

Revision of North American
Liris Fabricius
(Hymenoptera: Sphecoidea:
Larridae)

KARL V. KROMBEIN
and
SANDRA SHANKS GINGRAS

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Karl V. Krombein
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ABSTRACT

Krombein, Karl V., and Sandra Shanks Gingras. Revision of North American *Liris* Fabricius (Hymenoptera: Sphecoidea: Larridae). *Smithsonian Contributions to Zoology*, number 404, 96 pages, 49 figures, 18 maps, 1984.— This revisionary study treats the 27 taxa occurring in Canada, United States, and Mexico. They belong to two subgenera, *Motes* Kohl, with a single species, and *Leptolarra* Cameron, containing the rest of the taxa.

The following taxa are described as new, all in the subgenus *Leptolarra*: *Liris asymphonus*, *L. deliquus*, *L. evansi*, *L. infrunitus*, *L. mescalero latus*, *L. liparus*, *L. mexicanus*, *L. molestus*, *L. nearcticus*, *L. nigrispinus*, *L. partitus*, *L. similis*, and *L. vincenti*.

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Revision of North American *Liris* Fabricius (Hymenoptera: Sphecoidea: Larridae)

*Karl V. Krombein
and Sandra Shanks Gingras*

Introduction

Liris is a large, predominantly pan-tropical genus of solitary ground-nesting predaceous wasps. Bohart and Menke (1976:243–248) list more than 260 species and estimate that this number will be increased substantially when the poorly known Neotropical fauna has been studied. There is probably also a large unknown Oriental fauna. Within the Larridae *Liris* is exceeded in size only by *Tachysphex* Kohl, with 351 species, and *Tachytes* Panzer, with 268 species. However, the total fauna of the latter two genera is probably better known than that of *Liris*.

We have limited our revisionary study to North America, so it is concerned primarily with the Nearctic taxa. However, it does include some Neotropical elements that range northward along the coast of the Gulf of Mexico and a very few that are found only in extreme southern Florida or that occur there as well as in some of the Caribbean islands. We recognize 24 species, but three of those taxa are polytypic, and so we actually treat 27 species-level taxa.

Depository abbreviations used in “Material Ex-

amined” and type material sections are explained in “Acknowledgments.”

In-text references are not given dates unless the author cited has more than one entry in Literature Cited.

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Mr. George L. Venable, Department of Entomology, Smithsonian Institution (SI), prepared all illustrations and plates.

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sistance in several ways. He donated to the National Museum of Natural History (SI) the specimens he collected during several trips to Mexico, from which we selected several holo- and allotypes. (These and other specimens in the national collection are denoted by the acronym USNM.) He made helpful criticism of an early draft of the key to species of *Liris* and compared specimens with the Cameron types from Mexico and Central America during a trip to the British Museum (Natural History) (BMNH). Finally, during Dr. Evans' tenure at the Museum of Comparative Zoology (MCZ), Harvard University, he sent on loan the *Liris* in that collection.

The late Mr. Robert R. Dreisbach granted the senior author permission to deposit in the national collection any holo- and allotypes selected from the material he collected in Mexico; his collection of *Liris* otherwise, except for duplicate specimens, is now at Michigan State University (MSU).

We are obliged to Dr. Børge Petersen, Copenhagen Museum, for the loan of the holotype of *Liris labiatus* (Fabricius), and to Mr. Colin R. Vardy (BMNH) for the loan of the holotype of *Liris ignipennis* (Smith).

We are indebted to the following for the loan of other material used in this revision: Dr. Richard M. Bohart, University of California, Davis (UCD); Dr. David K. Faulkner, Natural History Museum, San Diego (SDM); the late Dr. Harold J. Grant, Academy of Natural Sciences, Philadelphia (ANSP); Mr. Terry Griswold, Bee Biology and Systematics Laboratory, USDA, Utah State University, Logan (USU); the late Dr. Paul D. Hurd, Jr., during his tenure at University of California, Berkeley (UCB); Dr. Lubomir Masner, Biosystematics Research Institute, Ottawa (BRI); Dr. Charles D. Michener, University of Kansas, Lawrence (KU); Dr. Wojciech J. Pulawski, California Academy of Sciences, San Francisco (CAS); the late Dr. Herman A. Scullen, Oregon State University, Corvallis (OSU); Mr. Roy R. Snelling, Los Angeles County Museum (LACM); Dr. Lionel A. Stange, Florida State Department of Agriculture, Gainesville (FSDA);

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Systematics

The diversity in the world fauna of *Liris* is so pronounced that more than 10 genera have been proposed for one or more of the component species. Bohart and Menke (1976:43) placed all of these names in the synonymy of *Liris*, but recognized three subgenera, typical *Liris*, *Motes* Kohl, and *Leptolarra* Cameron. Typical *Liris* occurs only in the Old World, but the latter two subgenera occur in both the New World and the Old World.

Liris and *Larra* Fabricius are the only New World larrids with a transverse swelling on the front beneath the fore ocellus that forms an M or inverted U by meeting a swelling along the inner eye margin. Also, the fore ocellus is in a broad depression and the modified hind ocelli are small, narrow, and elliptical.

The North American species of *Liris* are readily distinguished from the few species of *Larra* by having the female abdomen black rather than partly or entirely red, the female pygidium with moderate to dense vestiture rather than being shiny and devoid of hair, and the side of the male propodeum dull and impunctate rather than densely punctate with shiny interspaces.

Significant behavioral differences of evolutionary significance also separate *Larra* and *Liris*. The species of *Larra* whose biology has been confirmed prey upon mole crickets (Gryllotalpidae) and do not prepare a nest but merely paralyze the prey for a few minutes, laying an egg upon it during paralysis. The cricket recovers completely from the paralysis and continues a

subterranean existence in its burrow until the growing wasp larva destroys it and spins a cocoon. Most species of *Liris* are known to prey upon true crickets (Gryllidae), although one species uses camel crickets (Gryllacrididae). There is a dubious record of an African species using a gryllotalpid, whereas customarily this species of wasp preys upon gryllids. The known species of *Liris* place one or more paralyzed prey in a cell in the ground, depositing an egg upon the first prey brought into the cell. The wasp then seals the cell with bits of earth and pieces of debris. The prey are paralyzed for longer periods than in *Larra*, ranging from some minutes to several hours, but never recover completely and are rarely capable of coordinated locomotion. However, by the time that the paralysis abates, the prey is immured in the ground, incapable of escape from the cell.

SPECIES GROUPS.—J. de Beaumont (1961) placed the *Liris* species of the Mediterranean region into species groups. A particular difficulty with de Beaumont's groups is that many of the character states used to separate them are stated as being similar to those of other groups. We consider that when the fauna is known well enough, species groups should be defined by synapomorphies, that is, shared derived characters unique to those groups. In addition, some of the characters used to separate de Beaumont's groups appear to be of dubious value, at least in the way in which he used them. For example, he stated that the subgeneric name *Leptolarra* was to be equated with his species group *nigricans*. However, in his description of this group, he noted that the female mandible has two teeth on the inner margin. This character varies as exhibited by *L. championi*, which has only one subapical tooth but also possesses a subbasal one, unlike other species in the subgenus. The males of his *nigricans* group are defined partly on the basis of the position of the first antennal placoid (sixth flagellomere), but in most species in the subgenus *Leptolarra* they begin on the second, third, or fourth flagellomere, and within a species this varies. The similar relative length of the

gonostyli and parameres, another character state found in the *nigricans* group, is found in some, but not all species of *Leptolarra*. It appears that the *nigricans* group, as defined by de Beaumont, contains only some of the species currently included in the subgenus *Leptolarra*. None of his species groups appears to agree with the trends we noted in the North American fauna.

Because so many species of *Liris* range from southern Texas south into Central and South America, a definitive discussion of the relationships within the New World members of the genus must wait until the Neotropical fauna is thoroughly studied. However, several major trends are apparent.

One group of species (*L. argentatus*, *L. evansi*, *L. mescalero mescalero*, and *L. mescalero latus*) has the apical margin of the sixth sternum of the male biemarginate to varying degrees. The genitalia of these taxa exhibit several striking similarities (see Figures 1–4): all have volsella exceeding the length of the gonostyli; the volsella have short erect setae on the entire outer edges and halfway down the inner edges, as well as on the ventral surfaces; the gonostyli have long setae arising from the outer surfaces and fewer similar but shorter setae on the inner apical edges. In the Nearctic fauna, no other species exhibit this combination of character states on the genitalia.

The females in this group (the female of *L. evansi* is unknown) are similar also. In fact, the only reliable character state for distinguishing *L. argentatus* from *L. mescalero* is the presence or absence of an oval sensory pit on the last flagellomere. The females of *L. m. mescalero* and *L. m. latus* are indistinguishable except by geographic range.

A number of species of *Liris* males have unmodified sterna. Mr. David L. Vincent (pers. comm.) has pointed out a setal pattern occurring in the genitalia of several of these species. In the North American fauna, this pattern is best exhibited by *L. vincenti* (Figure 17). In this group of species, the apices of the gonostyli have only a few long setae on the inner edge. The volsella have a characteristic long basal "plume" of setae

(seen on the ventral view), and the upper surfaces of the volsella have many brush-like, inwardly curving setae. Sometimes the entire volsella is covered with these setae. In addition, the up-turned base of the volsella, visible in the ventral view, is short, crescent-shaped, and has a short fringe of setae apically. This latter character, however, is present in several other species with very different appearing genitalia. Similar patterns appear in *L. similis* (Figure 18) and *L. infrunitus* (Figure 19), although these two species have more setae on the apices of their gonostyli. Females are unknown for any of the North American species with this type of genitalia.

Several species (*L. partitus*, *L. apicipennis*, *L. rufipennis*, *L. labiata*, and the West Indian *L. ignipennis*) are similar in appearance because they have bicolored wings, the bases of the forewings being yellow and the apices gray. However, marked differences in other morphological features in the females, i.e., the form of the pygidium, hind tibial carina, and number of apical tergal "bands" of pubescence, lead us to conclude that the bicolored wings are a convergent character state. Again, because we lack males of some of these species, we are limited in discussing their relationships.

Both of us have examined the types of species described from Mexico and Central America by Cameron (1889), one of us (KVK) at the British Museum (Natural History), the other (SSG) while they were on loan to Mr. David Vincent.

Biology

Bohart and Menke (1976:243) summarized the biological information that was published on several species in various parts of the world. The available data indicate that all species nest in the ground, often in pre-existing empty burrows of other insects or arthropods. Many species make unicellular nests, others uni- or multicellular nests, and at least one always makes multicellular nests.

Much information has been published on *L. argentatus* (Palisot de Beauvois). Williams (1914), Rau and Rau (1918), and O'Brien and Kur-

czewski (1982) contributed rather lengthy studies of the nest, prey and various behavioral details of *L. argentatus*. Reinhard (1929) wrote a popular style account of its nesting and prey. Ashmead (1894), Rau (1922), and Krombein and Evans (1955) contributed shorter notes on the nest and prey, and Krombein and Evans (1954), Krombein (1958a), and Kurczewski and Kurczewski (1971) published a few prey records. O'Brien and Kurczewski included some flower-visiting records, and Krombein (1951) and Krombein and Evans (1955) reported visits to honeydew secretions. Steiner (1976) made exhaustive studies of prey stinging under controlled laboratory conditions using *L. argentatus* and *L. beatus* (Cameron) as experimental animals.

The other published information on North American species consists of an account of the nesting and prey of *Liris panamensis muesebecki* (Krombein), male territoriality and prey of *L. beatus*, both by Kurczewski (1976), and a prey record for *L. beatus* by Krombein (1958b).

The account that follows is based on *L. argentatus* and the references cited above, unless another species is mentioned specifically. We have included in our discussion a few unpublished prey records for *L. argentatus*, *L. beatus*, and *L. mexicanus*, new species, from prey specimens pinned with specimens of *Liris*. We have also included some unpublished flower-visiting records for those three taxa and for *L. apicipennis* (Cameron), *L. mescalero mescalero* (Pate), *L. mescalero latus*, new subspecies, *L. muspa* (Pate), *L. vincenti*, new species, and *L. infrunitus*, new species, which are included on label data with the wasps.

NEST SITES AND CONSTRUCTION.—*Liris argentatus* nests in soils of various types ranging from pure sand to heavy loam with some clay or gravel content. The nests may be in level or sloping ground, or in banks. The single nest of *L. panamensis muesebecki* was in moist sand among numerous fine rootlets.

No observer has published extensive notes on the digging of a nesting burrow by *L. argentatus*. Rau and Rau figured a nest under construction with a female in a cell at the bottom; the burrow

was almost vertical, 3.3 cm deep and 4–5 mm in diameter. O'Brien and Kurczewski watched a female digging a burrow in a gravelly slope, excavated the marked nest a week later, and found a paralyzed cricket in a cell with a small wasp larva feeding upon it. Rau noted a female nesting in a spider hole in a clay bank. Steiner reported that the European *L. niger* (Fabricius) nests either in "a preexisting gallery, crack in the ground, if available, or else [is] dug by her," a habit that is occasionally found in *L. argentatus*. Williams commented that the relatively short tarsal pecten of *L. argentatus* "did not very readily permit digging with the feet" in the heavy black earth in which he found it nesting. It appears that this species, and other *Liris* with relatively weak tarsal pectens, may nest preferentially in pre-existing burrows. O'Brien and Kurczewski, however, found that females of *L. argentatus* dug their own nests "from the ground surface and used the mandibles periodically and the legs in unison in making the excavation." The latter authors did not mention the elapsed time for construction of a complete nest.

PREY HUNTING AND CAPTURE.—The nest is prepared and the entrance left open before the wasp searches for her cricket prey. Williams noted *L. argentatus* hunting under dead, flattened grass, around grass clumps and in various holes, and O'Brien and Kurczewski saw wasps entering cricket burrows and other holes in the ground. Steiner's vivid summary of hunting behavior in *L. niger* follows.

In natural conditions, while hunting, these wasps run over the ground and flush the prey from such retreats as grass clumps, holes under stones and cracks in the ground. As time goes [passes], the excitation and responsiveness of the hunting wasps clearly increase, particularly after each new prey detection, [and] attack. At the peak of the hunting phase, the optimally responsive wasps are unlikely to easily give up their search, pursuit or stinging as they do at earlier stages. Prey capture is then highly probable.

Williams saw a nymphal *Gryllus* escape from *L. argentatus* by vigorous, continual hopping. Steiner noted that *L. niger*, which also preys upon *Gryllus*, must sting the prey quickly or the cricket will run or jump away, kick the wasp to escape,

or autotomize the hind leg that is often grasped by the wasp before stinging.

Later, Williams saw the wasp attack a small *Gryllus* that "leaped valiantly" but was soon immobilized by a sting under the thorax. Steiner's elaborate study of the stinging sequence in *L. niger*, *L. argentatus*, and *L. beatus* (= *L. aequalis* (Fox)) established that the complete and successful stinging pattern consisted of four stings, each close to one of the thoracic ganglia or the suboesophageal ganglion. The wasp jumps on the cricket, anchors herself with mandibles and/or legs, frequently grasping a hind leg, and bends her abdomen beneath the prey toward the rear of the thorax. The first sting is given toward the base and rear of a hind leg and immobilizes both hind legs, the jumping limbs. The cricket is still capable of walking with its fore- and midlegs, and the wasp now orients herself at right angles to the cricket's body and moves her abdomen forward on the venter of the prey. The second sting is then administered near the prothoracic ganglion and immobilizes the forelegs. The wasp now turns her abdomen rearward and delivers the third sting near the mesothoracic ganglion, immobilizing the midlegs. The final sting is given in the cervix near the suboesophageal ganglion, immobilizing the mouthparts and, "in part, locomotion coordination and 'activation' at a supra-segmental level." The second and third stings are occasionally reversed, and abortive stinging sequences may occur with one or more of the final stings being omitted. An abortive sequence usually makes the cricket unsatisfactory for nesting purposes because not all of the locomotor, escape, and defense reactions have been paralyzed.

Williams noted that his wasp malaxated the venter of the neck after stinging. This trait appears to be typical of many Larridae. Steiner said that it was "malaxation/compression of the fore-leg base(s)," and was repeated after the prey was placed in the cell.

The venom is apparently weak and paralysis lasts for minutes or sometimes hours. However, by that time the cricket is immured in a cell in the ground, unable to escape. Williams, Rau and

Rau, and Krombein and Evans (1955) found interred prey that were only partially paralyzed and were even able to run and hop. Kurczewski noted that the lightly paralyzed prey of *L. panamensis muesebecki* "began jumping out of the cell as soon as it was exposed."

PREY TRANSPORT.—Depending upon the size of the prey, the wasp either carries it forward on the ground to the nest, flies with it a few centimeters above the ground, or alternately runs and hops with it. Williams, as well as O'Brien and Kurczewski, noted that the wasp grasped the cricket by the bases of the antennae when prey transport began, but no one has noted whether the wasp grasps the prey with one or more pairs of legs during transport. The wasp must use its legs during transport on the wing, for neither Rau nor Krombein and Evans saw the prey dangling from the wasp's mandibles during flight. Kurczewski caught a female of *L. panamensis muesebecki* flying with her prey, holding it venter up and head forward. The wasp weighed only 20 mg, whereas her prey was 38 mg.

We find Williams' account of prey transport confusing. He noted twice that, after stinging, the wasp turned the prey on its dorsum to malaxate the soft ventral side of the neck, then turned it over onto its venter, and carried it venter down to the nest in "a series of runs and short jumps." O'Brien and Kurczewski, however, stated that the prey was "straddled venter-up" for transport to the nest. The latter is the normal method of prey carriage used by all wasps that transport their prey on the ground, for then the legs of the prey would not catch on objects on the substrate and impede forward progress.

NEST CONTENTS.—*Liris argentatus* stores from one to six prey per cell. Ashmead found as many as six in a single cell, an unusually high number, unless the crickets were very small; he gave no prey size. (Kurczewski suggests (in litt.) that Ashmead may have observed *Lyroda subita* (Say), which stores a larger number of prey.) At the other extreme, O'Brien and Kurczewski found only one prey per cell in 13 cells in three nests, with the prey weights ranging from 71 to 345

mg. Williams reported one prey each in two cells and two in a third. Krombein and Evans (1955) also found two prey in a completed cell. Rau and Rau noted three and four crickets each in two cells.

The prey consisted of nymphal or adult crickets of either sex, predominantly species of Gryllinae. Only one species of cricket was stored in all cells containing more than one prey, except that one cell reported by Rau and Rau contained three crickets belonging to two species, *Gryllus pennsylvanicus* Burmeister and *Allonemobius fasciatus* (DeGeer) (reported as *Nemobius*). Ashmead did not state the identity of his crickets. O'Brien and Kurczewski noted that only adult females and both sexes of nymphal *Gryllus veletis* (Alexander and Bigelow) were used.

Prey records for several species of *Liris* are presented below. These are consolidated from the literature and from wasps pinned with prey. The length or weight of prey is given when available. All prey belong to the family Gryllidae.

Liris argentatus (Palisot de Beauvois)

GRYLLINAE

Gryllus assimilis (Fabricius): nymph, 9 mm long (Krombein and Evans, 1954)

Gryllus pennsylvanicus Burmeister: nymph, four adult males (Rau and Rau); three nymphs, 10.1–10.6 mm long

Gryllus ?rubens Scudder: adult male (Kurczewski and Kurczewski)

Gryllus veletis (Alexander and Bigelow): adult females, nymphal males and females (O'Brien and Kurczewski)

Gryllus species: nymphs (Williams); nymphs less than 12 mm long (Steiner); nymph, 13.1 mm long

Miogryllus verticalis (Serville): nymph (Kurczewski and Kurczewski); nymph, 10.4 mm long

Acheta domesticus Linnaeus: nymphs, 10.5–15.5 mm long (Steiner)

NEMOBIINAE

Allonemobius fasciatus (DeGeer): nymphs (Rau and Rau, Rau); male nymph, 9.2 mm long, and adult female, 11.2 mm long

Nemobius species: two adults (Krombein and Evans, 1955)

ENEOPTERINAE

Orocharis saltator Uhler: nymph, 11 mm long (Krombein, 1967)

Liris beatus (Cameron)

GRYLLINAE

Gryllus assimilis (Fabricius): nymph (Krombein, 1958b)*Gryllus pennsylvanicus* Burmeister: two nymphs, 8.6 and 9.3 mm long, and adult female, 17.2 mm long*Gryllus*, possibly new species: adult male (Kurczewski)*Gryllus* species: specimens 21–22 mm long (Steiner)*Acheta domesticus* Linnaeus: specimens 10.5–15.5 mm long (Steiner)*Liris mexicanus*, new species

MOGOPLISTINAE

Ornebius sp.: nymph, 8.1 mm long*Liris panamensis muesebecki* (Krombein)

GRYLLINAE

Gryllodes sigillatus (Walker): two nymphs, 7 and 23 mg weight (Kurczewski)

MOGOPLISTINAE

Cycloptilum species: nymph, 5 mg (Kurczewski)

NEMOBIINAE

Pictonemobius ambitiosus (Scudder): two nymphs, 4 and 38 mg weight (Kurczewski)

NEST CLOSURE.—Williams, Rau and Rau, Reinhard, and Krombein and Evans (1955) included notes on nest closure after the cell had been stored with one or more prey and an egg laid. Williams saw one wasp gathering little lumps of earth, twigs, thorns and orthopterous excrement from "some little distance." These were brought in, one at a time, and placed within the burrow. About two trips a minute were made at the start, but her pace quickened until she was bringing in six to seven a minute. The bits of material were not compacted but placed lightly at the bottom of the burrow. She flew away after filling the burrow and disguising the site.

Rau and Rau noted several wasps closing their nests. One picked up pellets of earth, fragments of stems, dried leaves, and any available debris within a radius of a foot of the burrow entrance and dropped them into the burrow, which was on a sloping bank. Another wasp kicked in loose soil near the burrow entrance with her front legs, then tamped it down with the abdominal venter and rubbed "it smooth with a slow, grinding circular motion." This latter behavioral trait was not noted by other authors, who stated that the

debris was just placed loosely in the burrow.

Reinhard said that his wasp walked or flew to the burrow with small pellets of earth. She concealed the entrance by covering it with about a dozen fallen rose petals.

Krombein and Evans (1955) reported that their wasp, nesting in sandy soil, flew up to a foot from the nest to gather "small twigs, plant pieces, seeds and lumps of earth," which she carried forward and placed in the burrow. Finally, she scraped sand and debris from various directions over the filled burrow to conceal the entrance.

O'Brien and Kurczewski made no notes on nest closure but reported that one burrow was filled with sand and small pebbles, and a second with pebbles, 1–4 mm in diameter, pieces of moss, and sand. The wasp required 15 minutes to make the closure of the first burrow, 2 cm long.

Kurczewski stated that *L. panamensis muesebecki* carried three twigs in rapid succession and placed them inside the burrow. Then she raked sand backward into the opening. Finally, she alternated filling the cavity with plant debris and sand.

NEST ARCHITECTURE.—Williams, Rau and Rau, Rau, Krombein and Evans (1955), and O'Brien and Kurczewski presented details of nest architecture.

The most extensive observations were made by O'Brien and Kurczewski, who included diagrams of four nests. The nests were made in banks or in sloping ground with the burrow 7 mm in diameter, straight or slightly curved, and entering the ground at an angle of 30° to 45°. One completed nest had a burrow 10 cm long and contained two cells at the end of the burrow, 10 cm apart; the top 2 cm of the burrow was plugged with sand and small pebbles. Another nest had a burrow 11 cm long, terminating in an empty cell, 2.0×1.0 cm. A third nest had a burrow with the upper 5 cm filled with sand, small pebbles and plant debris, and a single stored cell, 11×6 mm, 9.5 cm from the entrance. The fourth nest had the upper 4 cm of the burrow packed

with small pebbles, 1–4 mm in diameter, pieces of moss, and sand. It contained a cluster of 10 provisioned cells at depths of from 9 to 14.5 cm, the shallower cells with older larvae in various stages of development, and the lower cells with eggs or newly hatched larvae on the prey. The cells were 1.2–3.5 cm long, 0.6–1.2 cm in diameter and were separated by soil with no noticeable connections. The observers found no correlation between cell length and prey weight, nor could they differentiate male and female cells.

Williams' single nest was in the side of a bank, had an entrance diameter "one-half inch high by nine-sixteenths of an inch wide," and a closing plug extending "an inch or two below the surface." The burrow was subhorizontal but soon narrowed and went down steeply. Williams lost the main burrow, but digging deeper he found three "neat shafts, each terminating in a rounded cell." The first cell was about five inches deep, seven from the burrow entrance, and contained one prey with a wasp egg. The second cell also had one prey with an egg, but the third cell contained two prey.

Rau and Rau had notes on two nests. The first completed nest in a gently sloping bank had a burrow diameter about "three-eighths inch," went downward for an inch, and ended in a cell "one-fourth inch in diameter." The other completed nest, also in a sloping bank, was about "two and one-half inches deep." The lower third of the burrow constituted the cell. The upper third of the burrow was filled with debris, and the section between the cell and the entrance plug was packed with soil.

The single nest found by Krombein and Evans (1955) was on the side of a sandy ridge, and the burrow was about 8 cm long. The upper 3 cm was filled with debris and the remainder with sand.

Rau's incompleting nest in a spider's hole in a clay bank was half an inch wide and six inches deep.

Kurczewski thought that *L. panamensis muesebecki* might nest in a pre-existing cavity, for her

burrow began from the middle of a crude depression 10 mm wide. The burrow was 5 mm wide and spiralled downward to a depth of 10 cm. The burrow finally disappeared at 14 cm among numerous fine rootlets in damp sand. The single cell contained four nymphal crickets. The observer excavated the surrounding soil to a depth of 40 cm but found no other cells.

LIFE CYCLE.—The egg is "white and slightly crescent-shaped" (i.e., sausage-shaped) (Rau and Rau), and is laid with the head end attached on the thoracic venter of the prey. The exact site is variable, Williams showing it attached at the inner edge of the left forecoxa, and extending slightly obliquely between the right fore- and midcoxae. Rau and Rau, and O'Brien and Kurczewski, found a rather similar orientation, but Krombein and Evans (1955) noted that it was attached on the sternum between the mid- and hind legs, and extended along the side of one of the hind femora.

Kurczewski stated that the egg of *L. panamensis muesebecki* was 1.8×0.45 mm, was laid on the prey at the bottom of the cell, was glued to the left forecoxal corium, and extended transversely between the fore- and midlegs.

Rau and Rau found that the egg hatched in one to two days, and Krombein and Evans (1955) noted that it occurred in a day or so.

Larval development is rapid. Krombein and Evans (1955) noted that larval feeding was completed and a cocoon spun in three days and that an adult emerged from the cocoon 44 days later.

Rau and Rau suspected that *L. argentatus* overwintered as an adult, because in Missouri and southern Illinois they found adults active as early as 7 April and as late as 28 October. O'Brien and Kurczewski confirmed that hibernation occurs, and they reported females digging hibernating burrows in sloping ground late in September and during mid-October in New York and Pennsylvania. The wasps removed pellets of sand, pushing them backward from the burrow entrance with the hind legs and pygidium. Later, the sand was raked backward from the entrance to form

a fan-shaped tumulus, 7×4.5–6 cm. The burrows had a diameter of 6 mm, entered the ground at a steep angle, and were left open. One was 30 cm long, 26.6 cm deep, and a torpid wasp was found at the bottom facing upward on 17 November. The second burrow was still being excavated by the wasp on 17 October. It was almost vertical, 32 cm long, and had a terminal cell 1.2×0.8 cm.

Various taxa of North American *Liris* visit many flowers to obtain nectar. Consolidated records from O'Brien and Kurczewski and from label data on specimens seen by us are as follows:

Liris apicipennis (Cameron)

Avicennia nitida Jacquin
Donnellsmithia hintonii Mathias and Constance
 "near *Helianthus*" (unknown whether a genus near *Helianthus* or near a plant of *Helianthus*)

Liris argentatus (Palisot de Beauvois)

Baileya
Cassia fasciculata Michaux
Cercidium
Chrysothamnus
 purple *Cleome*
Cleomella angustifolia Torrey
Croton
Daucus carota Linnaeus
Descrurania pinnata brachycarpa (Richardson)
Helianthus annuus Linnaeus
Helianthus
Melanthera deltoidea Michaux
Prunus virginiana Linnaeus
Solidago canadensis Linnaeus
Tetradymia canescens De Candolle
Wislizenia palmeri Gray

Liris beatus (Cameron)

Asclepias
Cassia tomentosa Linnaeus fil.
Cercidium
Eriogonum
Foeniculum vulgare Miller
Helianthus annuus Linnaeus
Melilotus alba Desrousseaux
Pluchea sericea Nuttall
Prosopis

Liris infrunitus, new species

Baccharis

Liris mescalero latus, new subspecies

Atriplex semibaccata Brown
Cryptantha intermedia (Gray)
Encelia farinosa Gray
Eriogonum fasciculatum Benth
Eriogonum gracile Benth
Eriogonum
Gnaphalium
Helianthus annuus Linnaeus
Lepidospartum
Viburnum

Liris mescalero mescalero (Pate)

Colubrina texensis (Torrey and Gray)
Condalia canescens (Gray)
Condalia

Liris muspa (Pate)

Bidens pinnata Linnaeus
Polygonum hydropiperoides Michaux

Liris vincenti, new species

Cucurbita
Helianthus (aquatic)

Wasps also occasionally visit honeydew exudates of plants or of scales. Krombein (1951) reported *L. argentatus* visiting honeydew secretions of the tulip-tree scale *Toumeyella liriiodendri* (Gmelin), and Krombein and Evans (1955) found it visiting honeydew secretions of thistle.

No one has reported information on mating activity, but Kurczewski noted that the male of *L. beatus* was territorial, maintaining stations from which it left periodically and returned. This male spent several nights in a burrow in the sand 9 mm wide. The burrow went downward at an angle of 60° for 13 cm and was not closed at night. It was obliterated by a torrential rain and was not replaced by another, so undoubtedly this male was utilizing a pre-existing burrow.

NATURAL ENEMIES.—No parasites have been reported for North American *Liris*. This is surprising when one considers the abundance of such a species as *L. argentatus* and the fact that it leaves its nest entrance open while it is hunting for prey. Satellite flies (Diptera: Sarcophagidae: Miltogramminae) commonly trail prey-laden wasps to their nest, but this has not been reported for any North American *Liris*.

Genus *Liris* FabriciusKey to North American *Liris* Fabricius

Ranges given extend only to southern Mexico; some species also occur in Central and South America. Females are unknown in *L. nigrispinus*, new species, *L. vincenti*, new species, *L. similis*, new species, *L. infrunitus*, new species, *L. asymphonus*, new species, and *L. evansi*, new species; males are unknown in *L. partitus*, new species, *L. dominganus* (Strand), *L. championi* (Cameron), and *L. molestus*, new species.

1. Mandibles without teeth along inner margin; female pygidium with fine, short, decumbent hair and a few interspersed, erect, longer hairs, without an apical fringe of flattened, coarse setae; tarsal claw of female with a small, erect subbasal tooth on inner margin; posterior surface of propodeum with dense appressed golden vestiture, and apices of first four terga with narrow bands of similar vestiture; front half of forewing infumated, posterior half at most somewhat yellowish; (Guerrero, Oaxaca, and Veracruz) 1. *Liris (Motes) anticus* (Smith)
- Mandibles with one or two teeth along inner margin, although these may be evanescent in some males and represented by only a very low obtuse angle; female pygidium with coarse appressed and erect setae, and with an apical fringe of four to six flattened, coarse setae; tarsal claw of female without a subbasal tooth on inner margin; posterior surface of propodeum without such vestiture; wings not so colored, either entirely fuliginous or yellowish, or colorless with the apices narrowly and weakly to strongly infumated. (*Liris* subgenus *Leptolarra* Cameron) 2
2. Males 3
- Females 24
3. Apical margin of sixth sternum biemarginate, the projection between emarginations angulate, the margin not thickened; fore- and mid-femora concave beneath on basal half; hind femur shallowly excavate beneath except angulate at extreme base 4
- Apical margin of sixth sternum usually broadly and shallowly concave or straight, if biemarginate (*L. luctuosus*) the margin thickened and projection between emarginations broadly rounded; fore- and mid-femora not concave beneath on basal half, but flattened or rounded out; hind femur either rounded out beneath or flattened on its entire length 7
4. Apical margin of sixth sternum shallowly biemarginate, that part of sternum between emarginations short and obtusely angulate [Figures 25 and 26] 5
- Apical margin of sixth sternum very deeply biemarginate, that part of sternum between emarginations narrower and acutely angulate [Figures 23 and 24]. (*Liris (Leptolarra) mescalero* (Pate)). 6
5. Middle of third and visible portions of fourth to sixth sterna with a moderately dense brush of short suberect hair; median angle of apical margin of sixth sternum about two-thirds as long as lateral projection [Figure 26] . . . 5. *Liris (Leptolarra) argentatus* (Palisot de Beauvois)

- Sterna with very sparse appressed vestiture on these areas; median angle of apical margin of sixth sternum very much shorter than lateral projection [Figure 25]; southern Arizona to Chiapas and Morelos 4. *Liris (Leptolarra) evansi*, new species
6. Vestiture of sixth sternum suberect, the median process very slender on apical three-fifths, the sides converging only very slightly and forming an angle of less than 10° at apex [Figure 23]; southern Arizona and southern Texas, south to Chiapas and Veracruz. 2. *Liris (Leptolarra) mescalero mescalero* (Pate)
- Vestiture of sixth sternum subrecumbent, the median process broader, the sides forming an angle of about 20° to 30° at apex [Figure 24]; southern California and Baja California 3. *Liris (Leptolarra) mescalero latus*, new subspecies
7. Apex of sixth sternum thickened, the margin with a short rounded lobe in middle and a small incurved tuft of bristles laterally [Figure 27a]; fourth and fifth sterna each with a larger lateral tuft of suberect bristles, that on fifth denser than that on fourth [Figure 27b,c]; hind femur compressed beneath; clypeus with lateral lobes extending further down than median lobe, the latter thickened and obtusely angulate in middle; head, thorax, and femora beneath with moderately long, suberect hair; propodeum dorsally with a shallow median furrow; first three terga with apical bands of appressed silvery pubescence; 10.0–11.5 mm long. (*Liris (Leptolarra) luctuosus* (Smith)) 8
- Apex of sixth sternum thin, the margin broadly and shallowly concave or straight; vestiture of sterna varied; hind femur not compressed beneath, but rounded out or flattened; median lobe of clypeus longer than lateral lobes, not thickened; body without such long suberect hair. 9
8. Wings clear except apices somewhat infumated; lateral lobe of clypeus ending in an acute tooth; Sonora, south along western coastal states to Chiapas, and Morelos and Veracruz 6. *Liris (Leptolarra) luctuosus luctuosus* (Smith)
- Wings fuliginous; lateral lobe of clypeus right-angled; southern Florida and Cuba 7. *Liris (Leptolarra) luctuosus dahlbomi* (Cresson)
9. Wings strongly yellowish except apices may be fuliginous 10
 Wings not yellowish 11
10. First four terga with broad apical bands of appressed silvery vestiture; specialized vestiture on sterna limited to small tufts posterolaterally on sixth and seventh [Figure 34]; margins of sterna straight or slightly incurved; median lobe of clypeus broad, half as wide as interocular distance at antennal insertions, the apex truncate; large species, 15–16.5 mm long; Mexico (Morelos and Veracruz) 12. *Liris (Leptolarra) rufipennis* Fabricius
- Only the first three terga with moderately broad apical bands of appressed silvery vestiture; brushes of dense recumbent vestiture present on third to sixth sterna, that on third roughly semicircular, that on fourth concentrated on apical lobes and basad of them, that on fifth longer and denser on each side of emargination, that on sixth a more

- or less arcuate band; fourth sternum bilobate at apex, with a deep median emargination and a shallower lateral one, fifth sternum with a shallow median emargination [Figure 32]; median lobe of clypeus narrower and rounded apically; smaller species, 6.5–8 mm long; southern Texas south to southern Mexico 14. *Liris (Leptolarra) apicipennis* (Cameron)
11. Sterna without brushes of specialized vestiture but second through sixth with two to four or six long dark stout macrochaetae scattered across in a subapical row, apices of these sterna straight or slightly incurved; wings rather strongly infuscated, veins dark brown; usually only first three terga with apical bands of appressed silvery pubescence, but occasionally the fourth with such a band also; large forms, 9–15 mm long; transcontinental in U.S.A, chiefly in Austral Zone, south to Oaxaca and Veracruz 10. *Liris (Leptolarra) beatus* (Cameron)
- Sterna with or without brushes of specialized vestiture, if macrochaetae present, then confined to sterna II–III and pale colored and inconspicuous; wings with apices slightly infuscated, the remainder of membrane colorless, the veins testaceous to light brown; first four terga with such bands of silvery pubescence 12
12. Hind trochanter beneath with a brush of dense suberect hair on apical half; seventh sternum covered with a brush of dense, short, suberect hair [Figure 31]; hypopygium broadly though shallowly emarginate at apex; spines of mid- and hind tibiae and tarsi black; clypeus keeled or strongly tumid along midline; Arizona, Texas, Florida, and Baja California south throughout Mexico to Chiapas and Veracruz 8. *Liris (Leptolarra) muspa* (Pate)
- Hind trochanter beneath with the usual decumbent vestiture; seventh sternum without such a brush; some of anterior sterna with brushes or these sterna entirely without specialized vestiture; hypopygium only narrowly emarginate at apex or subtruncate; spines of mid- and hind tibiae and tarsi usually whitish; clypeus flat or weakly raised along midline 13
13. Cuneate sensory area of last flagellomere extending almost to apex; scutum with dense, short, erect silvery vestiture; specialized vestiture of sterna consisting of a pair of small tufts of about a dozen rather long erect setae on the third [Figure 33] and shorter moderately scattered, subdecumbent setae on middle of third and across the fourth to sixth; southern Texas to Chiapas and Veracruz 9. *Liris (Leptolarra) argenticauda* (Cameron)
- Cuneate sensory area usually extending only halfway toward apex of last flagellomere, or entirely absent; scutum usually with appressed silvery vestiture; specialized vestiture of sterna other than above or entirely lacking 14
14. Last flagellomere with a cuneate sensory area (in occasional cases in which it is lacking, tenth flagellomere always has an impressed sensory area extending its entire length) 15
- Last flagellomere without such an area; tenth flagellomere with impressed sensory area either lacking or not extending its entire length

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15. Third, and occasionally the second, sternum with tufts of specialized vestiture. (*Liris (Leptolarra) panamensis* (Cameron)) 16
 Sterna without specialized brushes, although inconspicuous macrochaetae may be present on sterna II–III 17
16. Second sternum with a semicircular brush of dense recumbent setae; third sternum with a lateral brush of dense, erect setae, many of which are as long as last flagellomere [Figure 28]; apical margin of third sternum broadly and moderately shallowly emarginate; southern Texas and Baja California south to Chiapas and Veracruz
 16. *Liris (Leptolarra) panamensis panamensis* (Cameron)
 Second sternum with at most a faint indication of such a brush; third sternum with a similarly placed lateral brush, but the individual setae much shorter, scarcely half as long as last flagellomere [Figure 29]; apical margin of third sternum scarcely emarginate; Florida
 17. *Liris (Leptolarra) panamensis muesebecki* (Krombein)
17. Spines on mid- and hind tibiae and tarsi dark; cuneate sensory area on last flagellomere present on basal three-fourths 18
 Spines on mid- and hind tibiae and tarsi white; cuneate sensory area on last flagellomere extending half or less length of last flagellomere, occasionally entirely absent 19
18. Spines reddish brown; apex of hypopygium emarginate; southern Texas to Chiapas. 18. *Liris (Leptolarra) nearcticus*, new species
 Spines black; apex of hypopygium rounded; Chiapas, Puebla, and San Luis Potosi; female unknown
 19. *Liris (Leptolarra) nigrispinus*, new species
19. Median clypeal lobe rounded, cuneate sensory area on last flagellomere present on basal third; sterna II–III with several pale, inconspicuous macrochaetae in a subapical row; Texas, San Luis Potosi, and Sinaloa south to Chiapas 20. *Liris (Leptolarra) liparus*, new species
 Median clypeal lobe truncate, the lateral angles prominent; cuneate sensory area extending up to two-thirds length of last flagellomere, sometimes lacking entirely; sterna lacking macrochaetae 20
20. Seventh tergum laterally with a strong carina that is almost as long as tergal width at apex; last flagellomere with cuneate sensory area either entirely absent or present in varying extent up to half the length of flagellomere; volsella beneath without long, dense hair [Figure 20]; Arizona and Baja California south to Chiapas and Veracruz; female unknown 21. *Liris (Leptolarra) asymphonus*, new species
 Seventh tergum either without such a lateral carina or, if present, much shorter than tergal width at apex; cuneate sensory area on last flagellomere extending over basal fifth or less; volsella beneath with long, dense hair [Figure 18]; Morelos and Guerrero; female unknown 22. *Liris (Leptolarra) similis*, new species
21. Third to fifth sterna with lateral brushes of suberect hair decreasing in extent posteriorly [Figure 30]; southern Texas and Baja California south to Chiapas and Yucatan
 15. *Liris (Leptolarra) mexicanus*, new species

- Sterna entirely lacking specialized vestiture 22
22. Impressed sensory area on eighth flagellomere extending only over basal third to half; larger species, 7.5–8.5 mm long; Sinaloa and San Luis Potosi to Veracruz 25. *Liris (Leptolarra) deliquus*, new species
- Impressed sensory area present on eighth flagellomere, extending entire length; small species, 6–8 mm long 23
23. Ninth flagellomere with an impressed sensory area on entire length, tenth occasionally with a small area at base; volsella at base beneath with a fascicle of long bristles curving outwardly [Figure 17]; southern Texas to Chiapas and Yucatan; female unknown
- 26. *Liris (Leptolarra) vincenti*, new species
- Ninth flagellomere without an impressed sensory area or with only a small one at base, tenth entirely without such an area; volsella without such bristles [Figure 19]; western coastal states of Mexico from Sonora to Chiapas, and Morelos; female unknown
- 27. *Liris (Leptolarra) infrunitus*, new species
24. First four terga (and occasionally fifth) with apical bands of appressed silvery vestiture 25
- Only the first three terga with such bands of silvery vestiture 30
25. Pygidium with surface convex and entirely covered with short, dense, subappressed setae and interspersed, sparse, longer, suberect setae; first five sterna dull and densely micropunctate, the last sternum shining and with scattered, larger punctures except for areas of dense, small punctures along sides; clypeus keeled or tumid along midline; larger forms, 8.5–11 mm long; Arizona, Texas, Florida, and Baja California south in Mexico to Chiapas and Veracruz
- 8. *Liris (Leptolarra) muspa* (Pate)
- Pygidium flat and covered with sparser, appressed setae, and with or without a basal, bare triangular area; the first two to four sterna shining and with scattered larger punctures; clypeus not raised along midline; usually smaller forms 26
26. Pygidium with a bare, shining, impunctate, triangular area at base [as in Figure 47]; hind tibia strongly carinate 27
- Pygidium lacking such a bare triangular area at base [as in Figure 49] 28
27. Larger species, 12.5–14 mm long; hind tibia carinate only on basal one-half; flagellomeres IV through X with shallow impressed sensory pits, increasing slightly in size on terminal segments, that on tenth only one-third as long as flagellomere [Figure 38]; wings distinctly bicolorous, yellowish on basal two-thirds and smoky gray on apical third; southern Texas south to Veracruz; male unknown
- 13. *Liris (Leptolarra) partitus*, new species
- Smaller species, 9–10.5 mm long; hind tibia strongly carinate almost to base on outer surface; a shallow impressed sensory pit on fourth or fifth through tenth flagellomere, those on terminal segments larger, half or three-fourths as long as flagellomere [Figure 41]; wings slightly

- yellowish, veins testaceous; southern Texas and Baja California south to Chiapas and Yucatan
28. Hind tibia strongly carinate almost to base; wings strongly yellowish with apical third smoky; large species, 16.5–18.5 mm; Mexico (Morelos and Veracruz) 15. *Liris (Leptolarra) mexicanus*, new species
- Hind tibia very weakly carinate, the carina sometimes evanescent on basal half; wings clear with apices slightly fuliginous; much smaller species, 6–11 mm long 12. *Liris (Leptolarra) rufipennis* Fabricius
29. Smaller species, 6–7.5 mm long; hind tibia very weakly carinate on outer surface, the carina evanescent on basal half; a shallow impressed sensory pit on fourth or fifth through ninth flagellomeres, the pits small and not enlarged on terminal flagellomeres [Figure 43]; sterna I–IV dull, V–VI shining, with scattered, larger punctures apically; wings clear, slightly infumated apically; southern Texas to Chiapas 18. *Liris (Leptolarra) nearcticus*, new species
- Larger species, 9.5–10.5 mm long; hind tibia very weakly carinate on basal half, or carina entirely lacking; flagellomeres IV–X with small, impressed sensory pits; sterna I–III dull, IV–VI shining, with moderately dense small punctures, except V–VI with scattered larger punctures apically; Sinaloa and San Luis Potosi south to Veracruz 25. *Liris (Leptolarra) deliquus*, new species
30. Thoracic pubescence erect, cinereous to dark brown, short to moderately long; pygidium without a basal, shining, impunctate area 31
- Thoracic pubescence short and appressed, silvery to cinereous; pygidium with a basal, shining, impunctate area 36
31. Head and thorax with shaggy appearance due to the moderately abundant, long, erect cinereous hair; thorax also clothed with dense, short, erect dark hair; least interocular distance on vertex three-fourths the length of first flagellomere; impressed sensory pits on flagellomeres III or IV through IX, that on III occasionally lacking, those on VI through IX oval and about one-third as long as flagellomere [Figure 45]. (*Liris (Leptolarra) luctuosus* (Smith)) 32
- Head and thorax without long, erect hair, thorax with dense, short, erect cinereous or dark hair; least interocular distance nine-tenths or more the length of first flagellomere 33
32. Wings clear, except apices somewhat infumated; propodeal carinae weaker and lower, that between lateral and posterior surfaces evanescent except on lower third; Sonora, south along western coastal states to Chiapas, and Morelos and Veracruz 6. *Liris (Leptolarra) luctuosus luctuosus* (Smith)
- Wings fuliginous; propodeal carinae stronger and higher, that between lateral and posterior surfaces strongly developed on at least lower half; southern Florida and Cuba 7. *Liris (Leptolarra) luctuosus dahlbomi* (Cresson)
33. Larger forms, 13.0–19.5 mm long; wings fuliginous, the veins dark

- brown to piceous 34
 Smaller forms not over 10.5 mm long; wings clear except apices slightly infumated, the veins testaceous to light brown 35
34. Impressed sensory pits on flagellomeres V–IX very tiny, those on apical flagellomeres scarcely one-tenth as long as respective segments [Figure 39]; mandible bidentate subbasally on inner margin; transcontinental in U.S.A., chiefly in Austral Zone, south to Oaxaca and Veracruz 10. *Liris (Leptolarra) beatus* (Cameron)
 Impressed sensory pits on flagellomeres III–IX larger, those on apical flagellomeres one-fourth to one-third as long as respective segments; mandible with a subapical and subbasal tooth on inner margin; Chiapas; male unknown 11. *Liris (Leptolarra) championi* (Cameron)
35. Impressed sensory pits on flagellomeres III–X elongate, those on segments IV–IX two-thirds to three-fourths as long as segment [Figure 42]; pygidium with scattered, fine, suberect setae in addition to the finer recumbent setae; vestiture on thorax and abdomen tinged with golden; carina on outer surface of hind tibia weaker, evanescent on basal one-third; larger species, 10–10.5 mm; southern Texas to Chiapas and Veracruz 9. *Liris (Leptolarra) argenticauda* (Cameron)
 Impressed sensory pits on flagellomeres V–IX short, those on apical flagellomeres one-third to one-half as long as segment; pygidium with scattered stout, erect setae in addition to the finer, recumbent setae; vestiture on thorax and abdomen silvery; carina on outer surface of hind tibia very sharp, evanescent only on basal eighth; smaller forms, 7.5–9 mm long; Morelos; male unknown 23. *Liris (Leptolarra) dominganus* (Strand)
36. Hind tibia with a longitudinal carina on apical three-fourths or more of outer surface 37
 Hind tibia carinate only on apical half of outer surface 41
37. Wings fuliginous, veins dark brown; larger forms, 13–14.5 mm long; very dark in appearance owing to absence of almost all appressed silvery vestiture; appressed bands at apices of first three terga narrower, those on second and third covering no more than apical fourth; carina on hind tibia with three to five spines in addition to that at apex; Texas, Sinaloa, and San Luis Potosi south to Chiapas 20. *Liris (Leptolarra) liparus*, new species
 Wings yellowish, or very slightly infumated, the veins testaceous or light brown; smaller forms, usually not more than 12 mm long, silvery in appearance owing to presence of large amounts of appressed silvery vestiture on thorax and abdomen; appressed bands at apices of first three terga broader, those on second and third covering at least the apical third; carina on hind tibia with two or three spines in addition to that at apex 38
38. First three sterna dull and densely micropunctate, the last three shining and with scattered larger punctures except laterally; hind tibia carinate on apical three-fourths; forewing except tip strongly suffused with yellowish; flagellomeres III or IV to X each with an oval, shallowly

- impressed sensory pit beneath [Figure 40]; larger forms, 9–14 mm long; southern Texas to southern Mexico 14. *Liris (Leptolarra) apicipennis* (Cameron)
- First four sterna dull and densely micropunctate, the last two shining and with scattered larger punctures except laterally; hind tibia carinate on apical four-fifths or more; forewing weakly or not at all suffused with yellow; flagellomeres IV or V through IX with such sensory pits; smaller forms, 7–10 mm long 39
39. Flagellomeres V–IX each with a small oval sensory pit, wings not suffused with yellowish; Morelos; male unknown 24. *Liris (Leptolarra) molestus*, new species
- Flagellomeres IV–IX with such pits. (*Liris (Leptolarra) panamensis* (Cameron)) 40
40. Forewing except apex weakly suffused with yellowish, veins testaceous; clypeus evenly convex, not at all swollen along midline; southern Texas to southern Mexico 16. *Liris (Leptolarra) panamensis panamensis* (Cameron)
- Forewing not at all yellowish; veins brownish; clypeus slightly tumid along midline; Florida 17. *Liris (Leptolarra) panamensis musebecki* (Krombein)
41. Flagellomeres IV–X with a small, round or oval, shallow pit beneath, near middle of segment [Figure 36] *Liris (Leptolarra) argentatus* (Palisot de Beauvois)
- Flagellomeres IV or V through IX each with a small, round or oval, shallow pit beneath, near middle of segment [Figure 37]. (*Liris (Leptolarra) mescalero* (Pate)) 42
42. Forms ranging from southern Texas to Arizona and south in Mexico to Chiapas and Veracruz. 2. *Liris (Leptolarra) mescalero mescalero* (Pate)
- Forms from southern California and Baja California 3. *Liris (Leptolarra) mescalero latus*, new subspecies

1. *Liris (Motes) anticus* (Smith)

FIGURE 16; MAP 1

Larrada antica Smith, 1856:287–288 [♂; Brazil; unique type in British Museum (Natural History), London].

