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A TAXONOMIC AND ECOLOGIC STUDY OF THE ASILIDAE OF MICHIGAN

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ABSTRACT

Seventy-two species of Asilidae have been recorded from Michigan. An additional seven which may occur are included. Keys to subfamilies, genera and species are given. Two subfamilies and twenty-five genera are represented. A discussion of specific identification, habitat, and distribution is given where possible.

The *Laphria canis* complex, *index* complex, and *aeatus* complex are discussed. One new species, *Laphria calvescenta* is described. *Laphria disparella* has been raised from synonymy. *Machimus virginicus* was removed from *Asilus* sensu-latu and placed in the genus *Machimus.*

INTRODUCTION

This study is a review of the robber flies which occur within Michigan. Specimens for the study were collected during the summers of 1967 and 1968. Habitat and behavioral information was recorded as specimens were collected. Additional specimens were borrowed from the University of Michigan, Northern Michigan University, The Milwaukee Public Museum, University of Wisconsin, Field Museum of Natural History and the Illinois Natural History Survey. Approximately 5,000 specimens were examined during the course of this study.

Seventy-two species of Asilidae have been recorded from Michigan with an additional seven which may occur here. These species represent two subfamilies and twenty-five genera. A discussion of specific identification, habitat and distribution is given where possible. Distributional data is given in summary form for well known species and complete data for poorly known species.

The *Laphria canis* complex and *L. index* complex are discussed. One new species, *Laphria calvescenta* is described. *Laphria disparella* has been raised from synonymy. *Machimus virginicus* has been removed from *Asilus* sensu-latu and placed in *Machimus.* All nomenclatural and taxonomic changes are the responsibility of the senior author.

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SYSTEMATICS

Linnaeus erected the genus *Asilus* in the tenth edition of "Systema Naturae" in 1758. *Asilus crabroniformis* is the type species of the genus *Asilus. Asilus* is the type genus of family Asilidae. In 1803, Meigen separated *Asilus* into *Dasypogon, Leptogaster, Laphria* and *Asilus.* Past authors recognize these four genera as the basis of the four subfamilies

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recognized by Martin and Wilcox (1965) in "A catalog of the Diptera of America north of Mexico." Leach (1819) raised the genus *Asilus* to family level. Loew in a series of papers raised three genera of Asilidae into two subfamilies using *Leptogaster* and *Dasypogon* to form Dasypogoninae, and *Asilus* to form Asilinae. Macquart (1838) recognized *Laphria* as the subfamily Laphriinae. Schiner (1862) erected the subfamily Leptogasterinae.

Hardy (1934, 1935, 1948) proposed that only two subfamilies exist within Asilidae. Laphriinae assumed tribal status within Dasypogoninae and Leptogastrinae assumed tribal status within Asilinae. Carrera (1950), Oldroyd (1959) and Karl (1959) accepted this classification with only two subfamilies. Hull (1962) erected the subfamily Megapodinae, a small aberrant group of mostly neotropical species. Martin and Wilcox (1965) however recognized four subfamilies for North America: the Dasypogoninae, Laphriinae, Leptogastrinae and Asilinae. Martin (1968) raised Leptogastrinae to family status as Leptogastridae and proposed that Dasypogoninae, Megapodinae and Asilinae is a more natural classification of Asilidae. Laphriinae again assumed tribal status in Dasypogoninae. Most modern dipterists recognize Asilidae and Leptogastridae with one exception (Oldroyd, 1969). Martin and Papavero (1970) recognize Dasypogoninae, Megapodinae and Asilinae. This is the systematic treatment followed in this study. Only Dasypogoninae and Asilinae occur within Michigan.

In North America, Back, Hine, Osten-Sacken, and Williston were the first to contribute significant taxonomic studies on Asilidae. Since then, Bromley, Curran, Martin, and Wilcox have contributed a wealth of taxonomic papers. Several annotated lists of species have been published; notably by Bromley (1931, 1933, 1934b, 1937 and 1946), James (1941), Johnson (1909, 1913, 1925) and McAtee and Banks (1920).

TECHNIQUES

Most species of robberflies are found in restricted local habitats which can present problems in collecting and observing uncommon species since specific habitats for a number of species are unknown. The most productive collection method is to quietly walk through a habitat stalking and netting the flies as they are seen. Nearly all asilids are easily disturbed and, being strong fliers, will try to escape when alarmed. A few species of *Laphria* take stations and will return to the original site within a short time. Depending on the species, these flies may sit directly on the ground or up to ten feet above the ground on tree trunks. A few are quite well camouflaged by their coloration and spotting them can be difficult unless the specimen moves. Larger species have loud buzzing flights and are often heard before they are seen.

