

# Occasional Papers

## IN ENTOMOLOGY

A CLASSIFICATION OF THE SESIIDAE OF  
AMERICA NORTH OF MEXICO  
(LEPIDOPTERA: SESIOIDEA)

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**A CLASSIFICATION OF THE SESIIDAE OF  
AMERICA NORTH OF MEXICO  
(LEPIDOPTERA: SESIOIDEA)**

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**INTRODUCTION**

In 1971 we initiated a systematic study of the North American Sesiidae. After some months of research it became apparent that the scope of the project should be broadened to include the Central and South American sesiids in order to evaluate relationships within the family, especially at higher category levels. The objectives of this expanded study were to establish generic affinities of New World clearwing moths through a comparative study of morphology, distribution, and habits of as many species as possible; to define the species more precisely through detailed morphological studies, analysis of infra-specific variation, and host plant relationships; to gain a better understanding of sesiid phylogeny through an analysis of the evolutionary trends exhibited in various character systems; and to derive a classification for the family which would best reflect the relationships among the included taxa. Appropriately, certain higher category problems were pursued beyond the geographic confines of the Western Hemisphere through study of selected genera and species from other parts of the World (Duckworth and Eichlin, 1974).

After we began this study, sex pheromones were isolated by researchers from female sesiids, thereby opening an entirely new area of research on the North American Sesiidae, and resulting in

a rush of papers published on various aspects of these studies (Nielsen and Balderston, 1973; Tumlinson *et al.*, 1974; Yonce *et al.*, 1974; Nielsen *et al.*, 1975; Karandinos *et al.*, 1977). With the rise of this new and expanding area of experimental and applied research on North American sesiids has come a growing sense of urgency to make available the results of our research on the classification of the family and its application to the North American sesiid fauna. Therefore, we are presenting our concepts with definitions of all higher categories, with keys to facilitate their recognition. Each genus contains a list of the included species and their synonyms, as we interpret them. Detailed treatment of the species will be included in future publications dealing with the Western Hemisphere Sesiidae. Detailed information on the type-material of the North American species group names has been published (Duckworth and Eichlin, 1973a) and a similar study of the Central and South American species group names has been completed (Duckworth and Eichlin, 1977). An extensive bibliography of many of the taxa included in the present paper may be found in Dalla Torre and Strand (1925).

The institutional abbreviations used in the text are as follows: National Museum of Natural History, Smithsonian Institution (NMNH); American Museum of Natural History, New York (AMNH); British Museum (Natural History) (BMNH); Academy of Natural Sciences, Philadelphia (ANSP); Michigan State University (MSU); Museum of Comparative Zoology, Harvard University (MCZ); Field Museum of Natural History, Chicago (FMNH).

We are indebted to a large number of colleagues and institutions for their cooperation and assistance during the course of our studies. The nature of the present paper is such that acknowledgement of all those who have contributed significantly to the development of its contents would require more space than is available or appropriate here. We will, therefore, omit in the present paper specific acknowledgement of those individuals and organizations which have materially aided its completion through the loan of types and other specimens in their charge.

Since the principal stimulus for this paper, as mentioned previously, is the growing number of field and laboratory projects associated with the isolation and testing of sesiid sex pheromones, it seems appropriate at this point to acknowledge those individuals involved in that research who have given freely of their energies and resources in support of our studies. Their patience and cooperation during the data gathering and evalua-

tion period, when the classification defined herein was being developed and tested, contributed significantly to the results achieved. Therefore, we express our gratitude and thanks to the following: D. G. Nielsen, F. F. Purrington, Ohio Agricultural Research and Development Center, Wooster, Ohio; M. G. Karandinos, M. Greenfield, University of Wisconsin, Madison; J. H. Tumlinson, J. R. McLaughlin, J. L. Sharp, R. E. Doolittle, E. R. Mitchell, Insect Attractants and Basic Biology Research Laboratory, U.S.D.A., Gainesville, Florida; R. L. Holloway, Clemson University, Clemson, South Carolina; C. R. Gentry, C. E. Yonce, Southeastern Fruit and Tree Nut Research Laboratory, U.S.D.A., Byron, Georgia; J. D. Solomon, Southern Forest Experiment Station, U.S.D.A., Stoneville, Mississippi.

We also acknowledge with thanks the assistance of the following individuals who are associated with our project and have contributed significantly to it in various ways: G. L. Venable, V. Milbank, D. Thompson, Department of Entomology, National Museum of Natural History; T. P. Friedlander, University of Texas, Austin; J. Weller, M. Papp, California Department of Food and Agriculture, Sacramento.

## CLASSIFICATION

The Sesiidae is a well-defined family, worldwide in distribution, composed of approximately 170 genera and over 1,000 described species. Obviously, the development of a higher category classification to encompass a family of this size on a world basis requires extensive study of the included genera and species from throughout the range of the family. In addition, the results of studies by other workers provide valuable insights regarding relationships that might otherwise be overlooked or misinterpreted. We have been fortunate in having both a wide range of specimens available to us from various parts of the world and the benefit of three recent studies which have treated the classification of sesiids in some detail (Niculescu, 1964; MacKay, 1968; Naumann, 1971). We have attempted to benefit from these resources in the development of the classification herein presented.

Naumann (1971), in a very significant study, proposed a classification for the family Sesiidae based in large part on a detailed study of genital features and wing venation of the type-species of the Holarctic genera. In that study Naumann compared previous schemes for the higher categories of the family with his

concepts derived from an application of Hennig's principles and methods of phylogenetic systematics. Because of the thoroughness of his comparisons, we do not feel it necessary to review the previous classification schemes here and refer the reader to Naumann's publication.

As a result of his studies, Naumann subdivided the Holarctic sesiid fauna into two subfamilies, Tinthiinae and Sesiinae. These are further divided into tribes with their included genera or into generalized generic groupings.

Inherent in any undertaking as large and inclusive as Naumann's is the particular problem of interpreting generic level categories based on the study of only one or a few of the included species. As a result, when more of the species are examined, the genera become less clearly defined, and there is little concordance at the generic level when viewing the family as a whole. In particular, many of the genera listed by Naumann in the tribe Aegeriini (= Synanthedonini) appear to be on a lower level of ranking when the differences between them are compared with the overall degree of differentiation between other genera in the Aegeriini and especially between genera in other tribes.

Based on our studies of Western Hemisphere sesiids and a significant number of taxa from other parts of the world, including comparative structural morphology of virtually every portion of the adult anatomy, comparative biological data, and larval morphology, where available, we proposed a subdivision of the family into three subfamilies, Tinthiinae, Paranthreninae, and Sesiinae (Duckworth and Eichlin, 1974). This concept obviously differs from Naumann's at the tribal and generic levels as well.

Having had the benefit of the recent detailed studies referred to above on the higher classification of the family and having based our system on a broad range of characters derived from a greater representation of the family, we are of the opinion that the classification of the Sesiidae presented here is a more effective arrangement for expressing the relationships of the included taxa.

#### SYSTEMATIC POSITION OF SESIIDAE

Because of highly modified structures of adults to effect hymenopterous mimicry, while retaining certain primitive features, and convergences of larval characters with other groups having similar endophagous habits, it historically has been difficult to align the Sesiidae phylogenetically with other

families of the Ditrysia.

Until recently sesiids were grouped with fairly primitive families in the superfamily Tineoidea. Common (1970) and Bradley *et al.*, (1972) placed them in the Yponomeutoidea, because of certain character state trends represented in the Douglasiidae, Heliodinidae and a part of the Glyphipterigidae. Heppner (1977), expanding on the work of Brock (1971), segregates the Glyphipterigidae into two separate, relatively unrelated families, Glyphipterigidae (Copromorphoidea) and Choreutidae. The Choreutidae are grouped with the Sesiidae into a separate superfamily, Sesiioidea. Heppner places the Tortricoidea after the Sesiioidea in a linear arrangement, with the sesiids showing some affinities with the yponomeutoids and the choreutids demonstrating some character trends toward the tortricoids. In a more recent paper (Heppner and Duckworth, 1978) a more detailed classification of the superfamily Sesiioidea is provided along with descriptions of the included families and a discussion of phylogeny.

#### FAMILY SESIIDAE

Sesiidae Boisduval, 1828 (Sesiaridae; Type-genus: *Sesia* Fabricius, 1775). Aegeriidae Stephens, 1829 — Type-genus: *Aegeria* Fabricius, 1807. — Naumann, 1971. (Refer to Dalla Torre and Strand, 1925, for detailed bibliography.)

Diagnostic Characters.—Small to fairly large moths, forewing length 5-30mm, with form and patterns highly modified apparently to resemble those of various Hymenoptera. *Head*: Eyes relatively large compared to width and length of head; naked, ringed with short, flat white scales. Ocelli present and prominent. Pilifers with rather strong, spine like setae of varying lengths. Mandibles small, flattened and somewhat hatchet shaped. Proboscis naked and functional most often three to four times length of labial palpus, rudimentary and nonfunctional in some genera. Maxillary palpus small, 1 to 3-segmented, most species with variations involving 2 segments. Labial palpus up-curved; long, usually approaching or exceeding top of frons; segment 1 slightly more than one-half length of segment 2, which is generally the longest, segment 3 varying from one-third the length to subequal segment 2; generally, either thickened and roughened by long thin scales projecting ventrally, or slender and smooth with short, flat, appressed scales. Most species with

antenna variously clavate, tapered to a point apically, terminated by small scale tuft (absent in Tinthiinae); males with setae ventrally, lacking in few species, pectinate in some groups. Frons smoothly scaled, usually scales overlapping frons. Margin of head with occipital fringe of erect, thin, contrastingly-colored scales. *Thorax*: Unique in having dorsoanterior region of preepimeron with hollow, bag like protuberance on all species except those in Tinthiinae; many species with pale yellow or white, longitudinal stripe subdorsally above wing bases, and yellow or white patch beneath wings. *Legs*: Elongate, slender, though often variously tufted, normally at tibial spurs; first tarsal segment of hindleg elongate, generally one-half length of tibia. *Forewing*: Elongate, narrow, varying from mostly hyaline with prominent discal spot to completely opaque (see Fibiger and Kristensen, 1974, for nomenclature of hyaline areas, and Kristensen, 1974, for detailed discussion of types of sesiid wing scales). *Veins*: R generally with five branches  $R_4$  and  $R_5$  most often stalked; Cu with two branches; anal veins reduced or lost. *Hindwing*: Shorter and broader than forewing, varying from hyaline to opaque; frenulum single in both sexes. *Veins*: R veins combined ( $R_s$ ) and fused with  $M_1$ , as  $R_s + M_1$ , for all or most of its length to wing margin and often hidden from view in fold of costal margin; M veins widely separated;  $M_3$  and Cu<sub>1</sub> joined before or after crossvein, depending on the group; anal veins with 1A degenerate (though still indicated by line of scales in wing fold), present to varying degrees in primitive species; 2A present; 3A either short, fused to near base of 2A, or absent; 4A most often present, absent in primitive species. Characteristically with unique wing-locking mechanism in addition to frenulum/retinaculum system: hind-margin of forewing folded under, interlocking with upfolded costal margin of hindwing, held firmly by series of interlocking, recurved spines on both margins. *Abdomen*: Generally elongate, slender, tapering posteriorly and often narrowed at base; anal tuft well developed on males, reduced and brush like on females, originating from dorsolateral, sclerotized plates on posterior abdominal tergite (illustrated in Naumann, 1971); most often variously banded with either white, yellow, orange, or red, patterns varying interspecifically, and between sexes of same species. *Male genitalia*: Uncus simple in a few groups, more often modified and/or fused with tegumen, with lateral setaceous pads or with elongate, membranous sac (scopula androconalis) paired socii clothed with specialized bifurcate setae proximally continuous with soccii; gnathos absent or present in various

forms; tegumen simple, or reduced, or modified and fused with uncus; vinculum somewhat ring shaped, extended anteriorly as saccus of varying length and thickness; valva varies from small and quadrangular to elongate and slender, with either simple setae or combination of simple setae of varying shapes and sizes and arrangements of bifurcate or multifurcate setae; specialized saccular ridge (crista sacculi) present or absent. Aedeagus generally elongate, very slender, slightly bulbous at base. *Female genitalia*: Papillae anales generally small and narrow; ostium bursae situated ventrally between sclerites of abdominal segment 8, or in intersegmental membrane between 7 and 8, or on posterior margin or abdominal segment 7; ductus bursae most often elongate, narrow, with sclerotization for the most part confined to posterior portion; ductus seminalis originates from various points along ductus bursae, most often toward posterior end; corpus bursae generally small, obovate and membranous with convolutions or signa in some species. *Eggs*: Generally pale brown to chestnut brown, ovate, disc shaped, flat, or slightly concave ventrally; surface weakly sculptured with minute shagreening in hexagonal designs. *Larvae*: Pale, color restricted to head and bars on prothoracic shield; ocelli I to IV arranged in trapezoid and remote from V and VI; crochets uniorbital in two transverse rows. *Pupae*: Dorsal abdominal spines in double rows on segments 2 to 7 on male and 2 to 6 on female, single row on 7 in female, both sexes with single rows on 8 to 10; large spines ventrad on 10; cremaster absent; abdominal segments freely movable; head sometimes modified with cutting device, somewhat chisel like.