Larra antica (Smith).—Kohl, 1884:241 [listed].—Dalla Torre, 1897:663 [listed].

?*Tachysphex rufo-geniculata* Cameron, 1912:435 [♂; British Guiana; type in Georgetown Museum?].

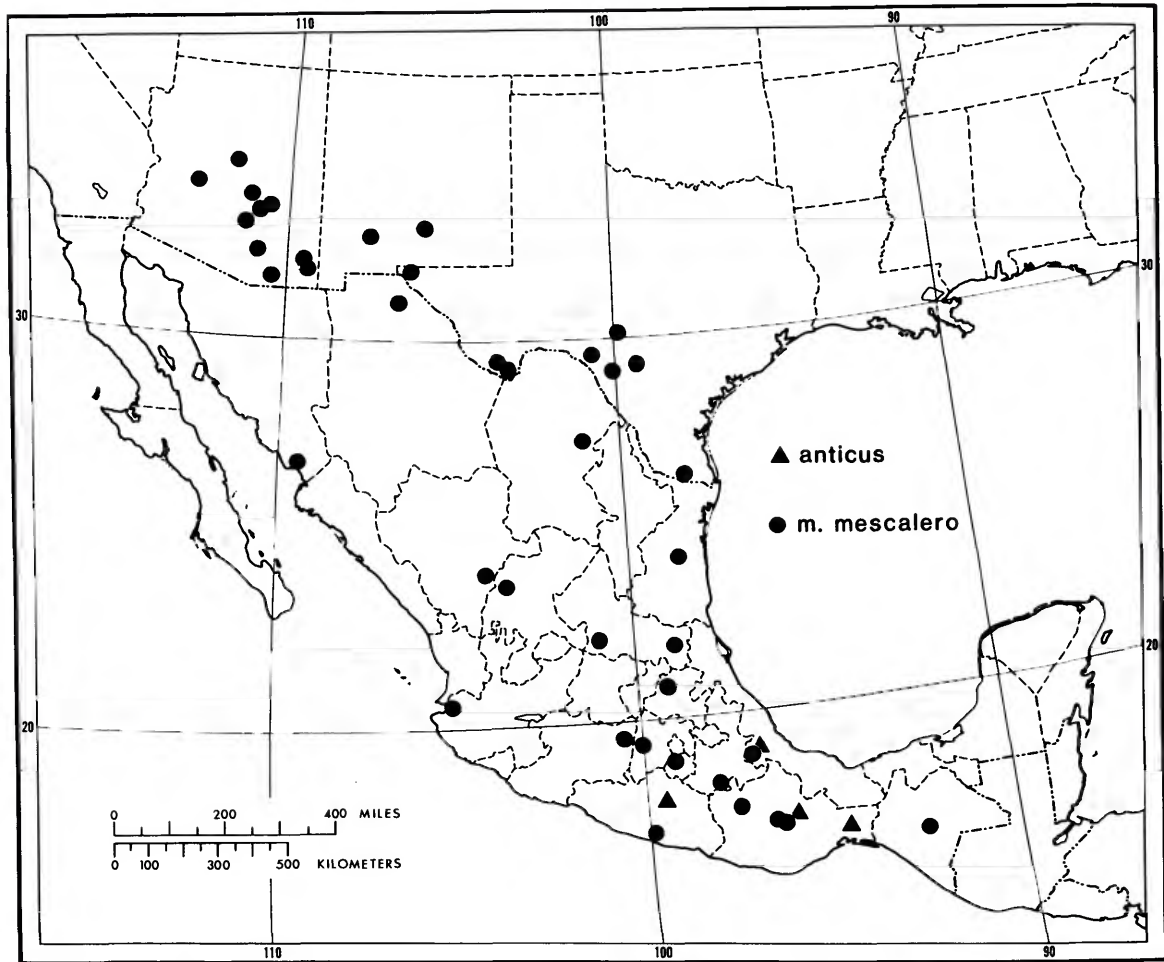
Liris (Motes) antica (Smith).—Bohart and Menke, 1976:244 [Brazil, Trinidad; *T. rufogeniculata* Cameron listed as a questionable synonym].

This is the only species in the subgenus *Motes* that occurs in the Nearctic Region. Both sexes

can be readily distinguished from species in the subgenus *Leptolarra* by the simple mandibles. The females have a toothed tarsal claw and lack the transverse apical spatulate spines on the pygidium.

COLOR.—Black; mandibles, apices of femora, ventral half of tibiae, and entire tarsi dark reddish brown; front half of wings infumated, posterior half clear or slightly yellowish, veins reddish brown.

VESTITURE.—Most areas of head and thorax sparsely pubescent, often tinged with golden; lateral areas of scutellum, subalar area, and posterior face of propodeum with dense appressed



MAP 1.—Known range in North America for *Liris anticus* (Smith) and *L. mescalero mescalero* (Pate).

golden vestiture; terga I–IV with apical bands of golden pubescence.

STRUCTURE.—*Female*: Length, 11.0–11.2 mm; clypeus somewhat tumid along midline, clypeal punctures dense above, becoming larger and more widely scattered below; mandible without teeth on inner edge; flagellomeres IV–X with oval placoids, those on apical segments one-half to two-thirds length of flagellomere; notauli, parapsidal lines, and admedian line barely visible; scutal, meso- and metapleural punctures some-

what large, coarse, and contiguous, those on propodeum coarser; scrobal sulcus distinctly impressed; hind tibia lacking a carina; sterna I–II dull, with close, fine punctures, III–VI shiny, with larger punctures scattered among the smaller, denser ones; pygidium slightly convex on dorsal surface, with fine, short, appressed vestiture and a few interspersed, longer, erect setae.

Male: Length, 10.1–10.3 mm; similar to female except most areas of face below middle with

dense patches of golden pubescence; thorax with denser golden vestiture on scutum adjacent to pronotal lobes, hypopleural area, basalar area, and anterior edge of propodeum; flagellomeres II–XI with broad placoids, that on XI extending over basal one-half; genitalia as in Figure 16.

MATERIAL EXAMINED.—MEXICO. Guerrero, 1♀, 3 mi N Chilpancingo, 4000', 19 Mar, H.E. Evans (USNM).

Oaxaca. 1♀, Palomares, 5–21 Sep, R., K. Dreisbach (UCD); 1♀, Temascal, 26 Oct 1967, K.H. Janzen (UCD).

Veracruz. 1♀, Cordoba, 13 Jul, J.S. Buckett, M.R., R.C. Gardner (UCD). (Description of male based on a specimen from Tegucigalpa, Honduras, in the USNM.)

2. *Liris (Leptolarra) mescalero mescalero* (Pate), new status

FIGURES 3, 23, 37; MAP 1

Motes mescalero Pate, 1943:200–201 [♂; Alamogordo, New Mexico; unique type in Academy of Natural Sciences, Philadelphia].

Motes (Notogonius) mescalero Pate.—G.E. Bohart, 1951:954.—Krombein, 1958b:188 [Texas, Mexico].

Liris mescalero (Pate).—Bohart and Menke, 1976:246 [California to Texas, northern Mexico].

Liris (Leptolarra) mescalero (Pate).—Krombein, 1979:1619 [south Texas to south Arizona, south to Honduras].

Liris mescalero mescalero is a common taxon found in southern Texas and Arizona, and we have seen specimens from throughout Mexico. The females are very similar in appearance to those of *L. argentatus* but lack an oval sensory pit on the last flagellomere. The males have a biemarginate sixth sternum as in *L. argentatus*, but the median process is narrower and acutely angulate in *L. mescalero mescalero*, forming a much deeper emargination on either side. The median process has dense, suberect, dark vestiture and forms a very acute angle (of less than 10°).

COLOR.—Black; bases of forefemora and tarsi ventrally dark reddish brown; wings clear, infumated apically, stigma and veins dark brown.

VESTITURE.—Head and thorax sparsely covered with short, pale, appressed setae; apices of terga I–III with broad apical bands of silvery pubescence.

STRUCTURE.—*Female:* Length, 8.4–11.3 mm; clypeus flat; clypeal punctures fine and close, more widely scattered below, the interspaces shining; flagellomere I slightly longer than flagellomere II, IV or V–IX with tiny oval placoids (Figure 37); admedian line, parapsidal lines and notauli barely visible; scutal punctures very fine and close; mesopleural punctures slightly smaller than those on scutum; scrobal sulcus very weakly impressed; hind tibia carinate only on apical half, with two short, stout spines along carina; propodeum with slightly coarser punctures than those on scutum, hind face with slight lateral striations dorsally; sterna I–IV dull, with fine, dense punctures, IV also with a few larger, scattered punctures apically, V and VI shiny, with large, scattered punctures and only a few smaller, close ones; sterna II–V with a few long, stout setae scattered in a subapical row; pygidium with a bare, shining, impunctate, triangular area dorsally at base; apex of pygidium with six stout, spatulate spines.

Male: Length, 6.4–8.7 mm; similar to female except clypeus slightly tumid along midline; flagellomeres II–X with broad placoids, XI with placoid extending only over basal three-fourths; apical margin of sternum VI deeply biemarginate with part between emarginations narrow and acutely angulate; sterna IV–VI with lateral tufts of dark, short, erect pubescence, VI also with such a tuft on median projection (Figure 23); apices of terga I–IV with narrow bands of silvery pubescence, sometimes V also with a narrower band of such pubescence; genitalia as in Figure 3.

MATERIAL EXAMINED.—UNITED STATES. Arizona. Cochise Co.: 1♀, Bowie, 5 Jun, A.D. Telford (UCD); 1♀, Huachuca Mts., Ramsey Canyon, 25 Apr, G. Butler, F. Werner (UCD); 1♂, 3♀, Portal, 5000', 2, 8 Sep, H.E. Evans (USNM); 1♀, Chiricahua Mts., 31 Jul, P.D. Hurd (UCB), 3♂, 2♀, Southwest Research Station, 5 mi W

Portal, 5400', 7, 21, 27 Aug, 24 Sep, 1 Nov, P.H. Arnaud, Jr., H.E. Evans (CAS, USNM). Coconino Co.: 1♂, Sedona, 27 Jul, swept on alfalfa, Butler, Gerhardt (UCD). Gila Co.: 1♀, 15 mi N Globe, 19 Jun, G. Butler, F. Werner (UCD); 1♀, Roosevelt Dam, 30 Oct, J.D. Gunder (CAS); 2♂, Roosevelt Lake, 11 May, H., M. Townes (USU). Maricopa Co.: 1♂, 5 mi SW Wickenburg, 5 May, P. Torchio, G. Bohart (UCD). Pima Co.: Santa Catalina Mts., 4♀, Molino Basin, 30 Jul, R.M. Bohart (UCD), 2♀, Sabino Canyon, 6 Apr, 24 May, C.W. O'Brien, G.D. Butler, F.G. Werner (UCD); 1♂, Tucson, 15 Jun, Bryant (CAS); 1♂, Upper Santa Canyon, 14 Aug, on *Condalia canescens*, P.H. Timberlake (UCR). Pinal Co.: 1♀, Florence, 7 May (ANSP); 2♂, 2♀, Superior, Boyce Thompson Arboretum, 19 Jun, 23 Jul, males taken on *Condalia*, F. Werner, G. Butler (UCD). Santa Cruz Co.: 1♀, Madera Canyon, Santa Rita Mts., 30 Jul, F.X. Williams (CAS); 3♀, Nogales, Apr (BMNH).

New Mexico. Otero Co.: 1♂, 10♀, Alamogordo, 1–9 May (ANSP). Sierra Co.: 1♀, Derry, 20 Jul, W.J. Pulawski (CAS). County unknown: 1♀, Malaga, M.B. Jackson (KU).

Texas. Bexar Co.: 1♂, 2♀, Ft. Sam Houston, 22, 29 Mar, 8 Apr, on *Colubrina texensis*, B.J. Adelson, M. Wasbauer (UCB). Brewster Co.: 2♂, Chisos Mts., 10–12 Jun, Mitchell, Cushman (USNM); Big Bend National Park, 1♂, Dugout Wells, 3000', 22 May, J.F. McAlpine (BRI), 3♂, 2♀, Nine Point Draw, 3000', 15, 21, 25 May, J.F. McAlpine, W.R.M. Mason (BRI, USNM); 2♂, 1♀, Santa Elena Canyon, 2100', 24 Apr, 5 May, B.J. Adelson, W.R.M. Mason (BRI, UCD); 2♀, 2 mi SE Study Butte, 18 Jul, W.J. Pulawski (CAS). El Paso Co.: 1♂, El Paso, 19 Aug, 55-8-18f, R.M. Bohart (UCD). Hidalgo Co.: 2♂, Bentsen Rio Grande Valley St. Park, 30 Nov–2 Dec, E.E. Grissell, A.S. Menke (USNM), 2♂, 3♀, 3 Aug, 16, 19, 20 Nov, C.C. Porter (FSDA); 1♂, 3♀, McAllen Botanical Garden, 16 Jan, 25 Aug, 24, 31 Dec, C.C. Porter (FSDA). Kerr Co.: 1♀, Kerrville, 16 Apr, W.R.M. Mason (BRI). Uvalde Co.: 1♂, Uvalde, 18 Jun, S.E. Jones (USNM). Val Verde Co.: 1♂, Amistad National Recreation

Area, 17 Jul, W.J. Pulawski (CAS). County unknown: 1♀, Ysleta, 3 Apr (ANSP).

MEXICO. Chiapas. 2♂, Nachic, 8000', 27 Apr, H.E. Evans (USNM); 7♂, San Cristobal las Casas, 7500', 25–29 Apr, H.E. Evans (USNM).

Chihuahua. 1♀, 10 mi S Villa Ahumada, 4 Jul, E.I. Schlinger (UCB).

Coahuila. 3♂, 12 mi N Hermanas, 11 Aug, A.S. Menke, L.A. Stange (UCD).

Durango. 1♀, 17 Jul, J.A. Chemsak (UCB), 1♂, 5 mi W, 14 May, L.A. Stange (UCD); 1♂, Nombre de Dios, 1 Aug, P.D. Hurd (UCB), 1♀, 4 mi N, 13 May, F.D. Parker (UCD).

Guerrero. 1♀, Acapulco, 1 Jul, P.D. Hurd (UCB).

Hidalgo. 1♀, Zimapan, 11–14 Jun, H.E. Evans (USNM).

Jalisco. 1♀, Puerto Vallarta, 31 Dec, sea level, P.H., M. Arnaud (CAS).

Mexico. 1♂, Valle de Bravo, 7 May, F.D. Parker (UCD).

Michoacan. 1♀, Jahuayo, 15 Jul, H.E. Evans (USNM); 1♂, Hidalgo, 12 Jul, F.D. Parker, L.A. Stange (UCD); 2♂, Tuxpan, 6000', 7 Jul, H.E. Evans (USNM).

Morelos. Cuernavaca, 10♂, 3 mi N, 7500', 14, 21 Mar, 10 Apr, H.E. Evans (USNM), 3♂, 7000', 12–19, 29 Jul, R., K. Dreisbach (UCD), 14♂, 3 mi NW, 6500', 30 Apr–30 Jun, H.E. Evans, D.M. Anderson (USNM), 11♂, 4 mi E, 6000', 2–29 Jun, H.E. Evans (USNM), 1♂, 5 mi E, 16 Mar, F.D. Parker (UCD), 2♂, 4 mi N, 7500', 6 Mar, H.E. Evans (USNM), 4♂, 4 mi NW, 7500', 12–28 Apr, H.E., M.A. Evans (USNM).

Nuevo Leon. 2♂, 4 Nov, R.P. Dow (USNM).

Oaxaca. 1♂, Mitla, 10 mi S, 6200', 5 May, H.E. Evans (USNM), 1♂, 12 mi E, 5400', 11 Feb, D. Bolinger (OSU); 2♂, Oaxaca, Crawford (UCD); 1♂, 10 mi NW Tamazulapan, 22 Aug, L.A. Stange, A.S. Menke (UCD).

Puebla. 1♀, 3 mi NW Petlalcingo, 4 Mar, F.D. Parker, D. Miller (USU).

San Luis Potosi. 1♂, El Bonito, 7 mi S Ciudad Valles, 300', 19 Dec, P.H., M. Arnaud (CAS); 1♂, 20 mi SW San Luis Potosi, 6800', 25 Jul, Univ. Kansas Mex. Exp. (KU).

Sonora. 5♀, Alamos, 5 Jan, P.H., M. Arnaud (CAS); 2♀, 15 mi E Yavaros, 12 Jun, F.G. Andrews (CDA).

Veracruz. 1♂, Orizaba, 12–22 Aug, R., K. Dreisbach (USU).

Zacatecas. 1♀, Sombrerete, 15 km E, 30 Jul, P.D. Hurd (UCB).

3. *Liris (Leptolarra) mescalero latus*, new subspecies

FIGURES 4, 24; MAP 2

This subspecies is restricted to southern California and Baja California. The males differ from those of *L. mescalero mescalero* because the vestiture on the median process of sternum VI is subrecumbent rather than suberect. Also, the angle formed by the apex of the process is wider, about 20° to 30°. The females cannot be separated from those of *L. m. mescalero* other than by the locality at which they are collected.

ETYMOLOGY.—The subspecific epithet is derived from the Latin *lata* (broad) and refers to the median pointed process on sternum VI of the males, which forms a broader apical angle in this subspecies than in the nominal subspecies.

HOLOTYPE.—♂; California, Orange Co., Corona del Mar, 25 Aug 1945 (USNM Type I00987).

MALE.—*Color*: Black entirely; wings slightly infumated, more so apically, veins dark brown.

Vestiture: Body with rather sparse appressed vestiture; densest on lower half of face; longer and subrecumbent on propodeum; terga I–IV with broad apical bands of silvery pubescence.

Structure: Length, 7.6 mm; clypeus slightly bulging medially, free margin broadly and slightly rounded; flagellomere I slightly shorter than II; flagellomeres II–X with broad placoids extending their entire length, XI with placoid extending only over basal three-fourths; notauli, admedian and parapsidal lines very weakly impressed; scutal punctures very fine, contiguous, those on mesopleura slightly coarser; scrobal sulcus weakly impressed; propodeal punctures coarser than those on mesopleura, slightly larger

and deeper, contiguous, hind face of propodeum with longitudinal coarse, shallow striae; sternum VI biemarginate, the sides forming the median process meeting at about a 20° angle at apex, vestiture on process subrecumbent (Figure 24); hind femur shallowly excavate beneath except at extreme base; genitalia as in Figure 4.

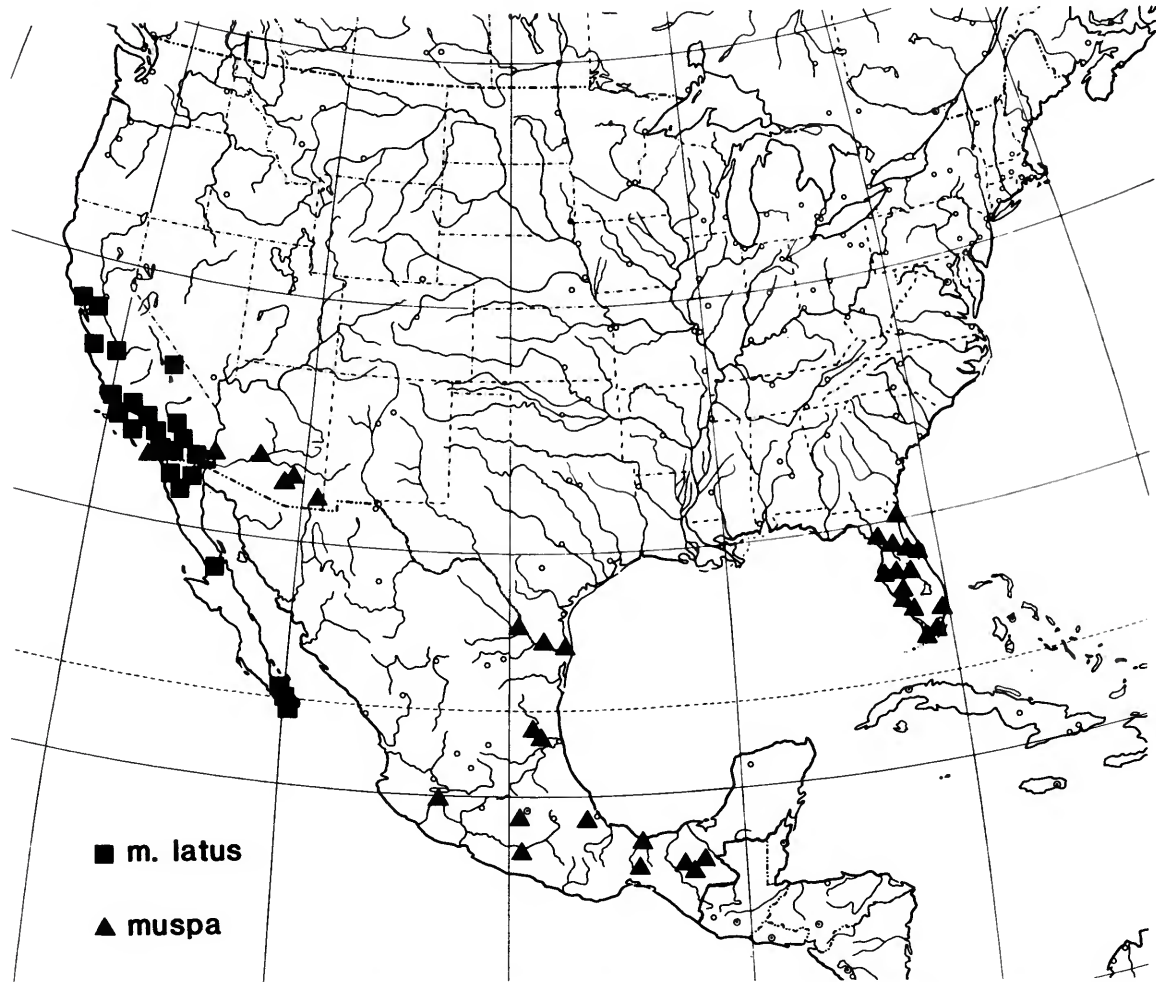
ALLOTYPE.—♀; California, Fish Canyon, 44e28 (= 28 May 1944, collected by K.W. Cooper) (USNM).

FEMALE.—*Color*: Black; tarsi ventrally dark reddish brown; wings more strongly infumated than in male, more so apically, veins brown.

Vestiture: Sparse and appressed on all parts of body, densest on lower half of face; terga I–III with broad apical bands of silvery pubescence, reflecting dull brassy highlights in certain lights.

Structure: Length, 10.3 mm; free margin of clypeus broadly and slightly rounded; flagellomeres IV–IX with small oval pits beneath, those on terminal flagellomeres about one-third as long as segment; admedian and parapsidal lines faint, notauli even more so; sculpturing on thorax similar to that of male; scrobal sulcus faintly impressed; hind tibial carina extending over apical half, with two spines in addition to that at apex; tarsal claws simple; sterna I–IV dull, with fine punctures, V–VI shiny, with scattered larger punctures; tergum VI shiny, with fine punctures, pubescent adjacent to lateral carina of pygidium; pygidium with a bare shiny triangular area at base, remainder of surface densely covered with pale, subrecumbent setae and a few longer, erect setae.

PARATYPES.—UNITED STATES. California. Contra Costa Co.: Moraga, 4♀, 24 May 1981, 2♂, 7 Jun 1981, W.J. Pulawski (CAS). Fresno Co.: 1♂, Piedra, 18 Oct 1955, M. Metcalf (UCD). Imperial Co.: 1♀, Calexico, 22 Mar 1956, T.R. Haig (UCD); 1♂, Fish Creek Mts., 20 Apr 1955, W.R. Richards (BRI); 1♂, Potholes, 10 Apr 1923, E.P. VanDuzee (USU); 2♂, no specific locality, J.C. Bridwell (USNM). Inyo Co.: 5♂, Surprise Canyon, Panamint Mountains, 24 Apr 1957, 9 May 1958, on *Encelia farinosa*, P.D. Hurd, R.M. Bohart (UCD). Los Angeles Co.: 1♂, Altadena, 1



MAP 2.—Known range in North America for *Liris mescalero latus*, new subspecies, and *L. muspa* (Pate).

Jul 1945, K.W. Cooper (USNM); 1♀, Elizabeth Canyon, 7 Jul 1959, E.I. Schlinger (UCD); Santa Catalina Island (all collected by A.S. Menke, D.R. Miller, R.W. Rust and deposited in USNM): 1♂, 1♀, Bull Rush Canyon, 100'–600', 29 Jun 1978, 1♂, Cherry Valley, 1 Jul 1978, 2♀, Little Springs Canyon, 550', 2 Jul 1978, 12♂, 5♀, Middle Canyon, 10'–200', 29 Jun 1978, 1♀, Sweetwater Canyon, 600'–800', 2 Jul 1978; 4♂, 3♀, Tanbark Flat, 9 May–16 Jul 1956, R.M. Bohart, R.C. Bechtel (UCD). Marin Co.: 1♂, Mill Valley, 8–11

Oct 1965, P.H. Arnaud, Jr. (CAS). Monterey Co.: Arroyo Seco Camp, 1♂, 3♀, 27 May–6 Jun 1956, R.C. Bechtel, R.M. Bohart (UCD), 2♂, 5 Jun 1957, R.M. Bohart (UCD), 1♀, 16 May 1958, E.G. Linsley (USNM), 1♀, 21 May 1955, P. Torchio (USU); 3♀, Paraiso Springs, 27 Sep 1934, 5 Oct 1919, pres. by L.S. Slevin, 4 Sep 1924, C.L. Fox (all USU). Orange Co.: 1♂, Corona del Mar, Oct 1916, (UCD); 3♂, 2♀, Peters Canyon, 30 Aug 1955, R.M. Bohart (UCD). Riverside Co.: 1♂, Andreas Canyon, Palm Springs, 11 Apr 1955,

W.R.M. Mason (BRI); 3♀, Agua Caliente Ind. Res., Palm Canyon, 24 Feb 1970, P.H. Arnaud, Jr., one collected in modified Arnaud Insect Flight Trap (CAS); 1♀, Banning, 9 Jul 1950, H.M. Graham (UCB); 2♂, 8 mi W Beaumont, 5 Jul 1957, J.E. Gillaspay (UCD); 1♀, Cathedral City, 27 Sep 1957, on *Eriogonum* (species illegible), P.H. Timberlake (UCR); 3♂, Corona, Sep 1920 (USU); 1♂, Deep Canyon, 305 m, 24 Oct 1965, flight trap over *Hyptis*, P.H. Arnaud, Jr. (CAS); 1♀, Palm Canyon W of Palm Springs, 9 Apr 1981, W.J. Pulawski (CAS); 1♂, Palm Springs, 30 Oct 1938, R.M. Bohart (USU); 5♂, 5♀, Riverside, 4 Jun–2 Sep 1926, 13 Oct 1927, 4 May 1934, 31 May 1935, 8 Apr 1937, 3 Apr 1946, on *Cryptantha intermedia*, *Eriogonum fasciculatum*, *E. gracile*, *Gnaphalium*, *Helianthus annuus*, *Lepidospartum*, *Viburnum*, A.J. Basinger, P.H. Timberlake (UCR, USNM); 2♀, White Water, 17, 19 Mar 1955, D.F. Hardwick, W.R.M. Mason (BRI). San Bernardino Co.: 3♂, Morongo Valley, 12 Oct 1958, O.C. LaFrance (UCD); 1♂, Wildwood Canyon, 8 Jul 1957, C.A. Moffitt (UCD). San Diego Co.: 1♀, Anza State Park, 23 Apr 1951, E.I. Schlinger (UCD); 1♀, Balboa St. Pk., 16 Oct 1978, D. Faulkner (SDM); 1♂, 1♀, Borego, 24 Apr 1955, P.D. Hurd (UCD); 1♂, Chula Vista, 8 Jul 1961, on *Atriplex semibaccata*, F.X. Williams (CAS); 3♀, Culp Canyon, Anza State Park, 4 Apr 1959, J.C. Hall, E.I. Schlinger (UCD); 1♀, Jamul, 16 Aug 1977, L. Guidry (SDM); 1♀, La Jolla, 14 Aug 1911, J.C. Bridwell (USNM); 1♀, La Mesa, 25 Jan 1953, F.X. Williams (CAS), 1♂, 27 Sep 1958, P. Rude (SDM), 1♀, near La Mesa, 30 May 1953, F.X. Williams (CAS); 1♀, Lemon Grove, 29 Sep 1954, H.A. Hill (SDM); Pt. Loma, 1♂, 3♀, 3, 7, 10 Aug, 5 Sep 1952, H.A. Hill (SDM), 2♂, 14, 21 Oct 1951, H. Atlebery (SDM); 1♂, Poway, 27 Oct 1954, H.A. Hill (SDM); 1♀, Ramona, 7 Sep 1958, P. Rude (SDM); 1♂, Rose Canyon (Brick Kiln), 29 Jul 1953, H.A. Hill (SDM); 1♀, San Diego, no further data (USNM); 2♂, San Diego River, 14 Oct 1953, H.A. Hill (SDM); 1♀, San Luis Rey Camp, 23 Apr 1959, E. I. Schlinger (UCD); 3♀, Sorrento Valley, 6, 20 Jul 1954, 17 Oct 1953, H.A. Hill (SDM); 3♂,

Torrey Pines St. Pk., 2 Sep 1982, Faulkner, Brown (SDM); 3♂, no specific locality, 2–5 Aug 1954, H.E., M.A. Evans (USNM). Santa Barbara Co.: 2♀, Mission Canyon, 1 Oct 1932, P.H. Timberlake (UCR); 1♂, Refugio Canyon, 4 Jul 1959, J.R. Russell (UCD); Santa Cruz Island: 1♀, Canada Cervada, 700'–1000', 27 Sep 1978, R. Coville, M. Buegler, J. Powell, 3♂, 2♀, Central Valley, 26 Sep 1978, J. Powell (UCB), 3♂, 3♀, Prisoners Harbor Cr., 25 Sep 1978, R. Coville, M. Buegler, J. Powell (UCB), 1♀, Willows Cove, 28 Sep 1978, R. Coville (UCB); 2♂, 3♀, Santa Ynez Mountains, 24 Jun 1959, R.M. Bohart, A.S. Menke, F.D. Parker (UCD). Stanislaus Co.: 2♂, Del Puerto Canyon, Frank Raines Park, 330 m, 1 Dec 1972, P.H. Arnaud, Jr. (CAS). Ventura Co.: 11♂, 3♀, Foster Park, 25 Jun–7 Jul 1959, R.M. Bohart, M. Bruck, P.M. Marsh, A.S. Menke, F.D. Parker (UCD); 1♂, 1♀, Santa Paula, Essig (UCR). County unknown.: 2♀, Fish Canyon (could be Inyo or Los Angeles Co.), 28 May 1944 (USNM); 1♂, Irvine Park, 8-4-38, R.H. Beamer (KU).

MEXICO. Baja California Norte. 1♂, Agua Caliente (San Carlos), 18.5 km E Maneadero, 6 Jul 1973, P.H. Arnaud, Jr. (CAS); 19♀, Arr. Santo Domingo, 5.7 mi E Hamilton Ranch, dam site, 23 Apr 1963, 5♀, 22 Apr 1963, 1♀, 23 Apr 1963, 1♀, 25 Apr 1963, 1♂, 28 Apr 1963, all collected by H.B. Leech, P.H. Arnaud, Jr. (CAS); Isla de Cedros, 1♀, Cerro de Cedros, 1 Jul 1983, D. Faulkner (SDM), 1♀, Grand Canyon, 2 Jul 1983, D. Faulkner (SDM); 1♀, 7 mi SW Mission San Borja, 30 Mar 1973, J.A. Powell (UCB); 1♀, 22 mi S Rosarito, 5 Jul 1973, Fisher, Westcott (LACM); 1♂, 21 mi SSE Rosarito, 28°38'N, 114°03'W, 9 Oct 1972, E.M. Fisher (LACM); 1♂, Santa Maria Va., 11 Aug 1954, J. Powell (UCD); 1♀, Sierra Juarez, Canyon del Tajo, 1 Apr 1953, on desert lavender, J.A. Powell (UCB); 1♀, Sierra Juarez, 6 mi N Laguna Hanson, 3 Jun 1982, Faulkner, Brown (SDM); 1♂, Sierra Laguna, Big Canyon, 13 Oct 1941, Ross, Bohart (USU).

Baja California Sur. 1♂, 1♀, 3.7 mi W La Burrera, 1400', 7–8 Oct 1975, R.R. Snelling

(LACM); 1♀, Boca de la Sierra, 900', 6 Mar 1969, R.R. Snelling (LACM); 2♂, 25 mi W La Paz, 30 Aug 1959, K.W. Radford, F.G. Werner (CAS, BMNH) (hardly any vestiture on sterna), 1♂, 20 km NW, 100', 5 Oct 1975, R.R. Snelling (LACM); 3♀, Los Barriles, 2, 5-6 May 1979, malaise trap, 7 A.M.-5 P.M. M. Wasbauer (CDA); 1♂, 5♀, 4 mi WSW Miraflores, 22-24 Apr 1979, malaise trap, 8 A.M.-5 P.M., 4 near water tank, 1 in grazed pasture, M. Wasbauer (CDA); 1♂, 4♀, San Perdito, 9.3 mi SE, on road to Rancho Saucito, 7 Oct 1981, D. Faulkner, F. Andrews (SDM); 1♂, 1♀, Sierra de la Laguna, La Laguna, 17.3 air mi ENE Todos Santos, 6000', 14-18 Dec 1979, in malaise trap, 8 A.M.-5 P.M., M. Wasbauer (CDA), 1♀, Sierra La Laguna ridge, 1200-1300 m, trail La Burrera-La Laguna, 20 Sep 1977, E. Fisher, R. Westcott (CAS); 1♂, El Pescadero, Playa Los Cerritos, 14-15 Apr 1979, M. Wasbauer, J. Slansky (CDA); 2♀, 27 km NE Todos Santos, 900', 8-9 Oct 1975, R.R. Snelling (LACM); 1♂, 29 km N Todos Santos, 275 m, 3 Sep 1977, E. Fisher, R. Westcott (CAS).

A pair of paratypes has been placed in the British Museum (Natural History).

4. *Liris (Leptolarra) evansi*, new species

FIGURES 2, 25; MAP 3

Females of this species are not known. The males belong to a group including *L. mescalero* and *L. argentatus*, which have the sixth sternum biemarginate and possessing a median projection between emarginations. However, this median process is short in *L. evansi*, extending only one-third as far as the lateral edges of sternum VI, and the sterna do not have specialized vestiture as in *L. mescalero* and *L. argentatus*. Also, the wings are distinctly infuscated along the apical margin in *L. evansi*.

ETYMOLOGY.—This species is named in honor of Dr. Howard E. Evans, whose extensive collecting of Mexican *Liris* has greatly added to our knowledge of the genus.

HOLOTYPE.—♂; Mexico, Guerrero, 3 mi N Taxco, 5500', VI-1-1959, H.E. Evans (USNM Type 100988).

MALE.—*Color*: Black; tarsi very dark reddish brown; wings clear, apices infumated.

Vestiture: Rather sparsely and evenly covered with appressed silvery vestiture, densest on lower half of face, longer and subrecumbent to suberect on propodeum; terga 1-IV with narrow apical bands of silvery vestiture.

Structure: Length, 7.5 mm; clypeus somewhat tumid medially; free margin narrowly rounded, almost produced into a rounded triangle; flagellomeres II-X with broad placoids extending over entire length; XI with placoid present only on basal three-fourths of segment; admedian lines and notauli very faint, parapsidal lines more deeply impressed; scutal punctures very fine and contiguous, those on mesopleuron slightly coarser; scrobal sulcus faint; propodeal sculpturing coarser than that on mesopleuron; sternum VI biemarginate, the median process between emarginations short, only about one-third as long as most apical margin of sternum; sterna lacking specialized vestiture; genitalia as in Figure 2.

FEMALE.—Unknown.

PARATYPES.—UNITED STATES. Arizona. Pima Co.: 1♂, Tucson, 1 Jun 1936, Bryant (CAS). Maricopa Co.: 1♂, Maricopa Mts., 13 Apr 1947, H., M. Townes (USU).

MEXICO. Baja California Norte. 1♂, Rio San Miguel, La Mision, 22 Aug 1981, D. Faulkner (SDM).

Chiapas. 1♂, Ixtapa, 11 Apr 1962, F.D. Parker (UCD).

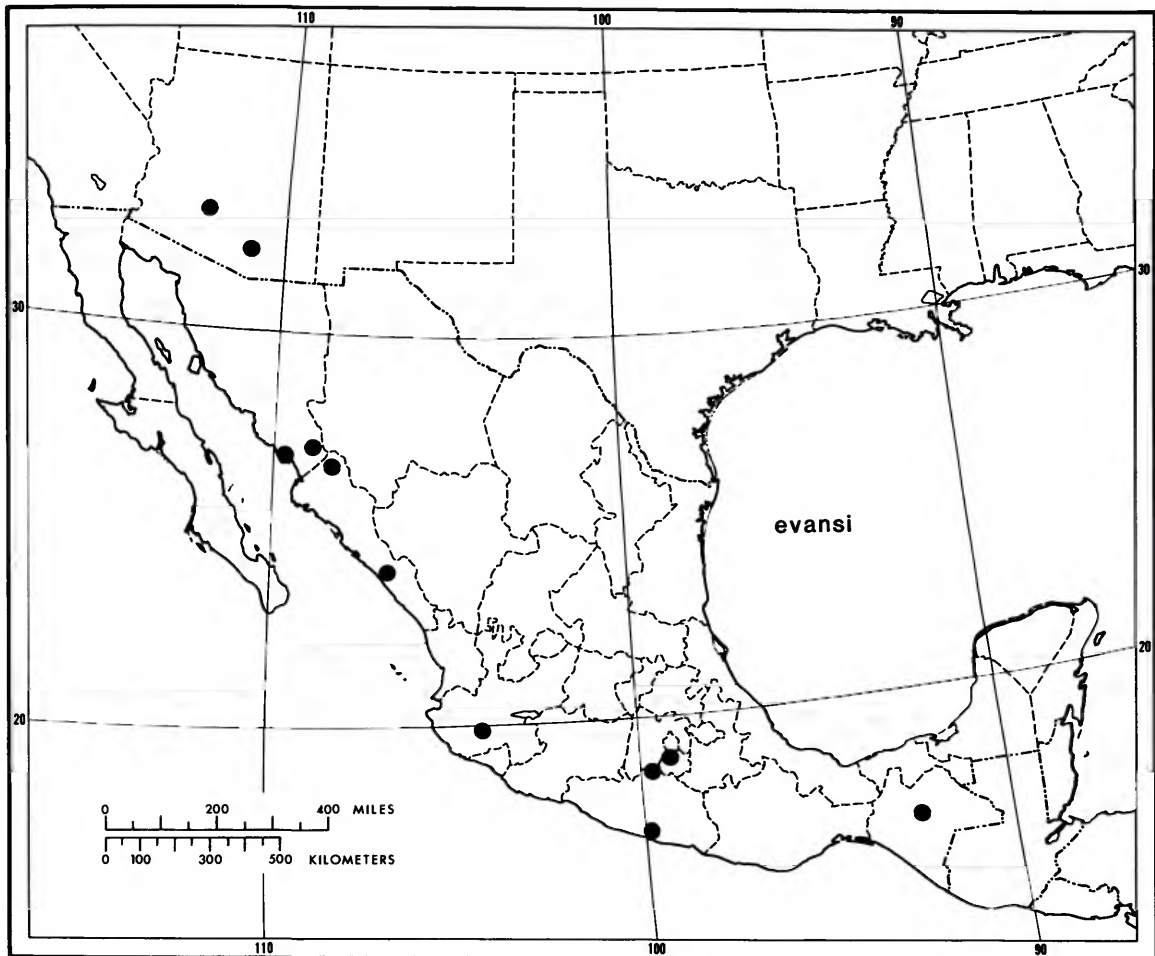
Guerrero. 9♂, Acapulco, 18 Mar 1957 (2), 20 Mar 1957 (2), 21 Mar 1957 (2), 23 Mar 1957 (3), G.R. Ferguson (OSU), 1♂, 19 Jul 1963, F.D. Parker, L.A. Stange (UCD).

Jalisco. 1♂, Plan de Barrancas, 24 Mar 1962, F.D. Parker (UCD); 1♂, Puerto Los Mazos, 9 mi N Autlan, 28 Aug 1970, M.S., J.S. Wasbauer (UCB).

Morelos. 1♂, 5 mi E Cuernavaca, 26 Mar 1962, F.D. Parker (UCD).

Sinaloa. 1♂, 3 mi N Elota, 18 Mar 1962, F.D. Parker (UCD); 1♂, 6 mi NW Choix, 6 Aug 1968, T.A. Sears, R.C. Gardner, C.S. Glaser (UCD).

Sonora. 1♂, Alamos, 5 Jan 1971, P.H., M.



MAP 3.—Known range in North America for *Liris evansi*, new species.

