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REVISION OF CHALCID WASPS
OF GENUS EURYTOMA
IN AMERICA NORTH OF MEXICO

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The species of the genus *Eurytoma* Illiger, from America north of Mexico, have never been treated in a taxonomic study. The first species of the genus from the United States were described by Thomas Say in 1836, probably from specimens taken somewhere in the state of Indiana, but the type material is lost. Additional species were described by Francis Walker (1843 and 1846), Asa Fitch (1859), and Benjamin D. Walsh (1870). In 1881 William Ashmead published his first descriptions of new species of *Eurytoma* and continued to do so into the early 1900's. He was a most productive worker and in 1888 issued a revised generic table of the family Eurytomidae, designated genotypes for all genera of the family in 1894, and in 1904 published the comprehensive "Classification of the Chalcid Flies." These works, however, consisted primarily of brief descriptions and keys to the genera but did not include keys to the species. Although many of the Ashmead species are recognized today on the basis of his type

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material, some of his published descriptions are so brief and general that they could apply to many species within the genus.

In more recent years additional species have been added by A. A. Girault (1916-1920), A. B. Gahan (1922-1934), and the author of this revision (1939-), among others.

Source of Study Material

A study of several collections was made in preparation for this revision. With the aid of a grant, No. G-1308, from the National Science Foundation it was possible to spend a sabbatical year studying collections of this genus in the United States. Collections studied included those of the U.S. National Museum, Washington, D.C., Department of Agriculture, Ottawa, Canada, and Cornell University, Ithaca, N.Y. In addition, collections from the Universities of Oregon, North Dakota, Wisconsin, and Illinois, as well as my own collections, were available and contained some new species and important host and distribution data.

All available types in the United States and Canada have been examined. Type material of a number of species has been lost or destroyed. This is true for the two species described by Say (*Eurytoma studiosa* and *E. orbiculata*), three species described by Walsh (*E. gigantea*, *E. bicolor*, and *E. auriceps*), and *E. solenozopheriae* Ashmead. Neotypes are designated for these species, and *E. studiosa* and *E. auriceps* are redescribed below.

Nineteen new species are described and several species, the original descriptions of which were brief and inadequate, are redescribed.

The key to the 82 species treated in this revision is based on an unpublished one by the late A. B. Gahan, formerly of the U.S. Department of Agriculture, Division of Insects. Mr. Gahan's key was modified and enlarged considerably. The key suffices for most of the more distinct species, but for many of the species good key characteristics have been difficult to find. Experience reveals certain characteristics that may seem obvious to the worker constructing the key but which are difficult to interpret by those unfamiliar with the group. No claim is made for a completely accurate and workable key, but a first attempt must be tried at some time. It is hoped that the present key will eventually lead to the preparation of a more adequate one as weaknesses are discovered.

In the course of preparing this revision, I have received help from a number of people. Dr. B. D. Burks of the U.S. Department of Agriculture, Entomology Research Branch, Washington, D.C., and Dr. Oswald Peck, Canada Department of Agriculture, Research Branch, Ottawa, Canada, made available collections containing

Eurytoma. Both men read the manuscript and made many constructive suggestions and criticisms. Their encouragement and help are gratefully acknowledged. Dr. Henry Dietrich, Curator of Insects, Cornell University, Ithaca, N.Y., extended to me many courtesies while I studied the collection at Cornell. Frank Kurczewski and Mrs. Karlin Happe Grunau, former students at Allegheny College, prepared some of the drawings. I am also indebted to my secretary, Vanile Birkbeck, who typed the manuscript.

Systematic Treatment

In the systematic treatment the species occur in the same order as in the key. The citation of the original description in addition to important papers dealing with synonymy, host relationships, and life-history data follow. No attempt has been made to be exhaustive in the list of references, but some care has been taken to select those that seem to contain the most important information. A citation of the location of the types, type locality, distribution, and host follow in order.

The locality records for most of the species are shown on maps. The records are based on specimens that were actually seen in the various collections listed in a previous paragraph.

Host Relationships

Five orders of insects and six families of plants are represented among the hosts (see appendix). Hosts for all but 2 of the 82 species in the revision are listed but should be accepted with the reservations stated in the next paragraph. About half (33 species) of the parasitic species occur on hosts belonging to eight families of the order Hymenoptera. Coleoptera (17 species, 6 families), Diptera (7 species, 4 families), Lepidoptera (4 species, 7 families), and Homoptera (3 species, 1 family) follow in descending order. At least 12 species are phytophagous, and one of these (*Eurytoma pachyneuron*) is suspected of being both phytophagous and parasitic. The habits of the remaining species are unknown or uncertain.

Host data for many species are incomplete. In many cases the host gall from which the parasite emerged is indicated, but it cannot always be assumed that this implies a direct host-parasite relationship. In most galls there may be other primary and secondary parasites of other genera, families, or orders and often inquiline, so that unless the parasites have actually been observed to emerge from the host larvae, the exact association is unknown. Often only the plant species on which the wasp was caught or from which galls were

collected is known. The information tells nothing about actual host relationships, since most plants may have more than one species of gallmaker on them. However, some parasite-host relationships have been well established, e.g., in *Eurytoma neomexicana* Girault (Brandhorst, 1943) *E. gigantea* Walsh (Hughes, 1934 and Uhler, 1951), *E. solenozopheriae* Ashmead (Driggers, 1927), *E. pissodis* Girault (Taylor, 1929), *E. obtusiventris* Gahan (Hughes, 1934 and Uhler, 1951), *E. pini* Bugbee (Miller, 1953), and *E. bolteri* Riley (Leiby, 1922 and Barber, 1938). There are a few other species in which the evidence is quite convincing, but the number is not more than one-quarter of the species treated herein.

Several species are known to be phytophagous in such unrelated plant tissues as bulbs, stems, leaves, and buds of orchids (*E. orchidearum* (Westwood)), sumac seeds (*E. rhois* Crosby and *E. seminis* Bugbee), the fleshy parts of the fruits of juniper (*E. juniperinus* Marcovitch), the seeds of *Ceanothus divaricatus* (*E. squamosa* new species), and in the stems of certain grasses (*E. bromi* (Howard), *E. eragrostidis* (Howard)).

In at least one species, *E. pater* Phillips(=*E. pachyneuron* Girault), both phytophagy and parasitism have been suggested (Phillips, 1917). This evidence suggests that the *Eurytoma* larva begins as a parasite of the larva of *Harmolita tritici* (Fitch) in the stems of *Elymus* species, but may complete its development on plant tissue. Whether this represents a transition from parasitism to phytophagy or vice versa or simply an ability to be somewhat omnivorous in its eating habits is not clear from the evidence presented. Gahan (1922, pages 37-38) presents some arguments in favor of the first alternative mentioned.

The citation of the host applies to the type material and is taken from the original description except for specimens in which a host was not indicated. In the latter case, hosts are listed that were indicated on labels of determined specimens found in the various collections or cited in publications subsequent to the original description.

It has been impossible to check all of the names of the hosts. Several reference works, however, have been consulted often and have been most helpful. These include: "Catalogue of the Coleoptera of America North of Mexico" by Leng, published in 1920 and the supplements issued in 1927, 1933, 1939, and 1948; "Hymenoptera of America North of Mexico," 1951, by Muesebeck, Krombein, Townes and others, and the first supplement published in 1958; "Insect Pests of Farm, Garden, and Orchard" by Peairs and Davidson, 1956; "Plant Galls and Gall Makers" by Felt, 1940; "Hymenoptera of Connecticut" by Viereck, 1916.

Explanation of Terms and Measurements

Segmentation of the abdomen: Following well-established homologies the propodeum and the petiole are counted as the first two segments of the abdomen. Thus the abdomen is considered to have seven terga beyond the petiole, and the long tergum, often referred to as the fourth, will be designated in this revision as the sixth.

The ninth tergum (ninth abdominal segment) varies from elongate and pointed to very short, broad, and stubby. Laterally, on each side, is a small round cercus.

Measurements of the ninth tergum have been made from the distal tip to the proximal limit of the chitinized area or to where the intersegmental membrane begins. In all cases the insect was viewed laterally. Measurements of the length of the abdomen were made from the same lateral view, from the distal tip of the ventral valves to the proximal end of the abdomen where it joins the petiole; i.e., the petiole is not included. The length of the sixth segment was measured in lateral view from the posterior border of the fifth segment to the posterior edge of the sixth, unless otherwise stated.

Female genitalia (fig. 4): The entire genitalia were dissected from the abdomen and mounted in diaphane on glass slides. Various terms have been applied to the parts of the female genitalia of the Chalcidoidea. In this paper the following terminology is used. The dorsal valves represent the ninth abdominal tergum, which consists proximally of two parts that fuse together distally to form the exposed tip of the ninth tergum. The ventral valves, designated as the gonoplac (Scudder, 1961) or third valvula (Snodgrass, 1935), lie internal to and extend distally beyond the dorsal valves. Proximally the ventral valves expand into a broad plate that bends dorsally or, sometimes, posteriorly. The fulcral plates, called the gonangulum (Scudder, 1961) or anterior plate (Snodgrass, 1935), are two rectangular-shaped parts that articulate at their proximal ends with the dorsal extension of the ventral valves, and along their anterior ventral margin with the proximal ends of the dorsal valves. Stylet arch is formed by the bending of the stylets dorsally, posteriorly, and finally ventrally to the point where they attach to the distal end of the fulcral plates. Depending upon the degree of dorsal extension of the ventral valves, the stylet arch may be in a horizontal, oblique, or vertical plane.

Petiole: The second abdominal segment connecting the abdomen to the propodeum.

Propodeum (fig. 3): The first abdominal segment fused with the thorax (Snodgrass, 1911). Viewed from the posterior of the thorax, the propodeum in most species is concave. In the center of

the concavity may be a wide or narrow, complete or incomplete, central or median groove demarked by lateral carinae. In the median groove there may be a single central carina that divides it equally into right and left halves. The carina usually extends ventrally only one-third to one-half the length of the groove. In other species the median groove may be absent and the whole surface uniformly punctate or irregularly ridged. Lateral areas are triangular and located laterad to the lateral carinae outlining the median groove. They are usually sculptured differently from the groove. Where the median groove is present dorsally only, the lateral areas blend into the concavity of the propodeum ventrally.

Tegula (fig. 1): A small scalelike sclerite carried on the thorax at the extreme base of the forewing.

Ocellocular line: Line between the lateral margin of a lateral ocellus to the medial margin of a compound eye as seen in dorsal view of the head.

Scape (fig. 2): The proximal division of the antenna that arises from the base of the scrobe cavity, and articulates distally with the pedicel.

Flagellum: That part of the antenna distal to the ring joint. The terminal unit may consist of what appears to be two and sometimes three closely fused segments. Most often the last two are closely fused, and the preceding third segment is separated by a distinct annulation. Thus the flagellum appears seven segmented or occasionally six segmented if all three terminal units are fused. In a few species the terminal unit may be weakly enlarged to give the appearance of a subclavate condition. The remaining segments of the flagellum are truncate distally.

Marginal vein (fig. 5): Measurement of the length was made from the point at which the proximal extension of the vein is flush with the margin of the wing, distally to the point at which the postmarginal and stigmal veins diverge.

Postmarginal vein: Measured from its point of departure from the marginal vein to its distal tip.

Stigmal vein and club: Short vein that extends from the distal end of the marginal vein outward at less than a 45° angle. It ends in a small enlargement known as the stigmal club.

Forecoxa: The anterior face of the forecoxa in most species has a shallow, oblique depression. In a few species the depression is accentuated by a raised carina that makes it appear much deeper.

Umbilicate puncture: Round depression circumscribed by a raised carina with a small raised tubercle in the center. It covers the dorsum of the thorax, head, and anterior of the head.

Genus *Eurytoma* Illiger

Eurytoma Illiger, 1807a, p. 192.—1807b, p. 128.

Decaloma Spinola, 1811, p. 151.

Ennetoma Dahlbom, 1857, p. 292.

Ennealoma [sic] Dalla Torre, 1898, p. 332. [Emendation.]

Bephratella Girault, 1913, p. 95.

Type species: *Chalcis abrotani* Panzer (= *Pteromalus appendigaster*) Swederus, designated by Westwood, 1840.

FEMALE.—Varies in length from 1.5 to 7.0 mm. Color is most often black; occasionally some yellow may occur on the head, lateral prothorax and mesothorax, tegula and legs; black may be replaced by deep brown in a few species. Abdomen showing seven terga not counting the petiole and propodeum; rectangular, oval, or circular from a lateral view with slight to extreme lateral compression; ninth tergum (exposed ends of the dorsal valves of the genitalia) varies in length from .06 to .45 mm; pointed and plow shaped with a prominent cercus on each side; may be in line with the horizontal axis of the abdomen or project dorsad with the ventral valves at a 30° to 40° angle. Petiole may be longer than wide and equal in length to the hind coxae or wider than long; sixth abdominal tergum usually as long or longer than fourth and fifth combined; lateral surface of sixth often covered with fine reticulations that may fade out so that dorsal surface is smooth and shiny, or they may extend over dorsal surface.

Internal genitalia variable; in most species dorsal and ventral valves turn dorsally, anteriorly, at less than a right angle; stylet arch is in an oblique plane; dorsal extension may be so slight that stylet arch is in horizontal plane in some species while in others dorsal and ventral valves may turn dorsally at right angle, and the ventral valves turn posteriorly forming an arc of 180°, in the latter case the stylet arch is in vertical plane; width of dorsal valves may be wide for horizontal length or quite narrow and may be yellow except for posterior tip or black for entire length.

Propodeum usually concave with or without a narrow to wide median furrow; if furrow is lacking, surface often finely reticulate; if furrow is present, lateral areas often reticulate or irregularly ridged; in a few species the propodeum is rounded or sloping posteriorly, but in most species it drops sharply at almost right angles to the scutellum.

Dorsal surface of the thorax covered with umbilicate punctures; parapsidal grooves on the mesothorax usually complete; broad collar-like pronotum usually as wide or only slightly less than width of mesonotum in dorsal view; prepectus always present.

Head with occiput, frons, and genae covered with umbilicate punctures, although in a few species punctures may be reduced or

wanting, especially on frons and genae; deep scrobal cavity; a few species with prominent striae converging on clypeus from below eyes and across lower part of face.

Antenna with one ring joint; pedicle usually shorter than first funicle joint; flagellum usually with five truncate segments followed by sixth segment that is separated from the terminal unit of two closely fused segments by a distinct annulation, but never as deeply excised as the preceding five segments; flagellum usually filiform although in a few species the terminal three units may be slightly swollen or subclavate.

Foretibia with a single curved tibial spur; hindtibia with two straight tibial spurs, one slightly longer than the other; front coxa rectangular with a shallow transverse depression on anterior surface; depression may be outlined ventrally in a few species by a raised carina.

Wings clear and hyaline; forewing with a short marginal vein that may be longer than or equal in length to the postmarginal; both veins most often linear, although in a few species marginal may be broader than postmarginal and more heavily chitinized; no true stigma; stigmal vein shorter than or equal in length to marginal and ending in a small club; only other vein present is the submarginal.

MALE.—Smaller than the female, ranging from .85 to 4.2 mm. in length. Resembles the female as far as head, thorax, legs, and wing characteristics are concerned. Chief differences are in antenna and abdomen. Antenna consists of a scape with a rounded, knoblike protuberance just below articulation with petiole; flagellum with five, occasionally four, longer than wide, dorsally produced, pedicellate segments with two long whorles of hairs on two, three, and four; terminal unit of two or three closely fused segments. Abdomen with an elongate petiole, equal to or longer than hindcoxae; shape of the abdomen from the side triangular to oval; in cross section round to oval and not as long or deep as in female; sixth tergum usually the longest.

Summary of generic characteristics (female only): Small; mostly black with extremities of femur and tibia, often tegula, scape of antenna, and tips of ventral valves yellow; abdomen with seven terga; most often showing varying degrees of lateral compression; sixth tergum usually as long or longer than fourth and fifth combined and with fine scalelike sculpturing on at least lower lateral surface; ninth tergum often elongate and pointed, bearing a round cercus on each side.

Female genitalia with dorsal and ventral valves produced dorsally, anteriorly, in varying degrees so that stylet arch may be in a horizontal, oblique, or vertical plane.

Propodeum most often at approximately a right angle to the scutellum; usually shallowly concave and with or without a median furrow.

Thorax covered dorsally with coarse umbilicate punctures; parasidal grooves on the mesonotum complete; pronotum collar-shaped and usually as long as the mesonotum; prepectus always present.

Head usually with umbilicate punctures on vertex, frons, and genae.

Antenna elbowed; scape attached at the base of a deep scrobal cavity; one small ring joint between pedicle and first joint of the flagellum; flagellum 6- or 7-segmented; if 6-segmented, terminal unit consists of three closely fused segments; otherwise two closely fused segments; antenna usually filiform or weakly clavate.

Front coxa always with a shallow oblique depression on anterior face; in a few species depression appears deeper because of a raised carina; foreleg with one curved tibial spur and hindleg with two straight tibial spurs.

REMARKS.—The description and summary of the characteristics of the genus *Eurytoma* are the author's concept of the genus, based on his knowledge of the North American species only. A revision of the genera of the family Eurytomidae on a worldwide basis might narrow or expand the limits of the genus, but as yet such a study has not appeared.

The genus is worldwide in its distribution with described species from the Arctic Circle to Patagonia and southern Africa. Although an accurate count has not been made, there must be in the neighborhood of 450 or more described species.

The author hopes that this treatment of the species of *Eurytoma* in North America north of Mexico will help increase the knowledge of this large genus and will aid those who are working with the genus in the United States and other countries, presently and in the future.

The key is restricted to the females because several species of *Eurytoma* lack males and in some others males occur sporadically in small numbers only. The species are not arranged phylogenetically although some of the more specialized morphologically appear at the beginning of the key and many of the more generalized toward the end.

Explanation of some of the structures and measurements used in the key appear in a preceding section.

Key to Species of *Eurytoma* of North America Based on Female

1. Abdominal petiole longer than wide; longer than, equal to, or only slightly shorter than the hindcoxa Group A. *Petiolata* (p. 442)
- Abdominal petiole short; breadth may be equal to length or greater than length Group B. *Brevipetiolata* (p. 443) 2

2. Head with frons, often clypeus and lateral surfaces of pronotum yellow or reddish brown Complex I. **Bicolor** (p. 443)
Head and thorax entirely black or wholly or in part dark brown 3
3. Abdomen narrow and rectangular in lateral view; only slight lateral compression; triangular in cross section; propodeum sloping posteriorly with a deep, narrow, complete median furrow; ninth tergum and ventral valves in line with horizontal axis of abdomen Complex II. **Pachyneuron** (p. 444)
Abdomen and propodeum not as above 4
4. Abdomen may be strongly laterally compressed, viewed from the side elongate or broad to deeply oval; in cross section narrowly oval with greatest width in upper one-third; ovipositor may be tilted dorsad in relation to longitudinal axis of abdomen Complex III. **Gigantea** (p. 444)
Abdomen not strongly compressed; more nearly oval in outline in lateral view and not greatly lengthened or deeply oval; ovipositor more nearly in line with longitudinal axis of abdomen.
Complex IV. **Tylodermatis** (p. 445)

Group A. Petiolata

1. Abdominal petiole longer than hindcoxa, very slender, approximately round in cross section; pronotum with 3-4 transverse ridges; abdomen extremely laterally compressed 1. **phloeotribi** Ashmead
Abdominal petiole not longer than hindcoxa, not so slender; more nearly triangular in cross section; ridges on pronotum absent 2
2. Abdominal petiole more nearly equal in length to hindcoxa 3
Abdominal petiole distinctly shorter than hindcoxa 5
3. Face with prominent striae converging on the clypeus; abdomen elongate and laterally compressed; medium large species averaging 3.5 mm. in length; ninth tergum elongate and pointed 2. **orchidearum** (Westwood)
Face nonstriated; abdomen short and plump; small species averaging 2-2.5 mm. in length; ninth tergum short and blunt 4
4. Propodeum with a prominent tubercle, dorsally, on each side of concavity; sixth tergum sculptured over entire surface; head entirely black.
3. **mammae**, new species
Tubercles absent on propodeum; sixth tergum smooth and shining dorsally; head yellow except for black area around ocelli and occiput.
4. **lycti** Ashmead
5. Forecoxa with a prominent raised ridge on anterior face outlining a deep, rounded depression 6
Forecoxa without a prominent raised ridge on anterior face 11
6. Legs yellow or orange yellow; black infuscation when present on hindfemora only 7
Legs with black or dark-brown infuscation on femora and often on tibiae 8
7. Anterior ocellus not separated from two lateral ocelli by distinct carinae; anterior edge of pronotum without tubercles; eyes without emargination medially 5. **dorcaschmae** Ashmead
Anterior ocellus separated from two lateral ocelli by raised carina; two small tubercles projecting dorsally on anterior edge of pronotum; eyes with prominent emargination medially 6. **semicircula**, new species
8. Propodeum with lateral areas narrow and rounded; surface covered with irregular ridges and pits; median furrow narrow and indicated by lateral carinae in dorsal half 9
Propodeum broad and concavity shallow; surface covered with fine uniform punctations; median furrow absent 7. **profunda**, new name

9. Length of sixth abdominal tergum dorsally, approximately equal to length of fifth or at most $1\frac{1}{2}$ times length of fifth; ninth tergum stout and as long or longer than eighth tergum 8. *conica* Provaneher
Length of sixth abdominal tergum, dorsally at least twice the length of fifth; ninth tergum half or less than half the length of the eighth tergum. 10
10. Central carina of median furrow present in upper half only; first joint of flagellum a third longer than second joint; stigmal club rectangular and large 9. *magdalidis* Ashmead
Central carina of median furrow extends to base of furrow; first joint of flagellum only a sixth longer than second; stigmal club narrowly rectangular, appearing as slight enlargement of stigmal vein. 10. *inornata* Bugbee
11. Propodeum sloping; narrowly concave with a narrow and deep median furrow; abdomen rectangular, very slightly compressed 12
Propodeum vertical or abrupt; concavity wide; median furrow wide, narrow or absent; abdomen not as above 13
12. Umbilicate punctures reduced on head and thorax, very shallow and delicate; abdomen with sixth segment longer than fifth dorsally. 11. *minnesota* Girault
Umbilicate punctures not reduced, sharp and deep; abdomen with sixth segment not much longer than fifth dorsally; marginal about twice the length of the postmarginal; antenna with distinct club. 12. *illinoisensis* Girault
13. Petiole about one-half the length of hindcoxa; marginal vein broad, but not heavily chitinized 13. *sphaera*, new species
Petiole one-half or less the length of hindcoxa; marginal vein linear; stigmal club rectangular 14. *obtusilobae* Ashmead

Group B. Brevipetiolata

Complex I. Bicolor

1. Postmarginal vein one-half or less the length of the marginal vein 2
Postmarginal vein more than one-half the length of the marginal vein 3
2. Small species averaging 1.9 mm. in length; propodeum wide and shallow; surface finely and evenly punctate; no median furrow; all coxae yellow; venter of abdomen reddish brown 15. *semivena* Bugbee
Medium-sized species averaging 2.9 mm. in length; propodeum wide and shallow with median furrow indicated by lateral carinae in upper half to two-thirds of length; hindcoxa often black on outer and anterior faces. 16. *flavovultus* Bugbee
3. Abdomen and thorax black; clypeus, upper part of frons, small spot behind eye, and spot on anterolateral edge of pronotum, yellow. 17. *bicolor* Walsh
Abdomen and thorax mostly deep brown; orange-yellow color on face, lateral aspect of pronotum, legs, and often coxae 4
4. Medium-sized species averaging 3.3 mm. in length; antenna distinctly clavate with a long and narrow first funicle joint, clearly longer than the pedicel 18. *lutea*, new species
Small species averaging 2.3 mm. in length; antenna filiform; first funicle joint only slightly longer or equal to pedicel as seen from above. 19. *juniperinus* Marcovitch

Complex II. Pachyneuron

1. Marginal vein thicker and broader (2 to 3 times) than postmarginal . . . 2
Marginal vein linear or less than twice width of postmarginal; not thickened 3
2. Color deep reddish brown including mid- and hindcoxae; head and thorax with reduced umbilicate punctures 20. *bromi* (Howard)
Color usually black; mid- and hindcoxae yellow; head and thorax with distinct umbilicate punctures 21. *pachyneuron* Girault
3. Body color light brown; legs and coxae yellow; sixth tergum two or more times the length of five and unsculptured laterally.
22. *eragrostidis* (Howard)
Body color dark reddish brown including coxae; sixth tergum about 1½ times the length of the fifth and finely sculptured laterally to dorsal surface.
23. *neomexicana* Girault

Complex III. Gigantea

1. Abdomen in lateral view deeply oval to circular in outline; strongly compressed; ovipositor tilted dorsad so that it is transverse to the longitudinal axis of the abdomen 2
Abdomen in lateral view elongate; if ovipositor is tilted dorsad, it is only slightly above the longitudinal axis of the abdomen 6
2. Marginal vein broad in relation to postmarginal; postmarginal half the length of marginal; prominent striae converging on the clypeus, covering lower half of face; first funicle segment twice as long as broad.
24. *californica* Ashmead
Marginal vein linear or nearly same width as postmarginal; the latter more than half the length of marginal; striae absent or only a few present . . . 3
3. Sixth gastral tergum strongly sculptured on sides, this sculpture extending dorsally nearly or to the horizontal dorsal portion of tergum 4
Sixth tergum smooth and polished dorsally; lateral sculpturing limited to lower two-thirds or less 5
4. Ninth gastral tergum long, its cercal located five or six times the long diameter of cercal scar from apex of tergum; margin of scrobe cavity with a distinct angle or tubercle a little above base of scape; scape, tegula, and legs black 25. *gigantea* Walsh
Ninth tergum much shorter, the cercal scar not more than two or three times its own length from apex of tergum; margin of scrobe cavity without angle or tubercle; scape, tegula, and legs except coxae, testaceous.
26. *querci-globuli* (Fitch)
5. Legs with reddish-brown infuscation on femora and tibiae; propodeum with a wide incomplete median furrow that narrows ventrally.
27. *solenozopheriae* Ashmead
Legs with femora and tibiae yellow; propodeum with a complete, wide median furrow that maintains same width dorsoventrally . . . 28. *furva* Bugbee
6. Face clothed with dense, long, recumbent yellow hair; legs more or less reddish 29. *pissodis* Girault
Face clothed with less dense, recumbent silvery white hair; legs yellowish brown 7
7. Head unusually thick anteroposteriorly, anterior surface viewed in profile from above strongly convex; sixth gastral tergum laterally as well as dorsally very nearly sculptureless; legs, including anterior and midcoxae,

- reddish testaceous; posterior pair sometimes with femora and tibiae infuscated 30. *cleri* Ashmead
- Head more transverse, if markedly convex anteriorly, the coxae at least are black and sixth tergum usually more strongly sculptured laterally . . . 8
8. Tegula, scape, flagellum, and legs, yellow; marginal vein about three times the length of the short postmarginal vein 31. *flavicus*, new species
- Tegula, often scape, flagellum, and legs, except extremities, black; marginal less than three times the length of the postmarginal vein, about $1\frac{1}{2}$. . . 9
9. Average length 3.0 mm. (2.4–3.4); ninth tergum averages .22 mm. (.20–.25); sixth tergum longer than three and four combined or about one-third length of abdomen 32. *contractura*, new species
- Large species averaging about 5.0 mm. (3.7–6.6); ninth tergum averages .46 mm. (.27–.63); sixth tergum about same length as three and four combined or about one-quarter length of abdomen 10
10. Scape yellow or with slight blackish tinge dorsally only; fore- and midlegs yellowish brown; veins pale clay yellow; marginal vein thin or linear; stigmal club narrow to linear 33. *discordans* Bugbee
- Scape, femora, and tibiae of all legs usually with some black infuscation; veins yellowish brown; marginal vein narrow to broad but never linear; stigmal club rectangular to square 34. *acuta* Bugbee

Complex IV. Tylodermatis

1. Abdomen reddish brown or at least sixth tergum reddish brown; femora and tibiae all yellow or testaceous 2
- Abdomen dark brown to black 3
2. Dorsal valves of genitalia narrow for horizontal length; stylet arch and fulcral plate in a vertical plane; postmarginal vein averages about one-half the length of the marginal 35. *prunicola* Walsh
- Dorsal valves of genitalia broad for horizontal length; stylet arch and fulcral plate in an oblique plane; postmarginal vein averages about 80% length of marginal 36. *celtigalla* Bugbee
3. Face with strong striae converging on clypeus; tegulae yellow to brown, never black 4
- Face without strong, distinct, converging striae; may be a few weak striae limited mostly to lower angle of face; not covering whole lower half of face; tegula variable but most often dark brown to black 8
4. Sixth tergum long, fully 40% length of abdomen; heavily sculptured over entire surface; marginal vein linear and twice the length of the postmarginal 37. *lacunae*, new species
- Sixth tergum less than 40% length of abdomen; sculpturing limited to lower three-quarters or less of sixth tergum; marginal vein may be broader and longer than, or equal in length to postmarginal 5
5. Marginal vein equal in length to postmarginal vein; propodeum wide and shallow; median furrow indistinct or indicated dorsally only; abdomen oval and plump 38. *nigricoxa* Provancher
- Marginal vein longer than postmarginal; abdomen laterally compressed . . . 6
6. Legs with black infuscation on femora and tibiae; coxae black; funicle joints of male antenna not noticeably pedicellate and lacking long whorles of hairs 39. *querci* Fullaway
- Legs all yellow, or brownish infuscation on hindfemora and tibiae only; coxae black or with some yellow on fore- and often on midcoxae; funicle joints of male pedicellate 7

7. Ninth tergum averages .12 mm. in length; marginal vein wider than postmarginal; median furrow of propodeum indicated in upper one-third to one-half. 40. *auriceps* Walsh
Ninth tergum averages .20 mm. in length; marginal and postmarginal linear or about same width; median furrow complete to base. 41. *brevivena* Bugbee
8. Transverse carina on underside of front coxa produced into a tooth or short, blunt tubercle on outer margin. 9
Transverse carina on underside of front coxa not produced into a tooth on outer margin; carina not sharp; bordering a very shallow depression. 10
9. Propodeum irregularly, transversely striated medially; coarsely rugose laterally; abdomen not compressed, rather blunt at apex. 42. *obtusiventris* Gahan
Propodeum within excavation, nearly uniformly alveolately sculptured; abdomen compressed, acute at apex. 43. *vernonia*, new species
10. Sixth, seventh, and eighth terga densely clothed laterally with long, white hair, continues across dorsum of seventh and eighth terga; all terga finely sculptured dorsally; face densely hairy; stigmal vein as long as marginal; postmarginal much longer than marginal. 44. *bigeloviae* Ashmead
Long, dense, white hair absent on terga; sixth tergum bare, others sparsely hairy, laterally, but vestiture not long. 11
11. Pedicel, viewed dorsally, as long as the first funicle joint. 12
Pedicel distinctly shorter than the first funicle joint. 14
12. Propodeum broad and shallowly concave to almost flat; median furrow absent or indicated by wide-spaced lateral carinae in upper one-third to one-half only; rest of surface irregularly ridged and pitted or finely punctate. 13
Propodeum rounded and narrowly concave with a deep and narrow median furrow usually complete to base; head viewed dorsally, rounded anteriorly. 45. *atripes* Gahan
13. Small species averaging 1.6 mm. (1.3-1.9) in length; veins yellowish brown and linear; marginal averaging .20 mm. (.17-.25) and postmarginal averaging .10 mm. (.07-.12); thus marginal averages twice the length of postmarginal. 46. *levivultus* Bugbee
Larger species averaging 3.3 mm. (2.7-3.7) in length; veins dark brown and marginal wider than linear postmarginal; marginal only slightly longer than postmarginal; marginal averaging .11 mm. and postmarginal .10 mm. in length. 47. *tumoris* Bugbee
14. Antennal club distinctly a little thicker than the funicle. 15
Antennae filiform or without a distinct club. 16
15. Propodeum with a wide, complete median furrow that fills concavity of propodeum; lateral areas absent. 48. *fossae*, new species
Median furrow in upper one-half only or complete to base; lateral areas distinct and finely punctate. 49. *tonici* Ashmead
16. Width of malar space less than half the eye height; sixth gastral tergum very weakly sculptured at lower angles only, otherwise it is smooth; interstices between umbilicate punctures of thorax unsculptured. 50. *appendigaster* (Swederus)
Width of malar space fully half as great as eye height (frequently longer); sculpture of sixth tergum usually more extensive; interstices often sculptured 17
17. Abdomen plump; globular in lateral and dorsal view; indicating only slight lateral compression; ninth tergum short, broad, and stubby, averaging

