A Review of the Genus *Eucerceris*

(Hymenoptera: Sphecidae)

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CORVALLIS, OREGON

OREGON STATE MONOGRAPHS

Studies in Entomology
Number 1, January 17, 1939
Published by Oregon State College
Oregon State System of Higher Education
Corvallis, Oregon

PREFACE

The genus *Eucerceris* was erected and monographed in 1865 by E. T. Cresson. Since that date numerous species have been described and some species have been reduced to synonymy, but no effort has been made to review the accumulated information relative to the genus up to the present time. In addition to bringing together all known published data, the writer here describes several new species and varieties. For the first time observations on the biology of the genus are recorded.

A study of the most common species in Oregon, *E. flavocincta* Cresson, has brought to light the interesting fact that the species feeds its young on a snout beetle, *Dyslobus lacontei* Casey, which is a pest on young conifer trees. The wasp species is therefore of value as a biological control. Further studies on less well known species of *Eucerceris* will doubtless reveal like bioligical relationships.

The manuscript, which was presented and accepted as a doctoral thesis at Iowa State College, was also accepted for publication by the United States National Museum. A serious shortage of funds at the National Museum for publication purposes made it necessary to put the date of publication far in the future. The manuscript was therefore withdrawn and through the recommendation of the General Research Council of the State System of Higher Education and the Publications Committee of Oregon State College, it is now being published as a contribution to the Oregon State Monograph series.

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I. INTRODUCTION

The present work was first undertaken at the suggestion of Dr. J. Chester Bradley as a part of a study of the tribe CERCERINI. Upon the suggestion of Mr. S. A. Rohwer and Mr. J. C. Bridwell, who have both spent considerable time studying this group, special attention was first turned to the genus *Eucerceris.* The genus *Eucerceris,* being much the smaller and confined to the western hemisphere, presented less of a problem to start with than the genus *Cerceris,* which is much larger and world-wide in distribution. The writer has already done considerable work on the latter genus and will continue with it.

Work was started on the genus *Eucerceris* in 1928. More or less time has been spent since that date on a survey of the literature and in becoming familiar with the group by studying available material. In the summer of 1933 the writer spent some time studying types in the United States National Museum, the collection of the American Entomological Society of Philadelphia, and the American Museum at New York. Close to 1,000 specimens have been borrowed from the leading collections of North America. It is estimated that this borrowed material represents more than 90 per cent of the available specimens in the United States.

The writer is especially indebted to several workers who have assisted in various ways in the progress of these studies. Particular mention should be made of the following: Dr. H. H. Knight, for his kindly suggestions during the latter part of the studies; Dr. J. Chester Bradley, for frequent suggestions during the studies; Mr. S. A. Rohwer, who has kindly placed his notes at the disposal of the writer, compared specimens with types and rendered other valuable assistance; Miss Grace Sandhouse, for making comparisons with types and rendering assistance in many other ways; Dr. Harold Morrison, for his kind assistance in arranging for accommodations while the writer was studying types at the National Museum; Mr. E. T. Cresson, Jr., for making comparisons with types and providing accommodations for the writer while studying types at Philadelphia; Dr. A. L. Mutchler, for making available the necessary accommodations for studying types at the American Museum; Mr.

V. S. L. Pate, for making comparisons with types on several occasions; Dr. R. E. Snodgrass, for suggestions on the morphology studies; Dr. D. Eldon Beck, for suggestions relating to the genitalia studies; Prof. Raymond Roberts, for making comparisons with Mickel's types at Nebraska; Dr. W. H. Wellhouse, for suggestions on the morphology; Dr. Robert B. Benson and O. F. Tassart of the British Museum, for descriptions and drawings of types and for making comparisons; and to Dr. Don C. Mote, for providing accommodations for research work at Oregon State College.

The following persons and institutions have assisted in these studies by the loan of material: Dr. Harold Morrison, United States Bureau of Entomology and Plant Quarantine, who assisted in arranging for the loan of specimens in the collection of the United States National Museum; Dr. J. Chester Bradley, Cornell University; Mr. E. T. Cresson, Jr., American Entomological Society; Dr. Clarence E. Mickel, University of Minnesota; Dr. E. P. Van Duzee, California Academy of Sciences; Dr. Herbert F. Schwarz, American Museum of Natural History; Dr. George P. Engelhard, Brooklyn Museum; Dr. H. B. Hungerford, University of Kansas; Dr. Walter Carter, University of Hawaii; Dr. Carl D. Duncan, Stanford University; Mr. Earl Pritchard, Oklahoma A. & M. College; Prof. Geo. A. Dean and Prof. Reginald H. Painter, Kansas State College; Dr. H. P. Severin, South Dakota Agricultural College; Prof. O. A. Stevens, North Dakota Agricultural College; Prof. Chas. T. Vorhies and Prof. L. P. Wehrle, University of Arizona; Dr. Richard Dow, Boston Society of Natural History; Dr. A. L. Strand, Montana State College; Dr. J. Bequaert, Harvard Medical School; Dr. T. H. Frison, Illinois Natural History Survey; Dr. Hugo Kahl, Carnegie Museum; Dr. L. J. Muckmore, Los Angeles Museum; Dr. R. W. Doane, Stanford University; Mr. Albert F. Winn, Peter Redpath Museum; Mr. C. H. Hicks; Prof. C. L. Fluke, University of Wisconsin; Prof. Sam C. McCampbell, Colorado Agricultural College; Dr. H. H. Knight, Iowa State College; Mr. E. R. Buckell, Canadian Department of Agriculture; Dr. P. H. Timberlake, University of California; Mr. Wyall W. Jones; Prof. Raymond Roberts, University of Nebraska.

The writer is further indebted to Miss Grace Sandhouse and Mr. S. A. Rohwer of the Bureau of Entomology and Plant Quarantine for critically examining the manuscript and offering constructive suggestions.

II. THE TRIBE CERCERINI

The tribe CERCERINI as recognized by Comstock (1936) includes the genera *Cerceris* and *Eucerceris*. The genus *Cerceris* was erected by Latreille in

1802. For many years it was included under the family CRABRONIDAE. In more recent years it has usually been placed in the family PHILANTHIDAE. Cresson (1865) in his "Monograph of the PHILANTHIDAE of North America," included the three genera: *Philanthus, Cerceris* and *Eucerceris.* Packard (1866) in his "Revision of the Fossorial Hymenoptera of North America," included the three genera under the subfamily PHILANTHINAE in the family CRABRONIDAE. Patton (1879) followed the method of classification used by Packard, and in 1880 erected the genus *Aphilanthops.* The African genus *Nectanebus* is also included in this family. Ashmead (1899), in his "Classification of the Entomophilous Wasps, or the superfamily SPHEGOIDEA," separated *Cerceris* and *Eucerceris* from *Philanthus* and *Aphilanthops.* The first two genera were placed in the subfamily CERCERINAE and the last two in the subfamily PHILANTHINAE. Both subfamilies were included in the family PHILANTHIDAE, which was included in the superfamily SPHEGOIDEA. European workers quite generally do not recognize *Eucerceris* as a distinct genus separate from *Cerceris,* which is placed in PHILANTHIDAE under the superfamily SPHEGOIDEA. Tillyard (1926) follows the European workers but does not mention *Eucerceris* as it is not represented in the Australian Realm.

In more recent years three somewhat distinct methods of classification appear to be followed. In all three methods of classification the genera *Cerceris* and *Eucerceris* are included under the superfamily SPHECOIDEA (spelled SPHEGOIDEA by some workers). The first method of classification is the one mentioned above as common among European workers, where the two genera are included with others under PHILANTHIDAE. The second method is used by Rohwer (1916) who follows Ashmead (1899) but places the two genera in the family CERCERIDAE as distinct from the family PHILANTHIDAE. The third method is that adopted by Comstock (1936), who places the two genera in the tribe CERCERINI in the subfamily BEMBICINAE and the family SPHECIDAE. Since the classification of the Hymenoptera as used by Comstock (1936) represents more or less the combined views of the three leading authorities on wasps in this country; viz., Bradley, Rohwer and Bequaert, the writer will follow that classification in so far as the general classification of Hymenoptera enters into consideration.

The genus *Cerceris* is world wide in distribution, while the genus *Eucerceris* is considered as native to North America only. Heretofore the latter genus has been considered as being limited to North America (Bradley, 1921). A male specimen of *E. canaliculata* (Say) labeled "Ivon Beni, Bolivia (W. H. Mann)" is in the collection of the United States National Museum. If this is not an error in labeling, it is probably an introduction. The unique specimen being described in this paper as *E. violaceipennis* from Cabima, Panama, rep-

resents the most southerly record for the genus in North America. As stated elsewhere, it is also distinctive in being one of the three species in which the females have cell 1st R_5 petiolate.

From the present studies the writer is led to accept the views of Patton (1880) and believes that the genus *Cerceris* arose as an offshoot from the genus *Eucerceris*. Four species; viz., *E. vittatifrons, E. tricolor, E. montana* and *E. angulata,* as a group show a close relationship to *Cerceris* in that the males of all four species have cell 1st R_5 petiolate. *E. violaceipennis, E. punctifrons* and *E. arizonensis* would be the most primitive of all the species in that the females have cell 1st R_5 not petiolate. In all the other species cell 1st R_5 is petiolate in the females but not in the males.

III. MORPHOLOGY OF EUCERCERIS

Plate I

The head is noticeably large but less so than in CRABRONIDAE. The mandibles in general are unarmed on the males but armed with one or two mesal denticles on the females. The males of *montana* and *angulata* are exceptions. The clypeus has the three distinct lobes common to all members of the tribe CERCERINI. As a rule the clypeus is shorter and broader on the females than on the males. The apical clypeal border of the female is variously modified and presents the most valuable characters for separating the species. In the males there is much similarity in the form of the clypeus except in such extreme cases as *angulata* and *lacunosa.* Distinct anterior tentorial pits (Atp) lie between the lateral wings and the medial portion of the clypeus.

The inner margins of the eyes may be subparallel or they may be noticeably converging. A depressed line extends from the antennae to the clypeus and is continued for a short distance above the antennae. In this depressed line the punctation is finer and more compact.

The antennae as a rule are normal in form. Two exceptions are the males of *angulata* and *lacunosa* (Figs. 36 and 37a).

The prothorax is represented by three distinct parts. The pronotum (N_1) is the largest and has the posterior lobe, or tubercle (tu) characteristic of all sphecoid wasps. The episternum of the prothorax (Eps_1) is a small sclerite on the side of the neck. The prosternum (S_1) is a small plate between the precoxal cavities (CxC_1).

The mesothorax consists of the scutum (Sct_2) and the scutellum (Scl_2), the tegula (Tg) and the mesopectus (Mpct), which, according to Snodgrass

(1910, p. 79) "consists of the fused mesosternum (S_2) and mesopleurites (Eps_2, and Epm_2)." Two small plates (Sa_2, Sb_2) lying between and just in front of the second pair of coxal cavities are assigned to the mesosternum by Snodgrass (1934). The prepectus common in some wasps (*Philanthus*, etc.) is not found in CERCERINI. A longitudinal furrow (z) divides the episternal area. Mesopleural tubercles (mpt) are present on some females.

The metathorax consists of the metanotum (N_3), the metapleura (Pl_3) and metasternum (S_3). The metanotum, which is frequently called the postscutellum, is a narrow rounded ridge between the mesoscutellum and the propodeum. The metapleura lie along the lateral borders of the propodeum. The metasternum consists of three more or less distinct parts (Sa_3, Sb_3, Sc_3) between the second and third coxal cavities (CxC_2, CxC_3).

The propodeum (IT), which is considered as the first segment of the abdomen in Hymenoptera, has a distinct triangular area dorsally with the base of the triangle resting on the posterior border of the metanotum. This triangular area is usually referred to as the enclosure (enc). It is often ridged or punctate and in some cases is of taxonomic value, but the sculpturing varies in amount within the species.

Following the usual custom of students of Hymenoptera the propodeum is not considered in referring to the abdominal segments by number. The abdomen proper consists of six segments in the females and seven segments in the males (Fig. 4). This is true of all CERCERINI. The first segment of the abdomen is much constricted and of subuniform width. The second segment suddenly widens back of its junction with the first segment to the maximum width of the abdomen. The last three or four segments become progressively smaller. The distal tergite has a well marked pygidial area, which is of some taxonomic value in the form of its outline.

The distal ends of the third pair of femora are characteristic in the tribe CERCERINI. They are broad and reniform in shape (Fig. 9).

The wing venation typical for most males of the genus is illustrated on Plate I. The venation nomenclature used is based on the Bradley (1931) system. In *Cerceris* cell 1st R_5 is always petiolate in both sexes and cell 2nd R_5 is separated from cell 1st R_1 by a deep incision and is not greatly enlarged. In *Eucerceris* cell 1st R_5 may or may not be petiolate and cell 2nd R_5 is much enlarged and not separated from cell 1st R_1 by a deep incision.

The male genitalia (Pl. 1, Fig. 13) consists of a single basal ring (BR) through which opens the genital foramen (GF), and the following paired parts: large lateral coxopodites (Cxp), smaller and more medial paramers (Par), and the valves of the penis (VP). The two latter parts are together known as the aedeagus.

The background color is black, fuliginous or ferruginous. The markings are yellow or ferruginous. It is common for the yellow to blend into or be replaced by ferruginous or fulvous. Some parts retain the yellow markings more persistently than other parts. This is especially true of the metanotum. The yellow markings on the posterior border of the protergum and on the mesoscutellum are also quite persistent when other markings tend to fade out. There is a general tendency for elevated convex areas to be of a lighter color than the depressed concave areas.

IV. BIOLOGY OF EUCERCERIS

Apparently no observations have ever been published relative to the nesting habits of any species of the genus *Eucerceris*. The habits of species of the genus *Cerceris* have been studied by several workers in this country. Peckham and Peckham (1898, 1905) studied *Cerceris clypeata* Dahlb., *Cerceris deserta* Say and *Cerceris nigrescens* Smith in Wisconsin. Carl Hartman (1905) published some brief notes on *Cerceris fumipennis* Say in Texas, and Rau and Rau (1918) published some observations on the same species. Rau (1928) records some detail studies on *Cerceris raui* Rohwer and *Cerceris serripes* (Fabr.) (*Cerceris bicornuta* Guerin) in Missouri. Brooks (1930) records some observations on an undescribed species of *Cerceris* in West Virginia.

In a personal letter J. C. Bridwell (1932) reports finding "a female at Detroit, Oregon, on July 11, 1907, nesting in the ground in the manner ordinary for *Cerceris*. The prey used was a large Otiorhynchid beetle which Dr. Van Dyke subsenquently determined for me as *Dyslobus segnis* LeConte." The wasp referred to by Mr. Bridwell was determined by him as *Eucerceris flavocincta* Cresson. In the same letter Mr. Bridwell states: "I have found a considerable number of the males of the same *Eucerceris* sleeping in burrows under stones at a place called 'Lost Prairie,' I believe, along the Santiam road in the Cascades two years later." Prof. O. A. Stevens made some interesting observations on *Eucerceris superba* Cresson in North Dakota. His notes are recorded under that species in Section V.

The writer had an unusual opportunity to study the nesting habits of *Eucerceris flavocincta* Cresson at Breitenbush Hot Springs, Oregon, from July 2 to 7, 1934. Two colonies of nesting wasps were found. The first and smaller colony of the two was located along a little-used roadway, which was more or less covered with chips and sawdust from a nearby deserted sawmill. Only five burrows were located in this colony. Two of these burrows were in the process of being excavated by females. A second and much larger

colony (Pl. XII, Fig. 157) was found in a large open patch of ground near the mineral springs, where the owner of the ground reported having seen them in considerable numbers for the preceding three years. Several dozen burrows were observed in this colony, which extended over an area as large as the average city lot. The burrows were more numerous along the border of a large patch of tipton weed (*Hypericum perforatum* L.). A few of the burrows were well hidden in the thick growth of the above plant. The soil where the nests were found was quite rocky. The rocks ranged in size from that of a pea to several inches in diameter and constituted nearly 50 per cent of the soil. The soil between the rocks was quite light and dry. Miscellaneous short weeds and grass covered the ground not occupied by the tipton weed. (St. Johnswort).

The burrows were approximately one-half inch in diameter at the surface opening. They entered the ground at an angle of about 75°. Two or three inches below the surface they appeared to be slightly enlarged. From this main tunnel, which extended to a depth of about four inches, the female wasp apparently excavated side galleries, at the ends of which the nursery cells were formed. The cells are about five-eighths of an inch in diameter and an inch in length. Apparently each cell is excavated and provisioned with beetles and an egg before another is started. It was impossible to find out how many cells are constructed from one main burrow but apparently from six to ten or more.

The prey used (Pl. XIII, Fig. 158d) by the female of *Eucerceris flavocincta* Cresson to provision her nest is *Dyslobus lecontei* Casey, which Dr. E. C. Van Dyke was kind enough to determine for the writer. Numerous females with their prey were taken while transporting the beetles to their burrows. Many additional specimens of the beetles were removed from the provisioned cells. All the beetles observed were of the same species. Four beetles appeared to be the usual number provided for each cell. Close observation showed that the beetles were carried by one of their front legs when they were being dragged over the weeds. When the wasp was flying with her prey she held the beetle close to her ventral surface. The writer was unable to determine how this was accomplished but doubtless the wasp used her legs for this purpose.

An effort was made to find how long it took the wasp to complete one collecting trip. A wasp was observed to return with a second beetle fifty-three minutes after it entered its burrow with a first beetle. The nest was not under observation, however, during all the intervening time. Though several other burrows were kept under observation for an hour or more, the wasps did not return with additional prey. It would seem that approximately an hour or more was necessary to add an additional beetle to the supply. Even on the most favorable days the wasps did not start out for prey until nearly ten in the morning. From these observations it seems unlikely that a wasp could exca-

vate and provision more than one cell in a day. Possibly a much longer time is necessary for the process.

No eggs were found on the beetles in the cells. Two very young larvae (Pl. XIII, Fig. 158c) were observed. Both of these were lying on the ventral surface of the thorax of a beetle. A few nearly mature larvae (Pl. XIII, Fig. 158b) were observed feeding on beetle remains. The majority of the cells that were found contained the prepupae (Pl. XIII, Fig. 158a, 158e) along with the remains of the beetles. These prepupae were still larval in form but more compact in shape and yellow in color than the larvae. They were completely enclosed by a light brown parchment-like silken cocoon, which was rounded on the anterior end but elongate and blunt on the posterior end. The anterior end of the cocoon was free but the posterior end was firmly attached to the end of the cell wall. The entire cocoon was loosely attached to beetle remains and to the side walls of the cell by means of slender silken threads.

It is not known how long the young wasps remain in the prepupa stage, but at least some of our solitary wasps and bees spend the winter as such and pupate in the spring. It is quite probable that such is also the case with *Eucerceris flavocincta* Cresson.

The females spend the night in the burrows, where they may be found until late in the forenoon. The burrows remain open at all times. As indicated above, Bridwell found males sleeping in burrows in the ground under stones. The writer also found males in small shallow burrows. They never were found in the larger burrows used by the females. During the warmer part of the day the males spend their time flying about the nesting grounds, sitting on rocks and chips or flying after the females when they come in with their prey.

Both females and males of many species of *Eucerceris* may be found on such plants as *Solidago, Eriogonum, Daucus carota* and similar plants, where they apparently feed on nectar or pollen. The floral visiting habits of some of the species are indicated in the list of specimens examined as given in section V.

From the large number of beetles taken by the colony of *Eucerceris flavocincta* Cresson under observation it would appear that the genus may be of considerable value as a biological check on injurious forms.

V. REVISION OF THE GENUS EUCERCERIS

A. INTRODUCTION

The genus *Eucerceris* was erected by Cresson in 1865. In this genus Cresson placed two species previously described by Say (1823) under the genus

Philanthus (Eucerceris zonata Say) and *E. canaliculata* (Say). The female of the latter species had been described by Say (1823) as *Cerceris bidentata.* At the time Cresson erected the genus *Eucerceris* he had not seen specimens of *E. canaliculata* (Say) and was not aware of the fact that *C. bidentata* Say belonged in the new genus. In addition to Say's two species referred to above, Cresson described and added the following new species to the genus *Eucerceris: E. laticeps* (here considered synonymous with Say's *E. zonata) E. superba, E. flavocincta, E. cingulata* (later recognized by Cresson as the male of *E. flavocincta),* and *E. fulvipes.* Later species have been added by Cresson (1879, 1881, 1882), Patton (1879), Cameron (1888), Provancher (1888), Banks (1915), Cockerell (1897), Viereck and Cockerell (1904), Cockerell and Rohwer (1908), Rohwer (1912), and Mickel (1916). Several of these are here considered as synonyms. A total of twenty-six species have been described. Three of these have heretofore been reduced to varieties or reported as synonyms. The writer here recognizes twenty-two species including six new ones described in this paper.

As stated before, the genus *Eucerceris* is confined to North America with the possible exception of the apparently introduced *E. canaliculata* (Say) recorded from Bolivia. The greatest number of species is to be found in the southwestern arid part of the United States. Only one species, *E. zonata* (Say), is recorded from east of the Mississippi River.

B. SPECIFIC CHARACTERS

Color patterns and shades of colors have been used by many past workers in this genus. These are of value as secondary characters, but the fact that there is considerable variation within the species makes it undesirable to depend on color for separating species. One finds a shifting from black to fuliginous and fuscous in the background color and from yellow to ferruginous in the markings. The extent of the lighter markings varies considerably. The tendency is for the medial parts to fade out first and the lateral parts last. The depressed areas on the tergites tend to retain the ground color longer than the elevated convex areas. On the abdomen the proximal segments are the first to show markings and the last to lose them. On the head, the lower part of the face and the genae are the first to show lighter markings and the last to lose them.

The sculpturing of the enclosure, in the opinion of the writer, has been overemphasized by some past workers. It is constant and of value in separating some species, but in others it varies in amount but not in nature.

The apical margin of the clypeus in the female and the erect rows of hairs on the venter of the male are of special value. For some reason the latter have been neglected by most writers who have worked on the genus in the past. The pygidial area of the female is of some value, but not of as much value as in the closely related genus *Cerceris*. The relative length of the segments of the antennae has been of little value. Wing venation is used in separating the three groups recognized. There is some slight variation in the venation within the species and in some cases between the wings of the same individual.

C. CLASSIFICATION

The twenty-two species of *Eucerceris* recognized in this paper are divided into three groups, based on the wing venation. Group A includes *E. arizonensis,* new species, *E. violaceipennis,* new species and *E. punctifrons* Cameron, in which the female has cell 1st R_5 not petiolate. *E. lacunosa,* new species, is placed in group A also, as it probably will prove to be the ♂ of *E. arizonensis,* new species. The males are unknown, but when found they will no doubt have cell 1st R_5 also not petiolate. Group C includes *E. vittatifrons* Cr., *E tricolor* Ckll., *E. montana* Cr. and *E. engulata* Rohwer. This group is distinguished by the fact that both the males and females have cell 1st R_5 petiolate. Group B, which includes all the other species not included in the other two groups, has cell 1st R_5 petiolate in the females but not petiolate in the males.

In arranging the species, an effort has been made to place them in their proper phylogenetic sequence. While this is not difficult in some cases, there is still some uncertainty in the case of a number of the species.

D. HISTORY AND DIAGNOSIS OF GENUS

Genus EUCERCERIS Cresson

Philanthus SAY (in part), West. Quart. Rep., II:79, 80, 1823.—SAY (in part), American Entomology, III:111-112, pl. 49, 1828.—LECONTE (in part), Writ. of Th. Say, I:111-112, 167, 1883.

Cerceris SAY (in part), West. Quart. Rep., II:80, 1823.—LECONTE (in part), Writ. of Th. Say, I:168, 1883.—CRESSON (in part), Proc. Ent. Soc. Phil., V:130, 1865.—PACKARD (in part), Proc. Ent. Soc. Phil., VI:64, 1866.—SCHLETTERER (in part), Zool. Jahrb., II:349-510, 1887.—DALLA TORRE (in part), Wien, Ent. Zeit., IX: 199-204, 1890.—DALLA TORRE (in part), Cat. Hymen., VIII:449-481, 1897.

Eucerceris CRESSON, Proc. Ent. Soc. Phil., V:104-112, 1865.—PACKARD, Proc. Ent. Soc. Phil., VI:58-59,1866.—CRESSON, Hymen. of Amer., p 281, 1887.—ASHMEAD, Canad. Ent., XXXI:292, 1899.—SMITH, Univ. Neb. Studies, VIII:371-372, 1908.—MICKEL, Univ. Neb. Studies, XVII:454-456, 1918.

GENOTYPE (Logotype).—*Philanthus zonatus* Say; by present designation.