### KEY TO THE SUBFAMILIES OF SESIIDAE

1. Scale tuft at tip of antenna absent; forewing with veins R<sub>4</sub> and R<sub>5</sub> separate, or if stalked then M<sub>3</sub> absent; hindwing with 1A partially or fully developed, 3A and 4A absent . . . . .  
 . . . . . Tinthiinae
- Scale tuft at tip of antenna present; forewing with veins R<sub>4</sub> and R<sub>5</sub> stalked, M<sub>3</sub> present; hindwing with 1A degenerate, 3A present and free or partially joined to 2A, 4A present. . . . .  
 . . . . . 2

2. Hindwing with vein 3A free;  $Cu_1$  arising distad of crossvein, or if arising at or basad of crossvein, then forewing with stalk of  $R_4$  plus  $R_5$  not more than one-half length of  $R_4$  or  $R_5$ , or  $R_4$  and  $R_5$  coincident . . . . . Sesiinae  
 Hindwing with vein 2A and 3A coincident except near base;  $Cu_1$  arising basad of crossvein, or if arising at or distad of crossvein, then forewing with stalk of  $R_4$  plus  $R_5$  greater than one-half length of  $R_4$  or  $R_5$ , or stalk of  $R_4$  plus  $R_5$  stalked with  $R_3$  . . . . . Paranthreninae

### SUBFAMILY TINTHIINAE

Tinthiinae LeCerf, 1917 — Type-genus: *Tinthia* Walker, 1864.  
 Bembeciinae Niculescu, 1964 — Type-genus: *Bembecia*, of authors (not Hübner, 1819). — Naumann, 1971.  
 Zenodoxinae MacKay, 1968 — Type-genus: *Zenodoxus* Grote and Robinson, 1868. — Naumann, 1971.

Diagnostic Characters.—Head comparatively small and eyes relatively small for family; antenna filiform, never clavate, ciliate ventrally on males, without terminal scale tuft; maxillary palpus one-segmented; thorax lacking bag like protuberance on preepimeron. Forewing with veins  $R_4$  and  $R_5$  stalked or unstalked;  $Cu_2$  absent or more often very short. Hindwing with vein 1A nearly or entirely developed, 2A present, 3A and 4A absent. Male genitalia with valva somewhat rectangular to quadrangular, having only simple setae on the concave inner surface, no crista sacculi; anellus fully developed, sleeve like; base of saccus and vinculum broad, thick, without processes (Naumann, 1971); tegumen unmodified; uncus simple or reduced to pair of setose knobs; gnathos and socii absent.

Discussion.—Due to the retention of certain characters, such as 1A on the hindwing and a generalized type of genitalia reminiscent of tineoids, and the lack of many specializations evident in the remainder of the Sesiidae, it is generally agreed that the Tinthiinae is the most primitive group in the family. World-wide, this group contains the fewest number of extant species, being best represented in the eastern Oriental Region. The subfamily in America north of Mexico consists of two tribes, Pennisetiini and Tinthiini, containing eight species in two genera.

## KEY TO THE TRIBES OF TINTHIINAE

- Forewing with veins  $R_4$  and  $R_5$  stalked, only two M veins present,  $Cu_2$  nearly as long as  $Cu_1$ ; hindwing with  $M_3$  and  $Cu_1$  long-stalked . . . . . (*Pennisetia*) Pennisetiini
- Forewing with veins  $R_4$  and  $R_5$  separate (Nearctic), three M veins present,  $Cu_2$  very short, coincident with  $Cu_1$  to near wing margin or absent; hindwing with  $M_3$  and  $Cu_1$  not stalked,  $Cu_1$  arising basad of crossvein . . . . . (*Zenodoxus*) Tinthiini

### TRIBE PENNISETIINI

Pennisetiini Naumann, 1971 — Type-genus: *Pennisetia* Dehne, 1850.

Diagnostic Characters.—Head with eyes somewhat larger than Tinthiini, greatest diameter slightly less than distance between eyes; antenna of male with long ventral cilia, strongly bipectinate on Holarctic species. Forewing with veins  $R_4$  and  $R_5$  stalked, stalk being less than one-half total length of either vein;  $M_3$  coincident with  $M_2$ ;  $Cu_2$  normal length. Hindwing with veins  $M_3$  and  $Cu_1$  long stalked.

Discussion.—In the Pennisetiini only one species in one genus is known from the United States and Canada.

### *PENNISETIA* DEHNE

*Pennisetia* Dehne, 1850 — Type-species: *Pennisetia anomala* Dehne, 1850, (a synonym of *Sesia hylaeiformis* Laspeyres, 1801), original designation.

*Anthrenoptera* Swinhoe, 1892 — Type-species: *Sphacia contracta* Walker, 1856.—Naumann, 1971.

*Lophocnema* Turner, 1917 — Type-species: *Lophocnema eusphyra* Turner, 1917.—Duckworth and Eichlin, 1974.

*Diaprya* Turner, 1917 — Type-species: *Sesia igniflua* Lucas, 1894.—Duckworth and Eichlin, 1974.

Diagnostic Characters.—Head with proboscis relatively short, about one and one-half length of labial palpus, male antenna strongly bipectinate in North American species; otherwise, characters as described for Pennisetiini.

*marginata* (Harris, 1839), (*Trochilium*), NEW COMBINATION  
Type-locality: New Hampshire. (lost).

*pleciaeformis* (Walker, 1856), (*Aegeria*)

Type-locality: Nova Scotia. (BMNH).

*odyneripennis* (Walker, 1856) (*Aegeria*)

Type-locality: Nova Scotia. (BMNH).

*rubi* (Riley, 1874), (*Aegeria*)

Type-locality: Missouri. (NMNH).

*flavipes* (Hulst, 1881), (*Sesia*)

Type-locality: Brooklyn, New York. (AMNH).

*marginata* variety *albicoma* (Hulst, 1883), (*Bembecia*)

Type-locality: Brooklyn, New York. (AMNH).

### TRIBE TINTHIINI

Tinthiini LeCerf, 1917 — Type-genus: *Tinthia* Walker, 1864.

Diagnostic Characters.—Head small, eyes proportionately small, greatest diameter only slightly more than one-half greatest distance between eyes; antenna of male long ciliate ventrally. Forewing with veins  $R_4$  and  $R_5$  usually separate, short stalked at least on Australian species; three M veins present;  $Cu_2$  very short, fused with  $Cu_1$  to near wing margin or fused entirely. Hindwing often with small triangular auxillary cell formed by reduced veins connecting base of  $M_2$  with  $R_s + M_1$ ; main crossvein at end of cell long, straight, verticle or slightly oblique;  $Cu_1$  arising basad of crossvein, forming very acute angle with cubitus.

Discussion.—In North America North of Mexico the tribe consists of only one genus with seven species.

### ZENODOXUS GROTE AND ROBINSON

*Zenodoxus* Grote and Robinson, 1868 — Type-species: *Zenodoxus maculipes* Grote and Robinson, 1868, original designation.

Diagnostic Characters.—Head with proboscis much reduced, about one-half length of labial palpus; labial palpus usually not extending to top of frons, roughened. Anal tuft on abdomen of male arising from weakly sclerotized, narrow band on posterior margin of segment 8. Wings entirely opaque or with small hyaline region on hindwing of few species. Forewing with veins  $R_4$  and  $R_5$  separate. Hindwing with small, rudimentary accessory cell. Male genitalia proportionately small; valva quadrangular, short and rounded apically, inner surface somewhat concave, clothed with

simple setae; saccus thick basally, tapering to broadly rounded apex; uncus reduced to setose knob distally; aedeagus elongate, slightly curved, extended basally, rod-like. Female genitalia with ductus bursae short, straight, somewhat rugose, ductus seminalis arising from ductus bursae about one-third from ostium bursae; small, granular, somewhat circular signum usually present on corpus bursae. Genitalia very similar throughout the genus.

Discussion.—The seven known species of *Zenodoxus* all occur in the western United States, with some species ranging into Mexico. Where habits are known, larvae are borers in roots and lower stems of plants in Malvaceae.

Naumann (1971) considered the Palearctic genus *Microsphecia* Bartel, 1912, to be congeneric with *Zenodoxus*; however, this was admittedly a tentative conclusion. Due mainly to basic differences in the genitalia, which Naumann illustrated, and comparative development of the proboscis, we do not consider the two synonymous. *Microsphecia* appears to us to be more closely allied to *Tinthia*, though we do not have comparative material which would permit us to make a more positive assignment.

*canescens* Henry Edwards, 1881

Type-locality: Colorado. (AMNH).

*canescens* race *sidae* Engelhardt, 1946

Type-locality: Blythe, Riverside County, California. (NMNH).

*heucherae* Henry Edwards, 1881

Type-locality: Lake Tahoe, California. (AMNH).

*potentillae* Henry Edwards, 1881

Type-locality: Lake Tahoe, California (AMNH).

*maculipes* Grote and Robinson, 1868

Type-locality: Texas. (AMNH).

*mexicanus* Beutenmüller, 1897

Type-locality: New Mexico. (AMNH).

*palmii* (Neumoegen, 1891), (*Larunda*)

Type-locality: South Arizona. (AMNH).

*palmiana* (Dalla Torre, 1925), (*Paranthrene*) (unjustified new name for *Larunda palmii* Neumoegen).

*wissadulae* Engelhardt, 1946, NEW SYNONYMY

Type-locality: Brownsville, Texas. (NMNH).

*palmii* race *sphaeralceae* Engelhardt, 1946

Type-locality: Snake River, Whitman County, Washington, opposite Clarkson. (NMNH).

*palmii* race *incanae* Engelhardt, 1946

Type-locality: Yuma, Arizona. (NMNH).

*rubens* Engelhardt, 1946

Type-locality: Davis Mountains, Texas. (NMNH).

*canescens* race *bexari* Engelhardt, 1946, NEW SYNONYMY

Type-locality: Bexar County, Texas. (NMNH).

*sidalceae* Engelhardt, 1946

Type-locality: Pullman, Washington. (NMNH).

### SUBFAMILY PARANTHRENINAE

Paranthreninae Niculescu, 1964 — Type-genus: *Paranthrene* Hübner, 1819.

Sesiinae Boisduval, Naumann, 1971 (in part).

Diagnostic Characters.—Average size largest of all sesiids except for species of Melittiini. Head with maxillary palpus normally 2-segmented (3-segmented in Cissuvorini), second segment large and usually indented in middle; labial palpus generally upcurved, extending above top of frons, thickened and roughened in appearance; antenna clavate with terminal scale tuft, ciliate ventrally on male, usually bipectinate; head and eyes proportionately larger than for species of Tinthiinae. Thorax with bag like protuberance on preepimeron. Abdomen of male with anal tuft arising from well formed, oblong to strap like sclerites on segment 8. Forewing most often with veins  $R_4$  and  $R_5$  long stalked, stalk generally longer than one-half total length of  $R_4$  or  $R_5$ ;  $Cu_2$  present, nearly as long as  $Cu_1$ . Hindwing with vein  $Cu_1$  arising just basad of crossvein (usually hidden by scale covering); no accessory cell; 1A degenerate (only line of scales remains on fold); 2A and 3A coincident except near base; 4A present. Male genitalia with valva having scales multifurcate dorsally and setaceous ventrally and apically, with median area unscaled or with thick, dark scales in saccular region; tegumen reduced, short; gnathos small, rounded or bifurcate, often with toothlike processes on ventral margin; uncus wide, elongate, about three to five times longer than tegumen, clothed lateroapically with long setaceous scales, mostly bilobed apically; vinculum narrow, with processes, saccus relatively short. Female genitalia with ductus bursae elongate, narrow, membranous, except for sclerotized ring near ostium bursae; ductus seminalis arises just anterior to ring; corpus bursae generally elongate ovate, often



MacKay (1968), in her description of the larva of *C. ampelopsis*, found it to be distinctive in the shape of the mandibles and by the presence of an unusual, prominent elevation on each side of the meso- and methathorax.

### CISSUVORA ENGELHARDT

*Cissuvora* Engelhardt, 1946 — Type-species: *Cissuvora ampelopsis* Engelhardt, 1946, original designation.

Diagnostic Characters.—Head with labial palpus having segment 3 approximately one-third length of segment 2; proboscis approximately one and one-half length of labial palpus, numerous small papillae ventrally near apex. Wings: Forewing with vein  $M_1$  nearer  $Cu_1$  than to  $M_2$  at cell; hindwing with  $M_2$  nearer  $M_1$  than to  $M_3$  at cell. Male genital with valva nearly as wide as long, pointed apically, with palmatefurcate scales on dorsal half, ventral half with scattered setae along ventral margin and apex; uncus as for Paranthreninae but sparsely clothed with short, setaceous scales lateroapically; tegumen not as reduced as for other Paranthreninae; gnathos well developed, elongate, knobbed apically; vinculum laterally compressed; saccus about one-half length of valva, constricted in middle, rounded apically; aedeagus with subapical, recurved spine as in *Paranthrene* species, vesica lacking cornuti. Female genitalia as for Paranthreninae, except for signum of corpus bursae, which consists of circular, lightly pigmented area near entrance of ductus bursae. Other characters as described for Cissuvorini.

Discussion.—*Cissuvora* contains a single species, currently known only from the vicinity of San Antonio, Texas. Its host plant, *Cissus incisa*, in the family Vitaceae, ranges south into Mexico. The larval feeding produces gall-like swellings in the vines, and pupation takes place in tough, leathery cocoons in the soil.

*ampelopsis* Engelhardt, 1946

Type-locality: Victoria, Texas. (NMNH).

