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STOLTZFUS, W. Bryan, 1932-
THE BIOLOGY AND TAXONOMY OF EUTRETA
(DIPTERA: TEPHRITIDAE).

Iowa State University, Ph.D., 1974
Entomology

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The biology and taxonomy of Eutreta
(Diptera: Tephritidae)

by

W. Bryan Stoltzfus

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Department: Zoology and Entomology
Major: Entomology

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa

1974

TABLE OF CONTENTS

	Page
INTRODUCTION AND REVIEW OF LITERATURE	1
Introduction	1
Review of Literature	3
MATERIAL AND METHODS	9
Material Studied	9
Study of Specimens	12
Rearing and Collecting Techniques	15
TERMINOLOGY	16
GENUS <u>EUTRETA</u>	19
Synonymy and Description	19
Key to Subgenera of <u>Eutreta</u>	21
<u>Eutreta lunulata</u> (Macquart, 1851) <u>incertae sedis</u>	21
<u>Tephritis baccharis</u> (Coquillett, 1894) New Status	22
SUBGENUS <u>EUTRETA</u>	26
<u>Eutreta</u> (<u>Eutreta</u>) Loew, 1873	26
Key to Species of the Subgenus <u>Eutreta</u>	28
<u>Eutreta</u> (<u>Eutreta</u>) <u>aczei</u> Costa Lima, 1954	31
<u>Eutreta</u> (<u>Eutreta</u>) <u>angusta</u> Banks, 1926	34
<u>Eutreta</u> (<u>Eutreta</u>) <u>apicata</u> Hering, 1935	43
<u>Eutreta</u> (<u>Eutreta</u>) <u>brasiliensis</u> New Species	45
<u>Eutreta</u> (<u>Eutreta</u>) <u>caliptera</u> (Say, 1830) New Combination	47
<u>Eutreta</u> (<u>Eutreta</u>) <u>distincta</u> (Schiner, 1868)	54
<u>Eutreta</u> (<u>Eutreta</u>) <u>frontalis</u> Curran, 1932	59

	Page
<u>Eutreta</u> (<u>Eutreta</u>) <u>frosti</u> Hering, 1938	66
<u>Eutreta</u> (<u>Eutreta</u>) <u>hespera</u> Banks, 1926	67
<u>Eutreta</u> (<u>Eutreta</u>) <u>intermedia</u> New Species	70
<u>Eutreta</u> (<u>Eutreta</u>) <u>margaritata</u> Hendel, 1914	73
<u>Eutreta</u> (<u>Eutreta</u>) <u>mexicana</u> New Species	74
<u>Eutreta</u> (<u>Eutreta</u>) <u>novaeboracensis</u> New Combination	76
<u>Eutreta</u> (<u>Eutreta</u>) <u>obliqua</u> New Species	88
<u>Eutreta</u> (<u>Eutreta</u>) <u>parasparsa</u> Blanchard, 1965	91
<u>Eutreta</u> (<u>Eutreta</u>) <u>patagiata</u> Wulp, 1899	92
<u>Eutreta</u> (<u>Eutreta</u>) <u>rhinophora</u> Hering, 1937	95
<u>Eutreta</u> (<u>Eutreta</u>) <u>simplex</u> Thomas, 1914	98
<u>Eutreta</u> (<u>Eutreta</u>) <u>sparsa</u> (Wiedemann, 1830)	99
<u>Eutreta</u> (<u>Eutreta</u>) <u>xanthochaeta</u> Aldrich, 1923	105
SUBGENUS ONCHOACULEATA	110
<u>Eutreta</u> (<u>Onchoaculeata</u>) New Subgenus	110
Key to the Species of the Subgenus <u>Onchoaculeata</u>	110
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>decora</u> New Species	111
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>diana</u> (Osten Sacken, 1877)	113
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>divisa</u> New Species	122
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>longicornis</u> Snow, 1894	126
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>oregona</u> Curran, 1932	132
<u>Eutreta</u> (<u>Onchoaculeata</u>) <u>pollinosa</u> Curran, 1932	135

	Page
SUBGENUS <u>SETOGENA</u>	139
<u>Eutreta</u> (<u>Setogena</u>) New Subgenus	139
Key to Species of the Subgenus <u>Setogena</u>	139
<u>Eutreta</u> (<u>Setogena</u>) <u>fenestra</u> New Species	140
<u>Eutreta</u> (<u>Setogena</u>) <u>rotundipennis</u> (Loew, 1862)	143
EVOLUTION OF THE GENUS <u>EUTRETA</u>	145
ILLUSTRATIONS	151
LITERATURE CITED	184
ACKNOWLEDGEMENTS	193
APPENDIX A	194
APPENDIX B	199
APPENDIX C	202

INTRODUCTION AND REVIEW OF LITERATURE

Introduction

The family Tephritidae is moderately large with an estimated 4,000 species (Christenson & Foote, 1960) and 500 genera world wide. All species are presumed to be phytophagous with many species feeding on fruits and causing severe damage to apples, cherries, citrus fruits, melons, papaya, cucumbers and many other fruits. All parts of plants are attacked in a wide variety of plant families by tephritid flies. Wasbauer (1972) reported 42 different plant families serving as hosts for tephritids in North America alone.

Considerable effort has been exerted to control the Mediterranean fruit fly, melon fly and oriental fruit fly (Ceratitis capitata, Dacus dorsalis and D. cucurbitae) by release of sterile individuals. From 1960 to 1965 an estimated 1.4 billion pupae of these three species of fruit flies were produced (Steiner & Mitchell, 1966).

Many fruit flies produce a pheromone attractive to both males and females. Attractants have been produced synthetically which are being used to determine population levels and migration of fruit flies. The potential for use of pheromones in insect mangement of fruit flies has been summarized by Bateman (1972).

Adult Tephritidae, or fruit flies, can generally be seen during the day on their particular host plants, usually on the underside of the leaves. The female may be moving about seeking suitable oviposition sites while the male often defends a territory in the event a receptive female should enter his area in search of an oviposition site.

The adults generally have patterned wings which are employed, at least in some species, in elaborate courtship displays. Wing patterns have been used extensively in identification.

The higher classification of the family has recently been reviewed by Hardy (1973) in which he recognizes four subfamilies: Dacinae, Trypetinae, Schistopterinae and Tephritinae. The Tephritinae is divided into four tribes; Ditrichini, Platensini, Tephrellini and Tephritini. Eutreta belongs to the Tephritini.

The genus Eutreta, as presently conceived has 29 species, 14 of which occur in Mexico and South America. Fifteen occur north of Mexico in North America and only one species has been found in both areas to date. Eutreta species, like other members of the subfamily Tephritinae for which host plants are known, usually attack composite plants. The benefit to man derived from the feeding habits by attacking seeds, fruits and other plant parts by tephritids can only be conjectured at present.

All but one species of Eutreta form galls in the stems or roots of Compositae. The remaining species has been reported producing swellings in one of its several host plants.

The genus Eutreta has never been taxonomically revised and very little has been written concerning the phylogeny of the group. My objectives in this study are to improve the classification of this New World genus, examine the evidence indicating phylogeny within the group and contribute to an understanding of the life history of several of the species.

Review of Literature

Eutreta was established by Loew in 1873 as a subgenus for Trypeta sparsa Wiedemann 1830 and T. rotundipennis Loew 1864. Loew (1864) gave an excellent review of earlier attempts at dividing the two genera of "Trypetidae", Dacus and Trypeta, into various genera. He discussed the characters upon which he recognized two subfamilies, Dacina[e] and Trypetina[e]. In 1873, he divided the North American species of the genus Trypeta into 26 subgenera (including Eutreta) and provided a key to the subgenera. He reviewed the two North American species of Eutreta and discussed the loss, or replacement, of the type specimen in the Vienna Museum. The name Eutreta was selected in reference to the characteristic picture of the wing.

Earlier, Schiner (1868) erected Icaria as a new genus for Trypeta sparsa and two new species, Icaria frauenfeldi, now placed in the genus Cecidochara, and I. distincta. Icaria, however, was preoccupied (Saussure, 1853). Eutreta was considered by Wulp (1883) as a valid genus.

Trypeta caliptera Say 1830, described from Indiana, Platystoma latipennis Macquart, 1843, of unknown origin and Acinia novaeboracensis Fitch, 1856, described from New York, were considered to be conspecific with Trypeta sparsa by Loew (1862). Other species subsequently placed with the genus Eutreta were Trypeta baccharis Coquillett, 1894, by Quisenberry (1951) and Platystoma lunulata Macquart, 1851, by Hendel (1914b). Doane (1899) discussed four species of Eutreta. Two of these species, E. nora and E. aurantiaca, were placed in different genera, Xanthomyia and Xenochaeta respectively. E. scudderi Weyenbergh, 1882, has been placed in Strobelia.

A major contribution to Central and South American forms was made by Hendel (1914b). He treated six species of Eutreta and provided a key to genera and species. The key included Eutreta oculata which is now placed in the genus Hexachaeta. The position of the genus Eutreta relative to Strobelia and Ictericia was also discussed. Other early keys to genera were by Williston (1888, 1896 and 1908), Coquillett (1899), Hendel (1914a), and Curran (1934). Hering (1935, 1937, 1938) studied the Eutreta of South America and contributed three new species,

continued Hendel's (1914b) key to species and erected a new subgenus for E. rhinophora.

Phillips (1923) presented a key to the trypetid genera, a key to the three species of Eutreta in eastern North America and discussed their distribution. The most important work on the taxonomy of the North American species was by Curran (1932). He discussed a possible division of the genus into two groups, provided a key to seven North American species and added six new species. Unfortunately, he was not aware of the Banks (1926) description of E. hespera and E. angusta, or E. simplex described by Thomas (1914). New species were also added by Osten Sacken (1877), Snow (1894), Coquillett (1894), Wulp (1899) and Aldrich (1923).

Major contributions to cataloging the species were made by Osten Sacken (1878), Aldrich (1905), Aczel (1949) and Foote (1965a, 1967a). The catalogs by Foote include all Eutreta species, along with their synonymy and distribution.

Townsend (1893) reported the first known host plant in the genus for E. diana. A valuable list of known host plants of tephritids was compiled by Phillips (1946). It included two Eutreta species. A later list by Wasbauer (1972) included all United States and Canadian species. Other contributors to host plant information include a key to galls by Felt (1940), a list of rearing records by Novak et al. (1967), notes on rearings by Painter (1935), Swezey (1915), Thompson (1907) and

Costa Lima (1934).

A contribution to understanding the biology of Eutreta was made by Frick (1972). He studied the seasonal distribution of Eutreta pacifica (a synonym of E. angusta) and reported rearing this species from various host plants.

Extensive collecting records have been reported by Foote & Blanc (1963) for six species occurring in California. This work also had a key to species, wing illustrations and the geographic range of each species in North America north of Mexico. The geographic range for all Eutreta species was given by Foote (1965a, 1967a). Cole (1969) gave a short discussion of each of the western United States species along with their general distribution.

Even though host plants were known for Eutreta as early as 1893, descriptions of immature stages are known for only two species, E. sparsa (considered to be E. novaeboracensis in this study) and E. frontalis. These were reported by Stoltzfus (1966).

Very little work has been done on the morphology of any species except as part of descriptions of new species. The only information published on genitalia is a dorsal view of the epandrium and proctiger of E. sparsa by Costa Lima (1934), an illustration of the extended ovipositor of E. aczeli by Costa Lima (1954) and a comparison of epandria by Perkins & Swezey (1924).

Little is known concerning the feeding damage caused to host plants by Eutreta species except for E. xanthochaeta. This species was introduced from Mexico into Hawaii along with several other insects as a biological control for Lantana (Perkins & Swezey, 1924). Thompson (1907) observed damage to developing Solidago shoots by E. sparsa, while Frick (1972) reported that injury caused by E. pacifica (considered E. angusta) was not serious to the various host plants it attacked.

The only parasites reported have been reared from Eutreta xanthochaeta (Perkins & Swezey, 1924; Inada & Tanada, 1946 and Clancy, 1950). Adult predators have been reported for this species (Williams, 1926). Many natural enemies have been reported to attack other tephritids including ants (Newell & Haramoto, 1968), beetles (Boyce, 1934), mites (Le Roux & Mukerji, 1963) and birds (Uhler, 1951).

The unusual courtship behavior of Eutreta sparsa (= novaeboracensis) was observed by Stoltzfus & Foote (1965). This is the only species for which behavioral observations have been reported. Pheromones have not been found in Eutreta but have been reported for other tephritids.

A number of tephritids have been found to have symbiotic bacteria, yeast or fungi. These microorganisms serve to break down proteins, utilize urea and uric acid and synthesize certain amino acids (Bateman, 1972). Most work on such

organisms has been done in the Dacinae but there are sufficient reports of symbionts in other subfamilies to indicate they are of general occurrence among the Tephritidae (Buchner, 1965).

MATERIAL AND METHODS

This study is based on the examination of over 2,200 specimens of the genus Eutreta from North and South America. Specimens from United States were from all states except five southeastern states and Alaska. Other countries from which specimens were studied were the Canadian provinces (except New Brunswick and Newfoundland), Mexico, El Salvador, Costa Rica, Colombia, Venezuela, Brazil, Ecuador Argentina and Jamaica.

Material Studied

All existing holotypes and lectotypes were studied except the types of Eutreta diana, E. margaritata, E. xanthochaeta E. distincta and E. aczeli.

The cooperation and courtesy of the curators of the institutions listed below made possible the loan of material for this study. The abbreviation following each institution is used to denote the collection from which each specimen was borrowed.

Academy of Natural Sciences of Philadelphia, W. Wayne Moss (ANSP)

University of Alberta, Margaret A. Abraham (UA)

American Museum of Natural History, F. Christian Thompson (AMNH)

Northern Arizona University, C. W. Johnson (NAU)

University of Arkansas, E. Phil Rouse (UAR)

British Museum of Natural History, Brian H. Cogan (BM)

California Academy of Sciences, Paul H. Arnaud, Jr. (CAS)

California Department of Agriculture, Marius S. Wasbauer
(CDA)

University of California at Riverside, Saul I. Frommer
(UCR)

Carnegie Museum, George Wallace (CM)

Cornell University, L. L. Pechuman (CU)

Florida State Collection of Arthropods, Howard V. Weems
(FSCA)

Frost Entomological Museum, Pennsylvania State University,
Ke Chung Kim (FEM)

University of Hawaii, D. Elmo Hardy (UH)

Helsinki Zoological Museum, B. Lindeberg (HZM)

University of Idaho, W. F. Barr (UID)

Illinois State Natural History Museum, Donald W. Webb
(INHS)

Instituto Miguel Lillo, A. Willink (IML)

Iowa State University, Robert E. Lewis (ISU)

Kansas State University, H. Derrick Blocker (KSSU)

Kent State University, Benjamin Foote (KSU)

University of Kentucky, Paul H. Freytag (UKY)

Los Angeles County Museum, Charles L. Hogue (LACM)

Louisiana State University, Joan B. Chapin (LSU)

University of Michigan, R. D. Alexander (UMI)

University of Minnesota, Philip J. Clausen (UMN)

University of Missouri, Wilbur R. Enns (UMO)

Montana State University, N. L. Anderson (MSU)
University of Montreal, Monique Coulloudon (UMT)
Museum of Comparative Zoology, Janice C. White (MCZ)
Naturhistoriska Riksmuseet, Stockholm, Per Inge Persson
(NR)
University of Nebraska, Brett C. Ratcliffe (UNB)
University of New Hampshire, R. L. Blickle (UNH)
North Dakota State University, Ted Schulz (NDSU)
Oregon State University, Paul Ritcher (OSU)
Peabody Museum of Natural History, Yale University,
C. L. Remington, K. W. Brown (PMNH)
Snow Entomological Museum, University of Kansas, George
W. Byers (SEM)
Purdue University, Arwin Provansha (PU)
South Dakota State University, Edward U. Balsbaugh, Jr.
(SDU)
University of Texas, Austin, Guy L. Bush (UTA)
United States National Museum, Paul D. Hurd, Jr. (USNM)
Utah State University, W. J. Hanson (USU)
Venezuela Instucion Zoologica, F. Fernandez Yopez (VIS)
University of Vermont, Ross T. Bell (UV)
Virginia Polytechnic Institute, Michael Kosztarab (VPI)
Institute Zoologique Warszawa, J. T. Nowakowski (IZW)
Washington State University, William J. Turner, Maurice
T. James (WSU)
Naturhistorisches Museum Wien, Ruth Lichtenberg (NMW)
University of Wisconsin, L. J. Bayer (UWI)
University of Wyoming, R. J. Lavigne (UWY)

Insect label data For species from which only a few specimens were examined complete data is given from their labels. Where a large number of specimens were from the same state, only the total specimens examined is given. Locality data not included under material examined are available upon request from the author. Data are given in the following form: number of specimens, sex (m, f or ?, if sex was not determined), locality, date, biological information, name of collector and institution from which the specimen was borrowed. Data for all reared specimens examined are included.

Plant names on insect labels were checked against those used by Gleason (1963) and Beetle (1960) for North American plants, by Sanchez (1968) for Central American plants and by Aristeguieta (1964) for South American plants.

Study of Specimens

Adult specimens were studied with the aid of a stereoscopic microscope with magnifications from 15 to 90. Measurements of length were made with an ocular micrometer. Genitalia measurements were made from dissected material on microscope slides. These slides were studied at 100 and 430 magnification using a compound microscope.

Angular measurements were made with the aid of a 360° micrometer marked in one degree units. This micrometer was mounted on one ocular of the microscope and was used in

conjunction with a grid in the same ocular. The rotation of the ocular grid against the stationary micrometer gave the angular rotation. Angular measurements of the female ovipositor were made using a microprojector.

Drawings of female genitalia were made with the aid of a microprojector. Other drawings were made using a stereoscopic microscope with an ocular grid and squared paper. Wing pictures were made from permanent slide mounts. The prints were touched-up to improve the visibility of the apical crescent and the posterior margin of the wing.

Methods of studying terminalia Specimens selected for study of the genitalia were placed in a relaxing chamber for several hours. Genitalia were then removed, including the last two abdominal segments, to insure removal of the spermatheca and phallic apodeme, with a fine scissors. Genitalia were left in a 5-10% solution of potassium hydroxide overnight. They were then placed in a drop of glycerine for study. For storage they were washed in water, placed in dilute glacial acetic acid and finally in glycerine in plastic vials on the specimen pin.

Measurements Measurements for each species were based on 20 males and 20 females. When insufficient specimens were available all individuals listed under material examined were included. Mean, standard deviation and range are given. If less than ten specimens were measured, standard deviation was

not given.

Body length was difficult to measure accurately because the abdomen was curled under on many specimens. The body was measured as if it were not contorted. This required an estimation of length of the abdomen in some cases.

Wing length was measured from the wing tip to the humeral plate. The wing width was measured at the widest point. Head height (Fig. 1) was measured in lateral view from the frontofacial angle near the antennae to the farthest point on the opposite side of the head, which was usually near the gular bristle. Head length was measured in lateral view from the socket of the innervertical bristle to the point farthest away, which was usually on the anterior oral margin. Facial height was measured in lateral view from the frontofacial angle to the oral margin. Frons length was measured from the lunule to the vertex. Frons width was the width at the lateral ocelli. Frons lateral length was measured from the socket of the innerverticle bristle to the frontofacial angle near the antennae. Stigmal length was measured from the subcostal break to the inner aspect of the junction of R_1 with the costa. Stigmal width was measured at the widest point perpendicular to the costa.

The aculeus blade angle (Fig. 5) was measured along the most rapidly expanding lateral margin anterior to the point of the aculeus. Since this expanding margin usually is linear,

measurements were quite accurate. The lateral margin of specimens in the subgenus Onchoaculeata had barbs which made angular measurements of the aculeus accurate only within about ± 5 degrees. The frons angle was considered to be the degree of distortion from parallel lateral margins. The frontofacial angle (Fig. 1) was the degree of rotation between the frons and face from a point near the antennae where the plane of the frons and face meet. Using the same point near the antennae the angle of oral protrusion was the angular rotation between the plane of the upper part of the face and the most anteriorly produced part of the oral margin.

Rearing and Collecting Techniques

Field-collected larvae and pupae were placed in deep petri dishes partly filled with peat moss. The peat moss was kept glistening wet at room temperature. As adults emerged they were removed to a larger container and held for several days to allow for complete pigmentation. Adults were fed water and a combination of honey and yeast mixed together to form a thick paste.

Plant host specimens were collected, pressed and dried for deposit in the Iowa State University Herbarium. Only one sample per host species was collected for this purpose.

TERMINOLOGY

The terminology used to describe the adults follows that used by Bush (1966) with several exceptions. The terms applied to the female genitalia follow those used by Munro (1947).

Genitalia is used here to include the ninth to eleventh segments of the male and the seventh to eleventh segments of the female.

The terms or descriptive phrases listed below are used to denote adult features occurring frequently or of special importance in Eutreta species.

Apodeme shaft - The shaft of the ejaculatory apodeme, or phallic apodeme, is here considered the middle to basal part which is restricted in size.

Apodeme blade - The part of the ejaculatory apodeme, or phallic apodeme, which is apical, broad and flattened.

Blade angle - Or lateral blade angle (Fig. 5) is the part of the aculeus of the female ovipositor. It is the lateral aspect which is sharply expanded just anterior to the point or narrow apical section of the aculeus.

Dorsal lobe - The epandrium has a lobe extending perpendicularly from the dorsal surface and parallel to the proctiger. This lobe is flattened laterally and sometimes bears a broad hook along the medial edge. The lateral aspect usually bears many small bristles.

Humero-notopleural brown band - This phrase is used to denote a darker brown band which extends across the upper humerus and across the notopleuron to the base of the wing. This band sometimes only appears more darkly pigmented because it is between a light colored row of setae ventral to it and a light area of setae dorsal to it.

Lateral barbs - Lateral barbs are large lateral extensions of the aculeus visible under low magnification. They are associated with a sensillum. There are usually three pairs of barbs and their apicies are directed away from the point of the aculeus.

Oral-genal area - This is an area mostly on the gena, along the oral margin, which is frequently darker or more reddish than the remainder of the gena or face. It often occurs in conjunction with a dark medial area of the face along the oral margin.

Outer clasper - This is the structure medial to the surstylus which bears two greatly thickened setae, the prensisetae, at the apex. The outer claspers are sometimes referred to as styles or gonostyles (Munro, 1947) or inner processes (Benjamin, 1934).

Postocular spot - This dark brown to black area of the postgena lies just below the postocular row of setae and at the upper edge of the postgenal bulge. It is sometimes present as a narrow band extending obliquely from the posterior margin

of the eye toward the occiput.

Serrations - The aculeus of the female ovipositor has fine indentations along the lateral margins. These are visible under magnifications of 100X or more. The serrations occur only along the lateral edge where the blade is rapidly expanded.

Point of aculeus - This term is used for the extreme tip of the ovipositor which is narrow and needle-like and posterior to the rapidly expanding blade angle. It bears two pairs of very small setae-like sensilla near the apex which are visible at 430X.

Surstyli - Surstyli are modified outgrowths of the tenth tergum. On the inner margin is a concavity in which the outer clasper is located. The distal part of the surstyli, beyond the level of the prensisetae, bears setae which show specific differences in number and arrangement.

GENUS EUTRETA

Synonymy and Description

Icaria Schiner, 1868: 276 (preoccupied by Icaria

Saussure, 1853 a genus of Vespidae). Type-species:

Trypeta sparsa Wiedeman, 1830 [original designation].

Eutreta Loew, 1873: 276, Pl. 10, Fig. 13 [wing].

Eutreta; Coquillett, 1910: 543 [Type species designation].

Description Body length 3.0 to 8.5 mm. Light yellowish-brown to black.

Head with 3 yellowish-brown to black lower fronto-orbital bristles; 2 upper fronto-orbital bristles, the anterior bristle yellowish-brown to black, the posterior bristle pale yellow. Inner vertical bristle yellowish-brown to black. Outer vertical bristle pale yellow, short and usually inflated. Two to seven postocular pale yellow setae with interspersed shorter black setae. Frons usually bearing pale yellow setae, ocellar bristle located lateral to anterior ocellus. Two to three small postvertical pale yellow small bristles. Genal bristle brown to black, gular bristle pale yellow to black. Numerous pale yellow to black setae along oral margin and postgena. Oral margin weakly to strongly produced. Lower 2/3 of head bulging posteriorly, bulge often set off dorsally by a darker brown and by the postocular spot. Antennae length

variable, third segment with length 2-4 times width, anterior margin usually concave, arista with only very small setae. Eyes large, generally oblong or oval. Palps bearing short stout setae and short hairs. Frons nearly flat, never greatly concave or bulging.

Thorax with bristles yellowish-brown to black. Notum bearing evenly spaced, short, decumbent, whitish to salmon-tinged setae. Anterior dorsal central bristle placed in front of a transverse line through the supra-alars. Propleuron with inflated whitish to salmon-tinged setae or small bristles. One to 5 mesopleural bristles, pteropleuron with 1-2 bristles, upper sternopleuron with 1 bristle. Setae on sternopleuron gradually increasing in size ventrally until nearly reaching the size of the dorsal sternopleural bristle. The scutellum bearing 2 pairs of bristles.

Legs with femora generally same color as thorax. Tibia and tarsomeres often yellow. Profemur with a longitudinal row of bristles ventrally, a row of short bristles dorsally and another row dorsolaterally. Mesofemur with 1-4 small bristles on subapical dorsal aspect. Mesotibia with an apical spur.

Abdomen with terga subequal in length. Pleural membrane often dark grayish-brown.

Wing light brown to black, with numerous hyaline spots throughout the wing. Spots fused into lighter bands or streaks in some species. The apex of the wing bears a whitish

crescent.

Key to Subgenera of Eutreta

1. Wing without spots...E. lunulata (incertae sedis), p. 21
 Wing with many small spots..... 2
2. Oral margin of face only slightly produced (Fig. 2). Smaller species, less than 5.5 mm. Costal margin with normal wing color, never with spots. Aculeus with blade arrowhead-like.....
E. (Onchoaculeata), p. 110
 Oral margin of face produced (Fig. 1), fronto-oral angle usually greater than 120°. Larger species, usually larger than 5 mm. Costal margin variable, often with spots or light areas. Blade of aculeus smooth or serrated..... 3
3. Wings broad, marginal spots large along both anterior and posterior edge of wing. Oviscape shorter than last 2 abdominal tergites. Most setae of oral margin, palps and postgena whitish and inflated, several black setae along oral margin and apically on palps.....
 E. (Setogena), p. 139
 Wings with spots variable. Oviscape as long as last 3 tergites. Setae of oral margin and lower postgena mostly, brown to black; if setae of oral margin are pale yellow, then setae are all pale yellow on palps.....
 E. (Eutreta), p. 26

Eutreta lunulata (Macquart, 1851) incertae sedis

Platystoma lunulata Macquart, 1851: 255, Pl. 26, Fig.

3, 3a [adult dorsum, head].

Eutreta lunulata; Hendel, 1914b: 54 [key].

Foote, 1967a: 57.25 [catalog, distribution].

Discussion No specimens of this species were examined. The type specimen was placed in the M. D'Orbigny Museum (Macquart, 1851). However, neither the type nor any other specimens of this species are in the Museum National D'Histoire Naturelle Entomologie (L. Tsacas, personal communication), the museum in Paris, France, where the D'Orbigny collection is now housed. In addition no specimens of this species were found in the Fundacao Instituto Oswaldo Cruz, Rio de Janeiro, Brazil (Oswaldo Cruz Filho, personal communication).

Hendel (1914b) placed this species in the genus Eutreta but was uncertain that it really belonged in this genus.

The number of lower fronto-orbital bristles, the vertical rather than oblique axis of the eye, the lack of hyaline spots in the wing field, the apical black band with the subapical white band and the white hindtarsus are all characters foreign to Eutreta.

Tephritis baccharis (Coquillett, 1894) New Status

Figs. 28, 45, 72, 92, 125, 185.

Trypeta baccharis Coquillett, 1894: 73.

Phillips, 1946: 127 [host].

Essig, 1958: 604 [host].

Icteric fasciata Adams, 1904: 449-450.

Tephritis baccharis; Aldrich, 1907: 6 [host].

Phillips, 1946: 122 [host].

Eutreta baccharis; Quisenberry, 1951: 59.

Foote & Blanc, 1963: 27-28 [key to species, hosts].

Foote, 1965a: 661 [catalog].

Cole, 1969: 354, [distribution].

Wasbauer, 1972: 13-14, 116 [host list].

Discussion This species has been difficult to place in relationship to other species. It was assigned to Tephritis by Aldrich (1907) without comment as to its characters. Quisenberry (1951) felt it was not properly placed in Tephritis due to the 2-4 lower fronto-orbital bristles (Tephritis species have 2), and because of the peculiar wing pattern. Adams (1904) assigned this species to Icterica on the basis of the similarity of the wing pattern. Foote & Blanc (1963) noted the superficial similarity of the wing pattern to Oxyna.

The wing pattern of this species does not fit the characteristic pattern found in Eutreta any better than the previous genera in which it has been placed. The wings do not have the typical apical crescent. The two brown bands on the crossveins, one from the stigma extending across the r-m and the other across the m to the posterior wing margin, are not separated as in E. (Eutreta). The brown bands and spots are oriented obliquely as in Tephritis arizonaensis rather than vertically and longitudinally. The wings are narrow as in E. (Onchoaculeata). The variable number of fronto-orbitals

does not fit Eutreta (which has 3) any better than Tephritis.

The genitalia (Figs. 28, 45, 72) fit several of the Eutreta subgenera in some respects but it is clearly not an intermediate form. The oviscapae is shorter as in E. (Setogena). The male epandrium and surstylus are like E. (Onchoaculeata) but the epandrium bears a dorsal lobe which is similar to E. (Eutreta) but more distally situated. The spermatheca and setae of the inversion membrane are like E. (Eutreta) but the aculeus, which has a pair of distally directed barbs, is unlike any Eutreta.

Therefore any similarity to Eutreta species seems to be due to convergent evolution rather than phylogenetic affinity.

There are more similarities with Tephritis. The spermatheca (Fig. 45) is very similar to T. arizonaensis (Fig. 46). The epandrium in Tephritis is wedge-shaped in lateral view as in E. baccharis and bears a similar type of dorsal lobe. The ejaculatory and phallic apodemes are similar in shape to T. arizonaensis (Fig. 94). Structures showing the most differences are the aculeus (Fig. 74) and setae of inversion membrane (Fig. 29).

The puparium exhibits more similarities to Tephritis arizonaensis. The anterior spiracles are shaped like a disc with the papillae arranged on the margin while in Eutreta species the papillae are clumped. The posterior spiracular slits are longer in these species and the spiracular scar is

depressed, while in Eutreta species the posterior end of the puparium is lacking noticeable depressions and the spiracular slits are more rounded. In both of these species the puparium is sculptured with fine ridges while in E. diana the puparium is nearly free of sculpturing. Eutreta species have a rather transparent, thin puparium which is light brown to dark brown. In Tephritis species the puparium is thicker and black.

Due to these similarities I feel E. baccharis should be placed in the genus Tephritis.

SUBGENUS EUTRETA

Eutreta (Eutreta) Loew, 1873

Hering (1937) described the first subgenus, Phasmatocephala, in the genus Eutreta and designated E. rhinophora as the type species. He based the new subgenus on the dorso-ventral compression of the head, the strongly produced oral margin and the obliquely elongated eye. Hering did not establish a subgenus to include the type species of the genus.

In reviewing the characters of the head upon which Hering based Phasmatocephala, there are variations within the species E. rhinophora and E. distincta (which he also included in this subgenus) which closely approach the characters found in E. sparsa.

Other characters of E. rhinophora and E. sparsa also indicate a rather close relationship. Both species have broad wings with the stigmal length less than twice its width. The palps are broad in both species and they both have facial and orbito-antennal spots. The males have similar phallic and ejaculatory apodemes, the number of apical setae on the surstyli are approximately the same and both species possess dorsal lobes on the epandrium. The females have a long slender aculeus with the point as long as the angled part of the blade.

In view of these similarities and the greater differences occurring among the members of the genus, I believe these two

species must be placed in the same subgenus.

According to article 44a of the International Code of Zoological Nomenclature the subgenus containing the type species must bear the name of the genus. Therefore E. (Phasmatocephala) is a synonym of E. (Eutreta).

Description Body usually brown to dark-brown. Medium to large species.

Head with frons from lunule to vertex nearly as long as frontal width, face with oral margin moderately to strongly produced. Spots usually on face and orbito-antennal area.

Wings with 2 brown bands apparent to unaided eye. One extending from the costa over the r-m crossvein and a second extending from the posterior margin across the m crossvein. Costa usually bearing one or more marginal spots.

Female genitalia with oviscape flattened and longer than last two abdominal tergites. Aculeus long and narrow, point as long or longer than the sharply angled part of the blade, lateral margin of blade smooth or finely serrated.

Male genitalia with dorsal lobe on epandrium. Surstyli apical to prensisetae wedge-shaped or truncate, never short and rounded, apical and subapical setae longer than width of surstylus.

Key to Species of the Subgenus Eutreta

1. Face without spots..... 2
 Face with a pair of large dark brown to black spots..... 4
2. Wing spots uniformly large; apical crescent absent in males, narrow in females and not reaching R_{2+3} anteriorly..... E. simplex, p. 98
 Wing with many small spots, apical crescent broader, extending anteriorly past R_{2+3} 3
3. Violet color occurring on face, postgena, pleuron and coxae. Apical whitish crescent wider than subapical brown band..... E. frosti, p. 66
 Violet color absent. Subapical brown band as wide as apical crescent. Costa without marginal spots beyond R_1 area..... E. intermedia, p. 70
4. Costal margin beyond end of R_1 vein whitish to yellowish-brown, distinctly lighter than ground color of wing..... 5
 Costa beyond R_1 area the same color as remainder of wing, marginal spots or lighter areas often present but never with a continuous light area from R_1 to apical crescent..... 7
5. Costal margin with a yellowish-brown band nearly as wide as, and continuous with, apical crescent, inner margin of band indistinct. Setae of tergites all pale yellow and inflated..... E. aczeli, p. 31
 Costal margin with light band as wide as costa or only slightly wider, inner margin of band distinct. Setae variable..... 6
6. Apical crescent with inner margin obliquely slanting, not concave..... E. obliqua, p. 88
 Apical crescent normal, inner margin concave. Costa with a continuous series of coalesced spots..... E. xanthochaeta, p. 105

7. Costa suddenly constricted at end of subcosta. R_1 light area very large, as large as stigma..... E. apicata, p. 43
- Costa normal, never concave beyond end of subcosta. R_1 light area variable, usually much smaller than stigma..... 8
8. Costa with broad whitish band nearly width of stigma, extending from base of the wing to beyond the end of R_1 E. patagiata, p. 92
- Costa before end of R_1 at most marked with large spots, never with a continuous whitish band.... 9
9. Apical crescent interrupted along R_{2+3} and M_{1+2} by extension of brown wing pattern..... E. margaritata, p. 73
- Apical crescent never interrupted..... 10
10. Head with a narrow whitish band extending from oral margin of gena obliquely along lower margin of eye and across postgena to comb. Apical crescent narrow, ending below R_{2+3} E. mexicana, p. 74
- Head without such a band, or band broad and indistinct. Apical crescent wider, usually extending above R_{2+3} 11
11. Apical crescent ending at or slightly below M_{1+2} , wing broad, stigmal length less than twice width. Central & South American species..... 12
- Apical crescent extending nearly width of R_5 cell below M_{1+2} . Wing length usually twice width, stigmal length twice width. North, Central or South American species..... 15
12. Apical crescent normal, inner margin evenly concave..... 13
- Apical crescent with inner margin suddenly curved toward wing margin near M_{1+2} vein, inner margin often undulate..... 14

13. Costa beyond R_1 area with 4-5 marginal spots, unpunctated subapical brown band narrower than apical crescent..... E. parasparsa, p. 91
- Costa beyond R_1 area with 0-2 marginal spots, unpunctated subapical brown band as wide as apical crescent..... E. sparsa, p. 99
14. Apical crescent ending at M_{1+2} . Oral margin very strongly produced..... E. rhinophora, p. 95
- Apical crescent extending width of a wing spot below M_{1+2} . Oral margin less strongly produced. E. distincta, p. 54
15. Base of wing with spots coalesced especially in anal and 1st M_2 cells resulting in a lighter band near middle of wing..... 16
- Spots of wing usually distinct, no lighter band near base of wing..... 17
16. Costa without spots beyond R_1 area. Frons with lateral margins gradually narrowing from vertex to antennae. Orbito-antennal spot small and indistinct..... E. frontalis, p. 59
- Costa with spots beyond R_1 light area. Frons with lateral margins suddenly narrowing near antennae. Orbito-antennal spot dark brown and distinct..... E. hespera, p. 67
17. Subapical, unpunctated brown band narrower than apical crescent, costa usually with spots beyond R_1 area..... E. angusta, p. 34
- Subapical, unpunctated brown band as wide as apical crescent, costa without spots beyond R_1 area..... 18
18. South American species, 2d M_2 cell without marginal spots..... E. brasiliensis, p. 45
- North American species, 2d M_2 usually with 2-3 spots..... 19

19. Female with lateral blade angle of aculeus less than 46° . Body dark brown to grayish-brown, R_1 area of wing small, not extending into cell R_1 , smaller species. Wing length 4.2-5.7 mm..... E. caliptera, p. 47
- Female with aculeus blade angle more than 48° . R_1 light area larger, usually extending wedge-like into R_1 cell. Body often slightly reddish to yellow-brown. Larger species. Wing length more than 5.0-7.5 mm..... E. novaeboracensis, p. 76

Eutreta (Eutreta) aczeli Costa Lima, 1954

Figs. 11, 44, 75, 156.

Eutreta aczeli Costa Lima, 1954: 173-175 [description], 173 Fig. 1 [antenna], 174 Fig. 1-4 [ovipositor, spermatheca, wing].

Foote, 1967a: 57.24 [catalog].

Diagnosis E. aczeli can be distinguished from other members of the subgenus by the broad, yellowish-brown band extending along the costa from the apical crescent to the wing base. The inner margin of this band is indistinct, but in E. obliqua the inner margin of the apical crescent is distinct and the costa is only narrowly marked with a yellowish-brown band. The spots of the wings are small, especially in the posterior half of the wing. There are no spots along the posterior margin of the wing as in most species of Eutreta.

Discussion Only two specimens of this species have been reported, the type, from an unknown locality and a female from Colombia. Neither specimen had collection data and nothing is known concerning the distribution of this species.

I was unable to borrow the type specimen from the Instituto Oswaldo Cruz. The specimen I have from Colombia differs from the illustration of the wing by Costa Lima (1954) in that the yellow band along the costa terminates near the end of the subcostal vein in the type specimen but continues to the base of the wing in the Colombia specimen. In other respects the Colombian specimen fits the description of the type by Costa Lima.

Due to the brief description given by Costa Lima I have redescribed this species based on the single female from Muzo, Colombia.

Redescription Body dark brown. Head appearing square in outline. Frons rust colored, with lateral margins yellowish; numerous pale yellow, inflated setae; bristles black. Face with two large spots below mid-line, oral margin moderately produced. Orbito-antennal spots large, largest near eye margin. Oral-genal area brown. A lighter band from oral-genal margin extending obliquely across postgena to near comb. Upper postgena, occiput and gular area dark brown. Postgenal setae along oral margin mostly black, setae pale yellow on remainder of postgena. Setae of oral-genal margin small and

black; genal bristle black and small, gular bristle pale yellow. Postocular pale yellow setae 5, smaller black setae 8 or more. Six postvertical pale yellowish setae. Eyes small. Antennae with first segment bearing long pale yellow setae, second segment with black setae, third segment .3 mm long, .25 mm wide.

Thorax dark brown, lower humerus and upper mesopleural line 3-5 setae deep, a light brown band in setal line. Notum with many decumbent, pale yellow, inflated setae. No notopleural brown band. Black bristles on thorax including 2 mesopleural, 1 pteropleural, 1 sternopleural. Sternopleuron with pale yellow setae dorsally, ventrally setae black and bristles smaller than in most species. Postscutellum dark. Squamae brown.

Legs with forefemur dark, bearing many yellowish setae, other femora color of abdomen. Tarsai and end of tibiae lighter brown.

Abdomen with inflated, pale yellowish setae covering all of tergites, sternites similar to other Eutreta, having black and white setae mixed. Pleural membrane charcoal-grey.

Wings (Fig. 156) with apical hyaline area extending along costa to wing base. Hyaline area as wide as stigma and half 2d C and R_1 cell width. Apical crescent begins $1/5$ width of R_5 cell below M_{1+2} cell. Spots generally small. Rows of punctations as follows: 2-3 in R_1 , 3-4 in R_3 , 4 in R , 5

irregular rows in R_5 and $1M_2$ with 4-5 irregular rows. No posterior marginal spots. Anal cell with no spots evident.