Cresson's original definition (1865 pp. 104-105) is as follows:

"*Head* large, wider than the thorax, subquadrate, wider and more transverse in the female, with the face much broader anteriorly; eyes lateral, more or less ovate, entire; ocelli in a triangle on the vertex; antennae subclavate, inserted above the clypeus, in the middle of the face, approximated; mandibles stout, acute or subacute at their apex; clypeus 3-toothed at tip, and trilobate in male, scarcely so in female. *Thorax* ovate, the collar transverse, the metathorax obtusely rounded or subtruncate. *Wings:* the anterior wing with one marginal and three submarginal cells; the female has the marginal cell oblong and obtusely rounded at tip, the first submarginal cell much longer than the two following, the second triangular, petiolated, and receiving the first recurrent nervure before the middle, the third submarginal very large, subquadrangular, the tip exceeding that of the marginal, the second recurrent nervure uniting with the second transverse cubital nervure; the male has the marginal rather shorter, subtriangular, especially at base, truncate or subtruncate at tip, the posterior nervure descending in a gradual curve, and the inferior edge in an angle, to meet the superior angle of the second submarginal cell, which is triangular and oblique, receiving the first recurrent nervure before the middle; the second recurrent nervure either unites with the second transverse cubital nervure, or is received near to the base of the third submarginal cell which is shaped much as in the ♀, but varying in being a trifle shorter and more quadrate. *Legs* stout, rather strongly spinose, the posterior tibiae serrate, the anterior tarsi ciliated exteriorly, but not strongly so. *Abdomen* as in *Cerceris*.

"This genus is much more closely related to *Cerceris* than to *Philanthus*, to which the two described species have been referred; it differs from the former genus especially in the neuration of the anterior wings, which, however, shows a remarkable difference in the male and female."

The writer's concept of the group conforms to this definition with the exception that the female may have cell 1st R_5 not petiolate.

It should be added that members of the genus *Eucerceris* differ from those of Cerceris by the presence of a depressed line on the tergites of the abdomen of both sexes and the different form of the pygidial area in the males. The hairs along the apical borders of the clypeus of male *Eucerceris* do not have a "waxed" appearance as do those of *Cerceris* males.

E. KEY TO SPECIES

Seven segments in abdomen.....Males.
Six segments in abdomen.....Females.

Males

1. Cell 1st R_5 petiolate.....2.
   Cell 1st R_5 not petiolate.....5.
2. Mandibles abnormally large.....**montana.**
   Mandibles normal.....3.
3. Scape wide and flattened, projections on first five segments of the flagellum, rows of erect hairs on sternites three and four.....**angulata**
   Antennae normal in form, one row of erect bristles on sternite five.....4.
4. Abdomen with ferruginous.....**tricolor.**
   Abdomen without ferruginous.....**vittatifrons.**
5. No rows of erect bristles on the venter.....**flavocincta**
   One or more rows of erect bristles on the venter.....6.

6. One row of bristles on the fifth sternite only ..... 7.
   More than one row of bristles on the venter ..... 9.
7. Second femora with a deep depression bordered with a row of long hairs ..... **lacunosa.**
   Second femora normal ..... 8.
8. Length 14 to 15 mm., ferruginous markings usually present ..... **rubripes.**
   Length about 12 mm., without ferruginous markings on body ..... **fulvipes.**
9. Two rows of bristles on the venter ..... **similis.**
   Three rows of bristles on the venter ..... 10.
10. All three rows of bristles with the bristles about equal in length ..... 11.
    One or two rows of bristles with the bristles shorter than in the other rows ..... 12.
11. Bristles moderately long, in unbroken rows ..... **superba.**
    Bristles short, rows of bristles divided ..... **zonata.**
12. Length 15 or more mm ..... 13.
    Length 11 to 12 mm ..... 14.
13. Ferruginous and yellow ..... **canaliculata.**
    Black and yellow ..... **canaliculata** var. **atronitida.**
14. Black and yellow ..... **insignis.**
    Black, yellow and rufus ..... **elegans.**

Females

1. Cell 1st R_5 not petiolate ..... 2.
   Cell 1st R_5 petiolate ..... 4.
2. Ferruginous and yellow ..... **arizonensis.**
   Black with yellow markings ..... 3.
3. Length about 23 mm. ..... **violaceipennis**
   Length 15 mm ..... **punctifrons**
4. Distinct projections on the middle or lateral lobes of the clypeus ..... 5.
   No distinct projections on the middle or lateral lobes of the clypeus; surface flat or slightly elevated or ridged ..... 10.
5. A prominent tooth on each lateral lobe of the clypeus ..... 6.
   No distinct projections on the lateral lobes ..... 7.
6. Ferruginous with yellow markings ..... **canaliculata.**
   Black with yellow markings ..... **canaliculata** var. **atronitida**
7. Beak-shaped projection on the lower border of the central lobe of the clypeus; tergites finely and closely pitted; enclosure strongly rugose ..... **zonata.**
   Cone-shaped projection on the middle lobe of the clypeus; tergites sparsely pitted; enclosure more or less transversely ridged ..... 9.
8. Abdomen black and ferruginous ..... **superba** var. **bicolor.**
   Abdomen largely yellow ..... **superba** var. **superba.**
9. Proximal tooth of mandible much smaller than the distal tooth; ridges on the enclosure parallel to the anterior border ..... **rubripes.**
   Distal tooth of mandible smaller than the proximal tooth; ridges on inclosure at a 45° angle to the anterior border ..... **conata.**
10. Apical border of clypeus without a distinct process ..... **arizonensis.**
    Apical border of clypeus with one or more processes ..... 11.
11. Apical border of clypeus with a single process ..... 12.
    Apical border of clypeus with more than one process ..... 14.
12. Clypeal process broadly rounded ..... 13.
    Clypeal process truncate, distal border sinuate ..... **sinuata.**
13. Lateral angles of pronotum dentate ..... **angulata.**
    Pronotum not dentate ..... 14.
14. Enclosure closely and coarsely pitted ..... **montana.**
    Enclosure transversely striated ..... **cerceriformis**

15. Two processes on the apical border of the clypeus.....16.
    More than two processes on the clypeal border.....18.
16. Processes truncate and not widely separated.....**bitruncata.**
    Processes pointed and widely separated.....17.
17. Black and yellow without ferruginous on the abdomen.....**vittatifrons.**
    Black and yellow with ferruginous on the abdomen.....**tricolor.**
18. Three processes on the clypeal border.....19.
    Four processes on the clypeal border.....20.
19. Lateral processes on the clypeal border bifid, medial process not bifid **flavocincta.**
    Lateral processes on the clypeal border not bifid, medial process bifid....**elegans.**
20. The two medial processes widely separated.....21.
    All processes about equally spaced.....22.
21. Black with pronounced yellow markings.....**insignis**
    Ferruginous with little or no yellow.....**ferruginosa.**
22. Elongate bristles emerge from above the medial processes; a distinct transverse ridge on the medial lobe of the clypeus.....**fulvipes.**
    Elongate bristles emerge from below the medial processes; no distinct transverse ridge on the medial lobe.....**similis.**

F. DISCUSSION OF SPECIES

Group A.

In this group cell 1st R_5 is not petiolate in either sex.

1. EUCERCERIS LACUNOSA, new species

Figs. 37, 37a, 76, 109, 123, 136.

Male.—Ferruginous with yellow and fuscous markings; mandibles with a medial carina; apical border of clypeus bidentate medially; antennae with the terminal segment hooked; front yellow; enclosure smooth with a central groove; two small but distinct clusters of four or five erect bristles on the posterior border of sternite 5; pygidial area truncate; a large depression on the ventral sides of the second pair of femora fringed on the anterior and posterior sides with dense rows of silky hairs. Length 19 mm.

Head (Fig. 37) subequal to thorax in width, closely to moderately punctate, clothed with long silvery hairs; mandibles nondentate but with a pronounced medial carina, yellow with the distal third and medial carina dark fuliginous, a row of hairs on the medial surface; clypeus slightly concave, lateral wings small, two blunt processes medially on the apical border closely and finely punctate, yellow, heavily clothed with silvery hairs dorsally and along the apical border; antennae (Fig 37a) with terminal segments hooked posteriorly, proximal segments ferruginous with a yellow patch on the scape, distal segments becoming fuliginous; front slightly narrowed above, yellow with short narrow fuliginous lines extending dorsad from the antennae; vertex ferruginous with the interocellar area dark fuscous; genae ferruginous with elongate fulvous patches along the border of the eyes.

Thorax closely and coarsely punctate, clothed with long silky hairs, longer and more numerous ventrally; pronotum with a wide yellow band on the posterior border confluent with a yellow patch on the tubercle; mesonotum ferruginous; tegula smooth, ferruginous with a yellow patch; scutellum ferruginous with a fulvous band; mesoscutum yellow with ferruginous borders and extremities; pleuron ferruginous; indefinite areas

on the prosternum, mesosternum and the posterior plates of the mesosternum, yellow; propodeum ferruginous with large yellow patches laterally; enclosure smooth with a central groove, ferruginous with two converging oval yellow patches along the lateral borders.

Abdomen closely punctate, more densely pitted in depressed areas of tergites; tergite 1 with a wide yellow band emarginate on both sides; tergite 2 with a wide yellow band dilated laterally; tergites 3 to 6 yellow with ferruginous borders; sternite 7 yellow; venter ferruginous with lateral yellow patches on sternites 2 to 5, two clusters of 4 or 5 erect bristles on the posterior border of sternite 5; pygidial area (Pl. IX, Fig. 109) truncate with a lateral carina, moderately pitted, yellow.

Legs largely ferruginous, with yellow spots on the first pair of coxae and on the posterior sides of the first four femora; a large depression on the ventral sides of the second pair of femora fringed on the anterior and posterior sides with dense rows of silky hairs.

Wings subhyaline with the costal half clouded; cell 1st R_5 not petiolate (Pl. VIII, Fig. 76).

Genitalia (Pl. X, Fig 123).

Holotype.—Male, Bill Williams Fork, Arizona, August (F. H. Snow), in the collection of the University of Kansas.

Paratypes.—Male, Dragoon, Cochise County, Arizona, July 20, 1917 (J. Bequaert); male, Higley, Arizona, July 11, 1930 (Edward Tatum), in the collections of Cornell University and University of Arizona.

Distribution.—Arizona (Pl. XI, Fig. 136).

E. lacunosa departs from the usual form by having the clypeal border bidentate in the male. Its pygidial area is also different from the usual form. Its resemblance to *E. arizonensis* leads the author to think that the latter will prove to be the female of *lacunosa.* One paratype is slightly smaller and has the ferruginous replaced by fuscous and black. The paratype from Dragoon, Arizona, shows slightly more yellow in some parts and the background is more ferruginous. *E. lacunosa* is about the same size and general color as the male of *E. canaliculata* from which it can be separated by the characters mentioned above.

2. EUCERCERIS ARIZONENSIS, new species

Figs. 14, 57, 90, 137.

Female.—Ferruginous with yellow markings; mandibles with a large tooth medially and a smaller tooth close to and proximad of the large one; clypeus short and broad, nondentate; enclosure with a velvety surface and medial groove; pygidial area wedge-shaped; cell 1st R_5 is not petiolate. Length 20 mm.

Head (Fig. 14) slightly wider than the thorax, closely and minutely punctate, clothed with yellowish hairs, which are shorter toward the vertex but longer toward the clypeus and ventrally; mandibles with a large tooth medially and a smaller tooth close to and proximad of the larger one; ferruginous, with the distal third and teeth dark fuscous; clypeus short and wide, nondentate, a medial carina extending from the apical border half way to the dorsal border, three or four elongate bristles emerging from the apical

border medially, clothed with long hairs medially and along the apical border, elsewhere with short hairs, yellow except for the medial carina and apical border, which are ferruginous; antennae normal in form, proximally ferruginous, distally becoming fuliginous; front yellow with short ferruginous lines above the antennae; vertex and genae ferruginous with an elongate yellow patch bordering the eye behind and two remote yellow spots on the occiput.

Thorax closely and minutely punctate, clothed with short amber hairs above, becoming much longer ventrally and posteriorly, ferruginous with the following parts yellow: band on the posterior border of the pronotum, tubercle, spot on the tegula, band on the scutellum, band on the metanotum, spot back of the tubercle, two large irregular patches on the propodeum, two converging patches on the enclosure; mesopleural tubercle present; enclosure impunctate and velvety with a central groove.

Abdomen closely and finely punctate, less so on the convex areas; tergite 1 with a wide yellow band emarginate on both sides; tergite 2 with a wide emarginate yellow band; tergites 3 to 5 yellow with the proximal borders ferruginous; tergite 6 fulvous; sternite 1 ferruginous; sternite 2 with two large lateral yellow patches confluent; sternites 3 to 5 with wide yellow bands; pygidial area (Pl. IX, Fig. 90) wedge-shaped with a lateral carina, fringed with a row of amber hairs.

Legs ferruginous with yellow patches on the lateral sides of the first four femora.

Wings subhyaline, cloudy along the costal half, with a tendency to be violaceous. Cell 1st R_5 is not petiolate (Pl. VII, Fig. 57).

Holotype.—Female, Oslar, Huachuca Mountains, Arizona, in the collection of the University of Kansas (lot no. 940).

Paratype.—Female, Southern Arizona, in the collection of Cornell University.

E. arizonensis may prove to be the female of *E. lacunosa,* which it closely resembles. Its general color and size make it superficially resemble the female of *E. canaliculata,* from which it may easily be separated by the clypeal structure. Like *E. punctifrons* and *E. violaceipennis* cell 1st R_5 is not petiolate in the female of *E. arizonensis.*

Distribution.—Arizona (Pl. XI, Fig. 137).

3. EUCERCERIS VIOLACEIPENNIS, new species

Figs. 17, 58, 91, 138.

Female.—Black with yellow markings on front and first tergite only; mandibles with one short rounded bulge; apical clypeal border with a broad obtuse medial extension, below which emerge a few elongate bristles; front broad and flat; enclosure closely and coarsely punctuate and with a medial groove; wings black with a tendency to be violaceous, cell 1st R_5 not petiolate. Length 23 mm.

Head (Fig. 17) large, closely and coarsely punctate, clothed with silvery hairs becoming more closely set toward the clypeal border, black with four yellow patches on the front dorsad of the lateral wings of the clypeus, the smaller patch bordering the eye, a small ferruginous spot just above the medial portion of the clypeus; mandibles with a short rounded bulge; clypeus short and broad, apical border with a single medial broad obtuse extension below which emerges a cluster of elongate bristles; antennae normal in form.

Thorax closely and coarsely punctate, immaculate, clothed with short silvery hairs becoming longer ventrally; mesopleural tubercle absent; enclosure closely and coarsely punctate and with a medial groove.

Abdomen closely and coarsely punctate, more finely punctate in the depressed areas of the tergites, clothed with silvery hairs, black except for two yellow patches on tergite 1; venter becoming slightly fuscous; pygidial area (Pl. IX, Fig. 91) bordered by an indistinct carina, and fringed by a row of hairs.

Legs black.

Wings black with a tendency to be violaceous, cell 1st R_5 not petiolate (Pl. VII, Fig. 58).

Holotype.—Female, Cabima, Panama, May 21, 1911 (August Busck), in the collection of the United States National Museum. (Type No. 50836).

E. violaceipennis is of special interest for two reasons. It represents the most southern record for the genus in North America. Furthermore, it is one of the only three species of the genus in which cell 1st R_5 is not petiolate in the female. Together with *E. arizonensis* and *E. punctifrons* it represents the most extreme departure from the *Cerceris* type of venation.

Distribution.—Panama (Pl. XI, Fig. 138).

4. EUCERCERIS PUNCTIFRONS (Cameron), New combination

Figs. 54, 55, 56, 135.

Aphilanthops punctifrons CAMERON, Biol. Centr.-Amer., Hymen., II:106, T. 7, Fig. 2, 1890 ♀.

Cerceris punctifrons DALLA TORRE, Cat. Hymen., VIII: 470, 1897.

Female.—Black with yellow markings; mandibles with one enlarged rough bulge; apical clypeal border with a flat rounded process with small rounded elevations at its base on each side; metanotum black; enclosure coarsely punctate with a medial groove; cell 1st R_5 not petiolate. Length 15 mm.

Head (Fig. 54) large, coarsely punctate, black with clypeus, except its projections, two large patches mesad of the eyes, a patch above the medial portion of the clypeus, oblong spots posterior to compound eyes and two minute spots posterio-laterad of the dorsal ocelli, yellow; mandibles with an enlarged rough bulge; clypeus short and broad, apical border with a medial rounded extension with a small rounded elevation at its base on each side; antennae normal in form.

Thorax closely and coarsely punctate, black except for two elongate patches on the pronotum, two irregular patches on the scutellum, patches on the tegula, a small patch back of the tubercle, two small patches on the enclosure, two large patches which are yellow on the propodium; mesopleural tubercle absent; enclosure coarsely punctate with a medial groove.

Abdomen closely and coarsely punctate, more closely and finely punctate in the depressed areas of the tergites, clothed with silvery hairs, black except for a broken band narrowed medially on the first tergite, a narrow band on the second tergite, a broken band on the third tergite, lateral wedge-shaped patches on the fourth and fifth tergites, which are yellow; venter immaculate; pygidial area (Pl. VI, Fig. 55) bordered by a carina and fringed by a row of hairs.

Legs black except for elongate yellow patches on the anterior surfaces of all femora and tibia.

Wings dark, with darker anterior borders, cell 1st R_5 not petiolate (Pl. VI, Fig. 56).

E. punctifrons is close to *E. violaceipennis,* but is much smaller and with more yellow markings. It belongs to group A, since it has cell 1st R_5 not petiolate. *E. punctifrons* Cameron also superficially resembles *E. montana* Cresson by its rounded clypeal process but in the latter species cell 1st R_5 is petiolate.

Holotype.—Female, Mexico, Temax in North Yucatan (Gaumer), in the collection of the British Museum (London).

Distribution.—Mexico (Pl. XI, Fig. 135).

Group B.

In this group cell 1st R_5 is petiolate in the females but not in the males.

5. EUCERCERIS FLAVOCINCTA Cresson

Figs. 1-13, 18, 39, 59, 77, 92, 110, 124, 139, 157, 158a,-158e.

Eucerceris flavocinctus CRESSON, Proc. Ent. Soc. Phil., V: 109-110, 1865, ♀.—PACKARD, Proc. Ent. Soc. Phil., VI: 58-59, 1866..—CRESSON, Trans. Amer. Ent. Soc., X: vi, vii, 1882 ♂, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♀, ♂.—ASHMEAD, Colo. Biol., Assoc., Bul., I: 32, 1890.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 100, 1916, ♀.

Eucerceris cingulatus CRESSON, Proc. Ent. Soc. Phil., V: 110-111, 1865, ♂.—PACKARD, Proc. Ent. Soc. Phil., VI: 58-59, 1866.

Cerceris flavocinctus SCHLETTETET, Zool. Jahrb., II: 492, 1887.

Cerceris flavocincta DALLA TORRE, Cat. Hymen., VIII: 460-461, 1897.

Cerceris cingulata SCHLETTERER, Zool. Jahrb., II: 488, 1887.

Eucerceris striareata VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 86, 1904, ♀.—CRESSON, Memoirs of the Amer. Ent. Soc., V: 50, 1928, ♀

Eucerceris chapmanae VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 86, 1904, ♂.—CRESSON, Memoirs of the Amer. Ent. Soc., V: 48, 1928, ♂.

Male.—Black with yellow markings; clypeus tridentate; front yellow; enclosure finely and obliquely striated; without rows of erect hairs on the venter; cell 1st R_5 not petiolate. Length 15 mm.

Head (Fig. 39) subequal to thorax in width; mandibles nondentate, proximal two-thirds yellow and sparsely clothed with hairs, distal third fuliginous and glabrous; clypeus sparsely punctate, tridentate medially at the apical margin, yellow, sparsely clothed with amber hairs on the surface, apical margin of lateral wings with a closely set band of amber hairs; scape of antennae black with a yellow patch on the anterior face, clothed with short hairs, pedicel and flagellum black; front narrowed above, convex areas sparsely punctured, concave areas closely punctured, sparsely hairy anteriorly, clothed with long amber hairs toward the vertex, black of vertex extending to and surrounding antennae and as an acute projection bordering the eye; vertex closely punctured, black clothed with amber hairs; genae closely punctured, black with oval yellow spots back of eyes, densely clothed with amber hairs.

Thorax, protergum closely punctured anteriorly, sparsely punctured posteriorly, clothed with short black hairs, black with subemarginate band of yellow on posterior

border and a small yellow spot on the side; tubercle black; mesoscutum moderately punctured, black and clothed with black hairs; scutellum moderately punctured, moderately clothed with short hairs, two small yellow spots; metanotum sparsely punctate, yellow, sparsely clothed with short hairs; tegula smooth, glabrous, anterior half yellow, posterior half amber; pleuron moderately punctate, black except for a yellow patch on the mesopleural region and an extension of the yellow of the mesosternum; sternum moderately pitted and hairy, mostly yellow with the yellow of the mesopectus extending on to the mesopleuron; propodeum black, closely punctate, moderately clothed with fine hairs; enclosure distinctly covered with fine parallel oblique ridges, a marked dip near the posterior angle.

Abdomen moderately punctuate, black areas more closely pitted than yellow areas; tergites 1 to 6 with yellow bands on distal margins, bands on tergites 1 to 4 dilated laterally; venter clothed with amber hairs, no prominent rows of erect hairs; sternites 1 to 4 with wide yellow bands; sternites 5 and 6 black; pygidial area (Pl. IX, Fig. 110) margined by a carina, fringed by a row of hairs, sparsely pitted.

Legs black and yellow; coxae, trochanters and femora yellow ventrally and black dorsally; first two pair of tibiae and tarsi dark amber, with some yellow ventrally.

Wings subhyaline, anterior two-fifths of forewing fuliginous; cell 1st R_5 not petiolate (Pl. VIII, Fig. 77).

Genitalia (Pl. X, Fig. 124).

Female.—Like male in all respects except for the usual sexual differences and as indicated. Mandibles unidentate; front black with two large patches bordering the eyes, a patch on the medial part of the clypeus and a stripe on the interantennal carina, yellow; cell 1st R_5 petiolate. Length 15 mm.

Head (Fig. 18) wider than thorax; mandibles unidentate, black, proximal two-thirds sparsely clothed with hairs ventrally; clypeus sparsely punctate, sparsely clothed with amber hairs on the surface, apical margin with two widely separated bidentate processes and a single small medial denticle above separated by a groove from two centrally located denticles below, a prominent row of bristles emerge from between the two rows of denticles, lateral wings bordered with a row of short amber hairs, central lobe with a yellow patch; antennae black; front comparatively wide, convex areas sparsely punctured, concave areas closely punctured, clothed with long amber hairs toward the vertex, a large yellow patch bordering the compound eye medially, a broken yellow line between the antennae dilated below; genae closely punctured, moderately clothed with amber hairs, black with wedge-shaped yellow marks bordering the compound eyes.

Thorax black with a divided band of yellow on the posterior border; tubercle black, mesoscutum moderately punctured, black, clothed with short black hairs; scutellum moderately punctured, moderately clothed with short hairs, two small yellow spots; metanotum very sparsely punctured, yellow, very sparsely clothed with short hairs; tegula smooth, fulvous with a yellow patch; pleuron moderately punctured, black; mesopleural tubercle present; propodeum and its enclosure as in the male.

Abdomen black marked with yellow, sculptured as in male; yellow band of first tergite emarginate; yellow bands of tergites 2 to 5 dilated laterally; venter black; pygidial area as illustrated (Pl. IX, Fig. 92), rugose, margined by a carina and friged by a row of prominent black hairs.

Legs black proximally to tibiae, tibiae yellow becoming fuliginous medially, tarsi fulvous.

Wings as in male, except cell 1st R_5 is petiolate. (Pl. VII, Fig. 59).

Holotype.—Female, Rocky Mountains, Colorado Territory (Ridings), in the collection of the American Entomological Society of Philadelphia (Type No. 1963).

The types of *E. chapmanae* Viereck and Cockerell and *E. striareata* Viereck and Cockerell are in the collection of the American Entomological Society of Philadelphia. They were compared with the type material of *flavocincta* Cresson and *cingulatus* Cresson and found to be synonymous. *E. striareata* V. and C. and *E. chapmanae* V. and C. are therefore being suppressed. *E. cingulatus* has long been recognized as the male of *E. flavocincta* Cresson. The type of *chapmanae* shows only slight differences in the amount of yellow from the type of *cingulatus*. The type of *striareata* has much more yellow than the type of *flavocincta*. The differences, however, are well within the range of variation. There is a tendency, especially among the females, for the yellow of the tergum to extend around the depressed areas, leaving the latter as isolated black patches. The species also shows considerable variation in size. The male is distinctive in not having rows of erect bristles on the venter.

Distribution.—British Columbia, California, Colorado, Idaho, Montana, Nevada, Oregon, South Dakota, Utah, Washington, Wyoming. (Pl. XI, Fig. 139).

This species ranges throughout most of the western states, where it is usually found in altitudes above 2,000 feet. It appears more common in wooded sections. The Eastern border of its range extends into the western end of South Dakota, where it has been taken at Custer and Pringle in Custer County. Its range may extend into western North Dakota, Nebraska, and Kansas, but up to the present time it is not recorded from those states. It appears to range south to Arizona and New Mexico and north to British Columbia, where it is recorded from Kasio, Vancouver, and Wycliffe. The specimens from the Central Cascade Mountains of Oregon are much larger than those from other sections.