Malaise traps were also used to collect specimens during this study. Successful collection of asilids is dependent upon careful placement of the trap. The best location is along an ecotonal area such as a forest edge. For the most part smaller species are captured, whereas larger species of the genera *Proctacanthus* and *Efferia* use the malaise trap as a lookout station and are seldom captured. Seventy per cent alcohol is used as a killing agent. Ethylene glycol should not be used because of the resulting poor condition of the specimens. The trap should be emptied daily and the specimens mounted following the instructions of Vockeroth (1966). Window pane traps can be especially effective for those species found in forests. Some species of *Machimus* are especially susceptible to pitfall trap capture. These species habitually land on light colored objects on the ground in the proper habitat.

The single greatest problem in species identification of the Asilidae is the tendency for specimens to "grease." Greasing obliterates the pattern and coloration of the pollinose condition and ground color characters important in the determination of many species. Recently pinned specimens showing signs of greasing can be restored by soaking the specimen in xylene or benzene. The specimen should not be treated in xylene or benzene any longer than necessary since the specimens tend to become brittle and faded. Older specimens will "degrease" but are usually not worth the effort. If specimens need to be relaxed, they should always be degreased first. Otherwise the specimens will deteriorate badly. Relaxing is best done by a short soaking in a solution of 3% aqueous ammonia.

MORPHOLOGICAL TERMINOLOGY

Morphological terms which need explanation are not very extensive in the Asilidae. Figures 1 through 10 illustrate these structures. Wing venation terminology follows that of Comstock and Needham from Crampton's "Guide to the Insects of Connecticut" (1942). Genitalic terminology follows that of Karl (1959) with minor changes from Martin (personal communication). Thoracic morphology follows that of Bonhag (1949).

Antenna.–The antennae of asilids may have three or apparently five segments. One or two microsegments plus a style may be present on the third segment.

Beard.–This refers to the thick patch of long, fine hair on each side of the face below the eyes on the gena and on the base of the proboscis.

Epandrium.–Van Emden (1956) and Karl (1959) both state that the epandrium is derived from the ninth abdominal tergum of the male dipteran. Martin (personal communication) has discovered that the surstyli of Leptogastridae (Karl, 1959 and Martin, 1968) is derived from tergite ten. In species with non-rotate genitalia (Asilinae), the epandria forms the dorsum of the hypopygium. The epandria is split longitudinally and when strongly developed, functions as a clasping organ corresponding to the "superior forceps" and "gonoforceps" of other authors. In species with rotate genitalia, the epandrium is in a ventral position and is not longitudinally split. See Figures 3, 4 (p. 57) and 5, 8 (p. 79).

Frons.–The frons is actually that sclerite between the eyes which extends from the oral margin up to the median ocellus and surrounds the antennae. For taxonomic purposes, however, the frons refers to the area between the bases of the antennae and the dorsal border of the gibbosity. (Fig. 2)

Front.–This is the area between the antennal bases to the median ocellus and is actually a part of the frons. (Fig. 2)

Gibbosity.–The lower portion of the frons; usually covered by the mystax. (Fig. 2)

Ground Color.–The integumental color of the specimen, not the color of the pollen.

Ground Color Bands.–The integumental color bands of the abdominal segments, designated as anterior or posterior.

Hypandrium.–This is derived from the ninth sternum of the male dipteran and usually forms the venter of the hypopygium except in rotate genitalia. This sclerite is usually reduced, and simple without protruberances or appendages. This structure is synonymous with the "subgenital plate" of other authors (Van Emden, 1956; Karl, 1959). See Figures 3, 4 (p. 57) and 5, 8 (p. 79).

Hypopygium.–This term refers to the entire male genital complex, including the ninth and succeeding abdominal segments in Asilidae. It is a morphologically noncommitent term. In Dasypogoninae the hypopygium may be rotate 90° to 180° explaining why the hypandrium may sometimes be dorsal.

Legs.–With the legs stretched out laterally, the anterior surface is that surface facing toward the head.

Mesoanepisternum.–The sclerite immediately below and just anterad of the base of the wing. (Fig. 2)

Microtrichia.–These are minute hair-like or bristle-like structures either covering the wings entirely or restricted to dense patches within cells.

Mystax.–The patch of hair or bristles above the mouth on the facial gibbosity. The mystax may only be a simple line of hairs or a very dense patch of coarse bristles.