Female genitalia (Figs. 11, 44, 75) with aculeus turned down at tip 23° , lateral edges smooth, similar to E. xanthochaeta. Egg guide with fine spicules along edge near apex. Inversion membrane with short conical setae. Spermathecae with length 3 times width, diameter greatest near middle, basal end constricted.

Type Holotype: female, 5559 (Instituto Oswaldo Cruz).

Material examined 1f, Muzo, Colombia (HMZ).

Biology Nothing is known of the biology or seasonal distribution of this species.

Eutreta (Eutreta) angusta Banks, 1926

Figs. 7, 35, 52, 55, 79, 111, 122, 123, 140, 141, 144, 157.

Eutreta angusta Banks, 1926: 44 [description, key].

Foote, 1965a: 661 [catalog, distribution].

Eutreta pacifica Curran, 1932: 15, 17 [key, description].

NEW SYNONYMY.

Foote & Blanc, 1963: 28, 30-32 [key, collection records], 111 Fig. 37 [wing].

Cole, 1969: 355 [distribution].

Frick, 1972: 629-630 [biology].

Wasbauer, 1972: 7, 18, 22, 80-81, 116-117 [host plant list].

Diagnosis This species can be distinguished by the spots along the costa, especially between the R_1 and apical crescent. The unpunctated, subapical brown band is narrower than the apical whitish crescent and the spots of the wing pattern are seldom coalesced.

Discussion This species is quite variable in body color, size, and spotting of the wings. The Mexican and southern Texas specimens examined tend to have larger and fewer spots. A few specimens may lack costal spots beyond the end of R_1 vein.

The series of specimens examined from Ft. Bragg, California, were dark brown to charcoal-brown. The wing spots tended to be in rows with very small spots, while the Mexican specimens tended to have mostly larger spots.

Banks (1926) described E. angusta from a Texas specimen and Curran (1932) described E. pacifica from a southern California specimen. Considering the variability within the species the two specimens are quite similar. Both are brown to light-brown, smaller than average for the species, both lack the paired dark areas on the tergites typical of the species and have a similar number of spots along the costal wing margin.

Curran was evidently unaware of Banks' work since he states that he had examples of the Nearctic species with the exception of E. rotundipennis; however, he did not mention E. angusta or E. hespera.

Due to the similarity of the types of E. angusta and E. pacifica and the lack of genitalic differences between specimens examined from the two type localities I believe the types are conspecific.

Redescription Body light brown to dark brown, similar to E. caliptera. Size medium to large.

Head with bristles black, setae pale yellow. Frons brown, often with reddish tinge or streak medially. Lateral margins of frons nearly parallel. Lunule gray, brown or reddish-brown. Orbito-antennal and facial spots dark brown to black, well defined. Face with oral margin moderately produced. Postgena light brown, upper postgena and occiput darker brown. Postocular spots variable, extending 1/2 distance to comb in some specimens. Lower postgenal setae black, upper postgenal setae pale yellow. Palps darker brown on apical 1/3, setae black or pale yellow. First antennal setae whitish, second antennal setae dark brown to black.

Thorax brown to reddish-brown or dark brown. Humero-notopleural band usually distinct, set off dorsally by decumbent pale yellow setae and grayish pollinosity, and ventrally by a line of setae (1-4 rows deep) on the lower

humerus and upper edge of mesopleuron. Thoracic bristles black, setae pale yellow. Upper squamae gray, lower squamae whitish. Post scutellum darker than pleuron.

Abdomen brown to reddish-brown, tergites with paired dark areas which cover more than half of each tergite. T5 with dark area covering most of tergite in many males. Sternites color of thorax, pleural membrane grayish-brown.

Legs light brown to dark brown. Forefemur often with a lateral darker streak, usually with several pale yellow setae ventrolaterally.

Wings (Fig. 157) with size and number of spots variable. Costa with 2 or more marginal spots before end of R_1 and usually more than 1 between end of R_1 and apical crescent. Marginal whitish area at end of R_1 small. Spots of wing silvery, appearing larger in reflected light than in transmitted light. Spots larger in posterior half of wing. Apical whitish crescent broader than in E. caliptera. Brown, unpunctated band by apical crescent narrower than width of whitish crescent. Posterior margin with 4-8 spots in 2d A, 2-3 in Cu_1 , 1-3 in 2d M_2 . Apical crescent extending from width of R_5 cell below M_{1+2} to slightly anterior to end of R_{2+3} . Stigma twice as long as wide, 2d C cell narrow.

Female genitalia (Figs. 7, 35, 52, 55) with oviscape often dark brown at each end. Aculeus blade angle similar to E. caliptera, bearing 25-35 serrations laterally. Serrations

poorly defined in a few specimens. Spermatheca elongate, widest near basal 1/3, spicules crowded.

Male genitalia (Figs. 79, 111, 122, 123, 140, 141, 144) with epandrium color of abdomen. Surstylus bearing 7-12 long black apical setae near apex. Dorsal lobe with hook medially. Outer clasper with 4-5 setae medial to prensisetae. Phallic apodeme lobed or bar-shaped apically. Ejaculatory apodeme with blade 4 times shaft width; blade subsymmetrical.

The holotype is smaller and lighter brown than most specimens. The spots of the wing are quite uniform in size, larger and less numerous than in most specimens. The inner margin of the whitish apical crescent is perpendicular to R_{4+5} posteriorly to the wing margin; anteriorly to R_{4+5} the inner margin curves apicad, reaching the costa well before R_{2+3} .

Figures 10 & 11 by Snow (1894) are of E. angusta. Other references to Eutreta spp. which are probably of this species are: Loew (p. 275, 1873), Osten Sacken (p. 345, 1877), Doane (p. 184, 1899), Wulp (p. 413, 1899), Cresson (p. 101, 1907), Enderlein (p. 445, 1911), Cole (p. 158, 1912) and Tucker (p. 298, 1918).

Type Lectotype: female, Texas, "Lefr.", No. 15669 (Museum of Comparative Zoology).

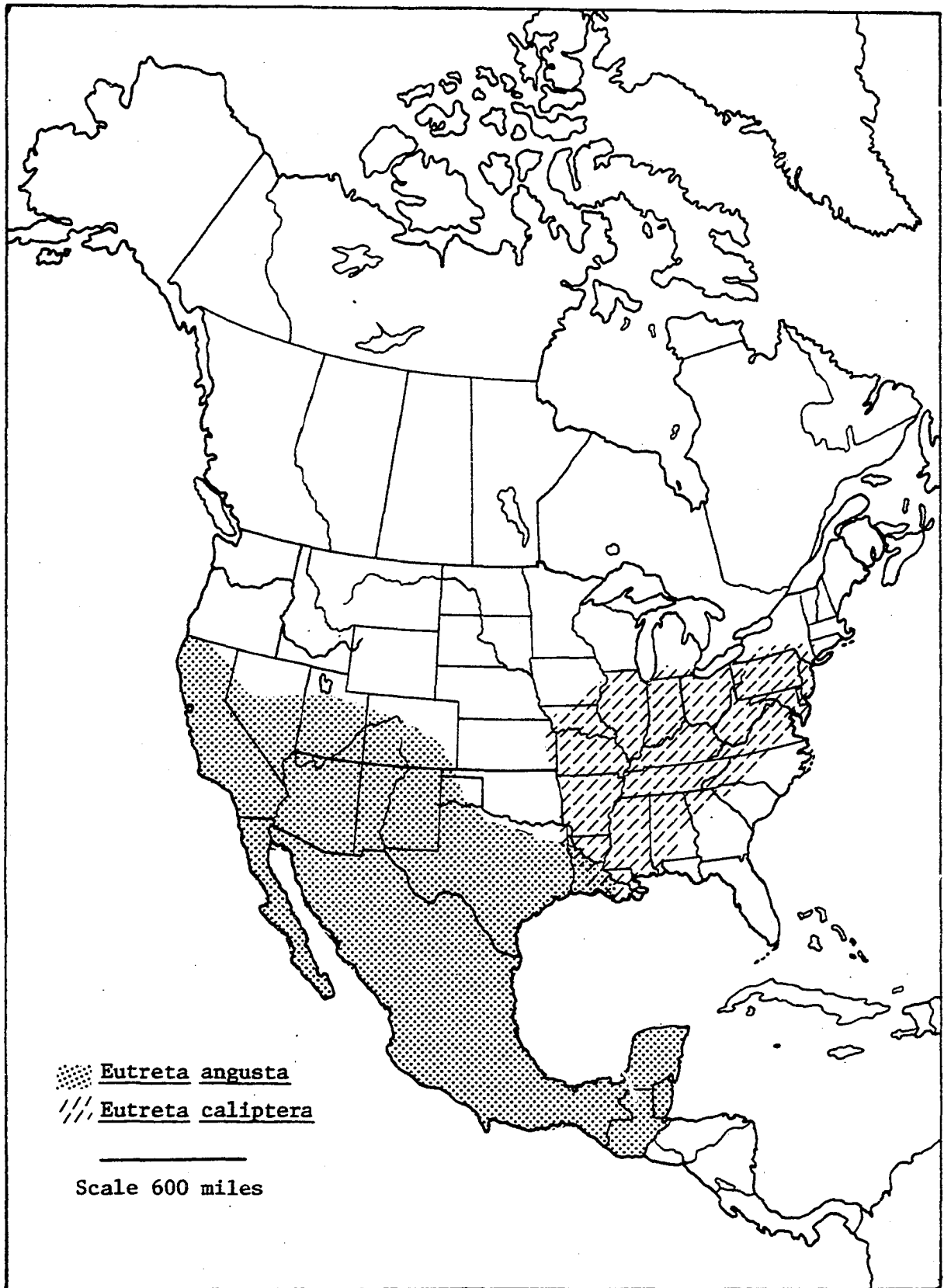
Material examined There were 356 specimens examined including the following specimens labeled as "types". The lectotype. 1, var. place, Loew Coll., "Type" 15669, Eutreta angusta Banks (MCZ). 1m, Pom [Pomonal], Calif., "Type"

Eutreta pacifica (MCZ). 1m, Manitou, Col., Osten Sacken Coll., "Type" 15670, Eutreta hespera Bank (MCZ). 1m, Compton, Calif., V-15, F. R. Cole Coll., A. N. S. Lot. 523, Type 15670 "Paratype" Eutreta hespera Bates, (ANSP). Other specimens examined. ARIZONA 1m, Oslar, Patagonia Mt., (ANSP). 2f, Pinery Canyon, Chiricahua Mts., Cochise Co., VII-12-1919, Elev. 6,000 feet, Witmer Stone (ANSP). 1m, 6 mi. n., Happyjack, VI-13-1971, B. A. Foote (KSU). 1f, Southwestern Res. Sta. Portal, VII-17-1969, L. L. Pechuman (CU). 1m, 5 mi. w., Portal, S. W. Res. Sta., VIII-1-1959, elev. 5,400 feet, H. E. Evans (CU). 1m, Chiricahua Mts., VII-17-1942, H. A. Scullen (OSU). 1f, Chiricahua Mts., VII-16-1942, elev. 8,600 feet, H. A. Scullen (OSU). CALIFORNIA 225 specimens examined. COLORADO 2m, 1f, DeLuz, VIII-1897 (CM). 1m, No. 2075, C. W. Johnson Coll. (MCZ). 1m, No. 2724, C. W. Johnson Coll., (MCZ). 1f, Trinidad, VIII-10-1936, elev. 6,000 feet, H. Evans (VIS). 1f, (USNM). LOUISIANA 1m, St. Mary Parish, IV-3-1963, swept from clover, Aithel McHahon (LSU). MEXICO 1f, Hidalgo Epazoyuean, VI-17-1961, elev. 8,100 feet, Univ. Kans. Mex. Expd., on flowers of blue Ipomea (SEM). 1m, Durango, Dgo., X-23-1957, elev. 6,500 feet. H. A. Scullen (OSU). 1f, Tuxpan, VI-1-1956, elev. 6,000 feet, H. A. Scullen (OSU). 1m, Guadalajara, IV-15-1903, C. M. Acc. 2441, McClendon (CM). 8m, 4f, Orizaba, XII-1887, H. H. Smith & F. D. Godman (BM). 3m, 2f, Mexico City, May 1888, H. H. Smith (BM). 1m, Xucumanathlan, Guerrero, July, H. H. Smith (BM). 1f, Presidio, Forrer (BM). 1m, N. Sonora, Morrison (BM). 1f, Orizaba, July, Bilimek, Hendel Coll., (NMW). 1f, El Salto Dgo., V-29-1937, 9,300 feet, J. Manuel (FSCA). 1m, Xochimilco, VIII-31-1947, H. E. Milliron (UMN). 1m, 1f, Carapa, IX-2-1938, L. J. Liporsky (SEM). 1m, Patzquero, VIII-31-1938, L. J. Lipovsky (SEM). 1f, Atlapulco D. F., V-27-1947, W. G. Downes (AMNH). NEW MEXICO 1, Cloudcroft, VI-16-1902, (ANSP). 1f, Carlsbad, IV-13, W. R. Connell (BM). TEXAS 69 specimens examined. UTAH 1m, Uintah Co., VI-30-1937, Wallace (CM).

Distribution E. angusta (Map 1) occurs in California east to southern Colorado, Texas and southwestern Louisiana, and south to Guatemala. Insufficient numbers were examined to establish the southernmost limits of its range.

Biology E. angusta has been reared from galls on 7 species of Compositae. Foote & Blanc (1963) reported it from

Map 1. North America. Distribution of Eutreta caliptera
and E. angusta



crown galls of Chrysanthemum sp. but its native host appears to be ragweed upon which it forms root galls. Frick (1972) reared E. angusta from Senecio sylvaticus and from the upper part of the root crown of S. jacobaea. Other rearing records are from Ambrosia psilostachya and Callistephus chinensis by Foote & Blanc (1963), Ratibida columnaries and Vernonia interior by Painter (1935), Vernonia sp. and Ratibida sp. by Felt (1940). The galls on chinese aster (C. chinensis) and Senecio sylvaticus are reported as stem galls; the galls on the other host plants are upper root or crown galls.

The galls (Frick, 1972) are 5-9 mm. in diameter on S. jacobaea, and are nearly round to just irregular swellings on Ratibida as reported by Felt (1940). Usually only one gall is produced per plant.

Adults were collected in all months of the year but most adult flies were collected from March to July. From galls collected in September and October Frick (1972) reported that adults emerged from September to January. The collection data suggests that more than one generation of E. angusta occurs per year.

This species has been collected from the costal plains of California and lowlands of Texas to as high as 9,300 feet in Mexico.

E. angusta does not appear to seriously injure the host plant, but it does retard its growth on the side of the plant

on which the gall occurs. In one case where the crown gall was located centrally on the plant the growing tip died due to larval feeding and eventually the whole plant succumbed (Frick, 1972).

Pupariation occurs within the gall. Foote & Blanc (1963) reported one case, however, where adults emerged from the soil near the base of a Chrysanthemum.

Nothing has been reported concerning the courtship, mating behavior or parasites of E. angusta.

Eutreta (Eutreta) apicata Hering, 1935

Figs. 66, 93, 100, 132, 158.

Eutreta apicata Hering, 1935: 225-226 [description, key].

Aczel, 1949: 264 [catalog].

Foote, 1967a: 57.24 [catalog].

Diagnosis This species is easily distinguished by the shape of the wing which is abruptly constricted along the costa beyond the end of the subcostal vein and by the shape of the apical crescent (Fig. 158).

This is one of the larger Eutreta species. It has long wings, a rather square head in lateral view and three thoracic longitudinal stripes on the dorsum.

Discussion The male genitalia of E. apicata is different from all other Eutreta due to the elongate surstyli

(Fig. 132) and outer claspers. The aculeus of the female (Fig. 66) is also long and thin but not unusually so for this subgenus.

The combination of large wings with a costal constriction (Fig. 158) beyond the end of the subcosta, the peculiar apical crescent, the lack of a well defined dorsal lobe and the epandrium and the long surstylus make this an unusual species in the subgenus. However, the two brown bands through the middle of the wing, the moderately produced oral margin, the shape of the aculeus and the presence of orbito-antennal and facial spots indicates its affinity to E. (Eutreta).

Biology Nothing has been reported concerning the biology of E. apicata. Hering described this species from two females. Only the three specimens listed below from Costa Rica are known to exist.

Type Holotype: female, Costa Rica, H. Schmidt S. (Institut Zoologique Warszawa). This specimen was placed in the Settin Museum but was moved to Poland during World War II. It is in excellent condition.

Material examined Holotype: 1f, Paratype, Costa Rica, H. Schmidt, S., T 68, (BM). 1m, San Jose, Costa Rica, V-8-1910, H. Schmidt S. (BM).

Eutreta (Eutreta) brasiliensis New Species

Figs. 8, 36, 54, 159.

Diagnosis This species can be distinguished by the narrower stigmal and 2d C cell. The stigmal length is more than twice its width. The costa lacks hyaline spots and the oral margin is only moderately produced.

The aculeus of the ovipositor has a long point, a serrated blade margin that is angled laterally, while E. sparsa has a smooth lateral blade margin which is rounded laterally.

Discussion This species is most like the North American species Eutreta caliptera. The head has the oral margin only moderately produced, the gula is short and the palps are slender. The wings are relatively narrow, the stigmal length is more than twice its width and the apical crescent has a regular, concave inner margin.

The aculeus of the ovipositor, however, has a long point, the blade is angled laterally and bears 22 small serrations.

The South American form which is most similar to E. brasiliensis is E. sparsa. The narrower wing and the serrations on the aculeus of the ovipositor set it apart.

Description Body dark brown, generally smaller than E. sparsa. Species similar to E. pacifica.

Head with frons nearly parallel, half the width of head, length equal to head height. Oral margin moderately produced

anteriorly. Facial spots normal, orbito-antennal spots small, bar-shaped. Oral-genal spots reddish brown, indistinct. Post-ocular spots small. Upper postgena brown, lower half yellow. Face, lunule and gena yellowish. Frons reddish anteriorly. Palps narrow, slightly darker at apex. Six whitish postocular setae with 13 interspersed shorter black setae.

Thorax brown to yellowish-brown; bristles black. Humero-notopleural brown band slightly darker than reddish-brown notum. Notum with scattered whitish setae. Lower humeral and upper mesopleural setal line whitish, 3-4 setae wide. Lower humerus yellowish. Sternopleural setae mostly dark brown, other pleural setae whitish. Squamae yellow, postscutellum dark brown.

Legs color of thorax. Profemur with lateral streak slightly darker brown, 10-12 whitish setae on ventrolateral aspect.

Wings (Fig. 159) brown, 2d C and stigma narrow, 2d C length four times width. Spots separate and of similar size, usually not in rows. No marginal spots along costa except small yellowish area at end of R_1 . Posterior margin with 9 spots in 2d A, 2 in Cu_1 , and 1 faint spot in 2d M_2 cell. Forty spots in $1M_2$, 28 in R and 32 in R_5 cells.

Abdomen brown, pleural membrane dark brown. No dark brown areas discernable on tergites.

Female genitalia (Figs. 8, 36, 54) with oviscape darker brown near base and apex. Aculeus point long, blade with 22 small serrations, angle moderate, point only slightly curved downward. Inversion membrane with setae widely set, conical, and large at the base. Spermathecal length 4 times width, widest near middle. Spicules normal, larger and more spreading than in E. sparsa.

Condition of specimen is greasy with many dirt particles making it hard to determine the true color of the thorax and abdomen. Most bristles of the head are missing as well as the halteres, right foretarsus and metatarsus.

Type Holotype: female, Brasilien, Alte Sammlung (Naturhistorische Museum, Wien). This species is only known from the type.

Biology Nothing has been determined concerning the natural history of this species.

Eutreta (Eutreta) caliptera (Say, 1830) New Combination

Trypeta caliptera Say, 1830: 370.

Loew, 1862: 78 [synonym of T. sparsa].

Hendel, 1914b: 55 [taxonomic note].

Foote, 1965a: 66 [catalog].

Diagnosis E. caliptera is the eastern compliment of E. angusta. It can be distinguished from E. angusta by the

lack of hyaline spots along the costa between the end of R_1 and the apical crescent. E. angusta also has more spots in the 2d C and stigmal cells. The unpunctated brown band along the apical crescent is as wide as the apical crescent while in E. angusta it is narrower.

It is more difficult to distinguish E. caliptera from E. novaeboracensis. The best character in the female is the width of the aculeus blade angle which is less than 46° in E. caliptera and over 50° in E. novaeboracensis. The male can be distinguished by the shape of the phallic apodeme which is bar-shaped in E. caliptera but has a terminal lobe in E. novaeboracensis. Most specimens can be separated by the smaller size (Table 1), very small whitish area at the end of R_1 and the more southern distribution.

E. caliptera differs from E. frontalis by the nearly parallel frons and the lack of confluent spots in the base of the wing pattern.

Discussion This species was described the same year that Wiedemann described E. sparsa and was considered by Loew (1862) as a synonym of E. sparsa. Since E. sparsa is distinctly different from the North American forms (see discussion of E. sparsa), E. caliptera is a valid name.

The type of E. caliptera (Say) has been destroyed. Of the species known to occur in the type locality in Indiana, E. caliptera seems to best fit the species described by Say

(1830). It is the smallest species, dull-brown in color, and appears to be the most common species in the type locality. Since Say lived in southern Indiana at New Harmony when this species was described it appears likely that his type was from that area. Two other species of Eutreta might be confused with Say's species (E. novaeboracensis and E. frontalis) but neither species is known to occur in southern Indiana.

Redescription Body dull-brown to grayish-brown; smaller and not as reddish as E. novaeboracensis.

Head with oral margin of face protruding more than E. novaeboracensis. Postocular spot broad, often extending obliquely to vertex. Occiput brown, postgena light brown. Face and lateral margins of frons grayish pollinose, reddish areas not as extensive as in E. novaeboracensis. Frons with lateral margins usually parallel.

Thorax with humeral-notopleural brown band distinct. Lower humeral and upper mesopleural line of setae whitish, in 1-3 irregular rows. Lower humerus light brown, mesopleuron same color as notopleuron. Upper squamae grayish-brown, lower squamae whitish. Mesopleuron with fewer whitish setae than E. novaeboracensis. Notum dull grayish-brown.

Abdomen in male sometimes with dark brown to black areas across anterior 2/3 of tergites. Fifth tergite often entirely darkened. Lighter longitudinal midline on tergites not as evident as in E. novaeboracensis. Pleural membrane grayish-

brown except in first segment which is yellowish-brown.

Legs dark brown, forefemur broadly darkened, other leg segments color of thorax. Forefemur with several whitish setae ventrolaterally, other femoral setae black.

Wings (Fig. 160) smaller than in E. novaeboracensis; hyaline spots generally smaller, more silvery and not as regular. Costa bearing 1-2 spots basad to subcostal break, whitish to yellow area at end of R_1 small, no spots between R_1 area and apical crescent. Four to six marginal or sub-marginal spots in 2d A, 1-3 in Cu_1 , 0-2 in 2d M_2 . Unpunctated brown band along apical crescent wider than crescent. Hyaline spots all separated, not confluent.

Male genitalia (Figs. 81, 108, 139, 147, 160) with surstylus wedge-shaped at apex, bearing 5-7 long setae terminally and 1 mediolaterally. Dorsal lobe narrower, longer and hook less prominent than E. novaeboracensis. Ejaculatory apodeme narrower, with a longer shaft; blade width 5 times shaft width. Phallic apodeme bar-shaped, not lobed or only slightly lobed at apex.

Female genitalia (Figs. 9, 37, 57) with aculeus point long, blade angle narrower than E. novaeboracensis. Spermatheca length less than six times width. Oviscape long and narrow, darker at apex, sometimes also at base.

Type Neotype: female, Lafayette, Indiana, June 11, J. M. Aldrich Collection. (United States National Museum).

Material examined ARKANSAS 1f, Miss. Co., VII-20-1971, cotton-sorghum strip, malaise trap, R. Kirsk (UAK). ILLINOIS 1f, DuBois, VIII-9-1917 (INHS). 1f, DuBois, V-23-1917 (INHS). 1f, DuBois V-14-1916 (INHS). 1f, East St. Louis, VII-19-1906 (INHS). 1f, Pulaski, V-13-1910 (INHS). 1f, Ashley, VIII-7-1917 (INHS). KANSAS 1f, Lawrence vicinity, Douglas Co., V-20-1962, Entomology class (SEM). KENTUCKY 1f, Lexington, IX-26-1928, M. Didlake, on window pane of lab., (UKY). LOUISIANA Baton Rouge: 1m, III-25-1947, W. W. Wirth (USNM); 1m, VII-27-1966, J. Chapin (LSU); 1m, V-16-1928, bred from Chrysanthemum, C. E. Smith (LSU); 1f, IV-14-1947, W. W. Wirth (USNM); 1f, VII-5-1962, D. L. Brooks (LSU). 1f, Homeplace, III-10-1944, on citrus (USNM). 1f, Gramercy, III-28-1965, D. M. Pollet (LSU). 1m, Bellerose, VI-2-1965, J. Chapin (LSU). MARYLAND 1f, Linnieville, VII-5-1913, R. C. Shannon (USNM). MISSISSIPPI 1f, Natchez, VI-2-1909 (USNM). MISSOURI 1f, Columbia Research Park, V-29-1966, D. M. Daugherty (USNM). 1f, Columbia, VI-1-1966, F. D. Parker (USNM). 1m, Weldon Springs, V-7-1947, Wing (UMO). 1f, Boone Co., IV-15-1967, D. L. Vincent (UMO). 1f, Saint Louis, VI-27-1952, F. C. Harmston (USU). NEW JERSEY 1f, Riverton, VI-20-1909 (USNM). 1f, New Brunswick, VI-6 (AMNH). 1m, Berkeley Hgts, VII-22, 24663, E. L. Dickerson (AMNH). 1f, Trenton VIII-26 (ANSP). NEW YORK 1f, Hempstead, Nassau Co., IX-4-1962, G. A. Matusa (SEM). 1f, Riverhead L. I., VI-30-1921 (CU). 1f, Flushing, VIII-31-1933, (AMNH). 1f, Kissina Park, L. I., X-8-1911, C. E. Olson (AMNH). NORTH CAROLINA 1f, Haywood Co., VI-9-1945, H. V. Weems (FSCA). 1, Haywood Co., Crestmont, VIII-2-1924, elev. 5,100 feet (UMI). OHIO 1m, 1 mi. s., Kent, VIII-16-1965, W. B. Stoltzfus (ISU). 1f, 4 mi. w., Bowling Green, Wood Co., VIII-28-1956, J. L. Laffoon (ISU). Empty puparia from H. giganteus, Kent; 1, 1 mi. s., VII-29-1965; 1, 1 mi. s., VIII-5-1965 (ISU). 1 empty puparium from Vernonia altissima, Kent, VIII-12-1964, W. B. Stoltzfus (ISU). INDIANA Neotype. PENNSYLVANIA 1f, Bustleton, V-30-1923, C. A. Thomas (FEM). 1m, Crafton, VIII-20-1905 (CM). 1f, Roxborough, VI-11-1911 (USNM). 2f, Schenley Park, Pittsburgh, VI-11-1956, Clench (CM). 1m, Pittsburg, May 18, 5031 (CM). TENNESSEE 1m, 3f, Cove Forest Gatlinburg, GSMNP, 4,400 feet, VII-21-1947, R. H. Whittaker (UKY). 1f, Smoky Mts., IX-1-1933, C. L. Fluke (UWI). VIRGINIA 2 mi. me., Singers Glen, Rockingham Co., from Bidens frondosa, W. B. Stoltzfus: 1f, emerg. IX-24-1968; 1m, emerg. X-2-1968; 1f, emerg. IX-19-1968; 1 empty puparium, IX-19-1968 (LSU). 1f, Hopkins, VI-6-1916, C. T. Greene (USNM). 1f, Falls Church, V-15-1916, M. V. Gray (USNM). 1m, Blacksburg, X-15-1940 (VPI). 1f, Rosslyn, VII-11-1913, R. C. Shannon (USNM). 1f, Falls Church, VIII-9-1911 (FSCA). 1f, Falls Church, July 4, N. Banks (FSCA). 1f, Falls Church, VIII-2, N. Banks (FSCA). WEST VIRGINIA 1f, Cheat Mts., June (CM).

Distribution (Map 1). E. caliptera has been collected from northern Ohio and New Jersey, south to Tennessee, Arkansas and Louisiana and west to eastern Kansas. It is sympatric with E. novaeboracensis in the northern part of its range and with E. angusta in the extreme southwestern part of its range.

Biology E. caliptera emerges as early as March in the southern part of its range and by May in the northern part. Most specimens examined were collected in May and June. The specimens collected in July, August and September are probably a second generation. All rearing records of this species are of the second generation which produces galls in the top half of the plant stems. The overwintering galls are probably crown or root galls.

Two galls on Bidens frondosa were found on the node of the plant. The galls collected September 19 & 20 contained puparia with larvae. By September 25, the larvae had pupated. They emerged 7 & 12 days later as adults.

The adults were held in a baby food jar with water and food. No mating was observed in this small container. When the flies were placed in a 10 gallon aquarium with a host plant they mated. The male patrolled a leaf similar to the territorial manner of other tephritids. The female appeared attracted to the male. Both the male and female made quick short lateral motions with the body, intermittently extending one wing then the other perpendicular to the body, exposing a

maximum amount of wing surface to view. The female approached the male in a head to head orientation. When the female had approached to within 1 or 2 cm of the male, the male leaped on the back of the female, turned around and copulated. The males anterior legs were placed dorsolaterally on the females first or second tergite, the second pair of legs clasped the ovipositor sheath and the third pair of legs were on the substratum. The pair remained in copula for about 4 hours. The pair copulated each day beginning about noon for 7 days.

E. caliptera occurs infrequently, at least in the northern part of its range. It is usually only found in moist habitats along streams or ecotonal areas of mesophytic forests.

One specimen from Tennessee was collected at 4,400 feet and one in North Carolina at 5,100 feet. Other specimens in Virginia and Ohio were collected at low elevations along streams.

The specimens collected from the southwestern part of the range appear darker and are larger than the ones reared from Helianthus or Bidens galls in Ohio and Virginia.

Hosts The records of E. sparsa forming galls on stems probably all belong to E. caliptera and E. angusta in their respective ranges. E. caliptera causes galls on the stems of various composites. I have reared specimens from galls of Bidens frondosa, Helianthus giganteus, H. tuberosus and

Vernonia novaeboracensis. E. caliptera has also been reared from Chrysanthemum sp.

Eutreta (Eutreta) distincta (Schiner, 1868)

Figs. 19, 42, 65, 86, 103, 136, 148, 161.

Icaria distincta Schiner, 1968: 276-277 [description].

Eutreta distincta; Wulp, 1899-1900: 414 [taxonomic note].

Hendel, 1914b: 54-55 [key, distribution, description], Tab. 2, Fig. 42 [wing].

Hering, 1935: 225 [key].

Foote, 1967a: 57.25 [catalog, distribution].

Eutreta (Phasmatocephala) distincta; Hering, 1937: 297-

298 [note], NEW SYNONYMY.

Aczel, 1949: 266 [catalog].

Hering, 1941: 145 [distribution, note].

Hardy, 1968: 138 [lectotype designation].

Diagnosis This species is distinguished by the apical crescent which extends below the M_{1+2} vein by the width of only a large spot. In the similar species E. rhinophora, the apical crescent ends at the M_{1+2} vein. The costa bears a large R_1 area which extends nearly half way to the end of R_{2+3} and bears 2-4 well marked spots between the R_1 area and the apical crescent.

The male has a short but very broad phallic apodeme. The aculeus of the female has a short point and the lateral edges are rounded, not distinctly angled as in E. rhinophora.

Discussion Hering (1937) stated that E. rhinophora could be distinguished from E. distincta by the marginal spots along the costa, Cu_1 , and $2M_2$ cells. Schiner (1868) described the costa between the end of R_1 and the apical crescent as having four clearly defined spots. In Hering's description of E. rhinophora he gives the number of spots as 4-5 instead of 3 [as found in E. distincta]. He also described E. rhinophora as having the inner margin of the apical crescent nearly straight. I find these characters variable in E. rhinophora and of no use in separating these two species.

The specimen Schiner (1868) described from South America had the apical crescent crossing the M_{1+2} vein, he stated: "dieser Spitzenfleck beginnt genau an der Mündung der Radialader und endet an der Discoidalader, unter derselben schliesst sich ein kleines, glashelles Fleckchen unmittelbar an". This character was ignored by Hendel (1914b) when he illustrated the wing of E. distincta as the apical crescent clearly ends at the M_{1+2} vein in his illustration. The differences in the male and female genitalia mentioned above, the locality and the shape of the apical crescent are the only satisfactory characters observed which can separate these species. Specimens from both Venezuela and Costa Rica will fit

the description of E. rhinophora but only the two specimens I have from Brazil will fit Schiner's description of E. distincta.

Hardy (1968) also ignored the shape of the apical crescent in his selection of a lectotype for E. distincta from among the material in the Naturhistorisches Museum in Wien. The lectotype designated by Hardy is a specimen from Venezuela; however, Schiner described E. distincta from material collected during the Reise der Novara expedition. The specimens collected from South America during the Reise der Novara 1857-1859 were collected during a 26 day stay (August 5-31, 1857) at Rio de Janeiro, Brazil and a 24 day stay (April 17-May 11, 1859) at Valparasio, Chile (Scherzer, 1862-1865). Since Eutreta has never been reported from Chile, Schiner's Eutreta must have been collected in Brazil. Schiner, therefore, probably never saw the specimen from Venezuela collected in 1864. According to the rules of nomenclature (Article 74a of the Code) a lectotype must be designated from a syntype. Hardy found an additional specimen in the collection labeled "Rio Grande do Sul, Stieglmayr". This specimen was probably added later since Stieglmayr did his collecting during 1899 to 1907 (Horn & Kahle, 1936). Evidently syntypes no longer exist and the designation is in error.

Redescription Medium to large species. Body dark brown. Head with frons nearly parallel, approximately half of head width. Oral margin strongly produced anteriorly, face

strongly concave. Facial spots black, oblong with the long axis tilted about 45° from perpendicular. Orbital-antennal spots large, semicircular and black. Postocular spot variable, not well defined. Oral-genal area brown to reddish-brown. Frons with stout pale yellow setae, bristles brown to dark brown. First antennal segment with pale yellow setae; second segment with setae dark dorsally and pale yellow ventrally; third segment with pubescence yellowish. Setae of palps short, black, stout. Genal bristle black, gular bristle pale yellow. Postgena lighter than face and gena, yellowish-brown; bearing black and pale yellow setae ventrally near oral margin; other setae pale yellow. Three to four pale yellow postocular setae each separated by 2-4 shorter black setae. Palps broad, rounded apically and slightly darker brown. Eyes oblique, width 61% of length. Occiput and upper postgena reddish-brown to grayish-brown.

Thorax reddish-brown to grayish-brown. Pale yellow, stout setae on the notum, mesopleuron, pteropleuron and near upper sternopleural bristle. Lower humeral and upper mesopleural setal line 3-4 rows deep. Postscutellum very dark brown. Upper squamae grayish-brown, lower squamae whitish. Notum tending toward gray, bearing 3 longitudinal strips, indistinct in some specimens.

Legs with femur and tibia color of thorax, tarsus slightly lighter. Forefemur with large pale yellow setae

ventrally and dorsolaterally.

Wings (Fig. 161) dark brown. Apical crescent beginning before end of R_{2+3} and extending below the M_{1+2} vein by the width of a wing spot. Costa broadly marked from before end of R_1 to 1/2 distance to R_{2+3} . Costa bearing 3-4 spots before stigma, 2 spots in stigma, and 2-4 spots between R_1 area and apical crescent. Posterior margin with 5-8 spots in 2A, 2-3 in Cu_1 and 2-3 in $2M_2$ cells. Hyaline spots of wing tending to form rows; 5 rows of spots sometimes incomplete in cells R_3 , R, and R_5 . Number of spots in cells variable, approximately 15 in 2d C, 5 in stigma, numerous small spots in R_1 and 74 in $1M_2$. Cells Cu_1 and 2d A with several larger spots.

Abdomen color of thorax except for darker brown areas anteriomedially on each segment. Pleural membrane dark grayish-brown.

Male genitalia (Figs. 86, 103, 136, 148, 161) with epandrium laterally expanded; color of tergites. Dorsal lobe similar to E. rhinophora, hook not well developed. Setae of surstylus medium length, 10-13 dorsolaterally in a line beyond level of prensisetae. Outer clasper with 5 setae medial to prensisetae and 3 apically. Prensisetae short, stout, oval in cross section. Phallic apodeme as broad as long. Ejaculatory apodeme wide at base, 1/3 width of the blade.

Female genitalia (Figs. 19, 42, 65) similar to E. rhinophora. Oviscape darker in basal half. Aculeus point

long, 0.26 mm, bearing a small bulge near tip; blade angle narrow, bearing approximately 24 fine serrations. Inversion membrane with short conical setae. Spermathacal length 3 times width, widest near middle; spicules broad and rounded apically, crowded, especially near middle.

Type The type is no longer in existence. The designation of a type for this species would be better served if such a designation awaited a more thorough study of the Brazilian Eutreta.

Material examined 1m, Rio Grande do Sul, Brazil, Stieglmayr (NMW). 1f, Rio Grande do Sul, Brazil (NMW)

Distribution This species is known only from Brazil. The records of its occurrence elsewhere probably should be credited to E. rhinophora.

Biology Nothing is known of the biology except that the original specimen must have been collected in August of 1857.

Eutreta (Eutreta) frontalis Curran, 1932

Figs. 3, 4, 10, 38, 56, 76, 99, 143, 145, 162.

Eutreta frontalis Curran, 1932: 15-17 [key, description].

Foote, 1965a: 661 [catalog, description].

Stoltzfus, 1966: 63-67 plus figures [larval description, life history].

Novak et al., 1967: 147 [host list].

Wasbauer, 1972: 12, 116 [host list].

Diagnosis This species can be identified by the shape of the frons. The lateral margins of the frons gradually narrow from the vertex to the antennae rather than suddenly narrowing near the antennae as in E. novaeboracensis. The second antennal segment bears whitish rather than black setae and the orbito-antennal spot is small and indistinct.

Discussion Curran (1932) in his discussion of E. frontalis states that the short hairs on the upper mesopleura are pure white. This character is variable in my specimens.

The genitalia are very similar to E. novaeboracensis, the only difference noted was that the blade angle of the aculeus (Fig. 56) in the female is less than in E. novae-boracensis.

Type Holotype: female, valley of Black Mountains, North Carolina, August 5, 1906, W. Beutenmuller, American Museum of Natural History.

Material examined Holotype. CONNECTICUT 1m, Fairfield, IX-28-1968, R. F. Wilkey (CEA). GEORGIA 1m, Townes & White Co., Blue Mt., VII-24-1932, H. R. Dodge (WSU). ILLINOIS 1m, Belfrage (NR). IOWA 1m, Devils Backbone, VII-17-1926, (CU). 1m, Fayette Co., Brush Creek Canyon St. Pk.,

VIII-18-1969, C. A. Toft (ISU). MANITOBA 1m, (Paratype) Britle. VIII-13-1928, R. D. Bird (AMNH). MICHIGAN 1m, Cheboygan Co., VII-10-1941, C. Hubbs (UMI). R. R. Dreisbach (UMI): 1m, Alger Co., IX-1-1946; 1m, Keweenaw Co., VIII-22-1959; 1m, Cheboygan Co., VIII-8-1945; 1m, Emmett Co., VIII-14-1943; 1f, Saginaw Co., VII-2-1947. 1f, 117 Thumb Lake, Charlevoix Co., VII-19-23, T. H. Hubbell. 1f, 2 mi. w. Carp Lake, Emmet Co., VIII-6-1958 (UMI). 1m, E. Lansing, VIII-15-1948 (USNM). 1m, Washtenaw Co., Ann Arbor, VIII-14-1927, N. K. Bigelow (UMI). MINNESOTA 1f, Plummer, IX-17-1931, D. Denning (UMN). 1f, Lake Itasca, VIII-14-1914 (UMN). 1m, Lake Itasca, VIII-10-1914 (OSU). 1m, Plummer, IX-8-1931, D. G. Denning (UMN). NEW HAMPSHIRE 1f, Durham, VIII-22-1956, W. J. Morse (UNH). NEW YORK 1m, 1f, Coppertown, VIII-17-1971, L. L. Pechuman (CU). 1m, Oswego, VIII-1-1891 (CU). L. Sebago, Bear Mt. Pk., H. K. Townes (FSCA): 1m, VIII-8-1936; 1m, VIII-9-1936. 1m, Saranac Lake, VIII-26-1916 (CU). 1m, (Paratype) Crugers, VII-3-1912 (FSCA). 1f, Sta. Study Insects Tuxedo, VIII-20-1928, C. H. Curran (AMNH). 1m, Putnam Co., VIII-20-1963, leg. L. J. Bayer (UWI). 1m, Washtenaw Co., Ann Arbor, VIII-14-1927, N. K. Bigelow (FSCA). Poughkeepsie, K. N. Townes (FSCA): 1m, VII-22-1963; 1m, VIII-2-1936. 1f, Poughkeepsie, VII-19-1936 (CU). NORTH DAKOTA 1f, Turtle Mt., VIII-4-1920, T. H. Hubbell, 117 (MCZ). NORTH CAROLINA N. Banks (MCZ): 1m, Black Mts., Mt. Mitchell, IX-5-1930, 5,000-6,711 feet; 1m, Blowing Rock to Linville, IX-5-1930, 3,000-4,000 feet; 1m, Smoky Mts., Newfound Gap, IX-1-1930, 5,000-52,000 feet; 1f, Andrews, VIII-25-1930, 1,800 feet; 1f, Balsam Mt., Balsam Gap, VIII-23-1930, 3,315 feet; 1f, Smoky Mts., Willets, VIII-25-1930, 2,000 feet. 1m, (Paratype) Black Mts., June (FSCA). 1m (ANSP). OHIO 4.5 mi. e., Kent: 1, VI-19-1967, J. Novak (FSCA); 1f, VIII-14-1967, D. Treka (KSU); 1m, IX-15-1966, R. Miller (KSU); 1, VIII-10-1964, W. B. Stoltzfus (KSU). 11 mi. w., Kent, G. Piper (KSU): 1f, VIII-6-1967; 1m, VIII-22-1967. 1m, R. M. Miller, Kent (KSU). 1m, 3 mi. e., Kent, emerg., VII-12-1965, Aster simplex (6513) W. B. Stoltzfus (KSU). 1f, 3 mi. w., Wadsworth, emerg., VI-10-1965, Aster simplex, W. B. Stoltzfus (ISU). 1f, 3 mi. w., Wadsworth VIII-20-1965, W. B. Stoltzfus (ISU). PENNSYLVANIA Hazeltown, Dr. Dietz Coll.: 1f, (Paratype), VIII-27-1909; 1f, VIII-27-1909 (AMNH); 1m, VIII-16-1909 (ANSP). 1m, Westmor Co., July (CM). 1m (Paratype), Lackawaxen, VIII-22-1908, J. L. Zabriskie (FSCA). QUEBEC 1m, 1f, Joliette, VII-20-1928, J. Quillet (UMT). 1f, Montreal, VIII-10 (UMT). 1, Ile Jesus, VIII-11-1933 (UMT). TENNESSEE 1f, Smoky Mts., IX-1-1933, C. L. Fluke (UWI).