### TRIBE PARANTHRENINI

Paranthrenini Niculescu, 1964 — Type-genus: *Paranthrene* Hübner, 1819.

Diagnostic Characters.—Head with maxillary palpus 2-seg-

mented, second segment large, positioned on apex of basal segment, often indented in middle, basal segment with few apical setae; proboscis approximately two to three times length of labial palpus, rudimentary in *Euhagena*; labial palpus with third segment generally about one-half length of second, variable depending on species; antenna of male usually bipectinate-ciliate, no pectination in *Albuna*. Genitalia very uniform throughout tribe, generally as described for Paranthreninae.

Discussion.—The Paranthrenini in this faunal area consists of four genera, containing a total of 14 species.

### PARANTHRENE HÜBNER

*Paranthrene* Hübner, 1819 — Type-species: *Sphinx tabaniformis* Rottemburg, 1775, designated by Newman, 1832.

*Memythrus* Newman, 1832 — Type-species: *Sphinx vespiformis* Linnaeus, 1761, *sensu* Newman (in this sense a synonym of *tabaniformis* Rottemburg, 1775).

*Paranthrena* Herrich-Schaffer, 1845 (incorrect emendation for *Paranthrene* Hübner, 1819).

*Sciapteron* Staudinger, 1854 — Type-species: *Sphinx asiliformis* Denis and Schiffermüller, 1775 (a synonym of *tabaniformis* Rottemburg, 1775).

*Sciapterum* Bartel, 1912 (incorrect emendation for *Sciapteron* Staudinger, 1854).

*Leptocimbicina* Bryk, 1947 — Type-species: *Leptocimbicina aurivena* Bryk, 1947.—Naumann, 1971.

Diagnostic Characters.—Male head with antenna bipectinate-ciliate ventrally. Forewing with bases of veins  $R_2$  and  $R_4 + R_5$  connate; scaling on wing fold not more than two times wider than scaling on 2A distally. Male with subapical spine on aedeagus. Female with corpus bursae having numerous transverse folds and one or more longitudinal pigmented bands. The larva, according to MacKay (1968), has ocellus I nearer II than IV; ocellus III nearer IV than II is to III; seta  $O^2$  ventral or posteroventral to ocellus I; dorsal pinacula of abdomen moderately small; shape of anal shield frequently modified; crochets slender, well developed.

Discussion.—The larvae of the six species of *Paranthrene* of our fauna are borers in the horizontal roots and under the bark into the wood of the trunks and branches of various willows, poplars, birches (Betulaceae), aspens (Salicaceae) and oaks

(Fagaceae). Generally, the life-cycle requires two years for completion, pupation taking place in a prepared pupal chamber in the larval gallery.

*asilipennis* (Boisduval, 1829), (*Sesia*)

Type-locality: "l'Amérique septentrionale." (NMNH).

*denudatum* (Harris, 1839), (*Trochilium*)

Type-locality: Massachusetts. (lost).

*vespipenne* (Herrich-Schäffer, 1854), (*Trochilium*)

Type-locality: China. (unknown).

*bombyciformis* (Walker, 1856), (*Tarsa*)

Type-locality: Unknown. (BMNH).

*championi* (Druce, 1883), (*Sphecia*)

Type-locality: Guatemala City, Guatemala. (BMNH).

*dollii* (Neumoegen, 1894), (*Sciapteron*)

Type-locality: New York, New York. (NMNH).

*dollii* variety *castaneum* (Beutenmüller, 1897), (*Sciapteron*)

Type-locality: Texas. (NMNH).

*dollii* form *fasciventris* Engelhardt, 1946

Type-locality: Chicago, Illinois. (NMNH).

*fenestrata* Barnes and Lindsey, 1922

Type-locality: Chiricahua Mountains, Cochise County, Arizona. (NMNH).

*robiniae* (Henry Edwards, 1880), (*Sciapteron*)

Type-locality: Virginia City, Nevada. (AMNH).

*perlucida* (Busck, 1915), (*Memythrus*)

Type-locality: Missoula, Montana. (NMNH).

*robiniae* form *palescens* Engelhardt, 1946

Type-locality: Palm Springs, California. (NMNH).

*simulans* (Grote, 1881), (*Trochilium*)

Type-locality: Algonquin, Illinois. (AMNH).

*palmii* (Henry Edwards, 1887), (*Fatua*), NEW SYNONYMY

Type-locality: Enterprise, Florida. (AMNH).

*luggeri* (Henry Edwards in Lugger, 1891), (*Trochilium*)

Type-locality: St. Anthony Park, Minnesota. (AMNH).

*tabaniformis* (Rottemburg, 1775, *Sphinx*)

Type-locality: "Lansberg an der Warthe, Germany." (lost).

*asiliformis* (Denis and Schiffermüller, 1775), (*Sphinx*)

Type-locality: Vienna, Austria. (destroyed).

*tricincta* (Harris, 1839), (*Aegeria*), NEW SYNONYMY

Type-locality: Massachusetts. (lost).

*serratiformis* (Freyer, 1842), (*Sphinx*)

- Type-locality: Hanover, Germany. (lost).  
*denotata* (Henry Edwards, 1882a), (*Albuna*), NEW SYNONYMY  
Type-locality: Montana Territory. (AMNH).  
*tricineta* form *oslari* Engelhardt, 1946, NEW SYNONYMY  
Type-locality: Bear Creek, Morrison County,  
Colorado. (NMNH).

### VITACEA ENGELHARDT

*Vitacea* Engelhardt, 1946 — Type-species: *Aegeria polistiformis* Harris, 1854, original designation.

Diagnostic Characters.—Male head with antenna bipectinate-ciliate ventrally, often rami longer than on species of *Paranthrene*. Forewing with scaling on wing fold more than two times wider than scaling on 2A distally. Males with anal tuft divided into two pairs of elongate tufts, a longer subdorsal pair and a shorter lateral pair. Male aedeagus usually lacking subapical spine. MacKay (1968) describes the larva as follows: ocelli I to IV extremely close together; seta O<sup>2</sup> adjacent to ocellus I, ventral and somewhat anterior to it, seta O<sup>1</sup> very near ocelli III and IV and nearly between them, seta O<sup>1</sup> and O<sup>2</sup> exceptionally close to each other; seta SD<sup>1</sup> on segment 8 distinctly anterior to spiracle; seta D<sup>1</sup> on segment 9 always somewhat anteriodorsal to SD<sup>1</sup>; shape of anal shield unmodified; crochets in early instars well developed, becoming poorly developed (short and broad) in later instars, noticeably reduced in number on segment 6 and anal prolegs.

Discussion.—The larva of the species of *Vitacea*, where known, constructs a cocoon prior to pupation, either attached in the larval gallery or in the soil adjacent to the host plant. The larvae feed in the horizontal roots of various species of the family Vitaceae. Four species are currently recognized in this genus.

*admiranda* (Henry Edwards, 1882a), (*Sciapteron*)

Type-locality: Texas. (AMNH).

*cupressi* (Henry Edwards, 1881), (*Sciapteron*)

Type-locality: Colorado. (NMNH).

*polistiformis* (Harris, 1854), (*Aegeria*)

Type-locality: Southeastern United States. (lost).

*seminole* (Neumoegen, 1894), (*Sciapteron*)

Type-locality: Florida. (NMNH).

*polistiformis* form *huron* Engelhardt, 1946

Type-locality: Pentwater, Michigan. (NMNH).

*scepsiformis* (Henry Edwards, 1881), (*Sciapteron*)

Type-locality: Texas. (NMNH).

### ALBUNA HENRY EDWARDS

*Albuna* Henry Edwards, 1881 — Type-species: *Aegeria hylotomiformis* Walker, 1856 (a synonym of *Aegeria pyralidiformis* Walker, 1856), original designation.

*Harmonia* Henry Edwards, 1882a — Type-species: *Harmonia morrisoni* Henry Edwards, 1882a (a synonym of *Carmenta fraxini* Henry Edwards, 1881), original designation. Preoccupied by *Harmonia* Mulsant, (Coleoptera); *Harmonia* Haswell, (Crustacea); and *Harmonia* Hartman, (Mollusca).

*Parharmonia* Beutenmüller, 1894 (new name for *Harmonia* Henry Edwards, 1882a).

Diagnostic Characters.—Head of male with antenna ciliate ventrally but not pectinate. Forewing with bases of veins  $R_3$  and  $R_4 + R_5$  connected by crossvein, not connate. Male genitalia with gnathos having small spine like processes on ventral margin; lateral portions of uncus nearly naked or sparsely clothed with setaceous scales. MacKay (1968) characterizes the larva as follows: ocelli I, II and IV usually faint, VI often absent; seta  $O^2$  some distance from ocellus I and anterior to it, seta  $O^1$  usually near ocellus III, setae  $O^1$  and  $O^2$  unusually close to each other as in *Vitacea* but for a different reason; seat  $SD^1$  on segment 8 is anterior to spiracle; seta  $D^1$  on segment 9 dorsal to  $SD^1$ ; anal shield not modified; crochets as in *Vitacea*; mandibles with outer surfaces distinctly shagreened or at least dull in appearance and reticulated.

Discussion.—The larvae of *Albuna* species are borers in the roots of certain perennial species of the families Onagraceae and Vitaceae. A cocoon is constructed near the soil surface in specially prepared vertical tunnels which lead from the roots. The life-cycle apparently requires one year. *Albuna* contains two species in America north of Mexico.

*fraxini* (Henry Edwards, 1881), (*Carmenta*)

Type-locality: Washington, D. C. (lost).

*morrisoni* (Henry Edwards, 1882a), (*Harmonia*)

Type-locality: Montana Territory. (AMNH).

*fraxini* form *vitriosa* Engelhardt, 1946

Type-locality: Chicago, Illinois. (NMNH).

*pyramidalis* (Walker, 1856, *Aegeria*)

Type-locality: St. Martin's Falls, Albany River, Hudson's Bay. (BMNH).

*hylotomiformis* (Walker, 1856), (*Aegeria*)

Type-locality: Nova Scotia. (BMNH).

*nomadaepennis* (Boisduval, 1869), (*Sesia*)

Type-locality: California (NMNH).

*rubescens* (Hulst, 1881), (*Sesia*)

Type-locality: Colorado. (AMNH).

*montana* Henry Edwards, 1881

Type-locality: Colorado. (AMNH).

*tanacetii* Henry Edwards, 1881

Type-locality: Sierra Nevada, California. (AMNH).

*vancouverensis* Henry Edwards, 1881

Type-locality: Vancouver Island, British Columbia. (AMNH).

*coloradensis* Henry Edwards, 1881

Type-locality: Colorado. (AMNH).

*torva* Henry Edwards, 1881

Type-locality: Vancouver Island, British Columbia. (AMNH).

*beutenmuelleri* Skinner, 1903

Type-locality: Stockton, Utah. (ANSP).

### **EUHAGENA HENRY EDWARDS**

*Euhagena* Henry Edwards, 1881 — Type-species: *Euhagena nebraskae* Henry Edwards, 1881, original designation.

*Larunda* Henry Edwards, 1881 — Type-species: *Larunda solituda* Henry Edwards, 1881 (a synonym of *Aegeria emphytiformis* Walker, 1856). NEW SYNONYMY.

*Gaea* Beutenmüller, 1896 (a replacement name for *Larunda* Henry Edwards, 1881, which is a homonym of *Larunda* Hübner, Geometridae). NEW SYNONYMY.

Diagnostic Characters.—Head with rudimentary proboscis; eyes relatively small, slightly larger than species of *Zenodoxus*; antenna of male bipectinate-ciliate ventrally, rami long, somewhat appressed. Male genitalia generally of *Paranthrene* type; juxta narrow, strap-like; saccus short, narrow, projecting anteriorly at near right angles to vinculum; basal two-thirds of aedeagus wide, gently curved then narrowed sharply, apical third less than one-half basal width, with or without subapical

spines, vesica uniformly shagreened. Female genitalia with ductus bursae long, slender, first narrowing then gradually expanding in width to corpus bursae; corpus bursae ovate, without signa. Larvae undescribed.

Discussion.—The two species of *Euhagena* are associated with species of the family Onagraceae. The larvae bore in the roots and like *Albuna* species construct vertical silk tunnels leading from the roots externally to the soil surface. Unlike species of *Albuna*, at least *Euhagena nebraskae* makes its cocoon in a chamber at the base of the tube adjacent to or just in the root. The species of *Euhagena* apparently have normally an annual life-cycle. Adults fly late in the year.

*emphytiformis* (Walker, 1856), (*Aegeria*), NEW COMBINATION

Type-locality: United States. (BMNH).

*solituda* (Henry Edwards, 1881), (*Larunda*), NEW SYNONYMY

Type-locality: Texas. (NMNH).

*nebraskae* Henry Edwards, 1881

Type-locality: Nebraska. (MCZ).

*coloradensis* (Beutenmüller, 1893), (*Pyrrhotaenia*)

Type-locality: Custer County, Colorado. (AMNH).

*nebraskae* form *mormoni* Engelhardt, 1946

Type-locality: Logan, Utah. (NMNH).

*nebraskae* form *intensa* Engelhardt, 1946

Type-locality: Barnwell, San Bernardino County, California. (NMNH).

#### SUBFAMILY SESIINAE

Sesiinae Boisduval, 1828 — Type-genus: *Sesia* Fabricius, 1775.

Aegeriinae *sensu* LeCerf, 1917 — Type-genus: *Aegeria* Fabricius, 1807 (a synonym of *Sesia* Fabricius, 1775).

