend upward to encompass the median ocellus.

The antennae consist of 13 segments: scape, pedicel, one ring segment, seven funicular segments, and three fused segments in the

club (Fig. 2). The scape may exceed the median ocellus or end considerably below it. The scape, in cross section, is round to compressed laterally and is straight or somewhat twisted or bent. The surface of the scape has cross hatch reticulations, which form irregular diamond-shaped figures, with or without setae at the intersections of these reticulations. The pedicel is trumpet-shaped and, on some species, the pedicel bears minute denticules which protrude from the apical margin. The ring segment is normally wider than long and is widest at its distal end. In some cases its length may equal or slightly exceed the width. The diameter of the ring segment is normally about one half the diameter of the first funicular segment. The ring segment bears a number of sensilla trichodea. The seven segments of the funicle have the ratio of their lengths and their widths distributed in the following patterns: 1) all longer than wide, 2) all wider than long, and 3) certain segments longer than wide or quadrate. In all cases, each segment becomes progressively shorter toward the end of the funicle even though each may not become wider. In cases where some segments are wider than long, each funicular segment does widen toward the end of the funicle. In species with antennal segments all longer than wide, each segment of the funicle bears many series of small sensilla placodea, each series interlocking (Figs. 15-16). In species with any of the funicular segments wider than long, there are only one or two series of long sensilla placodea (Figs. 17-19). The number of these sense organs

usually increases per segment from the first to the seventh. The number of sensilla placodea per segment varies from four to one hundred or more depending upon the species. Antennal ciliation may be so sparse as to expose the sensilla placodea readily as seen from any angle or so dense as to almost obscure completely the sensilla placodea except as seen from a lateral-apical angle. The club is composed of three fused segments each bearing sensilla placodea. The last segment of the club is triangular in shape with the apex rounded.

The mouth parts are typically those of the mandibulate insect. Each maxilla is composed of: 1) a heavily sclerotized basal cardo, 2) a broad, semicircular stipes, 3) a four-segmented maxillary palp, 4) a heavily spined galea, and 5) a lightly sclerotized oval lacinia. On the labium, the submentum is barely distinguishable. The submentum is followed distally by a dark, convex, oval-shaped mentum which bears a three segmented labial palp. The paraglossae subtend the broad, banded ligula. At the distal end of each band on the ligula is a prominent seta. The mandibles are tridentate. The first denticule is acute, the second acutely rounded, and the third (proximal) very much rounded. The exposed surface of each mandible is covered with long setae.

Thorax (Figs. 3-4). The chalcidoïd thorax is a highly modified structure in this specialized group of insects. The three conventional thoracic regions and an enlarged propodeum are distinguishable. The prothorax has a semicircular, collar-shaped pronotum; a subtriangular proepisternum with a prominent cervical sclerite anteriorly; and a

triangular prosternum. Dorsally, the thorax consists of: 1) the scutum (immediately posterior to the pronotum), 2) the rectangular parapsidal plates separated from the scutum by the parapsidal furrows, 3) the semi-oval scutellum posterior to the scutum (with or without a transscutellar suture), 4) the axillae (postscutum of Snodgrass) on either side of the scutellum, 5) the triangular tegulae (to which the fore wings are attached) articulating between the posterior alar plates and parapsidal plates, 6) the strap-shaped metanotum, and 7) the propodeum. Laterally, the thorax has: 1) a triangular prepectus (located below the parapsidal plates and posterior to the lateral lobes of the pronotum), 2) a mesepisternum joined by a plural suture diagonally with, 3) a notched or incised mesepimeron, 4) the metepisternum, and 5) a secondary epimeral plate at the dorso-anterior margin of the metepisternum. The mesepisternum is attached to the posterior margin of the prepectus and ends ventrally forming the anterior half of the mesocoxal cavity. The metasternum is fused ventrolaterally with the metepisternum and forms the posterior half of the mesocoxal cavity.

APPENDAGES OF THE THORAX. The procoxae are cylindrical and taper gradually toward the apices. The mesocoxae are the same shape as the procoxae, although slightly larger. The metacoxae are more than double the size of the mesocoxae and are compressed laterally and ridged along the dorso-lateral edge. There is a bifid spur on the ventral apical angle and a comb on the lateral apical angle of

the protibia, a single apical spur of the mesotibia, and a pair of unequal spurs on the ventral apical angle of the metatibia. The hind femur is swollen, widest beyond the middle the ventral margin with or without ornamentation. The first segment of the five segmented tarsus is normally the longest. Each succeeding segment diminishes in length except the fifth tarsal segment, which is longer than the fourth.

Approximately one-half of the wings extend beyond the tip of the abdomen. Each wing has a simple continuous vein, beginning with the submarginal vein (varies in length) which is followed by the marginal, stigmal, and postmarginal vein. The stigmal vein is composed of a petiole, the stigma, and the uncus (which normally does not exceed the diameter of the stigmal knob). The dorsal surface is covered with few to many cilia. The ventral surface is covered with cilia which are approximately one-half the length of those on the dorsal surface. Depending upon the species, the cilia may or may not be arranged in rows. The rounded, apical margin of the wing bears a continuous row of long, fine cilia. There is a wing rib on the posterior margin of the fore wing (Fig. 5).

The hind wing is one-half the width of the fore wing. It is without a stigmal vein and has three hooks on the frenulum. The postero-lateral apex of the marginal vein of the hind wing bears a row of short, stout spines as seen X 100 or greater magnification. The hind wing is fringed with hairs which arise on the anterior margin, just beyond the end of the marginal vein, and continue around the wing.

The hairs are longest on the posterior border near the wing base.

THE ABDOMEN (Figs. 6-7). The abdomen of the female is rounded to somewhat flattened dorsally and strongly carinate ventrally. The female has eight visible tergites, the first one to four of which are medially incised. There are five visible sternites. The male has seven visible tergites and sternites. However, the sternites are difficult to observe since they are overlapped by the terga.

The genitalia of the female is made up of essentially: a falcate plate, a fulcral plate, dorsal and ventral valves, and the stylets of the ovipositor (Fig. 9). The stylets may be shorter than the abdomen or three times as long as the body.

The phallus of Torymus is elongate and rather compact due to the tremendous reduction of its parts (Fig. 8). The distal lobe or aedeagus is acute with a rounded tip. On the base of the aedeagus, which extends into the caulis or the wider basal portion of the male genitalia, the aedeagal apodemes are attached. Basally, the caulis may or may not have a distinct ring. The caulis is essentially composed of parameral plates which are elongate folds. Apically, the parameral plates bear small lobes or parameres. Between the parameres is a pair of volsellar lobes which Snodgrass (65) presumes to be the digiti. The digiti are armed with three or four stout spines which vary in size, number, and curvature according to the species.

PART IV. THE BIOLOGY OF TORYMUS

This group of chalcidoid wasps displays a wide diversity of biological habits. They are one of the multitude of parasites which help to keep many destructive insects in bounds. The phytophagy of the genus was first thoroughly worked out by Crosby (15) for Torymus druparum Boheman showing the developmental stages in apple seeds together with an account of the life history. The writer removed several scores of the apple seed chalcid (T. druparum) from seeds of apple coming from Minnesota during the summer of 1955 and found the association of no other insect or organism within the seeds. Rohwer (62) lists only T. druparum, from this genus, as being injurious to forest-tree seeds, but gives a very complete bibliography on the subject (phytophagous chalcids) back to 1803. Gahan (31) lists all the species known to be phytophagous as of 1922. He states:

"Parasitic Eurytomidae and Callinomidae (Torymidae) are largely found infesting gall makers, borers in wood or herbaceous plants or insects which infest fruits or seed capsules. Rarely if ever is a species of either of these groups parasitic upon a free living or exposed larvae."

Further, he lists five species of Torymus for the world known to be phytophagous. Breland (6) charts briefly the phytophagous habits of Torymus, listing ten species reared from genera of conifers, dicotyledons, and monocotyledons.

Ashmead (2) considered the family Torymidae as a subfamily of Chalcididae and discussed the Chalcididae as being species which

destroy larvae, pupae, and imagoes of nearly all orders. Satterthwait (61) indicates that there are probably two or more generations a year in one species of Torymus. Balduf, (4) also records briefly the life history of Torymus racemariae Ash. Breland (8) gives notes on habits of Torymus albitarse (Breland), but does not publish details on its life history. In 1938, Breland (6) summarized the habits of 228 species for the world which exhibit parasitism. He lists internal and external parasites of eggs, internal and external parasites of larvae and pupae of the itoniids, internal parasites of the pupae of the cranberry fruit worm, hyperparasitism, and as parasites upon their own larvae. Hobbs (41) also shows Torymus festivus Hobbs as a parasite on its own larvae as well as its own pupae. In addition to this relationship, he includes, as far as is known, the first published, relatively complete life history of a parasite of the genus.

Milliron (54) offers a very fine account of several species of Torymus showing various habits displayed by the genus, including parasitism, phytophagy, and a combination of both. In order that the last habit might be illustrated, he states that once the parasite, Torymus amelanchieris (Cush.) has consumed its larval host, its cycle was completed by feeding upon the tissues within the seed before pupation.

PART V. REVISION OF THE GENUS TORYMUS

Linnaeus (1758) in his *Systema Naturae* described the first member of this genus under the name Ichneumon bedeguaris. Spinola (1811) erected Callimome as a separate genus for this group of chalcidoid wasps in which he included seventeen species. Misocampe Latreille (1818) and Torymus Dalman (1820) reverted to synonyms by priority. Syntomaspis Foerster (1856) was established to include all members of this group bearing a transscutellar suture (transverse cross furrow) on the apical one-third of the scutellum, but Huber (188) did not recognize the transscutellar suture as a valid generic character. In 1914, Curtis designated Ichneumon bedeguaris as the type of the genus Callimome. For many years, the generic name Callimome Spinola was used by the American writers, while the name Torymus Dalman was preferred by the European writers. Opinions and declarations rendered by the International Commission on Zoological Nomenclature, Vol. 2:227-238, July 12, 1944, permanently rejected Callimome in preference for Torymus. "In order to obviate the confusion incident to change of a long-established family name, ---."

Of the more than 460 species described for the world, 116 are recognized in America, north of Mexico. This thesis includes the description of 13 new species, bringing the total to 129. With few exceptions only incidental collections have been made of this group of parasitic wasps.

Specific Characters and Variations

The greatest variation among these wasps occurs in color. Color has been used excessively by some writers and perhaps insufficiently by others. Color can be used with advantage in combination with other factors in species determination, however, it alone can not be relied upon. In the male and female of the same species, the color often varies greatly and cannot be used as a reliable common character between interbreeding populations.

With rare exception, all of the species in the genus Torymus are of bright, metallic colors. The legs, wing veins, most of the antennae, and the ovipositor are some shade of yellow, to dark brown or black. In some instances, the wing veins and tarsi appear almost white. The basic colors of the head and body are green and blue. Other colors, such as shades of red, purple, and gold, are encountered either as basic color or as reflections from other basic colors. As in T. multicolor, (Huber) the exact description of the colors would be for the most part, a matter of personal opinion.

The antennae vary considerably in the length and size of each of their segments. In the descriptions which follow, precise measurements have been given for the length and width of segments of the funicle. Also, the approximate number of sensilla placodea per funicular segment is indicated. The sculpturing of the face in most species is finely reticulate-punctate, whereas, some species display distinct rugosity. The relative size of the facial carinae are sufficiently variable to be of diagnostic use. The margin of the mouth

may be entire or variously emarginate.

There are many types of sculpturing on the thoracic dorsum; fine reticulations (Fig. 10), irregular honeycomb reticulations of various relative sizes, minute punctures or large discoidal punctures (Fig. 12). These types of markings may appear alone or in combinations. The transscutellar suture is either absent, seen only with difficulty on the dorso-lateral margin of the scutellum, shallow across the entire scutellum, or deeply cut. The term "cross furrow" is a misnomer, and the transscutellar suture of Snodgrass is descriptively more accurate. The propodeum may be smooth, roughly sculptured, carinate, or with or without pits on the anterior border which provides excellent specific diagnosis (Fig. 11).

The fore wings present many good characters by which specific separation is possible. First, the number of cilia per unit of area varies greatly. In order to obtain the specific number of cilia on the fore wings of each species, the cilia were counted in an area 0.33 mm. square approximately half way between the anterior and posterior margins directly below the stigmal vein. By this means it was possible to establish a definite value in terms of light, moderate, and heavy ciliation. Second, the setal pattern, especially in the area surrounding the stigmal vein of the species, also varies. Three false veins are emphasized in the description of the species herein (Fig. 5): 1) the baso-stigmal vein when present commences at the stigmal knob, extends diagonally along a ridge in the wing toward the baso-posterior wing margin, changing direction half-way between

the apex of the stigmal knob and vein M_1 , and may or may not disappear immediately. When this vein continues it may extend to within one third the distance of the wing base at the center. The baso-stigmal vein may be expressed as an immaculate single row of setae or as several rows of setae merely converging along a common ridge in the wing. 2) The apico-stigmal vein commences immediately adjacent to but distad of the baso-stigmal vein; also found on a wing ridge, the apico-stigmal vein extends diagonally from the stigmal vein toward the postero-apical margin then bends toward the apical tip of the wing. The row or rows of setae of this false vein may not reach the bend, or the setae may be traced to the apical wing margin. 3) The post-uncul vein, when present, commences very close to the apical tip of the uncus and may be considered an extension of the uncus to the anterior wing margin. The post-uncul vein may be a single, double, or triple row of setae. In some cases it may start as a single row and then be joined by one or more rows before reaching the wing margin. The uncus combined with the post-uncul veins forms a cell with the post-marginal vein which may or may not contain setae.

The stigmal veins of Torymus are not truly sessile since the stigmal knob is wider than the juncture between the stigmal knob and the sub-marginal vein. Huber points out that it is sometimes difficult to distinguish whether the stigmal vein is sessile, subsessile, or petiolate. The writer is in agreement with Huber and has used these terms only as an expedient to general, not accurate, description

of the veins. Wherever reference is made to these terms the following photomicrographs are considered representative: 1) sessile (Photo. 32), sub-sessile (Photo. 38), and petiolate (Photo. 43).

ABDOMEN. With the exception of color, the abdomen apparently has few reliable diagnostic characteristics. The size, length and carination of the female abdomen as expressed in descriptions of previous authors are diagnostically of little value. The position at which the abdomen comes to rest as a result of the killing medium varies sufficiently to create a differential length of one millimeter within the same species. The characters of the abdomen which can be noted are the medially incised first one to first four tergites and the general shape of the abdomen. The female genitalia of approximately fifty species have been examined and variation was found in the intensity of color and ovipositor saw. The latter is a positive character which may assist in species separation. However, care must be taken that the ovipositor saw is properly mounted to show a true lateral view (Photos. 53-55). For practical purposes, the abdomen of the male varies only in color. The male genitalia in the fifty or more species thus far examined by the writer, vary sufficiently to facilitate species separation in the 1) presence or absence of the basal ring, 2) the intensity and shape of the basal ring, 3) the shape of the parameral plates and aedeagal apodemes and 4) the size of the digiti with the number of clasping spines (Photo. 92).

Systematic Arrangement

This paper treats forty species in the genus Torymus. They have been divided into two major groups: Group A: those species whose funicular segments are all longer than wide (Photo. 77); Group B: those species whose funicular segments are either wider than long or at least the seventh funicular segment is as wide as long (Photo. 83).

The species listed herein are not placed phylogenetically, but are placed numerically according to the key. Wherever possible, the nearest relative of each species has been indicated.

In the description of these metallic colored wasps, light reflection is a very important factor. Wherever possible, light has been reflected from a white surface in order that the light rays would strike the surface being described at right angles. Light shining directly upon the specimen causes distortion and misleads the observer especially concerning color.

All measurements taken of the funicular segments do not include the extension of antennal ciliation, but cover the actual dimensions of the segments proper.

In order to avoid repetition, reference to species listed in O. Peck (Muesebeck, et al, 59) has not been given.

History and Generic Description

Genus TORYMUS Dalman

Callimome Spinola, 1811. Paris Mus. Hist. Nat. Ann.
17:116, 118. Supressed by Internatl. Comm. Zool.
Nomencl. Op. 155, 1944.

Misocampe Latreille, 1818. Nouv. Dict. Hist. Nat.,
ed. 2, pp. 21, 213. Supressed by Internatl. Comm.
Zool. Nomencl. Op. 155, 1944.

Torymus Dalman, 1820. Svenska Vetensk. Akad. Handl. 41:
135, 178. Type: Ichneumon bedeguaris Linnaeus.
Desig. by Internatl. Com. Zool. Nomencl. Op. 155,
1944.

Misocampus Stephens, 1829. Cat. Brit. Ins. Mandibulata.
p. 395. Emend.

Syntomaspis Foerster, 1856. Hym. Stud., v. 2, 43, 44.
Type: (Torymus eurynotus Foerster) = Torymus
cyaneus Boheman. Desig. by Gahan and Fagan, 1923.

Hemitorymus Ashmead, 1904. Carnegie Mus. Mem. 1: 243,
400. Type: Hemitorymus thoracicus Ashmead. Monob.

According to Huber (48), (except for those words in parentheses)

the generic characters are as follows:

"Antenna with one ring-joint (segment), the joints (segments) of the funicle more or less uniform; transverse cross furrow (transscutellar suture) on the posterior one-third of the scutellum very deep to very inconspicuous; stigmal vein shortly petioled to sessile, and never as long as the postmarginal vein; marginal vein shorter than the submarginal; abdomen sessile."

The writer agrees with these characters except that the transscutellar suture may be absent in some cases. The segments of the funicle also vary considerably in length, width, and in the number of sense organs per segment.

Key to the Species

1. Females (abdomen ventrally carinate, ovipositor
 exserted) 2
 Males (abdomen subcircular in cross section, tip of aedeagus
 usually apparent) 42
2. All segments of funicle longer than wide 3
 All, or at least the seventh segment of the funicle wider
 than long, length never exceeding the width 16
3. Stigmal vein with a distinct petiole 4
 Stigmal vein sessile to subsessile 11
4. Ovipositor longer than the head and body combined 5
 Ovipositor the same length as or shorter than the head
 and body 6
5. Ovipositor normally twice as long as head and body, stigmal
 vein short and robust.

No. 1 spenceri

Ovipositor barely longer than body and head combined;
 stigmal vein very large with long petiole.

No. 2 megastigma

6. Wings with a clouded area, at least faintly, adjacent to
 the stigmal vein 7
 Wings entirely hyaline 9
7. Coxae and broad band on basal portion of abdomen yellow

No. 3 flavicoxatus

Coxae or abdomen never yellow 8

8. Hind femora with a distinct tooth; smoky area around
stigmatal vein; thoracic dorsum with large discoidal
punctures; transscutellar suture prominent

No. 4 fullawayi

Hind femora without a tooth; most of area of the wing
very lightly brown; thoracic dorsum with small
punctures; transscutellar suture absent

No. 5 chrysochlorus

9. Ovipositor shorter than the abdomen; thorax greenish
brown; antennal scrobes deep.

No. 6 pilularidis

Ovipositor as long as the abdomen, thorax green with
cupreous tinge; antennal scrobes shallow.

No. 7 baccharidis

Ovipositor as long as body, minus head 10

10. Species less than three mm. in length; coxae bronzy.

No. 8 kinseyi

Species greater than three mm. in length, normally four
mm.; coxa same color as body.

No. 9 viridis

11. Ovipositor not as long as head and body combined (thoracic
dorsum blue with tints of green and purple).

No. 10 gahani

Ovipositor longer than head and body combined 12

12. Species small, less than three mm.; stigmal vein little or no darker than marginal vein; body uniform green to blue-green.

No. 11 tubicolae

Species normally large, greater than four mm.; stigmal vein darker than marginal vein; body never uniform green13

13. Wings with major portion of area light brown; much of body area and hind femora dark purple.

No. 12 perplexus

Wings entirely hyaline; much of body area and hind femora with red, blue or green or some combination of these colors14

14. Thoracic dorsum with large discoidal punctures (transscutellar suture conspicuous, posterior one third of scutellum reticulate).

No. 13 californicus

Thoracic dorsum very lightly sculptured15

15. Thoracic dorsum dull green with rusty red-brown reflections; ovipositor more than 2 mm. longer than head and body combined.

No. 14 giganticus

Thoracic dorsum dark green with a bluish tinge in some lights; ovipositor nearly one mm. longer than head

and body combined.

No. 14 giganticus

Thoracic dorsum dark green with a bluish tinge in some lights; ovipositor nearly one mm. longer than head and body combined.

No. 15 castanopsidis

16. Stigmal vein petioled17
 Stigmal vein sessile to subsessile34
 17. Wings with dusky area, at least around stigmal
 vein18
 Wings entirely hyaline26
 18. Transscutellar suture present at least on dorsolateral
 margins of scutellum19
 Transscutellar suture absent21
 19. Transscutellar suture visible only at dorso-lateral
 margins.

No. 16 melanopterus

- Transscutellar suture complete and prominent20
 20. Scape same color as the body; body brilliant green with
 golden-red reflections.

No. 17 crystallinus

Scape, except dorsal apex, same color as femora; abdomen deep cuperous-red.

No. 18 alamedensis

21. Body blue with green and purple reflections; abdomen purple
with blue reflections.

No. 19 spiraeae

Body some combination of green, copper, or blue without

- purple 22
22. Abdomen green coppery red; propodeum rugose 23
- Abdomen never coppery red; propodeum lightly
reticulate 24
23. Propodeum without a distinct pattern, prominently
carinate.

No. 20 corrugatus

Propodeum with short-stemmed inverted Y-shaped carina medially,
carinate laterally.

No. 21 diastrophus

24. Coxae dark coppery green (the pleura dark cupreous and
entirely reticulated).

No. 23 atriplicis

- Coxae blue or citrine 25
25. Fore coxae citrine.

No. 22 galbanicoxatus

Fore coxae blue.

No. 24 lazulus

26. Transscutellar suture present at least on dorsolateral
margins of scutellum 27

- Transscutellar suture absent30
27. Body and most of legs brunneus; ovipositor shorter
than abdomen.
- No. 25 brachystylus
- Body and legs not brunneus; ovipositor longer than
abdomen28
28. Propodeum with two large pits on the anterior margin;
scape same color as body.
- No. 17 crystallinus
- Propodeum with many small pits on anterior margin;
scape a color other than that of body29
29. Transscutellar suture just visible; scape ochreous.
- No. 26 garryani
- Transscutellar suture deep and very prominent; scape
mostly brown.
- No. 27 sulcatus
30. Ovipositor shorter than the abdomen.
- No. 28 ferrugineipes
- Ovipositor longer than the abdomen31
31. Coxae and body brassy green; ovipositor nearly as long
as body without head.
- No. 29 festivus
- Coxae and body bronze, blue or green; ovipositor nearly or a
full mm. shorter than body and head combined.32

32. Body and coxae bronze (ring segment longer than wide).

No. 30 scalaris

Body and coxae blue or green, or some combination thereof...33

33. Legs uniform light brown except hind femora which have bluish reflections medially; coxae blue.

No. 19 spiraeae

Legs yellow, femora with slight greenish-brown tinge medially; coxae all green.

No. 31 longistigmus

34. Ovipositor as long as or longer than head and body
combined35

Ovipositor shorter than the body39

35. Thoracic dorsum with large closely set discoidal
punctures36

Thoracic dorsum minutely sculptured37

36. Thoracic dorsum and scutellar apex coppery-green.

No. 32 umbilicatus

Thoracic dorsum bluish-green, scutellar apex golden-green.

No. 33 tricolor

37. Coxae, trochanters and femora infusate with red and green reflections (mesepimeron above posterior emargination red).

No. 34 nutkanae

Coxae, trochanters and femora without red and green reflections38

38. Parapsidal furrows distinct; length 3.75 mm., (middle of scutellum with longitudinal convexity).

No. 35 occidentalis

Parapsidal furrows obscure; length 2.30 mm.

No. 36 koebeleri

39. Most of body, legs and scape cupreous (transscutellar suture obscure).

No. 37 multicolor

Most of body and legs blue or green 40

40. Scape yellow testaceous.

No. 38 minutissimus

Scape with some green at least dorsally. 41

41. Propodeum with a single anterior pit on each side larger than lateral spiracle; basal half of scape flavo-testaceous.

No. 39 rohweri

Propodeum with two prominent anterior carinae about as long as distance between them; scape mostly green.