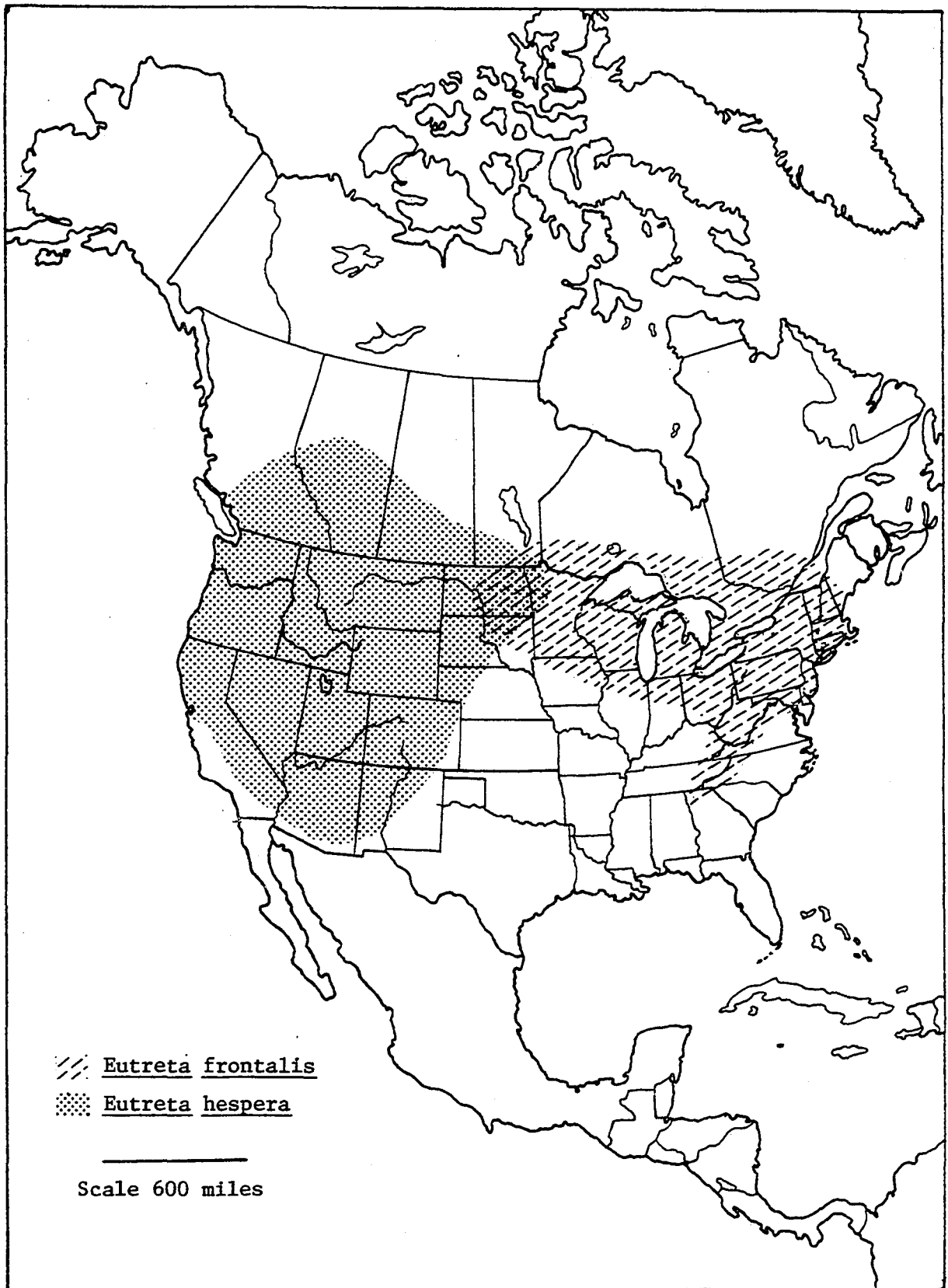
Distribution Eutreta frontalis (Map 2) occurs from southeastern Canada to northern Georgia and west to eastern Iowa and North Dakota.

Biology Adults begin emerging in early July. Peak populations occur in early August and adults have been taken from July 2 to September 28. Emergence usually occurred before noon in the laboratory.

Adults are usually found on the underside of leaves near the top of the host plant or on the stems, with the body oriented head downward. They are usually found in damp thickets and shaded areas along streams or low lying areas. Although the host plant was observed in open areas around such habitats, adults were never collected from them.

Courtship behavior Unlike E. novaeboracensis, E. frontalis was observed to mate in the laboratory. Mating behavior was similar to mating behavior observed in the field for E. novaeboracensis except that no froth mass was observed. The male, which is normally on the host plant, exhibits courtship behavior as the female comes into the vicinity. The male extends one wing perpendicular to its body with maximum amount of wing surface exposed to the view of the female, slowly withdraws it, then extends the opposite wing in the same manner. A complete cycle of wing motions may require several seconds. Interspersed with the wing movement are quick bobbing and sideway motions with the whole body. These

Map 2. North America. Distribution of Eutreta frontalis
and E. hespera



latter motions occur when the female is still more than several inches away. As the female approaches the male, his wing and body motions are less extreme. The pair face each other prior to copulation but the entire sequence leading up to copulation was not observed. Mating behavior occurred in the early evening in a gallon jar provided with several young plants of Aster simplex.

Host E. frontalis was found most frequently on Aster simplex. It has also been reared from Aster laevis.

The eggs were laid either in shoots developing at the apices of rhizomes or in shoots developing from the crown of last year's plant. They were inserted through the outer leaves of the shoot near the meristematic tissue of the stem.

A crown gall formed (Stoltzfus, 1966) as the larva developed. No stunting of infested plants was observed in the fall of the year but in the spring as the larvae matured rapidly the stems of infested plants were sometimes severely stunted, resulting in lack of flowering.

Galls were first noticed in October when the larvae were in the second instar. By June 15 of the following year the larvae were fully grown. The first puparium was taken June 17 in northeastern Ohio.

The galls form at ground level and are nearly round. They range in size from 7 to 11 mm. The larval cavity in the gall is only slightly larger than the larva. Pupariation

occurs within the gall. In one case however, where the gall was broken open, the larva moved out of the gall and pupated in the soil.

In one locality 11 of 100 plants of Aster simplex were infested by E. frontalis. A. laevis appears to sustain less infestation. Only one gall was found on 200 plants examined near Ravenna, Ohio.

Parasites A high rate of parasitism has been noted involving a pteromalid wasp. Of 22 galls examined for parasites, 13 were parasitized.

Eutreta (Eutreta) frosti Hering, 1938

Figs. 1, 163.

Eutreta frosti Hering, 1938: 401, Fig. 12 [wing], 415-416 [description].

Aczel, 1949: 264 [catalog, distribution].

Foote, 1967a: 57.25 [catalog, distribution].

Diagnosis This species is similar to E. simplex which also lacks facial spots. It can be distinguished by the tinge of violet found on the face, postgena, pleuron and coxae. The hyaline spots of the wings (Fig. 163) are smaller in E. frosti, the R_1 area is more prominently marked, the costa beyond the R_1 area has marginal spots and the apical crescent is much broader.

Discussion This distinctive species is known only from the male and female types. The allotype has the same data as the type. Since both specimens were labeled types, the female is here designated as the lectotype.

Type Lectotype: female, Banos, Ecuador, S.A., II-20-1937, S. W. Frost (British Museum Natural History).

Biology Nothing has been reported concerning the biology of this species.

Eutreta (Eutreta) hespera Banks, 1926

Figs. 15, 43, 58, 85, 98, 121, 124, 146, 164.

Eutreta angusta Banks, 1926: 44 [description, key].

Foot & Blanc, 1963: 29-30 [distribution, collection record, key], 110 Fig. 35 [wing].

Foot, 1965a: 661 [catalog].

Cole, 1969: 354-355 [distribution, note].

Diagnosis E. hespera can be distinguished by the hyaline wing spots which tend to fuse centrally in the basal part of the wing (Fig. 164), especially in the anal cell, and by the two large marginal spots between the humeral vein and the end of the subcosta. The apical crescent is narrower and the unpunctated brown band is wider than in E. angusta. The blade angle of the ovipositor (Fig. 58) is narrower and the

serrations of the lateral edges extend farther toward the apex. E. hespera can be distinguished from E. frontalis by the narrower wings and the nearly parallel lateral margins of the frons.

Discussion This species has been confused with E. angusta and E. novaeboracensis. It is generally larger than E. angusta. The spots on the wings are generally larger than either E. angusta or E. sparsa. The amount of fusion of the hyaline spots in the central part of the wing is quite variable, with some specimens having only a few coalesced spots. E. hespera is generally more reddish than E. angusta.

Type Lectotype: male, Type 15670, Manitou, Colorado, Osten Sacken Coll., Museum of Comparative Zoology.

Material examined Lectotype. ALBERTA Calgary, G. Salt (NR): 1m, VIII-21-1924; 1f, VIII-24-1924; 1f, VIII-5-1924; 1m, VIII-28-1925. 2m, Clymont, IX-1-1947, E. H. Strickland (UA). 1m, Wainwright, 1937, A. M. Eriksson (UA). 1m, Edmonton, VI-18-1920 (UMI). ARIZONA 1m, Ram, Canyon, Huachuca Mts., X-30-1937, Oman (USNM). BRITISH COLUMBIA 1m, Okanagan Lake, Shorts Point, VI-28-1902, Miss Ricardo, 1902-330 (BM). CALIFORNIA 1f, Inyo Co., White Mts., Silver Canyon, IX-10-1919, 6,000 feet, R. & H. (ANSP). 1m, Burlingame, VII-10-1909, J. A. Kusche (MCZ). 1m, Boca, Nev. Co., VII-5-1954 (USNM). 1m, San Bernadino, Bear Valley, VIII-13-1933, wet meadow at golf course, Timberlake (UCR). 1f, Crystal Lake, VII-22-1931 (FSCA). COLORADO 1m, Oslar, Silverton (ANSP). 2m, 2f, Ft. Garland, Ute Creek, VII-25-1969, L. L. Pechuman (CU). 1m, 1f, Vir. Dale, VII-24-1899 (CU). 1f, Capitol City, Hinsdale Co., VII-25-1936 (AMNH). 1m, Gothic, Gunnison Co., VIII-18-1971, C. L. Reming (UCT). 1f, Hendel (VM). 1m, 1f, 2253, J. M. Aldrich Coll., D. F. Baker (USNM). 1m, 6 mi. e., Castle Rock, VII-10-1972, W. B. Stoltzfus (ISU). IDAHO 1f, Cub River, VIII-1953, G. F. Knowlton (USU). MINNESOTA 1m, St. Anthony Park, Powder Plant,

VII-9-1921, E. Hoffmann (UMN). MONTANA 1m, Gallatin Val., VII-10-1903 (MSU). NEBRASKA 2m, Monroe Canon, Sioux Co., VIII-6-1908 (ISU). 1m, Glen Sioux Co., VIII-17-1906, 4,000 feet, H. S. Smith (ISU). NEVADA 1m, Douglas Co., Carson R. Valley, Scossa Ranch, IX-1-1967, T. W. Davies (UCT). NEW MEXICO 1m, Jemez Springs, IV-21-1914, J. Westgate (USU). 1m, White Mts., VIII-4, 10,000 feet, grassy slope, Townsend (USNM). SOUTH DAKOTA 1m, Custer, VII-22-1924, reared from root galls on goldenrod (SDU). 1f, North Cave Hills, Harding Co., VIII-6-1969, E. U. Balsbaugh, Jr. (SDU). UTAH 1m, 1f, Jensen, IX-3-1937, grass sweeping, G. F. Knowlton & F. C. Harmston (USU). 1f, Providence, IV-30-1948, W. J. Hanson (USU). 1f, Logan Canyon, VIII-11-1938, D. E. Hardy & G. S. Stains (USU). Wellington, IX-1915, C. W. Johnson: 1m, (MCZ); 1m, (CU).

Distribution (Map 2). E. hespera occurs from British Columbia and central Alberta east Manitoba and south to southern New Mexico and California. It has been collected along streams at low elevations in Colorado and California and at 10,000 feet from a grassy slope in New Mexico.

Seasonal distribution This species has been collected as early as April 21 in New Mexico and as late as October in Arizona. Most specimens were taken in July and August. The long seasonal occurrence suggests that two generations occur, at least in the southern part of its range.

Host The only host information is for a male reared from root galls on goldenrod near Custer, South Dakota.

Eutreta (Eutreta) intermedia New Species

Figs. 18, 51, 53, 97, 126, 142, 155, 165.

Diagnosis E. intermedia can be distinguished from other species by the lack of facial spots and the brown face, frons and antennae. It differs from all other Eutreta in the short strong black bristles of the proctiger, the 5-6 short setae apically on the surstylus and the narrow blade and short point of the aculeus.

Description Body dark brown, medium sized species, bristles long and shining black.

Head with frons wider than long, lateral margins narrowing anteriorly. Face without spots, bearing a pair of longitudinal grooves from antennae to oral margin. Whitish pollinosity on face, anterio-dorsal margins of eye and anterior to ocellar triangle. Reddish bands from lunule to vertex. Lunule with an indistinct band of whitish pollinosity between antennae. Reddish markings on oral-genal area and medially on oral margin of face extending dorsally but not reaching the antennae. Gena and lower postgena light brown. Upper postgena and occiput darker brown. Postgenal setae mostly whitish. Three to four postocular whitish setae, 9-12 shorter black setae. Orbito-antennal spot black.

Thorax dark brown. No humeral-notopleural brown band evident. Notum with scattered short whitish setae. Lower

humerus, upper mesopleuron with a single row of whitish setae; row irregular on upper mesopleuron. Mesopleuron with scattered whitish setae. Lower squamae whitish, upper squamae grayish-brown. Propleuron and lower half of humerus light brown. Postscutellum and sternopleuron dark brown.

Leg with femora color of sternopleuron except forefemur which has a darker streak laterally. Tibiae brown, tarsi light brown. Forefemur with bristles longer than leg width, no lateral whitish setae present.

Wings (Fig. 165) very dark brown. Spots generally not in rows, spots separated and of medium size. Costal spots variable, 1-4 before stigma, wedge-shaped yellowish area at end of R_1 , 0-2 spots beyond R_1 . Apical crescent extends from before R_{2+3} to width of R_5 cell below M_{1+2} , sometimes extending as a narrow, yellowish band halfway to stigma. Spots in cells as follows: R 10-14, R_5 13-18, $1M_2$ 19-23 and 1st M_2 20-23. Marginal spots in 2d M_2 1-2, Cu_1 3 and in 2d A 6-8. Wings narrower than in E. novaeboracensis, 2d C with length 5 times width, stigma length nearly 3 times width.

Abdomen dark brown, bristles black, setae black or white. T5 of male bearing many bristles along posterior margin, length of posterior inflection 1/5 of length laterally.

Male genitalia (Figs. 97, 126, 142, 155) with epandrium dark brown, enlarged laterally then suddenly reduced in size; bearing numerous small setae dorsally. Proctiger small with

several very stout pointed bristles apically. Surstylus with 5-6 small setae along medial aspect, setal length less than width of surstylus. Dorsal lobe small, bearing 3-4 small bristles. Epandrium bearing many bristles lateral to the dorsal lobe. Outer clasper with 9 setae medial to prensisetae, 3 at apex between prensisetae. Prensissetae oblong in cross section. Phallic apodeme long, bar-shaped. Ejaculatory apodeme long and narrow, width of blade 4 times width of shaft.

Female genitalia (Figs. 18, 53) with oviscape dark brown to black near apex and base, lighter in middle. Aculeus blade angle narrow, serrations few but well defined, point short. Aculeus widest near basal $1/3$. Inversion membrane with setae conical, not crowded. Spermatheca long, spicules long, thin, not crowded.

Types Holotype: female. 17 miles north, Atlacomulco, Mexico, VIII-18-1954, 8,600 feet, C. D. Michener & party (University of Kansas). Allotype: Xochimilco, Mexico, VIII-31-1947, H. E. Milliron (University of Minnesota). Paratypes: 1m, 1f, same data as allotype. 1f, Zitacuara, Micho, Mexico, Jan. 12-1941, C. Wingo Collection (University of Missouri).

Distribution This species is known only from Mexico. It has been taken at altitudes of 8,600 feet.

Biology Nothing is known of the biology of this species.

Eutreta (Eutreta) margaritata Hendel, 1914

Fig. 166.

Eutreta margaritata Hendel, 1914b: 54, 56 [key,
description], Pl. 3, Fig. 44 [wing].

Aczel, 1949: 265 [catalog, distribution].

Foote, 1967a: 57.25 [catalog, distribution].

Hardy, 1968: 116 [type designation].

Diagnosis The apical crescent is interrupted in this species along the R_{4+5} and M_{1+2} veins. The costa has many light colored area similar to E. xanthochaeta.

Discussion This species was not studied as only one specimen is known and it could not be borrowed. Dr. Ruth Lichtenberg graciously made drawings of the head and described the wing spot pattern for me.

The species appears to be allied to E. xanthochaeta. The illustration of the wing (Fig. 166) is sufficient to identify it. The oral margin is moderately produced and the palps are narrow as in E. xanthochaeta.

Type Holotype: male, Orizaba, Mexico, Bilimek (Naturhistorische Museum, Wien).

Biology Nothing is known concerning the biology of this species.

Eutreta (Eutreta) mexicana New Species

Figs. 95, 120, 167.

Diagnosis E. mexicana is a nearly black species. The apical crescent is narrow and does not reach anteriorly to the R_{2+3} vein. The postgena is very dark brown except for an oblique whitish band arising on the oral-genal margin. It is most like E. intermedia, from which it can be distinguished by the facial spots and shape of the apical crescent.

Description Body dark brown to black, medium size species. Head with orbito-antennal spot black. Facial spots large, black, with indistinct edges. Face with grayish-yellow pollinosity in ground color, blackish areas arising from oral margin medially and laterally. Lateral black areas on head extending from oral margin dorsally across gena to lower margin of eye. Posterior to this band is a whitish-yellow band extending from oral margin across gena and postgena. Occiput and remainder of postgena below and above whitish-yellow band are dark brown to black. Gular bristle black, postgenal setae mostly black. Six postocular whitish setae with interspersed smaller black setae. Palps, labrum, clypeus and proboscis dark brown to black.

Thorax uniformly brownish-black. Bristles black, notal setae small, mostly white except for a small group of black setae medial to humerus. A single to double row of white setae along lower humerus and upper mesopleuron. Squamae

color of thorax. Halteres yellow except capitellum dark brown.

Abdomen brownish-black, setae white mixed with black.

Pleural membrane black.

Legs with femur and upper tibia color of thorax. Lower tibia and tarsae yellow. Several white setae ventrolaterally on forefemur, other femoral bristles and setae black.

Wing (Fig. 167) brownish-black; whitish spots small, tending to form rows. Apical whitish crescent very small, extending only half the width of R_5 cell below M_{1+2} , and anteriorly only half way between R_{4+5} and R_{2+3} . Inner margin of crescent nearly perpendicular to longitudinal veins. Sub-apical brown band wide, 3 times width of crescent. Costal margin with 2 spots before stigma, a spot at end of R_1 , 4-5 faint spots between R_1 and apical crescent. Posterior margin with 3 spots before $Cu_2 + A_2$, 1 spot each in Cu_1 and 2d M_2 cells.

Male genitalia (Figs. 95, 120) with epandrium color of abdomen. Dorsal lobe without a hook medially, lobe larger apically. Surstylus short, broadly truncate, bearing 7 bristles on truncate margin. Bristles slightly longer than width of surstylus. Outer clasper bearing 4 setae medial to pensisetæ and 3 near apex. Phallic apodeme bar-shaped. Ejaculatory apodeme short, strongly one-sided.

Holotype Male: Mexico, Desierto le Los Leones,
July 1965, N. H. L. Krauss (United States National Museum).
Known only from the type specimen.

Biology Nothing is known of the biology of this
species.

Eutreta (Eutreta) novaeboracensis New Combination
Figs. 16, 41, 64, 83, 116, 168.

Acinia novaeboracensis Fitch, 1856: 67 [description].

Trypeta sparsa; Loew, 1862: 63 [key], 78 [redescription].

Eutreta sparsa; Loew, 1873: 274-276, Tab. 10 Fig. 13
[wing], 337 [taxonomy].

Thompson, 1907: 71-74 [biology], Fig. 2 [gall].

Phillips, 1923: 140-141 [key, biology,
distribution].

Johnson, 1925: 263 [host record].

Curran, 1932: 15-17 [key].

Felt, 1940: 322 [key to galls].

Proctor, 1946: 218 [host record].

Foote, 1965a: 661-662 [catalog].

Stoltzfus & Foote, 1965: 263-264 [courtship and
mating].

Wasbauer, 1972: 82, 85, 117 [host record].

Diagnosis E. novaeboracensis occurs in northeastern United States. The absence of hyaline spots along the costa except at the end of R_1 and the apical crescent separate it from the western U. S. species of the subgenus Eutreta. It can be separated from E. frontalis by the nearly parallel margins of the frons (Table 5) which in E. novaeboracensis suddenly narrows only near the antennae. In E. frontalis the lateral margins of the frons converge for the entire length of the frons. The hyaline spots in the first anal and M cells are usually confluent in E. frontalis, but in E. novaeboracensis they are separated. The orbito-antennal spot in E. frontalis is small and light brown, whereas in E. novaeboracensis it is larger and darker.

E. novaeboracensis can be satisfactorily separated from the somewhat smaller E. caliptera only by features of the genitalia. In E. novaeboracensis the aculeus angle is greater (Table 5) and the spermatheca is longer. In the male the bristles of the surstylus are longer and arise nearer the apex. The dorsal lobe is shorter and broader and has a more distinct point. In E. caliptera the surstylus has one or two setae near the middle of the inner aspect and only 6-8 setae compared to 7-10 in E. novaeboracensis. In E. novaeboracensis the phallic apodeme is triangular at the apex and the ejaculatory apodeme is shorter and broader while in E. caliptera the phallic apodeme is bar-shaped at the apex and

the ejaculatory apodeme has a longer shaft and narrower blade.

Most specimens can be separated on the basis of size and wing patterns. E. caliptera has only a small whitish area at the end of R_1 but E. novaeboracensis often has a wedge-shaped, whitish area with a point extending toward the r-m vein. E. novaeboracensis is larger, generally lighter and more reddish in color and with generally larger hyaline spots. Both species may have the costa marked once or rarely twice before the stigma. E. pacifica has the costa marked several times before the stigma and also distad of the hyaline area at the end of R_1 .

The row of setae on the humerus and across the upper mesopleuron varies from salmon-tinged to white in material reared from the same locality and host. It therefore cannot be depended upon as a character to differentiate E. novaeboracensis from E. frontalis as suggested by Curran (1932, p. 17).

Discussion There are two Eutreta species occurring in eastern United States that were commonly identified as E. sparsa (see discussion of E. sparsa). Since E. sparsa has been found to occur only in South America, E. caliptera and E. novaeboracensis can no longer be synonyms of that species. E. caliptera was first named and is therefore a valid name for a species described by Say from Indiana. E. novaeboracensis

appears to also be a valid name for the other eastern United States species. The description by Fitch fits either species except E. caliptera is apparently quite rare in New York, being known only from the southern part of the state; whereas, Fitch reports E. novaeboracensis as common. The size of Say's type is only 5.5 mm. while Fitch reported his species to be 0.35 inch. The general color of the thorax is reported by Say to be dull brown while Fitch reports more of the yellowish-brown for E. novaeboracensis.

The type material of neither species is extant. Due to the loss of all type material I designate a neotype for this species.

Type Neotype: New York, Tompkins Co., Sixmile Creek above Ithaca Reservoir, 0.2 mi. nw. Burns Road, IX-3-1969, elevation 710 feet, taken sweeping, Karl Valley (Cornell University).

Redescription Body brown to dark brown, medium sized species. Head with frons nearly parallel, approximately half of head width. Oral margin moderately produced anteriorly. Facial spots round to bar-shaped, dark brown to black, situated below midline of face. Oral-genal area dark brown to reddish. Orbito-antennal spot dark brown, bar-shaped. Lunule, pedicel and scape sometimes marked with reddish-brown. Postgena bulging, set off dorsally by dark brown postocular

streak which soon fades dorso-medially. Proboscis and antennae yellowish-brown. Three pairs of black lower fronto-orbital bristles, posterior upper fronto-orbital bristle pale yellow, anterior fronto-orbital bristle black. Frons with short pale yellowish-white setae. Gular bristle black or pale yellow. Postgenal setae pale yellow dorsally, mostly black to dark brown ventrally; 3-5 postocular pale yellow setae separated by one or more shorter black setae. Palps with black setae anterioventrally, whitish setae basad of black setae. Palps darker brown apically. Eyes with 4-5 greenish, horizontal bars in fresh specimens.

Thorax with a humeral-notopleural brown band bounded dorsally by pale yellow setae of notum and ventrally by a row (3-4 deep) of short, salmon-tinged to whitish setae on lower humerus and upper edge of mesopleuron. Dorsum with three brown longitudinal stripes sometimes evident; bearing numerous short decumbent whitish to pale yellow setae. Pteropleuron with one black bristle and 3-7 whitish setae; mesopleuron with 1-5 black bristles and scattered, short, whitish setae; upper sternopleuron with one black bristle, several whitish setae dorsally and numerous scattered short black setae. Setae increasing in size ventrally. Postscutellum and mediotergite brown, sometimes dark brown. Upper squamae slightly darker than whitish lower squamae. Lower squamae with a medial lobe.

Abdomen brown, tergites with lateral areas of dark brown to black, fifth tergite of male often entirely darkened except for median light brown vitta. Setae scattered, short, decumbent, mixed black and white. Male with T5 bearing 5-9 pairs of marginal bristles; S5 with posterior margin concave, length at center $\frac{3}{5}$ of length at lateral margins. T6 of female usually bearing 4-5 pairs of marginal bristles.

Wing (Fig. 168) dark brown, hyaline spots tending to form rows, R_1 cell with 3 rows of spots; R_3 , R, $1M_2$, and 2d A with 4 rows each; R_5 and Cu_1 with 5 rows each; some rows indistinct or incomplete. Apical whitish crescent extending from before R_{2+3} to width of R_5 cell below M_{1+2} vein. A triangular whitish area at end of R_1 , otherwise costa not marked from base of wing to whitish area, or marked but once. Dark band from stigma to r-m vein, with at least 2 spots before R_{2+3} . Posterior wing margin beyond Cu_2+2d A vein usually with 1-5 spots; 6-9 marginal or submarginal spots in 2d A cell. 1A and M cells usually with few or no confluent spots. Unpunctated dark area along apical crescent wider than whitish crescent. Stigma length 3 times width; cell 2d C with length 3.5 times width.

Legs brown, with bristles and setae mostly dark brown to black. Anterior femur frequently with fuscous streak ventrolaterally, a row of black bristles ventrally and two rows dorsolaterally. Pale yellow setae present along ventral row

of bristles in some specimens. Midfemur with small black bristles proximoventrally. Hindfemur with 2-4 small bristles dorso-apically.

Male genitalia (Figs. 83, 116) with epandrium brown to dark brown; bearing a broad, short, curved, blade-like dorsal lobe which is hooked medially and many black setae laterally. Surstylus truncate at apex, with 7-9 long setae apically. Prensisetae black, nearly round in cross section. Outer clasper with three setae apically between prensisetae and 5 setae medial to prensisetae. Phallic apodeme with a triangular lobe apically; ejaculatory apodeme nearly bilaterally symmetrical, width of blade 4-5 times shaft width.

Female genitalia (Figs. 16, 41, 64) with oviscape brown, darker near apex, sometimes also near base. Oviscape nearly as long (1.8 mm) as preceding 3 tergites. Inversion membrane with small conical setae; setae not crowded. Aculeus blade angle wide (Table 5) with fine serrations along angled margins; bearing two minute preapical setae. Spermatheca tubular, length 6 times width, widest $2/5$ distance from base, spicules long, narrow, not crowded.

Material examined 349 males, 331 females including the following specimens. CANADA 2m, Osten Sacken. CONNECTICUT 9 specimens. ILLINOIS 2f, Belfrage (NR). 2m, 2f, Oregon, VII-19-1927, T. H. F. and R. G., on bushes (INHS). 1f, Homer Park, VI-30-1925, T. H. Frison (INHS). INDIANA 1m, LaFayette, VII-14-1915 (USNM). 1m, 2f, Needmore, VIII-20-1961, J. C. Schaffner (ISU). 1f, Needmore, VII-23-1961, J. C. Schaffner (ISU). IOWA 113 specimens. MANITOBA 1m,

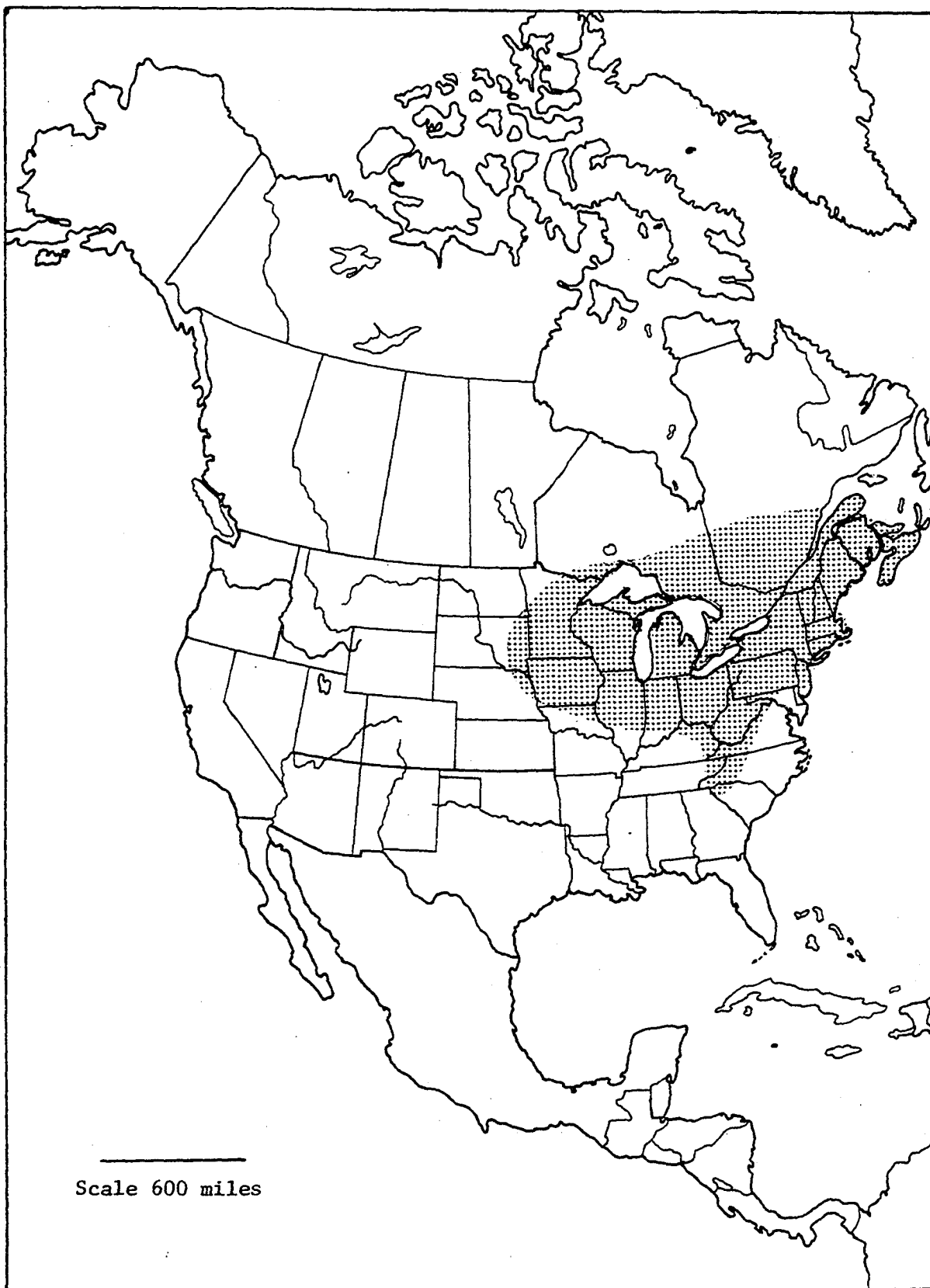
Osten Sacken (MCZ). MAINE 7 specimens. MASSACHUSETTS 30 specimens. MICHIGAN 42 specimens. MINNESOTA 30 specimens. NORTH CAROLINA 1f, 3m sw., Cashiers, Jackson Co., 3503.9'N, 8307.4'W, VI-23-1958, 2,700 feet, J. L. Laffoon (ISU). 1f, Nantahala Gorge, 2,000 feet, VIII-25-1930, Carpenter (ISU). NORTH DAKOTA 1f, Trail Co., VIII-4-1923, A. A. Nichol (ISU). NEW HAMPSHIRE 15 specimens. NEW JERSEY 8 specimens. NOVA SCOTIA 4 specimens. NEW YORK 127 specimens. NORTH AMERICA 1f, Brunetti coll. (BM). OHIO 51 specimens, including the following reared specimens. 1 mi. sw., Wadsworth, W. B. Stoltzfus, Solidago altissima (ISU): 1m, emerged VI-27-1965, note 6518; 1f, emerged VIII-4-1965, note 6518; 1f, emerged VI-23-1965, note 6518. ONTARIO 9 specimens. QUEBEC 35 specimens. RHODE ISLAND Westerly, M. Chapman (FSCA): 1f, VIII-7-1936; 1m, VIII-27-1936. SOUTH DAKOTA 1m, Brookings, VII-25-1891 (USNM). TENNESSEE 1m, 1f, Smoky Mt. Road to Newfound Gap, IX-2-1930, 3,500 feet, N. Banks (MCZ). VERMONT 8 specimens. WEST VIRGINIA 1f, Richmond, VII-4-1951, H. V. Weems, Jr., on Hydrangea arborescens (USNM). 1f, Cheat Mts., June, H. H. Smith (CM). 1f, Spring pool w. of Athens, VII-15-1930, J. G. Needham (CU). PENNSYLVANIA 38 specimens. WISCONSIN 18 specimens.

Distribution Map 3. E. novaeboracensis occurs in northeastern United States east of the 100th meridian, south to the Missouri and Ohio Rivers, and north to the southern part of the Canadian provinces. The range extends further south along the higher elevations of the Appalachian Mountains into Tennessee and North Carolina and probably Georgia.

Two specimens from Tennessee were taken at 3,500 feet and two specimens from North Carolina were taken at 2,000 and 2,700 feet. I have collected tephritids repeatedly in northeastern Virginia and eastern West Virginia at lower elevations, but have taken no E. novaeboracensis.

The range of the primary host plant, Solidago altissima, is quite similar to the distribution of E. novaeboracensis,

Map 3. North America. Distribution of Eutreta
novaeboracensis



except that it extends to the Gulf of Mexico. The many records from elsewhere likely refer to E. caliptera in southeastern United States, and to various other species in western United States and Mexico.

Host E. novaeboracensis has been reported attacking a variety of plants belonging to at least seven genera. It has also reportedly been reared from various plant parts including stem galls (Painter, 1935), crown galls (Novak et al., 1967), rhizome galls (Thompson, 1907), root galls (Phillips, 1923), bud galls (Felt, 1940) and tunneling in the rhizomes of plants.

An examination of the seasonal distribution of these eastern records reveals that those forming galls above ground (stem galls) emerge 1-2 months before those flies tunneling in rhizomes or forming crown galls. Furthermore the stem gall-formers have a bivoltine life cycle while the rhizome-feeders have a univoltine life cycle. The rhizome-feeding species from Solidago altissima emerge about the first of July in the latitudes of northern Ohio and the stem gall-forming species are found in May and again in late July and August. This allochronic distribution suggests the presence of sibling species.

Wasbauer (1972) lists nine species of host plants for E. sparsa. Of these only two are likely true hosts of E. novaeboracensis. The others probably belong to three other

species of Eutreta. Aster laevis reported by Novak et al. (1967) is a host of E. frontalis, and Helianthus annuus, H. giganteus, and Vernonia altissima are hosts of E. caliptera. The records (Blanton, 1952; Painter, 1935; Felt, 1940) for Chrysanthemum, Vernonia interior and Vernonia sp. respectively, are probably also of E. caliptera as these are all stem galls.

E. pacifica has been reared from Ratibida columnaris and the records of Painter (1935) and Felt (1940) are undoubtedly of this species. The record from Solidago rugosa was an isolated record from many plants examined and probably represents an occasional host of E. novaeboracensis. Thompson (1907) reported E. sparsa from Solidago rhizome galls but was not sure which species of Solidago was involved. He states "which I have not satisfactorily determined, perhaps [it is] S. juncea". I have examined this plant many times but have found no E. novaeboracensis larvae. The record could represent an occasional host, but the description of the infested plant clearly fits infestation of S. altissima. I therefore feel he was probably dealing with this species.

The record by Wasbauer (1972) of Felt (1940) incorrectly cites E. sparsa as attacking Solidago graminifolia. The record should read Solidago sp.

E. novaeboracensis is probably an oligophagous species attacking rhizomes of Solidago altissima and occasionally

attacking one or more species of Solidago. Such a range of larval food follows more closely the typical pattern of the gall-forming Tephritidae.

E. novaeboracensis can usually be found where the host plant S. altissima is found and occurs frequently where a large stand of the host plant exists. S. altissima occurs along streams and ecotonal areas having moist forests or wooded areas.

Courtship The courtship behavior of E. novaeboracensis was discussed by Stoltzfus and Foote (1965). The male employs a mating lure for attracting females. Mating lures have also been reported for Rioxa pornia by Pritchard (1967), for Afrocnerus mundus by Oldroyd (1964) and for Ictericia seriata by Foote (1967b).

Froth masses produced from the proboscis by the male were placed on the upper leaf surface of the host plant. The froth masses are 3 to 7 mm. in height and are generally cone shaped.

During courtship behavior several males and females may be in the same area indicating that a pheromone may be involved in attracting the females. Many tephritid males wait near suitable oviposition sites for the females but E. novaeboracensis females oviposit in rhizomes and therefore need a different attraction to bring them into a suitable site for courtship. The ground area would be unsuitable for courtship

due to predators.

As females come into the visual field of the male, a distance of up to several feet as evidenced by the males reaction, the male becomes excited and displays certain courtship behavior while remaining near the froth mass. The male attracts the female by making quick sideways motions of the body with the wings elevated and slightly spread. A quick bobbing motion with the whole body also occurs. Frequently, the wings are flicked upward or one wing is extended perpendicular to the body exposing maximum surface area of the wing to the female; then it is returned slowly to its normal position and the other wing is extended.

