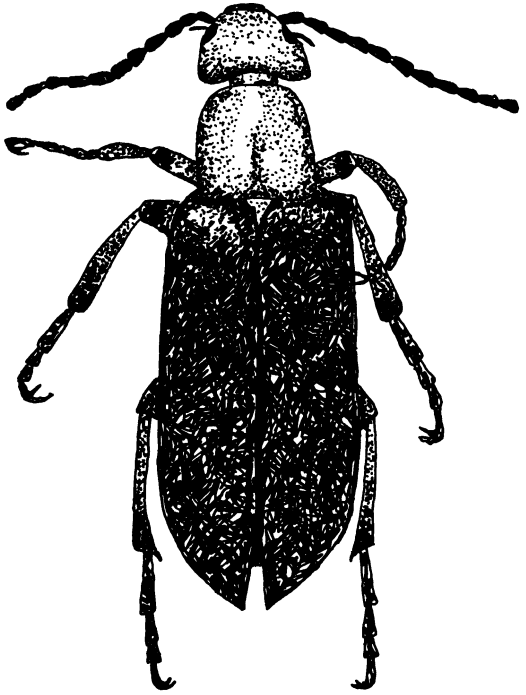

# Blister Beetles of Oklahoma

oklahoma state university
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## ERRATA

The following symbols were omitted from the chart on pages 18-19:

Keys 33 (species *albida*), 35 (species *torsa*) and 36 (species *fabricii* and *murina*) should be followed by the symbol for male (♂).

Keys 37 (species *fabricii*) and 43 (species *albida*) should be followed by the symbol for female (♀).

**Cover:** *Zonitis atripennis atripennis* (Say)

# Blister Beetles (Coleoptera:Meloidae) of Oklahoma

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## Introduction

Blister beetles may, at times, be quite important as crop pests. They are known to attack cotton, alfalfa, soybeans, peanuts and a number of garden crops. They may also be an animal health hazard. Dead beetles in alfalfa hay have been known to kill horses. The members of the genus *Epicauta* and probably all of the Epicautina can be considered beneficial as larvae because they feed on the eggs of grasshoppers. All the other groups probably feed on the stored food and eggs of wild bees.

The life cycle of all blister beetles for which details are known is quite complex. In general, the first instar larva is active and searches out a food supply. Later instars become more and more immobile until a hardened larval skin develops. The larva passes the winter thus protected. In the spring or summer the insect molts to a normal larva, pupates, and the adult emerges.

The arrangement of the higher taxa follows Selander (1964). The arrangement of the intrageneric taxa follows the latest worker in each genus.

As synonymy in most groups is readily available in the literature, it will not be presented in this paper. The distribution records listed for each species were also taken from the literature. Important papers including synonymy and distribution are those of Dillon (1952), Enns (1956), Linsley (1942), MacSwain (1952, 1958), Pinto and Selander (1970), Selander (1955, 1956, 1960, 1963), Selander and Mathieu (1969), VanDyke (1928, 1930), Werner (1943, 1944, 1945, 1949, 1953), and Werner, Enns, and Parker (1966).

The data for species listed in this publication came from the following sources: K. C. Emerson Museum, Oklahoma State University; the museum at the University of Oklahoma; the museum at Panhandle State University; the author's personal collections; and the literature. A total of 67 species and subspecies is recorded from Oklahoma and 5 additional species are included because their distribution is such that they probably occur here.

Hosts are included for both larvae and adults if they are known. Adult host plants are restricted to those on which beetles are known to feed in Oklahoma, but larval host records for the entire range of the species are included because these are not as well known as the adult hosts.

### Acknowledgments

I wish to express my sincere appreciation to the following: W. A. Drew for critically reading the manuscript; C. E. Hopla for use of facilities and specimens; F. G. Werner, R. B. Selander, W. R. Enns, J. M. Mathieu and J. D. Pinto for identifying and confirming specimens; J. H. Young, D. G. Bottrell, K. F. Schaefer, R. D. Eikenbary, J. H. Pickle and D. R. Molnar for collecting specimens; and to D. R. Molnar for the photographs (figures 35-52).

## County records

County records for each species are given as two letters (e.g., PH for panhandle, NW for northwest) followed by a number. This results in a combination such as NW 5. NW 5 refers to Woodward county, the fifth county in the northwest area of the state. Counties are listed alphabetically in the following list. Each is followed by its letter-number designation (see also figure 1).

## County identification

| | | | |
|---|---|---|---|
| Adair | NE 11 | LeFlore | SE 3 |
| Alfalfa | NW 3 | Lincoln | NC 13 |
| Atoka | SE 5 | Logan | NC 8 |
| Beaver | PH 3 | Love | SC 15 |
| Beckham | SW 1 | Major | NW 6 |
| Blaine | NW 9 | Marshall | SC 16 |
| Bryan | SC 17 | Mayes | NE 6 |
| Caddo | SW 3 | McClain | SC 2 |
| Canadian | NC 11 | McCurtain | SE 7 |
| Carter | SC 12 | McIntosh | NE 15 |
| Cherokee | NE 10 | Murray | SC 13 |
| Choctaw | SE 8 | Muskogee | NE 13 |
| Cimarron | PH 1 | Noble | NC 5 |
| Cleveland | SC 3 | Nowata | NE 2 |
| Coal | SC 10 | Okfuskee | NC 14 |
| Comanche | SW 8 | Oklahoma | NC 12 |
| Cotton | SW 10 | Okmulgee | NE 12 |
| Craig | NE 3 | Osage | NC 3 |
| Creek | NC 10 | Ottawa | NE 4 |
| Custer | NW 10 | Pawnee | NC 6 |
| Delaware | NE 7 | Payne | NC 9 |
| Dewey | NW 8 | Pittsburg | SE 1 |
| Ellis | NW 4 | Pontotoc | SC 9 |
| Garfield | NC 4 | Pottawatomie | SC 4 |
| Garvin | SC 8 | Pushmataha | SE 6 |
| Grady | SC 1 | Roger Mills | NW 7 |
| Grant | NC 1 | Rogers | NE 5 |
| Greer | SW 5 | Seminole | SC 5 |
| Harmon | SW 4 | Sequoyah | NE 14 |
| Harper | NW 1 | Stephens | SC 7 |
| Haskell | SE 2 | Texas | PH 2 |
| Hughes | SC 6 | Tillman | SW 9 |
| Jackson | SW 7 | Tulsa | NE 8 |
| Jefferson | SC 11 | Wagoner | NE 9 |
| Johnston | SC 14 | Washington | NE 1 |
| Kay | NC 2 | Washita | SW 2 |
| Kingfisher | NC 7 | Woods | NW 2 |
| Kiowa | SW 6 | Woodward | NW 5 |
| Latimer | SE 4 | | |

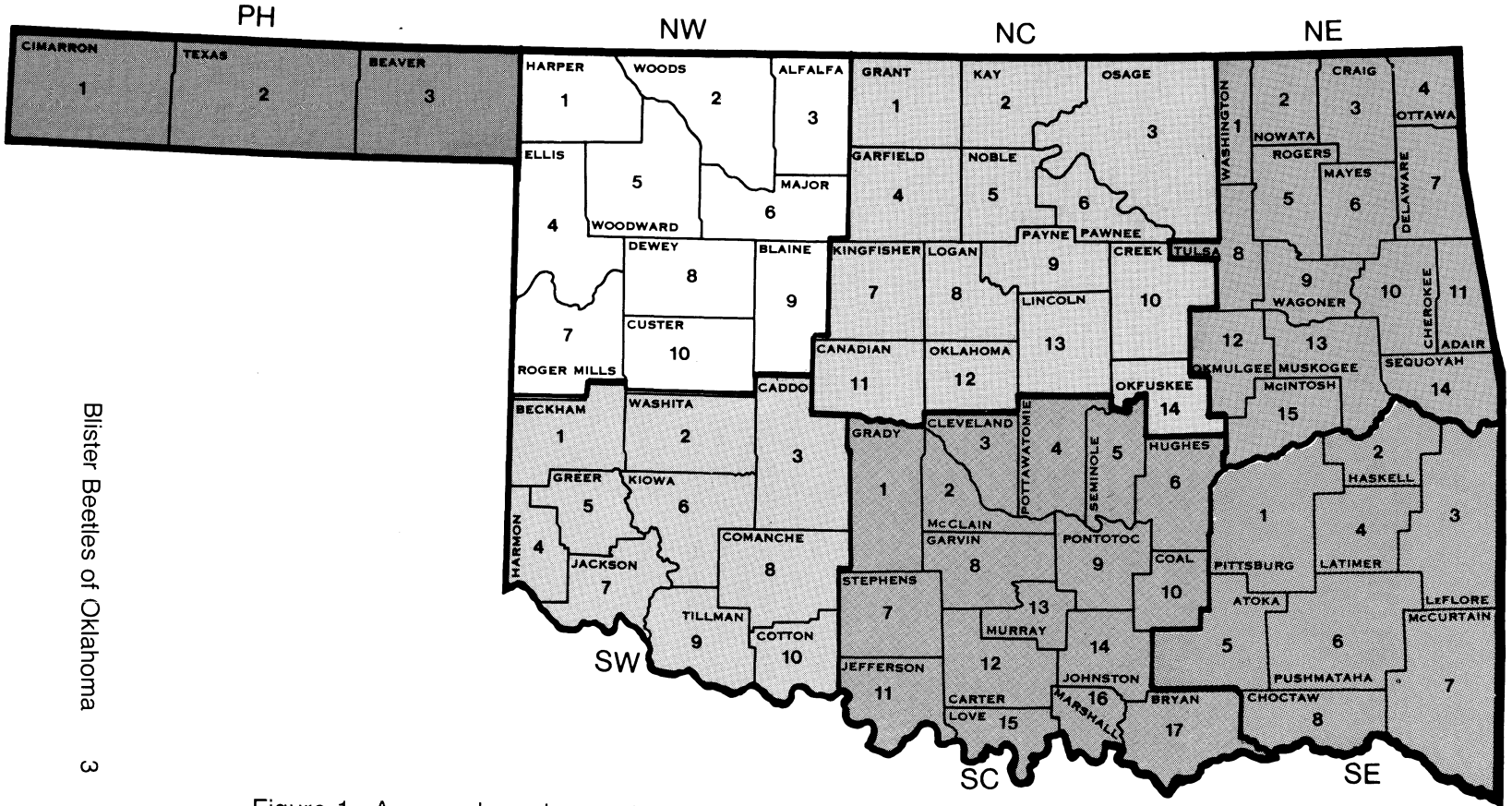



Figure 1: Area and number system used to designate counties for county records

# Systematics

## Family Meloidae

**Characteristics.** Head narrowed behind eyes into a neck. Pronotum generally narrower than the base of the elytra, usually narrowest at apex. Tarsal formula 5-5-4. Tarsi slender, almost always with narrow pads beneath segments. Claws each with a ventral blade, tooth or spine, often with a double row of fine teeth ventrally. Elytra entire or short, rarely connate along suture. Wings normal, rarely reduced, or absent. Abdomen with six visible sternites, the sutures entire. Male genitalia of the modified sheath type, penis large, often with one to three hooks distally. Female genitalia very short, lacking long membranous tube.

### KEY TO THE SUBFAMILIES

| Key | Description | Subfamily | Page |
|---|---|---|---|
| 1. | Tarsal claws cleft to base, without serrations (figure 2). | Meloinae | 5 |
| | Tarsal claws cleft to base, with serrations on upper blade (figure 3) or simple, not serrate, with a much reduced tooth near base (figure 4) and elytra very short. | Nemognathinae | 31 |

# Subfamily Meloinae

Characteristics. Head usually wider than prothorax. Maxillae unmodified. Spurs of pro- and mesotibiae as well as those of the metatibiae, often variously modified or entirely absent. Claws divided but not serrate.

## KEY TO THE GENERA

[modified from Arnett, 1962]

| Key | Description | Genera | Page | See |
|---|---|---|---|---|
| 1 | Profemora with patch of golden pubescence on under side. | | | 2 |
| | Profemora without patch of golden pubescence. | | | 3 |
| 2 | Elytra with raised costae (figure 46). | *Pleuropompha* | 30 | |
| | Elytra without raised costae. | *Epicauta* | 14 | |
| 3 | Antennae filiform, several apical segments cylindrical (figure 36). | *Pyrota* | 8 | |
| | Antennae robust externally, several apical segments moniliform or flattened (figure 37). | | | 4 |
| 4 | Inner edge of protibiae covered with dense, sericeous, brownish pubescence. | *Linsleya* | 13 | |
| | Inner edge of protibiae without sericeous pubescence. | | | 5 |
| 5 | Elytra meeting along suture. | *Lytta* | 12 | |
| | Elytra overlapping along suture near the base. | *Meloe* | 5 | |

## TRIBE MELOINI

### GENUS *MELOE* LINNAEUS

Characteristics. Moderate sized. Color black or metallic greenish, bluish or purplish black. Eyes small, not prominent. Elytra abbreviated, divergent apically, imbricate along suture. Hind wings absent.

## KEY TO THE SPECIES

[modified from Pinto and Selander, 1970]

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 1 | Last four antennal segments more slender than those immediately preceding. Male antennal segments V-VII distorted, semicircularly arranged (figure 35). Scutellum usually produced posteriorly. | | | 2 |
| | Last four antennal segments thicker than those immediately preceding, the intermediate segments unmodified in the male. Posterior margin of scutellum straight or shallowly emarginate. | *laevis* | 7 | |
| 2 | Head and pronotum finely, sparsely punctate. | *americanus* | 8 | |
| | Head and pronotum varying from finely and moderately densely punctate to coarsely and densely punctate. | | | 3 |
| 3 | Outer spur of metatibiae straight in lateral view (figure 5). Sides of pronotum obviously rounded in apical half, subparallel basally. | *campanicollis* | 7 | |
| | Outer spur of metatibiae with apical portion produced anteriorly (figure 6). Sides of pronotum not as above. | | | 4 |
| 4 | Male antennal segment V with a poorly defined, elongate platform at apex (figure 7), VI only slightly wider than long. Female with last segment of maxillary palpi at most as long as segment II. Sixth sternite usually entire. | *niger* | 7 | |
| | Male antennal V with a well-defined platform at apex (figure 8), VI about 1/4 wider than long. Female with last segment of maxillary palpi about 1/6 longer than segment II. Sixth abdominal sternum feebly emarginate. | *dianella* | 8 | |

## Subgenus *Treiodous* Duges

### *Meloe laevis* Leach

**Characteristics.** Color black, surface moderately shiny. Prothorax about as long as wide, sides straight and slightly convergent behind, very finely and sparsely punctured. Elytra smooth to moderately rugulose. Length to end of elytra 8 to 17 mm.

**Distribution.** Columbia and Venezuela north through Central America and Mexico to Arizona, Wyoming and Nebraska.

**Oklahoma county records.** None, but should occur in the Panhandle.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## Subgenus *Meloe* Linnaeus

### *Meloe campanicollis* Pinto and Selander

**Characteristics.** Color black to feebly metallic green or blue, surface generally opaque, rarely slightly shiny. Prothorax as long as wide, punctures rather dense anteriorly, larger and sparser posteriorly. Elytra moderately rugose. Pygidium broadly to sub-acutely rounded. Sixth abdominal sternite broadly emarginate in males, feebly emarginate in females. Length to end of elytra 8 to 17 mm.

**Distribution.** Nebraska east to Massachusetts, south to Texas, Mississippi and northern Georgia.

**Oklahoma county records.** NW 7; NC 8, 9, 12; SW 8; SC 3. November 2 to April 18.

**Larval hosts.** Unknown.

**Adult hosts.** One specimen was taken in an alfalfa field and another in a wheat field but these may not actually be host plants.

### *Meloe niger* Kirby

**Characteristics.** Color black to moderately metallic blue or green, surface opaque to moderately shiny. Prothorax slightly broader than long, rather coarsely and densely punctured at sides and in front, more sparsely at center, sides straight or broadly arcuate. Elytra obsolescently rugose. Pygidium broadly rounded to angulate. Sixth abdominal sternite broadly, rather shallowly emarginate in males, usually entire in females. Length to end of elytra 8 to 18 mm.

**Distribution.** Southern district of MacKenzie, central Ontario and Nova Scotia, Canada south to central California, southern Arizona and New Mexico, southwestern Texas, Oklahoma, northern Iowa and southeastern Pennsylvania.

**Oklahoma county records.** One specimen, Stillwater, Payne County, 20 April 1947, W. C. Rhoades.

**Larval hosts.** *Colletes fulgidus* Swenk (MacSwain, 1956).

**Adult hosts.** Unknown.

### *Meloe dianella* Pinto & Selander

**Characteristics.** Color black to feebly metallic green or blue, surface moderately shiny. Prothorax as long as wide, sides straight and gradually convergent posteriorly, often with a small impunctate area at center. Elytra obsolescently rugose. Pygidium subtriangular. Sixth abdominal sternite broadly to subacutely emarginate in males, feebly emarginate in females. Length to end of elytra 6 to 11 mm.

**Distribution.** British Columbia east to Nova Scotia and south to northern Utah, Texas, Kentucky, Pennsylvania and New Jersey.