- .17-.19 mm. in length; marginal and postmarginal veins often equal in length 18
- Abdomen oval, showing some lateral compression, ninth tergum variable; marginal vein usually longer than postmarginal 20
18. Abdomen lightly sculptured and limited on sixth to lower half or less; dorsal surface smooth and shiny; sixth segment narrow, averaging about $1\frac{1}{10}$ times the length of the fifth; marginal vein longer than postmarginal 51. *seminis* Bugbee
- Abdomen more or less uniformly reticulated all over; may disappear on dorsoposterior borders of fifth and sixth tergum or cover entire surface; marginal and postmarginal veins most often equal in length; sixth tergum more nearly twice length of fifth 19
19. Propodeum broad but with a narrow, deep, complete median furrow that narrows gradually toward base 52. *altifossa*, new species
- Propodeum without a median furrow or an indication of one in dorsal one-third only. 53. *crassa*, new species
20. Sculpturing on sixth abdominal tergum heavy ventrally and extending over dorsal surface, either covering entire surface or forming a narrow band along anterior margin 21
- Sculpturing on sixth tergum reduced to lower half to one-third or less of surface; dorsal surface smooth and shiny 30
21. Sixth tergum completely covered with fine reticulations; heavy ventrally, becoming lighter dorsally; dorsal valves broad for horizontal length. 54. *terrea* Bugbee
- Sixth tergum with closely spaced heavy reticulations ventrally that become lighter dorsally and recede toward anterior margin in the form of a narrow band 22
22. Propodeum with a narrow or wide complete median furrow 23
- Propodeum with an incomplete median furrow restricted to upper half or less 26
23. Dorsal valves narrow for horizontal length 24
- Dorsal valves broad for horizontal length 25
24. Ninth tergum elongate and pointed, averaging .29 mm. in length (.20-.35); antenna filiform 55. *incerta* Fullaway
- Ninth tergum short and broad, averaging .16 mm. in length (.13-.19); antenna weakly clavate 56. *stigma* Ashmead
25. Genitalia averages 2.1 mm. in length and .81 mm. in height; median groove with a median carina complete to base; ocellular line about twice diameter of lateral ocellus 57. *sciromatis* Bugbee
- Genitalia averages 1.5 mm. in length (1.4-1.8) and .75 mm. in height (.62-.87); thus the height is about half the length; stylet arch nearer to horizontal plane than an oblique plane; ocellular line less than twice the diameter of the lateral ocellus 58. *tylodermais* Ashmead
26. Dorsal valves of female genitalia broad for horizontal length 27
- Dorsal valves narrow for horizontal length 29
27. Legs with reddish-brown to black infuscation on fore- and hindfemora, rest of legs yellow; dorsal valves of female genitalia broad for horizontal length; marginal and postmarginal most often equal in length, averaging .29 mm. (.25-.35); marginal vein linear 59. *gossypii*, new species
- Legs with black or dark-brown infuscation on femora and tibiae of all legs or lacking on foretibia only; marginal vein broader than postmarginal vein 28

28. Propodeum with an incomplete median furrow; area below furrow and lateral areas finely and evenly punctate. Internal genitalia short; length equal to twice the height; stylet arch in a horizontal plane.
60. *squamosa*, new species
- Propodeum with a wide, shallow, complete median furrow that narrows ventrally; furrow crossed by irregular horizontal ridges; lateral areas roughly ridged and punctate. Internal genitalia with length less than twice the height and stylet arch in an oblique plane . 61. *calycis* Bugbee
29. Size large, averaging 4.5 mm. (3.9-5.2) in length; ninth tergum elongate averaging .28 mm. in length (.25-.32); marginal and postmarginal veins often equal in length 62. *pini* Bugbee
- Size medium, averaging 3.2 mm. (3.0-3.7) in length; ninth tergum averaging .20 mm. (.17-.22) in length; marginal usually longer than postmarginal.
63. *baccae*, new species
30. Ninth abdominal segment short and blunt, averaging less than 0.20 mm. in length (range .10-.19) 31
- Ninth abdominal segment more elongate and acutely pointed, averaging 0.20 mm. or more in length (range .23-.29) 42
31. Median furrow of propodeum wide and indicated by lateral carinae in upper one-third to one-half only, or may be absent 32
- Median furrow complete to base of propodeum and limited laterally by complete lateral carinae 38
32. Abdomen quite plump, only slight lateral compression; marginal vein longer than postmarginal vein; ninth tergum very short and stubby averaging less than .10 mm. in length 64. *rhois* Crosby
- Abdomen compressed but not extremely so; marginal vein often equal in length to postmarginal; ninth tergum more elongate, averaging .10 mm. or more in length 33
33. Legs with a black to dark reddish-brown infuscation on all femora and tibiae; coxae usually black 34
- Legs all yellow or black to dark-brown infuscation on hind- and midlegs only; coxae may be yellow or black 37
34. Color dark brown to black; marginal vein broader than postmarginal; tegula and scape yellow to brown 35
- Color black, marginal vein linear or about same width as postmarginal; tegula and scape most often black or dark brown 36
35. Marginal and postmarginal veins most often equal in length; antenna filiform; dorsal valves of genitalia narrow for horizontal length and stylet arch in an oblique plane 65. *levo*, new species
- Marginal vein always longer than postmarginal vein; antenna subclavate; dorsal valves broad for horizontal length and stylet arch in a horizontal plane 66. *crassineura* Ashmead
36. Propodeum with a median furrow that is wide at top but narrows ventrally; lateral and central carinae distinct in upper one-half to three-quarters; first funicle joint narrow and elongate 67. *parva* Phillips
- Propodeum flat and without a median furrow; surface finely punctate; first funicle joint longer than wide but not noticeably thin and elongate.
68. *fusca*, new species
37. Legs with black or brown infuscation on hindfemora and tibiae and occasionally on midfemora and tibiae; marginal vein stout or broader than postmarginal vein. Ninth tergum short, averaging .15 mm. in length (.12-.17) 69. *iniquus* Bugbee

- Legs all yellow often including front and midcoxae; marginal vein linear; ninth abdominal tergum short, averaging .19 mm. in length (.17-.20).
70. *flavircurensa* Bugbee
38. Postmarginal vein averages 70-72% the length of marginal vein; dorsal valves narrow to medium 39
Postmarginal vein averages 80% or better the length of marginal vein; dorsal valves of female genitalia wide for horizontal length 40
39. Marginal vein long, averaging .42 mm. (.35-.45) in length; tegula black.
71. *longavena* Bugbee
Marginal vein short, averaging .29 mm. (.25-.37) in length; tegula black or dark brown 72. *studiosa* Say
40. Ninth abdominal tergum short and blunt, averaging .10-.13 mm. in length (.07-.15) 41
Ninth abdominal tergum short, averaging .15 mm. or more in length (.10-.22).
73. *spongiosa* Bugbee
41. Sixth abdominal tergum about as long as four and five combined; median furrow of propodeum narrows toward base . . . 74. *obtusa*, new species
Sixth abdominal tergum narrow, very little longer than fifth; median furrow with approximately parallel lateral carinae . . . 75. *imminuta* Bugbee
42. Ocellocular line distinctly longer (approximately twice) than diameter of lateral ocellus 76. *bolteri* Riley
Ocellocular line subequal (less than twice; more nearly equal) to diameter of lateral ocellus 43
43. Dorsal valves of the female genitalia broad for horizontal length; propodeum with a narrow median furrow outlined by lateral carinae to base of propodeum; tegula black 77. *spina* Bugbee
Dorsal valves of female genitalia narrow for horizontal length and only slight dorsal extension of dorsal and ventral valves; propodeum variable, wide, and shallow without median furrow or incomplete median furrow 44
44. Marginal vein broader than postmarginal vein; all veins brown 45
Marginal vein linear and about same width as postmarginal; veins pale yellow 46
45. Sculpturing on lateral surface of sixth tergum limited to lower half or less; dorsal surface smooth and shiny; femora and tibiae with black infuscation.
78. *picea*, new species
Sculpturing on sixth covers most of lateral surface but may disappear or continue over dorsal surface; femora and tibiae often yellow or with some brown infuscation 79. *calcareae* Bugbee
46. Basic color of legs yellow with varying amounts of black or dark-brown infuscation on middle and hindtibia and femora; marginal vein longer than postmarginal vein 47
Basic color of legs orange-brown with brown infuscation on hindfemora in some specimens; marginal and postmarginal veins equal in length.
80. *apiculae* Bugbee
47. Legs yellow except for black or reddish-brown infuscation on hindfemora only; sculpturing on lateral aspect of sixth abdominal tergum limited to lower half 81. *mali*, new species
Forelegs often yellow or with black infuscation on femora; black infuscation on mid- and hindfemora and tibiae; lateral sculpturing on sixth abdominal tergum usually covers lower half completely and then diminishes toward anterior margin to just below dorsal surface . . . 82. *diastrophii* Walsh

Group A. Petiolata

1. *Eurytoma phloeotribi* Ashmead

MAP 1

Eurytoma phloeotribi Ashmead, 1894, p. 326.—Peck, 1951, p. 577.

Types: U.S. National Museum, no. 25505; type series consists of 6 females, 1 of which I have labelled and designated as lectotype.

Type locality: Morgantown, W. Va., bred Mar. 23, 1893, by A. D. Hopkins, Acc. no. 6117a, from Mulberry.

Distribution: United States: West Virginia, Virginia, Washington, D.C., North Carolina, New York, Oregon, California, Idaho. Canada: Quebec.

Hosts: *Phloeotribus frontalis* (Oliver) in Mulberry (Ashmead, 1894). *Phloeotribus dentifrons* (Blackman) (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Pityophthorus liquidambarus* Blackman (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Pseudopityophthorus minutissimus* (Zimmermann) (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Pseudopityophthorus pruinosis* (Eichhoff) (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Scolytus muticus* Say (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Stephanoderes dissimilis* (Zimmermann) (Peck, 1951, in Musebeck et al., U.S. Dept. Agric. Monogr., no. 2). *Scolytus abietis* Blackman from *Abies grandis* (specimens in U.S. National Museum collection).

Additional locality records and specimens: U.S. National Museum collection (22 females and 11 males).

This species seems to be limited in its parasitism to the Engraver beetles of the family Scolytidae.

Eurytoma phloeotribi with its abdomen extremely compressed laterally, round elongate petiole, and coiled female genitalia might well be separated from *Eurytoma* as a distinct genus. Since only the one species is known, and there are only a few specimens, it seems best to leave it in *Eurytoma* until more study material is available.

2. *Eurytoma orchidearum* (Westwood)

Isosoma orchidearum Westwood, 1869, p. 1230; 1882, pp. 307-328.—Moore, 1916, pp. 3-12.—Felt, 1916, p. 336.

Eurytoma orchidearum Gahan, 1922, p. 41.—Peck, 1951, p. 577.

Eurytoma phoenix Girault, 1917, p. 11; 1920, p. 204.—Bugbee, 1956, p. 504.

Types: Hope Department of Entomology, University Museum, Oxford, England.

Type locality: Brazil.

Distribution: Cosmopolitan.

Host: Orchids (*Cattleya* species).

Remarks: *E. orchidearum* (Westwood) occurs wherever orchids are grown and shipped. It first appeared in the United States in Natick, Mass. in 1889 (Felt, 1916). It is phytophagous in the bulbs, stems, buds, and leaves of many orchid species. An account of its biology is given by Moore (1916). See Bugbee (1956) for taxonomic notes. This species lacks the raised carinae bordering a deep depression on the anterior face of the forecoxae, and the propodeum has a deep median furrow with raised lateral carinae, especially prominent at the base.

3. *Eurytoma mammae*, new species

FIGURE 10; MAP 2

Female: Mostly black. Average length 2.3 mm. (1.8–2.7). Abdomen bluntly oval in lateral view and approximately equal in length to the head and thorax combined; length not including the petiole averages 1.0 mm. (.82–1.2); surface of sixth tergum of the abdomen covered entirely with fine scalelike sculpturing that becomes more delicate over dorsal surface. Ninth tergum short, blunt, and about equal in length to the eighth tergum; averages .07 mm. (.05–.10) in length. Internal genitalia average 1.1 mm. in length; dorsal valves broad for horizontal length and turn dorsally, anteriorly along with ventral valves at less than a right angle; stylet arch close to a horizontal plane; dorsal valves black at distal tip, remainder yellow; distal tip of ventral valves extends only slightly beyond tip of dorsal valves. Petiole longer than wide, and about two-thirds the length of hindcoxae; flattened dorsally and without a median, dorsally produced scale at anterior end. Propodeum broad and shallowly concave; surface finely punctate except dorsally and sometimes a narrow strip down middle that may be irregularly ridged; carina outlining dorsal margin of concavity slanting ventrolaterally and produced into a posteriorly directed, sharp tubercle on each side before it bends ventromedially; area lateral to carina, including sides of propodeum, punctate. Tegulae yellow. Pronotum flattened dorsally. Eyes, scrobe cavity, and clypeus emarginate. Antenna with yellow scape and pedicel; flagellum brown and six jointed, first segment longer than wide, two to five moniliform. Legs with dark-brown infuscation on femora only, except for midfemora that may lack it; tibiae yellow; forecoxae with an oblique raised carina on anterior face below a deep depression. Wing veins yellow; marginal and postmarginal linear; stigmal vein short; club narrow and rectangular; marginal longer than postmarginal vein, averaging .22 mm. (.20–.25) and .13 mm. (.10–.15) respectively.

Male: Unknown.

Types: 9 females. Holotype female and paratypes in the U.S. National Museum collection, Washington, D.C. (USNM 66051). Paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Arlington, Va., May 30, 1958, K. V. Krombein collection. Paratypes collected June 4, July 3 and 6, 1955; May 26, 1957, by K. V. Krombein.

Host: Unknown for the type series. Possibly *Stigmus* species and *Leperisinus aculeatus* (Say).

Distribution: United States: Virginia, New Jersey, Maryland, and Illinois.

Remarks: This species is close to *Eurytoma lycti* Ashmead but can be separated from it by the more extensive sculpturing that covers the dorsal surface of the sixth abdominal tergum, the tubercles on the propodeum, and the lack of any yellow on the head.

4. *Eurytoma lycti* Ashmead

MAP 2

Eurytoma lycti Ashmead, 1894, p. 325.—Elliott and Marley, 1911, pp. 452–496.—Peck, 1951, p. 576.

Types: U.S. National Museum, no. 11869. Type material consists of 1 female which I have labeled and designated as type.

Type locality: Morgantown, W. Va., bred Sept. 10, 1893, by A. D. Hopkins.

Distribution: United States: Virginia, West Virginia, Kansas.

Host: *Lyctus striatus* Melsh in Hickory (Ashmead, 1894).

Remarks: The only host record for this species is *Lyctus striatus* Melsh, nesting in Hickory, cited in the original description by Ashmead (1894). It is probably rather widely distributed as the lone specimen from Riley County, Kansas, suggests.

This species is distinguished by the presence on the propodeum of a very narrow but quite deep median furrow, the absence of a thin scale on the dorsal surface at the anterior end of the petiole, and a raised obtuse tubercle, and the absence of distinct, complete parapsidal grooves on the mesonotum.

5. *Eurytoma dorcascemae* Ashmead

MAPS 5, 35

Eurytoma dorcascemae Ashmead, 1888, p. 2, appendix.—Peck, 1951, p. 576.

Eurytoma dorchasemi Bridwell, 1899, pp. 203–211. [Emendation.]

Types: U.S. National Museum no. 11908. Type series consists of 2 females and 2 males and I have labelled and designated 1 female specimen as lectotype.

Type locality: Riley County, Kans. Marlatt collection, Sept., 718, 719.

Distribution: United States: Kansas, North Carolina, New Jersey. Canada: Saskatchewan.

Hosts: *Dorcaschema alternatum* (Say) (Ashmead, 1888). *Phloeotribus frontalis* (Oliver) (Peck, 1951, in Muesebeck et al., U.S. Dept. Agric. Monogr., no. 2).

Remarks: This species is similar to *E. conica* Provancher but differs from it in the yellow legs without dark brown to black infuscation on femora and tibiae.

The two female specimens from White Fox, Saskatchewan, Canada, differ slightly from the type female, but because of the all-yellow legs and only two specimens for comparison, it seems best to include them with *E. dorcaschetae*.

The scanty host data suggest that the species is parasitic on wood-boring beetles belonging to the families Cerambycidae and Scolytidae.

6. *Eurytoma semicircula*, new species

FIGURES 12, 22; MAP 3

Female: Black. Averages 4.5 mm. (4.3–4.8) in length. Abdomen averages 2.0 mm. (2.0–2.2) in length; oval in lateral view; sculpturing on lateral aspect of sixth tergum heavy ventrally but extends only to about middle of surface so that dorsal surface is smooth and shiny; sixth tergum longer than three and four combined; ninth tergum short and stubby, averages .15 mm. (.12–.17) in length. Internal genitalia averages 2.0 mm. in length and .50 mm. in height; height equal to one-quarter the length; dorsal valves black and wide for horizontal length; dorsal and ventral valves turn dorsally, anteriorly, only slightly so that stylet arch is in a horizontal plane. Petiole longer than wide and about half the length of the hindcoxa; anterior end of petiole with a flat, rounded, dorsally projecting scale flanked on each side by a bluntly pointed, dorsolaterally, projecting tubercle. Propodeum with a narrow concavity; median furrow dorsally, with one large or two round or slightly oval depressions with shiny surfaces, followed below by a single row of round, shiny-surfaced depressions that may be smaller toward base; lateral areas finely and evenly punctate. Tegula black. Prothorax with two dorsally projecting tubercles on anterior border, one on each side of middorsal line. Median ocellus separated from two lateral ocelli by a raised, curved carina. Compound eyes with a prominent carina along medial margin. Short hairs on face may have a golden tinge. Antennae filiform; joints longer than wide; first funicle joint about twice the length of the pedicel; scape with outer face orange brown. Legs with the coxae black; front coxae with a prominent, flared carina on anterior face running diagonally from the upper, outer margin to medial margin; rest of legs orange brown, except hindfemora which may have some black infuscation medially on outer surfaces. Wing veins straw yellow to light brown in color; linear; marginal averages

.29 mm. (.27-.32) and postmarginal averages .25 mm. (.25-.27) in length.

Male: There are no males in the type series.

Types: 4 females. Holotype female and paratypes in the U.S. National Museum collection, Washington, D.C. (USNM 66052). Paratype female in the Bugbee collection, Meadville, Pa.

Type locality: southwest Hidalgo County, Tex. Collected Jan. 1, 1947, by G. B. Vogt.

Host: Reared from larvae of *Leptostylus gibbulosus* in fruit of *Sapindus drummondii* in March 1947.

Distribution: Known only from the type locality in Texas.

Remarks: The new species is close to the *E. conica*, *E. profunda*, and *E. dorcasemae* group of species. It can be separated from them by the curved carina between the front and the two lateral ocelli, the emarginated eyes, the slightly raised tubercles on the anterior border of the prothorax, and the orange-brown color of the legs and scape.

7. *Eurytoma profunda* Bugbee, new name

MAP 3

Decatoma maculipes Ashmead, 1886, p. 126.

Eurytoma maculipes Ashmead, 1887, p. 195.—Peck, 1951, p. 576.

This new name with its redescription is presented for *Eurytoma maculipes* (Ashmead) 1887 not *Eurytoma maculipes* Motschulsky 1863.

Female: Black. Average length 3.7 mm. (3.0-4.1); abdomen averages in length 1.8 mm. (1.4-1.9); long sixth segment averages .73 mm. (.62-.80); thus the sixth is about 40% of the length of the abdomen; fine scaling on sixth segment covers lower $\frac{1}{3}$ to $\frac{2}{3}$ of lateral surface; heavy ventrally but becomes lighter and recedes toward anterior margin dorsally; dorsal valves (9th tergum) short and stubby; averages .16 mm. in length (.15-.17); abdominal petiole longer than is typical of the genus, averages .12 mm. (.10-.15); prominent dorsally projecting scale or node anteriorly where petiole joins the propodeum; petiole length equal to about one-quarter the length of the hindcoxae which averages .42 mm. in length (.35-.45). Internal genitalia with wide, stout dorsal valves with only slight dorsal curvature anteriorly; ventral valves bend dorsally, anteriorly, but extend only slightly above dorsal valves; stylet arch in a horizontal plane; length of genitalia averages 1.5 mm. (1.6-1.7); height averages .78 mm.; whole structure appears weakly developed with slight dorsal development, anteriorly. Propodeum wide and deeply concave; entire surface may be covered with fine uniform punctations or indication of median furrow that is wide at top but narrows abruptly and disappears in lower half.

Antenna short and stocky; scape yellow; flagellum including pedicel averages 1.0 mm. in length; first segment longer than wide; two to five becoming progressively shorter until four and five are approximately square; segments not moniliform but sharply truncate at distal ends; slightly swollen terminal unit composed of three closely fused segments; legs with the coxae black; dark brown to black on all femora; knees yellow; foretibiae may be yellowish brown or show dark-brown infuscation medially; dark brown to black infuscation on mid- and hindtibiae medially; forecoxae with a pronounced, semicircular, horizontal, carinated ridge about middle of anterior face in contrast to the usual shallow, rounded oblique depression characteristic of most species of the genus. Wing veins light yellow and thin; marginal vein averages .35 mm. in length (.30-.37) and postmarginal .24 mm. (.22-.25).

Male: Average length 3.3 mm. (3.2-3.4). Scape of antenna black; first 4 segments of flagellum, pedicellate distally, dorsally raised, and center slightly constricted; fifth segment not pedicellate distally but separated from terminal segments by a deep annulation; pointed terminal unit composed of two closely fused segments. Legs with black to dark brown on all femora and tibiae; knees yellowish brown. Marginal and postmarginal veins linear; marginal averages .33 mm. (.30-.35) in length and shorter postmarginal .23 mm. (.20-.27).

Types: Holotype female in the U.S. National Museum, no. 25506, Washington, D.C.

Type locality: Holotype locality, Jacksonville, Fla., bred April 1885.

Hosts: Specimens were bred from *Iva ciliata*, *Ambrosia trifida*, and *Solanum rostratum* stems. No insect host species stated. Holotype female from gall of *Dryorhizoxenus floridanus* Ashmead (Ashmead, 1886).

Distribution: Known so far only from central and southern Texas and Jacksonville, Fla.

Remarks: The redescription was based on the holotype female and the specimens listed above. The prominent raised almost horizontal carinated ridge on the forecoxae, the elongate petiole, the wide and shallow propodeum with the surface finely punctate, and the very long sixth abdominal segment make this species easily recognizable.

The host of this species was not given for any of the specimens in the series listed above. However, parasites determined as *Eurytoma tylodermatis* are recorded from weevil larvae (*Trichobaris texana*) in the stems of *Solanum rostratum* (Pierce 1908a, and Pierce, Cushman, and Hood, 1912), (*Lixus scrobicollis*) in *Ambrosia trifida* (ibid, and Pierce 1908b), and (*Trichobaris trinotata*) from stems of *Solanum*

carolinense (Chittenden, 1911). It is possible that one or more of the aforementioned weevils might serve as host for this species.

Dalla Torre (1898, p. 339) proposed the name *Eurytoma maculitarsis* for *Eurytoma maculipes* of Motschulsky when it should have been proposed for Ashmead's species. Since Dalla Torre did not accompany his proposal with a description and Motschulsky's species is still good, *Eurytoma maculitarsis* of Dalla Torre is a nomen nudum.

Decatoma (= *Eurytoma*) *maculipes* (Ashmead, 1886 and 1887) is preoccupied by *E. maculipes* of Motschulsky 1863.

I have hesitated to propose a new name for *E. maculipes* of Ashmead 1887, since I have not seen the type material of *E. maculipes* of Motschulsky 1863. However, since the species described by Motschulsky came from Ceylon and the species of Ashmead came from Florida, the chances of the two being the same are very remote; therefore, the new name is proposed for Ashmead's species.

8. *Eurytoma conica* Provancher

FIGURE 9; MAP 3

Eurytoma conica Provancher, 1887, pp. 192, 193.—Peck, 1951, p. 576.—Bugbee, 1956, p. 504.

Isosoma abnorme Ashmead, 1896, p. 219.

Harmolita abnorme Phillips and Emery, 1919, pp. 436, 468.

Eurytoma abnorme Hoffmann, 1942, p. 19.

Eurytoma abnormis Bugbee, 1956, p. 504.

Eurytoma phloeosini Ashmead, 1894, p. 327.—Bugbee, 1956, p. 504.

Types: Department of Agriculture, Ottawa, Canada: 1 female lectotype (see Bugbee, 1956).

Type locality: Ottawa, Canada.

Distribution: Canada: Quebec, Ontario, British Columbia. United States: Illinois, California, North Carolina, New York, Connecticut, Kansas, Massachusetts, New Jersey, Indiana, Oregon, West Virginia, Texas.

Hosts: *Dendroctonus frontalis* Zimmerman in *Pinus echinata* (specimens in U.S. National Museum collection). *Pissodes strobi* (Peck) (specimens in Dept. Agric. collection, Ottawa, Canada and U.S. National Museum collection). *Cylindrocopturus longulus* (LeConte) (U.S. National Museum collection). *Dendroctonus brevicomis* LeConte (Bugbee collection).

Remarks: *Eurytoma conica* can be easily confused with *E. dorcasemae*. The most consistent difference between the two is the presence in the former species of deep brown to black infuscation on all femora and tibiae in contrast to the all-yellow legs in the latter.

The hosts of this species are chiefly members of the family Scolytidae. For notes on synonymy, see Bugbee (1956).

9. *Eurytoma magdalidis* Ashmead

MAP 4

Eurytoma magdalidis Ashmead, 1894, p. 326.—Beal and Massey, 1942, pp. 316–318.—Hoffmann, 1942, p. 19.—Peck, 1951, p. 577.

Types: U.S. National Museum no. 11868; type series consists of 2 females, 1 of which, with the accession number 60586, I have labelled and designated lectotype.

Type locality: Morgantown, W. Va., bred by A. D. Hopkins, Acc. no. 6058b.

Distribution: United States: West Virginia, North Carolina, New York, Kansas, California. Canada: Quebec, Ontario, Manitoba.

Hosts: *Magdalis armicollis* Say, in elm (Ashmead, 1894). *Oncideres cingulatus* (Say), on hickory (hickory twig girdler) (Beal and Massey, 1942). *Anthribus cornutus* Say (U.S. National Museum collection). *Cylindrocopturus longulus* (LeConte) on *Pinus* sp. (U.S. National Museum collection).

Remarks: *E. magdalidis* Ashmead with its dark legs, rounded, narrow propodeum, long sixth abdominal segment, and generally smaller dimensions seems to be distinct from the preceding species. Its hosts belong to families of beetles whose larvae bore in plant tissue.

10. *Eurytoma inornata* Bugbee

Eurytoma inornata Bugbee, 1962, pp. 347–348.

Type: 3 females and 1 male. Holotype female emerged Mar. 27, 1962, from nest number 92361F, cell 1, K. V. Krombein collection. Two paratype females emerged Mar. 22 and 24, 1962, from nest number 92361B, cell 1 and nest number 92361F, cell 4. The single male emerged Mar. 22, 1962, from nest number 92361F, cell 3, K. V. Krombein collection. Holotype in the U.S. National Museum, Washington, D.C. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Plummers Island, Md.

Host: Believed to be *Euphilis rufigaster* (Packard), nesting in hibiscus stems.

Distribution: Maryland.

Additional specimens: Plummers Island, Md., collected July 22, 1962, by K. V. Krombein, 1 female; collected near Plummers Island, Md., Sept. 9, 1962, by K. V. Krombein and bred from cocoon of *Euphilis* sp., 1 female; Plummers Island, Md., collected Sept. 10, 1962, by K. V. Krombein and bred from cocoon of *Trypoxylon* species, 1 female.

Remarks: See Bugbee 1962.

11. *Eurytoma minnesotae* Girault

MAP 4

Eurytoma minnesota Girault, 1916, p. 338.

Eurytoma minnesotae Peck, 1951, p. 577.

Types: U.S. National Museum, no. 20322, 5 females and 2 males.

Type locality: Olmsted, Minn., reared from Quack grass, 1906, Ainslie collection.

Distribution: United States: Minnesota.

Host: *Agropyron* (Quackgrass sp.) (Girault, 1916).

Remarks: Additional specimens of *E. minnesotae* were not found in any of the collections examined. It seems to be a valid species, however, as the elongate petiole will separate it from any of the other species bred from Quackgrass, such as *E. pachyneuron* Girault. The small size, absence of a flared carina on the anterior surface of the front coxae, and the rounded narrow propodeum with a narrow and deep, complete, median furrow, will also help to distinguish *E. minnesotae*.

12. *Eurytoma illinoisensis* Girault

MAP 5

Eurytoma illinoisensis Girault, 1920, p. 206.—Peck, 1951, p. 576.

Types: U.S. National Museum, no. 20629, 2 females.

Type locality: Urbana, Ill. Reared in connection with *Isosoma* (= *Harmolita*).

Distribution: United States: Illinois, South Dakota, New Mexico, Wisconsin, and Iowa. Canada: Quebec, Ontario, Nova Scotia.

Host: Reared in connection with *Isosoma* (Girault, 1920). *Elymus* species (Girault, 1920). *Stipa columbiana*, *Vicia villosa*, *V. angustifolia*, and *V. americana* (Bugbee collection).

Remarks: The material included under *E. illinoisensis* Girault is a mixture of what may be more than one species. Unfortunately, good representative series from more than one locality were not encountered in this study. One or two specimens, often without host data, from a few scattered localities, are not enough to give an adequate picture of the variation of a species.

The rectangular-shaped abdomen with the narrow sixth abdominal tergum that is about equal in length to the fifth, the rounded propodeum with a deep and narrow concavity, and the obviously clavate, elongate antennae are characteristics of this species.

13. *Eurytoma sphaera*, new species

FIGURE 17; MAP 6

Female: Black. Average length 2.9 mm. (2.6–3.2). Abdomen plump, globular, or approximately round in outline from a lateral

view; averages 1.3 mm. (1.2–1.5) in length; sculpturing heavy on lateral surface of sixth, but disappears dorsally; segment six from a dorsal view as long or longer than segments five and six combined; ninth tergum short and stubby, averaging .09 mm. (.07–.12) in length with a small oval cercus on each side. Internal genitalia with broad dorsal valves for horizontal length and very little dorsal extension anteriorly; arch of the stylets in a horizontal to an oblique plane; length of genitalia averages 1.3 mm. (1.1–1.5) and height averages .88 mm. (.72–1.1); length thus about 1.7 times the height. Petiole elongate; less than half the length of hindcoxa; a prominent pointed scale on dorsal anterior surface, a small lateral projecting tubercle on each side. Tegula yellow to dark brown. Propodeum with a shallow concavity with a distinct median furrow demarked by lateral carinae complete to base and a central carina for three-quarters of length; furrow narrows toward base; lateral areas finely punctate ventrally and irregularly ridged dorsally. Antenna filiform; scape yellowish brown; flagellum six segmented; joints longer than wide but becoming progressively less so from base to tip; last segment consisting of three closely fused units. Fine striae on face converging on clypeus from below eyes and base of antennae. Legs may be all yellowish brown or black smudge on middle of outer face of front femora and tibiae; black infuscation encircling mid- and hindfemora and tibiae; front coxae may be yellow or all black. Wing veins yellowish brown to brown; marginal stout and broad but not heavily chitinized; postmarginal short, stout, and truncate at outer end; marginal averages .30 mm. (.25–.35) and postmarginal averages .20 mm. (.17–.25); marginal vein always longer than postmarginal by about .10 mm.; stigmal vein short; club large and almost square.

Males: Black. Average length, 2.9 mm. (2.2–3.3). Scape of antenna yellowish brown or upper one-third black and rest yellowish brown. Legs all yellowish brown or hindfemora and sometimes hindtibiae may have a brown to black smudge medially on outer surface; front coxae as in the female; midcoxae may be all yellow. Wing veins yellowish brown to dark brown. Marginal averages .29 mm. (.27–.35) and postmarginal averages .19 mm. (.15–.22).

Types: 56 females and 63 males. Holotype female, allotype male, and paratypes in the U.S. National Museum collection (USNM 66053).

Type locality: Wyatt, Ia., Oct. 31, 1934, Kinsey collection. Emerged from June 14 to 30, 1935.

Host: *Disholcaspis spongiosa* (Karsch) and *D. quercus-globulus* (Fitch) on *Quercus stellata*, Kinsey collected and determined.

Distribution: Southern Ohio and Illinois, south to the Gulf of Mexico: east to the Atlantic coast and west to eastern Texas and Missouri. This species seems to follow the coastal plain, extending

northward through the Mississippi River Valley and then spreading eastward and westward by way of its main tributaries, such as the Tennessee, Ohio, and Missouri. This suggests that the species may be found also even farther north, wherever its hosts occur.

Remarks: *E. sphaera* and *E. obtusiloba* Ashmead are closely related but *E. sphaera* has a longer petiole, averaging about half the length of the hindcoxae, in contrast to *E. obtusiloba* where the petiole averages nearer one-fourth the length of the hindcoxae. In addition, the marginal vein is broader, and also longer in relation to the post-marginal; the stigmal club is larger than in *E. obtusiloba*. *E. sphaera* also has a wider and not as deep a median furrow on the propodeum. *E. sphaera* has been bred from cynipid galls belonging to the genus *Disholcaspis* on oak only, while *E. obtusiloba* is restricted to the genus *Diplolepis* on rose.