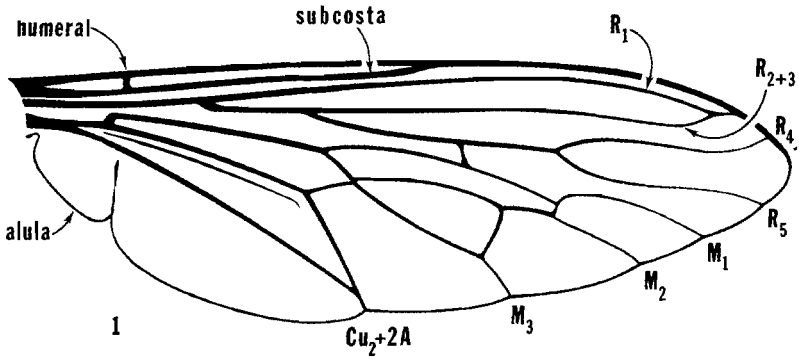
Ocellar tubercle.–The swelling upon which the ocelli are placed.

Occiput.–Within Diptera, the entire posterior region of the head behind the eyes.

Pleura.–The lateral areas of the thorax between the mesonotum, scutellum and the sterna.

Pollen.–The dusty or pruinose surface covering which under very high magnification (216X) is composed of extremely fine, short, dense recumbent hair. Unless referred to as ground color the general body color is attributable to these fine hairs.

Postmetacoxal Arch.–The unusual sclerotization of the membranous area between the metacoxae and abdomen of all species in the tribe Ommatini and North American Atomosini.



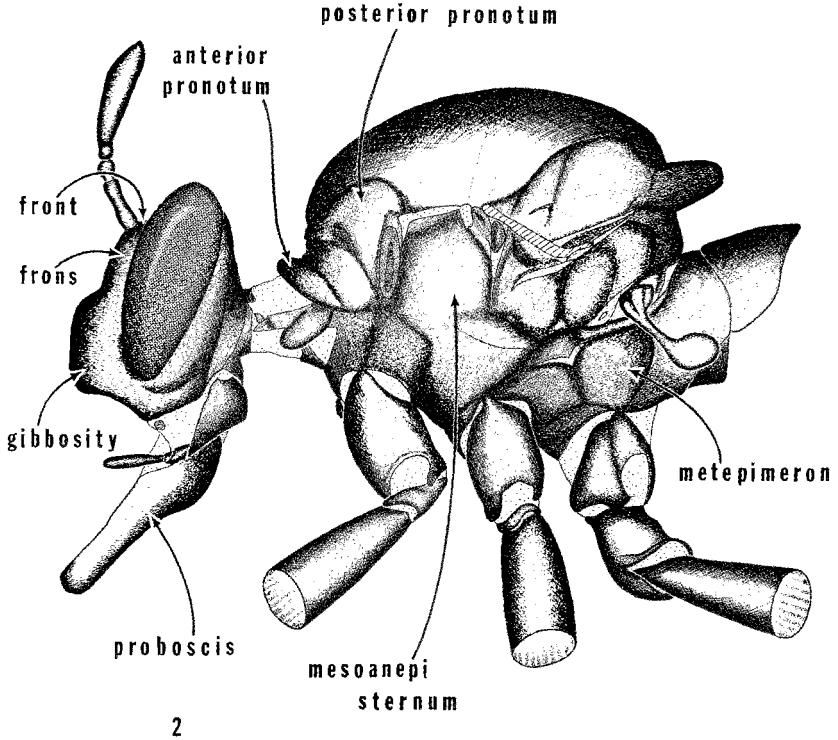


Fig. 1. Wing venation of *Asilus sericeus* Say.
Fig. 2. Diagrammatic lateral view of head and thorax of *Laphria* sp. showing taxonomically important morphologic characters.

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Pronotal Bristles.–The bristles present on the dorsum of the collar-like anterior pronotum. (Fig. 2)

Pronotum.–As in Tabanidae (Bonhag, 1949) the pronotum is divisible into an anterior collar-like structure and a posterior pronotum which is the humeral callus of older authors. (Fig. 2)

Sectoral Vein.–The crossvein (Fig. 1) which extends from the stem of R_{2+3} to R_{4+5} or from R_3 to R_4. It is also called the discal crossvein.

Tomentum.–This is a matted, woolly pubescence usually composed of short flattened recumbent feather-like hair. This pubescence is clearly visible at lower magnification on the face and pleura.