**Oklahoma county records.** None, but should occur here.

**Larval hosts.** First instar larvae have been taken on the bees *Hylaeus modestus* Say, *Augochlorella pura pura* (Say), *Augochloropsis metallica metallica* (Fab.), *Halictus ligatus* Say, *Megachile brevis* Say, *Osmia georgica* Cresson, *O. pumila* Cresson, *Ceratina calcarata* Robertson and *C. dupla* Say in Illinois (Pinto and Selander, 1970) and some of these probably are hosts.

**Adult hosts.** Unknown.

### *Meloe americanus* Leach

Figure 35

**Characteristics.** Color almost entirely black to moderately metallic blue, surface opaque or feebly shiny. Prothorax usually longer than wide, sides sinuate posteriorly, convergent at base, punctures fine and sparse, especially at center. Elytra moderately to obsolescently rugose, sometimes with poorly defined punctures. Pygidium subtriangular, often notched apically, with a well-developed, narrow flange along posterior margin in females. Sixth abdominal sternite broadly emarginate, with a weak projection at center of emargination, in males, feebly emarginate in females. Length to end of elytra 7 to 17 mm.

**Distribution.** Eastern Nebraska east to southern Ontario and Connecticut, south to the Gulf Coast, then west to central Oklahoma and Texas.

**Oklahoma county records.** NC 9; NE 6; SC 14. October 15 to April 6.

**Larval hosts.** First instar larvae have been taken on the bees *Augochloropsis metallica metallica* (Fab.) and *Halictus ligatus* Say in Illinois (Pinto and Selander, 1970) and these may serve as hosts.

**Adult hosts.** Unknown. One specimen was taken under a log and another in leaf litter at the base of a tree trunk.

## TRIBE LYTTINI
## Subtribe Pyrotina

### GENUS *PYROTA* LeCONTE

**Characteristics.** Elongate, moderately slender, mostly moderate in size. Body coloring mostly yellowish, spotted or striped with blackish. Eyes transverse. Pronotum always longer than wide. Maxillary palpi in males variable in shape in the different species, sometimes unmodified, sometimes greatly expanded.

## KEY TO THE SPECIES

[modified from Dillon, 1952]

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 1 | Elytra maculate (figure 9, 10). | | | 2 |
| | Elytra vittate (figure 11). | | | 5 |
| 2 | Elytra with median fascia occupying two-fifths length of disk, basally each with two maculae, the humeral one very small or absent (figure 10). | *terminata* | 10 | |
| | Elytra with median fascia occupying only one-fifth length of disk, each basally with a fascia, or if bimaculate, the outer macula nearly as large as the inner (figure 9). | | | 3 |
| 3 | Metatibiae with both spurs rather robust, the outer one not twice as broad as inner (figure 12). Male with terminal segment of palpi scarsely enlarged, about equal to half width of labrum (figure 13). | *perversa* | 10 | |
| | Metatibiae with inner spur less than half as broad as outer (figure 14). Male with terminal segment of palpi strongly expanded, at least as wide as labrum (figure 15). | | | 4 |
| 4 | Antennal segment I at most nine-tenths as long as frontal interocular distance in male, four-fifths as long in female. | *concinna* | 10 | |
| | Antennal segment I longer than frontal interocular distance in male, nine-tenths as long in female. | *deceptiva* | 10 | |
| 5 | Elytra with suture pale. | *bilineata* | 11 | |
| | Elytra with suture dark (figure 11). | | | 6 |
| 6 | Scutellum, legs and body beneath blackish. | *invita* | 11 | |
| | Scutellum, legs largely and body beneath in part yellowish. | *discoidea* | 11 | |

### *Pyrota concinna* Casey

**Characteristics.** Color yellow. There are three transverse black bands on the elytra, the first often broken into four spots, two small black spots on the prothorax and scattered black markings on the underside. Metatibiae with outer spurs rather acute at apex. Length 10 to 14 mm.

**Distribution.** Zacatecas through Chihuahua, Mexico and south Texas north to southern Montana, east to Arkansas, west to southern Nevada and south into northeastern Sonora, Mexico.

**Oklahoma county records.** PH 2, 3; NW 1, 3, 4, 5, 6, 8, 10; NC 1, 2, 3, 4, 5, 8, 9, 11, 12, 13; NE 1, 2, 6; SW 2, 3, 7, 10; SC 1, 2, 3, 5, 9, 12, 16; SE 2. June 10 to October 11.

**Larval hosts.** Unknown.

**Adult hosts.** Collected on yellow-flowered composites. *Haplopappus ciliatus* (Nutt.) D. C. is the most common host, but I have a few specimens from *Solidago* sp., *S. petiolaris* Ait., *Gutierrezia Sarothrae* (Pursh) Britton & Rusby, *Helianthus annuus* L., and *Heterotheca latifolia* Buckl.

### *Pyrota deceptiva* Selander

**Characteristics.** Color as in *P. concinna,* except there are usually more black markings on the underside, the black marks on the prothorax are larger, there are usually two black spots on each side of the prothorax, and there are often black markings on the head. Outer hind tibial spur greatly thickened and obliquely truncate, two to three times as wide as inner spur, which is somewhat thickened. Length 10 to 20 mm.

**Distribution.** Neuvo Leon, Mexico, eastern Texas and Oklahoma.

**Oklahoma county records.** NW 5; NC 9; SW 7, 10; SC 1. August 11 to September 1.

**Larval hosts.** Unknown.

**Adult hosts.** One specimen was swept from alfalfa but this is probably not a host plant.

### *Pyrota perversa* Dillon

**Characteristics.** Color essentially as in *P. deceptiva.* Metatibial spurs robust, concave, the inner oval, and outer less than twice as broad, ovate. Length 13 to 18 mm.

**Distribution.** Parts of Texas, Oklahoma, Kansas and Nebraska.

**Oklahoma county records.** NW 6; NC 2, 4, 9, 12; NE 3; SW 7. July 18 to September 2.

**Larval hosts.** Unknown.

**Adult hosts.** I have two collections from *Haplopappus ciliatus* (Nutt.) D. C. and one from *Gutierrezia dracunculoides* (D. C.) Blake (Compositae).

### *Pyrota terminata* LeConte

**Characteristics.** Elytra, pronotum and front of head yellow. Rest of body and legs black. Black markings as follows: two small maculae between eyes; two maculae on pronotum and usually several smaller spots on edges; elytra each with a large black macula near the scutellar angle and sometimes a small macula near the humeral angle, a broad fascia from the basal two-fifths to the apical fifth and a narrow lunule at the apical margin. Metatibial spurs with apices obliquely truncate, concave, the inner one narrowly so, acute, the outer one broadly ovate, about twice as broad as inner. Length 13 to 18 mm.

**Distribution.** From Indiana and Mississippi to the Rocky mountains.
**Oklahoma county records.** PH 2; NC 5, 9; SW 5; SC 3. April 23 to September 30.
**Larval hosts.** Unknown.
**Adult hosts.** Unknown.

### *Pyrota discoidea* LeConte

**Characteristics.** Color orange. Elytra with three black stripes, one being along the suture and two black spots near the scutellar angles. Pronotum with two small black spots. Metatibial spurs acute, inner very slender, outer robust. Length 6.5 to 11 mm.

**Distribution.** Kansas to Texas.

**Oklahoma county records.** PH 2, 3; NW 1, 2, 4, 5, 6, 8, 9; NC 5, 12; SW 1, 3, 6, 8; SC 2, 3, 8, 11, 13, 15. May 4 to September 8.

**Larval hosts.** Unknown.

**Adult hosts.** Most commonly taken on *Callirhoe* spp. (Malvaceae) including *C. digitata* Nutt., *C. involucrata* (Nutt. ex Torr.) Gray and *C. leiocarpa* Martin. I also have a few specimens from *Oenothera serrulata* Nutt. and *O. lavandulaefolia* T. & G. (Onagraceae) and one from *Ambrosia* sp. (Compositae).

### *Pyrota invita* Horn

Figure 36

**Characteristics.** Color pale yellow. Elytra with three broad black stripes, one along the suture and two large black spots near the scutellar angles. Prothorax with a large black spot. Head mostly black. Metatibial spurs flattened on inner face, inner slender, outer robust, the apex narrowly oval. Length 8 to 16 mm.

**Distribution.** Texas and Oklahoma.

**Oklahoma county records.** PH 3; NW 6, 7; NC 9; NE 6; SW 1, 3, 6; SC 16, 17. June 7 to July 5.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Pyrota bilineata* Horn

**Characteristics.** Elytra pale yellow with four longitudinal black stripes. Head and thorax orange, usually with two small black spots on thorax. Metatibial spurs with apices strongly obliquely truncate, the inner blunt, parallel-sided, the outer four times as wide, its apex acute. Length 6 to 10 mm.

**Distribution.** Great Plains in Colorado and Nebraska to west Texas and northern Durango, Mexico, west through New Mexico and Arizona to southwestern Utah.

**Oklahoma county records.** PH 1, 3; NW 1, 5, 6; NC 3, 9; SC 1. August 3 to September 2.

**Larval hosts.** Unknown.

**Adult hosts.** I have two collections from *Helianthus* sp. and one from *Haplopappus ciliatus* (Nutt.) DC.

## GENUS *LYTTA* FABRICIUS

**Characteristics.** Head broader than long. Antennae basically moniliform. Tarsal claws cleft to base. Male sixth abdominal sternite emarginate, the emargination triangular or rounded.

## KEY TO THE SPECIES

[modified from Selander, 1960]

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 1 | Labrum deeply emarginate. Femora orange. | *aenea* | 13 | |
| | Labrum shallowly emarginate. Femora black. | | | 2 |
| 2 | Elytra black, strongly reticulate. | *reticulata* | 13 | |
| | Elytra orange or yellow, not reticulate. | | | 3 |
| 3 | Elytra entirely orange. | *fulvipennis* | 12 | |
| | Elytra yellow with black spots or short vittae. | *biguttata* | 12 | |

### Subgenus *Paralytta* Selander

### *Lytta fulvipennis* LeConte

Figure 37

**Characteristics.** Color black except for elytra which are orange. Head with a diamond-shaped orange frontal spot. Pronotum generally wider than long, widest at middle. Metatibiae with outer spur robust, truncate and concave apically, apex subrotund, much longer than inner spur, which is sublinear. Length 11 to 26 mm.

**Distribution.** Southern Texas to southwestern Nebraska and west to Arizona.

**Oklahoma county records.** NW 1, 2, 4, 5, 6, 8, 9; NC 7, 8, 9, 11; SW 3, 4, 6, 7, 10; SC 1, 2, 3. May 27 to July 20.

**Larval hosts.** Unknown.

**Adult hosts.** Taken almost exclusively from *Argemone polyanthemos* (Fedde) G. B. Ownb. (Papaveraceae), but I have one specimen found feeding on *Pyrrhopappus scaposus* D. C. (Compositae).

### *Lytta biguttata* LeConte

**Characteristics.** Elytra yellow, each with a brown or black spot or short vitta at apical fourth. Pronotum orange, finely margined with black, usually with a black spot on each side just before middle. Pronotum subcircular, nearly as wide as head. Metatibiae with outer spur robust, its apex truncate, concave, broadly ovate, longer than inner, which is narrow and acute. Length 7 to 12 mm.

**Distribution.** State of Mexico north to southern Utah and western Texas, thence north on the Great Plains to South Dakota and Montana.

**Oklahoma county records.** One specimen, Blaine County, 22 May 1960, D. C. Bailey.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

*Lytta reticulata* Say

Characteristics. Entirely black, no pale frontal spot on head. Pronotum subcircular, barely to one-tenth wider than long, disk convex. Elytra coarsely reticulate, most cells 0.5 mm. or more in diameter. Outer metatibial spur no longer than inner spur, two or three times as wide. Length 11 to 22 mm.

Distribution. Texas, north to Nebraska and Wyoming.

Oklahoma county records. PH 1, 2; NW 5. June 21 to August 22.

Larval hosts. Unknown.

Adult hosts. Taken from *Psoralea lanceolata* Pursh (Leguminosae) and *Mentzelia stricta* (Osterhout) Stevens ex. Jeffs and Little (Loasaceae).

## Subgenus *Pomphopoea* LeConte

*Lytta aenea* Say

Characteristics. Elytra usually metallic blue or green but may be metallic copper-green. Femora and tibiae orange, the femora often black at apex. Pronotum as long as wide, one-ninth narrower than head, sides subparallel to apical third, thence strongly narrowed to apex. Metatibial spurs short, truncate and excavated at apex, the outer one somewhat more robust than inner. Length 9 to 16 mm.

Distribution. The range of this species appears to be divided into two major segments, one extends from New Hampshire south to Alabama and west to Missouri; the other includes Oklahoma, eastern Texas and northwestern Louisiana.

Oklahoma county records. NW 7; NC 6, 7, 9; SW 4; SC 11, 13. March 23 to July 16.

Larval hosts. Unknown.

Adult hosts. One collection was from a pear tree.

## Subtribe Epicautina

## GENUS *LINSLEYA* MacSWAIN

Characteristics. Color black or metallic green or blue. Antennae strongly compressed, rather short. Metatibial spurs equally slender, acute, the inner spur longer. There is one species in Oklahoma.

## Subgenus *Linsleya* MacSwain

*Linsleya convexa* (LeConte)
Figure 38

Characteristics. Color black except elytra which are dark metallic blue or greenish-blue. Pronotum more or less bell-shaped. Male protibiae usually lacking spurs. Male profemora each with a large spinose tubercle ventrally at base. Length 5.5 to 14 mm.

Distribution. Chihuahua, Mexico and southern New Mexico to the Oklahoma panhandle and central Texas.

Oklahoma county records. PH 1; SW 4. June 18 to 25.

Larval hosts. Unknown.

Adult hosts. Unknown.

## GENUS *EPICAUTA* DEJEAN

**Characteristics.** Small to rather large, usually slender forms. Profemora with a dense patch of sericeous pubescence. Elytra normal except in *E. conferta* where they are abbreviated and connate along the suture. Hind wings present, except in *E. conferta.*

### KEY TO THE SPECIES

[modified from Werner, 1945 and Pinto, 1975]