Diagnostic Characters.—Head with maxillary palpus 2-segmented, second segment much reduced on most species; eyes average proportionately larger than species of Paranthreninae and Tinthiinae; antenna variously clavate with terminal scale tuft, ventrally ciliate on male, pectinate only on certain species of Melittiini and Sesiini. Thorax with bag-like protuberance on prepimeron. Anal tuft issuing from well formed sclerites. Forewing generally with stalk of veins  $R_4 + R_5$  one-half or less than one-half total length of  $R_4$  or  $R_5$ ;  $Cu_2$  nearly as long as  $Cu_1$ . Hindwing

without accessory cell;  $M_3$  and  $Cu_1$  short-stalked distad of cross-vein except in Melittiini; 1A degenerate, though its position still indicated by line of scales on wing fold as in Paranthreninae, 2A, 3A, and 4A present. Male genitalia generally with tegumen and uncus fused, exact limits of each difficult to determine; gnathos usually well developed variously shaped socii present on most species, varying in structure, with scopula androconalis on many species; subscaphium usually thin, strap-like; vinculum narrow, with processes, saccus of varying lengths; valva variously modified, most frequently with specialized scales unlike in Paranthreninae. The various tribes of Sesiinae are morphologically diverse, but species within each tribe exhibit considerable structural homogeneity.

Discussion.—The Sesiinae have by far the greatest number of species in America north of Mexico and when viewed on a world basis. This is a highly diverse and successful group and the most highly evolved in morphological specializations and behavioral adaptations. Though the larvae of some species of Sesiinae are root borers in perennial herbs, the trend is toward a less concealed habitat in stems, branches, injured areas, under bark, or as inquiline in galls.

### KEY TO THE TRIBES OF SESIINAE

1. Hind leg with tibia and tarsus strongly tufted throughout; scale plate present beneath scape of antenna extending somewhat over eye; hindwing with vein  $M_3$  arising well basad of crossvein . . . . . (*Melittia*) Melittiini  
Without above combination of characters . . . . . 2
2. Proboscis reduced, shorter than labial palpus; forewing with veins  $R_1$  and  $R_2$  separate; hindwing with vein  $M_3$  arising at crossvein . . . . . (*Sesia*) Sesiini  
Proboscis coiled, longer than labial palpus, or if reduced then veins  $R_1$  and  $R_2$  of forewing coincident apically, and veins  $M_3$  and  $Cu_1$  of hindwing short-stalked . . . . . 3
3. Forewing with veins  $R_4$  and  $R_5$  coincident, or if stalked then hindwing with cell about two-thirds length of wing; antenna without cilia ventrally . . . . . Osminiini  
Forewing with veins  $R_4$  and  $R_5$  stalked; hindwing with cell less than two-thirds length of wing; male antenna ciliate ventrally . . . . . Synanthedonini

## TRIBE MELITTIINI

Melittiini LeCerf, 1917 — Type-genus: *Melittia* Hübner, 1819.

Diagnostic Characters.—Head with second segment of maxillary palpus nearly as large as first segment; proboscis functional, at least two times length of labial palpus; antenna strongly clavate, short cilia ventrally on male, rudimentarily pectinate to unipectinate depending on species. Hindwing with vein Cu<sub>1</sub> arising well basad of crossvein as in Tinthiini. Male genitalia generally with valva thick, well sclerotized, mostly naked at least on basal one-half, simple spine-like scales concentrated into dense dark patches apically; saccus thick, as long as valva in certain species; uncus most often deeply bifurcate apically with dense dark pads of short spine-like scales on mesal surface of bifurcation. Female genitalia with ductus bursae elongate, slender, membranous, some sclerotization near ostium bursae; ductus seminalis arising midway along ductus bursae or slightly nearer to ostium bursae than to corpus bursae; many species with narrow, semilunate, sclerite laterally and posterior to ostium bursae; corpus bursae ovate to obovate, with or without signum.

Discussion.—Although the Melittiini and Sesiini are distinctive groups within the family, relative similarities in structural morphology suggest that the above two tribes are more closely related to each other than to any other group.

In America north of Mexico the Melittiini consists of the single genus *Melittia* with six included species.

### MELITTIA HÜBNER

*Melittia* Hübner, 1819 — Type-species: *Melittia anthedoniformis* Hübner, 1819 (a synonym of *Sphinx bombiliformis* Cramer, 1782), original designation.

*Poderis* Boisduval, 1874 — Type-species: *Melittia anthedoniformis* Hübner, 1819, original designation.

*Premelittia* LeCerf, 1916 — Type-species: *Premelittia rufescens* LeCerf, 1916, Monotypy. NEW SYNONYMY.

*Neosphacia* LeCerf, 1916 — Type-species: *Neosphacia combusta* LeCerf, 1916, Monotypy. NEW SYNONYMY.

*Melittina* LeCerf, 1917 — Type-species: *Melittina nigra* LeCerf, 1917, Monotypy. NEW SYNONYMY.

Diagnostic Characters.—Head and eyes proportionately larger than most other species of Sesiidae; with plate of broad flat scales projecting horizontally from beneath scape of antenna over middle of eye; labial palpus roughened; hair like chaetosema

present on vertex. Hindleg of most species with tibia and tarsus very strongly tufted throughout, particularly dorsally and mesally. Abdomen with anal tuft poorly developed. Male and female genitalia as described for *Melittini*.

Discussion.—MacKay (1968) characterizes the larvae of *Melittia* as follows: L-2 on abdominal segment 8 posterior or posterior and somewhat dorsal to L-1; ocelli reduced to size of a setal base; the spiracles may be somewhat elongated with a dorsal lip present and the spiracle on segment 8 in its most extreme position near the posterior margin and in dorsal rather than lateral position on the segment; setae D-2 on segment 9 unusually small, far apart, each close to its corresponding D-1 and posteromedial to it in position; anal shield in some species modified by presence of medial hump, stout spine or transverse ridge; ventral prolegs scarcely apparent; most setae usually short; D-2 setae on anal shield as short as D-1 setae; papilla posterolateral to anal crotchets, if present, is dorsal to large seta.

The larvae, depending on the species, are borers in the petioles, stems, or tubers of species of Cucurbitaceae. Mature larvae leave the host plant to pupate in cocoons in the soil. The pupal head has well developed structures to aid in breaking through the tough cocoon and moving to the surface, where emergence of the adult occurs.

*calabaza* Duckworth and Eichlin, 1973b

Type-locality: Teotihuacan, Mexico. (NMNH).

*gloriosa* Henry Edwards, 1880

Type-locality: California. (AMNH).

*superba* Barnes and Lindsey, 1922 (preoccupied by *M. superba* Rothschild).

Type-locality: Seward County, Kansas. (NMNH).

*lindseyi* Barnes and Benjamin, 1925 (new name for *Melittia superba* Barnes and Lindsey, 1922).

*barnesi* Dalla Torre, 1925 (new name for *Melittia superba* Barnes and Lindsey, 1922).

*grandis* (Strecker, 1881), (*Trochilium grande*)

Type-locality: Texas. (FMNH).

*beckeri* Druce, 1892

Type-locality: Near Durango City, Mexico. (BMNH).

*grandis* variety *hermosa* Engelhardt, 1946

Type-locality: Arizona. (NMNH).

*magnifica* Beutenmüller, 1899a

Type-locality: Austin, Texas. (AMNH).

*satyriniformis* Hübner, [1825]

Type-locality: Georgia. (unknown).

*cucurbitae* (Harris, 1828), (*Aegeria*)

Type-locality: Massachusetts. (lost).

*ceto* (Westwood, 1848), (*Trochilium*)

Type-locality: North America. (unknown).

*amoena* Henry Edwards, 1883

Type-locality: Douglas County, Kansas, 900 feet.  
(unknown).

*snowii* Henry Edwards, 1882a

Type-locality: Kansas. (AMNH).

### TRIBE SESIINI

Sesiini Hübner, 1819 — Type-genus: *Sesia* Fabricius, 1775.

Aegeriini *sensu* LeCerf, 1917 — Type-genus: *Aegeria* Fabricius, 1807 (a synonym of *Sesia* Fabricius, 1775).

Diagnostic Characters.—Head with second segment of maxillary palpus much larger than first segment. Forewing with vein  $R_4$  terminating at apex,  $R_3$  below ( $R_3$  terminates at apex,  $R_4$  above, in other tribes of Sesiidae). Hindwing with veins  $M_3$  and  $Cu_1$  arising together at corner of cell or very short stalked. Male genitalia generally with uncus and tegumen nearly same length, point of articulation clearly visible; anellus thin, strap like, lacking finger like projections; gnathos well developed, thick, well sclerotized; scales on valva and uncus thick, dark, spine like or furcate apically; saccus short, fairly broad, projecting anteriorly at right angle to vinculum proper; aedeagus thick throughout, with several short, stout cornuti in vesica. Female genitalia for most species with ostium bursae relatively large, circular, surrounded by thickened membrane; ductus bursae thick, curved, some sclerotization near ostium bursae, ductus seminalis arising just beyond sclerotized area; corpus bursae relatively large, ovate to obovate, with or without weakly defined signum.

Discussion.—In North America the Sesiini includes only two species, both in the genus *Sesia*. The oriental genus *Toleria* Walker also belongs in this tribe (Naumann, 1971).

The Sesiini is a structurally unique tribe, especially genitally, somewhat related to the Melittiini and perhaps giving rise to the following modified group, the Osminiini.

## SESIA FABRICIUS

*Sesia* Fabricius, 1775 — Type-species: *Sphinx apiformis* Clerck, 1759, designated by Latreille, 1810.

*Aegeria* Fabricius, 1807 — Type-species: *Sphinx apiformis* Clerck, 1759, designated by Newman, 1832.

*Eusphecia* LeCerf, 1937 — Type-species: *Sesia pimplaeformis* (Boisduval in lit.) Oberthür, 1872, original designation.—Fibiger and Kristensen, 1974.

Diagnostic Characters.—Head with second segment of maxillary palpus about two to three times larger than first segment; proboscis reduced, approximately two-thirds length of labial palpus (at least for North American species); antenna relatively more strongly clavate than most Sesiinae, male ventrally ciliate-unipeccinate (at least for North American species); small, shelf like plate of scales beneath scape of antenna projecting horizontally slightly over eye, similar to *Melittia* species but less pronounced. Genitalia as described generally for Sesiini. Male with valva only slightly longer than wide, without crista sacculi, dark, spine-like scales confined mostly to marginal areas on apical one-half; uncus wide, bilobed, with dark, spine-like scales of varying lengths apically on inner margin of lobes.

Discussion.—MacKay (1968) mentions the following unique features of the larvae: The head with seta E<sup>2</sup> and its corresponding F<sup>1</sup> unusually close to each other; and the anal shield with a small dark brown spine present medioposteriorly, sometimes minute and sometimes absent in late instars.

The genus *Sesia* in North America consists of one introduced Palearctic species, *apiformis*, and one native species, *tibialis*. The larvae of both species are borers in the trunks or exposed roots mainly of willows and poplars (Salicaceae). The life-cycle requires two years; normally pupation occurs in cocoons in the larval gallery, but if in the exposed roots, the larva may leave and construct a cocoon in the surrounding soil.

*apiformis* (Clerck, 1759), (*Sphinx*)

Type-locality: South England. (lost).

*crabroniformis* Denis and Schiffermüller, 1775

Type-locality: Vienna, Austria. (destroyed).

*tibialis* (Harris, 1839), (*Trochilium tibiale*), NEW COMBINATION

Type-locality: New Hampshire. (lost).

*flavitibia* (Walker, 1856), (*Melittia*) (new name for *Trochilium tibiale* Harris, 1839).

- pacificum* (Henry Edwards, 1881), (*Trochilium*)  
 Type-locality: Washington Territory. (NMNH).  
*californicum* (Neumoegen, 1891), (*Trochilium*)  
 Type-locality: California. (NMNH).  
*minimum* (Neumoegen, 1891), (*Trochilium*)  
 Type-locality: Denver, Colorado. (NMNH).  
*tibialis* variety *dyari* (Cockerell, 1908), (*Aegeria*)  
 Type-locality: Las Vegas, New Mexico. (NMNH).  
*tibialis* variety *anonyma* (Strand in Dalla Torre and  
 Strand, 1925), (*Sphecia*)  
 Type-locality: unknown. (unknown).  
*tibialis* variety *melanoformis* (Engelhardt, 1946),  
 (*Aegeria*)  
 Type-locality: Keene Valley, Adirondack Mountains.  
 New York. (NMNH).

### TRIBE OSMINIINI NEW TRIBE

Type-genus: *Osminia* LeCerf, 1917.

Diagnostic Characters.—Head with maxillary palpus 2-segmented, subequal in size; third segment of labial palpus about one-half length of labial palpus; antenna relatively strongly clavate, uniquely lacking ventral cilia in both sexes. Hindwing generally with anal veins somewhat degenerate, though variable. Male genitalia without specialized furcated scales on valva or uncus; gnathos present, well developed. Female genitalia with signum present on corpus bursae of known species.

Discussion.—The Osminiini is represented in America north of Mexico by two genera, each with a single species. The genera are distinctive relative to each other and unique within the Sesiidae. Nothing is known about the life-histories of the included species of Osminiini.