KEY TO SUBFAMILIES OF MICHIGAN ASILIDAE[1]

1. Maxillary palpi two segmented; antennae without terminal arista but may bear a thickened style (an exception is *Dasylechia atrox* which has a distinct style and microsegment) . . . . . Dasypogoninae (p. 35)
1′. Maxillary palpi one segmented; antennae always with a slender terminal arista . . . . . Asilinae (p. 71)

KEY TO TRIBES AND GENERA OF MICHIGAN DASYPOGONINAE

1. R_1 cell closed 2
1′. R_1 cell open 4
2. Postmetacoxal arch sclerotized (Atomosini). 8
2′. Postmetacoxal arch membranous 3
3. Distal segment of the palpus bluntly rounded; proboscis usually more cylindrical, longer and not up-turned at tip (Laphriini). 9
3′. Distal segment of the palpus thin and spatulate; proboscis pointed or slightly up-turned in profile, thickened at base; facial gibbosity very prominent (Andrenosomini). . . . . *Andrenosoma* Rondani (p. 36)
4. Vertex wider than face at the antennae; face plane and bare of vestiture; metepimeron without pile (Stichopogonini) 11
4′. Vertex not noticeably wider than face at the antennae; face often with vestiture; metepimeron with pile. 5
5. Head twice as wide as high, vertex strongly sunken producing a goggle-eyed appearance; anterior tentorial pits usually deep (Damalini) . . . . . *Holcocephala* Jaennicke (p. 48)
5′. Head of more normal proportions without goggle-eyed aspect; anterior tentorial pits shallow or completely obscured 6
6. Spines present (may be small) on female genitalia; occiput with well developed bristles; protibia often with spur on inner side. 7
6′. Spines never present on female genitalia; occiput without well developed bristles; protibial apex never with claw-like spur on inner side (Dioctrini). 12
7. Protibia with claw-like spur on inner side of apical end. (Dasypogonini) 13
7′. Protibia without claw-like spur at apical end (Stenopogonini) 14
8. Antennal segment 1 three times or more the length of the second; vertex divergent . . . . . *Cerotainia* Schiner (p. 39)
8′. Antennal segment 1 subequal or only slightly longer in length to the second; vertex nearly parallel-sided . . . . . *Atomosia* Macquart (p. 37)
9. Antennae with a distinct terminal style; second palpal segment is swollen and clavate; genitalia very small; face coarsely pilose. . . . *Dasylechia* Williston (p. 43)
9′. Antennae without a distinct terminal style; palpus of normal size. 10
10. Metafemora with spinous tubercles on venter; body nearly or completely bare . . . . . *Lampria* Macquart (p. 51)

[1]Key does not include Leptogastridae (Martin, 1968) which may be separated from Asilidae by an open R_1 cell and one-segmented palpi. Asilidae have an open or closed R_1 cell with the exception that if the R_1 cell is open, the palpi are two segmented.

10′. Metafemora without spinous tubercles on venter; body always densely hairy although in some species pile is quite short and recumbent . . . . . *Laphria* Meigen (p. 51)
11. Face and frons distinctly swollen in profile, usually gibbous . . . . . *Lasiopogon* Loew (p. 67)
11′. Face flattened or gently convex. . . . . *Stichopogon* Loew (p. 69)
12. Numerous strong bristles on the anterior surface of the mesofemora and lateral surface of the metafemora . . . . . *Ecthodopa* Loew (p. 48)
12′. No or few strong bristles present, erect long pile present on entire length of femora as well as tibiae. . . . . *Dioctria* Meigen (p. 44)
13. Basitarsus of prothoracic leg with numerous stout denticles; third antennal segment with short, stout dorsal bristles . . . . . *Diogmites* Loew (p. 45)
13′. Basitarsus of prothoracic leg without denticles; third antennal segment with long pubescence . . . . . *Taracticus* Loew (p. 70)
14. Antennae five segmented, usually long, segment 4 short, segment 5 longer than segments 3 plus 4; antennae covered with dense short hair . . . . . *Ceraturgus* Weidemann (p. 38)
14′. Antennae short, 3 segmented, with a short or slender style 15
15. Facial gibbosity protruberant and gently rounded from base of antennae to oral margin; metatibia smaller in diameter than metafemora. . *Cyrtopogon* Loew (p. 40)
15′. Facial gibbosity protruberant only above the oral margin and below middle; metatibia more swollen than metafemora . . . . . *Holopogon* Loew (p. 49)

Genus ANDRENOSOMA Rondani

Andrenosoma Rondani, 1856. Dipterologiae Italicae Prodromus 1:160.

KEY TO SPECIES OF ANDRENOSOMA

1. Sectoral cross vein present, connecting R_{2+3} to R_4; last three abdominal segments blue-black . . . . . *A. dorsatum* (Say)
1′. Sectoral cross vein absent; last three abdominal segments brownish red . . . . . *A. fulvicauda* (Say)

Andrenosoma dorsatum (Say)

Laphria dorsata Say, 1824. Amer. Entomol. 1:13.