No. 40 thalassinus

42. All segments of the funicle longer than wide 43

All, or at least the seventh segment of the funicle wider than long, length never exceeding the width 53

43. Stigmal vein with a distinct petiole 44

Stigmal vein sessile to subsessile 50

44. Wings with some brown hyaline, at least around stigmal vein 45

- Wings entirely hyaline 47
45. Transscutellar suture absent or seen with difficulty.
- No. 3 flavoxatus
- Transscutellar prominent 46
46. Stigmal vein with long narrow petiole; apex of stigmal knob open.
- No. 2 megastigme
- Stigmal vein with short wide petiole; apex of stigmal vein closed 4
- No. 17 crystallinus
47. Legs, including apices of coxae, all light testaceous . . . 48
- Legs with coxae and femora fuscous with green reflections 49
48. Body length not exceeding 2.50 mm.; propodeum with fine anterior pits.
- No. 22 galbanocoxatus
- Body length greater than 3 mm.; propodeum with six prominent anterior pits commencing small medially and becoming larger laterally.
- No. 5 chrysochlorus
49. Propodium with light transverse aciculations, with four posteriorly open anterior pits; median carina very prominent ending in an acute point before the basal margin of the clypeus.

No. 8 kinseyi

Propodeum longitudinally reticulate with five closed
anterior pits diminishing in size laterally; median carina
wide extending to the basal margin of the clypeus.

No. 31 longistigmus

50. Thoracic dorsum with fine irregular honeycomb
reticulations; funicle with moderate closely
appressed ciliation51

Thoracic dorsum with either large discoidal setal
sockets or transversely reticulate; funicle with
sparse ciliation52

51. Median carina narrow reaching the anterior margin of
the mouth; scutellum with median blue-green stripe.

No. 14 giganticus

Median carina flat, wide, reaching slightly more than
half-way from antennal sockets to posterior margin of
the clypeus; scutellum without median blue-green stripe.

No. 15 castanopsidis

52. Thoracic dorsum with large discoidal setal sockets;
body green.

No. 13 californicus

Thoracic dorsum with transverse reticulations; body blue-
green with many purple reflections.

No. 12 perplexus

53. Stigmal vein distinctly petiolate54
 Stigmal vein sessile to subsessile63
 54. Transscutellar suture absent to very obscure55
 Transscutellar suture prominent61
 55. Wings with brown hyaline area around stigmal knobs
 and veins.

No. 16 melanopterus

- Wings entirely hyaline56
 56. Propodeum with many fine anterior pits, rather difficult
 to see57
 Propodeum with two small and two large anterior pits on
 either side.

No. 7 baccharidis

57. Length less than 2.00 mm.; median carina prominent
 extending beyond half the distance between antennal
 sockets and basal margin of clypeus58
 Length more than 2.00 mm. median carina extending half
 way or less to basal margin of clypeus59
 58. Body deep blue-green with fine irregular honeycomb reticu-
 lations on thoracic dorsum.

No. 24 lazulus

- Body fuscous with green reflections; transverse
 reticulations on thoracic dorsum, (propodeum with
 median longitudinal carina).

No. 30 scalaris

59. Wing ciliation very sparse; scape very short, bluish
purple.

No. 9 viridis

Wing ciliation very heavy; scape of moderate length
with dark to black-green pigmentation60

60. Head extremely transverse, 1.50 mm. wider than thick;
wing length exceeds combined head and body length.

No. 19 spirasae

Head only 1.00 mm. wider than thick; wing length less
than combined head and body length.

No. 29 festivus

61. Propodeum finely reticulate.

No. 18 alamedensis

Propodeum deeply rugose62

62. Propodeum without a distinct pattern, prominently carinate.

No. 20 corrugatus

Propodeum with short-stemmed inverted Y-shaped
carina medially, carinate laterally.

No. 21 diastrophus

63. Transscutellar suture absent to very obscure64

Transscutellar suture prominent68

64. Propodeum with prominent sharp median carina; dorsum
reticulate anteriorly becoming netted posteriorly
with irregular pits.

No. 11 tubicolae

- Propodeum finely reticulate without median carina; dorsum,
 if with netted reticulations, without irregular pits. . . .65
65. Propodeum with two anterior pits on either side66
- Propodeum with more than two pits, usually four or
 with depressions anteriorly, not well defined67
66. Antennal sense organs obscured by ciliation; wings
 with sparse short ciliation.
- No. 38 minutissimus
- Antennal sense organs prominent, in one series; wing
 with moderate long ciliation.
- No. 35 occidentalis
67. Body blue-green with brassy, blue, and purple tints;
 propodeum longitudinally reticulate with anterior
 depressions in place of anterior pits.
- No. 26 garryani
- Body fuscous with slight blue reflections; propodeum,
 shining, with four or more fine anterior pits.
- No. 36 koebeleri
68. Thoracic dorsum with netted reticulations; propodeum
 without a median carina69
- Thoracic dorsum with large discoidal setal sockets;
 propodeum with a distinct median carina71
69. Propodeum with one large anterior pit on either side70
- Propodeum with six anterior pits on either side.

No. 34 nutkani

70. Median carina prominent reaching basal margin of clypeus;
scape mostly blue.

No. 39 rohweri

Median carina prominent reaching half way to basal
margin of clypeus; scape mostly purple.

No. 40 thalassinus

71. Antennal sense organs in one series, few in numbers
on each funicular segment; propodeum with two
short secondary carina on either side.

No. 32 umbilicatus

Antennal sense organs in several overlapping series,
with many on each funicular segment; propodeum with
many distinct pits on either side.

No. 33 tricolor

1. TORYMUS SPENCERI, new species

Torymus spenceri may be separated from all other species by
the length of the ovipositor which is more than twice the length of
the body and head combined. This species, according to the
specialization of the false and true wing veins, shows remarkable
affinity to Torymus fullawayi. The ciliation in the wing of T.
fullawayi is light, and in T. spenceri, the ciliation is heavy.

Female. Length 3.70 mm.; ovipositor sheaths 8.70 mm.

(Photo. 62); thorax blue-green with mesepimeron purple; abdomen blue.

Head same width as thorax, triangular, considerably wider than high; face below antennal sockets roughly sculptured with prominent discoidal setal sockets, green with golden-red reflections; anterior margin of mouth deep blue becoming purple mesad; median carina prominent extending to the basal margin of the clypeus; clypeal carinae prominent, short; scape and pedicel blue-green, except basal one-third of scape which is ochreous; scape exceeding median ocellus; pedicel and ring segment together equal in length to first funicular segment (Photo. 79); funicular segment one 0.14 mm. long and 0.10 mm. wide with 32-36 sensilla placodea; funicular segment seven 0.13 mm. long and 0.10 mm. wide with 38-42 sensilla placodea in two or more overlapping rows; funicle and club combined 1.30 mm. in length.

Thorax. Dorsum blue-green with irregular patches of blue especially on axillae; pronotum and anterior one-third of mesoscutum rugose, remainder of thoracic dorsum coarsely sculptured; thoracic sutures, including transscutellar suture prominent; scutellum with apex golden-green, lateral one-third with a series of parallel furrows bending laterad from transscutellar suture to the margin of the metanotum; scutellar apex center lightly reticulate, shining; propodeum reticulate; brilliant blue; coxae and femora green; trochanters, tibia and tarsi flavo-testaceous; dorso-lateral surface of hind coxae with golden-red reflections from a large central, shallow depression; wings light brown, hyaline (Photo. 37); moderately ciliate with 40-45 setae per square 0.33 mm.; stigmal veins short, petiolate, much

darker than sub-marginal veins; baso-stigmal veins seen as a triple row of setae converging toward stigmal veins; apico-stigmal veins seen as irregular convergence of several rows of setae away from stigmal veins; post-uncul veins an irregular double row of setae; uncul cells filled with ten or more setae.

Abdomen. Segments one to four blue laterally; tergal segment one purple dorsally; segments five and six green to blue-green.

Male. Unknown.

Types. Holotype female, 1 paratype: Agness, Oregon, August 17, 1947 (Hobbs) reared from cynipid gall 1 inch in length with yellow felt-like covering from Quercus chrysolepis Leibm. The holotype is located in the California Academy of Science. One female paratype is in the author's collection.

Variation. The paratype female is 2.90 mm. in length and the ovipositor is 7.30 mm. long with more golden-green and red apparent on the body. In emerging, the paratype did not inflate its wings before death and its smaller size is attributed to rearing conditions.

2. TORYMUS MEGASTIGME, new species

Torymus megastigme may be separated from all other species of Torymus by the enlarged stigmal veins which are open at the apex. According to the wing structure, it is closely allied to T. bedeguaris (Photo. 50). The stigmal veins serve as an excellent separating character.

Female. Length 4.00 mm.; ovipositor sheaths 4.30 mm; body a combination of brilliant green, blue, and purple; stigmal veins extremely large. Head: 1.18 mm. wide, 0.53 mm. thick, 0.81 mm. high; face strongly reticulate, green with golden reflections; median carina prominent extending to basal margin of the clypeus; area just beyond and between clypeal carinae, dark purple; scape light testaceous except dorsal tip which is fuscous; scape not reaching median ocellus; pedicel olive-green, and with ring segments combine, of same length as first funicular segment; funicular segment one 0.13 mm. long and 1.10 mm. wide with 36-40 sensilla placodea; funicular segment seven 0.13 mm. long and 0.11 mm. wide with 38-42 sensilla placodea in several overlapping series; funicle and club combined 1.30 mm. long.

Thorax. Dorsum green, coarsely reticulate with many prominent setal sockets; pronotum with anterior margin and lateral surfaces purple; axillae with lateral surfaces purple; transscutellar suture very prominent; apical one-third of scutellum shining aciculate; metanotum deep purple; propodeum blue-green with purple reflections especially near spiracles; anterior pits four on each side becoming progressively larger; rather deeply reticulate over entire propodeum except carina; metapleuron purple; coxae green except lateral surfaces of hind coxae which are purple; trochanters light testaceous; femora olive-green except basal and apical tips which are testaceous; tibiae testaceous; first to fourth tarsal segments ochreous, fifth segment testaceous (Photo. 12); tegulae fuscous with purple reflections; wings heavily ciliate, with approximately 65-75 setae per square 0.33 mm.;

stigmatal veins with long petioles; stigmal knobs large with apical margins open (Photo. 52); areas near function of marginal and sub-marginal veins and around stigmal veins light fuscous; baso-stigmal veins absent; apico-stigmal veins apparent as convergent setae about a raised wing area; post-uncul veins commencing at stigmal knob posterior to uncus, expressed as a double row of setae, seen somewhat with difficulty because of surrounding setae; uncul cells with 20 or more setae.

Abdomen. Green with purple reflections ventrolaterally on fourth segment; first segment blue-green dorsally, purple laterally, golden then becoming testaceous apically; segment two and three testaceous dorsally; segments one to three medially incised.

Male. Length 2.70 mm. Face with red below antennal sockets; differs from female as follows: scape shorter, fuscous with green reflections; thoracic dorsum with no purple reflections except on anterior margin of pronotum; mesoscutum with apical tip red; abdomen with deep red reflections on apical tip; phallus with prominent basal ring strongly produced cephalad; parameral plates emarginate; digiti with four stout spines.

Types. Holotype female, allotype male; 23 female paratypes: Idyllwild, Riverside County, California, 1924 (collector unknown) reared from Disholcaspis truckeensis Ashm. The series is located in the United States National Museum. Three female paratypes are in the author's collection.

Variations. In the 26 females present there are only slight

size variations.

3. TORYMUS FLAVICOXATUS (O.S.)

Callinome flavicoxa Osten Sacken, 1870. American Ent. Soc. Trans. 3:61; Huber, 1927. United States National Museum Proc. 70 (14):26.

Torymus flavicoxa (Osten Sacken) Dalla Torre, 1898. Cat. Hymen., 5:305.

Torymus flavicoxatus can be separated from other species by the long narrow stigmal veins which are bent apically and close up the uncul cells. Wing structure and ciliation closely resembles T. festivus, but the latter has dome-shaped stigmal knobs.

The male is described here of the first time.

Female. Length 4.00 mm.; ovipositor sheaths 3.30 mm. (Photo. 71); wings 3.60 mm. Thorax black-green, legs and abdomen mostly testaceous. Head 1.00 mm. wide, wider than thorax, 0.50 mm. thick, and 0.85 mm. high; face black-green, with finely netted reticulations; median carina wider than diameter of antennal socket, extending half-way to basal margin of clypeus; clypeal carinae obscure; clypeus fuscous, produced and entire; scape dark testaceous exceeding base of median ocellus; pedicel and ring segment combined half as long as first funicular segment; funicular segment one 0.15 mm. long, 0.09 mm. wide with 16-20 sensilla placodea in two series; funicular segment seven 0.12 mm. long, 0.10 mm. wide with 18-22 sensilla placodea in two series; funicle and club dark fuscous, combined length 1.30 mm. with moderate closely appressed ciliation.

Thorax. Dorsum black-green with blue reflections, irregularly, roughly reticulate with prominent setal sockets; transscutellar suture

absent; propodeum black-green, finely netted with six oval-shaped anterior pits on either side, the first four each twice the size of the last two; legs all testaceous except dorso-basal edge of hind coxae which is green; wings light brown hyaline, moderately ciliate with 50-60 setae of moderate length per square 0.33 mm.; stigmal veins large, petiolate, bent strongly toward wing apex (Photo. 49); all false veins absent except apico-stigmal veins which are expressed obscurely by slight convergence of setae away from stigmal veins; uncul cells with several setae.

Abdomen. Testaceous except apical tip which has patches of dark brown; tergal segments 1-3 deeply incised medially; remainder of segments entire.

Male. Length 2.80 mm. Legs, including coxae and excepting the fifth tarsal segments and the hind tibiae, uniform light testaceous; thorax green with golden-red reflections at junction of mesoscutum and scutellum; abdomen with broad yellow band circumventing basal one-half. Head 0.75 mm. wide, 0.37 mm. thick, and 0.66 mm. high; face below the antennal sockets red; median carina distinctly protruding between antennal sockets becoming almost flat between extremely short clypeal carinae; clypeal apex emarginate; scape testaceous except extreme dorsal tip which is fuscous; antennae fuscous; funicular segments all longer than wide.

Thorax. Dorsum green with golden-red reflections, reticulate with prominent setal sockets on scutellum; transscutellar suture absent; metanotum red; propodeum transversely reticulate with row of pits

around anterior margin, green anteriorly, red posteriorly; legs uniform light testaceous; fore coxae approaching ochreous; hind coxae with dorsal surfaces green proximally; hind tibiae fuscous; wings moderately ciliate, somewhat cloudy; stigmal veins petiolate.

Abdomen. Basal one-third testaceous, remainder fuscus with purple reflections; phallus with prominent basal ring, rhomboid in shape, slight margin of membranous tissue cephalad to the basal ring; apodemes basally parallel (Fig. 31, Photo. 94).

Types. Holotype female; "presumably Connecticut" (Osten Sacken) from Rhodites radicum Osten Sacken, in The Museum of Comparative Zoology at Harvard College. Neallotype male: San Dimas, California, September 1949 (Hobbs and Tower) reared from galls of Andricus discularis Weld, a disk-shaped gall on Quercus chrysolepis Liebm. The neallotype is located in the California Academy of Sciences.

Distribution. Connecticut, Maine, New Hampshire, Massachusetts, New Jersey, Virginia, Ontario, Quebec. New records include 1 female 8 miles south of Prineville, Oregon, August 2, 1935 (Schuh); 2 females and 4 males (neallotype) $\frac{1}{2}$ mile north of San Dimas, California, September 1949 (Hobbs and Tower) reared from galls of Andricus discularis Weld, a disk-shaped gall on Quercus chrysolepis Liebm.

4. TORYMUS FULLAWAYI (Huber)

Syntomaspis caerulea Fullaway, 1912. New York Ent. Soc. Jour. 20: 275. Preocc.

Callimome fullawayi Huber, 1927. United States National Museum Proc. 70 (14): 19. New name; Breland, 1939. Brooklyn Ent. Soc. Bull. 34:87

Torymus fullawayi may be separated from all other species of Torymus by the presence of a tooth on the hind femora. Wing structure and venation is similar to T. spenceri. The latter has twice the number of setae per unit of area as T. fullawayi.

Female. Length 3.90 mm.; ovipositor sheaths 3.60 mm. (Photo. 69). Body blue-green with golden reflections on thoracic dorsum. Head 1.15 mm. wide, as wide as thorax, 0.45 mm. thick. 0.90 mm. high; face below antennal sockets dark reddish-black, above blue-green; face finely reticulate, setal sockets causing a distinct rugosity; median carina obscure, disappearing before reaching the prominent clypeal carinae; scape flavo-testaceous at basal attachment, remainder and pedicel dark brownish-green, scape just exceeding the vertex; pedicel and ring segment combined length 0.15 mm.; funicular segment one 0.21 mm. long, 0.12 mm. wide with 25-30 sensilla placodea; funicular segment seven 0.12 mm. long, 0.11 mm. wide with 23-28 sensilla placodea: funicle and club combined 1.40 mm. long.

Thorax. Dorsum blue-green with golden reflections; scutum highly irregularly rugose which somewhat obscures setal sockets except as seen from certain angles; scutellar sculpturing same as scutum, but with setal sockets prominent; transscutellar suture prominent; post-scutellar area lightly reticulate; propodeum with sharp median carina, surface longitudinally rugose; anterior pits four on each side

commencing more than twice the full diameter away from median carina, each pit becoming smaller laterally; coxae and femora blue-green; tibiae and tarsi various testaceous shades; hind femora with a distinct tooth on ventral apical margin (Photos. 10, 14), inner surface purple; wings with 24-28 setae per square 0.33 mm.; stigmal veins sessile with distinct brown area in wings around stigmata (Photo. 36); baso-stigmal veins absent; apico-stigmal veins composed of eight irregularly placed setae; post-uncul veins commencing as a double row of setae becoming three rows half way to anterior margin of wing; uncul cells without setae.

Abdomen. Terga blue with golden-green posteriorly; tergal segment one and two medially incised, first segment large overlapping major portion of second segment; third tergal segment deeply parted, fourth nearly entire.

Male. Specimens of the male could not be located. The original description does not mention a male.

Types. Holotype: "California from Callirhytis agrifoliae (Bassett) at Leland Stanford University (lot 499, S. 3)" (Huber). Recent information indicates that there are no specimens of this species in the Stanford University collection.

Distribution. California and Oregon. Two specimens have been reared by the writer: 1 from 3 miles north-west of Corvallis, Oregon, June 17, 1947, in galls of Callirhytis washingtonensis Gill on Quercus garryana Dougl., and the other from Del Amo Nursery, Del Amo, Los Angeles County, California, January 25, 1950. The galls from which

this specimen emerged in April of the same year were of Callirhytis agrifoliae (Bassett) on Quercus agrifolia Nee.

5. TORYMUS CHRYSOCHLORUS (O.S.)

Callimome chrysochlora Osten Sacken, 1870. American Ent. Soc. Trans. 3:63; Huber 1927. United States National Museum Proc. 70 (14): 37.

Callimome solitaria Osten Sacken, 1870. American Ent. Soc. Trans. 3: 64.

Torymus chrysochlorus may be separated from near relatives by the following combination of characters: funicular segments longer than wide, stigmal veins distinctly petiolate, ovipositor same length as body, wings with brown hyaline area, body totally green with red reflections from abdomen. T. chrysochlorus in wing structure and general body coloring is very closely related to T. bedeguaris. T. bedeguaris has a consistently ruby red abdomen and is reared from a single host Diplolepis rosae (L.). T. chrysochlorus has nearly a dozen recorded hosts none of which is the same as the host recorded for T. bedeguaris.

Female. Length 4.00 mm.; ovipositor sheaths 4.50 mm. long (Photos. 53, 55, 59, 60). Thorax blue-green with golden reflections. Abdomen magenta. Head: 1.05 mm. wide, wider than thorax, 0.50 mm. thick, 0.70 mm. high; face golden-green, irregularly reticulate, setal sockets apparent; median carina very prominent, reaching the basal margin of clypeus; clypeus entire, slightly produced; clypeal carinae

fuscous; anterior tentorial pits translucent light blue; scapes ochreous except dorsal apical surface which is infusate; scape reaches median ocellus; antenna except scape, fuscous; pedicel and ring segment combined length 0.18 mm.; funicular segment one 0.15 mm. long, 0.10 mm. wide with 25-30 sensilla placodea; funicular segment seven 0.13 mm. long, 0.11 mm. wide with 34-40 sensilla placodea; funicle and club combined length 1.30 mm.

Thorax. Dorsum finely reticulate with prominent setal sockets on all dorsal surfaces; lateral surfaces ruby red; transscutellar suture virtually absent, seen only at extreme lateral margins; propodeum very finely longitudinally reticulate, nearly aciculate and somewhat netted in some light; propodeal pits uniform in size except the enlarged fifth and commencing some distance from center; fore and mid coxae green anteriorly, rest ochreous; hind coxae brassy-green on ventro-lateral plane, ruby-red on dorso-lateral plane, rest of legs ochreous; wings heavily ciliated with 38-42 brown setae per square 0.33 mm.; stigmal veins petiolate with tinge of brown in wings around them (Photo. 48); baso-stigmal veins absent; apico-stigmal veins suggested by general convergence of setae some distance away from stigmal veins; post-uncul veins obscured by numerous setae in uncul cells.

Abdomen. Ruby red; tergal segments one to four medially incised; tergal segment five deeply emarginate.

Male. Generally darker than female and with more purple in abdominal pigments; phallus with a moderately apparent basal ring, area

cephalad, somewhat membranous; parameral plates prominently emarginate; apodemes apically slightly converging; digiti bearing four prominent stout spines (Photo. 93).

Types. Holotype female: from "probably Connecticut" reared from Rhodites dichloceros (Harris) Osten Sacken in the Museum of Comparative Zoology at Harvard College, No. 818. One paratype, female is in the United States National Museum, Cat. No. 25390. According to the labels on the type material, no date or locality is given.

Distribution. Arizona, New Mexico, California, Oregon, Colorado, Ohio, Illinois, New England, and New Jersey.

6. TORYMUS PILULARIDIS (Huber)

Callimome pilularidis Huber, 1927. United States National Museum Proc. 70 (14): 45.

The author has been unable to see type material of this species, therefore, it is impossible to assign a close relative. Huber indicates that T. pilularidis is closely related to T. baccharidis (Huber), but may be separated by the color of the hind femora and tibiae.

The following is the original description:

Female. "Length 2.25 mm.; ovipositor 0.9 mm. Thorax greenish-brown and finely sculptured; abdomen shining fuscous. Head transverse and decidedly wider than the thorax; viewed from the front minutely reticulated and sparsely clothed with short white hairs; green fuscous; antennal depression enlarged including most of the face, the depression as deep as the diameter of the scape plus that of the flagellum; antennae separated by a strongly developed carina; scape dark green and

extending three-fourths the distance to median ocellus; flagellum fuscous and somewhat shining; the pedicel a little longer than the ring-joint and first funicle joint combined; ring-joint not quite as long as wide, all joints of funicle gradually growing wider toward the tip, but all a little longer than wide; each funicle joint clothed with regularly arranged and widely separated testaceous hairs that are almost as long as a joint; eyes fuliginous. Thorax elongate and conspicuously clothed with rather long white bristly hairs; parapsidal furrows well defined; scutellar apex not so deeply sculptured as the anterior portion; the scutellar cross furrow not definite; propodeum rather smooth, the anterior margin with numerous small pits; coxae brownish, the hind ones with a greenish tinge; femora and tibiae shining light brown, except a little lighter at the tips; the hind femora and tibiae much darker; tarsi with basal half citrine; wings strongly ciliate; marginal vein two-thirds as long as submarginal, the stigmal vein petioled. Abdomen as long as thorax, slightly subcompressed and dorsally depressed; segments medially emarginate; conspicuous white hairs on sides; ovipositor a little shorter than abdomen.

"Male. Length 2.5 mm. Scape greenish brown; thorax rather robust, and with a cupreous tinge; legs darker than in female."

Types. Holotype female, allotype male: Martinez, California, January 1883, reared from Prosoma species on Baccharis pilularis De Candolle. The types are located in the United States National Museum, Cat. No. 25355.

7. TORYMUS BACCHARIDIS (Huber)

Callimome baccharidis Huber, 1927. United States National Museum Proc. 70 (14):46.

Torymus baccharidis is easily separated from other closely related species by the seven anterior propodeal pits of varying sizes.

According to Huber, T. baccharidis is closely related to T. pilularidis. On the basis of male genitalia, the writer feels that there is a closer affinity to T. flavocoxatus. T. flavocoxatus has six uniformly sized oval pits on the anterior margin of the propodeum.