Arnaud (CAS), 1♂, 25 Feb 1963, P.H. Arnaud, Jr. (CAS); 1♂, 15 mi E Yavaros, 12 Jun 1968, F. G. Andrews (CDA).

A paratype has been placed in the British Museum (Natural History).

5. *Liris (Leptolarra) argentatus* (Palisot de Beauvois)

FIGURES 1, 26, 36; MAP 4

Larra Pennsylvania Palisot de Beauvois, 1811:118, pl. 3: fig. 8 [Pennsylvania].—Kohl, 1884:246 [listed].—Fox, 1893:483 [possibly a species of *Tachysphex*].

Larra argentata Palisot de Beauvois, 1811:119, pl. 3: fig. 9

[Pennsylvania].—Kohl, 1884:241 [listed].—Cresson, 1887:277 [listed].—Ashmead, 1894:63 [nest, prey].—Dalla Torre, 1897:663.

Lyrops argentata (Palisot de Beauvois).—Say, 1837:370–371. *Tachytes murina* Dahlbom, 1843–1845:132 [♀; boreal America; syntypes in Zoologisches Museum, Berlin].

Larrada argentata (Palisot de Beauvois).—Smith, 1856:292.—Cresson, 1872:214 [Texas].

Larrada Pennsylvania [sic] (Palisot de Beauvois).—Smith, 1856:292.

Larrada nuda Taschenberg, 1870:5 [♀; Venezuela; unique type in Zoological Museum, Halle?].

Larra pennsylvanica [sic] (Palisot de Beauvois).—Cresson, 1887:277 [listed].

Larra nuda (Taschenberg).—Kohl, 1884:246.—Dalla Torre, 1897:671.

Notogonia argentata (Palisot de Beauvois).—Fox, 1893:485–486 [♀, ♂; “throughout the entire United States”.—Williams, 1914:141, 189–192, figs. 34, 49, 80, 88, 97, 118 [♀, ♂; Kansas; nest, prey hunting and transport].

Tachytes labiatus (Fabricius).—Dalla Torre, 1897:691 [incorrectly synonymized *T. murina* Dahlbom under *T. labiatus*].

Notogonia murina (Dahlbom).—Stadelmann, 1897:255.

Notogonidea argentata (Palisot de Beauvois).—Rohwer, 1916:684 [Connecticut].—Rau and Rau, 1918:152–158, fig. 35 [Missouri; nest, prey].—Rau, 1922:26 [nest, prey].—Reinhard, 1929:67–71 [nest, prey].

Motes argentata (Palisot de Beauvois).—Pate, 1943:200.—Krombein, 1951:143 [visiting honeydew].—Krombein and Evans, 1954:233 [prey]; 1955:232 [nest, prey, life history].—Krombein, 1958a:103 [prey].—Kurczewski and Kurczewski, 1971:134 [prey].

Motes (Notogonius) argentata (Palisot de Beauvois).—Bohart, 1951:954 [North America from Quebec and Washington south to Florida, Arizona, and Baja California].—Krombein, 1958b:188 [prey].

Liris argentata (Palisot de Beauvois).—Bohart and Menke, 1976:244 [synonymized *L. pennsylvanica* Palisot de Beauvois and *L. nuda* Taschenberg (teste Krombein)].—Steiner, 1976:343–380 [comparative stinging behavior].

Liris murina (Dahlbom).—Krombein, 1976:333 [lectotype designation and synonymized under *L. argentata* (Palisot de Beauvois)].

Liris (Leptolarra) argentata (Palisot de Beauvois).—Krombein, 1979:1618 [southern Ontario west to Nevada, south to Florida, Arizona, and southern California, south to Chiapas, Mexico, Venezuela?, Cuba, Bahamas, adventive in Hawaii].

Liris argentatus is one of the most common, widespread Nearctic species. It belongs to a group of species in which the males have the apical margin of the sixth sternum biemarginate with a pointed, median process. A middle semi-circular area of sternum III and the visible portions of IV–VI are covered with dense brushes of dark, short vestiture. Females have apical bands of silvery vestiture on terga I–IV, a bare, shining, triangular area on the base of the pygidium, and oval, impressed sensory pits on flagellomeres IV–X. Several females from the Eastern seaboard (D.C., Fla., Mass., Me.) have the bare area of the pygidium reddish brown and less sharply defined, although other specimens from these localities have the usual character states.

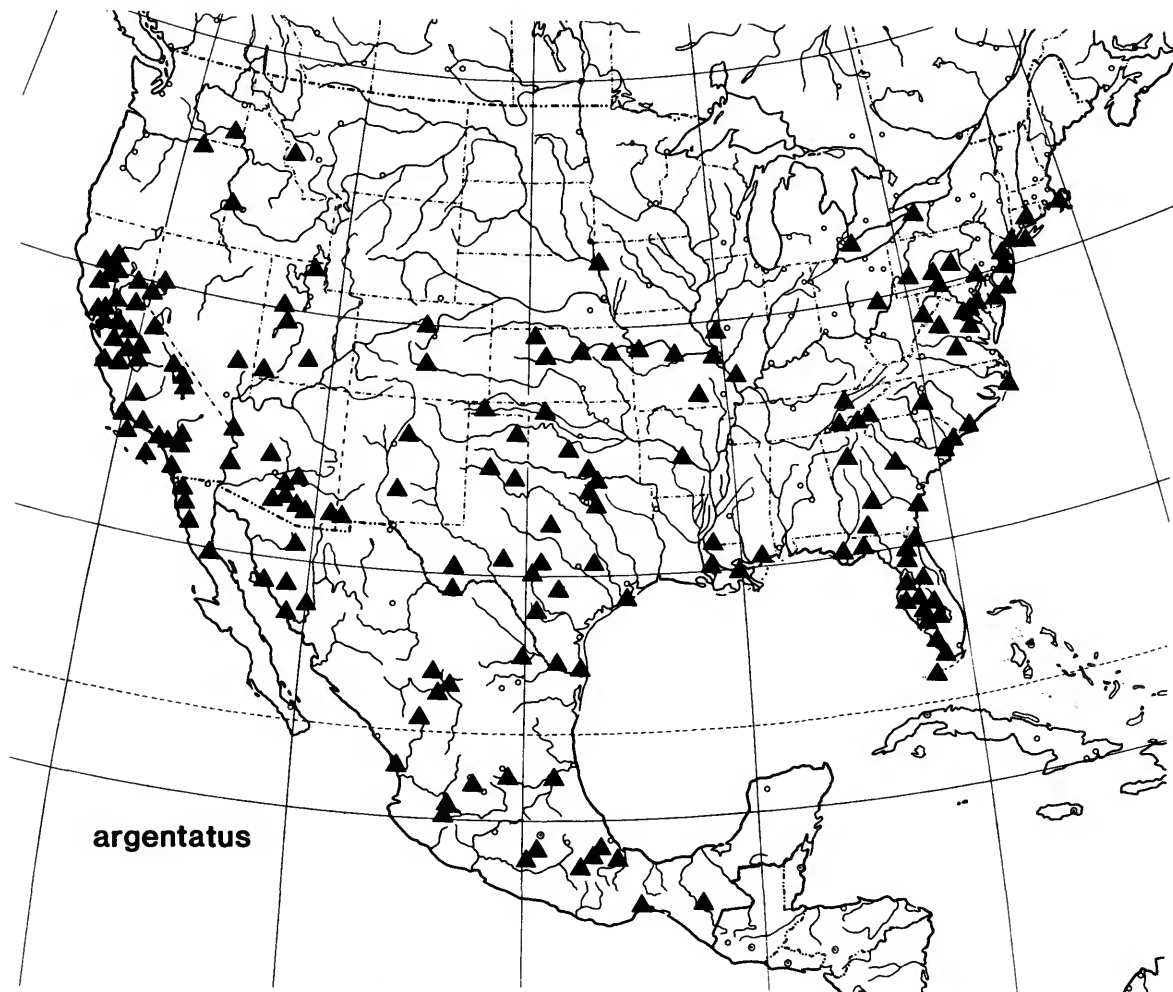
A larger, darker form of this species occurs in northern California, the Reno, Nevada, area, and

Oregon. The females are not so “bright,” due to the lack of silvery sheen on the abdominal fasciae. In the males the thoracic pubescence of these forms is cinereous, rather than silvery. Both sexes have fuliginous wings, in contrast to the clear wings with infuscated apices found in specimens from other localities. Originally, we intended to name this form as a new subspecies; however, several specimens we examined later caused us to discard this view. A pair of females from Poway, San Diego Co., California, are large and have the dark wings found in the northern California form. Other specimens from southern California have the clear wings found in typical *argentatus*. A male and female from Woodland, Yolo Co., California, confuse the picture further because the male is small with clear wings and bright silvery vestiture, whereas the female is larger, darker, and has dark wings. A female from Ozark Lake (Lake of the Ozarks?), Missouri, also has very dark wings, so apparently this is a variable character state.

COLOR.—Black; tarsi ventrally dark reddish brown; wings slightly yellowish, more infumated apically, stigma and veins dark brown.

VESTITURE.—Head and thorax with very sparse, short, appressed, pale setae; apices of terga I–III with narrow bands of silvery pubescence.

STRUCTURE.—*Female:* Length, 9.5–15.4 mm; clypeus slightly tumid along midline; clypeal punctures very fine and close, becoming larger and more widely scattered below; flagellomere I slightly longer than II, IV–X each with a small, round or oval placoid beneath near middle (Figure 36); admedian line, parapsidal lines, and notauli visible but very faint; scutal punctures very fine, contiguous; mesopleural and scutellar punctures similar to those on scutum; scrobal sulcus weakly impressed; forefemur flattened laterally; hind tibia carinate on apical half of outer surface, with two spines in addition to that on apex; propodeum with slightly coarser punctures than those on scutum; sterna I–IV dull, covered with fine, dense punctures, IV with an overlapping mixture of fine, close punctures and larger, deeper ones, which are separated by two or more



MAP 4.—Known range in North America for *Liris argentatus* (Palisot de Beauvois).

puncture widths, V and VI shining, with large, scattered punctures separated by two or more puncture widths, and finer, closer ones laterally; sterna II–V with a few (usually six) long, stout macrochaetae scattered in a subapical row; pygidium covered with short, appressed, pale pubescence, and with a basal, usually triangular, shining, impunctate area; apex of pygidium with four to six stout, spatulate spines.

Male: Length, 6.4–10.7 mm; similar to female except mandible with two small teeth on basal one-third of dorsal inner edge; flagellomeres II–X with broad placoids, each extending

full length of flagellomere, XI with placoid extending only over basal one-half to two-thirds; hind tibial carina lacking; sterna dull, covered with fine, dense punctures; middle of sterna III and portions of IV–VI with a moderately dense brush of suberect short hair (Figure 26); sterna VI shallowly biemarginate (Figure 26a); terga I–IV with apical bands of silvery pubescence, sometimes V with a very narrow band of such pubescence also, VI densely covered with short, silvery, appressed pubescence; genitalia as in Figure 1.

MATERIAL EXAMINED.—CANADA. Ontario, 1♀, Pt. Pelee, 9 Sep (BRI).

UNITED STATES. Arizona. Cochise Co.: 1♀, near Apache, 11 Aug, P.H. Timberlake (UCR), 9 mi N Apache, 27 Jul, E.G. Linsley (UCB); 1♂, 13 mi E Douglas, 12 Jun, L.A. Stange (UCD); 3♂, Portal, 5000', 15 Aug, 2, 8, 13 Sep, on honeydew on walnut, H.E. Evans, R.M. Bohart (USNM, UCD); 1♂, 1♀, Southwest Research Station, 5 mi W Portal, 1, 16 Aug, P.D. Hurd, H.E. Evans (UCB, USNM); 1♂, Wilcox, 12 Jul, on *Wislizenia palmeri*, Beamers, Lang, LaBerge (KU). Gila Co.: 1♂, 1♀, 15 mi N Globe, 19 Jun, Butler, Werner (UCD). Mojave Co.: 1♀, Littlefield, 12 Apr, F.D. Parker (USU); 1♀, Topock, Aug, T.W. Stradley (UCD), 1♀, 8 Apr, on *Cercidium*, B. Apperson (USU). Pima Co.: 1♂, Quijotoa, 7 Oct, T.R. Haig (UCD); 1♂, Santa Rita Mts., 29 Apr, R.M. Bohart (UCD); 1♂, 2♀, Tucson, Snow (KU), 2♂, 1♀, 13, 14, 24 Jun, Crandall (USNM, UCB). Pinal Co.: 1♀, 10 mi SW Clay, 26 May, T.R. Haig (UCB); 1♀, Florence (ANSP); 2♂, Picacho Pass, 22 Sep, P.H. Timberlake (UCR); 5♂, 1♀, Sacaton, 1-4 Jun, Telford (UCD). Santa Cruz Co.: 1♂, Amado, 23 Jul, swept on alfalfa, Butler (UCD); 1♂, 1♀, Sycamore Canyon, Ruby Rd., 11-13 Jun, 10 Sep, Hanson, Knowlton (USU); 1♀, Tumacacori, 14 Aug (UCR). Yavapai Co.: 1♀, Rock Springs, 7 Jul, Beamers, Lang, LaBerge (KU). Yuma Co.: 1♀, Ehrenberg, 13 Nov, J.W. McSwain (UCB). County unknown: 1♀, no specific locality, C.F. Baker (USNM).

Arkansas. Pulaski Co.: 1♀, Little Rock, 6 Feb (BRI).

California. Alameda Co.: 1♀, Coyote Creek near Warm Spr., 26 Jun, C.W. O'Brien (UCB); 1♂, Emoryville, 21 Sep. H.A. Hill (USNM); 3♀, 3♂, Tesla, 25 Sep, 15 Oct, 22 Mar, P.D. Hurd, J.W. MacSwain (UCB); 1♂, Vasco Rd. near Dublin, 31 Aug, W.W. Middlekauff (USNM); 1♀, 20 mi S Livermore, 24 Sep, M. Wasbauer (UCB). Butte Co.: 1♀, Biggs, 7 Jun, M. Wasbauer (UCB). Colusa Co.: 1♀, Colusa, 15 Aug, R.O. Schuster (UCB); 1♀, Maxwell, 11 Aug, E.I. Schlinger (UCB). Contra Costa Co.: 1♀, Ima, Antioch, 8 Jul, 11 Nov, on *Eriogonum*, P.D. Hurd, M. Wasbauer (UCB); 1♂, Richmond, 10 Aug, E.E. Seibert (UCB). Fresno Co.: 3♀, Firebaugh, 3 Jul, 4 Aug, 9 Sep, on *Helianthus*, R. Smith, A.D. Tel-

ford (UCB), 1♀, 20 mi W, 6 Jun, P. Torchio (USU), 2♀, Oilfields, 20 mi N, 14 Apr, (UCB). Glenn Co.: 253♀, 48♂, Artois, 16 Jun, 10-30 Jul, J.W. MacSwain, H.L. Hansen, E.G. Linsley (UCB); 2♂, 3 mi W Norman, 2, 12 Sep, M. Wasbauer (UCB); 1♀, 2♂, Willows, 21 Jun, M. Wasbauer (UCB), 1♀, 4 mi S, 25 Jun, M. Wasbauer (UCB). Inyo Co.: 1♀, Antelope Springs, 17 Jul, on *Chrysothamnus*, J.W. MacSwain (UCB); 1♀, Mazourka Canyon, 2 Jul, J.W. MacSwain (UCB); 2♀, Surprise Canyon, 24 Apr, 9 May, J. Powell, R.M. Bohart (UCD); 1♀, 3♂, Westgard Pass, 7 mi W, 26 Jun, W.D. McLellan (UCB). Kern Co.: 1♀, 11 mi W Bakersfield, 4 Mar, E.I. Schlinger (UCB); 1♀, Buttonwillow, 7 Jul (UCB); 1♀, 9♂, no specific locality, 14 Jul, E.I. Schlinger (UCB). Lake Co.: 1♀, Lakeport, 18 May, F.D. Parker (UCB); 1♀, N. Fk. Cache Cr., Hwy. 20, 19 Apr, E.I. Schlinger (UCB). Los Angeles Co.: 1♀, no further data, Coquillett (USNM); 1♀, 3 Mar, R.M. Bohart (UCD); 1♀, Monrovia, 10 Aug, B. Rosay (UCB); San Clemente Island: 1♂, China Point, 16 Jun, A.S. Menke, D.R. Miller, R.W. Rust (USNM), 1♀, Wall Rock Canyon area, 9 May, A.S. Menke, D.R. Miller (USNM), 1♀, Wilson Cove, 22 Mar, H.V. Daly (UCB); 1♂, Tanbark Flat, 12 Jul, R.M. Bohart (UCD); 1♀, 1♂, Whittier, 28 Nov, 30 Dec, H. Graham (UCB). Mendocino Co.: 2♀, Hopland Field Station, 13 Jul, one with cricket nymph, *Gryllus* sp., M. Wasbauer (UCB). Merced Co.: 1♀, 2.5 mi S Livingston, 26 Mar, R.R. Snelling (UCD); 1♀, 1♂, Merced Falls, 3 Sep, R.M. Bohart (UCD); 1♀, Turner Isl., N of Dos Palos, 18 Apr, C.D. MacNeil (UCB). Mono Co.: 1♀, Cottonwood Creek, 14 Jul, W.D. McLellan (UCB); 1♂, Topaz Lake, 26 Jun, J.M. Burns (USNM). Monterey Co.: 1♀, 3 mi W Gonzales, 24 Aug, W.W. Middlekauff (UCB). Napa Co.: 1♀, Putah Canyon, W.D. McLellan (UCB); 2♀, 2♂, Samuel Spr., 4, 28 Apr, 7 Jul, E.I. Schlinger, R.M. Bohart, R.C. Bechtel (UCB). Orange Co.: 7♀, 1♂, Fullerton, 15 Aug, R.M. Bohart (UCD). Placer Co.: 1♀, Colfax, 20 May, A.T. McClay (UCB). Riverside Co.: 1♀, Temecula, 8 Apr, P.D. Hurd, Jr. (UCB). Sacramento Co.: 1♀, 1♂, Sacramento, 13 Sep, 5 Oct, S. Morgan (UCB). San Benito Co.: 1♀, 5 mi

S Bitterwater, 1 Apr, D.J. Burdick (UCB). San Bernardino Co.: 1♂, Redlands, F.R. Cole (USNM); 1♀, 1♂, Victorville, 25 Jul, P.D. Hurd (UCB). San Diego Co.: 1♀, 1♂, La Jolla, Apr, 14 Aug, J.C. Bridwell (USNM); 1♀, Little Cedar Canyon, Jamul Creek, 7 Oct, D. Faulkner (SDM); 1♀, Poser Mt., 14 Apr, D. Faulkner (SDM). San Joaquin Co.: 4♀, 3♂, Tracy, 3, 7, 15, 21 Jun, 1 Aug, R. Smith, J.W. MacSwain (UCB). Santa Barbara Co.: 1♀, Goleta, 27 Jun, M. Bruck (UCB); 1♀, New Cayuma, 10 Apr, R.P. Allen (USNM); 1♂, Refugio, 4 Jul, J.R. Russell (UCD); Santa Cruz Island: 1♂, 19♀, Canada del Medio, 28–29 Apr, 1, 6, 7, 14, 15 May, 16–23 Jun, 20, 22 Sep, D.S. Horning, Jr., D.R. Miller, S.K. Senger, R.O. Schuster, T.W. Smithson (UCD), 2♀, Canada del Puerto, 9 May, 20 Jun, R.O. Schuster (UCD), 2♂, 7♀, Cascada, 27 Apr, 4, 6, 8 May, 23 Sep, D.R. Miller, R.O. Schuster (UCD), 4♂, 2♀, Central Valley, 25, 26 Sep, R. Coville, J. Powell (UCB), 2♂, 2♀, Christi Beach, 5 May, 23, 27 Sep, D.S. Horning, Jr., J. Powell, R.O. Schuster (UCB, UCD), 1♀, Coches Prietos, 10 May, D.S. Horning, Jr. (UCD), 1♀, El Sobrante, 15 May, D.S. Horning (UCD), 2♀, north slope El Tigre, 6 May, D.R. Miller (UCD), 2♀, 3♂, Prisoners Harbor, 28 Apr, 7 May, 7 Jun, 29 Sep, R. Coville, D.S. Horning, J. Powell, R.W. Rust (UCD, UCB), 1♂, 1♀, Prisoners Harbor Cr., 25 Sep, R. Coville, J. Powell (UCB), 5♀, South Ridge, 4, 9 May, D.R. Miller (UCD); 2♀, Tucker's Grove, 5 Jul, P.D. Hurd, Jr. (UCB). Sierra Co.: 1♀, 12 mi SE Sierraville, 4 Jul, R.M. Bohart (UCB). Solano Co.: 4♂, Vacaville, 25, 27 Aug, A.T. McClay (UCB). Sonoma Co.: 1♀, Tolay Crk., 31 Aug, E.I. Schlinger (UCB). Stanislaus Co.: 1♀, Patterson, 11 Aug, W.W. Middlekauff (UCB); 1♀, Turlock, 6 Feb, R.R. Snelling (UCD); 2♀, Westley, 1 Apr, 26 Aug, P.D. Hurd, T.F. Leigh (UCB). Tehama Co.: 1♀, Vina, 22 Sep, J. Hall, E.I. Schlinger (UCB). Tulare Co.: 1♀, no specific locality, 25 Apr, H.N. Sheldon (UCB); 1♀, Lemoncove, 29 Mar, P.D. Hurd (UCB); 1♂, Wood Lake, in rotary trap, 12 Jun, Norman Frazier (UCB). Ventura Co.: 2♀, 2♂, no specific locality, 25 Jun, 1, 7 Jul, R.M. Bohart, P.E. Paige (UCD); 3♀, Lockwood Valley, 3, 22 May, E.I.

Schlinger, J.R. Powell (UCB); San Nicolas Island: 9♀, NAS HQ area, 5, 6 May, one with nymph of *Gryllus* sp., J. Chemsak, R. Coville, M. Buegler, J. Powell (UCD), following collected by A.S. Menke, D.R. Miller, R.W. Rust, deposited in USNM, 2♀, Cattail Canyon, 100', 25 Jun, 2♂, 18♀, Celery Canyon, 100', 22–26 Jun, 2♂, 5♀, Celery Canyon to Army Camp Beach, 21 Jun, 2♂, 10♀, beach area from Sand Spit to canyon below sewage ponds, 22 Jun, 19♂, 17♀, Twin Rivers, east fork, 25'–50', 24 Jun, 1♀, Vizcaino Point to Thousand Springs, 23 Jun. Yolo Co.: 1♀, Elkhorn Ferry, 17 May, R.M. Bohart (UCD); 147♀, 138♂, Woodland, 4 May–22 Oct, F.D. Parker, J.C. Downey, E.I. Schlinger, A.S. Menke, R.C. Bechtel, R.E. Rice (UCD).

Colorado. Boulder Co.: 2♀, Boulder, 14 Apr, 30 Aug, S.A. Rohwer (USNM); 1♀, "Physics Library," 2 Nov, C.H. Hicks (BMNH). Fremont Co.: 1♀, Cañon City, 6 Aug, G.F. Hevel (USNM).

Connecticut. 2♂, 6♀, Hartford, 31 May–28 Oct (ANSP).

Delaware. 1♂, 1♀, no further data (ANSP).

District of Columbia. 2♀, 22 Jun–10 Jul, D.G. Shappirio (USNM), 1♀, 14 Apr, with cricket prey *Gryllus pennsylvanicus*, D.G. Shappirio collection (USNM), 2♀, 10 Jul, V.A. Roberts (USNM), 1♀, 15 Aug, with adult cricket *Allonemobius fasciatus* (USNM).

Florida. Charlotte Co.: 1♀, Bermont, taken on thistle honeydew, 30 Mar, K.V. Krombein (USNM). Clay Co.: 1♀, Gold Head Branch State Park, 15 Feb–14 Mar, L.H. Krombein (USNM). Collier Co.: 2♂, 1♀, Everglades, 1 Apr, K.V. Krombein (USNM, BRI). Dade Co.: 2♀, Cape Sable, 1 Feb, 25 Mar, L.L. Pechuman, K.V. Krombein (USNM). De Soto Co.: 7♂, 4♀, Arcadia, 21, 31 Mar, 2, 26 Apr, 30 Jun, taken on sand flats, K.V. Krombein, W.J. Pulawski (USNM, BMNH, BRI); 1♀, Ft. Ogden, 8 Apr (BRI). Duval Co.: 1♀, Mayport, 26 Jun (AMNH). Glades Co.: 1♀, Palmdale, 22 Apr, W.J. Pulawski (BMNH). Gulf Co.: 1♀, St. Joseph St. Pk., 1–3 May, malaise trap, W.W. Wirth (USNM). Hardee Co.: 1♀, Wauchula, 29 Jun, McDermott (KU). Hendry Co.: 1♀, LaBelle, 16 Jul, Beamer (KU). Highlands Co.: 7♂, 3♀, Archbold Biol. Sta., 26

Mar, 8 Oct, P.H. Arnaud, Jr., D. Ferguson (CAS, USNM). Lee Co.: 2♂, 7♀, Olga, 29, 30 Mar, taken on sand flats, K.V. Krombein (USNM). Leon Co.: 1♀, Tallahassee, 1 Apr, R., G. Bohart (USU). Liberty Co.: 1♀, Blountstown, 11 Apr, O.L. Cartwright (USNM). Manatee Co.: 1♂, Palmetto, 2 Dec, K. Taborsky (BMNH). Marion Co.: 1♀, Juniper Springs, 27 Jan–11 Feb, L.H. Krombein (USNM). Orange Co.: 1♀, Orlando, taken on sand flats, 3 Apr, K.V. Krombein (USNM), 2♀, same locality, caught in light trap, May, Jul, O.C. McBride (USNM). Pasco Co.: 1♂, Lacochee, 7 Jul, H.W. Crowder (KU). Seminole Co.: 4♀, Florida Fruit Fly Trap Survey, 27 Jul, 5, 8 Aug, 14 Dec, H. Clark, W. Chapman (USNM). Dry Tortugas: 1♀, East Key, 7 Jun, H.V. Weems, Jr. (FSDA); 3♀, Garden Key, 9 Jul, on *Melanthera deltoidea*, H.V. Weems, Jr. (FSDA); 3♀, Loggerhead Key, 2 Sep, H.V. Weems, Jr. (FSDA).

Georgia. Fulton Co.: 2♀, Atlanta, 28 Aug, 2 Sep, P.W. Fattig (USNM). Glynn Co.: 1♀, Brunswick, 26 Mar, P.W. Fattig (USNM). Richmond Co.: 1♀, Augusta, 1 Apr (UCD); 1♂, 5♀, Ft. Gordon, 20 Apr–20 Sep, R.R. Snelling (UCD). Thomas Co.: 1♂, 1♀, Thomasville, 1 Apr, 25 Jun (ANSP). Tifton Co.: 3♂, 4♀, Tifton, 13 Jun (Lot 209) (ANSP). County unknown: 1♀, Ft. Ogden, 8 Apr (CNC); 1♂, 6♀, no further data (ANSP).

Idaho. Canyon Co.: 3♂, Notus, 16 Aug (UCD).

Illinois. Jackson Co.: 1♂, Carbondale, 5 Oct, G.T. Weaver (UCD); 1♂, Quail Res., 22 Jun, R.W. Yates (UCD). Scott Co.: 1♂, 1♀, Bluffs, 29 Aug, McClay (UCD). County unknown: 1♂, no further data (ANSP).

Iowa. Woodbury Co.: 1♀, Sergeant Bluff, 24 Jul, C.N. Ainslie (USNM); 2♀, Sioux City, 7 Aug, C.N. Ainslie (USNM).

Kansas. Douglas Co.: 4♂, 31 Mar–19 Apr, J.G. Rozen (UCB), 1♀, 900', 16 Sep, F.X. Williams (KU), 1♀, 12 Aug, W.J. Brown (KU), 1♀, 29 Aug, W.F. Hoffmann (KU); 1♀, Baldwin, Jul, J.C. Bridwell (USNM); 2♂, Lawrence, 14 Jul, on *Cassia fasciculata*, 29 Jul, W. LaBerge (KU); 1♂, 1♀, Leavenworth, 20–30 Jun, Beamers, Breskey (KU). Phillips Co.: 1♀, 1940', 30 Aug, F.X. Williams (KU). Riley Co.: 1♀, Manhattan, 9 Oct,

G.F. Hevel (USNM). Russell Co.: 1♀, 1830', 26 Jul, F.X. Williams (KU).

Louisiana. Baton Rouge Parish: 3♀, Baton Rouge, 19 Feb, C.E. Smith (USNM). Orleans Parish: 3♀, New Orleans, E. Foster (USNM). Parish unknown: 1♀, no further data (ANSP).

Maryland. Calvert Co.: 1♀, Plum Point, 29 Aug, K.V. Krombein (USNM). Charles Co.: 1♀, near Nanjemoy, 28 Dec (BRI). Prince George's Co.: 4♂, 22♀, Beltsville, 15–27 Sep, P.H. Arnaud, Jr. (CAS); 1♀, Beltsville, Agricultural Research Station, 25 Aug, W.G. Bodenstein (USNM); 1♀, College Park, 4 Sep, A.M. Wilson (USNM). Montgomery Co.: 1♂, 3♀, Plummer's Island, 18 Aug, 12 Sep, 1 Oct, K.V. Krombein (USNM). County unknown: 1♀, no further data (ANSP).

Massachusetts. Barnstable Co.: 1♀, Wood's Hole, Nonameset Island, 2 Aug, K.W. Cooper (USNM); 1♀, Wood's Hole, Aug, with cricket nymph *Allonemobius fasciatus*. Hampshire Co.: 1♂, Southampton, 11 Jul (ANSP).

Mississippi. Adams Co.: 1♀, Natchez, 13 Jun, E.S. Tucker (USNM). Harrison Co.: 4♂, Biloxi, 10 mi N, 31 Aug, L.A. Stange (UCD); 1♀, Gulfport, 10 mi N, 15 Apr, O.L. Cartwright (USNM).

Missouri. Boone Co.: 7♂, 45♀, Columbia, malaise trap, 1 Apr to 15 Sep, F.D. Parker (USNM). Carter Co.: 1♂, Ridge Rd. at Rd. C, 4.5 mi SW Van Buren, 4 Aug, H. Leech (CAS). Jackson Co.: 1♀, Aug, R.H. Pine (USNM). St. Louis Co.: 4♀, Webster Groves, 14 Nov, Satterthwait (USNM).

Montana. Ravalli Co.: 1♀, Hamilton, 27 Jun, R.M. Bohart (UCD). County unknown: 1♀, no further data (ANSP).

Nevada. Churchill Co.: 8♂, 3♀, Eastgate, 11 Aug, on *Chrysothamnus*, E.G. Linsley (UCB). Lincoln Co.: 1♂, Alamo, 16 Jul, F.D. Parker (UCD). Washoe Co.: 1♀, 29 mi S Reno, 13 Jun, W. LaBerge (KU); 1♂, Sparks, 18 Jul, R.M. Bohart (UCD); 1♀, Sutcliffe, 18 Jun, G.I. Stage (UCB).

New Jersey. Burlington Co.: 1♀, Pemberton, 10 May, G.M. Greene (USNM); 1♀, Riverton, Apr (ANSP). Cape May Co.: 2♀, Cape May Pt., 23, 24 Aug, F. Lyons, F. Haimbach (ANSP); 2♂, 3♀, Cape May, 13 Jul, 5, 12, 27 Aug, W. Stone (ANSP). Gloucester Co.: 1♀, North Woodbury,

22 Jun (ANSP). Mercer Co.: 7♀, Princeton, 10, 13, 18 Apr, 9 Oct, K.W. Cooper (USNM). County unknown: 1♀, Da Costa, 19 Jul (ANSP); 1♂, no further data (ANSP).

New Mexico. Hidalgo Co.: 5♂, 5♀, Rodeo, 4000', 25 Jul–28 Aug, 12 Sep, on *Baileya*, E.G. Linsley, M.A. Cazier, H.E. Evans, R.M. Bohart (USNM, UCB, UCD); 1♀, 18 mi N Rodeo, 25 Aug, R.M. Bohart (UCD), 1♂, 7 mi SE, 21 Aug, R.M. Bohart (UCD). Otero Co.: 1♂, 1♀, Alamo-gordo, 10, 25 May (ANSP). Santa Fe Co.: 1♂, Santa Fe, Aug, on *Helianthus*, Cockerell (USNM). County unknown: 1♀, Granite Pass, 25 Aug, on *Croton*, P.D. Hurd (UCB); 1♀, La Luz Cañon, 15 Apr (ANSP).

New York. Erie Co.: 1♀, Buffalo, 21 Aug, K.V. Krombein (USNM). Queens Co.: 1♀, Flushing, Sep (UCB). Suffolk Co.: 1♂, Farmingville, scrub pine, 25 Aug, K.V. Krombein (USNM). Westchester Co.: 1♀, Ossining, 2 Sep (BMNH); 1♀, Yonkers, 30 Apr, L.L. Pechuman (UCB). County unknown: 1♂, no further data (ANSP).

North Carolina. Brunswick Co.: 1♀, Southport, 10 Oct, C.W. Sabrosky (USNM). Cumberland Co.: 10♂, 11♀, Ft. Bragg, 28 May, 3 Jun, 27 Sep–20 Oct, J.D. Birchim (CAS). Dare Co.: 27♂, 29♀, Kill Devil Hills, 23, 25 May, 2 Jun, 30 Jun–30 Jul, 1, 3, 4, 5, 9, 14, 22–30 Aug, 2, 8–14, 16–17 Sep, K.V. Krombein (USNM, UCB). Macon Co.: 1♂, Franklin, 2000', 19 Jun, (BRI); 3♀, Highlands, 21 Jun, 20 Jul, 21 Aug (BRI). Swain Co.: 1♀, Great Smoky Mts. Nat'l. Pk., 28 May (BRI). Wake Co.: 1♀, Raleigh, 7 Mar (BRI). County unknown: 1♀, Holly Shelter, 4 Apr, with cricket prey (BRI); 5♀, no further data (ANSP).

Ohio. Athens Co.: 1♀, 18 Apr (USNM).

Oklahoma. Cimarron Co.: 1♂, Lake Carl Etling, Black Mesa St. Pk., 25 mi by road NW Boise City, 14 Aug, H.B. Leech (CAS). Grady Co.: 1♀, Chickasha, 12 Apr, on *Descrurania pinnata brachycarpa*, Michener, Wille, Beamers, LaBerge (KU). Marshall Co.: 1♀, Lake Texoma, 15 Jul (KU). Woods Co.: 1♀, 3 mi W Waynoka, old road to Herman, 12 Aug, H.B. Leech (CAS).

Oregon. Umatilla Co.: 3♀, Hat Rock State Park, 16 Jun, E.I. Schlinger (USNM).

Pennsylvania. Allegheny Co.: 1♀, Fair Oaks, 11 May, Smith, Vosler (UCR). Cumberland Co.: 1♀, Camp Hill, 14 May, W.S. Fisher (USNM). Dauphin Co.: 1♀, Linglestown, 6 Jun, A. Champlain (USNM). Delaware Co.: 1♀, Swarthmore, 1 Jun, E.T. Cresson, Jr. (ANSP). Perry Co.: 1♀, Newport, 18–30 May, J.W. Adams (USNM). County unknown: 1♀, Elwyn, C.S. Wells (ANSP).

South Carolina. Georgetown Co.: 4♀, 1–3 Sep (USNM). Horry Co.: 5♂, 7♀, Myrtle Beach, 29 Aug–6 Sep, D.G. Shappirio (USNM).

Tennessee. Knox Co.: 1♀, Knoxville, G.G. Ainslie (USNM). Sevier Co.: 1♀, Clingman's Dome, Great Smoky Mts., 23 Aug (BRI).

Texas. Bexar Co.: 2♂, 2♀, Ft. Sam Houston, 22 Mar–23 Jul, M. Wasbauer (UCB); 1♂, Salado Creek, 11 May, M. Wasbauer (UCB). Brazos Co.: 1♀, College Station, 20 Nov (USNM). Brewster Co.: 2♀, Big Bend National Park, 5400', 24 Jul, R.M. Bohart (UCD); 1♂, 2♀, Big Bend National Park, Santa Elena Canyon, 2145', 24 Apr, 25 Jul, M. Wasbauer, R.M. Bohart, B.J. Adelson (UCD, UCB); 1♀, Marathon, 7 Jul (USNM). Cameron Co.: 1♂, Southmost Ranch, 7 mi SE Brownsville, 3–5 Dec, E. Grissell, A. Menke (USNM); 3♂, 4♀, Pt. Isabel, 23–27 Jun, H.E. Evans, E.G. Matthews (USNM). Dallas Co.: 6♀, Dallas, 6 Jun, 21 Sep, F.C. Bishopp, W.W. Yothers (USNM). Denton Co.: 2♂, Roanoke, 31 May, on composite, P.D. Hurd (UCB). Eastland Co.: 1♀, G.O. Wiley (KU). Hale Co.: 1♀, Plainview, 13 Aug (USU). Galveston Co.: 1♀, Galveston, 16 Jun, Trotter (USNM). Grayson Co.: 1♀, 19 Feb (USNM). Hemphill Co.: 1♂, Canadian, 24 Jul, Beamers, LaBerge, Lang (KU). Hidalgo Co.: 7♀, Bentsen Rio Grande Valley St. Park, 30 Nov–2 Dec, E.E. Grissell, A.S. Menke (USNM), 4♂, 3♀, 11 Jan, 11, 14 Jul, 16, 19 Nov, C. Porter (FSDA), 1♂, near Mission, 15–29 Aug, C. Porter (FSDA); 1♂, 3♀, McAllen Botanical Garden, 1 Jan, 21 Mar, 24, 27 Dec, C. Porter (FSDA), 1♀, McAllen Botanical Garden, in malaise trap, Feb, C. Porter (FSDA). Kerr Co.: 21♀, Kerrville, 29 Mar–17 Apr (BRI, USNM). King Co.: 1♀, Guthrie, 24 Aug, E.L. Kessel (CAS). Llano Co.: 1♀, 11 Jun, Gillaspay (UCB). LaSalle Co.: 1♀, Cotulla, 12 May, J.C.

Crawford (USNM). Lee Co.: 2♂, 4♀, Jun, 4, 11 Sep, 14 Nov (ANSP, USNM). Sutton Co.: 1♀, Sonora, 10 Apr, Beamers, Stephen, Michener, Rozen (KU). County unknown: 2♀, Fedor (ANSP); 1♂, Round Mt. (ANSP); 3♀, Cresson, 25 May, W.G. Bruce (USNM); 2♂, 7♀, no further data (ANSP, BMNH, USNM).

Utah. Cache Co.: 1♀, Logan, 16 Jul, W.P. Murdock (UCD); 1♂, Newton, 17 Jul, W.R. Walker (UCD); 1♀, Smithfield, 27 Jul, G.E. Bohart (UCB). Garfield Co.: 2♂, 9♀, Shooting Canyon, in malaise trap, 23, 25, 28, 30 Jul, 8 Aug, D. Vogt (USU). Millard Co.: 1♂, Delta, 24 Jul, on purple *Cleome*, G.E. Bohart (UCD). Tooele Co.: 1♂, Dugway Proving Grounds, Simpson Spring, 17 Aug (USU). Washington Co.: 1♀, Leeds Canyon, 22 Jul, Hanson, Clemons, Keller (USU).

Virginia. Amelia Co.: 1♀, Amelia, 29 Sep, D.G. Shappirio (USNM). Arlington Co.: 3♀, Arlington, 22 Jun, 5 Jul, K.V. Krombein (USNM). Fairfax Co.: 4♂, Dunn Loring, 4, 22 Aug, 5, 9 Sep, K.V. Krombein (USNM); 1♀, East Falls Church, 9 Aug, S.A. Rohwer (USNM); 1♀, Falls Church, 22 Apr, with cricket nymph, *Gryllus pennsylvanicus* Burm., (USNM); 1♀, Mt. Vernon, 13 Nov, J. Kotinsky (USNM); 1♀, Minor's Hill, Falls Church, running on young pine, 2 Apr, W. Middleton (USNM); 1♀, Vienna, 11 Aug, J.C. Bridwell (USNM). Page Co.: 1♂, Shenandoah, 21 Jul, W.W. Wirth (USNM). Stafford Co.: 2♂, Stafford Ch., 11 Sep, K.V. Krombein (USNM). Westmoreland Co.: 1♀, Westmoreland State Park, 6 Jul, K.V. Krombein (USNM). County unknown: 1♀, A.P. Hill Mil. Res., 11 Aug, with cricket prey *Miogryllus verticalis*, O.L. Cartwright (USNM); 1♀, Cp. Pickett, B.J. Adelson (UCB); 2♀, no further data (ANSP).

Washington. Whitman Co.: 2♂, Wawawai, W.M. Mann (USNM).

West Virginia. Hardy Co.: 1♀, Lost River State Park, 29 Jul–11 Aug, K.V. Krombein (USNM).

State unknown. 1♂, Providence Canyon, 15 Oct, D. Minion (USU).

MEXICO. Baja California Norte. 1♀, El Condor, 4 mi S, 28 May, Faulkner, Brown (SDM); 1♂, 5

mi S Guadalupe, Hwy. 3, 12 Jun, C.B. Phillip, F. Ennick (CAS); 1♀, Rio San Miguel, La Mision, 22 Aug, D. Faulkner (SDM); 1♂, 1♀, San Jose (Melting Ranch), 3 Jul, D. Patterson (CAS); 2♂, 10 mi S San Quentin, 15 May, J. Slansky, M., K. Wasbauer (CDA); 1♂, Descanso, 1 Nov, R.M. Bohart (UCD); 1♀, Santa Maria, 11 Aug (UCB).

Chiapas. 4♂, San Cristobal las Casas, 7500', 25–29 Apr, H.E. Evans (USNM, UCD); 1♂, Tuxtla Gutierrez, 1000', 24 Apr, H.E. Evans (USNM), 1♀, 12 Aug, F.D. Parker, L.A. Stange (UCD).

Coahuila. 2♂, 12 mi N Hermanas, 11 Aug, A.S. Menke, L.A. Stange (UCD).

Durango. 1♂, 1♀, Nombre de Dios, 1 Aug, P.D. Hurd (UCB), 1♀, 4 mi N, 13 May, L.A. Stange (UCD).

Guanajuato. 1♀, 6 mi N Silao, 24 Feb, R.C. Bechtel, E.I. Schlinger (UCD).

Guerrero. 1♂, Taxco, 5500', 19 Jun, H.E. Evans (USNM).

Jalisco. 1♀, Guadalajara, 5000', 14 Jul, H.E. Evans (USNM), 1♂, 27 Jun, S.C. Williams (CAS); 1♂, Jocotepec, 5000', 11 Jul, H.E. Evans (USNM); 1♂, Villa Guadalupe, 26 Jul, H.E. Evans (USNM).

Morelos. 1♂, Alpuyecá, 3400', 18 Apr, H.E. Evans (USNM); 6♂, Cuernavaca, 3 mi NW, 6500', 12–29 May, H.E. Evans (USNM), 2♂, 3 mi N, 7500', 14 Mar, H.E. Evans (USNM), 8♂, 4 mi E, 6000', 2–25 Jun, H.E. Evans (USNM), 3♂, 4 mi NW, 7500', 28 Jun, H.E. and M.A. Evans (USNM); 1♀, Yautepec, Canyon de Lobos, 4000', 18 Mar, H.E. Evans (USNM).

Nayarit. 1♀, 18 mi S Tepio, 7 Jul, F.D. Parker, L.A. Stange (UCD).

Oaxaca. 1♂, 4 mi S Tehuantepec, 18 Jul, E.E. Gilbert, C.D. MacNeil (UCD).

Puebla. 1♀, 3 mi NW Petlalcingo, 2 Apr, L.A. Stange (UCD); 2♂, Cacaloapan, 26 Apr, F.D. Parker (UCD).

San Luis Potosi. 1♀, 14 mi W Xilitla, 4200', 22 Aug, J.G. Chillcott (BRI).

Sinaloa. 1♀, La Guayanera, 32.9 mi NE Villa Union, 1 Jul (SDM).

Sonora. 1♀, Alamos, 5 Jan, P.H., M. Arnaud

(CAS), 1♀, SE Alamos, in malaise trap, 5 Sep, W.J. Hanson, T.L. Whitworth (USU); 1♀, 46 mi NW Bahia Kino, 12 Apr, E.M. Fisher (LACM); 20 mi S Hermosillo, 3 Sep, R.M. Bohart (UCD); 1♂, Magdalena, 2 Sep, G.E., R.M. Bohart (USU); 2♂, 15 mi E Yavaros, 12 Jun, F.G. Andrews (CDA).

Veracruz. 3♂, 5 mi E Acultzingo, 5000', 9–15 Jun, H.E. Evans (USNM); 1♀, Orizaba, Crawford (UCD).

Zacatecas. 1♀, 10 mi S Jalpa, 18 Sep (UCD); 1♂, 9 mi N Ojo Caliente, 12 May, F.D. Parker (UCD); 1♀, 15 km E Sombrerete, 30 Jul, P.D. Hurd (UCB).

State unknown. 4♀, "from Smith Coll." (BMNH); 1♀, no further data (ANSP); 1♀, cabin, plane, Brownsville, 29 May, 46-7862, 1♀, 28 Jun, 49-10637 (USNM).

6. *Liris (Leptolarra) luctuosus luctuosus* (Smith)

FIGURES 22, 27, 45; MAP 5

Larrada luctuosa Smith, 1856:289 [♀; Santo Domingo, Brazil; syntypes in British Museum (Natural History), London].

Larra luctuosa (Smith).—Taschenberg, 1870:5 [♀; Brazil].—Kohl, 1884:245 [listed].—Dalla Torre, 1897:669 [listed].

Liris luctuosa (Smith).—Bohart and Menke, 1976:246 [listed].

Liris luctuosa luctuosa (Smith).—Krombein, 1976:335 [Santo Domingo, Dominica; reduced to subspecific rank].

Liris (Leptolarra) luctuosa luctuosa (Smith).—Krombein, 1979:1619 [Santo Domingo, Mexico and Brazil].