6. EUCERCERIS RUBRIPES Cresson

Figs. 15, 16, 38, 60, 78, 93, 111, 125, 140.

Eucerceris rubripes CRESSON, Trans. Amer. Ent. Soc., VII: xxiii, 1879, ♂.—CRESSON, Trans. Amer. Ent. Soc., X: v, vi, vii, 1882, ♂, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂.—ASHMEAD, Colo. Biol. Assoc., Bul. I: 32, 1890.—BRIDWELL, Trans. Kansas Acad. Sci., XVI: 209, 1899.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 88, 1904.—VIERECK, Trans. Amer. Ent. Soc., XXXII: 233, 1906.—SMITH, Univ. Nebr. Studies, VIII: 372, 1908.—MICKEL, Univ. Nebr. Studies, XVII: 455, 1918, ♂, ♀.—CRESSON, Memoirs of the Amer. Ent. Soc., I; 101, 1916, ♂.

Eucerceris unicornis PATTON, Bul. U. S. Geol. and Geog. Survey, V: 359-360, 1879, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♀.—BRIDWELL, Trans. Kansas Acad. Sci., XVI: 209, 1899.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—VIER-

ECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 87, 1904.—VIERECK, Trans. Amer. Ent. Soc., XXXII: 233, 1906.

Cerceris unicornis SCHLETTERER, Zool. Jahrb., II; 505, 1887.—DALLA TORRE, Cat. Hymen., VIII: 480, 1897, ♀.

Cerceris rubripes DALLA TORRE, Wien. Ent. Zeit., IX: 201, 1890.—DALLA TORRE, Cat. Hymen., VIII: 473, 1897, ♂.

**Aphilanthops marginipennis* CAMERON. Biol. Centr.-Amer., Hymen. II: 105, T. 7, Fig. 1, 1890, ♂. Fig. 52, 53, 135).

Cerceris marginipennis DALLA TORRE, Cat. Hymen., VIII: 467, 1897.

Male.—Black and fulvo-fuliginous with yellow and creamy-white markings; clypeus tridentate; metatergum yellow; enclosure with prominent ridges running obliquely; sternite 5 with a distinct row of erect matted hairs; legs fulvous; cell 1st R_5 not petiolate. Length 13 mm.

Head (Fig. 38) slightly wider than thorax, moderately pitted and clothed with short silvery hairs; mandibles nondentate, fulvous, black at the tips; clypeus tridentate on the apical border of the medial part, yellow, apical border fulvous, black of front extending as a narrow line between the front and the medial part, between the front and the lateral wings, and between the medial part and the lateral wings, apical border of lateral wings with more elongate rows of light amber hairs; antennae normal in form, fulvous proximally becoming dark fuscous distally; front yellow with black of vertex extending as narrow stripes through the antennal scrobes to the clypeal border and as narrow wedges along the medial border of the eyes to the level of the antennae, yellow between antennae reaching the medial ocellus; vertex and genae black with large fulvous patches bordering the eyes.

Thorax closely to sparsely pitted, clothed with short silvery hairs; pronotum with a creamy-white band on the posterior border confluent with a patch of like color on the tubercle; a yellow margin on the ventral border of the pronotum; mesoscutum black; tegula smooth, fulvous with a creamy-white spot; scutellum black with a creamy-white subinterrupted line at the base dilated laterally; metanotum very sparsely pitted, creamy-white with narrow black borders and extremities; pleuron dark fuscous with a creamy-white spot behind the tubercle bordered by a patch of fulvous; sternum black becoming light fuliginous at extremities; propodeum black blending into two large fulvous areas on the sides, enclosure with a central groove and lateral ridges running somewhat obliquely.

Abdomen moderately pitted on convex areas, closely pitted on depressed areas, clothed with very short hairs dorsally, becoming longer ventrally; tergite 1 with a wide creamy-yellow band slightly emarginate; tergite 2 with a wide creamy-yellow band surrounding a depressed line of dark fuscous; tergites 3 and 4 with the yellow band narrow medially but dilated laterally; tergites 5 and 6 with yellow bands subequal throughout their length; venter fuliginous with the elevated areas more fulvous; two small confluent yellow spots on sternite 3; sternite 5 with an erect row of matted hairs on the posterior border; pygidial area (Pl. IX, Fig. 111) sparsely pitted with a lateral carina.

Legs fulvous, yellow spots on the anterior femora below, yellow lines on the anterior tibiae before.

Wings hyaline, apical costal margins clouded with a tendency to be violaceous; cell 1st R_5 not petiolate. (Pl. VIII, Fig. 78).

Genitalia (Pl. X, Fig. 125).

Female.—Similar to male except for the usual sexual differences and as indicated. Medial portion of clypeus with a prominent acute tubercle on its surface; clypeal border

* Through the kindness of Dr. Robert B. Benson, of the British Museum, comparisons have been made that show clearly that *Aphilanthops marginipennis* is a male of *Eucerceris rubripes* Cresson.

with two remote teeth and a medial broad process of equal length having its apical border sinuate. Length 11 mm.

Head (Figs. 15 and 16) ferruginous; mandibles with one small denticle; clypeal border with two remote teeth on the medial portion and a medial broad process of equal length having its apical border sinuate, medial portion with a prominent acute tubercle; front with black stripes through antennal scrobes to clypeal border; vertex and genae ferruginous except for ocellar region, which is black.

Thorax with more ferruginous; pronotum with yellow band broken into elongate patches; tubercle fulvous with little or no yellow; mesoscutum black with borders and a central angular patch fuliginous; tegula fuscous; scutellum fuliginous with the posterior part black; pleuron without yellow but with more fuliginous; sternum black becoming more fuliginous at extremities; propodeum largely fuliginous with a tendency to blackness along the anterior border of the enclosure and along the medial line to the posterior border.

Abdomen with fulvous replacing black of the male; tergite 1 with wide yellow band emarginate; tergites 3 to 5 with the yellow band tending to inclose the depressed fulvous line; tergite 6 with a wide yellow band including the depressed area; sternite 5 without an erect row of hairs; sternite 3 without yellow spots; pygidial area (Pl. IX, Fig. 93). subrugose, bordered by a carina and fringed by a row of curved amber hairs.

Legs fulvous without yellow.

Wings as in male except cell 1st R_5 is petiolate. (Pl. VII, Fig. 60).

Lectotype.—Male, Colorado (H. K. Morrison), in the collection of the American Entomological Society of Philadelphia (Type No. 1961).

The type male is somewhat smaller than most of the specimens examined, which are from 14 to 15 mm. in length. The color pattern varies in the male as follows: The black line between the medial portion and lateral wings of the clypeus may end in a black depression near the apical border; the thorax may be black and yellow only, without any shade of brown; there may be no creamy white on the scutellum; rarely yellow spots may appear on the enclosure; a trace of yellow may appear on the mesoscutum; the yellow bands on the tergites may or may not enclose or embody the depressed areas; the legs may be fulvous without yellow.

In the female the black stripes of the face may or may not reach the ocelli; the clypeus, the sides of the face, a solid band on the pronotum, the tubercles, a spot within the ferruginous patch of the propodeum, a band on sternites 2 to 5, and much of the legs may be yellow. Intermediate variations are found. The specimen selected as a lectotype differs from the original description of *E. unicornis* Patton as follows: black stripes through the antennae not confluent with the black of vertex; costa and stigma are not yellow but fulvous. Length of lectotype 13 mm.

The enclosure in *E. rubripes* may vary from nearly smooth to noticeably ridged. Slight variations in wing veins are observed.

Distribution.—Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah. (Pl. XI Fig. 140).

This species ranges throughout the western short-grass plains and into the Rocky Mountains. It is recorded from Montana and North Dakota on the north to the Mexican border on the south. The species is common along the western slope of the Rocky Mountains and in New Mexico.

In Oklahoma it was collected on *Tamarix gallica* L. by A. E. Pritchard.

7. EUCERCERIS FULVIPES Cresson

Figs. 19, 50, 61, 79, 94, 112, 126, 141.

Eucerceris fulvipes CRESSON, Proc. Ent. Soc. Phil., V: 111-112, 1865, ♂, ♀.—PACKARD, Proc. Ent. Soc. Phil., VI: 58-59, 1866.—CRESSON, Trans. Amer. Ent. Soc., X: vi, vii, 1882.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂, ♀.—ASHMEAD, Colo. Biol. Assoc. Bul., I: 32, 1890.—SMITH, Univ. Nebr. Studies, VIII: 372, 1908.—STEVENS, Ent. News, XXVIII: 422, 1917.—MICKEL, Univ. Nebr. Studies, XVII: 456, 1918, ♂, ♀.—VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 88, 1904.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 100, 1916, ♂, ♀.

Eucerceris flavipes ASHMEAD, Canad. Ent., XXXI: 295, 1899, ♀. (Apparently a mistake in spelling)

Eucerceris simulatrix VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 87, 1904.—CRESSON, Memoirs of the Amer. Ent. Soc., V: 50, 1928, ♂.

Cerceris fulvipes PATTON, Bul. U. S. Geol. and Geog. Survey, V: 360-361, 1879, ♀.

Cerceris cressoni SCHLETTERER, Zool. Jahrb., II: 489, 1887.—DALLA TORRE, Cat. Hymen., VIII: 456, 1897, ♂, ♀.

Male.—Black to fuscous with yellowish-white markings; clypeus tridentate; enclosure obliquely ridged; cell 1st R_5 not petiolate; sternite 5 with an erect matted row of hairs. Length 11 mm.

Head (Fig. 50) subequal to thorax in width, moderately pitted distally, becoming more closely pitted on the vertex and posterior aspects, clothed with short silvery hairs; mandibles nondentate, yellow, becoming fuliginous at the tips; clypeus tridentate on the apical border of the medial portion, moderately convex, moderately pitted, elongate rows of hairs on the apical borders of the lateral wings, yellow with a fuliginous apical border; antennae normal in form, dark fulvous becoming fuliginous distally, an elongate yellow spot on the medial side of the scape; front slightly narrowed above, yellow with black of vertex extending as a narrowing stripe through the antennal scrobes to the clypeus and as narrow strips along the mesal borders of the eyes to opposite the antennae, yellow of the medial carina reaching to the medial ocellus, hairs becoming longer toward the vertex; vertex and genae black with a small yellow spot bordering the upper part of the eye.

Thorax moderately to closely pitted, clothed with short silvery hairs becoming longer ventrally; pronotum with a yellow band on the posterior border; tubercle with a large yellow patch; mesoscutum black; tegula smooth, fulvous with a yellow patch; scutellum sparsely pitted, black with a yellow band interrupted by a narrow black line; metanotum subimpunctate, yellow slightly emarginate behind, borders and extremities black; mesopleuron with two irregular yellow patches, one back of the tubercle and one ventrad of the longitudinal furrow confluent with the yellow of the mesonotum; propleuron, mesopleuron, and metapleuron each with yellow patches; propodeum black with large yellow patches on the sides; enclosure obliquely striated, immaculate.

Abdomen moderately pitted except for the depressed lines which are closely pitted; tergite 1 with a wide yellow band emarginate on both sides; tergites 2 to 5 with narrower yellow bands dilated laterally; tergite 6 with a yellow band emarginate in front, narrowed

laterally; venter pale fulvous; sternites 1, 5 and 6 immaculate; sternite 2 with a broken yellow band; sternites 3 and 4 with unbroken yellow bands; sternite 5 with an erect, closely matted row of amber hairs on the posterior border; pygidial area (Pl. IX, Fig. 112) moderately pitted, lateral borders with a carina.

Legs; coxae, trochanters and first pair of femora yellow below, fuliginous above; third pair of femora fuliginous becoming yellow at the distal end; tibiae and tarsi yellow to fulvous.

Wings hyaline, clouded along the costal half to the apex; cell 1st R_5 not petiolate (Pl. VIII, Fig. 79).

Genitalia (Pl. X, Fig. 126).

Female.—Similar to the male in all respects except for the usual sexual differences and as indicated; mandibles unidentate; four teeth on the apical border of the clypeus, the two lateral ones more obtuse; a row of elongate hairs emerge from above the medial teeth, central portion elevated; legs ferruginous. Length 13 mm.

Head (Fig. 19) slightly wider than the thorax; mandibles with a small blunt denticle, dark fulvous except for yellow patch on lateral base; clypeus with the central portion noticeably elevated and dropping off sharply just above the apical border, apical border of medial portion with two remote obtuse teeth between which are two smaller blunt teeth, a row of elongate bristles emerge from above the smaller teeth, a slightly elongate row of hairs on the apical border of the lateral wings, fuscous with large yellow patches on the medial portion and lateral wings; antennae fulvous becoming black distally; front with yellow parts slightly less extended than in male; genae with yellow patches more elongate than in male.

Thorax black and yellow; scutellum with a yellow band unbroken, dilated laterally; pleuron with a yellow patch back of the tubercle only; sternum immaculate; inclosure with two converging oval yellow spots.

Abdomen with dorsal yellow bands, which are wider than in male and include the depressed areas; venter immaculate; pygidial area (Pl. IX, Fig. 94) with sides subparallel, rugose, bordered by a carina, fringed by a row of dark amber hairs.

Legs bright fulvous.

Wings as in male except cell Ist R_5 is petiolate (Pl. VII, Fig. 61).

Lectotype.—Female, Rocky Mountains, Colorado Territory (Ridings), in the collection of the American Entomological Society of Philadelphia (Type No. 1966.1).

Paratypes.—Two females, Colorado, in the collection of the American Entomological Society of Philadelphia (Type Nos. 1966a, 1966b).

The original allotype male apparently has been lost if one was ever selected. The type of *simulatrix* Viereck and Cockerell is in the collection of the American Entomological Society of Philadelphia (Type No. 1039.6). It was examined and found to be the same as *fulvipes* Cresson and the species is therefore being suppressed.

The extent of yellow varies. In the male the scutellum may be almost immaculate with only two yellow spots remaining. The inclosure is immaculate in the type, but not as a rule. The band on sternite 4 may be broken. The black stripes of the face may not be confluent with the black of the vertex. Two small yellow spots may appear on the propodium back of the enclosure and in one specimen they are confluent with the larger yellow patches.

E. fulvipes is very close to *E. rubripes.* The females are easily separated by the absence of the cone-like projection found on the medial portion of the clypeus of *rubripes.* Both sexes are smaller than *rubripes. E. fulvipes* is also superficially like *E. vittatifrons,* but the males may be separated by cell 1st R_5 being petiolate and the females by the apical clypeal border being bidentate in the latter.

Distribution.—Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Wyoming. (Pl. XI, Fig. 141).

E. fulvipes ranges throughout the Rocky Mountain region and eastward into the short-grass plains. Except for one specimen taken at Castle Rock, Oregon, by Carl D. Duncan, the species is not found west of the Rocky Mountains. The species extends from the Canadian border to the Mexican border.

8. EUCERCERIS SIMILIS Cresson

Figs. 20, 40, 62, 80, 95, 113, 127, 142.

Eucerceris similis CRESSON, Trans. Amer. Ent. Soc., VII: xxiv, 1879, ♂, ♀.—CRESSON, Trans. Amer. Ent. Soc., X: vi-vii, 1882, ♂, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 101, 1916, ♂, ♀.

Cerceris similis DALLA TORRE, Wien. Ent. Zeit., IX: 202, 1890, ♀.—DALLA TORRE, Cat. Hymen., VIII: 477, 1897, ♀.

Male.—Black with yellow markings; entire body shiny; mandibles nondentate; scutellum with an interrupted yellow band dilated laterally; enclosure smooth with a central groove and two converging oval yellow spots; sternites 3 and 4 with rows of long, erect, slightly matted hairs; sternite 5 with an inconspicuous short row of matted hairs. Length 10 mm.

Head (Fig. 40) large, sparsely pitted on the clypeus, becoming more closely pitted toward the vertex and occiput, clothed with short, appressed, silvery hairs; mandibles nondentate, yellow, becoming fuscous at the tips, slightly hairy at the base laterally; clypeus moderately convex, tridentate on the apical border of the medial portion; antennae normal in form, ferruginous with a yellow patch on the scape medially, first three or four segments of the flagellum with yellow patches becoming ferruginous distally; front narrowed above, yellow with black of vertex extending as a narrowing wedge to the antennae and as a narrow line on the mesal border of the eye for a short distance; vertex and genae black with a yellow patch along the lateral border of the eye to the base of the mandible.

Thorax sparsely to closely pitted, sparsely clothed with short hairs; pronotum with a wide yellow band on the posterior border slightly emarginate medially; tubercle with a yellow patch; mesonotum sparsely pitted except on anterior portion, black; tegula smooth, fulvous with a yellow patch; scutellum sparsely punctate with two yellow spots; metonotum subimpunctate, yellow with black borders and extremities; propleura with an elongate yellow patch; mesopleura with a large yellow patch extending from back of the tubercle ventrad to fuse with the yellow of the sternum; sternum largely yellow; propodeum closely pitted, black with large yellow patches; enclosure smooth except for a central groove, black with two large converging oval yellow patches.

Abdomen sparsely pitted except for depressed lines on tergites, which are closely punctate; tergite 1 with a wide yellow band emarginate medially on both sides; second tergite with a wide yellow band nearly enclosing and covering the depressed area; tergites 3 to 5 with a narrow yellow band dilating laterally; tergite 6 with a narrow yellow band; sternites 3 and 4 with rows of elongate hairs on the apical border, somewhat matted; sternite 5 with an inconspicuous short row of short matted hairs on the apical border; sternites 2 to 4 with yellow bands, slightly emarginate on 3; pygidial area (Pl. IX, Fig. 113) with a lateral carina ending distally in elongate projections, moderately pitted.

Legs yellow with elongate dark fuliginous patches on the dorsal sides of the coxae, trochanters, femora and tibiae; tarsi light fulvous.

Wings subhyaline, cloudy toward the apex, fulvous along the costal region; cell 1st R_5 not petiolate. (Pl. VIII, Fig. 80).

Genitalia (Pl. X, Fig. 127).

Female.—Like male in all respects except for the usual sexual differences and as indicated. Mandibles with one short rounded denticle; apical border of clypeus with five teeth, two large processes at the lateral border of the medial portion, one medial bifid projection below, two medial processes above, two elongate bristles merging from between the upper paired and lower bifid processes; enclosure smooth but for faint suggestion of striations; pygidial area somewhat wedge-shaped.

Head (Fig. 20) subequal to thorax in width; mandibles unidentate, denticle small and blunt, yellow proximally becoming fulvous medially and dark fuscous at the tips; apical border of the medial portion of the clypeus with two remote teeth, one medial bifid process below and two medial processes above, two elongate bristles emerge from between the upper and lower processes; antennae without yellow, dark fuliginous except for about the first four segments of the flagella, which are fulvous; black of front extends as wide stripes through the antennal scrobes to the clypeal border.

Thorax similar to male; tubercle immaculate; scutellum with an interrupted yellow band; propleura immaculate except for a yellow ventral margin; yellow of mesopleura reduced to two spots; inconspicuous mesopleural tubercle; venter with yellow much reduced; enclosure with a slight tendency to be ridged.

Abdomen with first four tergites much as in male; yellow of tergites 4 and 5 encroaching more on the black; tergite 6 with the yellow band emarginate on the anterior border; sternites 2 to 4 with wide yellow bands, that on sternite 2 divided by a line and the anterior border sinuate; pygidial area (Pl. IX, Fig. 95) somewhat wedge-shaped, rugose, bordered by a carina, fringed with fuliginous hairs.

Legs yellow with coxae, trochanters and proximal ends of femora dark fuliginous; stripe on ventral surface of 1st pair of tarsi, distal end of 3rd pair of femora, and all tarsi fulvo-ferruginous.

Wings as in male except 1st R_5 is petiolate. (Pl. VII, Fig. 62).

Lectotype.—Female, Nevada (H. K. Morrison), in the collection of the American Entomological Society of Philadelphia (Type No. 1965.1).

Paratypes.—Female, Nevada (Type No. 1965a); two males, Nevada (Type Nos. 1965b, 1965c). in the collection of the American Entomological Society of Philadelphia.

The yellow markings may vary to some extent. The yellow band of the scutellum may or may not be divided. Two yellow spots may be found on the scutellum of the male near the posterio-lateral angle. The pygidial area of the male may have yellow patches. The black lines through the antennae may not be confluent with the black of the vertex, and they may extend to near the

clypeal border. The yellow bands of the sternites may not be divided. The enclosure may be quite smooth except for the central groove, or it may show slight evidence of ridges.

E. similis is very close to *E. fulvipes* from which it can be separated by the single row of erect hairs on the venter of the male of *fulvipes* and by the different clypeal margin of the females. In the female of *fulvipes* the legs are ferruginous.

Distribution.—California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Wyoming. (Pl. XI, Fig. 142).

Except for one specimen from Montpelier, Idaho; one from Jackson, Wyoming; and one from Yellowstone National Park, the species is confined to the extreme west. It is especially common in the Siskiyou Mountains and southern Cascades of Oregon and Northern California.

9. EUCERCERIS ELEGANS Cresson

Figs. 21, 41, 63, 81, 96, 114, 128, 143.

Eucerceris elegans CRESSON, Trans. Amer. Ent. Soc., VII: xxiii, 1879, ♂.—CRESSON, Trans. Amer. Ent. Soc., X: vi, vii, 1882, ♂.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 100, 1916, ♂.—MICKEL, Trans. Amer. Ent. Soc., XLII: 413, 1916, ♂.—MICKEL, Univ. Neb. Studies, XVII: 456, 1918, ♂.

Cerceris elegantissima SCHLETTERER, Zool. Jahrb., II: 490, 1887.—DALLA TORRE, Cat. Hymen., VIII: 458, 1897.

Cerceris nevadensis DALLA TORRE, Wien. Ent. Zeit., IX: 200-201, 1890.

Eucerceris pimarium COCKERELL AND ROHWER, Canad. Ent. XL: 326, 1908, ♀.

Eucerceris apicata BANKS, Canad. Ent., XLVII: 404, 1915, ♂.

Male.—Shiny black with creamy-white and fulvous markings; mandibles nondentate; clypeus tridentate; enclosure obliquely striated; elongate rows of erect hairs on sternites 3 and 4; sternite 5 with an inconspicuous short row of short erect hairs; cell 1st R_5 not petiolate. Length 11 mm.

Head (Fig. 41) moderately punctate, shiny, clothed with short silvery hairs; mandibles nondentate, ferruginous becoming fuscous at the tips; clypeus tridentate on the apical border, creamy white, apical border ferruginous; antennae fulvous proximally becoming fuliginous distally; front creamy white with a black line above the antennae; vertex and occiput black; genae fulvous.

Thorax moderately punctate and clothed with short silvery hairs; pronotum with a creamy-white band on the posterior margin; tubercle creamy white; four creamy-white spots on the anterior margin of the mesoscutum; tegula creamy white with the posterior part fulvous; scutellum with a creamy-white band; metanotum creamy white; pleuron with a creamy-white patch back of the tubercle; sternum immaculate; propodeum immaculate, enclosure obliquely ridged.

Abdomen moderately to sparsely punctate; tergites 1 to 5 with wide creamy-white bands tending to be narrowed laterally; venter ferruginous to fuliginous; prominent rows of long erect hairs on the posterior borders of sternites 3 and 4; sternite 5 with an

inconspicuous short row of short erect hairs on the posterior border; pygidial area as illustrated (Pl. IX, Fig. 114).

Legs fulvous.

Wings subhyaline, costal region clouded with fulvous becoming blacker towards the tips; cell 1st R_5 not petiolate (Pl. VIII, Fig. 81).

Genitalia (Pl. X, Fig. 128).

Female.—Dark fuliginous, ferruginous and creamy white; mandibles with a broadly divided tooth; apical border of clypeus with two widely separated black denticles between which and on a lower level is a medial bifid process; a medial cluster of elongate bristles emerges from just above the medial process. Length 10 mm.

Head (Fig. 21) long, moderately and coarsely punctate, clothed with short silvery hairs, becoming longer and more thickly set along the apical border of the clypeus; mandibles with a broadly divided tooth, ferruginous with black tips and teeth; clypeus depressed, ferruginous; apical margin with two blunt teeth widely separated and a medial bifid process below a cluster of elongate bristles; antennae normal in form, ferruginous; front ferruginous; vertex, occiput and genae ferruginous, interocellar area black.

Thorax moderately to sparsely punctate, clothed with short silvery hairs; pronotum with a yellow band on the posterior border and a yellow ventral margin; tubercle ferruginous; mesoscutum black with slight evidence of ferruginous stripes; tegula fulvous; scutellum with an unbroken band of yellow; metanotum subimpunctate, creamy white; pleuron with a yellow patch back of the tubercle of the pronotum; a prominent mesopleural tubercle; sternum ferruginous to fuliginous; propodeum closely and coarsely punctate, ferruginous with large yellow patches, enclosure faintly ridged and with a central groove, fuliginous.

