

A REVISION OF THE LEPTOGAS-  
TRINAE IN THE UNITED  
STATES (DIPTERA,  
ASILIDAE)

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## INTRODUCTION

STUDENTS OF THE Leptogastrinae found in the United States have used the genus *Leptogaster*, which was originally described from Europe, as the repository for the small numbers of species each described. *Leptopteromyia*, only recently recognized in the United States, was described by Williston from South America. In 1913 Cockerell designated *Leptogaster badius* Loew as the genotype of *Tipulogaster*. In 1923 Aldrich arbitrarily synonymized *Tipulogaster* and erected *Psilonyx*, with *Leptogaster annulatus* Say as the genotype. First, D. E. Hardy (1942) arbitrarily reduced *Psilonyx* to a subgenus, and then Bromley (1951) in the same fashion reduced it to a synonym of *Leptogaster*.

A study of described and undescribed species of the Leptogastrinae shows that the genus *Leptogaster* contains several unrelated groups and isolated species. Two of the isolated species are removed from *Leptogaster* by the recognition of the monobasic genus of *Tipulogaster* Cockerell and *Psilonyx* Aldrich. With the erection of two new genera, *Beameromyia* and *Apachekolos*, a total of six described species are removed from *Leptogaster* and 13 new species are assigned to these genera. Even with the erection of these genera, several unrelated groups and isolated species are still present in *Leptogaster*. These groups and species are discussed under *Leptogaster*.

A total of 23 valid species of Leptogastrinae have been described from the United States. Twenty-two species have been placed in *Leptogaster* by writers and one in *Leptopteromyia*. Back (1909) in his monograph recognized 17 species in *Leptogaster*. *Leptogaster ochraceus* and *testaceus* of his list are considered synonyms in the present paper. Johnson (1913) added *floridensis* to Back's list. Banks (1914) described *loewi* which is considered here as a synonym of *flavipes*. Bromley (1934, 1951) described *texanus* and *weslacensis* from Texas. James (1937) described *arenicola* and *coloradensis* from Colorado. D. E. Hardy (1942) described *occidentis* and *bifidus* from Arizona which are included in the new genus *Beameromyia*, and in 1947 described *Leptopteromyia americana* from Texas. *Leptogaster obscuripes* Loew was

described from Cuba but is reported from the United States for the first time in this paper.

During the past seven years the writer has assembled an extensive collection of Leptogastrinae both by collecting and by borrowing. The series representing each species ranges from a single specimen for a few species up to as many as 200 for other species. Altogether, between 3000 and 3500 specimens have been examined, including those studied at museums. In this collection are 23 of the 24 valid species which have been described in the past. In addition, there are 13 undescribed species in *Leptogaster*, 11 undescribed in the new genus *Beameromyia*, and two undescribed in the new genus *Apachekolos*. Thus the subfamily Leptogastrinae is now represented by 50 species in six genera in the United States. Additional undescribed species represented only by females or by damaged males are at hand.

## ACKNOWLEDGMENTS

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Paratypes, wherever possible, are to be deposited in the American Museum of Natural History.

#### TECHNIQUE

The identification and studies of *Leptogaster* for this paper were done under a binocular microscope with magnifications of 36 $\times$  and 80 $\times$ . In the examination of the penis valves a higher power than 80 $\times$  would have been useful. A 100-W projection lamp furnished ample light.

Specimens were prepared for study by being kept in a moist chamber for two to three hours. They were then placed under a 36 $\times$  lens, and the gonoforceps were carefully spread either with a jeweler's needle-pointed forceps or with a pair of needles made from No. 000 insect pins, with the points bent to a 90-degree angle. The gonoforceps were carefully and repeatedly spread until the tissue hinging them basally and the muscles inside became sufficiently stretched so that the gonoforceps remained in the position desired. Once the gonoforceps were spread, the penis valves could be easily examined under 80 $\times$  magnification. Sometimes it was necessary to break off the hairs of one gonoforceps in order to examine the valves properly.

#### THE SUBFAMILY LEPTOGASTRINAE

G. H. Hardy (1935, 1948) has proposed uniting the subfamily Leptogastrinae with the Asilinae on the basis of the prosternum and "visible characters of the terminalia." Carrera (1950) has followed Hardy in the classification of Neotropical genera of Asilidae.

Contrary to this proposal many other authors consider the Leptogastrinae as a valid subfamily. Melin (1923, p. 207), who has studied the biology and the immature stages of the Asilidae, writes: "... the genus *Lepto-*

*gaster* . . . is widely separated from other Asilids. . . " not only "... through the absence of alulae and pulvilli. . . " of the adults "... but also through certain characters in their stages of development." He further states that the *Leptogaster* larvae are without maxillae, the upper lip is short, and the mandibles and the last abdominal segments are different from those of other Asilidae. In the pupae the posterior antennal processes are absent, and the appearance of the anterior antennal processes and the whole of their bristly covering separate them from other asilids.

The present writer believes that Melin's data strongly indicate that *Leptogaster* is only remotely related to the Asilinae, and also that the abdomen in the Leptogastrinae, the anterior abdominal sternites, and the organization of the male genitalia add weight to the conclusion that either the Leptogastrinae should be retained as a subfamily or the subfamily should be raised to a family rank.

**ABDOMEN OF LEPTOGASTRINAE:** In all the species of Leptogastrinae that the writer has studied, the second abdominal segment is several times longer than wide. While segments 3 and 4 are usually shorter than segment 2, the ratio of the length to the width is always much greater than that found in other Asilinae. This abdominal character seems to represent an abrupt and wide gap between Leptogastrinae and the other asilids.

**ANTERIOR ABDOMINAL STERNITES:** In 1908 Lundbeck called attention to the peculiar morphology of the first and second abdominal segments of *Leptogaster cylindrica* (De Geer), the genotype of *Leptogaster* Meigen. In this species the tergite of the first abdominal segment is short, while sternite 1 extends beneath tergite 2 for half of its length. This is also evident in North American species of *Leptogaster*. Also, there is a tendency for these sternites to become obsolete. In *Leptopteromyia* the sternites are obsolete in the four anterior abdominal segments. The genus *Beameromyia* shows an intermediate condition between *Leptopteromyia* and *Leptogaster*.

In all the Asilinae examined from North America and other continents, sternites 1 and 2 are always broad and are always located beneath their own tergite. There is no



tendency for the anterior sternites to become obsolete as is found in the Leptogastrinae.

**ORGANIZATION OF MALE GENITALIA:** The organization of the male genitalia of the Leptogastrinae is very different from that of the Asilinae. In most of the Leptogastrinae studied the penis has two components, while in the Asilinae there are three. The penes of many specimens of *Beameromyia* are extended as very long slender tubes. Some of the penes are divided for a short distance apically. Under proper lighting the two components can be seen continuing basad. In a second group of *Leptogaster* the penes are very large in diameter. Through the transparent walls of the larger penes two components can be seen which terminate apically in two short, tube-like structures. In other types of penes in the Leptogastrinae the division into components is not evident. Apparently, the penes are alike for species of the same genus.

What the writer interprets as penis valves (fig. 29) rise on sternite 9 at a considerable distance posterior to the base of the penis. The penis extends from beneath the proctiger posteriorly between the penis valves. In the Leptogastrinae the penis valves undergo many complex modifications which are useful for classification. In the genus *Leptogaster*, *sensu stricto*, there are two pair of penis valves (fig. 21).

In the genotype, *Asilus crabroniformis* Fabricius, the penis valves are completely fused to the penis except apically there is a brief separation so that three prongs appear (fig. 39). There are many modifications of the fused area but the trident pattern is typical of the Asilinae.

**INNER FORCEPS:** The presence or absence of forcep-like structures on the inner surface of the gonoforceps (fig. 38) is a constant difference between the Asilinae and the Leptogastrinae. In all the Asilinae examined by the writer the inner forceps were always present. Such structures have never been found on the inner surface of the gonoforceps of the Leptogastrinae.

## THE GENERA OF LEPTOGASTRINAE

The following key separates the Leptogastrinae into the six genera which the writer recognizes at the present time.

### KEY TO THE GENERA OF LEPTOGASTRINAE IN THE UNITED STATES

1. Four posterior cells in wings; length of thorax equal to length of halteres; sternites 1, 2, 3, and 4 of abdomen obsolete; third antennal segment without style . . . . . *Leptopteromyia* Williston
- Five posterior cells in wing; length of thorax 1.5 to 2 times the length of the halteres; abdominal sternites 3 and 4 not obsolete; third antennal segment with style . . . . . 2
2. Third antennal segment long and slender, style long; abdominal segment 2 thickened; arms of gonoforceps of about equal width . . . . . *Tipulogaster* Cockerell
- Third antennal segment not long and slender; abdominal segment 2 thinner . . . . . 3
3. Without median band of hair on abdominal segment 2; wing vein  $M_2$  usually straight but angulate in some species . . . . . 5
- With median band of hair on abdominal segment 2; sternites 1 and 2 narrow to obsolete, fused to tergite 2; wing vein  $M_2$ <sup>1</sup> sharply angulate . . . . . 4
4. Without empodia; male gonoforceps deeply bifid, dorsal arm very narrow, ventral arm broad, primary and secondary penis valves fused, forming block-like structures . . . . . *Psilonyx* Aldrich
- With empodia; male gonoforceps taper to point, except in *floridensis* expanded apically and notched; male genitalia with primary, secondary, and tertiary penis valves, with median process immediately below valves . . . . . *Beameromyia*, new genus
5. Femora long, slightly swollen apically, tibiae long, slender; female tergite 9 with two lateral narrow lobes forming a notch; gonoforceps deeply bifid, ventral arm broader than upper . . . . . *Apachekolos*, new genus
- Femora more strongly clavate; female tergite 9 not notched . . . . . *Leptogaster* Meigen

<sup>1</sup> While the older system of wing venation described by Williston is generally used here, Comstock's  $M_2$  is less clumsy for this particular venation.

## SYSTEMATIC DESCRIPTIONS

### LEPTOPTEROMYIA WILLISTON

*Leptopteromyia* WILLISTON, 1907, Jour. New York Ent. Soc. vol. 15, p. 1. (*Nomen nudum*.)

*Leptopteromyia* WILLISTON, 1908, Manual of North American Diptera, ed. 3, p. 195, fig. 35. (*Leptopteromyia gracilis* figured but not described.)

*Leptopteromyia*, ALDRICH, 1923, Proc. U. S. Natl. Mus., vol. 62, p. 3. (*Leptopteromyia gracilis* designated as genotype.)

*Leptopteromyia*, HERMANN, 1924, Verhandl. Zool.-Bot. Gesell. Wien, vol. 74, p. 143. (*Leptopteromyia willistoni* Hermann designated as genotype.)

*Leptopteromyia*, HARDY, 1947, Jour. Kansas Ent. Soc., vol. 20, pp. 72-74. (First generic description.)

*Leptopteromyia*, CARRERA, 1947, Papeis Avulsos, vol. 8, pp. 89-96. (Complete description of genotypic species.)

Only *Leptopteromyia americana* Hardy is found in the United States, in southern Texas. The male genitalia of this species are very much smaller but in some respects resemble those of the *brevicornis* group in *Leptogaster*. As in the *brevicornis* group, the gonoforceps are undivided, and sternite 9 does not have a median triangular or rectangular area. The secondary penis valves are triangular in shape and subequal in length to the primary valves. In *Leptopteromyia* the secondary valves are laterad to the primary valves as in the *flavipes* group. Carrera's figure of the male genitalia of *Leptopteromyia gracilis* indicates that the American species is not closely related to it.

### TIPULOGASTER COCKERELL

*Tipulogaster*, COCKERELL, 1913, Entomologist, vol. 46, p. 214. (Genotype: *Leptogaster badius* Loew.)

*Leptogaster*, ALDRICH, 1923, Proc. U. S. Natl. Mus., vol. 46, p. 5.

In 1913 Cockerell designated *Leptogaster badius* Loew as a genotype of *Tipulogaster* in these words: "In the American *L. badius* the anal cell is narrowed apically as in *L. hellii*, but the second posterior cell is no more produced basally than in *Cophura*. *L. cylindrica* (*tipuloides* Fabr.) is the type of *Leptogaster*; *L. badius* Loew may stand as the type of a new subgenus (or genus?)."

"*Tipulogaster*. This also has the second submarginal cell shorter than in typical

*Leptogaster*, while the distance between its base and the anterior crossvein is much greater."

The genotype, *Leptogaster badius*, is not closely related to any other species of Leptogastrinae in North America. The tapering long, third antennal segment with a long style is characteristic of this genus. *Leptogaster parvoclava* has a long, clavate, third antennal segment with a short style (fig. 32). The  $M_2$  wing vein is variable in the degree of angulation, but usually the angulation is not so sharp as in *Psilonyx* and *Beameromyia*. The second abdominal segment is shorter in proportion to its width than in other *Leptogaster*. The arms of the gonoforceps are about of equal width (fig. 37). The primary penis valves together form a horseshoe-shaped structure lying flat on the dorsal surface of sternite 9. Between the opening of the arms of the horseshoe are two lobes covered on the inner surface with white hair. Between them rises a median clavate process covered with white hair. The penis passes between the primary valves and through the dense white hair on their inner surfaces. The smooth sternite 9 projects posteriorly at a slight angle to the horizontal axis of the body.

### *Tipulogaster badius* (Loew)

#### Figure 37

*Leptogaster badius* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 188.

*Leptogaster badius*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 160-161.

*Tipulogaster badius*, COCKERELL, 1913, Entomologist, vol. 46, p. 213.

*Leptogaster badius*, ALDRICH, 1923, Proc. U. S. Natl. Mus., vol. 62, p. 5.

?*Leptogaster rubida*, WILLISTON, 1901, Biologia Centrali-Americana, Diptera, vol. 1, suppl., p. 299. (Believes *testaceus* a synonym of *rubida* from South America.)

?*Leptogaster rubidus*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 172-173.

*Leptogaster testaceus* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 190. (New synonymy.)

The writer has examined most of the specimens of *Leptogaster badius* and *testaceus* in the major collections of Asilidae in the United States; the male genitalia of the two species were always the same, the antennae



did not differ, and other characters were similar. A comparison of the type specimens at the Museum of Comparative Zoölogy showed that the two species are the same. Both type specimens of *badius* are females (Back stated that one was a male), and the single type specimen of *testaceus* is a female. Both species were described in the same paper, and *badius* is given priority by pagination.

*Tipulogaster badius* is a variable species. The color of the polished area of the thoracic dorsum varies from pale reddish yellow to almost totally black. Between these two extremes occur specimens with three partially diffuse notal stripes. The anterior cross vein is usually at the middle of the discal cell, but it may be far basad or somewhat distad of the middle. Usually the pollinosity of the vertex, thorax, and abdomen is grayish white. This pollinosity is golden on a few specimens from Wisconsin. On other specimens the pollinosity is not so noticeable. The male genitalia were alike in these specimens. This species is included in the key to *Leptogaster*.

Interestingly, Williston doubtfully considered *testaceus* as a synonym, but of *Leptogaster rubidus* Wiedemann. His description of a specimen from Mexico (northern Yucatan) indicates that the specimen may be *Leptogaster badius* Loew. Known specimens of *badius* have been collected in the eastern part of the United States and as far southwest as Texas.

The shining reddish yellow mesonotum with three black stripes of *Leptogaster intima* Williston is similar to that of many specimens of *badius*. However, the length of the third antennal segment of *intima* is subequal to the two proximal segments. Williston's female type specimen of *intima* was examined at the American Museum of Natural History.

**DISTRIBUTION:** The distribution of this species extends from the Atlantic seaboard almost to the Rocky Mountains and southward into southern Texas. Specific records are given in the Appendix.

#### PSILONYX ALDRICH

*Psilonyx* ALDRICH, 1923, Proc. U. S. Natl. Mus., vol. 62, p. 5.

*Psilonyx*, BROMLEY, 1934, Ann. Ent. Soc. Amer., vol. 27, pp. 80, 96.

*Leptogaster (Psilonyx)*, HARDY, 1942, Jour. Kansas Ent. Soc., vol. 15, p. 58.

*Leptogaster*, BROMLEY, 1951, Amer. Mus. Novitates, no. 1532, p. 1.

*Psilonyx*, KAI-LING, 1949, Sinensia, vol. 19, nos. 1-6, p. 24.

Say in 1832 suggested, while describing *Leptogaster annulatus*, that the wing venation and absence of empodia would justify a generic separation of this species. Aldrich followed this suggestion and added *Leptogaster schaefferi* Back to the genus. While *schaefferi* lacks empodia, it is very different from *annulatus* in other respects. (See *Leptogaster schaefferi*.)

Bromley (1951) arbitrarily made *Psilonyx* a synonym of *Leptogaster*, although he recognized it in 1934. The present writer has seen a note by Bromley attached to a series of *Leptogaster brevicornis* commenting that the short empodium of this species indicated that *Psilonyx* was a synonym. The length of the empodium in relation to the length of the tarsal claws does vary from one species to another. In addition to species without an empodium at the one extreme, there are species with the empodium slightly longer than the claws at the other extreme. Williston's species *macropygialis* and *micropygialis* from Mexico are without empodia, but they do not belong to the genus *Psilonyx*.

Kai-Ling records *Psilonyx annulatus* from China and gives a key to the three species of *Psilonyx* that he describes but omits *annulatus*. His descriptions are not sufficiently adequate to determine if he has *Psilonyx* Aldrich because he uses only the empodium-lacking character. The genus *Sinopsilonyx*, monobasic, has a rudimentary empodium which could represent the transition from the absence to the presence of an empodium.

After considering the characters of the numerous species at hand, the writer has concluded that *Psilonyx* should be recognized. In addition to the sharply angulate  $M_2$  wing vein, the gonoforceps and penis valves are distinct from those of other genera (fig. 25). The rotated sternite 9 with its rounded contour ventrally is a character distinctly unrelated to *Leptogaster*. The median band of long pale hairs on abdominal segment 2 and the narrow sternites 1 and 2 apparently fused to tergite 2 are found in *Beameromyia* but not in

*Leptogaster, sensu stricto*. Usually *Leptogaster, sensu stricto*, has strong upper occipital bristles, while *Psilonyx* has weak bristles. The widespread distribution further indicates a separation of *Psilonyx* from *Leptogaster*.

***Psilonyx annulatus* (Say)**

Figure 25

*Leptogaster annulatus* SAY, 1823, Jour. Acad. Nat. Sci. Philadelphia, vol. 3, p. 75; 1883, The complete writings of Thomas Say on the entomology of North America, vol. 2, p. 68.

*Leptogaster histrio* WIEDEMANN, 1828, Ausereuropäische zweiflügelige Insekten, vol. 1, p. 535; 1867, Verhandl. Zool.-Bot. Gesell. Wien, vol. 17, p. 536.

*Leptogaster annulatus*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 159.

*Psilonyx annulatus*, ALDRICH, 1923, Proc. U. S. Natl. Mus., vol. 62, p. 5.

*Psilonyx annulatus*, KAI-LING, 1949, Sinensia, vol. 19, nos. 1-6, p. 24.

This species is included in the key to *Leptogaster*.

**DISTRIBUTION:** The species has been taken both in the eastern United States and northern

South America and also in the West Indies. The type locality is Pennsylvania. See Appendix for records.