Diagnosis.—Legs black with mixed black and white hairs, white hair most abundant on prolegs and mesolegs; abdomen metallic blue-black with black hairs; sternite 6 of male with tooth-like projection on posterior margin; genitalia black with black hair. Length 13-23 mm.

Habitat Preference.—This species occurs in hot dry situations and is usually taken resting on stumps and logs of conifers. It has also been taken by window pane trap.

Bromley (1946) states that *A. dorsatum* is mimetic of some Pompilidae when flying and even flits its wings while at rest. The flight of this species produces a light whirring sound unlike the sonorous buzzing of most large Laphriinae.

Michigan Distribution.—Only three localities are known; Keweenaw Co., Isle Royale, 15 June 1966, R. B. Willson (three specimens); Chippewa Co., Whitefish Pt., 4 July 1913, A. W. Andrews; Oscoda Co., Luzerne, 28 June to 17 July 1967, L. F. Wilson (16 specimens taken by window pane trap). Bromley (1931) listed *A. dorsatum* as possibly occurring in Ohio but in subsequent lists (1934b, 1936a, 1947, 1950c) it remained unrecorded. Bromley (1934c) has recorded this species as part of the Atlantic Coastal Plain fauna. He reports it from New Jersey, Pennsylvania, Virginia, South Carolina, Georgia and Florida. Martin and Wilcox (1965) included Washington and Idaho as part of the known distribution, but this probably referred to *Andrenosoma ridingsi.*

Flight Range.—Bromley (1934c) reports *A. dorsatum* has been collected in mid-May in the southern states and in mid-July in northern states.

Andrenosoma fulvicauda (Say)

Laphria fulvicauda Say, 1823. Jour. Acad. Nat. Sci. Phil. 3:53.

Diagnosis.—Erect white hair on femora and tibiae; black bristles on tibiae and tarsi; abdominal ground color blue-black, last three segments largely brownish red; sternite 6 of male without tooth-like projection on posterior margin; male genitalia brownish red with reddish gold hair. Length 18-20 mm.

Habitat Preference.—Bromley (1934c) states *A. fulvicauda* is never very abundant anywhere and is very infrequently collected. It is usually collected in dry, sandy, situations where it rests on logs, stumps or tree trunks in full sunlight. Occasionally it is taken in numbers on freshly cut pitch pine logs or stumps. It usually rests closely appressed to the tree bark and if disturbed generally flies a short distance. Bromley further states that the behavior of this species is much like *Erax aestuans*. Prey is usually small Hymenoptera.

Bromley (1934c) records the following as prey: *Osmia* sp. (Megachilidae), Halictidae, *Vespula maculifrons* (Buysson) (Vespidae), *Trypoxylon rubrocinctum,* Packard (Sphecidae), *Evania* sp. (Evaniidae) and *Phasgonophora* sp. (Chalicidae).

Champlain and Knull (1923) have reared *fulvicauda* from the pupal cells of *Chrysobothris femorata* Olivier (Buprestidae) taken from an oak log. The evidence presented is extremely circumstantial and there is considerable doubt about the asilid larvae being carnivorous.

Michigan Distribution.—Only four specimens of *A. fulvicauda* have been taken in Michigan: Emmet Co., Conley, 5 July 1919, A. W. Andrews; Saginaw Co., 8 August 1942 and 11 September 1942, R. R. Dreisbach; Kalamazoo Co., Gull Lake Bio. Sta., 26 July 1969, R. L. Fischer. Martin (1965) reports this species as distributed over the United States and part of Ontario. It does not extend into Mexico.

Flight Range.—Bromley (1931, 1934c) reports 9 June to 22 August with majority of dates in July for Ohio.

Genus **ATOMOSIA** Macquart

Atomosia Macquart, 1838. Dipteres exotiques 1:73.

KEY TO THE SPECIES OF *ATOMOSIA*

1. Bristles on ocellar tubercle, antennae and occiput a very pale straw color . . . . . *A. rufipes* Macquart
1′. Bristles on ocellar tubercle, antennae and occiput dark brown or black . . . . . *A. puella* Wiedemann

Atomosia puella (Wiedemann)

Laphria puella Wiedemann, 1828. Auszereuropaische Zweiflugelige Insekten 1:531.