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 1 | Second segment of antennae one-half as long as third or shorter (figure 16). | | | 2 |
| | Second segment of antennae two-thirds as long as third or longer (figure 17). | | | 32 |
| 2 | Pubescence gray, denuded in a number of spots (figure 42). | | | 3 |
| | Pubescence not denuded in small spots. | | | 8 |
| 3 | Spots small to medium, not confluent (figure 42). | | | 4 |
| | Spots large, in part confluent. | *andersoni* | 24 | |
| 4 | Cuticle of tibiae and tarsi yellow brown, that of femora and rest of body dark brown or black. Maculae on head and pronotum subequal in size to those of elytra. | *cazieri* | 27 | |
| | Cuticle of tibiae and tarsi concolorous to, or only slightly lighter than, that of femora and rest of body. If considerably lighter, then maculae on head and pronotum no more than one-half the diameter of those on elytra. | | | 5 |
| 5 | Males with two straight spurs at apex of protibiae. Antennae robust with exserted sensory setae on apical segments not prominent, the length of those on segments VII-X less than one-half maximum segment width; length of segment X greater than twice its width. | | | |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| | Elytral maculae small, the diameter of largest less than length of antennal segment II. Mesotibiae with a line of dark setae on dorsal surface. | | | 6 |
| | Males with a single slightly curved spur at apex of protibiae. Females without the above combination of the other characters. | | | 7 |
| 6 | Tergum IV completely covered with grayish pubescence. Head and pronotum usually without maculae. Segment I of mesotarsi with a light colored pad beneath. Male maxillary palpi enlarged (as in figure 19), segments II and III lacking grayish pubescence on venter. | *punctipennis* | 27 | |
| | Tergum IV with large glabrous areas laterally. Head and pronotum usually with at least poorly defined maculae. Segment I of mesotarsi without a light colored pad beneath. Male maxillary palpi not noticeably enlarged. Segments II and III with some grayish pubescence on venter. | *bispinosa* | 27 | |
| 7 | Male maxillary palpi expanded, the last segment orbicular in outline (figure 18). | *maculata* | 23 | |
| | Male maxillary palpi not expanded (figure 19). | *normalis* | 23 | |
| 8 | Elytra with one or more vittae (figure 41). | | | 9 |
| | Elytra without vittae. | | | 11 |
| 9 | Vittae marked on elytra as well as in pubescence. | | | 10 |
| | Vittae marked only in pubescence. | *atrata* | 26 | |
| 10 | Outer edge of protibiae and tarsi smooth, denuded, shiny. Antennae flattened toward middle. | *occidentalis* | 22 | |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| | Protibiae and tarsi not shiny, moderately densely pubescent. Antennae not flattened. | *lemniscata* | 22 | |
| 11 | At least the third to fifth abdominal sternites with a median black spot. | | | 12 |
| | Abdominal sternites without spots. | | | 14 |
| 12 | Scutellar and humeral spots present (figure 20, 21). | | | 13 |
| | Scutellar and humeral spots absent. Elytra black across base (figure 22). | *ficta* | 21 | |
| 13 | Abdominal sternites broadly black-pubescent apically. Scutellar and humeral spots connected by a dark area across the base (figure 21). | *nigritarsis* | 23 | |
| | Spots on abdominal sternites rounded, small. Scutellar and humeral spots not connected (figure 20). | *aspera* | 24 | |
| 14 | Pubescence orange. Each elytron with two large black spots. | *stuarti* | 24 | |
| | Not so marked. | | | 15 |
| 15 | Pubescence black over body, white to gray on the suture and margins of the elytra (figure 40). | | | 16 |
| | Not so colored. | | | 17 |
| 16 | Metatibial spurs slender, spiniform. | *cinerea* | 21 | |
| | Metatibial spurs broadened. | *pestifera* | 21 | |
| 17 | With uniform black pubescence, at least above. | | | 18 |
| | Pubescence mainly gray to tan. | | | 22 |
| 18 | Outer spur of metatibiae somewhat broadened, never spiniform or sticklike. | | | 19 |
| | Outer spur of metatibiae spiniform or sticklike. | *corvina* | 19 | |
| 19 | Wings absent. Elytra fused. | *conferta* | 20 | |
| | Wings present. Elytra not fused. | | | 20 |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 20 | Inner spur of protibiae noticeably longer and stouter than the outer (figure 23). | *funebris* | 20 | |
| | Inner spur of protibiae not stouter than the outer. | | | 21 |
| 21 | Visible portion of scutellum very small. Antennae tapering toward apex. | *pennsylvanica* | 20 | |
| | Visible portion of scutellum normal in size. Antennae not tapering toward apex. Head black or red. | *atrata* | 26 | |
| 22 | With black markings at base of elytra. | | | 23 |
| | No black markings at base of elytra. | | | 27 |
| 23 | With dark scutellar and humeral spots (figure 21). | *nigritarsis* | 23 | |
| | No humeral and scutellar spots, black across base of elytra (figure 22). | | | 24 |
| 24 | Outer spur of metatibiae broadened (figure 24). | | | 26 |
| | Outer spur of metatibiae slender (figure 25). | | | 25 |
| 25 | First segment of antennae swollen, intermediate segments thickened (figure 26). | *cinerea* | 21 | |
| | First segment of antennae not greatly swollen, intermediate segments only moderately thickened (figure 27). | *floridensis* | 22 | |
| 26 | First segment of antennae swollen, intermediate segments thickened (figure 26). | *ficta* | 21 | |
| | First segment of antennae not swollen, intermediate segments longer, only slightly thickened (figure 27). | *pestifera* | 21 | |
| 27 | A pair of denuded callosities on pronotum. | | | 28 |
| | No denuded callosities on pronotum. | | | 29 |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 28 | Apical antennal segments longer than broad. | *callosa* | 25 | |
| | Apical antennal segments as broad as long. | *fortis* | 25 | |
| 29 | Outer metatibial spur broad (figure 24). | | | 30 |
| | Outer metatibial spur slender, spiniform or sticklike (figure 25). | *sericans* | 26 | |
| 30 | Third segment of antennae as long as first. | | | 31 |
| | Third segment of antennae almost as long as first two. | *atrata* | 26 | |
| 31 | Apical antennal segments longer than broad. | *ferruginea* | 25 | |
| | Apical antennal segments as broad as long. | *fortis* | 25 | |
| 32 | Second segment of antennae distinctly longer than third. | | | 33 |
| | Second segment of antennae equal to third or slightly shorter. | | | 39 |
| 33 | Basal two segments of antennae not markedly paler than the rest. | | | 34 |
| | Basal two segments of antennae orange, rest darker. | *albida* | 29 | |
| 34 | First segment of antennae attaining occiput. | | | 35 |
| | First segment of antennae reaching beyond eye in some but not coming near the occiput. | | | 37 |
| 35 | One spur on protibiae. Antennae curved, S-shaped. | *torsa* | 28 | |
| | Two spurs on protibiae. | | | 36 |
| 36 | Second segment of antennae distinctly shorter than the following three. | *fabricii* | 27 | |
| | Second segment of antennae as long as next three. | *murina* | 28 | |
| 37 | Second segment of antennae about equal to third. | *fabricii* | 27 | |
| | Second segment of antennae longer than third. | | | 38 |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 38 | Second segment of antennae four-fifths as long as first, third and following two-third as long as second. | *murina* | 28 | |
| | Second segment of antennae three-fifths as long as first, third and following three-fourths as long as second. | *torsa* | 28 | |
| 39 | With vittae on the elytra. | *albida* | 29 | |
| | Elytra without vittae. | | | 40 |
| 40 | Ground color black. Antennae filiform. | | | 41 |
| | Ground color brown. Antennae moniliform. | *ochrea* | 28 | |
| 41 | Elytra entirely black-pubescent. Hind margin of pronotum with white pubescence (figure 45). | | | 42 |
| | Elytra not black-pubescent. | | | 43 |
| 42 | Hind wings short, never long enough to fold near apical end. | *valida* | 30 | |
| | Hind wings normal, long enough that they must fold near the apical end to fit under the elytra. | *segmenta* | 29 | |
| 43 | Antennae with first two segments paler than the rest. | *albida* | 29 | |
| | Antennae uniform in color. | *immaculata* | 29 | |

## Subgenus *Epicauta* Dejean

### GROUP A

**[Group I of Werner, Enns, & Parker (1966)]**

#### *Epicauta corvina* (LeConte)

**Characteristics.** General color is black with rather dense but short black pubescence. Elytra are without markings. Pronotum subquadrate, almost as broad as long. Exposed portion of scutellum smaller than normal. Elytra with four indistinctly raised lines. Tibial spurs all spiniform. Length 13 to 24 mm.

**Distribution.** South Dakota south into Mexico and west to Arizona and Colorado.

**Oklahoma county records.** PH 1; NW 1. June 8 to July 10.

**Larval hosts.** Unknown.

**Adult hosts.** One specimen was taken from a young sunflower plant but it was not feeding.

### *Epicauta funebris* Horn

**Characteristics.** General color black, sparsely clothed with short black pubescence. Pronotum subquadrate, one-fifth longer than broad, sides parallel for the basal four-fifths, then converging abruptly. Protibiae with two spiniform spurs, the inner somewhat longer and stouter than the outer. Metatibial spurs flattened, the outer more blunt than the inner, both moderately broad. Length 11 to 18 mm.

**Distribution.** Kansas, Arkansas, Oklahoma, Texas and New Mexico.

**Oklahoma county records.** PH 1, 3; NW 1, 3, 5, 7, 8; NC 2, 3, 4, 5, 6, 9; NE 3, 6, 11, 12, 13, 14; SW 5, 6, 7, 9; SC 1, 2, 3; SE 7. June 16 to October 12.

**Larval hosts.** Predator of the eggs of *Melanoplus differentialis* (Thos.) and *M. bivittatus* (Say) in Arkansas (Horsfall, 1943).

**Adult hosts.** A rather general feeder that has been found on tomato, alfalfa, *Melilotus alba* Desv., *Solanum* sp., *S. Torreyi* Gray, *Tribulus terrestris* L., *Solidago* sp., and *Gutierrezia dracunculoides* (DC.) Blake.

### *Epicauta pennsylvanica* (DeGeer)

**Characteristics.** General color black, with short, sparse black pubescence, no markings on elytra. Pronotum quadrate, slightly broader at the front angles. Visible portion of scutellum very small. Posterior tibial spurs flattened, pointed, the outer broader, neither is narrow enough to be called sticklike. Length 6 to 12 mm.

**Distribution.** Maine to Florida, west to Montana and Texas.

**Oklahoma county records.** PH 3; NW 1, 2, 4, 5, 8, 9; NC 3, 5, 8, 9, 12; NE 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14; SW 3; SC 1, 2, 3, 4, 6, 8, 10, 13; SE 3, 5, 6, 7, 8. June 5 to November 3.

**Larval hosts.** Parker and Wakeland (1957) list this species as a predator of grasshopper eggs in Iowa, Montana, Nebraska and Wyoming, *Melanoplus sanguinipes* (F.) (as *M. mexicanus mexicanus* (Sauss.)) was the dominant grasshopper species in the Montana study area. Horsfall (1943) lists *M. differentialis* (Thos.) in Arkansas. Rees (1973) also lists *M. spretus* (Walsh) and *M. femurrubrum* (DeG.).

**Adult hosts.** Most commonly taken on goldenrod, including *Solidago canadensis* L., var. *gilvocanescens* Rydb., *S. missouriensis* Nutt., var. *fasciculata* Holz., and *S. petiolaris* Ait., but also is found on many other fall-flowering composites. These include *Achillea lanulosa* Nutt., *Aster* sp., *A. praealtus* Poir., *Eupatorium serotinum* Michx., *Grindelia lanceolata* Nutt., *Gutierrezia dracunculoides* (DC.) Blake, *G. Sarothrae* (Pursh) Britton & Rusby, and *Haplopappus ciliatus* (Nutt.) DC. They are also found on a few plants of other families, including *Amaranthus* sp., and *A. tamarascinus* Nutt. (Amaranthaceae), alfalfa (Leguminosae) and *Salsola Kali* L., var. *tenuifolia* Tausch (Chenopodiaceae).

### *Epicauta conferta* (Say)

Figure 39

**Characteristics.** General color black with sparse black pubescence, two triangular orange spots usually visible on sides of abdomen near apex. Pronotum quadrate, as broad as long, sides converging at the apical fifth, base somewhat excavated before scutellum. Elytra fused along suture and shorter than the abdomen. Wings absent. Inner spur of metatibiae spiniform, outer flattened but not very broad. Length 8 to 15 mm.

**Distribution.** Iowa and Arkansas, west to the Rocky mountains and south into Mexico.

**Oklahoma county records.** PH 1; NW 2, 3, 4, 5, 6, 8, 10; NC 1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15; NE 1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15; SW 5, 7, 8; SC 1, 2, 3, 4, 6, 8, 9, 10, 13, 16, 17; SE 2, 3, 4, 5, 6, 7, 8. April 8 to October 26.

**Larval hosts.** Larvae will feed on the eggs of *Melanoplus differentialis* (Thos.) and *M. bivittatus* (Say) in the laboratory (Gilbertson and Horsfall, 1940). The above species are hosts in the field in Arkansas (Horsfall, 1943).

**Adult hosts.** Known to feed on cotton, alfalfa, tomato, *Lespedeza stipulacea* Maxim. and the fallen fruit of *Sapindus drummondii* H. & A.

### *Epicauta cinerea* (Forster)

**Characteristics.** Elytra black; one form has entirely ash-colored pubescence except on the base of the elytra; another has black pubescence on the elytra except on the margins and suture and a pair of black marks on the head and pronotum; a third form is entirely black pubescent. Pronotum subquadrate, slightly broader apically. Metatibiae with spurs spiniform, quite slender but outer broader. Length 9 to 13 mm.

**Distribution.** Coastal states from New Hampshire to South Carolina, west to Iowa and Oklahoma.

**Oklahoma county records.** NW 4; NC 2, 9; NE 6, 7, 11, 13, 14; SC 3; SE 6, 7. May 4 to October 1.

**Larval hosts.** *Melanoplus differentialis* (Thos.) in Arkansas (Horsfall, 1943). Rees (1973) also lists *Melanoplus femurrubrum* (DeG.), *M. sanquinipes* (Fab.) and *M. spretus* (Walsh).

**Adult hosts.** Unknown.

### *Epicauta ficta* Werner

**Characteristics.** Elytra black, densely clothed with ash-colored to yellowish ash-colored pubescence, narrowly black at base. Some specimens have a row of median black spots on the apical edge of the abdominal sternites. Pronotum subquadrate, slightly longer than broad. Metatibial spurs broadened, the outer slightly the broader and longer. Length 9 to 12 mm.

**Distribution.** Oklahoma and Texas.

**Oklahoma county records.** NW 1, 3; NC 6, 9; NE 1, 2, 6, 7; SW 2, 3, 5, 6, 7; SC 1; SE 7. July 12 to November 3.

**Larval hosts.** Unknown.

**Adult hosts.** Most commonly collected from *Amaranthus* spp., including *A. tamarascinus* Nutt., *A. retroflexus* L., and *A. spinosus* L. (Amaranthaceae), and *Tribulus terrestris* L. (Zygophyllaceae). Other hosts include alfalfa (Leguminosae), tomato (Solanaceae), *Clematis* sp. (Ranunculaceae), and *Haplopappus ciliatus* (Nutt.) DC. and *Gutierrezia* sp. (Compositae).

### *Epicauta pestifera* Werner

Figure 40

**Characteristics.** Elytra black, usually densely clothed with black pubescence except on the suture and margins which have ash-colored pubescence. Another form is entirely covered with ash-colored pubescence except for the extreme base of the elytra which is black. Pronotum subquadrate, slightly broader apically. Inner metatibial spur flattened, pointed, outer broader and with a blunt tip. Length 6 to 16 mm.

**Distribution.** From the Atlantic coast to the Rocky mountains, south as far as Oklahoma.

**Oklahoma county records.** PH 3; NW 1; NC 3, 12; NE 3, 6, 7, 14; SW 9; SC 3; SE 4, 7. June 11 to October 5.

**Larval hosts.** *Melanoplus differentialis* (Thos.) and *M. bivittatus* (Say) in Arkansas (Horsfall, 1943).

**Adult hosts.** I have one collection from each of the following plants: alfalfa, tomato, *Solanum* sp. and *Tribulus terrestris* L.

### *Epicauta floridensis* Werner

**Characteristics.** Color is black, densely clothed with ash-colored pubescence. Pronotum subquadrate, one-fourth longer than broad. Metatibial spurs slender, spiniform. Length 6 to 11 mm.

**Distribution.** Known from Oklahoma, Mississippi, Florida and New Jersey.

**Oklahoma county records.** NC 5. June 6.

**Larval hosts.** Unknown.

**Adult hosts.** My only collection is from *Schrankia uncinata* Willd. (Leguminosae).

### *Epicauta lemniscata* (Fabricius)

Figure 41

**Characteristics.** General color brownish-yellow with three black stripes per elytron, pronotum with two longitudinal black stripes, head with two curved black marks on the occiput. Antennae slender, slightly flattened but not broadened. Pronotum one-third longer than broad, sides parallel for the basal three-fourths, then converging gradually. Outer edge of protibiae and tarsi not shiny, moderately pubescent. Inner metatibial spur flattened, sticklike, outer flattened and somewhat broadened. Length 8 to 16 mm.

**Distribution.** New Jersey and Florida to Nebraska and Texas, probably extending far into Mexico.

**Oklahoma county records.** NC 2, 3, 5, 6, 9; NE 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 14; SW 3, 7, 10; SC 1, 3, 6, 8, 12, 13, 16; SE 2, 3, 7, 8. May 18 to October 6.

**Larval hosts.** *Melanoplus differentialis* (Thos.) and *M. bivittatus* (Say) in Arkansas (Horsfall, 1943). Listed as a predator of grasshopper eggs in Iowa by Parker and Wakeland (1957). Rees (1973) also lists *Chortophaga* spp.

**Adult hosts.** Taken on alfalfa, peanuts and soybeans (Leguminosae), *Chenopodium album* L. and *Salsola Kali* L., var. *tenuifolia* Tausch (Chenopodiaceae) and *Amaranthus* sp. (Amaranthaceae).

### *Epicauta occidentalis* Werner

**Characteristics.** This species is identical with *E. lemniscata* except for the broadened, flattened antennae and smooth, shiny outer edge of the protibiae and tarsi.

**Distribution.** Nebraska and Colorado, south to Texas and Louisiana.

**Oklahoma county records.** PH 2; NW 1, 6; NC 3, 4, 5, 6, 9, 12; NE 1, 3, 5, 6, 7, 8, 11, 14; SW 3, 7, 10; SC 1, 3, 6, 8, 12, 16, 17; SE 2, 3, 4, 7. May 30 to October 21.

**Larval hosts.** Unknown.

**Adult hosts.** Also taken on alfalfa, peanuts, soybeans, *Chenopodium album* L., *Salsola Kali* L., var. *tenuifolia* Tausch and *Amaranthus* sp., often in the same collection with *E. lemniscata*.

## GROUP B

**[Group IV of Werner, Enns, & Parker (1966)]**

### *Epicauta nigritarsis* (LeConte)

**Characteristics.** Upper surfaces are tan, with rather dense ash-colored pubescence. Brown humeral and scutellar spots are present. Lower surfaces are mainly black, with ash-colored pubescence. Legs are tan, with apices of the segments brown. Pronotum quadrate, slightly broader than long. Metatibial spurs slender, sticklike, the inner long, the outer shorter. Length 7 to 13 mm.

**Distribution.** Tamaulipas, Mexico to southwestern Oklahoma and west to Arizona.

**Oklahoma county records.** SW 4, 5, 6, 7, 9; SC 11. June 24 to August 31.

**Larval hosts.** Unknown.

**Adult hosts.** One specimen was taken on *Prosopis juliflora* (Swartz) DC., var. *glandulosa* (Torr.) Cock. (leguminosae).