Both sexes of this species, but especially the female, have moderately long, sparse, suberect pale vestiture on the head and thorax. In the male, the apical edge of sternum VI is thickened and the margin has a short, rounded, protruding lobe. Sterna IV–VI possess lateral tufts of inwardly curving bristles. The clypeus of the male is distinct in that the lateral lobes extend further down than the median lobe. The female has apical bands present only on the first three terga, and the pygidium lacks a bare basal triangular area. The impressed sensory pits on the antenna

are about one-third as long as the flagellomeres bearing them.

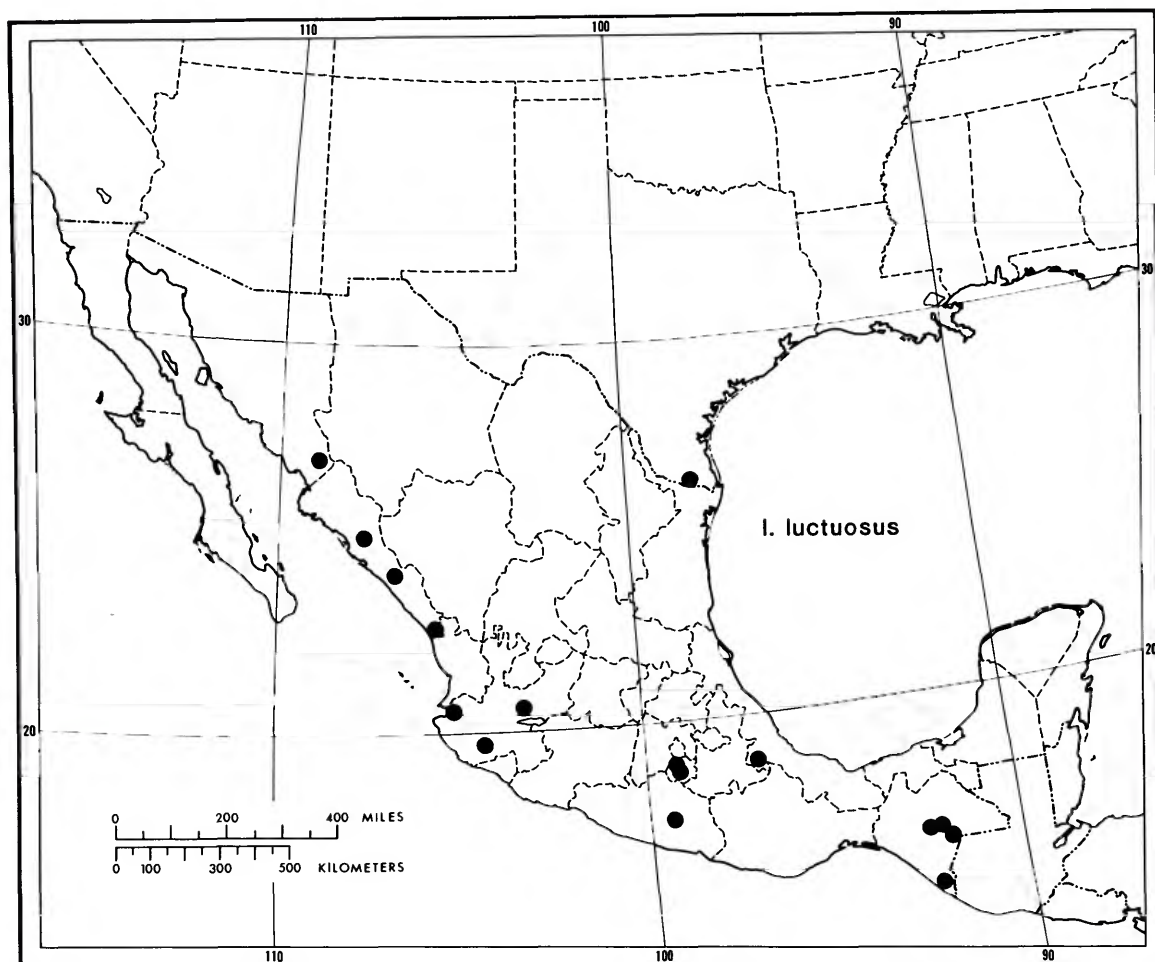
COLOR.—Black; posterior edges of tegula and lateral faces of tergum I sometimes suffused with reddish brown, bases of forefemora and apices of hind tibiae brown; wings clear, slightly infumated apically, stigma and veins dark brown.

VESTITURE.—Head, foretrochanters, forefemora, mesopleuron, scutum, and propodeum clothed with moderately long, suberect, white setae; apices of terga I–III with apical bands of silvery pubescence.

STRUCTURE.—*Female:* Length, 10.5–16.8 mm; clypeus raised along midline; punctures of clypeus and frons very fine and dense; flagellomere I slightly longer than II, IV–X each with a small oval placoid, the largest of these slightly more than one-fourth as long as flagellomere bearing it (Figure 45); admedian line, notauli, and parapsidal lines faintly impressed; scutal punctures small, deep, and nearly contiguous; mesopleural punctures finer, not so large or deep; scrobal sulcus deeply impressed; scutellar punctures slightly coarser than those on scutum; dorsal surface of propodeum coarsely punctate with a shallow median furrow, lateral faces and posterior half of dorsal finely striate; hind tibiae carinate almost to base, carina with three or four stout spines along its length; sterna I–IV dull, with dense, fine punctures, V medially and VI shining, with scattered, larger punctures; sterna II–V with a few long, stout setae in a subapical row; apex of pygidium with four or (usually) six stout, spatulate spines.

Male: Length, 10.0–11.4 mm; similar to female except entirely black; flagellomeres II–X with broad placoids extending entire length of flagellomere, XI with placoid extending only over basal three-fourths; hind tibial carina less strongly developed than in female; apex of sternum VI thickened, with small incurved tufts of bristles laterally (Figure 27a); IV and V each with larger lateral tufts of bristles, that on IV less dense than that on V (Figure 27b,c); genitalia as in Figure 22.

MATERIAL EXAMINED.—UNITED STATES.



MAP 5.—Known range in North America for *Liris luctuosus luctuosus* (Smith).

Texas. Hidalgo Co.: Bentsen Rio Grande Valley State Park, 7♂, 3♀, 7, 9, 10, 11, 14 Jan, 23 Nov, C. Porter (FSDA).

MEXICO. Chiapas. 1♀, Mahosik, Tenejapa, 4800', 9–12 Jul, D.E. Breedlove, J. Emmel (CAS); 1♀, Nachic, 8000', 27 Apr, H.E. Evans (USNM); 1♀, Municipio de la Independencia, along logging road between Las Margaritas and Campo Alegre, 6–10 km NNE La Soledad, 1600 m, 27 Nov, D.E., J.A. Breedlove (CAS); 5♀, Municipio Union, Cañon Juarez, SW slope Volcan Tacana near Talquian, 2134 m, 14 Dec, D.E., J.A. Breedlove (CAS); 1♀, San Cristobal las Casas, 12

Apr, F.D. Parker (UCD), 1♂, 20 mi W, 6000', 3 May, H.E. Evans (USNM); 1♀, 4 mi SE Soyalo, 28 Feb, R.C. Bechtel, E.I. Schlinger (UCB).

Guerrero. 1♂, Chilapa, 4600', 29 Jul, H.E. Evans (USNM); 1♂, Chilpancingo, 24 Jul, R., K. Dreisbach (UCD).

Jalisco. 1♂, 9 mi S Guadalajara, 24 Jul, H.E. Evans (USNM); 1♀, Puerto Los Mazos, 9 mi SW Autlan, 27 Aug, M.S., J.S. Wasbauer (UCB); 3♀, Puerto Vallarta, sea level, 31 Dec, 1 Jan, P.H., M. Arnaud (CAS).

Morelos. 1♂, 3 mi N Alpuyecua, 3400', 23 Mar, H.E. Evans (USNM); 1♂, 3♀, Cuernavaca, 5500',

1, 5, 14 Apr, 16 May, M.A., H.E. Evans (USNM); 3♂, 1♀, 4 mi E, 6000', 16, 18, 25 Jun, H.E. Evans (USNM), 2♂, 5 mi E, 26, 28 Mar, F.D. Parker, L.A. Stange (UCD).

Sinaloa. 1♂, 9 mi E Chupaderos, 15 May, F.D. Parker, L.A. Stange (UCD); 1♀, 13 mi N Culiacan, 17 Mar, L.A. Stange (UCD); 1♂, 3 mi N Elota, 18 Mar, L.A. Stange (UCD).

Sonora. 1♀, La Aduana, 22 May, F.D. Parker, L.A. Stange (UCD).

Veracruz. 1♀, Fortin de las Flores–Sumidero, Planta de la Cervecería, Ing., Daniel Rebago Res., 2500–3000', 21 May, H.V. Weems, Jr. (UCD).

State unknown. 1♀, no further data (BMNH).

7. *Liris (Leptolarra) luctuosus dahlbomi* (Cresson)

FIGURE 21; MAP 6

Larrada Dahlbomi Cresson, 1865:138 [♀; Cuba; syntypes in Academy of Natural Sciences, Philadelphia; provisional name to be used if specimens identified as *Larrada fuliginosa* (Dahlbom) were misidentified].

Larra fuliginosa Dahlbom.—Dalla Torre, 1897:667 [*Larra dahlbomi* listed as a questionable synonym].

Motes (Notogonius) fuliginosa (Dahlbom).—Krombein, 1958b:188 [Florida, Cuba; misidentification].

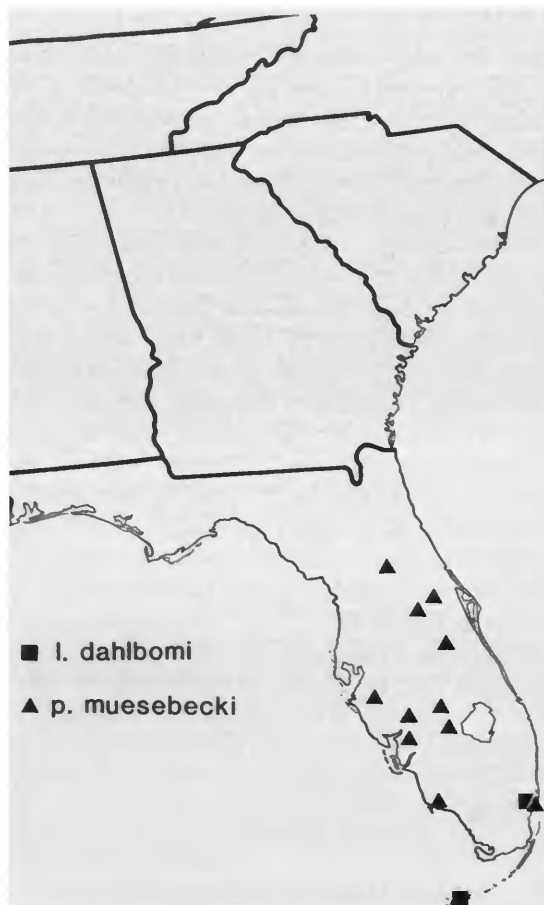
Liris fuliginosa (Dahlbom).—Bohart and Menke, 1976:245 [*Liris dahlbomi* listed as a synonym].

Liris luctuosa dahlbomi (Cresson).—Krombein, 1976:334–335 [lectotype designation for *Larrada dahlbomi* and placement as subspecies of *Liris luctuosa* (Smith)].

This subspecies occurs in southern Florida and Cuba. Both sexes have fuliginous wings. In the male, the lateral lobes of the clypeus are not as in *L. l. luctuosus* but are right-angled. The female, in addition to the darker wings, has the striae on the propodeum higher and more strongly developed.

COLOR.—Black; wings fuliginous, veins dark brown.

VESTITURE.—Head, thorax, and fore- and midcoxae and femora with sparse, long, erect white setae; thorax also with short, erect, cinereous pubescence; apices of terga I–III with narrow bands of silvery pubescence.



MAP 6.—Known range in North America for *Liris luctuosus dahlbomi* (Cresson) and *L. panamensis muesebecki* (Krombein).

STRUCTURE.—*Female:* Length, 12.3–19.3 mm; clypeus with coarse close punctures on upper half, those on lower half larger and more widely spaced; margin of clypeus rounded with a small median semicircular notch; flagellomeres III or IV through IX with oval placoids about one-third as long as flagellomeres; admedian lines, parapsidal lines, and notauli very faintly impressed; scutal and mesopleural punctures very fine and dense; propodeum with rather coarse striae laterally and on posterior face; scrobal sulcus faintly impressed; hind tibia carinate almost to base; carina with four short stout spines

decreasing in size basally; sterna I–IV dull, punctures fine and dense, V–VI shining, with more widely scattered, larger punctures; sterna II–V with several long, erect setae scattered in a subapical row; pygidium densely covered with large, pale recumbent setae; apex of pygidium with eight to 10 stout, spatulate spines.

Male: Length, 10.2–11.9 mm; very similar to female except clypeus with lateral lobes extending farther down than median lobe, not notched medially; flagellomeres II–X with broad placoids, that on X extending over basal one-half; hind femur compressed beneath; apex of sternum VI thickened, the margin with a short rounded lobe medially and small tufts of incurved bristles laterally, IV and V with longer lateral tufts of suberect bristles, that on fifth denser than that on fourth; apices of terga I–III with narrow bands of silvery pubescence; genitalia as in Figure 21.

MATERIAL EXAMINED.—UNITED STATES. Florida. Dade Co.: 1♀, Matheson Hammock, 11 Apr, H.V. Weems, Jr. (USNM). Dry Tortugas: 1♀, Loggerhead Key, 1.9 mi S of Cudjoe Key, 15–17 Feb, R. Thorington, J. Layne, P. Cone (USNM).

8. *Liris (Leptolarra) muspa* (Pate)

FIGURES 12, 31, 35; MAP 2

Motes muspa Pate, 1943:201–202 [♂; Miakha River State Park, Florida; holotype in Academy of Natural Sciences, Philadelphia].

Motes (Notogonius) muspa Pate.—Bohart, 1951:954 [central to southern Florida].

Motes vinulenta muspa Pate.—Krombein, 1954:14–15 [reduction to subspecific rank].

Motes (Notogonius) vinulenta muspa Pate.—Krombein, 1958b:188 [Florida and ?Texas].

Liris vinulenta muspa (Pate).—Bohart and Menke, 1976:248.

Liris fuliginosa muspa (Pate).—Krombein, 1976:334 [*L. vinulenta* (Cresson) synonymized under *L. fuliginosa* (Dahlbom)].

Liris (Leptolarra) fuliginosa muspa (Pate).—Krombein, 1979:1619 [southern Florida].

Liris muspa is a highly variable species, which occurs from Florida to California, south through Central America, and we have also seen speci-

mens from the northern coast of South America and Cuba. The clypeus is keeled or tumid in both sexes. In the males, the hind trochanters have a dense brush of recumbent setae beneath, and the seventh sternum is densely covered with short, suberect vestiture. The female pygidium is slightly convex and is covered with dense, subapressed setae. The first five sterna of the female are dull and densely micropunctate, with only the last shining with scattered larger punctures.

For some time this species was considered a subspecies of *L. vinulenta*, a West Indian species, because the male of that species also has dense brushes of recumbent setae on the hind trochanters. However, the clypeus of *L. vinulenta* is not actually tumid but rather has a pair of lateral gibbosities, one on each side of the clypeus. The synapomorphic character state exhibited by the brushes on the hind trochanters indicates that these two species are closely related phylogenetically, but the differences in the structure of the clypeus separate them.

Liris muspa exhibits some variation in the clypeus and the color of the apex of the hind tibia. Most specimens from Florida have the clypeus sharply keeled, whereas those in Mexico have the clypeus merely tumid along its midline. Mexican specimens also often have the apex of the hind tibia reddish, but specimens from other areas do not. However, one specimen we have examined from Florida has the apex of the hind tibia reddish, and a few Mexican specimens and some from South America have a keeled clypeus.

COLOR.—Black; apices of mandible beyond teeth dark maroon; wing membrane clear but so densely covered with dark brown, short, erect setae as to make wing appear fuliginous; stigma and veins dark brown.

VESTITURE.—Procoxae and mesopleura ventrally with moderately long, silvery setae; scutum with very short, erect cinereous vestiture, scutellum with slightly longer, erect, silvery vestiture; most other areas of head and thorax with very sparse, subrecumbent, pale setae; apices of terga I–IV with narrow bands of silvery pubescence, each covering about apical one-fourth of tergum.

STRUCTURE.—*Female:* Length, 8.6–10.9

mm, clypeus strongly keeled along midline; flagellomeres V–X with large, elongate oval sensory areas, extending from two-thirds to almost entire length of flagellomere; admedian line, parapsidal lines, and notauli very faintly impressed; scutal and mesopleural punctures very fine and dense, separated by much less than a puncture width; scrobal sulcus faintly impressed; hind tibia strongly carinate on apical four-fifths or more, carina bearing four short, stout spines, decreasing in length basally; dorsal and posterior surfaces of propodeum separated by a gently bicarinate carina, the median point joining a median longitudinal furrow on posterior surface (Figure 35); sterna I–V dull, covered with fine, dense punctures, VI shining, with very fine, scattered punctures and fewer larger, much more widely scattered ones; sterna II–V with several long, erect setae in a subapical row; tergum VI laterally dull, punctation and vestiture similar to that of tergum V; pygidium densely covered with moderately long, dark, subrecumbent setae and a few erect, shorter setae; apex of pygidium with six to eight short, stout, spatulate spines.

Male: Length, 6.8–12.0 mm; similar to female except mid- and hind tibiae reddish apically; flagellomeres II–X with broad placoids, that on X extending over basal three-fourths; sterna dull, apical margins of V–VI shallowly but broadly emarginate (Figure 31); hypopygium emarginate at apex; genitalia as in Figure 12.

MATERIAL EXAMINED.—UNITED STATES. Arizona. Cochise Co.: 1♀, Portal, Chiricahua Mts., 12 Aug, D.D. Linsdale (UCD); 1♀, Portal, 5 mi W, 5400', 1 Aug, H.E. Evans (USNM). Maricopa Co.: 1♂, 1♀, Phoenix, 2 May, 22 Sep, R.A. Crandall (UCD). Pima Co.: 1♂, 1♀, Sabino Canyon, Catalina Mts., Apr, 17 Oct, F.G. Werner, G.D. Butler (UCD); 1♀, Tucson, 20 May, R.H. Crandall (UCD). Yuma Co.: 1♀, Ehrenberg, 13 Nov, J.W. MacSwain (UCB); 1♀, Yuma, 13 Oct, D. Tuttle (UCD).

California. Riverside Co.: 4♂, Blythe, 17 Aug, P.D. Hurd, Jr. (USU). San Diego Co.: 2♂, Alvarado Canyon, 11 Oct, H. Atlebery (SDM).

Florida. Brevard Co.: 1♂, Cocoa, Jul, G.E. Bohart (USNM), 1♂, 4♀, Jul, G.E. Bohart (USU).

Broward Co.: 2♂, Dania Beach, 16 Jul (BMNH). Charlotte Co.: 1♂, 5♀, Bermont, 30 Mar, 8–10 Apr, taken on thistle honeydew, K.V. Krombein, J.G. Franclemont, H.I. Scudder (USNM). Dade Co.: 2♂, Homestead, 25 Nov, L.L. Pechuman (USNM). De Soto Co.: 4♂, Arcadia, 21, 31 Mar, K.V. Krombein (USNM). Duval Co.: 1♂, 1♀, Jacksonville, Ashmead Collection (USNM). Highlands Co.: 3♀, Archbold Biological Station, 12, 14 Oct, P.H. Arnaud, Jr. (CAS); 1♂, 6♀, Brighton, 7 Apr, J.G. Franclemont (USNM); 1♀, Lake Placid, 25 Jun, K.V. Krombein (USNM); 1♀, Sebring, 20 Mar, on *Bidens bipinnata*, H.V. Weems, Jr. (USNM). Lee Co.: 2♂, 3♀, Olga, 29, 30 Mar, K.V. Krombein (USNM). Levy Co.: 1♀, 10 Sep, on *Polygonum hydropiperoides*, H.V. Weems, Jr. (USNM). Marion Co.: 1♂, Juniper Springs, 27 Jan–11 Feb, L.H. Krombein (USNM). Monroe Co.: 1♀, Cape Sable, 25 Mar, K.V. Krombein (USNM). Pinellas Co.: 1♀, Florida Fruit Fly Trap Survey, 25 Jan, B.P. Moora (USNM). Polk Co.: 2♂, 1♀, Haines City, 17 Sep, at *Bidens bipinnata*, H.V. Weems, Jr. (USNM). Seminole Co.: 1♀, Florida Fruit Fly Trap Survey, 15 Jul, M.M. Brunk (ANSP). County unknown: 1♂, Paradise Key, Lodge Veranda, 8 Sep, C.A. Mosier (USNM); 1♀, Florida Fruit Fly Trap Survey, "28c" (USNM).

Texas. Cameron Co.: 2♂, 2♀, Brownsville, 9–28 Oct, H.S. Ross (CAS). Hidalgo Co.: 1♂, 2♀, Bentsen Rio Grande Valley St. Park, 30 Nov–2 Dec, E.E. Grissell, A.S. Menke (USNM), 2♂, 19 Nov, C.C. Porter (FSDA).

MEXICO. Chiapas. 1♀, Municipio Union, Canyon Juarez, SW slope of Volcan Tacana, near Talquian, 2134 m, 14 Dec, D.E., J.A. Breedlove (CAS); 1♂, 1♀, 6 mi S Puebla Nueva, 20 Mar, R.C. Bechtel, E.I. Schlinger (UCD); 1♂, Palenque, 10 Sep, W. Hanson, G. Bohart (USU); 4♂, 1♀, San Cristobal las Casas, 7500', 29–30 Apr, H.E. Evans (USNM).

Coahuila. 1♀, Neuvo Laredo, 24 Nov, F.C. Pratt (USNM).

Guerrero. 1♂, 8 mi S Chilpancingo, 4400', 19 Mar, H.E. Evans (USNM).

Michoacan. 1♂, Jiquilpan, 5166', 25 Sep, H.A. Scullen (OSU).

Morelos. Cuernavaca, 1♀, 5500', 5 Mar, H.E., M.A. Evans, D.M. Anderson (USNM), 1♂, 27 Mar, F.D. Parker (UCD), 1♂, S end, 4500', 11 May, H.E. Evans (USNM), 1♂, 2♀, 3 mi W, 6500', 10 Mar, H.E. Evans, D.M. Anderson (USNM), 1♂, 3 mi NW, 6500', 7 Jun, H.E. Evans (USNM), 1♂, 4 mi NW, 7500', 12 May, H.E. Evans (USNM), 3♂, 5 mi E, 26 Mar, F.D. Parker (UCD); 1♂, Lake Tequesquitengo, 2800', 1 Apr, H.E. Evans (USNM).

Oaxaca. 1♀, Palomares, 5–21 Sep, R., K. Dreisbach (UCD).

San Luis Potosi. 1♂, 30 mi NE Ciudad del Maiz, 1300', 19 Jun, Univ. Kansas Mex. Exp. (KU); 1♂, 30 mi S Ciudad Valles, 20 Sep, G. Bohart, W. Hanson (USU); 1♀, 18 mi SW Tamazunchale, 700 m, 15 Aug, E.I. Schlinger (UCB).

Veracruz. Cordoba, 1♂, 29 Jun, 2♀, 13, 25 Jul, J.S. Buckett, M.R., R.C. Gardner (UCD), 1♂, same locality, 1 Jan, G.E. Bohart (USU); 1♂, Minatitlan, 26 Aug–1 Sep, R., K. Dreisbach (UCD); 1♂, 1♀, Orizaba, 12–22 Aug, R., K. Dreisbach (UCD).

State unknown. 2♀, no further data (ANSP); 2♀, no further data (BMNH).

9. *Liris (Leptolarra) argenticauda* (Cameron)

FIGURES 10, 33, 42; MAP 7

Notogonia chrysur Cameron, 1889:57, pl. 4: fig. 14 [♂; Mexico, Presidio; unique type in British Museum (Natural History), London].

Notogonia argenticauda Cameron, 1889:58, pl. 4: fig. 15 [♂; Mexico, Veracruz; unique type in British Museum (Natural History), London].

Larra argenticauda (Cameron).—Kohl in Dalla Torre, 1897:663.

Larra chrysur (Cameron).—Kohl in Dalla Torre, 1897:665.

Liris argenticauda (Cameron).—Bohart and Menke, 1976:244 [synonymized *N. chrysur* Cameron].

Liris (Leptolarra) argenticauda (Cameron).—Krombein, 1979:1619 [southern Texas to Costa Rica].

This species occurs from southern Texas, south in Mexico to Chiapas and Veracruz. It has also been recorded from Central America. The males are easily recognized by their distinctive sternal modifications. The third sternum has a

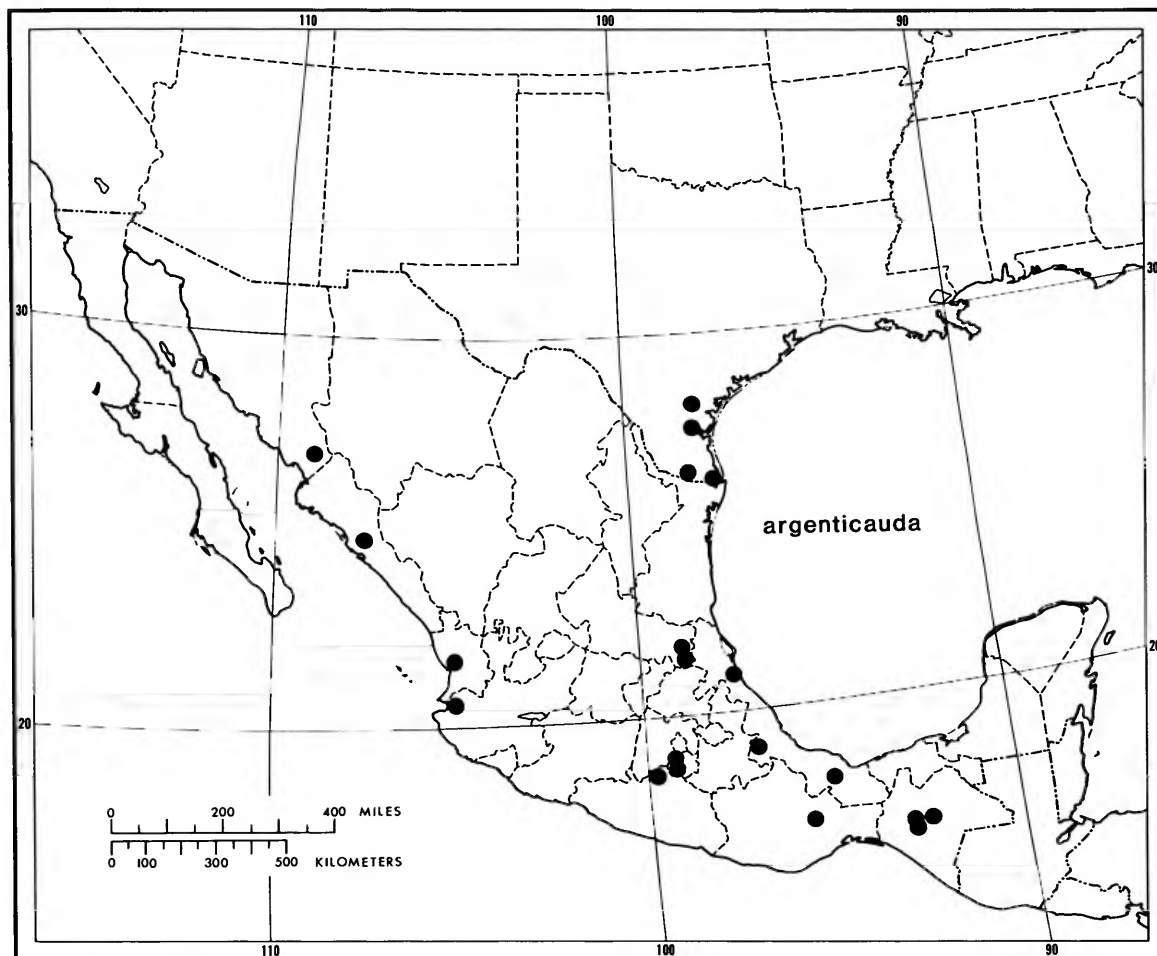
pair of small tufts of about a dozen rather long, erect setae, which can be easily spotted when viewing specimens with the naked eye. The middle of the third and most of the fourth, fifth, and sixth sterna have shorter, moderately scattered vestiture. The male antennae are rather thickened when compared to other species and have a sharply defined cuneate sensory area on the last flagellomere, extending almost to the apex. Females of this species have apical bands of silvery pubescence on the first three terga, lack a bare triangular area on the base of the pygidium, and have very elongate oval sensory pits on flagellomeres III–X (Figure 42).

COLOR.—Black; inner apices of hind tibiae reddish brown; wings clear, slightly infumated apically, stigma dark brown, veins light brown.

VESTITURE.—Head and thorax sparsely covered with golden-tinged, appressed setae; apices of terga I–III with narrow bands of silvery pubescence.

STRUCTURE.—*Female:* Length, 10.0–10.4 mm, clypeus flat, very slightly tumid along midline; clypeal punctures fine and close, more widely scattered along margin; flagellomere I very slightly shorter than II; III–X with elongate oval placoids, that on III about one-half as long as flagellomere, successive ones about three-fourths length of flagellomere (Figure 42); admedian line, parapsidal lines, and notauli faintly impressed; hind tibial carina weak, evanescent on basal one-third; scutal punctures fine and close, those on mesopleuron and propodeum coarser; scrobal sulcus distinctly impressed; sterna I–V dull, with fine, close punctures, VI shining, with larger, scattered punctures; sterna II–V with a few long, stout setae scattered in a subapical row; pygidium without a bare, shining, triangular area dorsally and with scattered, fine, recumbent setae in addition to the finer, more erect setae; apex of pygidium with six spatulate setae.

Male: Length, 6.6–8.9 mm, similar to female except apices of first four terga with bands of silvery pubescence; flagellomeres II–XI with broad placoids, that on XI extending almost to apex; scrobal sulcus less strongly impressed; ster-



MAP 7.—Known range in North America for *Liris argenticauda* (Cameron).

num II with a few long setae in lateral groups, sternum III with a pair of lateral tufts consisting of about a dozen long, erect setae each (Figure 33), middle of III and IV–VI with shorter, subdecumbent setae; genitalia as in Figure 10.

MATERIAL EXAMINED.—UNITED STATES. Texas. Cameron Co.: 1♂, Brownsville, Jun, Catal. No. 508, Brooklyn Mus. Colln. 1929 (USNM), 1♂, same locality, 7-3-38, R.H. Beamer (USU), 1♂, Brownsville, 7 mi SE Southmost Ranch, 3–5 Dec, E. Grissell, A. Menke (USNM). Hidalgo Co.: 3♂, Bentsen Rio Grande Valley St. Park, 30 Nov–

2 Dec, E.E. Grissell, A.S. Menke (USNM); 11♂, same locality, 2, 6, 9, 14 Jan, 15 Mar, 16, 23 Nov, C.C. Porter (FSDA); 21♂, McAllen Botanical Garden, 3, 15 Jan, 13, 14, 20, 21 Mar, 16 Aug, 22 Nov, 21, 23, 24, 26, 27 Dec, C.C. Porter (FSDA), 8♂, malaise trap, Feb, Nov, C.C. Porter (FSDA). Kleberg Co.: 1♂, Kingsville, 18 Oct, Gillaspay (USNM). San Patricio Co.: 1♂, Lk. Corpus Christi, 21 Jun, H.E. Evans, E.G. Matthews (USNM).

MEXICO. Chiapas. 1♀, Bochil, 16 Mar, R.C. Bechtel, E.I. Schlinger (UCD); 1♂, Tuxtla Gu-

tierez, 20 Jul, J.A. Chemsak, B.J. Rannells (UCD); 1♀, 9 mi N Villa Flores, 12 Aug, F.D. Parker, L.A. Stange (UCD).

Guerrero. 1♂, 8 mi N Taxco, 5500', 19 Jun, H.E. Evans (USNM).

Jalisco. 21♂, Puerto Vallarta, 31 Dec, 1 Jan, P.H., M. Arnaud (CAS).

Morelos. 1♂, 3 mi N Alpuyecá, 3400', 9 Mar, H.E. Evans, D.M. Anderson (USNM); Cuernavaca, 1♂, S end, 4500', 7 Apr, H.E. Evans (USNM), 1♂, 4 mi E, 6000', 2 Jun, H.E. Evans (USNM), 1♂, 5 mi E, 22 Mar, L.A. Stange (UCD); 1♂, Tetecala, 3500', 25 Mar, H.E. Evans, D.M. Anderson (USNM).

Nayarit. 1♂, San Blas, 27 Aug, A.S. Menke, L.A. Stange (UCD).

Oaxaca. 1♂, Temascal, 15 Oct, K.H. Janzen (UCD).

San Luis Potosí. 3♂, El Bonito, 7 mi S Ciudad Valles, 300', 20 Dec, P.H., M. Arnaud (CAS); 1♂, Tamazunchale, 400', 22 Dec, P.H., M. Arnaud (CAS).

Sinaloa. 1♀, Culiacan, 250', 21 Jul, H.E. Evans (USNM).

Sonora. 1♂, Alamos, 5 Sep, R.M. Bohart (UCD).

Veracruz. 1♀, 30 mi S Acayucan, 22 Apr, L.A. Stange (UCD); 2♂, Cordoba, 20 Jul, J.S. Buckett, M.R., R.C. Gardner (UCD); 1♂, 1♀, Orizaba, 12–22 Aug, R., K. Dreisbach, Crawford (UCD); 1♂, Tecolutla, 28 Feb, F.D. Parker, D. Miller (USU).

10. *Liris (Leptolarra) beatus* (Cameron)

FIGURES 5, 39, 49; MAP 8

Notogonia violaceipennis Cameron, 1889:51–52, pl. 4: fig. 12 [♀; Panama, Volcan de Chiriquí, 2000–3000 ft; unique type in British Museum (Natural History), London]. [Not *Liris violaceipennis* Cameron, 1904.]

Notogonia montezuma Cameron, 1889:52–53 [♀; Mexico, northern Sonora; unique type in British Museum (Natural History), London].

Notogonia truncata Cameron, 1889:54–55 [♀, ♂; Costa Rica, Cache; unique type in British Museum (Natural History), London]. [Preoccupied in *Larra* by *Larrada truncata* Smith, 1856.]

Notogonia beata Cameron, 1889:56–57, pl. 4: fig. 13 [♂;

Mexico, Orizaba; unique type in British Museum (Natural History), London].

Notogonia nigripennis Fox, 1894:486 [♀; New York; unique type in Academy of Natural Sciences, Philadelphia]. [Preoccupied in *Larra* by *Liris nigripennis* Cameron, 1889].—Cresson, 1928:45 [type in Academy of Natural Sciences, Philadelphia].

Notogonia aequalis Fox, 1894:486 [♀, ♂; New York, Georgia; syntypes in Academy of Natural Sciences, Philadelphia].—Cresson, 1928:45 [lectotype ♀ from New York in Philadelphia].

Larra aequalis (Fox).—Kohl in Dalla Torre, 1897:661.

Larra beata (Cameron).—Kohl in Dalla Torre, 1897:664.

Larra montezuma (Cameron).—Kohl in Dalla Torre, 1897:670.

Larra nigripennata Dalla Torre, 1897:670 [new name for *Larra nigripennis* (Fox) not *Larra nigripennis* (Cameron)].

Larra truncatula Dalla Torre, 1897:675 [new name for *Larra truncata* (Cameron) not *Larra truncata* (Smith)].

Larra violaceipennis (Cameron).—Kohl in Dalla Torre, 1897:675.

Notogonia nigripennis var. *occidentalis* Viereck, 1903:731 [♀; locality not listed; unique type in Academy of Natural Sciences, Philadelphia].—Cresson, 1928:45 [type in Philadelphia].

Notogonia subaequalis Rohwer, 1909:370–371 [♀; Fedor, Texas; unique type in Museum of Comparative Zoology, Cambridge].

Motes aequalis (Fox).—Pate, 1943:200.

Motes nigripennis (Fox).—Pate, 1943:200.

Motes occidentalis (Viereck).—Pate, 1943:200.

Motes subaequalis (Rohwer).—Pate, 1943:200.

Motes (Notogonius) aequalis (Fox).—Bohart, 1951:954 [synonymized *N. nigripennis* Fox, *Larra nigripennata* Dalla Torre, *N. nigripennis* var. *occidentalis* Viereck, and *N. subaequalis* Rohwer].—Krombein, 1958b:188 [prey record].

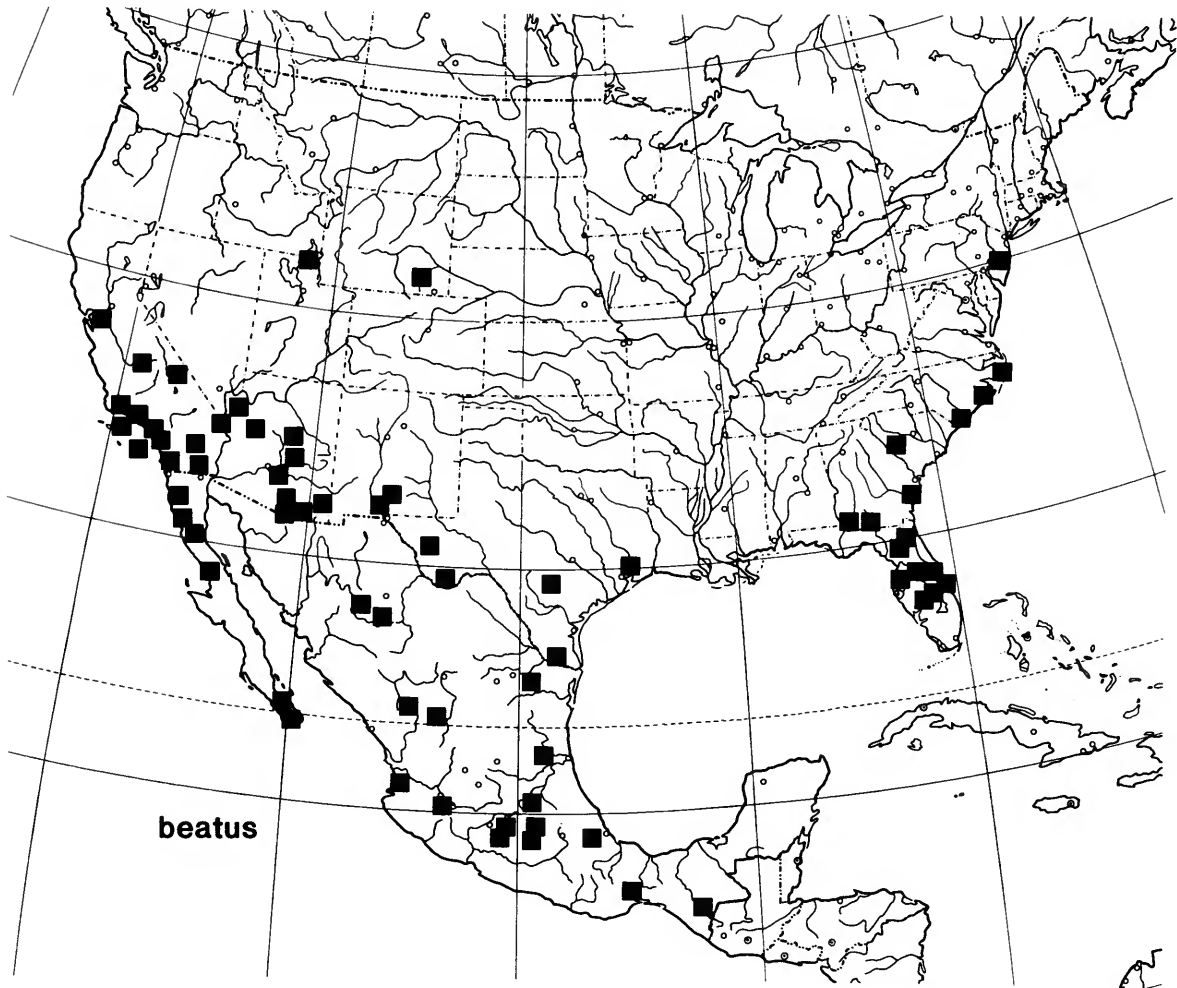
Liris aequalis (Fox).—Bohart and Menke, 1976:244 [noted *N. montezuma* Cameron as a questionable synonym].—Kurzewski, 1976:329–330 [male territorial behavior, prey].

Liris beata (Cameron).—Bohart and Menke, 1976:244 [noted *N. aequalis* Fox as a questionable synonym].

Liris truncatula (Dalla Torre).—Bohart and Menke, 1976:248 [noted *N. beata* Cameron as a questionable senior synonym].

Liris violaceipennis (Cameron).—Bohart and Menke, 1976:248.

Liris (Leptolarra) beata (Cameron).—Krombein, 1979:1619 [transcontinental in United States mostly in Austral Zone south to Panama; synonymized *N. violaceipennis* Cameron, *N. montezuma* Cameron, *N. truncata* Cameron, *N. nigripennis* Fox, *N. aequalis* Fox, *Larra nigripennata* Dalla Torre, *L. truncatula* Dalla Torre, *Notogonia nigripennis* var. *occidentalis* Viereck and *N. subaequalis* Rohwer].



MAP 8.—Known range in North America for *Liris beatus* (Cameron).

Liris beatus is a large, widespread species with dark brown wings. Although this species is most commonly collected in the southern U.S.A. (from coast to coast) and Mexico, it ranges north into Utah and Wyoming. The males are easily recognized by the subapical rows of scattered, erect macrochaetae on sterna II–VI. Females have very tiny oval placoids, which are only about one-tenth as long as their respective flagellomeres.

COLOR.—Black; bases of forefemora and tarsi

ventrally dark reddish brown; wings fuliginous, slightly more infumated apically and anteriorly, stigma and veins dark brown.

VESTITURE.—Clypeus with moderately long, recumbent dark setae; mesopleuron covered with short, erect, dark setae; dorsal and posterior surfaces of propodeum densely covered with short, erect white setae; most other areas of head, thorax, and legs with sparser, appressed pale setae; apices of terga I–III with narrow bands of silvery pubescence.

STRUCTURE.—*Female:* Length, 13.0–19.5 mm; clypeus slightly tumid along midline; punctures on clypeus fine and close above, becoming more widely scattered below, the interspaces shining; flagellomeres I and II approximately equal in length, V–IX with very tiny oval placoids medially (Figure 45); admedian line, parapsidal lines, and notauli weak; scutal punctures fine, dense, punctures separated by less than the width of a puncture; mesopleural punctures shallower, separated by one puncture width; scrobal sulcus deeply impressed; hind tibia carinate almost to base on outer surface, with a few short, stout spines along carina; propodeum with coarser, more contiguous punctures than those on scutum; sterna I–IV dull, covered with fine, dense punctures, V–VI shiny, with widely scattered, larger punctures; sterna II–V with a few long, erect setae scattered in a subapical row; tergum VI dull laterally, densely covered with fine punctures; pygidium with scattered stout, moderately long setae (Figure 49); apex of pygidium with six stout, spatulate spines.

Male: Length, 9.3–14.7 mm; similar to female except only last tarsomere reddish brown ventrally; flagellomeres II–X with broad placoids, each extending full length of flagellomere, XI with placoid extending only over basal one-third to two-thirds; hind tibial carina more weakly developed than in female; sterna I–VII dull, with dense, fine punctures; sterna II–VI with two to six long, stout setae scattered in a subapical row; terga I–III, but occasionally IV also, with narrow apical bands of silvery pubescence, VII densely covered with fine, appressed, light setae; genitalia as in Figure 5.

MATERIAL EXAMINED.—UNITED STATES. Arizona. Cochise Co.: 1♀, Douglas, Aug, Snow (KU); 1♂, Southwest Research Station, 27 Jul, on *Melilotus alba*, P.D. Hurd (UCB); 1♀, Chiricahua Mts., N. Fork Cave Cr., Southwest Research Station, 9 Jun, W.J. Hanson (USU); 1♀, Chiricahua Mts., Shake Gulch, 8 Jun, A.S. Menke, O.S. Flint (USNM); 2♀, Huachuca Mts., 11, 15 Jun, F.X. Williams (USU), 1♀, same locality (USNM); 1♂, 4♀, 4 mi W Portal, 22–23 Jul, W.J. Pulawski

(CAS). Gila Co.: 1♀, Parker Creek, Sierra Ancha, 9 May, H., M. Townes (USU); 1♀, near Roosevelt Lake, 21 Apr, H., M. Townes (USU). Mohave Co.: 1♂, Hualapai Mt. Pk., 8–9 Jun, W.J. Hanson (USU); 1♀, Topock, 8 Apr, on *Cercidium*, B. Apperson (USU). Pima Co.: 4♀, Baboquivari Mts., Snow (KU); 1♀, Santa Rita Mts., 5000'–8000', Jul, Snow (KU); 1♀, St. Xavier Mission, Tucson, 29 Jul (USU); 2♀, Tucson, Apr, 22 Sep, R.H. Crandall (USNM, BMNH). Pinal Co.: 1♂, Florence, 5 May 1903 (ANSP). Santa Cruz Co.: 2♂, 1♀, Madera Canyon, 12, 13 Jun, 2–4, 22 Aug, 1♀ with cricket prey *Gryllus pennsylvanicus*, A.S. Menke, O.S. Flint, K.V. Krombein, R.E. Coville (UCB, USNM). Yavapai Co.: 1♀, Prescott, 8000', 4 Jul, J. Kusche (USU); 1♀, Verde Valley, W.W. Jones (UCB). County unknown: 1♀, Bill Mts. Fork, Aug, Snow (KU).