**APACHEKOLOS, NEW GENUS**

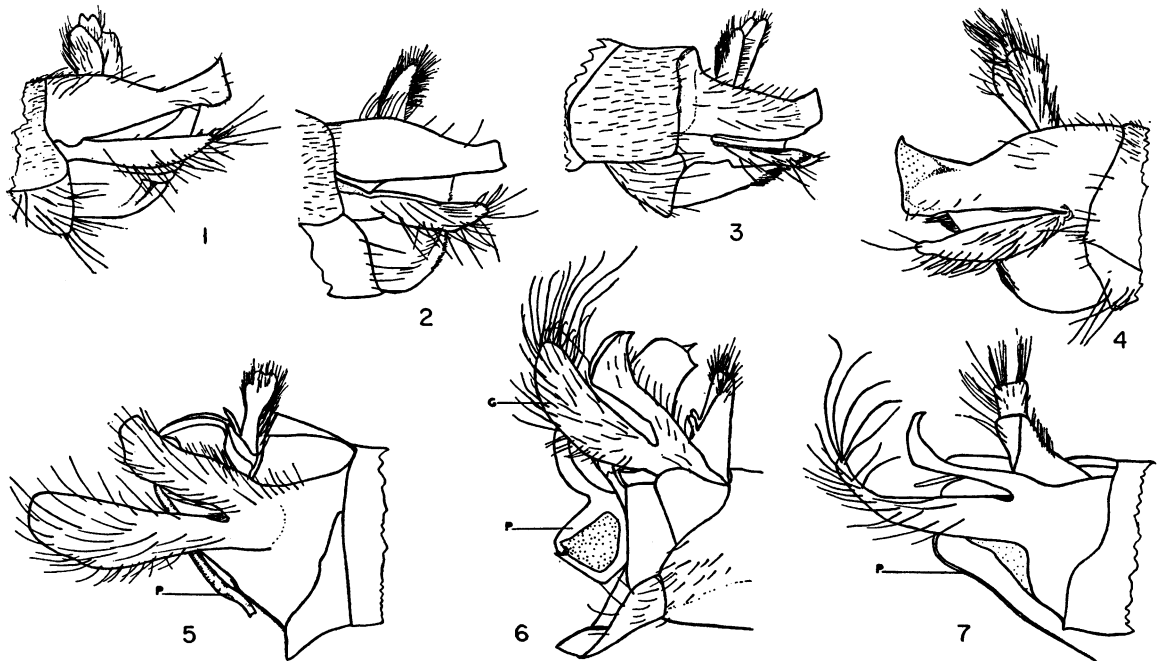
Figures 1-4

**GENOTYPE:** *Leptogaster scapularis* Bigot (1878, Ann. Soc. Ent. France, vol. 8, p. 444).

The species in the genus *Apachekolos* have similar habits in the field and similar morphology. The three southwestern species which the writer has collected were usually perching on the twigs of trees or shrubs. Bromley mentions collecting his species in a mesquite thicket.

The general color of the body is black, with varying amounts of red, particularly on the thoracic dorsum. The tomentum and pollen are usually white, gray, or brown. Laterally the abdomen is covered with more or less sparse heavy hair which is thicker on the posterior segments. Definite patterns are formed by the hair.

The gonoforceps of the known males



FIGS. 1-7. Lateral views of male genitalia. 1. *Apachekolos crinita*. 2. *Apachekolos scapularis*. 3. *Apachekolos confusio*. 4. *Apachekolos tenuipes*. 5. *Leptogaster texanus*. 6. *Leptogaster arborcola*. 7. *Leptogaster virgatus*.

Abbreviations: G, gonoforceps; p, penis.



resemble one another rather closely except for specific variations. The two arms of the gonoforceps are separated except at the base. The ventral fork is equal or subequal to the length of the dorsal arm. The width of the ventral arm is rather uniform and is usually less than the width of the dorsal arm. The dorsal arm is wider at the base and may taper to a truncate apex, or the apex may be expanded and more or less truncate.

The legs are long and slender in both sexes. This character will separate the genus from other genera in the United States.

In the females sternite 8 is broad; tergite 9 projects prominently beyond tergite 8. In other genera tergite 9 is generally withdrawn beneath tergite 8. Laterally on tergite 9 are two long narrow lobes which may represent tergite 10. The lobes form a definite notch on tergite 9.

The genus is named *Apachekolos* (feminine gender) to refer to the long slender legs of the species in this genus.

#### KEY TO THE SPECIES OF *Apachekolos*

1. Dorsum of thorax covered with dense, erect, dark hair as long as anterior cross vein (New Mexico; Arizona) . . . *crinita*, new species  
Dorsum with shorter hair . . . . . 2
2. Margin of scutellum with long bristles . . . 4  
Margin of scutellum with short bristles or no bristles . . . . . 3
3. Hind femora with patch of silvery hair (Texas) . . . . . *weslacensis* Bromley  
Hind femora without patch of silvery hair; no occipital bristles, or at most very weak hair (Arizona) . . . *confusio*, new species
4. Two distal tarsal segments of forelegs with prominent heavy ventral bristles at bases, with sparse hair anteriorly (Texas; Oklahoma; North Carolina; Virginia; Ohio) . . . . . *tenuipes* Loew  
Two distal segments of forelegs with dense erect hair concealing recumbent, heavy bristles (California; Texas) . *scapularis* Bigot

#### *Apachekolos scapularis* (Bigot)

##### Figure 2

*Leptogaster scapularis* BIGOT, 1878, Ann. Ent. Soc. France, vol. 8, p. 444.

*Leptogaster scapularis*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 169-170.

Examination of about 40 specimens of *Apachekolos scapularis* shows that, while both male and female genitalia exhibit con-

siderable variation, there is always a very similar pattern. Also there are other wide variations in both color and morphology. None of these variations is correlated with geographical distribution. Hence the writer concludes that all the specimens at hand belong to the same species.

LENGTH: Males varied from 6 to 12 mm. in length and females from 6 to 16 mm.

ANTENNAE: Specimens from Jacumba, California, have the first antennal segment black, as described by Bigot, with pale, weak bristles ventrally and one to several stronger, blackish brown bristles dorsally. On other specimens from other localities this segment ranged from a very dark red to a lighter red, with black bristles and no pale bristles. The second segment was 1.5 to 2 times as long as the first; the third segment ranged from equal to, to 1.4 times as long as, the length of the two proximal segments; the blackish brown style and the spine at the tip were 1.6 to 2.7 times longer than the blackish brown third segment.

THORAX: The color of the thoracic dorsum is black, with variable amounts of red laterally. On some specimens the black covers most of the dorsum, while on others the black area is very restricted by the red. The tomentum on the dorsum ranges from totally white to totally brown. Seven specimens collected from Mill Valley, Marin County, to Glendale, Los Angeles County, California, have the dorsum totally tomentose except for a very short median nude stripe anteriorly. Most specimens have distinct median and lateral nude, black stripes which vary in extent from specimen to specimen.

WINGS: There are two types of variation in the color of the wings. The wings of many specimens are uniformly tinged with a light brownish color. Several specimens have wings with the basal two-thirds a dark yellow-brown and the apex more or less hyaline. The same variability was noted in *tenuipes*. The position of the anterior cross vein was variable, although it is usually at the middle of the discal cell.

LEGS: The hind femur is about as long as the tibia and tapers gradually from the basal to the apical portion which is two to three times the width of the basal portion.

DISTRIBUTION: California: Collected from

Pope Creek, Napa County, in the north-central part of the state and southward to the Mexican border from April through September. In 1953, the species was common at Jacumba in April. Texas: Austin, April 30, 1921, and July 15, 1923 (R. H. Painter); Hidalgo County, March 26, 1954 (D. J. and J. N. Knoll).

***Apachekolos tenuipes* (Loew)**

Figure 4

*Leptogaster tenuipes* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 192.

*Leptogaster tenuipes*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 172.

*Leptogaster tenuipes*, BROMLEY, 1950, Ann. Ent. Soc. Amer., vol. 43, p. 231.

This species is closely related to the southwestern species of *Apachekolos*. The key characters (fig. 4), and Back's description will aid in the identification of the species.

**DISTRIBUTION:** This species is found in the eastern and southern parts of the United States, its distribution extending as far west as Virginia, Oklahoma, and Texas. See Appendix for detailed records. The District of Columbia is the type locality.

***Apachekolos weslacensis* (Bromley)**

*Leptogaster weslacensis* BROMLEY, 1951, Amer. Mus. Novitates, no. 1532, p. 3.

This species was described from a single female. The long, slender legs, coloration, and vestiture place the species in this genus. The species has been placed in the key on the basis of Bromley's description. The present writer has seen the type in the American Museum of Natural History.

**DISTRIBUTION:** Texas (type locality).

***Apachekolos crinita*, new species**

Figure 1

A species closely related to *Apachekolos scapularis* (Bigot) but easily separated from it and other species of *Apachekolos* by the long, sparse, black hair on the dorsum of the thorax. The hair on the scutellum is of similar length. In *scapularis* there is hair on the thoracic dorsum, but both hair and bristles are present on the scutellum. *Apachekolos crinita* males possess small mesal lobes at the

base of the secondary penis valves, while *scapularis* males lack these lobes. The supra-anal plates of the female of *crinita* are narrower at the base and somewhat more deeply cleft than those of *scapularis* females.

Other characters of *crinita* are similar to those of *scapularis*, including color variations.

**HOLOTYPE:** Male, 8 miles east of Pietown, New Mexico, near the Arizona eastern border, July 8, 1950 (Chas H. Martin). (Abdomen glued to label.)

**ALLOTYPE:** Female, Magdalena, New Mexico, August, 1894 (F. H. Snow).

**PARATYPES:** Same data as allotype, male, female; McNary, Arizona, August 8, 1948 (Dorothy W. Martin), female; Sabino Canyon, Santa Catalina Mountains, April 6, 1955 (F. G. Werner), female.

The holotype is deposited in the American Museum of Natural History, the allotype is in the collection of Ohio State University, and the paratypes are in the collections of the University of Arizona and of the writer.

**REMARKS:** The holotype was taken while flying through grass in the vicinity of pine trees. The female paratype collected at 6 P.M., McNary, Arizona, was sitting 6 inches from the end of a twig with the abdomen extended upward so that it resembled a small twig.

***Apachekolos confusio*, new species**

Figure 3

This species is closely related to *scapularis*, *tenuipes*, and *crinita*. *Apachekolos confusio* has sparse, short hair covering the thorax and short bristles on the margin of the scutellum.

**MALES:** In general *confusio* resembles *scapularis* except for these characters: *Confusio* has basal antennal segments yellow rather than dark red to black; eight widely spaced, weak bristles in the mystax, while *scapularis* has more bristles and they are closer together. *Apachekolos confusio* is without upper occipital bristles; *scapularis* has strong occipitals. The ventral fork of the gonoforceps of *confusio* is narrow (fig. 3), wider in *scapularis* (fig. 2). The sparse hair on the two distal tarsi of the front legs on *confusio* readily separates it from *scapularis* which has dense hair.

**FEMALE:** Same data as for male. The apical margin of tergite 9 is thinner than in the

other species in this group and is more shallowly notched.

**HOLOTYPE:** Male, Santa Rita Mountains, Madera Canyon, Arizona, August 31, 1955 (Chas. H. Martin).

**ALLOTYPE:** Female, Santa Rita Mountains, Arizona, August 4, 1930 (R. H. Painter).

**PARATYPES:** Arizona: North slope Santa Rita Mountains, Madera Canyon, 5380 feet, July, 1949 (F. Werner, W. N. Nutting), female; Middle Pioneer Camp, Pinal Mountains, Gila County, August 16, 1950 (T. Cohn, P. Boone, M. Cazier), male.

**REMARKS:** The holotype was collected from the end of a dead twig, along a small stream at an elevation of about 5400 feet. Approximately 50 specimens of *Leptogaster arborcola* were collected at the time the male of *confusio* was taken.

#### BEAMEROMYIA, NEW GENUS

**GENOTYPE:** *Leptogaster pictipes* Loew (1862, Berliner Ent. Zeitschr., yr. 6, p. 189).

The upper occipitals are weak bristles or hairs. No species has been found with strong occipitals. The median band of hair around abdominal segment 2 is usually present. In some species the band is not so prominent as in others. In one or two species this band is obscure on some specimens. The hairs in the band are always longer than any other hairs on the segment. Sternites 1 and 2 are always narrow and appear fused to tergite 2. Sternite 9 of the male is rotated 90 degrees from the horizontal axis of the abdomen. Two vertical lines beneath the mesad ventral corners of the gonoforceps divide the sternite into a large median area and two smaller lateral areas. Wing vein  $M_2$  is always sharply angulate.

This genus is dedicated to Dr. and Mrs. R. H. Beamer who have been a source of much inspiration to the writer, and who have furnished many species and specimens of this subfamily.

#### KEY TO THE SPECIES OF *Beameromyia* OF THE UNITED STATES

1. Gonoforceps expanded apically, with prominent notch (Florida) . . . . .  
     . . . . . *floridensis* Johnson  
     Gonoforceps with point not prominently notched . . . . . 2
- 2(1). Upper occiput, or at least posterior base

- of ocellar tubercle, brown . . . . . 10
- Occiput gray . . . . . 3
- 3(2). Dorsum of thorax brown pollinose, indistinct stripes, or stripes partially, or wholly separated by narrow, gray, pollinose, thin line . . . . . 8
- Thorax with distinct brown pollinose stripes or spots widely separated by gray pollinosity . . . . . 4
- 4(3). Hind tibia with median yellow ring (basally tibia only darkened in some specimens, yellow ring not sharp); gonoforceps truncate apically (Kansas; eastward) . . . . . *pictipes* (Loew)
- Hind tibia pale basally; gonoforceps usually bluntly or sharply pointed (*monticola* gonoforceps truncate) . . . 5
- 5(4). Laterally abdomen extensively gray pollinose, brown pollinose markings not extensive; male apical abdominal segments form a "C" (Arizona) . . . . .  
     . . . . . *occidentis* (Hardy)
- Abdomen with strong, distinct, brown pollinose and gray pollinose markings. 6
- 6(5). Thoracic vestiture reddish brown; apical point of gonoforceps truncate, broadly sloping along ventral margin (Arizona) . . . . . *monticola*, new species
- Apical point sharp and narrow . . . . . 7
- 7(6). Thoracic vestiture reddish brown, sparse; sternite 9 narrow; ventral margin of gonoforceps shallowly rounded; apical point straight (New Mexico) . . . . .  
     . . . . . *silvacola*, new species
- Thoracic vestiture pale white, more abundant; sternite 9 broader; ventral margin of gonoforceps deeply emarginate, apical point curved ventrad (Arizona) . . . . . *lunula*, new species
- 8(3). Distal half or more of hind tibia brown (also see *vulgaris*); apices of gonoforceps broad, rugose, truncate, prominent tufts of long, pale hair on primary penis valves (Arizona; California) . . . . .  
     . . . . . *lacinia*, new species
- Hind tibia apically with one or two darker rings, or a ring and an apical spot; without prominent tufts of hair on male genitalia . . . . . 9
- 9(8). First abdominal segment brown pollinose dorsally, gray laterally; apically gonoforceps pointed (Arizona) . . . . .  
     . . . . . *macula*, new species
- First abdominal segment totally gray pollinose; apically gonoforceps with small notch (Arizona; California) . . . . .  
     . . . . . *bifida* (Hardy)
- 10(2). Face yellow (Florida; Georgia; Alabama)

- . . . . . *chrysops*, new species  
 Face white . . . . . 11  
 11(10). Abdominal segments 3 and 4 with red  
 posterior ground-color rings broadly  
 interrupted; abdomen more robust than  
 in most species (Kansas; Nebraska)  
 . . . . . *kawiensis*, new species  
 Abdominal segments with yellow or red  
 posterior ground-color bands or ground-  
 color bands absent . . . . . 12  
 12(11). Abdominal segments with yellow or red-  
 dish yellow posterior ground-color  
 bands . . . . . 14  
 Posterior ground-color bands either very  
 dark red or absent . . . . . 13  
 13(12). Hind femora moderately incrassate; hairs  
 of band on abdominal segment 2 sparse,  
 short, or sometimes absent; gonoforceps  
 taper to short, narrow point (Arizona)  
 . . . . . *punicea*, new species  
 Hind femora more strongly incrassate;  
 hairs of band on abdominal segment 2  
 longer, more abundant; point of gono-  
 forceps projects from dorsal margin,  
 ventral angle sharp (New York; New  
 Jersey; Virginia) . *disfascia*, new species  
 14(12). Thorax with median, broad, dark brown  
 stripe separated from lateral stripes by  
 gray-brown pollinosity; tibia with med-  
 ian brown band and brown spot apically  
 on anterior side (Arizona) . . . . .  
 . . . . . *macula*, new species  
 Thorax without median stripe, or at most  
 an obsolete median stripe; hind femora  
 with incrassate portion uniformly  
 brown . . . . . 15  
 15(14). Abdominal, posterior, reddish yellow,  
 ground-color bands complete on seg-  
 ments 2 and 3, dorsally band red on  
 segment 4 and posterior corner of seg-  
 ment 5 yellow (Indiana; Ohio; Mary-  
 land; southward) . *vulgaris*, new species  
 Abdominal, posterior, reddish yellow,  
 ground-color bands more or less indis-  
 tinct dorsally on segment 2, distinct on  
 segments 3 and 4, no yellow posterior  
 corner on segment 5 (Kansas) . . . .  
 . . . . . *priariensis*, new species

**Beameromyia bifida (Hardy)**

*Leptogaster bifidus* HARDY, 1942, Jour. Kansas  
 Ent. Soc., vol. 15, pp. 59-60.

The species is easily recognized by the  
 long, slender gonoforceps, with a small notch  
 at the tips. Also, the tertiary penis valves are  
 slender, with a tuft of hair at the tip.

DISTRIBUTION: Arizona: Ruby (type local-

ity); Santa Rita Mountains, Madera Canyon,  
 August 16, 1949 (Chas. H. Martin), August  
 24, 1955 (Chas. H. Martin). California:  
 Escondido, July 15, 1941 (E. L. Todd).

**Beameromyia chrysops, new species**

Figure 12

MALE: Length, 7 mm. Head black, face  
 above mystax white, border and antennae  
 golden yellow, front and upper occiput  
 yellow-brown; occipital hairs white; five pale  
 bristles in mystax; two proximal antennal  
 segments subequal to third, yellowish red,  
 third segment subequal to style, both dark  
 brown. Large eye facets near face reflect a  
 golden color at certain angles.

Thorax black, posterior humeri red, brown  
 pollinose, gray pollinose behind transverse  
 suture, posterior humeri and above scutellum  
 gray pollinose; pleurae white tomentose;  
 scutellum white pollinose, six pale hairs on  
 margin.

Abdomen dark, with reddish yellow pos-  
 terior bands on segments 2 to 4, posterior  
 corners of segments 5 and 6 yellow, posterior  
 pollinose bands yellowish red; gonoforceps  
 long narrow apices, sparse dark hair on dorsal  
 margin, mixed black and pale on ventral  
 margin.

Legs orange-yellow, hind tibiae with median  
 dark shadow band.

Wings hyaline, stippled with microtrichia,  
 first basal cell clear basally.

FEMALE: Similar to male, posterior corner  
 segment 5 with small yellow spot, segment 6  
 without spot of yellow.