### *Epicauta maculata* (Say)

Figure 42

**Characteristics.** Elytra are black, quite densely clothed with ash-colored to yellowish ash-colored pubescence except for small denuded spots above and below. Pronotum quadrate, rather rotund. Protibiae of the male with a single short, stout, incurved spur. Metatibial spurs slender, spiniform, the inner longer. Length 6 to 12 mm.

**Distribution.** North Dakota south into Mexico, east to Iowa and Missouri, and west to the Rocky mountains.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 3, 4, 5, 7; NC 4, 5, 9, 12; SW 3, 6, 8, 9; SC 1, 2, 3, 8, 9; SE 3. May 23 to October 4.

**Larval hosts.** *Melanoplus sanguinipes* (F.) (as *M. mexicanus* (Sauss.)) in South Dakota (Gilbertson and Horsfall, 1940); Parker and Wakeland (1957) list it as a predator of grasshopper eggs in Colorado, Iowa, Kansas, Montana, Nebraska, North Dakota, South Dakota and Wyoming.

**Adult hosts.** Collected from soybeans, alfalfa and *Schrankia uncinata* Willd. (Leguminosae), *Kallstroemia hirsutissima* Vail and *Tribulus terrestris* L. (Zygophyllaceae), and *Salsola Kali* L., var. *tenuifolia* Tausch (Chenopodiaceae).

### *Epicauta normalis* Werner

**Characteristics.** This species is very similar to *E. maculata* except the maxillary palpi of the male are not expanded and the pads of segment one of the protarsi are confined to the apical fifth of the segment.

**Distribution.** Rocky mountains and Black hills west to Washington and California east of the Cascades and Sierras, south across Nevada and Utah to northern New Mexico and Arizona, and east to western Oklahoma.

**Oklahoma county records.** PH 1. June 21 to 29.

**Larval hosts.** Reared from an egg pod of *Aulocara elliotti* (Thos.) in Montana by Lavigne and Pfadt (1966). Meloid larvae, possibly this species, were also taken in egg pods of *Ageneotettix deorum* (Scud.) and *Cordillacris occipitalis* (Thos.)

**Adult hosts.** Unknown.

### *Epicauta andersoni* Werner

**Characteristics.** Elytra black, densely clothed with ash-colored pubescence except for fairly large round denuded spots, which are in part confluent. Pronotum as broad as long, sides parallel for the basal three-fourths, then converging abruptly. Protibiae of male with a single short, incurving spur. Inner spur of metatibiae quite long, spiniform, outer shorter, flattened, sticklike. Length 7 to 11 mm.

**Distribution.** Known from northern Mexico, West Texas, New Mexico, Oklahoma, southern Utah and Arizona.

**Oklahoma county records.** PH 1. June 22 to August 15.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## GROUP C

**[Group V of Werner, Enns, and Parker (1966)]**

### *Epicauta aspera* Werner

**Characteristics.** Color black, densely clothed with ash-colored pubescence. Elytra with a black scutellar spot extended narrowly across the base. Abdominal sternites with a median row of black spots. Sides of pronotum subparallel for the basal two-thirds, then converging abruptly. Metatibial spurs sticklike, rather long. Length 7 to 10 mm.

**Distribution.** Colorado and western Oklahoma to west Texas and Arizona.

**Oklahoma county records.** PH 3; NW 1, 2, 4, 8; 10; SW 3. September 14 to October 3.

**Larval hosts.** Unknown.

**Adult hosts.** Taken on *Gutierrezia Sarothrae* (Pursh) Britton and Rusby, *Solidago canadensis* L., var. *gilvocanescens* Rydb., and *S. petiolaris* Ait. (Compositae).

### *Epicauta stuarti* LeConte

**Characteristics.** Elytra black, densely covered with long orange pubescence, two large black maculae per elytron. Pronotum with two large black maculae, usually convergent medially. Head black down to level of eyes and orange between eyes. Pronotum almost twice as broad as long, flat, gradually narrowed forward. Metatibial spurs flattened, sticklike, the outer slightly broader than the inner. Length 6 to 11 mm.

**Distribution.** Colorado and Kansas, south to Texas, New Mexico and Arizona.

**Oklahoma county records.** PH 2, 3; NW 1, 4, 5, 8. September 10 to October 1.

**Larval hosts.** Unknown.

**Adult hosts.** Collected from *Gutierrezia Sarothrae* (Pursh) Britton and Rusby and *Solidago* spp., including *S. petiolaris* Ait., *S. canadensis* L., and *S. missouriensis* Nutt., var. *fasciculata* Holz. (Compositae).

## GROUP D

**[Group VI of Werner, Enns, & Parker (1966)]**

### *Epicauta ferruginea* (Say)

**Characteristics.** Elytra are black, densely clothed with rather long rusty red-brown pubescence and are without markings. Pronotum subquadrate, as broad as long, bulging somewhat, the sides converge three-fourths from the base. Outer spur of metatibiae broad, inner slender. Length 6 to 9 mm.

**Distribution.** Iowa to Idaho, south to Texas and Arizona.

**Oklahoma county records.** PH 2, 3; NW 1, 2, 3, 4, 5, 6, 10; NC 5, 9; NE 1, 3, 5, 7, 8; SW 2, 3, 6, 7; SC 1, 2. June 16 to October 26.

**Larval hosts.** Listed as a predator of grasshopper eggs in Iowa and Montana by Parker and Wakeland (1957). *Melanoplus sanguinipes* (F.) (as *M. m. mexicanus* (Sauss.)) was the dominant grasshopper in the Montana study area.

**Adult hosts.** Collected from *Haplopappus ciliatus* (Nutt.) DC., *Gutierrezia Sarothrae* (Pursh) Britton & Rusby, *Helianthus* sp., *H. annuus* L., *Solidago* sp., *S. canadensis* L., var. *gilvocanescens* Rydb., *S. missouriensis* Nutt., var. *fasciculata* Holz., and *S. petiolaris* Ait. (Compositae).

### *Epicauta fortis* Werner

**Characteristics.** Color black, densely clothed with ash-colored pubescence. Pronotum broad, at broadest part almost as wide as head, as broad as long, broadly bell-shaped. Outer spurs of metatibiae broad and flattened. Length 6 to 9 mm.

**Distribution.** Coahuila and Baja California, Mexico, Arizona, California, New Mexico, Texas and Oklahoma.

**Oklahoma county records.** PH 2, 3. September 10 to 15.

**Larval hosts.** Unknown.

**Adult hosts.** Both of our collections were from *Gutierrezia Sarothrae* (Pursh) Britton & Rusby.

### *Epicauta callosa* LeConte

**Characteristics.** Elytra black, densely clothed with tannish to rusty red-brown pubescence. Pronotum always with a pair of small, slightly raised, denuded areas, showing as black spots. Pronotum one-fourth longer than broad, bell-shaped. Metatibial spurs slender, sticklike, the outer sometimes a little broader. Length 7 to 10 mm.

**Distribution.** South Dakota, Nebraska, Kansas, Oklahoma and Texas, into Mexico. Also west to Arizona.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 3, 4, 5, 6, 7, 8, 10; NC 1, 4, 5, 6, 9, 11, 12; NE 10; SW 2, 3, 4, 6, 7, 8, 9, 10; SC 1, 2, 3, 4, 8, 9, 15; SE 6, 7, 8. May 12 to October 10.

**Larval hosts.** *Melanoplus sanguinipes* (F.) (as *M. mexicanus* (Sauss.)) in South Dakota (Gilbertson and Horsfall, 1940). Listed as a predator of grasshopper eggs in South Dakota by Parker and Wakeland (1957), dominant grasshopper species were *M. sanguinipes* (F.) (*M. m. mexicanus* (Sauss.)), *M. differentialis* (Thos.) and *M. femurrubrum* (DeG.). Has been associated with egg pods of *M. sanguinipes* (F.) by MacSwain (1956).

**Adult hosts.** Feeds on alfalfa, the flowers of cotton and many composites. These include *Achillea lanulosa* Nutt., *Centaurea americana* Nutt., *Coreopsis grandiflora* Hogg, *Gaillardia pinnatifida* Torr., *Haplopappus ciliatus* (Nutt.) DC., *Helianthus* sp., *H. annuus* L., *H. petiolaris* Nutt., *Rudbeckia amplexicaulis* Vahl, *Solidago missouriensis* Nutt., var. *fasciculata* Holz., and *Thelesperma filifolium* (Hook.) Gray.

### *Epicauta sericans* LeConte

**Characteristics.** Elytra black, densely clothed with ash-colored pubescence, no black markings. Pronotum stout, almost as wide as the head, as broad as long, subquadrate, sides parallel for the basal three-fourths, then converging abruptly. Metatibial spurs slender, sticklike. Length 7 to 11 mm.

**Distribution.** Indiana and Alabama, west to the Rocky mountains, and from Alberta and Saskatchewan, Canada to Texas.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 3, 4, 5, 6, 8; NC 3, 6, 9, 12, 13; NE 3, 7, 9, 11; SW 3, 5, 6, 7, 8, 9; SC 1, 2, 3, 8, 11, 12, 13, 15, 16, 17. May 9 to October 13.

**Larval hosts.** Parker and Wakeland (1957) list it as a predator of grasshopper eggs in North Dakota. The dominant grasshopper species in the study area were *Melanoplus sanguinipes* (F.) (as *M. m. mexicanus* (Sauss.)) and *M. differentialis* (Thos.)

**Adult hosts.** The most general feeder of the Oklahoma meloids, having been recorded from plants in nine families. These include peanuts, alfalfa, *Schrankia uncinata* Willd. (Leguminosae), cotton, *Callirhoe alcaeoides* (Michx.) Gray, *C. involucrata* (Nutt. ex Torr.) Gray (Malvaceae), *Cirsium* sp., *Englemannia pinnatifida* T. & G., *Gaillardia pulchella* Foug., *Lygodesmia juncea* (Pursh) D. Don, *Solidago* sp. (Compositae), *Convolvulus* sp., *C. arvensis* L., *Ipomoea leptophylla* Torr. (Convolvulaceae), *Opuntia* sp., *O. imbricata* (Haw.) DC., var. *arborescens* (Eng.) Weniger, *O. phaeacantha* Eng., var. *camanchica* (Eng. & Bigel.) Weniger (Cactaceae), *Oenothera laciniata* Hill, var. *grandiflora* (Wats.) Robinson (Onagraceae), *Proboscidea louisianica* (Miller) Thet. (Martyniaceae), *Solanum elaeagnifolium* Cav. (Solanaceae) and *Tribulus terrestris* L. (Zygophyllaceae).

### *Epicauta atrata* (Fabricius)

**Characteristics.** Elytra black, usually with black pubescence, but pubescence may be ash-colored or ash-colored with black vittae. Head usually bright red but occasionally black. Pronotum slightly broader than long, sides parallel for the basal four-fifths, then converging abruptly. Scutellum normal in size. Inner spur of metatibiae slender, spiniform, outer somewhat broad, flattened. Length 6 to 12 mm.

**Distribution.** From Maryland and North Carolina to Nebraska and Texas.

**Oklahoma county records.** NW 2, 4, 10; NC 4, 5, 6, 9, 10, 12, 13; NE 2, 3, 5, 6, 9, 13, 14, 15; SW 2, 6, 8, 9; SC 1, 3, 9, 11, 13, 14, 15, 16; SE 1, 2, 3, 4, 5, 6, 7, 8. April 29 to September 20.

**Larval hosts.** Unknown.

**Adult hosts.** Found mostly on spring-flowering composites, including *Cirsium* sp., *Coreopsis grandiflora* Hogg, var. *Harveyana* (Gray) Sherff, *C. tinctoria* Nutt., var. *tinctoria, Englemannia pinnatifida* T. & G., *Pyrrhopappus Geiseri* Shinners, *Rudbeckia hirta* L., var. *pulcherrima* Farwell and *Thelesperma filifolium* (Hook.) Gray. Other hosts are cotton and *Callirhoe alcaeoides* (Michx.) Gray (Malvaceae), *Oenothera speciosa* Nutt. (Onagraceae) and *Schrankia uncinata* Willd. (Leguminosae).

### *Epicauta bispinosa* Werner

**Characteristics.** Elytra are black, quite densely clothed with ash-colored to yellowish ash-colored pubescence except for small denuded spots above and below. Pronotum quadrate, rather rotund. Protibiae with two spurs. Metatibial spurs slender, spiniform, the inner longer. Length 9 to 13 mm.

**Distribution.** Western Kansas and eastern Colorado, southwest to southeast Arizona and south to Durango, Mexico.

**Oklahoma county records.** PH 1. June 29.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Epicauta punctipennis* Werner

**Characteristics.** This species is very similar to *E. bispinosa* except for the characters of tergum IV, the mesotarsi and the male maxillary palpi used in the key.

**Distribution.** Kansas, Oklahoma and Texas.

**Oklahoma county records.** NW 5, 8; NC 5, 9; SW 7; SC 1, 3, 8. May 10 to July 15.

**Larval hosts.** Unknown.

**Adult hosts.** Alfalfa and *Melilotus officinalis* (L.) Lam. (Leguminosae).

### *Epicauta cazieri* Dillon

**Characteristics.** This species is rather similar to *E. bispinosa* except for the color of the tibiae and tarsi and the size of the black spots on the head and pronotum.

**Distribution.** Northeastern Kansas and western New Mexico, south to San Luis Potosi, Mexico.

**Oklahoma county records.** None, but might occur in northwest Oklahoma.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## Subgenus *Macrobasis* LeConte

### *FABRICII* GROUP

### *Epicauta fabricii* (LeConte)

Figure 43

**Characteristics.** Elytra black, fairly densely clothed with ash-colored pubescence, black humeral and scutellar spots present. Pronotum one-fourth longer than broad, bell-shaped. Metatibial spurs flattened, spiniform, the outer broader. Length 9 to 15 mm.

**Distribution.** Maine to Florida, west to Montana and New Mexico. Also in Manitoba, in southern Canada.

**Oklahoma county records.** NW 3, 7; NC 9; NE 3, 4, 6, 7, 10, 11; SW 3; SC 3, 8; SE 4, 7. May 17 to June 29 plus one record on August 13.

**Larval hosts.** *Melanoplus sanguinipes* (F.) (as *M. mexicanus* (Sauss.)) in South Dakota (Gilbertson and Horsfall, 1940). Parker and Wakeland (1957) list this species as a predator of grasshopper eggs in Montana, Minnesota, Nebraska, North Dakota and South Dakota. *M. sanguinipes* (F.) (as *M. m. mexicanus* (Sauss.)) is a dominant grasshopper species in Montana, North Dakota and South Dakota. *M. differentialis* (Thos.) and *M. bivittatus* (Say) are hosts in Arkansas (Horsfall, 1943). Rees (1973) lists the above species and *M. femurrubrum* (DeG.).

**Adult hosts.** Recorded only from black locust (*Robinia Pseudo-Acacia* L.).

### *Epicauta murina* (LeConte)

**Characteristics.** Color is black, clothed with rather sparse short brown hairs, causing a dark gray color. Pronotum one-fourth longer than broad, slightly bell-shaped. Metatibial spurs slender, spiniform, equal. Length 7 to 11 mm.

**Distribution.** New Brunswick, Canada and Montana, south to Iowa and Oklahoma.

**Oklahoma county records.** NC 9, 13; NE 4. May 8 to June 10.

**Larval hosts.** *Melanoplus spretus* (Walsh) (Riley, 1878).

**Adult hosts.** Taken several times from alfalfa and once from radish leaves.

## *TORSA* GROUP

### *Epicauta torsa* (LeConte)

**Characteristics.** Elytra are black, rather sparsely clothed with short ash-colored pubescence. There are black, rather indistinct, humeral and scutellar spots. First antennal segment large, S-shaped in the male. Pronotum quadrate, as broad as long, with the sides parallel for the basal three-fourths, then converging abruptly. Protibiae of male with a single spiniform spur. Inner spur of metatibiae spiniform, the outer sticklike, shorter. Length 7 to 11 mm.

**Distribution.** From Texas and Oklahoma to Florida and North Carolina, also Massachusetts.

**Oklahoma county records.** NW 6, 7; NC 9, 10, 12, 13; NE 6, 7, 8, 11, 12; SW 8; SC 2, 3, 8, 12, 13, 14, 16; SE 6, 7. April 10 to June 18.

**Larval hosts.** Unknown.

**Adult hosts.** Feeds mostly on legumes, alfalfa, mimosa (*Albizzia* sp.) *Amorpha fruticosa* L., and black locust (*Robinia Pseudo-Acacia* L.), but I have one record from soapberry (*Sapindus Drummondii* H. & A., Sapindaceae).

## *OCHREA* GROUP

### *Epicauta ochrea* (LeConte)

**Characteristics.** General color rusty red-brown, rather sparsely clothed with rusty red-brown pubescence. Elytra with indistinct humeral and scutellar spots. Antennae distinctly moniliform. Pronotum quadrate, one-third longer than broad. Protibiae of male with a single stout, spiniform spur. Metatibial spurs rather stout, sticklike, the outer shorter. Length 9 to 14 mm.

