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CLEARWING MOTHS OF BAJA CALIFORNIA, MEXICO (LEPIDOPTERA: SESIIDAE)

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ABSTRACT.– The 15 known species of Sesiidae of Baja California, Mexico are discussed. Five species are unique to the Baja Peninsula, four of which are described as new species: *Melittia faulkneri* **n. sp.**, *M. gilberti* **n. sp.**, *Carmenta andrewsi* **n. sp.**, and *C. erici* **n. sp**. Adults are described, figured and salient features illustrated.

KEY WORDS: Betulaceae, biology, *Carmenta*, ***Carmenta andrewsi*** n. sp., ***Carmenta erici*** n. sp., Compositae, Cucurbitaceae, distribution, Fagaceae, hostplants, *Hymenoclea*, Lauraceae, Malvaceae, *Melittia*, ***Melittia faulkneri*** n. sp., ***Melittia gilberti*** n. sp., Nearctic, Neotropical, *Paranthrene*, Paranthreninae, *Penstemonia*, pheromones, Platanaceae, Polemoniaceae, Polygonaceae, Rosaceae, Salicaceae, Scrophulariaceae, Sesiinae, Solanaceae, *Sophona*, *Synanthedon*, Tinthiinae, Western Hemisphere, *Zenodoxus*, USA.

The clearwing moth (Sesiidae) fauna is poorly understood for most regions of the Western Hemisphere. The fauna for America north of Mexico is the exception, having been reviewed in several comprehensive treatments (Beutenmüller, 1901; Engelhardt, 1946; MacKay, 1968 (larvae); Duckworth and Eichlin, 1977; and Eichlin and Duckworth, 1988).

I have been gradually revising the Western Hemisphere clearwing moths according to subfamily (Tinthiinae – Eichlin, 1986; Paranthreninae – Eichlin, 1989), but the remaining subfamily (Sesiinae) is too large to treat for such an extensive geographic area. For practical reasons, instead of presenting portions of the Sesiinae for all of the Western Hemisphere, I plan to produce studies of the whole family for smaller geographical and/or geopolitical regions (as in Duckworth and Eichlin, 1978).

The sesiid fauna of the Baja Peninsula of Mexico is poorly known. Sampling the species in Baja is made difficult by the rugged terrain and often harsh environment. Surveying for sesiids is difficult due to the fugitive diurnal flight behavior, hymenopterous mimicry, and endophagous boring habit of the larvae. The recent use of sex attractants has greatly aided in sampling for males of certain species. The attractant used in Baja surveys is basically the pheromone of the peachtree borer, (Z,Z) 3,13-octadecadien-1-ol acetate (herein abbreviated as Z,Z-ODDA). Unfortunately, other isomers of this chemical have not yet been tried as bait for collecting on the peninsula. Perhaps, some of these isomers would help reveal additional Baja species.

The information on the species in the following paper is based in many instances on only a few collection records. Hopefully, with the framework provided here, much more data will be added in the near future.

For reasons of consistency, I present the descriptions of each species in essentially the same format as in my previous revisions (Eichlin, 1986; 1989). The term "collar" has been consistently used for the broad-scaled antero-dorsad margin of the thorax.

TINTHIINAE Le Cerf

SOPHONA Walker

Sophona snellingi Eichlin

Sophona snellingi Eichlin, 1986:349.

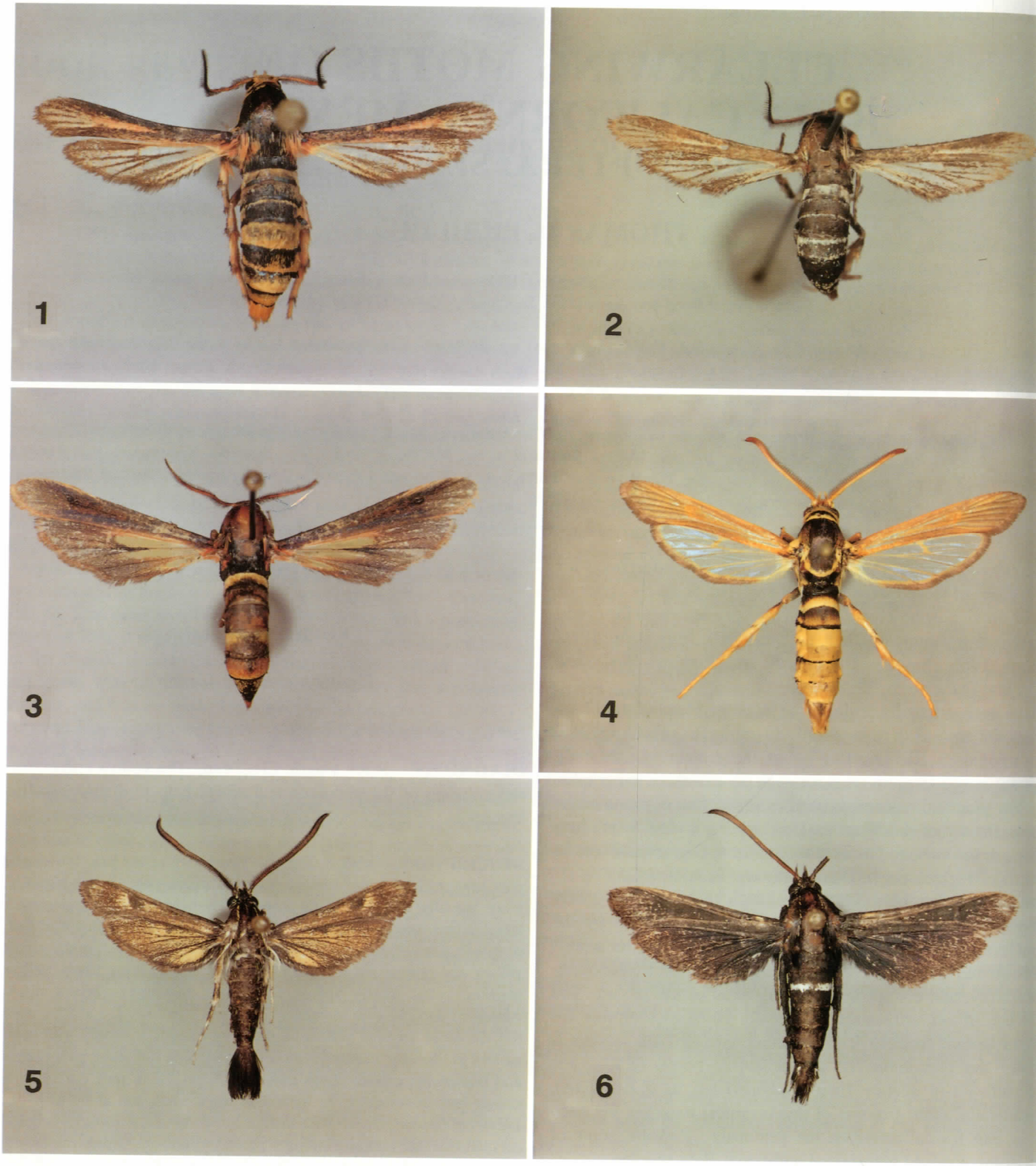
DIAGNOSIS.– Wing length: 11-12mm. The yellow and orange red coloring of the abdomen and wings help to distinguish this species.

DESCRIPTION.– MALE (Fig. 3): Head with vertex pale brown and pale orange; front pale orange; occipital fringe pale orange dorsally, white laterally; antenna mostly powdered orange and red-orange mixed; labial palpus roughened, white on basal half, pale orange on apical half; proboscis present, normal. Thorax brown but with much orange, pale yellow and orange red mixed in front and behind wing bases, yellow beneath; collar mostly yellow on margin; metathorax brown black. Abdomen dorsally with segments 1, 4, 6 and 7 yellow; 2, 3 and 5 orange red, the latter segment yellow on posterior margin; ventrally with color pattern as dorsally, perhaps somewhat paler; anal tuft short, pale orange and orange red mixed. Legs mostly pale yellow to pale orange with orange red on forecoxa, on tufts near tibial spurs and at tarsal joints. Forewing opaque, brown with orange brown in center through cell and on hind margin; ventrally strongly powdered orange. Hindwing mostly opaque but with hyaline areas basally in half of cell, below cell and small portion in anal area, concolorous with forewing dorsally and ventrally.

FEMALE: Marked as on male but with hindwing more opaque basally, powdered more heavily with yellow; antenna with contrastingly dark patch of longer scales dorsally about 1/3 from tip, which is absent on male.

HOSTS.– Unknown.

DISTRIBUTION.– Mexico: Baja California, records from near



Figs. 1-6. Adult moths (measurements for wing length): 1. *Zenodoxus palmii* (male; 9 mm); 2. *Z. mexicanus* (male; 8 mm); 3. *Sophona snellingi* (male; 13 mm
Paranthrene robiniae (male; 15 mm); 5. *Hymenoclea palmii* (male; 12 mm); 6. *H. palmii* (female; 14 mm).

Cataviña in the north to Todos Santos in the south; Sonora. Elsewhere, from southwestern New Mexico.

TYPES.– *Holotype* ♂. MEXICO.– Baja California Sur, La Burrera (LACM).

REMARKS.– Three specimens were captured in Sonora with E,Z-ODDA bait, the two male paratypes and one other badly damaged specimen. However, the holotype and other males responded to a bait containing mostly the other isomer, Z,Z-ODDA, and were collected in Baja along with a long series of another clearwing moth, *Carmenta andrewsi,* new sp. (Sesiinae), which was no doubt responding to the Z,Z-ODDA attractant formulation. *Carmenta andrewsi* has color patterns closely resembling *S. snellingi*. *Sophona snellingi* adults were captured in mid to late Jul for the Sonora and New Mexico specimens and late Aug and mid Sep for those taken on the peninsula.

ZENODOXUS Grote and Robinson

Zenodoxus mexicanus Beutenmüller

Zenodoxus mexicanus Beutenmüller, 1891:216.

DIAGNOSIS.– Wing length: 5-9mm ♂; 10-11mm ♀. The white on the apical area of the forewing of *Z. mexicanus* helps to separate this species from other species of *Zenodoxus*.

DESCRIPTION.– MALE (Fig. 2): Head with vertex brown black; front gray black, laterally mostly white; occipital fringe white or very pale yellow; antenna dorsally light brown; labial palpus roughened, white, brown black at apex. Thorax brown black, patch of pale yellow anterior to and beneath wing, setaceous pale yellow tuft behind wing, posteriorly often with pale pink scales mixed. Abdomen with ground color brown black, dorsally with yellow or white bands on segments 1, 4, 5, 6 and 7, with some pale pink or orange mixed on 5 and much pale pink or orange on 2 and 3; ventrally variously powdered with pale pink or yellow or mostly white; anal tuft brown black mixed with pale yellow, often with some pale pink or orange. Legs with forecoxa brown black and white, perhaps some pale pink; mid- and hindtibiae and 1st tarsal segments tufted, dark brown and pink or orange; hindtibia between spur pairs white with some pink or orange outside, mostly pink or orange inside, tarsi similarly colored with dark brown rings at joints; specimens from some localities with legs mostly white, with orange mixed at tibial tufts. Forewing opaque, dark brown with pale pink and white in cell, white between veins in apical area, sometimes also covering veins apically; ventrally mostly white with some pale pink powdering, dark brown on veins and discal spot; fringe dark brown, tipped with white. Hindwing mostly opaque but basally sparsely clothed with white or pale pink; ventrally mostly white, perhaps with some pale pink.