Abdomen moderately punctate, clothed with short silvery hairs; tergite 1 with a wide yellow band emarginate on both sides; tergite 2 with a yellow band dilated laterally and tending to inclose the dark depressed area; tergites 3 and 4 with yellow bands dilated laterally; tergite 5 with a subuniform yellow band; venter ferruginous except for traces of yellow on the lateral borders of sternites 3 and 4; pygidial area as illustrated. (Pl. IX, Fig. 96)

Legs ferruginous.

Wings subhyaline, clouded apically beyond the stigma. (Pl. VII, Fig. 63).

Lectotype.—Male, Nevada (H. K. Morrison), in the collection of the American Entomological Society of Philadelphia (Type No. 1968).

The male of *E. elegans* was described by Cresson in 1879. In 1908 Cockerell and Rohwer described a female from Phoenix, Arizona, as *E. pimarium.* In 1915 Banks described a male from Yuma, Arizona, as *E. apicata.* In 1918 Mickel described a female from Halsey, Nebraska, which he called the female of *E. elegans* Cresson, since two males taken at the same locality were recognized as *E. elegans* Cresson. Judging from a series of males and females taken in Arizona, the writer is convinced that *E. apicata* Banks is *E. elegans* Cresson, that *E. pimarium* Cockerell and Rohwer is the female of *E. elegans* Cresson, and that the female from Halsey, Nebraska, which Mickel thought was the female of *E. elegans* Cresson is the female of a new species close to *E. rubripes.* The female from Halsey, Nebraska, is therefore more fully described and given the new name of *E. conata.*

Through the kindness of Mr. Banks, comparisons have been made with his type of *E. apicata* in the Museum of Comparative Zoology at Harvard.

Miss Sandhouse and the writer have compared material with the type of *E. pimarium* Cockerell and Rohwer at Washington. The writer has compared material with the type of *E. elegans* Cresson at Philadelphia. Professor Raymond Roberts and the writer have compared material with Mickel's specimens from Halsey, Nebraska.

There is considerable color variation among the different specimens of *E. elegans* Cresson. The black background may be more or less fuliginous to ferruginous, and the yellow markings may vary from white to creamy yellow, or the light markings may blend into ferruginous.

Distribution.—Arizona, Nebraska, Nevada (Pl. XI, Fig. 143).

SPECIMENS EXAMINED

ARIZONA: 2 females, male, Tucson, October, 1927 (J. A. Downs); male, Tucson, October, 1927 (J. Hamilton); female, Tucson, October 2, 1922; 2 males, Tucson, October 3, 1923; female, Tucson, October 3, 1923 (C. D. Duncan); male, Tucson, October 9, 1923; female, Tucson, October 10, 1923; male, Tucson, October 19, 1921; male, Tucson, November, 1932 (Dixie Brayton); 5 males, female, Yuma, September, 1903.
NEBRASKA: male, Halsey, July 25, 1912 (J. T. Zimmer).
NEVADA: male, Nixon, June 20, 1927 (E. P. Van Duzee).
SONORA, MEXICO: Male, Tapoca, April 25, 1921 (E. P. Van Duzee).

10. EUCERCERIS CONATA, new species

Figs. 22, 23, 64, 97, 144.

Eucerceris elegans MICKEL, Trans. Amer. Ent. Soc., XLII: 413, 1916, ♀.—MICKEL, Univ. Neb. Studies, XVII: 138, 1917, ♀.

Female.—Black and ferruginous with yellow markings; mandibles bidentate; clypeus with a cone-like elevation on the surface of the medial portion and four denticles on the apical margin above which emerges a row of elongate bristles. Length 12 mm.

Head (Figs. 22 and 23) moderately and coarsely punctate, clothed with short amber hairs, ferruginous except for tips and denticles of the mandibles, the antennal scrobes and the interocellar area which are all dark fuscous; mandibles bidentate, the proximal denticle the longer; clypeus with a low cone-shaped process on the surface of the medial portion, four denticles on the apical border, a row of elongate bristles emerge from between the cone-like process and the apical border; antennae normal in form, ferruginous proximally becoming fuliginous distally.

Thorax sparsely to moderately punctate, clothed with short amber hairs; pronotum with a wide yellow band confluent with the yellow of the tubercle, a yellow line on the ventral margin of the pronotum; mesoscutum black; tegula fulvous; scutellum yellow with a black posterior border; metanotum yellow with black extremities; pleuron fuscous with elevated parts tending to be ferruginous, a yellow patch back of the tubercle; mesopleural tubercle barely evident; sternum fuliginous to fuscous; propodeum ferruginous mottled with fulvous becoming black medially; enclosure obliquely ridged becoming nearly smooth posteriorly, fuscous with two converging yellow patches along the lateral borders.

Abdomen moderately and coarsely punctate, fulvo-ferruginous with wide yellow bands on tergites 1 to 5 and yellow bands on sternites 3 and 4; lateral yellow patches on

sternites 1 and 5; pygidial area (Pl. IX, Fig. 97) with a bordering carina and fringed with hairs.

Legs ferruginous.

Wings subhyaline, clouded along the distal half of the costal region to the tip, cell 1st R_5 petiolate (Pl. VII, Fig. 64).

Holotype.—Female, Halsey, Neb., Aug. 28, 1911 (J. T. Zimmer), in the collection of the University of Nebraska.

Paratype.—Female, Halsey, Neb., Aug. 13, 1925 (R. W. Dawson); in the collections of the University of Minnesota.

E. conata was first described by Mickel (1916) who considered it to be the female of *E. elegans* Cresson. It is very close to the female of *E. rubripes* Cresson from which it may be separated by the bidentate mandibles of *E. conata.*

Distribution.—Nebraska (Pl. XI, Fig. 144).

11. EUCERCERIS BITRUNCATA, new species

Figs. 24, 65, 98, 145.

Female.—Black and ferruginous with yellow markings; mandibles with a broad subdivided tooth; clypeus short and broad, two truncate processes on the apical border of the medial portion, a medial cluster of three or four bristles emerges from below the two truncate processes; enclosure obliquely ridged becoming rugose laterally; legs ferruginous. Length 10 mm.

Head (Fig. 24) long, slightly wider than the thorax, moderately and coarsely punctate, more closely and finely pitted toward and on the clypeus, moderately clothed with very short silvery hairs, yellow mixed with ferruginous except for the tips and denticles of the mandibles, the medial clypeal border and processes, and the interocellar area, which are black; mandibles with a medial subdivided denticle; clypeus short and broad, two truncate processes on the apical border of the medial portion, a medial cluster of three or four bristles emerges from below the two truncate processes, hairs along the apical border somewhat elongate; antennae ferruginous proximally becoming fuliginous distally; front fulvous below becoming ferruginous above, fuscous stripes through the antennal scrobes to the clypeal border; vertex fuscous; genae and occiput ferruginous.

Thorax moderately to sparsely punctate, clothed with short silvery hairs; pronotum fuliginous to black with a yellow band on the posterior border confluent with a yellow patch on the tubercle; mesoscutum black; tegula smooth, fulvous, with a yellow spot; scutellum black with a divided yellow band dilated laterally and two smaller yellow spots on the posterior lateral margins; metanotum yellow with black borders and extremities; propleura black becoming fuliginous ventrally; mesopleura and metapleura dark fuliginous to black with a large yellow patch back of the tubercle; a distinct mesopleural tubercle present; propodeum ferruginous with large yellow patches, a black medial area embracing the enclosure; enclosure obliquely striated tending to be rugose laterally.

Abdomen moderately punctate, more closely and finely pitted in depressed areas on the tergites, clothed with short silvery hairs; tergite 1 with a yellow band emarginate on both sides; tergite 2 with a wide yellow band emarginate with black anteriorly which is confluent with a black line in the depression; tergites 3 to 4 with yellow bands dilated laterally, black of anterior borders confluent with the black of depressed areas; tergite 5

with a wide band; tergite 6 ferruginous; venter fulvo-ferruginous; pygidial area (Pl. IX, Fig 98) rugose, bordered by a carina, fringed with a row of dark hairs.

Legs ferruginous.

Wings subhyaline, costal margin and stigma light ferruginous, clouded beyond to the tip, cell 1st R_5 petiolate (Pl. VII, Fig. 65).

Holotype.—Female, San Antonio, Texas, June 16, 1906, (J. C. Crawford), in the collection of the United States National Museum. (Type No. 50835).

Paratype.—Female, Sierra Blanca, Texas, July 9, 1917, in the collection of Cornell University.

E. bitruncata appears close to the female of *E. elegans,* from which it can easily be separated by the clypeal processes.

Distribution.—Texas (Pl. XI, Fig. 145).

12. EUCERCERIS SUPERBA Cresson

Figs. 25, 25a, 42, 66, 83, 99, 115, 129, 146.

Eucerceris superbus CRESSON, Proc. Ent. Soc. Phil., V: 108-109, 1965, ♂—PACKARD, Proc. Ent. Soc. Phil., VI: 58, 1866.—PATTON, Bul. U. S. Geol. and Geog. Survey, V: 356-357, 1879, ♂.—CRESSON, Trans. Amer. Ent. Soc., X; vi-vii, 1882.—CRESSON, Hymen. of Amer., p. 281, 1887.—ASHMEAD, Colo. Biol. Assoc. Bul., I: 32, 1890.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—SMITH, Univ. Nebr. Studies, VIII: 371, 1908.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 101, 1916, ♂.

Eucerceris superba STEVENS, Ent. News, XXVIII: 422, 1917.—MICKEL, Univ. Nebr. Studies, XVII: 456, 1918, ♂.—CARTER, Canad. Ent., LVII: 133, 1925, ♂.

Cerceris superba SCHLETTERER, Zool. Jahrb., II: 503, 1887.—DALLA TORRE, Cat. Hymen., VIII: 478, 1897, ♂.

Eucerceris fulviceps CRESSON, Trans. Amer. Ent. Soc., VII: xxiii, 1879, ♀.—CRESSON, Trans. Amer. Ent. Soc., X: v, vii, 1882, ♀.—CRESSON, Hymen. of Amer., p 281, 1887, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 100, 1916, ♀.

Eucerceris fulviceps var. *rhodops* VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 88, 1904, ♀.—CRESSON, Memoirs of the Amer. Ent. Soc., V: 49 1928, ♀.

Cerceris fulviceps DALLA TORRE, Wien. Ent. Zeit., IX: 201, 1890.—DALLA TORRE, Cat. Hymen., VIII: 461, 1890. ♀.

Male.—Black with yellow and fulvo-ferruginous markings; mandibles nondentate; clypeal border tridentate on the medial portion; enclosure striated medially, rugose laterally; distal borders of sternites 3 to 5 with rows of long erect hairs somewhat matted. Length 18 mm.

Head (Fig. 42) subequal to thorax in width, closely and coarsely punctate, clothed with silvery hairs; mandibles nondentate, yellow with dark fuliginous tips; clypeus tridentate on the apical border of the medial portion, hairs elongate and closely packed along the apical border of the lateral wings; antennae normal in form, proximal half fulvous, becoming fuliginous distally; front slightly narrowed above, yellow with the black of the vertex extending well down on the front and continuing as narrowed stripes to the antennae; vertex black; genae ferruginous.

Thorax closely and coarsely punctate, clothed with silvery hairs; pronotum with a solid yellow band dilated laterally; tubercle with a yellow spot; mesoscutum black; tegula smooth, fulvous with a yellow spot; scutellum and metanotum moderately punctate, black; mesopleura black with a yellow patch back of the tubercle and with an extension of the yellow of the sternum; sternum largely yellow; propodeum and enclosure black; enclosure slightly and obliquely striated medially, laterally somewhat rugose, distal portion smooth, with a central groove.

Abdomen moderately punctate on convex areas, closely punctate in depressed areas, clothed with short silvery hairs; tergites 1 to 4 yellow with narrow black anterior and posterior borders; tergite 5 with black breaking into the yellow; tergite 6 black with two irregular yellow spots; tergite 7 black; sternite 1 with a large yellow patch in the center; sternite 2 with a wide yellow band sinuate anteriorly; other sternites piceous black; pygidial area as illustrated (Pl. IX, Fig. 115).

Legs yellow proximally, becoming more fulvous on the femora and beyond.

Wings subyaline, costal region fulvous to radial cell, dark fuliginous beyond to tip, cell 1st R_5 petiolate (Pl. VIII, Fig. 83).

Genitalia (Pl. X, Fig. 129).

Female.—Sculptured much as in male; head large; one large denticle on the mandible; clypeus short and broad with a prominent elevated pyramidal projection medially, two carina-like projections near the border of the lateral wings; mesopleural tubercles present; cell 1st R_5 petiolate; black with yellow and ferruginous markings. Length 16 mm.

Head large, closely and coarsely punctate, clothed with amber hairs; mandibles unidentate, ferruginous with distal two-thirds and denticle dark fuscous, rows of hairs along the medial angles; clypeus short and broad with a large subacute pyramidal projection medially, a short medial denticle below, two carina-like projections on the apical border of the lateral wings, yellow with apical border fulvous, a cluster of three or four elongate bristles emerging medially from the apical border between the two medial processes, hairs more closely set along the apical border; antennae with proximal half ferruginous, distal half fuliginous; front narrowed above, dark fulvo-ferruginous, large triangular yellow patches above the lateral wings of the clypeus and a smaller yellow patch above the medial portion extending nearly half way to the medial ocellus; vertex and genae fulvo-ferruginous except for the interocellar area which is black.

Thorax black except posterior border of prothorax, tubercle, spot on tegula, interrupted line on the metanotum, patches on the prosternum, mesosternum, metanotum, patches on the propodeum, and two spots on the enclosure, which are yellow.

Abdomen sculptured as in male; tergites 1 to 6, band on sternite 2, divided band on sternite 3, lateral patches on sternites 4 and 5, yellow; pygidial area (Pl. IX, Fig. 99) rugose, bordered by a carina and fringed by a row of fuscous hairs.

Legs ferruginous.

Wings as in male except less yellow on the costal area and cell 1st R_5 is petiolate.

Lectotype.—Male, Rocky Mountains, Colorado Territory (Ridings), in the collection of the American Entomological Society of Philadelphia (Type no. 1967.1).

12a. EUCERCERIS SUPERBA var. BICOLOR Cresson, New Combination

Eucerceris bicolor CRESSON, Trans. Amer. Ent. Soc., IX: xxxviii-xxxix, 1881, ♀.—CRESSON, Trans. Amer. Ent. Soc., X; v, vii, 1882, ♀.—CRESSON, Hymen of of Amer., p. 281, 1887, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—SMITH, Univ. Nebr. Studies, VIII: 372, 1908.—STEVENS, Ent. News, XXVIII: 422, 1917.—MICKEL, Univ. Nebr. Studies, XVII: 455, 1918, ♀.—CARTER, Canad. Ent.,

LVII: 133, 1925, ♀.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 99, 1916, ♀.

Cerceris dichroa DALLA TORRE, Wien. Ent. Zeit., IX: 199, 1890, ♀.—DALLA TORRE, Cat. Hymen., VIII: 457, 1897, ♀.

Female.—Head (Figs. 25 and 25a) large, closely and coarsely punctate, clothed with amber hairs; mandibles unidentate, ferruginous with distal two-thirds and denticle dark fuscous, rows of hairs along the medial angles; clypeus short and broad with a large subacute pyramidal projection medially, a short medial dentical below, two carina-like projections on apical border of the lateral wings, a cluster of three or four elongate bristles emerging medially from the apical border between the two medial processes, hairs more closely set along the apical border; antennae with proximal half ferruginous, distal half fuliginous; front narrowed above, dark fulvo-ferruginous; vertex and genae fulvo-ferruginous except for the interocellar area, which is black.

Thorax black except tubercle, tegula, metanotum, propodeum and scutellum, which are light ferruginous; propodeum ferruginous with a black line bordering the enclosure and a narrow medial stripe on the propodeum; enclosure as in male of typical *superba*.

Abdomen sculptured as in male of var. *superba*; tergites 1 to 3 ferruginous; tergite 4 darker; tergites 5 and 6 nearly black; sternites 1 to 3 ferruginous; sternites 4 and 5 nearly as dark as tergite 5; pygidial area (Pl. IX, Fig. 99) rugose, bordered by a carina and fringed by a row of fuscous hairs.

Legs ferruginous except for some black on coxae.

Wings as in male of var. *superba* except less yellow on the costal area and cell 1st R_5 is petiolate (Pl. VII, Fig. 66).

Holotype.—Female, Montana (Morrison), in the collection of the American Entomological Society of Philadelphia (Type No. 1959.1).

Paratypes.—Eight females, Montana, in the collection of the United States National Museum and the American Entomological Society of Philadelphia.

The male of typical *superba* shows some variations in its color pattern. The black of the vertex may not extend onto the front. Yellow patches surrounded by ferruginous may appear on the genae back of the eyes. The scutellum and metanotum may be fuliginous and the latter may have some yellow. The black on some of the tergites may be replaced by fuliginous. All tergites may have yellow bands. Some specimens are smaller than the type.

In the variety *bicolor,* which is distinguishable only in the female sex, the tubercles and the entire propodeum may be black.

In the female of the typical variety the tubercle may not be yellow, the metanotum may be ferruginous, and the propodeum may be without black. The sternum may be entirely black. Tergite 6 may be yellow or ferruginous and sternite 5 may lack the yellow marks.

To Prof. O. A. Stevens of North Dakota State college should go the credit for first calling attention to the fact that *E. bicolor* Cresson is a female color variety of *E. superba* Cresson. Prof. Stevens has had an unusual opportunity to observe these wasps in North Dakota and has kindly given the author permission to record below the following unpublished notes:

"My first specimens of *E. bicolor* were identified by Mr. Nathan Banks who wrote: '. . . a fine species; few collections have it.' From the specimens which he had examined I reported (Ent. News) this species from Minot, North Dakota, taken August 22, 1915, and *E. superba* at the same place and time, also at Williston, North Dakota, August 15, 1915, all at flowers of *Petalostemon oligophyllum*. Further collections in the state show the following records:

E. superba

STEEL—July 13, 1919; August 4, 1923; August 25, 1922; at *P. oligophyllum.*
MANDAN—August 22, 1922, at *Solodago canadensis.*
WASHBURN—July 23, 1926, at *P. oligophyllum.*

E. bicolor

VALLEY CITY—August 17, 1917 (P. W. Fattig) at *Petalostemon purpurea.*
STEELE—July 13, 1919; August 4, 1923, at *P. oligophyllum.*
MANDAN—August 22, 1922, at *P. oligophyllum.*
WASHBURN—July 23, 1926, at *P. oligophyllum.*
CANNON BALL—August 20, 1922.
BREIEN—August 21, 1921, at *Eriogonum annuum.*

"These records and further notes indicate that both forms are quite common over most of North Dakota (they would not be expected in the extreme eastern part of the state). From Nebraska, Mickel (Univ. Nebr. Studies 17: 137-138, 1917) had only four and five specimens, both sexes from one locality and one of each from two others. The fact that he had only females of *bicolor* and males of *superba,* that the other sex of neither had been described, and that I had repeatedly found both to be fairly common in different localities in North Dakota, seemed very strong evidence that these forms were the two sexes of a single species.

"About a mile south of the town of Steele, the highway cuts through a gravel ridge the like of which is uncommon in the vicinity. *Petalostemon* grew in abundance along the roadside and it was a good collecting ground for *Cerceris* and *Eucerceris.* I spent most of August 4 and 5, 1923, at this place trying to secure further information on these and other forms. My notes are as follows: 'Both were common at flowers of *Petalostemon oligophyllum.* The females *(E. bicolor)* spent most of their time on the blossoms. Frequently they rested upon the ground, and occasionally one was seen running around on the ground (not actively), but no suggestion of nesting habits was obtained. The males *(E. superbus)* appeared a little earlier in the day and spent a large part of their time flying about, evidently hunting for the females which they seemed unable to see until they came within 6 or 8 inches. Several times they were seen to fly past within a foot of a female. When a male did see a female, he usually paused a few seconds, then darted upon her. About a dozen times this was observed, the pair tumbling to the ground and the male soon flying away. Actual mating could not be observed but may have taken place. The males also hovered for a few seconds over flies *(Conops)* and other insects. After the middle of the afternoon they spent more time on the flowers giving little attention to the females.'

"Similar observations were made again at Washburn on July 23 and 24, 1926, where the wasps were even more numerous on the flowers in a railroad cut. I could have taken 100 males but the females were estimated at less than one-tenth as many. The same behavior as at Steele was noted. Males were seen to dart upon the females seven times during two and one-half hours in one forenoon.

"The slender build of the females and their continued failure to show any indication of nesting activities suggested an inquiline habit. For further evidence I captured five in the bare hand. They pinched with the mandibles and thrust the tip of the abdomen against my hand much as do male bees and wasps. No sting could be seen even with a lens."

In a later communication Prof. Stevens reports that Glen Berner captured a specimen of *"bicolor"* carrying a weevil which was identified as *Ophyeaster subcerosteis* Say by L. L. Buchanan. The specimen was taken at Arrowwood Lake near Jamestown, N. D., on August 25, 1935, about 3 p.m. The beetle was being carried by one fore leg.

The types of *E. fulviceps* Cresson and *E. fulviceps* var. *rhodops* Viereck and Cockerell in the collection of the American Entomological Society have been examined and were found to be females of *E. superba.*

E. superba is very close to *E. zonata* but the coloration is quite different. The males can also be separated by the much longer rows of longer hairs on the venter of *superba.* The females can be separated by the structure of the clypeus and the single undivided denticle on the mandible of *superba.*

Distribution.—Alberta (Canada), Colorado, Idaho, Kansas, Nebraska, Montana, New Mexico, North Dakota, South Dakota, Utah, Wyoming, (Pl. XI, Fig. 146).

SPECIMENS EXAMINED

ALBERTA (Canada): Female,* Lethbridge, August 6, 1923 (Walter Carter); 4 males, Lethbridge, August 6-16, 1923 (Walter Carter).

COLORADO: 2 males, Cortez, August 10, 1903; 6 males, Glenwood Springs, 5,800 feet elevation, about 39° 33′ N and 107° 20′ W, July 22, 1919 and August 5, 1920; female, McElmo, August 9, 1903; male, Pingree Park, August 20, 1923 (A. L. Lovett).

IDAHO: Female, Pocatello; female, 2 males, King Hill, September 7, 1923, at *Cleome lutea* (Carl D. Duncan); female, 2 males, Twin Falls, August 17, 1925 (Walter Carter).

KANSAS: Male, Gray County, 2,625 feet elevation, 1914.

MONTANA: Female,* 4 males; female, Bozeman, August 24, 1911; female, Forsyth, August 11, 1903; 2 females,* Huntley, August 16, 1916.

NEW MEXICO: Male, Glorieta, August 23 (Cockerell); female, Koehler, August 6, 1914 (W. R. Walton); male, Pecon (W. P. Cockerell).

DAKOTA: Male.

NORTH DAKOTA: 2 females,* Steele, July 13 and August 4, 1919, at *Kuhnistera oligophylla* (O. A. Stevens); 2 males, Steele, July 13, 1919, at *Kuhnistera oligophylla* (O. A. Stevens); female,* male, Washburn, July 23, 1926, at *Kuhnistera oligophylla* (O. A. Stevens); male, Williston, August 15, 1915 (O. A. Stevens).

SOUTH DAKOTA: Male, Beach (C. N. Ainslie); female,* Nowlin County (Wm. J. Fox); 3 females,* 3 males, Pierre; 2 females, 5 males, Pierre (Wm. J. Fox).

UTAH: Male, West side of Utah Lake (D. Elden Beck).

WYOMING: Female,* male, Graybull, August 16, 1927 (H. H. Knight).

13. EUCERCERIS ZONATA (Say)

Figs. 26, 44, 67, 84, 100, 116, 130, 147.

Philanthus zonata SAY, Western Quart. Rep., II: 80, 1823.—SAY, American Entomology, III: 111-112, pl. 49, Fig. 3, 1828, ♂.—LECONTE, Writ. of Th. Say, I: 111-112, 167, pl. 49, Fig. 3, 1883, ♂.

* Females of the variety *bicolor* are marked with a star. All other females are of the yellow variety.

Eucerceris zonatus CRESSON, Proc. Ent. Soc. Phil., V: 105-107, 1865, ♂, ♀.—PACKARD, Proc. Ent. Soc. Phil., VI: 58, 1866.—CRESSON, Trans. Amer. Ent. Soc., IV: 227, 1872.—CRESSON, Trans. Amer. Ent. Soc., X: vi-vii, 1882, ♂, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂, ♀.—ROBERTSON, Trans. Acad. Sci., St. Louis, VI: 104, 105, 106, 107, 1892.—ROBERTSON, Trans. Acad. Sci., St. Louis, VI: 453, 454, 455, 458, 460, 1894.—ROBERTSON, Bot. Gaz., XXI: 73, 1896.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—SMITH, 27th Ann. Rep. N. J. State Board of Agric. for 1899, p. 519, 1900.—SMITH, Ann. Rep. N. J. State Mus. for 1909, p. 678, 1910.—BRITTON, Conn. Geol. and Nat. Hist. Survey, Bul. XXXI: 341, 1920.—ROBERTSON, Flowers and Insects, pp. 13, 24, 55, 68, 70, 71, 72, 90, 92, 107, 115, 120, 122, 123, 153, 154, 155, 195, 198, 1928.