### KEY TO THE GENERA OF OSMINIINI

- Forewing with veins  $R_4$  and  $R_5$  coincident; hindwing with  $M_3$  and  $Cu_1$  connate at corner of cell . . . . . *Calasesia*  
 Forewing with veins  $R_4$  and  $R_5$  long-stalked; hindwing with  $M_3$  and  $Cu_1$  short-stalked . . . . . *Osminia*

## CALASESIA BEUTENMULLER

*Calasesia* Beutenmüller, 1899c — Type-species: *Pyrrhotaenia coccinea* Beutenmüller, 1898. monotypy.

Diagnostic Characters.—Forewing with vein  $R_5$  missing (probably confluent with  $R_4$ ). Hindwing with veins  $M_3$  and  $Cu_1$  connate at corner of cell. Male genitalia with valva quadrangular; setaceous scales scattered on apical portion, which is demarcated by ridge possessing an edge with four or five sharp, basally projecting points; uncus somewhat hood shaped, clothed with setaceous scales; gnathos sclerotized, thick, spoon shaped; aedeagus nearly of even width throughout, with apical spine directed anteriorly; vesica shagreened, without cornuti. Female genitalia with ostium bursae very wide; ductus bursae initially from ostium bursae broad, membranous, narrowing to short, sclerotized section, continuing to small corpus bursae as narrow membranous tube; corpus bursae with signum near entrance of ductus bursae, an elongate, pigmented patch; ductus seminalis arising from ductus bursae just anterior to short sclerotized section.

Discussion.—*Calasesia* is a monobasic genus. There is evidence to indicate that the included species may be associated with species of a legume in the genus *Hoffmannseggia*.

*coccinea* (Beutenmüller, 1898), (*Pyrrhotaenia*)

Type-locality: Albuquerque, New Mexico. (NMNH).

## OSMINIA LeCERF

*Osminia* LeCerf, 1917 — Type-species: *Osminia ferruginea* LeCerf, 1917, monotypy.

*Signaphora* Engelhardt, 1946 — Type-species: *Carmenta ruficornis* Henry Edwards, 1881, original designation.  
NEW SYNONYMY.

Diagnostic Characters.—Head with labial palpus roughened. Forewing with stalk of  $R_4 + 5$  very long, about four-fifths total length of  $R_4$  or  $R_5$  (stalk much shorter on other Sesiinae). Hindwing with cell very long, extending to about two-thirds of total wing length, veins from cell, therefore, relatively short;  $M_3$  and  $Cu_1$  very short stalked. Male genitalia with valva elongate, up-curved apically on most species; mostly densely clothed with long setaceous scales; various spine-like processes near center of valva, depending on species, without crista sacculi; vinculum

relatively wide, with saccus short, wide, broadly rounded apically; anellus with weakly defined, finger like, lateral projections; gnathos usually well developed, of various forms, depending on species; uncus roof shaped, thickly clothed with long setaceous scales as on valva; aedeagus narrow, with apex variously sclerotized, with long, lateral spine like processes on certain species. Female genitalia quite different between species; well pronounced signum of different structures present.

Discussion.—Engelhardt (1946), recognizing that the one species was unique among the sesiids of the United States, and unaware of LeCerf's Neotropical species *ferruginea*, placed *ruficornis* in a new genus. Recent unpublished studies by us of the Mexican fauna have revealed several more species belonging to *Osminia*.

*ruficornis* (Henry Edwards, 1881), (*Carmenta*), NEW COMBINATION

Type-locality: Georgia. (NMNH).

*minuta* (Henry Edwards, 1881), (*Carmenta*)

Type-locality: Georgia. (MSU).

*candescens* (Henry Edwards, 1882c), (*Aegeria*), NEW SYNONYMY

Type-locality: Arizona. (NMNH).

*marcia* (Druce, 1889), (*Tarsopoda*), NEW SYNONYMY

Type-locality: Dos Arroyos, Guerrero, Mexico. (BMNH).

### TRIBE SYNANTHEDONINI

Synanthedonini Niculescu, 1964 — Type-genus: *Synanthedon* Hübner, 1819.

Aegeriini *sensu* Naumann, 1971 — Type-genus: *Aegeria* of authors (not Fabricius, 1807).

Diagnostic Characters.—Head small, eyes proportionately large; maxillary palpus with second segment greatly reduced; antenna clavate, often weakly so, male with short ventral cilia, apparently never pectinate; labial palpus either roughened or smoothly scaled; proboscis fully developed or reduced. Male genitalia with specialized bifurcate scales on valvae and socii; fused uncus-tegmen complex; valva on most species with crista sacculi of various forms depending on species; juxta somewhat triangular with elongate, lateral, finger like processes on membranous anellus, saccus narrow, vinculum narrow with small



- Hindleg with first tarsal segment not thickened with tufts of scales, or if slightly thickened, not more than twice as thick as second segment; male without elongate tail like extension from apex of abdomen . . . . . 3
3. Hindleg very long, tibia about three times longer than femur and first tarsal segment almost three times longer than femur . . . . . *Podosesia*  
 Hindleg shorter, tibia at most two times longer than femur and first tarsal segment not more than one and one-half times longer than femur . . . . . 4
4. Apex of abdomen with long scale tufts (hair pencils), 5 on male and 2 on female; fore- and hindwings mostly opaque, blue-black; abdomen with segment 4 orange or orange-red . . . . . *Sannina*  
 Apex of abdomen without separate, long, scale tufts; scale pattern combinations not as above . . . . . 5
5. Labial palpus with third segment approximately as long as the second segment; fore- and hindwings opaque; forewing with veins  $R_1$  and  $R_2$  coincident ( $R_1 + 2$ ) . . . . . *Hymenoclea*  
 Without combination of characters as above . . . . . 6
6. Male with crista sacculi on ventral margin of valva projecting mesoventrad, gnathos without crista gnathi, apex of aedeagus deeply bifurcate; female lacking sclerotization on ductus bursae, slight pigmentation on ventral margin of ostium bursae . . . . . *Palmia*  
 Without above combination of genitalic characters . . . . . 7
7. Male with distal portion of crista sacculi downcurved toward ventral edge of valva, saccus long, more than one-third length of valva; female with ductus bursae sclerotized for at least one-half its length, ductus seminalis arising from ductus bursae midway between ostium and corpus bursae or closer to corpus bursae . . . . . *Carmenta*  
 Male with crista sacculi of various forms but distal portion not downcurved toward ventral edge of valva, saccus short, less than one-third length of valva; female with ductus bursae sclerotized for less than one-half its length, usually only near ostium bursae, ductus seminalis arising from ductus bursae closer to ostium than to corpus bursae . . . . . *Syanthedon*

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*SYNANTHEDON* HÜBNER

*Synanthedon* Hübner, 1819 — Type-species: *Sphinx oestri-formis* Rottemburg, 1775 (a synonym of *Sphinx vespiiformis* Linnaeus, 1761), designated by Newman, 1832.

*Conopia* Hübner, 1819 — Type-species: *Sphinx stomoxiformis* Hübner, 1790, designated by Bartel, 1912.

*Pyrrhotaenia* Grote, 1875 — Type-species: *Pyrrhotaenia floridensis* Grote, 1875 (a color form of *Aegeria sapygaeformis* Walker, 1856), original designation. NEW SYNONYMY.

*Vespa mima* Beutenmüller, 1894 — Type-species: *Bembecia sequoiae* Henry Edwards, 1881, original designation. NEW SYNONYMY.

*Sanninoidea* Beutenmüller, 1896 — Type-species: *Aegeria exitiosa* Say, 1823, designated by Walsingham, 1913. NEW SYNONYMY.

*Thamnosphecia* Spuler, 1910 — Type-species: *Sphinx culiciformis* Linnaeus, 1758, original designation.

*Ramosia* Engelhardt, 1946 — Type-species: *Sesia bibionipennis* Boisduval, 1869, original designation.

*Sylvora* Engelhardt, 1946 — Type-species: *Trochilium acerni* Clemens, 1860, original designation. NEW SYNONYMY.

Diagnostic Characters.—Structural features as described for *Synanthedonini*. Male genitalia with valva having crista sacculi either much expanded, modified, or absent, or, as on most species, a small, oblique ridge, nearly straight with variously modified scales; saccus short, less than one-third length of valva. Female genitalia with ductus bursae elongate, slender, membranous, sclerotization confined on most species to posterior one-third or less; ductus seminalis arises from ductus bursae nearer to posterior end, on posterior one-third on most species.

Discussion.—We currently recognize 41 species of *Synanthedon* in America north of Mexico. The larvae of most species are borers in the trunks, stems or roots of various trees and shrubs, while others attack stems and roots of herbaceous perennials, and a few invade galls caused by other insects.

*acerni* (Clemens, 1860), (*Trochilium*)

Type-locality: Unknown. (lost).

*acericolum* (Germadius, 1874), (*Trochilium*)

Type-locality: Champaign, Illinois. (unknown).

## SYNANTHEDON HÜBNER

*Synanthedon* Hübner, 1819 — Type-species: *Sphinx oestri-formis* Rottemburg, 1775 (a synonym of *Sphinx vespiformis* Linnaeus, 1761), designated by Newman, 1832.

*Conopia* Hübner, 1819 — Type-species: *Sphinx stoma-xiformis* Hübner, 1790, designated by Bartel, 1912.

*Pyrrhotaenia* Grote, 1875 — Type-species: *Pyrrhotaenia floridensis* Grote, 1875 (a color form of *Aegeria sapygaeformis* Walker, 1856), original designation. **NEW SYNONYMY.**

*Vespa-mima* Beutenmüller, 1894 — Type-species: *Bembecia sequoiae* Henry Edwards, 1881, original designation. **NEW SYNONYMY.**

*Sanninoidea* Beutenmüller, 1896 — Type-species: *Aegeria exitiosa* Say, 1823, designated by Walsingham, 1913.

*Thamnosphacia* Spuler, 1910 — Type-species: *Sphinx culiciformis* Linnaeus, 1758, original designation.

*Ramosia* Engelhardt, 1946 — Type-species: *Sesia bibionipennis* Boisduval, 1869, original designation. **NEW SYNONYMY.**

*Sylvora* Engelhardt, 1946 — Type-species: *Trochilium acerni* Clemens, 1860, original designation. **NEW SYNONYMY.**

Diagnostic Characters.—Structural features as described for Synanthedonini. Male genitalia with valva having crista sacculi either much expanded, modified, or absent, or, as on most species, a small, oblique ridge, nearly straight with variously modified scales; saccus short, less than one-third length of valva. Female genitalia with ductus bursae elongate, slender, membranous, sclerotization confined on most species to posterior one-third or less; ductus seminalis arises from ductus bursae nearer to posterior end, on posterior one-third on most species.

Discussion.—We currently recognize 41 species of *Synanthedon* in America north of Mexico. The larvae of most species are borers in the trunks, stems or roots of various trees and shrubs, while others attack stems and roots of herbaceous perennials, and a few invade galls caused by other insects.

*acerni* (Clemens, 1860), (*Trochilium*)

Type-locality: Unknown. (lost).

*acericulum* (Germadius, 1874), (*Trochilium*)

Type-locality: Champaign, Illinois. (unknown).

- tepperi* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Georgia. (MSU).
- acerni* race *buscki* (Engelhardt, 1946), (*Sylvora*)  
 Type-locality: Gainesville, Florida. (NMNH).
- acerrubri* Engelhardt, 1925a  
 Type-locality: Newton, Long Island, New York. (NMNH).
- albicornis* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Nevada. (MSU).
- alleri* (Engelhardt, 1946), (*Thamnosphecia*), **NEW COMBINATION**  
 Type-locality: Chickasaw, Alabama. (NMNH).
- artica* (Beutenmüller, 1900), (*Sesia*)  
 Type-locality: Kodiak, Alaska. (NMNH).
- arkansasensis* Duckworth and Eichlin, 1973b  
 Type-locality: Devil's Den State Park, Washington County, Arkansas. (NMNH).
- arizonensis* (Beutenmüller, 1916), (*Gaea*)  
 Type-locality: Pinal Mountains, Arizona. (NMNH).
- bibionipennis* (Boisduval, 1869), (*Sesia*)  
 Type-locality: California. (NMNH).
- rutilans* (Henry Edwards, 1881), (*Albuna*)  
 Type-locality: Virginia City, Nevada. (AMNH).
- lupini* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Marin County, California. (AMNH).
- perplexa* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Texas. (NMNH).
- impropria* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Washington Territory. (NMNH).
- aureola* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Nevada. (NMNH).
- neglecta* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Olympia, Washington (AMNH).
- washingtonia* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Washington Territory. (AMNH).
- hemizoniae* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Nevada. (AMNH).
- madariae* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: "Saucelito" [= Sausalito] California. (AMNH).
- bolteri* (Henry Edwards, 1883), (*Aegeria*)  
 Type-locality: Northern Illinois. (AMNH).
- canadensis* Duckworth and Eichlin, 1973b  
 Type-locality: Waterton, Alberta. (NMNH).

