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A NEW CLEARWING MOTH (SESIIDAE) FROM CENTRAL AMERICA: A STEM BORER IN *MIMOSA PIGRA*

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ABSTRACT. The eggs, last instar larva, pupa, and adult of a new species of Sesiidae, *Carmenta mimosa*, are described. This species is known to occur from southern Mexico to Nicaragua and has been reared from *Mimosa pigra* L.

This species is being described now to provide a name for a publication on insects injurious to *Mimosa pigra* L. (Leguminosae) in Honduras. This plant, native from Mexico to Argentina, is a serious weed pest in parts of northern Australia and Thailand. A survey to seek potential biological agents for control of the weed was conducted in 1981. This complements work by Australian scientists looking for natural enemies of *M. pigra* mainly in Brazil.

Engelhardt (1946) included 24 North American species in his concept of the genus *Carmenta*. MacKay (1968) in her study of the larvae of North American species restricted the genus *Carmenta* by placing some species of the "complex" in her "new genus I" and in *Alcathoe* Hy. Edw., based solely on larval characters. Duckworth and Eichlin (1977a) considered 25 species to be in the genus north of Mexico, three more having been added to the list since that publication. Heppner and Duckworth (1981) list 31 species of *Carmenta* worldwide, mostly from the New World but a few from the Australian region. Preliminary sorting of the Neotropical species by Eichlin reveals that the genus will eventually contain many more species (200+) once this portion of

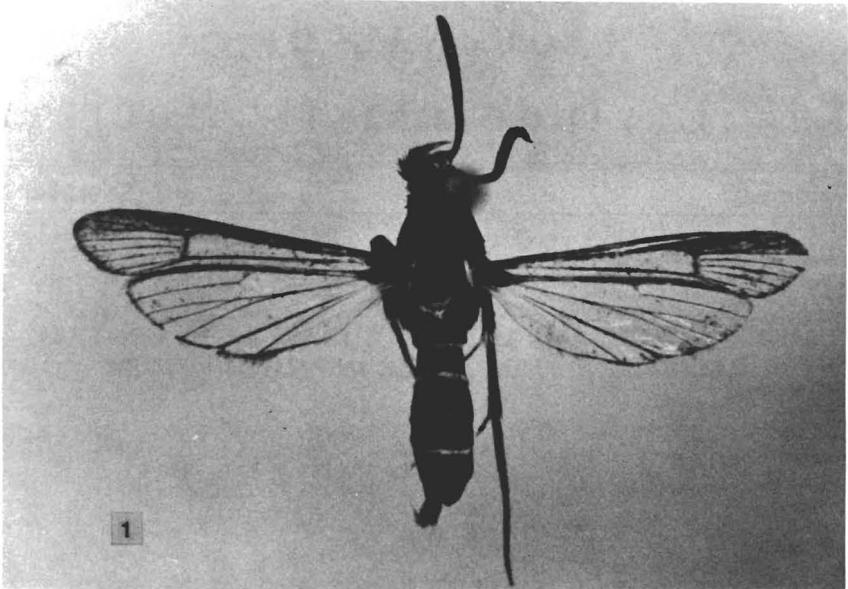


FIG. 1. *Carmenta mimosa*, n. sp., allotype female, near Linares, Nuevo Leon, Mexico.

major revisionary studies on Western Hemisphere Sesiidae has been concluded (Duckworth & Eichlin, in prep.).

One species from Argentina and Chile, *C. haematica* (Ureta), has been recommended for biological control of broomweed, *Gutierrezia* sp. (DeLoach, 1980).

***Carmenta mimosa* Eichlin and Passoa, new species**

(Figs. 1-22)

Description. Male: Head (Figs. 2-3) with vertex brown-black; front brownish gray, some white scales laterally; proboscis present, coiled; occipital fringe white or pale yellow dorsally, brown-black laterally with a few white scales mixed; antenna relatively short, thickened apically, less than one-half of forewing length, ciliate ventrally, dorsally brown-black with yellow powdered to apex, strongest apically; labial palpus slightly exceeding top of front, expanded somewhat laterally with roughened scales but sculptured ventrally appearing flattened, brown-black, strongly mixed with white ventrally, some pale yellow dorsally and on apical segment. Thorax brown-black, with narrow subdorsal yellow stripes; laterally with pale yellow at wing base and anteriorly. Abdomen constricted at base, brown-black, pale yellow on anterior half of segment 1, narrow pale yellow bands on posterior margin of segments 2, 4, 6 and 7 but may vary from bands only on 2 and 4 to bands on all segments, the latter condition apparently uncommon; ventrally, characteristically with segments 1 and 2 white, segment 4 pale yellow on posterior half, scales on posterior end forming keel; anal tuft not conspicuous at rest, narrowed to blunt point, laterally downwardly appressed, brown-black with some white scales mixed laterally.