Female. Length 2.20 mm.; ovipositor sheaths 1.00 mm.; wings 2.20; thorax green; abdomen fuscous with green reflections. Head 0.65 mm. wide; wider than thorax; 0.30 mm. thick; 0.55 high; face blue-green with fine transverse reticulations; median carina very prominent extending to the basal margin of the clypeus; clypeal carinae short, obscure; clypeus blue, not reaching median ocellus; scape testaceous ventrally, fuscous dorsally with blue reflections; pedicel and ring segment black-green, combined length one and one-half times longer than first funicular segment; funicular segment one 0.07 mm. long, 0.04 mm. wide with 4-6 sensilla placodea; funicular segment seven 0.06 mm. long, 0.07 mm. wide with 8-10 sensilla placodea; funicle and club combined 0.60 mm. long, moderately ciliate.

Thorax. Dorsum golden-green with irregularly roughened, transverse reticulations; entire dorsum with setal sockets prominent; transscutellar suture absent; scutellar apex shining coppery red; propodeum coppery-red with transverse reticulations medially, seven anterior pits on either side of varying sizes; coxae uniform oily-green; remainder of legs uniform, light testaceous; wings, hyaline, heavily ciliate with 65-75 moderately long setae per square 0.33 mm.; stigmal veins with prominent narrow petiole; uncus very long and narrow; baso-stigmal veins indicated only by setae bent toward stigmal

veins; apico-stigmal veins indicated by setae bent away from stigmal veins; post-uncul veins obscure to absent; uncul cells with few setae.

Abdomen. Oily-green dorsally, fuscous ventrally; tergal segments one to three medially notched; tergal segments four and five emarginate.

Male. Length 2.00 mm.; body as seen laterally fuscous with tints of red; scape distorted, color same as body; funicular segments very heavily ciliate with setae bent gently toward apical tip; 2-6 less sensilla placodea per segment than female; propodeum more finely reticulate; femora with fuscous band medially; wing setae slightly longer than in female; phallus with prominent basal ring forming nearly a 90° angle; parameral plates widely separated, slightly emarginate; apodemes crossing each other twice apically; digiti with three major teeth and two minor teeth, one on either side of center tooth.

Types. Holotype female, allotype male, and 13 paratypes: San Francisco, California, July 16, 1885, reared from Cecidomyia species gall on Baccharis pilularis De Candolle. The types are located in the United States National Museum, Cat. No. 25364.

8. TORYMUS KINSEYI (Huber)

Callimome kinseyi Huber, 1927. United States National Museum Proc. 70 (14) : 44.

Six anterior pits on either side of the propodeum which diminish

in size distinguish T. kinseyi from its close relative, T. obscurus.

Female. Length 2.85 mm.; ovipositor sheaths 1.50 mm.; wings 2.80 mm. long; body generally blue-green with purplish and reddish reflections. Head 0.80 mm. wide; slightly narrower than thorax; 0.40 mm. thick and 0.65 mm. high; face oily-green; median carina exceedingly prominent ending before basal clypeal margin in an acute point; clypeal carinae blue ending at tentorial pits; clypeus blue-green, emarginate, scape basally testaceous; remainder dark oily-green; pedicel same color as scape (remainder of antennae missing); posterior area of head bright blue-green.

Thorax. Dorsum dull oily-green with general patches of dull red; setal sockets seen only at certain angles; transscutellar suture very obscure; propodeum green with slight red reflections; six anterior pits on either side diminishing in size laterally; first anterior pit open posteriorly; coxae all same color as body; femora with longitudinal bands dorsally fuscous; remainder of legs flavo-testaceous; wings hyaline, moderately ciliate with 40-50 long erect setae per square 0.33 mm.; stigmal veins distinctly petiolate; baso-stigmal veins seen only as convergence of setae toward stigmal veins; apico-stigmal veins seen as setae bent away from stigmal veins; post-uncul veins irregular double row of setae; uncul cells filled with setae.

Abdomen. Tergal segment one blue-green, deeply incised medially; tergal segment two, fuscous, notched medially; tergal

segment three, fuscous, slightly emarginate medially; remaining segments fuscous, entire.

Male. Length 2.40; body blue-green with golden reflections; median carina extremely prominent, acute; anterior margin of mouth brilliant blue, emarginate; scape robust, fuscous; pedicel and ring segment combined equal in length to first funicular segment; funicular segment one 0.10 mm. long and 0.06 mm. wide with 4-6 sensilla placodea; funicular segment seven 0.12 mm. long and 0.10 mm. wide with 12-14 sensilla placodea; funicle and club combined 0.93 mm. long, densely coated with castaneus setae; mid and hind femora body color medially; testaceous apically; phallus with rather prominent basal ring fading gently into membranous area cephalad; basal phallic opening heart-shaped; parameral plates deeply emarginate; adodemes apically blunt, both crooked to the right side; digiti with three strong teeth and apparently intermediate teeth between them (Fig. 8).

Types. Holotype female, allotype male and 5 paratypes: Inyo, California, April 9, 1887, reared from a dipterous gall on Artemisia species. The types are located in the United States National Museum, Cat. No. 25361.

Distribution. In addition to the record from California (above) and a record from Utah, the writer has specimens collected at Redmond, Oregon, June 30, 1939 (Gray & Schuh) on Artemesia tridentata Nutt. and 1 specimen collected at Milton, Oregon, July 14, 1938 (Gray & Schuh) with no host record.

9. TORYMUS VIRIDIS, new species

Torymus viridis may be separated from its close relative T. chrysochlorus by the small anterior propodeal pits which decrease in size anteriorly. Torymus chrysochlorus has its digiti equipped with four prominent spines, whereas, the digiti of T. viridis is equipped with three prominent spines.

Female. Length 4.00 mm.; ovipositor sheaths 3.60 mm. (Photo. 73); wing 3.60 mm. body brilliant green with slight bluish tinge; abdomen reflecting purple in certain lights. Head 1.06 mm. wide; 0.40 mm. thick; 0.87 mm. high; clypeal carinae prominent, one-half as long as distance between them; carina separating the antennal sockets protrudes the distance equal to its width and extends as far below as above the antennal sockets; area half-way between the anterior margin of the mouth and the median carina with gold reflections; entire face with silky white setae twice as long as the distance between them; antennal scape just reaching median ocellus, 0.37 mm. long, yellow dorso-basally, remainder the same color as the body; pedicel and ring segments the same length as the first segment of funicle, funicular segment one 0.16 mm. long, 0.11 mm. wide; funicular segment seven 0.13 mm. long and 0.12 mm. wide; funicle and club combined 1.16 mm. long, fuscous, 26-30 sensilla placodea per funicular segment (Photo. 80).

Thorax. Green with golden reflections; long white setae of equal length distributed over entire dorsum; sculpture of mesoscutum

finely reticulate on anterior two-thirds with minute discoidal punctures on posterior one-third and on scutellum; transscutellar suture seen only slightly at lateral margins of scutellum; propodeum lightly reticulate in concentric rings around posterior center, uniform in color; anterior propodeal pits small decreasing in size and ceasing three-fourths way to spiracles; coxae same color as body, remainder of leg segments flavo-testaceous except tarsal segments one and two which are ochreous; all basal sclerites of the wing ochreous; basal two-thirds of submarginal veins white, remainder of veins light brown; wings lightly ciliate with 18-20 setae per square 0.33 mm.; stigmal veins petioled (Photo. 40); baso-stigmal veins absent; apico-stigmal veins a neat single row of setae continuing to apical wing margin; post-uncul veins appearing to branch three or more times before reaching wing margin; uncul cells with three or more setae.

Abdomen. Approximately same length as thorax; dorsum without reticulation or setae, with weak reticulations and long setae developing laterally becoming closer to the dorsum posteriorly; tergal segments three, four, and posterior portion of five purpureus, remaining segment green; tergal segments one to four incised; segment five emarginate.

Male. (Photos. 20, 41) Length 2.65 mm.; body generally blue-green with many purple reflections; scape same color as body, not reaching median ocellus, 0.25 mm. in length; funicle 1.00 mm. long with many short, curved, stout setae, each segment bearing an average of 12-16 sensilla placodea, all segments longer than wide becoming

subquadrate toward apex; coxae, trochanters, basal two-thirds of femora bluish purple, apical one-third of femora, tibiae, segments three, four, five of tarsi testaceous; phallus with semi-apparent to obscure wide basal ring; parameral plates deeply incised; apodemes slightly emarginate at basal third (Photo. 103, Fig. 23).

Types. Holotype female, allotype male, and 10 paratypes: Fort Rock, Oregon, June 15, 1938 (Schuh & Gray) reared from "galls on sage"; four female and two male paratypes, 15 miles west of Redmond, Oregon, July 28, 1939, from "sage galls"; one female and 4 male paratypes, Redmond, Oregon, June 30, 1939 from galls on Artemesia tridentata Nutt. (Gray & Schuh); 2 female paratypes, Black Butte, Oregon, May 16, 1947, emerged August 15, 1947 from galls (trypetid) on Chrysothamnus viscidiflorus Nutt. The types are located in the United States National Museum. Six male paratypes: 15 miles west of Redmond, Oregon, July 28, 1939 (Gray & Schuh) in the author's collection.

Variations. Beside the generic variations noted earlier, the females in the type series vary from 2.90 mm. to 4.60 mm. in length of the body and from 2.00 mm. to 3.50 mm. in length of the ovipositor. The male is from 1.60 mm. to 2.70 mm. in length.

10. TORYMUS GAHANI (Huber)

Callimome gahani Huber, 1927. United States National Museum Proc. 70 (14) : 69.

The writer has been unable to examine the male or female of this species, therefore, it is impossible to assign a close relative.

The following is the original description:

Female. "Length 4 mm.; ovipositor 3.75 mm. Thorax robust, dorsum blue with tints of green and a few purplish spots in some lights; abdomen dark green. Face minutely reticulately rugose but with a few irregularly placed impunctations; blue green and with a few silvery hairs; facial carina transversely aciculated, the sides with short bristly hairs; antennae attached just a little below the middle, scape yellow and cylindrical; pedicel fuscous and about three times as long as the ring-joint which is one-third as long as wide; pedicel and ring-joint combined scarcely as long as the first joint of the funicle; flagellum brown with minute longitudinal keels arranged so as to give joints double aspect; joints of funicle all longer than wide and of about equal length; eyes pinkish, ocelli amber; the ocellular line about one and one-fifth times the length of the long diameter or nearly twice the length of the short diameter of posterior ocellus; the lateral ocellar line exactly equal to the long diameter of post ocellus. Dorsum minutely reticulately punctate, and clothed with delicate hairs; parapsidal furrows deep and black; scutellum with a longitudinal depression which is more finely sculptured; scutellar cross furrow well define, the apex of scutellum not so deeply sculptured; propodeum mostly smooth and shining; coxae fuscescent blue; femora brownish inwardly and greenish brown outwardly and slightly pubescent; tibiae yellow; wing ciliate, veins yellow, except the stigmal vein which is brownish; stigmal vein sessile. Abdomen very feeble carinate dorsally; first four segments incised medially; area in region of first segment yellowish to light brown undershade.

Male. Length 3.5 mm. Antennae darker than in female; tibiae light brown the hind ones darkest; sub-marginal veins distinctly brown, the marginal infuscated."

Types. Holotype female, allotype male, and one male paratype:

Ashland, Oregon, February 26, 1916 reared from cynipid gall on Quercus garryana Doug. The types are located in the United States National Museum, Cat. No. 25320.

11. TORYMUS TUBICOLAE (Osten Sacken)

Callimome tubicola Osten Sacken, 1870. American Ent. Soc. Trans. 3: 60; Huber, 1927. United States National Museum Proc. 70 (14): 60.

Syntomaspis advena (Osten Sacken) Ashmead, 1887. Amer. Ent. Soc. Trans., 14:187, (Misidentification).

The short median propodeal carina and the four anterior pits which nearly double in size, progressing laterally, separates T. tubicolae from all other species. T. tubicolae has a structure in the male genitalia which places it as a close relative to T. giganticus and T. lazulus. It may be separated from both species by the sculpturing of the propodeum.

Female. Length 3.40 mm.; ovipositor sheaths 4.20 mm. Body blue with much green reflection. Dorsum with combination of plain transverse and irregular honey-comb reticulations, setalsockets creating irregular longitudinal furrows. Head: 1.10 mm. wide, wider than thorax, 0.43 mm. thick, 0.80 mm. high; face atropurpureus below, blue-green above with fine wavy transverse reticulations; median carina commencing blue, fading into lower face color, nearly indistinguishable near basal margin of clypeus; clypeal carinae seen only at certain angles; clypeus slightly emarginate, produced beyond anterior margin of oral cavity; scape ochreous, reaching median ocellus; pedicel greenish-black dorsally, combined length with ring segment 0.10 mm.; funicular segment one 0.16 mm. long, 0.10 mm. wide with 26-30 prominent sensilla placodea; segment seven 0.16 mm. long, 0.11 mm.

wide with 30-34 sensilla placodea; funicle and club combined, 1.20 mm. long, infusate.

Thorax. Dorsum blue-green with some golden reflection; mesoscutum with combination sculpturing as listed above; scutellum similar to mesoscutum in color and sculpturing; transscutellar suture quite evident; propodeum transversely carinate, longitudinal reticulations evident over entire surface except that area occupied by short median carina and four anterior pits on each side; pits nearly doubling in size as they progress laterally; coxae and femora blue; hind femora slightly enlarged beyond the middle; femora apices same color as the testaceous tibiae; tarsi white except segment five which is testaceous; wings hyaline, moderate to heavily ciliated, 26-30 setae per square 0.33 mm.; stigmal veins subsessile darker than marginal veins; baso-stigmal veins expressed by extremely general convergence of setae toward stigmal veins; apico-stigmal veins indicated by an irregular single row of setae which can be followed to apical wing margin; post-uncul veins shown by sparse double row of setae; uncul cells with 0-4 setae, if setae are present they are situated near the apical end of the post-uncul and post-marginal veins.

Abdomen. Tergal segments 1-4 medially incised; segment five very strongly emarginate; abdomen essentially blue with brown ventrally and apically.

Male. Length 2.40 mm. Body bluish-black with suggestion of green. Longitudinal propodeal carina with several prominent sharp carinae superimposed; base of aedeagus lightly sclerotized, evenly

rounded, without an apparent basal ring, pointed apically; apodemes slightly convergent basally; parameral plates, dark brown, distinctly produced medially becoming deeply concave; digiti with three strong spines (Photo. 86, Fig. 34).

Types. Holotype female, and allotype, male; Washington, D.C. (no date or collector given) from Andricus tubicola (Osten Sacken). The types are located in the Museum of Comparative Zoology at Harvard College.

Distribution. Quebec, Massachusetts, North Carolina, Indiana, Ohio, Louisiana, Texas, and California.

12. TORYMUS PERPLEXUS (Huber)

Callimome perplexus Huber, 1927. United States National Museum Proc. 70 (14); 49.

Gross characters of T. perplexus, e.g. shape, structure, and relative length of the ovipositor, show a relationship to T. giganticus and T. castanopsidis. It may be distinguished from both by the consistent purple coloration of the body and by large sessile stigmal veins. The false veins of T. perplexus are very prominent, whereas, the false veins of T. giganticus and T. castanopsidis are apparent, but not prominent in similar qualities.

The male is described here for the first time.

Female. Length 4.80 mm.; ovipositor sheaths 9.70 mm. (Photo. 68). Body blue-green with brilliant purple reflections. Dorsum with reticulate converging lines. Fore wings 4.30 mm. with most of area

light brown. Head: 1.40 mm. wide, as wide as the thorax, 0.60 mm. thick, 1.00 mm. high; face atropurpureus, transversely reticulated, setal sockets shallow and difficult to see in some lights; median carina apparent only between antennal sockets; clypeal carinae extending half-way to antennal bases changing direction one-third the way toward the lateral margin of antennal sockets; scape testaceous reaching median ocellus, ventral hump two thirds distance from base; antenna except scape, fuscus; pedicel and ring segment greenish-black; combined length 0.20 mm.; first funicular segment 0.25 mm. long, 0.13 mm. wide with 65-85 sensilla placodia; funicular segment seven 0.18 long, 0.15 wide with 90-110 sensilla placodea; funicle and club black, combined length 1.80 mm. (Figs. 13, 14; Photo. 7).

Thorax. Mesocutum bluish-purple with patch of wine color in center of scutum followed by blue-green band; scutellum wine colored; parapsidal plates blue-green; mesocutum reticulate-rugose with prominent but shallow setal sockets; scutellum purple with arching reticulations and slight irregular depressions; transscutellar suture prominent cutting off the longitudinally reticulate posterior one-third of scutellum; propodeum with anterior pits absent, replaced by six prominent carinae of varying lengths on each side; propodeal surface with remainder longitudinally reticulate; fore coxae green, mid coxae fuscous, hind coxae blue with sharp carina dorsally; fore and mid femora mostly fuscous, testaceous apically; hind femora same color as scutellum; tibiae all various shades of brown; tarsi flavo-testaceous; wings heavily ciliated, 30-35 setae per square .33mm.

with most of fore wing area very light brown; stigmal veins sessile (Photo. 32), darker than marginal veins; baso-stigmal veins commencing as rather indefinite triple row of setae, disappearing five setae basad of stigmal veins; area occupied by baso-stigmal veins darker brown than remainder of wing; apico-stigmal veins composed of ten setae in an irregular row ceasing as they commence toward apical wing margins; uncul veins barely discernable as several irregular rows of setae, rows increasing nearer wing margins; uncul cells with three or more setae between uncus and post-marginal veins.

Abdomen. Atropurpureus with blue-green reflections laterally; tergal segments one to four medially incised; tergal segments five to seven entire.

Male. Length 3.10 mm; body various combinations of blue and green. Head 1.03 mm. wide, 0.37 mm. thick, and 0.81 mm. high; face brunneus with gold, purple, and blue reflections, reticulate with prominent setal sockets; median carina shining, extending to basal margin of clypeus; clypeus slightly emarginate; scape compressed on lower half, blue with brunneus reflections, emarginate; pedicel and ring segment combined shorter than first segment of funicle which is 0.14 mm. long, 0.11 mm. wide with 65-75 sensilla placodea; funicular segment seven 0.13 mm. long, 0.11 mm. wide with 70-90 sensilla placodea; funicle and club combined 1.10 mm. long.

Thorax. Dorsum brilliant deep blue, punctate with prominent setal sockets; scutellar apex reticulate without setal sockets;

propodeum deeply striate, blue; two pits on either side of a sharp median, propodeal carina; coxae deep blue; femora blue with purple reflections; tibiae blue-green dorsally, fuscous ventrally; each tarsal segment becomes darker apically from citrine to fuscous; wings strongly ciliate with exceptionally long setae per square .33 mm.; veins testaceous; stigmal veins petiolate surrounded by light brown area.

Abdomen. 1.10 mm. long, shorter than thorax which is 1.62 mm. long, blue-green basally; apical one-third of first segment and all of second segment purplish-black; abdomen with apical one-half blue dorsally, lateral and ventral aspects blue with purple reflections; phallus with deeply emarginate prominent basal ring; acute crescent-shaped membranous area cephalad; parameral plates emarginate; apodemes commence basally in a diagonal direction toward parameres and slowly turn mesad; digiti with four prominent slightly curved spines (Photos. 90, 92; Fig. 21).

Types. Holotype female: Ashland, Oregon, August 9, 1915 (J. M. Miller) reared from Disholcaspis maculipennis (Gillette) on Quercus garryana Doug. Cat. No. 25339; neallotype male; Corvallis, Oregon, June 12, 1948 (Hobbs) reared from galls of Cynips mirabilis Kins. on Quercus garryana Doug. The types are located in the United States National Museum.

Distribution. In addition to the type localities, the writer has specimens from Ames, Iowa, August 23, 1934 (Scullen) reared from

galls of Cynips mirabilis Kins.

13. TORYMUS CALIFORNICUS (Ashm.)

Syntomaspis californica Ashmead, 1886. American Ent. Soc. Trans. 13:127; Fullaway, 1912. Journ. New York Ent. Soc. 20:274.

Callimome californica (Ash.) Huber, 1927. United States National Museum Proc. 70 (14) :87.

Torymus californicus (Ash.), Hobbs, 1948. Pan Pacific Ent. 24:95-96.

Torymus californicus separates itself from other closely related species by a consistent magenta color, the large size of the body, and the large discoidal setal sockets on the thoracic dorsum. It can only be related to T. tricolor and T. umbilicatus, both of which are consistently half the size of T. californicus. The phallobase of all three are similarly constructed, but the spodemes of T. californicus are entire, while those of T. tricolor and T. umbilicatus are emarginate.

Female. Length 4.00 mm.; ovipositor sheaths 7.00mm. (Photo. 70). Wings 4.10 mm. Body coppery green. Dorsum with large discoidal setal sockets. Head: 1.30 mm. wide, nearly as wide as thorax, 0.50 mm. thick, 1.20 mm. high; face crimson, reticulate with prominent setal sockets; median carina commencing between antennal sockets, becoming wider to the basal clypeal margin; clypeal carinae prominent; scape, pedicel, ring segment, and first segment of funicle ochreous remainder of flagellum infusate; scape just reaches median ocellus;

pedicel and ring segment combined 0.20 mm. shorter than first segment of funicle; first funicular segment 0.40 wide with 90-111 sensilla placodea; funicular segment seven 0.50 mm. long, 0.40 wide with 90-110 sensilla placodea; funicle and club 1.50 mm. in length (Photo. 81).

Thorax. Dorsum cupreous with rich green reflections from large discoidal setal sockets, highest elevations reticulate; parapsidal furrows somewhat obscure anteriorly becoming more prominent posteriorly; transscutellar suture prominent; posterior one-fourth of scutellum without discoidal setal sockets, irregular honey-comb type reticulation; propodeum brilliant magenta with five longitudinal reticulations converging posteriorly, anterior pits prominent; coxae essentially body color; femora and tibia infusate; hind femora enlarged, flavo-testaceous; wings moderately ciliate with 20 setae per .33 square mm.; a double row of setae extending from uncus toward apical wing margin; cell formed by this extension without setae; stigmal veins sessile, brown.

Abdomen. Tergal segments one and two, blue, medially incised as seen from above; segment three incised green with golden reflections; segment four incised golden with cupreous reflections; remaining segments brilliant cupreous, entire; sternum infusate.

Male. 3.30 mm. Head and body green; thorax with blue reflections laterally and ventrally. Antenna totally darker than that of female; tarsi and tibiae also darker, femora mostly body color; phallus

with extremely fine semi-circular basal ring; parameral plates slightly emarginate; apodemes nearly parallel; digiti with three stout spines (Fig. 20; Photo. 88).

Types. Holotype female, allotype male, one male paratype: "California" (Huber) reared from Andricus pomiformis (Bassett) Ashmead (dates and specific locality not available. The types are located in the United States National Museum, Cat. No. 25316.

Distribution. California, Oregon, Connecticut, and Florida. Further distributional records are as follows: 5 miles west of Lewisberg, Benton Co., Oregon, July 30, 1941 (Ferguson); Corvallis, Oregon, June 3, 1930 (Scullen); Corvallis, Oregon, July 7, 1947 (Hobbs) reared from galls of Callirhytis washingtonensis Gill.; Chico, California, Nov. 11, 1939 (Scullen); Davis, California, September, 1936 (Dorman).

Variations. Size and color variations are prominent in this species. The female body varies in length from 4.20 mm. to 6.50 mm. The ovipositor sheaths vary in length from 4.50 mm. to 14 mm. Color commences with golden green and shades through to brilliant magenta. The males vary in size from 2.40 mm. to 4.30 mm. Color of the males, however, appears rather constant.

14. TORYMUS GIGANTICUS (Huber)

Callimome giganteum Huber, 1928. United States National Museum Proc. 70 (14):65; Hobbs, 1948. Pan Pacific Ent. 24:95-96.

The sculpturing of the propodeum is the only consistent method of separating Torymus giganticus and Torymus castanopsidis (Huber) to which it is very closely related. On the propodeum of T. giganticus there are three anterior pits on either side with the third three times the size of the first two. In T. castanopsidis, the third pit is only double the size of the first two pits.

Female. Length 3.90 mm.; ovipositor sheaths 5.50 mm. Body blue-green, venter brown. Head 1.25 mm. wide, as wide as thorax, 0.50 mm. thick, 1.00 mm. high; face bluish-black; irregularly reticulate; setal sockets apparent in some lights; median carina indistinct, fading completely two-thirds way from antennal sockets; anterior margin of oral cavity smoothly curved; clypeus appears somewhat transparent, testaceous; clypeal carinae extremely short, but prominent; scape flavo-testaceous, exceeding the anterior margin of median ocellus; remainder of antennae infusate; pedicel and ring segment combined length 0.16 mm.; funicular segment one 0.20 mm. long, 0.13 mm. wide with 45-65 sensilla placodea; funicular segment seven 0.16 mm. long, 0.12 mm. wide with 35-55 sensilla placodea; funicle and club combined 1.30 mm. long (Photo. 77).