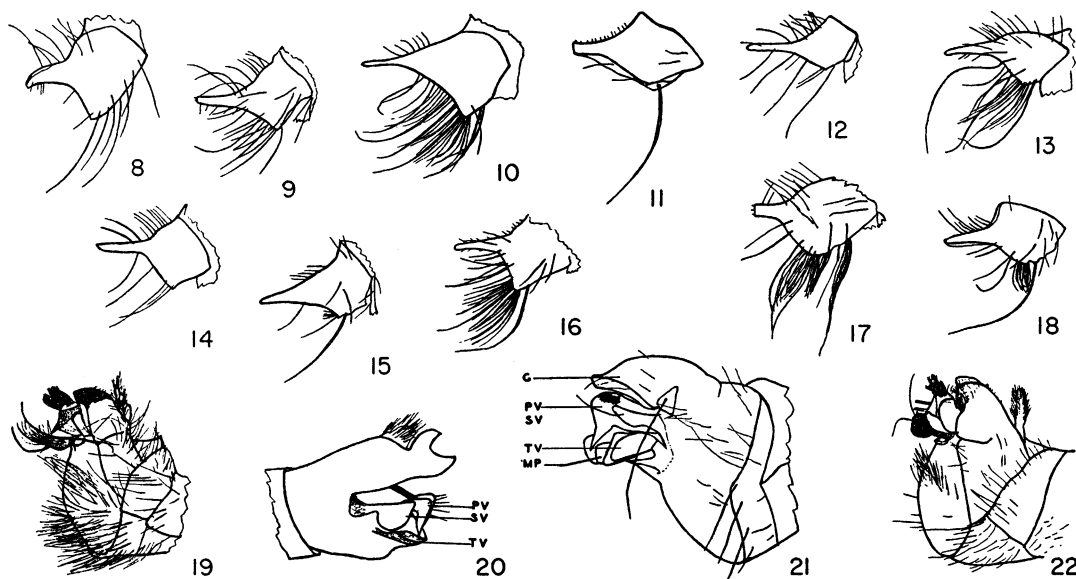
HOLOTYPE: Male, Royal Palm Park,  
 Florida, July 22, 1948 (R. H. Beamer).

ALLOTYPE: Female, same data.

PARATYPES: Florida: Royal Palm Park,  
 July 22, 1948 (R. H. Beamer), 13 males, 20  
 females; Homestead, July 20, 1948 (R. H.  
 Beamer, B. T. McDermott), two males, four  
 females; Palm Beach, July 18, 1939 (R. H.  
 Beamer), female; Quincy, July 10, 1939  
 (D. E. Hardy), female; Tallahassee, April 1,  
 1944 (R. and G. Bohart), male. Alabama:  
 Seminole, June 14, 1951 (Price, Beamers,  
 Weed), four males, 11 females; Mobile, June  
 13, 1951 (Price, Beamers, Weed), male, fe-  
 male. Georgia: Griffin, August 12, 1939 (R. H.  
 Beamer, D. E. Hardy), three males.

The holotype and allotype are deposited in





FIGS. 8-18. Dorsoposterior view of gonoforceps of *Beameromyia*. 8. *B. lunula*. 9. *B. vulgaris*. 10. *B. kawiensis*. 11. *B. monticola*. 12. *B. chrysops*. 13. *B. punicea*. 14. *B. prairiensis*. 15. *B. macula*. 16. *B. disfascia*. 17. *B. pictipes*. 18. *B. silvacola*.

FIGS. 19-22. Lateral view of male genitalia of *Beameromyia*. 19. *B. lacinia*. 20. *B. floridensis*. 21. *B. monticola*. 22. *B. occidentis*.

Abbreviations: G, gonoforceps; MP, median process; PV, primary penis valve; SV, secondary penis valve; TV, tertiary penis valve.

the collection of the University of Kansas. Paratypes are in the Kansas collection and in the collection of the writer.

**REMARKS:** The name *chrysops* refers to the golden reflections of the large eye facets near the face. In some specimens the reflection is reddish.

The color of the legs shows a great deal of variation, ranging from totally yellow to specimens with a dark brown band only on the hind tibia to those with a dark brown band on both the hind femur and tibia. Also, the first and second antennal segments range from dull reddish brown to bright yellow in color.

***Beameromyia disfascia*, new species**

Figure 16

**MALE:** Length, 7 mm. Head black, face white tomentose, vertex and upper occiput brown; six pale mystax bristles; proximal antennal segments, third segment, and style of equal length, orange-red in color, third and style reddish brown, third with two short stout bristles near apices.

Thorax black, brown pollinose, broadly

white pollinose laterally and posteriorly; scutellum black, white pollinose; pleurae white tomentose.

Abdomen black, without posterior yellow bands, brown pollinose, segments 2, 3, and 4 with white pollinose posterior bands, posterior corner of segment 5 white pollinose; ventral angle of gonoforceps almost 90 degrees, slender apical point projects from dorsal margin, yellowish hair along ventral margin.

Legs yellow, anterior four darkened dorsally, hind femora with reddish brown band on incrassate portion, apical 60 per cent of hind tibiae reddish brown.

Wings hyaline, strippled with microtrichia, more sparse basally.

**FEMALE:** Similar to male.

**HOLOTYPE:** Male, Pemberton, New Jersey, July 11, 1909.

**ALLOTYPE:** Female, same data.

**PARATYPES:** New Jersey; Pemberton, July 11, 1909, six males, four females; Riverton, June 16, 1905, one female; Lakehurst, July 3, 1912, two males, female. New York: Islip, Long Island, July 4, 1933 (F. S. Blanton), male, female; Coram, Pennyquid Barrens,

Long Island, July 8, 1920 (J. Bequaert), pair. Massachusetts: "Bruster," July 30, 1940 (Fraker), male. Virginia: Falls Church, June 18 (Nathan Banks), two females. Ohio: Columbus, Alum Creek, Franklin County, June 25, 1943 (Robt. M. Goslin), male.

The holotype and allotype are deposited in the United States National Museum. Paratypes are also in this collection and that of the writer.

REMARKS: This species is easily recognized by the absence of yellow ground-color bands and by the sharply angulate ventral margin of the gonoforceps. The species is named *disfascia* because of the absence of ground-color yellow bands. (Also see *punicea*.)

***Beameromyia floridensis* (Johnson)**

Figure 20

*Leptogaster floridensis* JOHNSON, 1913, Bull. Amer. Mus. Nat. Hist., vol. 32, p. 60.

*Leptogaster floridensis*, HARDY, *nec* Johnson, 1942, Jour. Kansas Ent. Soc., vol. 15, pp. 58-40. (Hardy illustrates a new species.)

Johnson's type series consisted of five specimens collected in Florida. The present writer has seen the male holotype at the Museum of Comparative Zoölogy and a paratype at the American Museum of Natural History. The species is easily recognized by the fact that the male gonoforceps are expanded apically with a shallow notch.

This species has the characters of *Beameromyia*, but the positions and structure of the elements of the male genitalia indicate that the species is not closely related to any of the other species placed in this genus.

DISTRIBUTION: Florida: (type locality). Virginia: Virginia Beach, August 14, 1913 (Fred King); August 26, 1928 (G. W. Barber). These specimens were found in a long series of *Psilonyx annulatus* received from the United States National Museum.

***Beameromyia kawiensis*, new species**

Figure 10

MALE: Length, 7 mm. Head black, face white tomentose, front and upper occiput brown; upper occipital hair light brown; mystax four pale bristles; first antennal segment subequal to second, two proximal segments strongly subequal to third and equal to style, third segment and style

reddish brown, short bristles posteriorly and anteriorly on the apices of second segment.

Thorax black, brown pollinose, darker indistinct broad median stripe, slightly lighter laterally; scutellum reddish, white pollinose, two hairs on margin; pleurae tan pollinose.

Abdomen reddish brown subshining; thin brownish pollinose, posterior corners of segments 2 to 4 light, with yellowish white pollinosity; abdomen thicker than in most *Beameromyia*. Sternite 1 narrow, sternite 2 triangular, sternite 3 narrower than sternite 4. Gonoforceps deeply emarginate on ventral side, long needle points round, closely set long weak and strong bristles on ventral corner.

Legs: Anterior four yellow, longer than usual; hind femora yellow, incrassate portion darkened; tibiae, basal two-fifths yellow, apical three-fifths strongly clavate, light reddish brown, lighter medianly.

Wings hyaline, uniformly covered with microtrichia except small area basally.

FEMALE: Similar to male, posterior corners of abdominal segments 2 to 4 light, with yellowish white pollinosity.

HOLOTYPE: Male, Manhattan, Kansas, May 25, sand dunes (R. H. Painter).

ALLOTYPE: Female, same locality, June, sand dunes (R. H. Painter).

PARATYPES: Same data as holotype, female; June (R. H. Painter), one male, six females.

The holotype and allotype are deposited in the collection of Dr. R. H. Painter. Paratypes are in Painter's and the writer's collections.

***Beameromyia lacinia*, new species**

Figure 19

MALE: Length, 6.5 mm. Head black, face white tomentose, front gray, with somewhat brownish tinge, occiput gray; occipital hairs pale; five pale bristles in mystax; two proximal antennal segments about two-thirds as long as third, subequal to style, first segment brown, second orange, third segment mostly brown, yellow basally.

Thorax black, posterior humeri yellow, gray pollinose with brown dorsum; scutellum yellow, white pollinose, four pale hairs on margin; pleurae gray.

Abdomen black, posterior yellow rings on segments 2 to 5, not quite so distinct on

segment 5; segment 1 gray pollinose, remaining segments brown pollinose. Gonoforceps smooth on basal two-thirds, apically roughened, truncate, primary penis valves with prominent tufts of long pale hair.

Legs: Anterior four yellow, darkened; hind femora not strongly incrassate, yellow, with indistinct brown band on incrassate portion; hind tibiae yellow on basal third, apically brown.

Wings hyaline, stippled with microtrichia except for small basal areas.

**FEMALE:** Similar to male; both proximal antennal segments yellow, more extensively gray on thorax.

**HOLOTYPE:** Male, Santa Rita Mountains, Arizona, July 10, 1950 (R. H. Beamer).

**ALLOTYPE:** Same data.

**PARATYPES:** Arizona: Santa Rita Mountains, Madera Canyon, July 10, 1950 (R. H. Beamer, Lucy D. Beamer), 40 males, 36 females; July 12, 1950 (Chas. H. Martin), eight males, six females; August 16, 1949 (Dorothy W. Martin, Chas. H. Martin), male, female; August 4, 1932 (R. H. Painter), two males, two females; Chiricahua Mountains, July 20, 1950 (Chas. H. Martin), two males, five females; July 4, 1940 (L. C. Kuitert), male.

The holotype and allotype are deposited in the collection of the University of Kansas. Paratypes are also in this collection and in that of the present writer.

**ADDITIONAL DISTRIBUTION RECORDS:** California: Guatay, July 12, 1941 (L. H. Banker); Anza, July 12, 1941 (L. H. Banker).

**REMARKS:** This species is named *lacinia* in reference to the two prominent tufts of pale hair on the primary penis valves.

***Beameromyia lunula*, new species**

Figure 8

**MALE:** Length, 8 mm. Head black, face white tomentose, vertex, occiput gray pollinose, occipital bristles pale, weak, weakest below ocellar tubercle; mystax with six pale weak bristles; first antennal segment red, second yellow, pale bristles anteriorly on first, both anteriorly and posteriorly on second segment, third segment with basal third yellow, apical two-thirds and style brown, 1.7 times longer than two proximal segments, equal to length of style and its apical bristle.

Thorax black, gray pollinose, median stripe and lateral spots light reddish brown; scutellum gray pollinose, eight weak bristles along margin; thoracic vestiture pale white; pleurae black, gray-white pollinose.

Abdomen: Segments 3 to 5 reddish anteriorly and posteriorly, dark reddish black medially, segment 2 reddish medially and white pollinose posteriorly, with anterior and posterior pollinose brown spots, remaining segments with pollinose brown spots almost reaching lateral margins; ventral margin of gonoforceps deeply emarginate, apical point curved ventrad, sparse vestiture of pale long hairs, more closely set on ventral angle, tertiary penis valves elongate, with dorsal margin bent over, forming a bracket.

Legs: Anterior four pale, darkened dorsally; hind legs pale, femora with incrassate portion reddish brown, slightly less than apical half of hind tibiae reddish brown.

Wings hyaline, apical 60 per cent stippled with microtrichia.

**FEMALE:** Similar to male; front brownish gray; thoracic brown stripe and spots distinct. Vestiture of thorax white.

**HOLOTYPE:** Male, Santa Rita Mountains, Madera Canyon, Arizona, August 16, 1949 (Dorothy W. Martin).

**ALLOTYPE:** Female, same data as holotype (Chas. H. Martin).

**PARATYPES:** Arizona: Santa Rita Mountains, Madera Canyon, August 16, 1949 (Dorothy W. Martin, Chas. H. Martin), 10 males, four females; July 12, 1950 (Chas. H. Martin), male, four females; August 16, 1950 (Dorothy W. Martin), female; August 29, 1955 (Chas. H. Martin), 14 males, two females; August 30, 1955 (Dorothy W. Martin, Joe Wilcox, Chas. H. Martin), 30 males, 17 females; August 31, 1955 (Chas. H. Martin, Joe Wilcox), 14 males, eight females.

The holotype and allotype are deposited in the American Museum of Natural History; the paratypes are in the collection of the present writer.

**REMARKS:** The females can be separated from those of *Beameromyia monticola* by the white vestiture of the thorax. The vestiture is more abundant and somewhat longer just above the scutellum on *lunula* than on *monticola*.

*Beameromyia lunula* refers to the crescent shape of the apices of the gonoforceps.

**Beameromyia macula**, new species

Figure 15

**MALE:** Length, 6 mm. Head black, face white tomentose, front gray, brown around ocellar tubercle, occiput gray; five pale mystax bristles; two proximal antennal segments subequal to third segment, reddish brown, third subequal to style, both brown.

Thorax black, gray pollinose, median brown stripe separated from lateral brown stripes by narrow gray and brown pollinose lines; scutellum white pollinose, eight pale short hairs on margin; pleurae gray tomentose.

Abdomen black, segments 2 and 3 with posterior reddish yellow bands, segment 4 with band interrupted dorsally, brown pollinose, with gray posterior pollinose bands, segments 6 to 8 gray pollinose laterally and ventrally; gonoforceps with long tips apically, tips cross.

**Legs:** Anterior four yellow, darkened dorsally, hind femora pale yellow basally, incrassate portion orange-yellow, apical band with brown band anteriorly, hind tibiae yellow basally, median reddish brown ring, apically orange-yellow, with dark spot on anterior side.

Wings hyaline, stippled with microtrichia, first basal cell almost completely clear.

**FEMALE:** Similar to male.

**HOLOTYPE:** Male, Ruby, Arizona, July 13, 1940 (D. E. Hardy).

**ALLOTYPE:** Female, same data.

**PARATYPES:** Arizona: Ruby, July 13, 1940 (R. H. Beamer, D. E. Hardy), five males, six females; Santa Rita Mountains, Madera Canyon, August 29, 1955 (Dorothy W. Martin), two males, female. Mexico: Twenty miles south of Saltillo, January 10, 1940 (G. E. Bohart), male.

The holotype and allotype are deposited in the University of Kansas collection. Paratypes are in the collection of Kansas and of the writer.

**REMARKS:** In some specimens the median thoracic stripe is poorly differentiated. The name *macula* refers to the apical spot on the hind tibia.

**Beameromyia monticola**, new species

Figures 11, 21

**MALE:** Length, 7 mm. Head black, face white tomentose, vertex brownish gray

pollinose, occiput gray pollinose; pale, weak occipitals; fine, weak, pale mystax bristles; first antennal segment polished red, second yellow, with pale apical bristles, third segment yellow basally, apical three-fourths and style brown, length of two proximal segments equal to third segment, style subequal.

Thorax black, gray pollinose, median stripe and lateral spots brown pollinose, thoracic vestiture reddish, more sparse than on *lunula*, a closely related species; scutellum black, red laterally, gray pollinose, several long weak hairs on margin; pleurae black, gray tomentose.

Abdomen black, posterior reddish yellow bands on segments 2 to 4, segment 1 gray pollinose, segment 2 with two brown pollinose bands, a broad band with mixed brown and white pollinosity, posterior white pollinose band, segments 3 and 4 dorsally whitish brown, pollinose anteriorly, laterally more whitish pollinose, reddish brown pollinose medially, yellowish white pollinose posteriorly; segments 6 to 8 gray pollinose, with dark brown bands not reaching lateral margins; sparse long pale hair on incisures of segment 1; apical point of gonoforceps broad, blunt, broadly sloping along ventral margin, tertiary penis valves truncate, with ventral corners rounded.

**Legs:** Anterior four yellow, darkened dorsally, hind femora yellow, reddish on incrassate portion, tibiae yellow, apical half or more reddish brown.

Wings hyaline, stippled uniformly with microtrichia.

**FEMALE:** Length, 10 mm. Similar in most respects to the male.

**HOLOTYPE:** Male, Santa Rita Mountains, Madera Canyon, Arizona, August 20, 1955 (Chas. H. Martin).

**ALLOTYPE:** Female, same data (Dorothy W. Martin).

**PARATYPES:** Arizona: Santa Rita Mountains, Madera Canyon, August 16, 1949 (Dorothy W. Martin, Chas. H. Martin), male, five females; August 29, 1955 (Chas. H. Martin), four males, two females; August 30, 1955 (Chas. H. Martin, Dorothy W. Martin), four males, seven females; August 31, 1955 (Chas. H. Martin), two males, four females; August 21-26, 1954 (W. A. McDonald), male; Huachuca Mountains, Au-



gust 24, 1934 (A. E. Pritchard), six males, 29 females.

The holotype and allotype are deposited in the American Museum of Natural History, and the paratypes are deposited in the collections of the writer and A. E. Pritchard.

REMARKS: The females of this species resemble those of *Beameromyia lunula* very closely. Females of *Beameromyia monticola* have a reddish brown vestiture, while those of *lunula* have a pale white vestiture on the thorax. Usually there are five or six bristles in the mystax.

***Beameromyia occidentis* (Hardy)**

Figure 22

*Leptogaster occidentis* HARDY, 1942, Jour. Kansas Ent. Soc., vol. 15, p. 61.

From a posterior view, the male gonoforceps resemble a parallelogram, with the ventral side deeply emarginate. Also, the "C" formed by abdominal segments 5 to 9 of the male is characteristic of the species.

DISTRIBUTION: Arizona: Chiricahua Mountains (type locality); Catalina Mountains, Mt. Lemmon, August 17, 1948 (Dorothy W. Martin, Chas. H. Martin). New Mexico: Mountain Park, June 27, 1940 (R. H. Beamer, D. E. Hardy) (reported by Hardy).

***Beameromyia pictipes* (Loew)**

Figure 17

*Leptogaster pictipes* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 189.

*Leptogaster varipes* LOEW, 1862, *ibid.*, yr. 6, p. 189.

*Leptogaster pictipes*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 169.

*Leptogaster pictipes*, HARDY, 1942, Jour. Kansas Ent. Soc., vol. 15, p. 60.

Many specimens of *Beameromyia* from the eastern United States have been misidentified as *pictipes*. Back's record from Huachuca Mountains, Arizona, is to be questioned. Hardy was the first to recognize the value of the truncate gonoforceps in separation of *pictipes* from most other species.

A comparison of the types of *pictipes* and *varipes* by the present writer again confirms the synonymy of *varipes*.

DISTRIBUTION: The type locality is Illinois. The range seems to be a narrow belt extend-

ing from Kansas to Maryland. Collection records are recorded in the Appendix.

***Beameromyia prairiensis*, new species**

Figure 14

MALE: Length, 4.5 mm. Head black, face white tomentose, front and occiput brown pollinose; upper occipital hair brown; six pale mystax bristles; two proximal antennal segments strongly subequal to third segment and to style, dark orange-yellow, short bristles anteriorly and posteriorly on apices of second segment, third segment and style reddish brown.