14. *Eurytoma obtusilobae* Ashmead

MAP 6

Eurytoma obtusilobae Ashmead, 1885, p. 13; 1888b, pp. 1-8 [lapsus calami].—Bugbee, 1951, pp. 251-253 [redescription].—Peck, 1951, p. 577.—Burks, 1958, p. 81.

Types: U.S. National Museum, no. 25504; type series consists of 3 females and 1 male of which I have labelled 1 female specimen as lectotype.

Type locality: Jacksonville, Fla.

Distribution: United States: Probably all of North America (Bugbee, 1951).

Hosts: Undetermined cynipid gall on *Quercus obtusiloba* (Ashmead, 1885). *Diplolepis radicum* (Osten Sacken) on *Rosa palustris* and *R. carolina* (Bugbee, 1951).

Remarks: This species is closely related to *E. sphaera*. For distinguishing characteristics, see remarks under the latter species.

Group B. Brevipetiolata

Complex I. Bicolor

15. *Eurytoma semivenae* Bugbee

MAP 7

Eurytoma semivenae Bugbee, 1957, pp. 47-48.—Moser, 1965, pp. 1-95.

Types: 5 females and 8 males; holotype female, allotype male and 3 paratypes in the U.S. National Museum (USNM 66035); paratypes in University of Texas and Cornell University.

Type locality: Palo Duro Canyon, Tex.

Distribution: United States: Texas, Kansas, Ohio, New York, Arkansas.

Host: *Pachyphylla vesicula* (Riley) on *Celtis reticulata*, *C. occidentalis* and *C. mississippiensis* and *P. mamma* (Riley) on *C. occidentalis*.

Remarks: Additional characteristics that will help to separate this species from the succeeding one are the presence of only two tubercles on the proximal end of the fulcral plate; the shorter ninth tergum that averages .14 mm. (.10-.17) in length, and the yellow color of the horizontal length of the dorsal valves.

16. *Eurytoma flavovultus* Bugbee

MAP 8

Eurytoma flavovultus Bugbee, 1957, pp. 45-47.

Types: 64 females and 25 males; holotype female, allotype male in the U.S. National Museum (USNM 66038); paratypes in the U.S. National Museum, University of Texas, and Cornell University.

Type locality: Austin, Tex.

Distribution: United States: Texas.

Host: *Pachyphylla venusta* Osten Sacken on *Celtis reticulata*.

Remarks: In addition to the characteristics listed in the key, the longer ninth tergum averaging .22 mm. (.20-.25), the black horizontal length of the dorsal valves, and the presence of three tubercles on the proximal end of the fulcral plate, will help to distinguish this species.

17. *Eurytoma bicolor* Walsh

MAP 7

Eurytoma bicolor Walsh, 1870, p. 298.—Ashmead, 1881b, p. 30.—Viereck, 1916, p. 521.—Cole, 1931, p. 35.—Peck, 1951, p. 575.

Types: 1 male and 2 females. Types lost. Neotypes: 29 females and 6 males in the U.S. National Museum.

Type locality: Probably from the vicinity of Rock Island, Ill. where Walsh did much of his collecting. Neotypes: Bloomington, Ind.

Distribution: United States: Connecticut, Washington, D.C., Iowa, Virginia, Indiana, Ohio, Illinois. Canada: Ontario.

Host: Galls on black oak (Walsh, 1870). *Typha latifolia* (cat-tails) *E. bicolor* larva found in dried galls on stem (Cole, 1931). *Spheg*=(*Isodontia*) *harrisi* (Fernald) (Peck, 1951). *Scolytus rugulosus* (Ratzeburg) (Peck, 1951). *Aulacidea tumida* (Bassett). *Aulacidea podagrae* (Bassett). *Eurosta solidaginis* Fitch.

Remarks: Some of the hosts listed for *E. bicolor* seem very doubtful, especially *Spheg harrisi* (Fernald) and *Scolytus rugulosus* (Ratzeburg). The hosts most commonly stated belong to the genus *Aulacidea* that produce galls on several species of *Lactuca*. *E. bicolor* is quite variable,

but the presence of yellow to yellow brown on the lower half of the frons, around the compound eyes, and the anterior lateral edges of the pronotum is quite consistent.

13. *Eurytoma lutea*, new species

MAP 8

Female: Mostly brown to orange yellow. Average length 3.3 mm. (3.0–3.9). Abdomen oval from a lateral view; medium amount of lateral compression; deep brown in color except for yellow venter anteriorly; sculpturing on lateral aspect of sixth tergum limited to lower half; ninth tergum in line with horizontal axis of abdomen and averages .21 mm. (.20–.25) in length. Internal genitalia average 1.6 mm. in length and 1.0 mm. in height, thus the height is more than half the length; dorsal valves black and narrow for horizontal length; turn dorsally, anteriorly, with ventral valves at right angles; stylet arch in an oblique plane. Propodeum with a complete median furrow that occupies most of the wide, shallow concavity; lateral carinae complete to base and central carina in upper half only; lateral areas narrow with fine irregular ridges covering surface. Tegula yellow. Two small spots on dorsum and lateral surfaces of pronotum yellow; rest of thorax brown above and yellow laterally. Head yellow except brown vertex. Antenna with yellow scape and flagellum; clavate; all funicle joints longer than wide; terminal three joints fused together to form a slightly enlarged club. Legs including coxae orange yellow, except brownish infuscation medially on hindfemora and tibiae, and occasionally on midtibiae. Wing veins linear and pale yellow; marginal vein averages .29 mm. (.25–.35) and postmarginal averages .21 mm. (.20–.22) in length.

Male: Averages 2.9 mm. (2.7–3.1) in length. Mostly yellow except for black area on vertex around ocelli; black to dark-brown dorsum of thorax. Abdomen and petiole dark brown. Wing veins yellow. Antenna with yellow scape and brown flagellum; funicle consists of five longer than wide pedicellate segments; the sixth segment not pedicellate distally but separated from terminal unit by a distinct annulation.

Types: 12 females and 7 males. Holotype female, allotype male, and paratypes in U.S. National Museum collection, Washington, D.C. (USNM 66054). Paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Monroe, Mich. L. C. Jones collector.

Distribution: United States: Michigan.

Host: From Elecampane (*Inula helenium* Linnaeus).

Remarks: No clear host relationship was discernible from the data on the labels, other than that the species was bred from Elecampane.

It might be phytophagous or parasitic on some gallmaker or borer.

The new species seems most closely related to *E. juniperinus* Marcovitch. The two can be separated, however, by the characteristics contained in the key.

19. *Eurytoma juniperinus* Marcovitch

MAP 8

Eurytoma juniperinus Marcovitch, 1915, p. 166.—Gahan, 1922, p. 41.—Peck, 1951, p. 576.

Types: Paratypes or cotypes in alcohol at Cornell University.

Type locality: Ithaca, N.Y.

Distribution: United States: New York. Canada: Ontario.

Host: Phytophagous in the fleshy part of fruits of *Juniperus virginiana* (Marcovitch, 1915).

Remarks: The broad marginal vein in relation to the linear post-marginal and the weakly clavate antennae are additional characteristics to look for in this species.

Complex II. Pachyneuron

20. *Eurytoma bromi* (Howard)

MAP 9

Isosoma bromi Howard, 1896, p. 11.

Harmolita bromi Gahan, 1922, p. 43.—Peck, 1951, p. 569.

Eurytoma bromi Bugbee, 1956, p. 505.—Burks, 1958, p. 80.

Types: U.S. National Museum, no. 2745, 2 females and 1 male.

Type locality: Los Angeles, Calif.

Distribution: United States: California, New York, Ohio.

Host: *Bromus ciliatus* Linnaeus (Howard, 1896). *Muhlenbergia sylvatica*.

Remarks: The weakly clavate antennae with a narrow and elongate first segment of the flagellum and the presence of the reddish-brown hindcoxae and sometimes midcoxae are additional characteristics of this species.

21. *Eurytoma pachyneuron* Girault

FIGURE 6; MAP 10

Eurytoma pachyneuron Girault, 1916, p. 337.—Jones, 1932, p. 412.—Bugbee, 1956, pp. 503-504.

Eurytoma pater Girault, 1920, p. 207.—Phillips, 1917, p. 145.—Gahan, 1922, p. 37.—Brandhorst, 1943, p. 174.

Eurytoma phoebus Girault, 1920, p. 204.—Gahan, 1933, pp. 33-36.—Hill and Pinckney, 1940, pp. 1-13.—Peck, 1951, p. 577.—Bugbee, 1956, pp. 503-504.

Types: U.S. National Museum, no. 20321, 1 female.

Type locality: Glendale, Calif., collected in 1914 by T. D. Urbahns, Webster no. 11214.

Distribution: United States: Northern United States from coast to coast. Canada: Alberta, Quebec.

Host: *Agropyron repens* (Linnaeus) (Cornell University collection. Host not stated). *Phytophaga destructor* (Say), (Gahan, 1933). *Harmolita tritici* (Fitch) (Gahan, 1933). *Elymus canadensis* Linnaeus (Gahan, 1933, host not stated). *Harmolita atlantica* Phillips and Emory (specimens in U.S. National Museum collection). *Elymus triticoides*, *E. condensatus* (specimens in U.S. National Museum collection). *Harmolita elymophage* Phillips and Emory (Peck, 1951 in Muesebeck et al, U.S. Dept. Agric. Monogr., no. 2). *Scolytus rugulosus* Ratzeburg (Peck, 1951 in Muesebeck et al, U.S. Dept. Agric. Monogr., no. 2). Galls on *Sitilias grandiflora* (Brandhorst, 1943).

Remarks: See Bugbee (1956) for notes on synonymy of this species. The most likely hosts of *E. pachyneuron* appear to be species of *Harmolita* on *Elymus* species. The record from *Scolytus rugulosus* (Ratzeburg) seems doubtful. The reference to *Phytophaga destructor* (Say), although doubtful, might be possible, since Phillips (1917) showed that *E. pater* = (*E. pachyneuron*) may be parasitic on *Harmolita* larvae in the early stages of its larval development but can finish its late larval growth as a plant feeder. In its earlier stages, it might destroy Hessian fly larvae as well as *Harmolita*.

In the collections of the U.S. National Museum, Department of Agriculture, Ottawa, Canada and Cornell University are numerous long series of *E. pachyneuron*. In the majority of cases, the host plant is cited as a species of *Elymus*, but the insect host was determined in one or two cases only. In the Cornell University collection is a long series from Quackgrass (*Agropyron repens*) but without any insect host designation. *Harmolita* species do occur in this grass and therefore could serve as hosts.

This is a variable species as pointed out in the article by Bugbee (loc. cit.). Leg color which was used to separate *E. pachyneuron*, *E. pater*, and *E. phoebus* proved unreliable, and since the three species were alike in all other characteristics, the latter two were placed in synonymy with *E. pachyneuron*.

The wide postmarginal vein in relation to the linear marginal vein, the clavate antennae, the weakly developed female genitalia with the wide dorsal valves and stylet arch in a horizontal plane, added to the characteristics mentioned in the key, will help to distinguish this species.

22. *Eurytoma eragrostidis* (Howard)

MAP 8

Eurytomocharis eragrostidis Howard, 1896, p. 21.—Girault, 1916, pp. 337-341.—
Gahan, 1922, pp. 42, 51.

Eurytoma eragrostidis Peck, 1951, p. 576.

Types: Female holotype no. 2754, U.S. National Museum, Washington, D.C.

Type locality: Lafayette, Ind.

Distribution: United States: Indiana, Illinois.

Host: Reared from *Eragrostis poaeoides* by F. M. Webster in September 1885 and March 1886 (Howard, 1896). *Agrostis alba* (Peck, 1951).

Remarks: This species was shifted to *Eurytoma* from *Eurytomocharis* by Peck (1951). It shows some affinities with *E. pachyneuron* and *E. neomexicana* in possessing a deep, narrow, complete median furrow on the propodeum, and in the lack of lateral compression of the triangular-shaped abdomen as viewed in cross section. Distinguishing features include: reduced umbilicate punctures on the thorax; rounded propodeum without lateral areas; very scanty, if any, sculpturing on the ventrolateral surface of the sixth tergum and the all-yellow legs and coxae.

23. *Eurytoma neomexicana* Girault

MAP 9

Eurytoma neomexicana Girault, 1920, p. 205.—Brandhorst, 1943, pp. 169-170.—
Peck, 1951, p. 577.

Types: 3 females and 1 male, no. 20627, U.S. National Museum, Washington, D.C.

Type locality: Koebele, N. Mex.

Distribution: United States: New Mexico, Kansas, Nevada, Colorado. Canada: Saskatchewan, Quebec.

Host: Reared in connection with *Isosoma* (Girault, 1920). *Sideranthus spinulosus* (Brandhorst, 1943).

Remarks: Brandhorst (1943) remarks that "Most every seed of the plant (*S. spinulosus*) has been destroyed by this phytophagous eurytomid."

The reduction in the prominence of the umbilicate punctures on the head and thorax, the deep reddish-brown color, the noticeably clavate antenna, the broad dorsal valves of the female genitalia, and the short first segment of the flagellum that is approximately equal to the pedicle from a dorsal view may be added to the characteristics mentioned in the key.

Complex III. *Gigantea*24. *Eurytoma californica* Ashmead

MAP 11

Eurytoma californica Ashmead, 1887, p. 195.—Peck, 1951, p. 575.

Types: U.S. National Museum, no. 25509; type series consists of 4 females and 2 males of which I have labelled and designated 1 female as lectotype.

Type locality: Los Angeles, Calif.

Distribution: United States: California, Washington.

Host: *Callirhytis pomiformis* (Ashmead) (Ashmead, 1887). *Andricus californicus* Ashmead on *Quercus lobata* (specimens in U.S. National Museum collection). *Disholcaspis corallina* (Bassett) on *Q. douglasii* (specimens in U.S. National Museum collection). *D. washingtonensis* (Gillette) on *Q. douglasii* (specimens in U.S. National Museum collection). *D. plumbella* Kinsey, Bugbee collection, Meadville, Pa.

Remarks: *Eurytoma californica* Ashmead is closest to *E. auriceps* and seems to be the west coast equivalent of the latter species. There is a question as to whether it should be considered as a species distinct from *E. auriceps*. If additional material was available from Oregon and Washington as well as east of the Sierras, *E. auriceps* and *E. californica* might grade into each other. The material from Seattle, Washington runs smaller and some of the specimens lack the black splotches on the femora and the tibiae of the legs which are more typical of *E. auriceps*.

The presence of black infuscation on the legs of most specimens, shallow propodeum occupied by the wide median furrow, the heavier, stouter marginal vein, and the heavier, more extensive sculpturing on the sixth abdominal segment can be used to distinguish *E. californica* from *E. auriceps*.

25. *Eurytoma gigantea* Walsh

FIGURE 7; MAP 11

Eurytoma gigantea Walsh, 1870, p. 300.—Ashmead, 1881b, p. 30; 1887, p. 194.—Fyles, 1894, pp. 120–122.—Hughes, 1934, pp. 119–122.—Gahan, 1934, pp. 116–117 (wrongly credits name to Ashmead).—Uhler, 1951, pp. 41, 42.—Peck, 1951, p. 576.—Judd, 1953, pp. 295–296.—Miller, 1959b, pp. 246–251.

Types: 2 females captured at large (Walsh, 1870). The two original specimens have been lost. Neotypes: Neotype female emerged June 10, 1934 from a gall of *Eurosta solidaginis*, collected on Nov. 28, 1933 on *Solidago*, Bugbee collected and determined. Paratype series

of 50 females and males collected in 1933 and 1934 from the same host. Neotype female and paratypes in the U.S. National Museum; paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Neotype locality: Bloomington, Ind.

Distribution: United States: Indiana, Florida, New York, Minnesota, Tennessee, Kansas, North Dakota, Arkansas, Mississippi, Michigan, Illinois, Ohio, Montana. Canada: Ontario, Quebec, New Brunswick.

Host: *Eurosta solidaginis* Fitch in Goldenrod.

Remarks: *Eurytoma gigantea* is one of the largest species of the genus found in the United States and is always well represented in most chalcid collections. Its host relationships, an external parasite of the trypetid fly, *Eurosta solidaginis*, have been well documented.

26. *Eurytoma querci-globuli* (Fitch)

MAP 12

Macroglenes querci-globuli Fitch, 1958, p. 812.

Eurytoma querci-globuli Ashmead, 1900, p. 554.—Judd, 1957, pp. 193-195.—Peck, 1951, p. 578.—Bugbee, 1958a, pp. 193-198.

Eurytoma punctiventris Walsh, 1870, p. 299.

Type: U.S. National Museum, no. 1829, holotype female.

Distribution: United States: Connecticut, New York, New Jersey, Minnesota, Wisconsin, Illinois, Michigan, Indiana, Ohio, Pennsylvania, New Hampshire, Kansas, Missouri, Kentucky, Arkansas, Tennessee, North Carolina, Georgia, North Dakota. Canada: Ontario.

Host: *Disholcaspis quercus-globulus* (Fitch). *Disholcaspis mamma* (Walsh). *Disholcaspis colorado* (Gillette). *Disholcaspis cinerosa* (Bassett).

Subspecies: Descriptions, Bugbee, 1958. *Eurytoma querci-globuli rubra* Bugbee. Mississippi, Florida. Host: *Disholcaspis virens* (Ashmead) on *Quercus virginiana*. (Holotype female and male and female paratypes in U.S. National Museum.) *E. querci-globuli utahensis* Bugbee. Utah. Host: *D. colorado* (Gillette) on *Q. utahensis* (holotype female and female paratypes in U.S. National Museum).

Remarks: See Bugbee (1958) for taxonomic, and distributional notes. The color of the abdomen in this species may vary from all black to entirely reddish brown or show varying combinations in between. The yellow scape and legs with occasionally black infuscation on the hindfemora only, will distinguish this species from *Eurytoma gigantea*.

27. *Eurytoma solenozopheriae* Ashmead

MAP 13

Eurytoma solenozopheriae Ashmead, 1887, p. 196.—Driggers, 1927, pp. 253-259.—McAlister and Anderson, 1932, pp. 1164-1169.—Peck, 1951, p. 578.

Neotypes: 18 females and 15 males, collected May 1, 1949, by O. Peck from gall of *Hemadas nubilipennis*. Neotype female and neoparatypes in the collection of the Department of Agriculture, Ottawa, Canada. Neoparatypes in the Bugbee collection, Allegheny College, Meadville, Pa. Ashmead (1887) states that the species was described from specimens from Toronto, Canada, sent to him by William Brodie. The types seem to have been lost.

Neotype locality: Marmora, Ontario, Canada.

Distribution: United States: Maine, Connecticut, Washington, D.C., New Jersey, Massachusetts, New York, Pennsylvania. Canada: Ontario, Quebec.

Host: *Hemadas nubilipennis* (Ashmead), gallmaker on blueberry, *Vaccinium corymbosum*, and *V. pennsylvanicum* (Driggers, 1927).

Remarks: Ashmead (1887) implies in his remarks following the description of *E. solenozopheriae* that the host gallmaker on blueberry was the cynipid *Solenozopheria* (= *Loxaulus*) *vaccinii* (Ashmead). Driggers (1927) demonstrated that the true gallmaker was a chalcid, *Hemadas nubilipennis* (Ashmead), and that he was unable to breed a single female specimen of *S. vaccinii* from the galls. It was discovered later that the single female specimen that Ashmead had was bred from a gall on oak rather than *Vaccinium*.

The yellow scape, tegula, and legs including the fore- and midcoxae and the deeper reddish-brown hindcoxa; the reddish-brown abdomen; the very narrow dorsal valves of the female genitalia that bend sharply dorsally, anteriorly, then posteriorly with the ventral valves, forming an arc of 180°, and the vertical plane of the stylet arch, are additional characteristics of this species.

28. *Eurytoma furva* Bugbee

MAP 13

Eurytoma furva Bugbee, 1958a, p. 198.

Types: 11 females and 9 males; holotype female in the U.S. National Museum (USNM 66031); paratypes in the Bugbee collection, Allegheny College, Meadville, Pa., and in the U.S. National Museum.

Type locality: Napa, Calif.

Distribution: Known only from the type locality.

Host: *Disholcaspis washingtonensis* (Gillette) on *Quercus douglasii*.

Remarks: This species differs from *Eurytoma querci-globuli* in the longer sixth abdominal tergum, the reduction of the sculpturing to

the lower half or two-thirds of the lateral surface of the sixth tergum, and in the deeper reddish-brown color of the abdomen and tegulae.

29. *Eurytoma pissodis* Girault

FIGURES 1-5; MAP 14

Eurytoma pissodis Girault, 1917b, p. 88.—Graham, 1918, pp. 175-180; 1926, pp. 26, 29.—Taylor, 1929, vol. 9, no. 4, pp. 167-246; vol. 10, no. 1, pp. 1-86.—Plummer and Pillsbury, 1929, p. 29.—MacAloney, 1930, pp. 1-87.—Peck, 1951, p. 577.

Types: 1 holotype female, no. 20969, 2 paratype females, and 1 male paratype, in the U.S. National Museum, Washington, D.C.

Type locality: Minnesota.

Distribution: United States: Minnesota, Wisconsin, New Hampshire, Massachusetts, New York, Connecticut, California, Washington. Canada: Ontario.

Host: *Pissodes strobi* (Peck) (white pine weevil).

Remarks: Additional characteristics that will help to distinguish this species include the heavy sculpturing on the sixth tergum of the abdomen that covers the dorsal as well as the lateral surface, the yellow legs including the fore- and midcoxae, and the elongate ninth tergum.

30. *Eurytoma cleri* Ashmead

MAP 15

Eurytoma cleri Ashmead, 1894, p. 323.—Hopkins, 1899, pp. 345, 427, 429.—Taylor, 1929, p. 37.—Peck, 1951, p. 576.

Types: 1 female, no. 11206, in the U.S. National Museum, Washington, D.C. is the only type material of this species known, so I have designated it as the type.

Type locality: Morgantown, W. Va.

Distribution: United States: Virginia, North Carolina, New York, New Mexico, California, Montana.

Host: Clerid larvae in scrub pine (Ashmead, 1894). *Pissodes strobi* (Peck) (Hopkins, 1899 and Taylor, 1929). *Ips oregoni* (Eichhoff), *Dendroctonus monticolae* Hopkins.

Remarks: The greatly elongated ninth tergum averaging .42 mm. (.30-.54) and the narrow dorsal valves of the female genitalia in conjunction with the characteristics noted in the key make this species quite distinct.

31. *Eurytoma flavicrus*, new species

FIGURES 19, 29; MAP 15

Female: Head and thorax black; abdomen black changing to reddish brown ventrally; antenna, tegula, legs including coxae yellow; occa-

sionally slight brownish infuscation on hindfemora and some black on forecoxae. Average 2.9 mm. (2.4-3.2) in length. Abdomen longer than head and thorax combined; averaging 1.9 mm. (1.4-2.1) in length; laterally compressed so that greatest width in cross section is in upper third; sixth segment as long as three, four, and five combined; its lateral surface heavily sculptured for lower three-quarters but dorsal surface smooth and shiny; ninth tergum long and pointed; averaging .35 mm. (.25-.40) in length; cercus about middle of length. Internal genitalia averages 2.1 mm. (2.0-2.2) in length and 1.2 mm. (1.1-1.3) in height; ventral and dorsal valves turn dorsally, anteriorly at approximately a right angle; broadened dorsal extension of ventral valves measures .25 mm. at widest part; dorsal valves narrow for horizontal length and yellow in color except for exposed black tip; stylet arch in an oblique plane; length of genitalia averages slightly longer than abdomen because of elongate ninth tergum. Propodeum with a wide concavity marked laterally by lateral carinae that may be complete to base or fade out in lower third; center of concavity finely punctate and with two or three short, incomplete carinae extending toward center from lateral carinae; lateral areas narrow and present in upper half only. Lateral ocelli large and approximately equal in diameter to length of ocellular line. Antenna with seven segmented flagellum, first five segments longer than wide, truncate, moniliform; sixth separated from terminal unit of two closely fused segments by a distinct annulation. Wing veins light yellow, linear; postmarginal vein short, averaging .12 mm. (.10-.15); marginal vein averaging .35 mm. (.25-.40) or approximately three times the length of the postmarginal.

Male: Length 2.3 mm. Color much as in the female; may be black infuscation on hindfemora and hindcoxae; rest of legs yellow. Antenna with four longer than wide, pedicellate segments; fifth segment without pedicle but separated from six by an annulation; seven and eight closely fused; two whorls of long hairs on two, three, and four. Marginal and postmarginal veins with same relationships as in the female.

Types: 9 females and 7 males. Holotype female and paratypes in the collection of the Department of Agriculture, Ottawa, Canada. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa. Paratype series dated as follows: 1 female, May 10; 4 females, May 14; 1 female, May 15; 1 female, May 18; 1 female, May 25; 2 males, May 5; 2 males, May 8; 3 males, May 9, 1951.

Type locality: Clemson, S.C., May 14, 1951, W. Mason.

Distribution: Known only from the type locality.

Host: From gall on *Nyssa sylvatica*. Host gallmaker not stated.

Remarks: This species seems most closely related to *Eurytoma contractura*, new species, *E. discordans*, and *E. acuta*. They all have

an elongated abdomen with considerable lateral compression and an elongated ninth tergum. The dorsal valves of the genitalia are narrow for their horizontal length. The yellow legs, tegula, antenna, the very short postmarginal vein in relation to the long marginal, and the four pedicellate segments of the male antenna instead of five, will distinguish this new species from those mentioned above.

32. *Eurytoma contractura*, new species

FIGURES 13, 31; MAP 15

Female: Black except for tarsi and extremities of femora and tibiae. Average 3.0 mm. (2.4–3.4) in length. Abdomen averages 1.7 mm. (1.6–1.8) in length; longer than head and thorax combined and laterally compressed; sixth segment longer than two and three combined, or about a third length of abdomen; densely sculptured on lower half; sparse, silvery pile on segments seven and eight. Ninth tergum long and pointed, averaging .22 mm. (.20–.25) in length. Internal genitalia averages 1.7 mm. (1.6–1.8) in length and 1.1 mm. (1.0–1.2) in height; dorsal and ventral valves turn dorsally, anteriorly at a right angle; stylet arch in an oblique plane; dorsal valves entirely black and narrow for horizontal length but expand, after turning dorsally, into a broader plate; ventral valves expand dorsally into a broad plate averaging .20 mm. at widest part. Propodeum with a wide concavity that is practically all median furrow; lateral areas absent; surface with irregular, horizontal ridges; lateral carinae in upper half to two-thirds. Tegula black. Umbilicate punctures on pro- and mesothorax very shallow and widely spaced with shagreened surfaces between; punctations fade into a shagreened area on anterior third of mesothorax. Antenna with the scape black; flagellum with five longer than wide truncate segments; first segment about twice as long as wide; sixth separated from seventh by a deep annulation and slightly swollen so that antenna appears weakly clavate. Legs with coxae black and black to dark-brown infuscation on all femora and tibiae. Wing veins yellow and linear; marginal vein averages .25 mm. or about 1.3 times the length of the postmarginal that averages .19 mm. (.17–.20).

Male: Color as in the female. Averages 1.8 mm. (1.4–2.1) in length. Antenna with five longer than wide pedicellate segments; last two closely fused. Wing vein relationships as in the female except both veins shorter; marginal averages .21 mm. and postmarginal .16 mm. in length.

Types: 6 females and 6 males. Holotype female and allotype in the collection of the Department of Agriculture, Ottawa, Canada. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Paratype specimens dated: 5 females, May 4, 1949; 6 males, May 30, 1949.

Type locality: Marmora, Ontario, Canada, May 4, 1949, O. Peck.

Distribution: Known only from the type locality.

Host: *Melanagromyza schineeri* (Giraud).

Remarks: *Eurytoma contractura* is close to *E. flavicrus*, the preceding new species, in the similarly shaped, elongated abdomen, configuration of the female genitalia, and the elongated ninth tergum. The former differs, however, in the black tegula and legs, the shorter postmarginal vein in relation to the marginal, and in the male antenna that has five pedicellate segments instead of only four.

33. *Eurytoma discordans* Bugbee

MAP 16

Eurytoma discordans Bugbee, 1951, pp. 220-223.—Burks, 1958, p. 81.

Types: 9 females and 12 males. Holotype female, allotype and paratypes in the U.S. National Museum (USNM 61219); paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Howe, Ind., galls, collected on Dec. 20, 1930.

Distribution: United States: Indiana, Massachusetts, Virginia, Michigan, Wisconsin, Maine. Canada: Ontario, Quebec, Alberta.

Host: *Diplolepis globuloides* (Beutenmuller) (= *D. variabilis* (Bassett)) on *Rosa* species, *Periclistus pirata* (Osten-Sacken) and *Synophromorpha* (= *Periclistus*) *sylvestris* (Osten-Sacken).

Remarks: The host of this species is believed to be an inquiline, *Periclistus sylvestris* (Osten-Sacken), that modifies the host gall, *D. globuloides* (Beutenmuller), described by Beutenmuller in 1892 from the gall only. The true gallmaker has been determined as *Diplolepis variabilis* (Bassett), and so *D. globuloides* (Beutenmuller) is placed as a synonym of *D. variabilis* (Bassett) in Hymenoptera of America North of Mexico (1951). *Eurytoma discordans* differs from *E. acuta* in the color of the scape (all yellow or upper extremity black only), the pale yellow color of the wing veins, narrow stigmal club and marginal vein, and the presence of a wide median furrow on the propodeum that maintains same width from top to bottom.

34. *Eurytoma acuta* Bugbee

MAP 16

Eurytoma acuta Bugbee, 1951, pp. 225-228.—Burks, 1958, p. 80.

Types: 27 females and 11 males: Holotype female, allotype and paratypes in the U.S. National Museum, Washington, D.C. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Price, Utah.

Distribution: United States: Utah, Colorado, North Dakota, Michigan, Minnesota, Arizona, Nevada, Montana. Canada: Manitoba, Saskatchewan, Alberta.

Host: *Diplolepis tuberculatrix xerophila* Kinsey and Ayres on *Rosa* species, *Diplolepis arefacta* (Gillette).

Subspecies: The following subspecies are included under *Eurytoma acuta*. The descriptions will be found in Bugbee, 1951, Ann. Ent. Soc. Amer. vol. 44, pp. 213-260.

Eurytoma acuta acuta Bugbee. Utah and Colorado. Hosts: *Diplolepis tuberculatrix* form *xerophila* Kinsey and Ayres, *D. tuberculator* variety *coloradensis* Kinsey and Ayres (USNM 61220).

E. a. absona Bugbee: Colorado. Host: ? *Diplolepis multispinosa* (Gillette) (USNM 61223).

E. a. gemina Bugbee. Arizona. Host unknown (USNM 61224).

E. a. intermedia Bugbee. N. Dakota. Host: Smooth rose gall (USNM 61221).

E. a. ramosa Bugbee. Michigan, Minnesota, Manitoba, Saskatchewan. Hosts: *Diplolepis tuberculator* complex.

Types: U.S. National Museum (USNM 61222).

Remarks: *E. acuta* is a close western relative of the eastern *E. discordans*. It can be distinguished from the latter, however, by the scape that may be all black or upper half black and lower half yellowish brown, the darker brown color of the wing veins, broader marginal vein, almost square stigmal club, the wide median furrow on the propodeum that narrows ventrally, and the black infuscation that usually occurs on all of the legs.

Complex IV. Tylodermatis

35. *Eurytoma prunicola* Walsh

MAP 17

Eurytoma prunicola Walsh, 1870, p. 298.—Peck, 1951, p. 578.

Eurytoma prunicola globulicola Walsh, 1870, p. 299.

Female: Reddish brown to black. Medium-sized species averaging 3.3 mm. (3.0-3.7) in length. Abdomen averages 1.6 mm. (1.5-1.7) in length; oval from a lateral view; laterally compressed but not extremely so; most often reddish brown in color with some black infuscation on dorsal surface of segments three through five and often on posterior half of ninth tergum; less often black may be more extensive but sixth segment usually reddish brown; longer than four and five combined and heavily sculptured on lower lateral surface; dorsal surface smooth; ninth tergum and ventral valves project upward at considerably less than a right angle in relation to horizontal axis of the abdomen; ninth tergum mediumly elongate, sloping and

somewhat blunt, averaging .19 mm. (.15-.25) in length. Internal genitalia with the dorsal valves very narrow for horizontal length and black to light reddish brown in color; dorsal and ventral valves turn dorsally, anteriorly, at approximately a right angle; ventral valves curve dorsally and then slightly posteriorly so that stylet arch and fuleral plate are in a vertical plane; whole structure averages 1.6 mm. (1.2-1.9) in length and 1.0 mm. (.87-1.1) in height; height averages about 64% of the length. Thorax with the tegula yellow or yellowish brown; most often some deep reddish-brown coloration on dorsal and lateral surface of the pronotum; less often dorsal thorax black, or reddish brown extensive on both dorsal and lateral surfaces. Propodeum narrowly concave; shallow concavity occupied almost entirely by the median furrow that may be delimited laterally by distinct, irregular carinae, or lateral carinae may lose identity in lower half; median carina more or less complete to base dividing furrow into small irregular rectangles, largest at top, smallest toward base; median carinae may separate deep rectangular depression below base of median furrow into two foveae; lateral areas narrow and irregularly ridged and pitted. Head most often black, occasionally deep reddish brown frons; fine striae on face converging on the clypeus. Antenna with the scape yellow; flagellum appears six jointed; segments longer than wide. Legs yellow including coxae. Wing veins yellow; marginal mediumly broad and stout and averages .32 mm. (.32-.37) in length; postmarginal linear, short, and averages .15 mm. (.15-.17) in length; thus the marginal is quite often twice the length of the postmarginal; stigmal vein short and club deeply rounded so that it appears almost square.