Eucerceris zonata VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 85, 88, 1904.—MICKEL, Univ. Nebr. Studies, XVII: 456, 1918, ♂, ♀.—WASHBURN, Hymen. of Minn., 17th Rep. St. Ent. of Minn., p. 219, pl. 2, Fig. 8, 1919.

Cerceris zonata SCHLETTERER, Zool. Jahrb., II: 506, 1887.—DALLA TORRE, Wien. Ent. Zeit., IX: 200, 1890.—DALLA TORRE, Cat. Hymen., VIII: 481, 1897, ♂, ♀.

Eucerceris laticeps CRESSON, Proc. Ent. Soc. Phil., V: 107-108, 1865, ♂, ♀.—PACKARD, Proc. Ent. Soc. Phil., VI: 58-59, 1866.—PATTON, Bul. U. S. Geol. and Geog. Survey, V: 357, 1879, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—SMITH, 27th Ann. Rep. N. J. State Board of Agric. for 1899, p. 519, 1900.—SMITH, Ann. Rep. N. J. State Mus. for 1909, p. 678, 1910.—LEONARD, A List of the Insects of N. Y., p. 1017, 1928.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 100, 1916, ♀.

Cerceris laticeps SCHLETTERER, Zool. Jahrb., II: 495, 1887.—DALLA TORRE, Cat. Hymen., VIII: 466, 1897.

Eucerceris zonatus var. *laticeps* CRESSON, Trans. Amer. Ent. Soc., X: vii, 1882, ♂, ♀.—SMITH, Univ. Nebr. Studies, VIII: 372, 1908.

Male.—Black with yellow marks, closely and coarsely pitted; clypeal border with three slender black teeth; enclosure strongly rugose; paired rows of short erect hairs on sternites 3 to 5; legs fulvous. Length 15 mm.

Head (Fig. 44) subequal in width to thorax, clothed with long fulvous hairs; mandibles nondentate, closely and finely pitted laterally at the base, yellow becoming fulvous and finally dark fuliginous at the tips; clypeus tridentate on the apical border of the medial portion, more closely pitted toward the apical border, densely clothed with long hairs forming a distinct elongate row on the apical border of the lateral wings, yellow with a black apical border including the denticles; antennae normal in form, fulvous proximally becoming fuliginous apically; front narrowing above with the black of the vertex extending as a wedge-shaped line through the antennal scrobes and half way to the clypeal border; vertex and genae black with an angular fulvous spot bordering the eye behind.

Thorax closely and coarsely pitted, clothed with long fulvous hairs; pronotum black with a divided yellow line on the posterior border; tubercles black; mesoscutum and scutellum black; tegula smooth, fulvous with a yellow spot; metanotum black with a yellow line; pleuron and sternum black except for a trace of yellow back of the tubercle; propodeum black with a small yellow spot on each side; enclosure densely pitted with the pits running into slightly oblique striae, smoother toward the posterior angle.

Abdomen closely pitted, more densely so in depressed lines on the tergites; tergites 1 to 6 with yellow bands, that on tergite 1 wider and emarginate on both sides, that on tergite 2 dilated laterally with a tendency to surround the depressed black area, those on tergites 3 to 5 uniformly narrow, than on tergite 6 irregular and interrupted; venter fuliginous becoming darker distally; pygidial area (Pl. IX, Fig. 116) truncate, lateral

borders with carinae ending in slight denticles apically, moderately pitted.

Legs blackish proximally becoming fulvous and finally light fulvous distally.

Wings subhyaline with a clouded area through the costal half; cell 1st R_5 is not petiolate. (Pl. VIII, Fig. 84).

Genitalia (Pl. X, Fig. 130).

Female.—Much like the male except for sexual differences and as stated below. Head slightly larger; mandibles with a large triangular obtuse tooth; clypeal border with a medial process and two small pointed denticles at the lateral borders of the medial portion; a small tubercle on the mesopectus. Length 19 mm.

Head (Fig. 26) closely and coarsely pitted, clothed with erect amber hairs; mandibles with a large triangular obtuse tooth, ferruginous with black tips and denticles, a row of long hairs on the medial angles; clypeus broad and short, a truncated process medially on the apical border, short pointed processes at the lateral-apical borders of the medial process, black with large yellow patches on the medial and lateral parts; antennae normal in form, fulvous proximally becoming fuliginous distally; front wide, narrowing above, black with large yellow triangular patches bordering the eyes and a yellow stripe extending from the clypeal border between the antennae to near the medial ocellus; vertex and genae black with a fulvo-ferruginous patch extending from just back of the lateral ocellus to and along the border of the eye to the base of the mandible.

Thorax closely and coarsely pitted, clothed with erect amber hairs; pronotum with a yellow band slightly emarginate; tubercle with a yellow spot; scutellum densely and finely pitted, ferruginous with a yellow band divided; metanotum with a wider yellow band than in male; mesopleural tubercle prominent, a yellow spot cephalad of the mesopleural tubercle and another yellow spot just back of the tubercle of the prothorax; propodeum with a large subpyriform yellow patch on each side; enclosure densely pitted with the pits running into slightly oblique striae, a medial groove, two small yellow patches along the lateral borders.

Abdomen densely and finely punctate, more so in the depressed areas on the tergites; yellow band on tergite 1 emarginate; yellow band on tergite 2 wide, surrounding the depressed area which is ferruginous, a ferruginous border between the black and yellow; tergites 3 and 4 with narrow yellow bands dilated laterally, two widely separated ferruginous spots near the proximal border of tergite 3; tergite 5 with a wider yellow band dilating laterally; venter immaculate piceous, sparsely pitted, second segment fulvous; pygidial area (Pl. IX, Fig. 100) ferruginous, with a carina around the border, fringed with long amber hairs.

Legs fuliginous becoming more fulvous and then yellow distally.

Wings similar to those of the male except cell 1st R_5 is petiolate (Pl. VII, Fig. 67).

Neotype.—Female, Illinois, in the collection of the American Entomological Society of Philadelphia.

The above type has been selected since it appears to have been determined by E. T. Cresson, Sr., as such. The author is compelled to consider *laticeps* Cresson as synonymous with *zonata* (Say) after carefully studying a large series. The female type (type No. 1962.1) of *laticeps* Cr. and one male labeled "Paratype," from Massachusetts (Type No. 1962) are in the collection of the American Entomological Society of Philadelphia.

Because of the wide variation in the extent of yellow found in this species, Cresson was led to consider the darker form, *laticeps* Cresson, as a distinct species. He evidently had a limited number of specimens available for study at the time. Cresson later (1882) reduced *laticeps* Cresson to subspecies

rank. After examining a series from all sections of its range, the writer is compelled to consider the two as synonymous. All variations appear to occur throughout its range. The types represent the more extreme forms from the standpoint of yellow coloration. Many forms can be found with the yellow markings replaced by ferruginous or lost completely except for the yellow marks of the propodeum and the first two tergites. The relative size of the head of the female varies, but this does not appear to indicate different species.

The truncated process on the clypeus of the female varies in the form of its distal end. In some specimens it is acute, in others it is truncate and in some it is slightly emarginate as in the illustration (Pl. III, Fig. 26).

E. zonata is close to *E. superba.* The males may be separated by the erect hairs on the venter of the former being much shorter and forming shorter broken rows. The females may be separated by the structure of the clypeus and the form of the denticle on the mandible.

Distribution.—Arkansas, Colorado, Connecticut, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, New York, South Dakota, Vermont, Wisconsin (Pl. XII, Fig. 147).

This is the only species of the genus *Eucerceris* found east of the Mississippi River. Specimens have been taken commonly in the New England States and throughout the upper Mississippi Valley. It has been taken as far west as Montana, Colorado, and New Mexico, but is not as common in these states as in the upper Mississippi Valley and further east.

14. EUCERCERIS INSIGNIS Provancher

Figs. 28, 43, 68, 82, 101, 117, 131, 148.

Eucerceris insignis PROVANCHER, Addit. faun. Canada, Hymen., p. 418, 1889, ♂ (not the ♀ as he indicates).—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—VIERECK, Proc. Acad. Nat. Sci. Phil., LIV: 731, 1903.—GAHAN AND ROHWER, Canad. Ent., XLIX: 398, 1917, ♂.

Cerceris provancheri DALLA TORRE, Wien. Ent. Zeit., IX: 204, 1890.—DALLA TORRE, Cat. Hymen., VIII: 470, 1897.

Male.—Dark fuliginous to black with yellow markings; mandibles nondentate; apical clypeal border tridentate; enclosure with coarse ridges parallel to the anterior border; rows of long erect hairs on sternites 3, 4 and 5; cell 1st R_5 not petiolate. Length 10 mm.

Head (Fig. 43) subequal in width to thorax, closely pitted, clothed with short silvery hairs; mandibles nondentate, scattered row of hairs along the lateral-ventral angle, yellow except tip, which is dark amber; clypeus convex, tridentate on apical border of medial portion, prominent rows of longer hairs on apical borders of lateral wings; antennae normal in form, yellow patch on scape, otherwise ferruginous; front yellow

with wedge-shaped extensions of the black of the vertex reaching to and below the antennae and along the border of the compound eyes, hairs of ocellar region longer; vertex black; genae black with a yellow band along the border of the eye to the mandible.

Thorax closely pitted and clothed with short hairs; pronotum with a yellow band on the posterior border confluent with an enlongate yellow patch on the propleura; tubercle yellow and ferruginous; mesoscutum black; tegula smooth, yellow with some fulvous; scutellum sparsely pitted, black with a divided yellow band, small yellow spots at the lateral extremities; metanotum very sparsely pitted, yellow with black extremities; mesopleura with an anteriorly emarginated yellow patch confluent with yellow of the mesosternum; sternum largely yellow on a background of dark fuliginous to black; propodeum black with a large yellow pyriform patch on each side; enclosure with 8 to 10 prominent ridges subparallel to anterior border, indistinct central groove, two posteriorly converging oval yellow spots.

Abdomen moderately pitted on convex areas, closely pitted on concave areas, clothed with short hairs becoming longer on the venter; rows of closely matted erect hairs on the posterior borders of sternites 3, 4 and 5, shorter on 5; wide bands of yellow on tergites and sternites 1 to 6; tergites 2 to 5 with elongate black patches in the central depressed lines; pygidial area (Pl. IX, Fig. 117) sparsely pitted, bordered by a carina, proximal half yellow.

Legs yellow with more or less brown on the inner surfaces of femora.

Wings subhyaline with the costal half of the anterior wings clouded; cell 1st R_5 not petiolate (Pl. VIII, Fig. 82).

Genitalia (Pl. X, Fig. 131).

Female.—Black with yellow markings. Like male in all respects except for usual sexual differences and as indicated; mandibles unindentate; apical clypeal border with a medial bifid projection ventrad of a single short acute medial projection, two large bidentate projections on the apical margin at the border between the medial and lateral portions; cell 1st R_5 petiolate. Length 11 mm.

Head (Fig. 28) large; mandibles with one small denticle, yellow with black tips and denticles; clypeal border with a medial bifid projection ventrad of a single short acute projection, two larger bidentate projections on the apical margin at the junction of the lateral wings with the medial portion, yellow, prominent row of elongate bristles on the medial apical border emerging from just below the smaller medial process; black stripes of front extending to clypeus, apical denticles black; vertex with two small spots of yellow posterior to lateral ocelli.

Thorax sculptured as in male; propleura without yellow; mesopleura with a deeply emarginated yellow patch not confluent with yellow of sterum; mesopleural tubercle present; sternum with much less yellow than on male.

Abdomen without prominent rows of long hairs on venter; pygidial area (Pl. IX, Fig. 101) bordered by a carina, fringed with long amber hairs.

Legs yellow, with black areas on basal portion above, coxae and trochanters with more or less black; distal end of third pair of femora black; third tibia with distal end darkened medially.

Wings as in male except cell 1st R_5 is petiolate (Pl. VII, Fig. 68).

Lectotype.—Male (Provancher records it as a female by mistake), Los Angeles County, California (Coquillett), in the collection of the United States National Museum.

Homotypes.—Eight males, Los Angeles County, California (Coquillett), in the collections of the United States National Museum and the author.

Many of the specimens examined are longer than the type. Variations observed in the male are as follows: band on the pronotum may be divided; small yellow spots may appear on the posterio-lateral angles of the scutellum and the yellow band of the scutellum may or may not be divided; the yellow of the mesopleura may be divided; the enclosure and the pygidial area may either or both be impunctate.

In the female the yellow of the genae may not always reach the mandibles; spots on the vertex may be absent; the yellow of the tegula may fade out or nearly so; the yellow of the scutellum may be divided.

The female is here described for the first time.

E. insignis is close to *E. fulvipes* but the males of *fulvipes* may be distinguished by having but one row of erect hairs on the venter, and the females by their clypeal borders. The apical clypeal border in the female is similar to that of *E. ferruginosa,* new species.

Distribution.—California and Nevada (Pl. XII, Fig. 148).

Except for a series of seventeen males taken in Ormsby County, Nevada, by Baker, *E. insignis* is not recorded outside of California. It appears to be more common in the bay region of that state. It was collected in abundance at Stanford University from June to August by Dr. Carl D. Duncan on *Baccharis douglasii, Solidago* sp., *Eriogonum fasciculatum, Daucus carota, Mentha pulegium, Eriogonum nudum, Carum kelloggii, Angelica* sp. and *Clematis* sp. Dr. Timberlake and others have taken it on *Eriogonum fasciculatum.*

15. EUCERCERIS FERRUGINOSA, new species

Figs. 29, 69, 102, 149.

Female.—Entire body ferruginous with creamy-white and black markings; mandibles with a single bidentate tooth; apical clypeal border with two medial truncate processes ventrad of a single short acute medial projection, and two widely separated large bidentate processes; cell 1st R_5 petiolate. Length 11 mm.

Head (Fig. 29) large, moderately and finely pitted, clothed with short hairs, ferruginous except as indicated; mandibles with one large bidentate tooth, ferruginous with black tips and denticles; apical clypeal border with two medial truncate processes ventrad of a single short acute projection, and two widely separated large bidentate processes, prominent row of elongate bristles on the medial apical border emerging from just below the small medial projection; interocellar area black; antennae normal in form, becoming darker apically.

Thorax ferruginous with depressed borders of sclerites blackish; tubercle of the prothorax testaceous; small spots on the mesopleura and propodium yellow; mesopleural tubercles present; metanotum creamy yellow; enclosure with a central groove and moderate ridges extending obliquely.

Abdomen moderately pitted on convex areas, closely and finely pitted on depressed areas, clothed with short hairs; tergite 1 with an emarginate band of yellow; tergites 2, 3 and 4 with medial narrow short bands of yellow on their posterior borders; pygidial

area (Pl. IX, Fig. 102) slightly rugose, truncate at the apex, bordered by a carina, fringed by a row of hairs.

Legs ferruginous.

Wings subhyaline with a medial dark band extending to the apex, costal margin and cell R_1 yellowish; cell 1st R_5 not petiolate (Pl. VII, Fig. 69).

Holotype.—Female, Angeles Bay, Gulf of California, June 26, 1921 (E. P. Van Duzee), in the collection of the California Academy of Sciences.

Paratypes.—Female, Angeles Bay, Gulf of California, June 26, 1921 (E. P. Van Duzee); female, Mohave Desert n. Palmdale, California, June 22, 1931 (F. E. Lutz), in the collection of the American Museum and in the author's collection.

Distribution.—Southern California. (Pl. XII, Fig. 149).

The paratype from the Mohave Desert lacks the yellow markings and the interocellar area is not black.

16. EUCERCERIS CERCERIFORMIS Cameron

Eucerceris cerceriformis CAMERON, Biol. Centr.-Amer., Hymen., II: 130, 1890, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.

Cerceris cerceriformis DALLA TORRE, Cat. Hymen., VIII: 455, 1897.

E. cerceriformis appears to resemble *E. montana* in the form of the clypeal border but differs from that species in the sculpturing of the enclosure and in other respects. No forms which answer to the description have been seen. Cameron's original description is quoted in full below:

"Nigra, facie, linea pronoti, linea scutelli, metanoto, abdominis segmentis marginibus, maculisque 2 segmento mediali, albidis; pedibus fulvis, geniculis tibiisque anterioribus albis; alis hyalinis, anticis fumatis, stigmate ochraceo. ♀. Long. 10 millim.

"Antennae with the flagellum brownish beneath, gradually thickened towards the apex; the third joint somewhat longer than the first, and nearly four times the length of the second. Head shining, closely and not very strongly punctured; from below the ocelli it is entirely whitish-yellow, and there is an elongated mark behind the eyes; a black elongated fossulet above the eyes, and a short furrow between these fossulets; ocelli separated from the eyes by somewhat less than the length of the third antennal joint; apex of the clypeus broadly rounded; eyes diverging a little below. Thorax rather strongly punctured; the pleurae rugose, the heart-shaped area of the median segment transversely striated, widely furrowed down the centre; a broad line on the pronotum, the tegulae, the tubercles, a mark behind them, a broad complete line at the base of the scutellum, the metanotum, two large marks on the median segment, and a broad band on the abdominal segments, yellowish-white. Abdomen shining, bearing scattered punctures; the pygidial area with some large punctures at the base, its sides curved, hollowed, ending as stout, somewhat triangular, teeth, and with a few large widely separated punctures; incision in the hypopygium short; there is a depression in the centre of the antepenultimate segment, and a row of stiff longish bristles at its base."

Holotype.—Female, Mexico (Saussure). The present location of type unknown. It is not at the British Museum or the Muséum d'Histoire Naturelle, Geneva.

Distribution.—Mexico.

17. EUCERCERIS SINUATA, new species

Figs. 27, 70, 103, 150.

Female.—Black and ferruginous with yellow markings; mandibles with two medial denticles, one dorsal and one ventral; clypeus depressed, apical border with a wide medial process sinuate distally; enclosure obliquely ridged. Length 14 mm.

Head (Fig. 27) closely and finely punctuate, densely clothed with short amber hairs; mandibles with two medial denticles, one dorsal and one ventral, fulvous at the base becoming ferruginous medially and black on the tip and denticles; clypeus short, broad and depressed, apical margin with a wide medial process sinuate distally; brownish yellow with dark fuscous stripes passing through the tentorial pits and confluent with the black apical border; antennae normal in form, ferruginous proximally becoming fuliginous distally; front brownish yellow with two wide fuscous stripes passing through the antennae, continuous with the stripes of the clypeus and confluent with the fuscous of the ocellar area; vertex and genae ferruginous except for the fuscous of the ocellar area and a narrow fuscous stripe along the mesal border of the compound eye.

Thorax closely to moderately punctuate, clothed with short amber hairs becoming longer ventrally; pronotum with a yellow band on the posterior border confluent with the yellow of the tubercle; mesoscutum black, mottled with ferruginous; tegula fulvous with a yellow patch; scutellum ferruginous with an emarginate yellow band; metanotum yellow; pleuron black in the depressed areas, becoming ferruginous on the elevated parts, a yellow patch back of the tubercle of the pronotum; mesopleural tubercle barely evident; sternum fuliginous, becoming yellowish between the second and third pair of coxae; propodeum ferruginous with large lateral yellow patches and a medial fuscous stripe; enclosure obliquely and coarsely ridged, fuscous with lateral fuliginous patches.

Abdomen closely and finely punctate except for the elevated ridges which are subimpunctate, clothed with amber hairs becoming more closely set and conspicuous on the posterior venter, fulvo-ferruginous and yellow; tergite 1 with a wide emarginate band of yellow; tergites 2 to 5 with the yellow bands becoming progressively less distinct from the ferruginous background and tending to surround the depressed areas; venter fuliginous, mottled with ferruginous; pygidial area (Pl. IX, Fig. 103) bordered by a carina, fringed with a row of hairs.

Legs ferruginous with yellow patches on the lateral sides of the first four tibiae.

Wings subhyaline, clouded along the costal region to the tip; cell 1st R_5 petiolate (Pl. VII, Fig. 70).

Holotype.—Devils River, Texas, May 5, 1907, on sumach (F. C. Bishopp), in the collection of the United States National Museum. (Type No. 50834).

E. sinuata superficially resembles *E. canaliculata* but may be separated from that species by the absence of the processes on the lateral wings of the clypeus as found on the latter and by the apical border of the clypeus.

Distribution.—Texas (Pl. XII, Fig. 150).

18. EUCERCERIS CANALICULATA (Say)

Figs. 30, 45, 71, 85, 104, 118, 132, 151.

Philanthus canaliculatus SAY, West. Quart. Rep., II: 79, 1823, ♂.—SAY, American Entomology, III: 111, Pl. 48, Fig. 1, 1828, ♂.—LECONTE, Writ. of Th. Say, I: 111, 167, 1883, ♂.

Cerceris bidentata SAY, West. Quart. Rep., II: 80, 1823, ♀.—LECONTE, Writ. of Th. Say, I: 168, 1883, ♀.—CRESSON, Proc. Ent. Soc. Phil., V: 130, 1865, ♀.—PACKARD, Proc. Ent. Soc. Phil., VI: 64, 1866.—PATTON, Bul. U. S. Geol. and Geog. Survey, V: 357-359, 1879.—CRESSON, Hymen. of Amer., p. 282, 1887.—SCHLETTERER, Zool. Jahrb., II: 487, 1887.

Eucerceris canaliculatus CRESSON, Proc. Ent. Soc. Phil., V: 112, 1865.—PACKARD, Proc. Ent. Soc. Phil., VI: 59, 1866.—PATTON, Bul. U. S. Geol. and Geog. Survey, V: 357-359, 1879, ♂, ♀.—SNOW, Trans. Kansas Acad. Sci., VII: 99, 1881.—CRESSON, Trans. Amer. Ent. Soc., X: vi, vii, viii, 1882, ♂, ♀.—CRESSON, Hymen. of Amer. p. 281, 1887, ♂, ♀.—ASHMEAD, Colo. Biol. Assoc. Bul., I: 32, 1890.—BRIDWELL, Trans. Kansas Acad. Sci., XVI: 209, 1899.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 88, 1904.—SMITH, Univ. Neb. Studies, VIII: 371, 1908, ♀.—MICKEL, Univ. Neb. Studies, XVII: 455, 1918, ♂, ♀.

Cerceris canaliculatus SCHLETTERER, Zool. Jahrb., II: 488, 1887.

Cerceris canaliculata DALLA TORRE, Wien, Ent. Zeit., IX: 200, 1890. DALLA TORRE, Cat. Hymen., VIII: 454, 1897.

Cerceris cameroni SCHULZ, Spolia Hymenopterologica, 194, 1906.

Male.—Yellow and ferruginous with occasional blackish parts; mandibles nondentate; clypeal border tridentate; ferruginous line through the antennae to the clypeus; sternites 3 and 4 with rows of long erect hairs; sternite 5 with a row of shorter and more closely matted hairs. Length 18 mm.

Head (Fig. 45) long; mandibles nondentate, yellow becoming dark amber at the tips, clothed with fine short hairs on the lateral base; clypeus tridentate medially at the apical margin, sparsely pitted above, becoming closely pitted toward the apical margin, hairs becoming longer and more closely set toward the apical margin, yellow with the apical border ferruginous; antennae normal in form, scape yellow, pedicel and flagellum ferruginous, becoming darker distally; front yellow with vertical ferruginous lines through scrobes to clypeal border; borders of compound eyes subparallel; vertex and genae ferruginous.

Thorax yellow to ferruginous; pronotum with a yellow band on the posterior border confluent with the yellow tubercle; mesoscutum light ferruginous with anterior and posterior margins narrowly black; scutellum sparsely pitted, light ferruginous with a yellow band on the anterior half; tegula smooth, fulvous with a yellow patch; metanotum sparsely pitted, yellow; pleuron and sternum fulvous with a yellow patch below the tegula, hairs of the venter longer; propodeum ferruginous with a large yellow patch on each side; enclosure smooth and velvety with a central groove.

Abdomen yellow, depressed areas closely pitted and fulvous; venter with longer hairs, sternites 3 and 4 with prominent rows of long hairs on the posterior borders, sternite 5 with a row of shorter stiff hairs closely fused together on the posterior border; pygidial area (Pl. IX, Fig. 118) sparsely pitted.

Legs furriginous with more or less yellow on all segments.

Wings hyaline; costal half ferruginous; cell 1st R_5 not petiolate (Pl. VIII, Fig. 85). Genitalia (Pl. X, Fig. 132).

Female.—Like the male in all respects except for the usual sexual differences and as stated. Mandibles unidentate; clypeus with a conical protuberance on the surface of each lateral wing, apical border with a single bifurcate projection and two large truncate processes widely separate, a group of elongate bristles emerge from just above the medial projection; cell 1st R_5 petiolate. Length 18 mm.