Thorax (Photo. 25). Dorsum finely reticulate anteriorly becoming irregularly honey-combed posteriorly, setal sockets imperceptible; transscutellar suture evident by a bright blue line; propodeum with more green than dorsum, three anterior pits on each side, the third three times the size of first two, areas other than pits, longitudinally reticulate; all coxae and femora body color except hind coxae

with lateral surface purple and apical portion of femora infusate; tibiae testaceous (Photo. 8); tarsi, flavo-testaceous; hind femora slightly enlarged; wings heavily ciliated with 30-35 setae per square 0.33 mm. with entire wing hyaline; stigmal veins sessile (Photo. 38), darker than submarginal veins; baso-stigmal veins completely indistinguishable; apico-stigmal veins expressed by converging setae past the curve directing the veins apically; uncul veins evidenced by a rather distinct double row of setae; uncul cells virtually devoid of setae.

Abdomen. Tergal segments one to three deeply incised medially; segments four and five incised.

Male. Length 3.20 mm.; colors the same, but essentially darker than the female; basal ring prominent, indentate before apex; hind femora distinctly enlarged; phallus with faint long oval-shaped basal ring; parameral plates strongly emarginate; apodemes bent slightly mesad apically; digiti with three stout spines (Fig. 33; Photo. 91).

Types. Holotype female; Tepic, Mexico reared from cynipid gall on Quercus species "(under Bureau of Entomology No. 5722°)"; allotype male: Grant's Pass, Oregon, April 7, 1920 (A. C. Kinsey) reared from Disholcaspis maculipennis Gillette on Quercus garryana Douglas. The types are in the United States National Museum, Cat. No. 25317.

Distribution. California and Oregon. The writer has reared many specimens of T. giganticus collected near Corvallis, Oregon from the following hosts; Amphibolips sp., Callirhytis washingtonensis Gill. X

and Cynips mirabilis Kins. all on Quercus garryana Dougl.

Variation. Size variations are prominent. The female varies in length from 2.10 mm. to 5.00 mm., the ovipositor from 2.00 mm. to 7.00 mm. Basic colors are relatively constant. The male varies in length from 1.70 mm. to 3.50 mm. These variations include limits from fifty specimens.

15. TORYMUS CASTANOPSIDIS (Huber)

Callimome castanopsidis Huber, 1927. United States National Museum Proc. 70(14): 64.

As mentioned in the previous species, T. castanopsidis can be separated from its close relative T. giganticus by the single character of the double sized third pit on the anterior margin of the propodeum. Huber considers T. castanopsidis as being closely related to T. gahani. The well-defined transscutellar suture of T. gahani would separate it markedly from T. castanopsidis with a transscutellar suture which is not well defined. The writer has not examined specimens of T. gahani, but if T. castanopsidis is as closely related to T. gahani as it is to T. giganticus, then all three species may be eventually placed in synonymy.

Female. Length 3.40 mm.; ovipositor sheaths 4.00 mm.; wings 3.00 mm. long; body blue with slight green and purple reflections. Head 1.00 mm. wide; as wide as thorax; 0.50 mm. thick; 0.80 mm. high; face blue-green, very lightly reticulate with moderately prominent

setal sockets; median carina shiny, flat, reaching the basal margin of the clypeus; clypeal carinae black, prominent to tentorial pits; clypeus brown, slightly produced and somewhat emarginate; scape flavo-testaceous exceeding base of median ocellus; remainder of antenna light fuscous; pedicel and ring segment combined shorter than first funicular segment; funicular segment one 0.13 mm. long and 0.10 mm. wide with 28-30 sensilla placodea in two series; funicular segment seven 0.13 mm. long and 0.10 mm. wide with 30-34 sensilla placodea in two series; funicle and club combined 1.00 mm. long with dense closely appressed ciliation.

Thorax. Dorsum brilliant blue with very slight green reflections; dorsal thoracic sutures purple; dorsal surfaces uneven with irregular honeycomb reticulations; transscutellar suture moderately prominent; propodeum brilliant blue with golden-green reflections laterally; three anterior pits on either side, first two small, third more than double in size than the first two combined; ventral sclerites purple; coxae blue with purple reflections; femora fuscous with bluish-purple reflections except tips which are testaceous; tibiae and tarsi testaceous; wings hyaline, moderately ciliate with 35-45 setae per square 0.33 mm.; stigmal veins subsessile; baso-stigmal veins expressed as several rows of setae converging toward stigmal veins; apico-stigmal veins a single irregular short row of setae; post-uncul veins commencing as a single row becoming double and then triple in less than half the distance to anterior wing margin; uncul cells

immaculate.

Abdomen. Purple; tergal segment one and two medially incised; tergal segment three and four slightly notched; remaining segments entire.

Male. Length 3.00 mm.; body generally blackish-green with blue and magenta on dorso-lateral surface of hind coxae; antenna robust, castaneous; legs considerably darker than in female; propodeum more deeply longitudinally reticulate; two anterior pits prominent, followed at some distance by a short carina; phallus with faint long oval-shaped basal ring; parameral plates strongly emarginate; apodemes bend slightly mesad apically; digiti with three stout spines.

Types. Holotype female, allotype male and 15 female and 6 male paratypes: "California - exact data as to locality is not available, presumably collected by A. Koebele" (Huber) reared from "probably gall on Castanopsis chrysophylla by Andricus castanopsidis Beutenmuller." The types are in the United States National Museum, Cat. No. 25337.

Distribution. Beside the type locality, this species has also been recorded from Connecticut.

16. TORYMUS MELANOPTERUS, new species

Torymus melanopterus can be separated from all other species of Torymus by the fuscous cloud around the stigmal veins, the relative absence of the transscutellar suture, and the four anterior

propodeal pits, the first of which is circular and the second, oval, and twice as large as the first. T. melanopterus, according to the structure of the phallobase, is related to T. festivus. T. festivus has a larger membranous area cephalad to the basal ring which attenuates to broad point. The membranous area on the phallobase of T. melanopterus is somewhat truncate.

Female. Length 2.70 mm.; ovipositor sheaths (Photo. 75), 1.25 mm.; wings 2.60 mm.; body brilliant green with bluish tinge, densely clothed with short white setae. Head 0.74 mm. wide, 0.37 mm. thick, and 0.72 mm. high; face green with coppery reflections below antennal sockets as seen in reflected light; median carina separating the antenna by a distance equal to the diameter of antennal socket, extending to the basal margin of the clypeus as seen at right angles to the surface in bright direct light; median carina with short prominent wrinkles on each side as it approaches the clypeal carinae; clypeal carinae extending upward about one-third the distance between them; scape light fuscous except dorsal apical one-third which is dark fuscous; pedicel green, combined with the ring segment twice as long as first funicular segment; funicular segment one 0.07 mm. long and 0.07 mm. wide with 8 sensilla placodea in one series; funicular segment seven 0.07 mm. long and 0.10 mm. wide with a total of 18 sensilla placodea in two series, a prominent series of 12, two-thirds as long as the segment and a narrow obscure series of 5, five-sixths as long as the segment; the prominent series is apparent on each

funicular segment and the club; the obscure series commences on the second funicular segment and ceases on the second segment of the club; funicle and club combined 0.77 mm. long.

Thorax. Dorsum moderately reticulate with many, regularly placed setal sockets, green with slight blue and gold reflections; transscutellar suture apparent only at lateral angles; scutellar apex less deeply sculptured than other dorsal surfaces; propodeum green with golden reflections, four anterior pits on each side of a highly polished median surface, first pit circular, second pit oval and twice as large as the first; lateral surface below and beyond spiracles prominently raised and roughly sculptured; mesepimeron coppery red; coxae, (same color as body, except ventral surface of fore coxae which is bluish-purple; legs, except tarsi, testaceous with green on hind femora; dorsal surface of hind tibiae dark fuscous; first and second tarsal segments nearly white; remaining segments fuscous, becoming darker toward the tip; tegulae dark fuscous; wings heavily ciliate with 45-55 setae per square 0.33 mm. (Photo. 16); basal one-third of submarginal veins white, remainder of veins translucent fuscous; stigmal veins with long petiole, fuscous with a distinct fuscous cloud around stigmal veins; baso-stigmal veins obscure to absent except in vicinity of stigmal knobs; apico-stigmal veins expressed by two to three rows of setae bent toward apical wing margin; post-uncul veins absent as such; post-uncul cells with many setae.

Abdomen. Green with blue reflections on first segment; first three segments, moderately, medially incised; dorsal surface of second and third segments dark fuscous.

Male. Length 1.60 mm.; differs from the female as follows: scape shorter; antenna generally darker; mesoscutum with broad carina with more distinct golden reflections; legs darker; stigmal veins without cloud; abdomen with dorsal surface deep red; phallus with narrow angular basal ring; narrow membranous area cephalad; parameral plates slightly emarginate; digiti with three short, stout spines (Fig. 26; Photo. 100).

Types. Holotype female, allotype male, 6 paratypes: collected on the Stanford University campus, Palo Alto, California, May 14, 1951 (Ferris) (host unknown). Each label bears both numbers, 7155 and 18A. The types are in the United States National Museum. One female and 2 male paratypes are in the author's collection.

17. TORYMUS CRYSTALLINUS, new species

Torymus crystallinus can be diagnosed by the single, large anterior pit on each side of the propodeum half way between the median line and the lateral spiracles. The wings of T. crystallinus are structurally similar to T. giganticus, but have one to two rows of setae in the post-uncul veins whereas T. giganticus has three to four rows of setae in the post-uncul veins.

Female. Length 2.50 mm.; ovipositor 1.55 mm. (Photo. 76).

Wings 2.80 mm. Body golden green with slight suggestion of red reflections on head and thorax. Head extremely transverse, 0.81 mm. wide, as wide as thorax, 0.37 mm. thick, and 0.66 mm. high; median carina moderately prominent, extending two-thirds the way to basal margin of the clypeus; clypeal carinae short, shining, black-green; clypeus dark green, shining; face dull, dark green; area on each side of median carina, brunneus becoming aureus above; scape reaches median ocellus, green, base testaceous, ventrally reddish as seen in some lights; pedicel and ring segment combined, only slightly longer than first funicular segment which is 0.10 mm. long, 0.07 mm. wide with 12 sensilla placodea of two lengths; funicular segment seven 0.08 mm. long, 0.10 wide with 20 sensilla placodea; funicle and club combined 0.47 mm. long.

Thorax. Dorsum green with golden reflections; reticulate; setal sockets prominent, especially on scutellum which is rather strongly pitted; transscutellar suture very prominent; posterior one-third of scutellum with netted sculpturing, green with no golden color; metanotum bright green with a suggestion of blue; propodeum aciculate, a large oval-shaped pit anteriorly half-way between median line and spiracles, golden green; lateral thoracic areas, coxae, and femora green with prominent golden and reddish reflections in most lights; hind coxae with lateral surface red; tibiae with basal and apical areas testaceous, remainder green; tarsi progressively become darker toward tip, from flavo-testaceous to fuscous; wings moderately ciliate with

38-42 setae per 0.33 square mm.; veins testaceous; petiolate stigmal veins fuscous bending strongly toward the apex of the wing (Photo. 39), with a slight stigmal cloud; baso-stigmal veins absent; apical-stigmal veins a double row of setae discontinuing as they turn toward apical wing margin; post-uncul veins an irregular but distinct double row of setae; uncul cells without setae.

Abdomen. Shorter than the ovipositor, green with slight golden reflection dorsally; first three segments emarginate, the third only slightly so.

Male. Length 2.20 mm. Scape one-third shorter than that of female, shining green; pits on scutellum not as prominent as in female; scutellum strongly golden with red reflections; surface of abdomen deep coppery red; phallus without basal ring, most of basal portion of phallus membranous forming a long, flat oval; parameral plates emarginate; apodemes curve rather strongly mesad; digiti with three primary teeth and three secondary teeth.

Types. Holotype female, allotype male, and one paratype female: collected 30 miles southwest of Palm Springs, Riverside County, California, November, 1949, (Hobbs) reared from galls of Andricus crystallinus Bass. collected on Quercus dumosa Nutt. The types are in the United States National Museum.

Variation. The paratype has a larger brunneous area below the antennal sockets than the type.

18. TORYMUS ALAMEDENSIS (Huber)

Callinome alamedensis Huber, 1927. United States National
Museum Proc. 70 (14) :28

Torymus alamedensis may be separated from its closest relative Torymus corrugatus, by the truncate stigmal knobs of T. alamedensis and the smoothly rounded knobs of T. corrugatus. Also, T. corrugatus has five pits on the propodeum and a prominent transscutellar suture, while T. alamedensis has but four propodeal pits and the transscutellar suture is absent.

Female. Length 3.20 mm. Ovipositor sheaths 1.80 mm. Body blue-green, abdomen fuscous apically. Head 0.93 mm. wide, slightly wider than thorax, 0.41 thick, 0.70 mm. high; face blue-green, cupreous around scobes, lightly, irregularly reticulate; median carina prominent half way to basal margin of clypeus; clypeus brown, prominently produced, entire; clypeal carinae moderately evident; scape ochreous; dorsal apical tip fuscous; scape barely reaching median ocellus; antenna except scape fuscous; pedicel and ring segment combined 0.15 mm.; funicular segment one 0.12 mm. long, 0.08 mm. wide with 10-14 sensilla placodea in one series; funicular segment seven 0.10 mm. long, 0.11 mm. wide with 20-30 sensilla placodea; combined funicle and club length 0.90 mm.

Thorax. Dorsum blue-green with golden reflections, reticulate becoming irregularly honey-combed posteriorly; setal sockets small; scutellar setal sockets twice the size of mesoscutal setal sockets;

transscutellar suture evident only by change of color on apical one-fourth of scutellum to shining blue; propodeum strongly rugose with four pits on each side, pit four one-fourth size of first; fore coxae flavo-testaceous on apical two-thirds, blue basally; mid coxae flavo-testaceous; hind coxa blue-green; tibiae and tarsi various shades of flavo-testaceous; wings hyaline, heavily ciliated, 40-60 short setae per square 0.33 mm.; stigmal veins petiolate (Photo. 46), same color as marginal veins; baso-stigmal veins absent; apico-stigmal veins seen only as slight convergence of setae; post-uncul veins more or less indistinguishable; uncul cells with many setae.

Abdomen. Tergal segment one emarginate, second slightly but broadly emarginate; tergal segments three to five entire.

The following is the original description of the male:

Male. "Length 2.75 mm. Scape yellowish beneath and mostly dark green above; joints of funicle about as long as wide and of nearly equal width; fore coxae not so yellow as in female, legs pale testaceous, the tips of joints yellowish. Abdomen shorter than the thorax."

Types. Holotype female, allotype male, 23 paratypes: Alameda, California, May 1888, reared from "gall on currant" (collector not given); and "from 9 specimens Hopkins No. 11059a¹ reared by B. T. Harvey from galls on Rubus nutkanus Mocino, at Necanicum, Oregon, May 2, 1913" (Huber). The types are in the United States National Museum, Cat. No. 25358.

Distribution. Besides localities recorded for Connecticut, California, and Oregon, the writer has two specimens, 1 from

Corvallis, Oregon, April 27, 1930 (Hudson), and 1 from 20 miles west of St. Helens, Oregon, June 21, 1938 (Gray and Schuh).

19. TORYMUS SPIRAEAE new species

Torymus spiraeae can be separated from its nearest relative, T. festivus by its darker wing veins and larger stigmal veins. Also, it is consistently nearly one millimeter longer than T. festivus.

Female. Length 3.10 mm.; ovipositor sheaths 2.20 mm.; wings 3.30 mm. Body blue-green on lateral surfaces as seen at right angles, dorsal surfaces purple on abdomen, deep blue on thorax. Head 0.90 mm. wide, 0.44 mm. thick, and 0.80 mm. high; face blue-green with slight golden reflections in certain lights on the median carina and dorso-laterally to the antennal sockets; median carina inconspicuous, commencing immediately above the antennal sockets and ending half way to the basal margin of the clypeus in a semicircular ridge, the latter commencing between the eye margin and ventral margin of the antennal sockets; median carina appears as a depression in some lights; clypeal carinae moderately conspicuous extending dorsad one-third the basal distance between them; scape not reaching the median ocellus, testaceous below shading to fuscous above; pedicel and ring segment combined very slightly longer than funicular segment one which is 0.10 mm. long and 0.08 mm. wide (Fig. 17); funicular segment seven 0.08 mm. long and 0.10 mm. wide; funicle and club combined 0.93 mm. long, infusate; approximately 14 sensilla placodea on funicular

segment one and 22 sensilla placodea on segment seven.

Thorax. Indigo with strong areas of deep blue; dorsum minutely punctured; transscutellar suture absent; scutellum uniformly punctured; metanotum green laterally seen from above, remainder deep blue; propodeum shining, greenish-blue dorsally, rather deeply reticulate and blue laterally; baso-lateral one-third of first coxae same color as legs, remainder dark blue; legs, except tarsi, testaceous; tarsi ochreous; wings heavily ciliate with 34-38 cilia per 0.33 square mm.; first one-fifth of submarginal veins light ochreous, remainder shading to light fuscous, marginal veins light ochreous nearly to stigmal veins; the stigmal veins, the post-marginal veins and the posterior margin of the marginal veins testaceous; stigmal veins petiolate (Photo. 50); baso-stigmal veins seen slightly by convergence of setae; apico-stigmal veins apparent as setae bending toward the posterior apical margin of wing; post-uncul veins formed by a mass of setae increasing in number of rows as they reach wing margins; uncul cells filled with setae.

Abdomen. Longer than thorax; dorsal surface purple except segment five which is green; lateral surfaces blue-green; dorsal surface infusate; first three segments incised.

Male. Length 2.20 mm.; scape blue, two-thirds as long as that of the female; funicle and club combined 0.89 mm. in length; legs except tarsi darker than the legs of female with most of femora blue; phallus, without aedeagus, rectangular; basal ring apparent nearly to

apex; crescent-shaped membranous area cephalad; parameral plates narrow, gently convex; apodemes emarginate bending slightly mesad apically; digiti with four large teeth, commencing mesally, each tooth being preceeded by a smaller tooth (Fig. 32).

Types. Holotype female, allotype male: 12 miles south of Florence, Oregon, June 5, 1941 (Schuh) and reared from the terminal midge gall on Spiraea species. The types are in the United States National Museum. Three paratypes from the same series are in the author's collection.

Variation. The paratypes appear to have less blue and more green generally. The legs, however, are quite uniform in color. The length of the female varies from 2.65 mm. to 3.30 mm. in length and the ovipositor varies from 1.35 mm. to 2.40 mm. in length. The males vary from 1.90 mm. to 2.20 mm. in length.

20. TORYMUS CORRUGATUS, new species

Torymus corrugatus, Torymus alamedensis, and Torymus diastrophus, new species, appear to be a complex of closely related sibling species. T. corrugatus has a stronger apico-stigmal vein than either of the other two. The evenly rounded stigmal knobs of T. corrugatus show greater affinity to T. diastrophus than to T. alamedensis which have somewhat truncate stigmal knobs. It can be separated from the former most conveniently by the presence of a short stemmed, inverted Y-shaped carina on the middle of the propodeum.

T. diastrophus has a phallobase with a light basal ring with a large membranous area cephalad, while the phallobase of T. corrugatus has a prominent basal ring with comparatively no membranous area cephalad.

Female. Length 2.80 mm.; ovipositor sheaths 1.50 mm. (Photo. 58). Wings 2.70 mm. Body green with major portion of abdomen ruby-red. Head 0.90 mm. wide, 0.44 mm. thick, and 0.74 mm. high; face green with reddish reflections below antennal sockets and around lateral margins of the ocelli; median carina wide, slightly convex within the antennal depression; clypeal carinae approximately one-fourth as long as the distance between them; clypeus produced into a semicircular lip; scape light testaceous except the extreme base and apex which has some black, not reaching the median ocellus, considerably compressed; pedicel and ring segment combined 0.18 mm. in length; ring segment subquadrate; funicular segment one 0.09 mm. wide with 14-16 sensilla placodea in two distinct lengths; funicular segment seven 0.07 mm. in length and 0.11 mm. wide with 28-32 sensilla placodea (Fig. 18).

Thorax. Dorsum green reflecting much golden color; dorsum reticulate with many shallow regular setal sockets; transscutellar suture absent on scutellum which is lightly reticulate and shining; propodeum rugose strongly on margins and less so dorsally near the median line; a sharp groove extending from posterior margin nearly to dorsal center of propodeum (Fig. 11); basal half of first coxae, the basal two-thirds of middle coxae and basal tip of hind coxae green, the remainder of each coxae and legs testaceous; tarsal segments somewhat

lighter; tegulae ochreous; wing veins very light infuscate except stigmal veins which are testaceous; major portion of wings below petiolate stigmal veins with a suggestion of smoky reflection, stigmal veins masked by dark area immediately surrounding them (Photo. 44); wings strongly ciliate with 50-60 setae per square 0.33 mm.

Abdomen. Generally red-grape in color, shorter than ovipositor; first segment green with reddish apical margin; basal two-thirds of remaining segments wine colored, apical one-third green; ovipositor saw with ten teeth.

Male. Length 2.60 mm.; median carina more prominent than that of female; scape shorter and only ventral one-third testaceous, remainder infuscate; genitalia with prominent basal ring, oval in shape; apodemes slightly directed laterally; digiti with three spines (Fig. 27, Photo. 99); the male is darker in all respects than the female.

Types. Holotype female, allotype male and eight paratypes: Corvallis, Oregon, March 26, 1936 (Ferguson) reared from galls on Rubus parviflorus Nutt., thimbleberry. The types are in the United States National Museum. Five paratypes: Fall Creek, Lincoln County, Oregon, April 12, 1941 (Scullen); 3 paratypes from Corvallis, Oregon, April 23, 1947 (Hobbs) all reared from stem galls on Rubus parviflorus Nutt. are in the author's collection.

Variation. Length of female is from 2.60 to 3.10 mm.; ovipositor length varies from 1.30 to 1.67 mm. Other differences consist of

variations in color intensity. The coxae of some specimens have more or less yellow than the type. The males vary from 2.37 mm. to 2.80 mm.

21. TORYMUS DIASTROPHUS, new species

Torymus diastrophus is closely related to T. corrugatus and is separated by the inverted Y-shaped carina on the propodeum of T. diastrophus.

Female. Length 2.90 mm.; ovipositor 1.70 mm.; wings 2.70 mm. Body green with golden, blue and brunneus reflection. Head 0.80 mm. wide, slightly wider than thorax, 0.46 mm. thick, 0.70 mm. high; face golden-green, transversely reticulate with small but prominent setal sockets; vertex with red reflections; median carina broad, discontinuing less than half way to basal clypeal margin; clypeal carinae extending as far above as below tentorial pits; clypeus entire; scape light testaceous, slightly bent laterally and not reaching median ocellus; pedicel and ring segment combined longer than first funicular segment; ring segment quadrate; funicular segment one 0.13 mm. long with 12-16 sensilla placodea in two series; funicular segment seven 0.10 mm. long, 0.10 mm. wide with 24-28 sensilla placodea; funicle and club dark brown, combined length 0.93 mm.

Thorax. Dorsum golden-green especially on scutellum, finely netted reticulations with many small setal sockets; transscutellar

suture prominent; scutellar apex shining green with extremely fine reticulations; propodeum green with three irregular but uniform sized anterior pits on each side; propodeal sculpturing: median inverted, short stemmed Y-shaped carina, two carinae of unequal length within the Y, six or more prominent carinae on posterior half of propodeum on each side; legs uniformly flavo-testaceous except extreme bases of fore and mid coxae which are brown and basal four-fifths of hind coxae which are dark blue; wings heavily ciliate with 55-65 setae per 0.33 square mm. and much of wing area pale brown hyaline, darker around stigmal veins; stigmal veins petiolate (Photo. 45); baso-stigmal and apico-stigmal veins indicated only by general emargination of setal rows in vicinity of stigmal veins; post-uncul veins present but highly obscured by presence of many setae; uncul cells filled with setae.

Abdomen. Brunneus with wine colored reflection; tergal segment one medially incised; segments two and three slightly notched; segments 4-6 entire.

Male. Length 2.40 mm. Very similar to female except as follows; scape with brown dorso-apical tip; fewer sensilla placodea per segment and in a single series; wings hyaline; apico-stigmal veins more prominent; propodeal sculpturing with carinae patterns essentially the same but less distinct; phallus with basal ring barely perceptible; large rectangular membranous area cephalad to the basal ring; digiti with three prominent curved spines (Fig. 25; Photo. 96).

Types. Holotype female, allotype male, 13 paratypes: Corvallis, Oregon, March 26, 1936, reared from thimbleberry galls (Ferguson). The types are in the United States National Museum. Two female and 4 male paratypes of the same series are in the author's collection.