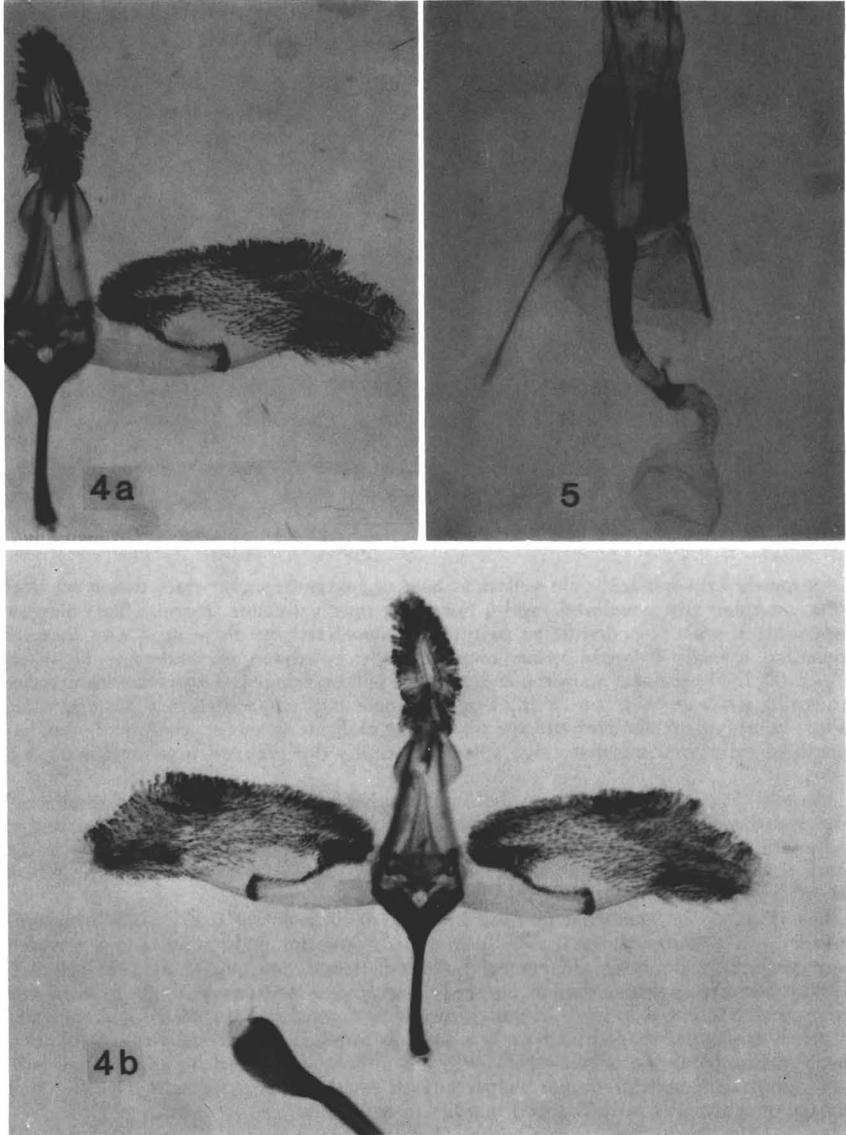
FIGS. 2, 3. Scanning electron micrographs of head of *Carmenta mimosa*, n. sp. **2** (left), side view, $\times 44$; **3** (right), close-up of ocellus, $\times 320$.

Legs mostly brown-black, pale yellow at base of forecoxa; some white mixed on tibial tufts, on spurs and powdered inside. Forewing mostly hyaline, margins very narrow, brown-black with pale orange to pale yellow powdered on discal spot, and margins, including apically between veins; more strongly powdered on underside of wings. Hindwing hyaline; costal margin powdered pale yellow; fringe concolorous with margins, becoming white at wing base. Wing length of male and female, 6–9 mm. Male genitalia (Figs. 4a, b) typical of *Carmenta* species, having elongate saccus approximately one-half length of valva, and saccular ridge apically abruptly downcurved to ventral margin of valva.