Head (Fig. 30) long; mandibles unidentate, light fulvous becoming black at the tips; clypeus short, a conical protuberance on the surface of each lateral wing, a single

bifurcate projection on the apical border of the medial portion, two larger truncate projections more laterad on the apical border of the medial portion, sparsely clothed with short hairs above becoming longer toward the apical border, a distinct row of long hairs along the border of the lateral wings, a group of elongate bristles emerge from above the medial projection, yellow with a ferruginous apical border and two spots at the angles between the lateral wings and medial portion; antennae ferruginous becoming black at the distal ends; front yellow with the ferruginous of the vertex extending as wide stripes through the scrobes to the clypeal border and as a wedge-shaped extension along the medial margin of the eye.

Thorax similar to that of the male; scutellum with a less distinct yellow band; mesopleural tubercle indistinct; enclosure with slight evidence of meso-lateral ridges.

Abdomen similar to that of male; venter ferruginous except for a trace of yellow on sternite 3, without prominent rows of erect hairs or bristles; pygidial area (Pl. IX, Fig. 104) bordered by a carina and fringed by a closely set row of hairs.

Legs without yellow except first tibia.

Wings as in male except cell 1st R_5 is petiolate (Pl. VIII, Fig. 71).

Neotype.—Male, Kansas, in the collection of the American Entomological Society of Philadelphia.

The specimen accepted as the neotype is marked with a small red label bearing a ♂ sign.

The male of *E. canaliculata* is superficially like the male of *E. lacunosa,* from which it may be separated by the absence of a depression on the second pair of femora and the bidentate clypeal border as found on the latter species.

The female closely resembles the female of *E. arizonensis,* from which it may be separated by the processes on the lateral wings of the clypeus of *E. canaliculata.*

Patton (1879) gives an extended discussion on the variations of *E. canaliculata.* Briefly it may be stated that much of the ferruginous background may be fuliginous to black. The ferruginous line through the antennae may be much shortened and not extend to the vertex or to the clypeal border.

The enclosure may also vary from smooth to slightly ridged. Size is also variable. Patton states that the length is from 11 mm. to 17 mm. The author's studies confirm this statement.

Patton (p. 359) also makes the following interesting statement relative to the early history of our knowledge regarding this species:

"Since 1820, when Thomas Say, while on Major Long's Expedition to the Rocky Mountains, captured one male and one female specimen, which he described as distinct species under different genera, this species has remained unrecovered. In establishing a new genus for the reception of those species in which the venation of the male resembles *Philanthus* and the venation of the female resembles *Cerceris,* Mr. Cresson, in 1865, relying on Say's description, referred *P. canaliculatus* to *Eucerceris,* while he left *C. bidentata* in *Cerceris,* not suspecting that they were the sexes of one species. The fine series collected by Mr. Williston enables me to unite them. The ♀ may be at once distinguished from all other wasps by the conical protuberance *on the lateral lobes* of the clypeus."

Distribution.—Arizona, Arkansas (?), California, Colorado, Kansas, Montana, New Mexico, Oklahoma, South Dakota (?), Texas, Utah, Bolivia (Pl. XII, Fig. 151).

This species is found in the short-grass plains and throughout the Rocky Mountains. It ranges from Montana on the north to the Mexican border. One male specimen has been seen by the writer from 29 Palms, California, where it was taken on *Wislizenia refracta.* In Texas, where it is common, it has been taken on *Koeberlinea spinosa* and on Cat's Claw acacia (F. C. Bishopp).

One male specimen in the National Museum was collected by W. H. Mann at Ivon Beni, Bolivia. This is of special interest, since the genus is not supposed to be in South America. It could be a mistake in labeling, or the species might have been introduced.

18a. EUCERCERIS CANALICULATA var. ATRONITIDA, new variety

Fig. 152.

Male and *female.*—Similar in all respects to the typical form except that the following parts are fuliginous to black and generally quite shiny: interocellar area, mesoscutum, and medial portion of propodeum.

Holotype.—Male, Beaver Canyon, Utah, in the collection of the United States National Museum (Type No. 51383).

Allotype.—Female, Beaver Canyon, Utah, in the collection of the United States National Museum (Type No. 51383).

Paratypes.—Two males, Dragoon, Cochise County, Arizona, July 20, 1917 (J. Bequaert); male, Fruita, Colorado, 4,500 feet elevation, July 16, 1919; female, Palisade, Colorado, 4,700 feet elevation, August, 1932 (Lee Jeppson); male, Albuquerque, New Mexico, 5,000 feet elevation, June 27, 1931 (Don Prentiss); female, Sierra Blanca, El Paso County, Texas, July 8, 1917 (J. Bequaert); male, Sierra Blanca, Texas, July 9, 1917 (R. C. Shannon); 5 males, Terlingua, Brewster County, Texas, May 10, 1927 (J. O. Martin); female, Valentine, Jeff Davis Co., Texas, July 8, 1917 (J. Bequaert); 3 males, female, Beaver Canyon, Utah; male, Trout Creek, Juab County, Utah, July 14, 1922 (Tom Spalding). Paratypes in the collections of the Museum of Brooklyn Institute, Cornell University, Brigham Young University, California Academy of Sciences, American Museum, and the author.

Distribution.—Arizona, Colorado, New Mexico, Texas, Utah.

The specimens from Texas and Arizona show less departure from the typical color-forms of *E. canaliculata* (Say).

Group C.

In this group cell 1st R_5 is petiolate in both females and males.

19. EUCERCERIS VITTATIFRONS Cresson

Figs. 31, 49, 72, 86, 105, 119, 133, 153.

Eucerceris vittatifrons CRESSON, Trans. Amer. Ent. Soc., VII: xxiv, 1879, ♂.—CRESSON, Trans. Amer. Ent. Soc., X: vii, viii, 1882, ♂.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 101, 1916, ♂.

Cerceris vittatifrons DALLA TORRE, Wien. Ent. Zeit., IX: 202, 1890.—DALLA TORRE, Cat. Hymen., VIII: 481, 1897, ♂.

Male.—Black with yellow markings; clypeus tridentate medially; front yellow with two black stripes extending from the vertex through the antennae to the apical border of the clypeus; a row of elongate erect hairs on the distal border of the fifth sternite. Length 11 mm.

Head (Fig. 49) somewhat wider than the thorax, moderately punctate, clothed with short silvery hairs; mandibles nondentate, trace of yellow on the proximal third, amber becoming black at the tip, very sparsely clothed with hairs; clypeus moderately punctured, tridentate medially at the apical margin, apical margin with a row of closely set hairs becoming longer on the lateral wings, yellow except for black apical border and narrow black stripes between the lateral wings and the medial segment reaching to apical border; antennae dark fuliginous; front convex, depressed areas more closely and finely pitted, yellow except for two black stripes extending from the black of the vertex through the scrobes to the apical margin of the clypeus; vertex closely punctate, black and clothed with short silvery hairs; genae black with a small yellow spot near the upper part of the eye.

Thorax closely punctate, clothed with short silvery hairs; protergum black with a yellow band on the posterior border, tubercle yellow; mesoscutum black; scutellum black with a yellow band divided by a line in the center; metanotum impunctate, yellow with black borders and extremities; tegula smooth, rufo-fulvous with an irregular yellow patch; pleuron closely and coarsely punctate, densely clothed with silvery hairs, black with a yellow patch behind the tubercle and a smaller spot more ventrad on the mesopleura; sternum closely and coarsely punctate, clothed with silvery hairs, black except for two yellow patches on the mesopleuron and two similar patches on the metapleuron; propodeum black with an oval yellow patch on each side, closely and coarsely punctate, clothed with silvery hairs; enclosure with a pitted central groove and with oblique ridges, disappearing toward the posterior angle, subimpunctate.

Abdomen black, convex areas sparsely punctate, concave areas closely punctate, sparsely clothed with short silvery hairs longer on the venter, one prominent row of amber bristles on the posterior border of sternite 5; yellow bands on the posterior part of tergites 1 to 6, emarginate and wider on the first, dilated laterally on tergites 2 and 3; sternites 2 and 4 with broken yellow bands; sternite 3 with a continuous yellow band; pygidal area (Pl. IX, Fig. 119) margined by a carina, sparsely pitted and fringed by silvery hairs.

Legs black to ferruginous with elongate yellow patches on the four anterior tibiae and small yellow spots on the mesocoxae.

Wings subhyaline, costal margin beyond stigma slightly fuliginous; cell 1st R_5 petiolate, (Pl. VIII, Fig. 86) (barely petiolate in right wing of type).

Genitalia (Pl. X, Fig. 133).

Female.—Black with yellow markings; mandibles unidentate; apical border of clypeus with two widely separated carina-like processes, between which and on a lower level are two smaller denticles; an elevated ridge on the medial process, below which emerges a row of elongate bristles. Length 11 mm.

Head (Fig. 31) like male except mandibles unidentate with a trace of cream on the lateral base; clypeus with two widely separated obtuse processes on the apical margin, between which and on a lower level are two smaller denticles, a prominent single row of bristles inserted below an elevated ridge on the medial lobe; black stripes of front wider; cream of genae larger than male and in contact with the eye.

Thorax like male except sternum immaculate, cream-colored spot on propodeum reduced.

Abdomen like male except hairs of venter short and inconspicuous; pygidial area (Pl. IX, Fig. 105) margined by a carina, rugose and fringed by a closely packed row of dark amber hairs.

Legs ferruginous to black, immaculate.

Wings as in male (Pl. VIII, Fig. 72).

Lectotype.—Male, Nevada (H. K. Morrison), in the collection of the American Entomological Society of Philadelphia (Type No. 1969.1).

Paratypes.—Three males, Nevada, in the collection of the American Entomological Society of Philadelphia (Type Nos. 1969a, 1969b, 1969c).

The yellow markings vary in their extent and shade. The black stripes on the face may or may not fuse with the black of the clypeal border. The propodeum may lack the yellow patches and the lower yellow patch of the mesopleura may be lacking. The first pair of coxae may be yellow. The band on the sixth tergite may be broken. The California series has the yellow bands of the tergites more dilated laterally. The enclosure may vary in its surface sculpturing from smooth with only a medial groove to quite rugose. The Washington and California series have the yellow markings more creamy white than the others.

E. vittatifrons is closely related to *E. tricolor,* which was originally described by Cockerell as a variety of the former. *E. vittatifrons* differs from the latter by the absence of ferruginous markings on the abdomen, by its larger size, and by its slightly different pygidial area. It shows some resemblance to *E. fulvipes,* but the latter does not have cell 1st R_5 petiolate in the male.

The female is here described for the first time.

Distribution.—Arizona, California, Colorado, Nevada, Utah, Washington (Pl. XII, Fig. 153).

SPECIMENS EXAMINED

ARIZONA: Female, Bill Williams Fork, August (F. H. Snow); female, Florence, August 23, 1902 (C. R. Biederman).

CALIFORNIA: 3 males, Big Pine, Inyo County, July 18, 1929 (E. P. Van Duzee); female, Helendale, September 14, 1935 (P. H. Timberlake); 8 males, Jacumba, San Diego County, August 12, 1917 (J. Bequaert); female, Riverside, at *Eriogonum gracile,* September 2, 1932; female, San Diego, August 25, 1927 (J. C. Van Boeker); male, White Water Cn., September 4, 1935 (P. H. Timberlake).

COLORADO: Male, Mesa Verda National Park, June, 1927 (James Kartchner).

NEVADA: Male, Nixon, June 30, 1927 (E. P. Van Duzee); male, Ormsby, July 6 (Baker).

NEW MEXICO: Female, Rinconada (?), September 26 (Cockerell).
UTAH: Male, Bellevue, Washington County; 2 males, Zion National Park (Vasco M. Tanner); female, Logan, Utah County, August 31 (F. Marlatt); female, Uinta County, July 13, 1911 (O. A. Peterson).
WASHINGTON: 7 females, 21 males, Satus Creek, August 8, 1925 (Walter Carter).

20. EUCERCERIS TRICOLOR Cockerell

Figs. 32, 46, 73, 87, 106, 120, 134, 154.

Eucerceris vittatifrons tricolor COCKERELL, The Entomologist, XXX: 136, 1897, ♂.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.

Eucerceris tricolor VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 87, 1904.

Male.—Black with yellow, cream-color and ferruginous markings; front yellow with two black stripes extending from the vertex to near the apical border of the clypeus; enclosure with oblique ridges; the first two abdominal segments with considerable ferruginous; a row of erect hairs on the fifth sternite. Length 10 mm.

Head (Fig. 46) slightly wider than the thorax; mandibles nondentate, proximal two-thirds yellow, distal third amber, becoming black at the tip, very sparsely clothed with hairs; clypeus moderately punctate, tridentate medially at the apical margin, apical margin with a row of closely set hairs becoming longer on the lateral wings, yellow except for black apical border and narrow black stripes between the lateral wings and the medial segment reaching nearly to apical border; antennae dark fuliginous; front with convex areas moderately pitted and clothed with short silvery hairs, concave areas more closely and finely pitted, yellow except for two black stripes extending from the black of the vertex through the scrobes to near the apical margin of the clypeus; vertex moderately punctate and clothed with short silvery hairs, black; genae moderately punctate and clothed with short silvery hairs, black with an oval yellow patch bordering the upper part of the eye.

Thorax closely punctate, clothed with short silvery hairs; pronotum black with a creamy-white band on the posterior border slightly concave anteriorly and confluent with the creamy-white tubercle, narrow yellow stripe on ventral border of prothorax; mesoscutum black; scutellum moderately punctate, black with a wide yellow band deeply and widely emarginate posteriorly; metanotum subimpunctate, yellow with black posterior border and extremities; tegula smooth, rufo-fulvous with an irregular cream-colored patch; pleuron closely and coarsely punctate, indistinct mesopleural tubercle, black with a creamy-white patch on the mesopleura; sternum closely and coarsely punctate, black except for two creamy-white patches on the mesosternum and two similar patches on the metasternum; propodeum black with a large, oval, creamy-white patch on each side, closely and coarsely punctate; enclosure with a central groove and with distinct oblique ridges.

Abdomen with convex areas sparsely punctate, concave areas closely punctate, sparsely clothed with short silvery hairs longer on the venter, one prominent row of amber bristles on the posterior border of sternite 5, black with a creamy-white band on the posterior part of tergites 1 to 6, emarginate on the first; sternites 3 and 4 with continuous creamy-white bands; black of tergites 1 and 2 largely replaced with ferruginous; sternites 2 and 5 with broken creamy-white bands; pygidal area (Pl. IX, Fig. 120) margined by a carina, sparsely pitted and fringed by silvery hairs.

Legs black to ferruginous with creamy-white patches on the first four coxae, femora and tibiae.

Wings subhyaline, cell R_1 and anterior margin beyond slightly fuliginous; cell 1st R_5 petiolate (Pl. VIII, Fig. 87).

Genitalia (Pl. X, Fig. 134).

Female.—Black with cream-color and ferruginous markings. Like male in all respects except for the usual sexual differences and as indicated. Length 10 mm.

Head (Fig. 32) like male except mandibles unidentate with a trace of yellow on the lateral base; clypeus tridentate on apical margin with the central process bifurcate and more ventrad, a prominent single row of bristles inserted dorsad of the medial process, medial lobe strongly convex; black stripes of front wider; yellow spot of genae larger than in male.

Thorax like male except yellow of scutellum is divided; yellow of sternum limited to four small spots on the mesosternum and metasternum.

Abdomen like male except yellow of first tergite is divided; venter is immaculate and lacks the prominent row of bristles; pygidial area (Pl. IX, Fig. 106) margined by a carina, rugose and fringed by amber hairs.

Legs ferruginous with creamy-white patches on the first four femora and black to ferruginous on all coxae.

Wings as in male (Pl. VIII, Fig. 73).

Lectotype.—Male, Las Cruces, New Mexico, 9-5 (Twns.), in the collection of the American Entomological Society of Philadelphia.

The ferruginous may extend onto the third tergite. In one specimen from Texas it extends onto the fourth tergite. The yellow of the scutellum may or may not be divided.

E. tricolor was originally described from the male only as a variety of *E. vittatifrons*. Later Viereck and Cockerell recognized it as a valid species. It differs from *E. vittatifrons* by its ferruginous abdominal segments, its smaller size, and its differently shaped pygidial area and clypeal border in the female.

Distribution.—Arizona, Mexico, New Mexico, Texas (Pl. XII, Fig. 154).

SPECIMENS EXAMINED

ARIZONA: Male, Dragoon, Cochise County, July 20, 1917; female Globe, July 27, 1932 (R. H. Painter).

MEXICO: October 9, 1896.

NEW MEXICO: Female, Alamogordo, May 13, 1902; 6 males, Alamogordo, May 13-June 17, 1902; 2 males, Eddy County, July 10 and 12, 1927 (R. H. Beamer); 2 females. Highrolls, May 30, and June 10, 1902; 9 males, Highrolls, May 30-June 10, 1902; female, Las Cruces, October 5, 1895 (Cockerell); male, Las Cruces, September 5; male, Organ, August 8, 1931 (R. H. Painter); 2 males, Steins, August 8, 1932 (R. H. Painter).

TEXAS: Female, Girvin, August 4, 1931 (R. H. Painter); female, 12 males, Sierra Blanca, El Paso County, July 8, 1917 (J. Bequaert); 12 females, 30 males, Sierra Blanca, July 9, 1917; 2 males, Sierra Blanca, July 9, 1917 (R. C. Shannon); 2 females, 2 males, Sierra Blanca, Hudspeth County, July 4, 1921 (Carl D. Duncan); male, Valentine, July 13, 1927 (R. H. Beamer).

21. EUCERCERIS MONTANA Cresson

Figs. 33, 47, 74, 88, 107, 121, 134a, 155.

Eucerceris montanus CRESSON, Trans. Amer. Ent. Soc., X: vi, vii, viii, 1882, ♂, ♀.—CRESSON, Hymen. of Amer., p. 281, 1887, ♂, ♀.—ASHMEAD, Canad. Ent., XXXI: 295, 1899.—CRESSON, Memoirs of the Amer. Ent. Soc., I: 101, 1916, ♂, ♀.

Eucerceris montana VIERECK AND COCKERELL, Jour. N. Y. Ent. Soc., XII: 84, 85, 86, 87, 1904.—MICKEL, Univ. Neb. Studies, XVII: 456, 1918, ♀.

Cerceris montana DALLA TORRE, Wien. Ent. Zeit., IX: 201, 1890.

Male.—Black and ferruginous with yellow markings; mandibles massive with a single recurved tooth; front broad and flat; apical border of clypeus unarmed; enclosure closely and deeply pitted; cell 1st R_5 petiolate. Length 13 mm.

Head (Fig. 47) large; mandibles massive, one large sharp recurved denticle, yellow except tip and denticle; clypeal surface flat, apical margin unarmed, closely punctate, yellow, clothed with yellow hairs becoming more pronounced along the apical borders of the lateral wings; antennae normal in form, scape yellow, pedicel and flagellum fulvous; front wide, closely punctate, clothed with moderately long silvery-yellow hairs, yellow with black of vertex extending as angular projections to the antennae; vertex closely punctate, black, hairs medium in length; genae closely pitted, black with a round yellow spot margined by amber bordering the upper part of the eye, hairs short.

Thorax closely punctate, clothed with moderately long hairs; pronotum black with a yellow band on the posterior border; tubercle black, narrow yellow stripe on ventral border of prothorax; mesoscutum, scutellum, pleuron, and sternum black; metanotum yellow with black anterior border and extremities; tegula smooth, fulvous with a yellow patch; propodeum black with a small yellow spot on each side; enclosure closely and coarsely pitted, with a central groove.

Abdomen with convex areas moderately pitted, concave areas closely pitted, clothed with short silvery hairs on the tergum, very long hairs on the venter, indistinct rows of erect amber hairs on the posterior borders of sternites 3, 4 and 5 nearly covered by the long silvery hairs; yellow bands on tergites 1 to 6, yellow on tergites 2 to 5 dilated laterally; sternites 3 to 5 with yellow bands; sternite 2 with a yellow patch; pygidial area (Pl. IX, Fig. 121) margined by a carina, moderately and coarsely pitted.

Legs yellow below, fuliginous above.

Wings subhyaline with costal area clouded, cell 1st R_5 petiolate. (Pl. VIII, Fig. 88).

Genitalia (Pl. X, Fig. 134a).

Female.—Like the male in all respects except for the usual sexual differences and as indicated. Black and ferruginous with yellow markings; mandibles unidentate; a flat rounded process on the apical border of the clypeus; mesopleural tubercle absent. Length 20 mm.

Head (Fig. 33) subequal to thorax in width; mandibles normal in size, unidentate, amber with black tips and denticles; clypeus with a flat rounded process on the apical border of the medial portion, moderately pitted, clothed with silvery-yellow hairs, apical border and a stripe between lateral and medial portions black; antennae fuliginous proximally becoming black distally; front black with large yellow patches between the antennae and compound eyes, and between the antennae; genae with yellow patches more elongate.

Thorax sculptured as in male; mesopleural tubercle absent; propodeum with much larger yellow patches tending to be confluent; enclosure with two small yellow patches.

Abdomen; tergites with wide bands; tergite 1 with yellow band deeply indented with fuliginous; yellow of tergites 2 to 4 surrounding depressed areas which are black in part; sternites 3 to 5 with two large yellow patches; less hairy than in male; no erect rows of long hairs; pygidial area (Pl. IX, Fig. 108) margined by a carina, rugose, fringed by amber hairs.

Legs fulvous-yellow.

Wings like those of the male. (Pl. VIII, Fig. 74).

Lectotype.—Female, Montana (Morrison) in the collection of the Philadelphia Academy of Sciences (Type No. 1946).

Paratypes.—Two males, Montana (Morrison), in the collection of the Philadelphia Academy of Sciences (Type Nos. 1946a, 1946b).

The extent of the yellow markings varies. The yellow band of the first tergite may be divided by a wide black stripe in the male. In the female the scutellum may have the yellow band broken or as a solid line. The first sternite may be fulvous.

E. montana is very close to *E. angulata,* from which it may be separated by the processes on the pronotum of the female and the unusual form of the antennae of the male in the latter.

Distribution.—Arizona, Colorado, Kansas, Montana, New Mexico, Oklahoma, Texas, Utah (Pl. XII, Fig. 155).

SPECIMENS EXAMINED

ARIZONA: Female, Texas Pass, July 20, 1917.

COLORADO: Male, Crowley, September 1, 1932 (M. T. James); female, Sterling, July 1, 1921 (Grace A. Sandhouse).

KANSAS: Male, Hamilton County, 3,350 feet elevation (F. H. Snow); female, Meade County, 2,500 feet elevation, July 10 (F. X. Williams); male, Meade County, 2,500 feet elevation, July 12, 1911 (F. X. Williams); 3 females, Morton County, 3,200 feet elevation (F. H. Snow); 2 females, Morton County, 2,800 feet elevation, August 5, 1911 (F. X. Williams).

NEW MEXICO: Female (Wm. J. Fox); 2 males, Alamogordo, May 13, 1902; female, Highrolls, May 30, 1902; 19 males, Highrolls, May 29-June 3, 1902; male, 35 miles east of Santa Fe, 6,900 feet elevation, June 27, 1931 (Don Prentiss).

OKLAHOMA: 2 males, Cimarron County, June 21 and July 6, 1933 (A. E. Pritchard); male, Guyman, 3,133 feet elevation, August 15-16, 1921 (R); female, Texas County, July 22, 1933 (A. E. Pritchard).

TEXAS: 5 males, Coyote Lake, Bailey County, August 25, 1921 at *Solidago* sp, and *Cuscuta* sp. (Carl D. Duncan); 2 males, Fabens, July 9, 1917; male, Hueco Mountains, El Paso County, 3,000 feet elevation, July 12, 1932 (Will and McIllroy); 2 males, Juno to Ozona, July 4, 1917; female, male, Marfa, May 15, 1918 (J. C. Bradley); female, Sierra Blanca, El Paso County, July 8, 1917 (J. Bequaert); 3 males, Sierra Blanca, July 9, 1917 (R. C. Shannon); male, Sierra Blanca, July 9, 1917; male, Sierra Blanca, Hudspeth County, July 4, 1921, at *Koeberlinia* sp. (Carl D. Duncan); female, Valentine, Presidio County, July 8, 1917 (J. Bequaert); male, Valentine, July 13, 1927 (L. A. Stephenson).

UTAH: Male, Salt Lake City, June 25, 1922 (E. P. Van Duzee).

22. EUCERCERIS ANGULATA Rohwer.

Figs. 34, 35, 36, 48, 51, 75, 89, 108, 122, 134b, 156.

Eucerceris angulata ROHWER, Bul. Amer. Mus. Nat. Hist., XXXI (24): 326, 1912.

Male.—Black with yellow markings; mandibles with a slightly elevated ridge medially above and a prominent rounded tooth below; clypeal border with a truncate process sinuate distally, surface depressed and very hairy; scape enlarged; first segment of flagellum enlarged, segments 1 to 5 with distinct distally pointed denticles; enclosure

moderately and coarsely pitted and with a medial groove; pygidial area without the usual lateral carina; cell 1st R_5 petiolate. Length 11 mm.