22. TORYMUS GALBANOCOXATUS, new species

Torymus galbanocoxatus can be separated from other species of Torymus by the flavo-testaceous color of the basal half of the coxae, the absence of the transscutellar suture, and the four anterior pits on the propodeum, the first three of which are twice the size of the fourth. It is closely related to Torymus mellipes (Huber), but is considerably different by having the petiole of the stigmal vein more than double the length of that of T. mellipes.

Female. Length 2.80 mm.; ovipositor 2.95 mm.; wings 3.10 mm.; body bluish-green with golden reflections dorsally and laterally on thorax; fore coxae lemon yellow. Head 0.81 mm. wide, slightly wider than the thorax, 0.41 mm. thick; 0.52 mm. high; front generally green with bluish tinge, area circumventing antennal depressions and median carina with strong golden reflections; median carina prominent, terminating at the bluish purple basal margin of the clypeus; clypeal carina very prominent; antennal depression shallow, green below, blue above and without reticulations; scape compressed laterally, ochreous except dorso-apical one-third which is fuscous,

just reaching the median ocellus; pedicel plus ring segment longer than junicular segment one; ring segment slightly wider than long; funicular segment one 0.12 mm. long, 0.06 mm. wide; segments 1-6 of equal length all being longer than wide, segment seven slightly wider than long, with 14-16 prominent sensilla placodea on each funicular segment; funicle brown length 0.74 mm. (Photo. 78).

Thorax. Dorsum green with golden reflections on posterior margin of axillae and apex of scutellum; pronotum and anterior half of mesoscutum reticulate with shallow setal sockets; posterior portion of mesoscutum and scutellum minutely punctured with deeper rather than prominent setal sockets; all dorsal thoracic sutures distinct except transscutellar suture which is absent; apex of scutellum with golden reflections; metascutum blue-green dorsally, blue laterally; propodeum blue-green, weakly reticulate except dorsally which is highly polished with reddish reflections; four anterior pits on each side, the first three twice as large as the fourth; apical three-fourths of fore coxae, apical tips of mid and hind coxae, and remainder of legs uniformly ochreous, remainder of mid and hind coxae green; hind coxae and metapleuron with coppery reflections on lateral surface; wings heavily ciliated with 60-70 setae per 0.33 square mm.; veins ochreous becoming testaceous apically; stigmal vein petiolate (Photo. 43); baso-stigmal and apico-stigmal veins formed by slight converging setae; post-uncul veins absent; uncul cells with numerous setae.

Abdomen. Longer than thorax; blue-green with purple reflections

at apex of second segment; segment five green; segment six red near margin of fifth; tergal segments one to four deeply incised, segments five and six entire (Photos. 23, 24).

Male. Length 2.20 mm.; antenna dark brown; propodeum shining green with little or no red reflection as in the female; body generally darker than female with less golden reflections; phallus completely without a basal ring; phallus tapers gently and becomes quite membranous cephalad; parameral plates rather strongly emarginate; apodemes are nearly straight converging slightly; digiti with three heavy spines.

Types. Holotype female: Corvallis, Oregon, April 8, 1930 (H. A. Scullen) bearing the Oregon State Experiment Station No. 3864 (host unknown); allotype male: Corvallis, Oregon, April 24, 1930 (H. A. Scullen). The types are in the United States National Museum.

23. TORYMUS ATRIPLICIS (Huber)

Callimome atriplicis Huber, 1927. United States National Museum Proc. 70 (14): 44.

The two widely separated anterior propodeal pits with the first pit twice the size of the second, separates Torymus atriplicis from other members of this genus. Its most close relative is probably Torymus garryani, new species. T. atriplicis is generally golden-green while the general body color of T. garryani is black-green

with blue reflections.

Female. Length 2.40 mm.; ovipositor 1.10 mm.; wings 2.20 mm.; body generally golden-green. Head 0.70 mm. wide, slightly wider than thorax, 0.34 mm. thick, 0.60 mm. high; vertex green; face below vertex coppery green; face below antennal sockets transversely reticulate; magenta laterally, coppery-green on median carina; median carina flat ending just before the clypeal base; clypeal carinae fine ending at tentorial pits; clypeus green, entire; scape testaceous except dorsal apical tip which is brown; scape just reaching median ocellus; remainder of antenna fuscous; pedicel and ring segment combined nearly twice the length of the first funicular segment; funicular segment one 0.06 mm. long, 0.07 mm. wide with 8-10 sensilla placodea; funicular segment seven 0.06 mm. long, 0.08 mm. wide with 8-12 sensilla placodea; funicle and club with fine, moderate ciliation, combined length 0.57 mm.

Thorax. Dorsum golden-green, irregularly transversely reticulate; transscutellar suture barely perceptible; propodeum golden-green; longitudinally aciculate; two anterior pits on either side, widely separated, the first twice the size of the second; coxae green with slight golden reflections; hind coxae with lateral area coppery green; remainder of legs uniformly light testaceous except tarsi; tarsal segments one and two approaching white, tarsal segments three to five shading from light flavo-testaceous to fuscous; wings hyaline, moderately ciliate with 32-38 very short setae per square 0.33 mm.; stigmal veins barely petiolate; baso-stigmal and

apico-stigmal veins a single sparse row of setae; post-uncul veins an irregular double row of setae; uncul cells with 1-3 setae.

Abdomen. Basal half, green; tergal segments three and four, coppery-green dorsally; remaining segments magenta; tergal segments one to three slightly notched, remaining segments entire.

Male. Unknown.

Types. Holotype female, 1 female paratype: "Los Angeles County, California, June 1887 (A. Koebele) from cecidomyid gall on Atriplex canescens (Pursh) Nuttall." (Huber). The type is in the United States National Museum, Cat. No. 25402. The labels on Huber's paratype series give only the records: June, Los Angeles County, California.

24. TORYMUS LAZULUS, new species

Torymus lazulus is separated from other species by the consistent small size, the bright blue color of the body, and relatively large stigmal knobs the lateral apical margins of which form a 90° angle with the unculus. Otherwise, it appears to be rather closely related to T. festivus. T. festivus is more consistently golden-green and averages nearly one millimeter larger in size.

Female. Length 2.14 mm.; ovipositor 2.60 mm. (Photo. 66). Wings 2.10 mm. Body blue with green reflections. Head 0.59 mm. wide, 0.33 mm. thick, and 0.48 mm. high, nearly circular as seen

from front; lower one-fourth of face green, upper three-fourths blue; median carina narrow extending nearly to basal margin of the clypeus; clypeal carinae very short; scape beneath infusate with some yellow, dark blue above, not reaching median ocellus; pedicel blue; pedicel and ring segment together 0.14 mm. long, more than twice the length of the first funicular segment which is 0.06 long and 0.05 mm. wide; funicular segment seven 0.05 mm. long and 0.08 mm. wide; funicle and club combined 0.64 mm. long; funicular segment one with four sensilla placodea; funicular segment seven with twelve sensilla placodea in only one series and length on each segment (Figs. 16, 19).

Thorax. Dorsum blue-green minutely punctured uniformly; parapsidal grooves quite indistinct; transscutellar suture absent; propodeum narrow, blue with many, small anterior pits of uniform size; coxae blue; basal and apical portions of trochanters and femora testaceous; remainder blue; tibia similarly marked except with faint blue reflections; tarsi becoming progressively darker from the first segment which is light yellow to the fifth segment which is fuscous; tegula testaceous with a blue spot; wings heavily ciliate, 40-50 setae per 0.33 square mm.; veins testaceous except colorless area just before the stigmal veins, stigmal veins fuscous, petiolate (Photo. 47); narrow cloud around stigmal veins and especially between stigmal veins and post-marginal veins; baso-stigmal veins seen as only slight convergence of setae; apico-stigmal veins expressed by a convergence of setae bent in the normal direction of these veins; post-uncul

veins seen as an irregular double row of setae; uncul cells dark with many setae.

Abdomen. Slightly longer than thorax, blue with purple and green reflections both dorsally and laterally, sharply and deeply carinate ventrally; tergal segments one to four deeply incised; segments five and six entire.

Male. Length 1.40 mm.; head appearing subcircular as seen from the front; scape entirely blue except extreme base which is fuscous; stigmal cloud absent; phallus with prominent basal ring disappearing before the bases, slightly and evenly produced beyond; parameral plates notched medially; apodemes straight and parallel; digiti with three short blunt spines (Fig. 35; Photo. 95).

Types. Holotype female, allotype male, and 12 paratypes: 10 miles east of Vernonia, Oregon, July 18, 1946 (Every) reared from cones of Pseudotsuga taxifolia (Lamb.) Britt., Douglas fir. The types are in the United States National Museum. One paratype: Scapose, Oregon, July 4, 1946 (Rosenstiel); five females and 5 male paratypes collected at Muir Woods, California, January 15, 1915 (Keen) each label bearing Hopkins Number 13202k, all reared from cones of Douglas fir, to be retained in the author's collection.

Variation. Colors vary strongly from green, dark blue to purple. In some specimens, no stigmal cloud can be seen, whereas in some male specimens, a stigmal cloud is present. The female varies in length from 1.10 mm. to 2.20 mm. The ovipositor varies

from 1.03 mm. to 2.80 mm. in length. There are three specimens in this series whose ovipositor is slightly longer than the head and body combined. The male varies from 1.18 mm. to 1.64 mm. in length.

25. TORYMUS BRACHYSTYLUS, new species

Torymus brachystylus can be distinguished from its close relatives by a subquadrate head, a very short ovipositor, and two large anterior pits of equal size on either side of the propodeum. Structurally and in color, T. brachystylus is similar to Torymus ferrugineipes (Huber). The latter is generally green, whereas T. brachystylus is brunneus with green reflections with heavier wing ciliation.

Female. Length 2.58 mm.; ovipositor 0.95 mm. (Photo. 64). Wings 1.90 mm. Body entirely brunneus with green reflections from thoracic dorsum and head. Head 0.75 mm. wide, 0.35 thick, 0.72 mm. high; as seen from front, face brunneus with narrow margin of green around eyes and mouth, finely reticulate; median facial carina prominent, narrow, extending just inside the clypeal carinae which are indistinct; scape entirely ochreous not reaching median ocellus; pedicel and ring segment nearly twice as long as first segment of funicle which is 0.07 mm. long and 0.06 mm. wide; funicular segment two slightly longer than the first; the segments of funicle becoming progressively wider toward the tip; funicular segment seven nearly twice as wide as long; 8-14 sensilla placodea per funicular segment;

funicle and club combined 0.06 mm. long.

Thorax. Dorsum brunneus with much green reflection, somewhat reticulate with the slight appearance of fine thimble-like setal sockets; scutellum with longitudinal reticulations; transscutellar suture evidenced by a faint green line changing in color to red and sculpturing to a high polish; propodeum with posterior and lateral margin green, remainder red; two large anterior pits on each side; coxae, trochanters, femora, and tibiae brunneus; tarsi with first segment ochreous becoming darker toward the tip; wings very lightly ciliated with 20-30 setae per 0.33 square mm.; veins testaceous, stigmal veins sessile (Photo. 27); baso-stigmal veins absent; apico-stigmal veins a single irregular row of setae which can be followed to apical wing margin; post-uncul veins an irregular single then double row of setae; uncul cells without setae.

Abdomen. Slightly longer than ovipositor, robust, brunneus masked by reflections of purple; only the first three segments incised (Photo. 22).

Male. Unknown.

Types. Holotype female and one female paratype: Lake Labish, Marion County, Oregon, August 7, 1941 (collector and host unknown.) The types are in the United States National Museum. Two female paratypes from the same series are to be retained in the author's collection.

Variation. Variation is but slight in the four specimens.

The only color variation is additional red in the hind femora of one specimen. The female paratypes are shorter in length by an average of 0.30 mm., whereas the ovipositor is the same length in all specimens.

26. TORYMUS GARRYANI, new species

Torymus garryani can be separated from its closest relative, Torymus anthomyiae (Ash.) and from other members of the genus by its robust form, the small round stigmal knobs with a short but distinct, narrow petioles, and distinct false veins around the stigmal veins.

Female. Length 2.20 mm.; ovipositor sheaths 1.42 mm. (Photo. 57); wings 2.10 mm. Body black-green with tints of blue in abdomen, thorax arched and rather robust. Head 0.81 mm. wide, 0.37 mm. thick, and 0.66 mm. high; face deep blue-green with slight brunneous reflections around antennal sockets as seen at certain angles; median carina prominent reaching the basal margin of the clypeus; clypeal carinae prominent and about half as long as the basal distance between them; antennal depressions wide and deep enough to hide the base of the scape as seen laterally; scape testaceous with darker streaks, barely reaching median ocellus; pedicel and ring segment slightly longer than first funicular segment; ring segment three times as wide as long; funicular segment one 0.08 mm. long and 0.07 wide with 10-14 sensilla placodea; funicular segment seven 0.07 mm. long and 0.10 mm.

wide with 18-22 sensilla placodea in two major lengths; pedicel and ring segment combined 0.60 mm. long.

Thorax. Dorsum blackish blue-green; reticulate with an increasing number of irregular setal sockets progressing posteriorly; transscutellar suture barely perceptible; anterior propodeal pits seven on each side commencing small on first four, next two large, last pit same size as first; coxae blue-green; hind coxae with brunneus reflections on dorso-lateral surface; femora blue-green except at their bases and apices which are brunneus; tibiae brownish black except bases and apices which are testaceous; tarsal segments all light flavo-testaceous except segment five which is testaceous; wings moderately ciliate with 30-40 setae per 0.33 square mm.; veins testaceous, stigmal veins fuscous and subsessile (Photo. 35); uncus extremely short; baso-stigmal veins are formed by a divergence of three rows of setae; apico-stigmal veins expressed by an irregular but distinct double row of setae curving apically two-thirds distance toward M_1 ; post-uncul veins a formal single row of setae; uncul cells immaculate.

Abdomen. Four-fifths as wide as thorax and highest at the apex of the first segment, blue-green with brunneus reflections in certain area; ovipositor with nine teeth on saw; tergal segment one medially notched; tergal segment two deeply parted; tergal segment three incised; remaining segments entire.

Male. Unknown.

Types. Holotype female, two female paratypes: Corvallis, Oregon, April 18, 1947 (Hobbs) reared from galls of Callirhytis washingtonensis Gill. from Quercus garryana Dougl. The types are in the United States National Museum. Two female paratypes from the same series are to be retained in the author's collection.

Variation. Two of the paratypes are more deeply blue than the type. The size varies from 1.60 mm. to 2.20 mm. The ovipositor varies from 1.20 mm. to 1.42 mm. in length.

27. TORYMUS SULCATUS (Huber)

Callimome sulcatum Huber, 1927. United States National Museum Proc. 70 (14) :22.

Though the writer has not had an opportunity to examine type material, the original description which follows, would indicate that the long narrow petioles of the stigmal veins combined with the distinctly prominent transscutellar suture separates T. sulcatus from other species of the genus.

The following is the original description:

Female. "Length 2 mm.; ovipositor 1.8 mm. Dark shining green, robust, the scutellum with a deep cross furrow. Head transverse and as wide as the thorax; viewed from the front, green with a golden tinge below the antennae; face reticulately-rugose and with a rather prominent carina; scape mostly brown, but yellow ferruginous beneath; flagellum brown; pedicel as long as the first joint of funicle; funicle joints, except the first two, as wide or wider than long; ring-joint wider than long; ocellocular line about one and one-half times the diameter of the ocellus. Thoracic dorsum wide, short

and strongly arched; furrows well defined; transversely rugose with a few shallow irregularly placed impressions; reticulate punctures on the scutellum more shallow than on the mesoscutum; the scutellar cross furrow very deep and the apex of the scutellum shining; mesepimeron brown, except the posterior part, which is dark green; propodeum smooth, feebly reticulated; coxae greenish-brown; femora greenish-brown in the middle, the hind ones very dark; fore and mid tibiae ferruginous, the hind ones infusate, except the tips; tarsi yellow ferruginous; wings strongly ciliate, veins pale brown, marginal vein four-sevenths as long as submarginal. Abdomen brownish-green and about as long as the thorax; ovipositor more than twice as long as abdomen."

Male. Unknown.

Types. Holotype female, 1 female paratype; Donner, California, January 21 to February 1, 1886 (A. Koebele), reared from cynipid gall on Quercus pumila Walter (Quercus pumila, however, is not known to occur in California). The types are in the United States National Museum, Cat. No. 25349.

28. TORYMUS FERRUGINEIPES (Huber)

Callimome ferrugineipes Huber, 1927. United States National Museum Proc. 70 (14): 33

Torymus ferrugineipes and T. brachystylus, its close relative, both have very short ovipositor sheaths. T. ferrugineipes can be separated from all other species by the unusual sculpturing of the propodeum which has several fine carinae on the median anterior margin followed by five anterior pits more or less diminishing in size. Males of this species have not been examined and further

correlation would be impossible without seeing the male genitalia.

Female. Length 2.40 mm.; ovipositor sheaths 0.60 mm.; wings 2.30 mm. long. Body green with bluish-purple reflections from abdomen. Head 0.60 mm. wide, as wide as thorax, 0.33 mm. thick, 0.70 mm. high; face golden-green, finely reticulate; median carina prominent extending nearly to base of clypeus; clypeal carinae evident as fine black ridges; clypeus entire; scape flavo-testaceous; barely reaching median ocellus; pedicel brown with metallic blue reflections, combined with ring joint nearly twice the length of the first funicular segment; funicular segment one 0.07 mm. long; quadrate with 6-8 sensilla placodea; funicular segment seven 0.06 mm. long, 0.08 mm. wide with 10-14 sensilla placodea; funicle and club combined 0.60 mm. long, dark brown with sparse appressed ciliation.

Thorax. Dorsum green with blue reflections on parapsidal plates and pronotum; entire dorsum very finely reticulate with obscure setal sockets; transscutellar suture essentially absent; scutellar apex more finely reticulate than anterior portion of scutellum; propodeum with several fine carinae on median anterior margin followed by five anterior pits more or less diminishing in size; propodeum medially shining without reticulations longitudinally reticulate laterally; coxae blue-green except apical tips which are testaceous, remainder of legs uniformly testaceous; lightly ciliate with 18-22 setae per 0.33 square mm., hyaline;

hyaline; stigmal veins distinctly petiolate, longer but slightly wider than prominent uncus; baso-stigmal and apico-stigmal veins a sparsely ciliated single row of setae; post-uncul veins commencing as an irregular single row of setae becoming a regular double row of setae half-way to the anterior margin of the wing; uncul cells with two to four setae.

Abdomen. Tergal segment one incised, purple as seen from above; tergal segments two and three notched medially; remaining segments entire.

Male. From the original description: "Length 2 mm. Darker than the female and without any apparent brassy tint. Scape dark green; two front pairs of femora and tibiae and the hind tibiae with brownish green markings on the outside, the hind femora entirely green with a bluish tint, except the tips; last joint of tarsi brown. Abdomen shorter than the thorax and depressed."

Types. Holotype female, allotype male, 11 female paratypes: Argus Mountains, California, May 1891 (A. Koebele) the labels bearing the name Pinus monophylla Torrey and Fremont. The types are in United States National Museum, Cat. No. 25394.

Distribution. Catalogue of Hymenoptera of America North of Mexico on page 523 lists the distribution of T. ferrugineipes for Connecticut and Florida. A recent communication from O. Peck indicates that the Florida record is a lapsus for California. The Connecticut record is to be found in Britton, 1938, Bul. Conn. State Geol. and Nat. His. Surv. 60:137 where direct reference is made to Huber (48). After examining Huber's records and his paratype material

the only authentic record existing is the Argus Mountains, California.

29. TORYMUS FESTIVUS Hobbs

Torymus festivus Hobbs, 1950. Pan-Pacific Entomologist 24
(4) :173-178.

The writer originally considered Torymus festivus as being closely related to Torymus coloradensis. After examining a greater number of specimens and the male genitalia, T. festivus shows greater affinity to T. flavocoxatus. The latter has six oval-shaped anterior propodeal pits on either side, while T. festivus has only five small circular pits. The combination of the propodeal sculpturing and the wings with indistinct false veins separated T. festivus from all other species.

Female. Length 2.40 mm.; ovipositor sheaths 2.20 mm.; wings 2.40 mm. Body green with blue and gold reflections. Head 0.60 mm. wide, slightly wider than thorax; 0.32 mm. thick and 0.60 mm. high; scape ochreous except dorsal apical tip which is fuscous, barely reaching median ocellus; pedicel fuscous with green reflections, combined with wing segment longer than the first funicular segment; funicular segment one 0.07 mm. long, 0.06 mm. wide, funicular segment seven 0.07 mm. long, 0.07 mm. wide; funicle and club combined 0.60 mm. long.

Thorax. Green with patches of blue with fine irregular honeycomb reticulations; transscutellar suture absent; propodeum

lightly reticulate with five small anterior pits on each side; fore coxae with basal two-thirds blue, apical third ochreous; mid and hind coxae green with ochreous tips; remainder of legs ochreous except outer dorsal surface of hind tibia which is fuscous; wings heavily ciliate with 50-55 setae per square 0.33 mm.; stigmal veins petiolate (Photo. 42); baso-stigmal veins absent; apico-stigmal veins appear as a double to triple row of setae, bent toward apical wing margin; uncul veins absent; uncal cells filled with setae; true wing veins testaceous.

Abdomen. Green with blue reflections dorsally, brown ventrally; tergal segments 1-4 medially incised; segments five and six entire.

Male. Length 1.90 mm.; differs from the female as follows: generally darker in all respects, green with almost complete absence of blue patches; middle of all femora body color with bases and apices testaceous; basal half of abdomen blue; apical half bruneus; phallus with a light but apparent basal ring, membranous area forming a semi-circular area cephalad to the basal ring; apodemes basally slightly curved mesad; digiti with three stout spines (Fig. 30; Photos. 97, 101).

Types. Holotype female, allotype male 164 female and 135 male paratypes: Corvallis, Oregon by sweeping Thuga plicata Don. and Chamaecyparis lawsoniana Parl., August 23 and 24, September 27, 1947. The types are in the California Academy of Sciences. The following paratypes; 25 females and 23 males all reared in the laboratory from larvae and pupae of Dasyneura species infesting cones

of T. plicata and C. lawsoniana. The cones from which T. festivus were reared came from as far north as Pullman, Washington, and from as far south as Ashland, Oregon. This species is not known to have been taken outside the range of the two conifers listed where its host infests the seeds.

Variation. The general color of the male and female varies from green with a few slight yellow reflections to rather dark purple. In one particular specimen, also included in the type series, the lateral and ventral body regions and coxae were a brilliant ruby red. The femora and tibiae of both sexes vary from honey yellow to brown to bright blue-green. Female length varies from 1.65 mm. to 2.90 mm. and the ovipositor sheaths from 1.40 mm. to 2.40 mm. The male ranges from 1.30 mm. to 2.30 mm. in length.

30. TORYMUS SCALARIS (Huber)

Callimome scalaris Huber, 1927. United States National Museum Proc. 70 (14) : 21.

Torymus scalaris may be separated from closely related species by the many fine anterior propodeal pits, with the first pit twice the width of the remaining pits, and prominent dome-shaped stigmal knobs. T. scalaris appears to be closely related to Torymus sulcatus but may be separated by the prominent transscutellar suture of the

latter.

Female. Length 2.20 mm.; ovipositor sheaths 1.50 mm. long; wing 2.00 long. Body brown with slight green reflections anteriorly. Head 0.50 mm. wide, slightly wider than thorax; 0.23 mm. thick and 0.47 mm. high; face green, very fine irregular honey-combed reticulations; median carina apparent to within the clypeal carinae; scape ochreous on ventral basal tip becoming testaceous apically exceeding median ocellus (face above antennal sockets on paratype strongly caved-in); pedicel and ring segment combined more than double the length of the first funicular segment; funicular segment one 0.047 mm. long, 0.030 mm. wide with 0-2 sensilla placodea; funicular segment seven 0.050 mm. long, 0.066 mm. wide with 2-4 sensilla placodea; funicle and club combined 0.500 mm. long; antenna except scape brown with moderate appressed ciliation.

Thorax. Dorsum metallic brown with slight green reflections, very finely reticulate; transscutellar suture absent; propodeum with many fine anterior pits, the first twice the width of remaining pits; coxae and legs various testaceous shades of brown; wings heavily ciliate with 50-60 short setae per square 0.33 mm., hyaline; stigmal viens with short petiole; stigmal knobs dome-shaped; false

veins indicated only by the ridges in the wings occupying the normal positions of these veins; uncul cells with three setae.

Abdomen. Metallic brown; tergal segments one to three medially incised, remaining segments entire.