The color patterns vary from one population to another: those with yellow abdominal bands may be powdered with pale pink on abdomen, wings and legs; those with white abdominal bands generally are powdered with orange on abdomen and legs.

FEMALE: Only one female has been seen, differing from the male on the head with a pale yellow vertex and white front; the hindwing lacks a hyaline area basally; and the forewing dorsally is more strongly powdered with pale yellow.

HOSTS.– Unknown (see discussion below).

DISTRIBUTION.– Mexico: Baja California, south of Cataviña. Elsewhere, from Billings, Montana south to Big Bend, Texas.

TYPES.– *Holotype* ♂. NEW MEXICO (AMNH).

REMARKS.– Collection records are from late May to early Aug, and Sep in Baja. A few males were attracted to the Z,Z-ODDA isomer of sex attractant in Mexico and during field studies being conducted by T. Friedlander in Santa Elena Canyon in the Big Bend area of Texas. The specimens were collected near a patch of *Sphaeralcea angustifolia* (Malvaceae) at 1030 h. They have not been definitely associated with this plant to date.

Zenodoxus palmii (Neumoegen)

Larunda palmii Neumoegen, 1891:108.
Paranthrene palmiana Dalla Torre, 1925:160.
Zenodoxus wissadulae Engelhardt, 1946:195.
Zenodoxus palmii race *sphaeralceae* Engelhardt, 1946:198.
Zenodoxus palmii race *incanae* Engelhardt, 1946:198.

DIAGNOSIS.– Wing length: 7-14mm. This species is variable, with several color forms. Most often there are yellow to orange bands on the abdomen, with similar colors on the wings and some pink scales on the hindwings.

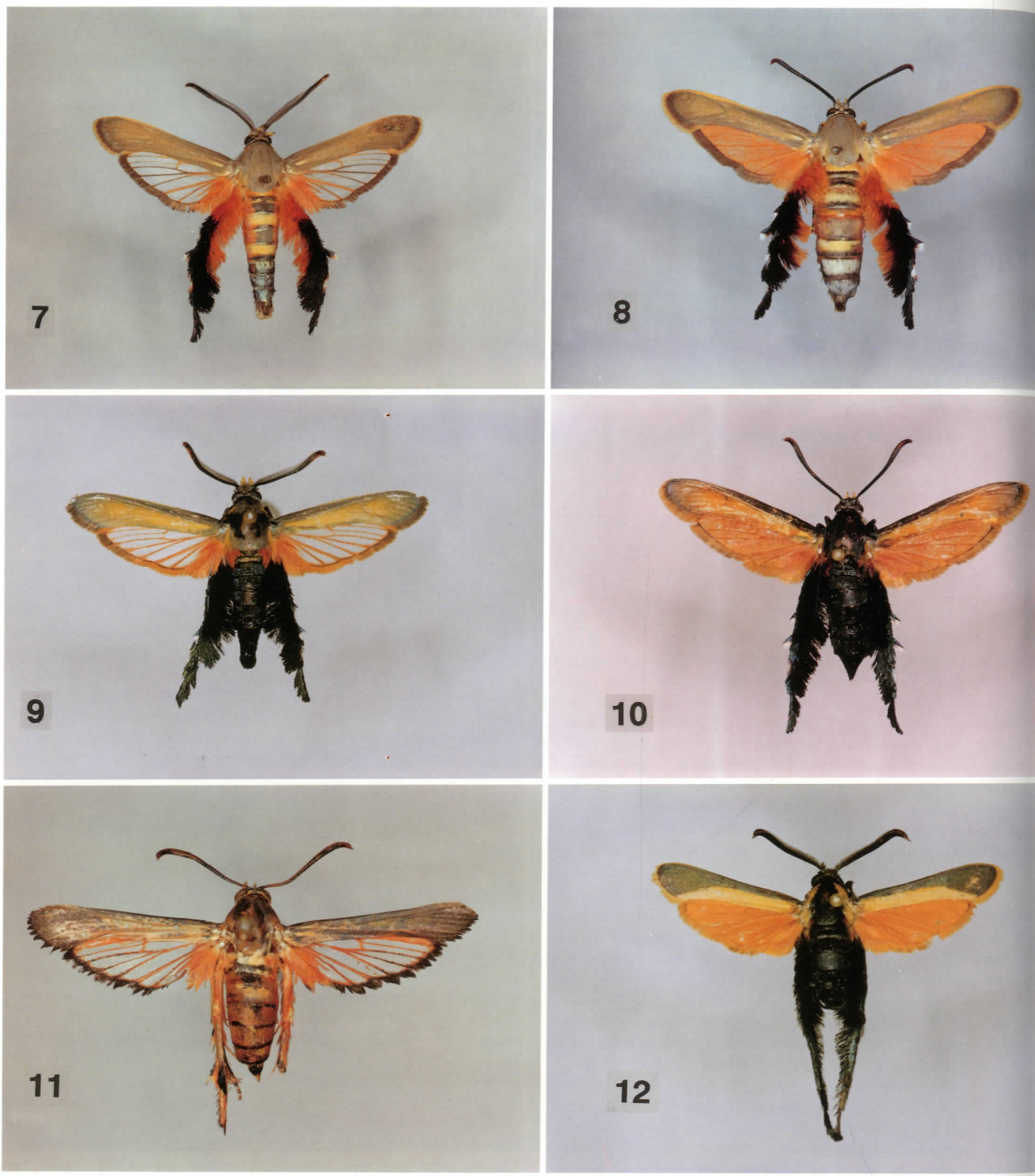
DESCRIPTION.– MALE (Fig. 1): Head with vertex brown black, yellow orange at antennal base; front dark gray with yellow ventrally and occasionally laterally; occipital fringe yellow orange dorsally, becoming yellow laterally; antenna dorsally powdered yellow orange; labial palpus thickened, only weakly roughened, yellow with yellow orange apically. Thorax brown black, yellow on collar and laterally before forewing; orange posteriorly and in narrow subdorsal stripe, which is widest at wing base. Abdomen dorsally mostly yellow, segments 2 and 3 chestnut brown, some dull orange on 4-7 and anal tuft; ventrally dull orange or yellow. Legs mostly yellow to orange; femora mostly brown black; forecoxa mostly yellow and orange with brown black basally. Forewing opaque, generally dark brown with pinkish orange medially and apically; ventrally mostly orange, becoming yellow apically. Hindwing generally opaque, but may be variously hyaline basally in certain forms, dark brown apically, basal 2/3 medially pinkish orange; ventrally as for forewing.

The form *"sphaeralceae"* differs from the typical form by having the orange of the typical form replaced with yellow; wings mostly yellow, hindwing with hyaline area in cell to base; abdominal segments 2 and 3 dorsally brown black. The form *"incanae"* differs from the typical form by the following: orange of typical form replaced by yellow; all abdominal segments mostly yellow dorsally, red pink on basal segments ventrally; hindleg with scale tufts orange red; forewing ventrally red pink powdering; hindwing with more extensive hyaline area than *"sphaeralceae,"* red pink basally; head with vertex pale yellow and brown black mixed, front pale yellow to white, and occipital fringe pale yellow dorsally, becoming white laterally. The form *"wissadulae"* differs from the typical form mainly by having the wings generally darker, with much less powdering and the abdomen with the yellow bands much narrower.

FEMALE: The female of each form is essentially the same in color patterns as its complimentary male, but none of the females has hyaline regions on the hindwing as do males of certain forms. The typical form has the head with front completely yellow and with a pinkish tint ventrally on the legs. For the form *"incanae"* the hindwing of the female has much more red pink than the male. The females are generally larger and heavier bodied than the males.

HOSTS.– *Sphaeralcea ambigua, S. munroana* and *Wissadula lozanii* (Malvaceae).

DISTRIBUTION.– Mexico: Baja California south of Cataviña, in B.C. Sur south of Mulege. Elsewhere, from eastern Washington and Oregon south in the Rocky Mountains to Arizona and



Figs. 7-12. Adult moths (measurements for wing length): 7. *Melittia gloriosa* (male; 22 mm); 8. *M. gloriosa* (female; 24 mm); 9. *M. gilberti* (Holotype male; 18 m
10. *M. gilberti* (female; 21 mm); 11. *M. faulkneri* (Holotype female; 15 mm); 12. *M. magnifica* (male; 17 mm).

southeastern California, southeastward to Brownsville, Texas.
TYPES.– *palmii: Lectotype* ♂. South ARIZONA (AMNH).
wissadulae: *Holotype* ♂. TEXAS: Brownsville (USNM).
palmii race *sphaeralceae*: *Holotype* ♂. WASHINGTON: Whitman County (USNM).
palmii race *incanae: Holotype* ♂. ARIZONA: Yuma (USNM).
REMARKS.– Although the various forms have been reared from the roots of the above listed host plants, specifics of the life history of this species have not been recorded. Adults have been collected from Jul to early Oct, depending on the portion of the range from which the specimens were obtained (early Sep in southeastern California, specimens from Brownsville, Texas reared out in Apr and May).

PARANTHRENINAE Niculescu

PARANTHRENE Hübner

Paranthrene robiniae (H. Edwards)

Sciapteron robiniae H. Edwards, 1880:72.
Memythrus perlucida Busck, 1915:80.
Paranthrene robiniae form *palescens* Engelhardt, 1946:144.

DIAGNOSIS.– Wing length: 11-18mm. Males have bipectinate-ciliate antennae. Forewings are opaque, rust, dull orange or pale yellow, and hindwings hyaline; abdomen mostly yellow.

DESCRIPTION.– MALE (Fig. 4): Head with vertex mostly orange or rust; front and occipital fringe yellow or orange; labial palpus roughened, yellow with orange and brown black laterally, occasionally some orange ventrally; antenna orange, occasionally with some black apically. Thorax brown black with collar yellow, U-shaped yellow band posteriorly, yellow spot anterior of wing bases extending down posterior margin of mesothorax beneath wings, and lightly powdered with rust scales subdorsally before wings. Abdomen mostly yellow in the typical form, with segment 1 brown black, segment 2 yellow on posterior half and segment 3 with narrow yellow band on posterior margin, segments 2 and 3 often with rust posteriorly, occasionally replacing yellow on segment 3. Legs mostly orange or red orange with some yellow especially on tarsi, coxa of foreleg brown black medially, hindleg with femur brown black, and tibia dorsally and occasionally laterally shaded with brown black, tibia of hindleg with ridge of raised yellow scales on dorsum. Forewing mostly opaque, rust or dull orange, purple black on veins, except for small hyaline area mediobasally and occasionally just beyond discal spot; ventrally, forewing lighter, pale orange with some yellow. Hindwing hyaline except where orange on discal spot and in very narrow band on wing margin.