California. Contra Costa Co.: 1♀, Antioch, 18 Apr, G.E. Bohart (UCB). Imperial Co.: 1♂, 3 mi E Imperial, 4 May, on *Pluchea sericea*, R.R. Snelling (UCD). Inyo Co.: 1♂, Darwin Falls, 8 May, L.A. Stange (UCD); 4♂, Furnace Creek, Death Valley, 1 Apr, E.G. Linsley, P.D. Hurd (UCB). Los Angeles Co.: 2♀, Monrovia, 13–24 Aug, B. Rosay (UCB); San Clemente Island: 1♂, China Canyon, 600', 16 Jun, A.S. Menke, D.R. Miller, R.W. Rust (USNM), 1♀, China Canyon, 11 Apr, D. Faulkner (SDM), 2♀, Eel Canyon, 600', 16 Jun, A.S. Menke, D.R. Miller, R.W. Rust (USNM), 2♂, 1♀, Horse Canyon, 50'–1600', 17 Jun, A.S. Menke, D.R. Miller, R.W. Rust (USNM), 1♀, Wilson Cove, 22 Mar, H.V. Daly (UCB); Santa Catalina Island, 1♂, Avalon, N. Garcia (USU), Santa Catalina Island (all specimens collected by A.S. Menke, D.R. Miller, and R.W. Rust, deposited in USNM): 5♂, 3♀, Bull Rush Canyon, 100'–600', 29 Jun, 1♂, 5♀, Cape Canyon, 700'–1000', 30 Jun, 1♂, Cottonwood Canyon, 250', 2 Jul, 1♀, The Isthmus, 28 Jun, 3♂, 4♀, Middle Canyon, 10'–200', 29 Jun; 1♀, Whittier, 25 Jan, H.M. Graham (UCB). Orange Co.: 10♂, Fullerton, 15 Aug, R.M. Bohart (USNM, UCD). Riverside Co.: 2♀, Gavilan, Apr, one on *Helianthus annuus*, one with ♀ nymph of *Gryllus assimilis*, P.H. Timberlake (UCR); 1♂,

Hopkins Well, 29 Apr (UCB); 1♀, Indio, 16 Feb (UCB); 1♂, 2♀, Riverside, 30 May, 7 Apr, Oct, P.H. Timberlake, E.I. Schlinger (USNM), 5♂, 4♀, same locality, 14 Jan–23 Oct, P.H. Timberlake, A.J. Basinger (UCR), 1♀, same locality, Oct (USU). San Bernardino Co.: 1♀, Needles, Feb–Mar, J. Kusche (USU), 1♀, 20 mi S, 3 May, P. Torchio, G. Bohart (USU). San Diego Co.: 1♀, Anza-Borrego Des. St. Pk., Earthquake Valley, 28 Oct, S. McElfresh (SDM); 4♀, Balboa Park, 3, 10, 18 Aug, 17 Sep, D. Faulkner (SDM); 1♀, Bonsaill, Beamer (UCD); 1♂, Borrego Valley, 26 Mar, A.A. Grigarick (UCD); 2♂, 1♀, Chula Vista, 17, 24, 29 Aug, on *Foeniculum vulgare*, F.X. Williams (CAS); 2♀, La Mesa, 9 Jan, F.X. Williams (CAS); 1♂, Olivehain, 31 Aug, R.M. Bohart (UCD); 3♀, San Diego, 1, 22 Aug, 22 Sep, H.A. Hill (USNM); 1♀, Tecate Peak, 2 Jun, Brown, Faulkner (SDM). Santa Barbara Co.: 2♀, Bluff Camp, San Rafael Mts., 29 Jun, F.D. Parker (USNM, UCB); 1♀, Canada del Venadito, 23 Jun, R.W. Spore (UCB); 1♂, Santa Barbara, 1 Aug, H.A. Hill (UCB); Santa Cruz Island: 2♂, 4♀, Canada del Medio, 29 Apr, 7, 12 May, 16–23 Jun, R.L. Brumley, D.S. Horning, Jr., R.O. Schuster (UCD), 5♂, 4♀, Cascada, 27 Apr, 4, 8 May, D.R. Miller, R.O. Schuster (UCD), 2♀, Christi Beach, 19 Jun, D.R. Miller, R.O. Schuster (UCD), 4♀, Prisoners Harbor, 25 Sep, J. Powell, R. Coville (UCB), 1♂, South Ridge, 9 May, D.R. Miller (UCD); 1♀, Santa Ynez Mts., 24 Jun, F.D. Parker (UCB); 1♂, 2♀, Saticoy, 19, 25 Jun, 22 Aug, T. Craig (USU). Tulare Co.: 1♂, Lindsay, on *Asclepias*, 9 Jun, W.A. Davidson (USNM). Ventura Co.: 1♂, 1♀, Foster Park, 1 Jul, F.D. Parker (UCD); 2♂, 2♀, Santa Paula, 1 Jul, Essig (UCR, USU).

Florida. Alachua Co.: 3♂, 5♀, Gainesville, 2 May, 20 Apr, Sep, 28 Oct, 21 Dec, N.H. Krauss, K.W. Cooper, H.V. Weems (USNM, UCD); 1♀, Newberry, road cave, 1 Nov, J.C. Dickenson (USNM). Brevard Co.: 1♀, Cocoa, Jul, G.E. Bohart (USU); 1♂, Merritt Island, 12 Mar, Weems (UCD). Clay Co.: 1♀, Gold Head Branch State Park, 15 Feb–14 Mar, L.H. Krombein (USNM). De Soto Co.: 1♀, Arcadia, 2 Jan, K.V. Krombein

(USNM); no specific locality, 1♀, 31 Mar, K.V. Krombein (USNM). Duval Co.: 1♂, 1♀, Jacksonville, 16 Feb (AMNH, USU). Highlands Co.: 2♂, 1♀, Archbold Biological Station, 14–25 Apr, 11 Nov, K.V. Krombein, P.H. Arnaud, Jr. (USNM, CAS); 2♂, Lake Placid, 13 Jul, 27 Dec, K.V. Krombein, H.W. Crowder (USNM, UCD); 1♂, Sebring, 20 Mar, H.V. Weems (USNM). Hillsborough Co.: 1♂, 5–16 Jan, L.H. Krombein (USNM). Orange Co.: 1♂, 2♀, Orlando, Mar, May, Russell, R., G. Bohart (USNM, USU); 2♀, Orlando, 1, 22 Mar, with cricket prey *Gryllus pennsylvanicus*, S.W. Bromley collection (USNM). Pasco Co.: 1♀, Moon Lake, 14 Apr, J.R. McGillis (BRI). St. John's Co.: 1♂, 1♀, no specific locality, Mar (USNM). St. Lucie Co.: 1♂, Ft. Pierce, 14 Apr, K.V. Krombein (USNM).

Georgia. Decatur Co.: 1♀, Spring Creek, P.W. Fattig (USNM). Liberty Co.: 1♀, South Beach, St. Catherine's Island, 27 Jun, R.O. Schuster, E.C. Toftner (UCD); 1♀, no further data (BMNH). Thomas Co.: 1♂, Thomasville, 30 Jun, Beamer (KU).

New Jersey. Camden Co.: 1♂, no specific locality (USNM).

New Mexico. Dona Ana Co.: 1♀, Mesilla Valley, Cockerell (ANSP). Otero Co.: 3♀, 2♂, Alamogordo, 13 May, 6 Jun (ANSP).

North Carolina. Brunswick Co.: 1♀, Long Beach, 7 May, H.F. Howden (BRI). Craven Co.: 1♂, Cherry Point, A.J. Walz (USU). Dare Co.: 2♂, 2♀, Kill Devil Hills, 1, 4, 22 Jul, 18 Nov, K.V. Krombein (USNM).

South Carolina. Aiken Co.: 1♀, Aiken, 24 Aug, W.R. Richards (BRI).

Texas. Bexar Co.: 2♀, 24 May, 10 Nov, J.F. Reinert (USNM); 3♂, 5♀, Ft. Sam Houston (one ♀ collected along Aparicio R.), 16 Jun, 19 Jul–19 Oct, on *Prosopis*, M. Wasbauer, B.J. Adelson (UCB); 1♂, Salado Creek, 16 Apr, M. Wasbauer (UCB). Brewster Co.: Big Bend National Park; 3♂, 4♀, Chisos Mts., 10–12 Jun, 3 Jul, Mitchell, Cushman, Scullen (USNM, UCD, USU), 1♀, Dagger Flats, 3500', 11 May, W.R.M. Mason (BRI), 3♀, Pulliam Canyon, 5500'–6500', 12 May, J.F. McAlpine (USNM, BRI), 1♀, Green

Gulch, 5300', 8 May, with cricket nymph, Howden, Becker (BRI). Jeff Davis Co.: 1♀, 23 mi W Ft. Davis, 4500', 1 Jun, W.R.M. Mason (BRI); 1♀, Davis Mts., malaise trap, 27 Aug, W.J. Hansen (USU). Hidalgo Co.: 3♂, Bentsen Rio Grande Valley State Park, 7 Jan, 23 Nov, C. Porter (FSDA); 1♂, Mission, 6 Dec (UCD). Liberty Co.: 1♀, Liberty, Mar (USU).

Utah. Cache Co.: 1♀, Logan, 11 Aug, W.J. Hansen (USU). County unknown: 1♀, Topaz, 6 Aug, G.E. Bohart, E.A. Cross (USU).

Wyoming. Laramie Co.: 1♀, Laramie, 5 Aug, H. Skinner (ANSP).

MEXICO. Baja California Norte. 1♀, 3.2 km S Rosarito, 1.6 km N of km 58 on Mex. Highway 1, 25 Jul, D. Weissman, C. Mullinex (CAS); 1♂, 20 mi W San Augustine, on *Eriogonum*, 24 Sep, Ross, Bohart (USU); 2♀, San Jose (Meling Ranch), 1 Jul, D. Patterson (CAS); 1♀, San Quentin, 18 Jul, G.D. Hanna (USU); 1♀, Santo Domingo, 14 Aug, J. Powell (UCB).

Baja California Sur. 1♀, Cabo S. Lucas, 10 May, B. Bonelli (USNM); 1♂, 4 mi WSW Miraflores, near water tank, 23–24 Apr, taken in malaise trap, 8 A.M.–5 P.M., M. Wasbauer (CDA); 1♀, Los Barriles, 1–2 May, malaise trap, 8 A.M.–6 P.M., M. Wasbauer (CDA).

Chiapas. 2♀, Municipio Nuevo Amatenango, Cañon de Rio Cuilco, 1158 m, 21 Nov, D.E., J.A. Breedlove (CAS); 1♀, Lagunas de Montebello Natl. Park, 4 km E of Laguna Tziskaw at Dos Lagunas, 1372 m, 19 Oct, D.E., J.A. Breedlove (CAS); 3♂, 35 mi E San Cristobal, 26 Jul, J.A. Chemsak, B.J. Rannells (UCB).

Chihuahua. 1♂, 9 mi S Hidalgo del Parral, 22 Jul, R.C. Gardner, C.R. Kovacic (UCD), 1♂, 12 mi W, 14 Jul, black and white lights, J.A. Chemsak, J. Powell (UCB); 1♂, 3 mi SE Temoris, 25 Aug, T.A. Sears, R.C. Gardner, C.S. Glaser (UCD).

Distrito Federal. 1♂, 14 mi SE Mexico, 7000', 17 Aug, R.H., E.M. Painter (MCZ).

Durango. 2♀, 5 mi W Durango, 14 May, L.A. Stange (UCD); 1♀, Nombre de Dios, 13 Jul, E.I. Schlinger (UCB).

Hidalgo. 1♂, 5 mi S Ixmiquilpan, 9 Jul, M.

Wasbauer, J. Slansky (UCD); 1♀, Jacala, 4500', 28 Mar, R. Haag (MCZ); 1♂, Zimapan, 6400', 12 Jun, H.A. Scullen (UCD).

Jalisco. 1♂, Chapala, 15 Oct, G.E. Bohart (USU); 1♀, Lake Chapala, 15 Jun, D.H. Janzen (UCB); 1♂, Puerto Vallarta, 1 Jan, P.H., M. Arnaud (CAS).

Mexico. 1♀, Ixtapan de la Sal, 6500', 4–10 Oct, E.G. Matthews (USNM); 1♂, Teotihuacan, 7500', 3 Jul, H.E., M.A. Evans (USNM); 3♂, Teotihuacan, Pyramid to the Sun, 27 Dec, on *Cassia tomentosa*, P.A., M. Arnaud (CAS).

Michoacan. 2♂, 3 mi E Carapan, 6500', H.E. Evans, F.D. Parker, L.A. Stange (USNM, UCD); 1♂, Huetama, Hwy. 15, 7 Mar, F.D. Parker, D. Miller (USU); 1♀, Tuxpan, 6000', 6 Jul, H.E. Evans (USNM).

Morelos. 3♂, 2♀, Cuernavaca, 5500', 1, 24 Mar, 5 Apr, 10 May, H.E., M.A. Evans (USNM), 7♂, 3♀, 3 mi E, 7500', 14 Mar, 4 Apr, 17, 26 May, 3, 17, 26 Jun, H.E. Evans (USNM), 5 mi E, 3♂, 22, 26 Mar, 5 May, F.D. Parker, L.A. Stange (UCD), 1♂, 3 mi NW, 6500', 7 Jun, H.E. Evans (USNM), 1♂, 2♀, 4 mi N, 7500', 2 Mar, 12 May, 2 Jun, H.E. Evans (USNM); 1♂, Canyon de Lobos, Yautepec, 4000', 7 Mar, H.E. Evans (USNM).

Nuevo Leon. 1♂, 32 km W Linares, San Pedro Iturbide, 6 Oct, H., M. Townes (OSU).

Oaxaca. 1♀, 24 mi W Tehuantepec, 21 Jul, E.E. Gilbert, C.D. MacNeil (UCB).

San Luis Potosi. 2♀, 30 mi S Ciudad Valles, 20 Sep, G. Bohart, W. Hanson (USU).

Sinaloa. 1♀, La Guayanera, 32.9 mi NE Villa Union, 1 Jul (SDM).

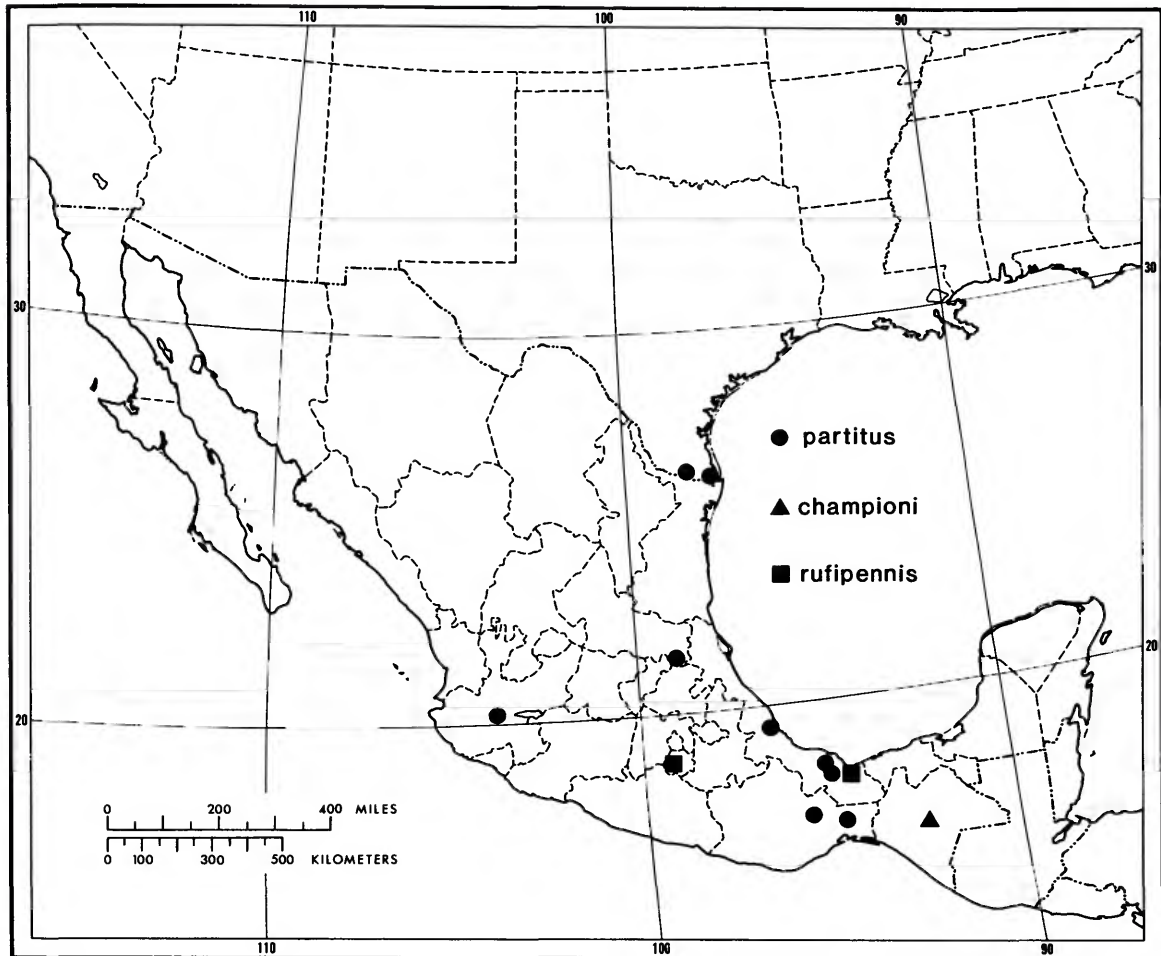
Veracruz. 1♂, 3♀, Cordoba, 13 Jul, J.S. Buckett, M.R., R.C. Gardner (UCD).

Zacatecas. 1♀, Sombrerete, 15 km E, 30 Jul, P.D. Hurd, Jr. (USNM).

11. *Liris (Leptolarra) championi* (Cameron)

MAP 9

Notogonia championi Cameron, 1889:53–54 [♀; Paraiso, Guatemala; unique type in British Museum (Natural History), London].



MAP 9.—Known range in North America for *Liris partitus*, new species, *L. championi* (Cameron), and *L. rufipennis* Fabricius.

Larra championii [sic] (Cameron).—Kohl in Dalla Torre, 1897:665 [listed].

Liris championi (Cameron).—Bohart and Menke, 1976:244 [listed].

We have seen only two specimens of this rarely collected species. The male is unknown. Females at first glance resemble *Liris beatus* (Cameron) because of their large size and dark brown wings; however, *L. championi* is the only species in our study with a subapical as well as a subbasal tooth on the mandible. In addition, the oval sensory pits on the antennae of *L. championi* measure

one-fourth to one-third the length of the flagellomeres, whereas those of *L. beatus* are scarcely one-tenth as long as their respective flagellomeres.

COLOR.—Body entirely black; wings fuliginous, veins dark brown.

VESTITURE.—Head and thorax with dense, short erect vestiture, mostly dark but some longer, subrecumbent vestiture with silvery or golden highlights, especially on venter of mesopleura, terga I–III with faint apical bands of silvery pubescence, visible only at certain angles.

STRUCTURE.—*Female*: Clypeus slightly tumid along midline, apical margin rounded, with a small median triangular notch; clypeal punctures fine and close, becoming larger and more scattered apically; mandible toothed subbasally and subapically on inner edge; flagellomeres III–IX with small oval placoids medially, those on apical flagellomeres one-fourth to one-third length of segment; parapsidal lines more deeply impressed than admedian line and notauli; scutal and scutellar punctures fine, contiguous, mesepipleural punctures finer, contiguous; scrobal sulcus contiguously foveolate; propodeal punctures coarser, deeper, but still contiguous; hind tibia carinate almost to base on outer surface, with two or three short stout spines in addition to that on apex; sterna dull, with very fine, dense, shallow punctures, V–VI with some additional larger, deeper punctures, but still dull in overall appearance; pygidium covered with pale recumbent setae, becoming denser apically; apex of pygidium with four to six stout, spatulate spines.

Male: Unknown.

MATERIAL EXAMINED.—MEXICO. 1♀, locality unknown, taken from floor of plane in New Orleans, 26 Apr, 29824-48-6460 (USNM).

Chiapas. 1♀, San Cristobal las Casas, 6–8 Aug, Flint and Ortiz (USNM).

12. *Liris (Leptolarra) rufipennis* Fabricius

FIGURES 6, 34; MAP 9

Liris rufipennis Fabricius, 1804:288 [♀, America meridionali; syntypes in Copenhagen Museum].—Vecht, 1961:23–24 [redescription of syntypes; ♂, ♀; Brazil and St. Vincent, West Indies].—Bohart and Menke, 1976:247 [Brazil, Ecuador, Peru, St. Vincent; synonymized *Liris compressifemur* (Giner Mari)].

Larrada decorata Smith, 1856:287 [♂, Para, Brazil; unique type in British Museum (Natural History)]. [New synonymy fide David Vincent.]

Larrada truncata Smith, 1856:290–291 [♂; Brazil; unique type in British Museum (Natural History)]. [New synonymy fide David Vincent.]

Larra decorata (Smith).—Kohl, 1884:243 [listed].—Dalla Torre, 1897:666 [listed].

Larra truncata (Smith).—Kohl, 1884:248 [listed].—Dalla Torre, 1897:675 [listed].

Larra rufipennis (Fabricius).—Kohl in Dalla Torre, 1897:673.

Notogonia compressifemur Giner Mari, 1944:355–356, fig. 6 [♀, ♂, Lima, Peru; syntypes in Barcelona Museum].

Liris decorata (Smith).—Bohart and Menke, 1976:245 [listed].

Liris truncata (Smith).—Bohart and Menke, 1976:248 [listed].

This is a large, attractive species with bicolored wings. The basal two-thirds of the wing is yellow, and the apical one-third is smoky gray. The male has small tufts of vestiture posterolaterally on the sixth and seventh sterna. Females have apical bands of silvery vestiture on the first four terga as in *Liris partitus*, new species, but lack the bare shining triangular area on the base of the pygidium.

COLOR.—Black; tarsi dark reddish brown ventrally; wings yellow with golden setae on basal two-thirds, apical one-third smoky, veins golden brown.

VESTITURE.—Head and thorax sparsely covered with slightly golden tinged subrecumbent setae, densest along inner eye margins, edge of occipital carina, on procoxae, forefemora, and along admedian line and lateral areas of scutum, procoxae also with scattered long, erect pale setae; lateral edges of dorsal surface and most of hind surface of propodeum with long, golden tinged recumbent setae; terga I–IV with apical bands of silvery pubescence, bands becoming wider medially; pygidium evenly but somewhat sparsely covered with pale pubescence, apical half also with about 12 to 15 dark, stout, suberect spine-like setae.

STRUCTURE.—*Female*: Length, 16.7–18.4 mm; clypeus bulging slightly, especially on upper half medially; upper half of clypeus dull, with dense, fine punctures, lower half shining between larger punctures, the largest of which form a distinct subapical row; mandible bidentate subbasally on inner margin, the more basal tooth slightly larger; flagellomeres IV–IX with oval placoids beneath near middle, becoming narrow and elongated on terminal flagellomeres, those on VIII–IX half as long as flagellomere; adme-

dian line more distinctly impressed than parapsidal lines or notauli; propodeal punctation coarser and more contiguous than that on scutum and mesopleura; scrobal sulcus distinctly impressed; hind tibia strongly carinate on apical four-fifths; sterna I–III dull, V–VI shining, with larger, more widely spaced punctures, IV somewhat intermediate, with fewer large punctures than V–VI; sterna II–V with a few long, erect setae scattered in a subapical row; pygidium lacking a bare triangular area basally, apex with six to eight spatulate spines.

Male: Length, 15.2–16.2 mm; similar to female except flagellomeres II–X with broad placoids, XI with a minute one at base; hind tibial carina weakly developed on basal four-fifths; sterna I–IV dull, V–VII shining between larger, more scattered punctures; sternum V with a faint indication of an apical band of silvery pubescence; genitalia as in Figure 6.

MATERIAL EXAMINED.—MEXICO. Morelos. 1♂, Huajintlan, 2800', 11 Apr, H.E. Evans (USNM). Veracruz. 2♂, 4♀, Minatitlan, 26 Aug–1 Sep, R., K. Dreisbach (USNM, UCD).

13. *Liris (Leptolarra) partitus*, new species

FIGURE 38; MAP 9

This species is known only from the female. *Liris partitus* belongs to a very confusing complex of mostly Neotropical species with yellow and gray wings, of which the females are extremely difficult to separate. Compounding the problem is the lectotype of one of the included species, *L. labiata* (Fabricius), which lacks the antennae and abdomen and is in otherwise poor condition. We have observed that the yellow and gray areas of the wing of this lectotype meet in a diffuse manner, as they also do in good, recently collected specimens of *L. rufipennis* Fabricius and *L. apicipennis* (Cameron). In some specimens of *L. ignipennis* (Smith) the apical gray area actually meets the yellow area in a very wavy line so that the gray does not invade the cells of the wing. In *L. partitus* these areas are separated by a very sharp

line, and the colors, particularly the gray, are much more intense than in the *L. labiata* lectotype. Therefore, we feel that there is more evidence to support naming *L. partitus* as a new species than to consider it as conspecific with the *L. labiata* lectotype. The problem of the actual identity of *L. labiata* is yet to be solved, however, and will have to wait until the Neotropical fauna is thoroughly studied.

Liris partitus females are easily distinguished from *L. rufipennis* by the presence of a basal bare triangular area in *L. partitus*. *Liris apicipennis* has such a bare area on the pygidium, but only the first three terga have apical silvery bands. *Liris ignipennis* is extremely similar to *L. partitus* but, based on our limited sample of specimens, appears to lack an oval sensory pit on the last flagellomere. As noted previously, the pattern of the wing coloration is different, and in addition, the gold setae on the wings of *L. ignipennis* are much more intensely colored than those of *L. partitus*.

ETYMOLOGY.—This specific epithet is from the Latin *partitus* (divided) and refers to the sharp separation in the yellow and gray colored areas of the forewing.

HOLOTYPE.—♀; Texas, Hidalgo Co., Bentsen Rio Grande Valley State Park, XI-30-XII-2-1978, E.E. Grissell and A.S. Menke (USNM Type I00989).

FEMALE.—*Color:* Black; apices of mandibles dark reddish brown; basal three-fourths of wings yellow with bright gold setae, apical one-fourth smoky with dark gray setae, stigma and veins golden brown.

Vestiture: Head with moderately long silvery setae, thorax with shorter, appressed silvery vestiture, except that on lateral margins of scutum next to tegulae denser and tinged with golden; terga I–IV with wide bands of silvery appressed pubescence.

Structure: Length, 13.7 mm; clypeus flat, very slightly tumid along midline, margin with a very small triangular notch medially; clypeal punctures fine, widely spaced, becoming more so apically; flagellomeres I and II equal in length,

IV–X each with a small oval sensory area medially, each extending about one-fourth length of flagellomere (Figure 38); admedian line, parapsidal lines, and notauli faintly impressed; hind tibial carina present on apical one-half; scutal punctures very fine and close, those on mesopleura and propodeum coarser; scrobal sulcus somewhat faintly impressed; tarsal claws simple; sterna I–II and lateral areas of III dull, with very fine punctation, middle of III and IV–VI shining, with very fine, shallow punctures and fewer larger, deeper ones; pygidium narrow, with an elongate bare triangular area basally, surrounded by fine, recumbent setae and longer, scattered erect setae; apex of pygidium with five spatulate spines.

MALE.—Unknown.

PARATYPES.—UNITED STATES. Texas. Cameron Co.: 2♀, Southmost Ranch, 7 mi SE Brownsville, 3–5 Dec, E. Grissell, A. Menke (USNM); 1♀, Brownsville, Jun (USU). Hidalgo Co.: 3♀, Bentsen Rio Grande Valley State Park, 13 Mar 1979, 15 Mar 1982, 21 Dec 1981, C.C. Porter (FSDA); 1♀, in park, near Mission, 17 Mar 1982, C.C. Porter (FSDA); 9♀, McAllen Botanical Garden, 2, 7, 15 Jan 1982, 23 Dec 1978, 23 Dec 1981, C.C. Porter (FSDA), 2♀, same locality, in malaise trap, Feb 1974, C.C. Porter (FSDA). Kleberg Co.: 4♀, Kingsville, 8, 18, 29 Oct, Gillaspay (Gillaspay, pers. collection).

COSTA RICA. 2♀, Turrialba, 4 Jul (USNM).

GUATEMALA. 1♀, Moca, Guatalon, 1000 m, Mar, Apr, J. Bequaert (MCZ).

MEXICO. Jalisco. 1♀, Tecolutlan, 18 Sep 1975, B. Villegas (UCD).

Oaxaca. 1♀, Palomares, 5–21 Sep 1961, R., K. Dreisbach (UCD); 3♀, Temascal, 24 Sep, 4, 17 Oct 1963, D.H., K.H. Janzen (UCB).

Puebla. 1♀, 20 mi NE Villa Acamacho, 28 Dec 1963, M.J. Tauber, C.A. Toschi (UCB).

San Luis Potosi. 1♀, Xilitla, 3500', 21 Jul, R.R. Dreisbach (UCD).

Veracruz. 1♀, Acayucan, 23 Oct, R., K. Dreisbach (UCD); 1♀, Lago Catemaco, 18 Sep 1975, B. Villegas (UCD); 1♀, Presidio, 15 Jul 1966, J.S. Buckett, M.R., R.C. Gardner (UCD).

A paratype has been deposited in the British Museum (Natural History), and three paratypes have been deposited in the California Academy of Sciences.

14. *Liris (Leptolarra) apicipennis* (Cameron)

FIGURES 7, 32, 40, 46, 47; MAP 10

Notogonia apicipennis Cameron 1889:58–59, pl. 4: figs. 16, 16a [♀, ♂; Panama; syntypes in British Museum (Natural History), London].

Liris apicipennis (Cameron).—Bohart and Menke, 1976:244 [Texas to Panama].

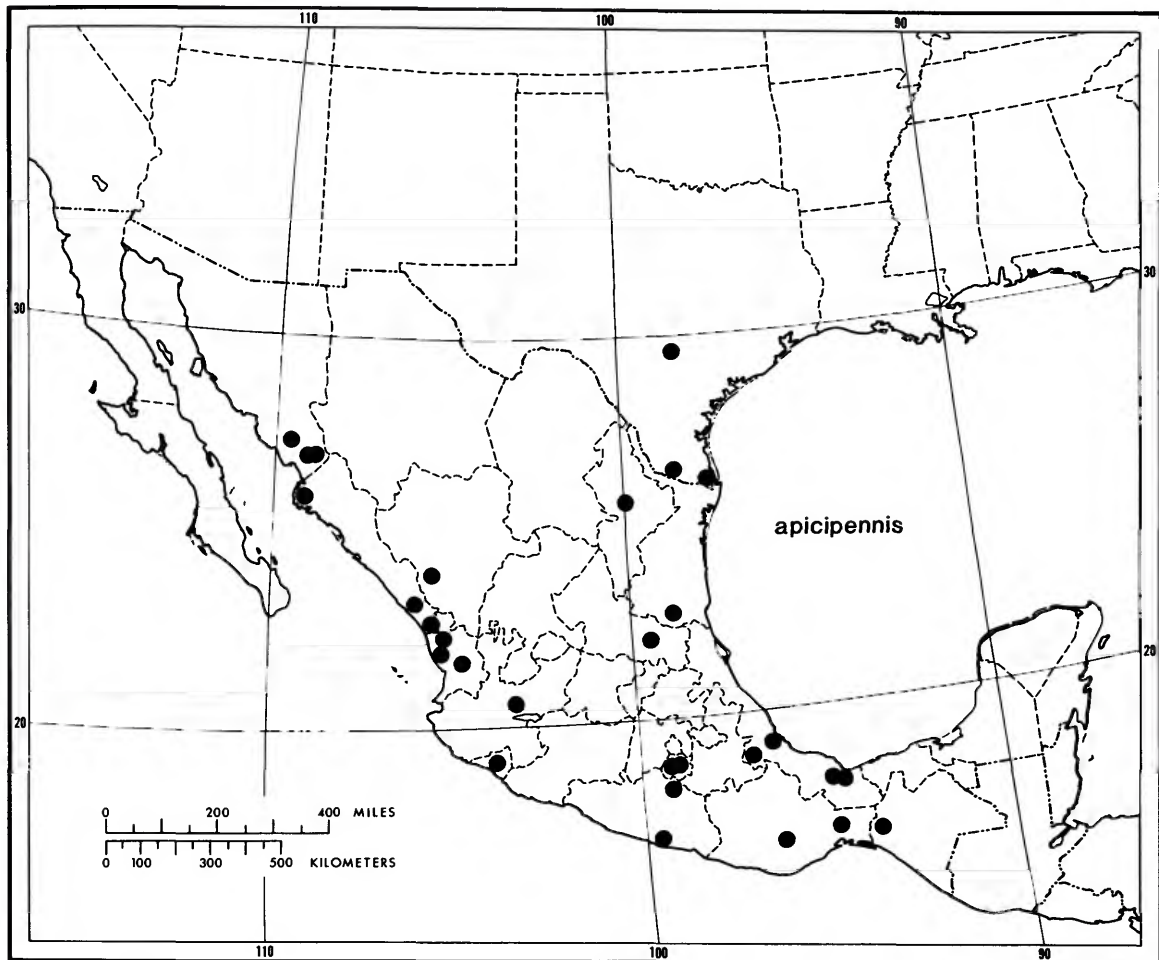
Liris (Leptolarra) apicipennis (Cameron).—Krombein, 1979:1618 [south Texas to Panama].

Liris apicipennis is primarily a Neotropical species that ranges as far north as southeastern Texas. The wings are yellowish in both sexes, but more so in the females. The males have a median semicircular emargination on sternum IV, with dense mats of recumbent dark setae on either side. Sterna III and V–VI also have dense brushes of vestiture present in varying degrees. Females have apical silvery bands present on terga I–III, a sharply defined bare, shining, triangular area on the base of the pygidium, and a long hind tibial carina. The first three sterna are dull and densely micropunctate, whereas the last three are shining with fewer larger, scattered punctures.

COLOR.—Black; tarsi ventrally and apices of hind tibiae dark reddish brown; wings yellowish, especially in females, veins dark yellowish to golden brown, stigma golden brown.

VESTITURE.—Head and thorax with very sparse, short, appressed, pale pubescence, which is thicker on face below median ocellus, lateral margins of scutum, ventral mesopleural area, and hind face of propodeum; apices of terga I–III with narrow bands of silvery pubescence.

STRUCTURE.—*Female*: Length, 9.4–13.4 mm; clypeus slightly tumid along midline, clypeal punctures fine, separated by more than a puncture width; flagellomere I slightly longer than II, III or IV through X each with a shallow, oval placoid about one-half to one-fourth the length



MAP 10.—Known range in North America for *Liris apicipennis* (Cameron).

of the flagellomere (Figure 40); notauli less strongly impressed than admedian lines or parapsidal lines; scutal punctures fine, dense, separated by less than the width of a puncture; mesopleural and metapleural punctures similar but slightly finer; scrobal sulcus weakly impressed; hind tibia carinate almost to base on outer surface, with two or three short, stout spines along carina; propodeal punctures slightly coarser than those on other areas of thorax; sterna I–IV dull, covered with fine, dense punctures, IV additionally with larger, more widely scattered punctures, V shining, with about an equal mix of fine, close

punctures and larger, more widely scattered ones, VI shining, with only a few larger, widely separated punctures; II–V with a few long, stout setae scattered in a subapical row; pygidium covered with short, appressed, pale setae except for a bare, shining, basal, triangular area with widely separated, small, shallow punctures; apex of pygidium with four to six stout, spatulate spines.

Male: Length, 7.4–9.6 mm; similar to female except only tarsi ventrally dark reddish-brown; flagellomeres I–X with broad placoids extending entire length of flagellomere, XI with placoid extending only over basal one-half; sterna I–VII

dull, with fine, dense punctures; sternum IV with a semicircular emargination, V with a similar but shallower emargination, lateral lobes of sterna IV–V with dense mats of recumbent vestiture (Figure 32); genitalia as in Figure 7.

LECTOTYPE DESIGNATION.—A male specimen from the British Museum (Natural History), labeled “PANAMA. Boucard” and with a printed label beneath reading “Notogonia apicipennis Cam.” is hereby designated as lectotype.

MATERIAL EXAMINED.—UNITED STATES. Texas. Bexar Co.: 1♂, Ft. Sam Houston, 19 Jul, M. Wasbauer (UCD). Cameron Co.: 1♀, Port Isabel, 20–23 Jun, on fls. of *Avicennia nitida*, H.E. Evans (USNM), 9♂, 15♀, 23–27 Jun, H.E. Evans, E.G. Matthews (USNM). Hidalgo Co.: 1♀, Mission, Bentsen Rio Grande Valley State Park, 28 Oct, (USNM); 5♂, 1♀, Bentsen Rio Grande Valley State Park, 10, 11, 16, 18, 21, 24–31 Jul, C. Porter (FSDA); 4♂, 1♀, McAllen Botanical Garden, 2 Jan, 13 Mar, 26 Nov, 27 Dec, C. Porter (FSDA).

MEXICO. Chiapas. 1♀, 28 mi W Cintalapa, 9 Apr, F.D. Parker (UCD).

Colima. 1♀, Vulcano, L. Conrad (USNM).

Durango. 1♀, El Salto, “near *Helianthus*,” 30 Oct, G., A. Bohart (UCD).

Guerrero. 3♂, 2♀, Acapulco, 1 Jul, P.D. Hurd (UCB), H.E. Evans (USNM); 1♂, 8 mi N Taxco, 5500', 1 Jun, H.E. Evans (USNM).

Jalisco. 1♀, Guadalajara, 17 Jul, H.E. Evans (USNM), 1♀, Crawford (UCD); 1♀, Plan de Barrancas, 8 Jul, F.D. Parker (UCD), 1♂, 3 mi SE, 8 Jul, F.D. Parker, L.A. Stange (UCD); 1♀, Zapotlanejo, 3 Oct, G.E., A.S. Bohart (USU).

Michoacan. 1♀, San Jose Purma, near Tuxpan, 5500', 1 Jun, H.A. Scullen (UCD).

Morelos. 1♀, Actopan, 3000', 13 Jul, R., K. Dreisbach (UCD); 3♂, 19♀, Alpuyeca, 27 Jun–3 Jul, P.D. Hurd (UCB), H.E. Evans (USNM), 2♂, 2 mi S, 3000', 14 May, 19 Jun, H.E. Evans (USNM), 3♂, 3 mi N, 3400', 3, 18 Apr, 18 May, H.E. Evans (USNM); 1♀, Cuernavaca, S end, 4500', 2 Apr, H.E. Evans (USNM), 14♂, 2♀, 3 mi W, 6500', 10 Mar–29 May, H.E. Evans, D.M. Anderson (USNM), 1♀, 5 mi E, 28 Mar, L.A.

Stange (UCD), 1♂, 12 mi E, 4300', 14 Aug, Univ. Kans. Mex. Expedition (KU); 2♂, 2♀, Huajintlan, 22 Aug, R., K. Dreisbach (MSU), 23 May, 1 Jun, H.E. Evans (USNM); 1♂, 1♀, Yautepec, 13, 31 Jul, F.D. Parker, L.A. Stange (UCD), 1♂, 1♀, Yautepec, Canyon de Lobos, 4000', 13 Apr, H.E. Evans (USNM).

Nayarit. 1♂, Acaponeta, 29 Sep, G.E., R.M. Bohart (UCD), 1♂, 1 mi W, 4 May, R.C. Bechtel, E.I. Schlinger (UCD); 1♂, Ahuacatlan, 18–22 Jul, on fls. of *Donnellsmithia hintonii*, P.D. Hurd (UCB); 1♀, Pichon, R., K. Dreisbach (MSU); 1♂, 16 mi NE San Blas, 21 Jul, R.L. Westcott (LACM); 1♀, San Juan, Peyotan, 2 Aug, B. Malkin (UCD); 1♀, Tepic, 7 Jul, F.D. Parker, L.A. Stange (UCD).

Nuevo Leon. 1♀, 40 mi S Monterrey, 23 Feb, G.E., R.M. Bohart (USU).

Oaxaca. 1♂, San Jose Viejo, 22 mi SE Totalpan, 8 Apr, E.I. Schlinger (UCD); 1♂, Palomares, 5–21 Sep, R., K. Dreisbach (UCD).

San Luis Potosi. 1♂, El Bonito, 7 mi S Ciudad Valles, 3000', 20 Dec, P.M., M. Arnaud (CAS).

Sinaloa. 2♂, 5♀, Chupaderos, 15 May, F.D. Parker, L.A. Stange (UCD), 1♂, 1♀, 9 mi E, 15 May, F.D. Parker, L.A. Stange (UCD), 1♀, 9 mi NE, 12 Mar, F.D. Parker, L.A. Stange (UCD); 1♂, Los Mochis, R., K. Dreisbach (UCD); 1♀, Mazatlan, 15 Aug, H. Evans (USNM), 1♀, 11 Sep, G.E., R.M. Bohart (USU), 1♂, 5 mi N, 26 Jun, J.A., M.A. Chemsak (UCD).

Sonora. 1♂, 2♀, Alamos, 24, 27 Feb, P.H. Arnaud, Jr. (CAS), 1♂, 7 Sep, G.E., R.M. Bohart (USU), 1♀, in malaise trap, 6 Sep, W.J. Hanson, T.L. Whitworth (USU), 1♂, 13 km W, 1 Sep, B. Villegas (UCD); 1♀, 13 mi SW Navajoa, 22 Aug, R.E. Ryckman, C.P. Christianson, D. Spencer (USNM); 2♀, 38 mi NW Obregon, 100', 23 Sep, Scullen, Bolinger (OSU).

Tamaulipas. 1♀, 18 mi E Ciudad Mante, 13 Aug, A.S. Menke, L.A. Stange (UCD).

Veracruz. 1♀, Acayucan, 23 Oct, R., K. Dreisbach (UCD); 1♂, 1♀, 36 mi W Las Choapas, 9 Sep, B. Villegas (UCD); 1♀, Cotaxtla Exp. Sta., Cotaxtla, 15 Aug, D.H. Janzen (UCD); 3♂, Minatitlan, 26 Aug–1 Sep, R., K. Dreisbach (UCD);

1♂, Orizaba, 12–22 Aug, R., K. Dreisbach (UCD); 1♀, Paso de San Juan, 23 Apr, E.C. Bechtel, E.I. Schlinger (UCD); 1♀, 5 mi NE Tinajas, 18 Aug, F.D. Parker, L.A. Stange (UCD); 1♀, Veracruz, 20 Jun, H.E. Evans (has both Cornell and RMB labels).

Yucatan. 1♀, Chichen Itza, 22 Mar, C.L. Bolton (UCD).

State unknown. 1♂, Valles, 8 Aug, R.R. Dreisbach (MSU).

15. *Liris (Leptolarra) mexicanus*, new species

FIGURES 9, 30, 41; MAP 11

Liris mexicanus is a rather common species, which ranges into southeastern Texas. The males possess lateral brushes of dark vestiture decreasing in size posteriorly on sterna III–V. Females have apical bands of silvery vestiture on terga I–IV, a bare, shiny, basal triangular area on the pygidium, and a strong carina extending almost the entire length of the hind tibia.

ETYMOLOGY.—The specific epithet *mexicanus* indicates that this species is found in Mexico.

HOLOTYPE.—♂, Mexico, Nayarit, San Blas, VII-20-1951, P.D. Hurd (UCB, on loan deposit to CAS, CAS Type 15039).

MALE.—*Color*: Black; venter of scape and tarsi ventrally dark reddish brown; wings light golden brown with stigma and veins brown.

Vestiture: Very sparse on vertex and upper half of gena, becoming progressively denser on lower half of face and gena, that on clypeus quite dense; thorax quite sparsely pubescent, somewhat longer, denser, and recumbent on mesopleuron; terga I–IV with wide silvery apical fasciae with faint brassy reddish highlights.

Structure: Length, 6.8 mm; clypeus with free apical margin very broadly and shallowly rounded; flagellomeres III–VII with broad placoids extending over entire length, VIII with an apically tapering placoid extending over entire length, IX–XI without such placoids; admedian and parapsidal lines and notauli very faintly impressed; scutal punctures very fine, contiguous, those on mesopleuron slightly coarser; scrobal

sulcus very shallowly impressed; propodeal punctures coarser than those on mesopleuron, but still contiguous; sternum III–V with apicolateral brushes of erect setae decreasing in size posteriorly (Figure 30); genitalia as in Figure 9.

ALLOTYPE.—♀, Mexico, Morelos, 4 mi E Cuernavaca, 6000', VI-18-1959, H.E. Evans (USNM).

FEMALE.—*Color*: Black; tarsi ventrally dark reddish brown; wings yellowish brown, veins slightly darker.