Thorax black, brownish pollinose, median stripe obsolete, laterally and posteriorly more or less mixed with gray pollinosity, scutellum brown, mixture of brown and gray pollinosity, four short hairs on margin; pleurae gray pollinose, with brown spot just above middle coxae.

Abdomen black, posterior corners of segments 2 to 4 yellow, extending around as a band on segment 3, brown pollinose, thin white pollinose bands posteriorly on segments 2 to 4, pollinose bands narrow dorsally, broader laterally on remaining segments; erect hairs of median band on segment 2 sparse, short; gonoforceps taper to a sharp point, third tertiary penis valves broadly expanded apically, penis in type specimen very small in diameter, tapers to thin point, extends between penis valves to sternite 8.

Legs: Anterior four brownish yellow; basal two-thirds of posterior femora slender, pale, incrassate third dark brown; basal third of hind tibiae pale yellow, apical two-thirds dark brown.

Wings hyaline, uniformly covered with microtrichia.

HOLOTYPE: Male, Ellis County, Kansas, June 9, 1950 (R. H. Painter).

ALLOTYPE: Female (greased thorax), same data as holotype.

PARATYPES: Three males, same data as holotype.

The holotype and allotype are deposited in the collection of Dr. R. H. Painter. Paratypes are in the Painter collection and the writer's collection.

REMARKS: Paratype males and allotype female with posterior bands on abdominal segments 2 to 4 complete.



in the American Museum of Natural History. Paratypes are in the collection of the University of Kansas, the United States National Museum, and the writer.

***Beameromyia vulgaris*, new species**

Figure 9

**MALE:** Length, 7 mm. Head black, face white tomentose, vertex and upper occiput brown; six pale mystax bristles; two proximal antennal segments somewhat more than half as long as third segment, orange-red, third segment 1.5 times longer than style, reddish brown, narrowly yellow at base, style reddish brown.

Thorax black, area around posterior humeri red, brown pollinose, lighter laterally, white pollinose anteriorly, behind transverse suture, scutellum red, white pollinose, hair on margin.

Abdomen dark, segment 2 with yellow posterior band; segments 3 and 4 with darker reddish band, brown pollinose, with median and posterior white pollinose bands broadly interrupted dorsally, posteriorly white band complete; segments 5 to 7 with white band narrow, interrupted dorsally; sternite 8, posterior margin polished, with numerous long pale hairs; sternite 9 not flattened, with medium triangular swelling, few long pale hairs on swelling, gonoforceps tapering to relatively short point, ventral corner rounded, long pale hair along ventral margin.

Legs: Apical half of hind tibiae brown, incrassate portion of hind femora with broad brown band.

Wings hyaline, stippled with microtrichia, first basal cell only partially so.

**FEMALE:** Similar to male, thorax laterally lighter than male, yellow posterior bands on abdominal segments 2, 3, and 4, lateral posterior yellow spot on segment 5.

**HOLOTYPE:** Rock Creek, District of Columbia, August 3, 1913 (R. C. Shannon).

**ALLOTYPE:** Female, same data, June 15, 1913 (R. C. Shannon).

**PARATYPES:** District of Columbia: Rock Creek, August 3, 1913 (R. C. Shannon), female. Maryland: Plummer's Island, July 4, 1914 (W. L. McAtee), female. Virginia: Great Falls, June 22, 1939 (C. T. Greene), female; June 23, 1939 (C. T. Greene), female; Falls Church, June 18 (Nathan Banks), female; June 20 (Nathan Banks), three males; July 6 (Nathan Banks), male; Veitch, June

9, 1912 (J. R. Malloch), three males. New Jersey: Atco, June 21, 1896, female; Lakehurst, May 20, male; May 27 (E. L. Dickinson), male, female; Millburn, August 25 (E. L. Dickinson), female. North Carolina: Raleigh, May to August (C. S. Brimley), 15 males, 12 females; Franklin, August 17, 1939 (D. E. Hardy), female. Georgia: South Georgia (Morrison), male; Griffin, August 12, 1939 (R. H. Beamer, Lucy D. Beamer, A. T. Hardy), five females. Alabama: Elgin, July 6, 1939 (D. E. Hardy), male; Birmingham, June 4, 1917 (J. M. Aldrich), female. Florida: Hobe Sound, July 21, 1939 (R. H. Beamer), female. Tennessee: Clarksville, July 4, 1939 (D. E. Hardy), female. Ohio: Columbus, June 24, 1943 (R. M. Goslin), male; Amherst, July 1934 (H. J. Reinhard), male. Indiana: Lafayette, June 23 (J. M. Aldrich), female.

**REMARKS:** The markings on this species show considerable variation. The number of posterior yellow bands on the abdomen varies from one to three; one female had dark red posterior bands. The hind tibiae of most specimens are orange apically, with a dark reddish brown band. The tibiae of a few specimens have half the apical portion darkened and some have an indistinct band.

**LEPTOGASTER MEIGEN**

*Leptogaster* MEIGEN, 1803, Illiger's Mag., vol. 2, p. 269.

*Gonypes* LATREILLE, 1804, Histoire naturelle . . . des crustacés et des insectes, vol. 14, p. 309.

*Leptogaster*, LUNDBECK, 1908, Diptera Danica, pt. 2, p. 7.

*Leptogaster*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 155.

*Leptogaster*, COQUILLETT, 1909, Proc. U. S. Natl. Mus., vol. 37, p. 559. (*Asilus cylindricus* De Geer designated as genotype of *Leptogaster* Meigen.)

*Leptogaster*, ENGEL, 1938, Asilidae, in Die Fliegen der Palaearktischen Region, vol. 4 (2), art. 24, p. 3.

In the Introduction it was stated that the genus *Leptogaster* is composed of several groups and isolated species. The following key separates *Leptogaster* into its several components.

**KEY TO GROUPS AND ISOLATED SPECIES  
OF *Leptogaster***

1. Wing vein  $M_2$  sharply angulate in all specimens . . . isolated species: *atridorsalis*; *aegra*  
Wing vein  $M_2$  usually straight or slightly bent, but occasional specimens with sharply angu-

- late  $M_2$  . . . . . 2
2. Sternite 9 subdivided into divisions by more or less distinct lines . . . . . 5  
Sternite 9 smooth basally or marked by indentations . . . . . 3
3. Gonoforceps not divided; sternite 9 smooth basally; three pairs of penis valves, with median process just below valves; sternite 1 narrow or triangular, sternite 2 narrow, both fused to tergite 2 . . . . .  
. . . *brevicornis* group: *brevicornis*; *schaefferi*  
Gonoforceps with two arms . . . . . 4
4. Sternite 1 broad, sternite 2 narrower; basally sternite 9 not smooth; ventral arm of gonoforceps attached to upper arm about midway between base and apex; secondary penis valves more prominent than primary valves . . . *obscuripes* group: *obscuripes*; *obscuripennis*  
Sternites 1 and 2 broad; basally sternite 9 smooth; primary penis valves as prominent as, or more prominent than secondary valves; ventral arm of gonoforceps broader than dorsal . . . . .  
. . . *virgatus* group: *virgatus*; *texanus*; *arborcola*
5. Apical half of gonoforceps notched; median area of sternite 9 quadrate . . . . .  
. . . . . isolated species: *lanata*  
Gonoforceps pointed apically; median area of sternite 9 convex and triangular, or rectangular, in shape (*Leptogaster, sensu stricto*) . . . . .  
. . . . . *flavipes* group
- a. Secondary penis valves elongate or otherwise modified . . . . . *arenicola*, *aridus*, *eudicranus*, *incisuralis*, *parvoclava*, *panda*
- b. Secondary valves more or less disc-like . . . . .  
*alticola*, *californica*, *coloradensis*, *cultiventris*, *flavipes*, *fornicata*, *hesperis*, *hirtipes*, *murinus*, *nitoris*, *patula*, *salvia*

KEY TO THE SPECIES OF *Leptogaster* OF THE UNITED STATES, INCLUDING *Tipulogaster badius* AND *Psilonyx annulatus*

1. Thick tomentum partially covering weak bristles on oral margin; sternite of male divided into three more or less quadrate areas (Utah; Idaho; Texas) . . . . .  
. . . . . *lanata*, new species  
Tomentum thin, not partially covering oral bristles . . . . . 2
- 2(1). Males with median triangular or rectangular area on sternite 9 . . . . . 11  
Males with sternite 9 smooth . . . . . 3
- 3(2). Apically gonoforceps shallowly notched to deeply cleft . . . . . 5  
Gonoforceps not notched or cleft . . . . . 4
- 4(3). Empodium short; gonoforceps truncate (Texas; Kansas; eastward) . . . . .  
. . . . . *brevicornis* Loew  
Without empodium; ventral angle of gonoforceps rounded (Texas) . . . . .  
. . . . . *schaefferi* Back
- 5(3). Dorsum of thorax partially or wholly covered with tomentum or pollen . . . . . 8  
Dorsum of thorax polished, tomentum confined to lateral and posterior margins . . . . . 6
- 6(5). Third antennal segment 2.5 times longer than the two basal segments, tapering; style long; dorsum with pale, procumbent hair (eastern United States) . . . . .  
. . . . . *Tipulogaster badius* (Loew)  
Length of third antennal segment about equal to two basal segments; dorsum of thorax with dark, more erect hair . . . 7
- 7(6). Anterior legs yellow (southeastern United States) . . . . . *obscuripennis* Johnson  
Anterior legs with dark dorsal stripe (Florida; Texas; Cuba) . . . . .  
. . . . . *obscuripes* Loew
- 8(5). Without empodia (Indiana; Oklahoma; eastern United States; Ecuador) . . . . .  
. . . . . *Psilonyx annulatus* (Say)  
With empodia . . . . . 9
- 9(8). Ground color of thoracic dorsum uniformly reddish yellow, yellowish brown pollinose; occiput yellowish brown (Texas) . . . . . *texanus* Bromley  
Ground color of thoracic dorsum dark . 10
- 10(9). Thoracic dorsum pollinose; strong black occipital bristles; distal half of tibiae blackish brown (Arizona) . . . . .  
. . . . . *arborcola*, new species  
Pale weak hair on occiput; thorax with median and lateral polished stripes (Texas; eastern United States) . . . . .  
. . . . . *virgatus* Coquillett
- 11(2). Thoracic dorsum pollinose . . . . . 13  
Thoracic dorsum polished . . . . . 12
- 12(11). Length, 8 to 10 mm.; dorsal abdominal segments 2 to 4 polished, laterally with white pollinose spots on posterior corners of segments 2 to 6; third antennal segment black (Pennsylvania; Virginia; Georgia) . . . . . *atridorsalis* Back  
Length, over 12 mm.; dorsal abdominal segments subshining, without pollinose spots; antennal segments yellow (North Carolina to Georgia) . . . . .  
. . . . . *aegra*, new species
- 13(11). Abdomen extensively pollinose . . . . . 16  
Abdominal segments 3 and 4 extensively polished, or pollinose with restricted polished patterns laterally or ventrally . . . . . 14
- 14(13). Dorsally abdominal segments 3 and 4 polished, except posteriorly a narrow pollinose band, other segments with



- thin pollinose patterns (Pacific coast; Nevada) . . . . . *nitoris*, new species
- Abdominal segments 2 to 4 pollinose, laterally irregular polished anterior spots, sternites 3 to 5 anteriorly with complete, or interrupted, polished bands . . . . . 15
- 15(14). Markings on thorax distinct; anterior polished bands on sternites not interrupted; distinct posterior ground-color bands on abdomen; median lobe of sternite 9 of male triangular (California; Oregon) . . . *cultaventris*, new species
- Markings on thorax not sharp; anterior polished bands on sternites broadly interrupted; ground-color bands not distinct; sternite 9 of male with median, equilateral, pointed arch (Idaho) . . . . . *fornicata*, new species
- 16(13). Average of 6 to 10 bristles in mystax . 24
- Average of 12 or more bristles in mystax . . . . . 17
- 17(16). Mystax bristles spaced closely together in single row, rarely matted (some specimens with fewer than 12 bristles); face and occiput ochraceous or white tinged with yellow (Montana; Nebraska; Kansas; eastward) . . . . . *murinus* Loew
- Mystax bristles close together, often two or more rows, frequently several matted together; face white . . . . . 18
- 18(17). Hind femora with prominent tuft of white hair ventrally; occipital bristles mixed black and white; in male median lobe of sternite 9 triangular, with long, narrow point apically (Colorado; New Mexico; Arizona) . . *hirtipes* Coquillett
- Without prominent tuft of white hair on hind femora; occipital bristles either pale or black . . . . . 19
- 19(18). Occipital bristles black; second antennal segment totally red or yellow; all femora and tibiae with dark fasciae; gonoforceps truncate apically (Texas; Colorado; New Mexico; Arizona; Nevada) . . . . . *eudicranus* Loew
- Occipital bristles pale, sometimes tinged with color . . . . . 20
- 20(19). Dorsum of abdomen subshining brown, thinly gray pollinose, laterally with denser pollen (Colorado) . . . . . *arenicola* James
- Dorsum of abdomen brown pollinose, laterally gray pollinose . . . . . 21
- 21(20). Vertex gray around ocellar tubercle; antennae brown; thorax gray tomentose, with brown markings (Idaho; Oregon) . . . . . *salvia*, new species
- Vertex brown; thoracic markings broad . . . . . 22
- 22(21). Third antennal segment very narrow basally, apical portion longer and narrower than basal portion (New Mexico) . . . *parvoclava*, new species
- Third antennal segment not narrow basally . . . . . 23
- 23(22). Antennae black brown; gonoforceps sharply pointed apically (Arizona) . . . . . *altacola*, new species
- Second antennal segment orange-yellow; gonoforceps truncate apically . . . . . *eudicranus* Loew
- 24(16). Occipital bristles black (some specimens of *californica* with yellow bristles) . 31
- Occipital bristles white, pale, or tinged with color . . . . . 25
- 25(24). Abdomen dark, with or without posterior light bands, gray and/or brown pollinose . . . . . 27
- Abdomen orange-yellow, with darker markings . . . . . 26
- 26(25). Ground color of thorax black dorsally, with varying amounts of yellow laterally; abdomen with dark bands around incisures, with or without bands between incisures (Alberta; Minnesota to Texas; eastward) . . *incisuralis* Loew
- Ground color of thorax red, white pollinose, with light brown markings; incisures without black bands (Arizona) . . . . . *patula*, new species
- 27(25). Hind tibiae normally wholly yellow or a light brownish yellow . . . . . 29
- Apical two-thirds or more of hind tibiae totally dark brown, at apex with or without narrow lighter band . . . . . 28
- 28(27). With light narrow band at apex of hind tibiae; occiput and vertex tan brown, median thoracic stripe indistinct, brown, separated from indistinct lateral stripes by lighter brown (Kansas) . . . . . *panda*, new species
- Entire apical two-thirds or more of hind tibiae brown, no apical lighter band; occiput and vertex gray; median thoracic stripe geminate, separated anteriorly by gray pollinosity (New Mexico; Arizona) . . . . . *hesperis*, new species
- 29(27). Antennae and legs normally yellow; thorax and abdomen gray laterally to brown pollinose dorsally, ground color of abdominal segments 2 to 4 dark, with posterior yellow or reddish bands (Minnesota to Kansas; eastward) . . . . . *flavipes* Loew
- Antennae and legs with second segment

- yellow . . . . .30
- 30(29). Anteriorly geminate thoracic stripe separated by gray pollinosity, laterally thorax extensively gray; gonoforceps with points bent upward, vestiture normal . . . . .*hesperis*, new species
- Anterior geminate thoracic stripe separated by gray pollinosity, laterally thorax extensively gray; points of gonoforceps more slender, bent upward, vestiture heavy (Colorado; Kansas; Nebraska; South Dakota) . . . . .*coloradensis* James
- 31(24). Face white, occiput ochraceous or yellow; mesonotum laterally brown, contrasting with yellow and/or white pleura; large reddish yellow species (California) . . . . .*californica*, new species
- Occiput gray, or gray with brownish below ocellar tubercle and beyond; mesonotum laterally white or gray, at least beyond transverse suture . . . . .32
- 32(31). Second antennal segment orange or yellow; posterior bands on margins of abdominal segments reddish yellow; apically gonoforceps somewhat obliquely truncate, ventral angle rounded, median section of sternite 9 rectangular (Oregon; California; Nevada) . . . . .*aridus* Cole
- Second antennal segment mostly brown, some yellow apically; broad, rather indistinct median and lateral thoracic stripes; abdomen subshining brown (Idaho) . . . . .*fornicata*, new species

#### *Brevicornis* GROUP

This small group includes *brevicornis* and *schaefferi* which have male genitalia more closely related to those of *Beameromyia* than to those of *Leptogaster* except for the penes. *Leptogaster schaefferi* has three pair of penis valves, with a median process just below them. The penis valves of *brevicornis* are more reduced, but the writer interprets their structure as indicating that three pair of valves are present. Also, the median process is present in *brevicornis*. Neither species is closely related to any in *Beameromyia* because both have a straight  $M_2$  wing vein and lack the median band of hair on the second abdominal segment. Because they are as out of place in *Beameromyia* as in *Leptogaster*, they are left where they were originally assigned.

#### *Leptogaster brevicornis* Loew

Figure 24

*Leptogaster brevicornis* LOEW, 1872, Berliner Ent. Zeitschr., yr. 16, p. 62.

*Leptogaster brevicornis*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 161-162.

The type is in the Museum of Comparative Zoölogy.

DISTRIBUTION: The species ranges from Texas northward to Kansas and east to Indiana. Texas is the type locality. See Appendix for detailed records.

#### *Leptogaster schaefferi* Back

Figure 27

*Leptogaster schaefferi* BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 170-171.

*Leptogaster schaefferi*, BROMLEY, 1934, Ann. Ent. Soc. Amer., vol. 27, p. 96. (Back's description cited; no new records.)

Back described the species from a single female taken at Brownsville, Texas, in May. The type is now in the United States National Museum.

DISTRIBUTION: Texas: Donna, August 4, 1935 (J. W. Monk); Laguna Madre, 25 miles southwest of Harlingen, April 16, 1945 (D. E. Hardy); Brownsville, March 25, 1945 (D. E. Hardy).