**Distribution.** Oklahoma panhandle to west Texas, west to California, extending into northern Mexico.

**Oklahoma county records.** One specimen, Kenton, Cimarron county, 26 June 1933, E. E. Ivy.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## *ALBIDA* GROUP

### *Epicauta albida* (Say)

Figure 44

**Characteristics.** Elytra black, with dense ash-colored pubescence, with oblique black markings on at least some of the abdominal sternites and usually two longitudinal black marks on the pronotum. First two antennal segments brownish-yellow, the rest darker brown. Elytra with black humeral and scutellar spots. Pronotum subquadrate, slightly longer than broad. Metatibial spurs slender, inner pointed, outer blunt. Length 13 to 24 mm.

**Distribution.** Kansas to Colorado, southward into Mexico.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 3, 4, 5, 6, 9, 10; NC 5, 9; NE 13; SW 1, 3, 5, 6, 7, 8, 9, 10; SC 1, 3, 8, 13, 15, 16, 17. June 8 to October 21.

**Larval hosts.** Parker and Wakeland (1957) list this species as a predator of grasshopper eggs in Colorado, Kansas and New Mexico.

**Adult hosts.** Taken mostly on *Solanum Torreyi* Gray (Solanaceae) and *Tribulus terrestris* L. (Zygophyllaceae). I have one record from cotton.

### *Epicauta immaculata* (Say)

**Characteristics.** Elytra are black, rather densely clothed with rusty red-brown to ash-colored pubescence. No black markings on the elytra. Pronotum quadrate, slightly bulging. Visible portion of scutellum small. Metatibial spurs slender, spiniform. Length 12 to 20 mm.

**Distribution.** From Indiana and Kentucky west to New Mexico.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; NC 3, 4, 5, 6, 9, 11, 12, 13; NE 1, 2, 3, 5, 6, 7, 10, 12; SW 1, 2, 4, 5, 6, 7, 8, 9; SC 1, 3, 4, 7, 8, 9, 10, 12, 13, 15, 16, 17; SE 3. June 1 to October 19.

**Larval hosts.** Several species of grasshoppers, chief of which are *Melanoplus bivittatus* (Say) and *M. differentialis* (Thos.) in South Dakota (Gilbertson and Horsfall, 1940).

**Adult hosts.** Feeds on *Chamaesaracha coniodes* (Moric.) Britt., *Physalis viscosa* L., *Solanum elaeagnifolium* Cav., *Solanum Torreyi* Gray (Solanaceae), peanuts, alfalfa, *Schrankia uncinata* Willd. (Leguminosae), cotton (Malvaceae), *Asclepias tuberosa* L. (Asclepiadaceae) and *Tribulus terrestris* L. (Zygophyllaceae).

### *Epicauta segmenta* (Say)

**Characteristics.** Color black. Pubescence mostly black but there is always white pubescence on the posterior margin of the pronotum and usually on the coxae, thoracic segments, back part of the head and posterior margins of the abdominal sternites. Pronotum subquadrate, a little longer than broad. Tibial spurs long and sticklike on all tibiae. Length 12 to 20 mm.

**Distribution.** States of Sinaloa, Durango and Chihuahua, Mexico through west Texas to the Great Plains, north to South Dakota; west through New Mexico to Arizona.

**Oklahoma county records.** PH 1; NW 1; SW 5; SC 3, 8. May 26 to July 16.

**Larval hosts.** The larvae have been associated with eggs of *Melanoplus sanguinipes* (Fab.), *M. differentialis* (Thos.) and *M. bivittatus* (Say) (MacSwain, 1956).

**Adult hosts.** I have single specimens from *Solanum Torreyi* Gray and *Physalis Virginiana* Mill., var *hispida* Waterfall (Solanaceae) and *Tribulus terrestris* L. (Zygophyllaceae).

### *Epicauta valida* (LeConte)

Figure 45

**Characteristics.** Essentially the same as for *E. segmenta* except for the length of the hind wings, which are never long enough to fold near the apical end.

**Distribution.** New Mexico, Texas and Louisiana north to South Dakota.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 7, 9, 10; NC 9; NE 7; SW 1, 3, 4, 5, 6, 7, 8; SC 8, 11, 13. May 22 to September 13.

**Larval hosts.** Unknown.

**Adult hosts.** Mostly taken on *Solanum Torreyi* Gray, but I have one collection from *Physalis virginiana* Mill., var. *hispida* Waterfall and one from *Tribulus terrestris* L.

## GENUS *PLEUROPOMPHA* LeCONTE

**Characteristics.** Eyes elongate, narrow. Elytra each with four strongly elevated costae. All tibiae with two spurs. There is one species in Oklahoma.

### *Pleuropompha costata* (LeConte)

Figure 46

**Characteristics.** Color black or dark brown, densely clothed above with flattened white hairs and below with ordinary white pubescence. Pronotum elongate bell-shaped, two thirds longer than broad. Elytra with the suture, side margins and four ridges on each sharply elevated. Outer spur of metatibiae broad, flattened. Length 7 to 16 mm.

**Distribution.** Durango and Chihuahua, Mexico, West Texas, New Mexico, Arizona and the Oklahoma panhandle.

**Oklahoma county records.** PH 2. July 16 to August 3.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

# Subfamily Nemognathinae

**Characteristics.** Head usually narrower than prothorax. Maxillae often with elongate processes, in many cases filamentous, as long as head or even as long as body; in other cases short, flattened and scarsely visible. Spurs of pro- and mesotibiae unmodified, those of metatibiae usually expanded and truncate or concave apically. Tarsi with claws divided, usually with serrations on the upper blade.

## KEY TO THE SPECIES

[modified from Linsley, 1942, MacSwain, 1952 and Enns, 1956]

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 1 | Elytra entirely covering abdomen. | | | 3 |
| | Elytra covering at most the first abdominal tergite (figure 52). | | | 2 |
| 2 | Basal spine of tarsal claw short or absent, at most attaining middle of claw (figure 4). | *Hornia minutipennis* | 41 | |
| | Basal spine of tarsal claw long, conspicuous, attaining apical three-fourths of claw. | *Hornia mexicana neomexicana* | 41 | |
| 3 | Antennae gradually enlarged toward apex (figure 48). | | | 4 |
| | Antennae equal in width throughout. | | | 6 |
| 4 | Pronotum coarsely to moderately coarsely and moderately densely punctate, most punctures separated by, at most, three times their diameter. | | | 5 |
| | Pronotum finely and sparsely punctate, most punctures separated by at least five times their diameter. | *Gnathium francilloni* | 37 | |
| 5 | Pronotum about as wide as long, coarsely punctured. | *Gnathium texanum* | 36 | |
| | Pronotum much longer than wide, moderately coarsely punctured. | *Gnathium minimum* | 36 | |
| 6 | Eyes extremely large, protuberant, strongly produced beneath head. | | | 7 |
| | Eyes rarely, if ever, produced beneath head and then not strongly. | | | 8 |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 7 | Femora dark at middle, pale at apices and bases. | *Pseudozonitis longicornis* | 37 | |
| | Femora pale at middle, dark at apices and bases. | *Pseudozonitis pallida* | 37 | |
| 8 | Galeae lobiform. | | | 9 |
| | Galeae produced into a sucking organ. | | | 11 |
| 9 | Metatibial spurs slender, concave, apices subacute (figure 28). | *Rhyphonemognatha rufa* | 40 | |
| | Metatibial spurs spatulate (figure 29). | | | 10 |
| 10 | Pronotum one-sixth wider than long. | *Zonitis bilineata* | 34 | |
| | Pronotum distinctly longer than wide. | *Zonitis atripennis atripennis* | 34 | |
| 11 | Galeae stout, no longer than maxillary palpi. | *Zonitis perforata* | 35 | |
| | Galeae distinctly longer than maxillary palpi, usually reaching or exceeding the metacoxae. | | | 12 |
| 12 | Galeae reach to or beyond the metacoxae. | | | 15 |
| | Galeae do not reach to the metacoxae. | | | 13 |
| 13 | Pronotum impunctate except for a few fine, sparse punctures at sides. | *Zonitis sayi* | 36 | |
| | Pronotum at least moderately densely punctate. | | | 14 |
| 14 | Pronotum with coarse, irregular punctures. | *Zonitis cribricollis* | 35 | |
| | Pronotum densely, finely punctate. | *Zonitis vittigera propinqua* | 35 | |
| 15 | Metatibial spurs dissimilar, outer wider than inner (figure 30). | | | 16 |
| | Metatibial spurs equal or subequal in width (figure 31). | | | 17 |
| 16 | Outer metatibial spur more than twice, usually three times, as wide as inner (figure 30). Galeae reaching only to third abdominal segment. | *Nemognatha lurida lurida* | 38 | |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| | Outer metatibial spur, at most twice as wide as inner. Galeae reaching apex of abdomen. | *Nemognatha lutea lutea* | 38 | |
| 17 | Galeae reach to or slightly beyond metacoxae but do not reach apex of abdomen. | | | 18 |
| | Galeae reach to apex of abdomen. | *Nemognatha piazata bicolor* | 40 | |
| 18 | Metatibial spurs slender, spiniform, apices acute. Small species. | *Nemognatha nemorensis* | 39 | |
| | Metatibial spurs flattened, parallel-sided, or spatulate, subacute or rounded at apices (figure 31). Larger species. | | | 19 |
| 19 | Elytra black. | | | 20 |
| | Elytra pale, reddish or yellowish, may have darker vittae. | | | 23 |
| 20 | Metatibial spurs short, subequal, somewhat flattened, apices subacute or bluntly rounded (figure 31). | | | 21 |
| | Metatibial spurs broadly spatulate, similar and equal (figure 29). | | | 22 |
| 21 | Abdominal sterna brownish-yellow. | *Nemognatha nebrascensis* | 39 | |
| | Abdominal sterna black. | *Nemognatha bifoveata* | 40 | |
| 22 | Elytra densely, coarsely rugose-punctate, with three feebly raised discal costae. | *Zonitis punctipennis punctipennis* | 36 | |
| | Elytra moderately densely punctate basally becoming scabrous-punctate apically, without raised discal costae. | *Nemognatha sparsa* | 38 | |
| 23 | Pronotum extremely sparsely punctate. | *Zonitis punctipennis punctipennis* | 36 | |
| | Pronotum at least moderately densely punctate. | | | 24 |
| 24 | Third antennal segment three times as long as second or longer (figure 32). | *Nemognatha cribraria cribraria* | 39 | |
| | Third antennal segment, at most, twice as long as second. | | | 25 |

| Key | Description | Species | Page | See |
|---|---|---|---|---|
| 25 | Third antennal segment twice as long as second (figure 33). | *Nemognatha nebrascensis* | 39 | |
| | Third antennal segment one-third longer than second (figure 34). | *Zonitis vittigera vittigera* | 35 | |

## TRIBE NEMOGNATHINI
## Subtribe Zonitina

### GENUS *ZONITIS* FABRICIUS

**Characteristics.** Eyes variable in size, rarely produced beneath head. Galeae lobiform or produced into a short sucking organ. Spurs of metatibiae usually spatulate but somewhat variable. Fifth and sixth abdominal sternites usually modified in the males. Aedeagus a sclerotized, bilobed structure, apex of tegmen usually compressed, sides not sclerotized.

### Subgenus *Neozonitis* Enns

#### *Zonitis bilineata* Say

**Characteristics.** Color of head, prothorax, legs and abdomen usually reddish-brown. Elytra usually pale gray or white, female usually with discal black vittae, rarely entirely black. Male with vittae obsolete or absent. Galeae lobiform, with a fringe of pale, coarse hairs. Pronotum one-sixth wider than long, sides usually evenly rounded. Metatibial spurs large, concave, similar and equal. Length 6.5 to 12 mm.

**Distribution.** New England to South Carolina, west to Idaho and southern California.

**Oklahoma county records.** NC 2, 3. July 21 to August 11.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

#### *Zonitis atripennis atripennis* (Say)

Figure 47

**Characteristics.** Head, prothorax, most of legs and at least apical abdominal segments yellow. Elytra and apices of leg segments black. Galeae lobiform, short, densely fringed with short, pale hairs. Pronotum longer than wide, sides parallel to apical fourth. Metatibial spurs large, unequal, the outer about one-third wider than inner with flared apex, inner spur narrow, apex not flared. Length 6 to 12 mm.

**Distribution.** Texas and South Dakota, west to Arizona and Idaho.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 4; NC 4; NE 10. July 18 to October 2.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## Subgenus *Parazonitis* Enns

### *Zonitis vittigera vittigera* (LeConte)

**Characteristics.** Color typically brownish-yellow with a broad, black discal vitta on each elytron. Varies to pale brownish-yellow with elytra not vittate or rarely with elytra entirely black except for narrow margins. Galeae stout, reaching the metacoxae. Pronotum scarsely wider than head, about one-sixth wider than long. Metatibial spurs subequal, stout, broad, with rounded apices. Length 7 to 12 mm.

**Distribution.** Northern Great Plains and Michigan southeastward to Louisiana and Florida.

**Oklahoma county records.** NW 4; NE 2, 3; SW 8; SE 1,7. June 10 to August 14.

**Larval hosts.** Unknown.

**Adult hosts.** One collection was from *Rudbeckia* sp. (Compositae).

### *Zonitis vittigera propinqua* MacSwain

**Characteristics.** As in subspecies *vittigera* except color usually somewhat paler and the galeae usually do not reach the metacoxae.

**Distribution.** Missouri and Nebraska to south Texas and western New Mexico.

**Oklahoma county records.** NC 4, 9, 10; NE 2, 3, 7, 12, 15; SW 7; SC 3; SE 1. June 3 to August 14.

**Larval hosts.** Unknown.

**Adult hosts.** Collected only from *Rudbeckia hirta* L., var. *pulcherrima* Farwell.

### *Zonitis perforata* Casey

**Characteristics.** Head and pronotum yellow. Elytra pale red. Tibiae and tarsi mostly black. Galeae stout, no longer than maxillary palpi. Pronotum about as wide as long, slightly widened toward base. Metatibial spurs similar and equal, large, apices rounded. Length 10 to 14 mm.

**Distribution.** Texas to Nebraska and northwestern Missouri.

**Oklahoma county records.** NW 6; SW 10; SC 13. June 1 to 19.

**Larval hosts.** Unknown.

**Adult hosts.** One collection was from *Rudbeckia hirta* L., var. *pulcherrima* Farwell.

### *Zonitis cribricollis* (LeConte)

**Characteristics.** Color usually brownish-yellow with metasternum, tibiae and tarsi dark brown. Galeae slender, not reaching metacoxae. Pronotum transverse, about one-fifth wider than long, sides usually evenly rounded. Metatibial spurs similar and equal, rather long, parallel-sided. Length 5 to 11 mm.

**Distribution.** Texas and eastern Colorado to Ohio and Florida.

**Oklahoma county records.** NW 3, 6, 8; NC 1, 9, 12; NE 2, 6, 7, 13; SW 3, 8; SC 4; SE 1, 7. May 22 to July 6.

**Larval hosts.** Unknown.

**Adult hosts.** Collected mostly from *Rudbeckia hirta* L., var. *pulcherrima* Farwell, but I have one collection from *Heliathus* sp., one from *Coreopsis grandiflora* Hogg and one from *Achillea lanulosa* Nutt. (Compositae).

### *Zonitis sayi* Wickham

**Characteristics.** Color variable, greenish to pale brownish-yellow except apices of femora and tibiae and entire tarsi black. Galeae almost reaching metacoxae. Pronotum scarsely broader than long, sides parallel to subsinuate. Metatibial spurs moderately large, inner narrower than outer and usually shorter. Length 8 to 12 mm.

**Distribution.** Great Plains from southern Canada to west Texas, east to eastern Minnesota and Kansas, west to Idaho, western Utah and eastern Arizona.

**Oklahoma county records.** PH 2; NW 10. August 14.

**Larval hosts.** Has been taken from *Nomia* nests in Utah (Enns, 1956).

**Adult hosts.** I have one collection from *Haplopappus ciliatus* (Nutt.) DC. (Compositae).

### *Zonitis punctipennis punctipennis* (LeConte)

**Characteristics.** Male usually entirely pale brownish-yellow with brown or black tarsi. Female usually with elytra entirely black or dark brown or broadly vittate and with ventral surface and appendages black in part. Galeae nearly twice as long as maxillary palpi. Pronotum less than one-sixth wider than long, sides usually evenly rounded. Metatibial spurs subequal in length, short, apices rounded, outer spur usually distinctly wider than inner. Length 8 to 14 mm.

**Distribution.** Kansas and west Texas to southern California.

**Oklahoma county records.** PH 1, 2, 3; NW 3, 4, 5; NC 3; NE 10; SW 2; SC 3. July 12 to September 2.

**Larval hosts.** Unknown.

**Adult hosts.** One collection is from *Helianthus* sp. (Compositae).

## GENUS *GNATHIUM* KIRBY

**Characteristics.** Small, slender species. Maxillary processes filamentous, at least as long as antennae. Metatibiae with outer spur broader than inner. Antennae distinctly enlarged toward apex, rather short.