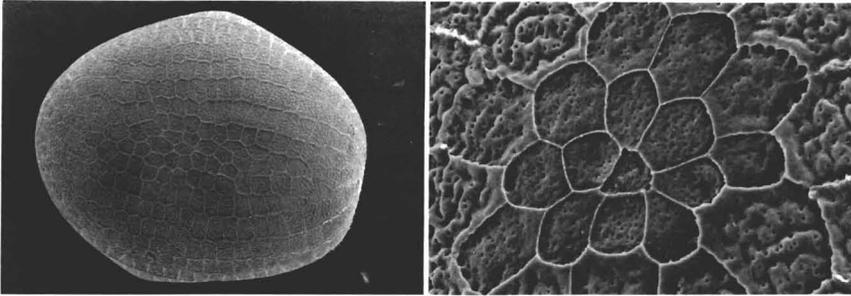
Female (Fig. 1): Antenna as on male but lacking ventral ciliation. Maculation much like described for male, perhaps with broader apical margin on forewing. Female genitalia (Fig. 5) typical for the genus, having ductus bursae pigmented and sclerotized for more than half its length (about two-thirds), with ductus seminalis originating from ductus bursae anteriorly beyond middle.

Egg (Figs. 6, 7). Somewhat obovoid in shape, $0.50 \pm 0.03 \times 0.33 \pm 0.02$ mm, with anterior end (micropylar end) slightly flattened; posterior end rounded; top rounded, perhaps slightly depressed in center, bottom flattened. Surface of chorion minutely bumpy, resembling skin of orange; covered by aeropyles; reticulate pattern of low narrow ridges which intersect to form irregular, mostly hexagonal designs. Micropyle consisting of nearly triangular shaped pit with hole at each corner, surrounded by rosette of about seven oblong petal-like primary cells, which are then surrounded by approximately 11 larger secondary cells of similar shape; surface within micropylar cells smoother than surface of other cells, with reduced number of aeropyles.

Larva (Figs. 9–19). Body cream colored; head tan-brown; tonofibrillary platelets faintly visible, forming two wide horizontal bands; adfrontals nearly reaching vertical angle; six stemmata: stemmata 5 and 6 separated from 1–4; prothoracic shield with two oblique lines, one on each side of midline; below this is group of pigmented spots; pinacula inconspicuous, concolorous with body. Mouthparts: Mandible with four teeth; two lateral mandibular setae present; spinneret about two times length of basal segment of labial palps; hypopharyngeal complex with proximomedial region membranous, each side with long ridge covered by fine spines; two minute stipular setae present. Crochets: Homoiodeous, uniserial, fewer on A6 compared to A7 ($\bar{x} = 31:39$ total number respectively); anal prolegs have small papillae above anal crochets. Chaetotaxy (setae as in MacKay, 1968):



FIGS. 4, 5. Genitalia of *Carmenta mimosa*, n. sp. (ventral view). 4a, b, male genitalia; 5, female genitalia.



FIGS. 6, 7. Scanning electron micrographs of egg of *Carmenta mimosa*, n. sp. **6** (left), top view (micropyle on right end), $\times 180$; **7** (right), close-up of end with micropylar area, $\times 600$.

Head with Adf1 and Adf2 widely separately from each other; frontal setae in line with frontal pores; clypeal setae as shown; labrum with medial and lateral setae as shown. Epicrania with three vertical setae in straight line angled toward Adf2; P1 long, below P2; L1 and A3 above A1 and A2; O1 between stemmata 2 and 3; O2 below stemma 1;