This activity may last a half hour or more and the female may be distracted by predators or interloping males. As the female approaches, the male retreats behind the froth mass. Finally when the female is attracted to feed at the froth mass, the male then walks around behind her and copulation occurs. The pair may remain in copula for several hours.

Competition between males was often observed during courtship. This involved fighting with the male who produced the froth mass or producing nearby froth masses to attract the same female. Three adjacent leaves on the same host plant were observed to have froth masses.

Eutreta (Eutreta) obliqua New Species

Figs. 102, 133, 151, 169.

Diagnosis E. obliqua can be distinguished from other Eutreta by the obliquely slanting inner margin of the apical crescent and the continuation of the crescent along the costa to the stigma as a narrow whitish band. The wing pattern looks somewhat like E. aczeli but lighter area along the costa is broader and yellowish-brown in E. aczeli but narrow are nearly white in E. obliqua.

Discussion This is a closely related species of E. rhinophora and E. distincta. The shape of the head with the oral margin moderately to strongly produced, the thin setae of the abdomen, the shape of the dorsal lobe with the medial hook and the wedge-shaped surstyli show a close relationship to these species.

This species was named for the oblique margin between the apical crescent and the dark brown pattern of the wing.

Description Body grayish-brown. Large species.

Head with lateral margins of frons nearly parallel, bristles dark brown, about 25 pale yellow setae between orbital bristles on frons. First antennal segment with short pale yellow setae, second segment with short black setae dorsally but whitish ventrally, third segment with whitish

pubescence. Face bearing a pair of obliquely oriented bar-shaped spots. Oral margin strongly produced but not as much as in E. rhinophora. Oral-genal area reddish-brown. Genal bristle black, postgena with setae black below, pale yellow above. A yellowish-brown band arising on oral margin of gena extends across lower eye margin and upper postgenal bulge to comb. Postocular spot bar-shaped and distinct. Upper postgena, occiput and lower postgena grayish-brown. Gula long and narrow. Palps broad, length only twice width. Orbito-antennal spot black.

Thorax with dorsum unicolorous, decumbent pale yellow setae only slightly inflated. Humerus and upper mesopleural setal line 2-3 rows deep. Lower humerus yellowish-brown. Pale yellow setae of pleuron scattered, only slightly inflated. Upper sternopleuron with 10 or more pale yellow setae, sternopleuron with size of black setae increasing ventrally to size of bristles. Upper squamae grayish-brown, lower squamae whitish. Halteres yellow with brown capitellum.

Legs brown with forefemur slightly darker brown. Forefemur with pale yellow setae dorsally and laterally.

Wings (Fig. 169) with spots sometimes elongated, mostly in rows, spots larger in posterior half of wing. Costal margin entirely yellowish-brown. Apical crescent arising slightly below M_{1+2} and extending obliquely anteriorly to before R_{2+3} but not quite reaching the costa. Inner margin of

apical crescent nearly straight. A very narrow yellowish band extends along the costa to stigma. Posterior margin with 2 spots in Cu_1 and 2 in $2d\ M_2$ cells. Stigma length about twice width, $2d\ C$ length 4 times width.

Abdomen with setae mostly whitish and thin, some setae dark brown. Posterior 1/3 of each tergite light brown, anterior 2/3 brown to dark brown.

Male genitalia (Figs. 102, 133, 151) color of abdomen. Dorsal lobe of epandrium well developed, bearing a hook medially. Surstylus long and wedge shaped apically, bearing 8-11 long setae at tip. Outer clasper with 3 setae apically, 8-10 medial to prensisetae. Phallic apodeme long and narrow with a lobe at the apex. Ejaculatory apodeme with blade small, 3 times shaft width.

Types Holotype: male, Villa Elvira, W. Colombia, VI-1908, elevation 1,800 meters (British Museum Natural History). Paratypes: 1m, Villa Elvira, W. Colombia, VII-20-1908 (ISU); 1m, Rio Aquacatal, W. Cord., Colombia, 2,000 meters, Fassl Coll. (BM); 1m, Rio Tocola, W. Colombia, VI-10-1908 (BM).

Distribution Known only from the type series from western Colombia. It has been taken at elevations of 2,000 meters.

Biology There is no information concerning the biology of this species.

Eutreta (Eutreta) parasparsa Blanchard, 1965

Figs. 87, 110, 135, 150, 170.

Eutreta parasparsa Blanchard, 1965: 79, unnumbered text-fig. [gall].

Footnote, 1967a: 57.25 [catalog, distribution].

Diagnosis The males are similar to the males of the dimorphic species E. sparsa. They can be distinguished by the 4-5 marginal spots along the costa of the wing beyond the R_1 area and the number of setae apically on the surstylus. E. parasparsa has a wider apical crescent than E. sparsa and the unpunctated subapical brown band is narrower.

Discussion This species was described by Blanchard for what he considered the South American form of E. sparsa. Despite the fact that he considered it conspecific with the species pictured by Hendel (1914b, Fig. 41) there are genitalic differences which indicate it is a separate species.

Blanchard (1965) gave a good species description but did not describe the genitalia, so a description of the male genitalia is included here.

Description Male genitalia (Figs. 87, 110, 135, 150) with epandrium color of abdomen. Surstylus enlarged apically and truncate so that the width of the apex equals the length from base of the prensisetae to apex. About 25 long setae on

surstylus from base of prensisetae to apical margin. Dorsal lobe broad, outer edge rounded. Phallic apodeme long and narrow, slightly lobed apically. Outer clasper with 4 small setae apically, 4-7 medial to prensisetae.

Type Cotypes: 4 males, Tafi Viego, Tucuman, Argentina, IV-9-1963, (Instituto Miguel Lillo).

Material examined 1 cotype. 1?, El Rodeo, Catamarca, Argentina, Jan. 8-28, 1959, Golbach, (IML).

Biology This species produces galls on the stems and is "noxious to Coleus blumei" (Blanchard, 1965). This is the extent of the known biology of E. parasparsa.

Distribution E. parasparsa is known from two localities in north central Argentina.

Eutreta (Eutreta) patagiata Wulp, 1899

Fig. 171.

Eutreta patagiata Wulp, 1899: 414 [description], Pl. 12,

Fig. 10, [wing].

Aldrich, 1905: 608 [catalog, distribution].

Hendel, 1914b: 54 [key].

Hering, 1937: 225 [key].

Aczel, 1949: 265 [catalog, distribution].

Foote, 1965a: 241-242 [lectotype designation].

Foote, 1967a: 57.25 [catalog, distribution].

Diagnosis This species is readily distinguished from other Eutreta by the hyaline area along the costa which is nearly as wide as the stigma (Fig. 171). The dark pattern of the wing reaches the costal margin only near the end of R_{2+3} .

Discussion This species is known from only four specimens from which it was described. A specimen from Costa Rica reported by Enderlein (1911) is misidentified.

Due to the very short description by Wulp this species is redescribed based on the lectotype.

Redescription General color brown. Size medium to large. Head yellowish-brown. Eyes subcircular, deep reddish-brown. Orbito-antennal spot small, black. Frons lateral margins nearly parallel, ocellar triangle black, lunule and anterior frons reddish-brown. Lunule large. First antennal segment with whitish setae, second segment with black setae, third segment with fine yellowish setae. Second antennal segment brown except gray to black dorsally near base, third segment rounded apically, arista black beyond second antennomere. Face with round black spots. Gena and postgena same color as normal for head. Postocular spot dark brown, small, oblique. Larger postocular setae whitish, smaller setae black. Genal bristle black. Occiput gray. Palps reddish-brown, 9 stout black setae near apex, other setae yellow and thinner. Oral-genal dark area reduced.

Thorax reddish-brown, notum with golden-brown pollinosity. Scapulars with 8 black setae, other notal setae golden-brown. Notal and pleural bristles black. Humeral-notopleural band silvery. Upper mesopleural setal line 3-4 rows deep. Upper squamae gray, lower squamae whitish. Pleuron below upper level of coxae lighter brown. Halteres yellow. Lower sternopleuron and coxae with setae mostly yellowish-brown. Postscutellum dark brown to black.

Abdomen with dark brown bands on anterior $1/2$ to $2/3$ of each tergite; band usually interrupted medially by a light yellowish-brown longitudinal vitta. Setae of T1 and T2 yellow, setae of other tergites dark brown. Last segment mostly light yellowish-brown, especially in midline. T6 with 6-8 pair black setae along apical margin. Oviscape very dark brown basally and apically, brown medially. Pleural membrane grayish, sternites and sternal setae yellowish-brown. Ovipositor 1.33 mm. long laterally.

Legs yellowish-brown. Forefemur with long black bristles in a row ventrally, long white setae dorsally near base.

Wing (Fig. 171) with large spots, very large in posterior half of wing. First subcostal cell mostly yellowish-white 2nd C dark in lower third, stigma mostly dark. Broad white area along costa at end of R_1 extends $1/4$ distance to R_{2+3} , large costal spot near end of R_{2+3} (but is only half the size as one at end of R_1). Apical crescent not reaching R_{2+3} anteriorly

and extending only slightly below M_{1+2} . Brown apical band wider than crescent. Spots in wing cells as follows: 23 in R_1 , 37 in R_3 , 20 in R , 32 in R_5 , 5 in M_1 , 35 in M_2 , 3 in anal, 8 in 2d M_2 (1 marginal), 20 in Cu_1 (2 marginal) and 11 in 2d A (1 marginal and 3 submarginal). Anal point short, r-m perpendicular to M_{1+2} , m convex. Apical crescent wide, nearly perpendicular to M_{1+2} .

Distribution All four specimens of this species were collected in southern Mexico at altitudes of 8,000 and 9,500 feet at Omilteme and Sierra de las Aguas Escondidas respectively.

Biology Nothing is known of the biology of this species.

Eutreta (Eutreta) rhinophora Hering, 1937

Figs. 5, 14, 49, 63, 89, 101, 117, 138, 149, 172.

Eutreta (Phasmatocephala) rhinophora Hering, 1937: 297-298 [description].

Aczel, 1949: 266 [catalog].

Foote, 1967a: 57.25 [catalog].

Diagnosis The distinctive shape of the apical crescent, which suddenly ends at the M_{1+2} vein, and the strongly produced oral margin identify this species. It is most closely allied to E. distincta from which it can be

distinguished by the shape of the apical crescent, the more produced oral margin and the sharp lateral angle of the aculeus blade.

Discussion Hering (1937) separated his material from Costa Rica and South America into two species on the basis of the pattern of wings spots. The pattern of wing spots is too variable in this group to satisfactorily separate them into species. The shape of the head appears to be a constant character in E. rhizophora. The shape of the apical crescent with respect to the M_{1+2} may vary but can be relied upon to separate most specimens.

Since the characters of the genitalia are important in separating E. distincta and E. rhizophora and Hering did not include them in his description, they are described here.

Description of genitalia Female (Figs. 14, 49, 63)
with aculeus point as long as the serrated lateral margin. The blade is distinctly angled laterally. Inversion membrane with setae of normal size, not crowded. Spermatheca largest near middle, tapering at both ends, length about twice width.

Male (Figs. 89, 101, 117, 138, 149) with dorsal lobe of epandrium bearing a well defined hook medially. Surstylus with 10-13 long setae near apex. Outer clasper with 4 setae apically and 7-8 medial to prensisetae. Blade of ejaculatory apodeme 3 times width of shaft. Phallic apodeme long and narrow with a triangular lobe at apex.

Type The type of E. rhinophora was placed in the Hamburg Museum and was apparently destroyed in the firebombing in World War II (personal communication, Dr. H. Weidner). The following specimen of a series of two is chosen as a neotype. Male, H. Schmidt S., Collector, Costa Rica (Institut Zoologique Warszawa).

Material examined Neotype. BRAZIL 1m, Roque, Ostand, VI-11-1925, Capollian?, sol., SV Amaz. Exp. 123-125 (HZM). COLOMBIA 1m, Cali District, Western Cordillera, elev. 4,800 feet, I-27-1935, H. F. Schwarz Coll. (AMNH). 1f, Vista Nieva, XII-16-1922, H. L. Viereck, C. H. Curran Coll., 31144 (AMNH), COSTA RICA 1m, Paso Ancho, sn Sebastian, X-18-1936, en Hibiseus sabdaxiffa, C. H. Ballou Coll. (VIS). 1?, H. Schmidt S., (IZW). EL SALVADOR 1m, E. slope Cerro Verde, VII-5-1963, 3,800 feet (LACM). VENEZUELA (VIS): 1m, Churuquara FA., 800 m., VIII-25-1951, F. Fernandez; 1f, Trincheras, Carabobo, XII-29-1969, F. Fernandez, y C. J. Rosales; 1m, El Valle DF, V-11-1950, emerged V-28-1950, ex. Erigeron spatulata [= Conyza spatulata]; 1m, El Valle DF, V-9-1950, emerged V-21-1950, ex. Erigeron bonariensis [= Conyza bonariensis]; 1m, E. Valle DF., V-19-1950, C. U. Rosales; 1f, Sn. Agustín, Monagas, IX-17-1965, F. Fernandes y C. J. Rosales; 1m, Cumbre de Aguirre, 850 m., IX-2-1955, F. Fernandes y C. J. Rosales; 1f, Parque Nacional, Rancho Grande, E. Arauca, X-2-1953, elev. 700 m., Ferd. Kern Coll.; 1f, Cr. Aguirre XI-23-1951, F. Fernandez y C. J. Rosales Coll.; 1f, Montaldon, Caraboba, VIII-18-1951, F. Fernandez; 1f, Tiara-AR, XII-4-1953, W. Szumkowski; 1f, Sanare-LA, II-19-1955, 1,300 m., F. Fernandez y C. J. Rosales; 1f, Pozp Diablo, cr. Maracay, AR, I-30-1954, 500 m., C. J. Rosales. 1m, Merida, III-30 to 31-1965, A. Paramanov (BM).

Distribution E. rhinophora occurs from El Salvador to Venezuela and Colombia along the coastal mountain ranges. One specimen was taken in northern Brazil at Roque. E. distincta has been reported to occur in Bolivia and Peru (Foote, 1967a). These records may, upon examination, turn out to be E. rhinophora.

Host E. rhinophora has been reared from galls of Conyza bonariensis and C. spatulata. The galls were 9 by 7 mm. and 10 by 7 mm. respectively. The gall is produced at the node of the stem. The stems on which the galls were found were 3-4 mm. in diameter.

Seasonal distribution Specimens of this species were taken throughout the year. The most collected in any one month was three. If a seasonal peak does occur it is not evident from the collection data.

Eutreta (Eutreta) simplex Thomas, 1914

Figs. 17, 47, 77, 96, 113, 128, 173.

Eutreta simplex Thomas, 1914: 425-426 [description],

Fig. 33 [wing].

Foote, 1965a: 661 [catalog, distribution].

Diagnosis Males of this species can be distinguished by the lack of an apical crescent in the wing. The female has a narrow apical crescent (Fig. 173) which does not reach R_{2+3} anteriorly. The wing spots of both sexes are uniformly large and evenly spaced in the wing pattern. The orbito-antennal and facial spots are lacking as well as costal spots on the wing margin before the stigma.

Type Holotype: female, Sunset, Colorado, VII-19-1903, elevation 8,000 feet, Van Duzee, type 7726, C. W. Johnson Collection (Museum Comparative Zoology).

Material examined Holotype. 1m, 1f, Big Meadow, San Bernardino Co., California, VIII-8-1950 (LACM).

Distribution E. simplex is known only from these two locations in Colorado and California.

Eutreta (Eutreta) sparsa (Wiedemann, 1830)

Figs. 12, 50, 60, 91, 107, 153, 174.

Trypeta sparsa Wiedemann, 1830: 492 (24) [description].

Eutreta sparsa; Loew, 1873: 274-276 [distribution, taxonomy].

Hendel, 1914b: 54-55 [key, taxonomy], Taf. 2, Fig. 41 [wing].

Aczel, 1949: 265-266 [catalog, distribution, host].

Foote, 1967a: 57.25 [catalog].

Costa Lima, 1968: 584 [host list].

Diagnosis E. sparsa females can be distinguished by the narrow whitish apical crescent and the broad adjacent unpunctated brown band. The wings are broad, the width is about 60% of their length, the stigmal width is 2/3 of its length. The costa bears no marginal markings except an indistinct spot sometimes present at the end of the R_1 . The posterior wing

margin bears spots only in the apical half of the wing. The oral margin is quite strongly produced but not as much as in E. rhinophora.

The male is similar to E. parasparsa, it can be distinguished by the number of setae apically on the surstylus which is less than 12 in E. sparsa and more than 20 in E. parasparsa. The surstylus appears inflated in dorsal view in E. parasparsa but truncate and less rounded in E. sparsa.

The costa of E. sparsa males has only 1-2 spots beyond the R_1 light area but E. parasparsa has 4-5 spots. The apical whitish crescent is wider in E. parasparsa and extends nearly the width of R_5 cell below M_{1+2} .

Discussion This species was described by Wiedemann from a specimen or specimens of unknown origin. Loew (1862) studied material from the Vienna Museum and found only specimens from Brazil. He assumed that Wiedemann later added specimens to the Vienna Museum collection from Brazil and that the original specimens were lost, or replaced. His reasons for this were that Wiedemann prepared his description from a female but both males and females were among the specimens he borrowed from Vienna for study. Wiedemann himself may have destroyed the type and replaced it with a better specimen. In a letter to Wintherman he wrote concerning some insects: "I am very glad my Diptera gave you some little satisfaction, certainly I shall in time exchange the bad specimens for better

ones." (quoted from Zimsen, 1954).

Loew felt that the specimens from Brazil were sufficiently similar to the Wisconsin specimens he was examining to be considered conspecific. He noted the wider "costal and stigmatal cell" as being different from Wisconsin specimens, but even though he described a new species, E. rotundipennis, he did not describe the Brazilian specimens as a new species.

Hendel (1914b) noted the difference in the wing pattern between the specimens from Rio Grande do Sul, Brazil, which he studied from the Vienna Museum, and the North American and Central American forms. He stated that if specific differences do exist, then Wiedemann's type is the South American species E. sparsa and the North American species must be called E. caliptera Say.

In Blanchard's description of E. parasparsa he refers to the Hendel (1914b) illustration of the wing of the species Blanchard considers to be E. parasparsa. This is an illustration of a wing from a specimen which Hendel felt was E. sparsa and conspecific with Wiedemann's type.

Costa Lima (1934) illustrates the terminalia of a specimen from Saco de São Francisco, Niteroi, Estado do Rio which he considers to be E. sparsa and in 1968, also lists a host plant for the species from Brazil. Aczel (1949) lists E. sparsa from Mexico, Costa Rica and Brazil. North American workers, however, view E. sparsa as a North American species

(Foote, 1965a; Curran, 1932; Phillips, 1923; Doane, 1899; Snow, 1894; and Osten Sacken, 1878).

Of the tephritid specimens described by Wiedemann (1830) as new species, one was from North America, three from Central America and 27 from South America. This indicates that he had a wealth of South American material.

Since the type no longer exists and evidence indicates a South American origin for the type specimen, a neotype is here designated and a redescription of the species is given, based on the neotype.

Redescription Body dark brown. Medium to large species. Head generally lighter brown than thorax. Frons bearing nearly 100 yellow to salmon-tinged inflated setae, reddish-brown, bristles black, lateral margins nearly parallel. Ocelli surrounding a dark brown spot. Antenna yellowish-brown, first segment with inflated salmon-tinged setae, second segment with setae black dorsally and laterally, but long and white ventrally. Third segment with fine whitish setae. Face yellowish-brown, with paired black spots, oral margin moderately to strongly produced. Oral-genal area darker than face. Orbito-antennal spots black and well defined. Genal bristles dark brown. Setae of oral margin and lower postgena dark brown, setae of upper postgenal bulge yellowish. A whitish band extending from oral-genal margin along lower margin of eye across upper postgena to comb. Gula narrow and

moderately long. Gular bristle whitish. Postocular spot, upper postgena and occiput brown. Five postocular whitish setae, 15 shorter black setae.

Thorax with upper mesoplural setal line 3-4 rows deep. Notopleuron same color as dorsum. Regularly spaced, yellowish, decumbent setae on mesonotum. Pleural setae scarce. Sternotopleuron with 1 black bristle dorsally and several small whitish setae, ventrally only 2 medium sized bristles and numerous black setae. Upper squamae grayish-brown, lower squamae whitish. Postscutellum and scutellum slightly darker than mesonotum. Halteres yellow.

Legs lighter brown than thorax. Bristles dark brown to black. Ventral row of bristles on forefemur longer than width of leg, lateral area with numerous small whitish setae.

Wings (Fig. 174) darker than thorax. Costal margin lacking spots, except small light brown area at end of R_1 . Apical crescent normal, extending from before R_{2+3} to nearly $1/2$ width of R_5 cell below M_{1+2} . Preapical, unpunctated, brown band wider than crescent. Brown bands extending over crossveins evident to unaided eye. Posterior wing margin with 5 marginal or submarginal spots in $2d A$, 2 in Cu_1 , and no marginal spots in $2d M_2$. Spots of wing medium to small, forming rows in some cells. Cell $2d C$ with several indistinct spots. Stigmal cell width $2/3$ length, $2d C$ width $1/3$ length. Wing width 58% of length.

Abdomen very dark brown. Setae yellowish-brown, not inflated. Last 1/3 of each tergite lighter brown. Oviscape uniformly dark brown.

Other females similar to type. Some specimens lack spots in Cu_1 along the posterior margin. Most specimens have capitellum of halteres dark brown.

Female genitalia (Figs. 12, 50, 60) with the aculeus bearing a long point, much longer than angular part of aculeus, lateral margins smooth, point curved downward 15° . Inversion membrane with setae moderately long, crowded. Spermatheca club-shaped, length 3 times width.

Male genitalia (Figs. 91, 107, 153) with epandrium color of abdomen. Surstylus truncate apically, bearing 8-9 apical setae. Dorsal lobe rectangular, bearing about 15 long setae. Outer clasper with 3 apical setae and 4-5 setae medial to prensisetae. Phallic apodeme long, narrow and slightly lobed apically. Ejaculatory apodeme with blade 3 times width of shaft.

Type Neotype: female, Rio de Janeiro, Brazil, F. Sahlberg (Helsinki Zoological Museum).

Material examined Neotype. BRAZIL (NMW): 1m, 1f, Grande do Sul, Stieglmayr, Hendel Coll.; 2f, Alte Sammlung.

Distribution The only records for this species are from southeastern Brazil. The many records of E. sparsa

occurring elsewhere belong to other species.

Biology E. sparsa has been reported (Costa Lima, 1934) to produce galls on Stachytarpheta cayennensis. Blanchard (1965) reports that E. sparsa is very common and that it produces galls on the branches of Stachytarpheta. The figure of the genitalia (Costa Lima, 1954) of E. sparsa shows an intermediate number of bristles (between E. sparsa and E. parasparsa) on the surstyli. It is difficult to determine from the drawings which species was actually studied by Costa Lima but I believe it is E. sparsa.

Eutreta (Eutreta) xanthochaeta Aldrich, 1923

Figs. 13, 48, 61, 88, 104, 134, 154, 175.

Aldrich, 1923: 261-262, [description].

Swezey, 1923: 304 [record of introduction into Hawaii].

Perkins & Swezey, 1924: 6, 9, 52, 71, 73, 79, 83

[biology, control of Lantana], Fig. 6 [habitus, epandrium].

Williams, 1926: 445 [predator record].

Bryan, 1927: 364 [biological note].

Williams, 1931: 305 [biological note].

Bryan, 1933: 431, 455 [biological note].

Krauss, 1944: 93 [collection record].

Fullaway & Krauss, 1945: 158 [biology, Pl. 10, Fig. 9
[habitus].

- Inada & Tanada, 1946-1948: 77 [parasite].
 Fullaway, 1949: 1 [parasite].
 Weber, 1949: 322 [biological note].
 Hardy, 1950: 8 [host record].
 Clancy, 1950: 25 [parasite biology].
 Tanada, 1951: 209 [fungus].
 Bess, et al., 1961: 377 [parasite frequency].
 Beardsley, 1961: 358 [parasite].
 Foote, 1967a: 57.25 [catalog, distribution].
 Haramoto & Bess, 1970: 556 [parasite].

Diagnosis The lantana gall-fly, Eutreta xanthochaeta, can be distinguished from the Eutreta of United States and Canada by the whitish apical crescent of the wing (Fig. 175) which extends along the entire costal margin as a narrow yellowish border. In some specimens this border appears as a series of fused hyaline spots. The bristles and setae are yellow instead of black as in most Eutreta. The facial, orbito-antennal and postocular spots are distinct and the oral margin is only moderately produced. The aculeus (Fig. 61) of the ovipositor is long and thin, lacks lateral serrations and is bent downward near the tip. The surstyli of the male are truncate apically and bear numerous setae.

Type Male: March 18, 1918, Honolulu, O. H. Swezey, Cat. No. 25,203 (USNM).

Material examined HAWAIIAN ISLANDS 1f, Oahu, Honolulu, IV-11-1919, Bridwell (OSU). 5m, 2f, 2?, Oahu, V-21-1911, H. Severin (SDU). 1f, Kuliouou, Oahu, VI-25-1916, Swezey Coll. (UCR). 1m, Moanalua, IV-9-1922, O. H. Swezey. 3m, Honolulu, Oahu, VI-1949, M. S. Adachi (HSM). 1, S. E. Koolau Mts., VIII-7-1927, E. H. Bryan Jr. (FSCA). 1m, 1f, Palehua, Waianae, Oahu, V-7-1922, O. H. Swezey (FSCA). 1f, Moanalua, Oahu, X-21-1922, E. H. Bryan Jr. (FSCA). 1f, Mt. Kaala, Oahu, VI-13-1947, P. W. Weber (UWI). 2m, 1f, Kulionou, Oahu, VI-25-1916, Timberlake (UCR). 4m, 5f, Nice Valley, Oahu, III-11-1918, ex. gall on Lantana, Timberlake (UCR). 1f, Maunawh, Oahu, I-31-1947, P. W. Weber (UWI). 1f, Auwahi, Maui, 4,000 ft. III-1-1970, swept on Osmanthus, W. Gagne (ISU). 1f, Kaluaa Gulch, near Puu Kanehoa, IV-26-1970, sweeping near intermittent stream, S. L. Montgomery (ISU). 1f, Kaumuolone, Oahu, IV-23-1916, Timberlake (UCR). MEXICO 1m, 1f, Morelos, Koebele (BM).

Distribution The only specimens I examined from the native country of Mexico were those collected by Albert Koebele at Morelos. In 1902 he was working on a biological control project against lantana bush under the auspices of the Hawaiian Sugar Planters' Association (Perkins & Swezey, 1924). The specimens sent to the Hawaiian Islands were from this area of Mexico. All specimens from the Hawaiian Islands examined in this study were from the islands of Oahu or Maui. Swezey (Perkins & Swezey, 1924) reported the gall-fly from all the islands except the islands of Lanai and Molokai which he did not visit.

Aldrich (Bryan, 1927) reported the collection of a specimen from Coban, Guatemala.

Biology The lantana gall-fly produces globular swellings on the spiny young stems of the lantana bush, Lantana camara, (Bryan, 1933). More rarely it will produce galls on the flower stems (Perkins & Swezey, 1924). The galls are half an inch in diameter and pupariation occurs within them.

Weber (1949) reported that larvae left the galls and pupated at the bottom of a jar in a field-collected sample. He felt the egress of the gall-fly was due to moisture loss by the galls. Fully formed adult flies emerged in this experiment.

The fly is apparently bivoltine, the puparia of the second generation remaining in the gall during the six months of the dry season.

Eggs are laid in the growing twigs and the larva feeds on the proliferating tissues. This feeding interferes with the normal growth of the twig which often dies as a result. E. xanthochaeta, however, is not considered important as a check on the growth of Lantana in Hawaii (Perkins & Swezey, 1924).

The seasonal distribution in Hawaii is from January 31 to October 21 for the material examined. Most adults were collected from March to June.

Lantana camara, a shrub introduced into the Hawaiian Islands by Dr. Hillebrand as an ornamental, is the main host plant of the lantana gall-fly. The lantana bush was rapidly spread by two exotic birds feeding on the seeds, and became

very numerous, crowding out desirable plants and taking over pastures. The establishment of eight insects (including E. xanthochaeta) from Mexico that fed on lantana bush helped to bring it under control.

The lantana gall-fly has been reared on three other hosts: Verbena bonariensis, Stachytarpheta cayennensis by (Fullaway & Krauss, 1945) and S. jamaicensis. Hardy (1950) reports the latter shrub as being "heavily infested by this fly" near Kaneohe. Clancy (1950) reported Verbena littoralis as bearing galls of E. xanthochaeta but did not report rearing the gall-fly.

Several parasites have been reared from E. xanthochaeta. Perkins (Perkins & Swezey, 1924) reported "a large eupelmine was bred from galls of Eutreta, and Koebele sent me a torymid under the same number as the fly". Inada and Tanada (1946-1948) found gall-fly larvae frequently parasitized by a braconid, Opius tryoni. O. tryoni parasitized the medfly Ceratitis capitata, but as E. xanthochaeta became more abundant the wasp parasitized the gall-fly more heavily (Bess et al., 1961).

Williams (1926) reported a sphecid wasp, Oreocrabro abnormis, as provisioning its nest mainly with the gall-fly and another tephritid, Procecidochares utilis.

SUBGENUS ONCHOACULEATA

Eutreta (Onchoaculeata) New Subgenus

The subgenus Onchoaculeata is erected to include six Nearctic species of western United States. The type of the subgenus is E. diana (Osten Sacken, 1877).

In this subgenus the oral margin of the head is only slightly produced. The female ovipositor is as long as the last three abdominal segments and is round rather than flattened. The aculeus has lateral barbs and is arrow-like in shape. The male epandrium lacks a dorsal lobe and the surstyli are short and rounded apically. The two pair of apical setae are shorter than the width of the surstylus.

Key to the Species of the Subgenus Onchoaculeata

1. Antennae long, reaching oral margin..... 2
 Antennae shorter, not reaching oral margin..... 3
2. Orbital plate darker than remainder of frons. Face yellowish to silvery-gray pollinose. Orbito-antennal spot small..... E. oregona, p. 132
 Orbital plate same color as frons. Face shining black or reddish-black in males. Females with face pollinose, with ground color of whitish, yellow or reddish. Orbito-antennal spot large..... E. longicornis, p. 126
3. Antennae dark brown to black. Males with 2 prominent white bars in center of wing. Females with few spots in the posterior half of wing.....
 E. divisa, p. 122

- Antenna yellow to light brown. Wing spots nearly as numerous in posterior half of wing as in anterior half..... 4
4. Postgena shining black or dark brown... E. diana, p. 113
Postgena yellowish-brown..... 5
5. Wings dark brown, spots small and distinct.....
..... E. decora, p. 111
- Wings brown, spots larger, coalesced into a yellowish-brown streak in the middle of wing.....
..... E. pollinosa, p. 135

Eutreta (Onchoaculeata) decora New Species

Figs. 20, 67, 176.

Diagnosis This species can easily be distinguished from other Eutreta by the grayish-brown postgena and occiput, the yellowish-brown body and dark brown wings with small scattered wing spots.

Description Body light yellowish-brown. Species medium sized, related to E. diana.

Head almost uniformly light yellowish-brown. Anterior 1/3 of frons slightly reddish. Upper postgena and occiput slightly grayish-brown. Face, orbital carina and gena with whitish pollinosity. Palps color of head, 8-10 dark-brown setae anterioventrally. Anterior upper fronto-orbital, lower fronto-orbital, ocellar, innerverticle and genal bristles brown; other bristles and setae yellowish except short setae dorsally on second antennal segment and short postocular setae which

are black. Frons gradually narrowing anteriorly. Oral margin only slightly produced.

Thorax with gray pollinosity on notum. Postscutellum dark brown. Sternum, pleuron and scutellum light brown. Bristles light brown. Notal setae yellowish-brown, evenly spaced. Upper humeral-notopleural band absent. Humerus color of notum. Scattered whitish-yellow setae on mesopleuron. Upper mesopleural and lower humeral setal line absent. Lower squamae whitish, upper squamae light grayish-brown.

Legs color of pleuron, bristles and setae brown, whitish setae absent.

Abdomen dull red. Tergites and sternites with several areas of bright yellow having no pattern sequence.

Wings (Fig. 176) dark brown with few spots, most spots in anterior half of wing. No spots along costa, in 2d C or stigma. Number of spots in the wing cells are: 5-6 in R_1 , 16 in R_3 , 11 in R, 23 in R_5 , 15 in anterior half of LM_2 , 1 in M and 3 in Cu_1 . Second anal cell lightly pigmented. Apical crescent extending from width of R_5 cell below M_{1+2} vein, anteriorly to near R_{2+3} .

Female genitalia (Figs. 20, 67) with long ov scape (1.8 mm), long as inversion membrane and aculeus combined. Ovi-scape dark brown. Aculeus length 3 times width, arrow-shaped at tip; tip with 3 pairs of lateral barbs, dorsal surface with a semicircular row of 13 barbs arching between anterior

pair of lateral barbs. Aculeus widest near base. Inversion membrane broad, short; setae as wide as long, closely set. Spermatheca club-shaped; length 2.5-3 times width; spicules broad, not crowded.

Holotype Female: Green Canyon, Utah, September 6, 1964, S. J. Kohler (United States National Museum). This species is known only from the type. The specimen is in good condition except the wings are badly frayed.

Biology Nothing is known of the biology of this species.

Eutreta (Onchoaculeata) diana (Osten Sacken, 1877)

Figs. 24, 30, 69, 82, 106, 130, 177.

Trypeta (Eutreta) diana Osten Sacken, 1877; 347-348

[description, host]. Osten Sacken, 1878: 191

[catalog, distribution].

Eutreta jonesi Curran, 1932: 19 [description],

Eutreta diana; Townsend, 1893: 14 [host].

Snow, 1894: 168 [description of E. diana var.

tricolor].

Aldrich, 1905: 608 [catalog].

Phillips, 1923: 141, Pl. 19, Fig. 41 [wing].

Curran, 1932: 16, 19 [key, distribution, biological

note].

Felt, 1940: 334 [key to gall (as trypetid)].

Phillips, 1946: 115 [host].

Foote & Blanc, 1963: 28-29 [key, collection record],
110 Fig. 34 [wing].

Fronk, Beetle and Fullerton, 1964: 575-576 [host,
parasite].

Foote, 1965a: 661 [catalog].

Cole, 1969: 354 [distribution].

Wasbauer, 1972: 10-11, 116 [host list].

Diagnosis This species can easily be distinguished by the yellowish antennae, whitish face and shining dark brown to black occiput. The wings (Fig. 177) have small, whitish spots in a nearly black field and lack marginal spots along the costa.

Discussion The color of the abdomen varies greatly from red or yellowish to black. The number of spots is reduced in the posterior half of the wing in some specimens. The color of the forefemur is dark brown to black; however, the mid- and hindfemur as well as the tibiae vary from black to yellowish. The tarsi are all yellow. The pleural setae vary from whitish to black. The antennae and frons vary from yellow to reddish or charcoal.

This great variability in color has led to an attempt to divide E. diana into species or subspecies.

Snow (1894) described the variety E. diana tricolor on the basis of these color differences as well as the shape of the m crossvein. Curran (1932) described E. jonesi on the basis of the presence of all black hairs on the pleura. In examining series of specimens from the same locality and host plant, these characters are not constant even within the same populations. The type of E. jonesi bears 3 yellow to whitish setae on the upper mesopleuron whereas Curran describes E. jonesi as having whitish setae only on the propleuron.

I therefore consider E. jonesi and E. diana tricolor as variants within populations of E. diana.

Type Holotype: female, Type 10242 [June 9, 1877], Osten Sacken Coll., Eutreta diana O. S., typical specimen Museum of Comparative Zoology. The type is in poor condition. It is missing the head, right wing, fore and midlegs.

Material examined Holotype. ALBERTA 1m, 30 mi. ne., Brooks, VIII-23-1966, A. R. Gittins (UID). 1f, Medicine Hat, VIII-21-1929, F. S. Carr (UA). CALIFORNIA 29 specimens examined. COLORADO 1m, 1330, C. W. Johnson Coll. (MCZ). 1m, 2193, W. M. Wheeler Coll. (AMNH). 1m, 5 mi. se., Estes Park, Rocky Mt. Nat'l Park, VII-27-1973, elev. 8,200 feet, W. B. Stoltzfus (ISU). 1m, Bondad, VI-27-1919, about 37° 52' w., elev. 6,100 feet (AMNH). 1m, 2 mi. s. Gould, VIII-13-1968, elev. 9,000 feet, Oman (OSU). 1f, Paonia, VII-10-1901, C. W. Johnson Coll. (MCZ). MONTANA 2m, 8 mi. w. Jordan, Garfield Co., VII-14-1957, R. C. Froeschner (MSU). 1m, 1f, Mont. Exp. Sta., Musselshell Creek, VIII-18-1917 (OSU). 1f, Bozeman, VII-10-1927 (MSU). 1m, Mont. Exp. Sta., Lo Lo, VI-10-1912,

sagebrush (MSU). 1m, 1f, 40 mi. s. Belgrade, Gallatin Co., on Gallatin R., VII-31-1971, H. S. Telford (WSU). 1m, C. U. Lot 35 (CU). 1m, 1f, 9 mi. sw. Lima, Beaverhead Co., VIII-14-1965, B. A. Foote (KSU). NEBRASKA 3m, 3f, Hat Creek, August, J. M. Aldrich Coll., (USNM). 1m, Sand Hills, July (UNB). NEVADA 1m, BYU-AEC-NTS, Mercury, VIII-13-1965 (USNM). 1f, 1 Double Spring, VII-21-1916, H. G. Dyar (USNM). 1m, VII-13-1916, H. G. Dyar (USNM). 1f, Ormsby Co., VII-6, Baker (USNM). 1 pair, Carter's, VI-21-1916, on sage, H. G. Dyar (USNM). 2m, 14f, 7 mi. e. Oreana, Pershing Co., VI-27-1972, T. R. Haig (CDA). IDAHO 299 specimens examined including the following specimens reared by R. G. Jones in the University of Idaho Collection.

Artemisia tridentata var. tridentata: 5m, 6f, 24 mi. s. Dietrich, Lincoln Co., VI-6-1968; 5m, 6f, 5.5 mi. e. Twin Falls, Twin Falls Co., VI-5-1968; 11m, 13f, 2 mi. e. Acequira, Minidoka Co., VII-4-1968; 2m, 22 mi. n. Mt. Home, VI-10-1968; 4m, 1f, 10.6 mi. ne. Richfield, Lincoln Co., VI-21-1968; 14m, 4f, 11.5 mi. w. Kimama, Lincoln Co., VII-4-1968; 8m, 6f, 3 mi. e. Twin Falls, Twin Falls Co., VI-5-1968.

Artemisia tridentata var. vaseyana: 8m, 3f, 15 mi. nw. Ketchum, Blaine Co., VII-20-1968; 4m, 3f, 12 mi. s. Fairfield, Camas Co., VII-25-1968; 3m, 1f 9 mi. n. Fairfield, VII-25-1968; 5f, 32 mi. n. Mackay, Custer Co., VI-21-1968; 1m, 2f, 22.5 mi. s. Hansen, Twin Falls Co., VI-19-1968; 1m, 3f, Elba-Basin Pass, Cassia Co., VI-14-1968; 2 pairs, 10 mi. w. Kimama, VII-9-1968; 1f, 5 mi. w. Almo, Cassia Co., VII-26-1966; 1m, 18mi. s., Grasmere, Owyhee Co., VI-10-1968; 2m, 1f, 15 mi. s., Grasmere, Owyhee Co., VI-10-1968.

Artemisia tridentata: 5m, 5f, 1.5 mi. w., Dayton, VII-12-1965; 1f, 3 mi. e., Oakley, Cassia Co., VII-12-1968; 2m, 4f, 8 mi. n., Medicine Lodge, Clark Co., VI-17-1968; 2m, 2mi. n., Georgetown, Bear Lake Co., VI-16-1968; 1m, Idaho City, Boise Co., VI-12-1968; 1m, 9 mi. s., Dingle, Bear Lake Co., VI-15-1968; 8m, 8f, 11.5 mi. w., Dimama, Lincoln Co., VI-18-1968; 2m, 1f, 28 mi. ne., Preston, Franklin Co., VI-15-1968; 1m, 3 mi. w., Carey, Blaine Co.; 2m, 2f, 3 mi. w., Carey Claine Co.; 1m, 1.5 mi. w., Dayton, Franklin Co., VI-15-1968; 1m, 3 mi. n., Mt. Home VI-10-1968; 2m, 20 mi. s., Marsing, Owyhee Co., VI-11-1968; 1f, 28 mi. w., Midvale, Washington Co., VI-11-1968; 3m, 8 mi. sw., Rogerson, Falls Co., VI-19-1968.

Artemisia cana, 4m, 5f, 10 mi. s., Stanley, Custer Co., VI-20-1968.