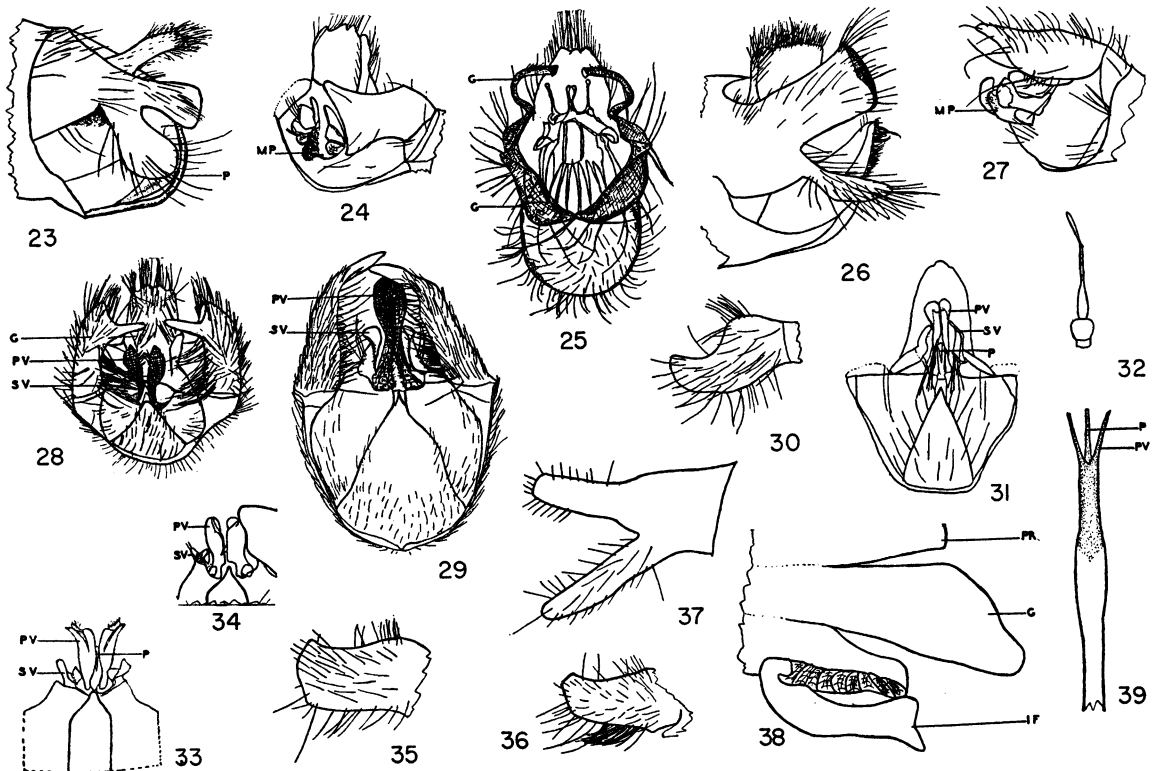
#### *Obscuripes* GROUP

This group differs from the other groups by the pollinose patterns on the abdomen and by the shape and arrangement of the parts of the male genitalia. The dorsum of abdominal segments 2 to 4 is polished, laterally thinly pollinose; the remaining segments are pollinose, with anterior, narrow, polished rings. Sternite 9 of the male is subdivided by swellings which form a median depression. The ventral fork of the male gonoforceps of both species is attached near the middle of the dorsal fork (fig. 26). The secondary penis valves are much broader and longer than the primary valves.

#### *Leptogaster obscuripes* Loew

*Leptogaster obscuripes* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 191.

*Leptogaster ramoni* JAENNECKE, 1867, Abhandl. Senckenbergischen Naturf. Gesell., vol. 6, pp. 354-356.



FIGS. 23-29. Male genitalia of Leptogastrinae. 23. *Leptogaster lanata*. 24. *Leptogaster brevicornis*. 25. *Psilonyx annulatus*. 26. *Leptogaster obscuripennis*. 27. *Leptogaster schaefferi*. 28. *Leptogaster californica*. 29. *Leptogaster cylindricus*.

FIGS. 30-32. *Leptogaster parvoclava*. 30. Dorsoposterior view of gonoforceps. 31. Posterior view of male genitalia, with gonoforceps removed. 32. Antenna.

FIGS. 33, 34. Penis valves. 33. *Leptogaster eudicranus*. 34. *Leptogaster aridus*.

FIGS. 35-37. Gonoforceps. 35. *Leptogaster eudicranus*. 36. *Leptogaster aridus*. 37. *Tipulogaster badius*.

FIGS. 38, 39. *Asilus crabroniformis*. 38. Inner forceps. 39. Penis and penis valves.

Abbreviations: G, gonoforceps; IF, inner forceps; MP, median process; PR, proctiger; PV, primary penis valves; SV, secondary penis valves.

*Leptogaster obscuripes*, BROMLEY, 1929, Ann. Amer. Ent. Soc., vol. 22, pp. 273-274.

*Leptogaster obscuripes* is a dark reddish to black species. The abdomen of the type of *obscuripes*, which is in the Museum of Comparative Zoölogy, is missing. Cuba is the type locality.

DISTRIBUTION: Florida: Key Largo, March 26, 1954 (K. V. Krombein). Texas: Donna, August 11, 1935 (J. W. Monk). Cuba: Havana.

#### *Leptogaster obscuripennis* Johnson

Figure 26

*Leptogaster obscuripennis* JOHNSON, 1895, Proc. Acad. Nat. Sci. Philadelphia, pp. 304, 323.

*Leptogaster obscuripennis*, BACK, 1909, Trans.

Amer. Ent. Soc., vol. 35, pp. 167-168.

*Leptogaster obscuripennis* has considerable yellow in its markings. The dark hair on the thorax is more sparse and not so erect as on *obscuripes*. The male and female type specimens of *obscuripennis* were examined at the Museum of Comparative Zoölogy. The male genitalia were encrusted with debris, so that only the gonoforceps and sternite 9 could be examined.

DISTRIBUTION: Florida: Capron, August 4 (H. G. Hubbard); Tampa, August 4 (H. G. Hubbard). South Carolina: McBee, May 14, 1945. North Carolina: Raleigh, August, 1906, to August, 1934 (C. S. Brimley).

*Virgatus* GROUP

The *virgatus* group is designated more for convenience than to show relationships. Actually the group is composed of several complexes, which may eventually prove to be genera.

The males of all species in the group have in common deeply bifid gonoforceps, with the dorsal arm narrower than the ventral. Also, a pair of lateral, spine-like processes are found projecting from the base of the proctiger. In *arborcola*, *texanus*, and two undescribed species the processes are elongate, with a different shape for each species; *virgatus* has globular structures.

The penes indicate that at least three complexes are involved within the group. In *virgatus* the penis is long and slender (fig. 7). In *texanus* the diameter of the penis is much greater and is shorter than in *virgatus* (figs. 5, 6). A damaged, undescribed species from Texas has a similar penis. The penis of *arborcola* has a very bizarre appearance (fig. 6). A second damaged, undescribed species has a penis somewhat similar to that of *arborcola*.

In the females sternite 8 is broad; tergite 9 is not notched.

*Leptogaster virgatus* Coquillett

## Figure 7

*Leptogaster virgatus* COQUILLETT, 1904, Proc. Ent. Soc. Washington, vol. 6, p. 177.

?*Gonypes nitidus* MACQUART, 1838, Diptères exotiques, vol. 1, pt. 2, p. 155. (*Incertae sedis*.)

?*Leptogaster carolinensis* SCHINER, 1866, Verhandl. Zool.-Bot. Gesell. Wien, vol. 16, p. 696. (*Incertae sedis*.)

*Leptogaster virgatus*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 173-174.

?*Leptogaster carolinensis*, BANKS, 1914, Psyche, vol. 21, p. 133.

The species is easily recognized by the three broad, polished stripes on the thorax, which are usually divided by tomentum, and by the shape of the deeply bifid gonoforceps. The writer has seen specimens of *virgatus* in collections erroneously labeled *badius* in which the tomentum was abraded. The third antennal segment of *virgatus* is about half as long as the style, while the third segment of *badius* is much longer.

Back has indicated that *Leptogaster virgatus* may be a synonym of either *Gonypes nitidus* Macquart or *Leptogaster carolinensis* Schiner. The types of these species have not been seen by the present writer. The type of *virgatus*, in the United States National Museum, has been studied by the author.

DISTRIBUTION: The species ranges from Texas and Oklahoma eastward and northward to Pennsylvania and Long Island, New York. Texas and Washington, D. C., have been designated as the type localities. See Appendix.

*Leptogaster texanus* Bromley

## Figure 5

*Leptogaster texanus* BROMLEY, 1934, Ann. Ent. Soc. Amer., vol. 27, p. 88.

The females have three long black bristles on the margin of tergite 8 about opposite the apical margin of sternite 8.

DISTRIBUTION: Texas: Type locality.

*Leptogaster arborcola*, new species

## Figure 6

MALE: Length, 10 mm. Face white tomentose, vertex and occiput gray tomentose, ocellar tubercle brown pollinose; four pale weak bristles in mystax; black bristles on upper occiput, pale weak bristles and hair on lower occiput. First antennal segment reddish brown, polished, very weak pale bristles; second segment yellow, dark spines on apex; third segment orange-yellow, slightly longer than two proximal segments, basal four-fifths ovoid, apex cylindrical; style brown, about 1.6 times longer than third segment.

Thorax: Ground color red laterad and anterior to the transverse suture, black dorsally, gray pollinose; dark brown, pollinose, central stripe separated anteriorly by gray pollinose triangle, two lateral dark brown stripes wider than central stripe; pleural region black except dorso-posterior angle of mesonotum and area posterior to hind coxae red; scutellum red, gray pollinose, eight short black bristles on posterior margin.

Abdomen black, gray pollinose, with more or less oblong and triangular-shaped dark

brown spots. Venter anteriorly gray, with central brown pollinose spots, seventh and eighth segments gray-brown pollinose. Sternite 8 produced to a point, with a long shining black groove on the dorsal side. The groove serves as a catch for the penis which apically consists of two arms bent in a circle, with a clear membrane covering the open circle. The arms do not quite meet. Gonoforceps deeply bifid; black, internal structures reddish brown; vestiture pale.

**Legs:** Four anterior femora and tibiae brown; posterior femora yellow basally, distal half blackish brown, with two reddish stripes on swollen portion; posterior tibiae mostly yellow basally and brown apically.

**Wings** hyaline.

**FEMALE:** Similar to male except third antennal segment brown, more slender than in male.

**HOLOTYPE:** Male, Santa Rita Mountains, Madera Canyon, Arizona, August 16, 1949 (Chas. H. Martin).

**ALLOTYPE:** Female, same data.

**PARATYPES:** Same data as holotype (Dorothy W. Martin, Chas. H. Martin), two males, female; August 30, 31, 1955 (J. Wilcox, Chas. H. Martin), 23 males, nine females; Huachuca Mountains, Arizona, August 7, 1953 (D. J. and J. N. Knull), male, female.

The holotype and allotype are deposited in the collection of the American Museum of Natural History. Paratypes are in the collections of J. Wilcox, Ohio State University, and the writer.

**REMARKS:** This species was captured while perching at the tips of twigs of trees along a small mountain stream. The body was held horizontally so that it appeared as an extension of the twig. Also, a few were taken while dangling by one leg from the end of the twig. Grass swept in the vicinity of the trees did not yield this species, although other *Leptogaster* were in the grass.

#### *Flavipes* GROUP

This large group, containing 18 species, represents *Leptogaster*, *sensu stricto*, in the United States. Many species in the group are difficult to identify because of the great variation within a species. For example in

*aridus* the color of the occiput ranges from gray to tan, and the pollinosity of the thorax ranges from yellowish brown to gray. The ground color of the body also may show great variation within a species.

The number of mystax bristles in the *flavipes* group is highly variable. The average number of bristles ranges from 5.2 in *aridus*, 7.7 in *flavipes*, 14.8 in *murinus*, 18.4 in *alticola*, to 23 in *salvia*. The range in *salvia* is from 19 to 31. Even where the average number of bristles is low, the deviation from the average is plus or minus two to three bristles. The number of mystax bristles of other species in this group falls within the above range.

The wing venation is generally stable in the *flavipes* group. *Leptogaster hirtipes* seems to be an exception. Back reports it as having both angulated and straight  $M_2$  veins. In a series of 50 specimens at hand  $M_2$  is straight in all specimens, but there is a strong tendency for extra cross veins to appear.

The genotype, *Leptogaster cylindrica* (De Geer), is a European species belonging to this group. The illustration of the male genitalia of this species in figure 29 shows the general features of this group. While the secondary penis valves are long in the genotype, in many species of the United States the secondary valve is usually less than half the length of the primary valve. In these species the secondary valves are usually disc-like structures of different but still similar shapes. For this reason the penis valves are only of secondary importance in the identification of many species of this group. The species in this country having long secondary valves are listed in the key to groups. In a few species the shape of the secondary valves is considerably modified, *aridus* and *eudicranus* being examples.

Apically the gonoforceps are straight and range from short to long and tapering in most species. In a few the apices are strongly curved, while in others they are broadly rounded.

The median area of sternite 9 shows a transition from those species with an equilateral triangle to those with a long isosceles triangle to a small group with a more or less rectangular area which usually ends in a slender point. There are gradations from one



type to another and from the triangle to the rectangle.

SPECIES WITH ELONGATE OR OTHERWISE  
MODIFIED SECONDARY VALVES

*Leptogaster arenicola* James

Figure 41

*Leptogaster arenicolus* JAMES, 1937, Ent. News, vol. 48, pp. 13-14.

*Leptogaster arenicola* JAMES, 1941, Jour. Kansas Ent. Soc., vol. 14, p. 32.

The present writer has at hand three specimens from the University of Nebraska collection which have been identified as *arenicola* by Hardy. The specimens seem to be this species. The type has not been studied.

The brown subshining dorsum of the abdomen, with the denser lateral pollinosity, will separate this species from most of the others. Also, in common with *salvia*, there are numerous bristles in the mystax, many of them being matted together. There are approximately 30 mystax bristles on each of the specimens at hand. The median section of sternite 9 is an isoscles triangle rather uniformly covered with long white hair. The secondary penis valves are about three-fourths of the length of the primary valves. The genotype (*Leptogaster cylindrica*) and *incisuralis* have similar long secondary valves. The male specimen is approximately 7 mm. and the two females about 9 mm. in length.

James collected his specimens on bare sand in a wind-blown area.

DISTRIBUTION: Colorado: Eads (type locality), July 29, 1933 (H. G. Rodeck and M. T. James). Nebraska: Bad Lands, mouth of Monroe Canyon, June 21, 1911 (R. W. Dawson).

*Leptogaster aridus* Cole

Figures 34, 36

*Leptogaster aridus* COLE, 1919, Proc. California Acad. Sci., vol. 9, p. 229.

This species was described from a male and a female taken at Hood River, Oregon, July, 1919. As Cole states, the species would run to *flavipes* in the keys of Back's monograph. Some specimens at hand resemble *incisuralis* in abdominal markings. In the

type specimens the occiput is gray pollinose, but in the specimens at hand the color ranges from gray to tan pollinose, with all gradations between the two colors. This variation is not associated with distribution. A series from Snowline, Eldorado County, and Strawberry, Tuolumne County, in California differ from most specimens in that the thorax is brown pollinose rather than extensively gray pollinose and the red posterior ground-color bands of the abdomen are lacking. The male genitalia are like the genitalia of *aridus* found in other localities.

The male genitalia separate the species from other *Leptogaster*. The mid-section of sternite 9 is a rectangle about three times as long as wide and with a small median point apically. From a lateral view it juts beyond the lateral sections very prominently. The gonoforceps are broadly rounded apically, without a tapering point. The secondary penis valves consist of two parts: a base and a U-shaped structure resting on the base. The species is closely related to *eudicranus* and could be mistaken for it.

DISTRIBUTION: The species ranges up and down the Pacific coast. The writer has a doubtful record from Arizona; this male specimen could be *eudicranus*. See Appendix.

*Leptogaster eudicranus* Loew

Figures 33, 35

*Leptogaster eudicranus* LOEW, 1874, Berliner Ent. Zeitschr., yr. 18, p. 353.

*Leptogaster eudicranus*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 162-163.

*Leptogaster eudicranus*, JAMES, 1937, Ent. News, vol. 48, p. 13.

*Leptogaster eudicranus*, JAMES, 1941, Jour. Kansas Ent. Soc., vol. 14, pp. 31-32.

The type female of *Leptogaster eudicranus* has approximately 15 bristles in the mystax. The occipital bristles are black on the type, but on the specimens at hand the bristles are mixed pale and black on some, all pale on others, and quite a number resemble the type in having black occipitals. The bristles on the incisure of abdominal segment 1 are pale, rather weak, and seem to be more stable in color than the occipitals.

The truncate gonoforceps and the secondary penis valves of *eudicranus* are similar to those of *aridus*. Sternite 9 is a long narrow

ellipse varying in width both basally and apically from specimen to specimen.

The fasciae on both the tibiae and femora vary in distance from specimen to specimen.

The holotype in the Museum of Comparative Zoölogy is from Texas. All the specimens sent to the writer as *eudicranus* from Texas have proved to be other species. Apparently the species is rare in Texas. It becomes more abundant west of Texas.

**DISTRIBUTION:** Texas (type locality). Colorado: (Reported by James). New Mexico: (Reported by Back). Arizona: Lake Mary, June 20, 1949 (Chas. H. Martin); Cochise Stronghold, October 2, 1954 (Butler, Werner). Nevada: Charleston Mountain, June 14, 1949 (Joe Wilcox).

***Leptogaster incisuralis* Loew**

Figure 40

*Leptogaster incisuralis* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 190.

*Leptogaster incisuralis*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 165.

*Leptogaster incisuralis*, BANKS, 1914, Psyche, vol. 21, p. 133.

*Leptogaster ochraceus* SCHINER, 1867, Verhandl. Zool.-Bot. Gesell. Wien, vol. 17, p. 165. (New synonymy.)

*Leptogaster incisuralis* can be easily confused with *flavipes*, because specimens of both species may have almost identical color patterns. The black bands around the abdominal incisures and orange coloration between the bands are usually distinctive of *incisuralis*, but from time to time specimens of *flavipes* are similarly marked. Usually *incisuralis* has more red ground color laterally on the dorsum of the thorax, whereas *flavipes* is more likely to have a totally black dorsum.

The only characters found to be constantly reliable for the separation of the two species are the male genitalia. The male gonoforceps of *incisuralis* are heavier and more truncate apically and have only a very short triangular point in comparison with the long, more narrow point of *flavipes*. The paper-thin secondary penis valves are elongate, very broad, truncate distally, and usually project at a 45-degree angle beyond the posterior margin of the upright primary valves. Occasionally the secondary valves are in a more or less erect position parallel to the

primary valves. They are subequal to the length of the primary penis valves (see *flavipes*).

Banks states that "*incisuralis* is *ochraceus*," but the name *incisuralis* has priority. The description of *ochraceus* seems to fit either *incisuralis* or some specimens of *flavipes*. *Leptogaster ochraceus* could not be a synonym of *testaceus*, as Back suggests. The thorax of *ochraceus* is covered with "bloom," but *testaceus*, which is a synonym of *badius*, has a polished thorax. The present writer considers *ochraceus* a synonym on the basis of the description and the examination of numerous *incisuralis* and *flavipes* specimens.

**DISTRIBUTION:** *Leptogaster incisuralis* ranges over the entire eastern United States. The most western records are from Minnesota to Texas. For detailed records, consult the Appendix.

***Leptogaster parvoclava*, new species**

Figures 30-32

**MALE:** Length, 7 mm. Head black, face white tomentose; orbits white, yellowish brown tomentose of vertex extending on upper occiput slightly beyond pale occipital bristles, remainder of occiput gray pollinose; mystax bristles pale, matted into groups, over 15 bristles, at least two rows; first antennal segment polished dark red, second dark red, tomentose, pale weak apical hairs, third segment as long as proximal two, black, polished except basal fifth pollinose, constricted apical portion about half as wide as basal portion, length equal to basal portion, style polished black, length about equal to constricted apical portion of third segment.

Thorax black, dorsum brown tomentose, thin on darker brown median stripe, lateral stripes darker brown, laterally yellowish gray fading to gray tomentose along border; pleurae white tomentose, scutellum dark, white tomentose, pale, weak, retrose hair along border.

Abdomen black; dorsum reddish brown pollinose, laterally gray pollinose, venter gray pollinose; vestiture short, pale hair, posterior margin of first abdominal segment with weak, pale hairs; male genitalia reddish, white hair; sternite 9 with median lobe about 1.8 times longer than wide at base, sparse white hair on basal two-thirds, apical third nude.