Male: Black or mostly reddish brown. Averages 2.6 mm. (2.3-3.0) in length. Thorax and abdomen most often black, or reddish-brown tinge to lateral pronotum and occasionally to dorsal pronotum and lower, lateral meso- and metanotum; may be a deep reddish-brown splotch on the lateral aspect of sixth abdominal segment. Head often black, or it may have a reddish-brown frons. Petiole longer than hindcoxa by about $1\frac{1}{2}$ times; most often black but may be reddish brown. Legs and all coxae yellow or hindcoxae may be black to dark reddish brown. Tegula yellow. Antenna with the scape yellow; flagellum appears 7-segmented. Wing veins with same relationships as in the female.

Types: U.S. National Museum, no. 1531, 1 female and 4 males, labelled by A. Bolter, 1890.

Type locality: No locality is given for the types but Walsh described many of his species from material collected in the vicinity of Rock Island, Ill. Lacking any specific evidence otherwise, it seems

safe to assume that the type material of this species may have come from the same area.

Distribution: United States: Kansas, southern Illinois and Indiana to Maryland, south to South Carolina and Mississippi, and west to Texas.

Host: Walsh (1870) lists his specimens as having been bred "from the Cynipidous oak-gall *Q. prunus*, Walsh," which appears to be *Amphibolips prunus* (Walsh) that occurs on various Red Oak species. *A. gainsei* Bassett and *Callirhytis seminator* (Harris).

Remarks: There does not seem to be any basis by which *E. prunicola globulicola* Walsh can be distinguished from *E. prunicola* Walsh. The considerable variation in the reddish-brown coloration of the specimens examined, on which the redescription is based, ranges from abdomens that are all black, except the long sixth segment, to those that are all reddish brown, except for some black infuscation on the dorsal surface of segments three to five. Walsh distinguishes *E. p. globulicola* from *E. prunicola* because of the former's reddish-brown (rufous) abdomen.

E. prunicola appears to be closest to *E. querci-globuli*. The reddish-brown coloration is much the same, and, as in *E. querci-globuli*, the color variation ranges from predominately black in some of the more northern populations (Indiana and Illinois), to predominately reddish brown in the southern material (Bonneau, S.C.). It differs, however, in the oval abdomen with less lateral compression, longer sixth abdominal segment, shorter ninth tergum, less posterior extension of the ventral valves of the female genitalia, less extensive sculpturing on the lateral surface of the sixth abdominal segment, a stouter, broader marginal vein, and a short postmarginal vein in relation to the marginal.

The redescription is based on the types in the U.S. National Museum collection and the considerable number of specimens in the author's collection.

36. *Eurytoma celtigalla* Bugbee

MAP 18

Eurytoma celtigalla Bugbee, 1957, pp. 49-50.

Types: Holotype female, allotype, and paratypes in the U.S. National Museum (USNM 66037). Paratypes in the University of Texas, Austin, Tex., Cornell University, Ithaca, N.Y., and Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Buda, Tex. Collected June and Aug. 13, 1955, February and Mar. 7, 1956, by J. Riemann.

Distribution: Known only from central Texas.

Host: *Phytophaga celtiphylla* Felt on *Celtis* species, *C. mississippiensis* and *C. laevigata*.

Remarks: This species runs generally smaller in all its measurements than *Eurytoma prunicola*. In addition, the dorsal valves of the female genitalia are broad in contrast to the narrow valves of the preceding species and the postmarginal vein is about 80% the length of the marginal instead of nearer 50%.

37. *Eurytoma lacunae*, new species

MAP 18

Female: Mostly black. Averages 2.2 mm. (2.0-2.3) in length. Abdomen averages 1.1 mm. (1.0-1.2) in length; oval in outline from a lateral and dorsal view; dark brown to black in color; sixth tergum fully two-fifths to one-half the length of the abdomen; its surface both dorsally and laterally covered by fine sculpturing; ninth tergum averages .17 mm. (.15-.20) in length. Internal genitalia average 1.0 mm. in length and .62 mm. in height; thus the height is slightly more than one-half the length; dorsal valves narrow for horizontal length and turn dorsally, anteriorly, at a right angle; stylet arch in an oblique plane; dorsal valves yellowish brown except for exposed distal tip which is black. Propodeum with a wide, shallow depression without any median furrow or distinct lateral areas; surface covered with irregular, fine punctations except for several larger pits dorso-laterally. Tegula yellow. Face with prominent striae from below eye and base of antennae that converge upon the clypeus. Antenna with yellow scape and yellow to light-brown flagellum; funicle five jointed; the first joint longer than wide, the rest becoming shorter, so that number five is about as long as wide; terminal unit of three closely fused segments. Legs including the fore- and midcoxae yellow; hindcoxae may have brown infuscation mixed with the yellow. Wing veins light yellow and linear; marginal vein, which averages .24 mm. (.22-.25), is twice the length of the postmarginal, which averages .12 mm. (.10-.12).

Male: Black. Averages 1.3 mm. in length. Legs all yellow except brownish infuscation on middle of hindfemora. Tegula yellow. Scape and flagellum of antenna yellow to yellowish brown; funicle consists of only four elongate, pedicellate joints; terminal unit of two closely fused joints separated from the fifth by an annulation. Wing veins yellow with the same length relationships as in the female.

Types: Holotype female, allotype, and paratypes in the U.S. National Museum (USNM 66055); paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Kent Island, Md. Specimens collected Feb. 8, 1953, and emerged Mar. 3, 1953.

Host: Bred from galls of *Protaplonx* species on *Baccharis helmifolia*.

Remarks: The male antenna of this new species has only four pedicellate segments in the flagellum. The fifth is separated from the two closely fused terminal units by an annulation rather than a short pedicle. The lack of yellow or reddish brown on the head, thorax, and abdomen will distinguish this species from *Eurytoma juniperinus* or *E. prunicola*.

33. *Eurytoma nigricoxa* Provancher

MAP 18

Eurytoma nigricoxa Provancher, 1887, p. 193.—Peck, 1951, p. 577.

Types: Department of Agriculture, Ottawa, Canada, 1 female with three labels. First label reads: "Type, *E. nigricoxa* Provancher no. 2513." Second label reads: "*E. nigricoxa* Provancher, Type 739." Third label reads: "Lectotype, *E. nigricoxa* Comeau, April, 1940."

Type locality: Ottawa, Canada.

Distribution: Canada: Quebec, British Columbia, and Manitoba.

Host: Rose galls and *Periclistus* species (specimens in Department of Agriculture collection, Ottawa, Canada).

Remarks: This species superficially resembles *E. studiosa* Say, but the thorax is more robust and the propodeum is broad and shallowly concave without a clearly defined median groove. It differs also in the equal length of the marginal and postmarginal veins.

39. *Eurytoma querci* Fullaway

MAP 18

Eurytoma querci Fullaway, 1912, p. 278.—Peck, 1951, p. 578.

Types: Leland Stanford University, lot 508, specimen 45, 1 female; lot 509, specimen 20, 1 male, paratype.

Type locality: Stevens Creek (Santa Clara County), Calif. Collected Nov. 24, 1906. The type female emerged Mar. 6, 1907, and the male emerged in the laboratory Jan. 27, 1907.

Distribution: United States: California.

Host: *Acraspis guadaloupeensis* (Fullaway) on *Q. chrysolepis* (Fullaway, 1912) *Andricus lasius* (Ashmead) (Fullaway, 1912).

Remarks: The type female seems close to *E. californica* Ashmead, but it is smaller in all its measurements; has more black infuscation on the legs (not in blotches as in *E. californica*); brown rather than yellow tegulae, and the abdomen is not deeply oval but more rectangular in shape in a lateral view.

40. *Eurytoma auriceps* Walsh

MAP 19

Eurytoma auriceps Walsh, 1870, p. 299.—Triggerson, 1914, pp. 1-34.—Viereck, 1916, p. 522.—Peck, 1951, p. 575.—Bugbee, 1956, p. 503.

Eurytoma auriceps seminatrix Walsh, 1870, p. 299.

Eurytoma vagabunda Ashmead, 1881a, p. 134.

Female: Black. Length averages 3.3 mm. (2.7-4.0). Abdomen black to deep reddish brown; oval in lateral view; averaging 1.3 mm. (1.0-2.0) in length; lateral compression medium; segment six dorsally equal in length to segments four and five combined; sculpturing on lower lateral surface of sixth heavy, but it plays out dorsally so that upper half of lateral surface and dorsal surface are smooth and shiny; white pile covers dorsal and lateral one-half of segment eight; a few scattered hairs on dorsal and lower lateral aspect of seven; ninth tergum short, broad and stubby; averaging .12 mm. (0.7-.22) in length; ninth with exposed ends of ventral valves projecting upward at less than a 45° angle in relation to horizontal axis of the abdomen. Internal genitalia average 1.3 mm. (1.0-2.0) in length; 1.0 mm. (.82-1.5) in height, height averages about 77% of the length; dorsal and ventral valves anteriorly turn dorsally at approximately a right angle; expanded plate of ventral valves may bend slightly posteriorly so that stylet arch approaches a vertical plane; dorsal valves black for horizontal length and narrow; black may or may not continue onto slightly wider dorsal extension of dorsal valves. Tegula yellow. Prepodium shallowly concave; median furrow outlined by distinct lateral carinae, clearly indicated in dorsal third or half only, extent of median carina same or ventrally for about three-quarters of length of furrow; lower area crossed by irregular horizontal ridges dividing surface roughly into rectangles. Scape with outer face all yellow or upper half black to dark brown; antenna filiform; segments of the flagellum in the larger specimens longer than wide with the fifth only a little shorter than the first; in smaller specimens, segments become progressively shorter distally, so that five may be almost square; six closely applied to seven and separated by a shallow annulation; seven appears to consist of two closely fused units, about equal in length to first segment. Lower half of face covered with striae that converge upon the clypeus. Legs chrome yellow or brownish infuscation on hindfemora and tibiae; front coxae may be all yellow, or medial and anterior faces yellow only; midcoxae also variable from yellow to black; hindcoxae black. Wing veins yellow to yellowish brown; marginal vein stout and wider than postmarginal; marginal averages .30 mm. (.22-.42) and the short, stubby postmarginal vein averages .16 mm.

(.12-.22) in length; the postmarginal averages about 53% the length of the marginal; stigmal vein short and stout, averaging .14 mm. (.12-.20).

Male: Body black. Abdominal petiole long, averaging 1.33 times the length of hindcoxa, or hindcoxa about three-fourths length of petiole; legs most often including all coxae, scape and tegula yellow; less often hindcoxa black and some black infuscation on middle of outer face of hindfemora and occasionally hindtibiae. Pile covering face and on thorax, often with a golden-yellow tinge; less often silvery white. Wing veins brown; marginal vein stout, averaging .30 mm. (.20-.37) and postmarginal averages .16 mm. (.12-.20) in length; stigmal averages .17 mm. (.15-.20).

Neotypes: Neotype female and male in U.S. National Museum; paratypes in the Bugbee collection, Meadville, Pa. Additional specimens in the series from which the types were picked include 31 females and 19 males.

Type locality: Elsay, Jersey County, Ill. (Principia College). J. E. Remington collection (ex pupa, June 6, 1946), 155.

Host: Reared from pupa June 5 and 6, 1946, in gall of *Callirhytis seminator* (Harris), L. H. Weld determined, on *Quercus alba*. The lost type material came from *Acraspis erinacei* (Beutenmuller), *A. hirta* (Osten-Sacken), *Amphibolips spongifica* (Osten-Sacken) and *Diplolepis radicum* (Osten-Sacken).

Distribution: *E. auriceps* occurs over most of the eastern half of the United States and Canada probably to the northern limit of white oak distribution. Its hosts are species of cynipids, producing galls, principally on the white oaks *Quercus alba* and *Q. stellata*.

The list of additional host records was taken from specimens in my own collection located at Allegheny College, Meadville, Pa., the collections of the U.S. National Museum, Washington, D.C., and Cornell University, Ithaca, N.Y. *Andricus flocci*, *A. ignotus*, *A. pattoni*, *A. foliatus*, *Amphibolips cookii*, *Acraspis pezomachoides*, *Callirhytis lanata*, *Disholcaspis globulus*, *D. spongiosa*, *D. mamma*, *Holcaspis fasciata*, and *Sphaeroteris melleum*.

Remarks: This is a highly variable species. It has been impossible to find any good morphological characteristics that would distinguish more than one species. All characters seem to intergrade throughout the widespread distributional area.

Since the original types seem to be lost, the redescription is based on a neotype and a paratype series from a locality in Illinois in proximity to the area where Walsh is believed to have collected.

41. *Eurytoma brevivena* Bugbee

MAP 20

Eurytoma brevivena Bugbee, 1958a, p. 198.

Types: 13 females and 1 male; holotype female in the U.S. National Museum (USNM no. 66032); paratypes in Bugbee collection, Meadville, Pa.

Type locality: Grand Canyon, Ariz., collected Jan. 26, 1920, A. C. Kinsey.

Distribution: Known only from the type locality.

Host: *Disholcaspis quercus-globulus* (Fitch) on *Quercus gambelii* (Bugbee, 1958).

Remarks: The host of this species is probably not the species indicated on the labels, because *D. quercus-globulus* does not extend westward to Arizona according to Weld in Muesebeck and others (1951). Its host will probably be found to be a western species of the genus *Disholcaspis* associated with *Quercus gambelii*.

The strong striations on the lower face converging on the clypeus, the short postmarginal vein that averages about half the length of the marginal, and the wide median furrow on the propodeum that narrows ventrally, are additional characteristics of this species.

42. *Eurytoma obtusiventris* Gahan

MAP 20

Eurytoma obtusiventris Gahan, 1934, pp. 116-118.—Hughes, 1934, pp. 119-122.—Breland, 1939, p. 725.—Uhler, 1951, p. 40.—Judd, 1953, p. 296.—Peck, 1951, p. 577.—Miller, 1959b, pp. 246-251.

Types: Holotype female, no. 49893, and 57 paratype females in the U.S. National Museum, Washington, D.C.

Type locality: Ithaca, N.Y., collected and reared by G. F. Hughes in 1930.

Distribution: United States: New York, Michigan, Indiana, Massachusetts, Louisiana, Kansas, Ohio. Canada: Ontario.

Host: *Eurosta solidaginis* Fitch on *Solidago* species (Gahan, 1934).

Remarks: No males have appeared in any of the series of *E. obtusiventris* from the more northern states (New York, Michigan, Indiana) and southern Canada. The females, therefore, must be parthenogenetic. However, the series reared from *Tephritis* (= *Neotephritis*) *finalis* (Loew) on *Helianthus* species from Columbus, Miss., by Breland (1939) and determined by Gahan as *E. obtusiventris*, does contain several males. I have examined some of the Breland specimens and have included them in the succeeding new species.

Characteristics that separate this species from the next one, in

addition to those listed in the key, are given in the section entitled "Remarks," under the succeeding species.

43. *Eurytoma vernonia*, new species

FIGURE 15; MAP 21

Female: Medium-sized species averaging 2.1 mm. (1.8–2.5) in length. Black except for proximal and distal extremities of tibiae and femora, all of tarsi and wing veins which are yellow to yellowish brown. Abdomen dorsally arched anteriorly, triangular in shape from a lateral view and moderately laterally compressed; averaging 1.3 mm. (1.3–1.4) in length; sculpturing on lateral aspect of the long sixth tergum heavy for lower half and then becomes lighter in upper half, disappearing entirely so that dorsal surface is smooth and shiny; ninth tergum short and pointed averaging .12 mm. (.10–.15) in length and in line with the horizontal axis of the abdomen; black to dark brown in color. Internal genitalia short; dorsal and ventral valves turn dorsally, anteriorly, at a right angle to horizontal axis so that stylet arch is in an almost vertical plane; height more than half of length; height averaging .82 mm. (.80–.87) and length 1.2 mm. (1.1–1.3); dorsal valves black and narrow for horizontal length. Propodeum at right angles to the scutellum; wide shallow concavity that is evenly punctate except for three or four large round pits with shiny surfaces along dorsal margin; median furrow, lateral and central carinae may be absent or carinae indicated dorsally by short stubs only. Tegula black. Pronotum narrow; its width less than half its length. Antenna short and stocky; enlarging slightly distally so that they appear clavate; pedicel and first funicle segment about equal in length viewed from above; first funicle segment slightly longer than wide, rest almost square; three closely fused units in the club; scape black. Front coxa with a prominent tubercle about midway on the anterior outer margin. Wing veins yellow; marginal and postmarginal linear, the marginal longer than the postmarginal, averaging .17 mm. (.15–.20) in length and the postmarginal averaging .12 mm.

Male: Black; exceptions as in the description of the female. Length averages 1.6 mm. (1.3–1.9). Antenna with the first four funicle segments about equal in length, pedicellate, longer than wide and depressed medially; a whorl of long hairs arises from each hump on either side of the depression and extends outward at right angles to the longitudinal plane of the segment; fifth funicle segment not pedicellate distally, nor noticeably depressed; its proximal end has longer hairs that appear to arise from a slight eminence and may or may not simu-

late a whorl; distal end with shorter hairs; terminal unit of two, short, closely fused segments separated from the fifth by a deep annulation and about same length as fifth; hair much shorter and extends anteriorly or in same plane as terminal segments. Marginal vein of the forewing averages .16 mm. (.15-.20) and postmarginal vein .11 mm. (.10-.12) in length.

Types: 32 females and 9 males. Holotype female, allotype, and paratypes in the U.S. National Museum (USNM 66056); paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Manhattan, Kans. Collected by R. Schwitzgebel, Sept. 1, 1940. Paratypes collected in August and September 1940.

Distribution: U.S.: Pennsylvania, Oklahoma, and Mississippi.

Host: Bred from trypetid seed maggots in seeds of *Vernonia interior* Small (Ironweed).

Additional host: *Tephritis* (= *Neotephritis*) *finalis* in sunflower (Breland, 1939).

Remarks: This new species is most closely related to *Eurytoma obtusiventris* Gahan. The relationship is suggested by the presence of the raised tubercle on the outer margin of the forecoxae, the narrow pronotum, the short, stocky female antenna, and the sharp angle formed by the scutellum and propodeum. It can be separated from *E. obtusiventris*, however, by its smaller size, the evenly punctate propodeum in contrast to the transversely striated propodeum of *E. obtusiventris*, its more oval and laterally compressed abdomen, and the presence of males with their distinctive antennae.

Schwitzgebel and Wilbur (1943) list two species of parasites as *Eurytoma* new species that were bred from trypetid seed maggots (p. 8). The series of 56 females mentioned above, from which this new species was described, was part of their reared material so that it is very likely that its real host is one of the species of trypetid listed in their paper. The exact relationships of host and parasite were not determined.

44. *Eurytoma bigeloviae* Ashmead

MAP 21

Eurytoma bigeloviae Ashmead, 1890, pp. 25, 45.—Peck, 1951, p. 575.—Bugbee, 1956, p. 504.

Eurytoma chalcidiformis Girault, 1917a, p. 3.

Types: U.S. National Museum no. 11865. Original description based on 1 female specimen, which is designated as type.

Type locality: West Cliff, Colo. (reared by T. D. A. Cockerell).

Distribution: United States: Colorado, California, Utah.

Host: *Trypeta* (= *Tephrella*) *bigeloviae* (Cockerell) (Ashmead, 1890).

Remarks: For notes on the synonymy of *E. chalcidiformis* Girault with this species, see Bugbee (1956, p. 504).

45. *Eurytoma atripes* Gahan

MAP 22

Eurytoma atripes Gahan, 1933, p. 36.—Hill and Pinckney, 1940, p. 8.—Peck, 1951, p. 575.—Nelson, 1953, p. 250.

Types: U.S. National Museum, 1 type female and 1 allotype, no. 44838, plus a paratype series of 24 specimens.

Type locality: Carlisle, Penn.

Distribution: United States: Pennsylvania, Maryland, New York, Ohio, Tennessee, Washington, Oregon, North Dakota. Canada: Alberta.

Host: Hessian fly puparia *Phytophaga destructor* (Say) and 1 specimen from *Cephus cinctus* Norton (Gahan, 1933). Larvae of both *Cephus cinctus* Norton and *Bracon cephi* (Gahan) (Nelson, 1953).

Remarks: Locality records shown on the map were taken from the paper by Gahan (1933) and represent the types plus the 24 additional specimens on which he based the description of the species.

This is a small species with a very short, stubby ninth tergum averaging 0.8 mm. (.06–.10). The female genitalia are weakly developed with wide dorsal valves, only slight dorsal extension anteriorly, and the stylet arch is in a horizontal plane. The antennae are weakly clavate.

46. *Eurytoma levivultus* Bugbee

MAP 21

Eurytoma levivultus Bugbee, 1957, pp. 48–49.

Types: 7 females and 3 males; holotype female in the U.S. National Museum; paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Columbus, Ohio, collected June 1955 by J. Moser.

Distribution: United States: Ohio and Texas.

Host: *Pachypsylla gemma* Riley.

Remarks: The lack of any yellow or reddish-brown color on the frons, the reduced umbilicate punctures on the pronotum, vertex, and occiput of the head, the flat evenly punctate propodeum, and the black infuscation always on the middle and hindfemora and tibiae and often on the front legs help to distinguish this species.

47. *Eurytoma tumoris* Bugbee

Eurytoma tumoris Bugbee, 1962, pp. 345–346.

Types: 24 females and 23 males. Holotype female and allotype male from Santa Cruz, Santa Cruz County, Calif. Collected by R. W. Stark, Mar. 25, 1962. Reared in Berkeley, Calif., Apr. 6, 1962, from Scots pine. Additional specimens in alcohol with the

same locality, collection, and rearing dates as above. Types and paratypes in the U.S. National Museum and paratypes in the Bugbee collection, Allegheny College, Meadville, Pa. and the University of California at Berkeley.

Type locality: Santa Cruz, Santa Cruz County, Calif.

Host: Believed to be phytophagous in the stems of *Pinus sylvestris*.

Distribution: California.

Remarks: See Bugbee (1962).

48. *Eurytoma fossae*, new species

FIGURES 11, 24; MAP 22

Female: Averages 2.8 mm. (2.2-3.3) in length. Black except for the tarsi, knees, and apices of mid- and hindtibiae, occasionally all of foretibiae and wing veins. Abdomen, viewed laterally, narrowly oval; longer than head and thorax combined; averaging in length 1.5 mm. (1.2-1.7); sixth tergum dorsally, longer than three and four combined; sculpturing limited to lower anterior half of lateral surface; rest of surface shiny black; ninth tergum short, averaging .14 mm. (.12-.17) in length. Internal genitalia average 1.5 mm. in length and .77 mm. in height; thus height is about half the length; dorsal valves narrow and black for horizontal length and turn dorsally, anteriorly, with ventral valves at less than a right angle in relation to the horizontal axis; stylet arch in an oblique plane. Propodeum rounded with a deep, narrow concavity occupied by a median furrow, wider at top and delimited laterally by complete lateral carinae to base; central carina may extend from dorsal margin for half to three-quarters length of median furrow; spaces in furrow with shiny, unsculptured surfaces; lateral areas absent or if present very narrow. Thorax with the tegula black. Antenna with the scape black; first segment of the funicle slightly longer than pedicle, itself longer than wide and truncate distally; next four segments subequal to square and truncate distally; distal three segments grouped closely together to form a slightly expanded club. Legs with black infuscation on all femora and tibiae, except occasionally foretibiae; tarsi may have black infuscation on dorsal surface. Wing veins light brown and linear; marginal vein longer than postmarginal, averaging .32 mm. (.25-.35) in length and postmarginal averaging .22 mm. (.20-.22).

Male: Averages 1.9 mm. (1.6-2.2) in length. Wing veins are dark brown; marginal longer than postmarginal, averaging .27 mm. (.25-.30), and postmarginal averaging .16 mm. (.15-.17) in length.

Types: 8 females and 10 males; holotype female and allotype male in the U.S. National Museum collection, Washington, D.C. (USNM 66057). Paratype females in the U.S. National Museum, Bugbee collection, Meadville, Pa., and University of California.

Type locality: Albany, Alameda County, Calif., collected May 1958 by L. E. Caltagirone.

Distribution: United States: California.

Host: Bred from gall on *Salix* species produced by *Euura pacifica* (Marlatt), Burks determined, and *E. resinicola* (Marlatt).

Remarks: The new species resembles *Eurytoma stigma* Ashmead and *E. tomici* Ashmead in the slightly clavate antennae and the wide median furrow of the propodeum.

49. *Eurytoma tomici* Ashmead

MAP 22

Eurytoma tomici Ashmead, 1894, pp. 325, 326.—Taylor, 1929, p. 37.—Peck, 1951, p. 579.

Types: 1 male type no. 11870, U.S. National Museum. Apparently this is all the type material there is and so the 1 male specimen is designated as type.

Type locality: Morgantown, W. Va.

Distribution: United States: New York, West Virginia.

Hosts: *Tomicus* (= *Pityogenes*) *plagiatus* (LeConte) (Ashmead, 1894), *Cylindrocopturus eatoni* Buchanan (Peck, 1951), *C. furnissi* Buchanan (Peck, 1951), *Epiblema strenuana* (Walker) (Peck, 1951).

Additional hosts: *Phloeosinus* species, and *Cylindrocopturus longulus* (LeConte); records U.S. National Museum.

Remarks: *Eurytoma tomici* Ashmead is very close to *E. stigma* Ashmead. The temptation to call them one species was strong, but because of the rather meager material of both species, it seems best to keep them separate with the hope that adequate series with precise host data will be available someday.

In general *E. tomici* seems to have more black infuscation on the legs, especially in the male, and less sculpturing on the surface of the sixth tergum. In *E. stigma* the fine scaling may extend over the dorsal surface while it is limited to the lower one-half of the lateral surface of the sixth tergum in *E. tomici*.

50. *Eurytoma appendigaster* (Swederus)

MAP 23

Pteromalus appendigaster Swederus, 1795, p. 217.

Eurytoma appendigaster (Swederus), Dalman, 1820, pp. 13–14 [designated by Dalman as genotype].—Muesebeck and Dohanian, 1927, pp. 20, 21.—Allen, Holloway and Haeussler, 1940, pp. 1–61.—Peck, 1951, p. 575.—Claridge, 1959, pp. 4–6.

Types: Swederus types nonexistent (see below). Neotype female in the collection of the Naturhistoriska Riksmuseum, Stockholm.

Type locality: Uncertain.

Distribution: Canada: Ontario, New Brunswick.

Host: *Macrocentrus ancyliivorus* Rohwer, *Apanteles solitarius* (Ratzeburg), *Cremastus minor* Cushman.

Additional localities: Specimens in the collection of the Department of Agriculture, Ottawa, Canada. Vineland, Ontario, host *Macrocentrus ancyliivorus*, *Cremastus minor*. McAdam, N.B., from *Apanteles solitarius*. Moncton, *Apanteles* cocoons. Vineland, Ontario, host *Lasperyresia* (= *Grapholitha*) *molesta* (Busck).

Remarks: The status of *Eurytoma appendigaster* in the United States is uncertain. It is listed by Peck (1951) as occurring in New England, New Jersey, Pennsylvania, and Wisconsin, but I have been unable to verify these localities. I have not recognized the species in my own extensive collection of eurytomids and the only material that I feel sure of in the U.S. National Museum collection is from Europe. The only specimens that seem to fit *E. appendigaster* are in the collection of the Department of Agriculture, Ottawa, Canada.

M. F. Claridge (1959) states that there is no Swederus material of this species existent, but there is material of Boheman, who probably saw the original material. He sent me one of Boheman's specimens and a specimen that Claridge himself had determined as *E. appendigaster*. I have also seen some specimens in the U.S. National Museum collection that A. B. Gahan compared with Boheman's specimens and determined as *E. appendigaster*. There are several characteristics that stand out in the material mentioned above. The male antenna are distinctly seven segmented with segment six separated from seven by a short petiole. All of the males of North American species of *Eurytoma* that I have seen have segments six and seven either closely fused or separated by a shallow annulation, not by a distinct petiole. The female has the sculpturing reduced on the long sixth abdominal segment, so that it is limited to the lower anterior third of the lateral surface. The umbilicate punctures on the mesonotum are large, close together, and the ridges between them are not sculptured but are smooth and shiny. The first segment of the antenna is longer than wide, at least twice as long as wide. The redescription by Claridge (loc. cit.) does not mention some of the characteristics listed above. He does, however, pick a neotype female from the Boheman collection.

The species is included in this revision because of the specimens in the collection of the Department of Agriculture, Ottawa, Canada.

51. *Eurytoma seminis* Bugbee

MAP 24

Eurytoma seminis Bugbee, 1941, pp. 98-102.—Peck, 1951, p. 578.

Types: 15 females and 8 males; holotype female, male, and female

paratypes in the U.S. National Museum (USNM 58244); paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Hays, Kans.

Host: Phytophagous in the seeds of *Schmaltzia* = (*Rhus*) *trilobata* (Nuttall).

Distribution: United States: Kansas, Oklahoma.

Remarks: The lack of black infuscation on the tibiae of the legs and the reddish-brown to yellow scape of the antenna are additional characteristics to look for in this species.

52. *Eurytoma altifossa*, new species

FIGURES 21, 23; MAP 23

Female: Black except for yellow fore- and midtibiae, extremities of hindtibiae and all femora, scape of antenna, and wing veins. Average in length 3.4 mm. (3.2–3.8). Abdomen globular and plump with only slight lateral compression; sixth tergum about $1\frac{1}{2}$ times the length of the fifth; sculpturing of fine, shallow punctations covers all of lateral surface of sixth tergum and extends over dorsal surface on anterior half; covers most of lateral and dorsal surfaces of all other abdominal terga; ninth tergum short and stubby, averaging .14 mm. (.12–.17) in length. Internal genitalia with broad dorsal valves for horizontal length and their color is black; very little dorsal extension anteriorly, of dorsal and ventral valves, so that stylet arch is close to a horizontal plane; average length of genitalia 1.5 mm. and average height .75 mm.; thus height is about half of length. Propodeum broad with a shallow concavity in center of which is a deep, narrow, complete median furrow that narrows gradually toward base; central carina in upper third; large lateral areas. Antenna filiform; flagellum with five truncate segments distally; sixth separated from seventh by a distinct annulation, terminal unit of two closely fused segments. Legs may have fore- and midtibiae yellow or with slight, light-brownish infuscation on middle of outer surface; same on hindtibiae; darker brown infuscation toward base of fore- and midfemora and on middle of hindfemora. Wing veins linear; marginal slightly longer than postmarginal; marginal averages .30 mm. (.25–.37) and postmarginal averages .25 mm. (.17–.30); stigmal club rectangular.

Male: Color much the same as in female except that color of the legs is darker and more extensive. Average length 2.4 mm. Relation of wing veins as in the female but average slightly shorter.

Types: 5 females and 1 male. Holotype female, allotype, and paratypes in the collection of the Department of Agriculture, Ottawa, Canada and paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Aweme, Manitoba. Collected June 10, 1929, by R. M. White. Paratypes collected June 12, 13, 16, and Aug. 13, 1929.

Host: From galls on *Oxytropis lamberti*. Host relationship not stated.

Distribution: Known only from the type locality.

Remarks: This new species resembles *Eurytoma crassa*, new species, in its plump, globular abdomen and extensive sculpturing of the abdominal terga. It differs, however, in the complete, narrow median furrow on the propodeum, the shorter postmarginal vein in relation to the marginal, and the lack of as dark and extensive infuscation on the legs.

53. *Eurytoma crassa*, new species

FIGURES 16, 25; MAP 24

Female: Black. Length averages 3.4 mm. (3.1-3.8). Abdomen plump; oval from a lateral view; averaging 1.9 mm. (1.7-2.0) in total length; most often whole surface of segments four through eight covered with fine punctations; less often sculpturing reduced on dorsal surface of sixth to a narrow band covering anterior half of surface; ninth tergum broad and pointed, averaging .19 mm. (.15-.22) in length and usually in line with horizontal axis of the abdomen. Internal genitalia with broad and stout dorsal valves for horizontal length anterior to concavity behind exposed tip; dorsal and ventral valves turn dorsally, anteriorly, at slightly less than a right angle; stylet arch in an oblique plane; length of genitalia averages 1.8 mm. (1.7-2.0) and height averages .98 mm. (.92-1.0); anterior dorsal expanded plate of ventral valves, narrow, maintaining same width or narrowing slightly at top. Propodeum broad, shallowly concave, without a median furrow, or an indication of one in dorsal third only; rest of surface covered with irregular ridges with fine punctations between. Tegula black. Antenna with the scape most often entirely black; less often with yellow base; flagellum filiform; segments one to five longer than wide; six closely applied to seven but distinguished from it by a shallow annulation. Legs with black infuscation on all femora and tibiae. Wing veins yellow; marginal and postmarginal linear; marginal averages .26 mm. (.22-.30) in length and postmarginal averages .27 mm. (.27-.32); thus the postmarginal is most often longer than the marginal, less often equal to it in length; stigmal club small and narrowly rectangular in shape.