### *Gnathium texanum* Horn

**Characteristics.** Color brownish-yellow with abdomen and sterna in part darker brown. Galeae about one and one-half times length of pronotum. Pronotum about as wide as long. Metatibial spurs unequal, the outer broader and longer. Length 4.5 to 6 mm.

**Distribution.** Kansas to eastern Texas.

**Oklahoma county records.** NW 3; NC 12; NE 12, 13; SE 7, 8. June 1 to 26.

**Larval hosts.** Unknown.

**Adult hosts.** I have one collection from *Rudbeckia hirta* L., var. *pulcherrima* Farwell.

### *Gnathium minimum* (Say)

Figure 48

**Characteristics.** Color usually brownish-yellow. Galeae about three times as long as pronotum. Pronotum much longer than wide, sides broadly arcuate. Metatibial spurs equal in length, the outer usually about twice as broad as the inner. Length 3.5 to 6.5 mm.

**Distribution.** Alberta, Canada to Louisiana, west to Arizona in the south.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 2, 3, 4, 5, 6, 8; NC 3, 4, 6, 8, 9, 11; NE 8; SW 2, 3, 4, 6, 7, 9; SC 1, 3; SE 7. May 26 to October 2.

**Larval hosts.** Unknown.

**Adult hosts.** Taken mostly on *Helianthus annuus* L. and *H. petiolaris* Nutt., but I have one record from *Rudbeckia hirta* L., var. *pulcherrima* Farwell. (Compositae).

### *Gnathium francilloni* Kirby

**Characteristics.** Color bright red-brown to dark brown. Pronotum brownish-yellow. Galeae about three times as long as pronotum. Pronotum one-seventh longer than wide, much broader than head. Metatibial spurs unequal, the outer broad, the inner slender, subspiniform. Length 3.5 to 4.5 mm.

**Distribution.** Georgia to Arizona and north to Wyoming.

**Oklahoma county records.** PH 2; NW 3, 5, 6, 7, 8, 10; NC 1, 2, 4, 5, 8, 10; NE 1, 4, 5, 6, 9, 10, 14; SE 6. July 22 to September 16.

**Larval hosts.** Unknown.

**Adult hosts.** Mostly collected on *Haplopappus ciliatus* (Nutt.) DC. with one collection from *Helianthus sp.* (Compositae).

## GENUS *PSEUDOZONITIS* DILLON

**Characteristics.** Antennae rather long and attenuate. Eyes large, protuberant, strongly produced beneath head. Galeae lobiform. Metatibial spurs broad, spatulate.

### *Pseudozonitis longicornis* (Horn)

**Characteristics.** Pronotum brownish-yellow with a median reddish macula. Elytra predominantly brown with sutures, margins and narrow discal vittae pale yellow. Underside mostly brown. Galeae triangular lobiform, short, inner margins with a dense fringe of coarse hairs. Pronotum distinctly wider than long, median macula irregularly rectangular. Metatibial spurs short, broad, equal. Length 10 to 12 mm.

**Distribution.** Kansas to Texas and east to Florida.

**Oklahoma county records.** NC 9; SC 16; SE 7. June 14 to July 9.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Pseudozonitis pallida* Dillon

Figure 49

**Characteristics.** Head, thorax, legs, and abdomen pale brownish-yellow. Elytra usually brownish-yellow with broad dark brown subsutural and submarginal vittae usually united near apices. Galeae lobiform, pronotum about as long as broad, slightly wider than head. Metatibial spurs subequal, short. Length 14 to 17 mm.

**Distribution.** West Texas to Florida and north into Oklahoma.

**Oklahoma county records.** PH 3; NC 14; SW 7; SC 6, 16. June 19 to July 29.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## Subtribe Nemognathina

### GENUS *NEMOGNATHA* ILLIGER

**Characteristics.** Galeae produced into a sucking tube, in some longer than the body, in others quite short. Metatibial spurs usually modified. Males with various modifications of the abdominal sternites. Aedeagus and tegmen almost entirely semimembranous, aedeagus not bilobed, often spinulate at apex.

### Subgenus *Pronemognatha* Enns

#### *Nemognatha sparsa* LeConte

**Characteristics.** Elytra, mesothorax, metathorax, tibiae and tarsi black. Head, prothorax, scutellum, coxae and femora yellow to light yellow-brown. Galeae attaining metacoxae. Pronotum scarcely wider than long, widest just before middle. Male abdominal sterna two to five not modified. Metatibial spurs broadly spatulate, similar and equal. Length 6 to 7.5 mm.

**Distribution.** Great Plains from South Dakota to northern New Mexico, west to southwestern Utah and northern Arizona.

**Oklahoma county records.** None, but should occur in the Panhandle.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### Subgenus *Meganemognatha* Enns

#### *Nemognatha lurida lurida* (LeConte)

Figure 50

**Characteristics.** Color varies from yellow to mostly black, but most commonly is brown to reddish-brown. Galeae distinctly exceed metacoxae. Pronotum about one-seventh wider than long, margins straight, almost imperceptibly but regularly widened from anterior angles to base. Male fourth abdominal sternum with a broad, triangular punctulate area and a small, round glabrous impression medially at apex, outer metatibial spurs usually three times as wide as inner spurs. Length 6.5 to 15 mm.

**Distribution.** From Durango, Mexico north to North Dakota and from the Mississippi River west to Arizona and Wyoming.

**Oklahoma county records.** PH 1, 2, 3; NW 1, 3, 4, 5, 6, 10; NC 1, 2, 3, 4, 5, 6, 9, 11, 12; NE 1, 2, 3, 6, 8; SW 2, 4, 7, 9; SC 1, 2, 3, 8, 13, 15, 17. June 10 to October 23.

**Larval hosts.** Recorded by Mickel (1928) from cells of *Anthophora occidentalis* Cresson in Colorado. Associated with *Megachile occidentalis* Fox in New Mexico (Linsley and MacSwain, 1952).

**Adult hosts.** Collected from *Helianthus annuus* L., *H. mollis* Lam., *H. petiolaris* Nutt. and *Haplopappus ciliatus* (Nutt.) DC. (Compositae).

#### *Nemognatha lutea lutea* LeConte

**Characteristics.** Color variable, usually with head, prothorax and elytra yellow or brownish-yellow. Galeae attaining apex of abdomen. Pronotum transverse, one-sixth wider than long, side margins rounded, slightly convergent to base. Male third abdominal sternum with a very small, triangular, punctulate area medially at apex, fourth with a large, triangular, median, punctulate impression. Outer metatibial spurs at least twice as wide as inner spurs. Length 8 to 14 mm.

**Distribution.** Western North Dakota, central Nebraska and west Texas, west to western Montana, eastern Nevada and Arizona.

**Oklahoma county records.** Listed as occurring in Oklahoma by Enns (1956).

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

## Subgenus *Pauronemognatha* Enns

### *Nemognatha cribraria cribraria* LeConte

**Characteristics.** Pronotum yellow, with or without dark brown spots on basal third. Elytra yellow with a dark stripe of varying length at apices, usually abbreviated into a cresent-shaped mark on apical fourth. Mostly dark brown or black ventrally. Galeae slender, reaching metacoxae. Pronotum one-fifth wider than long, sides rounded, gradually narrowed basally, varying to sinuate. Male fourth and fifth abdominal sterna with median tufts of hair in large, shallow, broadly oval, punctulate impressions. Metatibial spurs similar, subacute at apex. Length 7 to 10 mm.

**Distribution.** Southern New Mexico and western Kansas to California and Oregon.

**Oklahoma county records.** None, but should occur in the Panhandle.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Nemognatha nebrascensis* Enns

**Characteristics.** Color variable, usually light yellow-brown except eyes, antennae, palpi, galeae, scutellum, thoracic sterna and legs reddish-black or black. Elytra may be entirely brownish-yellow, brownish-yellow with dark discal vittae or entirely black. Galeae stout, scarcely reaching metacoxae. Pronotum about a sixth wider than long. Male fourth and fifth abdominal sterna with median tufts of hair in large, shallow, broadly oval, punctulate impressions. Metatibial spurs similar, short, stout, with apices bluntly rounded. Length 7 to 9 mm.

**Distribution.** Nebraska, Kansas and Oklahoma.

**Oklahoma county records.** NW 4. July 5 and 6.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Nemognatha nemorensis* Hentz

**Characteristics.** Mesothorax, metathorax, legs, abdomen and elytra black; pronotum yellow to brownish-yellow, usually with three black spots placed transversely in a row on basal third. Galeae exceeding metacoxae. Pronotum a fourth wider than long, side margins rounded. Male third, fourth and fifth abdominal sterna with median tufts of hair in shallow, broadly oval, densely punctulate impressions. Metatibial spurs similar, slender, spiniform, apices acute. Length 5 to 9 mm.

**Distribution.** Oklahoma and Nebraska east to Florida and Pennsylvania.

**Oklahoma county records.** NW 3; NC 3; NE 6, 12; SE 1, 5, 7. June 10 to August 31.

**Larval hosts.** Unknown.

**Adult hosts.** I have single collections from *Helianthus* sp., *H. mollis* Lam., *Rudbeckia hirta* L., var. *pulcherrima* Farwell and *Solidago* sp. (Compositae).

## Subgenus *Nemognatha* Illiger

### *Nemognatha bifoveata* Enns

**Characteristics.** Color black except pronotum and top of head which are yellow. Galeae reaching metacoxae. Pronotum usually one-fifth wider than long, sides subparallel at middle, oblique from anterior fourth to apex. Male fourth and fifth abdominal sterna with deep, circular, median cavities densely lined with long, fine hairs. Metatibial spurs short, subequal, somewhat flattened. Length 6 to 12 mm.

**Distribution.** Kansas and Texas to Utah and possibly southern California.

**Oklahoma county records.** None, but should occur over most of the state.

**Larval hosts.** Unknown.

**Adult hosts.** Unknown.

### *Nemognatha piazata bicolor* LeConte

**Characteristics.** Color ranges from entirely pale brownish-yellow to black with reddish head and prothorax. Two black stripes are present on the elytra in the darker forms. Galeae usually reach the apex of the abdomen. Pronotum usually a sixth wider than long, widest at anterior angles, almost imperceptibly narrowed to base. Male fourth and fifth abdominal sterna with broad, median, elongate, parallel-sided excavations which are lined with long, silky hairs. Metatibial spurs subequal, somewhat flattened, concave. Length 7 to 15 mm.

**Distribution.** Minnesota and eastern Texas to Idaho, Utah and Arizona.

**Oklahoma county records.** PH 1, 2, 3; NW 2, 3, 4, 6, 7; NC 4; SW 1, 5, 6, 7; SC 3, 11. May 24 to August 15.

**Larval hosts.** *Anthophora occidentalis* Cresson (Porter, 1951). Larvae have been taken in New Mexico by Linsley and MacSwain (1952) on *Centris caesalpiniae* (Cockerell), *Diadasia rinconis* Cockerell and *Anthophora californica texana* Cresson which might serve as hosts.

**Adult hosts.** Collected mostly on purple-flowered composites (thistles), including *Cirsium* sp., *C. ochrocentrum* (Gray) Gray and *Centaurea americana* Nutt., but I have one record from *Helianthus* sp. (Compositae) and one from *Amaranthus retroflexus* L. (Amaranthaceae).

## GENUS *RHYPHONEMOGNATHA* ENNS

**Characteristics.** Eyes small. Galeae scarcely modified, usually feebly lobiform, extremely short. Metatibial spurs moderately short, slender, concave, apices subacute. Tegmen and aedeagus semimembranous, aedeagus not bilobed, apex of tegmen compressed. There is one species in Oklahoma.

### *Rhyphonemognatha rufa* (LeConte)

Figure 51

**Characteristics.** Color is a bright, pale red. Galeae lobiform, extremely short. Head markedly elongated, somewhat flattened. Pronotum scarcely longer than wide, widest at anterior third. Metatibial spurs dissimilar, the outer broader than the inner. Length 7 to 9 mm.

**Distribution.** Arizona to southern Texas, northeastward to Iowa and northern Illinois.

**Oklahoma county records.** NW 2; NC 4, 9. April 17 to August 21.

**Larval hosts.** Unknown.

**Adult hosts.** One specimen was swept from alfalfa but this is probably not a host plant.

## GENUS *HORNIA* RILEY

**Characteristics.** Wings vestigial or entirely absent. Elytra reduced to scales which do not even cover the first abdominal tergum. Abdomen large and sac-like, with variably sclerotized plates on terga and sterna. Galeae unmodified. Claws simple, with a much reduced tooth near base.

### *Hornia minutipennis* Riley

Figure 52

**Characteristics.** Color of head, thorax and legs pale red to red-brown. Elytra brownish-yellow. Abdomen creamy white with paired, rectangular, dark brown tergal and sternal plates. Galeae are unmodified. Pronotum nearly as long as broad, subquadrate. Elytra barely extending over basal margin of first abdominal tergite. Length 14 to 17 mm.

**Distribution.** Ranges from northeastern United States to California, also southern Canada.

**Oklahoma county records.** NC 3, 9. May 11 to 19.

**Larval hosts.** Taken from cells of *Anthophora occidentalis* Cresson in Oklahoma. Also reported from this host by Mickel (1928) and Bohart and Selander (1955). Other hosts are *Anthophora bomboides* Kirby (Linsley, 1942), *A. bomboides sodalis* Cresson (Hocking, 1949), *A. bomboides neomexicana* Cockerell (Linsley, 1942; MacSwain, 1956) and *A. abrupta* Say (Riley, 1877; Rau, 1926).

**Adult hosts.** None, adults do not feed.

### *Hornia mexicana neomexicana* (Cockerell)

**Characteristics.** Color of head, thorax and legs black or dominantly black. Elytra brownish-yellow. Abdomen dark brown with narrow pale margins on tergites and sternites. Galeae are unmodified. Pronotum varies from a little wider than long to nearly one and one-third times as wide as long. Elytra nearly reaching apical margin of first abdominal tergite. Length 13 to 15 mm.

**Distribution.** Known from Kansas, Colorado, Oklahoma, Texas, and New Mexico.

**Oklahoma county records.** Listed as occurring in Oklahoma by Knaus (1928).

**Larval hosts.** *Anthophora occidentalis* Cresson (Hungerford and Williams, 1912; Mickel, 1928; MacSwain, 1958; Porter, 1951), *A. vallorum* (Cockerell) (Cockerell, 1899) and *A. bomboides neomexicana* Cockerell (Cockerell, 1905; Hicks, 1926).

**Adult hosts.** None, adults do not feed.

## Adult host plant index

Host plants are listed alphabetically with the meloid species found feeding on each plant also listed alphabetically. An attempt was made to include only those plants on which the beetles were feeding, but there is some doubt about some of the older collections. Plant species listed include only those on which the beetles have been taken in Oklahoma. Fernald (1950) and Waterfall (1962) were used to identify plant species except for the Cactaceae where Weniger (1971) was used.