- castaneae* (Busck, 1913), (*Sesia*)  
 Type-locality: Lynchburg, Virginia. (NMNH).
- chrysidipennis* (Boisduval, 1869), (*Sesia*)  
 Type-locality: Los Angeles, California. (NMNH).
- tacoma* (Beutenmüller, 1898), (*Sesia*)  
 Type-locality: Big Horn Mountains, Wyoming. (NMNH).
- chrysidipennis* race *wallowa* (Engelhardt, 1946), (*Ramosia*)  
 Type-locality: Elk Horn Mountains, Oregon, 5,000 ft. (NMNH).
- culiciformis* (Linnaeus, 1758), (*Sphinx*)  
 Type-locality: Europe. (lost).
- culiciformis* variety *americana* (Beutenmüller, 1896), (*Sesia*)  
 Type-locality: Nevada. (AMNH).
- decipiens* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).
- imperfecta* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).
- nicotianae* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Texas. (NMNH).
- rubristigma* (Kellicott, 1892b), (*Aegeria*)  
 Type-locality: Ohio. (AMNH).
- dominicki* Duckworth and Eichlin, 1973b  
 Type-locality: Wedge Plantation, South Santee River, Charleston County, South Carolina. (NMNH).
- exitiosa* (Say, 1823), (*Aegeria*)  
 Type-locality: Unknown. (lost).
- persica* (Thomas, 1824), (*Apis*)  
 Type-locality: Baltimore, Maryland. (unknown).
- pepsidiformis* (Hübner, [1825]), (*Paranthrene*)  
 Type-locality: Georgia. (unknown).
- xiphiaeformis* (Boisduval, 1874), (*Sesia*)  
 Type-locality: United States. (NMNH).
- graefti* (Henry Edwards, 1881), (*Sciapteron*)  
 Type-locality: Nevada. (NMNH).
- opalescens* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Nevada. (NMNH).
- exitiosa* variety *fitchii* (Henry Edwards, 1882a), (*Aegeria*)  
 Type-locality: Tallahassee, Florida. (AMNH).
- pacifica* (Riley, 1891), (*Sannina*)  
 Type-locality: Santa Clara County, California. (NMNH).

- exitiosa* variety *luminosa* (Neumoegen, 1894), (*Sannina*)  
 Type-locality: Glendale, Long Island, New York.  
 (NMNH).
- exitiosa* variety *edwardsii* (Beutenmüller, 1899b), (*Sanninoidea*)  
 Type-locality: Unknown. (AMNH).
- graefi* variety *barnesii* (Beutenmüller, 1901), (*Sanninoidea*)  
 Type-locality: Clear Creek Canyon, Colorado.  
 (NMNH).
- fatifera* Hodges, 1962  
 Type-locality: Mentor, Ohio. (NMNH).
- fulvipes* (Harris, 1839), (*Aegeria*)  
 Type-locality: Massachusetts. (lost).
- geliformis* (Walker, 1856), (*Aegeria*)  
 Type-locality: United States. (BMNH).
- helenis* (Engelhardt, 1946), (*Carmenta*), **NEW COMBINATION**  
 Type-locality: Earl Grey, Saskatchewan. (NMNH).
- kathya* Duckworth and Eichlin, 1977  
 Type-locality: Halifax, Nova Scotia. (Nova Scotia  
 Museum).
- mellinipennis* (Boisduval, 1836), (*Sesia*)  
 Type-locality: Amerique septentrionale. (lost).
- artemisiae* (Henry Edwards, 1881), (*Albuna*)  
 Type-locality: Sierra Nevada, California. (AMNH).
- seneciodes* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: California. (AMNH).
- novaroensis* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Soda Springs, Siskiyou County, California.  
 (AMNH).
- piceae* (Dyar, 1904), (*Parharmonia*)  
 Type-locality: Hoquiam, Washington. (NMNH).
- brunneri* (Busck, 1914), (*Sesia*)  
 Type-locality: Camas, Montana. (NMNH).
- pictipes* (Grote and Robinson, 1868), (*Aegeria*)  
 Type-locality: Atlantic District, Pennsylvania. (lost).
- inusitata* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Andover, Massachusetts. (AMNH).
- polygoni* Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: San Miguel, California. (AMNH).
- fragariae* (Henry Edwards, 1881), (*Pyrrhotaenia*), **NEW  
 SYNONYMY**  
 Type-locality: Colorado. (AMNH).

- helianthi* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Virginia City, Nevada. (MSU).
- achillae* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: San Rafael, California. (AMNH).
- eremocarpi* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Sierra Nevada, California. (AMNH).
- meadii* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Lake Tahoe, California. (AMNH).
- orthocarpi* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Washoe Lake, Nevada. (AMNH).
- praestans* (Henry Edwards, 1882b), (*Aegeria*), **NEW SYNONYMY**  
 Type-locality: Washington, Territory. (NMNH).
- behrensii* (Henry Edwards, 1882c), (*Pyrrhotaenia*)  
 Type-locality: Soda Springs, Shasta County, California. (AMNH).
- animosa* (Henry Edwards, 1883), (*Pyrrhotaenia*)  
 Type-locality: Arizona. (NMNH).
- elda* (Henry Edwards, 1885), (*Pyrrhotaenia*)  
 Type-locality: Siskiyou County, California. (AMNH).
- fragariae* variety *semipraestans* (Cockerell, 1908), (*Sesia*)  
 Type-locality: Florissant, Colorado. (NMNH).
- pini* (Kellicott, 1881), (*Aegeria*), **NEW COMBINATION**  
 Type-locality: New York. (lost).
- proxima* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: White Mountains, New Hampshire. (MSU).
- modesta* (Kellicott, 1892a), (*Albuna*)  
 Type-locality: Columbus, Ohio. (unknown).
- pyri* (Harris, 1830), (*Aegeria*)  
 Type-locality: Massachusetts. (lost).
- koebeleri* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Tallahassee, Florida. (AMNH).
- refulgens* Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Georgia. (MSU).
- marica* (Beutenmüller, 1899c), (*Sesia*), **NEW SYNONYMY**  
 Type-locality: Punta Gorda, Florida. (AMNH).
- seminole* (Beutenmüller, 1899c), (*Sesia*)  
 Type-locality: Lake Worth, Florida. (AMNH).
- resplendens* (Henry Edwards, 1881), (*Albuna*)  
 Type-locality: Soda Springs, Siskiyou County, California. (AMNH).
- rhododendri* (Beutenmüller, 1909), (*Sesia*)  
 Type-locality: Cheltenham, Pennsylvania. (NMNH).

- richardsi* (Engelhardt, 1946), (*Conopia*), **NEW COMBINATION**  
 Type-locality: Clark County, Georgia. (NMNH).
- rileyana* (Henry Edwards, 1881), (*Albuna*)  
 Type-locality: Cadet, Missouri. (AMNH).
- brunneipennis* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Georgia. (MSU).
- hyperici* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: West Virginia. (AMNH).
- austini* (Engelhardt, 1946), (*Carmenta*), **NEW SYNONYMY**  
 Type-locality: Austin, Texas. (NMNH).
- rubrofascia* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Georgia. (AMNH).
- sapygaeformis* (Walker, 1856), (*Aegeria*)  
 Type-locality: United States. (BMNH).
- floridensis* (Grote, 1875), (*Pyrrhotaenia*)  
 Type-locality: Enterprise, Florida. (AMNH).
- saxifragae* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).
- henshawii* (Henry Edwards, 1882a), (*Aegeria*)  
 Type-locality: Mingan Island, Labrador. (AMNH).
- scitula* (Harris, 1839), (*Aegeria*)  
 Type-locality: Unknown. (lost).
- gallivorum* (Westwood, 1854), (*Trochilium*)  
 Type-locality: North America. (unknown).
- hospes* (Walsh, 1866), (*Trochilium*)  
 Type-locality: Unknown. (Unknown).
- corusca* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Texas. (AMNH).
- aemula* (Henry Edwards, 1883), (*Aegeria*)  
 Type-locality: Unknown. (NMNH).
- sequoiae* (Henry Edwards, 1881), (*Bembecia*). **NEW COMBINATION**  
 Type-locality: Mendocino County, California (AMNH).
- superba* (Henry Edwards, 1881), (*Bembecia*)  
 Type-locality: Washington Territory. (NMNH).
- pinorum* (Behrens, 1889), (*Aegeria*)  
 Type-locality: Monterey, California. (lost).
- sigmoidea* (Beutenmüller, 1897), (*Sesia*)  
 Type-locality: Walpole, Massachusetts. (AMNH).
- tipuliformis* (Clerck, 1759), (*Sphinx*)  
 Type-locality: Unknown. (unknown).
- viburni* Engelhardt, 1925a  
 Type-locality: Woodhaven, South Long Island, New York. (NMNH).

## PALMIA BEUTENMÜLLER

*Palmia* Beutenmüller, 1896 — Type-species: *Sciapteron praece-*  
*dens* Henry Edwards, 1883, original designation.

Diagnostic Characters.—Head with maxillary palpus having long thick setae apically on first segment, second segment slightly smaller than first, positioned laterally on first segment; proboscis about two times length of labial palpus. Forewing with veins  $R_4$  and  $R_5$  stalked for more than one-half total length of either vein. Male genitalia with crista sacculi on ventral margin of valva, projecting mesoventrad; saccus less than one-third length of valva; gnathos without crista gnathi, lateral lobes projecting ventrad; aedeagus with apex deeply bifurcate. Female genitalia lacking sclerotization on ductus bursae, some slight pigmentation on ventral margin of ostium bursae, otherwise as described for following genus, *Podosesia*.

Discussion.—*Palmia* is most closely related to *Podosesia*. The distinctively elongate hindlegs of *Podosesia* easily set these two genera apart from each other. The general form of the genitalia separate these two genera from the other Synanthedonini. Nothing is known about the life history of the single included species of *Palmia*.

*praece-dens* (Henry Edwards, 1883), (*Sciapteron*)

Type-locality: North Carolina? (NMNH).

(The type-locality is very suspect, particularly since males of *praece-dens* have recently been found around Tucson, Arizona, and the species has never been recollected in the eastern United States.)

## PODOSESIA MÖSCHLER

*Podosesia* Möschler, 1879 — Type-species: *Grotea longipes*  
Möschler, 1876 (a synonym of *Aegeria syringae* Harris, 1839),  
original designation.

*Grotea* Möschler, 1876 — Type-species: *Grotea longipes*  
Möschler, 1876, original designation. (Note: *Podosesia*  
is a replacement name for *Grotea* Möschler, 1876, which  
is a homonym of *Grotea* Cresson, (Hymenoptera); *Grotea*  
Moore, (Lepidoptera); and *Grotea* Theobald, (Reptilia).)

Diagnostic Characters.—Head with third segment of labial palpus about two-thirds length of second segment; second segment of maxillary palpus somewhat pigmented, positioned

laterally on first segment; proboscis about two times length of labial palpus. Hindleg uniquely long, first tarsal segment as long as tibia. Male genitalia with valva having bifurcate scales on dorsal two-thirds, crista sacculi located on ventral margin projecting ventrally with apical margin of crista sacculi having row of flattened, apically truncate scales; saccus less than one-third length of valva, wide, either broadly rounded or concave apically; gnathos without crista gnathi, lateral lobes of gnathos directed ventrad; aedeagus well sclerotized, deeply bifurcate at apex, vesica with many minute spine like cornuti. Female genitalia with ostium bursae recessed in membranous pouch located mesoventrally in center of abdominal segment eight; ductus bursae sclerotized on short section near ostium bursae; ductus seminalis arising just beyond sclerotized area.

Discussion.—*Podosesia* contains one species, which is a borer in ashes and lilac (Oleaceae).

*syringae* (Harris, 1839), (*Aegeria*)

Type-locality: Massachusetts. (lost).

*longipes* (Möschler, 1876), (*Grotea*)

Type-locality: North America. (lost).

*fraxini* (Lugger, 1891), (*Trochilium*)

Type-locality: Unknown. (unknown).

### SANNINA WALKER

*Sannina* Walker, 1856 — Type-species: *Sannina uroceriformis* Walker, 1856, original designation.

*Sospita* Henry Edwards, 1882a — Type-species: *Aegeria quinquecaudata* Ridings, 1862 (a synonym of *Sannina uroceriformis* Walker, 1856).

*Phemonoe* Henry Edwards, 1882b (replacement name for *Sospita* Edwards, 1882b, which is a homonym of *Sospita* Rafinesque, (Ctenophora); *Sospita* Reichenbach, (Aves); *Sospita* Hewitson, (Lepidoptera); and *Sospita* Stål, (Orthoptera).

Diagnostic Characters.—Head with minute second segment of maxillary palpus slightly pigmented, positioned laterally on larger first segment; third segment of labial palpus slightly more than one-half length of labial palpus. Abdomen uniquely with long, individual, scale tufts (hair pencils) at tip: male with one short pair and one long pair of lateral tufts and one dorsomesal tuft; female with short, rounded anal tuft and one pair of short,

dorsolateral tufts. Male genitalia with apex of valva sharply pointed, valva with bifurcate scales on dorsal one-half, thickly concentrated around basal one-half of crista sacculi, apically crista sacculi thickened, sharply curved ventrad, clothed with thick, dark, pointed scales; saccus about one-third length of valva, wide, slightly concave apically; gnathos with crista gnathi reduced; aedeagus with eight or more thorn like spines on side of slightly swollen area on apical third, vesica with numerous minute cornuti, one or more slightly larger than others. Female genitalia with ostium bursae situated in somewhat sclerotized mesoventral area; ductus bursae sclerotized for two-thirds its length, slightly curved apically; ductus seminalis arising near corpus bursae in membranous portion adjacent to sclerotized portion of ductus bursae; corpus bursae obovate, somewhat longitudinally striate.

Discussion.—MacKay (1968) states that the monotypic genus *Sannina* is easily defined in the larval stage by the conspicuous spinulation of the integument, and the fusion of the V-1 pinacula on segments 7, 8 and 9. The single species of the genus is a root borer in persimmon (Ebenaceae) and requires two to three years to complete its life-cycle.