Legs: Anterior four yellow, first pair of femora slightly darkened dorsally, middle femora completely darkened except basally and apically, tibiae darkened dorsally; hind femora yellow basally, reddish brown apically, vestiture pale recumbent hair, posteriorly a broad nude area; hind tibiae mostly reddish brown except basally, thin pale hair anteriorly, thicker pale hair posteriorly.

Wings more heavily strippled at apex than basally, veins brown.

**FEMALE:** Similar to male.

**HOLOTYPE:** Male, Milagro, New Mexico, June 23, 1941 (R. H. Beamer).

**ALLOTYPE:** Female, same data as holotype.

**PARATYPES:** Same data as holotype, six males, seven females.

The holotype and allotype deposited at the University of Kansas. Paratypes are in the University of Kansas and in the writer's collection.

**REMARKS:** This small black species is named *parvoclava* in reference to the slenderness of the third antennal segment, which

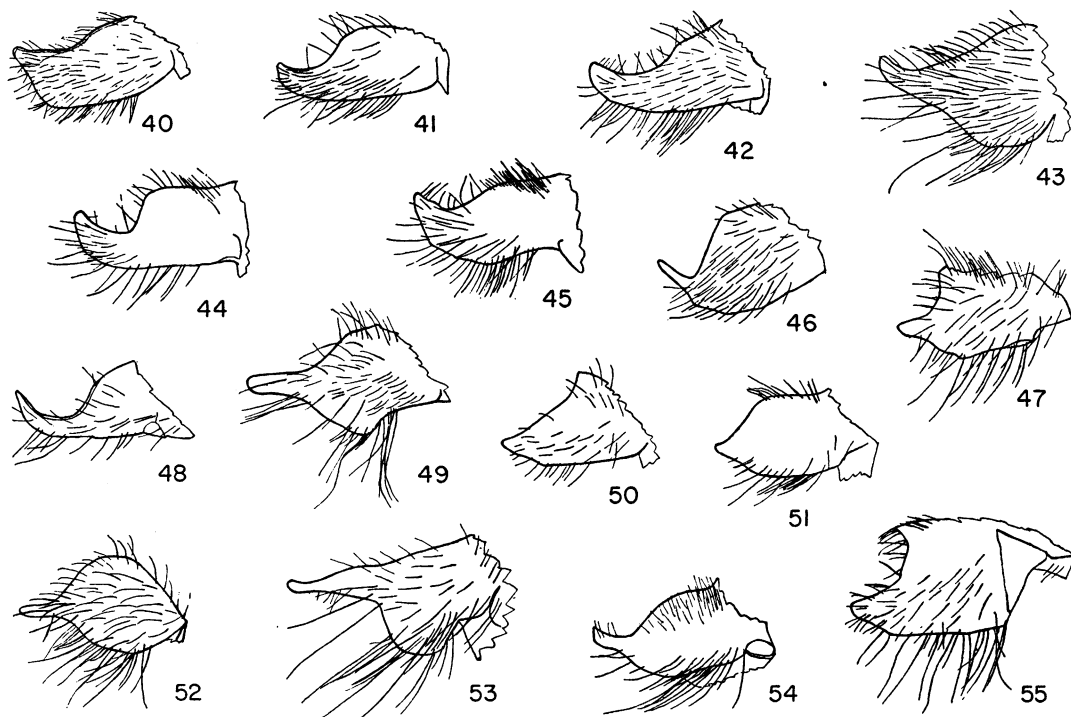
separates this species from other known species.

***Leptogaster panda*, new species**

Figure 44

**MALE:** Length, 7 mm. Head black, face gray tomentose, with faint brownish tinge, vertex and occiput between ocellar tubercle and occipital bristles brown pollinose, fading to grayish brown pollinose; about 12 pale mystax bristles spaced closely together; strong, pale occipital bristles; polished first and tomentose third antennal segments, style dark reddish brown, second segment darkened yellowish orange, with two black short apical bristles, third segment about 1.5 times longer than either of proximal two segments or style.

Thorax black, yellowish brown pollinose dorsally, somewhat lighter laterally, posterior margin and scutellum discolored white pollinose, indistinct median and lateral dark brown stripes dorsally, pleurae gray.



FIGS. 40-55. Dorsoposterior view of gonoforceps of *Leptogaster*. 40. *L. incisuralis*. 41. *L. arenicola*. 42. *L. salvia*. 43. *L. murinus*. 44. *L. panda*. 45. *L. alticola*. 46. *L. coloradensis*. 47. *L. hesperis*. 48. *L. atridorsalis*. 49. *L. flavipes*. 50. *L. patula*. 51. *L. cultaventris*. 52. *L. fornicata*. 53. *L. aegra*. 54. *L. nitoris*. 55. *L. hirtipes*.

Abdomen black, posterior corner of segments 2 to 4 reddish yellow, light pollinose, dorsally all segments dark brown; sternite 9 triangular, very sparse hair, gonoforceps long curved points, secondary penis valves about two-thirds of the length of the primary valves, greatly expanded apically.

Wings hyaline, rather heavily stippled with microtrichia;  $M_2$  slightly angulate.

Legs: Anterior four yellow, femora darkened; hind femora yellow, broad reddish brown band on incrassate portion; distal two-thirds of hind tibiae reddish brown, lighter indistinct band at apex.

HOLOTYPE: Male (one wing broken off and one hind tibia missing), Emporia, Kansas, June 18, 1941 (R. H. Beamer), in the collection of the University of Kansas.

REMARKS: Named *panda* in reference to the very broad apical expansion of the secondary penis valves.

#### SPECIES WITH DISC-LIKE SECONDARY PENIS VALVES

##### *Leptogaster altacola*, new species

Figure 45

MALE: Length, 10 mm. Head black, face and front white tomentose, orbits pale, vertex cinnamon-brown pollinose, occiput gray pollinose, with brown area below ocellar tubercle; 25 to 30 pale bristles in mystax; occipital bristles pale. Antennae dark brownish black, third segment basally narrowly reddish yellow, brown tomentose, longer than proximal segments or style, apical third constricted to width of style; several short brown bristles on apex of second segment, weak bristles on first.

Thorax: Dorsum black, yellowish brown pollinose, median and the broader lateral stripes darker brown, metanotum posteriorly gray pollinose tinged with brown, posterior humeri and scutellum gray pollinose. Along margin of median stripe sparse, weak, divergent brown bristles; presutural pale, supra-alar black. Long, narrow paratergite black, white pollinose; pleura black, white tomentose.

Abdomen black, reddish brown pollinose dorsally, gray-white pollinose laterally and on venter, vestiture sparse, mixture of short pale hair and long hairs along posterior margin of first abdominal segment except

medially; male genitalia brownish red, sternite 9 with median lobe polished, band of fairly dense, pale hair across middle, bases of lateral lobes of sternite with weak tuft of pale hair; gonoforceps obliquely truncate ventrally, with short dull point extending from upper margin.

Legs: Femora of front legs reddish brown, middle femora dark medially and lighter distally and apically; tibiae of anterior four legs yellow, with dark stripe anteriorly, vestiture pale; hind femora pale basally, incrassate portion reddish brown on basal three-fourths, distal fourth paler, vestiture pale; hind tibiae dark reddish brown except narrow light band distally, vestiture pale.

Wings iridescent, cells with microtrichia except for costal cell and middle area of first and second basal cells. Anterior cross vein slightly before middle of discal cell.

FEMALE: Similar to male.

HOLOTYPE: Male, Chiricahua Mountains, Arizona, July 20, 1950 (Chas. H. Martin).

ALLOTYPE: Female, same data (R. H. Beamer).

PARATYPES: Arizona: Chiricahua Mountains, July 20, 1950 (Chas. H. Martin), 19 males, three females; (R. H. Beamer), four males, seven females; (H. O. Wright), male, female; (J. Arnold), female; Chiricahua Mountains, Rustler's Park, July 5, 1940 (E. H. Kanager), female; (L. C. Kuitert), male.

The holotype is deposited in the American Museum of Natural History; the allotype, in the University of Kansas collection. Paratypes are deposited in the above institutions and in the writer's collection.

REMARKS: This species was collected between 7000 and 8000 feet, hence the name *altacola*. The extent of the brown around and below the ocellar tubercle is variable; on most specimens the brown extends to the occipital bristles, while on others the area below the ocellar tubercle is lighter and almost or wholly gray, with the orbital regions behind the tubercle brown.

##### *Leptogaster californica*, new species

Figure 28

MALE: Length, 10 mm. Head black in ground color, face white tomentose; vertex ochraceous; occiput ochraceous tomentose above, gray below. Six pale weak bristles in mystax; hair on lower occiput white, strong

black bristles on upper occiput. Antennae dark brown, with second segment reddish, first segment subequal to second, both equal to length of style; third segment 1.5 times as long as proximal two segments, basal two-thirds ovoid, with distal third compressed to diameter of style.

Thorax ground color black, with mesonotal margins red, dorsum yellow-brown tomentose, with dark broad median stripe partially divided by lighter stripe, broad lateral dark stripes; posteriorly red ground-color areas white pollinose; scutellum red, white pollinose, with a median brown spot on margin; pleura mostly reddish ground color, white tomentose. Thoracic bristles black.

Abdomen: Ground-color of segments 1 to 4 and anterior portion of segment 5 red, remaining portion of abdomen black; segment 1 brownish pollinose, segment 2 with alternate bands of brown pollinosity and ochraceous pollinosity, segments 3 and 4 with alternate pollinose bands of reddish brown and yellowish red, segment 5 similar but darker, segments 6 to 9 reddish brown pollinose, sternite and tergites of segment 8 reddish brown pollinose, with posterior margin polished, yellow; short, sparse, yellowish white hair on segments 2 and 3, similar but somewhat longer hair on remaining segments. Gonoforceps are more hollowed inside than in most species.

Legs: Anterior four pale yellow, tibiae and femora darkened dorsally; hind femora clavate, yellow basally, gradually darkening to light reddish brown on incrassate portion, vestiture white, basal 10 per cent of hind tibiae pale yellow, remainder light reddish brown, vestiture pale except apical spines brown.

Wings: Dark brown veins, except basally subcostal vein is yellow.

**FEMALE:** Usually mesopleurae stained yellow in female but white in male; otherwise similar.

**HOLOTYPE:** Male, Monrovia Canyon, California, June 14, 1931 (Chas. H. Martin).

**ALLOTYPE:** Female, same data (Dorothy W. Martin).

**PARATYPES:** California: Same data as holotype and allotype, and with additional dates of June 7, 19, July 2, 1931, 30 specimens of both sexes; Tanbark Flat, Los Angeles County, June 20, 1950 (H. E. Robinson,

J. W. McSwain), male, female; June 21, 1950 (J. W. McSwain), two males, three females, (F. X. Williams), male, (J. W. Hall), female, (K. G. Whitesell), female; June 23, 1950 (F. X. Williams), female, (J. W. Hall), female, (K. G. Whitesell), female; June 24, 1950 (F. X. Williams), female; June 25, 1950 (F. X. Williams), male; June 27, 1950 (F. X. Williams), female; July 4, 1952 (R. M. Bohart), female; July 7, 1950 (H. F. Robinson), female; July 8, 1950 (F. X. Williams), male, female, (R. E. McKenzie), female, (R. M. Bohart), male; July 9, 1950 (W. A. McDonald), two females; July 10, 1950 (C. D. Michener), female; July 11, 1950 (R. M. Bohart), male; July 12, 1952 (S. Miyagawa), female; July 13, 1950 (W. A. McDonald), pair, (K. G. Whitesell), male; July 14, 1950 (R. M. Bohart), female; July 17, 1952 (D. F. Barcas), male; Herkey Creek, San Jacinto Mountains, June 4, 1940 (C. D. Michener), male; Idyllwild Road, July 22, 1930 (T. F. Winburn, R. H. Painter), female; Arcadia, June 17, 1945, male; Crystal Lake Road, 4700 feet, Los Angeles County, July 9, 1952 (J. H. Nakata), two females; Cabazon, Riverside County, June 1, 1941 (E. C. Van Duzee), female; Mariposa, June 25, 1940 ("B. E. W.") female; June 7, 1940 (B. Brockman, T. Aitken, M. Cazier), female; Lake Almanor, Plumas County (J. W. McSwain), female; Sequoia National Park, 2000 to 5000 feet, Potwisha, June 2, 1929 (E. C. Van Duzee), female.

The holotype and allotype are deposited in the American Museum of Natural History. Paratypes are in the collections of the University of California at Davis and of the writer.

**REMARKS:** The ochraceous color of the occiput varies by the amount of gray that encroaches from the lower occiput. Some females have yellow rather than black occipital bristles. The marks on the thorax are much more distinct on some specimens than on others. The ochraceous upper occiput and the brown border of the mesonotum, contrasting sharply with the white pleurae, are very similar to those of *murinus*. The bands of color on the abdomen vary in extent and sharpness; on some specimens they are almost obsolete. The abdomen of some specimens resembles that of *Leptogaster incisuralis* of the eastern United States.

**Leptogaster coloradensis** James

Figure 46

*Leptogaster coloradensis* JAMES, 1937, Ent. News, vol. 48, p. 14.

The writer has studied 150 specimens of *coloradensis*. This is one of the dozen species which have primary and secondary penis valves so similar to those of *flavipes* that the valves cannot be used to separate the species. One character that separates *coloradensis* from *flavipes* is the combination of a blackish brown antenna with an orange second segment. Most *flavipes* specimens have all antennal segments yellow, although a few specimens outside the geographical range of *coloradensis* have a dark third antennal segment. Also, the tips of the gonoforceps differ in shape. The amount of gray on the lateral margins of the dorsum of the thorax is variable. With many specimens the gray is mixed with varying amounts of brown, while in others the gray is whitish and more extensive. In most specimens the geminate median thoracic stripe is separated anteriorly by brownish pollen, but occasionally gray pollen separates the stripe.

The color of the abdomen is more variable than James's description indicates. In many specimens the abdomen is black, with lateral, posterior corners of segments 2 to 4 reddish yellow. The reddish yellow may continue anteriorly along the lateral margins. With other specimens the light posterior corners are present only on one or two segments, or all segments are black as James describes. In some specimens the reddish corners are apparent only under strong light or when the pollen is abraded.

**DISTRIBUTION:** Apparently the range of both *coloradensis* and *flavipes* narrowly overlaps in Kansas, Nebraska, and South Dakota. No *flavipes* specimens have been seen from Colorado or near-by mountain states, and no *coloradensis* have been seen from the eastern states. The type locality is Boulder, Colorado. See Appendix.

**Leptogaster cultaventris**, new species

Figure 51

**MALE:** Length, 9 mm. Head black, face white tomentose, vertex light yellowish brown, occiput gray, with margin light yellowish brown; mystax with six pale

bristles; occipital bristles black. Antennae reddish yellow-brown, second and third segment lighter than first and style, third segment about 1.6 times longer than two proximal segments and about 1.3 times longer than style; apex of second segment with groups of weak pale bristles ventrally and dorsally, first segment with several darker weak bristles basally.

Thorax black, with anterior and posterior humeri and dorsum yellowish brown-gray, V-shaped median stripe, broad, somewhat indistinct, lateral stripes brown, dorsum below V-shaped stripe, scutellum, pleura, gray pollinose, with yellowish tinge on metapleura.

**Abdomen:** Ground-color of anterior third of segment 2, and segments 6 to 8 black, segment 2 posteriorly and segments 3 to 5 red, with narrow black bands around incisions; segment 1 reddish brown-gray pollinose, segment 2 with pollinose bands of different shades of yellow-brown, segments 3 to 8 reddish brown pollinose, light yellowish red posterior pollinose bands on segments 3 to 4; anterior margin of sternites 3 to 5 with narrow polished reddish brown bands, same segments with anterior lateral polished areas.

**Legs:** Anterior four yellowish; hind femora yellowish, with indistinct darkened band on incrassate portion; hind tibiae yellow basally, darkened distally, vestiture of femora and tibiae pale.

**FEMALE:** Similar to male; more gray on first abdominal segment and anterior portion of second; third antennal segment lighter than in male.

**HOLOTYPE:** Male, Danville, California, May 22, 1949 (F. X. Williams). Allotype on same block of cork with holotype.

**PARATYPES:** California: Mariposa, Mariposa County, June 7, 1940 (B. Brookman, T. Aitken, M. Cazier), four males, five females, May 25, 1940 (W. P. Barr), male; Livermore, Alameda County, May 12, 1940 (Mont Cazier), female; North Fork, Madera County, June 8, 1940 (B. Brookman, T. Aitken, M. Cazier), female; Yosemite Fork, Madera County (B. Brookman, T. Aitken, M. Cazier), female; Sequoia National Park, 2000 to 5000 feet, Potwiska, June 13, 1929 (E. C. Van Duzee), female; Stanford University, Santa Clara County, May 23, 1949 (P. H. Arnaud, Jr.), five males, four females;



Redwood City, July 14, 1940 (E. S. Ross), female; Trinity River Camp, Trinity County, July 17, 1953 (A. T. McClay), male; Boca, Nevada County (A. D. Telford), female; Lone Pine, July 28, 1940 (R. H. Beamer), female; Monrovia Canyon, June 7, 1931 (Chas. H. Martin), male; June 14, 1931 (Chas. H. Martin), male; Cabazon, Riverside County, June 1, 1941 (E. C. Van Dyke), three males; Dark Canyon, San Jacinto Mountains, June 6, 1939 (E. S. Ross), female; Glenwood, July 31, 1930 (T. F. Windburn, R. H. Painter), male. Oregon: Medford, Jackson County, September 7, 1953 (A. T. McClay), male; 22 miles east of Burns, dry hillside, July 20, 1938 (H. A. Scullen), male; Kiger Island, Benton County, July 17, 1941, two males. Washington: Three miles south of Peola, July 10, 1952 (M. and Helen James), female.

The holotype and allotype and some paratypes are deposited in the California Academy of Science collections. Paratypes are also at the University of California at Davis, Washington State College, and in the writer's collection.

**REMARKS:** This species can be separated from all others by the polished, usually reddish brown band on the anterior margin of sternites 3 to 5. Sometimes these bands are on only two segments. There are lateral polished reddish areas on the anterior abdominal segments. *Leptogaster fornicata* also has similar polished lateral areas which are usually black. Also, some specimens of *aridus* have similar smaller nude areas which may extend along the margin of the segment.

The name *cultaventris* is from the Latin words *culta* (polished) and *ventris* (belly) and refers to the polished bands on the venter. These bands and the male genitalia are the most stable characters of the species. The second antennal segment is usually yellow but may be almost the same color as the third segment. Also, the posterior band on abdominal segments 2 to 4 may be either yellow or red and sometimes is present on segment 5. There may be anterior red bands on segments 2 and 3 in addition to the posterior bands. The bands may have indistinct margins or sharply defined margins. The anterior abdominal segments may be dark brown pollinose, with yellow or red

bands, or the light ground color and gray pollinosity may be more extensive.

#### ***Leptogaster flavipes* Loew**

Figure 49

*Leptogaster flavipes* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 193.

*Leptogaster flavipes*, VAN DER WULP, 1884, Tijdschr. v. Ent., vol. 27, pp. 207-208. (Description of male.)

*Leptogaster flavipes*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 163.

*Leptogaster favillaceus* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 191.

*Leptogaster flavicornis* VAN DER WULP, 1867, Tijdschr. v. Ent., vol. 10, p. 136.

*Leptogaster flavicornis*, LOEW, 1870, Zeitschr. f. Ges. Naturwiss., vol. 26, p. 120. (Believed a probable synonym of *flavipes*.)

*Leptogaster loewi* BANKS, 1914, Psyche, vol. 21, p. 133.