| | |
|---|---|
| *Achillea lanulosa* Nutt. (yarrow) | *Epicauta callosa* LeConte<br>*Epicauta pennsylvanica* (DeGeer)<br>*Zonitis cribricollis* (LeConte) |
| *Albizzia* sp. (mimosa) | *Epicauta torsa* (LeConte) |
| *Amaranthus* sp. (pigweed) | *Epicauta ficta* Werner<br>*Epicauta lemniscata* (Fabricius)<br>*Epicauta occidentalis* Werner<br>*Epicauta pennsylvanica* (DeGeer) |
| *Amaranthus retroflexus* L. | *Epicauta ficta* Werner<br>*Nemognatha piazata bicolor* LeConte |
| *Amaranthus spinosus* L. | *Epicauta ficta* Werner |
| *Amaranthus tamarascinus* Nutt. | *Epicauta ficta* Werner<br>*Epicauta pennsylvanica* (DeGeer) |
| *Ambrosia* sp. (ragweed) | *Pyrota discoidea* LeConte |
| *Amorpha fruticosa* L. | *Epicauta torsa* (LeConte) |
| *Arachis hypogaea* L. (peanut) | *Epicauta immaculata* (Say)<br>*Epicauta lemniscata* (Fab.)<br>*Epicauta occidentalis* Werner<br>*Epicauta sericans* LeConte |
| *Argemone polyanthemos* (Fedde) G. B. Ownb. | *Lytta fulvipennis* LeConte |
| *Asclepias tuberosa* L. (butterfly milkweed) | *Epicauta immaculata* (Say) |
| *Aster* sp. (wild aster) | *Epicauta pennsylvanica* (DeGeer) |
| *Aster praealtus* Poir. | *Epicauta pennsylvanica* (DeGeer) |
| *Callirhoe* sp. | *Pyrota discoidea* LeConte |
| *Callirhoe alcaeoides* (Michx.) Gray | *Epicauta atrata* (Fab.)<br>*Epicauta sericans* (LeConte) |
| *Callirhoe digitata* Nutt. | *Pyrota discoidea* LeConte |
| *Callirhoe involucrata* (Nutt. ex Torr.) Gray | *Epicauta sericans* (LeConte)<br>*Pyrota discoidea* LeConte |
| *Callirhoe leiocarpa* Martin | *Pyrota discoidea* LeConte |

| | |
|---|---|
| *Centaurea americana* Nutt. | *Epicauta callosa* LeConte<br>*Nemognatha piazata bicolor* LeConte |
| *Chamaesaracha coniodes* (Moric.) Britt. | *Epicauta immaculata* (Say) |
| *Chenopodium album* L. (lambs-quarter) | *Epicauta lemniscata* (Fab.)<br>*Epicauta occidentalis* Werner |
| *Cirsium* sp. (thistle) | *Epicauta atrata* (Fab.)<br>*Epicauta sericans* LeConte<br>*Nemognatha piazata bicolor* LeConte |
| *Cirsium ochrocentrum* (Gray) Gray | *Nemognatha piazata bicolor* LeConte |
| *Clematis* sp. (clematis) | *Epicauta ficta* Werner |
| *Convolvulus* sp. (bindweed) | *Epicauta sericans* LeConte |
| *Convolvulus arvensis* L. | *Epicauta sericans* LeConte |
| *Coreopsis grandiflora* Hogg | *Epicauta atrata* (Fab.)<br>*Epicauta callosa LeConte*<br>*Zonitis cribricollis* (LeConte) |
| *Coreopsis grandiflora* Hogg, var. *Harveyana* (Gray) Sherff | *Epicauta atrata* (Fab.) |
| *Coreopsis tinctoria* Nutt., var. *tinctoria* | Epicauta atrata (Fab.) |
| *Englemannia pinnatifida* T. & G. | *Epicauta atrata* (Fab.)<br>*Epicauta sericans* LeConte |
| *Eupatorium serotinum* Michx. | *Epicauta pennsylvanica* (DeGeer) |
| *Gaillardia pinnatifida* Torr. | *Epicauta callosa* LeConte |
| *Gaillardia pulchella* Foug. | *Epicauta sericans* LeConte |
| *Glycine Max* (L.) Merr. (soybean) | *Epicauta lemniscata* (Fab.)<br>*Epicauta maculata* Say<br>*Epicauta occidentalis* Werner |
| *Gossypium* sp. (cotton) | *Epicauta albida* (Say)<br>*Epicauta atrata* (Fab.)<br>*Epicauta callosa* LeConte<br>*Epicauta conferta* (Say)<br>*Epicauta immaculata* (Say)<br>*Epicauta sericans* LeConte |
| *Grindelia lanceolata* Nutt. | *Epicauta pennsylvanica* (DeGeer)<br>*Gnathium francilloni* Kirby |
| *Gutierrezia* sp. (broomweed) | *Epicauta aspera* Werner<br>*Epicauta ferruginea* (Say)<br>*Epicauta ficta* Werner<br>*Epicauta pennsylvanica* (DeGeer) |

| | |
|---|---|
| *Gutierrezia dracunculoides* (DC.) Blake | *Epicauta funebris* Horn<br>*Epicauta pennsylvanica* (DeGeer)<br>*Pyrota perversa* Dillon |
| *Gutierrezia Sarothrae* (Pursh) Britton & Rusby | *Epicauta aspera* Werner<br>*Epicauta fortis* Werner<br>*Epicauta ferruginea* (Say)<br>*Epicauta pennsylvanica* (DeGeer)<br>*Epicauta stuarti* LeConte<br>*Pyrota concinna* Casey |
| *Haplopappus ciliatus* (Nutt.) DC. | *Epicauta callosa* LeConte<br>*Epicauta ferruginea* (Say)<br>*Epicauta ficta* Werner<br>*Epicauta pennsylvanica* (DeGeer)<br>*Gnathium francilloni* Kirby<br>*Nemognatha lurida lurida* LeConte<br>*Pyrota concinna* Casey<br>*Pyrota perversa* Dillon<br>*Zonitis sayi* Wickham |
| *Helianthus* sp. (sunflower) | *Epicauta callosa* LeConte<br>*Epicauta corvina* (LeConte)<br>*Epicauta ferruginea* (Say)<br>*Gnathium francilloni* Kirby<br>*Gnathium minimum* (Say)<br>*Nemognatha lurida lurida* LeConte<br>*Nemognatha nemorensis* Hentz<br>*Nemognatha piazata bicolor* LeConte<br>*Pyrota bilineata* Horn<br>*Pyrota concinna* Casey<br>*Zonitis cribricollis* (LeConte)<br>*Zonitis punctipennis punctipennis* (LeConte) |
| *Helianthus annuus* L. | *Epicauta callosa* LeConte<br>*Epicauta ferruginea* (Say)<br>*Gnathium minimum* (Say)<br>*Nemognatha lurida lurida* LeConte<br>*Pyrota concinna* Casey |
| *Helianthus mollis* Lam. | *Nemognatha lurida lurida* LeConte<br>*Nemognatha nemorensis* Hentz |
| *Helianthus petiolaris* Nutt. | *Epicauta callosa* LeConte<br>*Gnathium minimum* (Say)<br>*Nemognatha lurida lurida* LeConte |
| *Heterotheca latifolia* Buckl. | *Pyrota concinna* Casey |
| *Ipomoea leptophylla* Torr. (morningglory) | *Epicauta sericans* LeConte |
| *Kallstroemia hirsutissima* Vail | *Epicauta maculata* Say |
| *Lespedeza stipulacea* Maxim. | *Epicauta conferta* (Say) |

| | |
|---|---|
| *Lycopersicum esculetum* Mill. (tomato) | *Epicauta conferta* (Say)<br>*Epicauta ficta* Werner<br>*Epicauta funebris* Horn<br>*Epicauta pestifera* Werner |
| *Lygodesmia juncea* (Pursh) D. Don | *Epicauta sericans* LeConte |
| *Medicago sativa* L. (alfalfa) | *Epicauta callosa* LeConte<br>*Epicauta conferta* (Say)<br>*Epicauta ficta* Werner<br>*Epicauta funebris* Horn<br>*Epicauta immaculata* (Say)<br>*Epicauta lemniscata* (Fab.)<br>*Epicauta maculata* Say<br>*Epicauta murina* (LeConte)<br>*Epicauta occidentalis* Werner<br>*Epicauta pennsylvanica* (DeGeer)<br>*Epicauta pestifera* Werner<br>*Epicauta punctipennis* Werner<br>*Epicauta sericans* LeConte<br>*Epicauta torsa* (LeConte)<br>*Pyrota deceptiva* Selander |
| *Melilotus alba* Desv. (white sweet clover) | *Epicauta funebris* Horn |
| *Melilotus officinalis* (L.) Lam. (yellow sweet clover) | *Epicauta punctipennis* Werner |
| *Mentzelia stricta* (Osterhout) | *Lytta reticulata* Say |
| *Oenothera laciniata* Hill, var. *grandiflora* (Wats.) Robinson | *Epicauta sericans* LeConte |
| *Oenothera lavandulaefolia* T. & G. | *Pyrota discoidea* LeConte |
| *Oenothera serrulata* Nutt. | *Pyrota discoidea* LeConte |
| *Oenothera speciosa* Nutt. | *Epicauta atrata* (Fab.) |
| *Opuntia* sp. | *Epicauta sericans* LeConte |
| *Opuntia imbricata* (Haw.) DC., var. *arborescens* (Eng.) Weniger (cholla) | *Epicauta sericans* LeConte |
| *Opuntia phaeacantha* Eng., var. *camanchica* (Eng. & Bigel.) Weniger (prickly pear) | *Epicauta sericans* LeConte |
| *Physalis virginiana* Mill, var. *hispida* Waterfall | *Epicauta segmenta* (Say)<br>*Epicauta valida* (LeConte) |
| *Physalis viscosa* L. | *Epicauta immaculata* (Say) |

| | |
|---|---|
| *Proboscidea louisianica* (Miller) Thet. (devil's claw) | *Epicauta sericans* LeConte |
| *Prosopis juliflora* (Swartz) DC., var. *glandulosa* (Torr.) Cock. (mesquite) | *Epicauta nigritarsis* (LeConte) |
| *Psoralea lanceolata* Pursh | *Lytta reticulata* Say |
| *Pyrrhopappus Geiseri* Shinners | *Epicauta atrata* (Fab.) |
| *Pyrrhopappus scaposus* DC. | *Lytta fulvipennis* LeConte |
| *Pyrus* sp. (pear) | *Lytta aenea* Say |
| *Raphanus sativus* L. (radish) | *Epicauta murina* (LeConte) |
| *Robinia Pseudo-Acacia* L. (black locust) | *Epicauta fabricii* (LeConte)<br>*Epicauta torsa* (LeConte) |
| *Rudbeckia amplexicaulis* Vahl | *Epicauta callosa* LeConte |
| *Rudbeckia hirta* L., var. *pulcherrima* Farwell | *Epicauta atrata* (Fab.)<br>*Gnathium minimum* (Say)<br>*Gnathium texanum* Horn<br>*Nemognatha nemorensis* Hentz<br>*Zonitis cribricollis* (LeConte)<br>*Zonitis perforata* Casey<br>*Zonitis vittigera propinqua* MacSwain |
| *Salsola Kali* L., var. *tenuifolia* Tausch (tumbleweed) | *Epicauta lemniscata* (Fab.)<br>*Epicauta maculata* Say<br>*Epicauta occidentalis* Werner<br>*Epicauta pennsylvanica* (DeGeer) |
| *Sapindus Drummondii* H. & A. (soapberry) | *Epicauta conferta* (Say) on fruit<br>*Epicauta torsa* (LeConte) |
| *Schrankia uncinata* Willd. | *Epicauta atrata* (Fab.)<br>*Epicauta floridensis* Werner<br>*Epicauta immaculata* (Say)<br>*Epicauta maculata* Say<br>*Epicauta sericans* LeConte |
| *Solanum* sp. (night shade) | *Epicauta albida* (Say)<br>*Epicauta funebris* Horn<br>*Epicauta immaculata* (Say)<br>*Epicauta pestifera* Werner |
| *Solanum elaeagnifolium* Cav. | *Epicauta immaculata* (Say)<br>*Epicauta sericans* LeConte |
| *Solanum Torreyi* Gray | *Epicauta albida* (Say)<br>*Epicauta funebris* Horn<br>*Epicauta immaculata* (Say)<br>*Epicauta segmenta* (Say)<br>*Epicauta valida* (LeConte) |

| | |
|---|---|
| *Solidago* sp. (goldenrod) | *Epicauta aspera* Werner<br>*Epicauta ferruginea* (Say)<br>*Epicauta funebris* Horn<br>*Epicauta pennsylvanica* (DeGreer)<br>*Epicauta sericans* LeConte<br>*Epicauta stuarti* LeConte<br>*Nemognatha nemorensis* Hentz<br>*Pyrota concinna* Casey |
| *Solidago canadensis* L. | *Epicauta pennsylvanica* (DeGreer)<br>*Epicauta stuarti* LeConte |
| *Solidago canadensis* L.,<br>var. *gilvocanescens* Rydb. | *Epicauta aspera* Werner<br>*Epicauta ferruginea* (Say)<br>*Epicauta pennsylvanica* (DeGeer) |
| *Solidago missouriensis* Nutt.,<br>var. *fasciculata* Holz. | *Epicauta callosa* LeConte<br>*Epicauta ferruginea* (Say)<br>*Epicauta pennsylvanica* (DeGeer)<br>*Epicauta stuarti* LeConte |
| *Solidago petiolaris* Ait. | *Epicauta aspera* Werner<br>*Epicauta ferruginea* (Say)<br>*Epicauta pennsylvanica* (DeGeer)<br>*Epicauta stuarti* LeConte<br>*Pyrota concinna* Casey |
| *Thelesperma filifolium*<br>(Hook.) Gray | *Epicauta atrata* (Fab.)<br>*Epicauta callosa* LeConte |
| *Tribulus terrestris*<br>L. (puncturevine) | *Epicauta albida* (Say)<br>*Epicauta ficta* Werner<br>*Epicauta funebris* Horn<br>*Epicauta immaculata* (Say)<br>*Epicauta maculata* Say<br>*Epicauta pestifera* Werner<br>*Epicauta sericans* LeConte<br>*Epicauta segmenta* (Say)<br>*Epicauta valida* (LeConte) |

# Plates

## Plate I

Figure 2. *Epicauta valida* (LeConte), tarsal claw, lateral view.

Figure 3. *Nemognatha lurida lurida* (LeConte), tarsal claw, lateral view.

Figure 4. *Hornia minutipennis* Riley, tarsal claw, lateral view.

Figure 5. *Meloe campanicollis* Pinto & Selander, outer metatibial spur, lateral view.

Figure 6. *Meloe niger* Kirby, outer metatibial spur, lateral view.

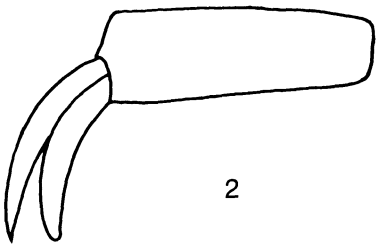
Figure 7. *Meloe niger* Kirby, apex of antennal segment V of male (after Pinto & Selander, 1970).

Figure 8. *Meloe dianella* Pinto & Selander, apex of antennal segment V of male.

Figure 9. *Pyrota concinna* Casey, elytra, dorsal view.

Figure 10. *Pyrota terminata* LeConte, elytra, dorsal view.

Figure 11. *Pyrota discoidea* LeConte, elytra, dorsal view.



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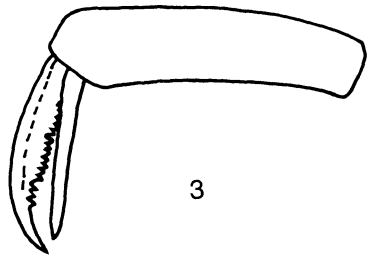

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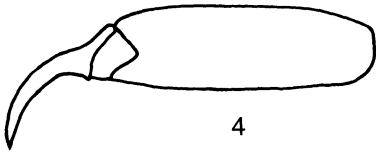

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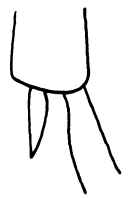

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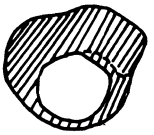

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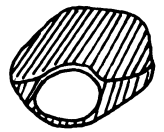

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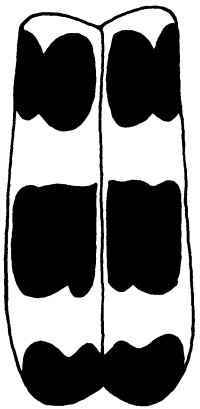

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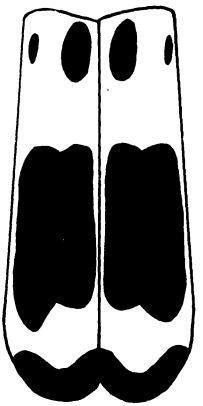

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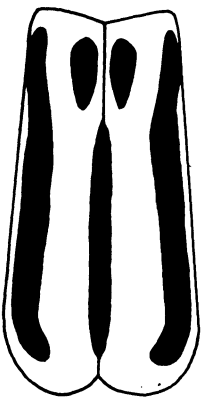

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Plate I

## Plate II

Figure 12. *Pyrota perversa* Dillon, metatibial spurs.

Figure 13. *Pyrota perversa* Dillon, maxillary palpus of male.

Figure 14. *Pyrota concinna* Casey, metatibial spurs.

Figure 15. *Pyrota concinna* Casey, maxillary palpus of male.

Figure 16. *Epicauta sericans* LeConte, antennal segments I-III.

Figure 17. *Epicauta immaculata* (Say), antennal segments I-III of female.

Figure 18. *Epicauta maculata* (Say), maxillary palpus of male.

Figure 19. *Epicauta normalis* Werner, maxillary palpus of male.

Figure 20. *Epicauta aspera* Werner, bases of pronotum and elytra, dorsal view.

Figure 21. *Epicauta nigritarsis* (LeConte), bases of pronotum and elytra, dorsal view.

Figure 22. *Epicauta ficta* Werner, bases of pronotum and elytra, dorsal view.

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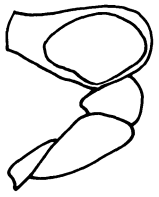

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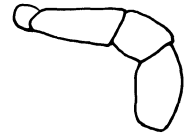

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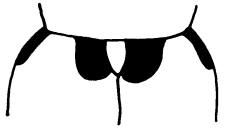

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Plate II

## Plate III

Figure 23. *Epicauta funebris* Horn, protibial spurs.

Figure 24. *Epicauta ficta* Werner, metatibial spurs.

Figure 25. *Epicauta sericans* LeConte, metatibial spurs.

Figure 26. *Epicauta ficta* Werner, antenna.

Figure 27. *Epicauta pestifera* Werner, antenna.

Figure 28. *Rhyphonemognatha rufa* (LeConte), metatibial spurs.

Figure 29. *Zonitis punctipennis* (LeConte), metatibial spurs.

Figure 30. *Nemognatha lurida lurida* (LeConte), metatibial spurs.

Figure 31. *Nemognatha nebrascensis* Enns, metatibial spurs.