Head (Fig. 48) very little wider than thorax; mandibles with a slightly elevated ridge on the inner dorsal angle and a prominent rounded tooth on the inner ventral angle (Pl. VI, Fig. 51) proximal two-thirds yellow, distal third amber, a row of long hairs along the inner dorsal angle and short hairs on the lateral aspect; clypeus with a strongly protruding truncate process on the apical border medially with the distal end sinuate, medially concave, yellow, closely punctate and densely clothed with moderately long yellow hairs over its entire surface above; antennae (Pl. IV, Fig. 36) with scape dilated distally, pedicel normal, first segment of flagellum dilated and segments 1 to 5 with a distally pointed denticle on the dorsal aspect, dark amber with a yellow patch on the scape, pedicel, and base of first segment of flagellum; front yellow extending to anterior ocellus, black of vertex extending to the scrobes, closely punctate, clothed with silvery hairs; vertex black, closely and coarsely punctate, clothed with silvery hairs; genae moderately punctate, clothed with silvery hairs, small yellow patch bordering the upper part of the eye.

Thorax normal in form; protergum closely punctate, clothed with short silvery hairs, black with a yellow band on the posterior border confluent with a yellow patch on the tubercle, narrow yellow stripe on the ventral border of the prothorax; mesoscutum and scutellum black, closely punctate, clothed with short silvery hairs; metanotum sparsely punctate, yellow with black extremities; tegula smooth, fulvous with a yellow patch; pleuron, sternum and propodeum closely and coarsely punctate, black, clothed with silvery hairs; enclosure with a central groove, moderately punctate.

Abdomen with convex areas sparsely punctate, concave areas closely punctate, clothed with short silvery hairs, longer on venter and tergite 6, black with yellow bands on tergites 1 to 5, wider and emarginate on first, laterally dilated on 3 to 5, two lateral yellow patches on tergite 6, prominent rows of erect long hairs on posterior borders of sternites 3 and 4, and inconspicuous row on sternite 5; pygidial area (Pl. IX, Fig. 122) subequal in width and length, sparsely punctate, without a bordering carina, fringed by unusually long silvery hairs.

Legs dark fuliginous dorsally, yellow ventrally.

Wings subhyaline except anterior half of mesal wing which is slightly fuliginous; cell 1st R_5 petiolate (Pl. VIII, Fig. 89).

Genitalia (Pl. X, Fig. 134b).

Female.—Like the male in all respects except for the usual sexual differences and as indicated. Mandibles unidentate; apical border of clypeus with a flat rounded process; antennae normal in form; mesopleural tubercle absent. Length 11 mm.

Head (Fig. 34) subequal to thorax in width; mandibles with a single sharp tooth, dark fuliginous to black with a small yellow patch on the lateral base, less hairy than on male; clypeus with a flat rounded process on the apical border of the medial portion; front black except for large yellow patches bordering the compound eyes, the facial carina and a patch on the median portion of the clypeus; antennae normal in form, fuliginous to black; genae with yellow patches more elongate.

Thorax with lateral anterior angles of pronotum distinctly dentate (Pl. IV, Fig. 35); no yellow on ventral border of prothorax; mesopleural tubercle absent; large yellow patches on the propodeum.

Abdomen with yellow bands on tergites 2 and 4 broken, yellow of tergites 2 to 4 laterally dilated, yellow patches on tergite 6 laterad of pygidial area; venter without distinct rows of erect hairs; pygidial area (Pl. IX, Fig. 108) margined by a carina, rugose and fringed by silvery hairs.

Legs dark fuliginous to black; yellow elongate patches on dorsal surface of first four tibiae.

Wings as in male (Pl. VIII, Fig. 75).

Holotype.—Female, Lower California, between San Jose del Cabo and Triunfo. Collected by 'Albatross' Expedition, 1911; in the collection of the American Museum of Natural History.

The yellow patches vary somewhat in different specimens.

E. angulata is very close to *E. montana* in many respects, but can be separated from it by the more normal form of the mandibles and the unusual type of antennae in the male, and by the processes on the protergum of the female of the former.

The male is here described for the first time.

Distribution.—Lower California, Arizona (Pl. XII, Fig. 156).

SPECIMENS EXAMINED

ARIZONA: 2 females, male, Sabino Cn., Santa Catalina Mountains August 13, 1924 (E. P. Van Duzee); female, male, Sabino Cn., Santa Catalina Mountains, August 14, 1924 (E. P. Van Duzee); male, Tucson; male, Tucson (F. H. Snow); male, 16 miles south of Tucson, August 11, 1924 (J. O. Martin); female, 18 miles south of Tucson, July 31, 1924 (E. P. Van Duzee).

LOWER CALIFORNIA: Female, La Paz, Baja, October, 1923 (W. M. Mann).

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Abbreviations.

Atp, anterior tentorial pits.
BR, basal ring.
CxC_1, CxC_2, CxC_3, Coxal cavities.
Cxp, coxopodite.
Epm_2, epimeron.
Eps_1, Eps_2, episternum.
GF, genital foramen.

IT, propodeum.
Mpct, mesopectus.
mpt, mesopleural tubercle.
N_1, N_3, pronotum, metanotum.
Par, paramers.
Pl_3,metapleura.
S_1, S_2, S_3, sternum.
Sa_1, Sb_2, plates of the mesosternum.
Sa_3, Sb_3, Sc_3, parts of the metasternum.
Scl_2, scutellum.
Sct_2, scutum.
Tg, tegula.
tu, tubercle of the prothorax.
VP, valve of the penis.

PLATE I

Fig. 1. Lateral view of thorax, *E. flavocincta,* male.
2. Dorsal view of thorax, *E. flavocincta,* male.
3. Ventral view of thorax, *E. flavocincta,* male.
4. Lateral view of abdomen, *E. flavocincta,* male.
5. Fore wing, *E. flavocincta,* male.
(Labels of cells are underlined.)
6. Hind wing, *E. flavocincta,* male.
7. Distal portion of fore wing, *E. flavocincta,* female.
8. Antennae, *E. flavocincta,* male.
9. Posterior leg, *E. flavocincta,* male.
10. Lateral view of mesopectus, *E. flavocincta,* female.
11. Face, *E. flavocincta,* male.
12. Mouthparts, *E. flavocincta,* male.
13. Genitalia, *E. flavocincta,* male.

PLATE II

14. Face, *E. arizonensis,* new species, female.
15. Face, *E. rubripes* Cresson, female.
16. Lateral view of clypeal projection, *E. rubripes* Cresson, female.
17. Face, *E. violaceipennis,* new species, female.
18. Face, *E. flavocincta* Cresson, female.
19. Face, *E. fulvipes* Cresson, female.

PLATE III

20. Face, *E. similis* Cresson, female.
21. Face, *E. elegans* Cresson, female.
22. Face, *E. conata,* new species, female.
23. Lateral view of clypeal process, *E. conata,* new species, female.
24. Face, *E. bitruncata,* new species, female.
25. Face, *E. superba* var. *bicolor* Cresson, female.
25a. Lateral view of clypeal process, *E. superba* var. *bicolor* Cresson, female.
26. Face, *E. zonata* (Say), female.
27. Face, *E. sinuata,* new species, female.
28. Face, *E. insignis* Provancher, female.
29. Face, *E. ferruginosa,* new species, female.

PLATE IV

30. Face, *E. canaliculata* (Say), female.
31. Face, *E. vittatifrons* Cresson, female.
32. Face, *E. tricolor* Cockerell, female.
33. Face, *E. montana* Cresson, female.
34. Face, *E. angulata* Rohwer, female.
35. Pronotum of *E. angulata* Rohwer, female.
36. Antenna, *E. angulata* Rohwer, male.
37. Face, *E. lacunosa,* new species, male.
37a. Distal segment of antenna of *E. lacunosa,* new species, male.
38. Face, *E. rubripes* Cresson, male.

PLATE V

39. Face, *E. flavocincta* Cresson, male.
40. Face, *E. similis* Cresson, male.
41. Face, *E. elegans* Cresson, male.
42. Face, *E. superba* Cresson, male.
43. Face, *E. insignis* Provancher, male.
44. Face, *E. zonata* (Say), male.
45. Face, *E. canaliculata* (Say), male.

PLATE VI

46. Face, *E. tricolor* Cockerell, male.
47. Face, *E. montana* Cresson, male.
48. Face, E. *angulata* Rohwer, male.
49. Face, *E. vittatifrons* Cresson, male.
50. Face, *E. fulvipes* Cresson, male.
51. Mesal view of mandible, *E. angulata* Rohwer, male.
52. Face, *E. marginipennis* (Cameron), male.
    (Drawing by O. F. Tassart.)
53. Wing, *E. marginipennis* (Cameron), male.
    (Drawing by O. F. Tassart.)
54. Face, *E. punctifrons* (Cameron), female.
    (Drawing by O. F. Tassart.)
55. Pygidial area, *E. punctifrons* (Cameron), female.
    (Drawing by O. F. Tassart.)
56. Wing, *E. punctifrons* (Cameron), female.
    (Drawing by O. F. Tassart.)

PLATE VII

Venation in the Region of Cell 1st R.

57. *E. arizonensis,* new species, female.
58. *E. violaceipennis,* new species, female.
59. *E. flavocincta* Cresson, female.
60. *E. rubripes* Cresson, female.
61. *E. fulvipes* Cresson, female.
62. *E. similis* Cresson, female.
63. *E. elegans* Cresson, female.
64. *E. conata,* new species, female.

65. *E. bitruncata,* new species, female.
66. *E. superba* var. *bicolor,* new combination, female.
67. *E. zonata* (Say), female.
68. *E. insignis* Provancher, female.
69. *E. ferruginosa,* new species, female.
70. *E. sinuata,* new species, female.

PLATE VIII

71. *E. canaliculata* (Say), female.
72. *E. vittatifrons* Cresson, female.
73. *E. tricolor* Cockerell, female.
74. *E. montana* Cresson, female.
75. *E. angulata* Rohwer, female.
76. *E. lacunosa,* new species, male.
77. *E. flavocincta* Cresson, male.
78. *E. rubripes* Cresson, male.
79. *E. fulvipes* Cresson, male.
80. *E. similis* Cresson, male.
81. *E. elegans* Cresson, male.
82. *E. insignis* Provancher, male.
83. *E. superba* Cresson, male.
84. *E. zonata* (Say), male.
85. *E. canaliculata* (Say), male.
86. *E. vittatifrons* Cresson, male.
87. *E. tricolor* Cockerell, male.
88. *E. montana* Cresson, male.
89. *E. angulata* Rohwer, male.

PLATE IX

Pygidial Area

90. *E. arizonensis,* new species, female.
91. *E. violaceipennis,* new species, female.
92. *E. flavocincta* Cresson, female.
93. *E. rubripes* Cresson, female.
94. *E. fulvipes* Cresson, female.
95. *E. similis* Cresson, female.
96. *E. elegans* Cresson, female.
97. *E. conata,* new name, female.
98. *E. bitruncata,* new species, female.
99. *E. superba* var. *bicolor,* new combination, female.
100. *E. zonata* (Say), female.
101. *E. insignis* Provancher, female.
102. *E. ferruginosa,* new species, female.
103. *E. sinuata,* new species, female.
104. *E. canaliculata* (Say), female.
105. *E. vittatifrons* Cresson, female.
106. *E. tricolor* Cockerell, female.
107. *E. montana* Cresson, female.
108. *E. angulata* Rohwer, female.

109. *E. lacunosa,* new species, male.
110. *E. flavocincta* Cresson, male.
111. *E. rubripes* Cresson, male.
112. *E. fulvipes* Cresson, male.
113. *E. similis* Cresson, male.
114. *E. elegans* Cresson, male.
115. *E. superba* Cresson, male.
116. *E. zonata* (Say), male.
117. *E. insignis* Provancher, male.
118. *E. canaliculata* (Say), male.
119. *E. vittatifrons* Cresson, male.
120. *E. tricolor* Cockerell, male.
121. *E. montana* Cresson, male.
122. *E. angulata* Rohwer, male.

PLATE X

Genitalia of Male

123. *E. lacunosa,* new species.
124. *E. flavocincta* Cresson.
125. *E. rubripes* Cresson.
126. *E. fulvipes* Cresson.
127. *E. similis* Cresson.
128. *E. elegans* Cresson.
129. *E. superba* Cresson.
130. *E. zonata* (Say).
131. *E. insignis* Provancher.
132. *E. canaliculata* (Say).
133. *E. vittatifrons* Cresson.
134. *E. tricolor* Cockerell.
134a. *E. montana* Cresson.
134b. *E. angulata* Rohwer.

PLATE XI

Geographical distribution

(Note: Type localities are indicated by large circles inclosing the male or female sign. Locality records are indicated by a cross and state records by a small circle.)

135. Type localities of *E. marginipennis* (Cameron), male and E. *punctifrons* (Cameron), female.
136. *E. lacunosa,* new species.
137. *E. arizonensis,* new species.
138. *E. violaceipennis,* new species.
139. *E. flavocincta* Cresson.
140. *E. rubripes* Cresson.
141. *E. fulvipes* Cresson.
142. *E. similis* Cresson.
143. *E. elegans* Cresson.
144. *E. conata,* new species.
145. *E. bitruncata,* new species.
146. *E. superba* Cresson and *E. superba* var. *bicolor,* new combination.

PLATE XII

147. *E. zonata* (Say).
148. *E. insignis* Provancher.
149. *E. ferruginosa,* new species.
150. *E. sinuata,* new species.
151. *E. canaliculata* (Say).
152. *E. canaliculata* var. *atronitida,* new variety.
153. *E. vittatifrons* Cresson.
154. *E. tricolor* Cockerell.
155. *E. montana* Cresson.
156. *E. angulata* Rohwer.

PLATE XIII

157. Nesting habitat of *E. flavocincta* Cresson.
158a. Prepupa of *E. flavocincta* Cresson with cocoon removed.
158b. Mature larva of *E. flavocincta* Cresson.
158c. Immature larva of *E. flavocincta* Cresson, feeding on a specimen of *Dyslobus lecontei* Casey.
158d. Specimens of *Dyslobus lecontei* Casey, taken from females of *E. flavocincta* Cresson.
158e. Prepupae with cocoons attached to cell walls and remains of beetles.

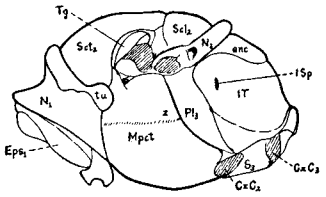
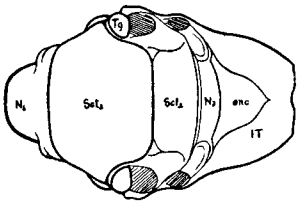


Fig. 1.



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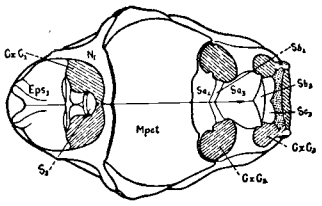
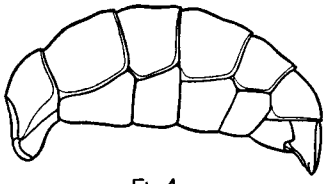


Fig. 3.



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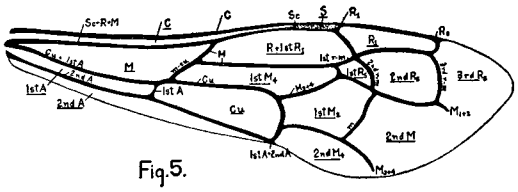
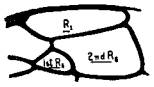


Fig. 5.



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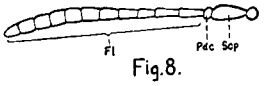

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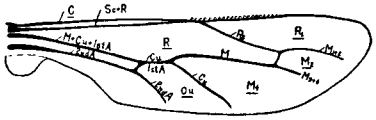
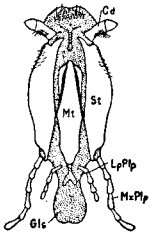


Fig. 6.



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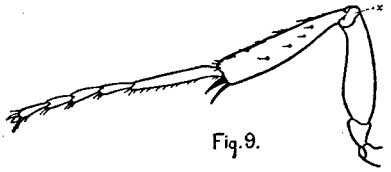
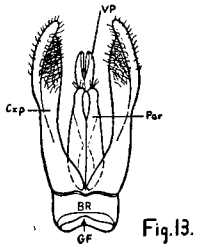


Fig. 9.



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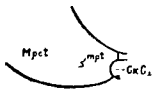


Fig. 10.

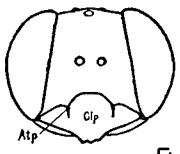
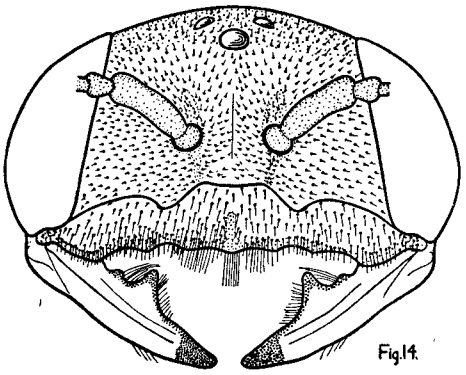


Fig. 11.

PLATE I.



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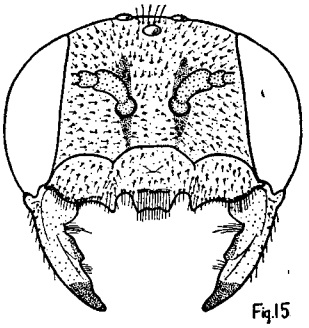


Fig.15

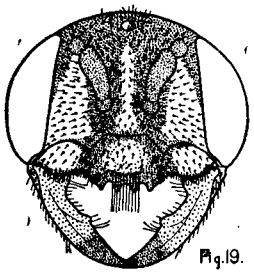


Fig.19.

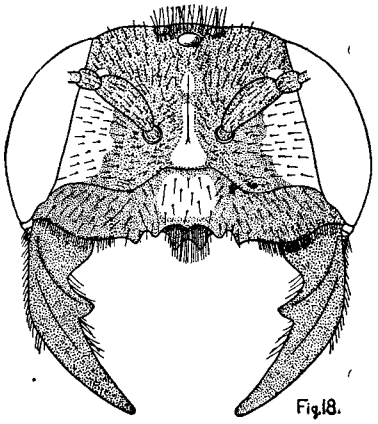


Fig.18.

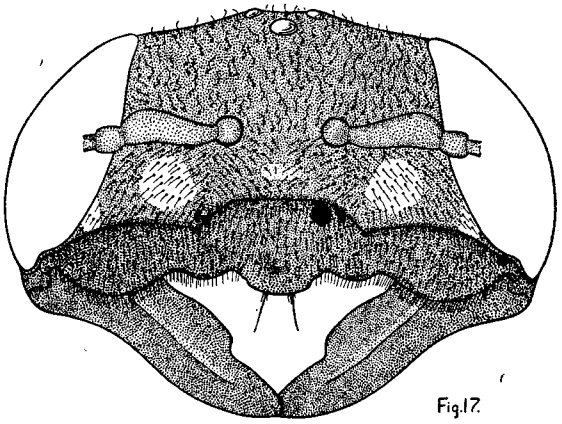


Fig.17.

Fig.16.

PLATE II.

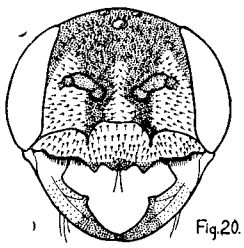
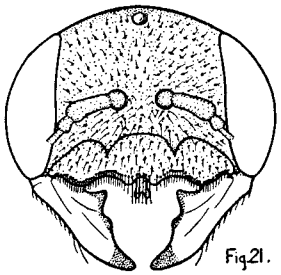


Fig.20.



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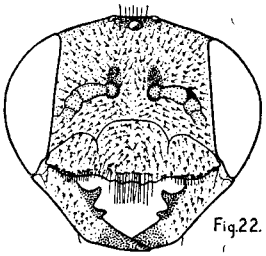

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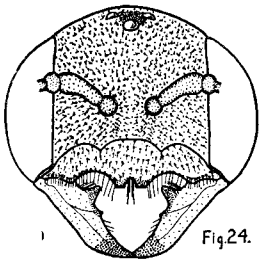

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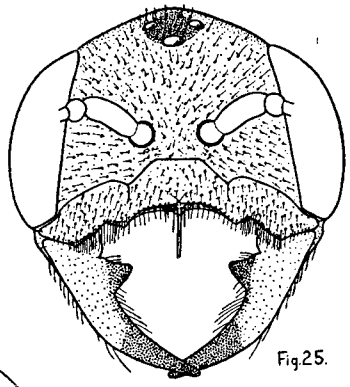

Fig.25.

Fig.23.

Fig.25a.

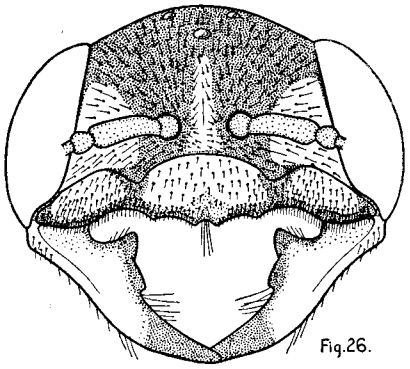

Fig.26.

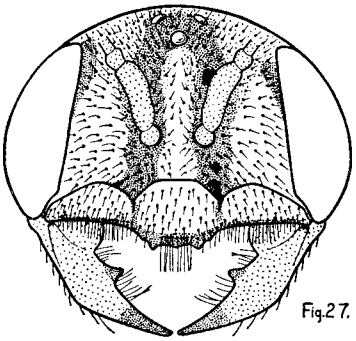

Fig.27.

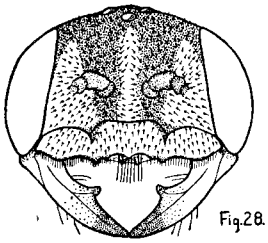

Fig.28.

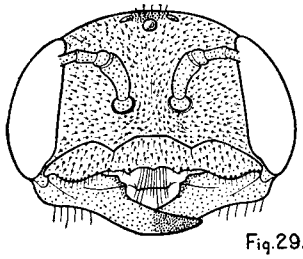

Fig.29.

PLATE III.

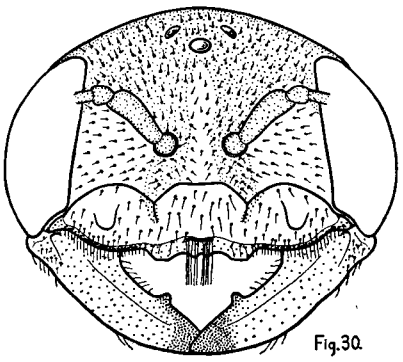

Fig.30.

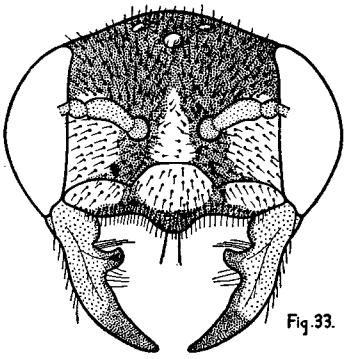

Fig.33.

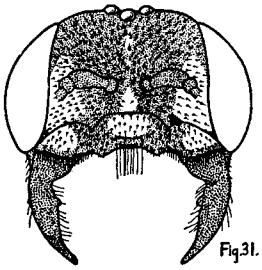

Fig.31.

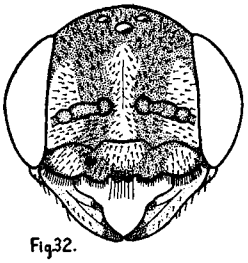

Fig.32.

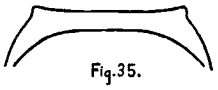

Fig.35.

Fig.36.

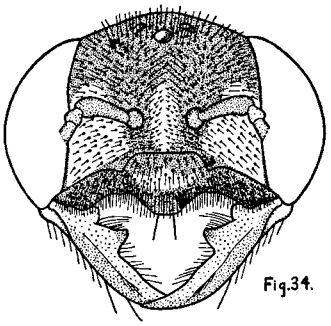

Fig.34.

Fig.37a.

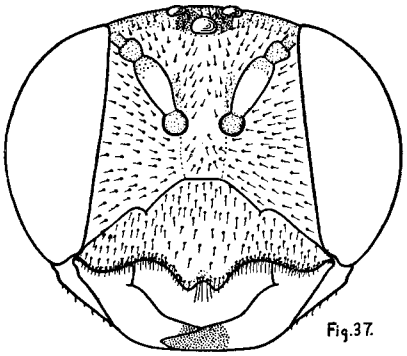

Fig.37.

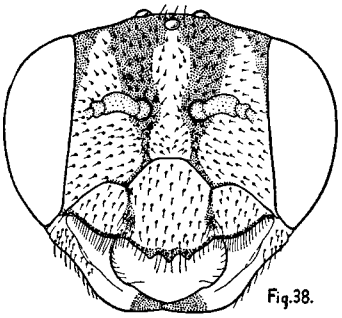

Fig.38.