Diagnosis.—A black robust species; frons, vertex and occiput silvery pollinose; mystax, beard and facial hair white; thorax and abdomen with scattered appressed minute pale yellow hairs; legs brownish black; pile of tibiae and femora white; metatibia with dense ventral white pile; abdomen highly convex, brownish at apex. Length 5-8 mm.

Habitat Preference.—Blanton (1939), Bromley (1934c, 1946), McAtee and Banks (1920) report that *A. puella* usually rests head down on exposed tree trunks, posts, buildings and stones in full sunlight. This species is often taken in large numbers on woodpiles. It has been taken by malaise traps in areas of sandy soil with thick plantings of conifers in Michigan.

Bromley (1934c) reports that this species preys on small Diptera, including *Drosophila* sp. (Drosophilidae), *Hippelates* sp. (Chloropidae), and *Holopogon snowi* (Asilidae). McAtee and Banks (1920) also record *Simulium* sp. (Simuliidae).

Michigan Distribution.—Forty-four specimens of *A. puella* have this distribution: Mecosta, Midland, Huron, Saginaw, Shiawassee, Ingham, Ottawa, Van Buren and Wayne. Bromley (1934c, 1950a) reports this species from New York southward to Florida and westward to Illinois, Kansas and Texas.

Flight Range.—20 May to 8 August with the majority of dates in early July.

Atomosia rufipes Macquart

Atomosia rufipes Macquart, 1847. Diptera Exotiques, Supplement p. 2, 9, 39.

Diagnosis.—A black robust species very similar to *A. puella* but with these diagnostic differences; bristles on ocellar tubercle, antennae and occiput pale straw colored, legs reddish-yellow with concolorous pile. Bromley (1934c) states that the narrow white posterior margins of abdominal segments two thru five is supposed to be characteristic for this species. Examination of *A. puella* and other species shows however that this character is not diagnostic for *A. rufipes.* Length 9-11 mm.

Michigan Distribution.—Bromley (1934c unpublished) reports that "there are specimens in the Illinois Natural History Survey Collection from Grand Traverse Bay, Michigan, October 26, 1891;" but these specimens did not come to our attention when their material was examined. Nor have subsequent specimens been collected either. The existence of *A. rufipes* in Michigan is best considered tentative at this point.

Genus CERATURGUS Wiedemann

Ceraturgus Wiedemann, 1824. Analecta Entomol. p. 12.

KEY TO SPECIES OF *CERATURGUS*

1. Legs entirely yellow; body extensively golden yellow pollinose; black triangular spots on abdominal segments . . . . . *C. aurulentus* (Fabricius)
1′. Femora brown, tibia yellowish; body black; abdominal segments black with posterior whitish pollinose bands . . . . . *C. cruciatus* (Say)

Ceraturgus aurulentus (Fabricius)

Dasypogon aurulentus Fabricius, 1805. Syst. Antl. p. 166.

Diagnosis.—Ground color black, golden pollinose everywhere except stripes of thoracic dorsum and proximal portions of abdominal segments; wings hyaline; legs bright yellow; abdominal segments with black triangular spots; last two segments completely black. Length 8-9 mm.

Habitat Preference.—Bromley (1946, 1950c) collected this species on a freshly cut black birch stump in a clearing. A single specimen has been taken by light trap in Ohio. This species is extremely rare and less than a dozen specimens have been recorded.

Bromley (1950c) notes that this species is a mimic of a worker yellow jacket, *Vespula maculifrons* (Buysson) or *Vespula arenaria* Fabricius.

Michigan Distribution.—Only one specimen has been collected: Washtenaw Co., 17 August 1925, W. W. Newcomb. Back (1909) and Bromley (1950c) record the known range of this species from New York westward to Jackson Co., Ohio, and southward to Georgia.
one collected in Oakland Co, 11 Aug. 1982, M. O'Brien in open oak woods
Flight Range.—11 July to 17 September with the majority of dates in July for the entire range of the species. (Back, 1909 and Bromley, 1950c).

Ceraturgus cruciatus (Say)

Dasypogon cruciatus Say, 1823. Jour. Acad. Sci. Phila. 111:52.

Diagnosis.—Ground color black; polished thorax margined and spotted with yellow; abdomen with apical yellow annuli; wings vary from deep yellow and blackish to nearly

hyaline; legs vary from pale to dark rusty reddish-brown; abdomen polished black, each segment with a brown golden cross band on its posterior portion. Length 16-20 mm.

Habitat Preference.–Cockerell (1894, 1913), reports this species from areas of oak and mixed mesophytic forests. Usually it is taken in brushy pastures or edges of forests in very thick brush. This species flies slowly and with a loud buzz. Prey are usually slow flying beetles. Feeding is accomplished by hanging from a twig by a proleg and grasping the prey with the other legs and sucking on the prey.