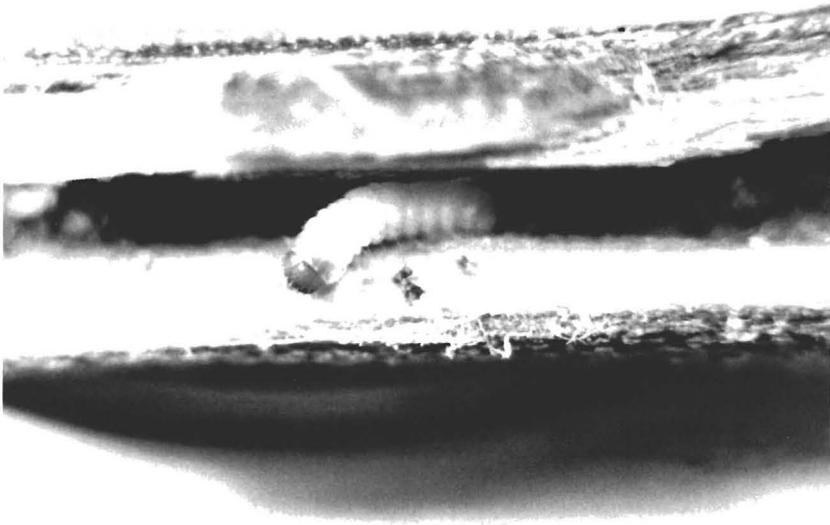
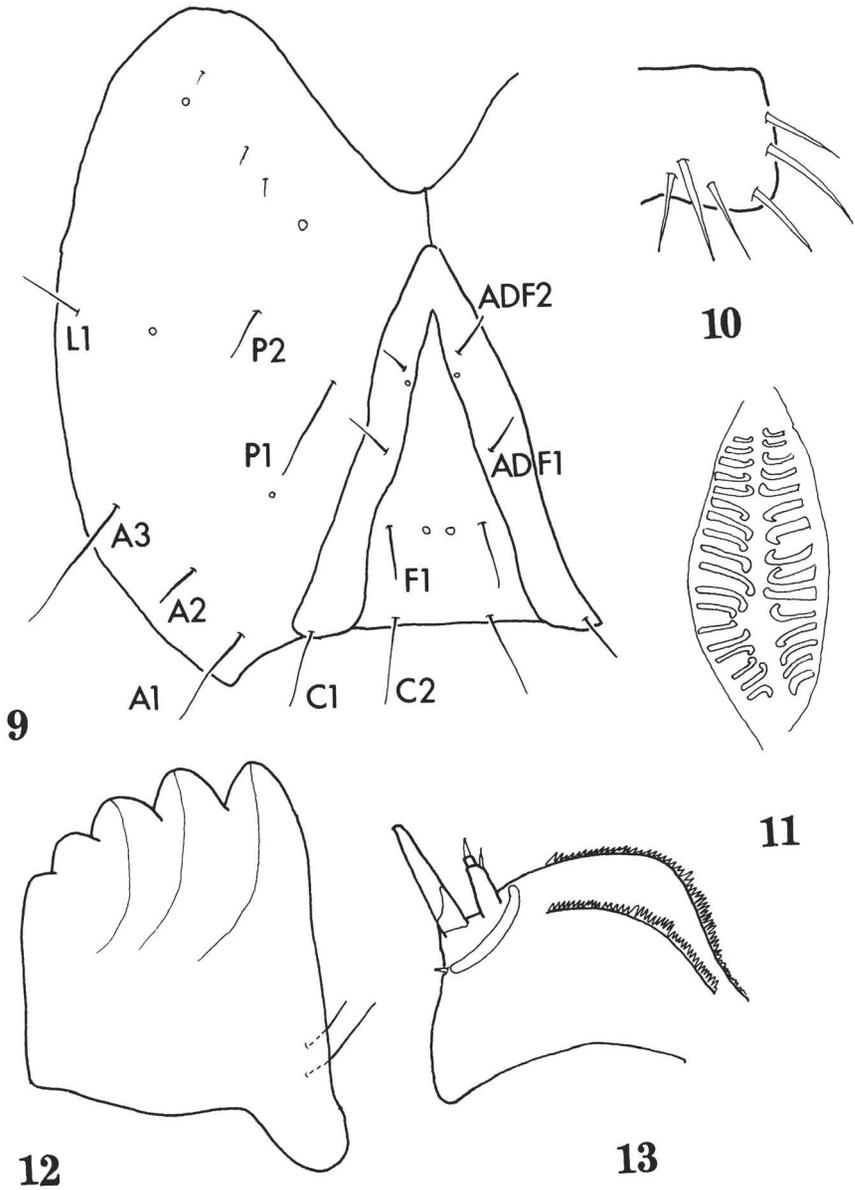
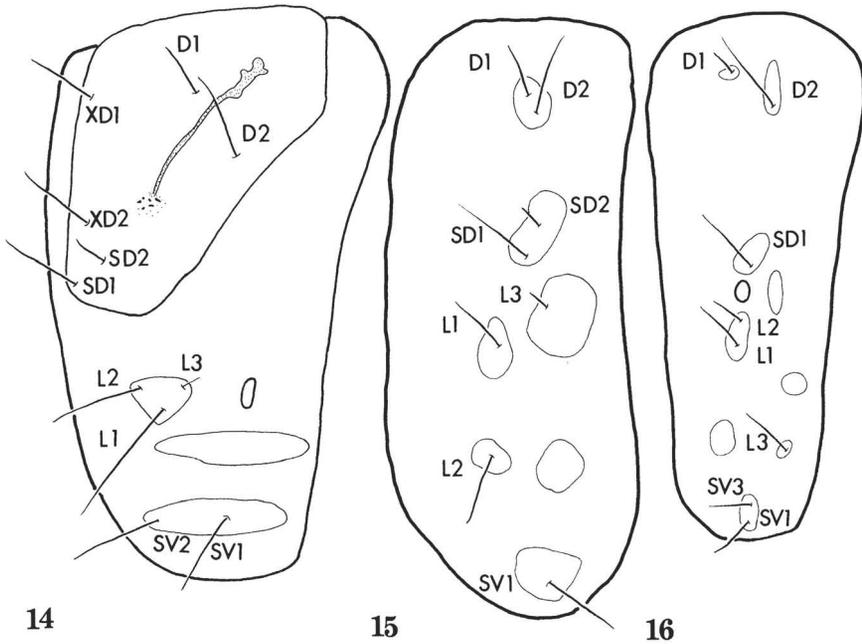


FIG. 8. Larva of *Carmenta mimosa* in chamber exposed in branch of host plant, *Mimosa pigra*.