*uroceriformis* Walker, 1856

Type-locality: United States. (BMNH).

*quinquecaudata* (Ridings, 1862), (*Aegeria*)

Type-locality: Middletown, Frederick County, Virginia. (unknown).

*uroceripennis* Boisduval, 1874 (unjustified new name for *Sannina uroceriformis* Walker, 1856).

### CARMENTA HENRY EDWARDS

*Carmenta* Henry Edwards, 1881 — Type-species: *Aegeria pyralidiformis* Walker, 1856, original designation.

Diagnostic Characters.—Generally as given for *Synanthedonini*. Forewing with veins R<sub>1</sub> and R<sub>2</sub> either remaining separate to margin, confluent at margin, or coalescing into single vein, depending on species, or varying intraspecifically in some species. No single character or combination of external features has been found to differentiate between *Carmenta* and *Synanthedon*; therefore, characters of the genitalia must be used to separate the two groups. Male genitalia with valva having crista sacculi downcurved to ventral margin, recurved toward base of

valva in some species, this portion the only remaining part of crista sacculi on some species; saccus more than one-third length of valva; bend of tegumen-uncus complex at approximately right angle. Female genitalia with ductus bursae sclerotized on at least one-half its length for most species, with ductus seminalis arising midway between posterior end and corpus bursae or nearer to the latter for most species; most species without signum on corpus bursae.

Discussion.—The majority of the species of *Carmenta* for which the life histories are known have larvae which are borers in the stems and roots of herbaceous plants. Based on genitalic features and similarities in behavior, *Carmenta* appears to be very closely related to the Palearctic genus *Bembecia* Scopoli, as used in the sense of Bradley *et al.* (1972) and Fibiger and Kristensen (1974). The two may be congeneric, but we lack the comparative material necessary to verify their relative status.

*Carmenta* in America north of Mexico consists of 25 species.

The genus is also well represented in the Neotropics.

*albociliata* (Engelhardt, 1925c), (*Synanthedon*)

Type-locality: Kerrville, Texas. (NMNH).

*anthracipennis* (Boisduval, 1874), (*Sesia*)

Type-locality: Georgia. (NMNH).

*sanborni* Henry Edwards, 1881

Type-locality: Andover, Massachusetts. (AMNH).

*morula* (Henry Edwards, 1881), (*Aegeria*)

Type-locality: Texas. (NMNH).

*apache* Engelhardt, 1946

Type-locality: Prescott, Arizona. (NMNH).

*arizonae* (Beutenmüller, 1898), (*Sesia*), NEW COMBINATION

Type-locality: Summit of Mt. Union, 9,000 ft., Arizona. (AMNH).

*auritincta* (Engelhardt, 1925c), (*Synanthedon*)

Type-locality: Baboquivari Mountains, Pima County, Arizona. (NMNH).

*bassiformis* (Walker, 1856), (*Aegeria*)

Type-locality: United States. (BMNH).

*lustrans* (Grote, 1880), (*Trochilium*)

Type-locality: Dayton, Ohio. (AMNH).

*aureopurpura* (Henry Edwards, 1880), (*Aegeria*),

NEW SYNONYMY

Type-locality: Dallas, Texas. (MCZ).

*bolli* (Henry Edwards, 1881), (*Aegeria*)

- Type-locality: Texas. (NMNH).  
*sexfasciata* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Texas. (AMNH).  
*consimilis* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Long Island, New York. (AMNH).  
*eupatorii* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Long Island, New York. (AMNH).  
*imitata* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Pennsylvania. (NMNH).  
*corni* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Purgatory Swamp, Massachusetts.  
 (AMNH).  
*infirma* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Long Island, New York. (AMNH).  
*engelhardti* Duckworth and Eichlin, 1973b  
 Type-locality: Garden Canyon, 5,300 ft., Huachuca  
 Mountains, Cochise County, Arizona. (LACM).  
*giliae* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).  
*vitrina* (Neumoegen, 1891), (*Albana*)  
 Type-locality: Fort Calgary, Northwest British  
 Columbia. (NMNH).  
*deceptiva* (Beutenmüller, 1894), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).  
*giliae* race *woodgatei* Engelhardt, 1946  
 Type-locality: Fort Wingate, New Mexico.  
 (NMNH).  
*ithacae* (Beutenmüller, 1897), (*Sesia*)  
 Type-locality: Ithaca, New York. (AMNH).  
*mariona* (Beutenmüller, 1901), (*Sesia*)  
 Type-locality: Trimble Springs, Colorado. (NMNH).  
*mimuli* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (AMNH).  
*torrancia* Engelhardt, 1946, NEW SYNONYMY  
 Type-locality: Tarrant County, New Mexico.  
 (NMNH).  
*odda* Duckworth and Eichlin, 1977  
 Type-locality: Edgefield County, South Carolina.  
 (NMNH).  
*ogalala* Engelhardt, 1946  
 Type-locality: Durango, Colorado. (NMNH).  
*phoradendri* Engelhardt, 1946  
 Type-locality: San Antonio, Texas. (NMNH).

- prosopis* (Henry Edwards, 1882b), (*Aegeria*)  
 Type-locality: Fort Grant, Arizona. (AMNH).
- pyralidiformis* (Walker, 1856), (*Aegeria*)  
 Type-locality: United States. (BMNH).
- nigella* (Hulst, 1881), (*Sesia*)  
 Type-locality: Fairport, Western New York.  
 (AMNH).
- pyralidiformis* variety *aurantis* Engelhardt, 1946  
 Type-locality: Mobile, Alabama. (NMNH).
- querci* (Henry Edwards, 1882a), (*Aegeria*)  
 Type-locality: St. Grand, Arizona. (AMNH).
- comes* (Heinrich, 1920), (*Podosesia*)  
 Type-locality: British Corral, Arizona. (NMNH).
- rubricincta* (Beutenmüller, 1909), (*Sesia*), NEW COM-  
 BINATION  
 Type-locality: Palmerlee, Cochise County, Arizona.  
 (NMNH).
- subaerea* (Henry Edwards, 1883), (*Pyrrhotaenia*), NEW  
 COMBINATION  
 Type-locality: Arizona. (NMNH).
- suffusata* Engelhardt, 1946  
 Type-locality: McAlester, Pittsburg County,  
 Oklahoma. (NMNH).
- tecta* (Henry Edwards, 1882a), (*Aegeria*)  
 Type-locality: Prescott, Arizona. (NMNH).
- texana* (Henry Edwards, 1881), (*Pyrrhotaenia*)  
 Type-locality: Texas. (NMNH).
- wittfeldii* (Henry Edwards, 1883), (*Pyrrhotaenia*)  
 Type-locality: Indian River, Florida. (AMNH).
- verecunda* (Henry Edwards, 1881), (*Aegeria*)  
 Type-locality: Colorado. (MSU).
- nigra* Beutenmüller, 1894  
 Type-locality: Utah. (AMNH).
- florissantella* (Cockerell, 1908), (*Sesia*)  
 Type-locality: Florissant, Colorado. (NMNH).
- hirsuta* (Engelhardt, 1946), (*Euhagena*), NEW SYN-  
 ONYMY  
 Type-locality: Davis Mountains, Texas, 5,000 ft.  
 (NMNH).
- welleræ* Duckworth and Eichlin, 1976  
 Type-locality: Cuiteco, Chihuahua, Mexico. (NMNH)

## PENSTEMONIA ENGELHARDT

*Penstemonia* Engelhardt, 1946 — Type-species: *Aegeria edwardsii* Beutenmuller, 1894, original designation.

Diagnostic Characters.—Head with rudimentary proboscis. Forewing with veins  $R_1$  and  $R_2$  confluent at wing margin. Genitalia of the *Carmenta* type. Male genitalia with valva having distal end of crista sacculi downcurved; saccus elongate, more than one-half length of valva. Female genitalia with ductus bursae elongate, sclerotized except for short section entering corpus bursae; ductus seminalis arising near corpus bursae.

Discussion.—*Penstemonia* contains four species. The larvae are borers in the stems and roots of various species of *Penstemon* (Scrophulariaceae).

*clarkei* Engelhardt, 1946

Type-locality: The Dalles, Oregon. (NMNH).

*dammersi* Engelhardt, 1946

Type-locality: Mt. Wilson, California. (NMNH).

*brevifolia* Engelhardt, 1946, NEW SYNONYMY

Type-locality: Greenhorn Mountains, California. (NMNH).

*edwardsii* (Beutenmüller, 1894), (*Aegeria*)

Type-locality: Denver, Colorado. (NMNH).

*utahensis* (Beutenmüller, 1909), (*Sesia*)

Type-locality: St. George, Washington County, Utah. (NMNH).

*hennei* Engelhardt, 1946

Type-locality: San Bernardino County, California. (NMNH).

## ALCATHOE HENRY EDWARDS

*Alcathoe* Henry Edwards, 1882a — Type-species: *Aegeria caudata* Harris, 1839, original designation.

Diagnostic Characters.—Head with third segment of labial palpus one-half to two-thirds length of second segment; proboscis about three times length of labial palpus. Forewing with veins  $R_1$  and  $R_2$  coalescing to form a single vein. Abdomen of male uniquely with long, slender, flexible, scaled process arising dorsomedially at posterior end of eighth segment, not present on female. Male genitalia with valva broad, rounded apically, distal portion of crista sacculi curved toward ventral margin of valva as

in *Carmenta*, continuing back toward base of valva as sinuous, unscaled ridge; saccus broad, about one-fifth or more as wide as long, somewhat truncate apically. Female genitalia with ductus bursae sclerotized for more than one-half its length.

Discussion.—Based on a comparison of the genitalia, *Alcathoe* is closely related to *Carmenta*. The larvae of species of *Alcathoe* are borers in the roots and stems of species of *Clematis* (Ranunculaceae), so far as is known. There is a one year life-cycle, and pupation takes place in gall-like swellings in the host plant. The adults appear to mimic pepsid wasps both in color patterns and flight behavior.

North of Mexico this genus contains four species, with more species occurring in Mexico.

*carolinensis* Engelhardt, 1925b

Type-locality: Black Mountains, North Carolina. (AMNH).

(This is probably an erroneous locality.)

*autumnalis* Engelhardt, 1946, NEW SYNONYMY

Type-locality: San Antonio, Texas. (NMNH).

*caudata* (Harris, 1839), (*Aegeria*)

Type-locality: Massachusetts. (lost).

*caudatum* aberration *walkeri* Neumoegen, 1894

Type-locality: Jamaica, Long Island, New York. (NMNH).

*caudata* race *annettella* Engelhardt, 1946

Type-locality: Cincinnati, Ohio. (NMNH).

*pepsioides* Engelhardt, 1925b

Type-locality: Durango, Colorado. (NMNH).

*pepsioides atra* Engelhardt, 1925b

Type-locality: Jemez Springs, New Mexico, 7,000 ft. (NMNH).

*pepsioides ferrugata* Engelhardt, 1946

Type-locality: Rifle, Colorado. (NMNH).

*verruugo* (Druce, 1884), (*Sannina*)

Type-locality: Esperanza, Mexico. (BMNH).

*verruugo corvinus* Engelhardt, 1946

Type-locality: Arroyo Seco, S. Pasadena, California. (NMNH).

### ***HYMENOCLEA* ENGELHARDT**

*Hymenoclea* Engelhardt, 1946 — Type-species: *Sesia palmii*  
Beutenmüller, 1902, original designation.

**Diagnostic Characters.**—A monobasic genus closely related to *Alcathoe*, but *Hymenoclea* males lack the long caudal appendage. Head with maxillary palpus having two segments nearly equal in size, second positioned laterally on first; third segment of labial palpus nearly subequal to second segment; proboscis about two times length of labial palpus; antenna of male with relatively long ventral cilia. Much sexual dimorphism in color patterns. Forewing with veins  $R_1$  and  $R_2$  coalescing to form a single vein as for *Alcathoe*. Genitalia similar to *Alcathoe* species.

**Discussion.**—*Hymenoclea* consists of a single species, the larva of which bores in the roots of burrobrush (*Hymenoclea* spp., Asteraceae). It is presently known from Arizona and western Texas.

*palmii* (Beutenmüller, 1902), (*Sesia*)

Type-locality: Phoenix, Arizona. (NMNH).