The color form *"perlucida"* differs by having the abdomen and thorax mostly deep red and with yellow on the abdomen confined to a wide band on segment 4 and a narrow band posteriorly on segment 2, however, other segments may have varying amounts of yellow intermixed. This color variant occurs in the northern Rocky Mountains of the United States and Canada. The color form from the extreme desert regions of southern California is referred to as *"palescens."* This form is pale yellow except for some slight orange powdering on the thorax, wing bases, and anteriorly on abdominal segments 2 and 3, and occasionally 4. The forewings are mixed light brown and pale yellow with some scattered pale orange.

FEMALE: Similar to male. Genitalia with corpus bursae short and ovoid, and with two or four weakly sclerotized, longitudinal, narrow signa equally spaced on the posterior half.
HOSTS.– *Populus* spp. (poplars) and *Salix* spp. (willows) (Salicaceae) and ornamental plantings of *Betula* spp. (birches) (Betulaceae).
DISTRIBUTION.– Mexico: south to Baja California Sur. Elsewhere, from the Rocky Mountains to the California coast, to Alaska and to the desert Southwest (except for one record from western Kansas).
TYPES.– *robiniae*: *Lectotype* ♂. NEVADA: Virginia City (AMNH).
perlucida: *Holotype* ♀. MONTANA: Missoula (USNM).
robiniae form *palescens*: *Holotype* ♀. CALIFORNIA: Palm Springs (USNM).
REMARKS.– *Paranthrene robiniae* is referred to as the western poplar borer. Ovipositing females are attracted to weakened or damaged trees of young poplars and low-growing willows, and the larvae attack the stems and branches. The eggs are deposited in bark crevices and around knots and wounds, hatching in about 20 days. The larvae reach maximum size normally in the fall of the second year of a two-year cycle. They overwinter in a pupal chamber prepared at the upper part of the larval burrow, which is capped with silk, but without preparing a silken cocoon. Pupation occurs in late spring, emergence of the adult following two to three weeks later. The flight period appears to be May through Jul throughout most of the range; however, in southern California specimens have been taken in Nov and in Feb through May. Some males have been captured using the Z,Z-ODDA attractant.

SESIINAE Boisduval

MELITTIA Hübner

Melittia gloriosa H. Edwards

Melittia gloriosa H. Edwards, 1880:71.
Melittia superba Barnes and Lindsey, 1922:122.
NOTE – *Melittia superba* Barnes and Lindsey, 1922, is a junior homonym of *Melittia superba* Rothschild, 1909.
Melittia lindseyi Barnes and Benjamin, 1925:14.
NOTE – *Melittia lindseyi* Barnes and Benjamin, 1925, is a replacement name for *Melittia superba* Barnes and Lindsey, 1922.
Melittia barnesi Dalla Torre, 1925:138.
NOTE – *Melittia barnesi* is a replacement name for *Melittia superba* Barnes and Lindsey, 1922.

DIAGNOSIS.– Wing length: 15-28mm, females average larger. This large beautiful *Melittia* can be recognized by the distinctive banding pattern on the abdomen.

DESCRIPTION.– MALE (Fig. 7): Head with vertex roughened, greenish tan; front white, perhaps with some gray dorsally; occipital fringe yellow; labial palpus thick, venter flattened, white, subventrally with line of long hairlike black scales; antenna unipectinate ciliate, brown black, slightly powdered white on one side, yellow on other side. Thorax mostly tan with yellow laterally before wings, yellow tufts at base of wings dorsally; collar with yellow; metathorax yellow. Abdomen dorsally with segment 1 dark brown, yellow on posterior margin; segments 2 and 4 tan medially; segments 3 and 5 pale yellow; the 1st 5 segments orange laterally; segments 6, 7 and anal tuft lustrous pale blue,

with some white and pale yellow powdering on 6; posterior margin of all but 1st segment narrowly brown black; abdomen ventrally mixed pale yellow and white. Foreleg yellow except for white at apex of coxa and brown black around joints of tarsal segments. Midleg with femur brown black, pale yellow dorsally, yellow ventrally; tibia white, yellow dorsally and ventrally, spurs brown black; tarsus brown black with pale yellow at joints. Hindleg with coxa brown black, orange and yellow ventrally; tibia with the typical strong dorsal and mesial tufting that is orange basad of middle spurs, orange medially beyond the spurs, brown black dorsally, ventrally, and laterally; pale yellow on basal half laterally and between middle and apical spurs; spurs brown black with tufts of white posteriorly on both lateral spurs; 1st tarsal segment tufted as for tibia but with brown black dorsoapically and pale yellow ventrally; remaining tarsal segments brown black, strongly tufted dorsomedially. Forewing opaque, dorsally tan, variously powdered with pale yellow, heaviest in apical area; fringe fuscous tipped with yellow; ventrally yellow or yellow orange. Hindwing mostly hyaline with orange on veins and at wing base, orange more diffuse on some specimens. Male genitalia with uncus deeply bifid, with each process tapering to a sharp point, gently curving to apex then slightly recurved; valva with saccular ridge naked, narrow; center of valva with an additional flat, strongly projecting, somewhat triangular process folded back on itself on its basal edge; ventral 2/3 of valva apex with dense patch of short black, pointed scales, becoming longer and less densely packed toward ventral margin of valva; and similar dense patches on uncus.

FEMALE (Fig. 8): Differs from the male by having tan patterns of the male replaced with olive green; hindwing opaque, orange, though variously hyaline in the form *"lindseyi."*

HOSTS.– *Cucurbita foetidissima* HBK, *C. palmata* Watson, *C. digitata* Gray, *Marah fabaceus* (Naudin) and *M. oreganus* (Torrey and Gray) (Thompson, 1927; 1929; Engelhardt, 1946) (Cucurbitaceae).

DISTRIBUTION.– Mexico: Baja California, south of Cataviña; Sonora. Elsewhere, *Melittia gloriosa* occurs from Kansas south to western Texas, west through New Mexico and Arizona into southern California and the coastal islands, and north to central Oregon.

TYPES.– *gloriosa*: *Holotype* ♀. CALIFORNIA: San Leandro (AMNH).

superba: *Holotype* ♂. KANSAS: Seward County (USNM).

REMARKS.– Larvae bore in the large tubers of various cucurbitaceous plants. From the leathery cocoon in the soil, the pupa is able to work its way to the surface at the time of emergence with the aide of remarkable cutting and drilling structures on the pupal head and large, posteriorly directed spine rows on most abdominal segments. Depending on the locality, the moths have been found from May through Oct. Adults of *M. gloriosa* can be found in the cool morning hours sitting docilely on the cucurbit leaves near the bases facing outward. The moths become more active as the ambient temperature increases and are capable of rapid flight.

The ability of *M. gloriosa* to utilize the two species of *Marah* is why this species extended its range through California to central Oregon.

Melittia magnifica Beutenmüller

Melittia magnifica Beutenmüller, [1900]:151.

DIAGNOSIS.– Wing length: 15-18mm. The color of the forewings (anterior half dark blue, posterior half yellow orange) a the color of the opaque hindwings (orange) on both sexes w distinguish this species.

DESCRIPTION.– Adult (Fig. 12, ♂): Head with vertex gray; occipi fringe gray mixed with some pale orange laterally; front gray; lab palpus orange with black apically; antenna blue black. Thorax bl black with orange laterally above wing bases; metathorax with de orange tufts laterally. Abdomen entirely blue black. Legs mostly bl black. Wings opaque. Forewing with anterior portion and apical ar blue black and posterior portion orange; fringe pale orange. Hindwi deep orange but ventrally with apical area blue black.

HOSTS.– Unknown.

DISTRIBUTION.– Until recently, it was known only from t original unique female (labeled Austin, Texas). A male has sin been collected near the southern end of Baja California Su Playa Los Cerritos, 11.2 mi. S Todos Santos.

TYPES.– *Holotype* ♀. TEXAS: Austin (see Remarks belo (AMNH).

REMARKS.– Beutenmüller characterized *M. magnifica* as t most beautiful and brilliant species of the genus. No date capture is given for the type; the male was collected on 28 S 1981. Engelhardt (1946:191) was dubious about the type locali of *M. magnifica*. He wrote that the type female was obtained Beutenmüller from the late Josef Mattes, who once lived in Au tin, Texas and who, according to Engelhardt, "loved brig showy insects and freely exchanged for exotic species, but w careless about locality and date labels." Additionally, intensi studies on *Melittia* borers of cucurbits in the Austin area by Friedlander (pers. comm.) had failed to yield any specimens this species. Since *M. magnifica* is now known from southe Baja California, this suggests that Engelhardt probably w correct and that *magnifica* may not occur north of Mexico.

Melittia gilberti, new sp.

DIAGNOSIS.– Wing length: 17-21mm. This species resembl *M. magnifica* but differs by having the central portion of the fo wings orange yellow and the hindwings hyaline on the male.

DESCRIPTION.– MALE (Fig. 9): Head with vertex gray, media scales upright, setaceous, laterally blue green, flat scales over anten bases, chaetosemae black; occipital fringe black with white mix yellow mixed laterally; front gray; antenna blue black, orange scaling distal half; labial palpus yellow, white dorsally and mixed ventral black mixed laterally. Thorax blue green, yellow orange before and o wing base; orange red tufts on metathorax subdorsally to laterally. Le blue black with bluish iridescence on flatter scales laterally and on tar tufts of hindleg; foreleg with coxa gray black, orange yellow on dis half of tibia and 1st tarsal segment; white tufts on hindtibial spu Abdomen entirely blue black. Forewing dorsally orange yellow, w broad, blue green costal margin, blue green anal margin, blue gre somewhat diffuse on apical margin; apical fringe scales gray becomi orange toward posterior margin; ventrally mostly yellow oran Hindwing hyaline, orange red on narrow margins, at base and on vei Genitalia (Fig. 25) similar to *gloriosa*.

FEMALE (Fig. 10): Differs from the male with hindwings tota opaque, orange red. Genitalia as illustrated (Fig. 28).

HOSTS.– *Cucurbita palmata* (label on La Paz female states *mixta*) (Cucurbitaceae).

DISTRIBUTION.– Mexico: Baja California, south of Cataviña; Baja California Sur, near La Paz (see discussion below).

TYPES.– *Holotype* ♂. MEXICO.– Baja California: 49 mi. S Cataviña, 1900', 7 Sep 1990, F. Andrews, T. Eichlin, A. Gilbert; CDFA Lot #230, from eggs reared in lab on art. diet, Em. 26 Feb 1991; Associated pupal skin and cell in collection (USNM). *Allotype* ♀ (USNM): same as holotype except Em. 29 May 1991. *Paratypes* (4; CDFA, CAS): same as holotype except – (1 ♀) em. 13 May 1991; (1 ♀) em. 15 Apr 1991; (1 ♀, parent) Genitalia Slide By S.A. Kinnee, CDFA #792, On Cucurbita palmata; (1 ♂) Em. 3 Apr 1991, Genitalia Slide By S.A. Kinnee, CDFA #810.