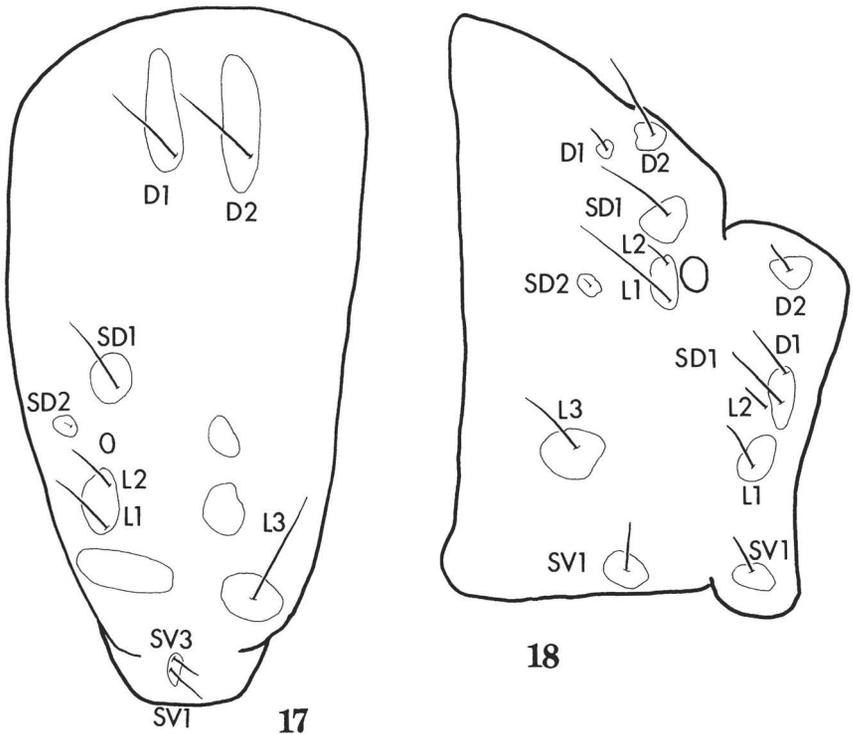
FIGS. 9-13. *Carmenta mimosa* larva. 9, epicrania and front; 10, labrum; 11, crochets on abdominal segment one; 12, mandible, ventral view; 13, spinneret and hypopharyngeal complex. (See p. 206 for abbreviations used in figures 9-19.)



FIGS. 14–16. *Carmentia mimosa* larval chaetotaxy (lateral view). 14, prothorax; 15, mesothorax; 16, first abdominal segment.

SO3 below stemma 6; SO2 between stemmata 5 and 6; O3 remote from SO3 and stemma 6. Prothorax with D2 longer than D1; XD1, XD2 and SD1 in a vertical row, SD2 smaller, behind and below XD2; prespiracular group trisetose, L3 much shorter than L1 or L2, all on triangular pinaculum; two SV setae widely spaced. Mesothorax with D2 longer than D1, both on same pinaculum; SD1 on same pinaculum with SD2; the position of L1 variable, more commonly close to L3, or equidistant between L3 and L2; one subventral seta behind and below L2. Abdominal segment one with D2 below D1; SD2 minute; SD1 above spiracle; L2 and L1 below spiracle on same pinaculum; L3 closer to SV3 than to L1; SV group bisetose, on same pinaculum. Abdominal segment seven with D2 longer than D1, each one on an oblong transverse pinaculum; SD1 above spiracle; SD2 minute, in front of spiracle; L1 and L2 on same pinaculum, below spiracle; L3 widely spaced from L1; SV group bisetose, on same pinaculum. Abdominal segment eight with D2 above D1; SD1 below D2 and D1; L1 longer than L2; SD2 minute, in front of L2 + L1; L3 below SD2; one SV seta present. Abdominal segment nine with D2 above D1 and SD1, latter two setae on one pinaculum; L2 present but reduced; L1 above SV1. Anal shield with SD1, L1 and D2 along margin; D1 smaller and set inward; one ventral seta present on all segments.