Male. Length 1.85 mm.; brown with bluish reflections; antenna light brown except apical two-thirds of scape which is brown with blue reflections; funicle with heavy appressed ciliation; one sensilla placodea apparent on every other funicular segment as seen from one angle; phallus with basal ring absent; margins of the phallus base membranous, curving gently mesad to the irregular emarginate parameral plates; apodemes apparently crossed at apical tip; digiti with three finely curved spines.

Types. Holotype female, allotype male, 6 paratypes females: "Arizona" (Huber) reared March 5, 1888 from material collected by P. T. Baron from Pachypsylla gemma Riley on Celtis species.; "6 specimens reared February 14, 1888 from material collected in Alameda County, California" (Huber). The types are in the United States National Museum, Cat. No. 25352.

31. TORYMUS LONGISTIGMOSUS (Huber)

Callimome longistigmum Huber, 1927. United States National Museum Proc. 70 (14):47.

Torymus longistigmus has a wing structure similar to that of T. galbanocoxatus, its closest relative. Propodeal sculpturing of the two species is quite different with four prominent short carinae on the anterior margin of T. longistigmus and four distinct pits on the anterior margin of T. galbanocoxatus with the first three twice as large as the fourth.

Female. Length 2.80 mm.; ovipositor sheaths 1.20 mm.; wings 2.20 mm.; body generally green with blue and purple reflections. Head 0.70 mm. wide, considerably wider than thorax; 0.37 mm. thick; 0.51 mm. high; face green with fine netted reticulations; median carina extending to basal margin of clypeus forming an acute but flat ridge; clypeal carinae prominent, extending further above than below tentorial pits, fuscous; clypeus green, entire; scape somewhat distorted, basally light testaceous fading to dark testaceous apically ending considerably below median ocellus; remainder of antenna light fuscous; pedicel and ring segment twice the length of first funicular segment; funicular segment one 0.07 mm. long, 0.05 mm. wide with 4-8 sensilla placodea; funicular segment seven 0.08 mm. long, 0.09 mm. wide with 10-14 sensilla placodea; funicle and club combined 0.70 mm. with moderate fine ciliation.

Thorax. Dorsum golden-green becoming blue posteriorly on scutellum with moderate transverse aciculations; mesoscutum with very fine setal sockets seen only in the best of lights; scutellum with larger more prominent setal sockets; transscutellar suture very obscure; propodeum brassy-green with four prominent short carinae on either side of anterior margin; propodeum somewhat pitted posteriorly; legs uniformly ochreous except coxae; fore and mid coxae green basally, ochreous apically, hind coxae blue-green except apical tip which is ochreous; wings hyaline, strongly ciliate with 85-90 black setae of moderate length per square 0.33 mm.; stigmal veins prominently petiolate; baso-stigmal veins absent; apico-stigmal veins with erect setae forming a single row to the apical wing margin; post-uncul veins seen only as a wing ridge in the normal position of these veins; uncul cells with four or more prominent black setae.

Abdomen. Green basally followed by a purple band, remainder of abdomen blue; shorter than the thorax; tergal segments one to three medially incised.

Male. Length 2.00 mm.; color generally green; abdomen dark fuscous; funicular segments slightly wider than in the female; phallus without basal ring; parameral slates lightly sclerotized, nearly entire; apodemes emarginate and crossed at apical one third; digiti with three heavy spines.

Types. Holotype female, allotype male, 4 female and one male paratype: "Los Angeles County, California, from woody gall

on willow, Cecidomyia species by D. W. Coquillett" (Huber). The types are in the United States National Museum, Cat. No. 25359.

32. TORYMUS UMBILICATUS (Gahan)

Syntomaspis umbilicata Gahan, 1919, Ann. Ent. Soc. American. 12:163.

Callimome umbilicatum (Gahan), Huber, 1927. United States National Museum Proc. 70 (14) : 94.

Torymus umbilicatus shows a close relationship to Torymus tricolor but may be separated from it and other close relatives by the presence of three large anterior pits open posteriorly on either side of the propodeum. The large discoidal setal sockets and the structure and ciliation of the wings are similar to T. tricolor. T. tricolor has a propodeum with a median carina and several closed pits on the anterior margin.

Female. Length 2.50 mm.; ovipositor sheaths 2.30 mm.; wing 2.30 mm. Body various shades of blue and brown with green reflections. Head 0.75 mm. wide, wider than thorax, 0.35 mm. thick, 0.60 mm. high; face blue-green laterally, irregularly roughened, brown with purple reflections below antennal sockets; median carina prominent extending only as far below as above antennal sockets; clypeal carinae obscure; clypeal area brown without reticulations; scape ochreous except dorsal apical tip which is testaceous; remainder of antenna dark brown; pedicel and ring segment combined

longer than first funicular segment; funicular segment one 0.07 mm. long, 0.06 mm. wide with 8-10 sensilla placodea; funicular segment seven 0.08 mm. wide with 12-14 sensilla placodea; funicle and club combined 0.70 mm. long with very sparse ciliation.

Thorax. Dorsum blue-green with large discoidal setal sockets with fine reticulations between them; transscutellar suture prominent; scutellar apex rugose with two discoidal setal sockets anteriorly; propodeum shining green with many longitudinal carinae; posterior margin of three large anterior pits not closed; legs except tarsi brown with blue reflections on coxae and femora; tarsi white basally shading to testaceous apically; wings lightly ciliate with 24-28 long setae per square 0.33 mm., hyaline; stigmal veins completely sessile; baso-stigmal veins absent; apico-stigmal veins irregular single row of long setae which can be followed nearly to the apical tip of the wing; post-uncul veins a single somewhat irregular row of setae; uncul cells without setae.

Abdomen. Dorsally green, laterally brown with green reflections; tergal segments one to three medially incised, remaining segments entire.

Male. Length 2.00 mm.; body blue with green reflections with areas of brown; propodeum differs from the female in having a strong median carina as well as other carinae distributed in the lateral areas; phallus with basal ring apparent; membranous area cephalad, somewhat truncate, crescent-shaped; parameral plates emarginate to a mesal projection; apodemes gently curving mesad;

digit with three black heavy spines.

Types. Holotype female, allotype male, two male paratypes: Tempe, Arizona, reared from gall of a Itonidid on Suaeda species reared by V. L. Wildermuth. The types are in the United States National Museum, Cat. No. 22298.

Distribution. California, Arizona, Florida and Connecticut. Specimens have been collected in Los Angeles County, California, June, 1887, from e.c. cecidomyid galls on Atriplex canescens (Pursh) Watson, collected by A. Koebele.

33. TORYMUS TRICOLOR (Huber)

Callimome tricolor Huber, 1927. United States National Museum Proc. 70 (14):96.

Torymus tricolor has four anterior pits on the propodeum, the first three being uniform in size with the fourth four times the size of the third. This sculpturing separates it from the other species and its close relative T. umbilicatus.

Female. Length 2.80 mm.; ovipositor sheaths 2.60 mm. Body blue-green with purple abdominal reflections. Dorsum with large, deep setal sockets. Head 0.90 mm. wide, as wide as thorax; 0.40 mm. thick, 0.80 mm. high; face greenish-black below, blue-green above, finely reticulate with large, prominent setal sockets; median carina and clypeal carinae indistinct; scape flavo-testaceous, slender, ending before reaching median ocellus; antenna, except scape, fuscus; pedicel and ring segment combined length 0.10 mm.,

same length as funicular segment one; funicular segment one with 14-18 sensilla placodea, 0.10 mm. wide; funicular segment seven 0.10 mm. long, 0.12 mm. wide with 16-20 sensilla placodea; funicle and club 0.80 mm.

Thorax. Dorsum blue-green, axillae with golden reflections, setal sockets so large as to occupy most of dorsal area, normal dorsal reticulations obscure except in certain lights; scutellum with prominent transscutellar suture, apical one-third with transverse reticulations; propodeum abnormally short, laterally without sculpturing, carinal area distinctly deeply reticulate; anterior propodeal pits four, the first three uniform in size, the fourth four times the size of third; coxae and femora purple; tibiae testaceous; tarsi barely lighter than tibiae; wings with 25-30 setae per 0.33 square mm., entirely hyaline; stigmal veins sessile; baso-stigmal veins absent; apico-stigmal veins just discernable by an irregular double row of eight setae; post-uncul veins commencing with single alternating veins becoming a neat double row half way to anterior wing margin; uncul cells without setae.

Abdomen. Tergal segments purpureus, medially slightly notched, notches becoming less prominent caudally, segment four to six entire.

Male. Length 2.00 mm. Darker than female in all respects except tarsi which are dirty white; antenna and segments thereof, proportionately shorter than in female; propodeum with sharp

median carina with one fine carina on either side; propodeal pits three instead of four as in female; phallus with basal ring apparent faintly; membranous area cephalad somewhat truncate; parameral plates lightly, irregularly emarginate; apodemes irregularly emarginate, tapering, apically to fine tips, digiti with apparently three heavy spines; digiti with their inner margins showing diagonal creases.

Types. Holotype female, allotype male, 9 female and 6 male paratypes: Brownsville, Texas, July 3-11, 1912 from Asphondylia species (collector not given). The types are in the United States National Museum, Cat. No. 25326.

Variation. Usual size variations are as follows from a series of 17 females and 13 males: female length varies from 1.60 mm. to 2.80 mm., ovipositor 1.20 mm. to 3.20 mm. Male length 1.50 mm to 2.00 mm.

Distribution. California and Texas. The writer collected galls of Dasyneura species on Franseria acanthicarpa (Hook.) Cov. and reared thirty-two specimens of this species from Oceanside, California, July 1949.

34. TORYMUS NUTKANAE, new species

Torymus nutkanae appears to have several characters which relate it to no other species. The short erect stigmal vein, the diamond-shaped basal ring of the phallobase, and the four anterior propodeal pits which become progressively smaller separates this

species from all others. The general appearance of the wing shows some similarity to T. garryani which has a very narrow petiole of the stigmal vein.

Female. Length 2.86 mm.; ovipositor sheaths 3.56 mm.

(Photo. 61). Wings 2.40mm. Body castaneous with thoracic dorsum green and green reflections on head, legs, and abdomen. Head 0.88 mm. wide, slightly wider than thorax at tegulae, 0.40 mm. thick, 0.81 mm. high; entire face except margin of mouth, castaneous when viewed at right angles to surface, the latter green, vertex between and behind ocelli green; median carina distinct extending half distance to basal margin of the clypeus; clypeal carinae extending upward just outside green band of basal clypeal margin, not as long as basal distance between them; antennal depression shallow, shining; scape testaceous, not flattened; remainder of antenna fuscous; pedicel and ring segment combined barely longer than first segment of funicle; funicular segments decrease in length from 0.09 mm. to 0.07 mm.; funicular segment seven 0.10 mm. wide with 12-16 sensilla placodea on each segment of the funicle; funicle and club combined 0.76 mm. long.

Thorax. Dorsum green with red-brown reflections in certain lights with uniform irregular honeycomb type sculpturing except on pronotum which is reticulate; transscutellar suture evidenced by brilliant green line and scutellar apex which is mostly castaneous; propodeum green except an area on each side of a broad shining green carina which is the same color as the scutellar apex; propodeum with

four anterior pits on each side becoming progressively smaller; portion of mesepimeron above notch red; coxae, trochanters, and femora infusate with slight red and green reflections; hind coxae with most of dorso-lateral surfaces red; tibiae testaceous; tarsi of meso and meta legs, except last segment, flavo-testaceous, the latter being testaceous; wings extremely hyaline, lightly ciliate, 28-30 setae per square 0.33 mm.; marginal and submarginal veins testaceous, stigmal veins fuscous, sessile (Photo. 30); baso-stigmal veins absent; apico-stigmal veins commencing in a compact single row of setae and continuing to the apical wing margin; post-uncul veins a loose single row of setae until the anterior apical wing margin is reached where the row becomes double; uncul cells with one to no setae.

Abdomen. Generally castaneous becoming green toward the tip; two-thirds of the first segment green; tergal segment one to four deeply incised; segments five and six entire.

Male. Length 2.35 mm.; body generally much darker than that of the female; legs same color as body with brown reflections except front and middle tibia and tarsi, the first two being testaceous with an inner margin of fuscous; tarsi flavo-testaceous with tarsi of pro legs darker than meta tarsi; apex of scape fuscous; wing veins flavo-testaceous almost white (Photo. 31); base of phallus with prominent diamond-shaped basal ring, without membranous area cephalad to the basal ring. (Fig. 28; Photo. 85)

Types. Holotype female, 5 female and 1 male paratypes:

Corvallis, Oregon, July 29, 1947, (Hobbs) on Rosa nutkana and reared from galls of Diplolepis nebulosus; allotype male, 9 female and 2 male paratypes; Corvallis, Oregon, April 7, 1947, (Roth) on Rosa species from stem galls; and the following male and female paratypes are in the United States National Museum: 26 females and 35 males, Corvallis, Oregon, April 5, 1948 (Hobbs) on R. nutkana from terminal bud galls; 4 females and 1 male collected Corvallis, Oregon, July 24, 1946 (Hobbs); 7 females and 2 males, Corvallis, Oregon, July 20, 1947 (Hobbs) from Diplolepis bicolor on R. nutkana; 6 females and 9 males, Corvallis, Oregon, June 14, 1947 (Morgan) from galls on R. nutkana; 2 females and 3 males, Corvallis, Oregon, April 21, 1947 (Duspiva) from galls of D. nebulosus on R. nutkana; 2 females, Corvallis, Oregon, May 8, 1947 (Hobbs) from seeds of R. nutkana; 5 females, Corvallis, Oregon, June 29, 1946 (Hobbs); 1 female, Corvallis, Oregon, Spring 1937 (Scullen); 5 females and 1 male, Corvallis, May 20, 1939 (Scullen); 6 females and 2 males, Philomath, Oregon, March 14 - April 2, 1929 (Scullen) from rose bud galls; 8 females and 9 males, Corvallis, Oregon, April 19, 1949 (Hobbs) from bud gall of R. nutkana; 3 females, Corvallis, Oregon, May 6, 1947 (Roth); 2 females and 1 male, Corvallis, Oregon, June 16, 1946 (Hobbs); 2 females, Corvallis, Oregon, June 11, 1946 (Hobbs); 3 females and 3 males, Corvallis, Oregon, August 18, 1947 (Hobbs) from spring rose gall on R. nutkana. The last series is retained in the author's collection.

Variation. Body length of the female varies from 1.90 mm.

to 3.10 mm. The ovipositor varies from 2.20 mm. to 3.70 mm. The length of the male of the present series commences at 1.30 mm. to 2.35 mm. The color reflections of red have a tendency to disappear in some specimens and are replaced with darker colors of blue.

35. TORYMUS OCCIDENTALIS (Huber)

Callimome occidentale Huber, 1927. United States National Museum Proc. 70 (14):79.

The absence of propodeal sculpturing and the six posteriorly open anterior pits are the distinguishing characters of Torymus occidentalis. It does not appear to have a close western relative although Huber states that it is closely related to Torymus albitarse. The propodeal sculpturing of the two species shows a close relationship.

Female. Length 2.90 mm.; ovipositor sheaths 3.80 mm. long; wing 2.70 mm. long; body blue with purple and green reflections. Head 0.90 mm. wide, as wide as thorax, 0.40 mm. thick and 0.80 mm. high; face purple finely reticulate; median carina blue-green ending half-way to basal margin of the clypeus; clypeal carinae prominent, anterior margin of the mouth emarginate; scape fuscous barely reaching median ocellus; pedicel and ring segment as long as first funicular segment; funicular segment one 0.10 mm. long, 0.12 mm. wide with 20-24 sensilla placodea in two series; funicular segment seven 0.09 mm. long, 0.10 mm. wide with 26-30 sensilla placodea in two series; funicle and club combined 0.90 mm. long.

Thorax. Blue with green reflections; fine irregular honey-comb reticulations ceasing just before posterior margin of mesoscutum; scutellum with irregular longitudinal furrows; transscutellar suture apparent only as a change in color on apical third of scutellum to blue, without green reflections; propodeum except pits without sculpturing of any kind; anterior pits open posteriorly, six in number commencing as a minute pit then becoming large then diminishing in size equal to the first pit; legs including coxae brown with brilliant purple reflections especially on hind femora, except tarsi; tarsi light ochreous; wings very lightly ciliate with 12-16 short setae per square 0.33 mm.; stigmal veins distinctly sessile; baso-stigmal veins a short series of setae in single row; apico-stigmal veins a single row of setae extending nearly to the apical tip of the wings; post-uncul veins exceedingly sparse, single row of setae; uncul cells without setae.

Abdomen. Purple; tergal segments one to four incised; tergal segment five emarginate; tergal segment six entire.

Male. Length 1.60 mm.; body brilliant blue with green reflections; antenna dark brown with moderately prominent appressed ciliation; sensilla placodea in one long series per funicular segment; stigmal vein sub-sessile; colors essentially darker on legs than in female; phallus without basal ring; basal area of phallus membranous tapering very gradually from an acute basal tip to the irregular emarginate perameral plates; apodemes bent slightly mesad apically; digiti with three stout short spines.

Types. Holotype female, allotype male, 7 paratypes; Hilt, California, May 20, 1914 (P.D. Sargent) reared from dipterous galls on Juniperus occidentalis Hooker. The types are in the United States National Museum, Cat. No. 25332.

36. TORYMUS KOEBELEI (Huber)

Callimome koebelei Huber, 1927. United States National Museum Proc. 70 (14):52.

Torymus koebelei may be separated from other species by the following combination of characters: the relative short lengths of the ovipositor sheaths, the quadrate segments of the funicle, the sparse ciliation of the antennae and the six very fine anterior pits on the propodeum. The structure of the male genitalia of T. koebelei and T. nutkanae shows a possible relationship between the two species.

Female. Length 1.75 mm.; ovipositor sheaths 0.90 mm.; wings 1.45 mm.; body color mainly fuscous with slight green and blue reflections. Head 0.50 mm. wide, wider than thorax, 0.22 mm. thick, 0.55 mm. high; face blue-green minutely reticulate; median carina prominent with acute ridge reaching the base of the clypeus; clypeal carinae prominent, widely separated; clypeus fuscous, entire; scape, basally light testaceous, fuscous above with blue-green reflections; remainder of antenna fuscous; pedicel and ring segments combined slightly longer than first funicular segment; funicular segment one 0.05 mm. long, 0.05 mm. wide with 4-6 sensilla placodea;

funicular segment seven 0.06 mm. long, 0.08 mm. wide with 16-20 sensilla placodea; funicle and club very sparsely ciliate; combined length 0.35 mm. long.

Thorax. Mesoscutum black-green, finely transversely reticulate; scutellum green, longitudinally reticulate with shiny longitudinal carina medially; transscutellar suture apparent, anterior to fine transverse reticulations on posterior one-third of scutellum; propodeum brassy green with tints of red in some lights; six extremely fine anterior pits on either side increasing slightly in size laterally; legs except hind coxae and tarsi uniform shining fuscous; hind coxae purple dorso-laterally; tarsal segments one to four very light ochraceous; tarsal segment five fuscous; wings hyaline, heavily ciliate with 80-90 short setae per square 0.33 mm.; submarginal veins widen prominently at the sessile stigmal veins; false veins apparent by sparsely ciliate single row of short setae; uncul cells without setae.

Abdomen. Fuscous with blue-green and purple reflections dorsally; tergal segment one produced caudally with closed median notch; remaining segments entire.

Male. Length 1.10 mm.; thorax bluish-black dorsally, fuscous ventrally; abdomen testaceous on basal one-third, remainder fuscous; funicular segments with only from 1-6 sensilla placodea; true wing veins white to ochreous much lighter than in the female; Phallus with basal ring apparent rectangular with corners rounded; slightly produced cephalad; parameral plates entire, lightly sclerotized;

apodemes parallel; digiti with three strongly curved spines.

Types. Holotype female, allotype male and 13 paratypes: San Francisco, California, reared from itonidid gall on Baccharis pilularis De Candolle on July 16, 1885. The types are in the United States National Museum, Cat. No. 25407.

37. TORYMUS MULTICOLOR (Huber)

Callimome multicolor Huber, 1927. United States National Museum Proc. 70 (14):51.

Torymus multicolor is unique by having its general body a brilliant magenta with prominent green areas and by having four anterior propodeal pits which commence some distance from the median line. Body structure and shape of T. multicolor is similar to T. nutkanae. T. nutkanae is consistently smaller and has no magenta color on the body.

Female. Length 2.70 mm.; ovipositor sheaths 1.30 mm.; wings 2.30 mm.; thorax green with patches of magenta, abdomen bruneus to fuscous. Head 0.83 mm. wide, considerably wider than thorax; 0.37 mm. thick; 0.70 mm. high; face rich magenta with fine honeycomb reticulations; median carina narrow, sharp, extending to the basal margin of the clypeus; clypeal carinae obscure; clypeus emarginate; scape basally ochreous, apical two-thirds same as face; scape strongly bent laterally, barely reaches median ocellus; pedicel and ring segment magenta; combined length twice the length of the first funicular segment; funicular segment one 0.03 mm. long, 0.04 mm.

wide with 14-18 sensilla placodea; funicular segment seven 0.03 mm. long and 0.10 mm. wide with 18-22 sensilla placodea; funicle and club fuscous, moderately ciliate, combined length 0.60 mm.

Thorax. Dorsum brassy magenta with suture blue shading to golden-green; mesoscutum with irregular honeycomb reticulations; anterior half of scutellum with transverse reticulations converging medially to a blue-green line; posterior half of scutellum with larger but not deep irregular honeycomb reticulations; propodeum brassy magenta without reticulations medially; finely aciculate laterally; anterior pits prominent, four in number commencing same distance on either side of the median line; legs except tarsi magenta; tarsi testaceous; wings not clearly hyaline, moderately ciliate with 34-38 short setae per square 0.33 mm.; stigmal veins sessile; baso-stigmal, apico-stigmal and post uncul veins prominent forming a single row of compact setae; uncul cells without setae.

Abdomen. Magenta above, fuscous below; tergal segments one to three moderately incised; remaining segments slightly emarginate.

Male. Unknown.

Types. Holotype female, 1 female paratype: "Los Angeles County, California, May, 1887 (A. Koebele) reared from gall on Ephedra species" (Huber). The types are in the United States National Museum, Cat. No. 25341.

38. TORYMUS MINUTISSIMUS (Huber)

Callimome minutissimum Huber, 1927. United States National Museum Proc. 70 (14):78.

Torymus minutissimus can be separated from other species by its consistent small size, the few but prominent sensilla placodea on the funicular segments, and the four irregular carinae on each side of the anterior margin of the propodeum. According to the similarities of the male genitalia it is oddly enough most closely related to T. giganticum. The consistent size of both species readily separates them.

The male is described here for the first time.

Female. Length 1.60 mm.; ovipositor sheaths 1.50 mm.; wings 1.40 mm.; body blue-green. Head 0.50 mm. wide; as wide as thorax; 0.20 mm. thick; face blue-green; median carinae fairly apparent; clypeal carinae prominent, short; clypeus very light ochreous; scape ventrally dirty ochreous, fuscous above; remainder of antennae fuscous; pedicel and first ring segment combined equal in length to the first funicular segment; funicular segment one 0.07 mm. long, 0.06 mm. wide with 4-6 sensilla placodea; funicular segment seven 0.05 mm. long, 0.08 mm. wide with 8-10 sensilla placodea; funicle and club combined 0.46 mm. long with very sparse appressed ciliation.

Thorax. Dorsum blue-green with minute irregular honeycomb reticulation; scutellum golden green with slight change in size of reticulation on posterior third; transscutellar suture barely apparent;

propodeum blue with four irregular carinae forming posteriorly open pits; fore coxae dark testaceous with blue reflections basally; remaining leg segments fuscous except tarsi and apical tips of tibiae which are light testaceous; tarsi very light ochreous; wings hyaline, heavily ciliate with 75-85 black setae per square 0.33 mm.; baso-stigmal veins absent; apico-stigmal and post-uncul veins irregular single rows of short setae; stigmal veins sessile; uncul cells without setae.

Abdomen. Fuscous with blue reflections; tergal segments one and two slightly emarginate; remaining segments entire.

Male. Length 2.00 mm.; body blue-green. Head 0.66 mm. wide, 0.30 mm. thick, and 0.59 mm. high; face finely punctured, golden blue-green; median carina narrow but prominent just reaching the basal margin of the clypeus; two fine grooves as seen in direct light commencing at the intersection of the median carina and the margin of the mouth, extend diagonally to the apices of the clypeal carinae; margin of the mouth nearly entire; basal one-third of scape testaceous, remainder blue, not reaching median ocellus; funicle and club combined 0.70 mm. long.