Male: Black. Averages in length 2.0 mm. (1.5-2.8). Abdomen may be covered with fine, delicate punctations over entire surface, or sculpturing extends over two-thirds of lateral surface of sixth segment

only, leaving dorsal surface smooth and shiny. Propodeum may have a complete wide median furrow that maintains same width from top to bottom. Wing vein relationships and color of the legs same as in the female.

Types: 6 females and 1 male. Holotype female in the U.S. National Museum (USNM 66058); paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Gosport, Ind. Holotype collected on Mar. 28, 1933; emerged May 30, 1933. Paratypes collected on Mar. 28 and Apr. 3, 1933; emerged May 30 and June 1, 1933.

Host: Bred from dipterous gall on Ragweed (*Ambrosia* species). The gallmaker is believed to be a species of *Trypetidae*.

Additional hosts records include *Trypeta* (= *Callachna*) *gibba* Loew, and *T.* (= *Aciurina*) *notata* Coquillett.

Distribution: Eastern half of the United States, from Illinois, Ohio, and Indiana, south to Louisiana and west to Texas and New Mexico.

Remarks: The most likely hosts of this new species seem to be dipterous gallmakers of the family *Trypetidae* and *Ortalidae*.

This species differs from *E. tylodermatis* and *E. pini* in having a broader, shallow, concave propodeum with a wider median furrow that is indicated dorsally only; in other specimens the median furrow may be lacking entirely, and the surface may be covered with fine, even punctations dorsally and irregular horizontal ridges ventrally; postmarginal vein is usually longer or equal in length to the marginal, seldom shorter; the extensive reticulation of the abdominal segments, especially the sixth, which may be completely covered or reduced to a narrow band on the anterior half of the dorsal surface.

54. *Eurytoma terrea* Bugbee

MAP 25

Eurytoma terrea Bugbee, 1951, pp. 238-240.—Burks, 1958, p. 82.

Types: 7 females. Holotype female in the U.S. National Museum. Paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Ashland, Oreg.

Distribution: Oregon.

Host: *Diplolepis polita* (Ashmead) var. on *Rosa* species.

Remarks: Additional characteristics that will help to define this species include: black tegula and scape; black infuscation on femora and tibiae of all legs; broad dorsal valves of the female genitalia that turn dorsally, anteriorly, only slightly with ventral valves, so that stylet arch is in a horizontal plane.

55. *Eurytoma incerta* Fullaway

MAP 16

Eurytoma incerta Fullaway, 1912, pp. 274-282.—Bugbee, 1951, pp. 234-238 [re-description].—Peck, 1951, p. 576.—Burks, 1958, p. 81.

Types: 4 females and 1 male in collection L.S.J.U. (lot 499, specimen 23). Types could not be located under the above number and must be presumed lost. Neotypes: Junction City, Oreg., Apr. 9, 1920, from *Diplolepis neglectus* on *Rosa* species Kinsey collected. In addition, there are 22 females and 20 males in the U.S. National Museum and in the Bugbee collection, Meadville, Pa.

Neotype locality: Junction City, Oreg.

Distribution: United States: Oregon, California. Canada: Saskatchewan.

Host: *Diplolepis neglectus* (Gillette) (= *D. tuberculatrix* (Cockerell)), *D. polita* (Ashmead) variety and *D.t. descansonis* Kinsey and Ayres, on *Rosa* species.

Subspecies: Description in Bugbee, 1951. *Eurytoma incerta varia* Bugbee. California.

Host: *Diplolepis tuberculator descansonis* Kinsey and Ayres.

Remarks: *Diplolepis neglectus* galls are indicated as being modified inquiline inhabited galls of *D. tuberculatrix* (Kinsey and Ayres, 1922). The actual host then is an unknown inquiline cynipid species rather than the true gallmaker.

Eurytoma incerta is the equivalent of *E. acuta* of the east. It runs smaller in all its measurements, the propodeal median furrow is narrower and deeper, and the scape of the antenna is most often all black.

56. *Eurytoma stigni* Ashmead

MAP 26

Eurytoma stigni Ashmead, 1895, p. 271.—Peck, 1951, p. 578.

Types: Type series consists of 2 females and 3 males, no. 25507, U.S. National Museum. One female specimen is labelled and designated as lectotype.

Type locality: Los Angeles, Calif.

Distribution: United States: California, Oregon.

Host: *Stigmus inordinatus* Fox (Ashmead, 1895).

Remarks: See *E. tomici*.

57. *Eurytoma sciromatis* Bugbee

Eurytoma sciromatis Bugbee, 1962, pp. 346, 347.

Types: 10 females and 5 males. Holotype female and allotype male in the U.S. National Museum. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Watson, La. Holotype collected Feb. 23, 1962, by S. J. Barras.

Paratypes collected Feb. 23 and Mar. 14, 1960 by S. J. Barras.

Host: Bred from cankers on loblolly pine (*Pinus taeda*) and slash pine (*P. elliotti*) caused by *Cronartium fusiforme*.

Distribution: United States: Louisiana and Georgia.

Remarks: The exact host relationships of this species are not known (see discussion, Bugbee, 1962).

53. *Eurytoma tylodermatis* Ashmead

FIGURE 30; MAP 25

Eurytoma tylodermatis Ashmead, 1896, p. 218.—Gahan, 1932, p. 738 [places *Bruchophagus herrerae* Ashmead as synonym of *E. tylodermatis*].—Pierce, 1907, pp. 39–44; 1908a, pp. 1–53; 1908b, pp. 117–122; 1908d, pp. 380–396.—Chittenden, 1908, pp. 29–32; 1911, pp. 85–93.—Cushman, 1911, pp. 489–510.—Pierce, Cushman, and Hood, 1912, pp. 9–99 [list of weevil hosts].—Dickerson and Weiss, 1920, pp. 32–74.—Myers, 1927, pp. 241–244.—Fenton and Dunham, 1929, pp. 66–68.—Parker and Lamerson, 1934, pp. 90–95.—Putman, 1935, pp. 105–109.—Beacher, 1947, pp. 530–544.—Peck, 1951, p. 579.
Bruchophagus herrerae Ashmead, 1902, p. 324.

Female: Black. Length averages 3.9 mm. (3.6–4.8). Abdomen, from the side, narrowly oval or conical; lateral compression slight; averaging 2.2 mm. (1.8–2.6) in length; sixth segment long, averaging .78 mm. (.70–.90) at widest point; sculpturing on lateral surface of sixth tergum heavy ventrally, continues dorsally for about one-half to two-thirds of surface and then fades out so that dorsal surface is smooth and shiny. Valves of ovipositor usually in line with the horizontal axis of abdomen. Ninth tergum short to moderately elongate, broad and somewhat bluntly pointed; averaging .19 mm. (.12–.25) in length. Internal genitalia with very little dorsal extension of valves anteriorly; dorsal valves mediumly broad for horizontal length turning dorsally with ventral valves at much less than a right angle; stylet arch in a horizontal to oblique plane; whole structure averages 1.5 mm. (1.4–1.8) in length and .75 mm. (.62–.87) in height; thus height is half of length or length equal to about twice the height. Tegula black. Propodeum with a wide, shallow concavity and a narrow and deep, to wide and shallow, usually complete median furrow; furrow widest at top and narrows ventrally; lateral areas with rough punctations between fine irregular ridges; median carina in furrow in upper one-third to one-half only; lateral carinae usually discernible to base. Antenna filiform; the scape all yellow or dark brown to black except yellow base; flagellum often with segments one to five longer than wide, moniliform, or segments four and five may be almost square; segment six separated from seven by a distinct annulation but not as truncate as proximal segments; whole structure appears short and

stocky. Legs may have dark brown to black infuscation on all femora and tibiae or may be all yellowish brown; most often some infuscation medially on hindfemora and tibiae; all coxae black or deep reddish brown. Wing veins yellow to yellowish brown; marginal linear to about twice the width of postmarginal; marginal averages .36 mm. (.30-.42) and postmarginal averages .28 mm. (.22-.37) in length; thus marginal is always longer than postmarginal; stigmal club small and more or less rectangular in shape.

Males: Black. Length averages 3.4 mm. (3.0-4.0). Scape of antenna most often black; less often base of scape with varying amounts of yellow or yellowish brown. Legs variable; may be black to dark-brown infuscation on all femora and tibiae; less often infuscation on hindfemora only or legs all yellowish brown. Wing veins brown to brownish yellow; marginal vein averages .33 mm. (.27-.37) and postmarginal averages .24 mm. (.20-.27) in length.

Types: Lectotype female and allotype male, USNM 25503, Agriculture rearing number 113203. One additional female with Agriculture number 113202 in the U.S. National Museum collection, Washington, D.C. The first female cited above is labelled and designated as lectotype. Additional specimens used in connection with the redescription include 89 females and 29 males also in the U.S. National Museum collection.

Type locality: Rosslyn, Va., F. H. Chittenden.

Host: From the larva of *Tyloderma foveolatum* Say.

Distribution: Canada and the eastern two-thirds of the United States, Ontario, south to South Carolina and Louisiana and west to Texas and Arizona.

Remarks: In 1896 Ashmead described *Eurytoma tylodermatis* as a parasite of the "larva of a beetle, *Tyloderma foveolatum* Say." Additional determinations during the succeeding years have raised the number of hosts of *E. tylodermatis* to 56 or more (Peck, 1951, in Muesebeck et al., U.S. Dept. Agric. Monogr., no. 2).

This is due in part to Ashmead's description which is so general that it encompasses many species of the genus *Eurytoma*. Furthermore, his description was based on two females and one male specimen only, which was not enough material to give an adequate picture of the range and limits of variation of the species.

In 1951 the U.S. National Museum loaned me all the specimens which had been accumulating in their collection of Hymenoptera for many years under the label of *E. tylodermatis*. A study was made of the material plus specimens in my own collection amounting altogether to about 4000 individuals. Even this number was not enough to give an adequate picture of the geographical distribution, or the range of variation of the several species in the complex. Many

collections consisted of only one or two specimens. Too often the host was not indicated or only the host plant was named from which the parasite was bred. Exact relationships of host and parasite, therefore, were impossible to determine in many cases.

The results of this study must be considered as only tentative. The need for more material from additional localities, plus more exact determinations of host relationships, will lead to clearer definitions of the species of the complex in the future. Nevertheless the importance of these parasites, occurring as they do on many hosts of economic importance, makes it necessary to make some attempt to put the classification of the parasites on a more realistic basis. The redescription is based on the holotype female, allotype male, and an additional series of 7 females in the U.S. National Museum collection, Washington, D.C.

This species has its closest affinities with the *Eurytoma pini*, *E. diastrophi*, and *E. bolteri* group of species. The whole complex is probably associated with the larvae of weevils and small moths that live in stems of various species of plants. They act as either primary or secondary parasites. Hosts listed for the specimens of *E. tyloder-matis* examined include: *Trichobaris texana*, which is reported to occur in stems of *Solanum rostratum*; *Lixus scrobicollis* in stems of *Ambrosia trifida* (Pierce, 1908 a, b, and c; Pierce, Cushman and Hood, 1912); *Tyloderma foveolatum* in the stems of *Oenothera biennis*; *Mompha eloisella* also in stems of *O. biennis*. Additional possibilities reported in the literature include *Trichobaris trinotata* in *Solanum carolinense* (Chittenden, 1911) and *Lixus musculus*, in *Polygonum pennsylvanicum* (Pierce, 1907); *Coleophora malivorella* and *Trichobaris rostratum*.

59. *Eurytoma gossypii*, new species

MAP 26

Female: Black. Length averages 4.2 mm. (3.8–4.6). Abdomen plump and oval in lateral view; averages 2.2 mm. (1.9–2.4) in length; long sixth abdominal segment averages .68 mm. (.62–.75); surface of sixth covered by fine shallow pitting which covers all of lateral surface for lower half to three-fourths, then sculpturing recedes toward anterior margin and may continue over dorsal surface in a narrow band. Ninth tergum, mediumly long and pointed; averages .26 mm. in length (.25–.30); anterior half naked and with finely shagreened or smooth surface; posterior half with shallow pits and covered with white pile. Internal genitalia average 2.1 mm. in length; in height 1.2 mm.; anterior expanded plate of dorsal valves averages .20 mm. in width at widest point; dorsal and ventral valves bend dorsally, anteriorly, at about a right angle and stylet arch is in

an oblique plane; dorsal valves broad for posterior two-thirds. Propodeum narrow; deeply concave; median furrow, if present, wide and indicated in upper one-quarter to one-third only; lateral surfaces roughly pitted and center crossed by fine horizontal irregular carinae; flat carina across top center bends ventrolaterally; shallow rectangular depression at base. Tegula black to dark brown. Antenna with the outer face of scape yellowish brown; whole structure short and stocky; segments truncate on distal ends; first segment longer than wide; two to five almost square; last three closely fused to form a bluntly pointed terminal unit. Legs reddish brown on base of forefemora and reddish brown to black medially on hindfemora; apices yellow; tibiae yellowish brown. Wing veins light yellow and thin; marginal and postmarginal veins usually equal in length; marginal averages .29 mm. (.27-.32); postmarginal averages .29 mm. (.25-.35).

Male: Black. Length averages 3.0 mm. (2.6-3.5). Scape usually with lower half yellowish brown and upper half black or dark brown; antenna with first five segments pedicellate; six and seven closely united; first segment longer than wide and covered with long hairs; two to five shorter, though still slightly longer than wide and each with two whorls of long hairs. Legs with dark brown on all femora and tibiae; knees and apices yellowish brown. Wing veins yellow and marginal and postmarginal veins equal in length, marginal averages .26 mm. (.25-.27); postmarginal averages .26 mm. (.25-.30).

Types: 6 females and 5 males. Holotype female and allotype male in the U.S. National Museum (USNM 66059). Paratypes in Bugbee collection, Meadville, Pa.

Type locality: Arlington, Tex. Holotype female collected Aug. 6, 1908, by F. C. Bishop. Male and female paratypes bred Aug. 14-21, 1908.

Distribution: Its range will probably correspond to that of its host *Anthonomus grandis*, the cotton-boll weevil, although this study included specimens from Texas, Oklahoma, and Louisiana only. Fenton and Dunnam (1929) record a species determined as *E. tylodermatis*, which could be this species, from Florence, S.C., and Pierce, Cushman and Hood (1912) list *E. tylodermatis* as a cotton-boll weevil parasite from Arkansas, Louisiana, Oklahoma, Texas, and Mexico.

Host: Parasite of *Anthonomus grandis* Boheman, the cotton-boll weevil.

Remarks: This species seems to be close to *E. pini* in the equal length of the marginal and postmarginal veins, the fine pitting on the surface of segment 6 of the abdomen, which extends as a narrow band over the anterodorsal surface, and the short, stocky antenna with segments 2 to 5 approximately square.

It may be distinguished from *E. pini* by the broad dorsal valves of the female genitalia; the narrower, more deeply depressed propodeum; lack of brown infuscation on the yellowish tibiae; and the shorter but equal lengths of the marginal and postmarginal veins.

The importance of this parasite in reducing the number of the boll weevils is considerable. Fenton and Dunnam (loc. cit.) found it third in importance to *Microbracon mellitor* (Say) and *Catolaccus hunteri* Crawford, at Florence, S.C. Pierce (1910) believes that it occurs most often as a primary, ectoparasite of the larvae of *A. grandis*. He also believed (Pierce 1908a) that this species, which he knew as *E. tylodermatis*, had several alternate hosts including *Lixus scrobicollis* in the stems of *Ambrosia trifida*. In several ways this species is close to *E. tylodermatis* which has been bred from *L. scrobicollis*, but the characteristics listed above will separate them. *L. scrobicollis* is a native weevil while the cotton-boll weevil was introduced from Central America, and it seems to be almost exclusively confined to cotton as its host. Furthermore, the weevil passes through 3 to 5 generations a year thus providing ample stages for the parasite to oviposit on, and a need for alternate hosts seems quite unlikely.

The sex ratio favors the females, as Pierce (1908b) found the percentage of males in his rearings to be 35.4%. Pierce, Cushman, and Hood (1912) report a sex ratio of 64.9% females to 35.1% males.

60. *Eurytoma squamosa*, new species

FIGURE 20; MAP 27

Female: Mostly black. Averages 2.2 mm. (2.0–2.6) in length. Abdomen oval from a lateral view and quite plump; averaging 1.1 mm. (1.0–1.3) in length; terga two through eight heavily sculptured laterally, becoming lighter over dorsal surface; sixth tergum, laterally and dorsally as long or longer than four and five combined; ninth tergum short and stubby, averaging .08 mm. (.07–.10) in length. Internal genitalia short and widely spread; average 1.3 mm. (1.2–1.5) in length and .65 mm. (.57–.75) in height; thus the height is equal to half the length; dorsal valves broad for horizontal length and black; dorsal and ventral valves turn dorsally, anteriorly, only slightly at much less than a right angle; stylet arch in a horizontal plane. Propodeum concavity broad, wide and shallow; median furrow indicated dorsally by barely discernible lateral carinae that converge and fade out entirely about the middle of propodeum; area below median furrow and lateral areas finely and evenly punctate with a few fine horizontal ridges among punctations. Tegula dark brown to black. Scape of antenna black or yellow; pedicle not less than three-quarters the length of the first funicle joint, that is, slightly longer than wide;

rest of funicle joints approximately square. Legs with black to dark-brown infuscation on all femora and tibiae, except yellow foretibiae in a few. Wing veins brownish yellow; marginal vein broad, especially toward distal end; postmarginal vein linear; marginal vein only slightly longer, averaging .19 mm. (.17-.22) in length, than the postmarginal which averages .17 mm. (.17-.20).

Male: Mostly black. Averages 1.8 mm. (1.7-1.9) in length. Abdomen with fine sculpturing over entire surface. Legs with black infuscation on all femora and tibiae. Scape of antenna black; flagellum with five pedicellate segments and a terminal unit of two closely fused segments. Wing veins brown; marginal vein broad, averaging .19 mm. and postmarginal averages .16 mm. in length.

Types: 49 females and 3 males. Holotype female, allotype male, and paratypes in the U.S. National Museum collection (USNM 66060). Paratypes in Bugbee collection, Meadville, Pa.

Type locality: Ventura County, Calif. Holotype female collected Jan. 11, 1941, lot 41-594. Paratypes collected Jan. 11, 1941, lot 41-594, from Pleasanton, Calif.

Distribution: United States: California, Idaho, Washington.

Host: Bred from seeds of *Ceanothus divaricatus*.

Additional host species: *C. thyraiflorus*, *C. cordulatus*, *C. velutinus*, and *C. sanguineus*.

Remarks: This new species is apparently phytophagous within the seeds of several species of *Ceanothus*. It seems to be closely related to the phytophagous seed infesting species (*Eurytoma rhois* Crosby and *E. seminis* Bugbee) in sumac. The sixth abdominal tergum that is longer than four and five combined, and the short stubby ninth tergum, averaging .08 mm. in length will distinguish this species from *E. seminis*, while the plump abdomen with the more extensive sculpturing of the sixth tergum will separate it from *E. rhois*.

61. *Eurytoma calycis* Bugbee

MAP 27

Eurytoma calycis Bugbee, 1961, pp. 33, 34.—Thomas and Herdy, 1961, pp. 34-39.

Types: 27 females and 28 males. Holotype female, allotype male, and paratypes in the collection of the Canada Department of Agriculture, Ottawa, Canada. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Black Sturgeon Lake, Ontario, Canada. Emerged July 2, 1958, J. B. Thomas collection, vial 4, no. 6, lot 59-153. Paratype specimens from the same locality, collected by J. B. Thomas on June 13, 1956, 2 females and 2 males; July 2, 1956, 1 female; emerged June 4-25 and July 2-4, 1958, 24 females and 11 males; June 1958,

15 males. All specimens except those collected in 1956 from vial 4 or 5, nos. 1, 2, 3, 4, 5, 6, 7; lot 59-153.

Distribution: Canada: Ontario.

Host: Phytophagous in the buds of jack pine (*Pinus banksiana*).

Remarks: This species is close to *E. squamosa* in its size relationships, short ninth tergum, sculpturing of the abdomen, color of the legs, and phytophagous habit. It differs, however, in the shallow, complete median furrow and the rougher sculpturing of the lateral areas, the more dorsally produced female genitalia, and the different host.

62. *Eurytoma pini* Bugbee

MAP 27

Eurytoma pini Bugbee, 1958b, pp. 197-200.—Watson and Arthur, 1959, pp. 478-484.—Miller, 1959a, pp. 768, 769.

Types: Holotype female, allotype, and paratypes in the U.S. National Museum (USNM 66025). Paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Washington, D.C., A. D. Hopkins collection.

Host: *Rhyacionia rigidiana* (Fernald), *R. buoliana* (Schifferrmüller), and *R. frustrana* (Comstock) on *Pinus sylvestris* and *P. banksiana*. Additional hosts from labels on determined specimens in the U.S. National Museum and Bugbee collections: *Acrobasis rubrifasciella* (Peck). *Eucosoma scudderiana* Clemens. *Pectinophora gossypiella* (Saunders). *Thyridopteryx ephemeraeformis* (Haworth). *Epiblema strenuana* (Walker). *Cremastus cookii* Weed.

Distribution: Throughout the pine-growing regions of Canada and the United States from southern Quebec, Ontario, Manitoba, Saskatchewan, and British Columbia south to Maryland, Virginia, Missouri, and Nebraska.

Remarks: For more complete details of host relationships, see Bugbee (1958). This important parasite has been confused for many years with *Eurytoma tylodermatis* Ashmead. It differs from *E. tylodermatis*, however, in averaging larger (4.5 mm.); presence of more extensive sculpturing on the sixth abdominal tergum; longer ninth tergum (averaging .28 mm.); narrow horizontal portion of the dorsal valves and the lack of a well-defined, complete median furrow on the propodeum.

63. *Eurytoma baccae*, new species

FIGURE 26; MAP 28

Female: Black. Averages in length 3.2 mm. (3.0-3.7). Abdomen oval; lateral compression medium; abdomen averages in length 1.8 mm. (1.6-2.5); sixth segment averages .57 mm. (.50-.62); three-quarters of its lateral surface covered with fine, shallow punctations

which recede dorsally toward anterior margin and continue over dorsal surface in a narrow band; ninth abdominal segment elongate and sharply pointed, averaging .20 mm. (.17-.22) in length. Internal genitalia dorsally extended, anteriorly, so that both dorsal and ventral valves turn dorsad at approximately a right angle in relation to horizontal length; stylet arch in an oblique plane or halfway between a horizontal and vertical plane; dorsal valves not broad, mediumly narrow for horizontal length; whole structure averages 1.6 mm. (1.5-1.7) in length, 1.1 mm. (1.0-1.1) in height. Propodeum concave; faint, wide median furrow sometimes indicated by lateral carinae in dorsal half only or often lacking; lateral areas irregularly punctate and ridged. Tegula black. Scape variable, all black or dark brown except base, or outer face all yellowish brown; flagellum short and stocky; first segment longer than wide; segments two to five becoming progressively shorter so that five is approximately square; six to eight closely grouped, although six is separated from seven by a shallow annulation; flagellum same diameter throughout length, and segments one to five truncate distally. Legs with black to dark brown on all femora and tibiae except sometimes yellowish brown foretibiae; knees and apices yellowish brown. Wing veins yellow and narrow to linear; marginal either longer than postmarginal or equal to it in length; marginal averages .27 mm. (.25-.32) in length and postmarginal averages .24 mm. (.22-.25); stigmal club small and rectangular in shape.

Male: No males in the type series. Two male specimens from Glen Burnie, Md., appear to belong to this series.

Types: 4 females. Holotype female and paratypes in the U.S. National Museum collection (USNM 66061); additional paratypes (3 females and 2 males) in the Bugbee collection, Meadville, Pa.

Type locality: Wathena, Kans., emerged July 3-11, 1939, P.G. Lamerson collection.

Distribution: United States: Kansas, Maryland.

Host: Parasite (external on larvae) of the Strawberry Leafroller (*Ancylis comptana* (Frolich)), and hyperparasite (?) of *Cremastus cookii* Weed, a primary parasite of the Strawberry Leafroller.

Remarks: This species can be distinguished from *E. pini* by its more dorsally produced genitalia that turn dorsad anteriorly, at almost a right angle; its smaller size; shorter marginal and postmarginal veins; and the short, stocky antenna with the segments of the flagellum truncate distally.

The host is a native of Europe; it was introduced into the United States and is now quite widespread. According to Peairs and Davidson (1956, p. 495) it is "present over a large part of the United States, from the Mississippi Valley eastward."

64. *Eurytoma rhois* Crosby

MAP 28

Eurytoma rhois Crosby, 1909, p. 52; 1909, pp. 369, 385-388.—Gahan, 1922, p. 42.—Bridwell, 1923, p. 262.—Bugbee, 1939, pp. 415-427; 1941, p. 101.—Peck, 1951, p. 578.

Types: Female holotype and male allotype, plus paratypes, in the collection of Cornell University, Ithaca, N. Y.

Type locality: Ithaca, N. Y.

Distribution: United States: New York, Washington, D. C., Pennsylvania, Ohio, Indiana, Tennessee, Arkansas, Missouri, Louisiana, Kansas, and Michigan.

Host: Phytophagous in the seeds of sumac, *Rhus typhina*, *R. glabra*, and *R. copallina*.

Remarks: This widespread species occurs wherever its host, sumac species, are found. The oval abdomen with the sixth tergum equal in length to four and five combined, the reduced sculpturing on the lateral surface of the sixth, and its smaller size, will help to differentiate this species from *E. seminis* Bugbee.

65. *Eurytoma levo*, new species

MAP 29

Female: Black. Length averages 3.3 mm. (2.5-3.8). Abdomen averages 2.0 mm. (1.7-2.4) in length; plump with slight lateral compression; laterally and ventrally dark brown to rufous, shiny black dorsally only; oval from a lateral and dorsal view; sculpturing limited to lower half of segment six or less. Ninth tergum short and broad, averaging .15 mm. (.12-.17) in length. Internal genitalia with the dorsal valves mediumly narrow for horizontal length or the length of the exposed portion of the ninth tergum is about two-thirds the width of the dorsal valves at their widest point; dorsal and ventral valves turn dorsally, anteriorly, at less than a right angle; stylet arch oblique; whole structure averages 1.6 mm. (1.5-1.7) in length and 1.0 mm. (.09-1.1) in height; thus height averages 62 percent of the length. Tegula dark brown. Propodeum broad; shallowly depressed; wide median furrow indicated dorsally by lateral carinae for about one-half or less of length; surface of furrow crossed by irregular horizontal ridges; deep pit absent at base of propodeum; lateral areas narrow; dorsal carina flat across top of furrow. Antenna filiform, with the scape yellowish brown and flagellum dark brown; segments of funicle moniliform, longer than wide; legs with dark-brown to black infuscation on all femora; dark brown on middle of mid- and hindtibiae and often on foretibiae; knees and apices yellow and foretibiae may be also; medial and outer faces of forecoxae may be yellowish brown. Wing

veins yellow; marginal broader than postmarginal; marginal averages .26 mm. (.25-.30) and postmarginal averages .26 mm. (.22-.30) in length; thus marginal and postmarginal often equal in length; stigmal club small and rectangular in shape.

Males: There are only two males in the series that are curled up so that a true measurement of their length cannot be made. Probably averages 2.18 mm. in length. Abdomen shiny black to very deep brown. Tegula dark brown. Scape of antenna black except base which may be yellowish brown. Legs with black or dark brown on all femora and tibiae; apices and knees yellowish brown. Wing veins much the same as in the female; marginal averages .25 mm. and postmarginal .23 mm. in length.

Types: 6 females and 2 males. Holotype female, allotype male, and paratypes in the U.S. National Museum (USNM 66062); paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: King and Queen Co., Va. Collected June 5 and 8, 1940. L. A. Hetrick collection.

Distribution: United States: Known only from Virginia.

Host: Parasite of pine xyelid gall.

Remarks: The marginal vein is broader than the linear postmarginal and the two veins are most often equal in length. The female genitalia are short in relation to the height and the dorsal valves are narrow for their horizontal length. Scape and tegula are yellowish brown.

66. *Eurytoma crassineura* Ashmead

MAP 29

Eurytoma crassineura Ashmead, 1894, p. 324.—Schedl, 1932, pp. 1, 2.—Peck, 1951, p. 576.

Types: U.S. National Museum no. 25508. Type series consists of 6 females and 3 males of which 1 female has been labeled and designated as lectotype.

Type locality: Morgantown, W. Va. from *Scolytus rugulosus* Ratzeburg.

Distribution: United States: Virginia, West Virginia, Ohio, Washington, D.C., New York, North Carolina, Idaho, Oregon, Colorado. Canada: Quebec, Ontario, Nova Scotia.

Host: Scolytid larvae in plum, cherry, and apple (Ashmead, 1894). *Scolytus rugulosus* Ratzeburg in peach (Ashmead, 1894). *Magdalis armicollis* Say in elm (record from U.S. National Museum collection).

Remarks: The rectangular-shaped abdomen, very broad dorsally, with the long sixth abdominal tergum that often covers the seventh tergum and that lacks sculpturing except at the extreme ventral, anterior edge, help to distinguish this species. In addition, the

slightly longer petiole that has its width about equal to its length, the broad postmarginal vein that is usually twice the length of the marginal, the very weakly developed female genitalia with widespread and broad dorsal valves, and the stylet arch in a horizontal plane make this species quite distinct.

67. *Eurytoma parva* Phillips

MAFS 30, 35

Eurytoma bolteri var. *parva* Phillips, 1918, pp. 11, 14.—Gahan, 1933, pp. 1-147.

Eurytoma bolteri Riley *parva* Girault, 1920, pp. 207, 208.

Eurytoma parva Phillips, 1927, pp. 743-758.

Eurytoma bolteri parva Peck, 1951, p. 575.

Types: Female holotype and 5 female paratypes in the U.S. National Museum, no. 23779.

Type locality: Warrenton, Va. Emerged 1917, W. J. Phillips collection, Webster no. 9350.

Distribution: United States: New York, Virginia, Indiana, Kansas, Ohio, Washington, D.C., Pennsylvania. Canada: Alberta, Saskatchewan.

Host: *Harmolita tritici* (Fitch) on wheat (Phillips, 1918 and 1927). *Lepidopterous* galls on *Solidago* (Girault, 1920).

Additional hosts: *Cephus cinctus* (Department of Agriculture collection, Ottawa, Canada).

Remarks: This species has never had a full description published. Phillips (1918) published a picture but did not give a description because he was using a manuscript name given the species by Girault. Girault's paper (1920) was delayed in publication and does not contain a description either but merely a reference to some specimens from Youngstown, Ohio, Front Royal, Va., Holliday, Utah, and Waterloo, N.Y., with a few notes on scape color, wing vein length, and on variation in the median channel of the propodeum. Thus the species is credited to Phillips. I have been unable to discover all the specimens that Girault mentions, but the three females from Falls Church, Va. (R. A. Cushman collection) from lepidopteran galls on *Solidago* have been determined by me as *Eurytoma bolteri* Riley. The type specimens in the U.S. National Museum, collected by Phillips, are quite different from *E. bolteri*. On the basis stated above, I doubt that *E. parva* has been bred from lepidopterous galls on *Solidago* as stated in Girault's paper.

In the description of *Eurytoma atripes*, Gahan (1933) points out that *E. atripes* and *E. parva* are very similar. He further suggests that the two species may be one and the same. He separates the two on the basis of the smaller size and the shorter funicle joints of *E. atripes*.

Both species are bred from wheat, but *E. atripes* parasitizes Hessian fly puparia (*Phytophaga destructor* (Say)) and *E. parva* destroys larvae of the wheat jointworm (*Harmolita tritici* (Fitch)). There are also records of both species having been bred from the larvae of the wheat stem sawfly (*Cephus cinctus* Norton). *E. atripes*, so far as I have been able to determine, has never been observed emerging from *H. tritici* larvae. Until suitable life-history studies are made that show that these two species of *Eurytoma* are either restricted to distinct hosts or will parasitize the same hosts, it seems best to treat them as two good species.

E. parva displays an additional characteristic that can be used to separate it from *E. atripes*. The propodeum has a wider median furrow with lateral and median carinae that extend ventrally about three-fourths the length of the propodeum before fading out. Below the furrow the surface is finely punctate.