Pupa (Figs. 20–23). Uniformly tan-brown in color. Head: Frons with projecting circular ridge and two large carinae near eyes; labrum triangular, with 4 setae, inner ones largest; mandibles elevated; maxillary palps present, almost reaching maxillae; antennae about $\frac{3}{4}$ length of wings; maxillae long, ending slightly before caudal margin of wings; labial palps present, widest in middle. Thorax: Prothoracic femur exposed; dorsum of prothorax with single median transverse ridge, mesothorax with one median ridge flanked



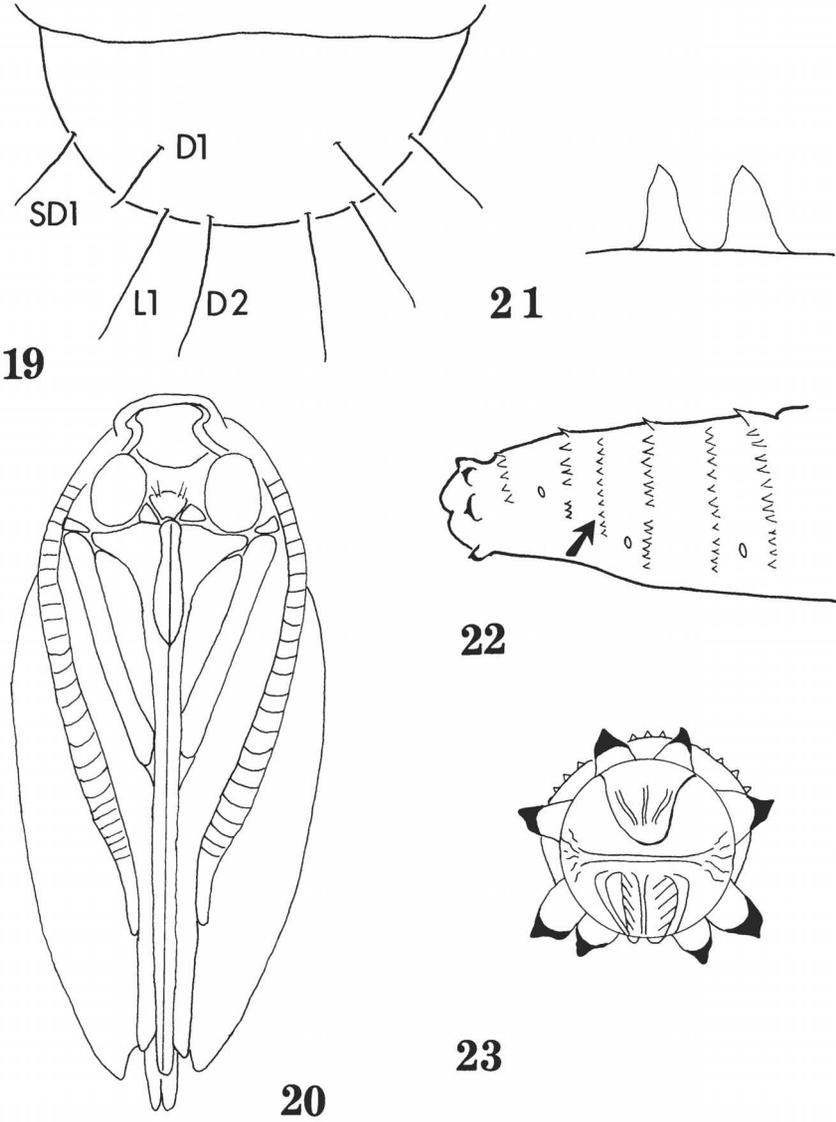
FIGS. 17, 18. *Carmentia mimosa* larval chaetotaxy (lateral view). **17**, seventh abdominal segment; **18**, abdominal segments 8 and 9.

on each side by two furrows; prothoracic leg about half length of maxillae; only tips of metathoracic legs exposed. Abdomen: A2 and A8-9 with single transverse row of stout spines dorsally; A3-6 with two rows of dorsolateral spines, those on anterior margin larger and more stout than those on posterior margin; on A7 males have two rows, females one; cremaster absent, in its place eight flattened spines irregularly spaced in circular pattern with their tips heavily sclerotized.

Host. *Mimosa pigra* L. (Figs. 24-25).

Distribution. MEXICO: Nuevo Leon, Michoacan and Oaxaca; HONDURAS and NICARAGUA.