Thorax. Dorsum blue with green reflections, minutely punctate; pronotum with anterior one-half purple, remainder blue; transscutellar suture barely visible only at certain angles and in certain lights; propodeum with broad carina, bluish purple on carina and blue-green laterally; propodeum with two large, sub-equal pits anteriorly on either side of carina; legs olive-green with blue

reflections; fore tibia light infusate; tarsi, except tips, testaceous; wings entirely haline, lightly ciliate; veins infusate; stigmal veins sessile.

Abdomen. Dark infusate, banded with blue reflections; first three segments medially incised; phallus with basal ring apparent but not prominent; especially at basal tip; membranous area commencing at base outside basal ring becoming progressively wider nearer parameral plates; parameral plates with deep convex notch; apodemes emarginate, slightly curved laterad, apically; digiti widen strongly, with three stout, blue spines, intermediate spines absent.

Types. Holotype female and 2 female paratypes: Yosemite Park, California, August 20, 1919 (J. E. Patterson) and reared from twig galls on Quercus species; neallotype male collected Corvallis, Oregon, June 17, 1947, (Hobbs) (host unknown). The types are in the United States National Museum.

39. TORYMUS ROHWERI (Huber)

Callimome rohweri Huber, 1927. United States National Museum Proc. 70 (14):58.

Torymus rohweri is the only species with a single anterior pit on either side of the propodeum which is larger than the spiracle. Huber considers T. rohweri closely related to Torymus thalassinus but the structure of the phallobase of these two species does not indicate this relationship.

Female. Length, 2.60 mm.; ovipositor sheaths 1.10 mm.; wings 2.30 mm.; body green, fuscous below. Head 0.70 mm. wide; slightly wider than thorax; 0.35 mm. thick; 0.70 mm. high; face brassy green with tints of brown; blue-green band on inner eye margin becoming wider toward the vertex to encompass entire area; anterior margin of mouth green; median carinae very prominent extending nearly to basal margin of the clypeus; clypeus testaceous; scape flavo-testaceous on basal half; apical half fuscous with green reflections; pedicel same color as apical portion of scape; remainder of antenna light fuscous; pedicel and ring segment combined more than one and a half times long as first funicular segment; funicular segment one 0.08 mm. long, 0.07 mm. wide with 10-14 sensilla placodea; funicular segment seven 0.07 mm. long, 0.10 mm. wide with 22-26 sensilla placodea; funicle and club combined 0.70 mm. long with very sparse appressed ciliation.

Thorax. Dorsum green with blue and gold reflections, prominently brassy between wings; parapsidal plates purple; dorsum with honeycomb reticulations; transscutellar suture prominent; propodeum golden green, finely reticulate with a single anterior pit larger than spiracle; fore coxa green; mid coxae brown with slight green reflections; hind coxae green basally; brown on ventro-lateral surface with slight green reflections, brown on dorso-lateral surface with wine-colored and blue reflections; femora fuscous with green reflections except apical tips which are testaceous; fore and

mid tibiae fuscous medially, testaceous basally and apically; hind tibiae brown with green reflections on basal half; tarsi approaching white except fifth segment which is fuscous; wings lightly ciliate with 18-22 setae per square 0.33 mm., hyaline; true veins ochreous; stigmal veins subsessile; baso-, apico-stigmal and post-uncul veins all a neat single row of setae; uncul cells without setae.

Abdomen. Green with blue reflections dorsally, fuscous ventrally; tergal segments one and two medially incised; tergal segment three emarginate, remaining segments entire.

Male. Length 1.80 mm.; body blue-green with fewer golden reflections than in female; scape shining blue-green except basal tip which is ochreous; sensilla placodea average 2-4 less per funicular segment than in female; phallus with lightly chitinized but an apparent oval-shaped basal ring; parameral plates nearly entire; apodemes cross at the basal one-third; digiti with three prominent spines.

Types. Holotype female: Rio Vista, California on Lolium temulentum L. containing Harmolita species, June 3, 1920 (B. G. Thompson); allotype male: Hercules, California, August 10, 1913 (C. M. Packard) from Lolium temulentum L. The types are in the United States National Museum, Cat. No. 25336.

40. TORYMUS THALASSINUS (Crosby)

Syntomaspis thalassinus Crosby, 1908. Canadian Ent. 40:43.

Torymus thalassinus may be separated from other species by the two prominent anterior propodeal carinae, which are about as long as the distance between them and the very sparse ciliation of the wing. The appearance of the wing shows a relationship to T. obscurus, but the setae on the wings of T. obscurus are half the length of the setae of T. thalassinus.

Female. Length 2.40 mm.; ovipositor sheaths 1.00mm.

(Photo. 67); wings 2.10 mm. Body generally blue with tints of green. Head 0.65 mm. wide, wider than thorax, 0.30 mm. thick and 0.06 mm. high; face black-green with fine irregular honey-combed reticulations; median carina moderately prominent ending half way to basal margin of the clypeus; clypeal carinae prominent extending upward for a distance equal to one-third the space between them; scape dark green with basal ventral tips ochreous, narrow, but not reaching median ocellus; pedicel and ring segment nearly twice as long as first funicular segment; funicular segment one 0.07 mm. long and 0.06 mm. wide with 5-6 sensilla placodea; funicular segment seven 0.07 mm. long and 0.10 mm. wide with 10-12 sensilla placodea; funicle and club combined 0.61 mm. long; antenna except scape dark brown, very sparsely ciliated.

Thorax. Dorsum blue with green reflections on posterior half; dorsum with fine irregular honey-combed reticulations;

transscutellar suture moderately prominent, slightly emarginate medially; posterior one-third of scutellum somewhat more finely reticulate than rest of dorsum; propodeum longitudinally reticulate with two prominent anterior carinae about as long as the distance between them causing the appearance of a single large anterior pit; coxae and femora blue with green reflections except apices of femora which are ochreous on fore and mid leg and brown on hind leg; tibiae various shades of brown; tarsi white, except fifth segment which is brown; wings very lightly ciliate with 18-22 setae per square 0.33 mm.; veins very light ochreous approaching white; stigmal veins sessile same color as marginal veins (Photo. 34); baso-stigmal veins formed by a neat single row of setae which can be followed to the apical wing margin; post-uncul veins commencing as a single row of setae joined by other rows near the anterior wing margin; uncul cells without setae.

Abdomen. Blue, with purple reflections; tergal segment one lightly incised medially; tergal segments two and three emarginate medially; tergal segment four entire; segment five slightly notched; segment six entire.

Male. Length 1.90 mm. Body shining black-green with tints of blue. Antennae short, robust with heavy appressed ciliation; legs, except tarsi, fuscous with bluish-green reflections; tarsi very light flavo-testaceous; phallus with basal ring only faintly visible near parameral plates

fading into prominent membranous area; parameral plates notched, moderately sclerotized; apodemes virtually entire, parallel; digiti with three long, narrow teeth with smaller teeth between.

Types. Lectotype female, lectoallotype male, and 3 paratypes: "Cornell University Exp. No. 768, Sub. a, Feb. 22, '07 from timothy (lectotype); Cornell University Exp. No. 784, Sub. a, (no date) from orchard grass (lectoallotype). These 5 types are in the Cornell University collection. (Note: the writer has seen the entire series which was before Crosby at the time of the original description at which time types were not designated. Subsequent to the description, Crosby designated a lectotype and an "allotype", but did not publish. The writer concurs with his choice for the lectotype. His "allotype" belongs to the subfamily Erimerinae, therefore a male paratype has been chosen to represent the lectoallotype.

Distribution. During 1907, Crosby collected a series of over 40 specimens which represented his conception of T. thalassinus from various localities as follows: (from the type book sheet, Cornell University, in Crosby's hand writing) paratypes 3-33, Ithaca, N. Y. (no date), paratypes 34, 35, Bluff Pt., N. Y. (no date), and 1 paratype from each: Lake Keuka, Elmira, Louisville, Victor, N. Y., Oneonta, N. Y., Cortland (lost off point Nov. 1915) and Amsterdam, N. Y. (no date). The writer has specimens from Corvallis, Oregon on the following dates: Aug. 22, 1924

(H. A. Scullen) (no host), June 20, 1935 (Ferguson) (no host), Aug. 20, 1947 (Crowell) sweeping, and Sept. 2, 1947 (Roth) sweeping.

Variation. The greatest variation in the forty or more specimens observed is in color. The types are essentially blue with slight green reflections, while other specimens shade into green and fuscous losing nearly all the blue. The legs and ventral body regions are the first areas to display shades of brown without any metallic colors. There appears to be little variation in relative sizes.

ILLUSTRATIONS

PLATE I (Figures 1-9) MORPHOLOGY

Explanation of Figures

- Fig. 1. Frontal view of head. (T. festivus) X 112
 Fig. 2. Lateral view of thorax. (Torymus) X 100
 Fig. 3. Dorsal view of thorax. (Torymus) X 100
 Fig. 4. Antenna. (T. festivus) X 150
 Fig. 5. Right mesothoracic wing. (T. perplexus) X 150
 Fig. 6. Dorsal view of abdomen. (T. festivus) X 100
 Fig. 7. Lateral view of abdomen. (T. festivus) X 100
 Fig. 8. Phallus. (T. kinseyi) X 150 enlarged
 Fig. 9. Ovipositor. (T. festivus) X 100

AED, aedeagus; AEDA, aedeagal apodemes; ASO, antennal socket; ASV, apico-stigmal vein; AX, axilla; BR, basal ring; BVS, baso-stigmal vein; CL, club; CLC, clypeal carina; CLP, clypeus; CU₁, 1st cubital branch; CXC'', mesocoxal cavity; CXC''', metacoxal cavity; DG, digiti; E, compound eye; EPM, metepimeron; FP, fulcral plate; FU, funicle; IP, inner plate; IPP, pivoting sclerite of the inner plate; LO, lateral ocellus; M, median vein; MBR, membrane of the phallobase; MC, median carina; MD, mandible; MEPM, mesepimeron; MEPS, mesepisternum; MN, metanotum; MO, median ocellus; MV, marginal vein; OP, outer plate; PAR, parapsidal plate; PD, propodeum; PDC, pedicel; PF,

parapsidal furrow; PMR, paramere; PMRP, parameral plate; PMV, postmarginal vein; PN, pronotum; PRP, prepectus; PT, petiole; PUV, post-uncul vein; RS, ring segment; SCL, scutellum; SCP, scape; SCR, scrobe; SCS, subcostal scale; SCT, scutum; SEP, secondary epimeral plate; SK, stigmal knob; SMV, submarginal vein; SP, sensilla placodea; Sp, spiracle; SS, sensory palp (ovipositor sheath); STV, stigmal vein; STY STYS, stylet plus stylet sheath; TEG, tegula; TSCS, transcutellar suture; UN, uncus; WR, wing ridge; 3T, third tergite, etc; 3S, third sternite, etc.

PLATE I (FIGS. 1 - 9) MORPHOLOGY

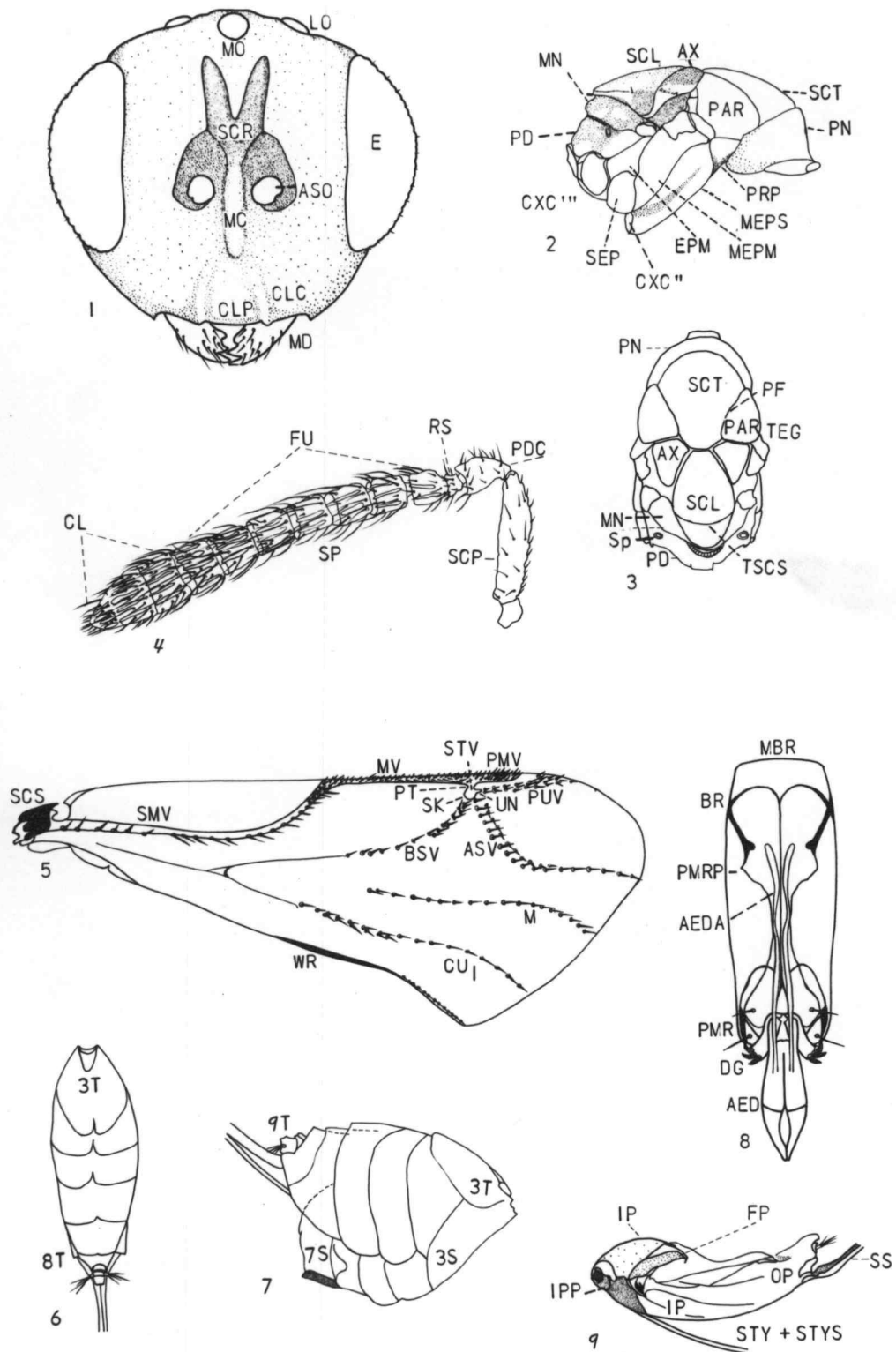


PLATE II (Figs. 10-19)

Propodeal Patterns, Dorsal Sculpturing
and Antennal SegmentsFigure

10. T. spenceri - anterior mesoscutal sculpturing; (left) with light reflected from rear, (right) light reflected from above, X 112.
11. T. corrugatus - propodeum X 100
12. T. californicus - dorsal sculpturing X 100
13. T. perplexus - scape X 100
14. T. perplexus - first funicular segment X 100
15. T. viridis - first funicular segment X 100
16. T. lazulus - antenna (except last funicular segment and club) X 100
17. T. spiraeae - first funicular segment X 430
18. T. corrugatus - first funicular segment X 430
19. T. lazulus - first funicular segment X 430

PLATE II (FIGS. 10 - 19)

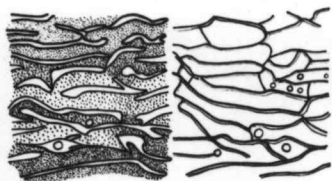
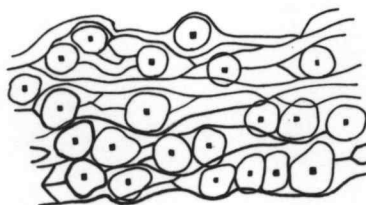
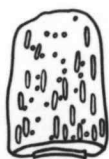
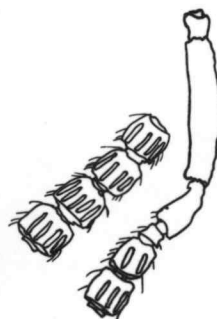
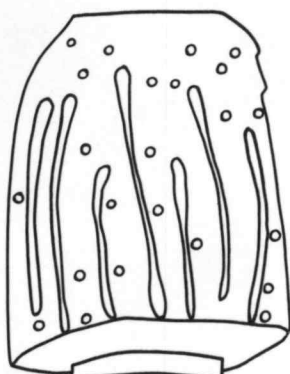
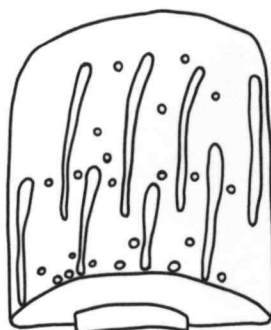
PROPODEAL PATTERNS
ANTENNAL SEGMENTS10. *spenceri*11. *corrugatus*12. *californicus*13. *perplexus*14. *perplexus*15. *viridis*16. *lazulus*17. *spiraeae*18. *corrugatus*19. *lazulus*

PLATE III (Figs. 20-35)

Basal Ring of the Phallus X 150

PLATE III (FIGS. 20 - 35)

BASAL RING OF PHALLUS

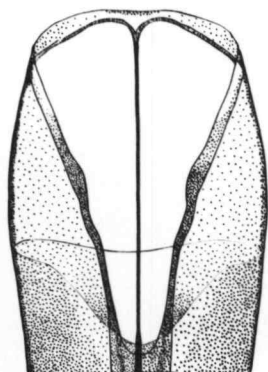
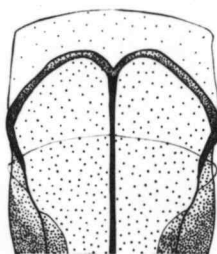
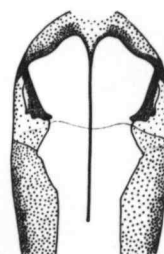
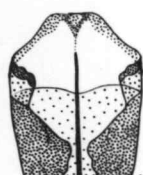
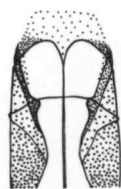
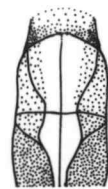
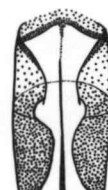
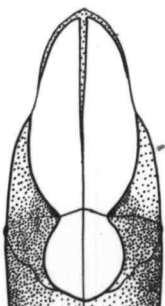
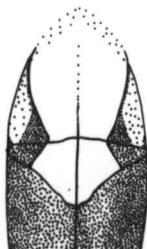
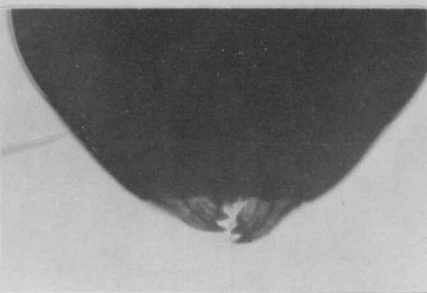
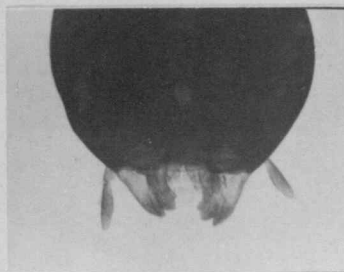
20. *californicus*21. *perplexus*22. *Toromyia* sp.23. *viridis*24. *obscurus*25. *diastrophus*26. *melanopterus*27. *corrugatus*28. *nutkanae*29. *chrysochlorus*30. *festivus*31. *flavicoxatus*32. *spiraeae*33. *giganticus*34. *tubicolae*35. *lazulus*

PLATE IV (Photos 1-14)

Photomicrographs

1. Torymus sp. - head showing denticules on mandibles X 60
2. T. alaskensis - head showing denticules on mandibles X 60
3. T. giganticus - mandible X 150
4. Torymus sp. - maxillae and labium X 150
5. Torymus sp. - portion of maxillae and labium X 150
6. Torymus sp. - cardos showing attachment X 150
7. T. perplexus - funicular segments rolled out to show sense
organs X 150
8. T. giganticus - pro-tibia bifid spur X 150
9. Torymus sp. - apex of hind tibia showing paired, unequal
spines X 150
10. T. fullawayi - meta-leg showing femoral tooth X 30
11. Torymus sp. - mid-leg X 30
12. T. megastigma - meta-leg X 30
13. Torymus sp. - meta-leg X 30
14. T. fullawayi - meta-leg showing femoral tooth X 150

PLATE IV (Photos 1-14) MORPHOLOGY

1. Torymus sp.2. T. alaskensis

3.

T. giganticus4. Torymus sp.5. Torymus sp.

6.

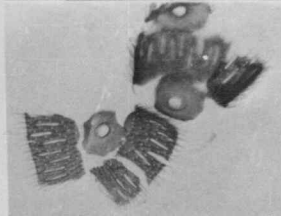
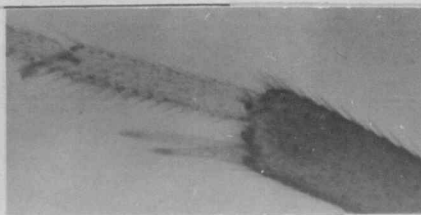
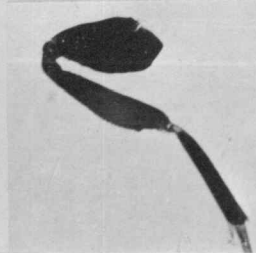
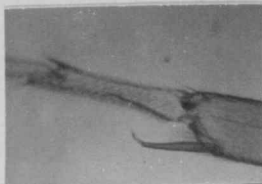
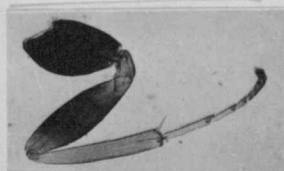
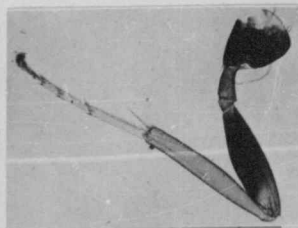
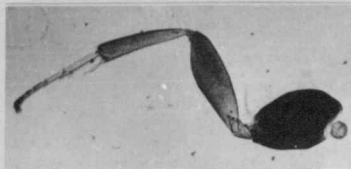
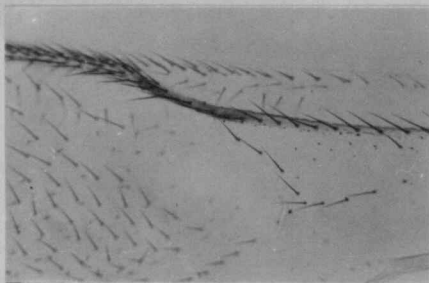
Torymus sp.7. T. perplexus9. Torymus sp.10. T. fullawayi8. T. giganticus12. T. megastigme11. Torymus sp.13. Torymus sp.14. T. fullawayi

PLATE V (Photos 15-23)

15. Torymus sp. - anterior wing margin showing sub-marginal vein becoming marginal vein X 150
16. T. melanopterus - bases of fore and hind wing showing articulation X 150
17. Torymus sp. - intersection of fore and hind wing showing hooks and frenulum X 150
18. Torymus sp. - posterior margin of front wing showing wing rib X 150
19. Torymus sp. - wing base showing setal patterns, sub-marginal vein and vein remnants X 150 enlarged
20. T. viridis - dorso-lateral aspect of male abdomen showing spiracles on eighth tergite X 150 enlarged
21. T. viridis-wing base X 150
22. T. brachystylus - third tergite and sternite to show position of attachment to second abdominal segment X 150 enlarged
23. T. galbanocoxatus - third tergite and sternite to show position of attachment to second abdominal segment X 150 enlarged

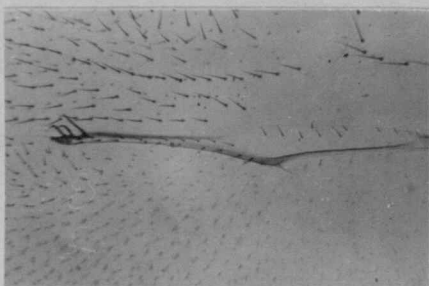
PLATE V (Photos 15-23) MORPHOLOGY



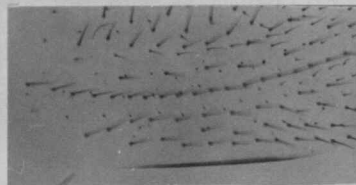
15. Torymus sp.