68. *Eurytoma fusca*, new species

MAP 30

Female: Black. Length averages 2.1 mm. (1.8-2.9); abdomen plump; oval from a lateral view and with some lateral compression; length averages 1.4 mm. (1.2-1.6); sixth abdominal segment at longest point averages .47 mm. (.40-.55); fine pitting limited to lower anterior quarter of lateral surface of sixth; surface of rest of segment smooth; ninth abdominal segment short but sharply pointed, averaging in length .15 mm. (.12-.17). Internal genitalia short and weakly developed dorsally, anteriorly; dorsal valves narrow for horizontal length and bend dorsally at less than a right angle anteriorly; stylet arch in an oblique plane but only a little above a horizontal plane; whole structure averages 1.4 mm. in length, .73 mm. in height, and expanded dorsal extension of ventral valves averages .12 mm. in width. Propodeum only slightly depressed to flat; median furrow absent or indicated in upper one-half only; surface finely punctate; slightly arched dorsal carinae curves ventrally for about one-third length of propodeum and then fades out or turns laterally. Scape of antenna most often with outer face black to dark brown, except yellowish-brown base; less often lower half yellowish brown; rest black to dark brown; segments of flagellum slightly longer than wide; first the longest, two to five about equal, six to eight closely fused as a terminal unit. Legs most often with black to dark brown on all femora and tibiae; knees and apices yellowish brown; less often foretibiae all yellowish brown. Tegula often deep reddish brown. Wing veins straw yellow; marginal longer than postmarginal; marginal averages

.24 mm. (.20-.27) and postmarginal averages .18 mm. (.17-.20) in length.

Male: Black. Averages 1.6 mm. (1.1-2.1) in length. Scape with outer face black to dark brown. Black to dark brown on all femora and tibiae of legs, except for knees and apices which are yellowish brown. Wing veins light yellow; marginal averages .23 mm. (.20-.27) and postmarginal averages .18 mm. (.15-.22) in length.

Types: 8 females and 6 males. Holotype female, allotype male, and paratypes in U.S. National Museum (USNM 66063). Paratype specimens in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Crown Point, N. Y., July 19, 1934, O. H. Hammer collection.

Distribution: United States: New York, Kansas, Washington.

Host: Bred from apple curculio material, *Tachypterellus quadrigibbus* (Say), *T. q. magnus* List, and *T. consors* Dietz.

Remarks: This species is close to *Eurytoma mali*, new species, but can be separated from it by its much smaller size, more black to dark-brown infuscation on the legs, and the shallower more uniformly punctate propodeum.

It is probably a primary parasite of the apple curculio. Specimens which were determined as *Eurytoma tylodermatis* have been shown by Parker and Lamerson (1934) and Hammer (1936) to be external parasites of the larvae, pupae, and occasionally adults of *T. q. magnus* List and *T. quadrigibbus* (Say). Although this smaller species is bred from the Apple Curculio along with *E. mali*, and both species occurred in the same series, they can be easily separated by the characteristics mentioned above.

69. *Eurytoma iniquus* Bugbee

MAP 31

Eurytoma iniquus Bugbee, 1951, pp. 253, 254.—Burks, 1958, p. 81.

Types: Holotype female and allotype male in the U.S. National Museum, Washington, D.C. (USNM 61235). Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Manitou, Colo.

Distribution: United States: Colorado.

Host: *Diplolepis neglecta* (Gillette) (= *D. tuberculatrix*) on *Rosa* species.

Remarks: The short ninth tergum averaging .15 mm. in length, combined with the broad marginal vein in contrast to the linear postmarginal, and the narrow dorsal valves that turn at right angles dorsally, anteriorly, with the ventral valves so that the stylet arch is vertical, help to characterize this species.

70. *Eurytoma flavicrurensa* Bugbee

MAP 31

Eurytoma flavicrurensa Bugbee, 1951, pp. 258, 259.—Burks, 1958, p. 81.

Types: Holotype female in the U.S. National Museum (USNM 61238). Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Ashland, Oreg.

Distribution: United States: Oregon.

Host: *Diplolepis polita* (Ashmead) variety on *Rosa* species.

Remarks: This species differs from other eurytomids from rose galls in the yellow legs including the fore and midcoxae.

71. *Eurytoma longavena* Bugbee

MAP 35

Eurytoma longavena Bugbee, 1951, pp. 249, 250.—Burks, 1958, p. 81.

Types: 4 females and 3 males; holotype female, allotype male, and paratypes in the U.S. National Museum (USNM 61233). Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Terrace, B. C., Canada.

Distribution: Canada: British Columbia.

Host: *Diplolepis bicolor* (Harris) subspecies on *Rosa* species.

Remarks: The unusually long marginal vein that averages 1.4 times the length of the postmarginal and the long sixth tergum with the sculpturing reduced to the lower one-third of the lateral surface aid in differentiating this species.

72. *Eurytoma studiosa* Say

MAP 32

Eurytoma studiosa Say, 1836, pp. 272, 273.—Walsh, 1870, p. 299.—Ashmead, 1887, p. 195.—Townsend, 1894, pp. 102–104.—Bridwell, 1899, pp. 203–211.—Triggerson, 1914, pp. 1–34.—Viereck, 1916, pp. 520, 521.—Peck, 1951, p. 578.—Bugbee, 1956, p. 505.

Eurytoma succinipedis Ashmead, 1881, p. 31.

Eurytoma lanulac Fitch, 1859, pp. 781–854. [New synonymy].

Female: Mostly black. Length averages 2.6 mm. (2.3–3.2). Abdomen deep reddish brown to black; oval from a side view and broadly oval from a dorsal view indicating only slight lateral compression. Length of abdomen averages 1.3 mm. (1.3–1.5); long sixth segment equal to four and five combined and lateral surface finely scaled or pitted on lower half to one-third only. Ninth tergum mediumly elongate and pointed, averaging .13 mm. (.10–.17) in length. Internal genitalia with the dorsal valves narrow or mediumly wide for horizontal length; dorsal and ventral valves turn dorsally, anteriorly at less than a right angle, and expanded plate of ventral valves bends only slightly posteriorly; stylet arch and fulcral plate in an oblique rather

than a vertical plane; whole structure averages 1.5 mm. (1.4–1.9) in length and .98 mm. (.87–1.2) in height; thus the height averages about 65% of the length. Thorax black or with a deep reddish-brown tinge. Tegula brown to black. May be a few weak striae on lower part of face. Propodeum shallowly concave with a wide median furrow that may be complete to base; furrow may narrow toward base; central carina divides furrow into squares with largest at top; carina may be complete to base or fade out about halfway down; surface of squares shiny and smooth; large carinated pits dorsolateral to furrow; lateral areas with rough-pitted and ridged surfaces. Scape of antenna yellowish brown to black; flagellum distinctly 6-jointed; joints longer than wide but they become progressively shorter distally so fourth and fifth may be almost square. Legs with black or deep reddish-brown infuscation on all femora and mid- and hindtibiae or fore- and mid-legs yellow and hindlegs with infuscation only; coxae black or deep reddish brown. Wing veins yellow, linear; marginal always longer than postmarginal; averaging .29 mm. (.25–.37) in length and postmarginal averages .21 mm. (.17–.27); thus postmarginal is equal to about 72% of length of marginal.

Male: Black. Averages 2.2 mm. (1.8–2.6) in length. Tegula black or deep brown. Scape black or base may be yellow. Antenna with the flagellum seven segmented; first five segments truncate and pedicellate on distal ends and all about equal in length; six and seven closely applied together but separated by a shallow annulation. Legs with black infuscation on all femora and tibiae except forelegs in a few; coxae black. Petiole slightly longer than hindcoxa which averages about 85 to 90% length of petiole.

Neotype: Female, Bloomfield, Ind. Collected Oct. 18, 1936, by A. C. Kinsey; emerged May 5, 1937. In U.S. National Museum. In addition there are 18 female and 15 male specimens in the U.S. National Museum and in the Bugbee collection, Allegheny College, Meadville, Pa.

Host: Neotypes from *Acraspis pezomachoides* (Osten Sacken) on *Quercus alba*, Kinsey determined.

Range: The United States wherever oak occurs.

Additional host records from specimens in the study collections include: *Acraspis hirta*, *A. erinacei*, *A. macrocarpae*, *A. villosa*, *A. derivatus*, *A. ozark*, *A. gemmula*, *Andricus ignotus*, *A. cicatricula*, *A. flocci*, *Callirhytis elongata*, *C. clavula*, *C. seminator*, *Disholcaspis spongiosa*, *D. washingtonensis*, *D. quercus-globulus*, *D. succinipes*.

Remarks: The additional hosts indicated below were taken from the list compiled by Peck (1951, in Muesebeck et al., Monogr., no. 2, U.S. Dept. Agric.):

Rhabdophaga batatus Walsh, *R. brassicoides* Osten Sacken, *R. cornuta* Walsh, *R. strobiloides* Walsh, dipterous gall on *Leptilon canadense*, galls of *Euura nodus* Walsh, *E. salicis-ovulum* (Dalla Torre), *E. perturbans* (Walsh), *Nematus hospes* (Walsh), *Amphibolips spongifica* (Osten Sacken), *Callirhytis seminator* (Harris), *Diastrophus fragariae* Beutenmuller, *Dryocosmus palustris* (Osten Sacken), *Xanthoteras forticorne* (Walsh), *Mordellistena nigricans* (Melsheimer) in galls of *Eurosta solidaginis* Fitch, *Euura orbitalis* Norton, *E. salicicola* Smith, *Phylloxera caryae-fallax* Riley, *P. c.-globuli* Walsh, *Lasioptera solidaginis* Osten Sacken.

Eurytomid specimens from most of the above hosts were not encountered in the various collections studied so that I can vouch for only those detailed following the redescription of *E. studiosa*.

The majority of hosts belong to the gall-making genera, *Acraspis* and *Andricus* of the family *Cynipidae*.

E. studiosa is an extremely variable, wide ranging species with a wide selection of hosts. It probably contains several subspecies and might be separated into two or more species. The whole complex needs more detailed morphological and life-history studies so that accurate host data can be secured.

The original types of *E. studiosa* are believed lost. In the U.S. National Museum collection are several specimens determined by Ashmead as this species from Jacksonville, Fla. However, they do not seem to fit the original description too well. The original description is rather meager and so generalized that it could be applied to any number of eurytomid species. In one respect, however, Say's description is quite clear—that the color of the legs (i.e., femora and tibiae) is dark, except for the "whitish" tarsi. This is not much to go on, but the specimens determined by Ashmead and other specimens determined later by A. B. Gahan have yellow legs with at the most some light-brown infuscation on the femora and tibiae, as well as yellowish-brown fore- and midcoxae. Say's description also implies that the general coloration of the species is black. Many of the specimens in the collection of the U.S. National Museum have brown abdomens, yellow to brownish scapes and tegulae. In addition, Say's original specimens came from Indiana; and the neotype specimens from Bloomfield, Ind., bred from *Acraspis pezomachoides* on *Quercus alba*, seem to come closer to Say's description than any other material examined.

Ashmead (1887) lists *E. lanulae* Fitch, *E. teredon* Walker, *E. pythes* Walker, and *E. bolteri* Riley as synonyms of *E. studiosa*. *E. bolteri* Riley is a good species. I have been unable to check the two Walker species, so they are not included. *E. lanulae* is represented in the

U.S. National Museum by a single female whose characteristics fall within the range of variation of *E. studiosa* as limited in the revision.

73. *Eurytoma spongiosa* Bugbee

MAP 33

Eurytoma spongiosa Bugbee, 1951, pp. 254-257.—Burks, 1958, p. 82.

Types: 44 females and 16 males; holotype female, allotype male, and paratypes in the U.S. National Museum (USNM 61236). Paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Bloomington, Ind.

Distribution: United States: east of the Sierra Nevada mountains. Canada: Saskatchewan, Ontario.

Host: *Diplolepis rosae* (Linnaeus), *D. dichlocera* (Harris), and *D. tuberculator* (Cockerell) on *Rosa* species.

Subspecies: *Eurytoma spongiosa curvavena* Bugbee. Description, Bugbee (1951). Minnesota. Host: *Diplolepis multispinosa* (Gillette) (USNM 61237).

Remarks: *E. spongiosa* is the eurytomid parasite bred from the common mossy rose gall (*Diplolepis rosae* (Linnaeus)) on wild rose. Its small oval abdomen with only slight lateral compression, short sixth abdominal tergum that is about the same length as the fifth, black tegula, and its weakly developed female genitalia, anteriorly, with the stylet arch in a horizontal plane are distinguishing characteristics in addition to those given in the key.

71. *Eurytoma obtusa*, new species

FIGURE 28; MAP 31

Female: Black. Length averages 3.3 mm. (3.0-4.1). Abdomen plump; slight lateral compression; averages 1.9 mm. (1.8-1.9) in length, first segment, in lateral view, rises abruptly almost straight dorsad from petiole before curving posteriorly. Sixth segment, viewed laterally or dorsally longer than segments four and five together; averages .74 mm. (.70-.80) in length; sculpturing on lateral surface of sixth covers lower half to three-fourths then recedes anteriorly; does not extend over dorsal surface; ninth abdominal segment short and stubby, averaging .13 mm. (.12-.15) in length; fringe of hairs limited to tip and along ventral margin, covering posterior third to quarter of segment; rest naked; cercus close to ventral margin and oval in outline. Internal genitalia averages 1.7 mm. (1.6-1.8) in length, .97 mm. (.95-1.0) in height, and anterior expanded plate of ventral valves averages .18 mm. (.17-.20) in width at widest point; whole structure short but sturdy; dorsal valves wide for horizontal length except just anterior to exposed tips; dorsal and ventral valves turn dorsally, anteriorly at less than a right angle; stylet arch in an

oblique plane. Propodeum depressed and with a narrow, shallow, but distinct median furrow; widest at top; lateral carinae converging immediately below two large rectangular depressions at top of furrow; lateral to rectangular depressions; leading lateroventrally, are three or four pentagonal- or hexagonal-sided pits; below these, rest of lateral areas covered with fine small pits. Tegula black. Scape of antenna all yellowish brown or with upper tip dark brown; segments one to five of flagellum longer than wide and moniliform; segment six closely applied to segment seven but separated by a distinct annulation; six to eight form terminal unit; flagellum filiform. Legs all yellowish brown except black coxae and white tarsi or may be dark brown on base of forefemora and medially on hindfemora; wing veins thin, yellow in color; marginal averages .31 mm. in length (.30-.37) and postmarginal averages .25 mm. (.22-.27); thus the marginal is always longer than the postmarginal.

Male: Black. Averages 2.6 mm. (2.1-3.2) in length; scape of antenna with lower half to two-thirds yellowish brown, rest black; segments one to five pedicellate and slightly constricted; six separated from seven by a distinct annulation; all segments longer than wide; two to five with two whorls of long hairs. Legs light yellowish brown, except hindfemora which are brown or black medially; tarsi white. Marginal vein averages .29 mm. (.27-.32) in length and postmarginal averages .20 mm. (.20-.22).

Types: 7 females and 5 males. Holotype female, allotype male, and paratypes in U.S. National Museum (USNM 66064). Paratypes in Bugbee collection, Meadville, Pa.

Type locality: Haddon Heights, N.J., collected Aug. 8, 1931, by L. J. Bottimer.

Host: Bred from *Bruchus brachialis* Fahraeus in seeds of *Vicia villosa* (Hairy vetch).

Distribution: The host weevil (*B. brachialis*) of this species was introduced from Europe into the United States and first discovered at Haddon Heights, N.J. in June 1930 (Pinckney, 1937). Bridwell and Bottimer (1933) give the distribution of the host as New Jersey, Delaware, Maryland, North Carolina, and Virginia. Peairs (1947) and Peairs and Davidson (1956) add Georgia, and state that it has been "recorded in a limited area near Portland, Oregon, and in Washington." The only parasite specimens that I have seen came from the type locality.

Remarks: This species is close to *E. tylodermatis* in size, length of abdomen, relation of length of marginal and postmarginal veins, genitalic, and antennal characteristics. It differs in possessing a

shorter ninth abdominal segment, a more dorsally arched and plumper abdomen, lighter colored scape of the antenna, and its range.

75. *Eurytoma imminuta* Bugbee

MAP 31

Eurytoma imminuta Bugbee, 1951, pp. 259-260.—Burks, 1958, p. 81.

Types: 9 females and 1 male, holotype female, allotype male, paratypes in the U.S. National Museum (USNM 61239). Paratypes in Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Pyramid Lake, Nev.

Distribution: United States: Nevada, Utah, Oregon.

Host: *Diplolepis variabilis* (Bassett) variety on *Rosa puberulenta*.

Remarks: Although close to *E. spongiosa*, this species can be separated by its very short dorsal valves (ninth tergum) that average .10 mm. (.07-.12) in length, and the narrow and deep, complete median furrow on the propodeum.

76. *Eurytoma bolteri* Riley

MAP 34

Eurytoma bolteri Riley, 1869, p. 177.—Viereck, 1916, p. 521 [emendation].—Ashmead, 1887, p. 195.—Bridwell, 1899, pp. 203-211.—Leiby, 1922, pp. 81-94.—Barber, 1938, pp. 173-176.—Peck, 1951, p. 575.

Types: 3 females, no. 2789 in the U.S. National Museum.

Type locality: One of the female types bears the no. 38E. The following notations under type locality were taken from a card file in the U.S. National Museum. Washington, D.C., galls collected Aug. 1867; emerged May 1, 1868.

Distribution: United States: Washington, D.C., New York, Virginia, Indiana, South Dakota, Kansas.

Host: *Gnorimoschema gallaesolidaginis* (Riley) on *Solidago* species.

Remarks: The commonest host for this species is *Gnorimoschema gallaesolidaginis* on *Solidago* species. Other host designations are questionable as I have bred many specimens of eurytomids and never recovered this species from any other host.

E. bolteri is a large species averaging 5.0 mm. in length. The marginal and postmarginal veins are most often equal in length, and the propodeum is wide with a shallow concavity, in the center of which is a narrow, shallow median furrow that narrows ventrally. The lateral surface of the sixth tergum is heavily sculptured to the dorsal surface where sculpturing becomes lighter and may continue over dorsal surface along anterior border, or fade out altogether.

77. *Eurytoma spina* Bugbee

MAP 34

Eurytoma spina Bugbee, 1951, pp. 250, 251.—Burks, 1958, p. 81.

Types: 5 females; holotype female, paratypes in U.S. National Museum collection, no. 61234.

Type locality: La Grande, Oreg.

Distribution: United States: Oregon. Canada: Saskatchewan.

Host: *Diplolepis tuberculator* var. *versicolor* Kinsey and Ayres on *Rosa* species.

Remarks: Characteristics in addition to those in the key include the length of the ninth tergum that averages .22 mm., the length of the marginal and postmarginal veins (the marginal averages only .04-.05 mm. longer than the postmarginal), and the weakly developed female genitalia with wide dorsal valves for horizontal length.

78. *Eurytoma picea*, new species

MAP 35

Female: Black except for brown wing veins, yellow base of scape, and extremities of femora, tibiae, and whitish tarsi. Length averages 3.6 mm. (3.1-4.1). Abdomen oval from lateral and dorsal views; medium lateral compression so that greatest width in cross section is nearer middle; sixth tergum about two times the length of the fifth; smooth and shiny surface except for fine scaling on lower, anterior half; ninth tergum elongate, averaging .22 mm. (.24-.25) in length. Internal genitalia with narrow dorsal valves that turn dorsally, anteriorly, with the ventral valves at slightly less than a right angle so that stylet arch and fulcral plate are in an oblique plane; dorsal valves dark brown to black for entire length; whole structure averages 1.7 mm. (1.6-1.8) in length and .97 mm. (.95-1.0) in height. Propodeum narrowly concave with a wide, shallow, complete median furrow that narrows toward base; central carina about one-quarter to three-quarters length of furrow; surface between horizontal ridges within furrow, smooth and shiny; lateral areas narrow or nonexistent. Antenna with a flagellum of five truncate, slightly moniliform, segments; sixth separated from the terminal unit by a shallow annulation. Legs with black to dark-brown infuscation on all femora and tibiae. Wing veins brown; marginal about two times the width of postmarginal, quite long, averaging .40 mm. (.35-.50) in length; postmarginal averages .27 mm. (.22-.32) in length.

Male: Color as in the female except that scape is entirely black. Length averages 2.2 mm. (2.1–2.4). Abdomen sculptureless dorsally and laterally. Umbilicate punctures on mesothorax with interstices sculptureless. Antenna with five pedicellate segments and a terminal unit of two closely fused segments in flagellum; segments two to five with two whorles of long hairs. Marginal vein averages .36 mm. (.32–.40) and postmarginal averages .25 mm. (.22–.27) in length.

Types: Holotype female, allotype, and a paratype series of 24 females and 19 males in the collection of the Department of Agriculture, Ottawa, Canada. Collected or emerged July 29, 1938, Sept. 6, 1938, and May 5–19, 1939. R. H. Longmore collector. Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa. and the U.S. National Museum.

Type locality: New Westminster, B. C., Canada, forestry station. Distribution: United States: Washington. Canada: British Columbia.

Host: *Pissodes sitchensis* Hopkins on *Picea sitchensis*.

Remarks: This new species runs smaller than *Eurytoma pissodis*; has more infuscation on the legs; brown wing veins; less sculpturing on the sixth abdominal tergum and a distinct, complete median furrow on the propodeum. Its host is a different species of weevil occurring on the Sitka Spruce (*Picea sitchensis*).

79. *Eurytoma calcarea* Bugbee

MAP 36

Eurytoma calcarea Bugbee, 1951, pp. 240–248.—Burks, 1958, p. 81.

Types: Holotype female, allotype, and paratype in the U. S. National Museum (USNM 61227). Paratypes in the Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Wellsville, Utah.

Distribution: Eastern two-thirds of the United States from the Atlantic coast west to Oregon and south to Kansas.

Host: *Diplolepis variabilis* (Bassett) and *D. bicolor* (Harris) on *Rosa* species.

Subspecies: Description, Bugbee (1951).

Eurytoma calcarea ignobilis Bugbee (USNM 61228). Nebraska. Host: *Diplolepis bicolor* (Harris).

E. c. infima Bugbee. Illinois. Host: *D. bicolor* (Harris) (USNM 61230).

E. c. lucida Bugbee. Illinois. Host: *D. bicolor* (Harris) (USNM 61229).

E. c. mimica Bugbee. Maine and Massachusetts. Host: *D. bicolor* (Harris). (USNM 61231.)

E. c. singularis Bugbee. Massachusetts. Host: *D. nebulosus* (Bassett). (USNM 61232.)

Remarks: The dorsal and ventral valves of the female genitalia turn dorsally, anteriorly, at right angles so that the stylet arch is in an oblique plane and the dorsal valves are uniformly narrow for their horizontal length (see figs. 9 and 10, Bugbee, 1951).

80. *Eurytoma apiculae* Bugbee

Eurytoma apiculae Bugbee, 1966, pp. 210-211.

Types: 21 females and 17 males. Holotype and allotype from a series of 8 females and 10 males from Contra Costa County, Calif. Collected July 8, 1965, from nest of *Ceratina punctigena*, nos. 261 and 142 c, d, e, h, by T. Brown and H. Daly. Types and paratypes in the U.S. National Museum, Univ. of California, Berkeley, and Bugbee collection, Allegheny College, Meadville, Pa.

Type locality: Contra Costa County, Calif., Russel Tree Farm.

Host: *Ceratina punctigena* Cockerell, *C. nanula* Cockerell, and *C. dallatorreana* Friese.

Remarks: See Bugbee, 1966.

81. *Eurytoma mali*, new species

FIGURES 18, 27; MAP 36

Female: Black. Averages 4.1 mm. (3.4-4.8) in length. Abdomen plump with only slight lateral compression, averaging 2.4 mm. in length (2.1-2.6); sixth abdominal segment long, averaging .74 mm. (.65-.80); sculpturing on lateral face of sixth limited to lower half; ninth segment elongated and sharply pointed, averaging .25 mm. in length (.20-.30); internal genitalia averages 1.9 mm. (1.5-2.1) in length and in height 1.1 mm. (1.0-1.2); expanded anterior plate of ventral valves averages .19 mm. (.15-.22) at widest point; dorsal valves narrow for horizontal length and turn dorsally with ventral valves, anteriorly, at a right angle in relation to horizontal length; stylet arch oblique or halfway between a vertical and horizontal plane. Propodeum concave; indications dorsally of a wide, shallow median furrow that may fade out completely in lower quarter; lateral areas with uneven surface finely punctate and irregularly ridged, and without deeper five- or six-sided punctures limiting areas dorsally. Tegula deep brown to black. Antenna with the outer face of scape all yellowish brown; segments one to five of a flagellum

longer than wide and truncate distally; six separated from seven by a shallow annulation; flagellum filiform. Legs may have all femora and tibiae yellowish brown or hindfemora may be brown to dark brown medially. Wings with the veins yellow to brown; marginal vein thin and long, averaging .38 mm. (.35-.40) in length; postmarginal shorter than marginal, averaging .30 mm. (.27-.32) in length; stigmal club narrowly rectangular in shape.

Male: Black. Averages 3.3 mm. (3.0-3.6) in length. Outer face of scape black except yellowish-brown basal extremity. Legs with femora and tibiae of fore- and midlegs yellowish brown; hindfemora dark to light brown, except yellowish-brown apices and knees; hindtibiae yellowish brown. Wing veins brownish yellow to straw yellow; marginal vein longer than postmarginal; marginal averages .37 mm. (.35-.40) in length; postmarginal averages .27 mm. (.25-.27).

Types: 6 females and 4 males. Holotype female, allotype male, and paratypes in the U.S. National Museum (USNM 66065). Paratypes in the Bugbee collection, Meadville, Pa.

Type locality: Troy, Kans. Collected or bred (?) July 2-14, 1932. P. G. Lamerson collection.

Distribution: Kansas, New York, Wisconsin, Washington.

Hosts: Parasite of the apple curculio, *Tachypterellus quadrigibbus* (Say), *T. q. magnus* List, and *T. consors* Dietz.

Remarks: This species is apparently widespread, occurring wherever apples are grown and its hosts, the apple curculio, *Tachypterellus quadrigibbus* or *T. consors*, are present. The importance of the parasite as a natural control of the host is great. Parker and Lamerson (1934) credit it with over half of the total parasitism of the curculio (*T. q. magnus*) in northeast Kansas in the years 1932-1933. Ritcher (1936), using the name *E. tylodermatis*, states that it was the most important and numerous parasite in Wisconsin in 1934-1935, where parasitism ran as high as 40-63%. Hammer (1936) lists it again as *E. tylodermatis*, from *T. quadrigibbus* in the Champlain Valley.

Distinguishing features of this species are the extremely narrow dorsal valves of the female genitalia, the reduced sculpturing on the sixth abdominal segment, the all yellowish-brown legs with the exception of the reddish-brown tinge to the hindfemora, and the longer than wide segments of the antenna. It resembles *E. fusca*, new species, but the characteristics mentioned above will separate them.

82. *Eurytoma diastrophi* Walsh

MAP 37

Eurytoma diastrophi Walsh, 1870, p. 299.—Mayr, 1878, p. 311.—Ashmead, 1881, p. 30; 1887, pp. 194-198 [Ashmead proposed the name, *E. Mayri* for *E. diastrophi* of Mayr 1878].—Bridwell, 1899, pp. 203-211.—Viereck, 1916, p. 521.—Peck, 1951, p. 576.

Types: Walsh (1870) states that there were 2 males and 19 females on which his description was based. In the U.S. National Museum is a single male, bearing the type no. 1532 and the notation, "through A. Bolter, 1890." This male specimen is probably not one of the original types. In order to have something more definite to go by, I have chosen a neotype female from Bloomington, Ind. The female emerged May 23, 1933, from a gall of *Diastrophus nebulosus* collected by R. Bugbee on Apr. 12, 1933, on *Rubus* species, Kinsey determined. An additional neoparatype series from the same locality, date of collection, and host includes 49 males and 28 females that emerged from May 23-30, 1933. Neotype female and neoparatypes in the Bugbee collection, Allegheny College, Meadville, Pa. and in the U.S. National Museum, Washington, D.C.

Type locality: Probably from the vicinity of Rock Island, Ill. where Walsh conducted much of his collecting. Neotype locality, Bloomington, Ind.

Distribution: United States: Connecticut, New Jersey, New York, Virginia, Massachusetts, Washington, D.C., North Carolina, Indiana, Illinois, Tennessee, Kansas, Colorado, New Mexico, or wherever blackberry occurs.

Hosts: *Distrophus cuscutoeformis* (Osten Sacken). *Diastrophus nebulosus* (Osten Sacken). *Diastrophus niger* Bassett. Galls of *Callachna gibba* (Loew) (Peck, 1951).

Remarks: The host record *Callachna gibba* (Loew), is very doubtful as this species seems to be restricted to gallmakers on blackberry belonging to the cynipid genus *Diastrophus*.

This is a medium-sized species averaging 3.9 mm. in length. The propodeum displays an incomplete, weakly developed median furrow in the upper half to one-quarter, or furrow may be absent entirely. Ninth tergum averages .26 mm. (.17-.32) in length. Female genitalia moderately developed anteriorly, so that stylet arch is in an oblique plane.

Appendix

Species Not Included in the Revision

The species listed below have not been included in the revision for one or more of the following reasons: Types not checked by the author; types inadequate to make a satisfactory judgment; types lost; the original description too brief or general to allow a definite decision; inclusion in the genus *Eurytoma*, as limited by the generic description, doubtful.

The types of the six species *Eurytoma abatos*, *E. cretheis*, *E. hecale*, *E. pythes*, and *E. teredon*, described by Walker (1843) and *E. iphis* Walker (1846), are located in the British Museum and I have not been able to check them personally. Letters from M. F. Claridge, Department of Zoology, University College, Cardiff, England, and G. J. Kerrich of the British Museum, London, give their impressions of the Walker types. They seem to agree that *E. iphis*, *E. cretheis*, and *E. pythes* are probably not true *Eurytoma*. The British Museum did loan me a single cotype male of *E. teredon*, and it is a good *Eurytoma*, but the single male specimen is insufficient to determine the status of the species.

E. abnormicornis Walsh (1870). This species was described from a single female captured at large that seems to be lost. The three males in the U.S. National Museum collection under this species are not adequate to determine the position of the species.

E. albipes (Ashmead). Transferred to the genus *Tenuipetiobus* (Bugbee, 1951).

E. albitarsis Ashmead, nomen nudum (Bugbee, 1956).

E. ashmeadi (Ashmead). Ashmead (1894, page 327) described *Eurytomocharis minuta* and designated it as the genotype. *Minuta* was preoccupied by Walker (1832), and so the new name was proposed by Peck (1951, page 575) who, at the same time, placed *Eurytomocharis* as a synonym of *Eurytoma*. Until the genera of the family *Eurytomidae* are revised, I would exclude *ashmeadi* from the genus *Eurytoma*.

E. aulacis Ashmead, nomen nudum (Bugbee, 1956).

E. brachypterum (Ashmead). This species was originally described as *Systole brachyptera* by Ashmead in 1886 (page 126). In 1894 (page 328) he transferred the species to *Evoxysona* and in 1951 (page 574) Peck placed the genus as a synonym of *Eurytoma*. The very elongate abdomen is not typical of the genus *Eurytoma*, so the species is not included in the revision.

E. floridana (Ashmead) 1887, was described as *Lamprostylus floridanus* from a single male captured at large and transferred to the genus *Eurytoma* by Peck (1951). The shape and sculpturing of the abdomen are not typical of *Eurytoma*.

E. hegehi, nomen nudum (Bugbee, 1956).

E. lanulæ Fitch, 1859. This species is a synonym of *Eurytoma studiosa* Say, 1836, according to Ashmead, 1887. The single female type, no. 1824, in the U.S. National Museum collection would fall within the range of variation of *E. studiosa*.

E. maga Girault, 1920. Removed to the genus *Prodecatoma* (Bugbee, 1956).

E. medicaginis (Gahan). Transferred to the genus *Tenuipetiolus* (Bugbee, 1951).

E. muhlenbergiae (Howard), 1896. Removed to the genus *Eurytomocharis* (Bugbee, 1956).

E. nevadense Ashmead, 1894. This species is represented by a single male specimen located in the collection of the Philadelphia Academy of Science.

E. orbiculata Say, 1836. Described from a single male specimen that seems to be lost. The description is not complete enough to place this species with certainty.

E. polygraphi (Ashmead). Transferred to the genus *Ipideurytoma* (Bugbee, 1956).

E. querci-pisi (Fitch), 1859. Described originally in the genus *Macroglenes*, the species was removed to *Eurytoma* by Ashmead in Smith's, "Insects of New Jersey," 1900. The holotype female, no. 1830, in the U.S. National Museum collection has the abdomen broken off and glued on a tip below the rest of the specimen. It is possible that this is not the original type as it does not fit the original description. The specimen is yellow to reddish brown and Fitch describes the species as black.

E. sculpta Ashmead, 1887. Transferred to *Bruchophagus* (Bugbee, 1956).

E. triodiae (Howard), 1896. Holotype female no. 2755 in the U.S. National Museum. Howard placed this species in the genus *Eurytomocharis* but Peck in Muesebeck, Krombein and others (1951) placed it in *Eurytoma*. Until the genera of the family *Eurytomidae* are studied and more clearly delimited, I prefer to exclude this species from *Eurytoma*, chiefly on the basis of the lack of any sculpturing on the lateral surface of the sixth tergum.