Artemisia Tripartita: 1m, 3f, 45 mi. w., Tetonia, Teton Co., VI-16-1968; 4m 5f, 3 mi. w., Carey, Blaine Co., VI-21-1968.

Artemisia nova, 2m 2f, 8 mi. sw., Rogerson, Falls Co., VI-19-1968.

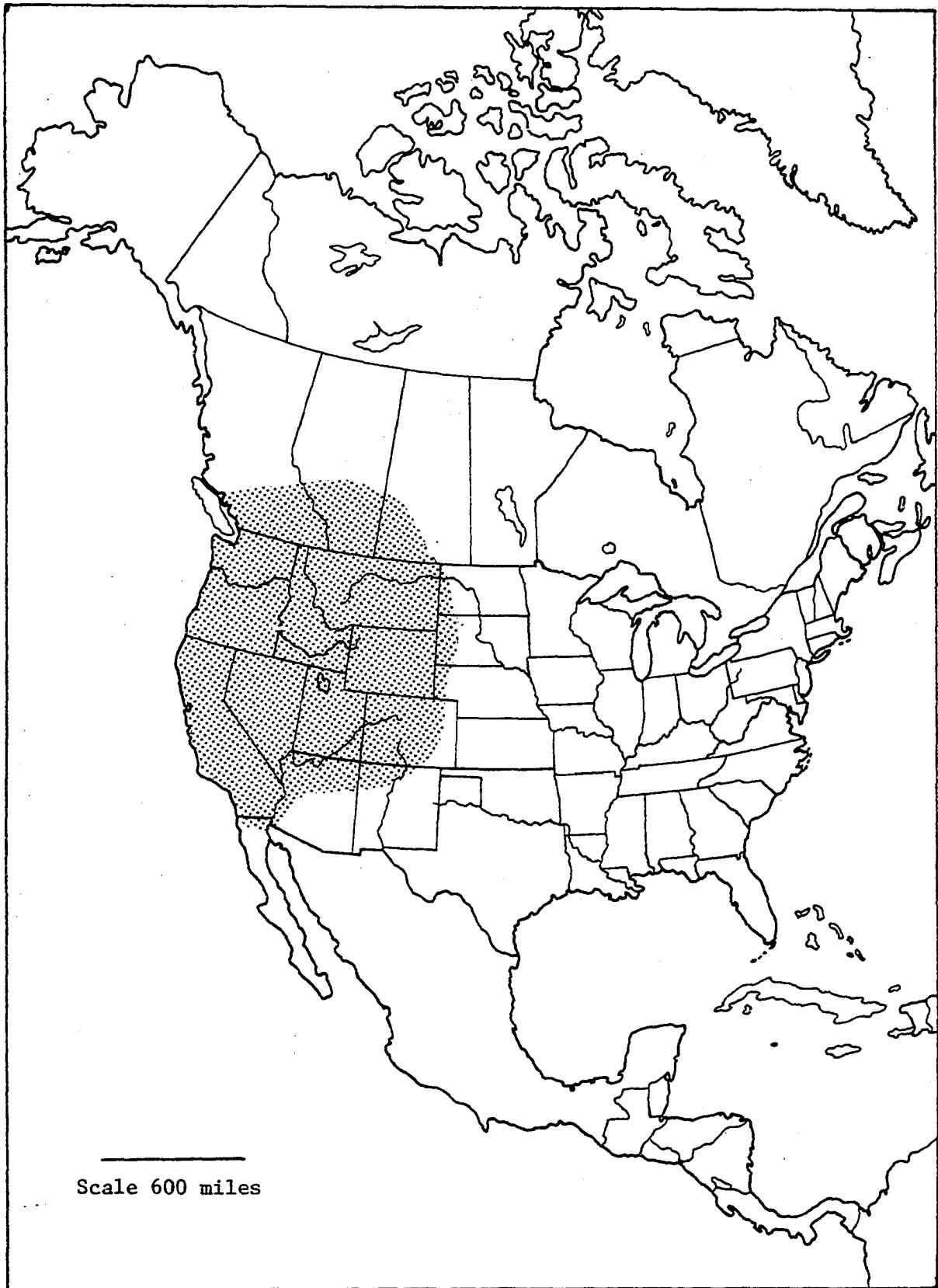
Artemisia arbuscula, 3m, 8 mi. sw., Rogerson, Falls Co., VI-19-1968.

OREGON 288 specimens including the following reared specimens. Artemisia tridentata, Bend, S. C. Jones (OSU): 1m, 4f, VII-16-1933; 2m, 5f, VI-20-1934; 1m, 6f, VI-24-1933; 1m, 2f, VII-21-1933; 2m, VII-13-1933. 11m, 3f, Bear Valley, near Seneca, Grant Co., VII-25-1935, A. tridentata, F. C. Jones & Joe Schuh. 12m, 5f,

10 mi. w., Klamath Falls, sagebrush, emerged VI-28 to VII-7-1952, V. Roth (OSU). 1m, 1f, 7 mi. e., Shearville, Malheur Co., VI-11-1968, A. tridentata, R. G. Jones (UID). 3m, 1f, 2?, Klamath Falls, reared Artemisia, VI-9-1936, K. A. Salmon. UTAH 107 specimens examined. WASHINGTON 3m, 3f, Benton Co., McNary Nat'l Wild Life Ref., IV-14-1973, emerg. V-7 to V-13-1973, Artemisia tridentata? (WSU). 2f, Grand Coulee, Osborn's Ranch, VII-8 to VII-12-1902 (WSU). 1f, Cliffdale, VII-7-1935, Oman (USNM). 1f, 5 mi. s., Vantage, V-31-1951, E. F. Dailey (WSU). 1f, Palouse Falls, VI-6-1933, H. F. Clements, reared from Artemisia tridentata (WSU). 1f, Rainier Nat'l. For., VII-7-1935, Currant Flat, J. Wilcox (FSCA). 1m, 15 mi. e., Dayton, Columbia Co., VI-3-1968, S. M. Hogue & R. L. Penrose (UID). 1f, VI-22, on Quercus, D. Henshaw (UCR). 1f, Wenatchee, VII-8-1952, ex. sage gall (WSU). WYOMING 1m, Douglas, VII-22-1973, W. B. Stoltzfus (ISU). 1f, Wyocolo, VIII-11-1959, Enns & Thomas, elev. 8,800 feet (UMO). 1m, 7 mi. s., McFadden, in Medicine Bow State For., 7,800 feet, VII-6-1972, W. B. Stoltzfus (ISU). 1f, Grand Teton Nat'l. Park, VII-19-1947 (USNM). 1f, 10 mi. e., Sweetwater Co., VIII-9-1963, G. Bohart & P. Torchio, (USU). 1m, Auburn, G. L. Hayward (FSCA). 1f, 1m, Woods Landing, Albany Co., VIII-16-1963, R. J. Lavigne (UWY). 1f, Lusk, VIII-26-1898 (AMNH). 1m, 15 mi. sw., Green River, in Flaming Gorge Nat'l. Rec. Area, elev. 6,000 feet, VII-7-1972, W. B. Stoltzfus (ISU). 1f, 6 mi. e., Laramie, VIII-16-1968, ex. [collected] Cercocarpus montanus, Oman (OSU). 1f, Shoshoni, Ant Plots, VII-14-1964, R. J. Lavigne (UWY). 1f, S. Fork Powder R. at Hwy. 20, 1.8 mi. w., Powder River, Natrona Co., VIII-21-1965, H. B. Leech (CAS). 1f, at mouth Shell Canyon, Bighorn Co., 4230 feet, VII-24-1964, H. B. Leech (CAS).

Distribution (Map 4). E. diana has been collected frequently in eastern Oregon, southern Idaho, Wyoming and Utah. It has also been collected commonly in central California along the Nevada border, in southeastern Washington, southern Montana and western Colorado. It is associated with Artemisia as far east as Missouri and occurs north to Alberta and British Columbia and south to southern California. No specimens have been reported from Arizona, New Mexico, Mexico, Texas, the Dakotas, Oklahoma or Kansas although it quite

Map 4. North America. Distribution of Eutreta diana



likely occurs in parts of these states.

Biology In late May and early June adults of E. diana are emerging from the overwintering galls. The earliest collection record was May 5 in Pine Valley California. By the end of July in southern states and by August in northern states and Canada most adults had died out for the season. The short life span for adults indicates that this species is univoltine.

The adult male can be observed maintaining a territory on the upper half of the host plant where suitable oviposition sites exist. Wing and body motions are employed in chasing away other insects or other males. The female is usually moving about up and down the stem, or from stem to stem, in search of suitable oviposition sites. As the female approaches the males' territory, courtship behavior is elicited in the male which involves the use of stylized wing movements.

Galls produced by E. diana vary greatly in size, ranging from 4 by 6 mm. to 10 by 17 mm. Most galls are ovate with very hard walls. Fronk et al. (1964) reports that galls of A. cana are much thinner than those on other Artemisia spp.

E. diana does not appear to adversely affect the host to any great extent. The stem of the plant does not develop properly beyond the gall in many cases but the remainder of the plant is not noticeably affected.

Only one larva occurs per gall but many galls may be found per plant. The larva excavates a cavity inside the gall

only slightly larger than itself and pupates within the gall.

Fronk et al. (1964) reported the only record of rearing a parasite, Dacnusa sp. (Hymenoptera; Braconidae), from E. diana galls.

Host E. diana has been reported from 5 species and two varieties of Artemisia. The host plant reported most frequently was Artemisia tridentata tridentata. Other hosts were A. arbuscula, A. cana cana, A. nova, A. tripartita, A. tridentata vaseyana and A. cana viscidula.

Beetle (1960) recognizes 11 species in the Tridentatae section of the genus Artemisia, plus 11 subspecies and forms. He considers viscidula as a variety of A. cana and vaseyana as a variety of A. tridentata. R. G. Jones lists these two forms as species on his insects labels. An additional subspecies (A. tridentata wyomingensis) was recognized by Beetle & Young (1965) which he considers intermediate between A. tridentata tridentata and A. tridentata vaseyana.

According to Beetle (1960) the Artemisia species of the section Tridentatae differentiated throughout Cenozoic times probably arising from Old World Artemisia and migrated into North America. E. diana does not attack the most ancient members of the group indicating that they likely did not evolve until after establishment of Artemisia as a common western shrub in the Tertiary Period.

Five forms of Artemisia are thought to have arisen from polyploid crossing, these are A. arbuscula arbuscula, A. arbuscula thernopola, A. argilosa, A. rothrockii and A. tridentata tridentata form spiciformis. Only one of these has been reported as a host of E. diana.

All of the erect or taller growing Artemisia spp. are attacked by E. diana while only one of the "dwarf shrubs" serves as a host. A. nova is a low growing shrub but is "occasionally upright in habit" (Beetle, 1960). Fronk et al. (1964) reported that E. diana does not attack A. nova in Wyoming whereas Metephritis fenestrata attacks A. nova but none of the other species of Artemisia. G. G. Jones, however, reared 2 males and 2 females from A. nova from Rogerson, Idaho.

Eutreta (Onchoaculeata) divisa New Species

Figs. 21, 31, 71, 84, 109, 118, 178, 179.

Diagnosis The males of this dimorphic species are easily recognized by the pair of oblique hyaline bars through the middle of the wing. The females are similar to E. diana except that most of the posterior half of the wing lacks spots and the head has charcoal gray areas on the upper face, frons and antennae. In Eutreta diana these areas are generally yellowish.

Description Female similar to E. diana, males smaller than females. Body generally dark brown to black.

Head with palps, oral margin, lower third of face and gena whitish. Upper 2/3 of face, frons, and antennae charcoal gray. Charcoal gray area reduced to antennae in some specimens. Frons often yellowish-brown in male. Upper postgena and occiput shining black. Lower postgena and proboscis yellow. Bristles of frons grayish-brown, setae white. Seven postocular whitish setae, 1-2 short black setae between each pair of white setae. Postgena with yellow area along genal-oral margin; wide black band from posterior oral margin and gula extending dorsally along foramen to occiput. Antenna charcoal gray dorso-anteriorly to brown ventromedially. First antennal seta white, second antennal seta black. Palps with 4-7 black setae, other setae whitish. Mentum dark brown. Orbito-antennal spot small and black.

Thorax shining black. Bristles whitish-gray, setae whitish. Squamae gray, halteres yellow.

Legs with femora mostly shining black, hindfemur usually dark brown. Tibiae and tarsi yellowish-brown.

Abdomen of female dull red, orange or dark brown. Setae black and white mixed. Male abdomen with yellowish-brown on sternum, pleural membrane, T1, T2, lateral and posterior edges of T3-T5; other areas of tergites and sometimes sternites dark brown. T5 and S5 entirely dark brown in some specimens.

Wing of female (Fig. 178) similar to E. decora, dark brown to black, 2d A cell lighter. Spots small, separate, mostly in anterior half of wing. Apical crescent extending from anterior to R_{2+3} posteriorly to near middle of 2d M_2 cell. One row of spots along R_{2+3} vein in R_1 cell, 3 in R_3 cell, 3 rows in R cell, 4 irregular rows in R_5 cell and 2 in anterior half of $1M_2$ cell. Cu_1 cell sometimes with spots. No marginal spots on wing.

Male wing (Fig. 179) with two conspicuous white bands running obliquely through the posterior 2/3 of wing. Bands are separated by twice the width of one band. Anterior whitish band covers posterior half of Cu_1 cell and margins of $Cu_2 + A_2$. Posterior band arises in R cell and extends obliquely in $1M_2$ cell. Apical hyaline crescent more extensive in male, sometimes reaching $M_3 + Cu_1$ vein posteriorly and nearly to R_1 anteriorly. Wing spot pattern similar to female.

Female genitalia (Figs. 21, 31, 71) with oviscapae dark reddish-brown to black; 1.1 mm. long. Aculeus length 4 times width; tip arrow-like, often with 3 barbs on right lateral margin of blade and 2 barbs on left margin, occasionally sides symmetrical. Dorsal aspect with an arching semicircle of 11-13 smaller barbs, larger medially. Two longitudinal rows of sensilla basad of arrow-tip on each side of aculeus with approximately 14 in each row. Inversion membrane with setae short, crowded. Spermatheca oval, widest 2/3 distance from base.

Male genitalia (Figs. 84, 109, 118) with epandrium color of last tergite, bearing 2 very small setae on medio-apical margin, and 7 bristles along dorsolateral margin near base. Surstylus shorter than prensisetae. Outer clasper with 3 setae near apex between prensisetae and 7 basomedially to prensisetae. Prensisetae large, egg-shaped in cross section, triangular in lateral view. Ejaculatory apodeme with blade asymmetrical, shaft appearing narrow. Phallic apodeme with only a slight apical lobe.

Types Holotype: male, Regina, Idaho, VI-23-1938, H. M. Harris (United States National Museum). Allotype: female, 4 miles north Dietrich, Lincoln Co., Idaho, VI-6-1968, Artemisia tridentata var. tridentata, R. G. Jones Collector, 152-30A (University of Idaho). Paratypes: 4m, 1f, same data as holotype; 1m, 1f, Eureka, Idaho, VI-23-1938, H. M. Harris (Iowa State University); 2f, 3 mi. n., Mt. Home, Idaho, VI-10-1968, Artemisia tridentata var. tridentata, R. G. Jones 165-30A; 1f, 24 mi. e. Dietrich, Idaho, VI-6-1963, Artemisia tridentata var. tridentata, R. G. Jones 154-30c (University of Idaho); 1f, Bend Creek, Oregon, VII-23-1933 (Oregon State University).

Distribution This species has been taken only from southwestern Idaho and a single specimen was collected at Bend Creek, Oregon?.

Host E. divisa has been reared from two galls of Artemisi tridentata var. tridentata. The galls measure 8 by 9 mm. and 7 by 9 mm. and are very much like the galls of E. diana.

Seasonal distribution The earliest adult was collected June 10 in Dietrich, Idaho and the latest collection was July 23 in Bend Creek, Oregon.

Eutreta (Onchoaculeata) longicornis Snow, 1894

Figs. 2, 22, 33, 70, 80, 114, 119, 180.

Snow, 1894: 168 [description], Pl. 6, Fig. 12
[wing].

Aldrich, 1905: 608 [catalog].

Foote, 1965a: 661 [catalog].

Cole, 1969: 354-355 [distribution, note].

Eutreta facialis Curran, 1932: 15, 17-18 [key,
description]. NEW SYNONYMY

Diagnosis E. longicornis is a small, very dark brown to black species with long black antennae (Fig. 1). It is similar to E. oregona but the latter species has the orbital plates set off by dark brown or black. The face of the male is shining but in the female the face is whitish pollinose. E. oregona has a yellowish pollinosity on the face.

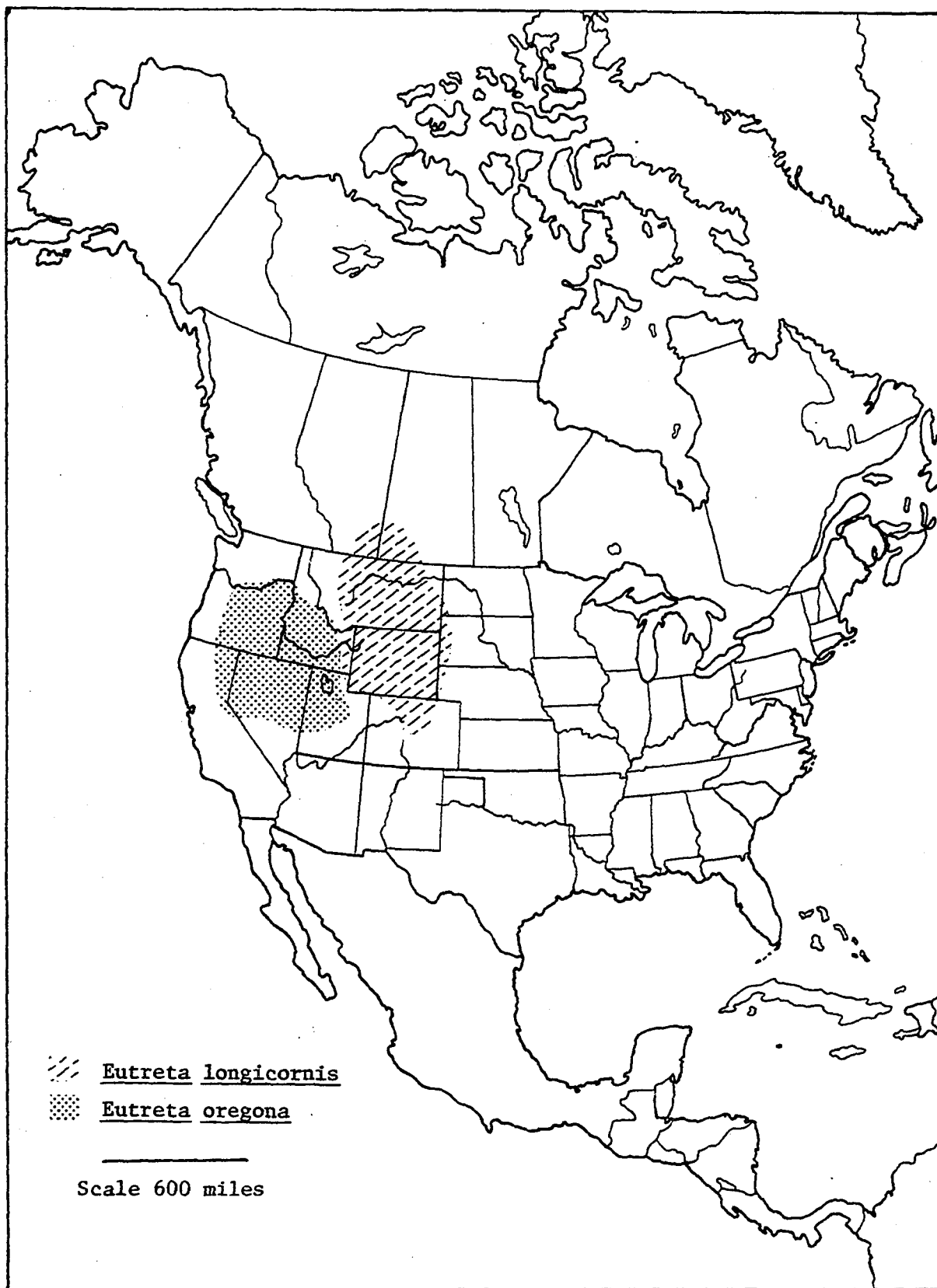
Discussion This dimorphic species was described from a single male from Montana. The female was described as E. facialis also from a single specimen from Montana. The male and female are similar in general appearance but differ in several ways. The female is larger, slightly lighter in color, especially the face, which in the male is often a shining dark reddish to black and the wings have more fused whitish spots in the central basal area. Males have larger whitish spots in the posterior half of the wing. Older specimens tend to be a shining brown to reddish-brown. Recently captured specimens are usually shining black.

Distribution (Map 5). Of 53 specimens examined, 36 are from two localities in eastern Wyoming. The distribution therefore is based on a limited number of specimens collected. It probably occurs throughout most of Wyoming and Montana. It has been collected from southern Alberta and north central Colorado.

Type Holotype: male, Montana, Morrison (Snow Entomological Museum).

Material examined Type: Eutreta facialis Curran, Huntley, Montana, VII-19-1919 [A. L. Strand]. ALBERTA 1m, Walsh, VIII-2-1927, F. S. Carr (UA). Medicine Hat (UA): 1m, VI-20-1926, F. S. Carr; 1f, VI-30-1940; 1, VI-5-1940, J. L. Carr. COLORADO 1f, 5 mi. se., Estes Park., Rocky Mt. Nat. Park, VII-23-1973, W. B. Stoltzfus, elev. 8,200 feet, on Artemisia sp. (ISU). MONTANA 1m, C. U. Lot 35 (CU). 1f, Yellowstone Co., VII-3-1926, R. C. Donohoe (ISU). 1m, VII-19-1920, Boseman (MSU). 1m, Bozeman, VII-26-1939, R. Foote

Map 5. North America. Distribution of Eutreta
longicornis and E. oregona



(USNM). WYOMING 17m, 8f, in or near Douglas, VII-22-1973, on Artemisia cana, W. B. Stoltzfus (ISU). 1m, Lusk, 40 mi. n., VII-1895 (MCZ). 1, Niobrara Co., VII-8-1949, D. G. Denning (UWY). 1, Flaming Gorge Rec. Area, 15 mi. sw., Green River, VII-7-1972, elev. 6,000 feet, on Artemisia sp. (ISU). 1m, Converse Co., VII-1895 (MCZ). 1f, Wheatland, VIII-20-1947 (WYU). 1f, Horse Creek, VIII-1895 (CU). 5m 8f, Manville, VII-16-1947, D. G. Denning (UWY). 1m, along Cheyenne River, 14 mi. s., Newcastle, VII-22-1973, Artemisia cana, elev. 5,000 feet, W. B. Stoltzfus (ISU).

Biology This species is found on silver sagebrush (Artemisia cana) along streams, rivers and low-lying areas. These small black flies can be seen running rapidly at times up and down the stems or sitting on the upper half of the outer branches.

Adults were collected from June 20 to August 20 with most specimens taken in July. The seasonal distribution indicates this species is apparently univoltine.

Although E. longicornis has been collected infrequently it apparently is quite abundant in some areas. Twenty six flies were observed on A. cana along 100 feet of fence row at the edge of a pasture field. In another area 13 flies were collected by D. G. Denning on one day.

Galls were found on the lateral branches of A. cana at the nodes which produced the last years growth. The size of the branch beyond the gall was generally not affected by the gall development, although in two cases where unusually large galls formed, a branch did not develop beyond the galls.

Of 18 galls collected, 17 had empty (puparia) and one was parasitized by a hymenopteran. Several galls were opened, evidently by woodpeckers.

Host E. longicornis has not been reared from Artemisia cana, but from the number of adults found on this plant, the courtship activity observed and the galls collected, there is little doubt that it serves as a host of E. longicornis.

Behavior The males are territorial but due to their small size they appear to be intimidated rather easily by larger insects and will fly to a nearby stem or sometimes to another bush. At no time were they observed trying to chase away even small ants. The flies used maximum wing exposure and short lunges, similar to E. novaeboracensis, in attempts to scare away intruders from the potential courtship area.

Other types of wing motions were observed. One type occurred in the male when the female was not within the observed vicinity of the male. One wing at a time was moved laterally about 15° from the normal (slightly spread position when at rest) and then back again followed by the same sequence for the opposite wing. The motions were jerky, each motion requiring about 1 second, or about 4 seconds for the total sequence. Such behavior may continue for several minutes until interrupted by an intruding insect or a female.

A second type of male behavior was observed at the approach of a female. The male, upon observing the approaching female, walked excitedly about the stem with the wings held up over the back and spread about 30° from normal. In this behavior, which lasted several seconds, the wings were held motionless. During this activity the long black antennae were held straight out in front of the head.

When an approaching female had moved to within about 1 1/4 inch of the male, the pair orientated themselves to face each other. The male began moving one wing at a time laterally about 20 or 30° but with a smooth rather than a jerky motion. The female was observed to employ wing motions but the pattern of such motions was not determined.

This sequence of behavior, or part of it, was repeated several times without copulation. The pair was often interrupted by ants or larger insects or wind blown adjacent branches would dislodge them. Finally the pair became too widely separated during escape to return.

Eutreta (Onchoaculeata) oregona Curran, 1932

Figs. 25, 34, 68, 78, 115, 131, 181.

Curran, 1932: 15 [key], 18 [description].

Foote & Blanc, 1963: 28, 30 [key, distribution, note], 110 Fig. 36 [wing].

Foote, 1965a: 661 [catalog].

Cole, 1969: 355 [distribution, note].

Diagnosis E. oregona can be distinguished from other species except E. longicornis, by the long black antennae that extend to the oral margin. Most specimens can be distinguished from E. longicornis by the orbital plates which are darker than the remainder of the frons. The face of E. oregona has a silvery-gray pollinosity in both sexes that extends dorsally to the antennae. In E. longicornis the pollinosity fades before the antennae and the face is shining reddish-black. In E. oregona the ground color of the wing (Fig. 181) extends as a narrow border along the costa around the apical crescent to M_{1+2} ; in E. longicornis the costa between the end of R_{2+3} and M_{1+2} is merely yellowish. The apical crescent is narrower in E. oregona and there is less fusion of hyaline spots in the wing pattern.

Discussion This species is somewhat dimorphic. The males have a narrower apical crescent, are darker colored and smaller than the female.

E. oregona has been confused with E. longicornis in the past.

Type Holotype: male, Blitzen River, Oregon, VII-6-1906 (American Museum of Natural History).

Material examined IDAHO Artemisia tridentata var. tridentata, R. G. Jones (UID): 1m, 5.5 mi. e., Twin Falls, Twin Falls Co., VI-5-1968; 1m, 1f, 4 mi. w. Dietrich, Lincoln Co., VI-6-1968; 4m, 2f, 5 mi. ne., Shoshone, Lincoln Co., VI-6-1968; 1f, 8 mi. n., Rosewood, Twin Falls Co., IV-21-1968. Artemisia tridentata, R. G. Jones (UID): 3m, 1f, 5 mi. e., Challis, Custer Co., VI-21-1968; 1m, 1f, 5 mi. n., Reynolds, Owyhee Co., VI-11-1968; 1f, 6 mi. w., Burley, Cassia Co., IV-22-1968. 1m, 1f, 32 mi. n., Mackay, Custer Co., VI-21-1968, Artemisia tridentata var. vaseyana, R. G. Jones (UID). 2m, 6 mi. n., Holbrook, Oneida Co., VI-9-1969, on A. tridentata, G. F. Knowlton (USU). 1m, 1f, 10 mi. s., Marsing, Owyhee Co., Hiway 95, VI-20-1953, H. G. Manis (USNM). NEVADA 18m, 1f, 27 mi. w., Denio, Humboldt Co., VI-23-1971, ex. Artemisia tridentata, Oman (OSU). 1m, 1f, Emigrant Pass, Eureka Co., VI-19-1952, E. I. Schlinger (USNM). UTAH 1f, Bermore Environs, Clive Jorgensen, 772 (USNM). 1m, Cedar Balley Environs, C. Horgensen 772 (USNM). OREGON 1f, Lower Klamath Lake Hill, VII-19-1953, J. Schuh (OSU). 2m, Blitzen River, VII-6-1906, J. M. Aldrich Coll., (USNM). 1m, [Paratype] Warm Springs VII-7-1906 (OSU). 1m, Narrows, VII-1-1906, [Paratype] (OSU). 1f, Tencent Lake, Henry Co., VI-18-1951, B. Malkin (CAS).

Distribution This species (Map 5) occurs in Oregon, southern Idaho and the northern part of California, Nevada and Utah.

Biology Adults have been collected from June 5 to July 19 with most collections occurring in late June. E. oregona produces galls on Artemisia tridentata tridentata and A. tridentata vaseyana. The galls range in size from 3 by 5 mm. to 4 by 6.5 mm.

Eggs laid in the lateral buds during June and July hatch and larvae induce galls from which adults emerge the following

June.

Artemisia tridentata tridentata, or basin big sagebrush, generally occurs below 6,000 feet elevation while A. tridentata vaseyana occurs above 6,000 feet (Beetle, 1960). The known distribution of E. oregona corresponds roughly to the northern distribution given for A. tridentata tridentata by Beetle.

Eutreta (Onchoaculeata) pollinosa Curran, 1932

Figs. 23, 32, 73, 112, 129, 182.

Eutreta pollinosa Curran, 1932: 16, 18-19 [key, description].

Foote & Blanc, 1963: 28, 32 [key, distribution, discussion], 111 Fig. 38 [wing].

Foote, 1965a: 661 [catalog, distribution].

Cole, 1969: 355 [distribution].

Diagnosis This species is easily distinguished by the completely yellowish head and the fused spots in the middle of the wing pattern (Fig. 182). It has a wide apical whitish crescent and a grayish thorax and abdomen.

Type Holotype: male, Antelope Mt., Harney Co., Oregon, IX-4-1931, elevation 6,500 feet, D. K. Frewing (American Museum Natural History).

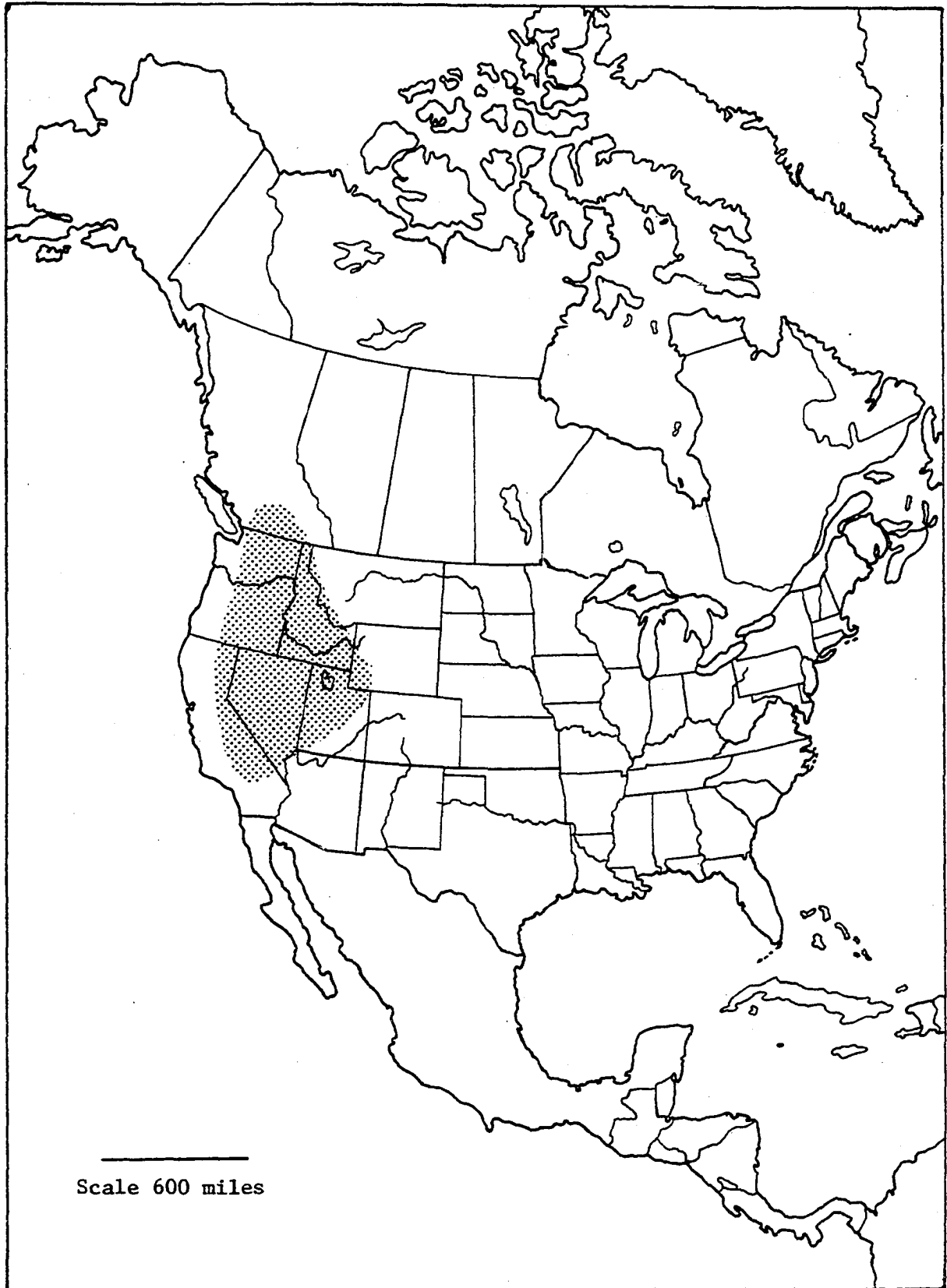
Material examined Holotype. CALIFORNIA 1f, Hallelujah Jct., Lassen Co., IX-9-1968, R. R. Pinger (ISU). IDAHO 1m, Regina, VI-23-1938, H. M. Harris (ISU). 1m, Craters of Moon, VI-29-1930, D. M. DeLong (USNM). NEVADA 1m, 20 mi. e., Wells, VIII-10-1968, P. Oman (OSU). OREGON 1, Ontario, VII-15-1963, Potato field, S. Besse (OSU). UTAH 1f, Green Canyon, IX-11-1964, S. J. Kohler (USU). 1f, Duchesne, VII-28-1949, G. F. Knowlton & S. L. Wood (USNM). 1f, Orton, VIII-10-1936, G. F. Knowlton (USU). WASHINGTON 1f, Hanford works, Denton Co., VI-4-1952, sagebrush, R. H. Whittaker (USNM).

Distribution This rarely-collected species (Map 6) occurs from Washington to California and east to eastern Utah.

Biology E. pollinosa has been collected from June 4 to September 11. This chronic distribution indicates that more than one generation may occur per year.

It has been taken from sagebrush and from a potato field. Sagebrush appears to be a likely host. E. pollinosa has an ovipositor which is very similar to that of the females of other species which attack sagebrush.

Map 6. North America. Distribution of E. pollinosa



SUBGENUS SETOGENAEutreta (Setogena) New Subgenus

The subgenus Setogena is formed to include two species E. rotundipennis and E. fenestra. The type of the subgenus is E. rotundipennis Loew, 1862.

Members of this subgenus can be distinguished by the inflated setae of the gena, postgena and palps. The wings are very broad and possess large marginal spots. The size of the wing spots is widely variable. The female has a short ovipositor, the aculeus has a very short point and the blade angle of the aculeus is very large. The male has short surstyli which are enlarged apically. The apical setae are short, only as long as the width of the surstylus and the dorsal lobe is moderately developed.

The frons is much wider than long and the oral margin is moderately produced.

Key to Species of the Subgenus Setogena

1. Wing with many coalced spots in R and adjacent cells. Areas tinged with violet on oral margin, antennae, postgena, pleuron and coxae. Apical crescent complete..... E. fenestra, p. 140
- Wing with spots usually distinct. No large hyaline area in center of wing. Violet areas absent. Apical crescent interrupted along veins by the extension of brown pattern of wing.....
..... E. rotundipennis, p. 143

Eutreta (Setogena) fenestra New Species

Figs. 26, 39, 62, 183.

Diagnosis This species can easily be distinguished by the pattern of the wing which has several hyaline spots fused to form a large clear area in the middle of the wing.

Description Body generally brown with some membranous areas showing tinges of violet. Main bristles black. Many thick whitish setae. Species similar to E. rotundipennis.

Head with whitish pollinosity on face, gena and orbital carina. Frons with 25-30 short stout whitish setae. Setae of first antennal segment whitish; black dorsally and whitish ventrally on second segment; third segment with whitish pollinosity. Arista black. Palps with 10-12 strong black setae ventro-apically, numerous whitish setae of equal length. Lateral oral margin of face with whitish setae. Oral-genal area with black setae. Genal bristle black. Postgenal oral margin with 6 large whitish setae, 4 black setae; all other postgenal setae whitish. Four postocular large whitish setae, 8 interspersed smaller black setae. Upper postgena and occiput grayish-brown. Oral-genal area and frons brown. Oral membranes, third antennal segment and postgena with tinge of violet. Face without spots; orbito-antennal spot small, dark brown, with indistinct margins. A shallow groove on face beneath antenna, fading before oral margin. Innervertical,

ocellars lower ocellus set off by silvery pollinosity.

Ocellar bristles set behind anterior ocellus. Fronto-orbitals and anterior upper fronto-orbital bristles long, thin and black.

Thorax brown. Humero-notopleural brown band slightly lighter brown than notum. Lower humerus, mesopleural suture, halteres and pleural membranes tinged with violet. Notal setae whitish, scattered, fewer than in E. novaeboracensis. Faint "M"-shaped yellow brown pattern over acrostical bristles. Apex of scutellum yellowish-brown. A single row of whitish setae on lower humerus and upper mesopleuron. Upper squamae grayish-brown, lower squamae whitish. Postscutellum dark brown, upper edge violet. Mesopleuron with 14 scattered stout whitish setae, pteropleuron with 5. Sternopleural setae mostly black.

Legs color of thorax. Forefemur with long black ventral bristles and several whitish setae. Dorsal row of setae black on apical half, whitish on basal half, dorsolateral row of setae all black except basal setae.

Abdomen yellowish-brown. Paired brown areas on each tergite separated medially and posteriorly by yellowish-brown area. T6 with 4 pair marginal bristles.

Wing (Fig. 183) brown spots irregular in size; not in rows. Wings broad, length less than twice width, 2d C and stigma broad; stigma length only twice width. Marginal wing

spots larger than most other wing spots. Apical crescent with inner margin undulate. Crescent extending from width of R_5 cell below M_{1+2} anteriorly to R_{2+3} vein. Brown band by apical crescent narrower than crescent. Many spots fusing near center of wing to form a large irregular whitish area twice as wide as R cell. Spots fusing also in M, 1A and Cu_1 cells. Costa with 4 marginal spots before stigma, 1 in stigma, 1 large spot at end of R_1 , 3 more before apical crescent. Posterior margin with 5 spots before $Cu_2 + A_2$ vein, 3 in Cu_1 , and 2 in 2d M_2 cells.

Female genitalia (Figs. 26, 39, 62) with oviscape yellowish-brown, darker brown apically. Oviscape short, only as long as preceding two tergites. Aculeus point short, blade angle broad, bearing 10 well defined serrations. Each serration with an associated sensillum. Aculeus bearing 10 pairs sensilla ventromedially. Inversion membrane with short, broad, triangular-shaped setae, setae not crowded. Spermatheca bulb-shaped; length 2.7 times width; spicules short, broad and crowded.

Type Holotype: female, Ramsey Canyon, Huachuca Mts., Arizona XI-30-1937, P. Oman (United States National Museum). Known only from the holotype.

Biology Nothing is known concerning the biology of this species.

Eutreta (Setogena) rotundipennis (Loew, 1862)

Figs. 27, 40, 59, 90, 105, 127, 137, 152, 184.

Trypeta rotundipennis Loew, 1862: 79-80 [description].

Trypeta (Eutreta) rotundipennis; Loew, 1873: 276

[discussion of taxonomy], Pl. 10, Fig. 4 [wing].

Eutreta rotundipennis; Smith, 1890: 398 [catalog].

Crevecoeur, 1906: 95 [ecological note].

Phillips, 1923: 141 [key, distribution].

Curran, 1932: 16 [key].

Brimley, 1938: 384 [catalog, seasonal distribution].

Foote, 1965a: 661 [catalog, distribution].

Diagnosis This medium sized Eutreta is easily distinguished from other North American forms by the broadly rounded wings (Fig. 184) and the apical crescent which is interrupted along the veins by the brown extension of the wing pattern.

Discussion In a letter to Phillips (1923) C. W. Johnson wrote that Loew's type was from Texas rather than "Middle states" as recorded in his monograph.

The type specimen is in poor condition. It is missing the head, abdomen, 5 legs and part of the prothorax and right side.