While many specimens of *Leptogaster flavipes* can be accurately identified by the color patterns of authors, some specimens can be mistaken for other species. Usually the lateral margins of the mesothorax and metathorax are gray pollinose, with the dorsum brown, which is also true for *coloradensis*, *aridus*, and *incisuralis*. Sometimes the dorsum is more gray pollinose than brown. The ground color of the dorsum is usually black, but some specimens have considerable red laterally. The dorsum of the abdomen is brown, with the lateral margins gray pollinose. In many specimens the posterior three segments and the anterior half of the second segment of the abdomen are totally gray pollinose, with the exception of the yellow sternites. Usually there are narrow, yellow or reddish ground-color bands on the posterior margins of segments 2 to 4, but occasionally only on 2, or 2 and 3. Sometimes the anterior segments of the abdomen are entirely yellow, as in *incisuralis*, with the black band around the incisures. (See *incisuralis* and *murinus*.)

The most stable characters for the identification of *flavipes* are sternite 9 and the genitalia of the male. The width at the base of the triangular mid-section of sternite 9 is usually subequal to its length. On some specimens this mid-section is narrower and is over 1.5 times longer than wide at the base. *Leptogaster incisuralis* is similar but has

more consistently a narrower mid-section, with a slight constriction near the tip.

The gonoforceps of *flavipes* have a long, narrow, apical point. The diameter of the truncated, lobe-shaped, secondary penis valve is about one-third of the length of the primary penis valve, and the flattened axis is parallel to that of the primary valve. Normally the primary penis valves are upright, but in some specimens they lie parallel to the horizontal axis of the body. The species having penis valves that closely resemble those of *flavipes* are listed in the key to the groups of *Leptogaster*.

In the past Loew believed that *flavicornis* Van der Wulp was probably a synonym of *flavipes*. Back believed that both *flavicornis* and *favillaceus* Loew were synonyms of *flavipes*. Banks considered both species valid on the basis of color patterns and color of thoracic bristles. He also described *loewi* on this basis.

Examination of the type of *loewi* shows that it is a synonym of *flavipes*. The two males in the type series of *loewi* have genitalia which very closely resemble those of *flavipes* males. Also, I was unable to find any other characters that would separate the two species.

No good characters have been found which will separate *favillaceus* from *flavipes*. The type of *favillaceus* is a female that is larger than the average female of *flavipes*. A number of both male and female specimens identified as *favillaceus* are at hand; some of the females resemble the type female. All are *flavipes*. I follow Loew and Back in continuing to consider *favillaceus* as a synonym of *flavipes*.

Also, I follow Loew and Back in considering *flavicornis* Van der Wulp as a synonym of *flavipes*.

**DISTRIBUTION:** While the type locality of *flavipes* is Nebraska, collecting records indicate the species to be more abundant in the northeastern states. As records in the Appendix show, the species ranges from Minnesota to Maine and southward to southern Kansas and Georgia.

*Leptogaster fornicata*, new species

Figure 52

**MALE:** Length, 10 mm. Head black, face, front white tomentose, vertex, occiput, gray

pollinose; mystax with eight pale bristles; occipital bristles black. Third antennal segment dark brown, tapering, slightly longer than proximal segments or the dark brown style; three short black bristles on yellowish apex of second segment, single short hair at base of first.

Thorax black, gray pollinose, brown, rather indistinct, median and lateral stripes; humeri reddish, anterior humeri with short pale hairs; scutellum gray pollinose, with two weak bristles on dorsum; few very weak, divergent brown bristles along margin of median stripe; pleura black, white pollinose.

Abdomen: Ground color reddish brown, polished, segments 2 to 4 with indefinite reddish areas near posterior margin; anterior lateral polished corners on margin, segment 8 with more extensive lateral polished areas, sternite 1 is polished laterally and posteriorly on one side but not on other, sternite 3 and 5 with polished band on anterior margin thinly pollinose medially, sternite 4 is completely polished on the type specimen; segments 1 and 2 anteriorly mixed gray and brown pollinose, dorsum of segment 2 posteriorly and remaining segments brown pollinose, yellowish white pollinose laterally and across reddish areas, segment 3 very thinly pollinose; vestiture pale except darker hairs on the male genitalia; median lobe of sternite 9 forming an equilateral pointed arch, pale hair distally but along base.

Legs: Anterior four legs yellow, darkened on anterior side; hind femora yellow except brownish red band on incrassate portion, tibiae brownish red except basal portion pale, vestiture of posterior femora short reddish hair basally, incrassate portion white haired, hind tibiae with white hair ventrally, black dorsally.

Wings stippled with microtrichia, more heavily apically.

**FEMALE:** Abdomen polished black, sternites 3 and 4 with anterior band polished only laterally, completely pollinose on sternite 5. Otherwise similar to male.

**HOLOTYPE:** Male, with allotype female (caught *in coitu*, on same pin), Long Valley, Alpha, Idaho, June 17, 1934 (Chas. H. Martin).

**PARATYPES:** Same locality as holotype, June 17, 1934 (Chas. H. Martin), male,

female; July 8, 1934 (Chas. H. Martin), female; June 10, 1934 (Dorothy W. Martin), male, female; June 17, 1934 (Dorothy W. Martin), male; July 1, 1934 (Dorothy W. Martin), female; July 8, 1934 (Dorothy W. Martin), female.

The holotype and allotype are deposited in the American Museum of Natural History. Paratypes are in the collection of the writer.

REMARKS: The name *fornicata* refers to the equilateral pointed-arch appearance of the median lobe of sternite 9 of the male.

The irregular polished lateral spots on the anterior margin of segments 3 to 5 are not very distinct in two females of the type series. Also, the anterior polished sternite band is polished only laterally.

**Leptogaster hesperis**, new species

Figure 47

MALE: Length, 11 mm. Head black, face white tomentose, vertex, occiput gray pollinose; eight weak pale bristles in mystax; occipital bristles pale. First antennal segment polished, reddish brown, second segment orange-yellow, pollinose, third segment brown pollinose except narrowly orange-yellow basally, style brown, third segment longer than proximal two segments, approximately as long as style, pale bristles on apex of second segment.

Thorax black, gray pollinose, V-shaped stripe and indefinite lateral stripes brown, sparse, short pale hair on dorsum; scutellum, pleura, sternites, gray pollinose.

Abdomen black, dorsum brown pollinose, gray posterior pollinose bands on segments 1 to 5, laterally and ventrally gray pollinose, short erect sparse hair more abundant laterally and posteriorly on segment 2; prominently concave median lobe of sternite 9 apically an equilateral pointed arch, covered with long sparse pale hair.

Legs: Anterior four yellow, vestiture pale; posterior femora yellow, incrassate portion reddish brown, short, sparse, pale hair, tibiae reddish brown except yellow basally, vestiture pale.

Wings more heavily stippled with microtrichia apically than basally. Anterior cross vein before middle of discal cell.

FEMALE: Similar to male. Thoracic median stripe geminate.

HOLOTYPE: Oak Creek Canyon, Pine Flat, Arizona, June 20, 1950 (C. H. Martin).

ALLOTYPE: Flagstaff, Arizona, July 21, 1949 (Dorothy W. Martin).

PARATYPES: Arizona: Oak Creek Canyon, Pine Flat, June 19, 1949 (Chas. H. Martin), pair *in coitu*; June 20, 1950 (Dorothy W. Martin, Chas. H. Martin), pair *in coitu*, 19 males, 17 females; Oak Creek Canyon, July 15, 1947 (R. H. Beamer), males; Flagstaff, July 21, 1949 (Dorothy W. Martin, Chas. H. Martin), 18 males, 22 females; White Mountains, McNary, August 9, 1948 (Dorothy W. Martin), male; August 10, 1949 (Dorothy W. Martin, Chas. H. Martin), seven males, two females; July 17, 1949 (Dorothy W. Martin), male, four females. New Mexico: La Cueva Springs, July 27, 1950 (Dorothy W. Martin, Chas. H. Martin), 12 males, three females; Cloudcroft, June 27, 1944 (L. J. Liponsky), male; Otero County, 8000 feet, June 20 (E. M. Painter, R. H. Painter), pair on same pin, female.

The holotype and allotype are deposited in the American Museum of Natural History. Paratypes are in the collections of R. H. Painter and the writer.

REMARKS: Some specimens have the posterior margins of the abdominal segments with rather indistinct reddish yellow bands. The primary and secondary penis valves resemble those of *flavipes*, but the gonoforceps are heavier apically than in *flavipes*.

**Leptogaster hirtipes** Coquillett

*Leptogaster hirtipes* COQUILLET, 1904, Proc. Ent. Soc. Washington, vol. 6, p. 178.

*Leptogaster hirtipes*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 164-165.

This species is easily identified by the conspicuous tuft of white hair on the hind femora. The dorsal margin of the gonoforceps is strongly emarginate, forming a triangular point with the ventral margin. Sternite 9 is triangular, apically with a long, narrow, clavate point covered with sparse, short, white hair. The hair on the point of the triangle is not typical of the *flavipes* group.

DISTRIBUTION: Colorado (type locality); 11-mile Canyon, Park County, 8000 feet July 15, 1954 (M. A. Evans). New Mexico: Cloudcroft, June 27, 1940 (R. H. Beamer,

L. C. Kuitert, E. H. Kanager, D. E. Hardy). Arizona: White Mountains, McNary, August 10, 1949 (Dorothy W. Martin, Chas. H. Martin).

***Leptogaster murinus* Loew**

*Leptogaster murinus* LOEW, 1862, Berliner Ent. Zeitschr., yr. 6, p. 190.

*Leptogaster murinus*, BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 166-167.

*Leptogaster murinus* is usually a large, robust species over 13 mm. in length, but a few small specimens are at hand from South Dakota. Normally the antennae are dark brown, but some specimens have a yellow or red second antennal segment which is similar to the antennae of *coloradensis*. Also, a few specimens with totally yellow antennae have been seen. The mystax bristles are usually pale, but a specimen from Nebraska had a reddish brown mystax. The average number of bristles in the mystax is 15, with a range of nine to 20; *flavipes* averages eight, with a range of six to 15.

The mesonotum and metanotum are brown, contrasting sharply with the white or ochraceous-tinged white of the pleurae.

The discal cell of *murinus* is stippled with dense microtrichia, while the cell is partially hyaline in *flavipes* and *coloradensis*.

The solid ground color of the abdomen aids in the separation of this species from *flavipes*. While the lateral margins of the abdomen are gray and the dorsum is brown, *murinus* lacks the red bands around the posterior margins of the three anterior segments.

The secondary penis valve of the male is a pointed lobe somewhat smaller than the more truncate lobe of *flavipes*. Because of its small size, the tip does not extend to the posterior margin of the primary valve, which makes it appear to be placed more anteriorly than in *flavipes* or *coloradensis*.

The writer has identified for R. H. Painter specimens of *murinus* which he had collected at lights at Manhattan, Kansas, during 1954 and 1955.

**DISTRIBUTION:** This species seems restricted to the midwest. It has been collected from South Dakota to Texas and as far east as Arkansas, Ohio, and Michigan. See Appendix.

***Leptogaster nitoris*, new species**

**Figure 54**

**MALE:** Length, 9 mm. Head black, face white tomentose, vertex, ocellar tubercle, upper portion of occiput brown pollinose, lower occiput gray pollinose; seven pale bristles in mystax; black bristles on upper occiput; extending to lower portion, sparse white hair on lower occiput; first antennal segment polished reddish brown, second pollinose and lighter in color, with short black apical bristles, two proximal segments approximately equal to length of third segment and to style, third segment and style dark reddish brown, basally third segment ovoid, apically cylindrical.

Thorax black, brown tomentose, darker median stripe divided by lighter stripe, lateral stripes dark, indistinct, scutellum and posterior callosities brownish white pollinose; thoracic bristles black; four inconspicuous, very weak bristles on margin of scutellum; mesopleura light golden tomentose, metapleura and sternites gray tomentose.

Abdomen polished, segment 1 yellow, with indistinct dorsal reddish brown spot, long, black, lateral bristles, ground color of segment 2 with alternate bands of dark reddish brown and yellow, the two anterior bands thinly brown pollinose, segment 3 similar except narrow, thin, brown, pollinose band on anterior margin and a broader yellow pollinose band on posterior margin, segment 4 similar, with more extensive dark red color, segments 5 to 8 reddish brown, segment 5 with thin, pollinose, narrow, dorsal stripe, segments 6 and 7 with dorsal, triangular, pollinose areas, segment 8 with dorsal spot of pollinosity; short pale hair on abdomen thickens on segments 6 to 8; genitalia blackish brown, covered with brown hair, proctiger with white hair.

**Legs:** Four anterior tibiae and femora pale, darkened dorsally; posterior femora yellow, with incrassate portion reddish brown, posterior tibiae yellow basally and reddish distally.

**Wings:** Iridescent, microtrichia in all cells except basal cells; anterior cross vein distinctly before middle of discal cell.

**FEMALE:** Similar to male; second antennal segment is distinctly yellow on allotype.

HOLOTYPE: Male, Yelm, Washington, July 9, 1932 (Chas. H. Martin).

ALLOTYPE: Female, same data.

PARATYPES: Washington: Same data as holotype, 10 males, 10 females; (Joe Wilcox), 25 males, 22 females, July 6, 1932 (Joe Wilcox), 40 males, 30 females; American River, Indian Flat, July 10, 1932 (Chas. H. Martin), female. Oregon: Hood River, July 17, 1931 (John Nottingham), female. Nevada: Verdi, June 25, 1954 (R. M. Bohart), five females. California: Quincy, 4 miles west, Plumas County, June 22, 1949 (J. W. McSwain), two males; June 25, 1949 (Claude I. Smith), pair; June 26, 1949 (J. W. McSwain), pair, female; July 3, 1949 (J. E. Gillaspay), male, (P. D. Hurd), female; Strawberry, Toulume County, June 29, 1951 (A. T. McClay), two females; Boca, Nevada County, June 28, 1954 (R. M. Bohart), female, (E. I. Schlinger), male; July 5, 1954 (R. C. Bechtal), male; Blue Lake, Lassen County, July 19, 20, 1947 (R. L. Usinger), male; Yosemite National Park, August 1, 1941 ("D. E. G."), female; Kyburz, July 22, 1948 (H. E. Cott), female.

The holotype and allotype are deposited in the American Museum of Natural History. Paratypes are in the collections of Joe Wilcox and the writer.

REMARKS: This species is named *nitoris* in reference to the polished dorsum of abdominal segments 3 and 4 which separate this species from other western species.

The second antennal segment is usually yellow, but in some specimens it is reddish brown and almost as dark as segments 1 and 3.

The color of the abdomen ranges from almost totally yellow to totally dark. The third abdominal segment of one female is bright yellow, with a narrow anterior black band, segment 2 is about two-thirds yellow posteriorly, and segment 4 is mostly yellow. Also, abdominal segments 3 to 8 of a male are brownish red, with nearly blackish red narrow bands on the anterior margins.

***Leptogaster patula*, new species**

Figure 50

MALE: Length, 10 mm. Head red, face white tomentose, vertex and occiput light tan pollinose, margin of occiput around eyes

gray pollinose; occipital bristles pale; four long and two short mystax bristles pale; proximal antennal segments orange-red, third antennal segment darkened, white pollinose, style pale, proximal segments of antenna subequal, together about half as long as third segment and equal to length of style; third segment with basal half slender but thicker than the apical half, tapering slightly to the diameter of the style.

Thorax red, brownish white pollinose, with light brown indistinct spot in center of dorsum, light reddish brown, thinly pollinose, narrow geminate median stripe widely separated anteriorly, other indistinct light reddish brown patterns interrupting the brownish white pollinosity, humeri pollinose; scutellum same color as thorax, no bristles or hair on margin; pleurae similar to dorsum.

Abdomen red, segment 1 and anterior third of segment 2 thick, light reddish brown pollinose, segment 2 with posterior two-thirds thinly pollinose, a darker reddish brown band with a lighter band anterior and posterior to it, segment 3 with dark reddish ground-color band anteriorly, remaining segments with reddish brown bands alternating with lighter yellowish brown bands; vestiture short, pale. Bristles on incisure of segment 1 pale, weak, sparse. Single gonoforceps red, with dorsal margin yellow, primary penis valves more widely spaced apart than usual, secondary penis valves more or less hemispherical disc, thin, and bases extend farther beyond primary valves than usual. Median area of sternite 9 pointed apically, very prominent, sparse, long, pale hair.

Legs yellow, tibiae long, clavate, tapering, vestiture pale.

Wings hyaline, lightly stippled with microtrichia,  $M_2$  somewhat angulate.

HOLOTYPE: Male (wing glued to point), Atascosa Mountain, Arizona, October 24, 1937 (P. W. Oman), in the United States National Museum.

REMARKS: This species is named *patula* in reference to the wide open space between the primary penis valves.

***Leptogaster salvia*, new species**

Figure 42

MALE: Length, 9 mm. Head black, face, front, vertex, occiput, gray pollinose; numer-

ous pale bristles in mystax, occipital bristles weak, pale; antennae reddish brown, third segment longer than two proximal segments and longer than style; no bristles on first and second segments.

Thorax black; dorsum, scutellum, pleura, gray pollinose; median, light brown, narrow, V-shaped stripe and light brown, narrow, short, lateral stripes; humeri reddish; vestiture pale, medially short, reclinate hair on notum.

Abdomen: Ground color black-brown, grayish brown pollinose, reclinate pale hair. Genitalia reddish brown, with pale hair; median lobe of sternite 9 with sparse hair.

Legs: Anterior four yellow, with reddish brown anterior stripe, vestiture pale; hind femora and tibiae light reddish brown except basal portions pale, vestiture pale.

Wings lightly stippled except first, second, and third basal cells.

FEMALE: Similar to male.

HOLOTYPE: Male, Parma, Idaho, August 4, 1934 (Chas. H. Martin).

ALLOTYPE: Female, same data (Dorothy W. Martin).

PARATYPES: Idaho: Same data as holotype and allotype, 26 males, five females; Parma, August 11, 1934 (Joe Wilcox), male. Oregon: Adrian, Owyhee River, July 24, 1934 (Dorothy W. Martin), male, female; 25 miles north of Ontario, August 13, 1934 (Joe Wilcox), male; Burns, 20 miles west, August 19, 1953 (R. M. Bohart), male.

The holotype and allotype are deposited in the American Museum of Natural History. Paratypes are in the collections of the University of California at Davis, Joe Wilcox, and the writer.

REMARKS: The species is named *salvia* because it was collected on the ground around sage brush.

The number of bristles in the mystax varied from 19 to 30 in the series at hand.

The paratype from Burns, Oregon, has long, lateral brown stripes on the thorax, while the type series have only short lateral stripes.

#### ISOLATED SPECIES

As more species of the Leptogastrinae become known, *Leptogaster aegra*, *atr dorsalis*, and *lanata* will be removed to other genera.

These species are retained in *Leptogaster* for convenience.

#### *Leptogaster aegra*, new species

Figure 53

MALE: Length, 13 mm. Head black, face white tomentose, front brownish tomentose, occiput gray pollinose, with pale bristles restricted to lower two-thirds, hair above; four pale weak bristles in mystax; antennae pale yellow, style darker, length of two basal segments subequal to third, style twice as long as third.

Thorax reddish yellow, dorsum polished, white pollinose laterally and posteriorly, sparse pale hair; scutellum yellow, white pollinose, pale, short, weak hair on margin.

Abdomen: Vestiture pale; second segment dark, thinly white pollinose, segments 3 to 4 dark dorsally, yellow laterally, segments 5 to 8 dark reddish brown, subshining. Male gonoforceps tapered to a point; a more or less triangular keel attached to sternite 9 just below penis valves, sternite 9 with a median depression, lines dividing the sternite into areas more distinct from some angles than others.