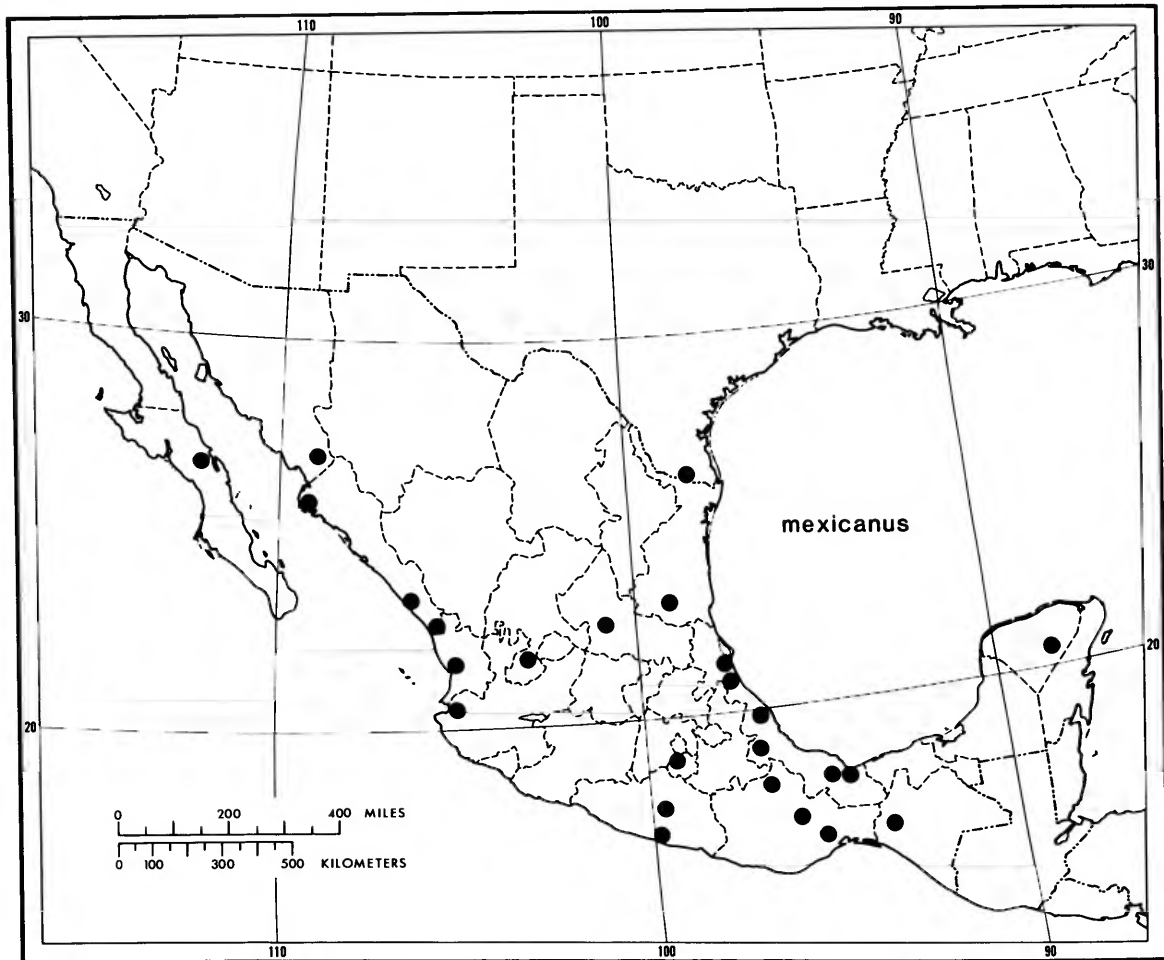
Vestiture: Entire body densely covered with short, appressed silvery vestiture, densest on lower half of face, sparsest on dorsal surface of propodeum; terga I–IV with broad apical bands of silvery vestiture.

Structure: Length, 10.0 mm; clypeus similar to that of male; flagellomeres II–X with oval sensory pits, increasing in size on terminal flagellomeres to more than three-fourths length of flagellomere (Figure 41); admedian line, notauli, and parapsidal lines faintly impressed, a shallow depression present between notauli and admedian line; scutal and mesopleural punctures very fine, contiguous; scrobal sulcus distinct, but fainter than episternal sulcus; propodeal punctures coarser than those on other areas of thorax; tarsal claws simple; hind tibial carina very sharp, glabrous, absent only on basal one-eighth of tibia; sterna I–IV dull, V–VI shiny with scattered large punctures; tergum VI dull, pubescent, except for basal one-fourth, which is shiny and impunctate; pygidium with a basal bare triangular area, remainder of surface densely covered with recumbent silvery pubescence and some longer, erect scattered setae; apex of pygidium with seven stout spatulate spines.

PARATYPES.—UNITED STATES. Texas. Hidalgo Co.: 1♂, 1♀, Bentsen Rio Grande Valley State Park, 7 Jan 1980, 21 Nov 1977, C.C. Porter (FSDA), 1♂, same park, near Mission, 15–29 Aug 1980, C.C. Porter (FSDA).

MEXICO. Baja California Sur. 2♀, Mulege, 24 Nov 1968, D.R. Miller (UCD), 1♀, same locality, 14 May 1921, E.P. VanDuzee (USU).

Chiapas. 1♀, 28 mi W Cintalapa, 9 Apr 1962, F.D. Parker (UCD).



MAP 11.—Known range in North America for *Liris mexicanus*, new species.

Guerrero. 1♀, Acapulco, 19 Mar 1957, G.R. Ferguson (OSU); 1♀, Tixtla, 12 Jan 1941, F. Bonet (OSU); 1♀, Zihuatanejo, 12 Dec 1966, G.E. Bohart (UCD).

Jalisco. 10♀, Puerto Vallarta, 31 Dec 1970 (9), 1 Jan 1971 (1), P.H., M. Arnaud (CAS).

Nayarit. 1♂, San Blas, 22 Mar 1962, F.D. Parker (UCD).

Oaxaca. 1♀, 5 mi NW Cuicatlan, 22 Jul 1966, with ♂ cricket nymph of *Ornebius* sp., J.S. Buckett, M.R., R.C. Gardner (UCD); 1♀, Jalapa, Craw-

ford (UCD); 2♀, Temascal, 3 Oct 1963, K.H. Janzen (UCD).

San Luis Potosi. 1♀, El Salto, 3 Sep 1962, malaise trap (BMNH).

Sinaloa. 1♀, 9 mi NE Chupaderos, 12 Mar 1972, F.D. Parker, D. Miller (USU), 1♀, 9 mi E, 19 Mar 1962, F.D. Parker (UCD); 3♀, Mazatlan, 28 Oct 1965, G.E., A.S. Bohart (UCD), 1♂, 10 Feb 1974, G.E. Bohart (USU), 1♂, 18 May 1962, F.D. Parker, L.A. Stange (UCD); 2♂, Topolobampo, 50', 20 Feb 1966, D. Bolinger (OSU).

Sonora. 1♂, Aduana, 15 Mar 1962, L.A. Stange, (UCD); 4♀, Alamos, 5 Jan 1971, P.H. M. Arnaud (CAS), 1♀, 24 Feb 1963, P.H. Arnaud, Jr. (CAS), 1♀, 7 Sep 1970, G.E., R.M. Bohart (USU), 3♀, 4, 6 Sep 1970, in malaise trap, W.J. Hanson, T.L. Whitworth (USU), 1♀, 5–10 Sep 1970, in malaise trap, G.E. Bohart (USU).

Tamaulipas. 1♀, Gomex Farias and vic., 400–600m, 20–24 Jul 1965, malaise trap, Cornell Univ. Mexico Field Party (MCZ).

Veracruz. 2♀, 30 mi S Acayucan, 21 Apr 1962, L.A. Stange, 22 Apr 1962, F.D. Parker (UCD); 1♂, Cordoba, 28 Jul 1966, J.S. Buckett, M.R., R.C. Gardner (UCD), 1♀, 20 Sep 1966, A. B. Lau (UCD); 1♀, Coscomatepec, 27 Apr 1962, L.A. Stange (UCD); 1♀, Fortin de las Flores-Sumidero, Planta de la Cerveceria, Ing., Daniel Rabago Res., 2500'–3000', 12 Jul 1968, in malaise trap, H.V. Weems, Jr. (UCD), 1♀, 1010m, 7–12 Jul 1974, J.A. Chemsak, E.G. Linsley, J. Powell (UCB); 4♀, Minatitlan, 26 Aug–1 Sep 1961, R., K. Dreisbach (UCD); 1♀, 7.1 mi S Panuco, 14 Aug 1959, A.S. Menke, L.A. Stange (UCD); 15♂, Tecolutla, 28 Feb 1972, F.D. Parker, D. Miller (USU); 1♀, 9 mi S Tuxpan, 11 Jun 1961, Michener, Ordway (KU); 1♂, Veracruz, 16 Aug 1963, F.D. Parker, L.A. Stange (UCD).

Yucatan. 1♀, Chichen Itza, 18 Apr 1962, F.D. Parker, L.A. Stange (UCD).

Zacatecas. 2♀, 10 mi S Jalpa, 18 Sep 1970, R.M. Bohart (UCD), 3♀, 17 Sep 1970, in malaise trap, R.M., G.E. Bohart (USU).

State unknown. 1♀, no specific locality (USU).

COSTA RICA. Guanacaste Province. 1♀, Comelco, 8 km NW Bagaces, on *Cissus*, IX-21-71, P.A. Opler, OTS Ecosystem Analysis Specimen #13674 (UCB).

A pair of paratypes has been deposited in the British Museum (Natural History).

16. *Liris (Leptolarra) panamensis panamensis* (Cameron)

FIGURES 11, 28, 44; MAP 12

Notogonia panamensis Cameron, 1889:59, pl. 4: fig. 17 [♂; Bugaba and Volcan de Chiriqui, Panama; unique type in

British Museum (Natural History), London].

Larra panamensis (Cameron).—Kohl in Dalla Torre, 1897:671.

Notogonidea sternalis Rohwer, 1914:519 [♂; Gualan, Guatemala; unique type in USNM].

Liris panamensis (Cameron).—Bohart and Menke, 1976:247 [placed *N. apicipennis* Cameron as a questionable synonym].

Liris sternalis (Rohwer).—Bohart and Menke, 1976:248 [Guatemala, Honduras, Costa Rica].

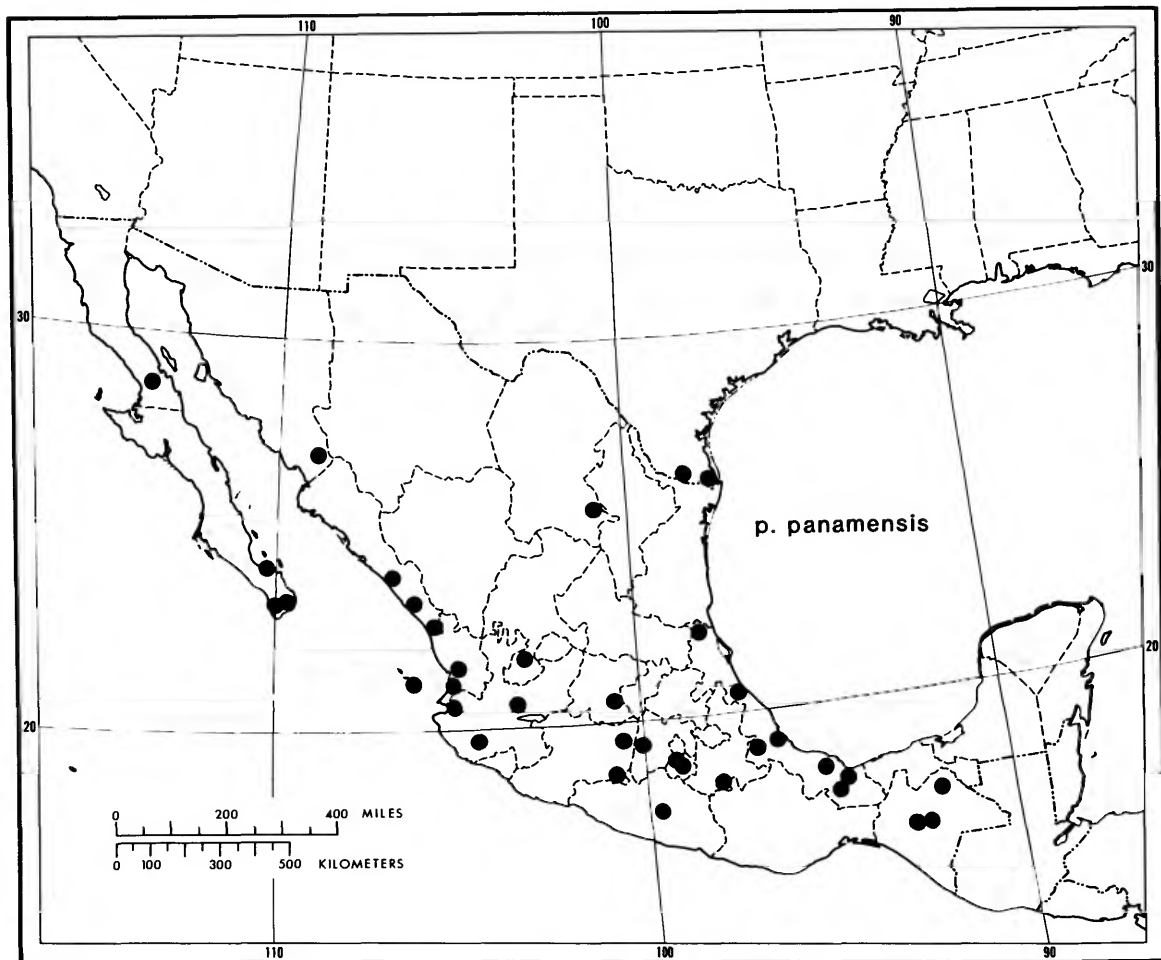
Liris (Leptolarra) panamensis panamensis (Cameron).—Krombein, 1979:1619 [south Texas to Panama; synonymized *N. sternalis* Rohwer].

This species is very common and occurs from southern Texas and Baja California south to Panama. The wings are suffused with yellow in both sexes, but more so in the females. The male is easily distinguished by the dense semicircular brush of recumbent setae on the second sternum and the lateral brushes of erect setae on the third sternum. The apical margin of the third sternum is broadly emarginate. Females of this species have apical bands of silvery vestiture on the first three terga, a bare, shiny triangular area on the base of the pygidium, hind tibia carinate on apical three-fourths, and flagellomeres IV–IX with small, oval sensory pits. The clypeus is evenly convex, and not tumid as in *L. panamensis mue-sebecki*.

COLOR.—Black; tarsi and middle third of mandibles dark reddish brown; wings weakly suffused with yellowish, lightly infuscated apically, stigma dark brown, veins lighter brown.

VESTITURE.—Most areas of head and thorax with sparse, appressed silvery vestiture, clypeus also with some longer, subrecumbent setae; terga I–III with apical bands of silvery pubescence; pygidium densely covered with appressed silvery setae and fewer longer, subrecumbent pale setae.

STRUCTURE.—*Female:* Length, 8.8–11.3 mm; clypeus flat, apical margin shining, with very few punctures; flagellomere I slightly longer than II; flagellomeres IV–IX with small oval placoids beneath near middle (Figure 44); admedian line, parapsidal lines, and notauli very faintly impressed; propodeal punctures slightly coarser and more contiguous than those on scutum and mesopleura; scrobal sulcus somewhat faintly im-



MAP 12.—Known range in North America for *Liris panamensis panamensis* (Cameron).

pressed; hind tibiae carinate almost to base; sterna I–IV dull, with dense, fine punctures, V–VI shining, with larger, more widely spaced punctures; sterna II–V each with a subapical row of long, erect setae; pygidium with a bare, shining triangular area basally; apex of pygidium with six to eight spatulate, spine-like setae.

Male: Length, 6.4–8.3 mm; similar to female except flagellomeres II–XI with broad placoids, that on XI extending over basal one-third; scrobal sulcus very faintly impressed; sternum II with

a semicircular brush of dense, recumbent setae; sternum III with lateral brushes of dense, erect dark setae, apical margin of III broadly and shallowly emarginate (Figure 28); terga I–IV with apical bands of silvery pubescence, VII densely covered with appressed, silvery vestiture; genitalia as in Figure 11.

MATERIAL EXAMINED.—UNITED STATES. Texas. Cameron Co.: 1♂, Brownsville, "S. Tex. Garden," 1 Dec (UCD); 3♂, Southmost Ranch, 7 mi SE Brownsville, 3–5 Dec, E.E. Grissell, A.S.

Menke (USNM); 1♂, Laguna Madre, 25 mi SE Harlingen, 27 Mar, D.E. Hardy, V.L. Wooley (USNM); 1♀, Port Isabel, 23–27 Jun, H.E. Evans, E.G. Matthews (USNM). Hidalgo Co.: 2♂, 5♀, Bentsen Rio Grande Valley State Park, 6, 7, 14 Jan, 7 Jul, 26 Aug, 20 Nov, 22 Dec, C.C. Porter (FSDA); 1♂, 1♀, McAllen Botanical Garden, 27 Dec, C.C. Porter (FSDA).

MEXICO. Baja California Norte. 1♀, 38 km S Rosarito, 46 m, 24 Aug, R.R. Snelling (LACM).

Baja California Sur. 1♂, 1♀, 4 mi WSW Miraflores, 22–24 Apr, one near water tank, one in grazed pasture, taken in malaise trap, M. Wasbauer (CDA); 2♀, Los Barriles, 29–30 Apr, malaise trap, 8 A.M.–6 P.M., M. Wasbauer (CDA); 1♂, El Pescadero, Playa Los Cerritos, 16–17 Apr, M. Wasbauer (CDA); 1♀, San Perdido, 9.3 mi SE, on road to Rancho Saucito, 7 Oct, D. Faulkner, F. Andrews (SDM).

Chiapas. 1♂, Palenque, 10 Sep, G.E. Bohart, W. Hanson (USU); 1♂, San Cristobal las Casas, 12 Apr, F.D. Parker (UCD); 1♂, El Sumidero, 14 Sep, G.E. Bohart, W. Hanson (USU); 2♀, Tuxtla Gutierrez, 1000', 24 Apr, H.E. Evans (USNM), 1♂, 14 mi N, 11 Jul, E.E. Gilbert, C.D. MacNeil (USNM); 1♀, El Zapotel, 2 mi S Tuxtla Gutierrez, 11 Jul, P.D. Hurd, Jr. (UCB).

Coahuila. 1♀, 23 mi N Saltillo, 11 Aug, L. Stange, A. Menke (UCD).

Guanajuato. 1♀, 14 mi E Celaya, 23 Aug, F.D. Parker, L.A. Stange (UCD).

Guerrero. 1♂, 8 mi S Chilpancingo, 4400', 19 Mar, H.E. Evans (USNM).

Jalisco. 1♀, 15 mi NE Guadalajara, 17 Sep, G.E., R.M. Bohart (USU); 2♀, Puerto Vallarta, 1 Jan 1971, P.H., M. Arnaud (CAS); 1♀, Puerto Los Mazos, 9 mi NW Autlan, 28 Aug, M.S., J.S. Wasbauer (UCB).

Mexico. 2♀, Valle de Bravo, 6500', 3 Aug, H.E. Evans (USNM).

Michoacan. 2♂, Huetamo, Hwy. 15, 7 Mar, F.D. Parker, D. Miller (USU); 2♀, Tuxpan, 6000', 31 May, H.A. Scullen (UCD).

Morelos. Cuernavaca: 5♂, 5♀, 5500', 1, 6, 7, 19, 26 Mar, 5 Apr, 10, 14 May, H.E., M.A. Evans (USNM), 1♀, 3 mi N, 7500', 26 Mar, H.E.

Evans (USNM), 1♀, 3 mi W, 6500', H.E. Evans, D.M. Anderson (USNM), 11♂, 2♀, 4 mi E, 6000', 18, 20, 25, 29 Jun, H.E. Evans (USNM), 4♂, 1♀, S end, 4500', 27 Mar, 11, 22 May, H.E. Evans (USNM), 4♂, 5 mi E, 26, 28 Mar, F.D. Parker, L.A. Stange (UCD), 1♀, 6 mi E, 1 Sep, G.E. Bohart, W. Hanson (USU); 1♂, Tetecala, 3500', 25 Mar, H.E. Evans, D.M. Anderson (USNM); 1♀, Yautepac, Canyon de Lobos, 4000', 13 Mar, H.E. Evans (USNM).

Nayarit. 1♀, vic. Higuera Blanca, ~6 mi SW Sayulita, 29 Jul, E.M. Fisher (LACM); 1♂, 4♀, Maria Cleofas, Islas Tres Marias, 26, 27 Mar, R.R. Snelling (LACM); 1♂, Tepic, 15 Sep, G.E., R.M. Bohart (USU).

Oaxaca. 1♀, 3 mi W El Camaron, 6 Aug, F.D. Parker, L.A. Stange (UCD); 1♂, Palomares, 5–21 Sep, R., K. Dreisbach (UCD); 1♀, Temascal, 3 Oct, K.H. Janzen (UCD).

Puebla. 2♀, 3 mi NW Petlalcingo, 4 Mar, 2 Apr, L.A. Stange (UCD).

Sinaloa. 2♂, 1♀, 9 mi E Chupaderos, 19 Mar, 15 May, F.D. Parker, L.A. Stange (UCD); 1♂, 3 mi N Elota, 18 Mar, F.D. Parker (UCD), 1♂, 8 mi SE, 19 May, L.A. Stange (UCD); 1♀, Mazatlan, 18 May, F.D. Parker, L.A. Stange (UCD), 2♀, 5 mi N, 15 Aug, M.S., J.S., C.E. Wasbauer (UCB), 1♀, 2.5 mi N, 10 Aug, malaise trap, 10 A.M.–2 P.M., M. Wasbauer, J. Chemsak (UCB).

Sonora. 1♂, 1♀, Alamos, 24 Feb, P.H. Arnaud, Jr. (CAS), 1♀, 5 Sep, R.M. Bohart (UCD).

Veracruz. 1♂, 1♀, 30 mi S Acayucan, 21 Apr, L.A. Stange, F.D. Parker (UCD); 1♂, 3♀, Cordoba, 6, 13, 20 Jul, J.S. Buckett, M.R., R.C. Gardner (UCD), 1♂, same locality, 1 Jan, G.E. Bohart (USU); 1♂, Fortin de las Flores, 1010 m, 7–12 Jul, P.D. Hurd, Jr. (UCB); 1♀, Lago Catemaco, 14 Jul, M. Wasbauer, J. Slansky (UCD); 1♂, Minatitlan, 26 Aug–1 Sep, R., K. Dreisbach (UCD); 1♂, Panuco, 26 Feb, F.D. Parker, D. Miller (UCD); 1♀, Tecolutla, 28 Feb, F.D. Parker, D. Miller (UCD); 2♀, Veracruz, 1–6 Aug, R., K. Dreisbach (UCD).

Zacatecas. 1♀, 10 mi S Jalpa, 17 Sep, G.E., R.M. Bohart (USU).

State unknown. 2♂, no further data (USU).

**17. *Liris (Leptolarra) panamensis muesebecki*
(Krombein)**

FIGURE 29; MAP 6

Motes muesebecki Krombein, 1954:15–20 [♂, ♀; Florida localities; holotype in USNM].

Motes (Notogonius) muesebecki Krombein.—Krombein, 1958b:188 [recorded questionably from Texas].

Liris muesebecki (Krombein).—Bohart and Menke, 1976:246 [listed].—Kurczewski, 1976:330–331, fig. 2 [nest, prey].

Liris (Leptolarra) panamensis muesebecki (Krombein).—Krombein, 1979:1619 [southern Florida; placed as a subspecies of *L. panamensis* (Cameron)].

This subspecies occurs only in Florida. The male has a much less developed semicircular brush of setae on the second sternum, and the lateral brushes of setae on the third sternum are much shorter (individual setae less than length of last flagellomere). In addition, the apical margin of sternum III is not broadly emarginate as in *L. p. panamensis*. The females have the clypeus slightly tumid along the midline and have no yellow in the wings.

COLOR.—Entirely black, although sternum of females occasionally dark brown, golden-brown laterally; wings slightly infumated, more so apically, veins brown.

VESTITURE.—Most areas of head and thorax with dense, fine, appressed silvery vestiture; apices of first four terga of male and first three of female with narrow bands of silvery pubescence, those on female slightly broader.

STRUCTURE.—*Female:* Length, 7.9–10.7 mm; clypeus densely punctate except nearly impunctate along apical margin, very slightly tumid along midline, apical margin very broadly rounded; flagellomeres V–IX with small oval placoids on middle beneath, about one-third as long as flagellomeres; admedian line faintly impressed, parapsidal lines and notauli less impressed, barely visible; scutal and mesopleural punctures very fine, contiguous; propodeal and metepisternal punctures coarser, contiguous; scrobal sulcus faintly impressed; hind tibia carinate almost to base, with two or three spines in addition to that on apex; dorsal face of propodeum separated from hind face by a bisinuate

carina (similar to Figure 35), hind face also with a median longitudinal furrow; sterna I–IV dull, with dense, fine, shallow punctures, V with similar punctures basally but becoming shiny with fewer larger scattered punctures apically, VI shiny with widely scattered, deep punctures separated by at least two puncture widths, and finer, denser punctures basally and laterally; pygidium with long, stout, pale subrecumbent setae and a few longer, finer, pale, suberect setae, basal area of pygidium with a bare, shining, triangular area, apex with six to 10 stout, spatulate setae.

Male: Length, 6.6–7.2 mm; similar to female except flagellomeres III–X with broad placoids, that on X extending over basal one-half of flagellomere; hind tibial carina becoming evanescent on basal one-fourth; sterna dull, sternum II with a faint semicircular brush of pale recumbent setae, sternum III with thin lateral brushes of erect, pale setae, apical margin slightly emarginate (Figure 29).

MATERIAL EXAMINED.—UNITED STATES. Florida. Charlotte Co.: 2♂, Bermont, 30 Mar, K.V. Krombein (USNM); 1♂, Bermont, 8–10 Apr 1937, H.I. Scudder (USNM, paratype). Collier Co.: 1♀, near Collier Seminole St. Pk., ½ mi NW Hwy 92 and 41, 11 Apr, R.F. Denno, D. Miller (USNM). Dade Co.: 1♀, Miami, 29–30 Mar, taken on sand flats, K.V. Krombein (USNM), 1♂, same data, (USNM, paratype). De Soto Co.: 1♂, 2♀, Arcadia, taken on sand flats, 21 Mar, 26 Apr, K.V. Krombein (USNM), 1♂, 2♀, Arcadia, 2–3 Apr 1953, K.V. Krombein (USNM, paratypes). Glades Co.: 1♀, Palmdale, 22 Apr, K.V. Krombein (USNM). Highlands Co.: 16♂, 23♀, Archbold Biol. Sta., 7–14 Oct, P.H. Arnaud, Jr. (CAS), 1♂, same locality, 10–26 Apr, K.V. Krombein (USNM); 4♀, Lake Annie, 22–27 Apr, K.V. Krombein (USNM); 2♂, 2♀, Lake Placid, 1 Apr, 21 Jun, K.V. Krombein (USNM). Manatee Co.: 1♀, 14 Mar, R.F. Tinker, Florida Fruit Fly Trap Survey (USNM). Marion Co.: 2♀, Juniper Springs, 5 Apr 1953, H.E. Evans (USNM, paratype). Orange Co.: 3♂, 1♀, Orlando, 24 Jan, 3 Apr, K.V. Krombein, A.W. Morrill (USNM), 1♀, 4 Apr 1953, H.E. Evans (USNM, paratype); 2♀, no specific locality, 25 Jan, 3 Feb–30 Aug, R.B.

Mason, R.S. Thomas, Florida Fruit Fly Trap Survey (USNM). Osceola Co.: 1♂, 2♀, 1, 3 Feb, 5 Jul, J.W. Chapman, W.A. Hiers, R.S. Thomas, Florida Fruit Fly Trap Survey (USNM). Seminole Co.: 1♀, 29 Aug, H. Clark, Florida Fruit Fly Trap Survey (USNM).

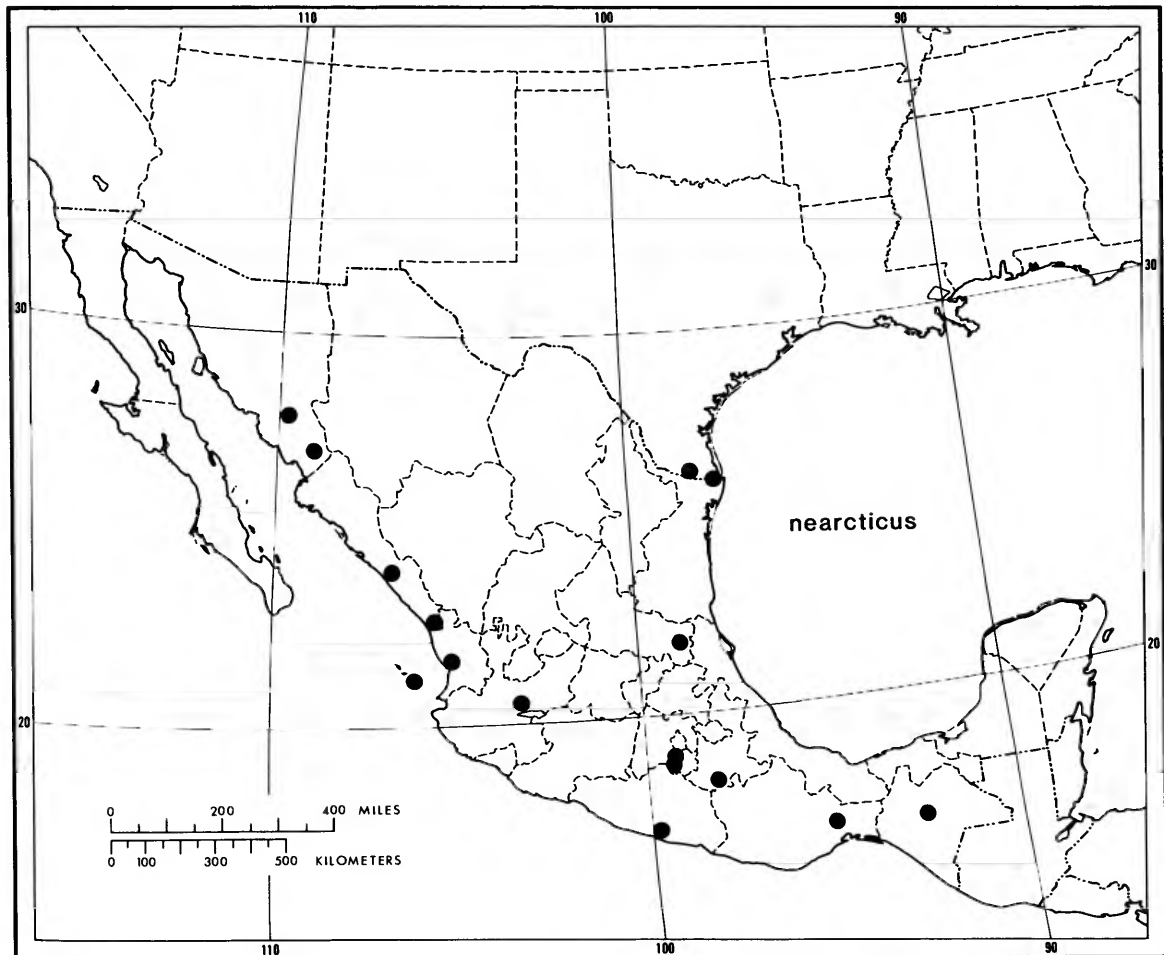
18. *Liris (Leptolarra) nearcticus*, new species

FIGURES 13, 43; MAP 13

Females of this species have apical silvery bands of vestiture on terga I–IV, lack a bare,

shiny triangular area on the base of the pygidium, and have a weakly developed hind tibial carina, which is evanescent on its basal one-half. Small oval sensory pits are present on the fourth or fifth through ninth flagellomeres. Males have unmodified sterna and a cuneate sensory area on the basal three-fourths of the last flagellomere; they can be distinguished from males of *L. nigripinus* by the reddish brown spines on the middle and hind legs, and genitalic differences (Figures 13, 14).

ETYMOLOGY.—The specific epithet *nearcticus*



MAP 13.—Known range in North America for *Liris nearcticus*, new species.

indicates that this species is found in the Nearctic Region.

HOLOTYPE.—♀; Mexico, Guerrero, Acapulco, 1 Jul 1951, coll. on sand, H.E. Evans (USNM Type 100991).

FEMALE.—*Color:* Black; except following areas dark reddish brown: apex of mandible, underside of flagellum, tergum and sternum VI, mid and hind tibiae; tarsi ventrally golden-brown; wings clear, veins golden-brown.

Vestiture: Head covered with silvery appressed pubescence, densest on face between antennal socket and inner eye margin, and lower half of gena; thorax evenly and densely pubescent, propodeum laterally with denser, longer, subdecumbent silvery vestiture; terga 1–IV with apical bands of silvery vestiture.

Structure: Length, 6.1 mm; clypeus with a small notch medially, free margin on either side of this notch slanting upwards slightly to lateral edge; flagellomeres 1V–1X with small oval placoids about one-seventh width of flagellomere (Figure 43); admedian and parapsidal lines and notauli very faintly impressed; scutal and mesopleural punctures very fine, contiguous; scrobal sulcus very faintly impressed; propodeal punctures slightly coarser than those on scutum; tarsal claws simple; hind tibial carina very weak, evanescent on basal half, with two spines in addition to one at apex; sterna I–IV dull, V–VI shiny, with scattered larger punctures separated by more than two punctures; tergum VI impunctate on lower half; pygidium lacking a bare triangular area basally, covered with short recumbent setae and some scattered longer, erect setae; apex with four stout spatulate spine-like setae.

ALLOTYPE.—♂; Mexico, Morelos, Huajintlan, 2800', IV-11-1959, H.E. Evans (USNM).

MALE.—*Color:* Black; spines on mid and hind legs dark reddish brown; wings clear, apices slightly infumated, veins golden brown.

Vestiture: Same as female, except posterior face of propodeum also with longer, denser vestiture.

Structure: Length, 5.8 mm; clypeus slightly tumid along midline; flagellomeres II–X with

broad placoids extending along entire length, that on XI extending only over basal three-fourths; notauli and admedian line faintly impressed, parapsidal lines very faintly impressed; thoracic punctation similar to female; scrobal sulcus shallowly impressed; femora flattened beneath; sterna dull, unmodified; apex of hypopygium emarginate; genitalia as in Figure 13.

PARATYPES.—UNITED STATES. Texas. Cameron Co.: 1♀, Brownsville, 26 Jun 1956, H.E. Evans, E.G. Matthews (USNM). Hidalgo Co.: 6♀, Bentsen Rio Grande Valley State Park, 11 Jan 1980, 17 Jul 1980, 16, 19 Nov 1979, 22 Dec 1978, C.C. Porter (FSDA), 1♂, 1♀, same park, near Mission, 17 Mar 1982, 15–29 Aug 1980, C.C. Porter (FSDA); 7♂, 7♀, McAllen Botanical Garden, 4, 5 Jan 1979, 2, 16 Jan 1982, 9 Sep 1978, 22, 23 Nov 1981, 25 Nov 1979, 21, 25, 27 Dec 1978, 27, 28 Dec 1981, C.C. Porter (FSDA).

MEXICO. Chiapas. 1♀, Ixtapa, 11 Apr 1962, F.D. Parker (UCD).

Guerrero. 3♂, Acapulco, 20, 21, 23 Mar 1957, G.R. Ferguson (OSU).

Jalisco. 1♂, 15 mi NE Guadalajara, 17 Sep 1970, R.M. Bohart (UCD); 1♂, 5 mi SE Plan de Barrancas, 3 May 1953, R.C. Bechtel, E.I. Schlinger (UCD).

Morelos. 1♂, Cuernavaca, 27 Mar 1962, F.D. Parker (UCD), 1♂, 3 mi NW, 6500', 3 Jun 1959, H.E. Evans (USNM), 1♂, 5 mi E, 26 Mar 1962, F.D. Parker (UCD); 1♀, 7.3 mi S Yautepec, 3000', 16 Aug 1962, Ordway, Naumann (KU).

Nayarit. 1♀, Maria Cleofas, Islas Marias, 27 Mar 1964, R.R. Snelling (LACM); 1♂, San Blas, 22 Mar 1962, F.D. Parker (UCD), 1♂, 4 mi E, 5 Feb 1964, E.I. Schlinger (UCD).

Oaxaca. 2♀, 23 mi S Matias Romero, 7 Apr 1962, F.D. Parker (UCD).

Puebla. 2♂, 3♀, 3 mi NW Petlalcingo, 3 Apr 1962, F.D. Parker (UCD), 1♀, 4 Mar 1962, F.D. Parker, D. Miller (USU).

San Luis Potosi. 1♂, El Bonito, 7 mi S Ciudad Valles, 300', 19 Dec 1970, P.H., M. Arnaud (CAS).

Sinaloa. 1♀, Chupaderos, 15 May 1962, F.D.

Parker, L.A. Stange (UCD), 1♂, 9 mi E, 19 Mar 1962, F.D. Parker (UCD); 1♂, 8 mi SE Elota, 18 May 1962, F.D. Parker (UCD).

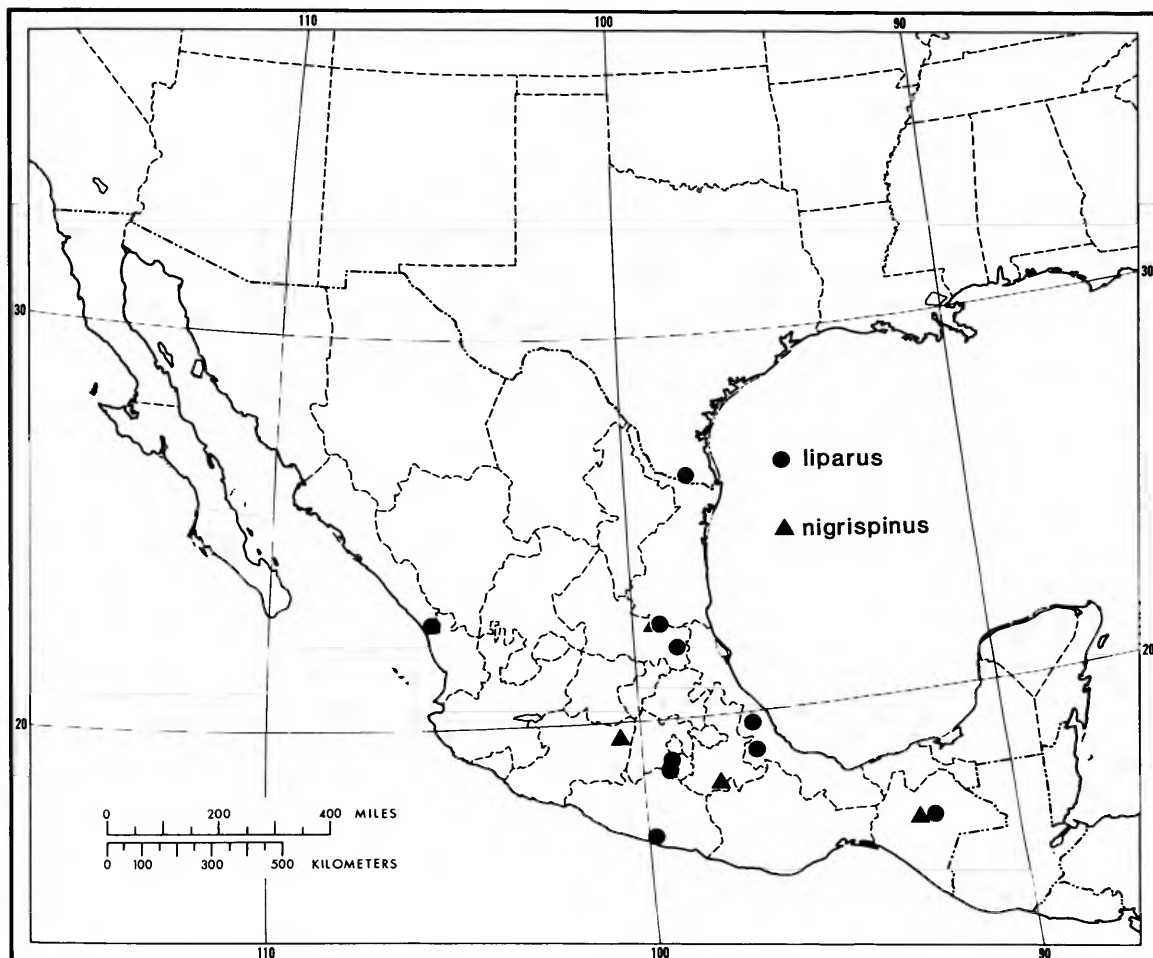
Sonora. 1♂, Alamos, 7 Sep 1970, G.E., R.M. Bohart (USU); 1♂, Cocorit, 27 Sep 1966, G.E., A.S. Bohart (UCD).

A pair of paratypes has been deposited in the British Museum (Natural History), and two pairs have been deposited in the California Academy of Sciences.

19. *Liris (Leptolarra) nigrispinus*, new species

FIGURE 14; MAP 14

This species is known only from the male, which has no sternal modifications and is best recognized by the stout black spines on the mid and hind legs and by the rounded hypopygial apex. *Liris nearcticus* keys out to the same couplet as *L. nigrispinus* but has reddish brown spines and an emarginate hypopygial apex. Also, the



MAP 14.—Known range in North America for *Liris liparus*, new species, and *L. nigrispinus*, new species.

genitalia of these two species are very different (Figures 13, 14).

ETYMOLOGY.—The specific epithet is formed from the Latin *niger* (black) plus *spina* (spine) and refers to the stout black spines on the mid and hind legs.

HOLOTYPE.—♂; Mexico, Michoacan, Tuxpan, 6 Jul 1959, 6000', H.E. Evans (USNM Type 100990).

MALE.—*Color:* Black; apical tarsomeres dark brown ventrally; spines on legs black; wings lightly infumated, slightly more so apically, veins dark brown.

Vestiture: Sparse, moderately long, pale and appressed (specimen may have been wet at one time); vestiture on hind face of propodeum pale, suberect; apices of terga I–III with wide bands of appressed silvery vestiture (remainder of abdomen missing from genitalia dissection).

Structure: Length, 8.4 mm; free margin of clypeus narrowly rounded, almost produced into a triangle; flagellomeres II–X with broad placoids extending over entire length of segment, that on XI extending only over basal three-fourths; notauli, admedian and parapsidal lines very faint; scutal punctures fine, contiguous, mesopleural punctures slightly coarser; scrobal sulcus barely visible; propodeal sculpture coarser than that on mesopleura; sterna unmodified in paratypes (only I–III still with holotype); genitalia as in Figure 14.

FEMALE.—Unknown.

PARATYPES.—MEXICO. Chiapas. 1♂, Ixtapa, 11 Apr 1962, L.A. Stange (UCD).

Puebla. 1♂, 3 mi NW Petlalcingo, 4 Mar 1972, F. Parker, D. Miller (UCD).

San Luis Potosi. 1♂, El Naranjo, ±24 km W Nuevo Morelos, 9 Oct 1962, H., M. Townes (OSU).

20. *Liris (Leptolarra) liparus*, new species

FIGURE 15; MAP 14

The male of *L. liparus* may be easily recognized by the rounded median clypeal lobe and the subapical rows of pale, inconspicuous macro-

chaetae on sterna II and III. The sterna are otherwise unmodified. Females of this species are large with dark wings; they have a somewhat oily appearance, lacking most of the silvery appressed vestiture normally present. The hind tibial carina extends over the basal three-fourths of the tibia and has three, four, or sometimes even five spines.

We have seen a female homotype (designated by A.S. Menke) of *Larrada polita* Taschenberg, which is extremely similar in appearance to *Liris liparus*. The sculpture on the mesopleuron is coarser on *L. liparus*, and the last flagellomere has an oval placoid, which is not present on the homotype of *L. polita*.

ETYMOLOGY.—The specific epithet is formed from the Greek *liparos* (oily, sleek). It is chosen because the females have very sparse vestiture and the integument is somewhat greasy in appearance.

HOLOTYPE.—♂; Mexico, Morelos, Canyon de Lobos, Yautepec, 4000', III-13-1959, H.E. Evans (USNM Type 100992).

MALE.—*Color:* Black; spines on legs whitish; wings light brown, apices darker; veins brown.

Vestiture: On head, densest on lower half of face; thorax with very sparse vestiture in places, subrecumbent, moderately long, longer and suberect on propodeum; terga I–IV with apical bands of silvery vestiture.

Structure: Length, 9.3 mm; clypeus rounded; flagellomeres II–X with broad placoids over entire length, XI with placoid extending only over basal one-third; thoracic lines faint; scutal punctures fine, deep, separated by less than one puncture width, those on mesopleura slightly larger, shallower, closer; scrobal sulcus distinct; propodeal punctures coarser than those on mesopleura, lateral faces with fine vertical striae; sterna unmodified, but II–III with a few inconspicuous, erect, pale macrochaetae scattered in a subapical row; genitalia as in Figure 15.

ALLOTYPE.—♀, Mexico, Morelos, Yautepec, 4000', III-7-1959, H.E. Evans, D.M. Anderson (USNM).

FEMALE.—*Color:* Black; last tarsomere ven-

trally dark golden brown; wings very dark brown with bluish highlights, veins dark brown.

Vestiture: Entire body very sparsely pubescent, overall appearance very dark and "oily"; vestiture on face giving a dull appearance, not shiny and reflective; terga 1–III with narrow bands of apical silvery vestiture, each band about one-fourth width of visible portion of tergum.

Structure: Length, 14.2 mm; clypeus gently rounded with a very slight median notch; flagellomeres IV–IX with small oval placoids ranging from one-fourth to almost one-half length of flagellomere, increasing in size on terminal segments; thoracic lines faint; scutal punctures fine, shallow, contiguous, those on mesopleura similar to those on scutum; scrobal sulcus distinctly impressed; propodeal punctures small, deep, contiguous, hind faces with coarse horizontal striae; hind tibia carinate to base, with three spines on one leg and four on the other, in addition to that at apex; sterna I–III dull, with fine, close punctures, IV–VI shiny, with larger scattered punctures in addition to some small, fine ones; tergum VI completely dull, pubescent; pygidium with a bare shining triangular area basally, remainder of pygidium with pale, dense subrecumbent setae and many longer, erect ones scattered over surface; apex of pygidium with four stout, spatulate spines.

PARATYPES.—UNITED STATES. Texas. Hidalgo Co.: 1♀, Bentsen Rio Grande Valley State Park, 30 Nov—2 Dec 1978, E.E. Grissell, A.S. Menke (USNM), 4♀, 15, 16, 19 Mar 1982, C.C. Porter (FSDA), 1♂, in park, near Mission, 17 Mar 1982, C.C. Porter (FSDA), 1♀, in park, near Mission, 17 Mar 1982, C.C. Porter (FSDA); 1♀, McAllen Botanical Garden, 11 Aug 1982, C.C. Porter (FSDA).

GUATEMALA. 1♀, Moca, Guatallon, 1000 m, Mar, Apr, J. Bequaert (MCZ).

HONDURAS. 1♂, Mt. Pozo Azul, Lake Yojoa, 17 Aug 1978, J.A. Chemsak (UCB).

MEXICO. Chiapas. 1♂, 7 mi SE Soyalo, 27 Mar 1953, R.C. Bechtel, E.I. Schlinger (UCD).

Guerrero. 1♂, Acapulco, 18 Mar 1957, G.R. Ferguson (OSU).