Type Holotype: male, Middle States, Loew Coll., Type 13302 (Museum of Comparative Zoology).

Material examined Holotype. ILLINOIS 1m, Olive Granch, IX-5-1923, O. Bryant, C. W. Johnson Coll. (MCZ). KANSAS 1f, Onaga, Crevecoeur (USNM). 1f, Cab. John Br., VII-23-1910, F. Knab (USNM). 1m, Onaga, H. Kahl Coll. (CM). MARYLAND 1f, Plummers Is., VII?-6-1906, D. H. Clemons (USNM). MISSOURI 1f, Columbia, VI-6-1969, W. S. Craig (KSU). NORTH CAROLINA 1f, (ANSP). 1m, (USNM). TEXAS 1f, Dallas, Tex. Boll. (MCZ). VIRGINIA 1f, Black Pond, Fairfax Co., VI-19-1919 (USNM). 1m, Great Falls, N. Banks (MCZ). 1f, 1 mi. w., Elkton, X-9-1968, W. B. Stoltzfus, coll. from Helianthus tuberosus (ISU). 1f, Great Falls, VII-27-1938, C. T. Greene (USNM). 1m, 5 mi. e., Harrisonburg, V-1-1968, W. B. Stoltzfus (ISU).

Distribution E. rotundipennis has been reported from New Jersey and Ohio as well as the states listed above.

Biology This rarely collected species has been taken as early as June 1 and as late as October 9 in Virginia.

Host plants have not been reported for this species. It was collected by Crevecoeur (1906) on weeds in heavy timber in the middle of June. It has also been observed on Helianthus tuberosus in a wooded area near a river. It appears to be associated with ecotonal shaded areas with higher humidity.

The short ovipositor of this species indicates that it likely inserts its eggs in rhizomes or root crowns, and the chronic distribution indicates that a second generation may occur each year.

EVOLUTION OF THE GENUS EUTRETA

The genus Eutreta has evolved along three main lines. In the subgenus Onchoaculeata the aculeus of the ovipositor developed into a short, rather thick, arrow-shaped structure with short lateral barbs. The oviscapae became nearly round in cross section and remained long; longer than the aculeus. The head did not elongate and the face therefore is only slightly concave. The palps remained narrow and the eyes are nearly round, resulting in a wide gena. The wings lost all costal hyaline areas and the surstylus of the male retained only one pair of small apical setae. The surstyli evolved toward short triangular structures. The dorsal lobes were lost but along with this trend the prensisetae became broader and angled near the middle. All species in this subgenus (except possibly E. pollinosa and E. decora) adapted to producing stem galls on sagebrush (Artemisia).

A second line of adaptation, as seen in the subgenus Setogena, resulted in a short broad aculeus, with a large lateral blade angle and fairly large serrations. The oviscapae became shorter than the last two abdominal segments. The frons decreased in length and the head developed many inflated setae. The wings became broad, the R_{2+3} vein became undulate and the marginal wing spots extended into the submarginal area to form large hyaline spots.

The third line of evolution, evident in the subgenus Eutreta, is the main line of adaptation. The aculeus became narrower and the point long. The serrations of the aculeus are very small and tend to be lost. Elongation of the head caused the eyes to be slanting in some species. The oral margin became strongly produced, consequently the length of the frons and gula increased. A variety of patterns developed in the wings, but all species in the subgenus show at least one hyaline marking along the costa and faint brown bands on the r-m and m cross veins extending from the anterior and posterior margin respectively. The oviscap flattened dorso-ventrally and remained long. In the male a dorsal lobe developed and the surstyli became long and wedge-shaped with many long apical setae. This subgenus adapted to a variety of plant hosts but remained gall formers on roots and stems.

Within the Onchoaculeata two lines of evolution are apparent. In one group (E. pollinosa and E. decora), the postgena and occiput lost its dark brown to shining black color. The head became brownish-yellow and the thoracic notum was covered by a grayish pollinosity. The other species in this subgenus (E. longicornis, E. oregona, E. diana and E. divisa) developed a dark brown to black postgena, probably as a result of the increased pigmentation of the postocular spot and the dark area of the occiput. The thorax also became shining black and the setae and bristles became black. This

second group shows a trend for the antennae to elongate and become black. Sexual dimorphism is also evident.

Within the subgenus Eutreta there are several evolutionary trends. In the group E. simplex, E. intermedia and E. frosti, the facial spots disappeared. Members of this group are intermediate between the Onchoaculeata and the remainder of the subgenus as evidenced by the reduced apical setae and the shape of the surstylus. The aculeus and surtsyli of E. simplex are similar to those found in the Onchoaculeata species but the presence of brown wing bands over the cross-veins, the marginal spots of the costa and the produced oral margin show the species affinity to the subgenus Eutreta.

Half of the species in the subgenus Eutreta generally share the following characteristics: an increased length of the surstylus in the males, a long, narrow, ovipositor with weak lateral serrations in the female, and the retention of the dark brown color along the costa. This half of the subgenus can be farther divided into two groups. In a group of South American species (E. rhinophora, E. distincta, E. obliqua, E. sparsa and E. parasparsa) the apical crescent tends to end at or near the M_{1+2} vein, the palps are broader and the head is more elongated. A second group, mostly from North America, include the species E. angusta, E. brasiliensis, E. caliptera, E. frontalis, E. hespera and E. novaeboracensis. In these species the palps are narrow, the aculeus broader,

the oral margin less produced and they are generally lighter in color.

Three species, E. aczeli, E. xanthochaeta and E. margaritata show a trend toward increased hyaline areas or coalesced spots along the costal margin (a specimen of E. margaritata became available after the body of this thesis had been written). These species show more golden-brown color and the bristles tend to be brown to pale yellow.

Two other species of E. (Eutreta), E. apicata and E. patagiata, have heads that are somewhat square in silhouette, but the face is concave. There are numerous inflated pale yellow setae, the apical crescent has a concave inner margin and the costal margin in E. apicata is concave distad of the end of R_1 . These two species do not seem to be closely allied to each other or to other members of this subgenus. They are placed here, however, because of the brown bands on the cross-veins, the long flattened oviscape and the costal hyaline areas of the wing.

Eutreta mexicana shows affinities to E. xanthochaeta in the shape of the surstyli but the wing pattern and size of setae is nearer to that found in E. simplex.

The number of species of Eutreta occurring in the southwestern United States and Central America with primitive characters suggests this area as a likely origin of this genus. Half of the known species occur in this area.

Only members of the subgenus Eutreta have been found in South America. The rhinophora group are all from South America while the angusta group are from North America, with the exception of E. brasiliensis. Eutreta frosti and E. aczeli are also found in South America. The migration of Eutreta into South America must have occurred after the period of the separation of the North and South American continents during the Miocene. Compositae, upon which larval Eutreta usually feed, were not known to occur before the lower Miocene (Bush, 1966).

Only three species occur in eastern United States, two of these (E. caliptera and E. novaeborcensis) seem to be of recent origin, the third (E. rotundipennis) occurs as far west as Texas.

Table 1 is a phenogram of the relationship of the various species of E. (Eutreta). It was derived from a cluster analysis of 64 characters listed in Table 3. Only those characters were selected that showed a high degree of uniformity within at least some of the species in this subgenus, those having at least two character states and those not considered redundant. The cluster analysis program compared negative as well as positive characters of the matrix. Each species was compared with every other species and the percentage of similarity to each of the other species as well as to the whole group was determined. The numbers along the bottom

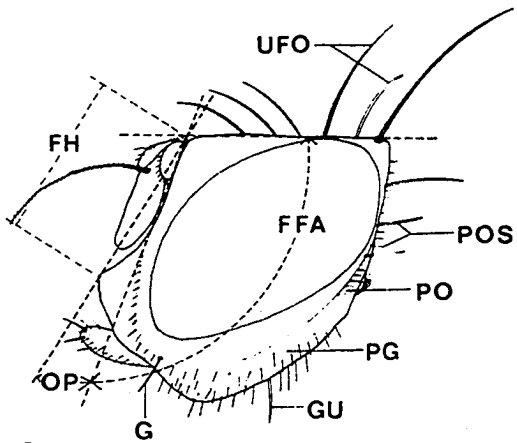
gives the level of similarity of that species to the sub-genus for the characters used and the number following each species is the number of characters actually compared for that species.

The phenogram in Table 2 includes all the species of Eutreta and is based upon the study of the cluster analysis as well as on more classical study of characters. Characters were studied to determine whether they were ancestral or derived (Mayr, 1969). Characters found in Table 3 are listed in the derived state if this was determined.

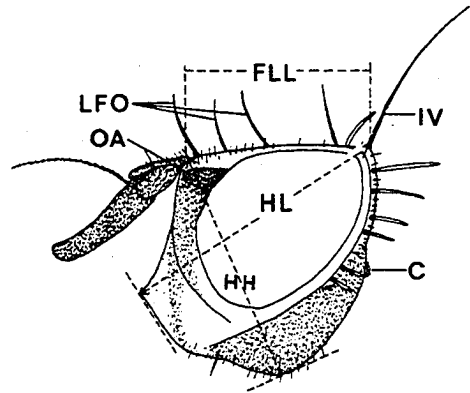
ILLUSTRATIONS

Plate I. Terminology of structures

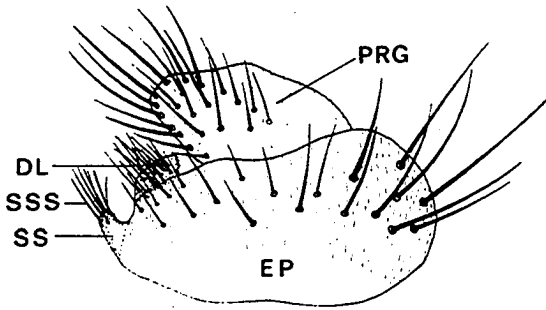
- Fig. 1. Eutreta frosti. Head, lateral view. FFA, fronto-facial angle; FH, facial height; G, genal bristle; GU, gular bristle; OP, oral protrusion; PG, postgena; PO, postocular spot; POS, postocular setae (absent in E. frosti); UFO, upper fronto-orbital bristle
- Fig. 2. E. longicornis. Head, lateral view. C, comb; FLL, frons lateral length; HH, head height; HL, head length; IV, inner vertical bristle; LFO, lower fronto-orbital bristle; OA, orbito-antennal spot
- Fig. 3. E. frontalis. Male terminalia, lateral view. EP, epandrium; DL, dorsal lobe; PRG, proctiger; SS, surstylus; SSS, apical setae of surstylus
- Fig. 4. E. frontalis. Male terminalia, posterior view. DL, dorsal lobe; OC, outer clasper; PRS, prensisetae; SOC, apical setae of outer clasper; SS, surstylus; SSS, apical setae of surstylus
- Fig. 5. E. rhinophora. Aculeus of female ovipositor, ventral view. EG, egg guide; S, sensoria; SE, serrated edge
- Fig. 6. E. caliptera. Female ovipositor, dorsal view. A, aculeus; EG, egg guide; IM, inversion membrane; LBA, lateral blade angle; OV, oviscape; PO, point of the aculeus; SP, spiracle



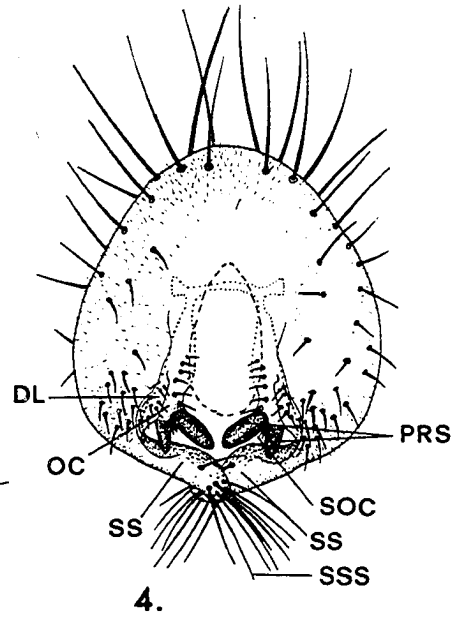
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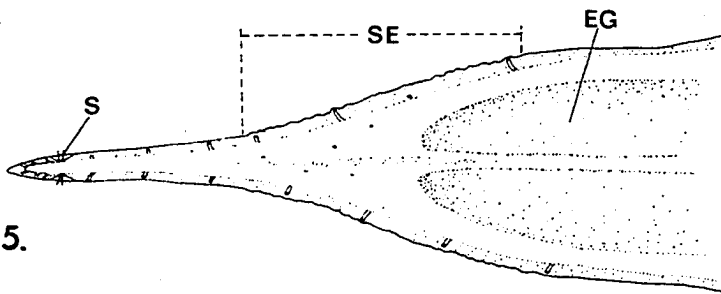
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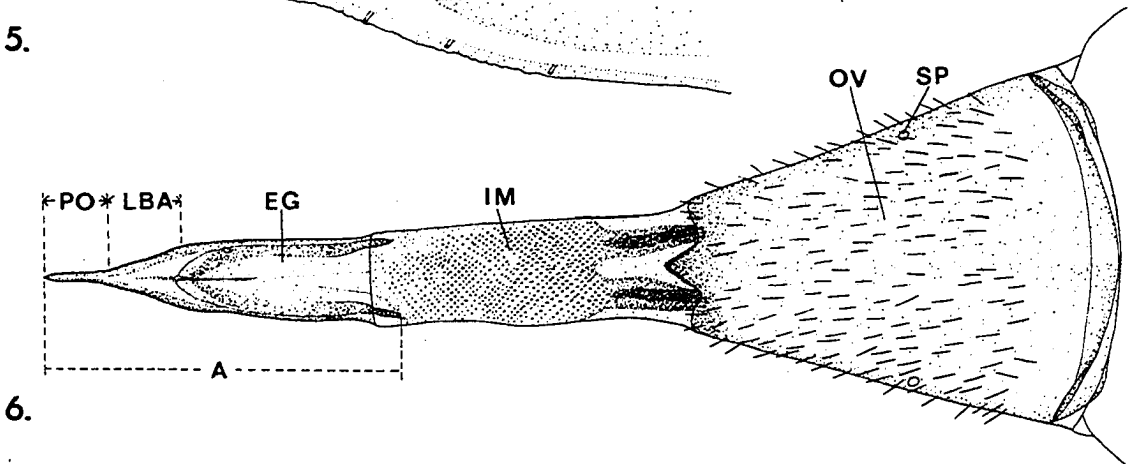
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Plate II. Setae of inversion membrane and the spermathecae of females

- Fig. 7. Eutreta angusta. (holotype)
Fig. 8. E. brasiliensis. (holotype)
Fig. 9. E. caliptera. (Singers Glen, Virginia)
Fig. 10. E. frontalis. (Wadsworth, Ohio)
Fig. 11. E. Aczeli. (Muza, Colombia)
Fig. 12. E. sparsa. (Brazil)
Fig. 13. E. xanthochaeta. (Oahu, Hawaii)
Fig. 14. E. rhinophora. (Carabola, Venezuela)
Fig. 15. E. hespera. (Boca, California)
Fig. 16. E. novaeboracensis. (Nova Scotia)
Fig. 17. E. simplex. (San Bernardino, Co., California)
Fig. 18. E. intermedia. (Xochimilco, Mexico)
Fig. 19. E. distincta. (Rio Grande do Sul, Brazil)
Fig. 20. E. decora. (holotype)
Fig. 21. E. divisa. (Bend Creek, Oregon)
Fig. 22. E. longicornis. (Douglas, Wyoming)
Fig. 23. E. pollinosa. (Hallelujah Junction, California)
Fig. 24. E. diana. (Fruitland, Utah)
Fig. 25. E. oregona. (Bemore, Utah)
Fig. 26. E. fenestra. (holotype)
Fig. 27. E. rotundipennis. (Elkton, Virginia)
Fig. 28. Tephritis baccharis. (San Ysidro, California)
Fig. 29. Tephritis arizonaensis. (Hidalgo Co., Texas)
Fig. 30. Eutreta diana. (Belgrade, Montana)
Fig. 31. E. divisa. (Bend Creek, Oregon)
Fig. 32. E. pollinosa. (Hallelujah Junction, California)
Fig. 33. E. longicornis. (Douglas, Wyoming)
Fig. 34. E. oregona. (Humboldt Co., Nevada)



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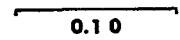
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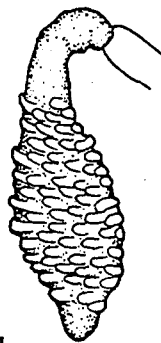
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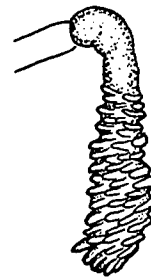
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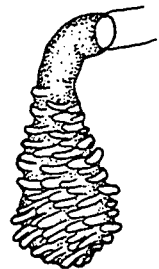
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Plate III. Spermathecae of female

- Fig. 35. Eutreta angusta. (holotype)
Fig. 36. E. brasiliensis. (holotype)
Fig. 37. E. caliptera. (Singers Glen, Virginia)
Fig. 38. E. frontalis. (Wadsworth, Ohio).
Fig. 39. E. fenestra. (holotype)
Fig. 40. E. rotundipennis. (Elkton, Virginia)
Fig. 41. E. novaeboracensis. (Ames, Iowa)
Fig. 42. E. distincta. (Rio Grande do Sul, Brazil)
Fig. 43. E. hespera. (Boca, California)
Fig. 44. E. aczeli. (Muzo, Colombia)
Fig. 45. Tephritis baccharis. (San Ysidro, California)
Fig. 46. Tephritis arizonaensis. (Hidalgo Co., Texas)
Fig. 47. E. simplex. (San Bernardino Co., California)
Fig. 48. E. xanthochaeta. (Oahu, Hawaii)
Fig. 49. E. rhinophora. (Carabola, Venezuela)
Fig. 50. E. sparsa. (Brazil)
Fig. 51. E. intermedia. (Xochimilco, Mexico)



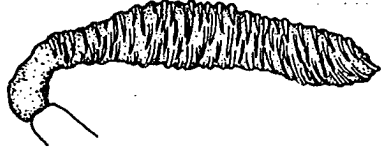
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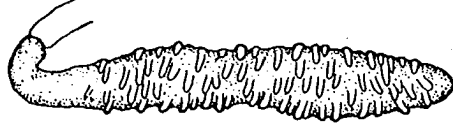
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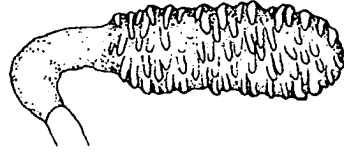
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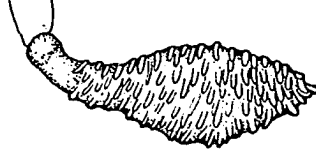
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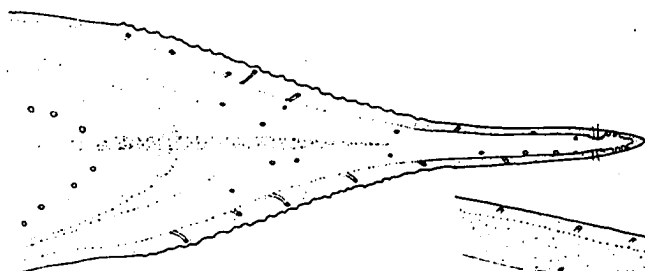


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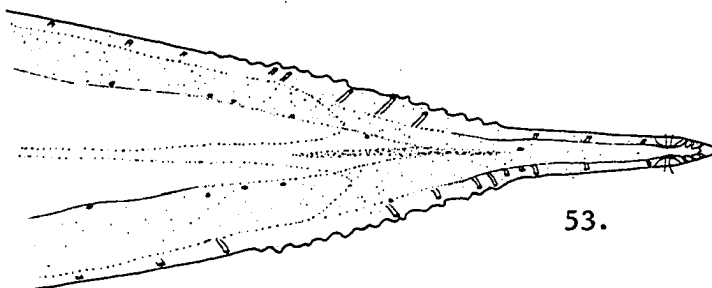
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Plate IV. Aculeus of the female ovipositor

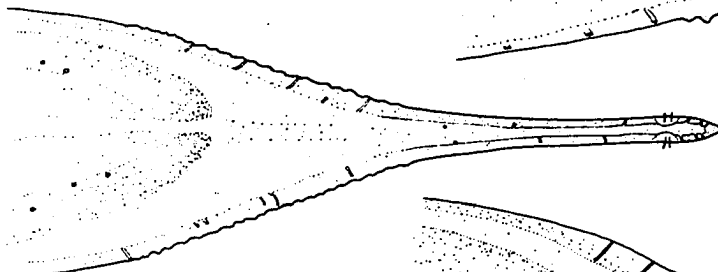
- Fig. 52. Eutreta angusta. (holotype)
Fig. 53. E. intermedia. (Xochimilco, Mexico)
Fig. 54. E. brasiliensis. (Brazil)
Fig. 55. E. angusta. (Deming, New Mexico)
Fig. 56. E. frontalis. (Wadsworth, Ohio)
Fig. 57. E. caliptera. (Singers Glen, Virginia)
Fig. 58. E. hespera. (Boca, California)



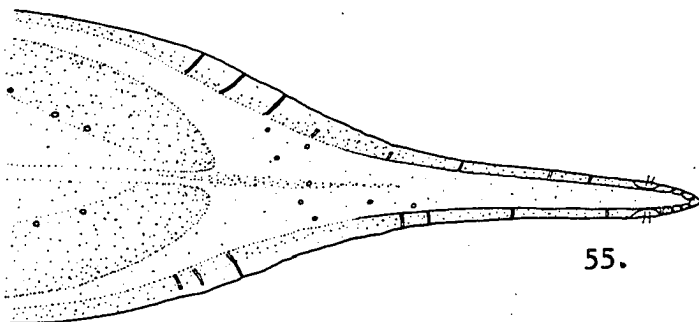
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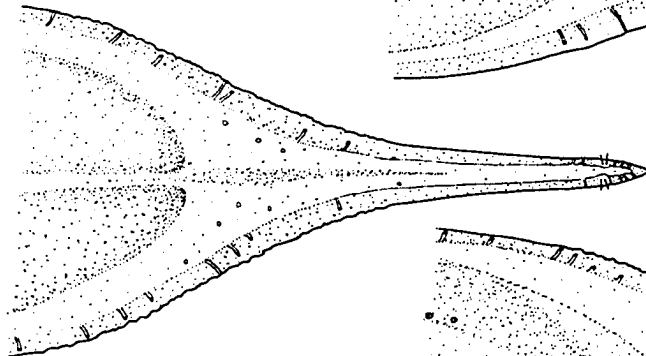
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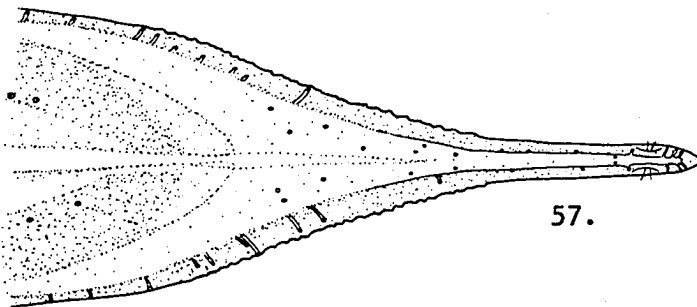
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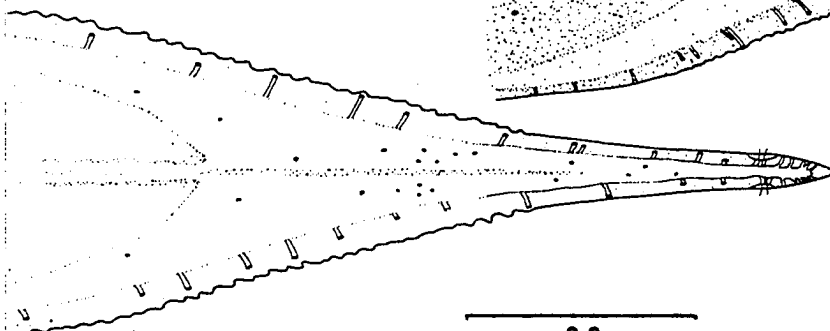
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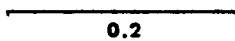
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Plate V. Aculeus of ovipositor

Fig. 59. Eutreta rotundipennis. (Elkton, Virginia)

Fig. 60. E. sparsa. (Brazil)

Fig. 61. E. xanthochaeta. (Oahu, Hawaii)

Fig. 62. E. fenestra. (holotype)

Fig. 63. E. rhinophora. (Carabola, Venezuela)

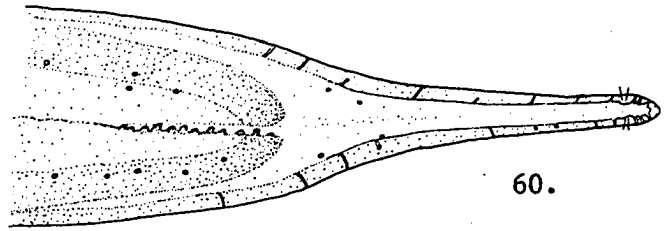
Fig. 64. E. novaeboracensis. (Nova Scotia)

Fig. 65. E. distincta. (Rio Grande do Sul, Brazil)

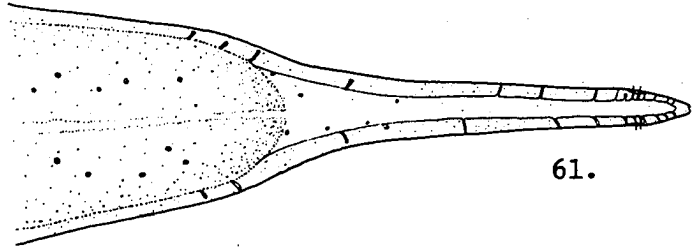
Fig. 66. E. apicata. (San Jose, Costa Rica)



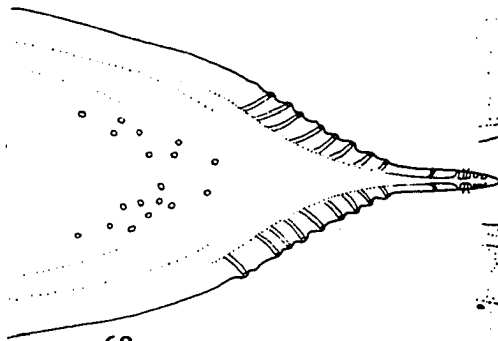
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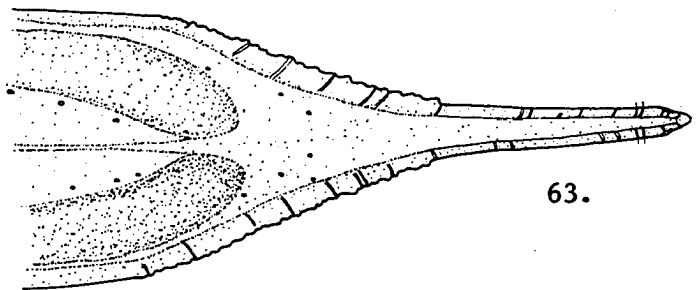
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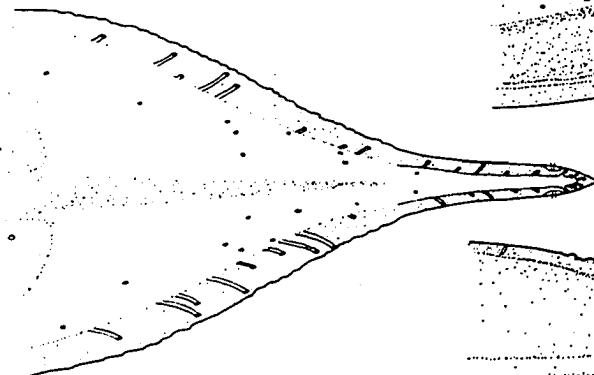
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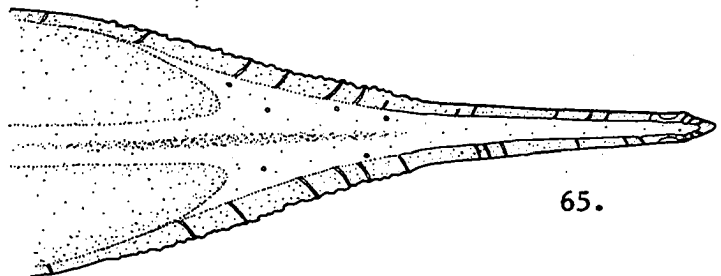
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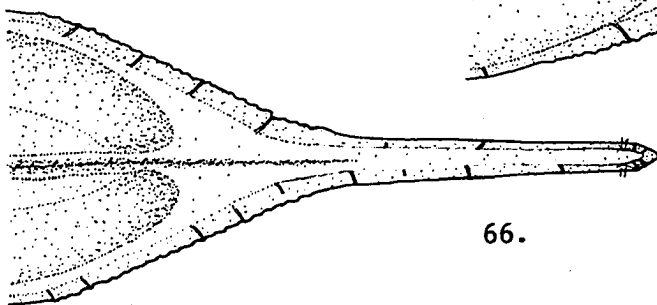
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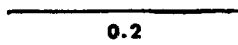
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Plate VI. Aculeus of ovipositor

Fig. 67. Eutreta decora. (holotype)

Fig. 68. E. oregona. (New Humboldt Co., Nevada)

Fig. 69. E. diana. (Belgrade, Montana)

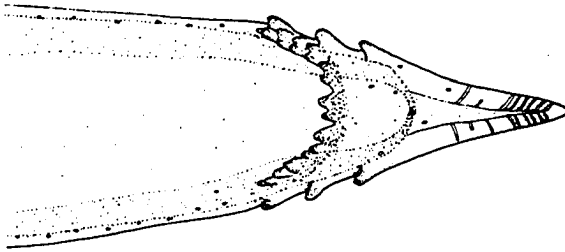
Fig. 70. E. longicornis. (Douglas, Wyoming)

Fig. 71. E. divisa. (Bend Creek, Oregon)

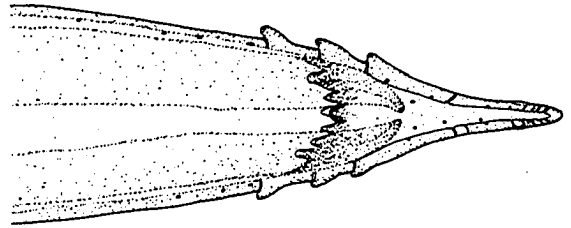
Fig. 72. Tephritis baccharis. (San Ysidro, California)

Fig. 73. Eutreta pollinosa. (Hallelujah Junction, California)

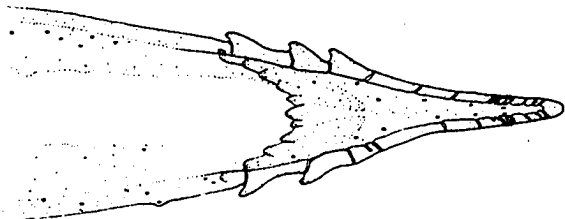
Fig. 74. Tephritis arizonaensis. (Hidalgo Co., Texas)



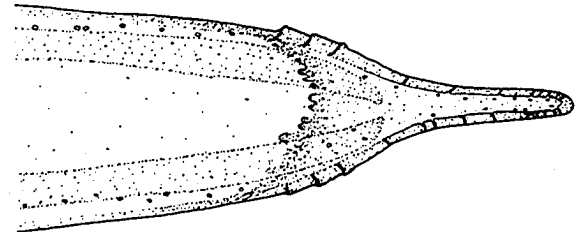
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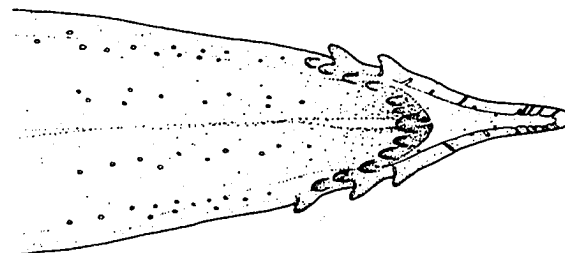
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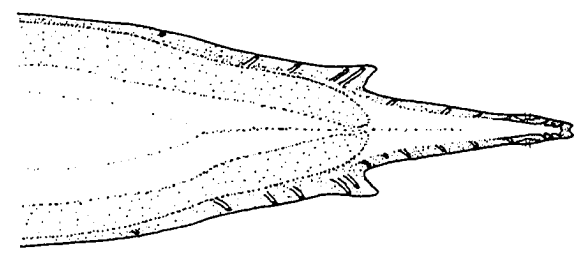
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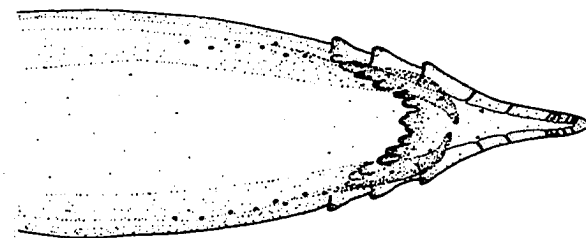
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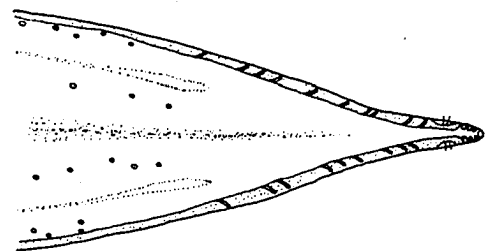
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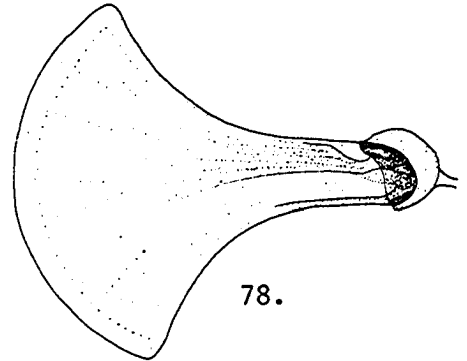
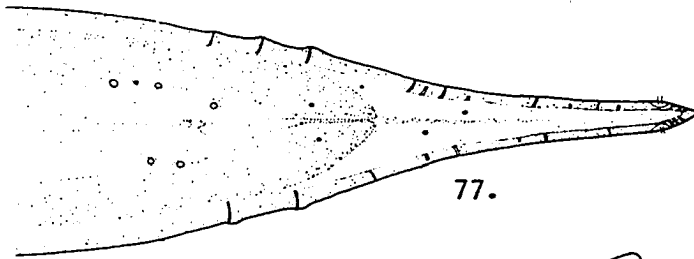
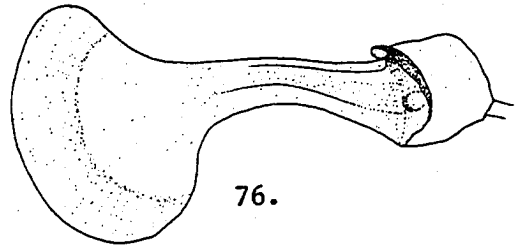
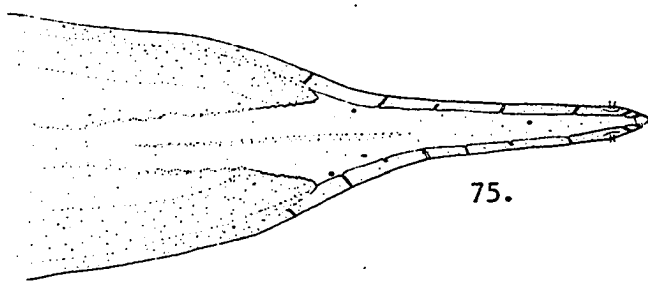


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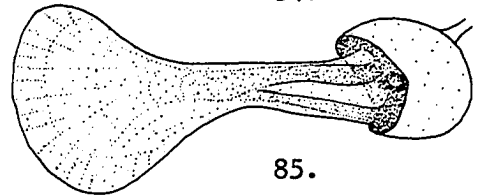
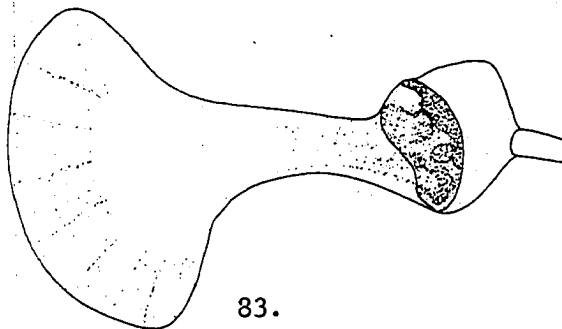
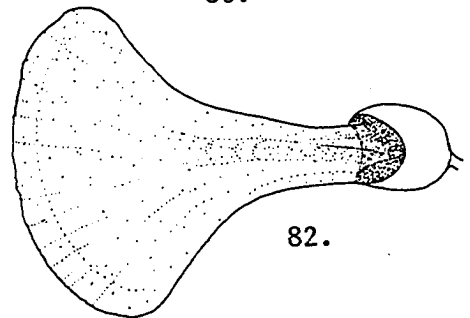
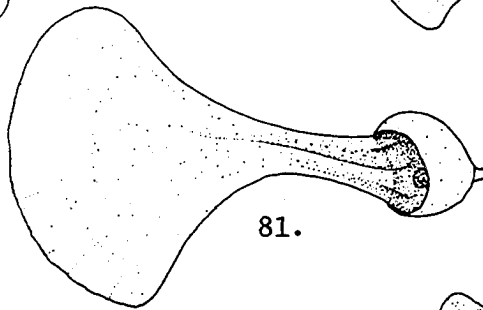
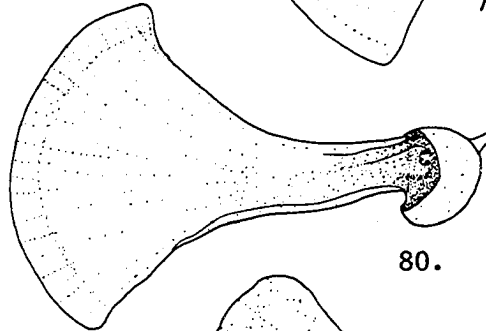
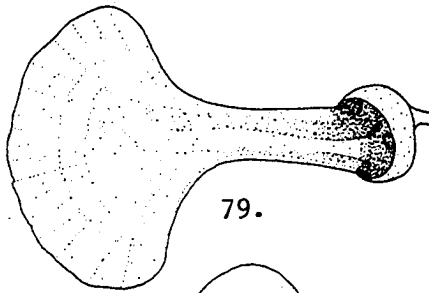
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Plate VII. Aculeus of female ovipositor and ejaculatory apodemes of male

- Fig. 75. Eutreta aczeli. (Muzo, Colombia)
- Fig. 76. E. frontalis. (Crugers, New York)
- Fig. 77. E. simplex. (San Bernardino Co., California)
- Fig. 78. E. oregona. (Warm Springs, Oregon)
- Fig. 79. E. angusta. (Mission, Texas)
- Fig. 80. E. longicornis. (Douglas, Wyoming)
- Fig. 81. E. caliptera. (Singers Glen, Virginia)
- Fig. 82. E. diana. (Lake Co., Oregon)
- Fig. 83. E. novaeboracensis. (Ithaca, New York)
- Fig. 84. E. divisa. (Regina, Idaho)
- Fig. 85. E. hespera. (Castle Rock, Colorado)



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Plate VIII. Ejaculatory apodemes of male terminalia

- Fig. 86. Eutreta distincta. (Rio Grande do Sul, Brazil)
- Fig. 87. E. parasparsa. (cotype)
- Fig. 88. E. xanthochaeta. (Oahu, Hawaii)
- Fig. 89. E. rhinophora. (El Valle, Venezuela)
- Fig. 90. E. rotundipennis. (Dallas, Texas)
- Fig. 91. E. sparsa. (Rio Grande do Sul, Brazil)
- Fig. 92. Tephritis baccharis. (Bill Williams Fork, Arizona)
- Fig. 93. Eutreta apicata. (San Jose, Costa Rica)
- Fig. 94. Tephritis arizonaensis. (Hidalgo, Texas)
- Fig. 95. Eutreta mexicana. (holotype)
- Fig. 96. E. obliqua. (Villa Elirxa, Colombia)
- Fig. 97. E. intermedia. (Xochimilco, Mexico)

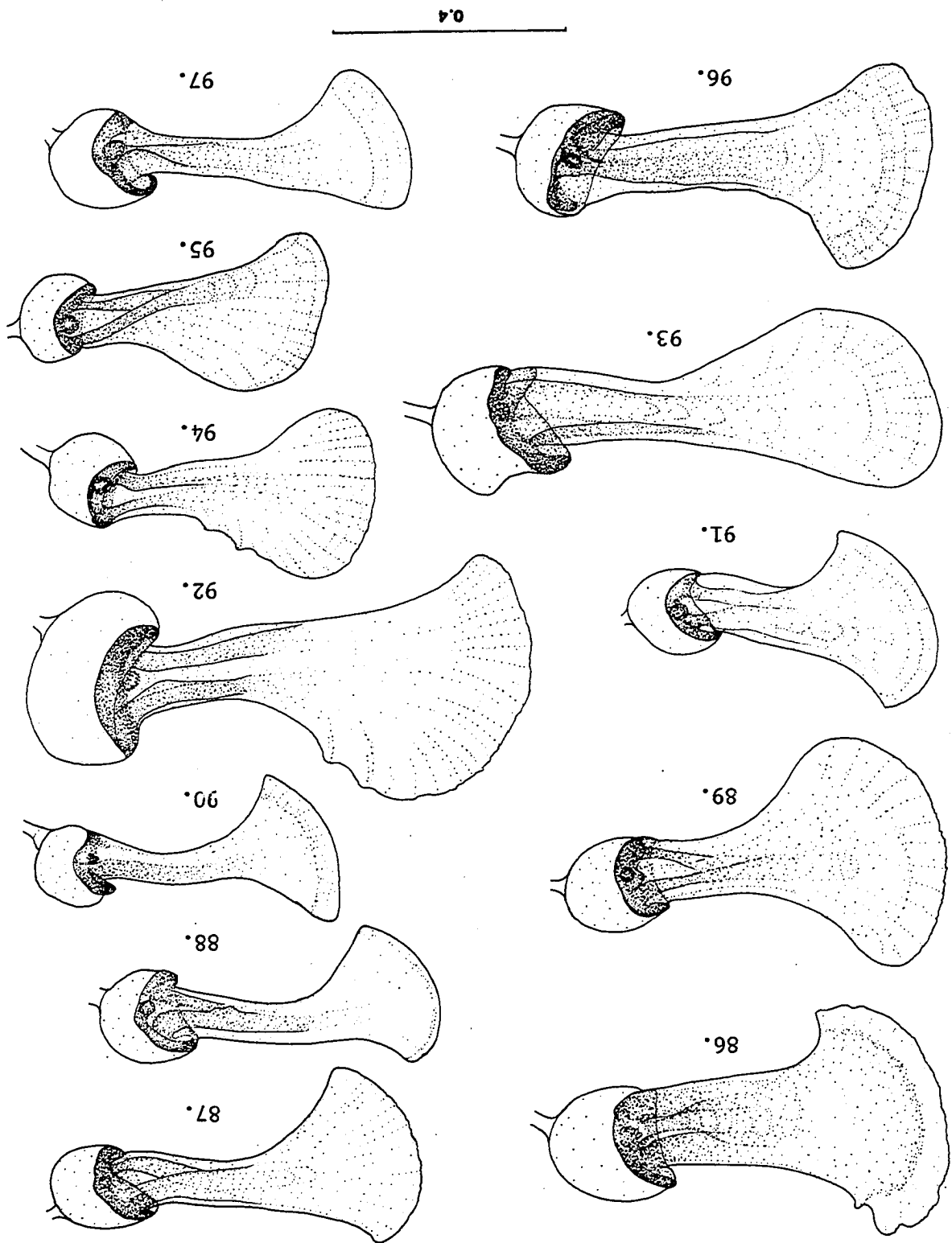
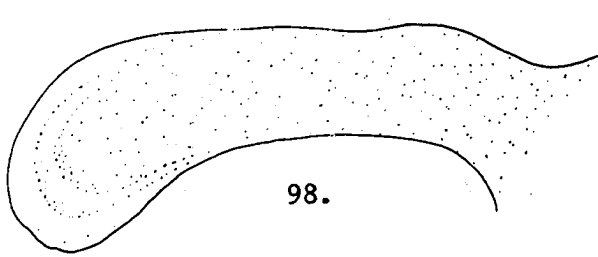
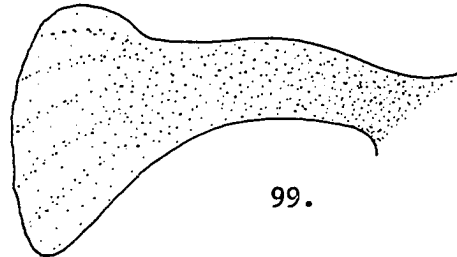


Plate IX. Phallic apodemes of male terminalia

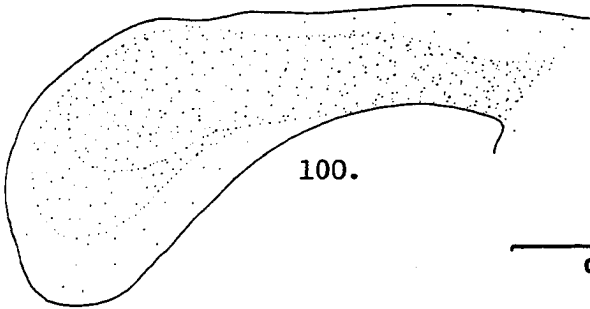
- Fig. 98. Eutreta hespera. (Castle Rock, Colorado)
Fig. 99. E. frontalis. (Crugers, New York)
Fig. 100. E. apicata. (Costa Rica)
Fig. 101. E. rhinophora. (El Salvador)
Fig. 102. E. obliqua. (Villa Elirxa, Colombia)
Fig. 103. E. distincta. (Rio Grande do Sul, Brazil)
Fig. 104. E. xanthochaeta. (Oahu, Hawaii)
Fig. 105. E. rotundipennis. (Dallas, Texas)
Fig. 106. E. diana. (Cloverdale, Oregon)
Fig. 107. E. sparsa. (Rio Grande do Sul, Brazil)
Fig. 108. E. caliptera. (Blacksburg, Virginia)
Fig. 109. E. divisa. (Regina, Idaho)
Fig. 110. E. parasparsa. (cotype)
Fig. 111. E. angusta. (Mission, Texas)
Fig. 112. E. pollinosa. (Hallelujah Junction, California)
Fig. 113. E. simplex. (San Bernardino Co., California)
Fig. 114. E. longicornis. (Douglas, Wyoming)
Fig. 115. E. oregona. (Warm Springs, Oregon)



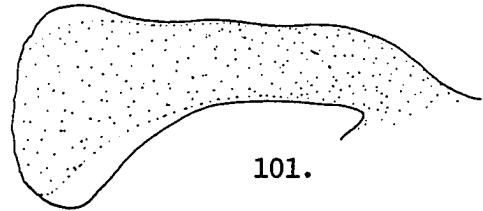
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99.