REMARKS.– The following procedure was worked out by my assistant Scott Kinnee: Eggs were obtained from the paratype parental female caught on 7 Sep 1990 and from which the rest of the type series were reared. Hatching occurred on 24 Sep 1990. Larvae were reared on a meridic diet (@BIOSERV 9001) poured into plastic petri plates. Fresh diet was provided as needed. Late 5th instars ceased feeding and began spinning, at which time the plate was inverted over a dish containing autoclaved sand. The 1st pupal cell (containing the cocoon) was formed 30 Nov 1990 and the last on 17 Jan 1991. Of the original six larvae forming cocoons, four adults emerged in perfect condition on 3 Apr, 15 Apr, 29 May and 13 Jun 1991. Of the two which didn't survive, one never pupated and one pupa (Figs. 30-34) was fully formed but did not emerge (apparently some diet had hardened over the exit area of the cocoon). As with other related desert species, *M. gilberti* probably can sustain diapause until favorable conditions occur.

After closer examination, I determined that the small worn female from near La Paz, 2 Aug 1966 published previously as *magnifica* (Eichlin and Duckworth 1988:58) is in fact *M. gilberti*.

I named this for Art Gilbert, CDFA, Fresno, CA, for his discovery of the species and his dogged determination in collecting the parental female.

Melittia faulkneri, new sp.

DIAGNOSIS.– Wing length: 14-15mm. This species averages smaller than the other *Melittia* known from the Peninsula. Though resembling *M. gloriosa*, the abdomen is mostly yellow, and the hindwings of the female are hyaline.

DESCRIPTION.– FEMALE (Fig. 11; male unknown): Head with vertex gray to white; front white to pale yellow laterally; occipital fringe pale yellow; labial palpus yellow, some white dorsally and ventrally; antenna strongly powdered yellow to pale orange. Thorax gray green; collar orange, orange before and beneath wings; pale orange posteriorly on mesothorax; pale orange on metathorax dorsally, becoming orange red laterally. Abdomen dorsally mostly yellow, some brown black on segments 1, 2 and 4; laterally mostly orange; ventrally yellow to pale yellow. Legs mostly orange red; foreleg mostly yellow orange; hindleg with some brown black apically on tibia and on 1st tarsal segment. Forewing opaque, gray green; ventrally red orange, costal margin pale orange. Hindwing hyaline, with orange red on costal margin, on veins and widely in anal region; fringe brown black. Genitalia as in Fig. 29.

HOSTS.– *Cucurbita palmata* (Cucurbitaceae).

DISTRIBUTION.– Mexico: Baja California, south of Cataviña. Also, one specimen from California, eastern Imperial County.

TYPES.– *Holotype* ♀. MEXICO.– Baja California: 49 mi. S Cataviña, 1900', 7 Sep 1990, F. Andrews, T. Eichlin, A. Gilbert; On Cucurbita palmata; Genitalia Slide, CDFA #817, by S.A. Kinnee (USNM).

Paratype (1 ♀; CDFA): CALIFORNIA.– 10mi. S Palo Verde, Imperial County, 8 Sep 1967; Collectors S.C. Williams, M.A. Cazier; Cazier (hand written); Genitalia Slide By T. Friedlander, USNM 77056.

REMARKS.– Using the existing data on *M. faulkneri*, though limited, it should now be possible to collect additional specimens, including males, and fill in the gaps in our understanding of this species.

This species is named for David Faulkner, San Diego Natural History Museum. His long-standing interest in the insect fauna of Baja California has resulted in many specimens collected and much information obtained.

SYNANTHEDON Hübner

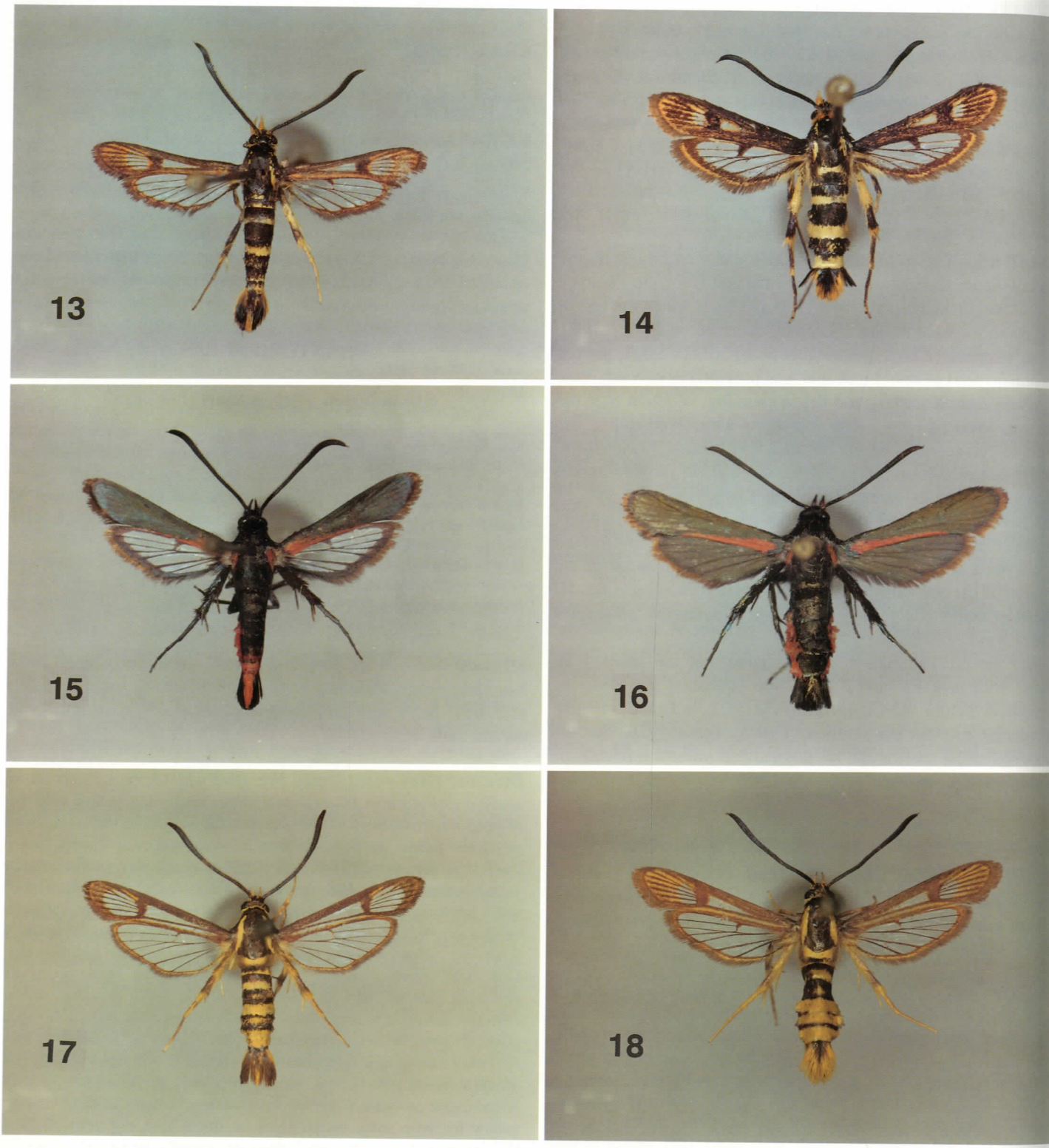
Synanthedon bibionipennis (Boisduval)

Sesia bibionipennis Boisduval, 1869:64.
Albuna rutilans H. Edwards, 1881:186.
Aegeria lupini H. Edwards, 1881:192.
Aegeria perplexa H. Edwards, 1881:192.
Aegeria impropria H. Edwards, 1881:193.
Aegeria aureola H. Edwards, 1881:194.
Aegeria neglecta H. Edwards, 1881:197
Aegeria washingtonia H. Edwards, 1881:197
Aegeria hemizoniae H. Edwards, 1881:198.
Aegeria madariae H. Edwards, 1881:201.

DIAGNOSIS.– Wing length: 8-10mm. This fairly small moth has clear wings, abdomen with yellow bands on some segments and labial palps with projecting elongate scales, most noticeable on the male.

DESCRIPTION.– MALE (Fig. 13): Head with vertex and front brown black; occipital fringe yellow; labial palpus roughened, yellow with row of elongate brown black scales subventrally; antenna brown black, often powdered yellow on posterior margin, scape yellow. Thorax brown black with narrow subdorsal yellow stripe, metathorax yellow; mostly yellow beneath wing. Abdomen brown black; dorsally with segments 2 and 4 banded yellow on posterior 1/2, other segments may be variously banded on different individuals; yellow laterally; ventrally sparsely powdered yellow; anal tuft brown black, yellow laterally and ventrally. Legs with forecoxa mostly yellow; femora brown black, variously powdered yellow; fore- and midtibiae brown black dorsally, yellow ventrally; hindtibia mostly yellow but with brown black distally between pairs of spurs, mixed dorsobasally; tarsi mostly or entirely yellow. Forewing mostly hyaline, dorsally with broad, brown black discal spot, often margined with yellow, broad, outer margin, variously powdered yellow between veins, some specimens extensively so; ventrally mostly yellow but with some brown black on discal spot and veins distally. Hindwing hyaline, with narrow margins, strongly powdered yellow on some specimens; fringe yellow near wing base; ventrally, opaque areas mostly yellow. Genitalia with crista sacculi narrow, straight, with ventral extension near middle, slightly basad, crista and extension heavily clothed with elongate, dark scales, somewhat cleft apically.

FEMALE (Fig. 14): Similar to male except for: labial palpus without elongate, subventral, brown-black scales; forewing generally more opaque, powdering often dull orange; yellow on wings and abdomen usually more extensive; anal tuft brushlike, brown black with yellow subdorsally to mostly yellow.



Figs. 13-18. Adult moths (measurements for wing length): 13. *Synanthedon bibionipennis* (male; 9 mm); 14. *S. bibionipennis* (female; 8 mm); 15. *S. polygoni* fo
"animosa" (male; 8 mm); 16. *S. polygoni* form *"animosa"* (female; 9 mm); 17. *S. resplendens* (male; 9 mm); 18. *S. resplendens* (female; 9 mm).

HOSTS.– *Fragaria* sp. (strawberries), *Potentilla* sp., *Rosa* sp. (roses), *Rubus* spp. (raspberries, blackberries, boysenberries) (Rosaceae).

DISTRIBUTION.– Mexico: northern Baja California. Elsewhere, from the Rocky Mountains in Montana, south to northwestern Texas, and west to the Pacific Coast from British Columbia to California.