Morelos. 1♀, Cuernavaca, 5500', 7 Mar 1959, H.E., M.A. Evans, 1♂, Aug 1959, N. Krauss (USNM), 2♂, 4 mi E, 6000', 16, 18, 20 Jun 1959, H.E. Evans (USNM); 1♀, S end Cuernavaca, 4500', 2 Apr 1959, H.E. Evans (USNM).

Puebla. 1♂, 3 mi NW Petlalcingo, 4 Mar 1972, F.D. Parker, D. Miller (USU).

San Luis Potosi. 1♂, El Bonito, 7 mi S Ciudad Valles, 300', 20 Dec 1970, P.H., M. Arnaud (CAS), 2♂, El Naranjo, El Salto, 29 Jun 1965, P.J. Spangler (USNM).

Sinaloa. 1♂, Chupaderos, 15 May 1962, F.D. Parker, L.A. Stange (UCD).

Veracruz. 1♂, 1♀, Cordoba, 13 Jul 1966, J.S. Buckett, M.R., R.C. Gardner (UCD); 1♂, Jalapa, 28 Sep–3 Oct 1961, R., K. Dreisbach (UCD).

A male paratype has been placed in the British Museum (Natural History), and a female paratype has been deposited in the California Academy of Sciences.

21. *Liris (Leptolarra) asymphonus*, new species

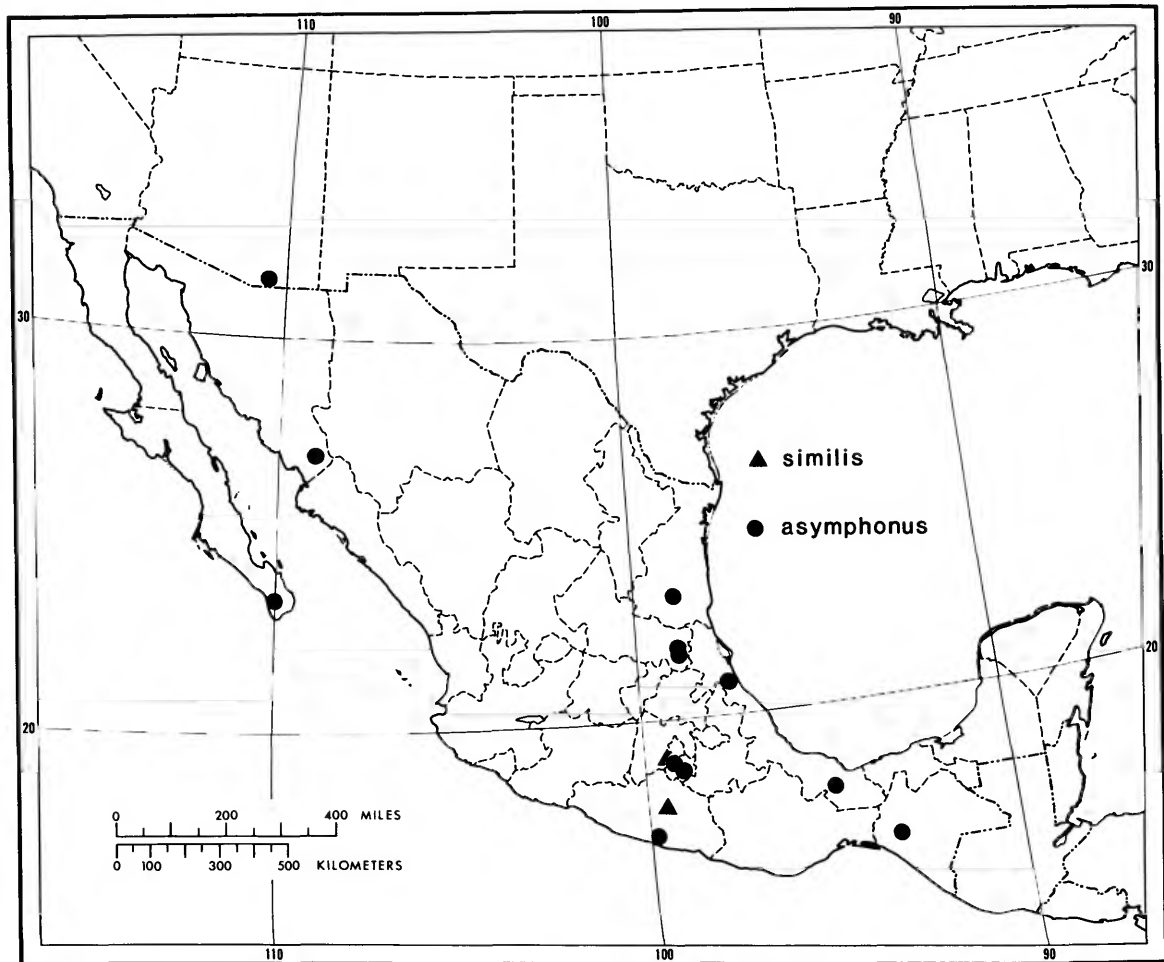
FIGURE 20; MAP 15

This species is known only from the male, which lacks sternal modifications. The seventh tergum possesses a strong lateral carina, which is as long as the last tergal width at its apex. The tenth flagellomere has a cuneate sensory area extending over its entire length, but the sensory area on the last flagellomere is extremely variable in length. It may be absent, or it may extend various lengths up to one-half the length of the flagellomere.

ETYMOLOGY.—This specific epithet is formed from the Greek *asymphonos* (inconsistent) and refers to the variable length of the cuneate sensory area on the last flagellomere of the males, a character state that varies little in the other Nearctic species.

HOLOTYPE.—♂; Mexico, Morelos, S end Cuernavaca, 4500', V-11-1959, H.E. Evans (USNM Type 100993).

MALE.—*Color:* Black; spines on legs whitish; wings very slightly infumated, apices much more so; veins brown.



MAP 15.—Known range in North America for *Liris similis*, new species, and *L. asymphonus*, new species.

Vestiture: Moderately densely covered with silvery appressed vestiture, densest on lower half of face and in depressions between inner eye margins and antennal sockets; vestiture longer and subrecumbent on propodeum; terga I–IV with apical bands of silvery pubescence, that on IV much narrower than others.

Structure: Length, 7.6 mm; free margin of clypeus broadly rounded; flagellomere II with a narrow placoid extending entire length, III–IX

with broad, entire placoids, X with placoid tapering apically, extending entire length of segment, XI lacking a placoid; notauli and admedian lines very weakly impressed, parapsidal lines distinct; scutal punctures fine, dense, contiguous, mesopleural punctures slightly coarser; scrobal sulcus shallow, broad; propodeal punctures slightly coarser than those on mesopleuron; tergum VII with a lateral carina at apex about as long as tergal width at apex; sterna unmodified, lacking

brushes of specialized vestiture; genitalia as in Figure 20.

FEMALE.—Unknown.

PARATYPES.—UNITED STATES. Arizona. Santa Cruz Co.: 1♂, Sycamore Canyon, Ruby Rd., 10 Sep 1978, Hanson, Knowlton (USU).

COSTA RICA. 1♂, Turrialba, 49F15 (=15 Jun 1949), K. W. Cooper (USNM); 1♂, LaLola, 6 Jul 1957, M.J. Stelzer, MS59-1094G (USNM).

GUATEMALA. 1♂, Concepcion, 1400', 3 Mar 1932, C.N. Ainslie (USNM); 1♂, Guatemala City, 5000', Mar 1932, C.N. Ainslie (USNM).

MEXICO. Baja California Norte. 2♂, Sierra Laguna, Big Canyon, 13 Oct 1941, Ross, Bohart (USU).

Baja California Sur. 1♂, El Pescadero, Playa Los Cerritos, 14–15 Apr 1979, M. Wasbauer, J. Slansky (CDA).

Chiapas. 1♂, 10 mi S San Carlos, 11 Mar 1953, R.F. Smith (UCD); 1♂, Suchiapa, 18 Jul 1957, P.D. Hurd, Jr. (UCB).

Guerrero. 1♂, Acapulco, 27 Dec 1949, L.D. Beamer (KU).

Morelos. 8♂, S end Cuernavaca, 4500', H.E. Evans (USNM), 1♂, Cuernavaca, 5500', 20 May 1959, H.E. Evans (USNM), 1♂, 27 Mar 1962, F.D. Parker (UCD); 1♂, Yautepac, Canyon de Lobos, 4000', 25 May 1959, H.E. Evans (USNM).

San Luis Potosi. 1♂, El Bonito, 7 mi S Ciudad Valles, 300', 20 Dec 1970, P.H., M. Arnaud (CAS); 1♂, 30 mi S Ciudad Valles, 20 Sep 1974, G. Bohart, W. Hanson (USU).

Sonora. 2♂, Alamos, 25, 27 Feb 1963, P.H. Arnaud, Jr. (CAS).

Tamaulipas. 1♂, 15 mi N Llera, 24 Feb 1972, F. Parker, D. Miller (USU).

Veracruz. 1♂, 30 mi S Acayucan, 21 Apr 1962, F.D. Parker (UCD); 1♂, 13 mi NW Lucrecia, 17 Apr 1953, R.C. Bechtel, E. I. Schlinger (UCD); 3♂, Tecolutla, 28 Feb 1972, F.D. Parker, D. Miller (USU); 1♂, 16 mi S, 26 Jun 1953, Univ. Kansas Mex. Expedition (KU).

A paratype has been placed in the British Museum (Natural History), and two have been placed in the California Academy of Sciences.

22. *Liris (Leptolarra) similis*, new species

FIGURE 18; MAP 15

Liris similis is known only from the male. The sterna are unmodified. This species may be confused with *L. asymphonus*, new species, because the cuneate sensory area on the last flagellomere of that species varies in length and may be very short, as it is in *L. similis*. However, *L. asymphonus* has a long carina laterally on tergum VII, whereas *L. similis* either lacks this carina or has it reduced to less than the width of tergum VII at its apex. In addition, the volsella of *L. asymphonus* lacks long, dense hair beneath (Figure 20), but such hairs are present in *L. similis* (Figure 18).

ETYMOLOGY.—The specific epithet is from the Latin *similis* (resembling) and refers to the similarity between this species and *Liris asymphonus*, new species.

HOLOTYPE.—♂; Mexico, Morelos, Cuernavaca, 5500', III-5-1959, H.E. Evans and D.M. Anderson (USNM Type 100994).

MALE.—*Color*: Black; abdomen and legs dark brownish black; wings clear, apices slightly infumated.

Vestiture: Sparse, appressed on most areas of body, densest on lower two-thirds of face; terga I–IV with apical bands of silvery vestiture with dull coppery highlights.

Structure: Length, 6.7 mm; clypeus slightly tumid along midline, truncate, the lateral angles prominent; flagellomeres II–X with broad placoids extending entire length, XI with only a small area, about one-fifth length of segment, at base; notauli, admedian and parapsidal lines faintly impressed; scutal punctures fine, deep, contiguous, those on mesopleura slightly coarser; scrobal sulcus weakly impressed, short, not extending behind scrobe; propodeal sculpture slightly coarser than that on mesopleura; sterna unmodified; last tergum with a very short lateral carina at apex; genitalia as in Figure 18.

FEMALE.—Unknown.

PARATYPES.—MEXICO (all USNM). Guerrero.

1♂, 8 mi S Chilpancingo, 4400', 19 Mar 1959, H.E. Evans.

Morelos. Cuernavaca, 5500', 4♂, 5 Mar 1959, 1♂, 15 Mar 1959, 1♂, 28 Mar 1959, H.E. Evans, D.M. Anderson, 1♂, 16 Mar 1959, 1♂, 2 Apr 1959, 2♂, 5 Apr 1959, H.E., M.A. Evans; 1♂, 5500', 1 Apr 1959, M.A. Evans, 2♂, 19 Apr, 30 May 1959, H.E. Evans; 1♂, 3 mi W, 6500', 10 Mar 1959, H.E. Evans, D.M. Anderson; 3♂, S end Cuernavaca, 4500', 27 Mar, 7 Apr 1959, H.E. Evans, 2♂, 28 Mar 1959, H.E. Evans, D.M. Anderson.

A paratype has been placed in the British Museum (Natural History), and three have been placed in the California Academy of Sciences.

23. *Liris (Leptolarra) dominganus* (Strand)

Map 16

Notogonia domingana Strand, 1911:154-155 [♀; Ecuador, Santo Domingo de Los Colorados, 510 m; unique type in Muséum National d'Histoire Naturelle, Paris].

Liris domingana (Strand).—Bohart and Menke, 1976:245 [listed].

This is a very uncommon species, and the male has never been collected. The female can be recognized only by a combination of character states, namely, the presence of apical silvery bands on terga I-III, pygidium without a bare triangular basal area, hind tibial carina sharp, extending almost to base, wings clear with slightly infumated apices, and small oval sensory pits on flagellomeres V-IX.

FEMALE.—*Color:* Black; tarsi dark brown; wings slightly infumated, apices slightly more so.

Vestiture: Somewhat sparse; on head, densest on lower half of face; short, appressed and cinereous on thorax; apices of terga I-III with fairly wide bands of silvery appressed vestiture.

Structure: Length, 7.5-8.8 mm; free margin of clypeus broadly rounded with a small, triangular median notch; flagellomeres IV-IX with small oval sensory pits medially, those on terminal segments slightly more than half length of flagellomere; notauli, admedian and parapsidal lines very faintly impressed; scutal punctures

fine, deep and separated by less than one puncture diameter, mesopleural punctures slightly larger; scrobal sulcus distinctly impressed; propodeal punctures coarser than those on mesopleura; hind tibia carinate almost to base, with three spines in addition to one at apex of tibia; tergum VI very shiny and lacking vestiture, except for a pubescent narrow strip adjacent to lateral carina of pygidium; pygidium densely covered with dark subrecumbent setae and many longer, dark, suberect spine-like setae; pygidium lacking bare triangular area basally, and with eight stout spatulate setae at apex.

MALE.—Unknown.

MATERIAL EXAMINED.—MEXICO. Chiapas. 1♀, Soyalo, 4 mi SE, 1 Mar, R.C. Bechtel, E.I. Schlinger (UCD)

Morelos. 1♀, Cuernavaca, 5500', 17 May, H.E. Evans (USNM).

24. *Liris (Leptolarra) molestus*, new species

Map 16

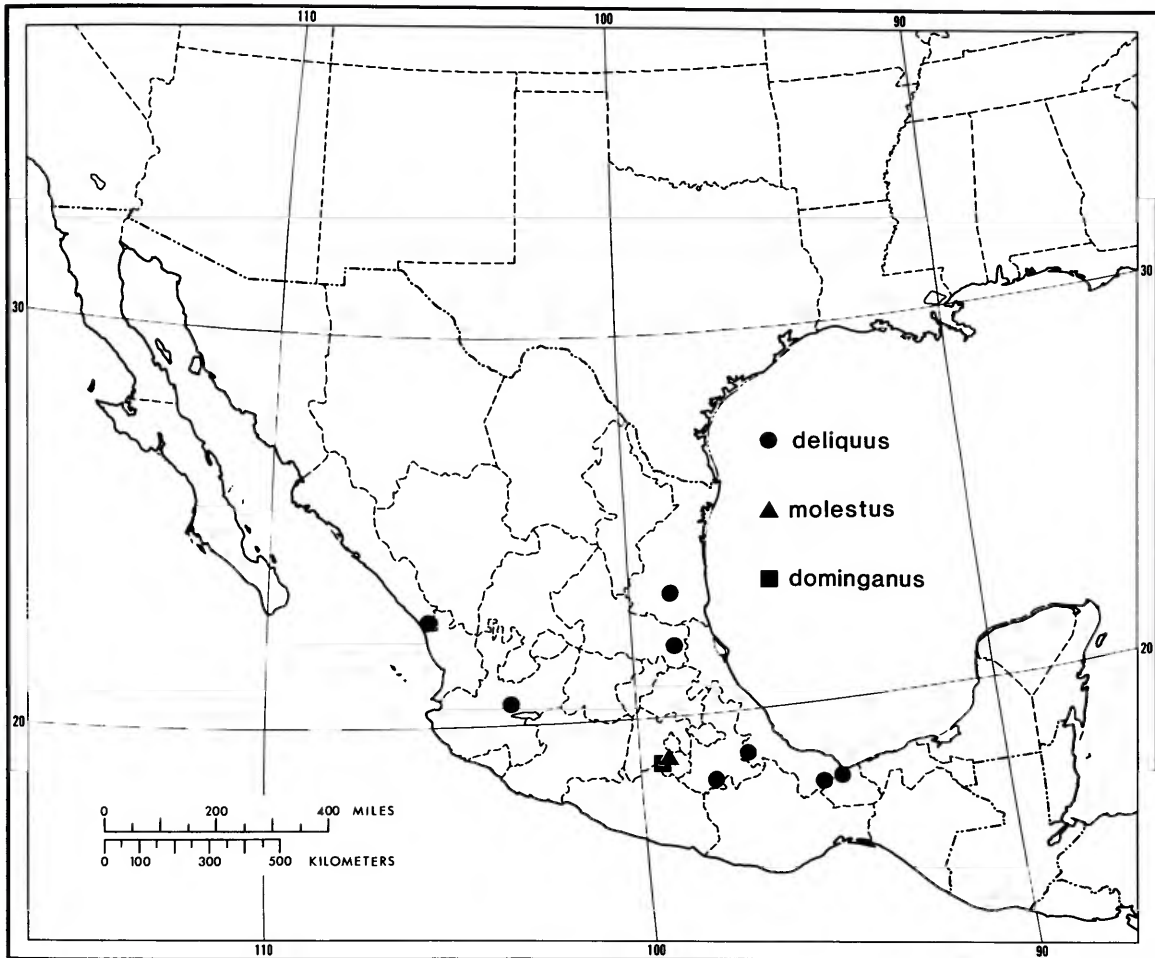
Liris molestus is known only from the female. It is similar in appearance to *L. panamensis* but lacks an oval sensory pit on flagellomere IV. The wings are clear and not suffused with yellowish as in *L. panamensis*. Since the degree of yellow in the wings of *L. panamensis* varies, in some specimens the most reliable character for separating the two is the presence or absence of a sensory pit on flagellomere IV.

ETYMOLOGY.—The specific epithet is from the Latin *molestus* (troublesome, annoying) and refers to the difficulty in distinguishing this species from *Liris panamensis*.

HOLOTYPE.—♀; Mexico, Morelos, Cuernavaca, 5500', VI-5-1959, M.A. Evans (USNM Type 100995).

FEMALE.—*Color:* Black; tarsi ventrally dark brown; wings slightly infumated, more so apically.

Vestiture: Evenly and somewhat sparsely pubescent, densest on lower half of face; terga I-III with broad bands of apical silvery vestiture,



MAP 16.—Known range in North America for *Liris deliquus*, new species, *L. molestus*, new species, and *L. dominganus* (Strand).

each band about one-third width of visible portion of tergum.

Structure: Length, 10.0 mm; clypeus with a very small median triangular notch, free margin broadly rounded; flagellomeres V–IX with small oval placoids slightly less than one-third length of respective flagellomere; notauli, admedian and parapsidal lines faintly impressed; scutal punctures very fine, contiguous, those of mesopleuron slightly coarser; scrobal sulcus weakly impressed, forming about a 120° angle

with scrobe at apex; propodeal punctures similar to those of mesopleuron; hind tibia carinate almost to base, with two spines in addition to that at apex; sterna I–IV dull, finely punctate, V–VI shiny, with scattered larger punctures; tergum VI pubescent and finely punctate on upper half adjacent to lateral carina of pygidium, shiny with scattered larger punctures on lower half; pygidium without a basal bare triangular area, densely covered with coarse, pale recumbent setae and scattered longer, suberect setae; apex of

pygidium with seven stout spatulate spines.

MALES.—Unknown.

PARATYPES.—MEXICO (all USNM). Morelos, 9♀, Cuernavaca, 5500', all collected 1959 by H.E. Evans unless otherwise noted, 1♀, 1 Mar, 1♀, 4 Mar, 2♀, 7 Mar, 1♀, 10 Mar, H.E., M.A. Evans, 1♀, 12 Mar, H.E. Evans, D.M. Anderson, 1♀, 16 Mar, 2♀, 29 Mar, 1♀, 5 Jun.

A paratype has been placed in the British Museum (Natural History), and two have been placed in the California Academy of Sciences.

25. *Liris (Leptolarra) deliquus*, new species

FIGURES 8, 48; MAP 16

Females of this species lack or have a very weakly developed hind tibial carina, which is present in all other Nearctic species. In addition, this species has a very characteristic pygidium (Figure 48). Although it has a bare basal area, this area is ill-defined and is not distinctly triangular. Males of *L. deliquus* have no sternal modifications. This is the only such Nearctic species that has the cuneate sensory area extending only over a small basal fraction of flagellomere VIII.

ETYMOLOGY.—The specific epithet is from the Latin *deliquus* (wanting, lacking) and indicates the very weak or absent hind tibial carina of the females.

HOLOTYPE.—♂; Mexico, Veracruz, Minatitlan, VIII-26-IX-1-1961, R. and K. Dreisbach (USNM Type 100996).

MALE.—*Color*: Black; apical two-thirds of mandible reddish brown; wings slightly infumated, apices more so, veins brown.

Vestiture: Densest on head on lower half of face and in depressions between inner margins of eyes and antennal sockets; on thorax densest on lateral edges of scutum, hind face of propodeum, and mesopleura; terga 1–IV with apical bands of silvery pubescence.

Structure: Length, 7.6 mm; clypeus slightly tumid along midline, free margin rounded; flagellomeres IV–VII with broad placoids extending over entire length, VIII with placoid extending only over basal one-third; notauli faint, ad-

median and parapsidal lines more impressed; scutal punctures very fine, contiguous, mesopleural punctures slightly coarser; scrobal sulcus distinct, extending almost across entire width of mesopleuron, straight; propodeal punctures slightly coarser than those on mesopleuron; sterna unmodified; genitalia as in Figure 8.

ALLOTYPE.—♀; Mexico, Veracruz, Acayucan, X-23-1957, R. and K. Dreisbach (USNM).

FEMALE.—*Color*: Black; apices of mandible dark brown; wings as in male.

Vestiture: Rather sparse on entire body, on thorax, suberect, densest on posterior half of lateral face of propodeum; terga I–IV with apical bands of silvery vestiture, that on IV much fainter than those on I–III.

Structure: Length, 10.2 mm; free margin of clypeus straight; flagellomeres IV–X with small oval placoids slightly basad of middle of segment, those on terminal segments almost one-half length of flagellomere; notauli, admedian and parapsidal lines distinctly impressed; scutal punctures fine, deep, separated by more than one puncture width, those on mesopleuron more contiguous; scrobal sulcus weakly impressed; propodeal punctures coarser than those on other areas of thorax; hind tibia lacking a carina; sterna 1–III dull, finely punctate, IV–VI shiny with scattered larger punctures; tergum VI shiny except for dull pubescent strip along lateral carina of pygidium; pygidium with an ill-defined bare triangular area basally (Figure 48); apex of pygidium with four spatulate spine-like setae.

PARATYPES.—MEXICO. Jalisco. 1♀, Guadalajara, 17 Sep 1970, R.M. Bohart (UCD).

Puebla. 3 mi NW Petlalcingo, 2♀, 2 Apr 1962, F.D. Parker (UCD), 1♂, 4 Mar 1972, F.D. Parker, D. Miller (USU).

San Luis Potosi. 1♂, 20 mi S Ciudad Valles, 20 Sep 1974, G. Bohart, W. Hanson (USU).

Sinaloa. 1♀, Chupaderos, 15 May 1962, F.D. Parker, L.A. Stange (UCD).

Tamaulipas. 1♀, 15 mi N Llera, 24 Feb 1972, F.D. Parker, D. Miller (USU).

Veracruz. 1♂, 3♀, Acayucan, 23 Oct 1957, R., K. Dreisbach (MSU); 1♀, Orizaba, 12–22 Aug 1961, R., K. Dreisbach (UCD); 9♂, Minatitlan,

26 Aug–1 Sep 1961, R., K. Driesbach (MSU, UCD).

26. *Liris (Leptolarra) vincenti*, new species

FIGURE 17; MAP 17

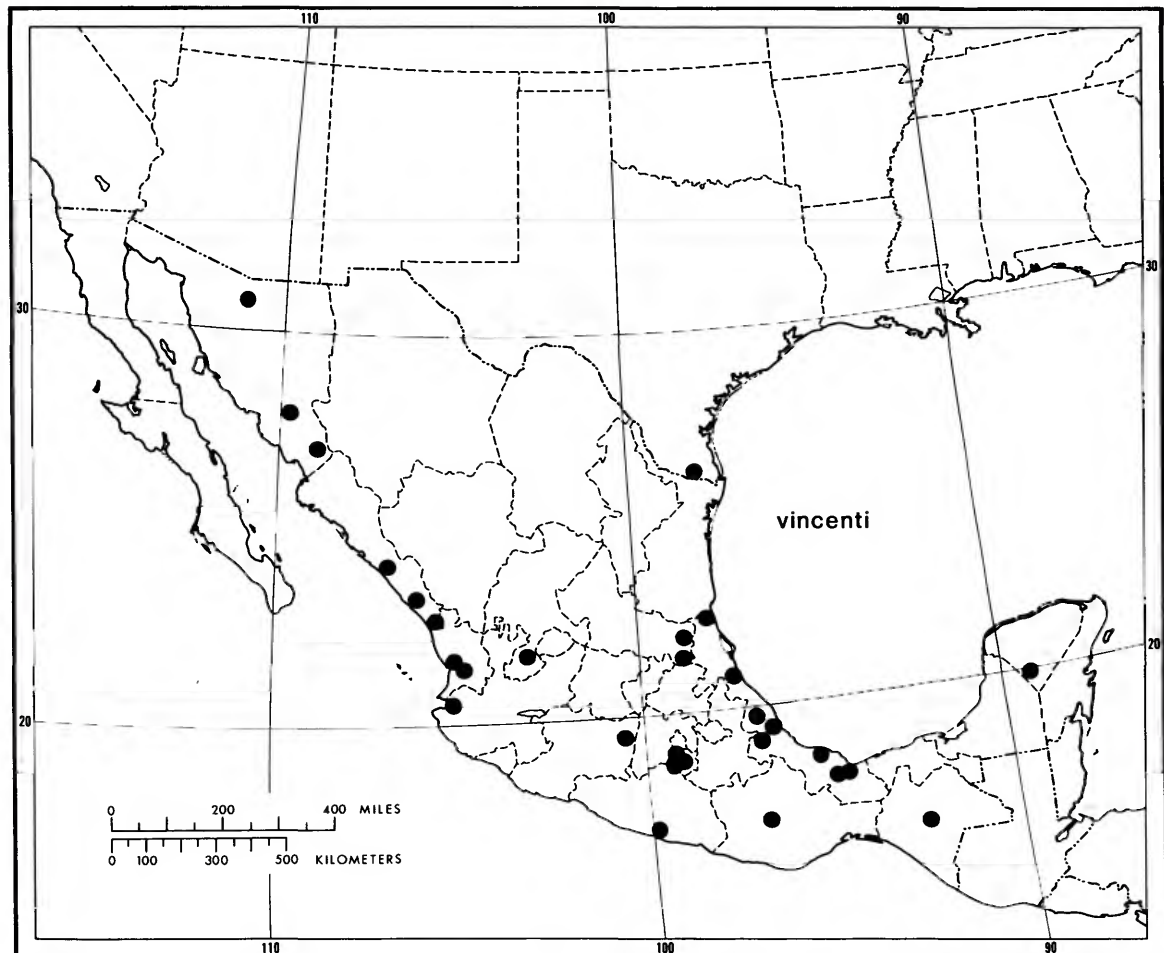
This species is known only from the male, which has simple, unmodified sterna. The ninth flagellomere always has an impressed cuneate sensory area extending its entire length, and occasionally a small one is also present on the base of the tenth flagellomere. *Liris infrunitus*,

new species, is similar in appearance to *L. vincenti* but its ninth flagellomere either lacks a cuneate sensory area or has only a small one at its base. The volsella bears outwardly curving bristles (Figure 17), unlike *L. infrunitus*, new species.

ETYMOLOGY.—This species is named for Mr. David L. Vincent in appreciation for the valuable knowledge of Neotropical *Liris*, which he shared with us during the later stages of this study.

HOLOTYPE.—♂; Mexico, Morelos, S end Cuernavaca, 4500', V-22-1959, H.E. Evans (USNM Type 100997).

MALE.—*Color:* Black; tarsi ventrally dark



MAP 17.—Known range in North America for *Liris vincenti*, new species.

brown; spines on legs whitish; wings light brown, apices slightly more infumated, veins brown.

Vestiture: Most of body sparsely covered with silvery subrecumbent vestiture, densest on lower half of face and in depressions between inner eye margins and antennal sockets; terga I–III with broad apical bands of silvery vestiture, IV and V with much narrower, fainter bands; tergal vestiture with dull coppery highlights.

Structure: Length, 7.3 mm; clypeus with free margin very gently and broadly rounded; flagellomeres III–IX with broad placoids extending entire length, X with only a very small area at base; admedian lines, notauli, and parapsidal lines faintly impressed; scutal punctures fine, deep, almost contiguous, those on mesopleuron slightly coarser; scrobal sulcus broad, diffuse, not strongly impressed; propodeal punctures somewhat coarser than those on mesopleura; sterna without specialized brushes, margins all entire, III–V with slight median concavities, increasing in extent posteriorly; genitalia as in Figure 17.

FEMALE.—Unknown.

PARATYPES.—UNITED STATES. Texas. Hidalgo Co.: 1♂, Mission, 5 Dec 1910 (UCD).

GUATEMALA. 2♂, Concepcion, 1400', 4 Mar 1932, C.N. Ainslie (USNM); 1♂, Guatemala City, 5000', Mar 1932, C.N. Ainslie (USNM); 2♂, El Rancho, 900', 15, 18 Feb 1932, C.N. Ainslie (USNM).

HONDURAS. 2♂, Zamorano, 21 Jan 1946, 27 Nov, T.D.A. Cockerell (USNM).

MEXICO. Chiapas. 3♂, 2 mi SE Revolution, 23 Mar 1953, E.I. Schlinger (UCD); 1♂, Tuxtla Gutierrez, 1000', 24 Apr 1959, H.E. Evans (USNM).

Guerrero. 8♂, Acapulco, 1 Jul 1951, P.D. Hurd, Jr. (UCB); 1♂, Xalitla, 1500', 20 Mar 1959, H.E. Evans, D.M. Anderson (USNM).

Jalisco. 11♂, Puerto Vallarta, 1 Jan 1971, P.H., M. Arnaud (CAS).

Michoacan. 1♂, Tuxpan, 6000', 31 May 1956, H.A. Scullen (UCD).

Morelos. 6♂, 3 mi N Alpuyecá, 3400', 9, 29, 30 Mar, 5 Jun 1959, H.E. Evans, and H.E. Evans, D.M. Anderson (USNM); 3♂, Cuernavaca,

5500', 5 Mar, 21 Jun 1959, H.E. Evans (USNM), 9♂, S end of Cuernavaca, 4500', 27 Mar, 2, 15 Apr, 11, 22 May, 2 Jun 1959, H.E. Evans (USNM), 1♂, mts. near Cuernavaca, Crawford (UCD); 2♂, Lake Tequesquitengo, 2800', 1 Jun 1959, H.E. Evans (USNM); 1♂, Las Estacas, 3000', 6 Jun 1959, H.E. Evans (USNM); 1♂, 4–7 mi S Yautepec, 3300', 13 Apr 1959, H.E. Evans (USNM).

Oaxaca. 1♂, Oaxaca, Crawford (UCD).

Nayarit. 1♂, Playa Matanchen, near San Blas, 7 Aug 1965, H.E. Evans (USNM); 3♂, San Blas, 20 Jul 1951, P.D. Hurd, Jr. (UCB); 2♂, 9 mi NW Santa Isabella, 10 Mar 1972, F.D. Parker, D. Miller (UCD).

San Luis Potosi. 3♂, Tamazunchale, 11 Jun 1951, H.E. Evans (USNM), 3♂, 400', 22 Dec 1970, P.H., M. Arnaud (CAS); 1♂, El Bonito, 7 mi S Ciudad Valles, 300', 19 Dec 1970, P.H., M. Arnaud (CAS).

Sinaloa. 3♂, Chupaderos, 600', 21 Aug 1962, H.E. Evans (USNM), 6♂, 15 May 1962, F.D. Parker, L.A. Stange (UCD); 13♂, 8 mi SE Elota, 19 May 1962, F.D. Parker (UCD); 1♂, Mazatlan (USU).

Sonora. 6♂, Alamos, 24, 25 Feb 1963, P.H. Arnaud, Jr. (CAS), 1♂, 7 Sep 1970, G.E., R.M. Bohart (USU), 1♂, 13 km W, 1 Sep 1975, B. Villegas (UCD); 1♂, Cocorit, 11 Jun 1961, F.D. Parker (UCD); 1♂, Magdalena, 14 Oct, on aquatic *Helianthus*, G.E. Bohart (USU).

Tamaulipas. 1♂, Playa Altamira, 5 Jul 1968, M.S. Wasbauer, J. Slansky (UCD).

Veracruz. 5♂, Acayucan, 23 Oct 1957, R., K. Dreisbach (MSU); 2♀, Coscomatepec, 27 Apr 1962, F.D. Parker, L.A. Stange (UCD); 1♂, Fortin de Las Flores-Sumidero, Planta de la Cerveceria, Ing., Daniel Rabago Res., 2500'–3000', 12 Dec 1968, H.V. Weems (FSDA); 2♂, Jalapa, Crawford (UCD); 1♂, Lago Catemaco, 14 Jul 1968, M.S. Wasbauer, J.E. Slansky (UCD); 9♂, Minatitlan, 26 Aug–1 Sep 1961, R., K. Dreisbach (MSU); 1♂, Sontecomapan, 16 Aug 1962, on *Cucurbita*, R.F. Smith (UCD); 1♂, Tecolutla, 28 Feb 1972, F.D. Parker, D. Miller (USU); 2♂, Veracruz, 28 Jul–11 Aug 1956, R., K. Dreisbach

(UCD), 12 Jun 1959, H.E. Evans (USNM).

Yucatan. 1♂, Kabah Ruins, 13 Aug 1963, Scullen, Bolinger (OSU).

Zacatecas. 2♂, 10 mi S Jalpa, 17 Sep 1970, G.E., R.M. Bohart (USU).

A paratype has been placed in the British Museum (Natural History).

27. *Liris (Leptolarra) infrunitus*, new species

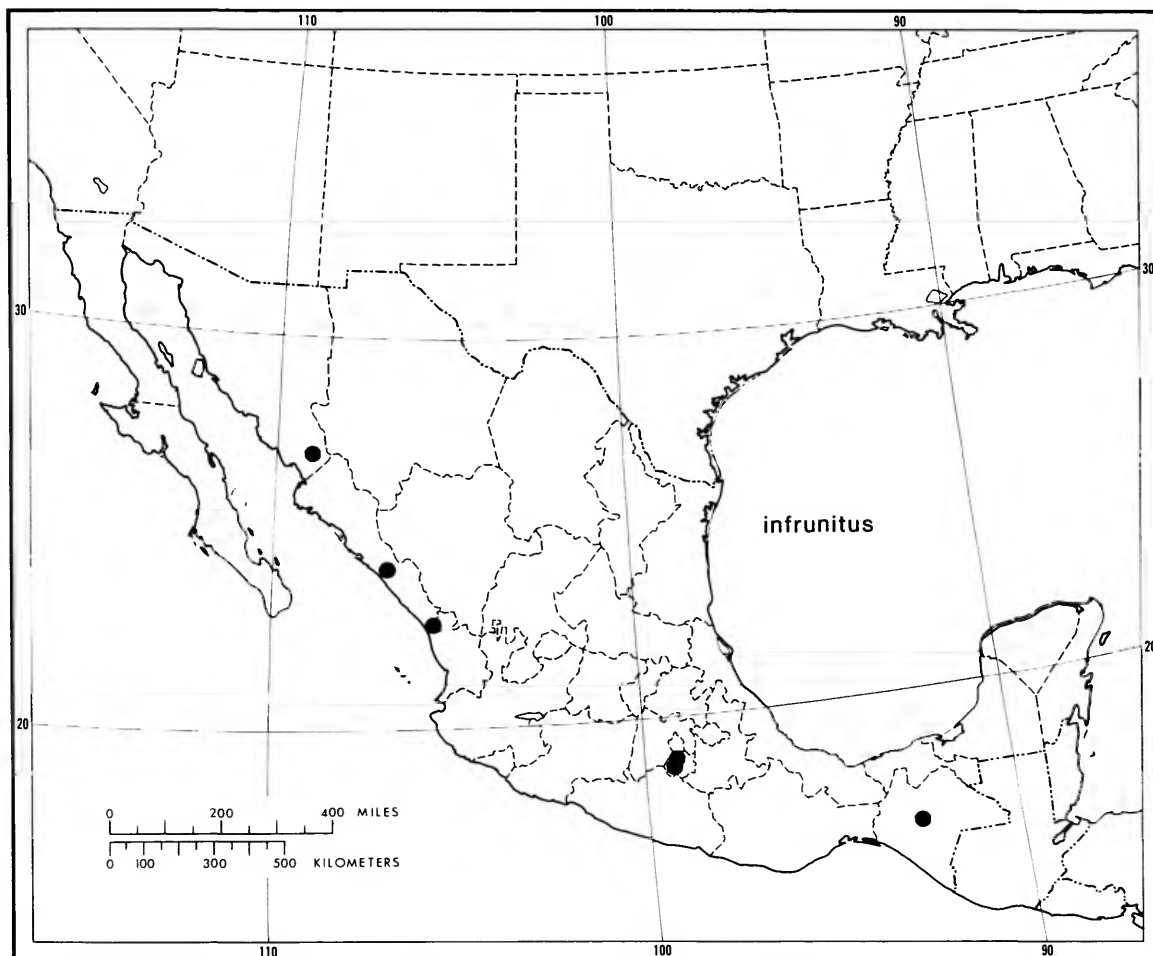
FIGURE 19; MAP 18

The females of this species are unknown. The males are small and lack sternal modifications.

The ninth flagellomere usually lacks a cuneate sensory area, but occasionally a small one is present at its base. The volsella (Figure 19) lacks outwardly curving bristles such as those found in the similar *L. vincenti*, new species (Figure 17).

ETYMOLOGY.—The specific epithet is from the Latin *infrunitus* (unfit for enjoyment) and was chosen because this is the most dull and featureless species treated in our study.

HOLOTYPE.—♂; Mexico, Morelos, 3 mi N Alpuyecá, 3400', V-9-1959, H.E. Evans (USNM Type 100998).



MAP 18.—Known range in North America for *Liris infrunitus*, new species.

MALE.—*Color:* Black; spines on legs whitish; wings slightly infumated, apices more so.

Vestiture: Body moderately densely covered with appressed silvery vestiture, densest on lower half of face; terga I–IV with apical bands of silvery vestiture.

Structure: Length: 6.8 mm; clypeus truncate, lateral angles of median lobe prominent; flagellomere III with broad placoid on apical half, IV–VIII with placoids on entire length, IX with a very small area at base; notauli and parapsidal lines more strongly impressed than admedian line; scutal punctures fine, deep, distinct, separated by less than one puncture width, mesopleural punctures similar; scrobal sulcus distinctly impressed; propodeal punctures slightly coarser than those on mesopleura; tergum VII lacking a lateral carina; sterna without brushes of specialized vestiture or other modifications; genitalia as in Figure 19.

FEMALE.—Unknown.

PARATYPES.—GUATEMALA. 1♂, Guatemala City, 5000', Mar 1932, C.N. Ainslie (USNM).

MEXICO. Baja California Sur. 1♂, San Bartolo

microwave station, 3 Oct 1981, D. Faulkner, F. Andrews (SDM).

Chiapas. 1♂, Tuxtla Gutierrez, 2 Aug 1957, J.A. Chemsak, R. J. Rannells (UCD).

Guerrero. 3♂, Xalitla, 1500', 20 Mar 1959, H.E. Evans, D.M. Anderson (USNM).

Morelos. 2♂, 3 mi N Alpuyeca, 3400', 8 Apr, 9 May 1959, H.E. Evans, 1♂, 9 Mar 1959, H.E. Evans, D.M. Anderson; 3♂, S end Cuernavaca, 4500', 2 Apr, 11, 22 May 1959, H.E. Evans (USNM).

Sinaloa. 2♂, Chupaderos, 15 May 1962, F.D. Parker, L.A. Stange (UCD); 1 ♂, 8 mi SE Elota, 19 May 1962, F.D. Parker (UCD).

Sonora. 2♂, Alamos, 5 Jan 1971, 27 Feb 1963, P.H., M. Arnaud (CAS), 1♂, 7 Sep 1970, on *Baccharis*, G.E., R.M. Bohart (USU), 1♂, 5 Sep 1970, malaise trap, W.J. Hanson, T.L. Whitworth (USU).

State unknown. 1♂, Ontagota, Yaqui Valley, 11-7-17, beaten from tree cotton, E.A. McGregor (USNM).

A paratype has been placed in the British Museum (Natural History).