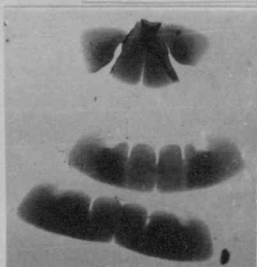
16. T. melanopterus



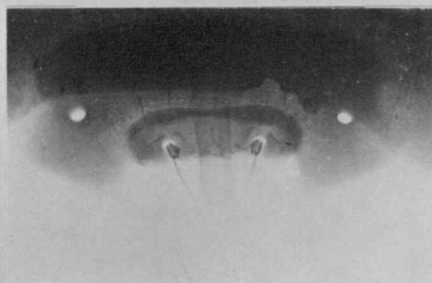
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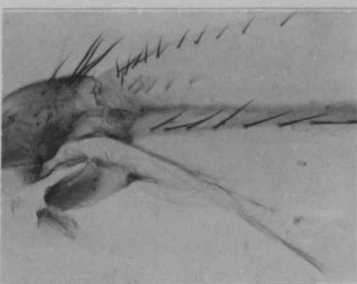
18. Torymus sp.



19. Torymus sp.



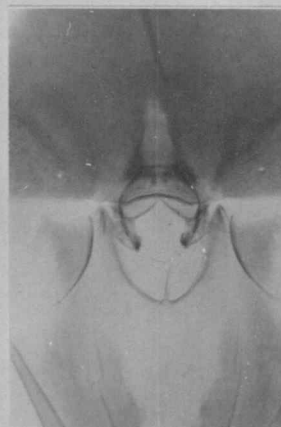
20. T. viridis



21. T. viridis



22. T. brachystylus



23. T. galbanicoxatus

PLATE VI (Photos 24-31) MORPHOLOGY AND WING VEINS

24. T. galbanicoxatus - abdominal sternites of female X 150
enlarged
25. T. giganticus - showing metanotum, propodium with lateral
spiracles and the second morphological segment of
the abdomen X 60
26. Torymus sp. - basal four-fifth of female genitalia X 150

Photos 27-31

WINGS (with stigmal vein, baso- and apico-stigmal and post-
uncul cell) all X 60 enlarged

PLATE VI (Photos 24-31) MORPHOLOGY AND WING VEINS

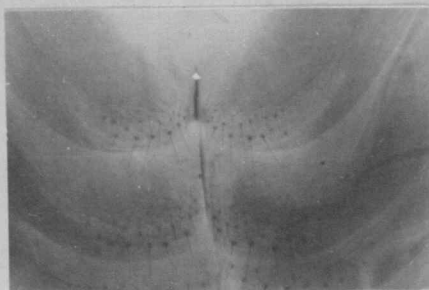
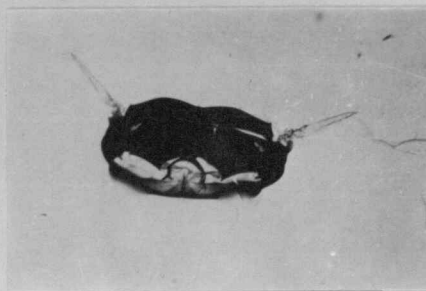
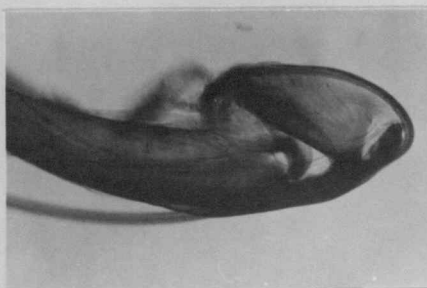
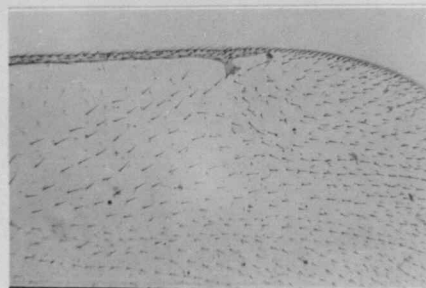
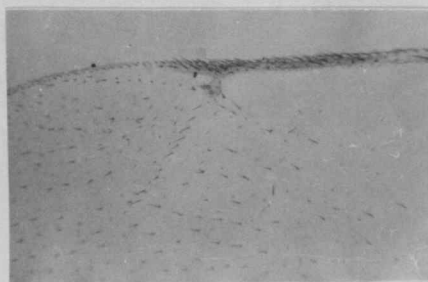
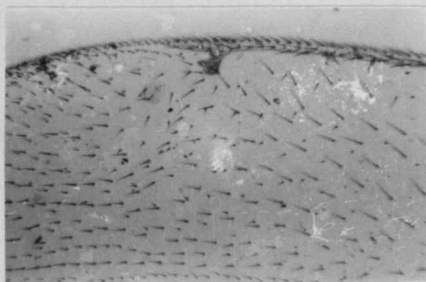
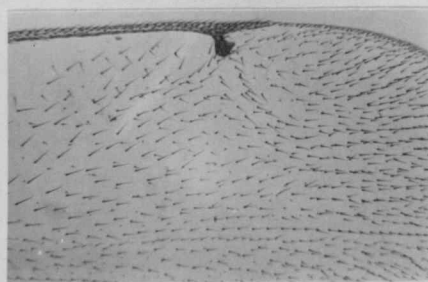
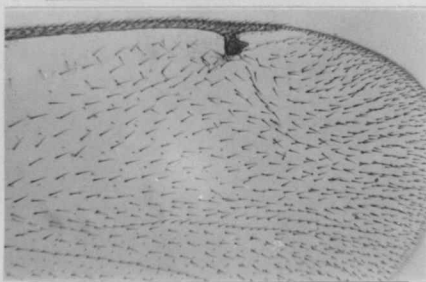
24. T. galbanicoxatus25. T. giganteus26. Torymus sp.27. T. brachystylus28. T. sativae29. T. pachypsyllae30. T. nutkanae31. T. nutkanae, male

PLATE VII (Photos 32-39)

Wings (with stigmal vein, baso- and apico-stigmal and post-
uncul cell) all X 60 enlarged

PLATE VII (Photos 32-39) WING VEINS

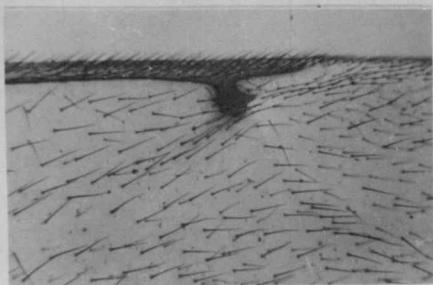
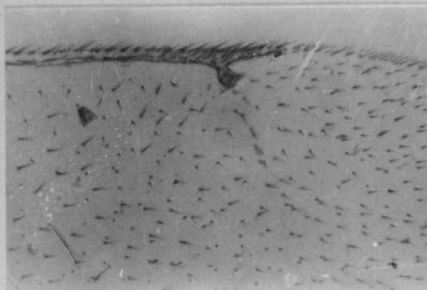
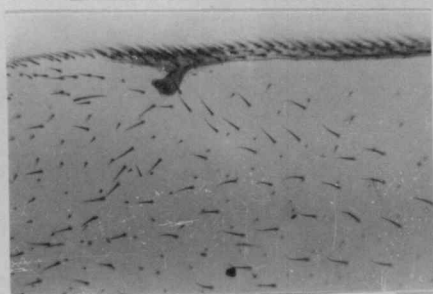
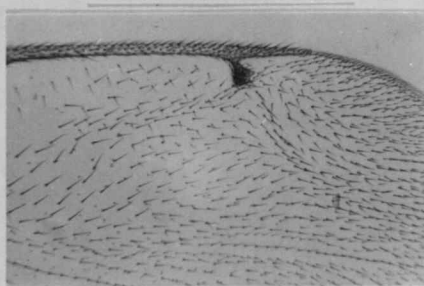
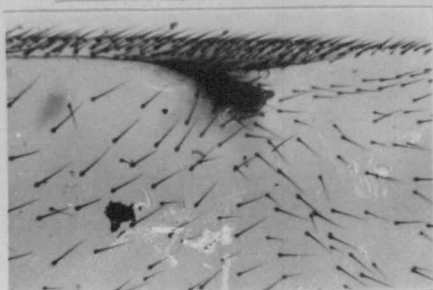
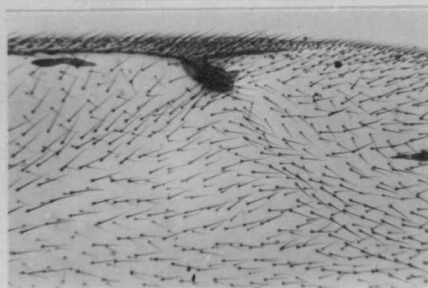
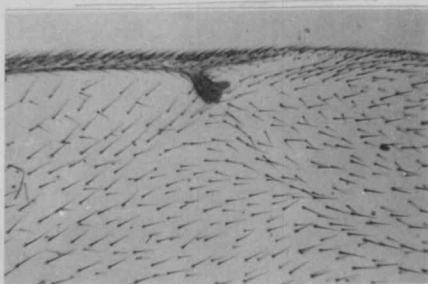
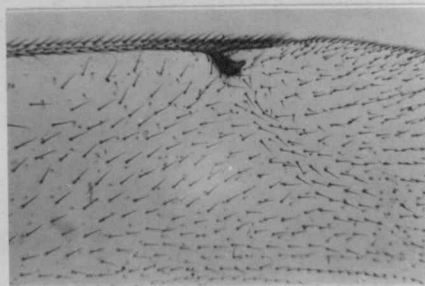
32. T. perplexus33. T. obscura34. T. thalassinus35. T. garryani36. T. fullawayi37. T. spenceri38. T. giganticus39. T. crystallinus

PLATE VIII (Photos 40-47)

Wings (with stigmal vein, baso- and apico- stigmal and post-uncul cell) all X 60 enlarged

PLATE VIII(Photos 40-47) WING VEINS

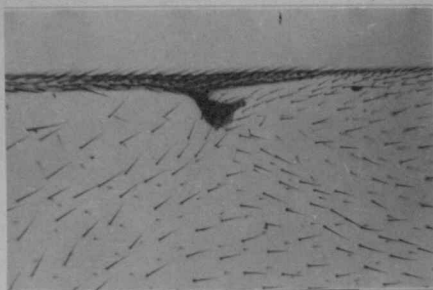
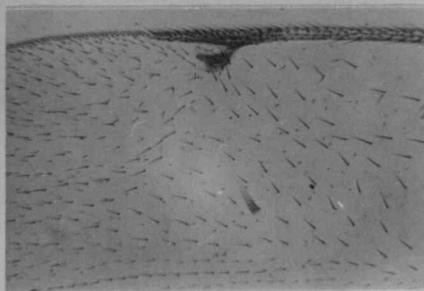
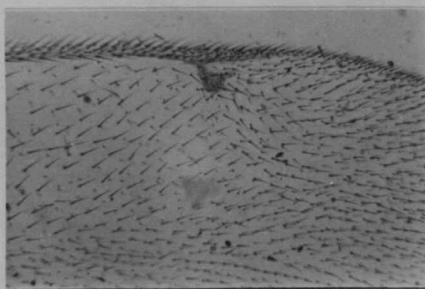
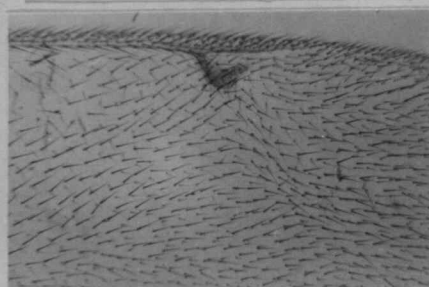
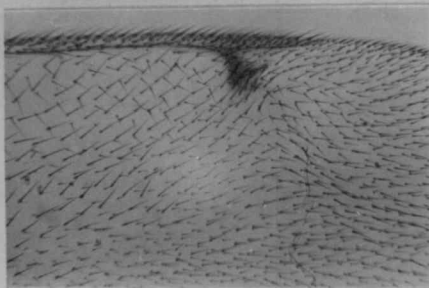
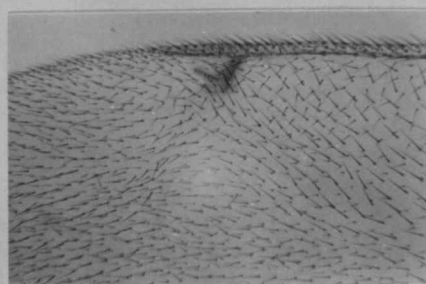
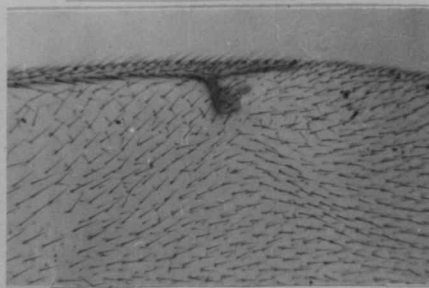
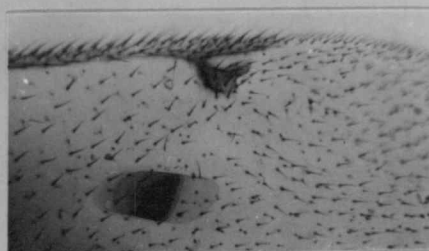
40. T. viridus41. T. viridus - male42. T. festivus43. T. galbanicoxatus44. T. corrugatus45. T. diastrophus46. T. alamedensis47. T. lazulus

PLATE IX (Photos 48-52)

Wings (with stigmal vein, baso- and apico- stigmal and post-uncul cell) all X 60 enlarged

Photos 53-55

Ovipositor Saws X 150 greatly enlarged

PLATE IX (Photos 48-55) WING VEINS AND OVIPOSITOR SAWS

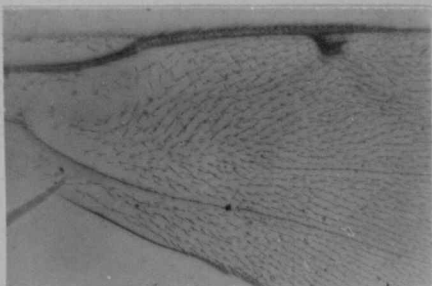
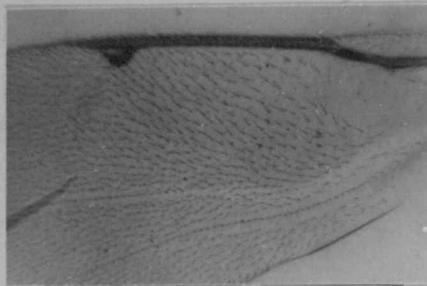
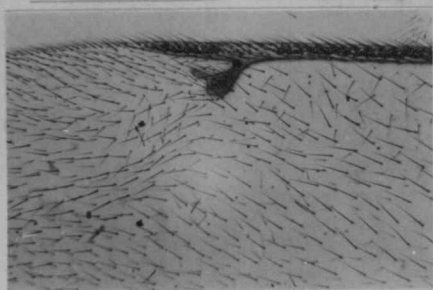
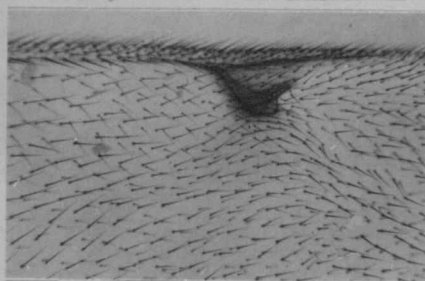
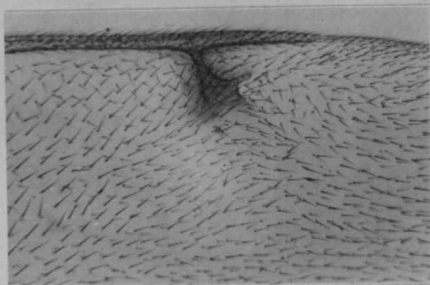
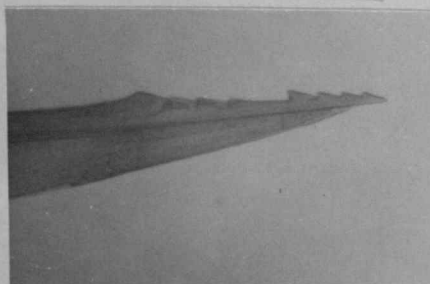
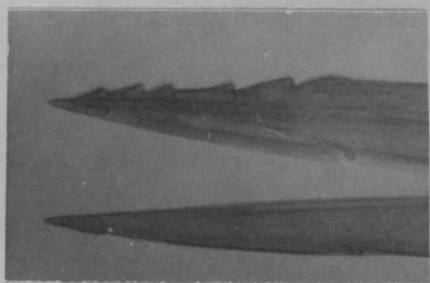
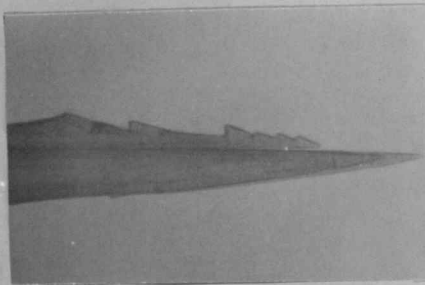
48. T. chrysochlorus49. T. flavocoxatus50. T. spiraeae51. T. bedeguaris52. T. megastigma53. T. chrysochlorus54. T. bedeguaris55. T. chrysochlorus

PLATE X (Photos 56-76)

Ovipositor Saws X 150 not enlarged

PLATE X (Photos 56-76) OVIPOSITOR SAWS

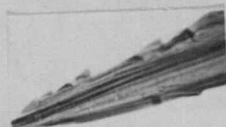
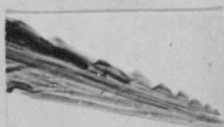
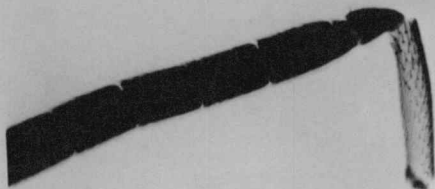
56. T. sativae57. T. garryani58. T. corrugatus59. T. chrysochlorus60. T. chrysochlorus61. T. nutkanae62. T. spenceri63. T. strobiloides64. T. brachystylus65. T. pachypsyllae66. T. lazulus67. T. thalassinus68. T. perplexus69. T. fullawayi70. T. californicus71. T. flavicoxatus72. T. obscurus73. T. viridis74. T. spiraeae75. T. melanopterus76. T. crystallinus

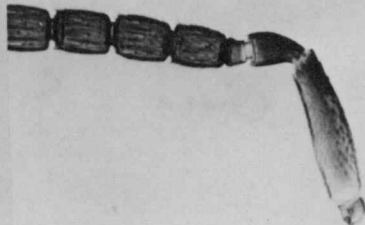
PLATE XI (Photos 77-84)

Antennae X 60 enlarged

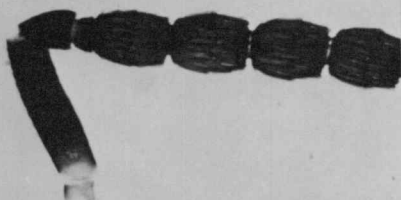
PLATE IX (Photos 77-84) ANTENNAE



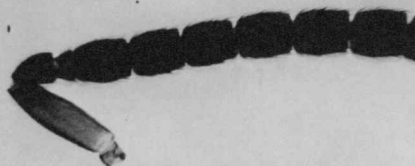
77. T. giganticus



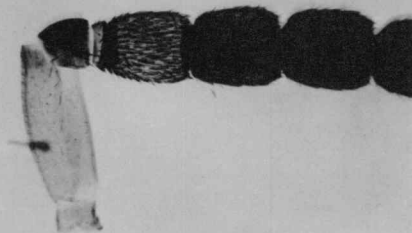
78. T. galbanocoxatus



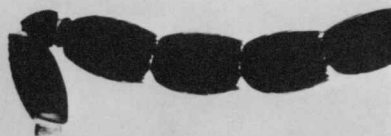
79. T. spenceri



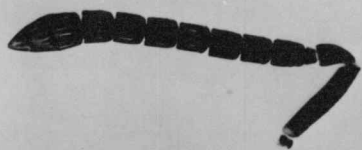
80. T. viridis



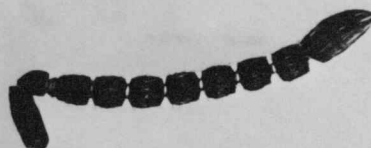
81. T. californicus



82. Torymus sp.



83. alaskensis, female



84. T. alaskensis, male

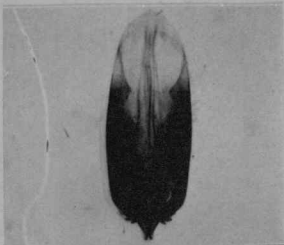
PLATE XII (Photos 85-93)

Male genitalia X 150 enlarged

PLATE XII (Photos 85-93) MALE GENITALIA



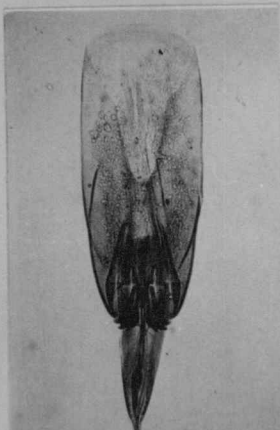
85. T. nutkanae



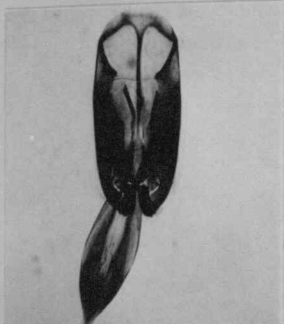
86. T. tubicolae



87. Torymus sp.



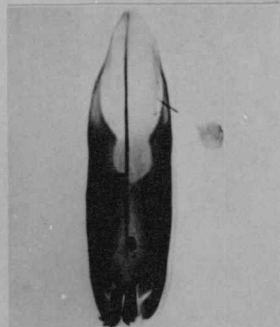
88. T. californicus



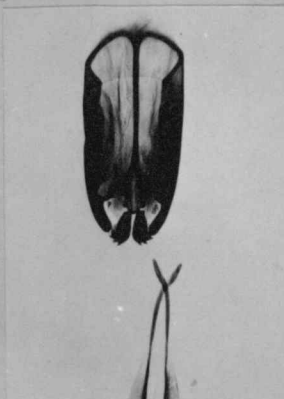
89. Torymus sp.



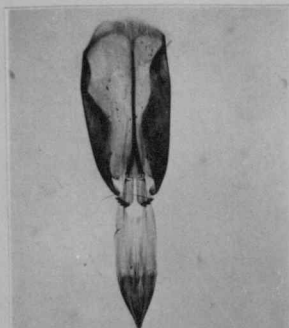
90. T. perplexus



91. T. giganteus



92. T. perplexus

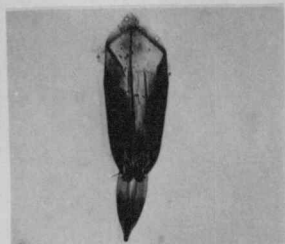
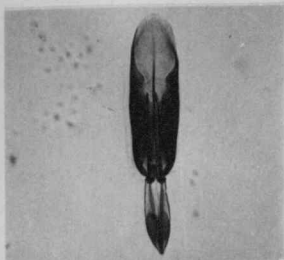
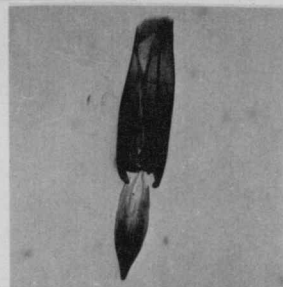
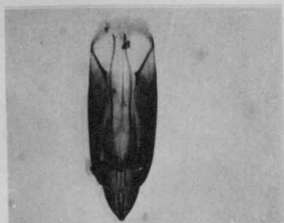
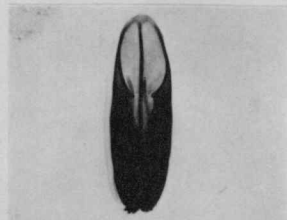
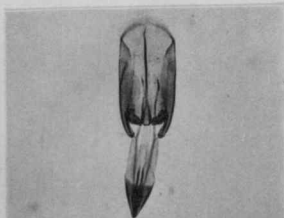
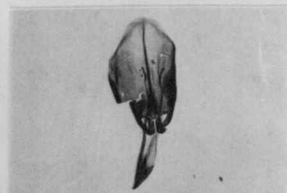
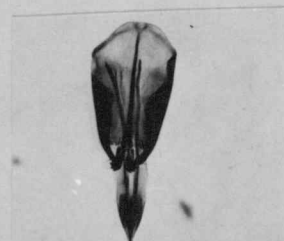


93. T. chrysochlorus

PLATE XIII (Photos 94-103)

Male genitalia X 150 enlarged

PLATE XIII (Photos 94-103) MALE GENITALIA

94. T. flavocoxatus95. T. lazulus96. T. diastrophus97. T. festivus98. T. obscurus99. T. corrugatus100. T. melanopterus101. T. festivus102. Torymus sp.103. T. viridis

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