TYPES.– *bibionipennis*: *Holotype* ♂. CALIFORNIA (USNM).
rutilans: *Holotype* ♀. NEVADA: Virginia City (AMNH).
lupini: *Lectotype* ♂. CALIFORNIA: Marin County (AMNH).
perplexa: *Holotype* ♂. TEXAS (USNM).
impropria: *Lectotype* ♀. WASHINGTON Terr. (USNM).
aureola: *Holotype* ♀. NEVADA (USNM).
neglecta: *Holotype* ♀. WASHINGTON: Olympia (AMNH).
washingtonia: *Holotype* ♂. WASHINGTON Terr. (AMNH).
hemizoniae: *Lectotype* ♀. NEVADA (AMNH).
madariae: *Lectotype* ♀. CALIFORNIA: Saucelito (sic) (AMNH).

REMARKS.– *Synanthedon bibionipennis* is a potentially destructive species to strawberries under cultivation and is very common in the Pacific Coast regions of the United States. The following information is summarized from several sources (Thompson, 1927; 1929; Mote et al., 1929; Engelhardt, 1946; Essig, 1958). The larvae bore in the roots near the crown or in the stems near the base of the host plant. They feed until Sep or Oct and then prepare a silken chamber in the burrow, in which they overwinter. Feeding is resumed the following spring. Just prior to pupation the mature larva bores to the outside above ground level, leaving an exit hole for the pupa and prepares a cocoon a short distance back from the exit hole. Pupation occurs about nine days following the formation of the cocoon; the pupal stage is about 23 days. At emergence the pupa pushes the cap off the cocoon and works itself partially out of the exit hole, from which position the adult emerges. Adult emergence occurs from Apr through mid-Aug. They often are seen taking nectar from flowers of various kinds. Female moths spend much time crawling among dead leaves and stems close to the crown of a host plant, depositing single eggs on the underside of various objects. In the laboratory one female may lay 400 eggs on the average. In a study by Nielsen et al. (1978), the most effective sex attractant lure was a 2:1 blend of E,Z-ODDA/E,Z-ODDOH.

Synanthedon polygoni (H. Edwards)

Pyrrhotaenia polygoni H. Edwards, 1881:202.
Pyrrhotaenia fragariae H. Edwards, 1881:202.
Pyrrhotaenia heliantii H. Edwards, 1881:203.
Pyrrhotaenia achillae H. Edwards, 1881:203.
Pyrrhotaenia eremocarpi H. Edwards, 1881:203.
Pyrrhotaenia meadii H. Edwards, 1881:204.
Pyrrhotaenia orthocarpi H. Edwards, 1881:204.
Aegeria praestans H. Edwards, 1882:98.
Pyrrhotaenia behrensii H. Edwards, 1882:123.
Pyrrhotaenia animosa H. Edwards, 1883:156.
Pyrrhotaenia elda H. Edwards, 1885:49.
Sesia fragariae var. *semipraestans* Cockerell, 1908:329.

DIAGNOSIS.– Wing length: 7-12mm. *Synanthedon polygoni* is a polymorphic species. The ground color is blue black with various patterns of orange red on the wings, legs, and abdomen. The degree of opacity on the fore- and hindwings is highly variable.

DESCRIPTION.– Adults: The patterns of the head are more stable and are as follows: Vertex blue black (orange red on form *"praestans");* front brown black; occipital fringe blue black, or mixed with orange red, or solid orange red; labial palpus roughened, orange red, blue black apically and often ventrally; antenna blue black.

As one might expect from reviewing the history of clearwing moth taxonomy, most of the forms were named without regard for infraspecific variability. The form *"animosa"* (Figs. 15 & 16), which has females with totally opaque fore- and hindwings, is mostly from northern Mexico, California, and Arizona. Generally, the form *"fragariae"* with mostly hyaline forewings is found at higher elevations in the Sierra Nevada and Rocky Mountains, northward to Alaska. In the mountainous regions of Oregon and Washington, the form *"praestans"* predominates, a form which looks like a larger version of *"fragariae."* The other color forms and all gradations between are found mostly at lower elevations in California and Arizona, including the coastal sand dunes.

HOSTS.– *Eriogonum compositum* Douglas, *E. fasciculatum* Bentham, *E. gracile* Bentham, *E. inflatum* Torrey and Bentham, *E. latifolium sulphureum* (Greene). *E. parvifolium* Smith, *E. wrightii* Torrey and Bentham, *Polygonum paronychia* Chamisso and Schlechtendal (all Polygonaceae) (Williams, 1909; Engelhardt, 1946), and once from *Leptodactylon pungens hallii* (Parish) (Polemoniaceae) (Duckworth and Eichlin, 1978).

DISTRIBUTION.– Mexico: northern Baja California. Elsewhere, in western half of North America from northern Mexico to Alaska.

TYPES.– *polygoni*: *Holotype* ♀. CALIFORNIA: San Miguel (AMNH).
fragariae: *Lectotype* ♀. COLORADO (AMNH).
helianthi: *Lectotype* ♀. NEVADA (MSU).
achillae: *Holotype* ♂. CALIFORNIA: San Rafael (AMNH).
eremocarpi: *Holotype* ♂. CALIFORNIA: Sierra Nevada (AMNH).
meadii: *Lectotype* ♂. CALIFORNIA: Lake Tahoe (AMNH).
orthocarpi: *Lectotype* ♂. NEVADA (AMNH).
praestans: *Holotype* ♂. WASHINGTON Terr. (USNM).
behrensii: *Lectotype* ♂. CALIFORNIA: Soda Springs (AMNH).
animosa: *Lectotype* ♂. ARIZONA (USNM).
elda: *Lectotype* ♀. CALIFORNIA: Siskiyou Co. (AMNH).
fragariae var. *semipraestans*: *Holotype* ♀. COLORADO: Florissant (USNM).

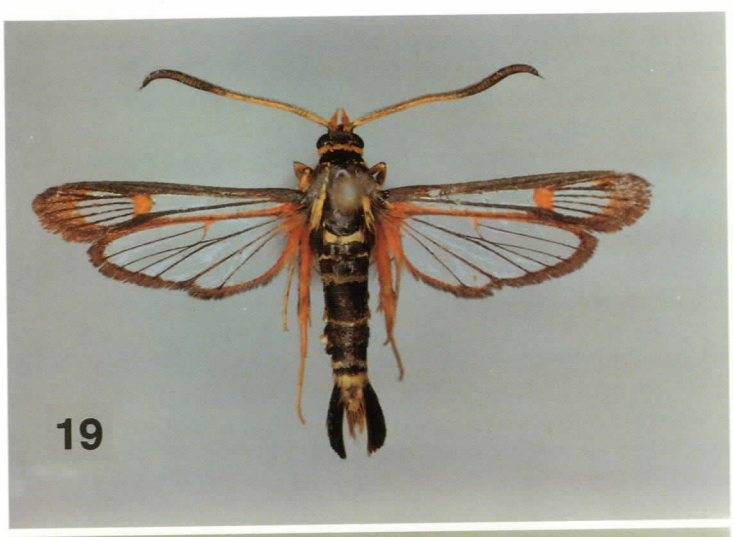
REMARKS.– The larvae tunnel into the root and somewhat into the stem. Reddish fecal pellets are extruded at the base of the plant and fill the abandoned portions of the galleries. The last 25-50 mm of the larval burrow serves as the pupal chamber, which is silk-lined and leads to a thinly covered exit hole above ground level.

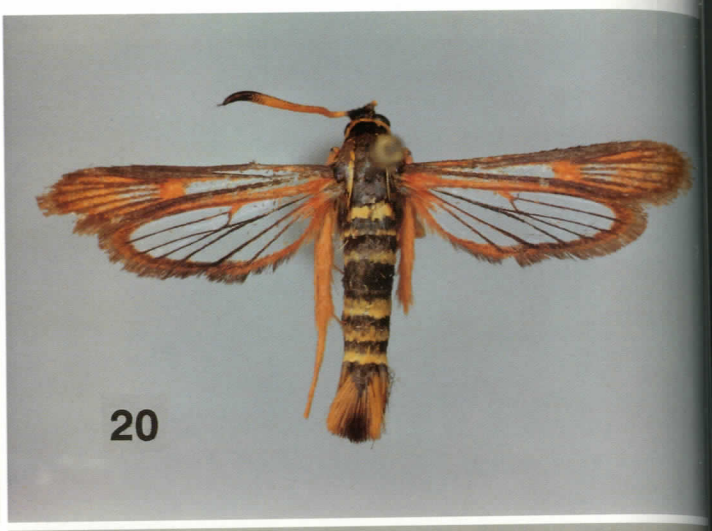
Synanthedon polygoni is a very commonly collected species. Adults are present as early as Apr and May in the coastal and southern portions of the range and Jun to Aug in the mountains and northern portions. They frequently visit flowers, not necessarily those of their host plants.

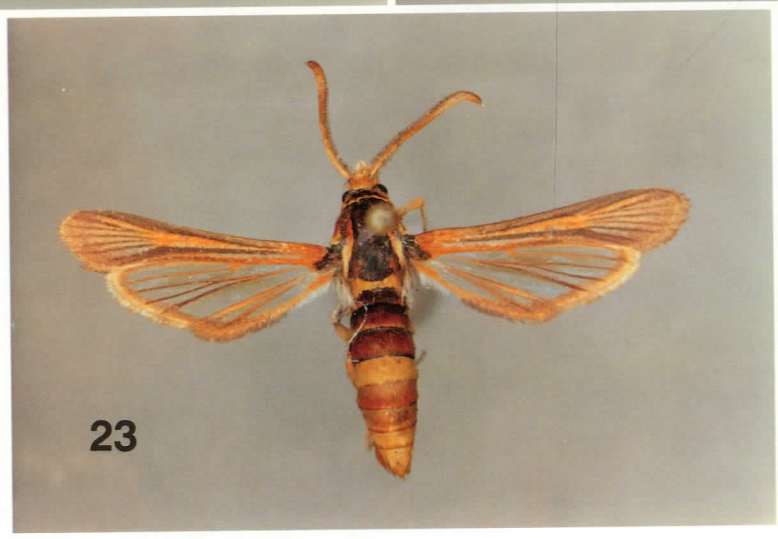
Synanthedon resplendens (H. Edwards)

Albuna resplendens H. Edwards, 1881:186.

DIAGNOSIS.– Wing length: 8-10mm. Generally looks like *S. bibionipennis* but lacks the bushy labial palps and is usually more yellow on the abdomen and wings.







Figs. 19-23. Adult moths (measurements for wing length): 19. *Carmenta erici* (Holotype male; 11 mm); 20. *C. erici* (Allotype female; 11 mm); 21. *Penstemonia henn* (male; 9 mm); 22. *P. hennei* (female; 10 mm); 23. *Carmenta andrewsi* (male; 14 mm).