E. vitis (Saunders), 1869. Although transferred to the genus *Eurytoma* by Peck (1951), this species belongs in the genus *Evoxysoma*, which seems to be a recognizable genus (see Bugbee, 1936, pages 199, 200).

Fossil Species

Eurytoma sepulta Brues, 1910. Described from three specimens, no. A9 (type), A103 both from Station 14 and no. 2100, MCZ, Florissant, Colo. Types in the American Museum of Natural History.

Eurytoma sequax Brues, 1910. No. A120 from Station 14, Florissant, Colo. Type in the American Museum of Natural History.

Parasites and Hosts

- | | |
|------------------------------------|---|
| <i>Eurytoma acuta</i> Bugbee | <i>Diplolepis tuberculator</i> var. <i>xerophila</i> Kinsey and Ayres. |
| <i>E. altifossa</i> Bugbee | <i>D. arefacta</i> (Gillette) on <i>Rosa</i> species.
From galls on <i>Oxytropis lamberti</i> ; host relationship not stated. |
| <i>E. apicalae</i> Bugbee | <i>Ceratina punctigena</i> Cockerell
<i>C. nanula</i> Cockerell
<i>C. dallatorreana</i> Friese |
| <i>E. appendigaster</i> (Swederus) | <i>Macrocentrus ancylivorus</i> Rohwer
<i>Apanteles solitarius</i> (Ratzeburg)
<i>Cremastrus minor</i> Cushman |
| <i>E. atripes</i> Gahan | <i>Phytophaga destructor</i> (Say)
<i>Cephus cinctus</i> Norton
<i>Bracon cephi</i> (Gahan) |
| <i>E. auriceps</i> Walsh | <i>Amphibolips spongifica</i> (Osten Sacken)
<i>A. cookii</i> Gillette
<i>Andricus pattoni</i> (Bassett)
<i>A. foliatus</i> Ashmead
<i>A. ignotus</i> (Bassett)
<i>A. flocci</i> (Osten Sacken)
<i>Acraspis pezomachoides</i> (Osten Sacken)
<i>A. erinacei</i> (Beutenmuller)
<i>Callirhytis lanata</i> (Gillette)
<i>C. seminator</i> (Harris)
<i>Diplolepis radicum</i> (Osten Sacken)
<i>D. weldi</i> (Beutenmuller)
<i>Disholcaspis mamma</i> (Cresson)
<i>D. spongiosa</i> (Karsch)
<i>D. quercus-globulus</i> (Fitch)
<i>Dryocosmus imbricariae</i> (Ashmead)
<i>Philonix fulvicollis</i> Fitch
<i>Sphaeroterus melleum</i> (Ashmead) |
| <i>E. baccae</i> Bugbee | <i>Ancylis comptana</i> (Frolich) |
| <i>E. bicolor</i> Walsh | <i>Aulacidea tumida</i> (Bassett)
<i>A. podagrae</i> (Bassett)
<i>Isodontia harrisi</i> (Fernald)
<i>Scolytus rugulosus</i> Ratzeburg
<i>Eurosta solidaginis</i> Fitch
In dried galls on stem of <i>Typha latifolia</i> .
host relationship not stated. |
| <i>E. bigeloviae</i> Ashmead | <i>Trypeta bigeloviae</i> (Cockerell) |

- E. bolteri* Riley
E. brevivena Bugbee
E. bromi (Howard)
E. calcarea Bugbee
E. californica Ashmead
E. calycis Bugbee
E. celtigalla Bugbee
E. cleri Ashmead
E. conica Provancher
E. contractura Bugbee
E. crassa Bugbee
E. crassineura Ashmead
E. diastrophi Walsh
E. discordans Bugbee
E. dorcaschemae Ashmead
E. eragrostidis (Howard)
E. flavicrus Bugbee
E. flavicrurensa Bugbee
E. flavovultus Bugbee
E. fossae Bugbee
E. furva Bugbee
E. fusca Bugbee
E. gigantea Walsh
- Gnorimoschema gallaesolidaginis* (Riley)
Eurosta solidaginis Fitch
Tyloderma foveolatum Say
Disholcaspis quercus-globulus (Fitch)
Phytophagous in stems of *Bromus ciliatus*,
Muhlenbergia sylvatica, and timothy.
Diplolepis bilolor (Harris)
D. variabilis (Bassett)
Callirhytis pomiformis (Ashmead)
Andricus californicus Ashmead
Disholcaspis corallina (Bassett)
D. plumbella Kinsey
D. washingtonensis (Gillette)
Phytophagous in buds of *Pinus banksiana*
Phytophaga celtiphylla Felt
Dendroctonus frontalis Zimmermann
D. monticolae Hopkins
Ips oregoni (Eichhoff)
Pissodes strobi (Peck)
Dendroctonus frontalis Zimmermann
D. brevicomis LeConte
Pissodes strobi (Peck)
Cylindrocopturus longulus (LeConte)
Phloeosinus dentatus (Say)
Stephenoderes dissimilis (Zimmermann)
Melanagromyza shineri (Giraud)
Trypeta (= *Callachna*) *gibba* (Loew)
T. (= *Aciurina*) *notata* (Coquilett)
Dipterous galls on *Ambrosia* species
Scolytus rugulosus Ratzeburg
Magdalis armicollis Say
Diastrophus cuscutiformis (Osten Sacken)
D. nebulosus (Osten Sacken)
D. niger Bassett
Callachna gibba (Loew)
Diplolepis variabilis (Bassett)
Periclistus pirata (Osten Sacken)
Synophromorpha (= *Periclistus*) *sylvestris*
(Osten Sacken)
Dorcaschema alternatum (Say)
Phlocotribus frontalis (Oliver)
Phytophagous in stems of *Eragrostis*
poaeoides and *Agrostis alba*
Galls on *Nyssa sylvatica*
Diplolepis polita (Ashmead) var.
Pachypsylla venusta Osten Sacken
Euura pacifica (Marlatt)
E. resinicola (Marlatt)
Disholcaspis washingtonensis (Gillette)
Tachypterellus quadrigibbus (Say)
T. q. magnus List
T. consors Dietz
Eurosta solidaginis Fitch

- E. gossypii* Bugbee
E. illinoisensis Girault

E. imminuta Bugbee
E. incerta Fullaway

E. iniquus Bugbee
E. inornata Bugbee

E. juniperinus Marcovitch

E. lacunae Bugbee
E. levivultus Bugbee
E. levo Bugbee
E. longavena Bugbee
E. lutea Bugbee
E. lycti Ashmead
E. magdalis Ashmead

E. mali Bugbee

E. mammae Bugbee

E. minnesota Girault
E. neomezicana Girault

E. nigricoxa Provancher
E. obtusa Bugbee
E. obtusilobae Ashmead
E. obtusiventris Gahan
E. orchidearum (Westwood)
E. pachyneuron Girault

E. parva Phillips

E. phloeotribi Ashmead
- Anthonomus grandis* Boheman
 Host relationships unknown, reared in connection with *Harmolita* and from *Elymus* species
Diplolepis variabilis (Bassett)
Diplolepis neglecta (Gillette)
D. polita (Ashmead)
D. tuberculator var. *descansonis* Kinsey and Ayres
Diplolepis neglecta (Gillette)
Euphilis rufigaster (Packard) in *Hibiscus* stems
 Phytophagous in the fruits of *Juniperus virginiana*
 From galls of *Protaplona* species
Pachypsylla gemma Riley
 From pine xyelid gall
Diplolepis bicolor (Harris)
 From Elecampane
Lyctus striatus Melsh
Anthribus cornutus (Say)
Cylindrocopturus longulus (LeConte)
Magdalis armicollis Say
Oncideres cingulatus (Say)
Tachypterellus quadrigibbus (Say)
T. q. magnus List
T. consors Dietz
Leperisinus aculeatus (Say)
Stigmus species
 Phytophagous in *Agropyron* species
 Reared in connection with *Harmolita*
 Phytophagous in seeds of *Sideranthus spinulosus*
Periclistus species
Bruchus brachialis Fahraeus
Diplolepis radicum Osten Sacken
Eurosta solidaginis Fitch
 Phytophagous in *Cattleya* species
 Phytophagous in *Agropyron repens*, *Elymus canadensis*, and *E. triticoides*
 Parasite of *Harmolita tritici* (Fitch) and *Phytophaga destructor* (Say)
 Galls on *Sitilias grandiflora*
Harmolita tritici (Fitch)
 Lepidopterous galls on *Solidago*
Cephus cinctus Norton
Phloeotribus frontalis (Oliver)
P. dentifrons (Blackman)
Pityophthorus liquidembarus Blackman
Pseudopityophthorus minutissimus (Zimmermann)
P. pruinosis (Eichhoff)
Scolytus muticus Say

- E. picea* Bugbee
E. pini Bugbee
- E. pissodis* Girault
E. profunda Bugbee
 (= *E. maculipes* Ashmead)
E. prunicola Walsh
- E. querci* Fullaway
E. querci-globuli (Fitch)
- E. rhois* Crosby
E. sciromatis Bugbee
- E. semicircula* Bugbee
E. seminis Bugbee
- E. semivena* Bugbee
E. solenozopheriae Ashmead
E. sphaera Bugbee
- E. spina* Bugbee
E. spongiosa Bugbee
- E. squamosa* Bugbee
- S. abietis* Blackman
Stephanoderes dissimilis (Zimmermann)
Pissodes sitchensis Hopkins
Acrobasis rubrifasciella Peck
Eucosoma scudderiana Clemens
Pectinophora gossypiella (Saunders)
Rhyacionia buoliana (Schiffermuller)
R. frustrana (Comstock)
R. rigidana (Fernald)
Thyridopteryx ephemeraeformis (Haworth)
Epiblema strenuana (Walker)
Cremastus cookii Weed
Pissodes strobi (Peck)
Dryorhizoxenus floridanus (Ashmead)
Belonocnema treatae Mayr
Amphibolips prunus (Walsh)
A. gainesi Bassett
Philonix fulvicollis Fitch
Callirhytis seminator (Harris)
Acraspis guadaloupensis (Fullaway)
Andricus lasius (Ashmead)
Disholcaspis quercus-globulus (Fitch)
D. colorado (Gillette)
D. mamma (Cresson)
D. cinerosa (Bassett)
 Phytophagous in seeds of *Rhus typhina*,
R. glabra, and *R. copallina*
 From cankers on *Pinus taeda* and *P.*
elliotti caused by *Cronartium fusiforme*
Leptostylus gibbulosus
 Phytophagous in seeds of *Schmaltzia tri-*
lobata
Pachypsylla vesicula Riley
Hemadas nubilipennis (Ashmead)
Disholcaspis spongiosa (Karsch)
D. quercus-globulus (Fitch)
D. succinipes (Ashmead)
D. sileri (Bassett)
Diplolepis tuberculator versicolor Kinsey
 and Ayres
Diplolepis rosae (Linnaeus)
D. dicholcerus (Harris)
D. tuberculator (Cockerell)
D. t. wasatchensis Kinsey and Ayres
 Phytophagous in seeds of *Ceanothus divari-*
catus
C. thyraiflorus
C. cordulatus
C. velutinus
C. sanguineus

- E. stigmati* Ashmead
E. studiosa Say
- Stigmus inordinatus* Fox
Acraspis pezomachoides (Osten Sacken)
A. hirta (Osten Sacken)
A. erinacei (Beutenmuller)
A. macrocarpae Bassett
A. villosa Gillette
A. derivatus (Kinsey)
A. ozark (Kinsey)
A. gemmula (Bassett)
Andricus ignotus (Bassett)
A. cicatricula Bassett
A. flocci (Osten Sacken)
Callirhytis elongata (Kinsey)
C. clavula (Osten Sacken)
C. seminator (Harris)
Disholcaspis spongiosa (Karsch)
D. washingtonensis (Gillette)
D. quercus-globulus (Fitch)
D. succinipes (Ashmead)
D. sileri (Bassett)
D. colorado (Gillette)
Dryocosmus palustris (Ashmead)
Philonix fulvicollis Fitch
Sphaeroterus melleum (Ashmead)
Xenthoterus eburnea (Bassett)
Diplolepis polita (Ashmead) var.
Tomicus (= *Pityogenes*) *plagiatus* (LeConte)
Cylindrocopturus eatoni Buchanan
C. furnissi Buchanan
C. longulus (LeConte)
Epiblema strenuana (Walker)
Phloeosinus species
 Phytophagous in stems of *Pinus sylvestris*
Tyloderma foveolatum Say
Coleophora malivorella Riley
Mompha eloisella (Clemens)
Trichobaris texana LeConte
T. trinotata (Say)
Lixus scrobicollis Boheman
L. musculus Say
Tephritis (= *Neotephritis*) *finalis* Loew
 Trypetid seed maggots in *Vernonia interior*
- E. terrea* Bugbee
E. tomici Ashmead
- E. tumoris* Bugbee
E. tylodermatis Ashmead
- E. vernonia* Bugbee

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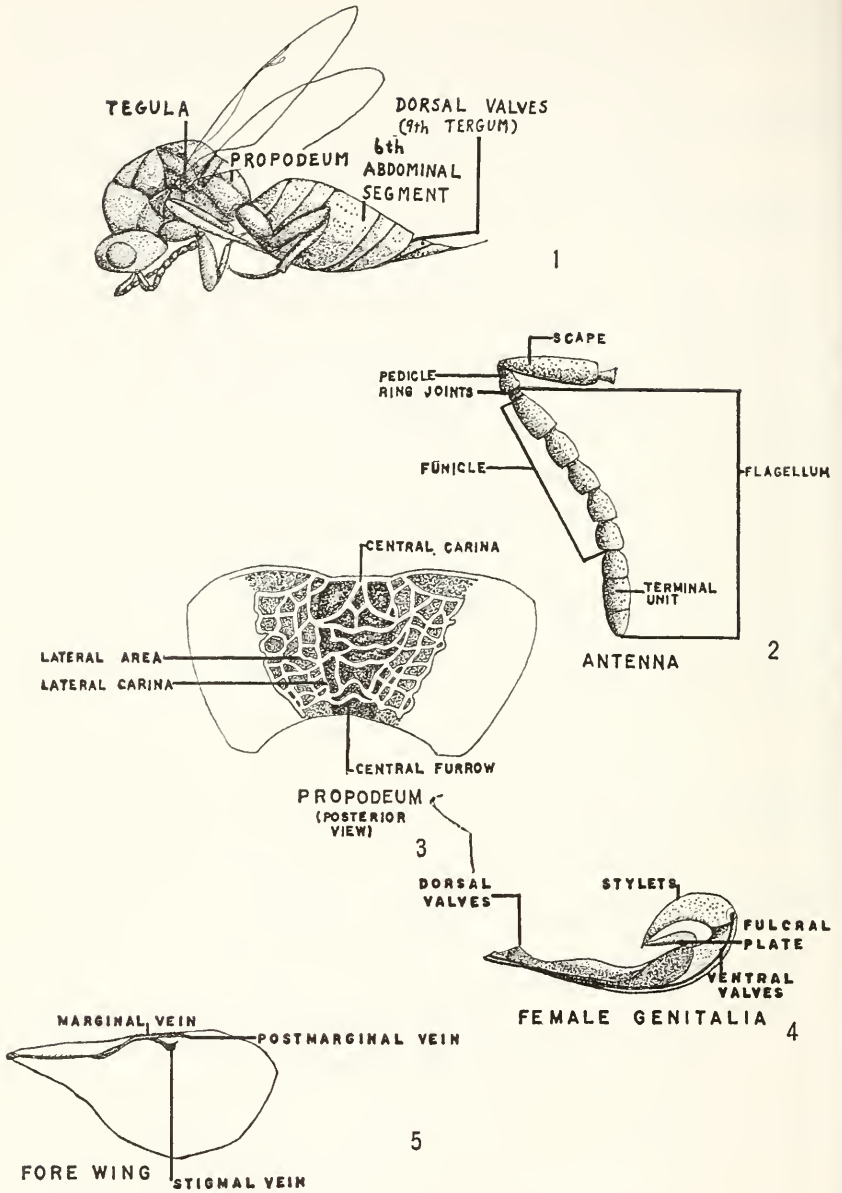
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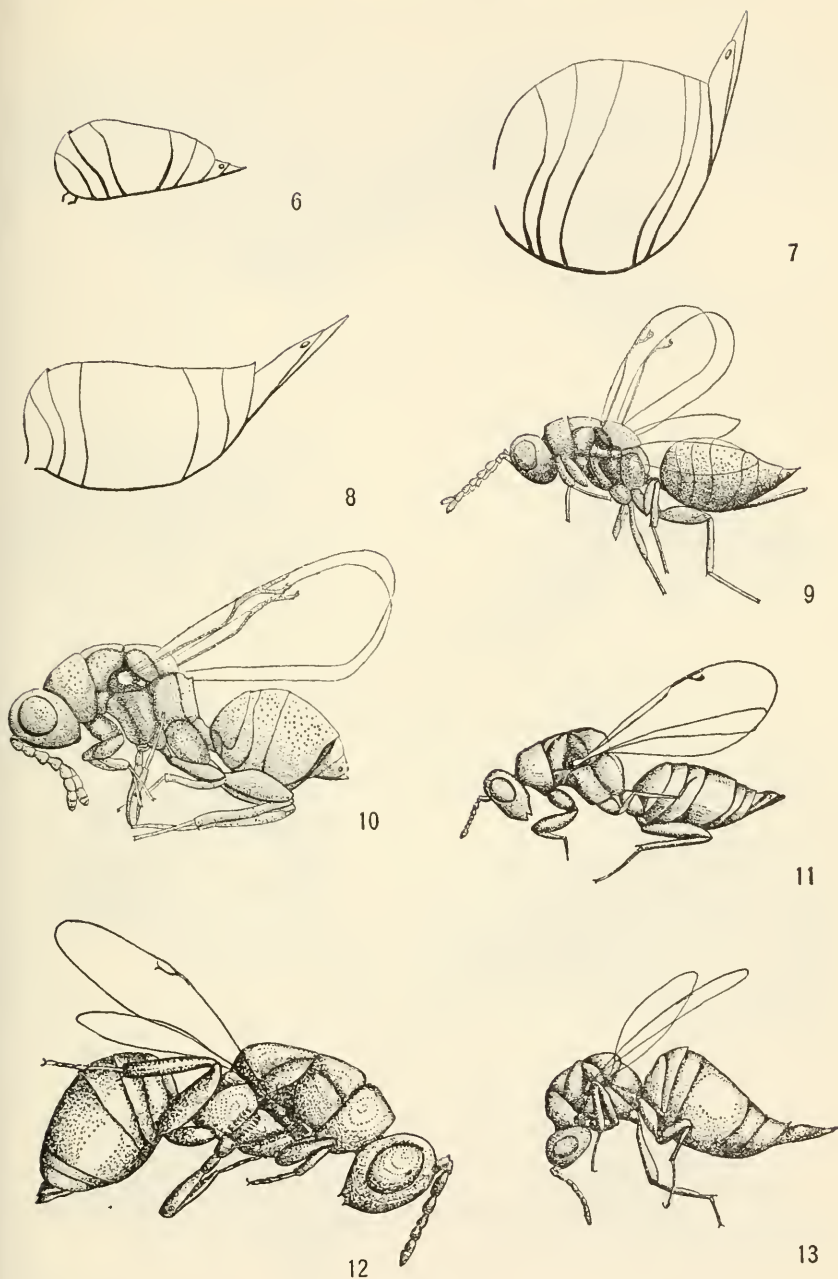
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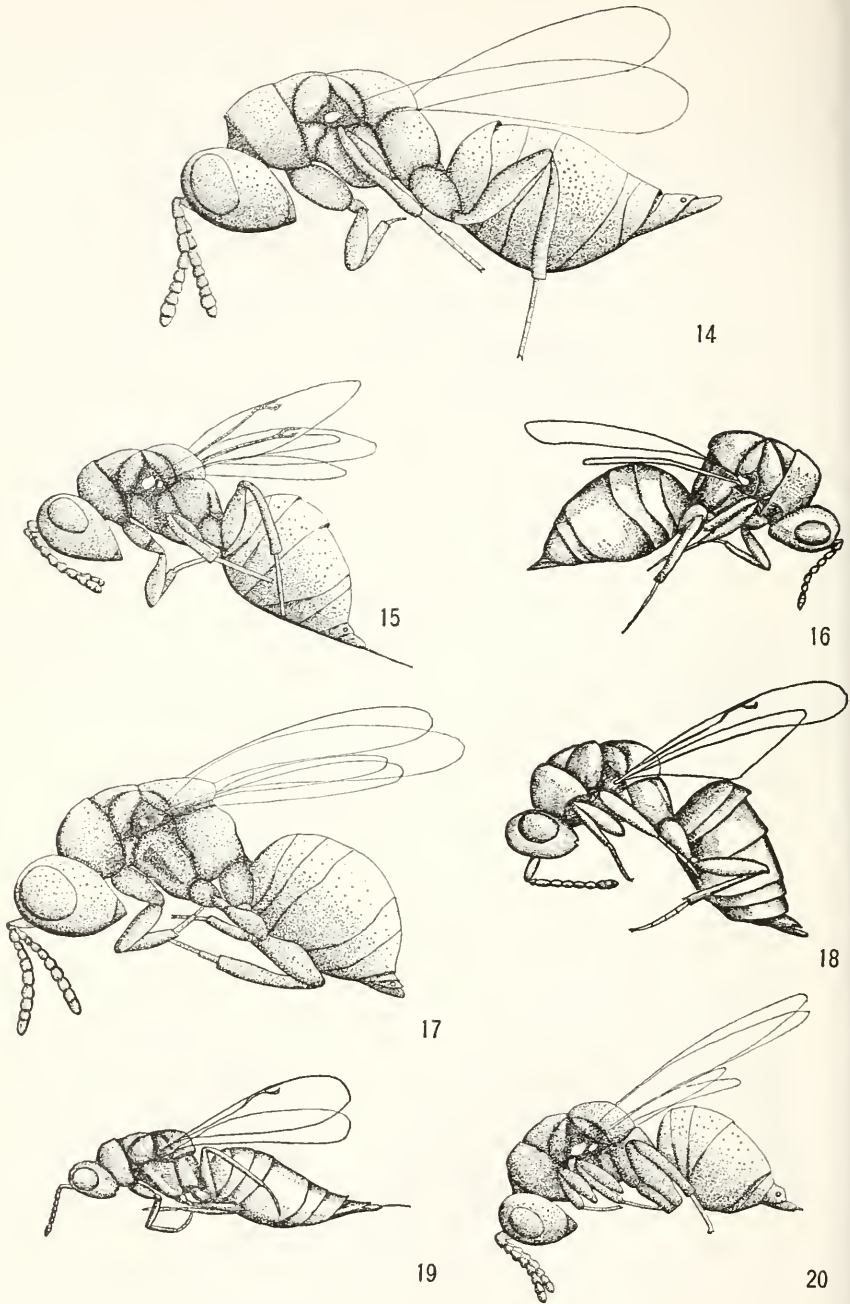
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FIGURES 1-5.—*Eurytoma pissodis* Girault, female: 1, lateral view; 2, antenna, lateral view; 3, propodeum, posterior view; 4, genitalia, lateral view; 5, forewing, dorsal view.



FIGURES 6-13.—Female, lateral view: 6, *Eurytoma pachyneuron*, abdomen; 7, *E. gigantea*, abdomen; 8, *E. contractura*, new species, abdomen; 9, *E. conica*; 10, *E. mammae*, new species; 11, *E. fossae*, new species; 12, *E. semicircula*; 13, *E. contractura*, new species.



FIGURES 14-20.—New species, female, lateral view: 14, *Eurytoma lutea*; 15, *E. vernonia*; 16, *E. crassa*; 17, *E. sphaerae*; 18, *E. mali*; 19, *E. flavicrus*; 20, *E. squamosa*.



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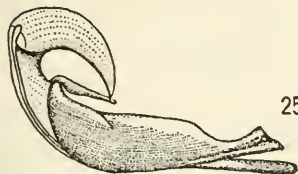
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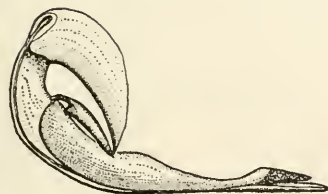
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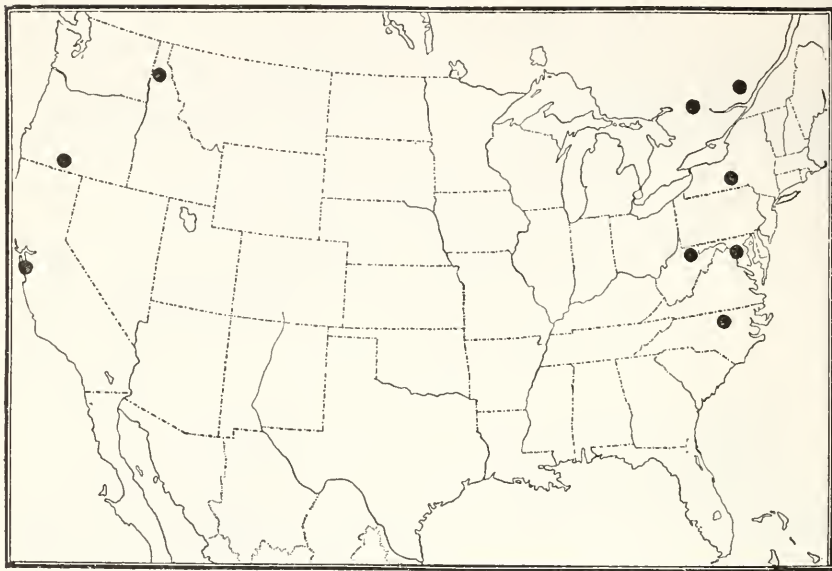
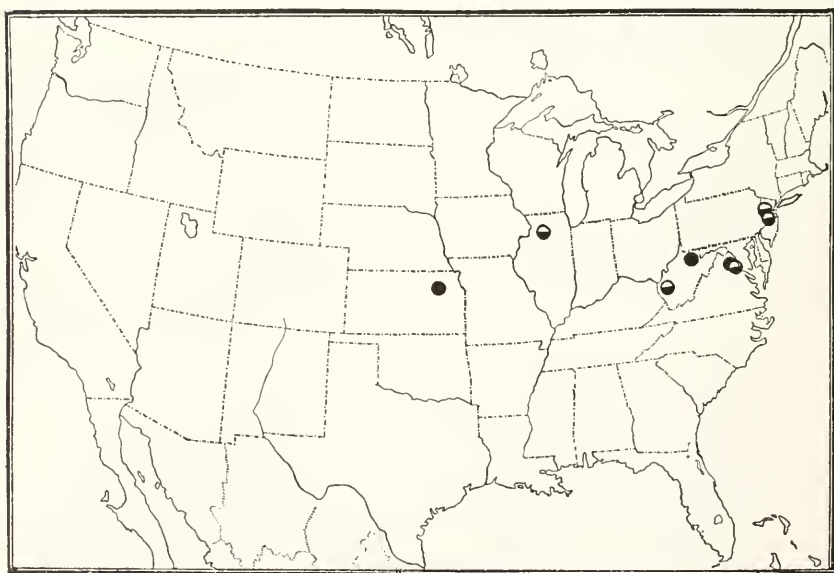


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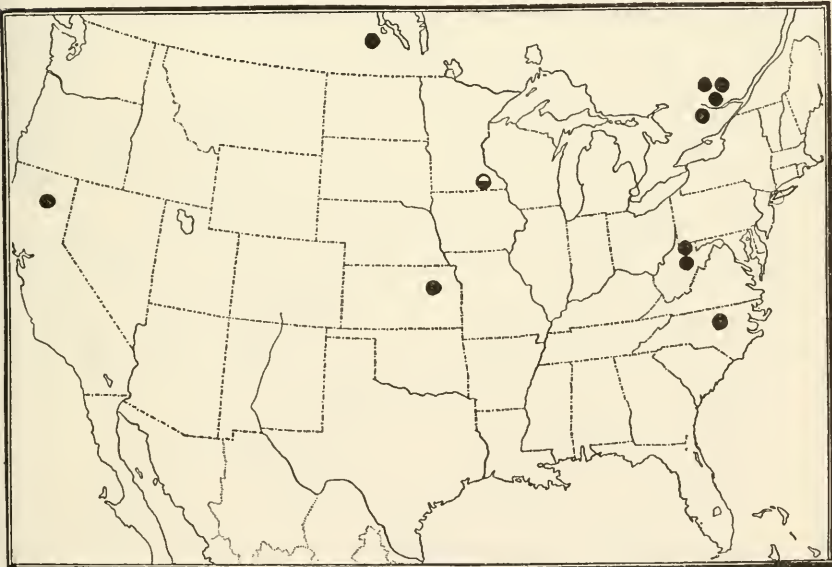
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FIGURES 21-31.—New species, female, lateral view: 21, *Eurytoma altifossa*. Genitalia: 22, *E. semicircula*; 23, *E. altifossa*; 24, *E. fossae*; 25, *E. crassa*; 26, *E. baccae*; 27, *E. mali*; 28, *E. obtusa*; 29, *E. flavicrus*; 30, *E. tylodermatis*; 31, *E. contractura*.