Legs pale, hind femora and tibiae darkened apically; empodium of foreleg about one-third of length of claws.

Wings hyaline,  $M_2$  vein sharply angulate.

FEMALE: Similar to male.

HOLOTYPE: Male, Raleigh, North Carolina, August 16, 1932 (C. S. Brimley).

ALLOTYPE: Female, Manning, South Carolina, May 14, 1945 (C. W. Sabrosky).

PARATYPES: Same locality and collector as holotype, July 16, 1926, one female; July 23, 1929, one female; July 18, 1930, one male, three females; July 11, 1930, one female.

The holotype is deposited in the collection of the North Carolina Department of Agriculture; the allotype, in the United States National Museum. Paratypes are in the collections of North Carolina Department of Agriculture and the writer.

REMARKS: The abdomen of the paratype specimens is a more uniform reddish brown than that of the holotype specimen. This species appears to be more closely related to the *flavipes* group because of the tapered gonoforceps and the lines on sternite 9. Superficially it resembles *badius* because of



the polished thorax. The third antennal segment of *aegra* is much shorter than that of *badius*. Both species occur in North Carolina.

This species is called *aegra* in reference to the depressed median triangular portion of sternite 9 of the male.

***Leptogaster atridorsalis* Back**

Figure 48

*Leptogaster atridorsalis* BACK, 1909, Trans. Amer. Ent. Soc., vol. 35, pp. 159-160.

This fragile species is one of the isolated species that have been assigned to *Leptogaster*. The sharply angulate  $M_2$  wing vein separates it from most species in this genus. Also, the triangular area of sternite 9 is not separated from the rest of the sternite by lines, as it is in *Leptogaster*. The triangular area becomes long and narrow apically. Continuing beyond the apex of the narrow tip is a median process covered with a brush of white hair, which is not found in *Leptogaster*. Also, the penis valves are more complex than in *Leptogaster*.

**DISTRIBUTION:** Present collecting records indicate that *atridorsalis* is confined to a rather small area, being distributed from southern Pennsylvania to North Carolina and westward as far as Indiana. See Appendix.

***Leptogaster lanata*, new species**

Figure 23

A small species easily separated from known North American species by the white, heavily matted, woolly tomentum on the slightly swollen oral margin, hiding the bases of a few short, weak, oral bristles.

**MALE:** Length, 8 mm. Head red, face, vertex, occiput white tomentose; ocellar tubercle black, brown tomentose, no bristles; occiput, strong bristles below ocellar tubercle, sparse, long, weak hair on remainder; four pale, weak bristles on oral margin. First segment of antennae polished red, with few pale bristles, second segment basally polished red and distally pale brownish tomentose, with two short black bristles anteriorly and posteriorly; third segment tapering, blackish tomentose, slightly longer than two basal segments; style same color, slightly longer than third.

**Thorax:** Dorsum light yellowish brown tomentose, with an indistinct gray bloom,

laterally, including callosities, whitish gray; indistinct, median, narrow stripe covered with broader indistinct white pollinose stripe; bristles pale, supra-alar black. Scutellum white tomentose, no bristles.

**Abdomen:** Dorsum brown, with lighter, narrow, posterior bands on segments 2 to 6 (segments 5 and 6 greased on type specimen but band can be seen), segment 7 uniformly brown; segment 8 brown dorsally, broadly white tomentose laterally. First abdominal segment without bristles on incisure. Male genitalia dark reddish black, ventrally red; distal third of gonoforceps divided, the dorsal fork truncate, ventral fork rounded and 1.6 times wider; distally penis of large diameter catching under edge of sternite 8; vestiture pale. Ninth sternite divided into three more or less quadrate parts.

**Legs:** The anterior pair pale, darkened dorsally on femora and tibiae; vestiture pale; hind femur pale yellow, distal half swollen, dark reddish brown, from dorsal aspect swollen, portion bent mesad; hind tibiae dark reddish brown except basal 15 per cent, distal three-fourths subequal in width to apex.

Wings hyaline, veins brown, anterior cross vein distinctly basad of middle of discal cell.

**FEMALE:** Similar to male; tergite 8 red, pale gray pollinose, with lateral patches of black bristles, sternite 8 with short black bristles apically and laterally, very short yellow bristles along edge of small medial notch, long pale bristles across middle of sternite. From dorsal aspect hind femora almost straight, apex slightly bent mesad.

**HOLOTYPE:** Male, Logan, Utah, July 18, 1953 (W. J. Hanson).

**ALLOTYPE:** Female, same data.

**PARATYPES:** Dubois, Idaho, July 14, 1934 (Chas. H. Martin), two females; Donna, Texas, September 24, 1933 (J. W. Monks), male (S. W. Bromley collection at United States National Museum).

The holotype and allotype are deposited in the collection at the University of Kansas. Paratypes are in the collections of the United States National Museum and the writer.

**REMARKS:** The paratype females were collected along a shallow wash with a sparse cover of dry grass. The species is named *lanata* because of the woolly-like tomentum around the oral margin.

## APPENDIX. DISTRIBUTION OF LEPTOGASTRINAE

### **Tipulogaster badius** (Loew)

CANADA: *Ottawa*: June 30, 1912 (E. P. Van Duzee); Fort Erie, July 14, 1922 (M. C. Van Duzee). *Quebec*: St. Placide, June 27, 1931.

UNITED STATES: *Alabama*: Wilson Dam F. Q.; July 1, 1942 (J. N. Belkin). *Connecticut*: Stamford, June and July. *Florida*: (Bromley records). *Illinois*: (Type locality). *Indiana*: (Back records). *Kansas*: Douglas Co.; *Ottawa*. *Maine*: Lincoln Co., July 7, 1948 (D. J. Borror). *Massachusetts*: (Back records). *Michigan*: Wexford Co., June 11, 1941 (R. R. Dreisbach); Midland Co., July 10, 1944, June 27, 1949 (R. R. Dreisbach); Cheboygan Co., July 3, 1944 (H. B. Hungerford). *Nebraska*: (Back records). *New Hampshire*: (Back records). *New York*: Records from numerous localities, June and July. *North Carolina*: Raleigh, May 16, 1909 (C. S. Brimley). *Ohio*: Records from numerous localities, June and July. *Oklahoma*: Stillwater, June 23, 1933 (L. E. Rozeboom); Hugo, June 20, 1934 (A. E. Pritchard). *Pennsylvania*: (Back records). *Tennessee*: (Reported as *testaceus* by Goslin). *Texas*: Bastrop Park, April 11, 1953 (Lucy D. Beamer). *Virginia*: Falls Church, June 29 (C. T. Greene); Augusta Co., July 1, 1951 (W. S. Murry). *Wisconsin*: Madison, June and July (C. L. Fluke); Clintonville, June 15, 1934 (H. R. Dodge).

### **Psilonyx annulatus** (Say)

UNITED STATES: Back records from these states: *Georgia*; *Massachusetts*; *New Jersey*; *New York*; *North Carolina*; *Pennsylvania*. Additional records: *Ohio*: Amherst, July 1933 (H. J. Reinhard); Columbus, Alum Creek, July 29, 1942 (R. M. Goslin). *Oklahoma*: Hugo, June 2, 1934 (A. E. Pritchard). *Virginia*: Great Falls, July 27 (Nathan Banks); Falls Church, July 2 (Nathan Banks).

MEXICO: *Yucatan*: (Back records).

WEST INDIES: *Cuba*; *Jamaica*.

ECUADOR: Malacatus, Aug. 16, 1941, 1500 meters, D. B. L. (F. M. and H. Brown).

### **Apachekolos tenuipes** (Loew)

Back records from these states: *District of Columbia*; *Delaware*; *Georgia*; *Texas*; *Florida* (Bromley records). Additional records: *Maryland*: Plummer's Island, Oct. 23, 1920 (R. C. Shannon). *North Carolina*: Tennessee Ridge Mountains, Owen's Gap, 4000 feet (Nathan Banks). *Oklahoma*: Page, June 23, 1934 (A. E. Pritchard). *Virginia*: Roslyn, Sept. 22, 1912 (Frank Knab); Great Falls, Sept. 24 (Nathan Banks).

### **Beameromyia pictipes** (Loew)

*District of Columbia*: Rock Creek, June 15, 1913 (R. C. Shannon). *Kansas*: Pottawatomie Co., June 5, 1932 (S. W. Sabrosky); Manhattan, June 5, 1932 (R. H. Painter); Lawrence (J. M. Aldrich). *Illinois*: (Type locality). *Maryland*: Octenton, June 20, 1915 (W. L. McAtee). *New Jersey*: Delaware Water Gap. *Ohio*: Delaware Co., July 17 (D. J., J. N. Knull). *West Virginia*: Franklin, June 26, 1951 (W. W. Wirth).

### **Leptogaster aridus** Cole

*California*: Snowline Camp, Eldorado Co., July 7, 1948 (P. D. Hurd, J. McSwain, L. W. Quate); Strawberry, Tuolumne Co., July 15, 1951 (D. P. Lawfer); Yosemite National Park, Aug. 11, 1940 (R. H. Beamer); Whitney Portal, Inyo Co., Aug. 6, 1948 (P. D. Hurd, J. M. McSwain); Tanbark Flat, Los Angeles Co., June 23, 1950 (W. A. McDonald); Glendale, July 29, 1948 (E. I. Schlinger); Big Bear Lake, Hanna Flats, Aug. 15, 1951 (Joe Wilcox, Chas. H. Martin).

### **Leptogaster atridorsalis** Back

*Indiana*: Lafayette, July 18 (J. M. Aldrich). *Maryland*: Plummer's Island, July 22, 1914 (R. C. Shannon). *North Carolina*: Raleigh, July 14, 1941 (C. S. Brimley). *Ohio*: Columbus, Aug. 16, 1936 (R. M. Goslin). *Pennsylvania*: Philadelphia, July 14, 1891; Folsom, Delaware Co. (type locality). *Virginia*: Falls Church, July 10 (Nathan Banks).

### **Leptogaster brevicornis** Loew

*Florida*: (Bromley records). *Georgia*: (Fattig records). *Indiana*: Spencer, June 27, 1925 (E. G. Anderson); vicinity of Indianapolis, July 9, 1944 (Fred C. Harmiston). *Kansas*: Reno Co., June 17, 1941 (R. H. Beamer). *Maryland*: College Park, June 17, 1932. *North Carolina*: Raleigh, June and July (C. S. Brimley). *Oklahoma*: Flint, June 16, 1933 (A. E. Pritchard); Grove, June 27, 1934 (A. E. Pritchard); Page, June 23, 1934 (A. E. Pritchard); Sallisaw, June 8, 1934 (A. E. Pritchard). *Tennessee*: Clarksville, July 24. *Texas*: *Virginia*: Great Falls, July 25 (Nathan Banks); Falls Church, July 16 (Nathan Banks); Glen-carlyn, June 24 (Nathan Banks).

### **Leptogaster coloradensis** James

*Colorado*: Boulder, June 22, 1933 (M. T. and Helen B. James) (type locality); Berthoud Pass, July 2, 1949 (J. R. White). *Kansas*: Ellis Co., June 29, 1950 (R. H. Painter); Sheridan Co., June 9, 1950 (R. H. Painter). *South Dakota*: Cedar

Canyon, June 27, 1947 (H. C. Severin); Cottonwood, June 29, 1949 (H. C. Severin); Buffalo, June 28, 1947 (H. C. Severin); Highmore, Aug. 14, 1949 (H. C. Severin); Presho, July 17, 1947 (H. C. Severin); Kennebec, July 8, 1947 (H. C. Severin); DeSmet, June 23, 1950 (H. C. Severin); Gettysburg, June 26, 1947 (H. C. Severin). Many other South Dakota records are available.

#### **Leptogaster flavipes** Loew

*Connecticut*: Storrs, June 27, 1953 (H. W. Smith). *Georgia*: (Fattig records). *Indiana*: Lafayette, July 2 (J. M. Aldrich). *Kansas*: Wichita, June 20, 1946 (R. H. Beamer). *Maine*: Lincoln Co., July 10, 1940 (D. J. Borror). *Maryland*: Plummer's Island, June 20, 1912. *Massachusetts*: Amherst, July 5, 1905; Stockbridge, July 11, 1948 (S. W. Bromley). *Michigan*: Marquette, July 7 (H. G. Hubbard); Douglas Lake, Aug.; Grand Rapids, July 1, 1937 (Hansens); Midland Co., June 19, 1941 (R. R. Dreisbach). *Minnesota*: Itaska Park, July 20, 1937 (A. E. Pritchard). *Missouri*: St. Louis, June 4, 1904 (W. V. Warner). *Nebraska*: (Type locality). *New Hampshire*: Hanover (C. M. Weed). *New Jersey*: (Back records). *New York*: (Numerous records). *North Carolina*: Raleigh, May 20, 1930 (C. S. Brimley). *Ohio*: Alum Creek, Columbus, June and July (R. H. Goslin). *Pennsylvania*: Klages (J. M. Aldrich); Roxborough, July 11, 1908; Glenside, June 17, 1906. *South Dakota*: (H. C. Severin). *Tennessee*: (Goslin records). *Virginia*: Veitch, June 9, 1912 (J. R. Mallock); Chain Bridge, May 25 (Nathan Banks). *Wisconsin*: Madison, July 24, 1935 (H. R. Dodge).

#### **Leptogaster incisuralis** Loew

CANADA: *Ontario*: Toronto, July 3, 1911 (W. C. Van Duzee).

UNITED STATES: *Connecticut*: Tolland Co., June 19, 1953 (H. W. Smith). *Georgia*: (Fattig records). *Illinois*: (Type locality). *Kansas*: Wichita, June 20, 1946 (R. H. Beamer). *Maryland*: Plummer's Island, July 25, 1943 (R. H. Beamer).

*Michigan*: Muskegon Co., Aug. 13, 1945 (R. R. Dreisbach); Midland Co., July 19, 1938 (R. R. Dreisbach); Cheboygan (H. B. Hungerford). *Minnesota*: Itaska Park, July 20, 1937 (A. E. Pritchard). *New Jersey*: Lakehurst, Aug. 4, 1955 (D. M. Anderson). *New York*: Fort Montgomery, Aug. 6, 1923 (F. M. Schott); Long Island, July 21, 1925 (F. M. Schott); Bear Mountain, Aug. 17, 1924 (F. M. Schott). *North Carolina*: Southern Pines, July 29, 1912 (A. H. Mann). *Ohio*: Amherst, July, 1936 (H. J. Reinhard); Vinton, July 19, 1901. *Pennsylvania*: (Back records). *South Dakota*: (H. C. Severin). *Tennessee*: (Goslin records). *Texas*: Bay City, May 6, 1953 (Lucy D. Beamer). *Virginia*: Falls Church, Sept. 6, 1912 (C. T. Greene); Arlington, Aug. 1, 1943 (R. H. Beamer). *Wisconsin*: (Back records).

#### **Leptogaster murinus** Loew

*Kansas*: Ellis Co., June 9, 1950 (R. H. Painter); Emporia, June 18, 1941; Larned, June 14, 1949 (Michener, Beamer); Manhattan, June 14, 1936 (R. H. Painter); Reno Co., June 17, 1941 (R. H. Painter); Sheridan Co., June 9, 1950 (R. H. Painter). *Illinois*: Champaign (W. A. Snow). *Iowa*: Ames, June, 1926 (H. M. Harris). *Michigan*: Midland, June 13, 1939 (R. R. Dreisbach). *Nebraska*: (Type Locality). *Ohio*: Columbus, July 25, 1945 (R. M. Bohart). *Oklahoma*: Broken Bow, June 19, 1934 (A. E. Pritchard); Oklahoma City, Aug. 13, 1931 (A. E. Pritchard). *South Dakota*: Cavor, June 7, 1950 (H. C. Severin); Cottonwood, June 24, 1950 (H. C. Severin); Blunt, June 7, 1950 (H. C. Severin); DeSmet, June 23, 1950 (H. C. Severin); Plankinton, June 17, 1947 (G. B. Spaen). *Texas*: (Bromley reports). *Wisconsin*: Madison, July 8, 1934 (H. R. Dodge).

#### **Leptogaster virgatus** Coquillett

*Georgia*: (Fattig reports). *Maryland*: College Park, July 25, 1925 (C. T. Greene); Plummer's Island, June 21, 1915 (R. C. Shannon). *New York*: Long Island, July (F. S. Blanton). *Oklahoma*: Flint, June 26, 1934 (A. E. Pritchard). *Pennsylvania*: (Back reports); *Texas*: (Coquillett reports).

## REFERENCES

- ALDRICH, J. M.  
1923. New genera of two-winged flies of the subfamily Leptogastrinae of the family Asilidae. *Proc. U. S. Natl. Mus.*, vol. 62, p. 5.
- BACK, E. A.  
1909. The robber-flies of North America, north of Mexico belonging to the subfamilies Leptogastrinae and Dasypoginae. *Trans. Amer. Ent. Soc.*, vol. 35, pp. 155-174.
- BANKS, NATHAN  
1914. Notes on Asilidae, with new species. *Psyche*, vol. 21, pp. 131-133.
- BROMLEY, S. W.  
1934. The robber flies of Texas (Diptera, Asilidae). *Ann. Ent. Soc. Amer.*, vol. 28, pp. 74-110.  
1950. Florida Asilidae (Diptera) with description of one new species. *Ibid.*, vol. 43, pp. 227-239.  
1951. Asilid notes (Diptera), with descriptions of thirty-two new species. *Amer. Mus. Novitates*, no. 1532, pp. 1-36.
- CARRERA, MESSISA  
1950. Synoptical keys for the genera of Brazilian "Asilidae" (Diptera). *Rev. Brasileira Biol.*, vol. 10, pp. 99-111.
- COCKERELL, T. D. A.  
1913. A fossil asilid fly from Colorado. *Entomologist*, vol. 46, p. 213.
- COQUILLET, D. W.  
1904. New North American Diptera. *Proc. Ent. Soc. Washington*, vol. 6, p. 177.
- FATTIG, P. W.  
1945. The Asilidae or robber flies of Georgia. *Bull. Emory Univ. Mus.*, no. 3, pp. 3-33.
- GOSLIN, ROBERT M.  
1950. Some robber flies from Campbell County, Tennessee. *Jour. Tennessee Acad. Sci.*, vol. 25, pp. 303-306.
- HARDY, D. ELMO  
1942. New western Asilidae. *Jour. Kansas Ent. Soc.*, vol. 15, pp. 57-61.  
1947. The Genus *Leptopteromyia* (Asilidae, Diptera). *Ibid.*, vol. 20, pp. 72-75.
- HARDY, G. H.  
1935. The Asilidae of Australia. Part III. *Ann. Mag. Nat. Hist.*, ser. 10, vol. 16, pp. 161-167.  
1948. On classifying Asilidae. *Ent. Monthly Mag.*, vol. 84, pp. 116-119.
- JAMES, MAURICE T.  
1937. New Colorado Asilidae (Diptera). *Ent. News*, vol. 58, pp. 12-15.
- JOHNSON, C. W.  
1913. Insects of Florida. *Bull. Amer. Mus. Nat. Hist.*, vol. 32, p. 60.
- LUNDBECK, W.  
1908. *Diptera Danica*. Part II. Copenhagen, pp. 7-14.
- MELIN, DOUGLAS  
1923. Contributions to the knowledge of the biology, metamorphosis and distribution of the Swedish asilids in relation to the whole family of asilids. Uppsala.