DESCRIPTION.– MALE (Fig. 17): Head with vertex brown black or mixed with yellow anteriorly; front brown black or mixed with yellow ventrally; occipital fringe yellow; labial palpus smooth, yellow; antenna brown black. Thorax dorsally brown black with fairly broad subdorsal yellow stripe; metathorax yellow; mostly yellow beneath wings. Abdomen dorsally brown black with segments 2, 4, 6, and 7 broadly banded yellow and often some yellow on 3 and 5; all segments yellow laterally; ventrally yellow except segment 3 and medially on 2; anal tuft brown black medially, yellow laterally and ventrally. Legs with forecoxa mostly yellow, brown black medially; femora brown black; tibiae mostly yellow but with brown black dorsally and laterally on distal 1/3; tarsi yellow ventrally and around joint of 1st segment, brown black dorsally. Forewing mostly hyaline, margins and discal spot brown black, powdered variously with yellow; ventrally mostly yellow except for discal spot and apical veins. Hindwing hyaline with very narrow margins; fringe yellow near wing base; ventrally with margins mostly yellow. Genitalia with crista sacculi small but thickly scaled, scales covering to distal end, ventral extension relatively long, straight, slanted toward base and nearly reaching ventral edge of valva, relatively small naked area on valva dorsad of crista sacculi.

FEMALE (Fig. 18): similar to male except forewing with much broader outer margin, much stronger yellow powdering between the veins; abdomen entirely yellow except anterior 1/2 of segment 2 and most of 3; anal tuft brushlike, yellow. Genitalia with bursae well sclerotized on posterior 1/2, slightly expanded near ostium bursae; corpus bursae small, ovate.

HOSTS.– *Platanus racemosa* Nuttal (California sycamore, Platanaceae). In addition to sycamore, larvae of *resplendens* are bark borers in *Quercus agrifolia* Nee (coast live oak, Fagaceae) (Engelhardt, 1946; Brown and Eads, 1965a; 1965b) and were reported from *Persea americana* Miller (avocado, Lauraceae) (Ryan, 1928).

DISTRIBUTION.– Mexico: northern Baja California. Also occurs from southern California to Washington and western Idaho.

TYPES.– *Lectotype* ♀. CALIFORNIA: Siskiyou Co., Soda Springs (AMNH).

REMARKS.– This species is often referred to in literature as the sycamore borer, because of its preferred host. Larvae usually are found in older and larger trees. Pupation occurs in the larval gallery in a cocoon, which incorporates frass and bits of chewed bark. As with nearly all sesiids, the exit is covered by a thin layer of bark, which is broken through by the mature pupa at the time of emergence. Adults can be reared with comparative ease from sections of infested bark. The moths are found mostly in Jun and Jul, but some have been collected as early as Apr in southern California and as late as Aug at higher elevations. The adults confine most of their activities to the crown of the trees except for emergence and oviposition.

CARMENTA H. Edwards

Carmenta andrewsi, new sp.

DIAGNOSIS.– Wing length: 11-14mm. Overall, the opaque forewings and the yellow, orange and red color patterns of this species superficially resemble the tinthiine *Sophona snellingi*. Both may occur together in various localities.

DESCRIPTION.– MALE (Fig. 23; female unknown): Head with vertex orange, variously overlaid with red orange; occipital fringe orange; front pale yellow; labial palpus thickened and roughened, yellow with pale orange dorsally, red orange variously mixed; antenna pale yellow to pale orange, often powdered with red orange. Thorax mostly yellow but dorsally brown black, some rust red before wing and mixed with yellow on collar; metathorax yellow. Abdomen with segments 1-3 brown black overlaid with rust red, 2 yellow on posterior margin; 4 entirely yellow; 5-7 mostly yellow with 5 and 6 variously overlaid with rust red; anal tuft reduced. Legs mostly pale orange and yellow; meso- and metafemora variously brown black. Forewing mostly opaque, often with small diffuse hyaline area in apical region; margins and veins brown, areas between rust red with orange (more intensely marked specimens with color patterns somewhat darker). Hindwing hyaline, veins, margins and fringe orange, variously powdered rust red. Genitalia as in Fig. 26.

HOSTS.– Unknown.

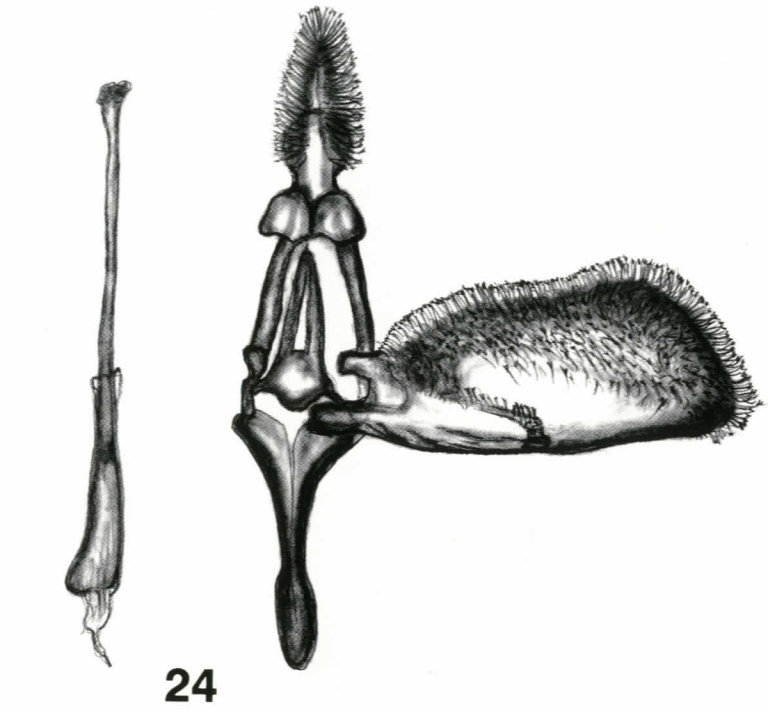
DISTRIBUTION.– MEXICO: Baja California, known from western coast north of Cataviña and scattered locations throughout B. C. Sur to the Cape.

TYPES.– *Holotype* ♂. MEXICO: Baja Calif. Sur, 3.3 mi. S El Cien, 26 Sep 1981, D. Faulkner & F. Andrews (SDNH).

Paratypes (384 – SDNH, UNAM, LACM, CAS, UCB, USNM, CDFA): (6) same as holotype; (11) 11.2 mi. S Todos Santos, 28 Sep 1981; (7) 6.4 mi. SE San Perdito, 9 Oct 1981; (11) 20 mi. W La Paz, 9 Oct 1981; (11) Playa Los Cerritos, 8 Oct 1983; (37) 36.6 Mi. SE Todos Santos, 10 Oct 1983; (8) Arroyo San Bartolo, 28 Aug 1982, Faulkner, Brown; (11) 5.2 mi. W Hwy 1, road to Coro, 23 Mar 1986, Faulkner, Bloomfield; (6) 28 km N Todos Santos (km. 24), 24/27 Aug 1977, Fisher & Westcott; (45) El Pescadero-Playa, Los Cerritos, 14 Apr 1979, Coll: M. Wasbauer & C. Freeburg, Malaise Trap with pheromone Z,Z-ODDA; (28) Cañon de la Zorra, 260 m, 11 km W Santiago, 4-5 Sep 1977, coll. R. R. Snelling, attracted to Farchan ZZ-ODDA pheromone; (5) 3 mi N San Pedro, 15 Sep 1983 (same collector & attractant; (8) 21 mi NE Todos Santos, 16 Sep 1983 (same collector & attractant); (31) Hwy 1, KP 15.3, 3 NE Cabo San Lucas, on beach, 10 Sep 1983, J. P. & K. E. Donahue, ZZ-ODDA; (28) Hwy 19, 14.5 rd mi NW Cabo San Lucas, 250 ft., 11 Sep 1983 (same collectors & attractant; (9) 7 rd mi NW, 1.1 mi SW of El Cien, on Santa Fe Road, elev. 100 feet, 13 Sep 1983 (same collectors & attractant); (1) B.C. Sur, 12 mi. S Gulliermo Prieto, 7 Apr 1982, Coll: B. Phelps; (14) Ramal Naranjos Rd., 0.1 mi W Hwy 1, 650', 1 Sep 1990 Andrews, Gilbert, Eichlin; (6) 0.2 mi S Santa Anita, 5 Sep 1990, 200' (same collectors); (1) Ramal Naranjos Rd., 7.3 mi. W Hwy. 1, 1500' 1 Sep 1990 (same collectors).

REMARKS.– Since *C. andrewsi* males respond so well to the chemical sex attractant (Z,Z) 3,13-ODDA, this species has been the most commonly and most widely collected species on the peninsula. Nearly all specimens were collected with the aid of sex attractant, even though this was not always recorded on the label. Unfortunately, the female has not been found to date. Specimens were collected early in the year in Mar and Apr and later from late Aug through mid-Oct. I made a concerted effort, without success, to associate *C. andrewsi* with a common solanum (Solanaceae), evident wherever I collected the moth. This sesiid resembles one or more seemingly common wasps, which constantly caused me to suspect them in flight and even net collect them on several occasions.

It is a pleasure to name this species in honor of Fred Andrews, my friend, colleague and collecting partner. Though a Coleopterist, Fred Andrews has provided me with several interesting sesiids over the years.



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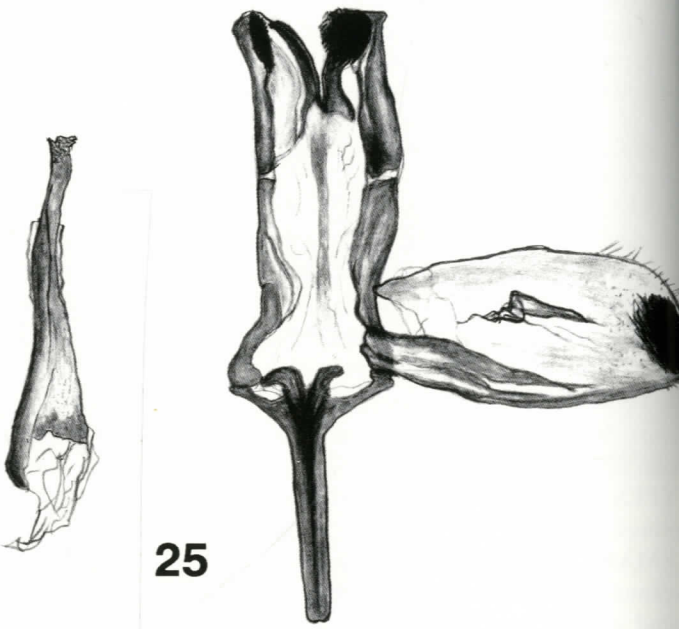