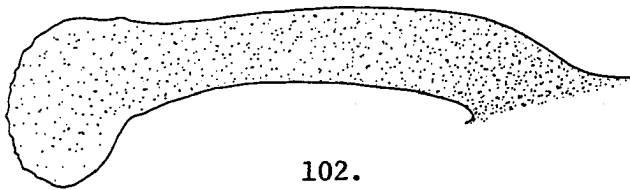


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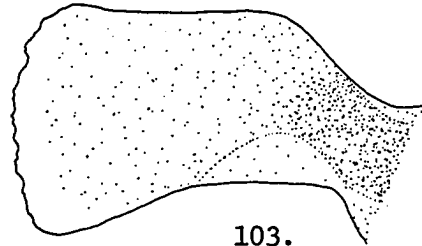


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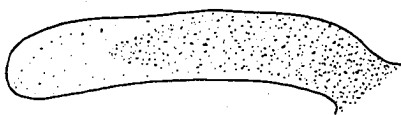
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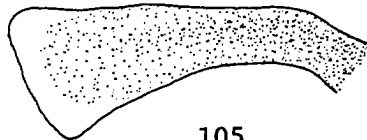
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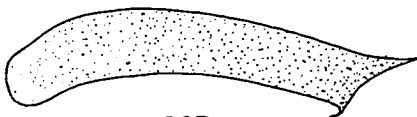
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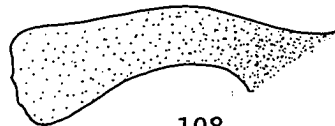
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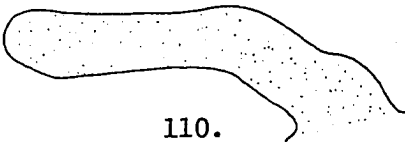
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108.



109.



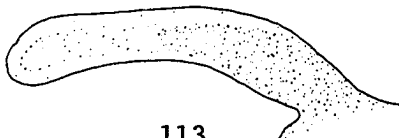
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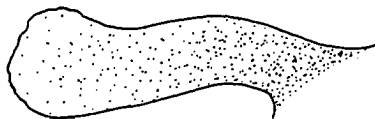
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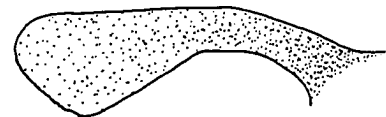
112.



113.



114.



115.

Plate X. Posterior view of male terminalia, proctiger removed

Fig. 116. Eutreta novaeboracensis. (Dickerson Co., Iowa)

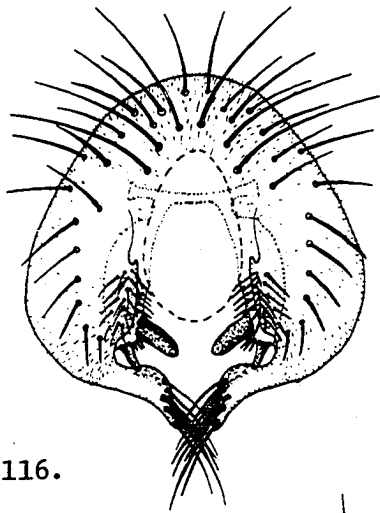
Fig. 117. E. rhinophora. (El Valle, Venezuela)

Fig. 118. E. divisa. (Regina, Idaho)

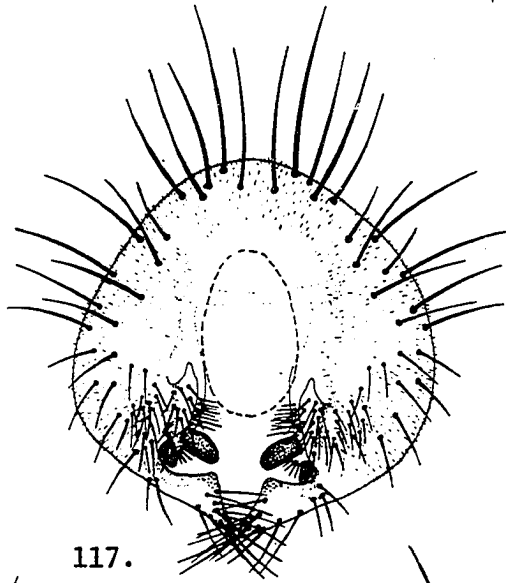
Fig. 119. E. longicornis. (Douglas, Wyoming)

Fig. 120. E. mexicana. (holotype)

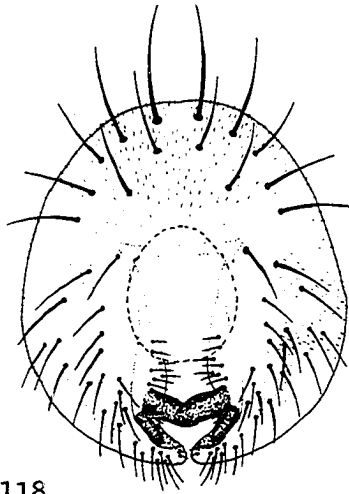
Fig. 121. E. hespera. (Castle Rock, Colorado)



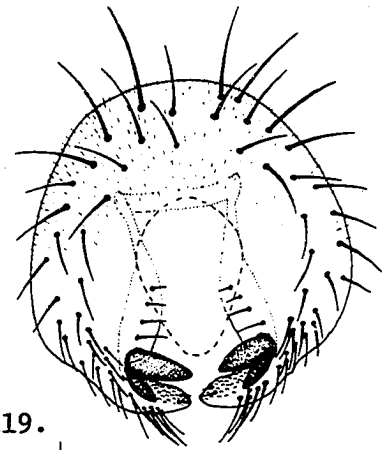
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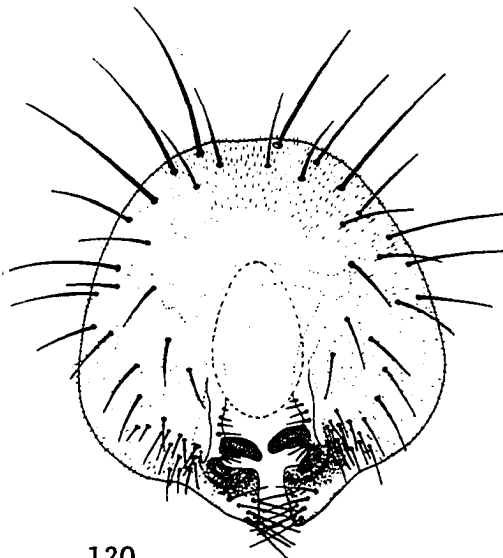
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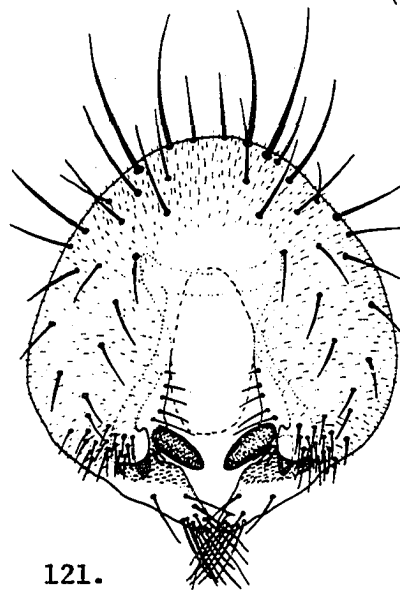
118.



119.



120.



121.

0.2

Plate XI. Male terminalia

Fig. 122. Eutreta angusta, posterior view, proctiger removed.
(Campo, California)

Fig. 123. E. angusta, left side. (Campo, California)

Fig. 124. E. hespera, left side. (Castle Rock, Colorado)

Fig. 125. Tephritis baccharis, posterior view, proctiger removed. (San Ysidro, California)

Fig. 126. Eutreta intermedia, left side. (Xochimilco, Mexico)

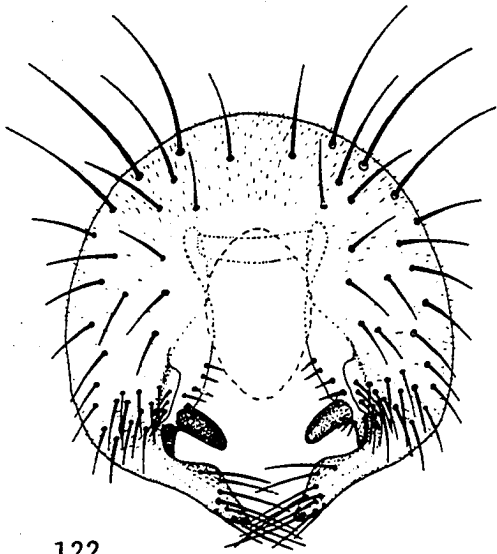
Fig. 127. E. rotundipennis, right side. (Dallas, Texas)

Fig. 128. E. simplex, right surstylus, posterior view.
(San Bernardino Co., California)

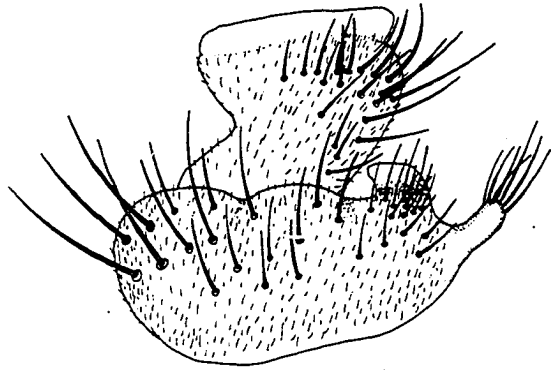
Fig. 129. E. pollinosa, right surstylus, posterior view.
(Regina, Idaho)

Fig. 130. E. diana, right surstylus, posterior view.
(Montana)

Fig. 131. E. oregona, right surstylus, posterior view. (Warm Springs, Oregon)

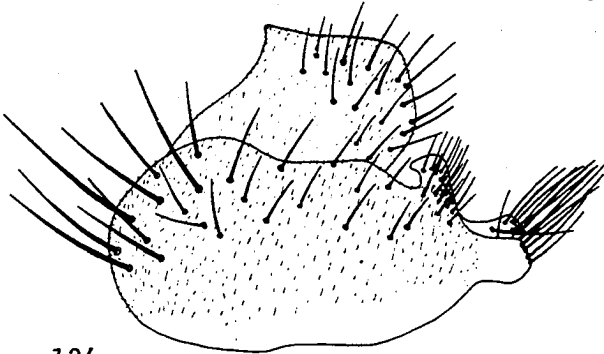


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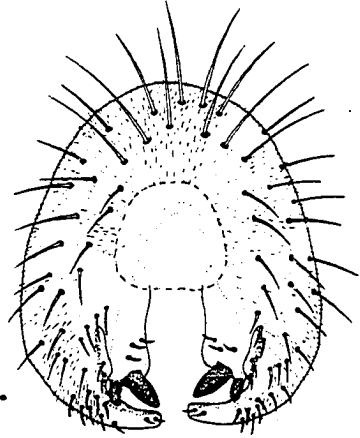


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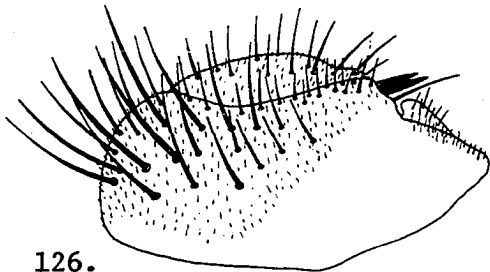
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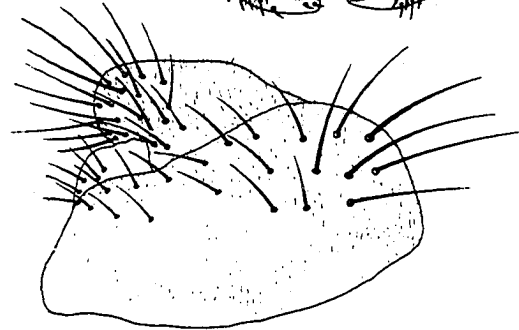
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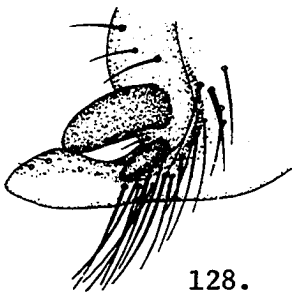
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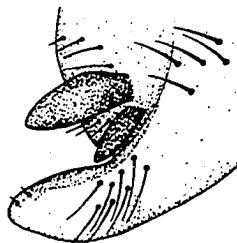
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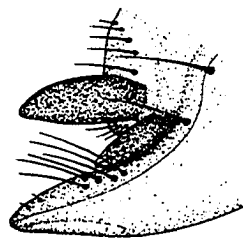
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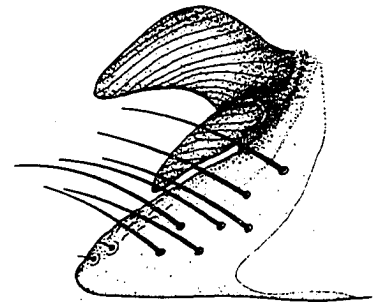
128.



129.



130.



131.

0.068

0.114

Plate XII. Right surstyli of male terminalia, posterior view

Fig. 132. Eutreta apicata. (Costa Rica)

Fig. 133. E. obliqua. (Villa Elirxa, Colombia)

Fig. 134. E. xanthochaeta. (Oahu, Hawaii)

Fig. 135. E. parasparsa. (cotype)

Fig. 136. E. distincta. (Rio Grande do Sul, Brazil)

Fig. 137. E. rotundipennis. (Dallas, Texas)

Fig. 138. E. rhinophora. (El Valle, Venezuela)

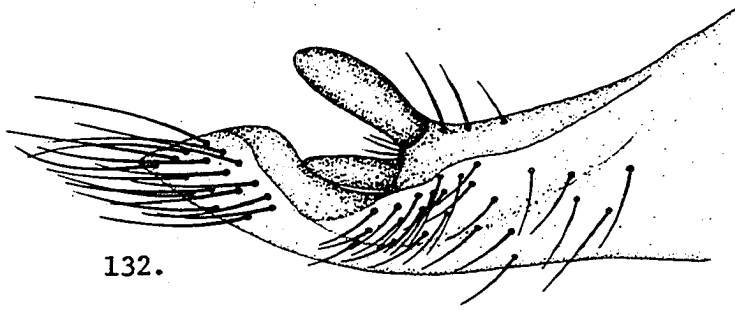
Fig. 139. E. caliptera. (Singers Glen, Virginia)

Fig. 140. E. angusta. (Cochise Co., Arizona)

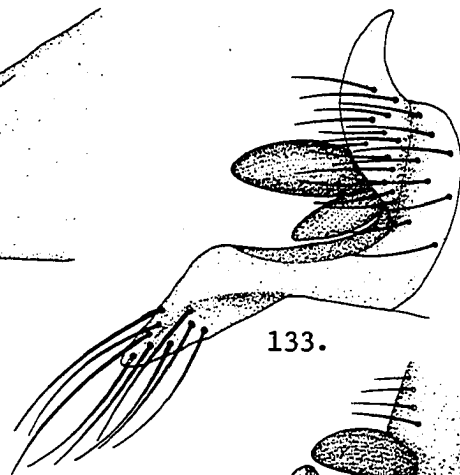
Fig. 141. E. angusta. (Mission, Texas)

Fig. 142. E. intermedia. (Xochimilco, Mexico)

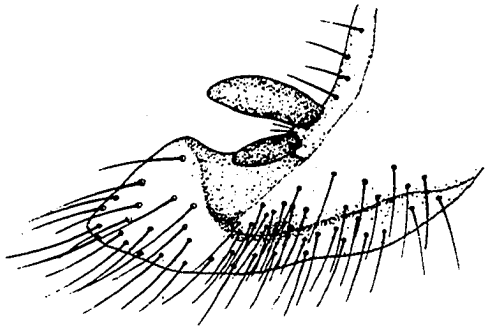
Fig. 143. E. frontalis. (Castle Rock, Colorado)



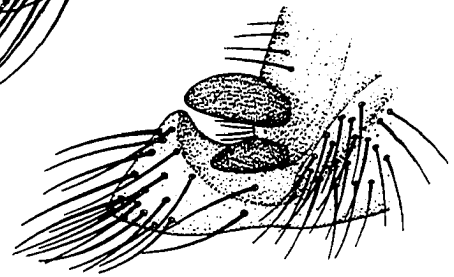
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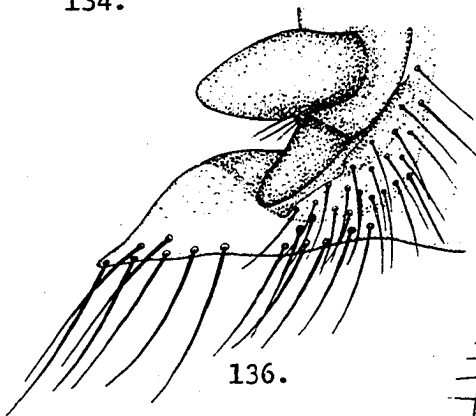
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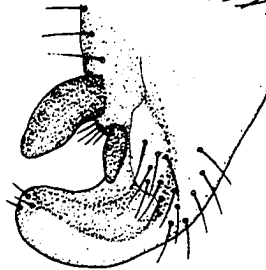
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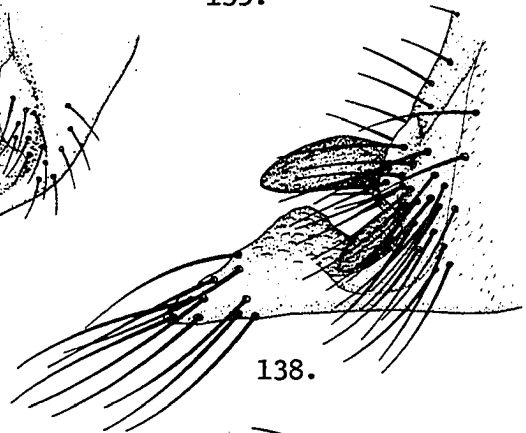
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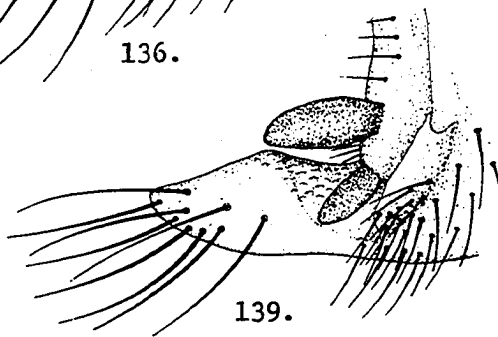
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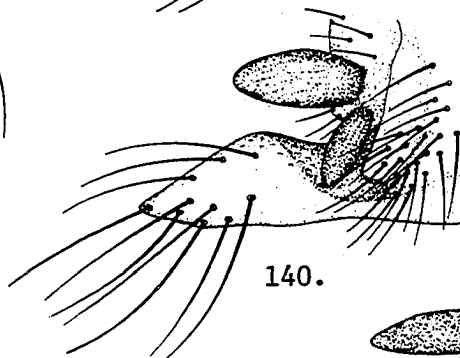
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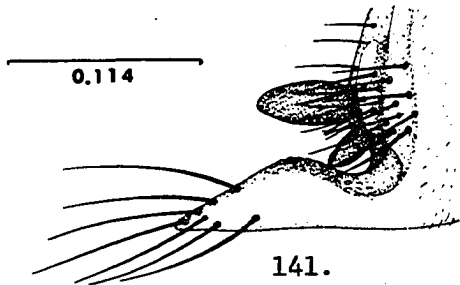
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139.



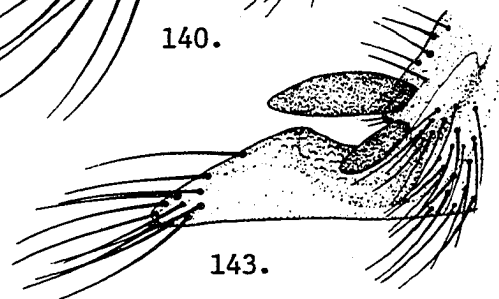
140.



141.



142.



143.

0.114

Plate XIII. Dorsal lobe of the epandrium of the male terminalia

Fig. 144. Eutreta angusta. (Cochise Co., Arizona)

Fig. 145. E. frontalis. (Crugers, New York)

Fig. 146. E. hespera. (Castle Rock, Colorado)

Fig. 147. E. caliptera. (Singers Glen, Virginia)

Fig. 148. E. distincta. (Rio Grande do Sul, Brazil)

Fig. 149. E. rhinophora. (El Salvador)

Fig. 150. E. parasparsa. (cotype)

Fig. 151. E. obliqua. (Villa Elirxa, Colombia)

Fig. 152. E. rotundipennis. (Dallas, Texas)

Fig. 153. E. sparsa. (Rio Grande do Sul, Brazil)

Fig. 154. E. xanthochaeta. (Oahu, Hawaii)

Fig. 155. E. intermedia. (Xochimilco, Mexico)

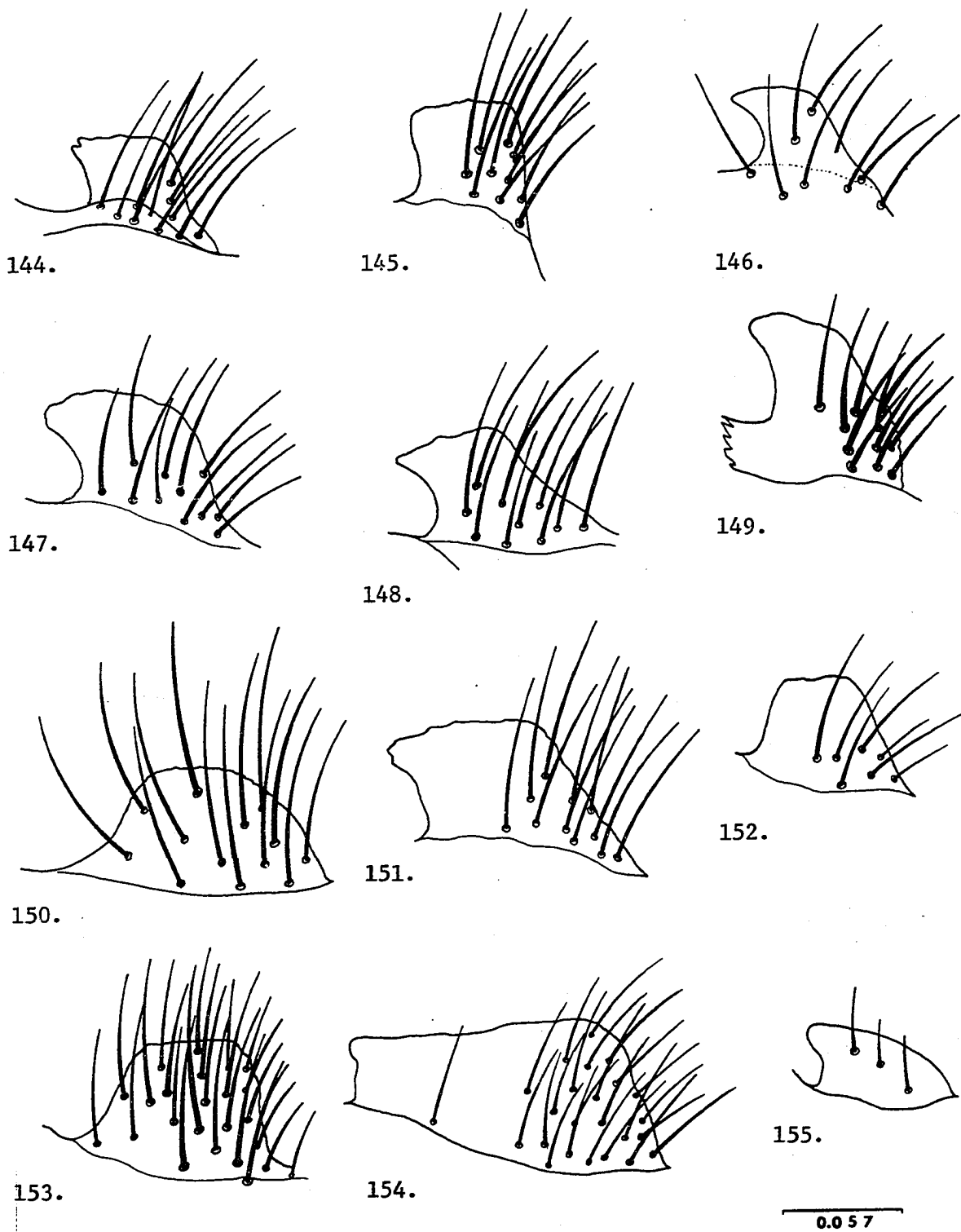


Plate XIV. Wing patterns of Eutreta species

Fig. 156. E. aczeli, female. (Muzo, California)

Fig. 157. E. angusta, female. (Riverside, California)

Fig. 158. E. apicata, female. (Costa Rica)

Fig. 159. E. brasiliensis, female. (Brazil)

Fig. 160. E. caliptera, male. (Singers Glen, Virginia)

Fig. 161. E. distincta, female. (Rio Grande do Sul, Brazil)

Fig. 162. E. frontalis, male. (Kent, Ohio)

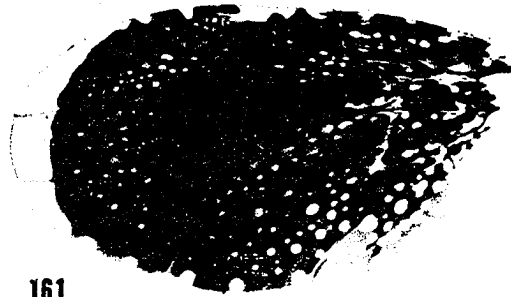
Fig. 163. E. frosti, female. (San Isidro, Ecuador)

Fig. 164. E. hespera, male. (Boca, Nevada Co., California)

Fig. 165. E. intermedia, female. (Xochimilco, Mexico)



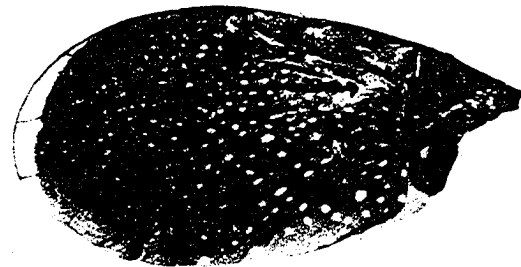
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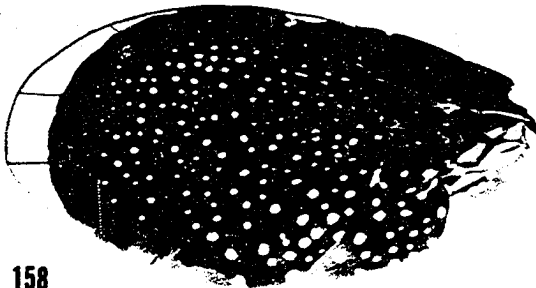
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157



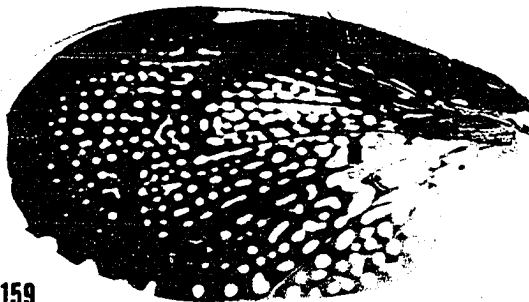
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158



163



159



164



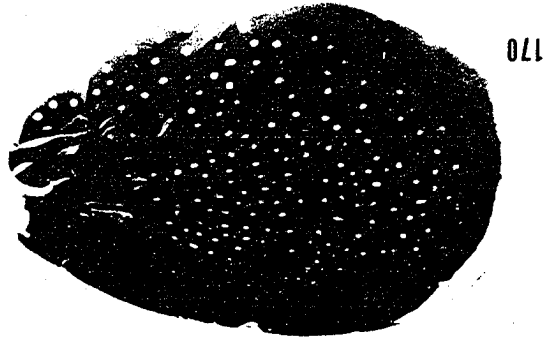
160



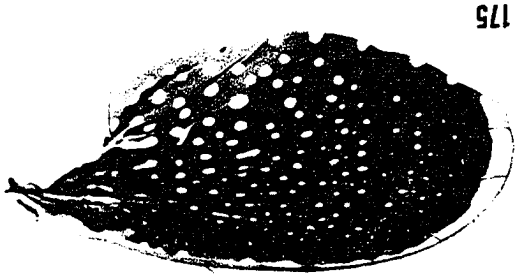
165

Plate XV. Wing patterns of Eutreta species

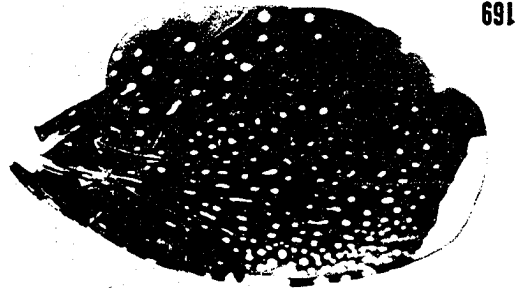
- Fig. 166. E. margaritata. (Zontehuitz, Mexico)
- Fig. 167. E. Mexicana, male. (holotype)
- Fig. 168. E. novaeboracensis, male. (Ames, Iowa)
- Fig. 169. E. obliqua. (Villa Elvira, Colombia)
- Fig. 170. E. parasparsa, male. (drawn from cotype)
- Fig. 171. E. patagiata, female. (lectotype)
- Fig. 172. E. rhinophora, female. (E. Aragua, Venezuela)
- Fig. 173. E. simplex, female. (holotype)
- Fig. 174. E. sparsa, female. (Rio Grande do Sul, Brazil)
- Fig. 175. E. xanthochaeta, female. (Oahu, Hawaii)



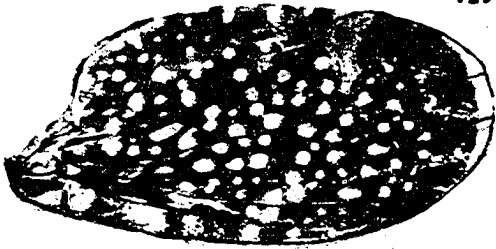
170



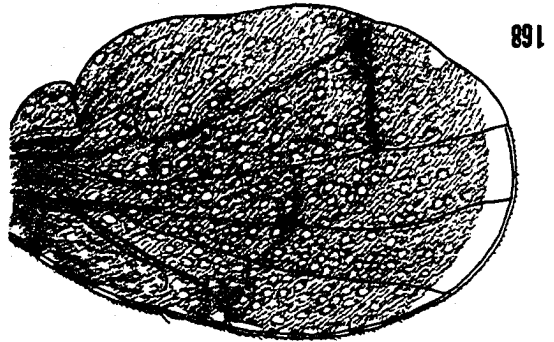
175



169



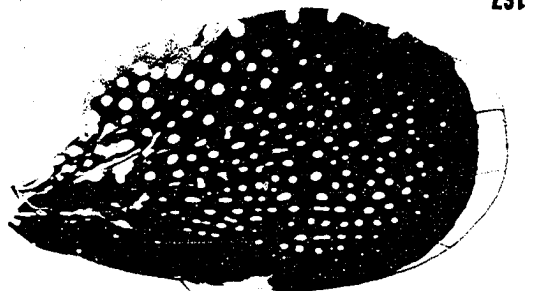
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168



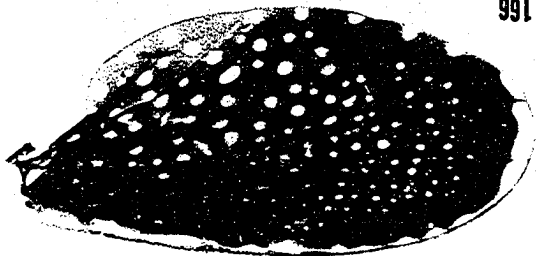
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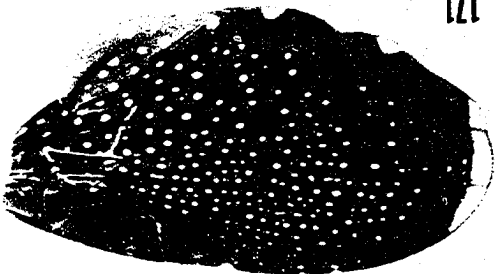
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172



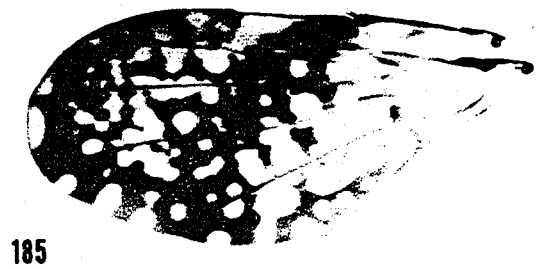
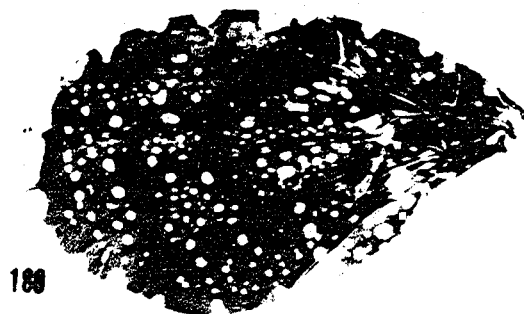
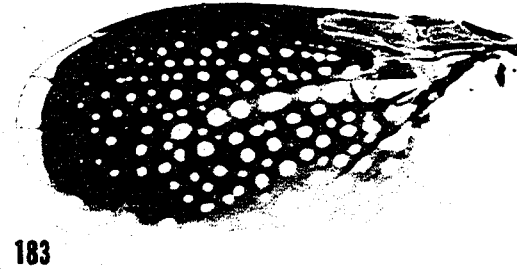
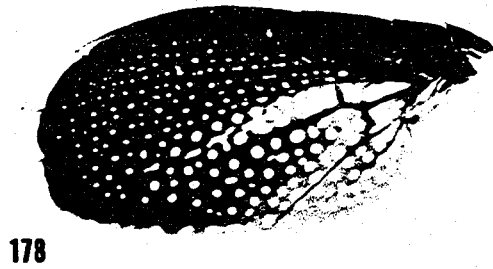
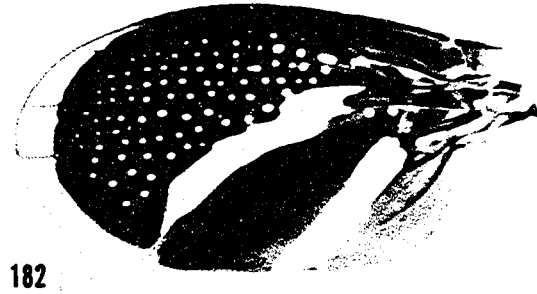
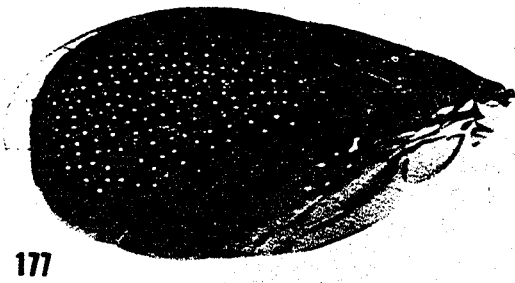
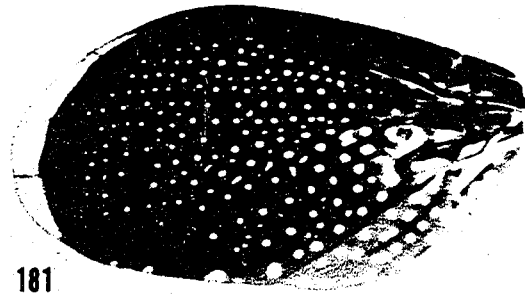
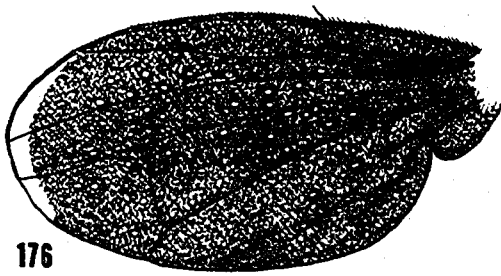
166



171

Plate XVI. Wing patterns

- Fig. 176. Eutreta decora, female. (drawn from holotype)
- Fig. 177. E. diana, female. (Seneca, Oregon)
- Fig. 178. E. divisa, female. (Bend, Oregon)
- Fig. 179. E. divisa, male. (Regina, Idaho)
- Fig. 180. E. longicornis, male. (Douglas, Wyoming)
- Fig. 181. E. oregona, male. (Blitzen River, Oregon)
- Fig. 182. E. pollinosa, female. (Orton, Utah)
- Fig. 183. E. fenestra, female. (holotype)
- Fig. 184. E. rotundipennis, male. (Harrisonburg, Virginia)
- Fig. 185. Tephritis baccharis, female. (Bill Williams Fork,
Arizona)



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ACKNOWLEDGEMENTS

I am grateful to the late Dr. Jean L. Laffoon for his many contributions and professional inspiration during the earlier part of this study. He was an invaluable aid in helping me think through problems and in formulation of precise ideas when writing.