Figure 32. *Nemognatha cribraria* LeConte, antennal segments I-III (after Enns, 1956).

Figure 33. *Nemognatha nebrascensis* Enns, antennal segments I-III.

Figure 34. *Zonitis vittigera* (LeConte), antennal segments I-III.

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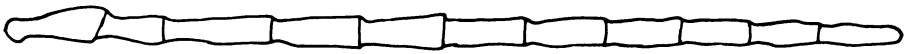

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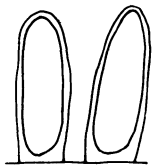

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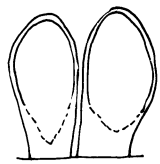

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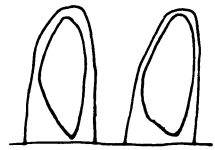

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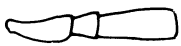

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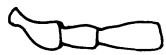

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Plate III

## Plate IV

Figure 35. *Meloe americanus* Leach.

Figure 36. *Pyrota invita* Horn.

Figure 37. *Lytta fulvipennis* LeConte.

Figure 38. *Linsleya convexa* (LeConte).

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Plate IV

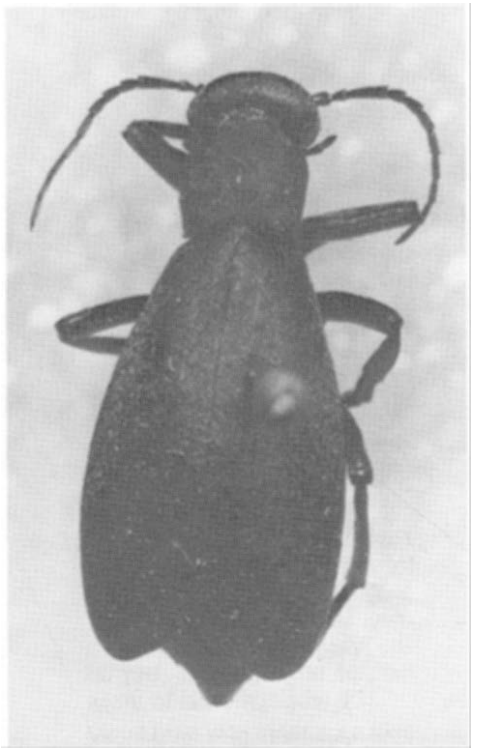
## Plate V

Figure 39. *Epicauta conferta* (Say)

Figure 40. *Epicauta pestifera* Werner.

Figure 41. *Epicauta lemniscata* (Fabricius)

Figure 42. *Epicauta maculata* (Say)



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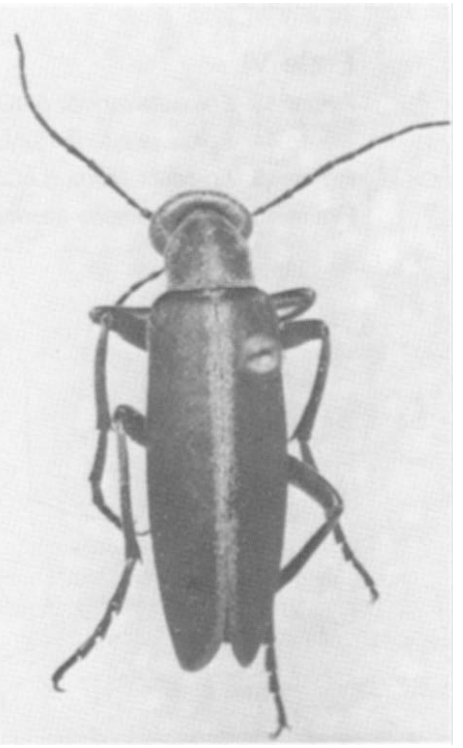

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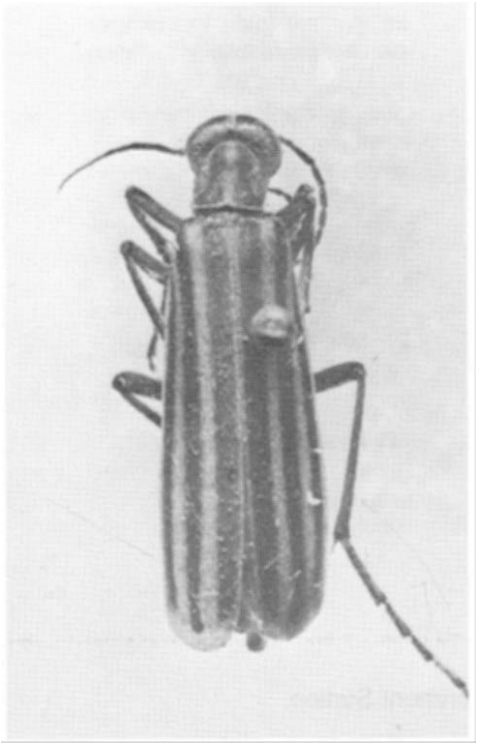

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Plate V

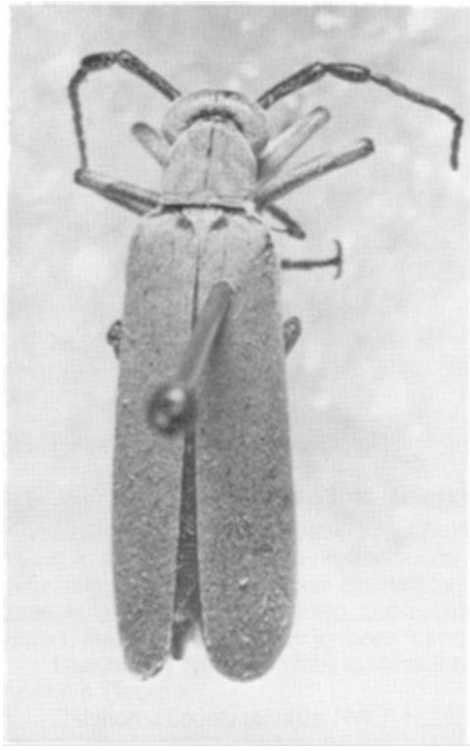
## Plate VI

Figure 43. *Epicauta fabricii* (LeConte)

Figure 44. *Epicauta albida* (Say)

Figure 45. *Epicauta valida* (LeConte)

Figure 46. *Pleuropompha costata* (LeConte)



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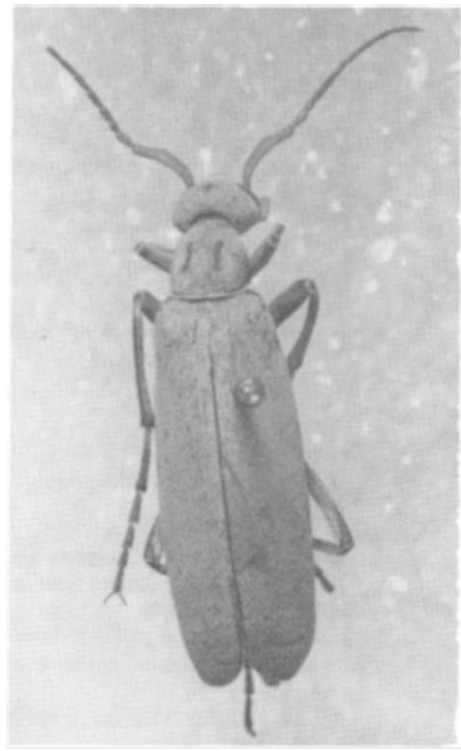

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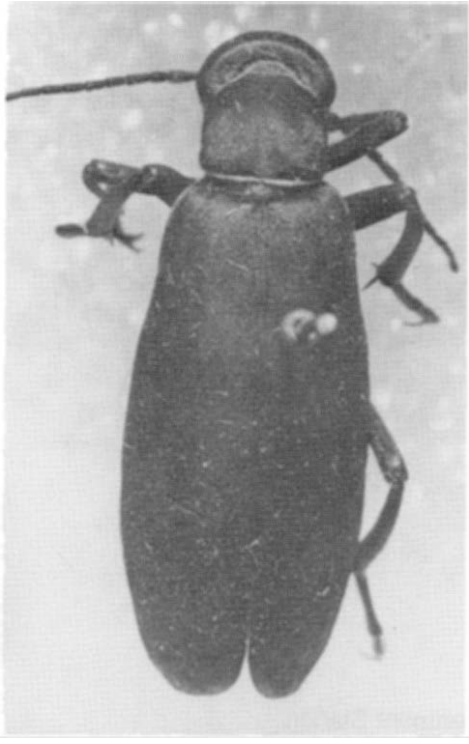

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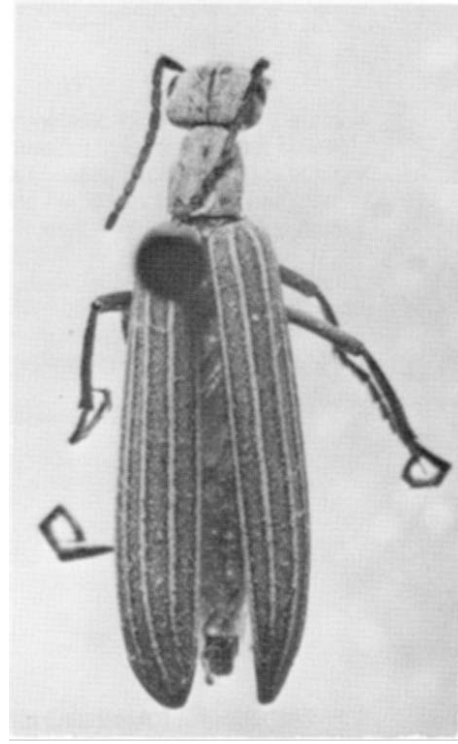

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Plate VI

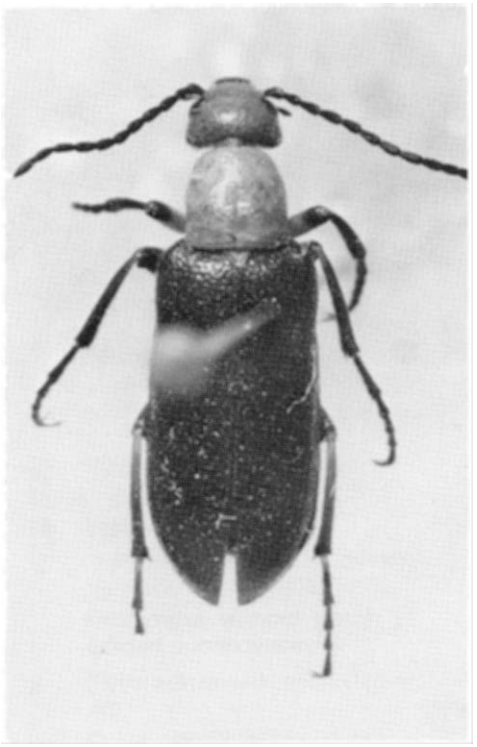
## Plate VII

Figure 47. *Zonitis atripennis atripennis* (Say)

Figure 48. *Gnathium minimum* (Say)

Figure 49. *Pseudozonitis pallida* Dillon

Figure 50. *Nemognatha lurida lurida* (LeConte)



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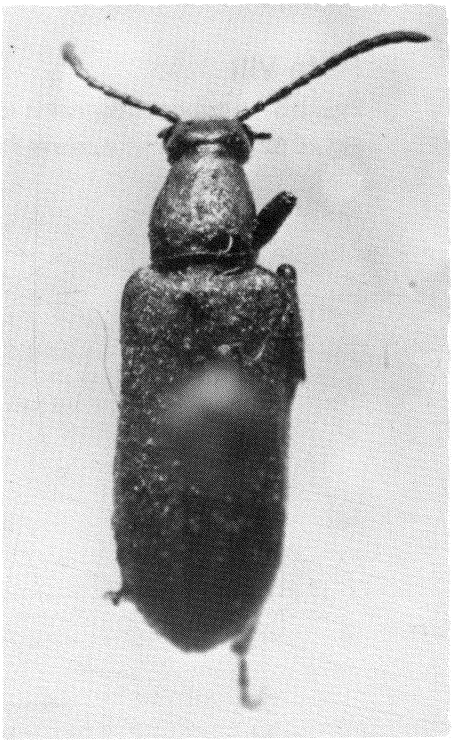

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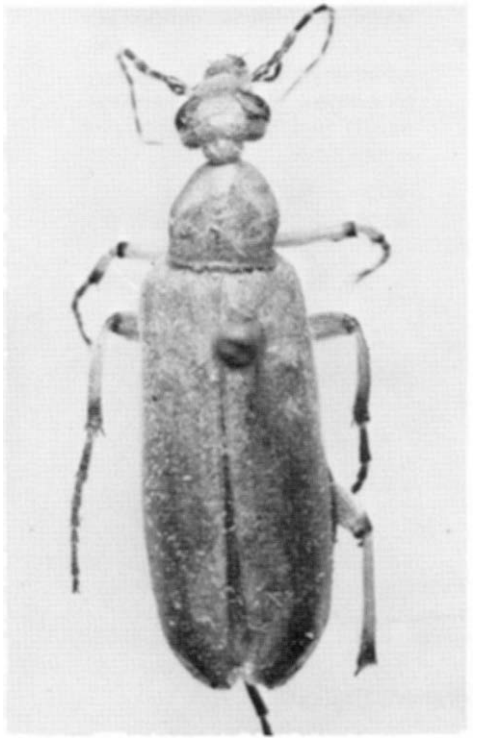

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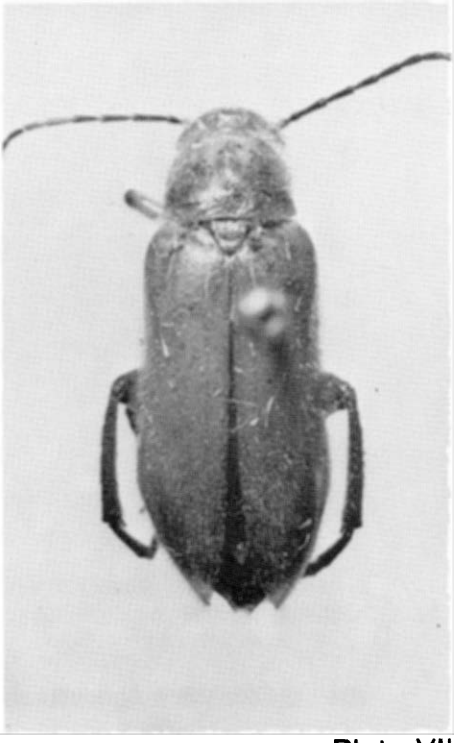

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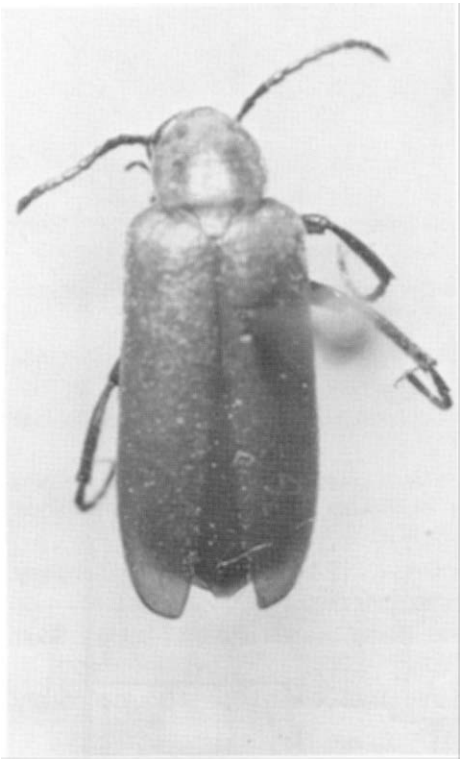
Plate VII

## Plate VIII

Figure 51. *Rhyphonemognatha rufa* (LeConte)

Figure 52. *Hornia minutipennis* Riley



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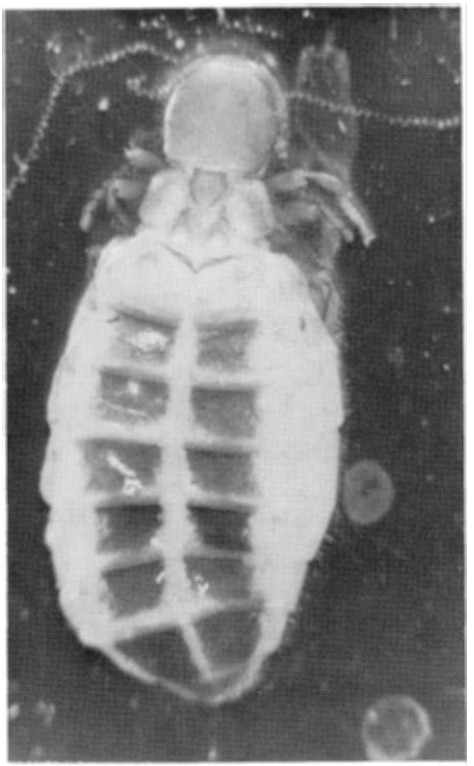

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Plate VIII

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