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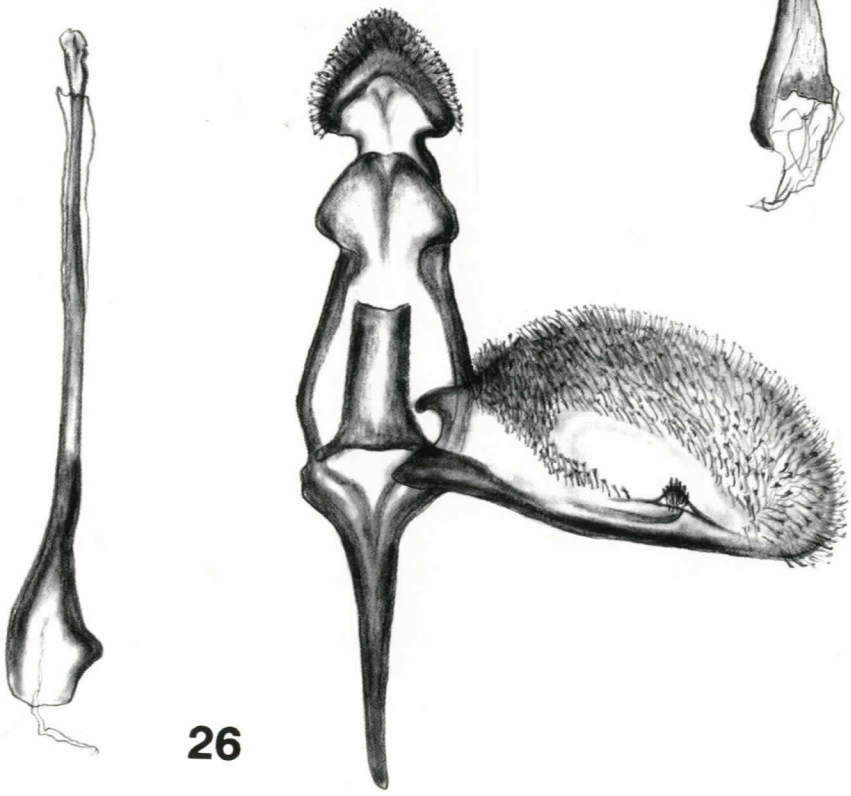

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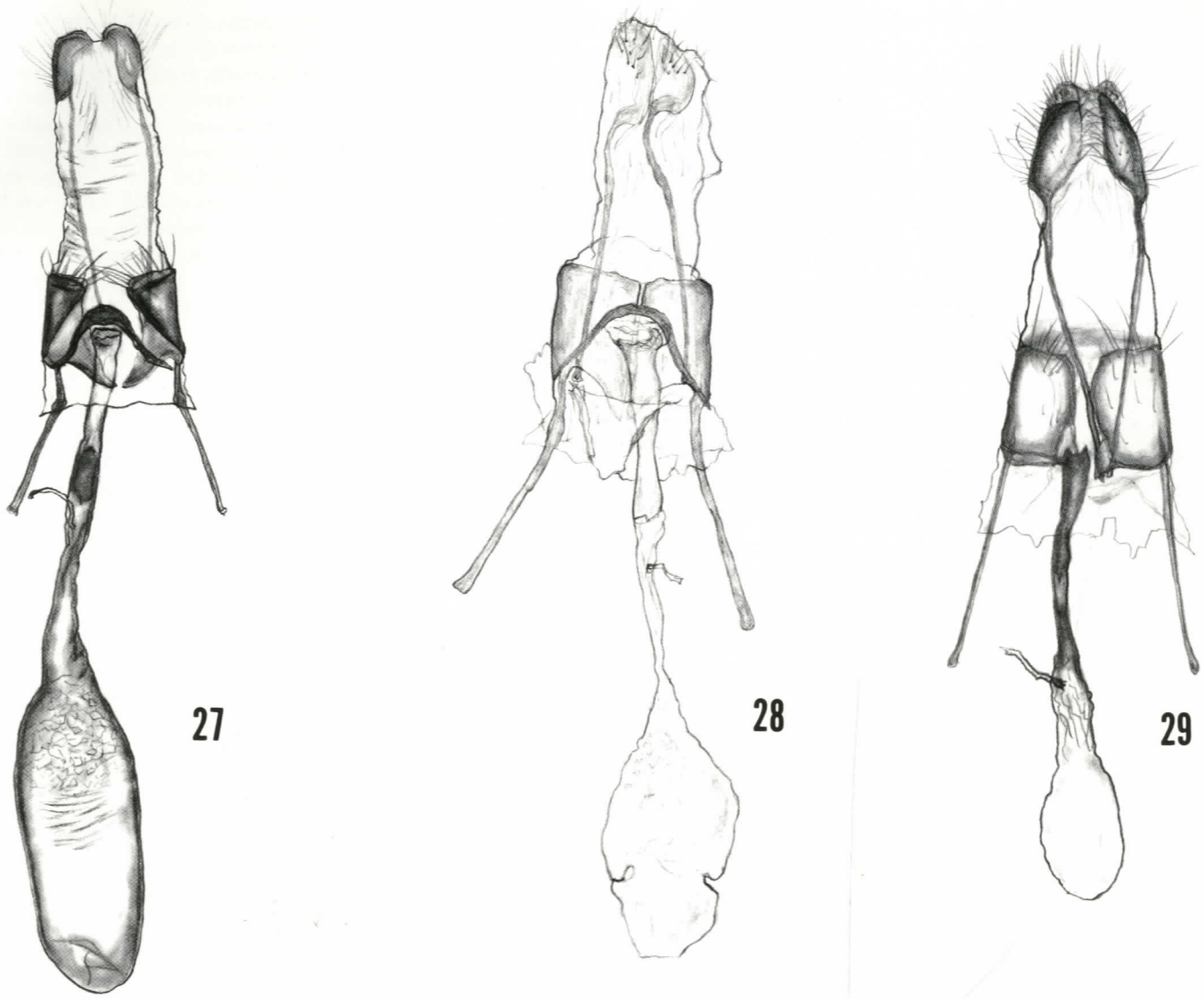
Figs. 24-26. Male genitalia (ventral view; left valve removed, aedeagus separated): 24. *Carmenta erici;* 25. *Melittia gilberti;* 26. *C. andrewsi.*



Figs. 27-29. Female genitalia (ventral view): 27. *Carmenta erici;* 28. *Melittia gilberti;* 29. *M. faulkneri.*

Carmenta erici, new sp.

DIAGNOSIS.– Wing length: 11-13mm. Though mostly orange or red orange in general coloration like *C. andrewsi,* this species differs by the mostly hyaline forewings and well defined yellow abdominal banding.

DESCRIPTION.– MALE (Fig. 19): Head with vertex brown black, yellow orange mixed anteriorly; occipital fringe yellow orange; front gray brown, perhaps some pale yellow laterally; labial palpus not thickened, smoothly scaled, yellow orange; antenna yellow orange, brown black on apical 1/4. Thorax brown black, yellow beneath wing and in narrow stripe above wing base; metathorax yellow. Abdomen brown black with yellow bands posteriorly on all but segment 3; anal tuft with yellow medially; ventrally with some yellow on all segments. Legs orange except mostly brown black on coxae and femora, some brown black distally on tibiae. Forewing mostly hyaline; costal margin, fringe and veins mostly brown black, anal margin and discal spot red orange, somewhat widened apical margin strongly powdered red orange between veins. Hindwing hyaline with red orange at base and on fringe of anal margin; ventrally with veins, margins and fringe red orange. Genitalia as in Fig. 24.

FEMALE (Fig. 20): Much like male but differs by having forewing with much broader apical margin, red orange between veins; abdomen with anal tuft brush-like, all yellow or pale orange. Genitalia as Fig. 27.

HOSTS.– Unknown.

DISTRIBUTION.– Known only from the upper elevations of the Sierra La Laguna.

TYPES.– *Holotype* ♂. MEXICO: Baja California Sur, Sierra La Laguna, 1770-1850m, 30 Aug 1977, E. Fisher, R. Westcott (CAS). *Allotype* ♀: MEXICO: B.C. Sur, La Laguna, 1675-1725m, Sierra de La Laguna, 28 Aug-1 Sep 1977, coll. R. R. Snelling (LACM).

Paratypes (34): (2 ♂, 7 ♀) same as holotype; (19 ♂, 5 ♀) same as allotype except – (2 ♂) genitalia slides: CDA 429, M. R. Papp; CDFA #814, S. A. Kinnee; (4 ♀) genitalia slides: CDFA #'s 807, 808, 809, 815, S. A. Kinnee; (1 ♀) B.C. Sur: trail, LaBurrera-LaLaguna, Sierra de LaLaguna, 1200-1350m, 28 Aug 1977, coll. R. R. Snelling.

REMARKS.– Apparently, all specimens were net collected and none responded to sex attractant (Z,Z 3,13-ODDA). Specimens were all captured from late Aug to early Sep. I proudly name this species for my son Eric, who is currently pursuing a career in the biological sciences.

PENSTEMONIA Engelhardt

Penstemonia hennei Engelhardt

Penstemonia hennei Engelhardt, 1946:16.

DIAGNOSIS.– Wing length: 7-12mm. The wings are mostly hyaline, and species of this genus lack a functional elongate proboscis.

DESCRIPTION.– MALE (Fig. 21): Head with vertex, front, and antenna brown black; occipital fringe yellow mixed with brown black dorsally, white laterally; labial palpus somewhat roughened, white with brown black apically. Abdomen dorsally brown black with pale yellow or white on all of segment 4 and posterior 1/2 of segment 7, occasionally on posterior edge of segment 2; ventrally mostly white except for segments 3 and 7. Legs with forecoxa mostly white, some brown black medially; femora mostly brown black with some white dorsally; tibiae mostly white with brown black at base and distally; tarsi mostly white with some brown black laterally on distal segments. Forewing with extensive hyaline areas in cell and anal region and just distad of discal spot, with yellow on veins in latter area, margins of cell, and lightly powdered between veins apically; patterns similar ventrally. Hindwing hyaline with very narrow margins; some pale yellow on veins and anal margin ventrally.

FEMALE (Fig. 22): Differs from male by: head with front yellow; labial palpus smooth, yellow; abdomen dorsally with segments 2, 4, 5, and 6 broadly banded yellow, all segments yellow laterally, and all segments yellow except segment 3 ventrally; legs with yellow where white on male; forewing nearly or entirely opaque, hyaline areas of male yellow scaled in female.

HOSTS.– *Penstemonia spectabilis* Thurber and *P. parishii* Gray (Scrophulariaceae).

DISTRIBUTION.– Mexico: northern Baja California. California: western San Bernardino and Riverside counties to southern coastal California. One specimen was seen from Santa Catalina Island.

TYPES.– *Holotype* ♂. CALIFORNIA: San Bernardino Co., [no date] (USNM).

REMARKS.– The larvae bore in the crown roots and lower stems and can be detected by an accumulation of pale frass at the base of the plants (Engelhardt, 1946:18). Most specimens have been obtained from rearing, adults emerging from May to Sep.

HYMENOCLEA Engelhardt

Hymenoclea palmii (Beutenmüller)

Sesia palmii Beutenmüller, 1902:126.

DIAGNOSIS.– Wing length: 10-17mm. Males and females have opaque fore- and hindwings. The males have pale orange hindwings and brown forewings and brown abdomen, while the females have all wings brownish black and the abdomen brownish black with a white band on segment 2.