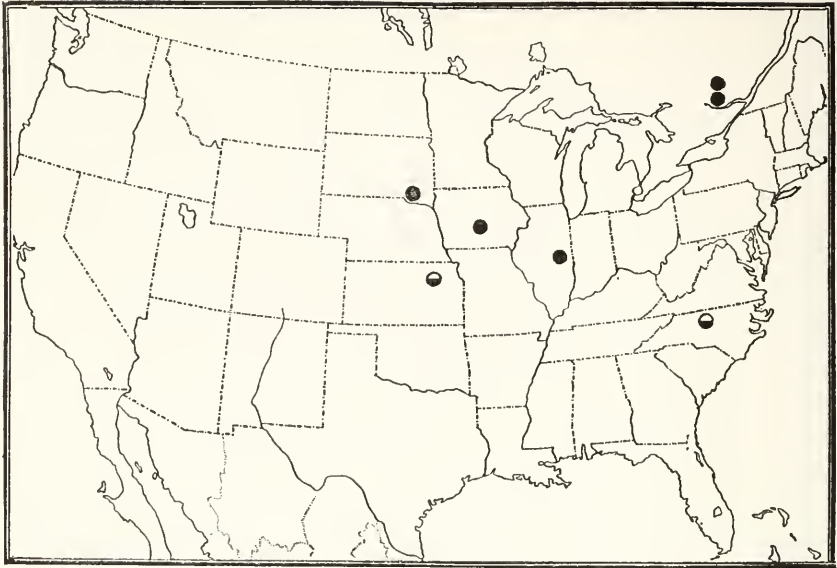
MAP 1.—Locality records for *E. phlocotribi*.MAP 2.—Locality records.
E. mammae ◐ *E. lycti* ●



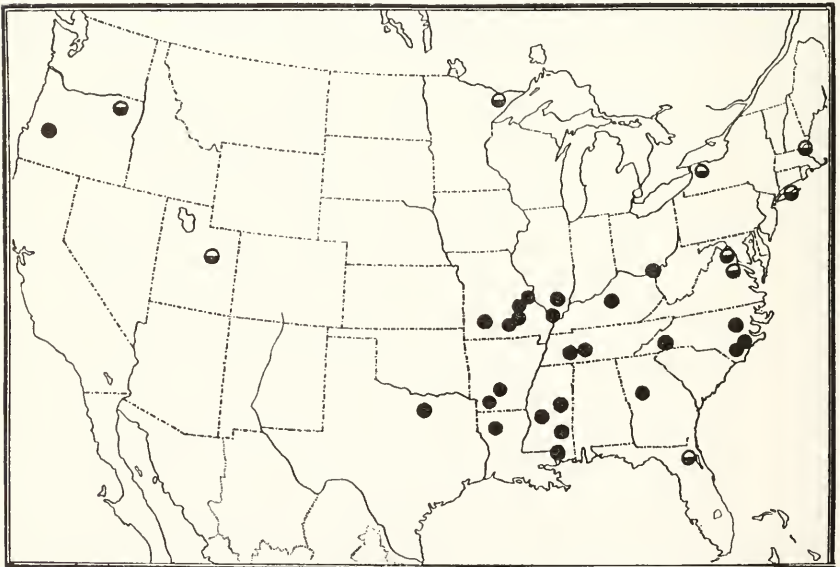
MAP 3.—Locality records.
E. semicircula ◐ *E. profunda* ◑ *E. conica* ●



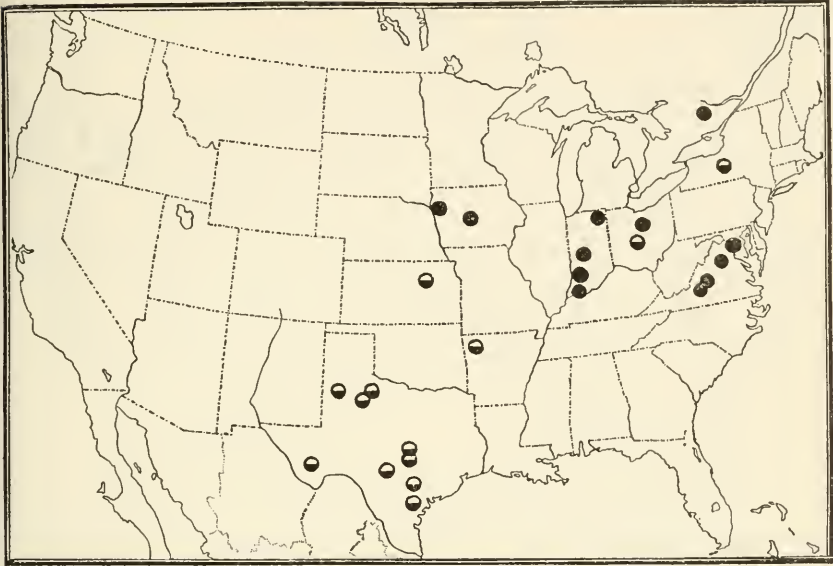
MAP 4.—Locality records.
E. magdalis ● *E. minnesotae* ◐



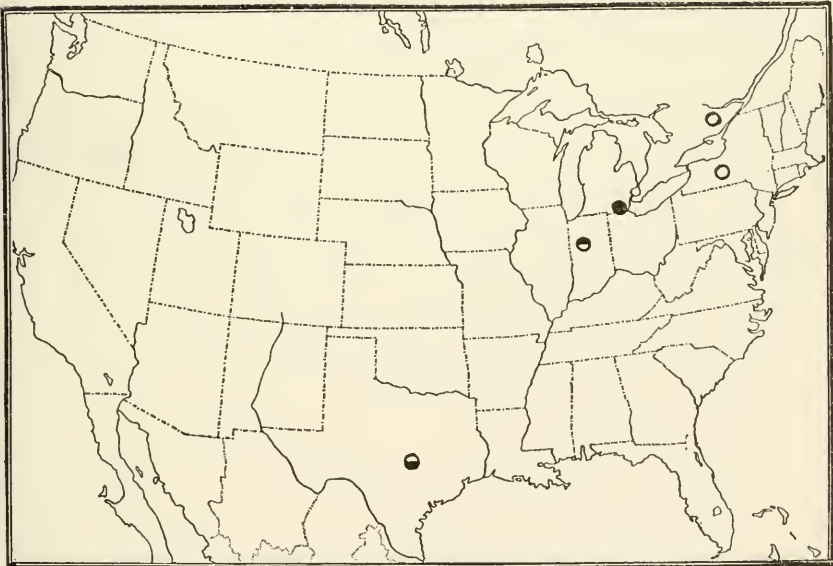
MAP 5.—Locality records.
E. illinoisensis ● *E. dorcasemae* ◐



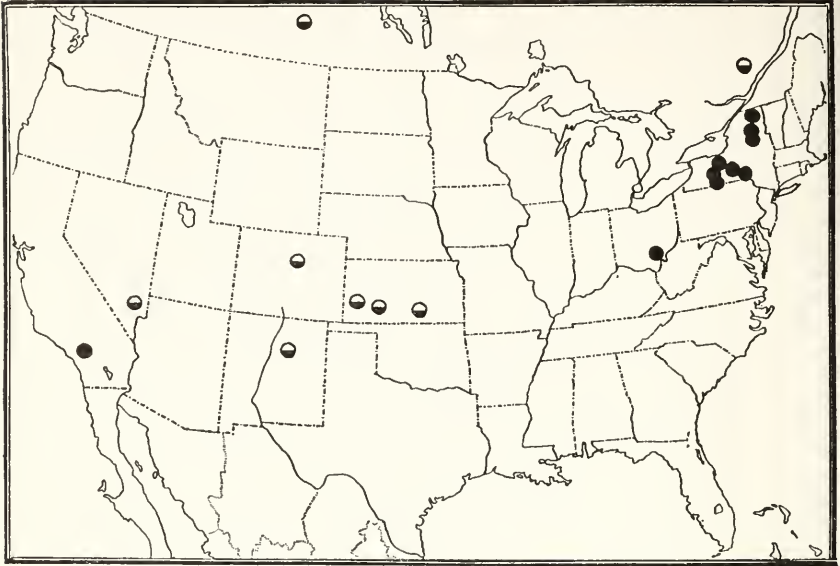
MAP 6.—Locality records.
E. sphaera ● *E. obtusilobae* ◐



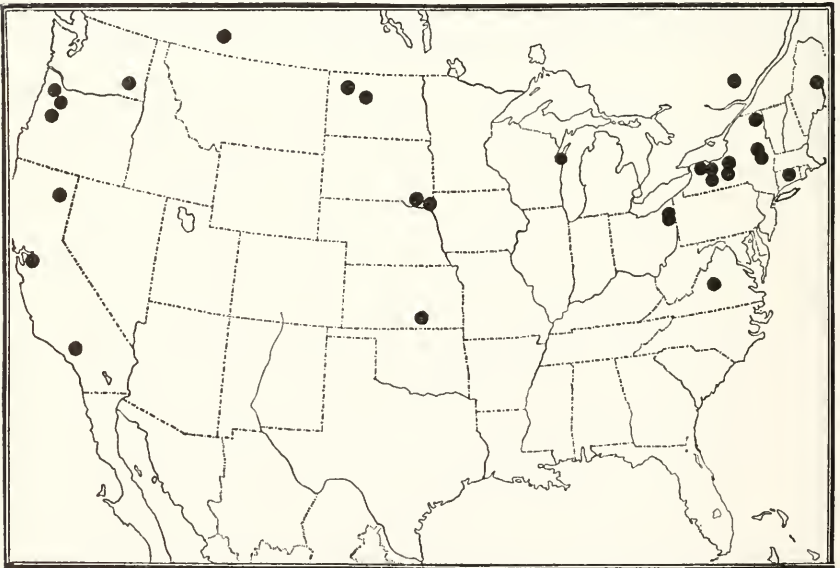
MAP 7.—Locality records.
E. semivena ◐ *E. bicolor* ●



MAP 8.—Locality records.
E. flavovultus ◐ *E. lutea* ● *E. juniperinus* ○ *E. eragrostidis* ◐



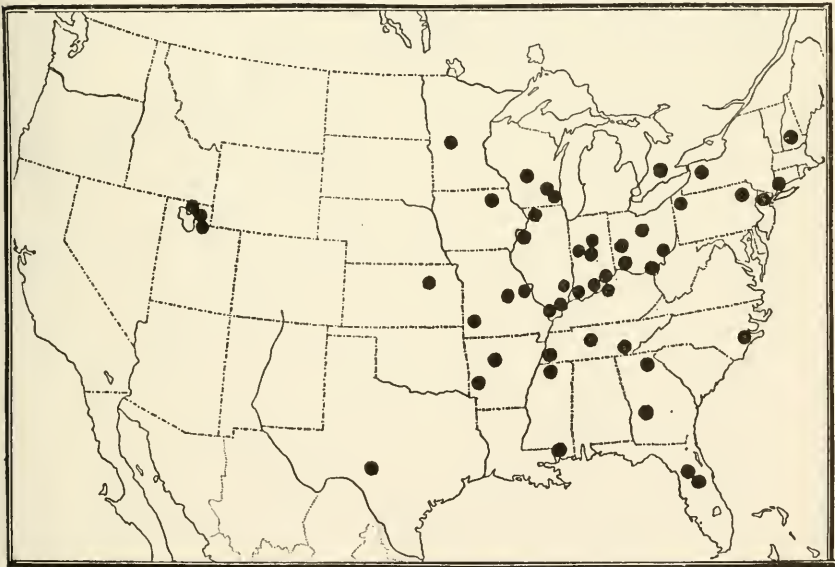
MAP 9.—Locality records.
E. bromi ● *E. neomexicana* ◐



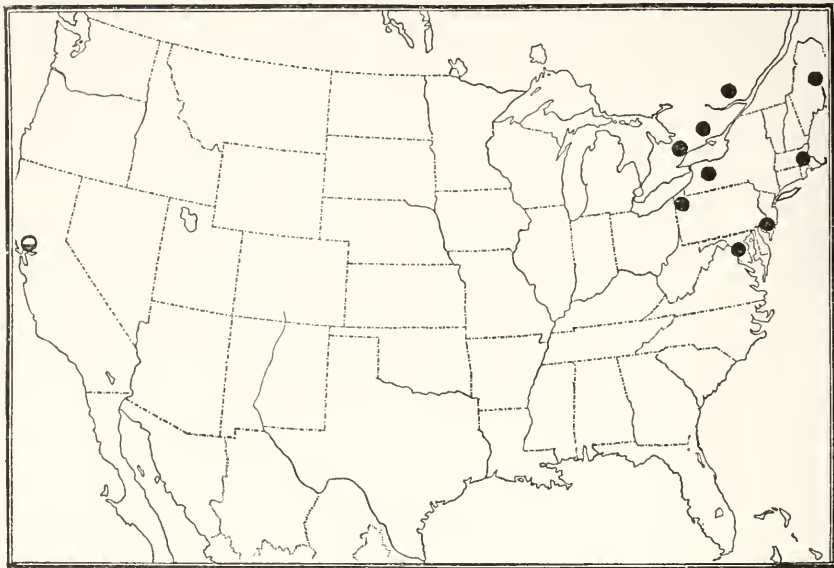
MAP 10.—Locality records for *E. pachyneuron*.



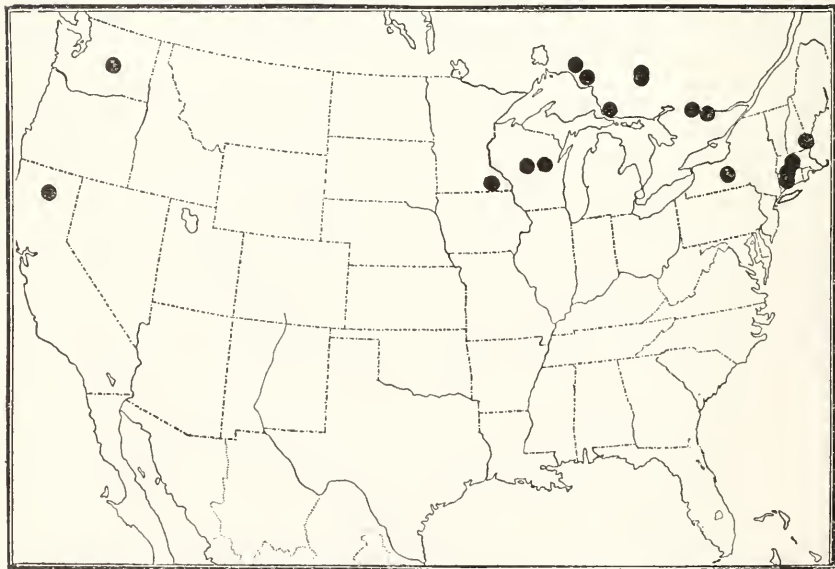
MAP 11.—Locality records.
E. californica ○ *E. gigantea* ●



MAP 12.—Locality records for *E. querci-globuli*.



MAP 13.—Locality records.
E. solenozopheriae ● *E. turva* ○



MAP 14.—Locality records for *E. pissodis*.



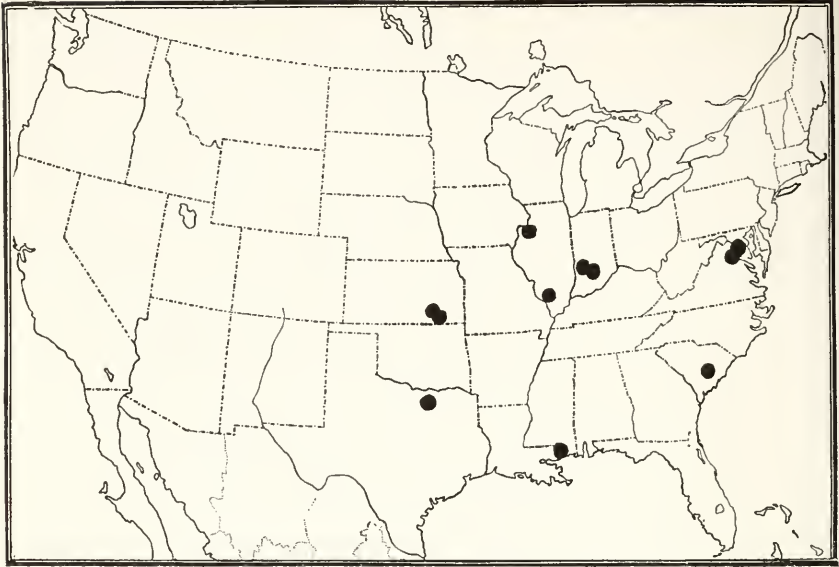
MAP 15.—Locality records.

E. cleri ● *E. flavicrus* ◌ *E. contratura* ◌

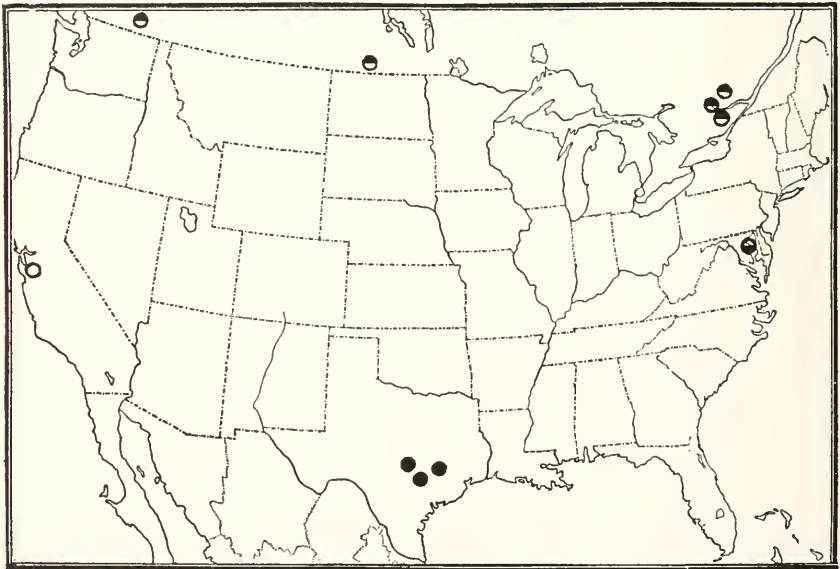


MAP 16.—Locality records.

E. discordans ● *E. acuta* ◌ *E. incerta* ◌

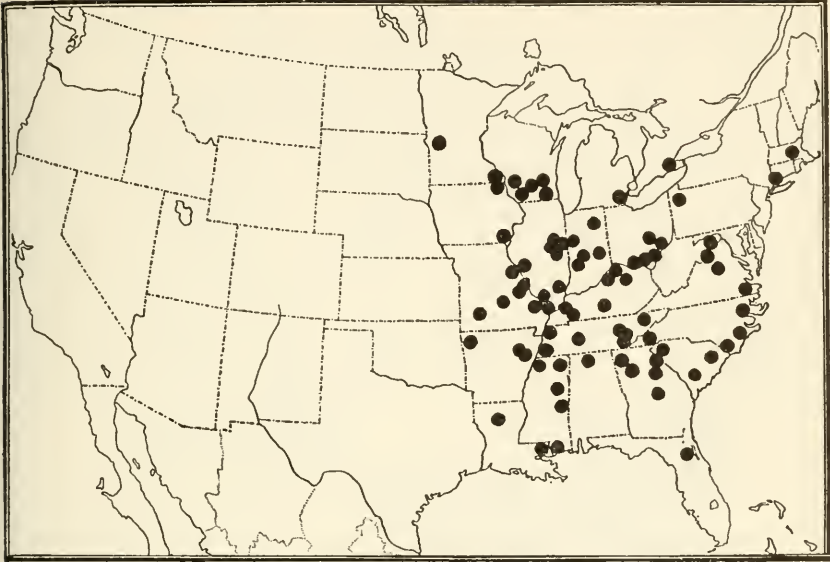


MAP 17.—Locality records for *E. prunicola*.



MAP 18.—Locality records.

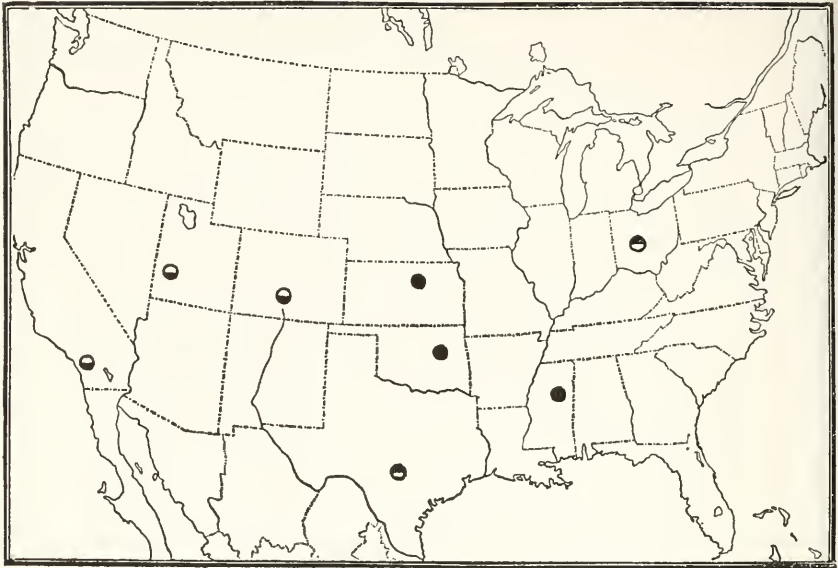
E. celtigalla ● *E. lacunae* ◐ *E. nigricoxa* ◑ *E. querci* ○



MAP 19.—Locality records for *E. auriceps*.

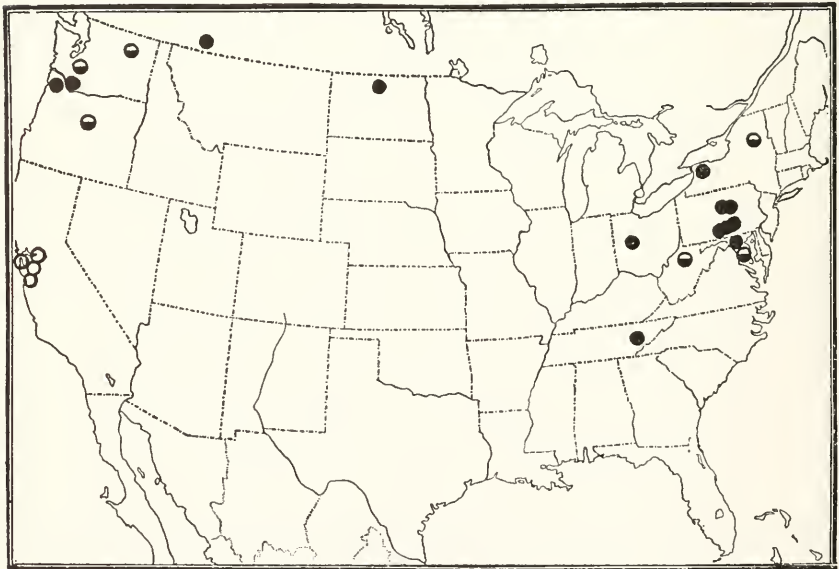


MAP 20.—Locality records.
E. brevivena ○ *E. obtusiventris* ●



MAP 21.—Locality records.

E. vernonia ● *E. bigeloviae* ◐ *E. levivultus* ◑

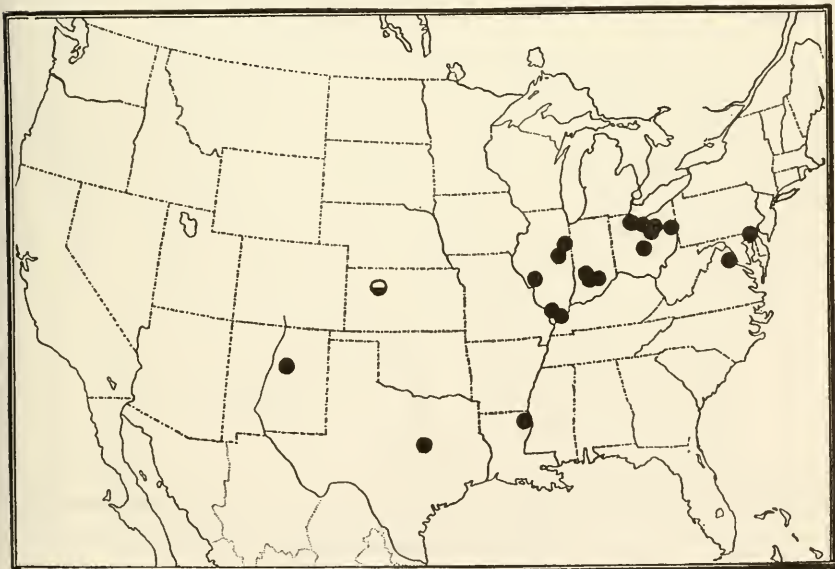


MAP 22.—Locality records.

E. atripes ● *E. fossae* ○ *E. tomicus* ◐



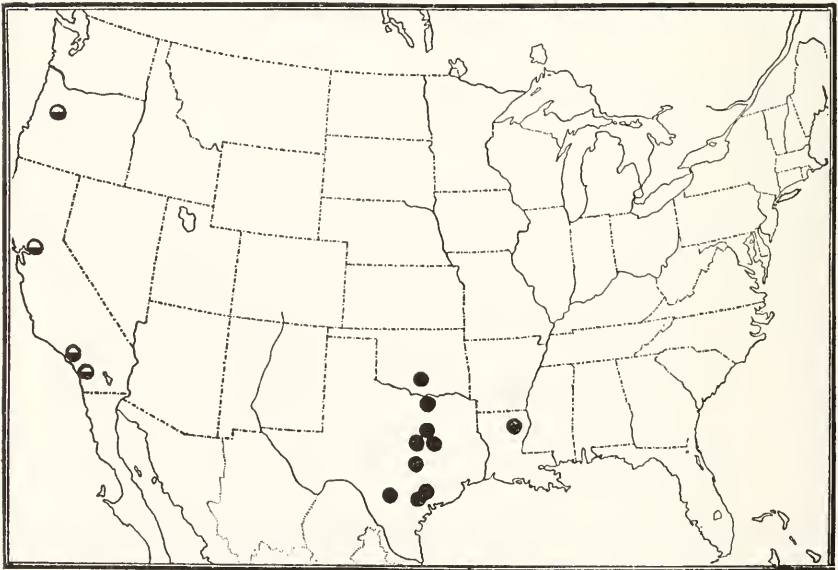
MAP 23.—Locality records.
E. appendigaster ● *E. altifossa* ◐



MAP 24.—Locality records.
E. crassa ● *E. seminis* ◐



MAP 25.—Locality records.
E. tyloclermatis ● *E. terrea* ○



MAP 26.—Locality records.
E. stigmati ○ *E. gossypii* ●



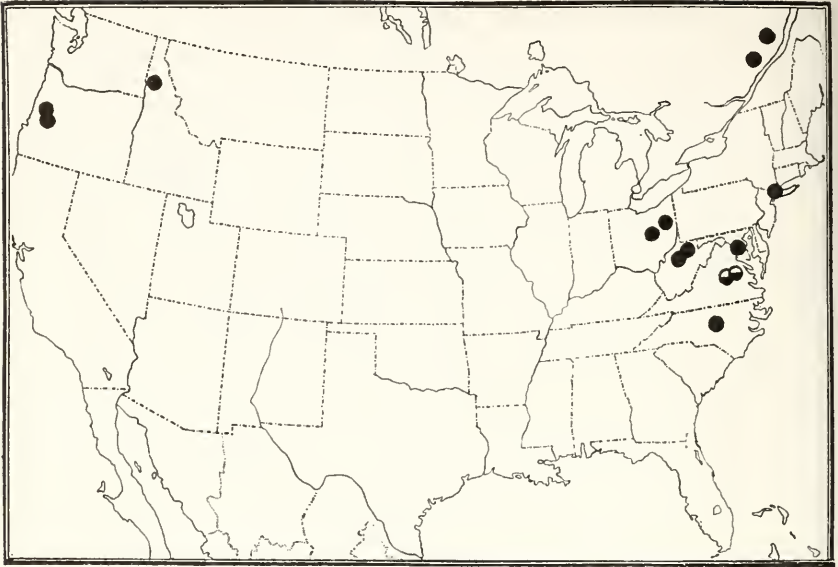
MAP 27.—Locality records.

E. squamosa ◐ *E. calycis* ◑ *E. pini* ●

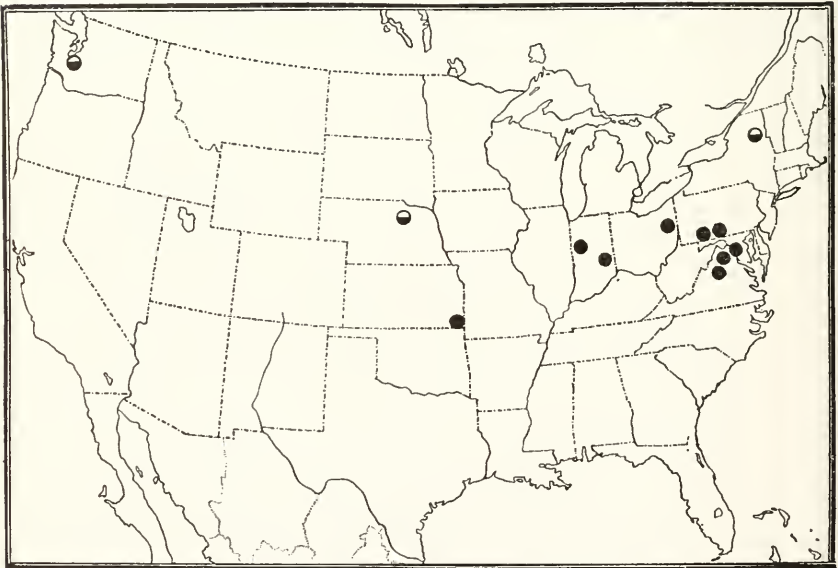


MAP 28.—Locality records.

E. baccae ◐ *E. rhois* ●



MAP 29.—Locality records.
E. levo ○ *E. crassineura* ●

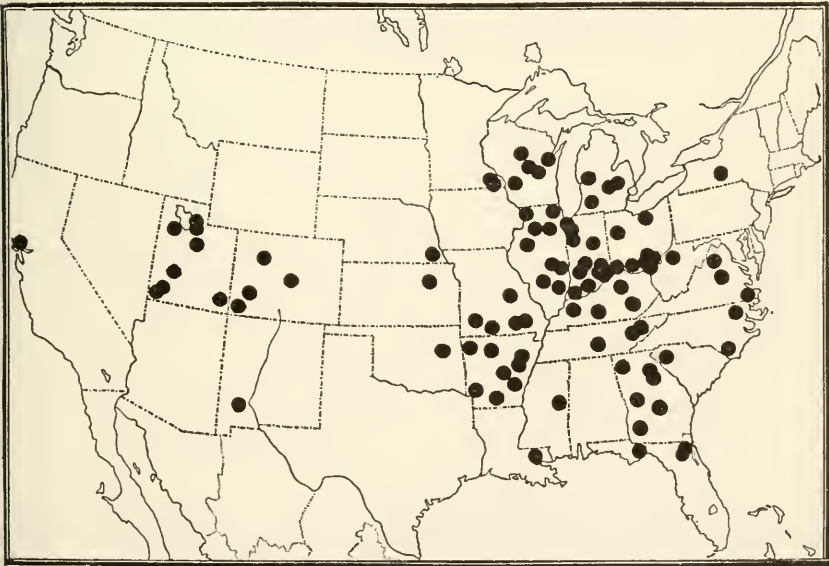


MAP 30.—Locality records.
E. parva ● *E. fusca* ○



MAP 31.—Locality records.

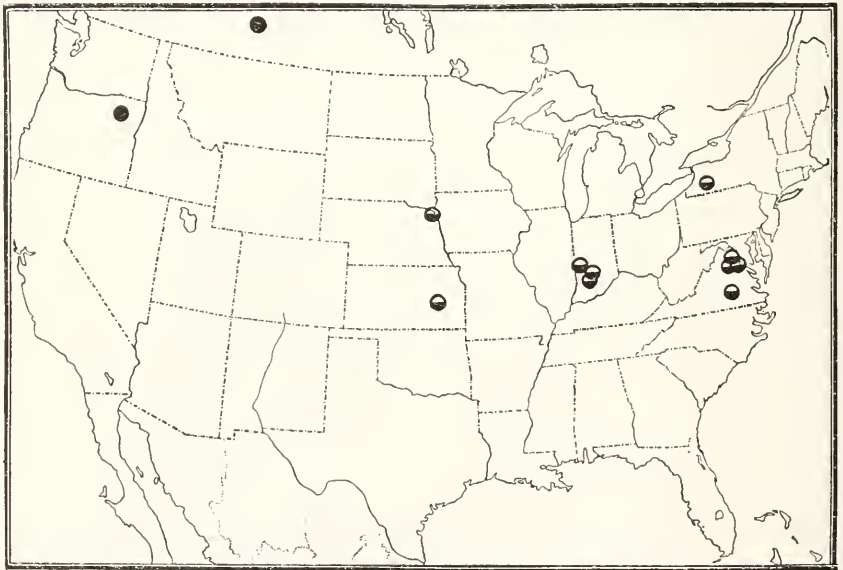
E. iniquus ○ *E. flavicurensa* ◐ *E. obtusa* ● *E. imminuta* ○



MAP 32.—Locality records for *E. studiosa*.



MAP 33.—Locality records for *E. spongiosa*.

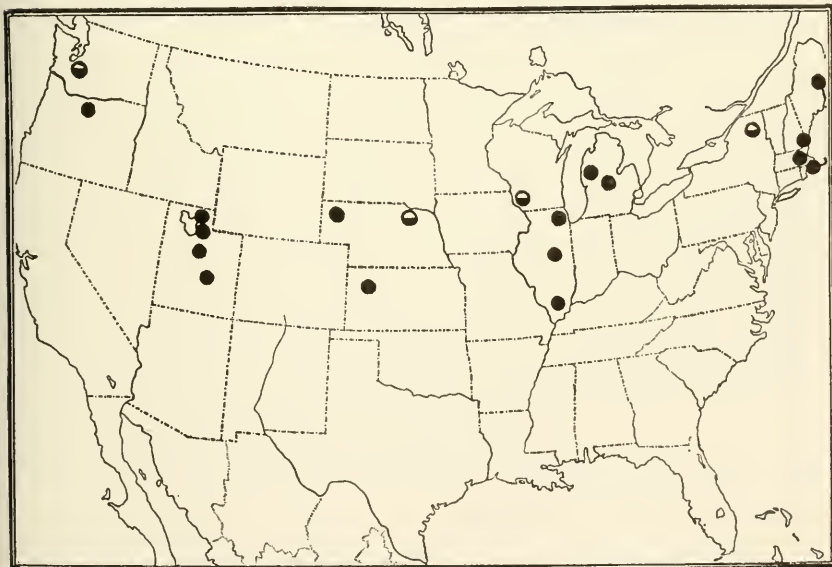


MAP 34.—Locality records.
E. bolteri ● *E. spina* ●



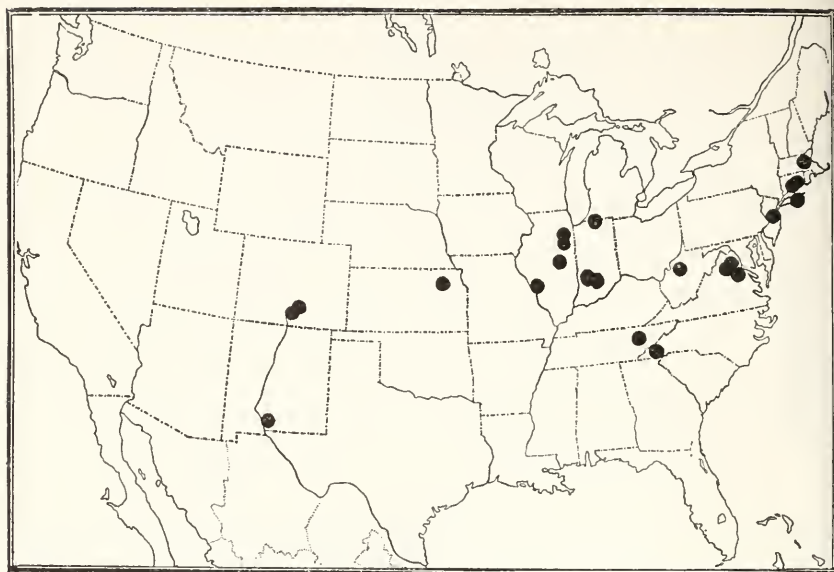
MAP 35.—Locality records.

E. dorcaschemae ◐ *E. parva* ● *E. longavena* ◑ *E. picea* ○



MAP 36.—Locality records.

E. calcarea ● *E. mali* ◑



MAP 37.—Locality records for *E. diastrophii*.