My sincere appreciation is extended to Dr. Robert E. Lewis for his supervision of the later part of this study and for his kind and helpful criticisms on any problem that occurred. I would also like to thank Dr. Wayne Rowley, Dr. John Mutchmor, Dr. Oscar Tauber and Dr. Roger Landers for their aid and encouragement in many ways.

Thanks are also due to Mr. Ray Miller for his help and advice, especially during the literature search, and to Mr. Gerald Kutish and Mr. Richard Mitchell for their advice on photography. I would also like to express my thanks to Dr. Richard Foote, Mr. George Steyskal and Dr. Elwood Hart for their advice on taxonomic problems.

Finally, I wish to thank my wife, Margaret, for her patience during this study and for proofreading of this thesis.

APPENDIX A

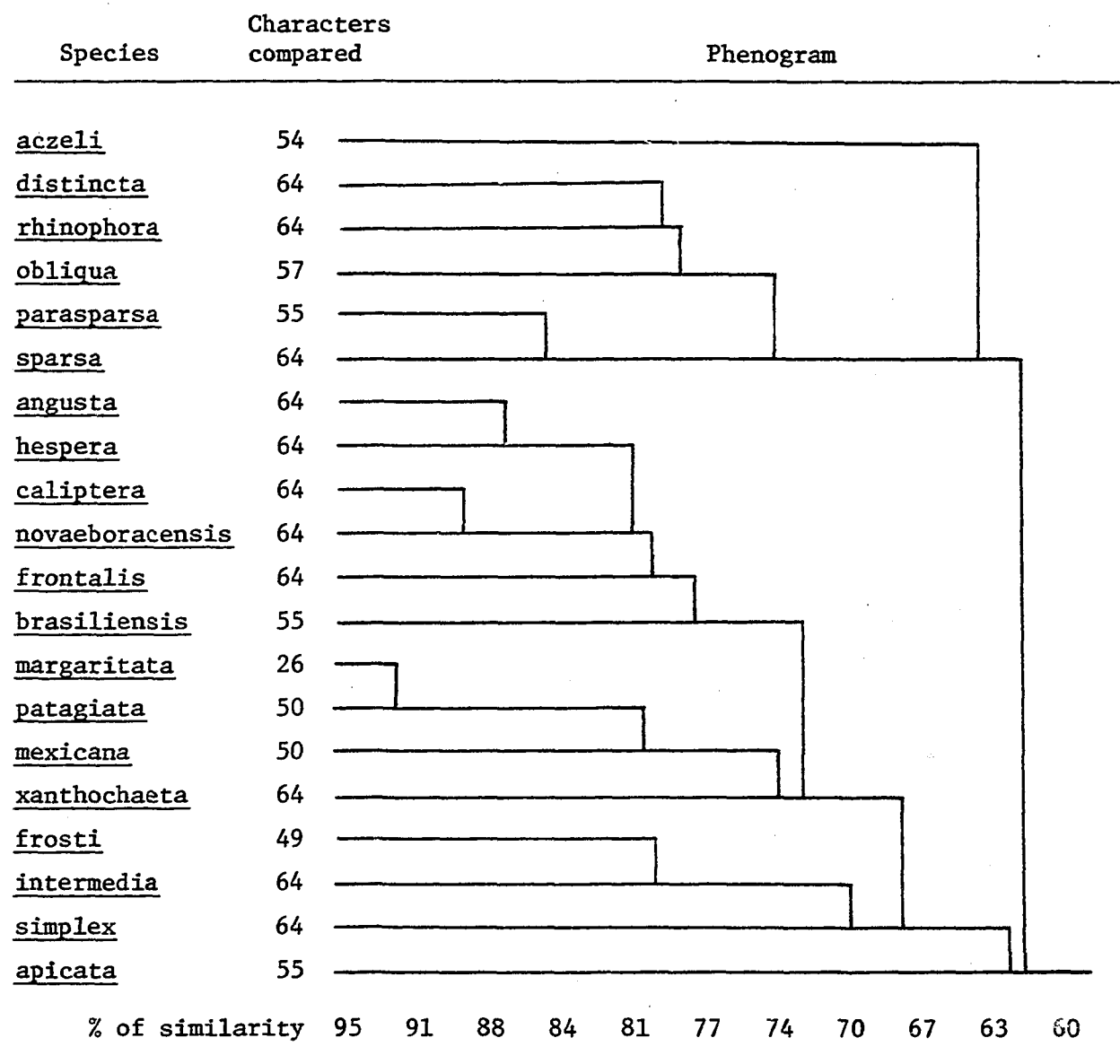
Table 1. Phenogram from computer analysis of characters of *Eutreta* (*Eutreta*)

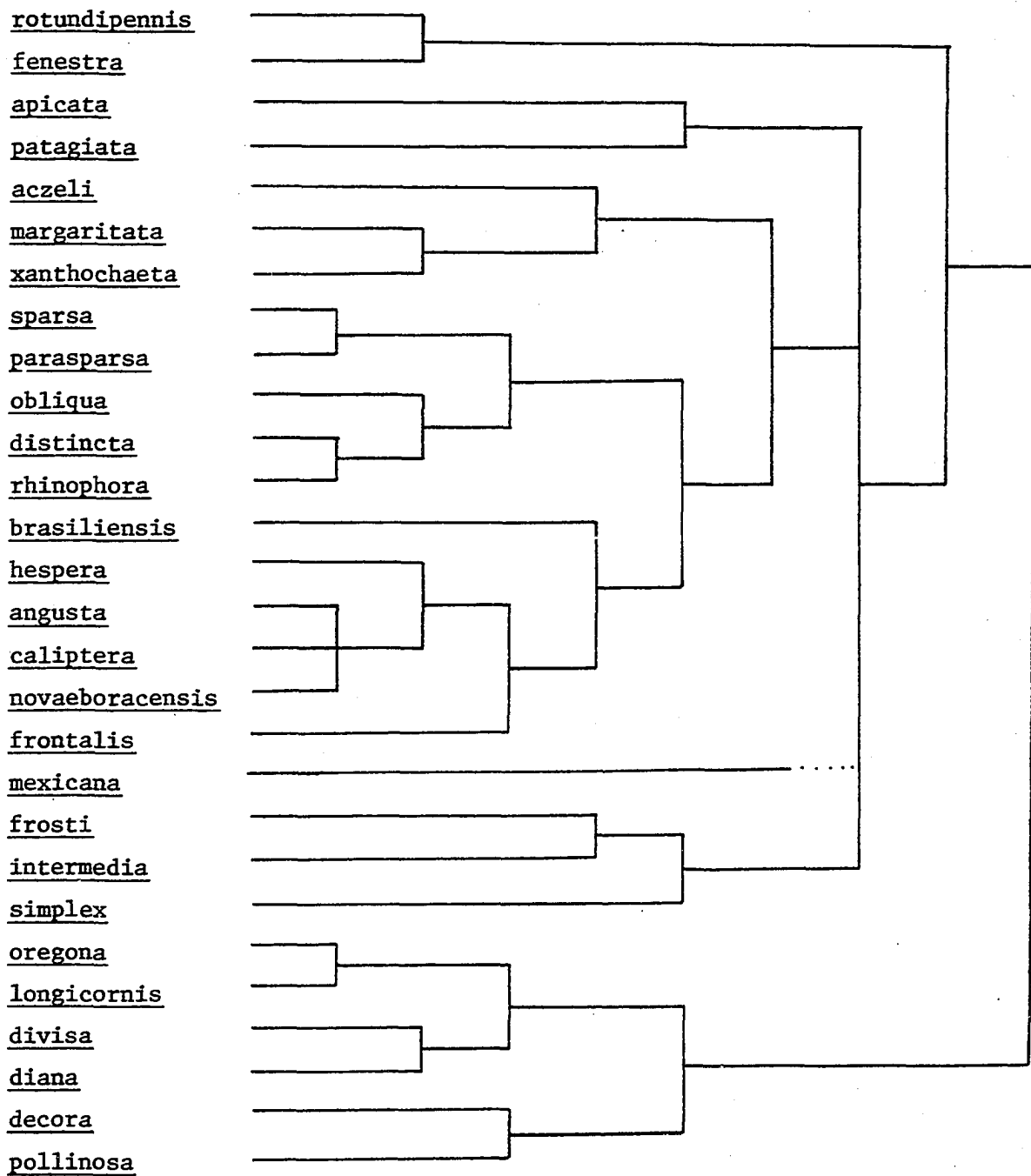
Table 2. Phenogram showing the evolution of the species of Eutreta

Table 3. Characters used in computer analysis of phylogeny

Head characters

1. Facial spots absent
2. Orbito-antennal spot not clearly defined
3. Postocular spots absent
4. Antenna - second antennal segment with whitish setae
5. Gena with inflated pale yellow setae
6. Bristles light brown or yellow
7. Palps broad
8. Oral margin strongly produced
9. Eyes strongly slanting
10. Frons narrowing anteriorly

Thorax characters

11. Lower humerus and upper mesopleural setae line absent
12. Humerus-notopleural brown band absent
13. Vitae on dorsum
14. Dorsum grayish-pollinose
15. Pleuron with inflated pale yellow setae
16. Whitish setae on upper sternopleuron (6 or more)
17. Halteres with capitellum dark brown
18. Postscutellum color than pleuron

Leg characters

19. Whitish setae on profemur (6 or more)
20. Profemur with lateral dark stripe
21. Femora and tibiae darker than tarsi

Abdomen characters

22. Tergites with paired dark lateral areas
23. Tergites with lighter brown on posterior 1/3 of segment
24. All setae inflated and pale yellow
25. Ground color light brown to yellowish

Wing characters

26. Stigma width more than 1/2 length
27. Wings with costa concave apical to end of R_1
28. Apical crescent ending at M_{1+2} or slightly below
29. Apical crescent ending below R_{2+3}
30. Apical crescent interrupted
31. Apical crescent narrow or absent

Table 3 (Continued)

-
- 32. Apical crescent oblique with respect to M_{1+2}
 - 33. Costa without spots beyond R_1 area
 - 34. Costa with dark pattern absent
 - 35. Costa and subcostal cells with a large light area (as large as stigma)
 - 36. Spots small
 - 37. Spots in rows
 - 38. Spots larger posteriorly
 - 39. Spots coalesced into a band near center of wing
 - 40. Unpunctated apical brown band narrower than apical crescent
 - 41. No posterior wing marginal spots beyond apical half of wing

Male genitalia characters

- 42. Dorsal lobe on epandrium absent or reduced
- 43. Surstylus long and wedge-shaped apically
- 44. Surstylus truncate apically
- 45. Surstylus with long setae apically (longer than width of surstylus)
- 46. Surstylus apical setae numerous (more than 20 apical to prenisetae)
- 47. Phallic apodeme truncate
- 48. Phallic apodeme bar-shaped
- 49. Ejaculatory apodeme broad
- 50. Ejaculatory apodeme with shaft broad
- 51. Epandrium elongate
- 52. Proctiger with spines

Female genitalia characters

- 53. Aculeus long pointed
- 54. Aculeus blade with large angle
- 55. Aculeus blade without serrations laterally
- 56. Aculeus tip curved downward
- 57. Spermatheca long and thin
- 58. Spermatheca bulbous
- 59. Oviscape with apical end darker brown

Distributional characters

- 60. Inhabit eastern United States
 - 61. Inhabit Central America
 - 62. Inhabit South America
 - 63. Wings broad
 - 64. Large species, length 7.0 mm. or more
-

APPENDIX B

Table 4. List of host plants for Eutreta species

Species	Host	Damage
<u>Eutreta</u> (<u>Eutreta</u>)		
<u>aczeli</u>	No host information	
<u>angusta</u>	<u>Ambrosia psilostachya</u>	crown gall
	<u>Ambrosia</u> sp.	crown gall
	<u>Callistephus chinensis</u>	stem gall
	<u>Ratibida columnaris</u>	crown gall
	<u>Ratibida</u> sp.	crown gall
	<u>Senecio jacobaea</u>	crown gall
	<u>S. sylvaticus</u>	stem gall
<u>apicata</u>	No host information	
<u>brasiliensis</u>	No host information	
<u>caliptera</u>	<u>Bidens frondosa</u>	stem gall ^a
	<u>Chrysanthemum</u> sp.	stem gall
	<u>Helianthus giganteus</u>	stem gall
	<u>H. tuberosus</u>	stem gall ^a
	<u>Vernonia noveboracensis</u>	stem gall
<u>distincta</u>	No host information	
<u>frontalis</u>	<u>Aster simplex</u>	crown gall
<u>frosti</u>	No host information	
<u>hespera</u>	<u>Solidago</u> sp.	root gall ^a
<u>novaeboracensis</u>	<u>Solidago altissima</u>	tunnels rhizomes, rhizome gall
	<u>S. rugosa</u>	rhizome gall
<u>intermedia</u>	No host information	
<u>margaritata</u>	No host information	
<u>mexicana</u>	No host information	
<u>obliqua</u>	No host information	
<u>patagiata</u>	No host information	
<u>parasparsa</u>	<u>Coleus blumei</u>	stem gall

^aNew host record.

Table 4 (Continued)

Species	Host	Damage
<u>rhinophora</u>	<u>Conyza bonariensis</u> <u>C. apurensis</u>	stem gall ^a stem gall ^a
<u>simplex</u>	No host information	
<u>sparsa</u>	<u>Stachytarpheta cayennensis</u>	stem gall
<u>xanthochaeta</u>	<u>Lantana camara</u> <u>Stachytarpheta cayennensis</u> <u>S. jamaicensis</u> <u>Verbena bonariensis</u> <u>V. litoralis</u>	stem gall stem gall stem gall stem gall stem gall
<u>Eutreta (Onchoaculeata)</u>		
<u>decora</u>	No host information	
<u>diana</u>	<u>Artemisia arbuscula</u> <u>A. cana</u> <u>A. cana viscidula</u> <u>A. nova</u> <u>A. tridentata tridentata</u> <u>A. tridentata vaseyana</u> <u>A. tripartita</u>	stem gall stem gall stem gall ^a stem gall ^a stem gall stem gall stem gall
<u>divisa</u>	<u>Artemisia tridentata tridentata</u>	stem gall ^a
<u>longicornis</u>	<u>Artemisia cana</u>	stem gall ^a
<u>oregona</u>	<u>Artemisia tridentata tridentata</u> <u>A. tridentata vaseyana</u> <u>A. tridentata</u>	stem gall ^a stem gall ^a
<u>pollinosa</u>	No host information	
<u>Eutreta (Setogena)</u>		
<u>fenestra</u>	No host information	
<u>rotundipennis</u>	No host information	

APPENDIX C

Table 5. Body and wing measurements of Eutreta

Species	Sex	Body length ^a	Wing length	Wing width
<u>aczeli</u>	F	8.5	7.8	3.4
<u>angusta</u>	F	6.5 \pm .70 (4.9-7.5)	5.6 \pm .52 (4.0-6.0)	2.8 \pm .23 (2.0-3.1)
	M	5.4 \pm .49 (4.6-6.0)	5.0 \pm .42 (4.5-6.1)	2.6 \pm .24 (2.1-2.9)
<u>apicata</u>	F	8.2	7.7	3.2
	M	7.5	7.5	3.2
<u>brasiliensis</u>	F	7.0	5.5	2.8
<u>caliptera</u>	F	6.3 \pm .51 (5.3-7.0)	5.2 \pm .35 (4.4-5.7)	2.7 \pm .19 (2.5-3.0)
	M	4.3 \pm .37 (4.2-5.3)	5.0 \pm .39 (4.2-5.2)	2.6 \pm .24 (2.1-2.8)
<u>distincta</u>	F	7.0	6.2	3.3
	M	6.2	6.7	3.6
<u>frontalis</u>	F	6.6 \pm .63 (5.0-7.0)	5.8 \pm .48 (4.5-6.3)	2.9 \pm .24 (2.4-3.2)
	M	5.7 \pm .52 (4.8-6.5)	5.4 \pm .46 (4.5-6.3)	2.8 \pm .26 (2.3-3.4)
<u>frosti</u>	F	6.0	5.8	2.7
	M	5.2	4.7	2.2
<u>hespera</u>	F	7.3 \pm .53 (6.5-7.8)	6.1 \pm .35 (5.5-6.6)	2.9 \pm .18 (2.6-3.2)
	M	6.4 \pm .44 (5.7-7.0)	6.1 \pm .32 (5.5-6.8)	2.8 \pm .19 (2.5-3.3)
<u>intermedia</u>	F	6.2 (5.1-7.2)	5.1 (4.2-6.0)	2.4 (1.9-2.8)
	M	5.4 (5.3-5.4)	5.1	2.4 (2.4-2.5)
<u>margaritata</u>	F	5.8	5.3	2.3
	M	6.0	6.0	2.6
<u>mexicana</u>	M	5.0	4.9	2.4
<u>novaeboracensis</u>	F	7.5 \pm .60 (6.2-8.3)	6.2 \pm .68 (5.1-7.5)	3.3 \pm .27 (2.7-3.6)
	M	6.6 \pm .61 (5.2-7.7)	6.0 \pm .64 (4.7-7.0)	3.1 \pm .30 (2.8-3.5)
<u>obliqua</u>	M	6.7 (6.3-7.0)	6.6 (6.5-6.8)	3.4 (3.3-3.4)
<u>parasparsa</u>	M	5.7	5.8 (5.7-6.0)	3.2 (3.1-3.3)
<u>patagiata</u>	F	7.5	6.9	3.2

<u>rhinophora</u>	F	6.9	$\pm .72$ (6.0-8.2)	6.1	$\pm .51$ (5.3-7.0)	3.3	$\pm .26$ (3.0-3.8)
	M	5.7	$\pm .35$ (5.2-6.2)	5.6	$\pm .29$ (4.5-6.3)	3.1	$\pm .26$ (3.0-3.4)
<u>simplex</u>	F	6.0		5.4	(5.2-5.5)	2.5	(2.4-2.6)
	M	5.2		4.7		2.1	
<u>sparsa</u>	F	6.7	(5.6-7.5)	5.9	(5.5-6.7)	3.6	(3.5-3.8)
	M	5.0		5.0		3.0	
<u>xanthochaeta</u>	F	6.7	$\pm .34$ (6.4-7.0)	5.8	$\pm .25$ (5.4-6.3)	2.8	$\pm .12$ (2.6-3.1)
	M	5.7	$\pm .15$ (5.5-6.0)	5.5	$\pm .15$ (5.2-5.7)	2.5	$\pm .15$ (2.4-2.7)

Eutreta (Onchoaculeata)

<u>decora</u>	F	5.5		4.4		2.0	
<u>diana</u>	F	5.1	$\pm .52$ (3.3-5.6)	3.9	$\pm .31$ (3.1-4.2)	2.0	$\pm .15$ (1.6-2.2)
	M	3.8	$\pm .42$ (2.9-4.4)	3.3	$\pm .21$ (2.9-3.8)	1.7	$\pm .14$ (1.6-2.2)
<u>divisa</u>	F	5.5	(5.4-5.7)	4.5	(4.2-4.9)	2.3	(2.1-2.4)
	M	3.9	(3.7-4.2)	3.7	(3.6-4.0)	1.9	(1.8-2.0)
<u>pollinosa</u>	F	4.5	(4.2-4.8)	3.9	(3.5-4.2)	1.9	(1.7-2.0)
	M	3.5		3.6	(3.4-3.8)	1.7	(1.7-1.8)
<u>longicornis</u>	F	4.5	$\pm .27$ (3.9-4.7)	3.9	$\pm .29$ (3.3-4.7)	1.7	$\pm .09$ (1.5-1.8)
	M	3.5	$\pm .28$ (3.1-4.0)	3.2	$\pm .16$ (2.5-2.9)	1.7	$\pm .09$ (1.5-1.8)
<u>oregona</u>	F	4.3	$\pm .23$ (3.9-4.7)	3.1	$\pm .23$ (2.4-3.3)	1.3	$\pm .12$ (1.0-1.5)
	M	3.2	$\pm .14$ (3.0-3.5)	2.6	$\pm .16$ (2.5-2.9)	1.1	$\pm .08$ (1.0-1.3)

Eutreta (Setogena)

<u>fenestra</u>	F	6.8		5.7		3.2	
<u>rotundipennis</u>	F	6.0	(5.7-6.1)	5.2	(4.8-5.5)	3.2	(2.8-3.3)
	M	5.1	(4.5-5.7)	4.9	(4.5-5.5)	3.0	(2.7-3.2)

^aFigures represent mean, standard deviation and range. Measurements are given in mm.

Table 5 (Continued)

Species	Sex	Head length	Head height	Facial height
<u>Eutreta (Eutreta)</u>				
<u>aczeli</u>	F	1.67	1.33	
<u>angusta</u>	F	1.41 $\pm .08$ (1.00-1.60)	1.13 $\pm .10$ (0.85-1.25)	
	M	1.38 $\pm .12$ (1.17-1.63)	1.10 $\pm .08$ (0.97-1.17)	
<u>apicata</u>	F	1.84	1.52	.78
<u>brasiliensis</u>	F	1.5	1.13	
<u>caliptera</u>	F	1.37 $\pm .10$ (1.17-1.46)	1.09 $\pm .08$ (0.97-1.15)	
	M	1.22 $\pm .10$ (1.13-1.40)	0.86 $\pm .07$ (0.93-1.08)	
<u>distincta</u>	F	1.67	1.16	
	M	1.58	1.13	
<u>frontalis</u>	F	1.51 $\pm .15$ (0.92-1.77)	1.13 $\pm .11$ (1.05-1.25)	.67 $\pm .07$ (.62-.77)
	M	1.48 $\pm .10$ (1.28-1.70)	1.17 $\pm .08$ (1.10-1.30)	.66 $\pm .07$ (.58-.77)
<u>frosti</u>	F	1.57	1.0	.76
	M	1.33	1.1	.75
<u>hespera</u>	F	1.60 $\pm .14$ (1.42-1.80)	1.31 $\pm .12$ (1.17-1.37)	.65 $\pm .04$ (.60-.72)
	M	1.57 $\pm .13$ (1.38-1.79)	1.30 $\pm .09$ (1.17-1.45)	.67 $\pm .05$ (.59-.77)
<u>intermedia</u>	F	1.25 (1.10-1.33)	1.05 (0.87-1.17)	.53 (.43-.58)
	M	1.32 (1.30-1.33)	1.05 (1.00-1.10)	.59 (.55-.63)
<u>margaritata</u>	F	1.17	1.00	.50
	M	1.32	1.21	.56
<u>mexicana</u>	M	1.25	0.88	.50
<u>novaeboracensis</u>	F	1.62 $\pm .11$ (1.42-1.83)	1.33 $\pm .11$ (1.12-1.45)	.67 $\pm .05$ (.62-.78)
	M	1.65 $\pm .14$ (1.30-1.85)	1.40 $\pm .12$ (1.17-1.60)	.70 $\pm .07$ (.62-1.0)
<u>oblique</u>	M	1.74 (1.63-1.83)	1.25 (1.22-1.27)	.67

<u>parasparsa</u>	M	1.50		1.25		.72
<u>patagiata</u>	F	1.50		1.28		.67
<u>rhinophora</u>	F	1.59	+.15 (1.33-1.78)	1.10	+.08 (1.00-1.25)	
	M	1.53	±.07 (1.42-1.67)	1.04	±.06 (1.00-1.17)	
<u>simplex</u>	F	1.42		1.17		.57
	M	1.33				
<u>sparsa</u>	F	1.44	(1.30-1.57)	1.13	(1.05-1.17)	(.57-.67)
	M	1.22		.92		.53
<u>xanthochaeta</u>	F	1.43	+.08 (1.30-1.50)	1.22	+.05 (1.10-1.28)	.56 ±.03 (.50-.60)
	M	1.35	±.09 (1.11-1.45)	1.24	±.08 (1.08-1.25)	.55 ±.09 (.50-.62)

Eutreta (Parallela)

<u>decora</u>	F	1.25		1.0		.61
<u>diana</u>	F	1.29	+.07 (1.13-1.38)	1.02	+.07 (0.88-1.20)	.65 ±.06 (.52-.75)
	M	1.11	±.11 (0.90-1.33)	0.95	±.10 (0.77-1.13)	.55 ±.06 (.48-.63)
<u>divisa</u>	F	1.21	(1.10-1.27)	0.98	(0.92-1.02)	.52 (.48-.60)
	M	1.08	(1.00-1.10)	0.85	(0.75-0.93)	.49 (.45-.53)
<u>pollinosa</u>	F	1.01	(1.04-1.10)	0.96	(0.90-0.97)	.52 (.50-.56)
	M	1.01	(1.00-1.04)	0.90	(0.87-0.95)	.44 (.42-.50)
<u>longicornis</u>	F	1.11	+.08 (0.96-1.25)	1.02	+.08 (0.86-1.25)	.57 ±.04 (.50-.65)
	M	1.01	±.05 (0.83-0.99)	0.87	±.05 (0.79-0.98)	.54 ±.04 (.48-.67)
<u>oregona</u>	F	1.03	+.07 (0.83-1.16)	0.85	+.05 (0.68-0.92)	.48 ±.02 (.42-.50)
	M	0.91	±.08 (0.83-0.99)	0.78	±.04 (0.72-0.84)	.43 ±.04 (.37-.48)

Eutreta (Setosa)

<u>fenestra</u>	F	1.33		1.18		.63
<u>rotundipennis</u>	F	1.30	(1.23-1.42)	1.10	(1.05-1.12)	.58 (.53-.63)
	M	1.23	(1.12-1.33)	1.05	(0.92-1.12)	.54 (.48-.58)

Table 5 (Continued)

Species	Sex	Frons length (medial)	Frons width	Frons length (lateral)
<u>Eutreta (Eutreta)</u>				
<u>aczei</u>	F	.85	1.00	1.10
<u>angusta</u>	F	.75 \pm .08 (.53-.87)	0.81 \pm .08 (.55-.92)	1.00 \pm .11 (.92-1.17)
	M	.73 \pm .07 (.60-.92)	0.78 \pm .06 (.65-.85)	0.97 \pm .08 (.83-1.12)
<u>apicata</u>	F	.97	1.05	1.33
	M	.83	0.98	
<u>brasiliensis</u>	F	.76	0.75	1.00
<u>caliptera</u>	F	.71 \pm .05 (.64-.78)	0.77 \pm .06 (.67-.93)	0.95 \pm .07 (.78-1.05)
	M	.65 \pm .05 (.58-.75)	0.71 \pm .06 (.62-.78)	0.85 \pm .05 (.80-0.95)
<u>distincta</u>	F			1.05
	M	.78	0.75	1.00
<u>frontalis</u>	F	.78 \pm .08 (.57-.92)	0.80 \pm .09 (.57-.97)	1.02 \pm .10 (.83-1.17)
	M	.77 \pm .08 (.70-.88)	0.76 \pm .06 (.70-.92)	1.01 \pm .08 (.87-1.17)
<u>frosti</u>	F	.74	0.72	0.99
	M	.62	0.62	0.79
<u>hespera</u>	F	.86 \pm .05 (.84-.93)	0.91 \pm .07 (.84-1.1)	1.12 \pm .05 (1.0-1.17)
	M	.85 \pm .06 (.76-.93)	0.89 \pm .07 (.74-1.0)	1.10 \pm .08 (.93-1.25)
<u>intermedia</u>	F	.62 (.53-.57)	0.78 (.72-.87)	0.80 (.70-.88)
	M	.61 (.58-.63)	0.82 (.80-.83)	0.83
<u>margaritata</u>	F	.67	0.67	0.83
	M			0.82
<u>mexicana</u>	M	.58	0.63	0.78
<u>novaeboracensis</u>	F	.86 \pm .07 (.72-.97)	0.91 \pm .08 (.75-1.05)	1.15 \pm .10 (1.0-1.28)
	M	.87 \pm .10 (.80-1.1)	0.93 \pm .09 (.80-1.08)	1.19 \pm .15 (1.0-1.58)
<u>obliqua</u>	M	.86 (.83-.91)	0.83 (.80-0.90)	1.17

<u>parasparsa</u>	M	.75	0.83	1.00
<u>patagiata</u>	F		0.73	
<u>rhinophora</u>	F	.79 $\pm .08$ (.67-.90)	0.82 $\pm .08$ (.70-.92)	1.07 $\pm .09$ (.92-1.17)
	M	.73 $\pm .07$ (.67-.90)	0.74 $\pm .04$ (.71-.82)	1.01 $\pm .06$ (.93-1.12)
<u>simplex</u>	F	.75	0.72	0.85
<u>sparsa</u>	F	.79 (.70-.87)	0.77 (.67-.87)	1.00 (.92-1.08)
	M	.62	0.67	0.83
<u>xanthochaeta</u>	F	.68 $\pm .05$ (.63-.78)	0.86 $\pm .06$ (.75-.93)	1.01 $\pm .05$ (.92-1.10)
	M	.70 $\pm .05$ (.55-.75)	0.82 $\pm .05$ (.67-.89)	0.88 $\pm .07$ (.78-1.05)

Eutreta (Parallela)

<u>decora</u>	F	.75	0.71	0.87
<u>diana</u>	F	.73 $\pm .05$ (.63-.78)	0.74 $\pm .05$ (.62-.82)	0.86 $\pm .06$ (.75-0.92)
	M	.60 $\pm .06$ (.42-.67)	0.62 $\pm .07$ (.50-.80)	0.72 $\pm .08$ (.58-0.90)
<u>divisa</u>	F	.67 (.65-.68)	0.74 (.70-.77)	0.84 (.77-0.94)
	M	.61 (.58-.63)	0.58 (.53-.62)	0.71 (.67-0.77)
<u>pollinosa</u>	F	.60 (.54-.64)	0.64 (.60-.70)	0.76 (.75-0.79)
	M	.55 (.50-.60)	0.60 (.58-.64)	0.70 (.69-0.72)
<u>longicornis</u>	F	.63 $\pm .05$ (.50-.70)	0.68 $\pm .04$ (.60-.75)	0.81 $\pm .04$ (.71-0.87)
	M	.57 $\pm .05$ (.46-.66)	0.55 $\pm .03$ (.53-.65)	0.73 $\pm .04$ (.67-0.80)
<u>oregona</u>	F	.59 $\pm .04$ (.47-.64)	0.62 $\pm .05$ (.54-.67)	0.75 $\pm .05$ (.60-0.83)
	M	.54 $\pm .05$ (.46-.66)	0.55 $\pm .04$ (.47-.66)	0.68 $\pm .04$ (.63-0.75)

Eutreta (Setosa)

<u>fenestra</u>	F	.63	0.92	0.92
<u>rotundipennis</u>	F	.62 (.50-.67)	0.84 (.73-.92)	0.78 (.72-0.87)
	M	.54 (.52-.60)	0.82 (.77-.88)	0.83 (.78-0.87)

Table 5 (Continued)

Species	Sex	Frontofacial angle	Oral protrusion	Frons Angle
<u>Eutreta (Eutreta)</u>				
<u>aczeli</u>	F	97	21	0
<u>angusta</u>	F	103 + 3.3 (96-109)	23 + 5.7 (17-31)	8 + 4.0 (1-13)
	M	104 + 3.6 (96-110)	23 + 3.7 (16-30)	9 + 4.5 (3-16)
<u>apicata</u>	F	107	27	0
	M	108	20	8
<u>brasiliensis</u>	F	110	18	11
<u>caliptera</u>	F	105 + 2.2 (102-109)	23 + 3.3 (17-30)	10 + 4.5 (4-23)
	M	104 + 3.2 (100-108)	23 + 2.8 (20-26)	10 + 2.9 (7-15)
<u>distincta</u>	F	110		
<u>frontalis</u>	F	111 + 2.7 (108-116)	16 + 2.2 (14-20)	15 + 1.9 (12-20)
	M	109 + 2.7 (107-113)	17 + 2.8 (15-22)	16 + 2.4 (13-20)
<u>frosti</u>	F	108	12	10
	M	109	13	14
<u>hespera</u>	F	99 + 3.3 (92-102)	22 + 3.9 (16-27)	5 + 2.8 (0-10)
	M	98 + 1.9 (95-102)	24 + 3.1 (19-33)	3 + 4.5 (0-14)
<u>intermedia</u>	F	113 (112-114)	18 (17-20)	10 (3-16)
	M	117 (116-117)	20 (18-22)	10 (9-10)
<u>margaritata</u>	F	106	16	4
	M	107	21	
<u>mexicana</u>	M	126	21	
<u>novaeboracensis</u>	F	104 + 2.8 (100-107)	18 + 2.5 (14-24)	6 + 1.8 (2-9)
	M	105 + 2.1 (102-110)	18 + 2.5 (15-23)	6 + 1.7 (3-9)
<u>obliqua</u>	M	112	23	6

<u>parasparsa</u>	M	118	21	6
<u>patagiata</u>	F	107	38	
<u>rhinophora</u>	F	116 + 2.9(109-118)	24 + 3.1(19-29)	4 + 3.0(0-8)
	M	115 + 5.8(111-130)	26 + 3.2(22-30)	5 + 3.6(0-10)
<u>simplex</u>	F	99		12
<u>sparsa</u>	F	112 (107-116)	27 (25-28)	6 (4-8)
	M	113	23	7
<u>xanthochaeta</u>	F	108 + 1.7(104-110)	22 + 2.6(19-28)	5 + 4.5(0-13)
	M	109 + 4.0(102-115)	20 + 2.2(16-25)	5 + 2.3(0-9)

Eutreta (Parallela)

<u>decora</u>	F	109	6	8
<u>diana</u>	F	107 + 3.0(104-113)	9 + 1.9(6-15)	4 + 2.6(0-8)
	M	104 + 3.1(98-110)	12 + 3.0(8-20)	8 + 4.3(2-15)
<u>divisa</u>	F	110 (109-112)	12 (9-14)	9 (7-10)
	M	105 (101-108)	13 (9-18)	13 (8-18)
<u>pollinosa</u>	F	109 (106-113)	8 (7-8)	5 (4-7)
	M	107 (106-108)	10 (9-11)	9 (4-15)
<u>longicornis</u>	F	98 + 3.4(93-105)	10 + 2.8(5-15)	4 + 3.6(0-11)
	M	94 + 2.9(91-101)	8 + 1.5(5-11)	6 + 2.2(0-10)
<u>oregona</u>	F	103 + 4.0(98-110)	7 + 1.7(4-10)	8 + 5.0(2-20)
	M	102 + 4.9(95-109)	8 + 1.9(4-10)	8 + 3.0(2-13)

Eutreta (Setosa)

<u>fenestra</u>	F	104	16	3
<u>rotundipennis</u>	F	109 (106-111)	22 (19-26)	14 (10-17)
	M	108 (105-112)	21 (15-24)	15 (12-18)

Table 5 (Continued)

Species	Sex	Stigma length	Stigma width	Aculeus blade angle
<u>Eutreta</u> (<u>Eutreta</u>)				
<u>aczeli</u>	F	.72	.30	24
<u>angusta</u>	F	.59 \pm .06 (.47-.77)	.28 \pm .08 (.23-.30)	40 (35-44)
	M	.55 \pm .05 (.48-.67)	.25 \pm .02 (.23-.28)	
<u>apicata</u>	F	.67	.27	46
	M	.71	.28	
<u>brasilensis</u>	F	.57	.23	38
<u>caliptera</u>	F	.57 \pm .04 (.50-.62)	.26 \pm .02 (.20-.28)	43 (40-46)
	M	.55 \pm .05 (.50-.62)	.23 \pm .02 (.22-.25)	
<u>distincta</u>	F	.57	.39	32
	M	.58	.38	
<u>frontalis</u>	F	.68 \pm .06 (.67-.75)	.26 \pm .03 (.20-.31)	47 (45-50)
	M	.61 \pm .05 (.60-.72)	.24 \pm .01 (.22-.28)	
<u>frosti</u>	F	.67	.25	
	M	.51	.22	
<u>hespera</u>	F	.68 \pm .05 (.55-.78)	.23 \pm .02 (.21-.28)	33 (29-39)
	M	.65 \pm .07 (.57-.82)	.24 \pm .02 (.21-.28)	
<u>intermedia</u>	F	.47 (.45-.50)	.18 (.15-.20)	30
	M	.48 (.43-.52)	.19 (.17-.20)	
<u>margaritata</u>	F	.53	.20	
	M	.65	.23	
<u>mexicana</u>	M	.49	.30	
<u>novaeboracensis</u>	F	.66 \pm .07 (.53-.58)	.28 \pm .02 (.22-.32)	53 \pm 4.1 (48-60)
<u>oblique</u>	M	.71 (.68-.78)	.33 (.32-.37)	

<u>parasparsa</u>	M	.60		.35		
<u>patagiata</u>	F	.90		.28		
<u>rhinophora</u>	F	.67 \pm .07 (.55-.78)		.40 \pm .04 (.33-.45)	43	(41-44)
	M	.62 \pm .08 (.53-.75)		.34 \pm .03 (.30-.40)		
<u>simplex</u>	F	.48		.20	28	
	M	.43		.13		
<u>sparsa</u>	F	.68 (.62-.78)		.39 (.35-.45)	43	(42-44)
	M	.55		.37		
<u>xanthochaeta</u>	F	.57 \pm .04 (.50-.63)		.25 \pm .01 (.23-.27)	30	(29-31)
	M	.53 \pm .04 (.47-.60)		.22 \pm .01 (.20-.26)		

Eutreta (Parallela)

<u>decora</u>	F	.38		.20	40	
<u>diana</u>	F	.45 \pm .04 (.38-.50)		.20 \pm .02 (.17-.23)	46	(38-56)
	M	.37 \pm .06 (.28-.52)		.17 \pm .01 (.15-.20)		
<u>divisa</u>	F	.53 (.45-.58)		.22 (.20-.23)	52	(47-57)
	M	.41 (.38-.46)		.17 (.16-.20)		
<u>pollinosa</u>	F	.46 (.37-.53)		.18 (.17-.21)	52	
	M	.43 (.39-.46)		.16 (.15-.18)		
<u>longicornis</u>	F	.41 \pm .03 (.35-.47)		.13 \pm .01 (.11-.15)	55	(50-60)
	M	.33 \pm .02 (.27-.38)		.10 \pm .01 (.09-.13)		
<u>oregona</u>	F	.36 \pm .01 (.27-.46)		.11 \pm .01 (.09-.12)	45	(39-49)
	M	.30 \pm .03 (.26-.37)		.10 \pm .01 (.08-.12)		

Eutreta (Setosa)

<u>fenestra</u>	F	.63		.35	56	
<u>rotundipennis</u>	F	.47 (.42-.53)		.38 (.35-.42)	68	(63-72)
	M	.41 (.35-.45)		.35 (.30-.37)		