DESCRIPTION.– MALE (Fig. 5): Head with vertex brown black mixed with some tan, rosette of chaetosema on posterior margin behind each ocellus; front strongly roughened, appearing somewhat conical, tan, becoming darker brown laterally; occipital fringe brown black mixed with tan and white dorsally; labial palpus cream white, roughened some brown black laterally, 3rd segment nearly as long as 2nd, mo tan, smooth; antenna brown black dorsally, ventral cilia relatively l Thorax brown black, mixed with tan beneath wings, on collar, teg and around wing base; narrow subdorsal cream white stripe and anc stripe medially to posterior margin of mesothorax; metathorax cream white lateral tufts. Abdomen dark brown, often stro powdered tan except for segment 7; anal tuft well developed, dark br with cream white laterally. Legs with forecoxa cream white, br medially; femora brown black; tibiae and tarsi brown and tan or m with cream white, somewhat lighter on tarsi. Forewing opaque, dors mostly tan, darker on margins, powdered yellow apically with a lig spot just beyond discal mark, which is brown black, diffusing somew into cell; ventrally yellow orange before discal spot and just beyo Hindwing opaque, mostly yellow orange, dusted brown on apical discal spot and veins brown black; fringes fuscous. Genitalia with va broadly rounded apically, crista sacculi extending nearly to ver margin of valva with short naked recurved portion; saccus br truncated apically; vesica of aedeagus with several short thorn- cornuti.

FEMALE (Fig. 6): Mostly deep brown black, but with front medi gray brown; subdorsal stripe on mesothorax cream white with a va hint of median stripe; 2nd abdominal segment dorsally banded white posterior 1/2; forewing with white powdering before and beyond di spot or with very weakly scattered white scales. Genitalia with duc bursae sclerotized posteriorly for more than 1/2 its length, slig curving anteriorly, then broader and membranous to small, ovate cor bursae; ductus seminalis arises in membranous portion of ductus burs

HOSTS.– *Hymenoclea monogyra* Torrey and Gray (Composita

TYPES.– *Lectotype* ♀. ARIZONA: Phoenix (USNM).

DISTRIBUTION.– Mexico: arroyos in southern Baja Californ Elsewhere, Arizona, and western Texas.

REMARKS.– Engelhardt observed that most often adults can found near their host along irrigation ditches and the banks rivers. I observed similar situations in Baja. The larvae c tunnel into the roots several feet below the ground, pupating the galleries close to the crown of the root (Engelhardt, 19 100). R. S. Wielgus (pers. comm.) studied a population of *palmii* for several years in a wash in Phoenix, Maricopa Coun Arizona. He has observed the moths emerging, mating, a ovipositing. The timing of emergence seems geared to the on of lower night temperatures and just as the plants come i flower bud. Females oviposit on host plants of all sizes, placi their eggs on plant scars, nodes, and injuries on stems abou foot or more above the ground. Males are attracted to Z ODDA. Adults have been found from Aug to Oct, depending the location.

ACKNOWLEDGMENTS

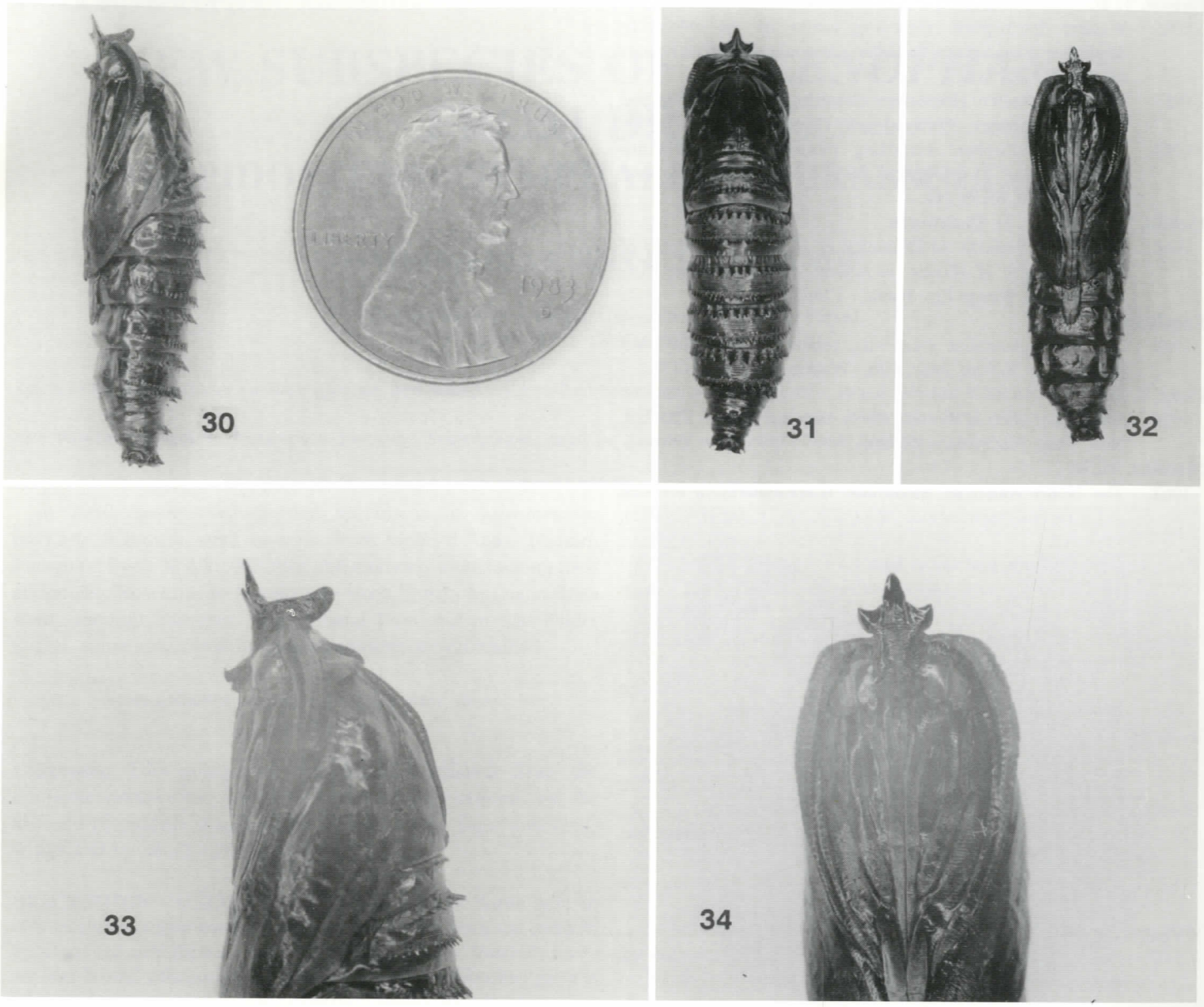
I thank the following individuals and their institutions f making their specimens available to me for this project. Th patience and cooperation is greatly appreciated.

CAS - California Academy of Sciences, San Francisco; H. Arnaud, Jr.

FLAS - Collection of Hermann Flaschka, Decatur, Georg

LACM - Los Angeles County Museum of Natural Histo California; J. P. Donahue

SDNH - San Diego Natural History Museum, California; K. Faulkner.



Figs. 30-34. Pupa of *Melittia gilberti:* 30. lateral view; 31. dorsal view; 32. ventral view; 33. enlarged anteriolateral view; 34. enlarged anterioventral view.

UCB - Essig Museum of Entomology, University of California, Berkeley; J. A. Powell
UCR - University of California, Riverside; S. I. Frommer
UNAM - Instituto de Biología, Universidad Nacional Autónoma de Mexico, México City.
USNM - Smithsonian Institution (U. S. National Museum), Washington, DC; D. R. Davis.

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LITERATURE CITED

Beutenmüller, W.
1901. Monograph of the Sesiidae of America, north of Mexico. *Mem. Amer. Mus. Nat. Hist.* (New York), 1:217-315.

Brown, L. R., and C. O. Eads
1965a. A technical study of insects affecting the oak tree in southern California. *Univ. Calif. Agric. Exp. Sta. Bull.* (Berkeley), 810: 3-106.
1965b. A technical study of insects affecting the sycamore tree in southern California. *Univ. Calif. Agric. Exp. Sta. Bull.* (Berkeley), 818: 3-38.

Duckworth, W. D., and T. D. Eichlin
1977. A classification of the Sesiidae of America north of Mexico (Lepidoptera: Sesioidea). *Calif. Dept. Food Agric., Occas. Papers Ent.* (Sacramento), 26:1-54.
1978. The clearwing moths of California (Lepidoptera: Sesiidae). *Calif Dept. Food Agric., Occas. Papers Ent.* (Sacramento), 27:1-80.

Eichlin, T. D.

1986. Western Hemisphere clearwing moths of the subfamily Tinthiinae (Lepidoptera: Sesiidae). *Entomography* (Sacramento), 4:315-378.

1987. Three new Western Hemisphere clearwing moths (Lepidoptera: Sesiidae: Sesiinae). *Entomography* (Sacramento), 5:531-540.

1989. Western Hemisphere clearwing moths of the subfamily Paranthreninae (Lepidoptera: Sesiidae). *Entomography* (Sacramento), 6:159-212.

Eichlin, T. D. and W. D. Duckworth

1988. Sesioidea: Sesiidae. *In* Dominick *et al.* (ed.), *The Moths of America North of Mexico, including Greeenland.* Fasc. 5.1. Washington: Wedge Ent. Found. 176pp.

Engelhardt, G. P.

1946. The North American clear-wing moths of the family Aegeriidae. *U. S. Natl. Mus. Bull.* (Washington), 190:1-222.

Essig, E. O.

1958. *Insects and Mites of Western North America.* 2nd ed.: 720-728. New York: MacMillan. 1050pp.

MacKay, M. R.

1968. The North American Aegeriidae (Lepidoptera): a revision based on late-instar larvae. *Mem. Ent. Soc. Canada* (Ottawa), 58:3-112.

Mote, D. C., J. Wilcox, and O. A. Hill

1929. The strawberry crown-moth in Oregon. *J. Econ. Ent.* (Washington), 22:936-943.

Nielsen, D. G., F. F. Purrington, R. L. Campbell, T. R. Wilmot, J. Capizzi, and J. H. Tumlinson

1978. Sex attractants for sequoia pitch moth and strawberry crown moth. *Environ. Ent.* (Washington), 7:544-546.

Ryan, H. J.

1928. Sycamore borer damages avocado (County Commission's Report). *Calif. Dept. Agric. Mon. Bull.* (Sacramento), 17:624.

Thompson, B. G.

1927. The Aegeriidae or clearwing moths occurring in Oregon. *Ore. St. Board Hort.* (Salem), 19:125-138.

1929. Moths of the family Aegeriidae occurring in Oregon, with notes. *Pan-Pacific Ent.* (San Francisco), 5:117-122.

Williams, F. X.

1909. Notes on the life-histories of certain woodboring Lepidoptera. *Ent. News* (Philadelphia), 20:58-62.