Types. HOLOTYPE: ♂, HONDURAS, 30 km SE Siguatepeque, VI-15-1979, J. A. Chemsak, collector (California Insect Survey, Berkeley). ALLOTYPE: ♀, MEXICO, Nuevo Leon, 18 mi. W Linare, IX-17-76, J. A. Powell & J. A. Chemsak, collectors (California Insect Survey, Berkeley). PARATYPES 21: 2♂♂, 1♀, HONDURAS, Dept. Comayagua, Comayagua, reared ex. *Mimosa pigra*, S. Passoa, coll. I-9&10-81, (1 ♂, 1 ♀) emerged I-12-81, (1 ♂) emerged II-10-81, Genitalia Slide CDA #520, (1 ♀) Genitalia Slide CDA #610; 13 ♂♂, HONDURAS, Yoro, El Progreso, IV/10-15/79, C. Gentry, Pherocon 1C trap baited w Z,Z-ODDA, (1 ♂) Genitalia Slide CDA #522. 1 ♂, NICARAGUA, San Ramon, Matagalpa, VII-11-78, C. Gentry, Pherocon 1C trap baited w Z,Z-ODDA. 2 ♂♂, MEXICO, Oaxaca, Temascal, K. H. Janzen, collector (California Insect Survey, Berkeley), (1 ♂) X-10-1963, (1 ♂) X-3-1963, Genitalia Slide CDA #094; 1 ♀, MEXICO, Michoacan, Cotija, IX-14-



FIGS. 19-23. *Carmentia mimosa*, larva and pupa. 19, anal shield, dorsal view; 20, pupa, ventral view; 21, close-up of pupal abdominal spines; 22, pupal abdomen, lateral view, male (female lacks the indicated row); 23, caudal view of pupal terminal abdominal segment.



FIGS. 24, 25. *Mimosa pigra*, host plant for *Carmenta mimosa*, Comayagua, Honduras.

1975, B. Villegas (University of California, Davis). Paratypes will be distributed among the two California institution collections listed above; Florida State Collection of Arthropods, Gainesville; National Museum of Natural History, Washington, D.C., and Passoa's collection.

Also, the following material was studied: HONDURAS, Dept. of Comayagua, on *Mimosa pigra* (5 preserved larvae and 4 pupae associated with the reared adults mentioned above): 3 larvae in alcohol, 2 on slides with skin (lepidoptera mandible slides #200, 201, S. Passoa collection), 4 pupae, 2 cast pupal exuviae (one with larval skin mounted, lepidoptera mandible slide #19, Fla. State Coll. of Arthropods), 1 in alcohol (died close to eclosion, female genitalia dissected out, genitalia slide #267, S. Passoa Coll.), 1 pinned, Honduras, Dept. of Comayagua, Comayagua, XII-8-1981, in stem of *Mimosa pigra*, larva, not fully grown, lepidoptera mandible slide #18, Fla. State Coll. of Arthropods. This material will be placed in the Florida State Collection of Arthropods, University of California (Berkeley), and Passoa's private collection.

Discussion. With its clear wings, slender legs, shortened antennae, abdomen with narrow pale banding and constricted "waist," labial palps sculptured to resemble mandibles when viewed face-on, *C. mimosa* effectively creates the impression of being a small species of vespid wasp. In Honduras the genus *Polybia* (Hymenoptera: Vespidae) resembles *C. mimosa* in markings, and this wasp is relatively common.

As reported in the above data the adults from Comayagua, Honduras were reared from *Mimosa pigra*. A male and female emerged on 12 January 1981 from pupae extracted from the branches a few days earlier. Another male emerged on 10 February 1981 from a section of branch where the larva was first observed on 9 January. Another larva was collected at the same clump of plants a year later (Fig. 8).

The 13 male adults from El Progreso, Honduras were collected from 10 April to 13 June 1979 in sticky traps baited with a sex attractant containing about 96% of the Z,Z isomer of 3,13-octadecadien-1-ol acetate (Z,Z-ODDA), a major component of the sex pheromone systems of various sesiids (Duckworth & Eichlin, 1977b; Karandinos et al., 1977; Sharp et al., 1978; Sharp & Eichlin, 1979; Neal & Eichlin, 1983; Nielsen, 1979; Reed et al., 1981). An additional male was captured in the same manner in Matagalpa, Nicaragua, 11 July 1978.

The Mexican specimens were captured in September and October. From the limited label data it appears as though the flight period extends over a long time (April to October); or the flight period varies depending on the locality; or there is more than one generation per year; or the actual situation involves some combination of the above possibilities.

Carmenta prosopis (Hy. Edwards), a slightly smaller species on the average (wing length 5–8 mm) occurring from northern Mexico into southwestern United States, has been reared on several occasions from species of *Prosopis* (mesquite) and from *Mimosa biuncifera* Benth., where they developed as inquilines in hymenopteran-caused stem galls

(Engelhardt, 1946). *C. prosopis* also has the somewhat unusually shortened antennae found on *C. mimosa* but lacks the narrow waist and differs in several details of maculation and structures of the genitalia. Two other species in a closely related genus, *Aegerina harti* (Druce) and *A. vignae* (Busck, 1929), are known to be borers in various leguminous plants, some of which are cultivated species (Duckworth & Eichlin, 1978). These moths also have shortened antennae and constricted abdomens but differ from *C. mimosa* mainly in details of genitalic morphology.