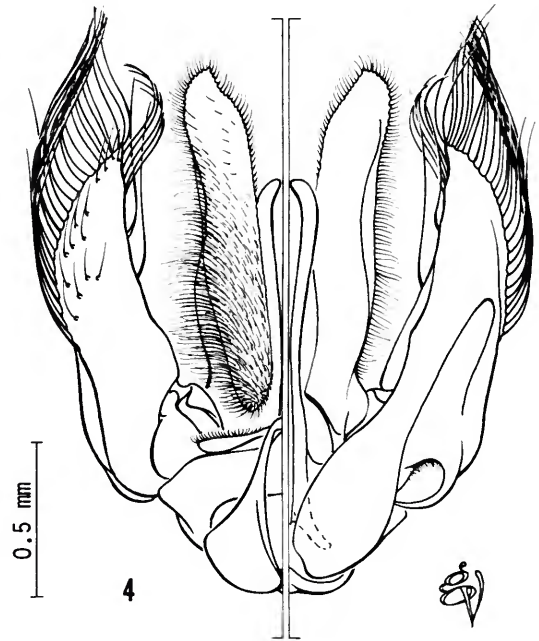
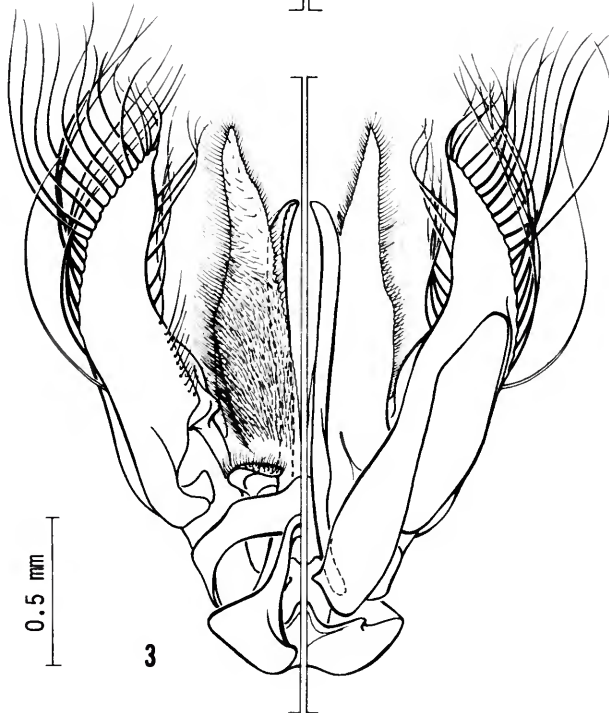
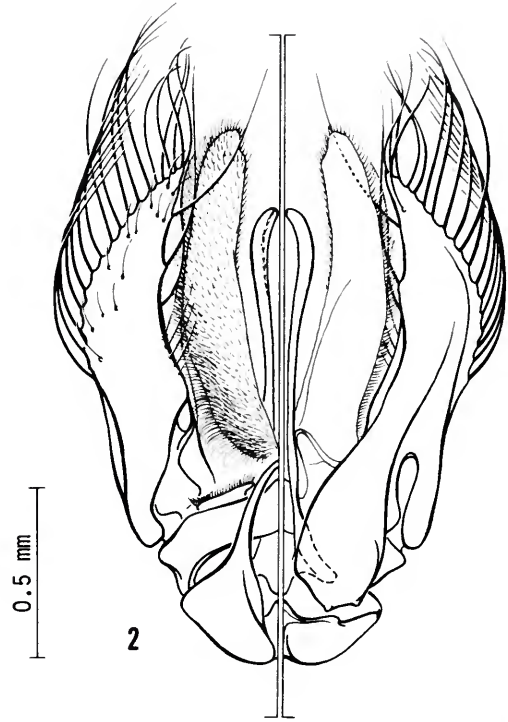
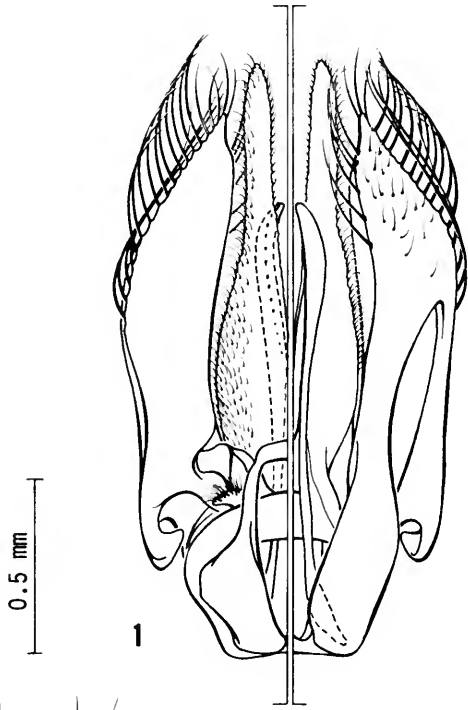
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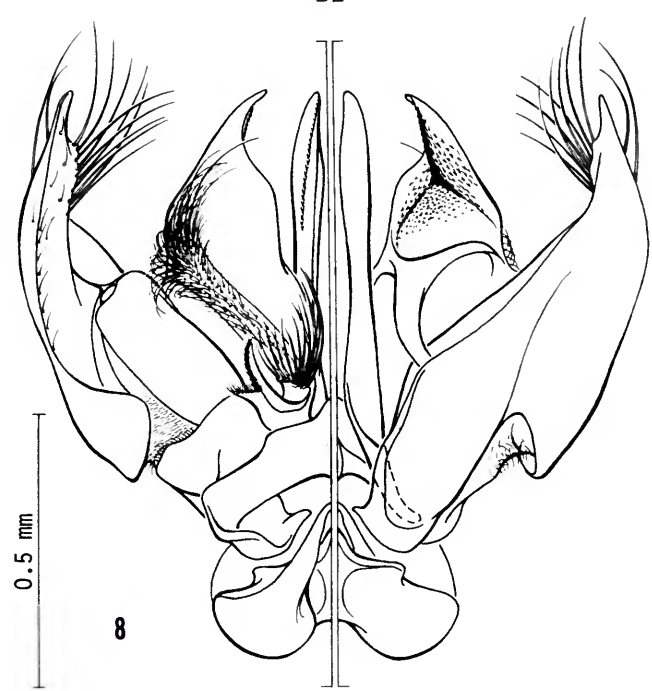
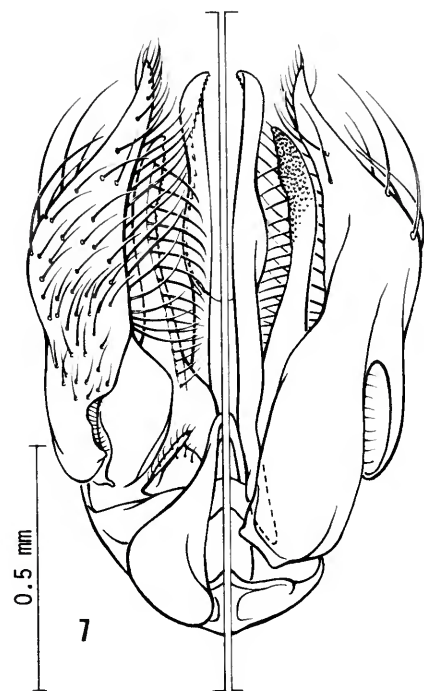
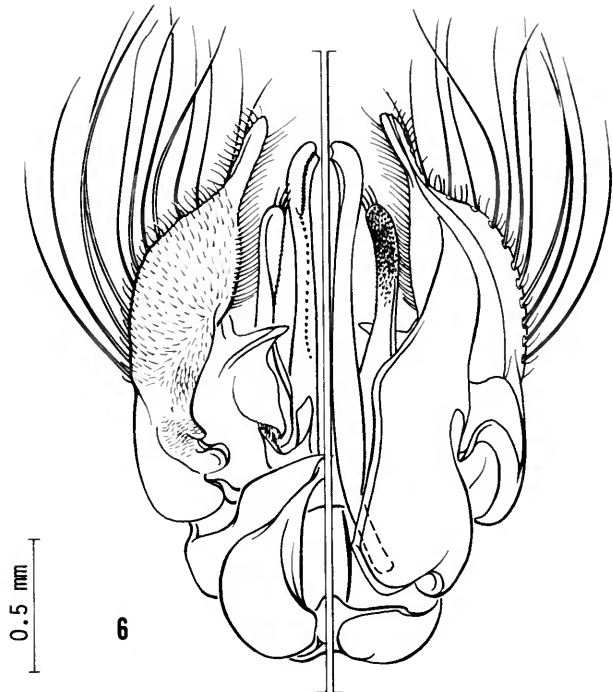
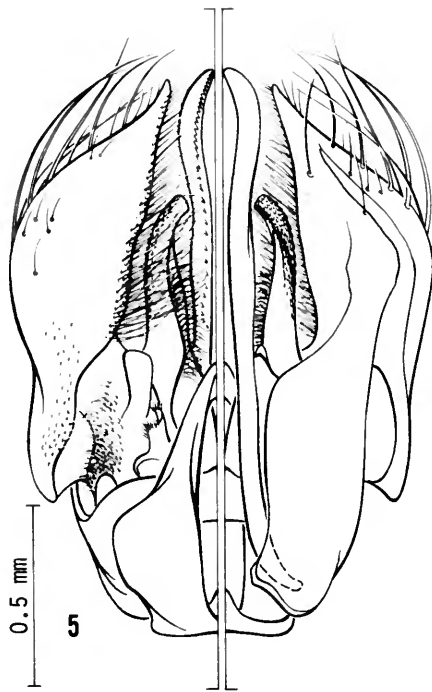
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Figures

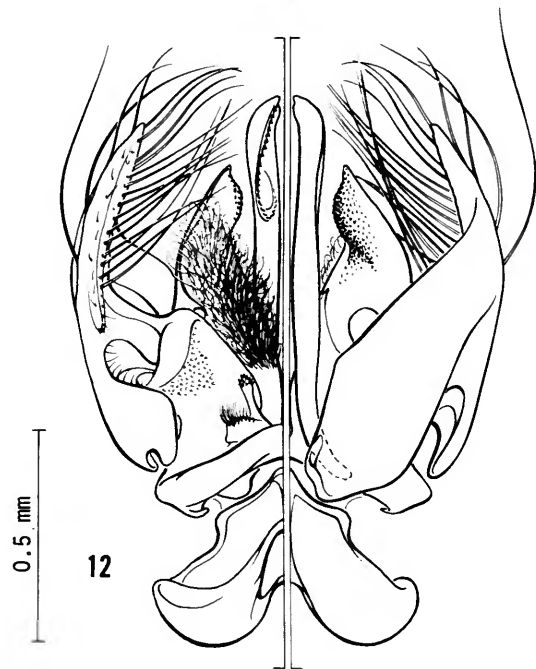
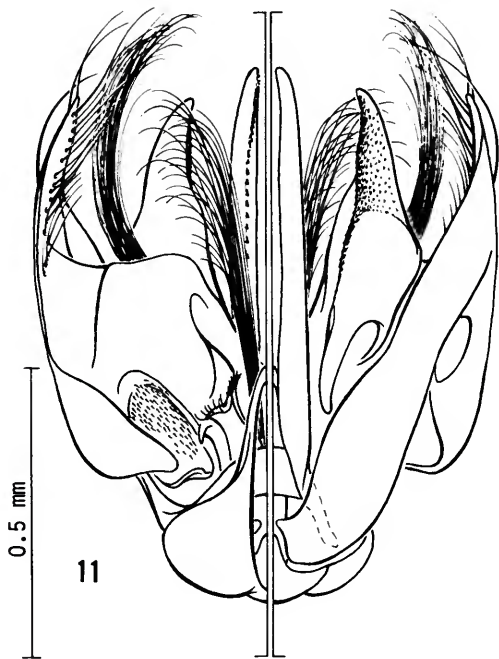
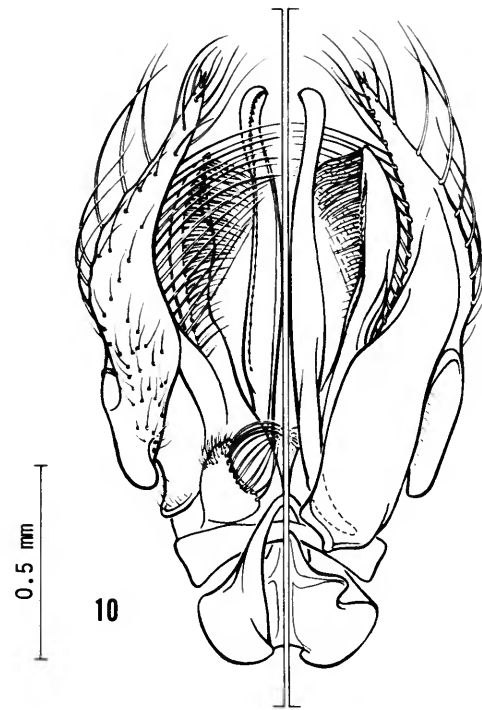
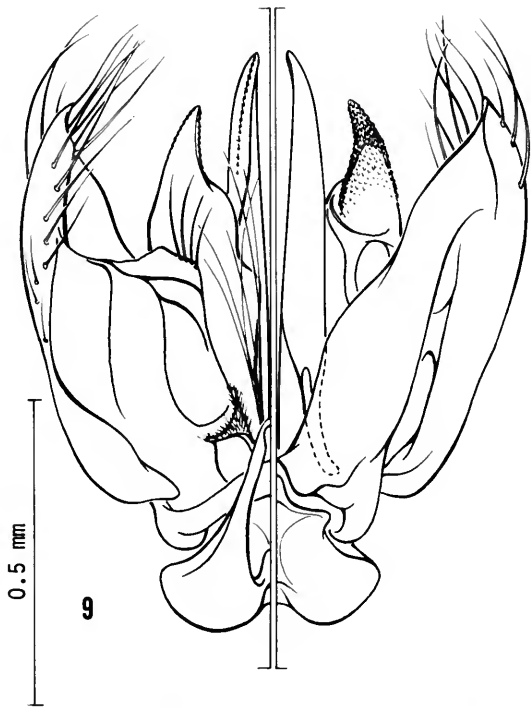
FIGURES 1-4.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 1, *L. argentatus* (Palisot de Beauvois); 2, *L. evansi*, new species; 3, *L. mescalero mescalero* (Pate); 4, *L. mescalero latus*, new subspecies.



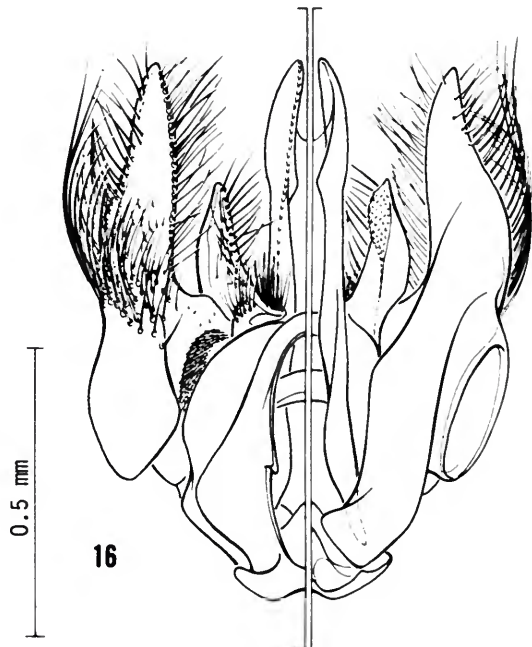
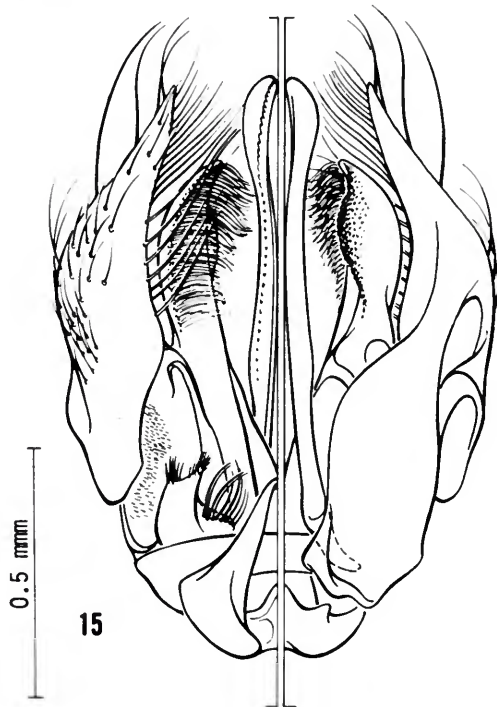
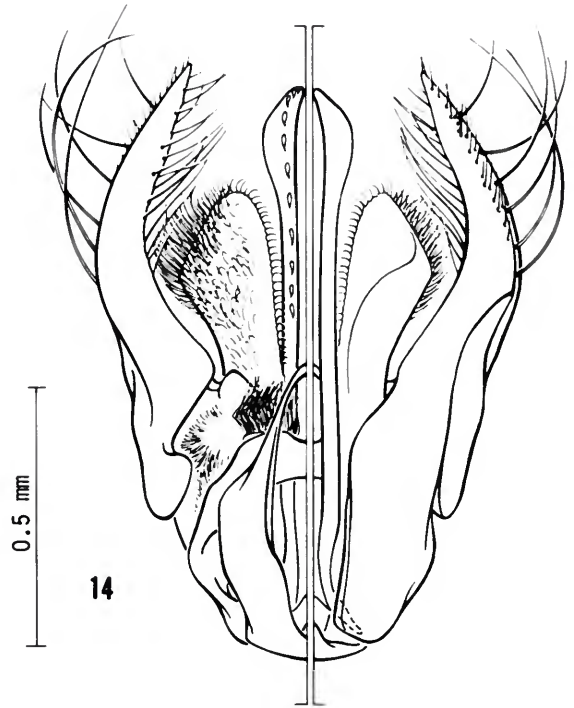
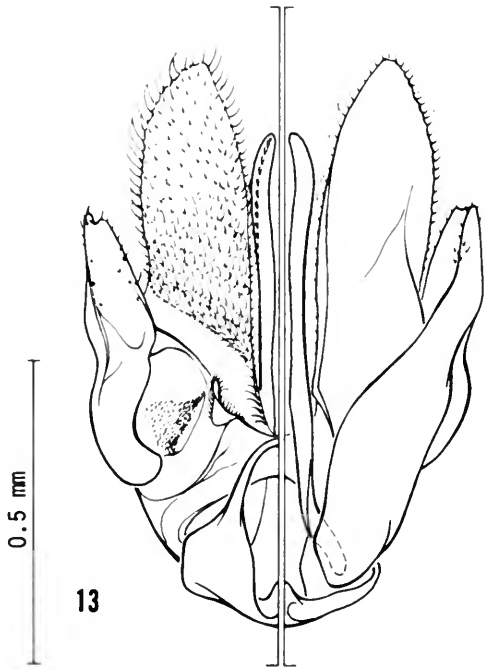
FIGURES 5-8.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 5, *L. beatus* (Cameron); 6, *L. rufipennis* Fabricius; 7, *L. apicipennis* (Cameron); 8, *L. deliquus*, new species.



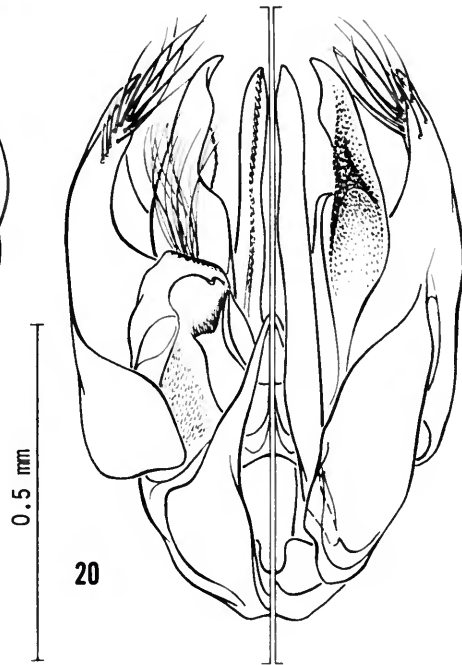
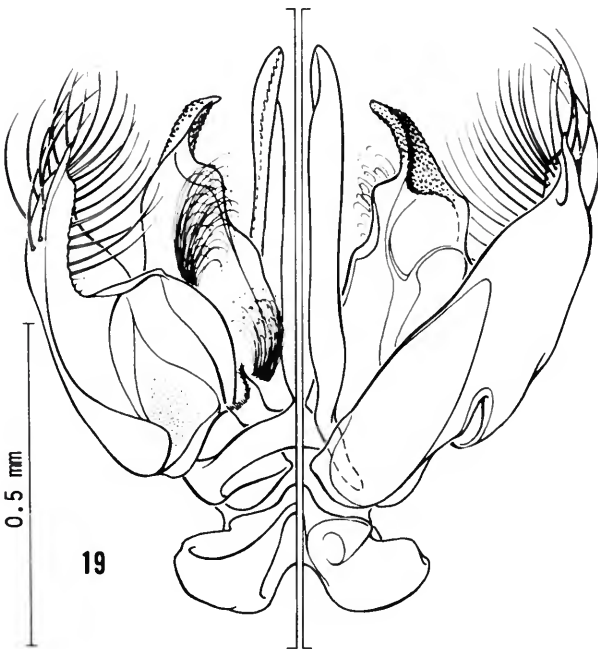
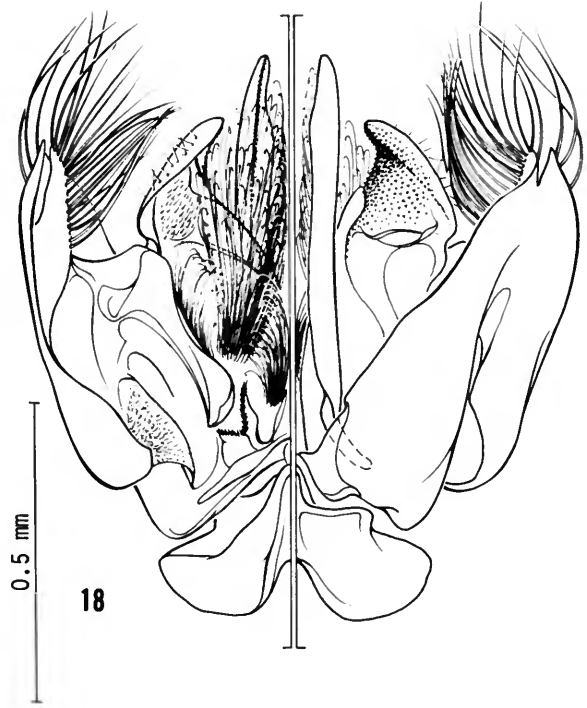
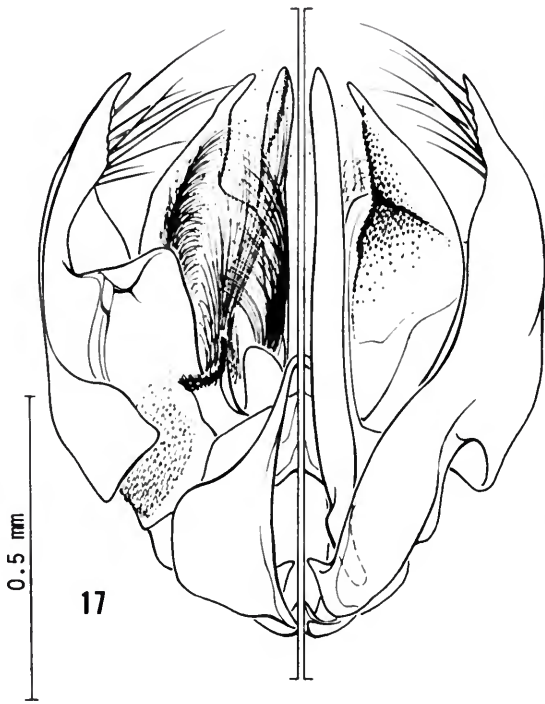
FIGURES 9-12.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 9, *L. mexicanus*, new species; 10, *L. argenticauda* (Cameron); 11, *L. panamensis panamensis* (Cameron); 12, *L. muspa* (Pate).



FIGURES 13–16.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 13, *L. nearcticus*, new species; 14, *L. nigrispinus*, new species; 15, *L. liparus*, new species; 16, *L. anticus* (Smith).

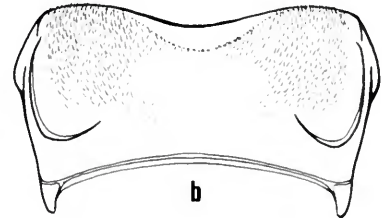
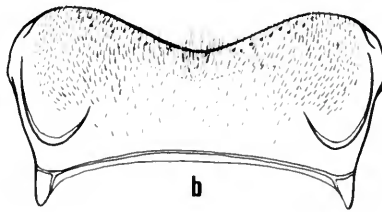
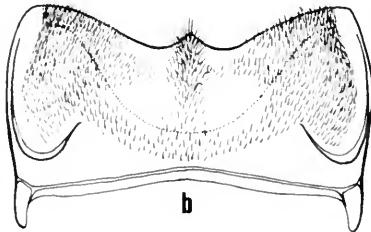
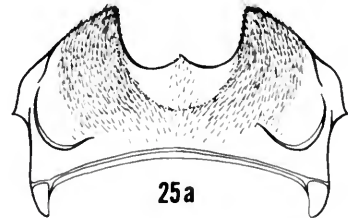
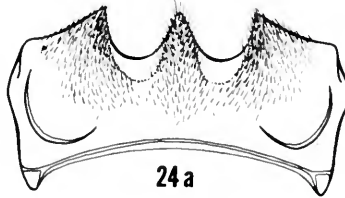
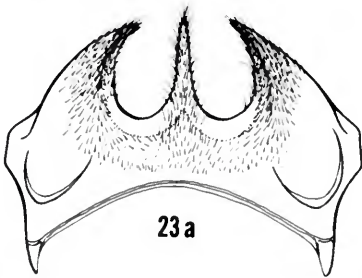
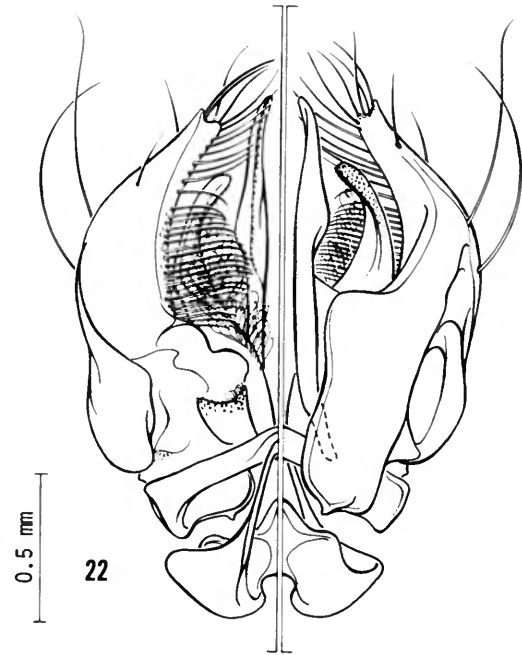
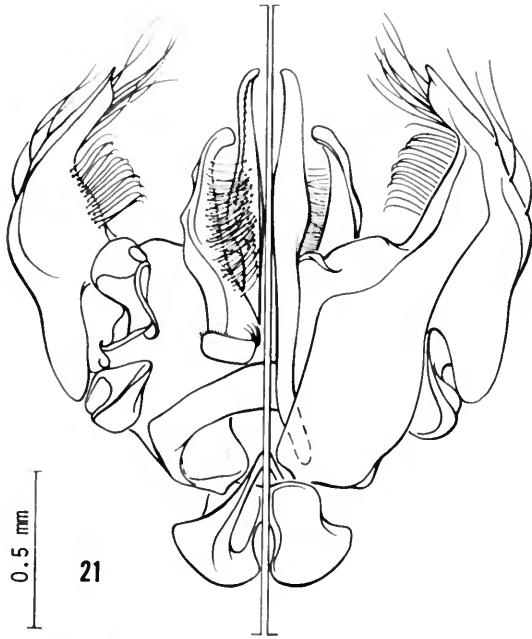


FIGURES 17–20.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 17, *L. vincenti*, new species; 18, *L. similis*, new species; 19, *L. infrunitus*, new species; 20, *L. asymphonus*, new species.

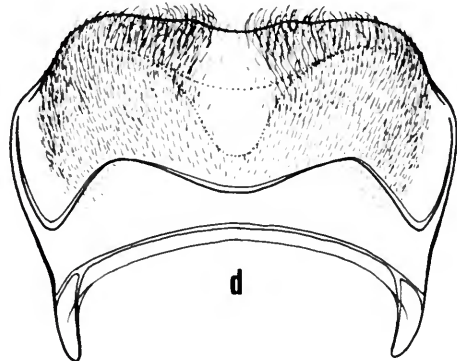
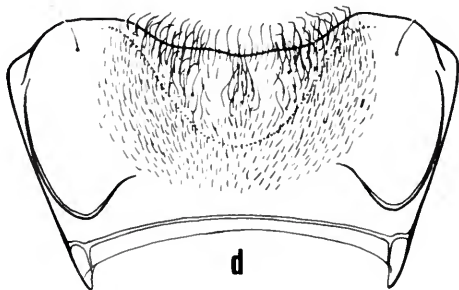
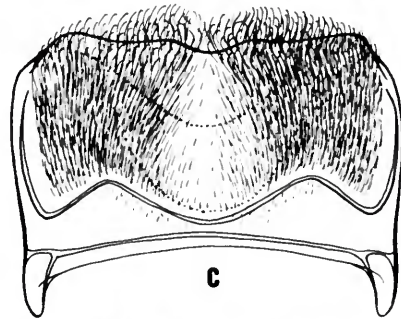
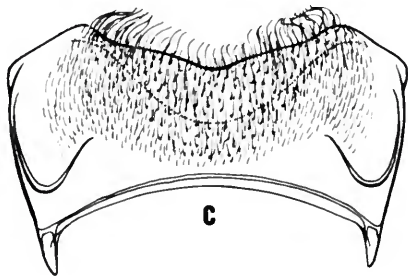
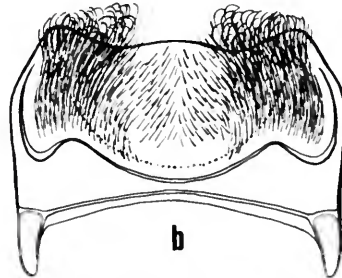
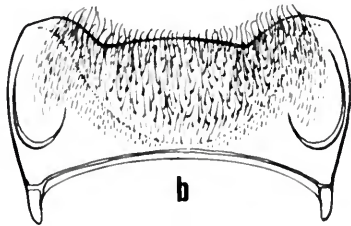
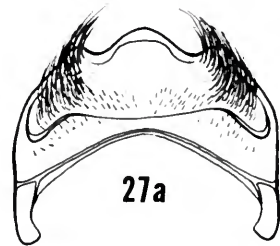
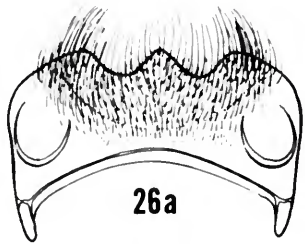


FIGURES 21, 22.—Male *Liris* genitalia, left side ventral view, right side dorsal view: 21, *L. luctuosus dahlbomi* (Cresson) 22, *L. luctuosus luctuosus* (Smith).

FIGURES 23–25.—Male *Liris* sterna VI (a), and V (b): 23, *L. mescalero mescalero* (Pate); 24, *L. mescalero latus*, new subspecies; 25, *L. evansi*, new species.



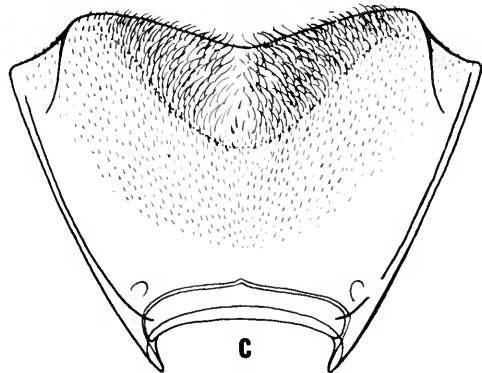
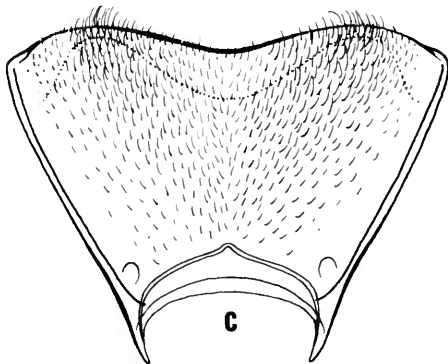
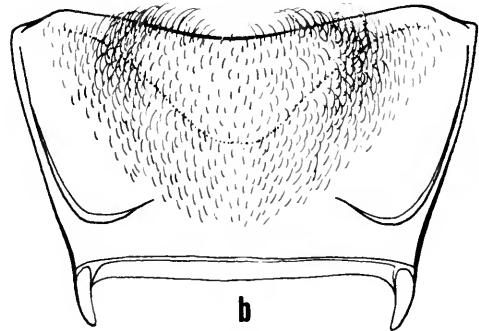
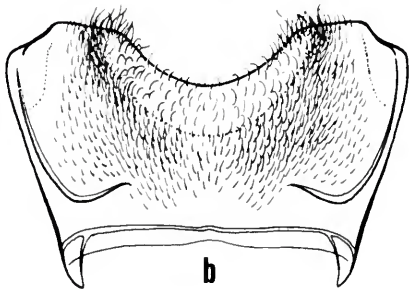
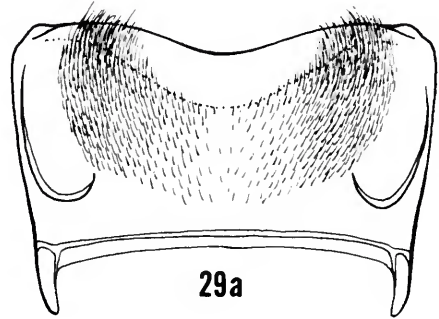
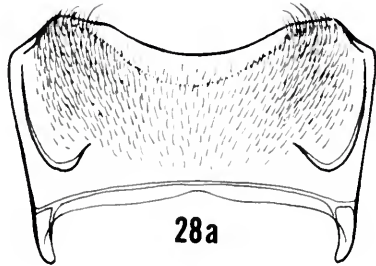
FIGURES 26, 27.—Male *Liris sterna* VI (a), V (b), IV (c), and III (d); 26, *L. argentatus* (Palisot de Beauvois); 27, *L. luctuosus luctuosus* (Smith).



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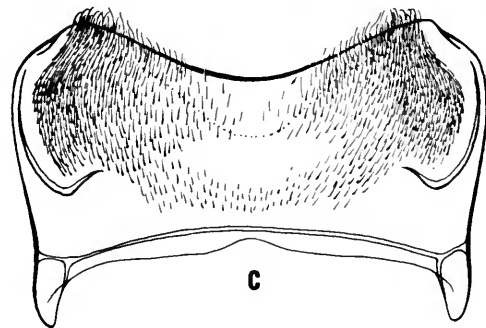
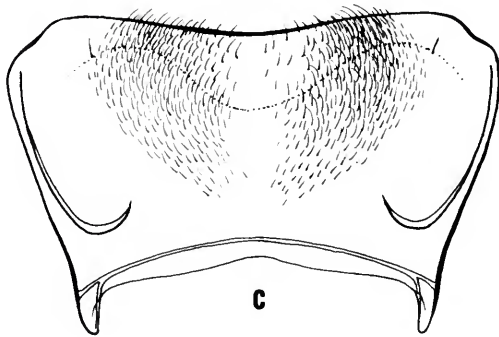
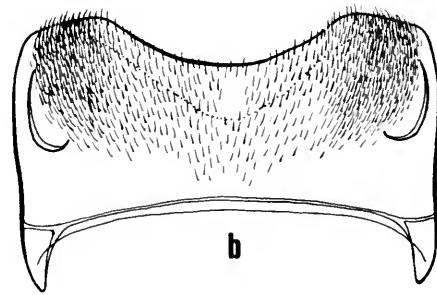
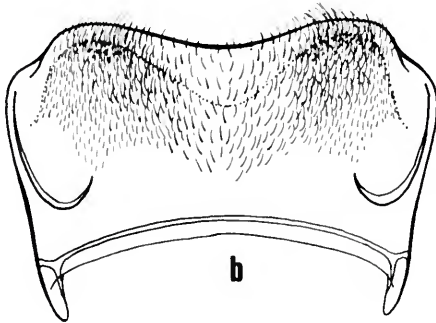
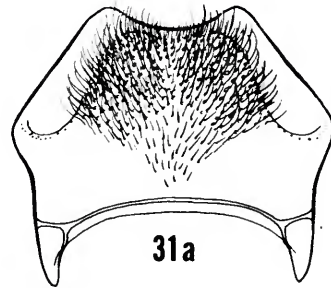
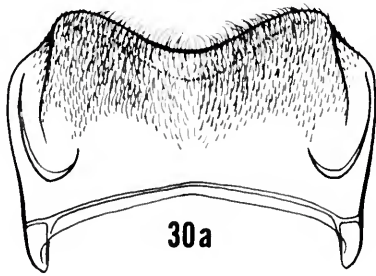
FIGURES 28, 29.—Male *Liris sterna* IV (*a*), III (*b*), and II (*c*): 28, *L. panamensis panamensis* (Cameron); 29, *L. panamensis muesebecki* (Krombein).



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FIGURES 30, 31.—Male *Liris sterna* V (*a*), IV (*b*), and III (*c*): 30, *L. mexicanus*, new species; 31, *L. muspa* (Pate).



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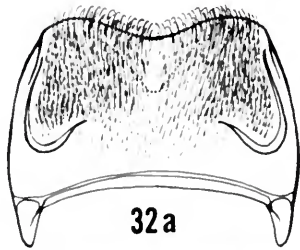
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FIGURE 32.—Male *Liris sterna* VI (a), V (b), and IV (c), *L. apicipennis* (Cameron).

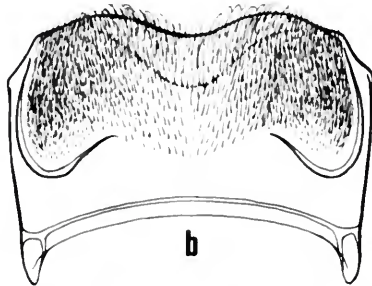
FIGURE 33.—Male sternum III, *L. argenticauda* (Cameron).

FIGURE 34.—Male sterna VII (a) and VI (b), *L. rufipennis* Fabricius.

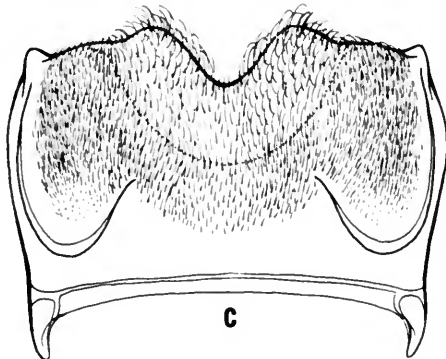
FIGURE 35.—Female hind face of propodeum, *L. muspa* (Pate).



32a

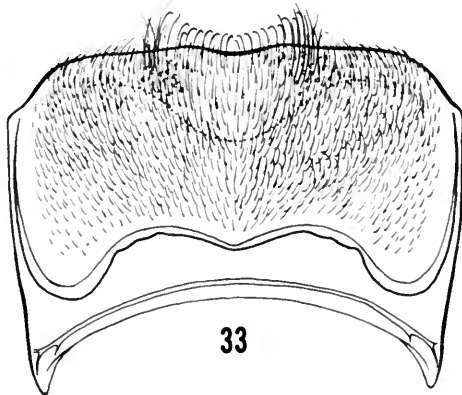


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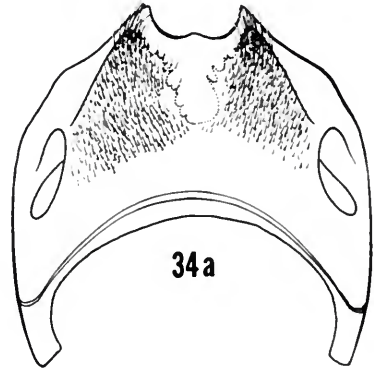
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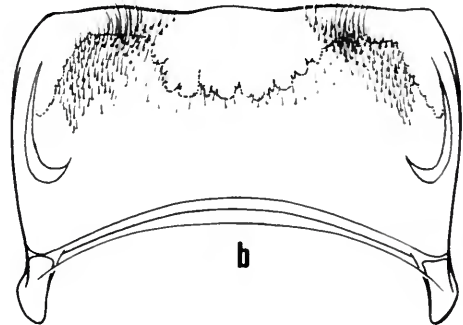


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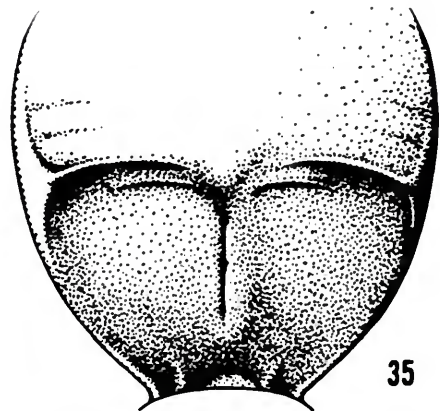


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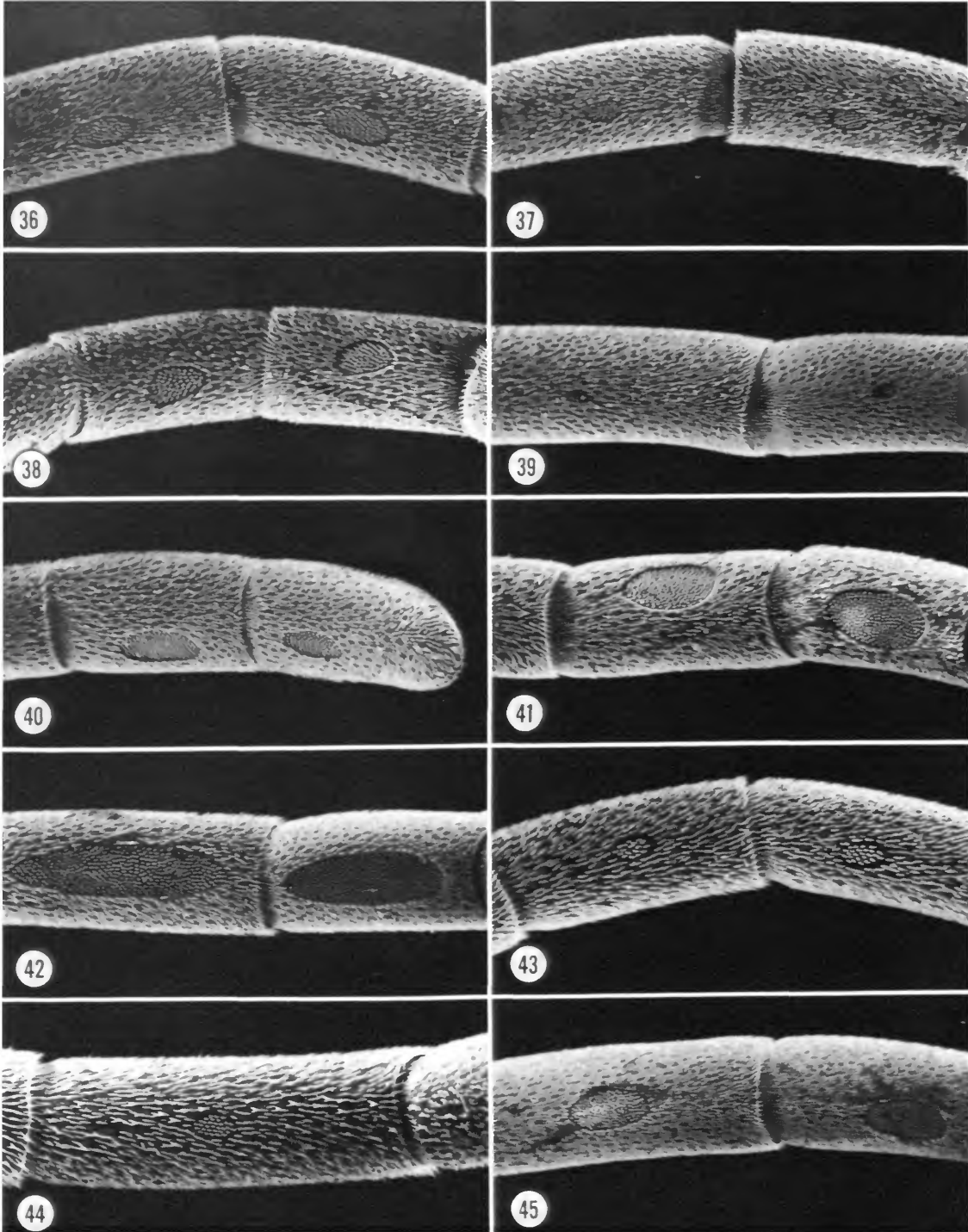
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35

FIGURES 36–45.—Female *Liris* flagellomeres showing sensory areas: 36, *L. argentatus* (Palisot de Beauvois) (×100); 37, *L. mescalero mescalero* (Pate) (×95); 38, *L. partitus*, new species (×100); 39, *L. beatus* (Cameron) (×85); 40, *L. apicipennis* (Cameron) (×100); 41, *L. mexicanus*, new species (×120); 42, *L. argenticauda* (Cameron) (×100); 43, *L. nearcticus*, new species (×150); 44, *L. panamensis panamensis* (Cameron) (×125); 45, *L. luctuosus luctuosus* (Smith) (×85).



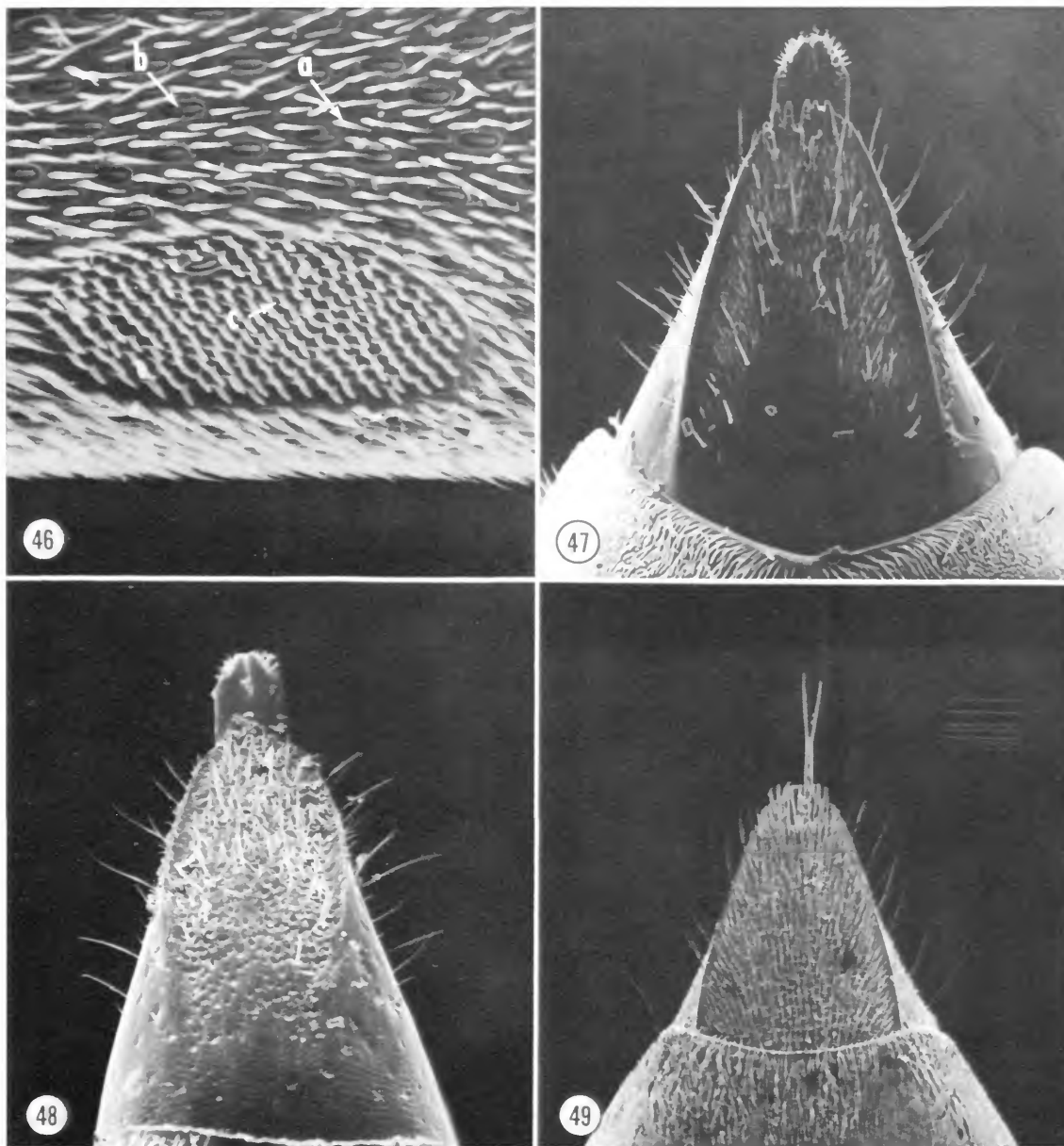


FIGURE 46.—Female flagellar sensory area, *L. apicipennis* (Cameron) (×525) (a = tactile hair, b = sensilla placodea, c = sensilla basiconica).

FIGURES 47–49.—Female *Liris*, pygidium: 47, *L. apicipennis* (Cameron) (×65); 48, *L. deliquus*, new species (×80); 49, *L. beatus* (Cameron) (×34).

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Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under "Literature Cited." For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in "Literature Cited") is optional.

Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones, 1910:122)" or "... Jones (1910:122)." If bibliographic footnotes are required, use the short form (author,

brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed "Literature Cited," "References," or "Bibliography." Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses/colon system for volume(number):pagination: "10(2):5-9." For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

Legends for illustrations must be submitted at the end of the manuscript, with as many legends typed, double-spaced, to a page as convenient.

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Some points of style: Do not use periods after such abbreviations as "mm, ft, USNM, NNE." Spell out numbers "one" through "nine" in expository text, but use digits in all other cases if possible. Use of the metric system of measurement is preferable; where use of the English system is unavoidable, supply metric equivalents in parentheses. Use the decimal system for precise measurements and relationships, common fractions for approximations. Use day/month/year sequence for dates: "9 April 1976." For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc. Omit space between initials of a personal name: "J.B. Jones."

Arrange and paginate sequentially every sheet of manuscript in the following order: (1) title page, (2) abstract, (3) contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes section, (8) glossary, (9) bibliography, (10) legends, (11) tables. Index copy may be submitted at page proof stage, but plans for an index should be indicated when manuscript is submitted.