PLATE IV.

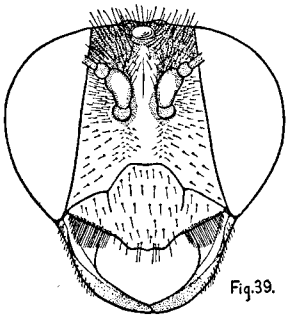

Fig.39.

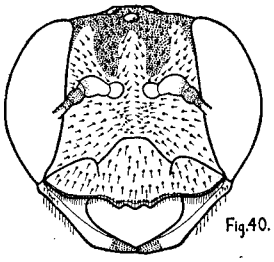

Fig.40.

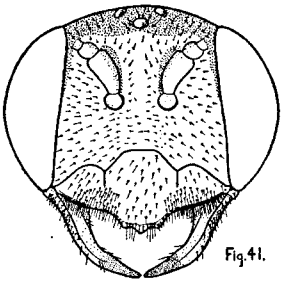

Fig.41.

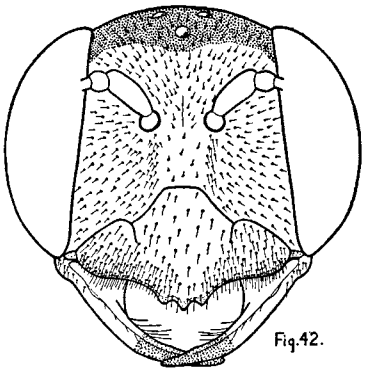

Fig.42.

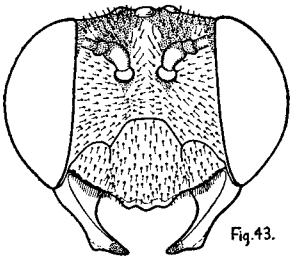

Fig.43.

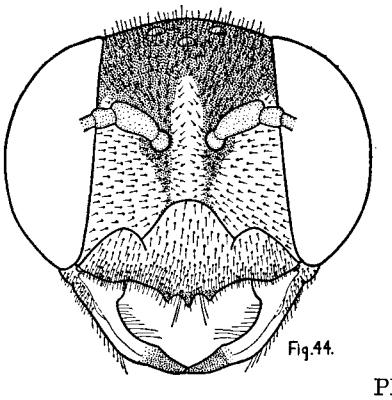

Fig.44.

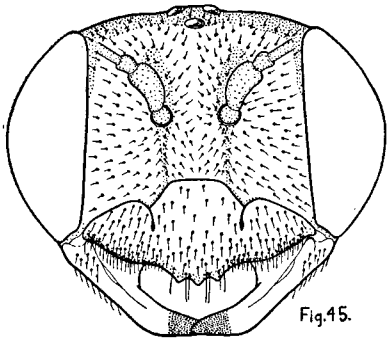

Fig.45.

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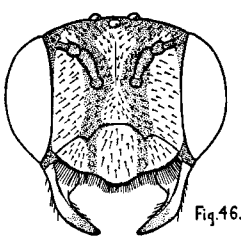

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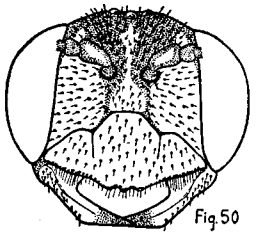

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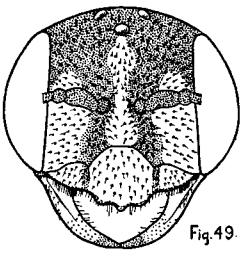

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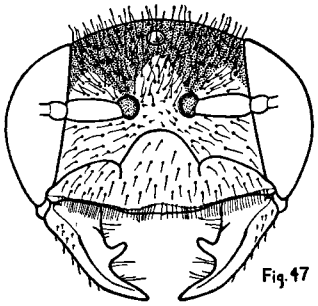
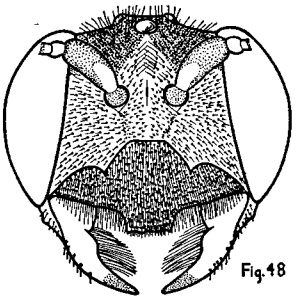


Fig.47

Fig.51



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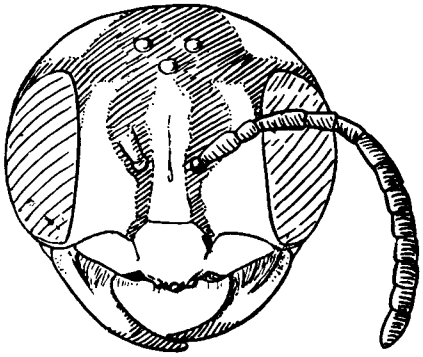

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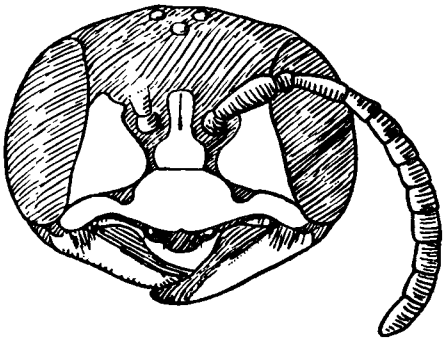

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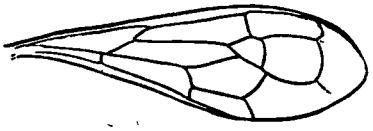
Fig.55.



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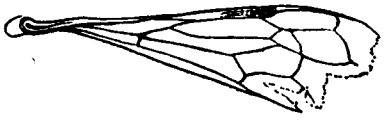

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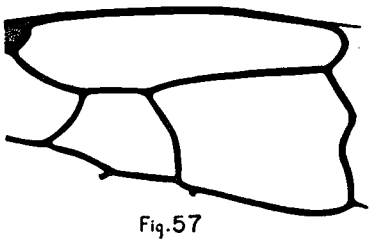

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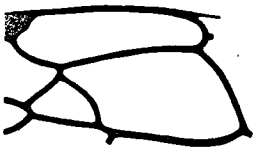

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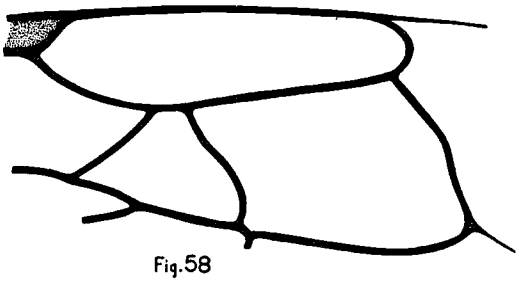

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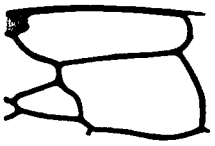

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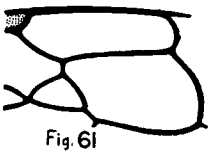
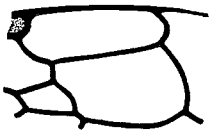


Fig.61

Fig.62



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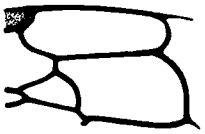
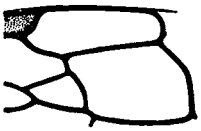


Fig.64

Fig.65

Fig.66



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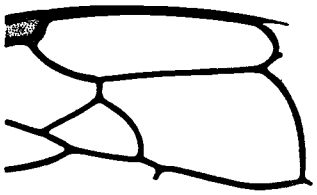

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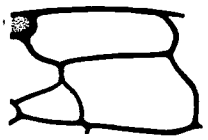

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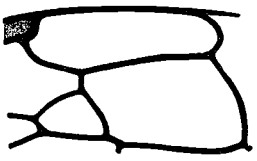
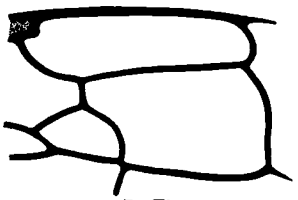


Fig. 70

PLATE VII.



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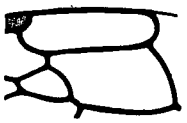

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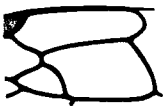

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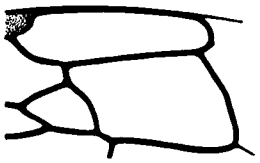

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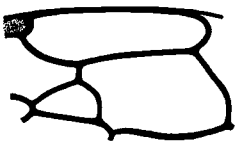

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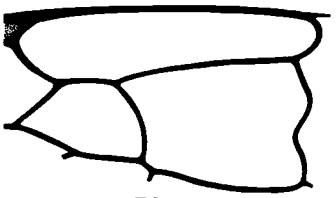

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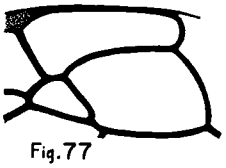

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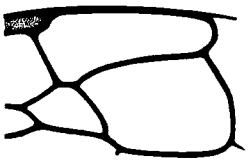

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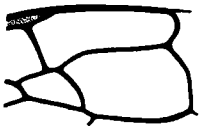

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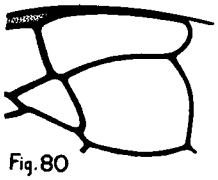

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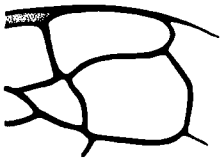

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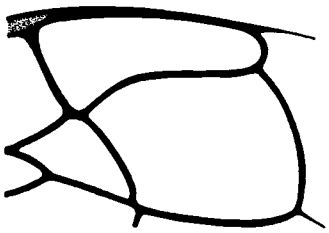
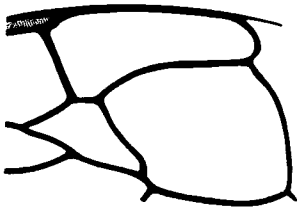


Fig. 83

Fig. 82



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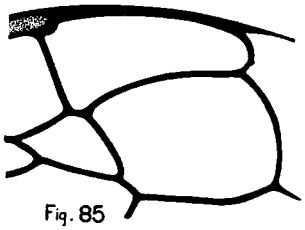
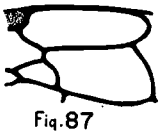


Fig. 85

Fig. 86



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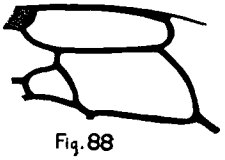

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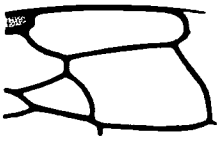

Fig. 89

PLATE VIII.

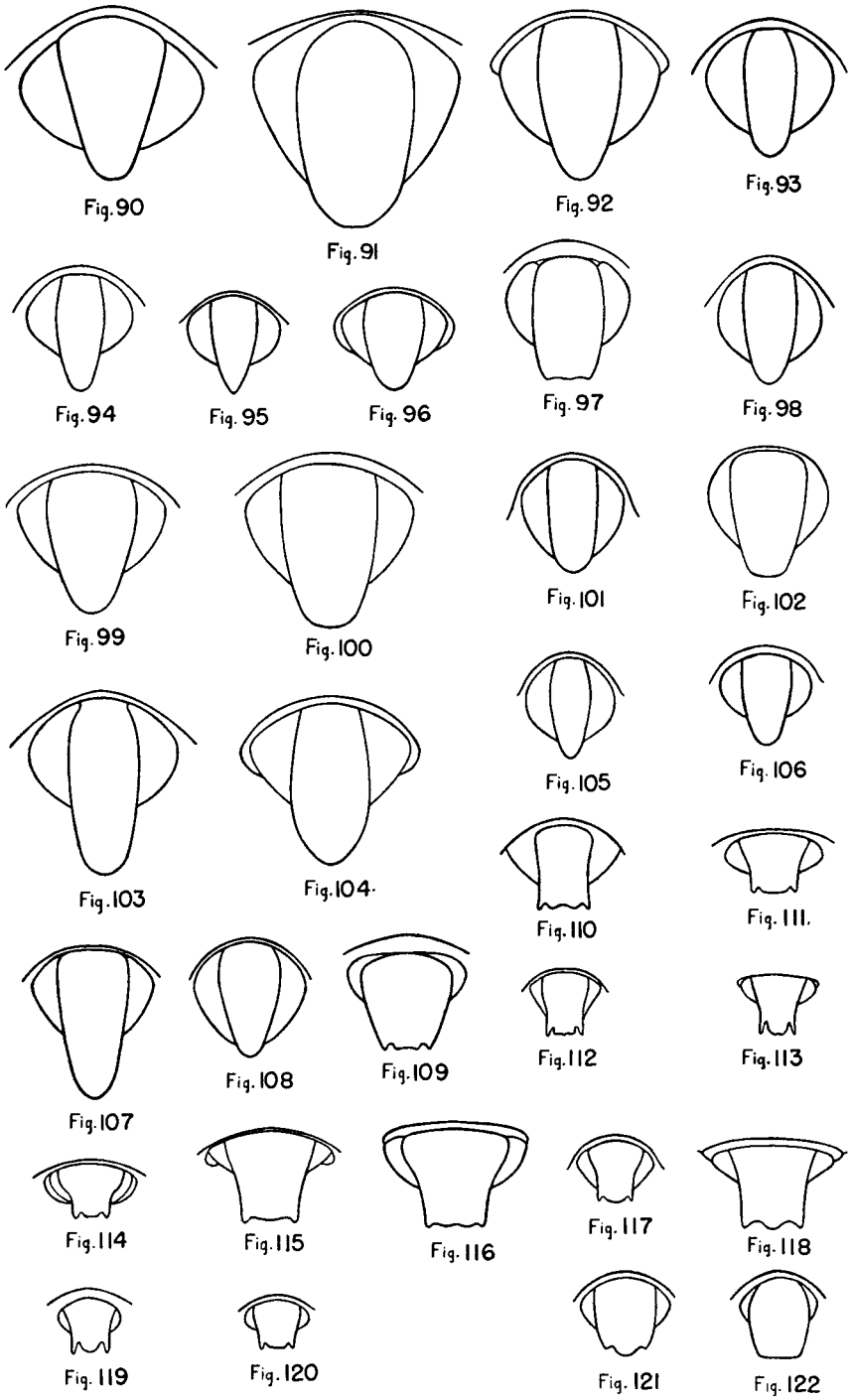
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PLATE IX.

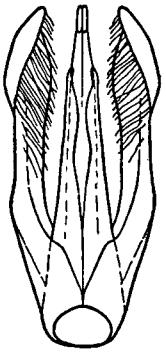


Fig 123

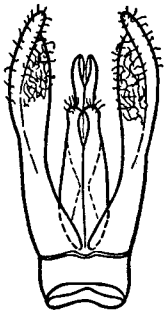


Fig 124

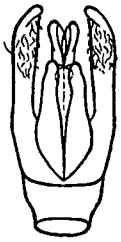
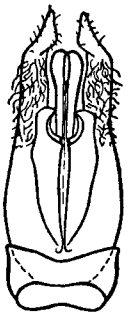


Fig.125

Fig. 126

Fig.127

Fig.128



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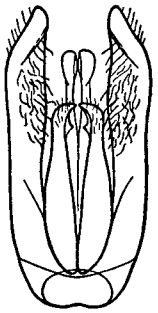

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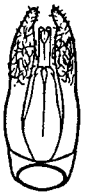


Fig.131

Fig.133

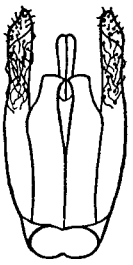
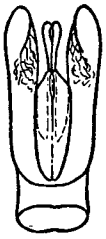


Fig.132

Fig.134



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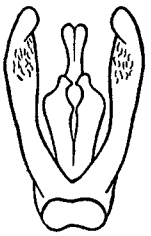
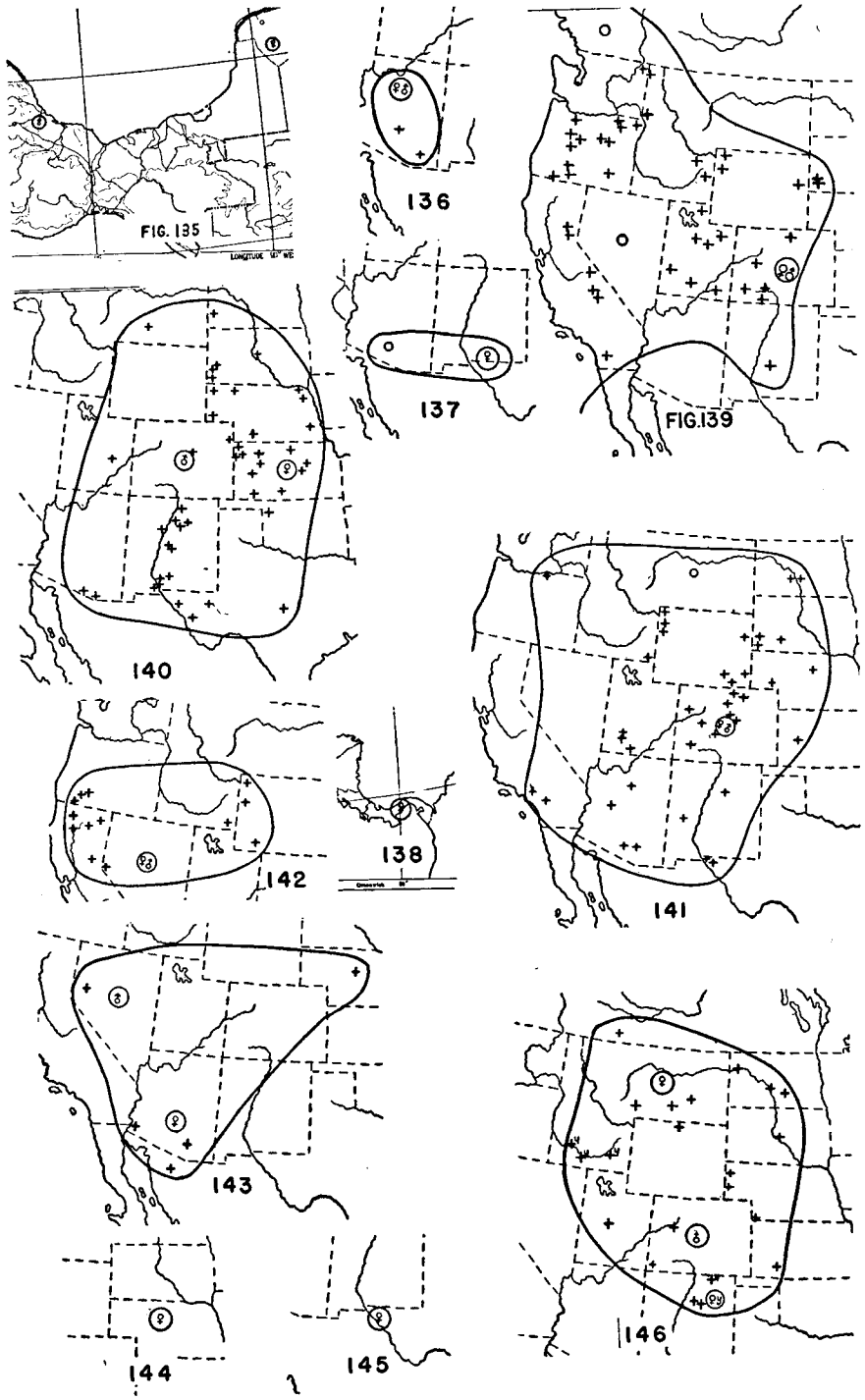


Fig.134b

PLATE X.



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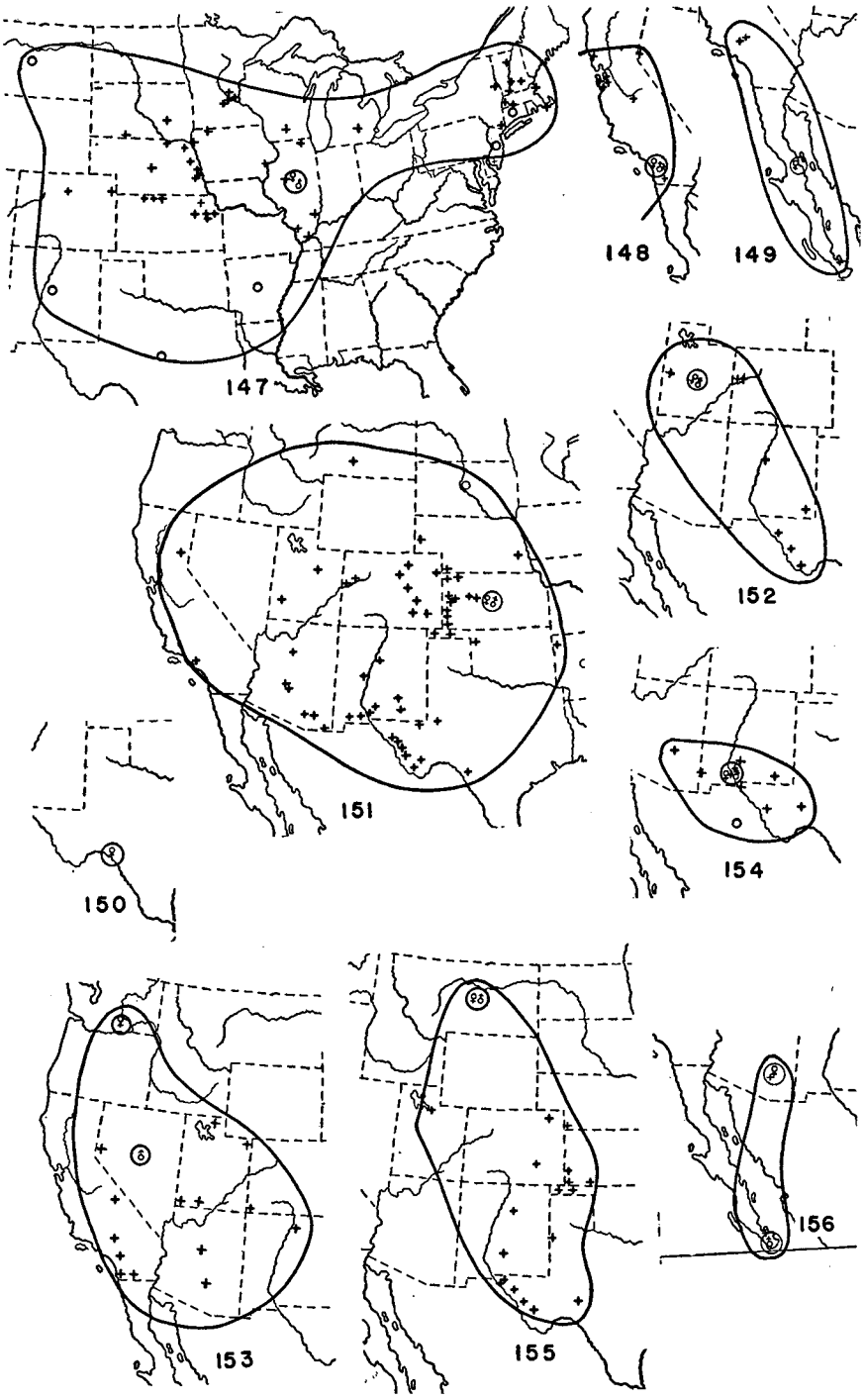

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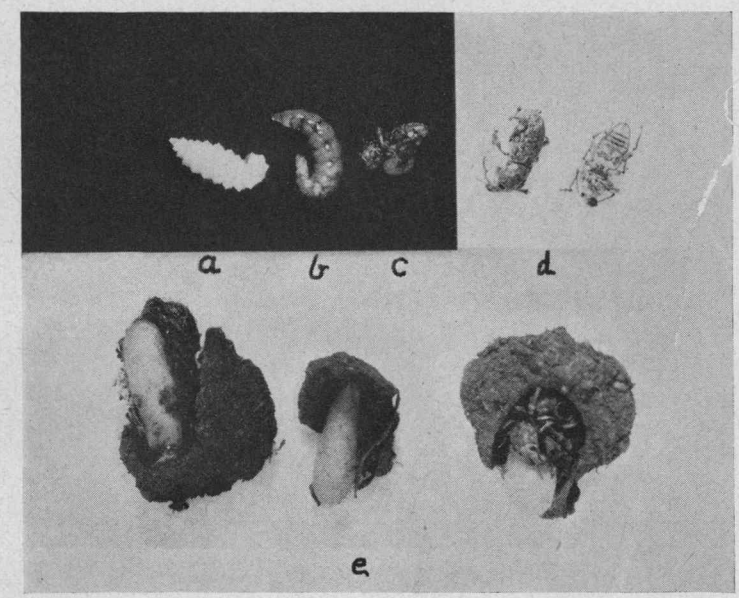

PLATE XIII.

INDEX

(All species and varieties included in this paper are included in this index. Species other than *Eucerceris* are in bold-faced type. Generic names other than *Eucerceris* are in brackets. All references are included. The principal reference is indicated by bold-faced type. Group names are in small caps. Valid names appear in roman and synonyms in italics.)

PLANTS