In Mosher's key (1916), the pupae of *C. mimosa* will key out with *Podosesia* Möschler and *Memythrus* Newman (= *Paranthrene* Hübner), due to the unarmed clypeus. However, *Paranthrene* are larger, 20–25 mm, than *C. mimosa* which measures only 8–15 mm. *Podosesia*, as illustrated by Mosher, differs from *C. mimosa* in that the maxillae extend $\frac{3}{4}$ of the way to the caudal margins of the wings. In *C. mimosa* they extend $\frac{1}{10}$ that distance.

The larva of *C. mimosa* agrees with MacKay's (1968) definition of the genus in having both D1 and D2 on large pinacula, especially on abdominal segment seven. The prespiracular group is arranged in an equilateral triangle rather than in an obtuse angle as in other members of the genus *Carmenta* as defined by MacKay. Specific identification will likely depend on small differences in the size and shape of the various pinacula. Unfortunately, these pinacula can be difficult to see unless the larval skin is cleared. Certain pinacula lacking setae are present but were not named by MacKay. In this study they are all illustrated but also left unnamed.

External symptoms of larval damage include exit holes in the stems of the host and frass extruding from the holes. *C. mimosa* apparently was not seriously damaging its host in Honduras. However, larvae were collected from the same clump of plants in successive years, and such cumulative damage might weaken the plant in the long run. *C. mimosa* might be effective as a biological control agent in areas where strong winds and heavy rains make such a weakness in the stem a liability to the plant. Although the borer was never collected from any commercial crops in Honduras during a three year period (Passoa, unpub. data), some related species attack economically important legumes. Host specificity tests on this insect should include legumes. The use of pheromones for sampling populations could allow for easy evaluation of establishment if releases are made.

ACKNOWLEDGMENTS

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University of California, Berkeley; R. O. Schuster, University of California, Davis. We are grateful to C. R. Gentry, USDA/SEA-AR, Southeastern Fruit and Tree Nut Laboratory, Byron, Georgia, for trapping the series of specimens with attractants in Honduras and supplying them for this study. Thanks also to J. H. Tumlinson, USDA/SEA-AR, Insect Attractants, Behavior and Basic Biology Research Laboratory, Gainesville, Florida, for providing attractants used in this and most of our research. We appreciate the constructive reviews of the manuscript by G. Buckingham and D. Habeck, University of Florida, Gainesville. Preparation of genitalia slides and other technical assistance were provided by Magda R. Papp, Biological Technician, California Department of Food and Agriculture, Sacramento.

Special thanks are due to Kyra Carroll, Peace Corps (Honduras); her company during long field trips, sharp eyes for collecting, and help in choosing field sites are appreciated. The field work in Honduras was supported by the International Plant Protection Center, Aquatic Weed Program, at the University of Florida. We wish to thank M. Fonseca, Agriculture Director, Peace Corps, Honduras, for his guidance. G. Reyes, Regional Director, Recursos Naturales, Comayagua, kindly provided office space and equipment needed to carry out this study.

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Abbreviations used in figures (9-19) of immature stages:

- (A1, A2, A3)—first, second and third anterior setae
- (ADF1, ADF2)—first and second adfrontal setae
- (C1, C2)—clypeal setae
- (D1, D2)—first and second dorsal setae
- (F1)—frontal seta
- (L1, L2, L3)—first, second, and third lateral setae
- (P1, P2)—first and second posterior setae
- (SD1, SD2)—first and second subdorsal setae
- (SV1, SV2, SV3)—first, second, and third subventral setae
- (XD1, XD2)—first and second prothoracic dorsal setae

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OBITUARY

JOSEPH MULLER (1903-1982)

Joseph Muller of Lebanon, New Jersey died in September 1982 at the age of 79 years.

Joe had pretty much devoted a lifetime to Lepidoptera. He came to this country from his native Alsace-Lorraine as a young adult and spent the remainder of his life in New Jersey. He was always identified with the Newark Entomological Society and indeed for years the Fall meeting of that group was held at his home. He loved to recall the society beer fests of an earlier era.

Joe was an authority on the butterflies and moths of New Jersey and frequently reported new records, particularly moths, from our state. He authored many articles, some of which appeared in the *Journal of the Lepidopterists' Society*. In recent years, one of his favorite haunts was the farm of Dr. Brooke Worth in Eldora, Cape May County, which has been featured in national publications of the Nature Conservancy and Audubon Society.

The Muller collection has been donated to the American Museum of Natural History. His spirit and interest in insects and his zest for the chase live on with those who knew him well.

JOHN J. BOWE, *Van Neste Medical Arts Center, 127 Union Street, Ridgewood, New Jersey 07450.*