Bromley (1950c) states this species is a mimic of yellow jackets *Vespula maculifrons* (Buysson) or *Vespula arenaria* Fabricius.

Michigan Distribution.–Only one specimen has been collected: Iosco Co., State Game Refuge, 24 July 1935, Olson and Gloyd. Back (1909) reports this species is very common in Massachusetts and is found from New York southward to Florida and Arkansas and westward from New England to South Dakota. Bromley (1931) reported this species in north-central Ohio from Ashland Co. and Waterloo in southern Ohio.

Flight Range.–Back (1909) reports 23 June to 7 August for Massachusetts. Bromley (1931) reports three specimens all taken in early June in central Ohio.

Genus CEROTAINIA Schiner

Cerotainia Schiner, 1866. Verh. zool.-bot. Ges. Wien 16:673.

KEY TO SPECIES OF *CEROTAINIA*

1. Vestiture silvery white; frons grayish white pollinose . . . . . *C. albipilosa* Curran
1′. Vestiture brownish; frons yellow brown pollinose . . . . . .*C. macrocera* (Say)

Cerotainia albipilosa Curran

Cerotainia albipilosa Curran, 1930. Amer. Mus. Novitates 425, p. 13.

Diagnosis.–Frons and vertex grayish white pollinose, often with narrow yellow pollinose stripes at ocular margin; thorax black, pleura silvery white pollinose, dorsum black and shining with white recumbent hair; femora brownish black with fine white hair, appressed dorsally, erect ventrally and laterally; tibiae and tarsi yellowish brown, with dense short fine silvery white decumbent hair ventrally, otherwise with white erect bristles; abdomen polished. Length 7-8 mm.

Habitat Preference.–Bromley (1934c) states that this species has been observed to alight on the tips of grass or weed leaves.

Michigan Distribution.–Only six specimens of *C. albipilosa* have been collected in Michigan: Mecosta Co., 14 July 1942, R. R. Dreisbach; Midland Co., 12 July 1960, R. R. Dreisbach; Ingham Co., Stockbridge, 6 July 1939, C. W. Sabrosky; St. Joseph Co., 2 July 1942, C. W. Sabrosky; St. Joseph Co., Constantine, 13 June 1959, G. C. Eickwort; Branch Co., Bronson, 14 June 1959, A. L. Borgatti. Bromley (1934c, 1947) records this species from numerous localities in Ohio and Indiana, and also from Tennessee, and Mississippi. Curran (1930) described the species from North Carolina.

Flight Range.–Bromley (1934c) records 11 June to 11 September as flight dates for *C. albipilosa* over its known range.

Cerotainia macrocera (Say)

Laphria macrocera Say, 1823. Jour. Acad. Nat. Sci. Phil. 3:73.

Diagnosis.–Frons and vertex brownish-yellow pollinose; thorax black, pleura grayish to sometimes yellow pollinose, dorsum black and shining with recumbent pale yellow to brownish hair; femora black, with fine appressed brown hair dorsally, and fine white erect hair laterally and ventrally; tibiae reddish brown, with fine dense white erect short hair ventrally, with large pale brown bristles; abdomen semi-polished. Length 5-9 mm.

Habitat Preference.—Bromley (1931, 1946, 1950c) states *C. macrocera* is usually found alighting on the tips of twigs and leaves in open fields or forests edges.

Michigan Distribution.—Nine specimens of *C. macrocera* were examined from these counties: Oceana, Midland, Muskegon, Barry, Ingham, Van Buren, Kalamazoo, Calhoun and Branch. Bromley (1931, 1936a, 1950a) gives the known distribution of this species as Maryland and Pennsylvania westward to Indiana, and south to Florida.

Flight Range.—14 June to 17 August with majority of dates in late June. McAtee and Banks (1920) give 5 June to 22 August and state that it is known to come to light.

Genus CYRTOPOGON Loew

Cyrtopogon Loew, 1847. Linnaea Entomol. 2:516.