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APPENDIX  
CHECKLIST OF NORTH AMERICAN SESIIDAE

Subfamily *Tinithinae* Le Cerf  
Tribe *Pennisetiinae* Dehne

*Pennisetia* Dehne

- marginata* (Harris), n. comb.
- pleciaeformis* (Walker)
- odyneripennis* (Walker)
- rubi* (Riley)
- flavipes* (Hulst)
- marginata albicoma* (Hulst)

Tribe *Tinithini* Le Cerf

- |                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li><i>Zenodorus</i> Grote and Robinson</li> <li><i>canescens</i> Hy. Edwards</li> <li><i>canescens sidae</i> Engelhardt</li> <li><i>heucherae</i> Hy. Edwards</li> <li><i>potentillae</i> Hy. Edwards</li> <li><i>maculipes</i> Grote and Robinson</li> <li><i>mexicanus</i> Beutenmüller</li> </ul> | <ul style="list-style-type: none"> <li><i>palmii</i> (Neumoegen)</li> <li><i>palmiana</i> (Dalla Torre)</li> <li><i>wissadulae</i> Engelhardt, n. syn.</li> <li><i>palmii sphaeralceae</i> Engelhardt</li> <li><i>palmii incanae</i> Engelhardt</li> <li><i>rubens</i> Engelhardt</li> <li><i>canescens bezari</i> Engelhardt, n. syn.</li> <li><i>sidalceae</i> Engelhardt</li> </ul> |
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Subfamily *Paranthreninae* Niculescu

Tribe *Cissuvorini* Duckworth and Eichlin, n. tribe

- Cissuvora* Engelhardt
- ampelopsis* Engelhardt

Tribe *Paranthrenini* Niculescu

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li><i>Paranthrene</i> Hübner</li> <li><i>asilipennis</i> (Boisduval)</li> <li><i>denudatum</i> (Harris)</li> <li><i>vespipenne</i> (Herrich-Schäffer)</li> <li><i>bombyciformis</i> (Walker)</li> <li><i>championi</i> (Druce)</li> <li><i>dollii</i> (Neumoegen)</li> <li><i>dollii castaneum</i> (Beutenmüller)</li> <li><i>dollii fasciventris</i> Engelhardt</li> <li><i>fenestrata</i> Barnes and Lindsey</li> <li><i>robiniae</i> (Hy. Edwards)</li> <li><i>perlucida</i> (Busck)</li> <li><i>robiniae palescens</i> Engelhardt</li> <li><i>simulans</i> (Grote)</li> <li><i>palmii</i> (Hy. Edwards), n. syn.</li> <li><i>luggeri</i> (Hy. Edwards)</li> </ul> | <ul style="list-style-type: none"> <li><i>tabaniformis</i> (Rottemburg)</li> <li><i>asiliformis</i> (Denis &amp; Schiffermüller)</li> <li><i>tricincta</i> (Harris), n. syn.</li> <li><i>serratiformis</i> (Freyer)</li> <li><i>denotata</i> (Hy. Edwards), n. syn.</li> <li><i>tricincta oslari</i> Engelhardt, n. syn.</li> <li><i>Vitacea</i> Engelhardt</li> <li><i>admiranda</i> (Hy. Edwards)</li> <li><i>cupressi</i> (Hy. Edwards)</li> <li><i>polistiformis</i> (Harris)</li> <li><i>seminole</i> (Neumoegen)</li> <li><i>polistiformis huron</i> Engelhardt</li> <li><i>scepsiformis</i> (Hy. Edwards)</li> <li><i>Albuna</i> Hy. Edwards</li> <li><i>fraxini</i> (Hy. Edwards)</li> <li><i>morrisoni</i> (Hy. Edwards)</li> <li><i>fraxini vitriosa</i> Engelhardt</li> </ul> |
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*pyramidalis* (Walker)  
*hylotomiformis* (Walker)  
*nomadaepennis* (Boisduval)  
*rubescens* (Hulst)  
*montana* Hy. Edwards  
*tanaceti* Hy. Edwards  
*vancouverensis* Hy. Edwards  
*coloradensis* Hy. Edwards  
*torva* Hy. Edwards  
*beutenmuelleri* Skinner

*Euhagena* Hy. Edwards  
*emphytiformis* (Walker), n. comb.  
*solituda* (Hy. Edwards), n. syn.  
*nebraskae* Hy. Edwards  
*coloradensis* (Beutenmüller)  
*nebraskae mormoni* Engelhardt  
*nebraskae intensa* Engelhardt

#### Subfamily *Sesiinae* Boisduval

##### Tribe *Melittiini* Le Cerf

*Melittia* Hubner  
*calabaza* Duckworth and Eichlin  
*gloriosa* Hy. Edwards  
*superba* Barnes and Lindsey  
*lindseyi* Barnes and Benjamin  
*barnesi* Dalla Torre

*grandis* (Strecker)  
*beckeri* Druce  
*grandis hermosa* Engelhardt  
*magnifica* Beutenmüller  
*satyriniformis* Hübner  
*cucurbitae* (Harris)  
*ceto* (Westwood)  
*amoena* Hy. Edwards  
*snowii* Hy. Edwards

##### Tribe *Sesiini* Boisduval

*Sesia* Fabricius  
*apiformis* (Clerck)  
*crabroniformis* Denis and Schiffermüller  
*tibialis* (Harris), n. comb.  
*flavitibia* (Walker)  
*pacificum* (Hy. Edwards)  
*californicum* (Neumoegen)  
*tibialis dyari* (Cockerell)  
*tibialis anonyma* (Strand)  
*tibialis melanoformis* Engelhardt

##### Tribe *Osminiini* Duckworth and Eichlin, n. tribe

*Calasesia* Beutenmüller  
*coccinea* (Beutenmüller)

*Osminia* Le Cerf  
*ruficornis* (Hy. Edwards), n. comb.  
*minuta* (Hy. Edwards)  
*candescens* (Hy. Edwards)  
*marcia* (Druce), n. syn.

Tribe *Synanthesdonini* Niculescu

*Synanthesdon* Hübner

- acerni* (Clemens)  
*acericolum* (Germadius)  
*tepperi* (Hy. Edwards)  
*acerni buscki* (Engelhardt)  
*acerrubri* Engelhardt  
*albicornis* (Hy. Edwards)  
*alleri* (Engelhardt), n. comb.  
*arctica* (Beutenmüller)  
*arkansasensis* Duckworth and Eichlin  
*arizonensis* (Beutenmüller)  
*bibionipennis* (Boisduval)  
*rutilans* (Hy. Edwards)  
*lupini* (Hy. Edwards)  
*perplexa* (Hy. Edwards)  
*impropria* (Hy. Edwards)  
*aureola* (Hy. Edwards)  
*neglecta* (Hy. Edwards)  
*washingtonia* (Hy. Edwards)  
*hemizoniae* (Hy. Edwards)  
*madariae* (Hy. Edwards)  
*bolteri* (Hy. Edwards)  
*canadensis* Duckworth and Eichlin  
*castaneae* (Busck)  
*chrysidipennis* (Boisduval)  
*tacoma* (Beutenmüller)  
*chrysidipennis wallowa*  
 (Engelhardt)  
*culiciformis* (Linnaeus)  
*culiciformis americana*  
 (Beutenmüller)  
*decipiens* (Hy. Edwards)  
*imperfecta* (Hy. Edwards)  
*nicotianae* (Hy. Edwards)  
*rubristigma* (Kelicott)  
*dominicki* Duckworth and Eichlin  
*exitiosa* (Say)  
*persica* (Thomas)  
*pepsidiformis* (Hübner)  
*xiphiaeformis* (Boisduval)  
*graefi* (Hy. Edwards)  
*opalescens* (Hy. Edwards)  
*exitiosa fitchii* (Hy. Edwards)  
*pacifica* (Riley)  
*exitiosa luminosa* (Neumoegen)  
*exitiosa edwardsii* (Beutenmüller)  
*graefi barnesii* (Beutenmüller)  
*fatifera* Hodges  
*fulvipes* (Harris)  
*helenis* (Engelhardt), n. comb.  
*geliformis* (Walker)  
*kathya* Duckworth and Eichlin

- mellinipennis* (Boisduval)  
*artemisiae* (Hy. Edwards)  
*seneciodes* (Hy. Edwards)  
*novaroensis* (Hy. Edwards)  
*piceae* (Dyar)  
*brunneri* (Busck)  
*pictipes* (Grote and Robinson)  
*inusetata* (Hy. Edwards)  
*polygomi* (Hy. Edwards)  
*fragariae* (Hy. Edwards), n. syn.  
*helianthi* (Hy. Edwards)  
*achillae* (Hy. Edwards)  
*eremocarpi* (Hy. Edwards)  
*meadii* (Hy. Edwards)  
*orthocarpi* (Hy. Edwards)  
*praestans* (Hy. Edwards), n. syn.  
*behrensii* (Hy. Edwards)  
*animosa* (Hy. Edwards)  
*elda* (Hy. Edwards)  
*fragariae semipraestans* (Cockerell)  
*pini* (Kelicott), n. comb.  
*proxima* (Hy. Edwards)  
*modesta* (Kelicott)  
*pyri* (Harris)  
*koebeleri* (Hy. Edwards)  
*refulgens* (Hy. Edwards)  
*marica* (Beutenmüller), n. syn.  
*seminole* (Beutenmüller)  
*resplendens* (Hy. Edwards)  
*rhododendri* (Beutenmüller)  
*richardsi* (Engelhardt), n. comb.  
*rileyana* (Hy. Edwards)  
*brunneipennis* (Hy. Edwards)  
*hyperici* (Hy. Edwards)  
*austini* (Engelhardt), n. syn.  
*rubrofascia* (Hy. Edwards)  
*sapygaeformis* (Walker)  
*floridensis* (Grote)  
*saxifragae* (Hy. Edwards)  
*henshawii* (Hy. Edwards)  
*scitula* (Harris)  
*gallivorum* (Westwood)  
*hospes* (Walsh)  
*corusca* (Hy. Edwards)  
*aemula* (Hy. Edwards)  
*sequoiae* (Hy. Edwards), n. comb.  
*superba* (Hy. Edwards)  
*pinorum* (Behrens)  
*sigmoidea* (Beutenmüller)  
*tipuliformis* (Clerck)  
*viburni* Engelhardt, n. comb.

*Palma* Beutenmüller  
*praecedens* (Hy Edwards)  
*Podosesia* Möschler  
*syringae* (Harris)  
*longipes* (Möschler)  
*frazini* (Lugger)  
*Sannina* Walker  
*uroceriformis* Walker  
*quinquecaudata* (Ridings)  
*uroceripennis* Boisduval  
*Carmenta* Hy. Edwards  
*albociliata* (Engelhardt)  
*anthracipennis* (Boisduval)  
*sanborni* Hy. Edwards  
*morula* (Hy. Edwards)  
*apache* Engelhardt  
*arizonae* (Beutenmüller)  
*auritincta* (Engelhardt)  
*bassiformis* (Walker)  
*lustrans* (Grote)  
*aureopurpura* (Hy. Edwards),  
n. syn.  
*bolli* (Hy. Edwards)  
*sexfasciata* (Hy. Edwards)  
*consimilis* (Hy. Edwards)  
*eupatorii* (Hy. Edwards)  
*imitata* (Hy. Edwards)  
*corni* (Hy. Edwards)  
*infirmata* (Hy. Edwards)  
*engelhardti* Duckworth and Eichlin  
*giliae* (Hy. Edwards)  
*vitrina* (Neumoegen)  
*deceptiva* (Beutenmüller)  
*giliae woodgatei* Engelhardt  
*ithacae* (Beutenmüller)  
*mimuli* (Hy. Edwards)  
*torrancia* Engelhardt, n. syn.  
*mariona* (Beutenmüller)  
*odda* Duckworth and Eichlin

*ogalala* Engelhardt  
*phoradendri* Engelhardt  
*prosopis* (Hy. Edwards)  
*pyralidiformis* (Walker)  
*nigella* (Hulst)  
*pyralidiformis aurantis* Engelhardt  
*querci* (Hy. Edwards)  
*comes* (Heinrich)  
*rubricincta* (Beutenmüller), n. comb.  
*subaerea* (Hy. Edwards), n. comb.  
*suffusata* Engelhardt  
*tecta* (Hy. Edwards)  
*texana* (Hy. Edwards)  
*wittfeldii* (Hy. Edwards)  
*verecunda* (Hy. Edwards)  
*nigra* Beutenmüller  
*florissantella* (Cockerell)  
*hirsuta* (Engelhardt), n. syn.  
*welleriae* Duckworth and Eichlin  
*Pentstemonia* Engelhardt  
*clarkei* Engelhardt  
*dammersi* Engelhardt  
*brevifolia* Engelhardt, n. syn.  
*edwardsii* (Beutenmüller)  
*utahensis* (Beutenmüller)  
*hennei* Engelhardt  
*Alcathoe* Hy. Edwards  
*carolinensis* Engelhardt  
*autumnalis* Engelhardt, n. syn.  
*caudata* (Harris)  
*caudatum walkeri* Neumoegen  
*caudata annetella* Engelhardt  
*pepsioides* Engelhardt  
*pepsioides atra* Engelhardt  
*pepsioides ferrugata* Engelhardt  
*verruco* (Druce)  
*verruco corvinus* Engelhardt  
*Hymenoclea* Engelhardt  
*palmii* (Beutenmüller)



PHOTO BY C. S. PAPP

Drs. Duckworth and Eichlin have been collaborating for several years on studies of the taxonomy and biosystematics of Western Hemisphere clearwing moths and have co-authored various research papers on this topic.

Dr. W. Donald Duckworth has been a research entomologist with the National Museum of Natural History, Smithsonian Institution for the past 15 years. As a Lepidopterist, his primary responsibility is in the Yponomeutoidea, with most research production in the Stenomidae and Sesiidae. Don currently spends about 50% of his time in administrative activities serving as Special Assistant to the Director working primarily on the development of a new museum support facility. He also takes a very active role in professional societies and participates on various national committees. Dr. Duckworth has conducted field studies throughout Central and South America and serves as Executive Director for the Association for Tropical Biology. Don, married and with three children, was born in Athens, Tennessee. He received his B. Sc. from Middle Tennessee State University and the M. Sc. and Ph. D. from North Carolina State University.

Dr. Thomas D. Eichlin came on the staff of the California Department of Food and Agriculture as a Systematic Entomologist four years ago after two years as a Research Fellow with the Smithsonian Institution. Additional biographical information on Tom was presented in the *Occasional Papers in Entomology*, No. 21, 1975.