KEY TO SPECIES OF *CYRTOPOGON*

1. Scutellum more or less flattened, rugose and pollinose except for two lateral polished spots. . . . . *C. lutatius* (Walker)
1′. Scutellum convex and entirely shining or with narrow transverse band of pollen at base 2
2. Abdominal segments of males conspicuously yellow pollinose, females usually pollinose laterally. 3
2′. Without conspicuous yellow pollinose areas in both sexes, but with narrow caudal pollinose margins 4
3. Third antennal segment yellowish-red . . . . . *C. varans* Curran
3′. Third antennal segment black . . . . . *C. vulneratus* Melander
4. Third antennal segment yellowish-red . . . . . *C. marginalis* Loew
4′. Third antennal segment black 5
5. Wings bimaculate, at apex of wing and apex of anal cell, dark in males, faint to almost lacking in female; proximal two-thirds of tibia brown . . . . . *C. bimacula* (Walker)
5′. Wings not maculated; proximal one-half of tibia yellow. . . . . *C. falto* (Walker)

Cyrtopogon bimacula (Walker)

Euarmostus bimacula Walker, 1851. Dipt. Saund., Pt. 2:102.

Diagnosis.—Antennae black, first two segments with black hair; frons and front densely yellow-brown pollinose; mystax dense, pale yellow mesally, black on outer margins; thoracic dorsum with yellow-gray pollinose pattern except on posterior pronotum and notopleural suture; scutellum pollinose only at the base with black pile longer than on mesonotum; ground color of tibiae and tarsi dark brown and black distally; pile of legs black except for pale yellow hairs on femora and dense short appressed golden hair on inner side of tibia and tarsi of proleg and metaleg; wings hyaline with two dark brown spots in male, and less pronounced to almost lacking in female; abdomen blue-black and polished, posterior lateral margins of segments 2 to 5 white pollinose, sides of segments with pale yellow to white tufts of long hair.

Habitat Preference.—Unknown.

Michigan Distribution.—This species, *C. bimacula,* has been collected from only two localities: Chippewa Co., 25 July 1960, R. R. Dreisbach; Marquette Co., 20 July 1955, R. R. Dreisbach. Back (1909), Curran (1923, 1924), Melander (1923a) and Wilcox and Martin (1936) have recorded this species from New Hampshire westward through Ontario and Minnesota to British Columbia and southward into New Mexico. This species is apparently a boreal species judging from the known distribution and from the fact that Wilcox and Martin (1936) record a number of more southern localities restricted to elevations above 6,400 feet.

Flight Range.—Wilcox and Martin (1936) report 22 June to 18 August for the known range of this species.

Cyrtopogon falto (Walker)

Dasypogon falto Walker, 1849. List., Pt. 2:355.

Diagnosis.—Antennae black; frons silvery pollinose at sides; front brownish pollinose; mystax dense in male, golden above and black on oral margin, mystax much thinner in female, golden in center and black on outer margin; thoracic dorsum yellowish-brown pollinose with median and lateral subpolished stripes; scutellum convex, polished black and pollinose only at base; dorsum of thorax and scutellum with black pile of equal length; legs black and polished, except the basal half or third of tibiae and distal portion of tarsal segments yellowish; white pile on femora except at apex; tibiae, tarsi, and apex of femora with black pile; mesal side of protarsi in male with white hair; wings hyaline with posterior margin and apex grayish; veins black but yellowish at base, some veins infuscated; abdomen wholly black, polished, white pilose, apex of abdomen in male with more black pile than female, lateral margins of segments 2 to 5 white pollinose.

Habitat Preference.—Bromley (1946) reports this common species is usually collected near oak and mixed mesophytic woods and in areas of white pine. It most commonly alights on shrubbery or other low plants along sunny edges of woods. This species has been taken in similar situations in Michigan associated with areas of sandy soils and plants generally less than one foot tall.

Bromley (1946) records this species feeding on *Aedes* (Culicidae), *Chrysogaster* (Syrphidae), Pipunculidae and *Dioctria* (Asilidae).

Michigan Distribution.—*Cyrtopogon falto* is the most common species in the genus. Eighty-six specimens have been collected from these counties: Keweenaw, Marquette, Dickinson, Schoolcraft, Mackinac, Chippewa, Cheboygan, Presque Isle, Grand Traverse, Kalkaska, Crawford, Oscoda, Manistee, Wexford, Arenac, Lake, Osceola, Clare, Gladwin, Iosco, Oceana, Isabella, Midland, Bay, Saginaw, Sanilac, Livingston, Oakland, and Wayne.

Wilcox and Martin (1936) report this species occurs throughout Canada from Nova Scotia to Alberta and in the United States from Wisconsin, Illinois and New England states south along the Atlantic seaboard to Florida. Bromley (1931) reported this species from Ohio.

Flight Range.—18 May to 4 August with the majority of dates in early June.

Cyrtopogon lutatius (Walker)

Dasypogon lutatius Walker, 1849. List. Pt. 2:357.

Diagnosis.—Antennae black; frons and front grayish pollinose; mystax white; thoracic dorsum with brown pollinose pattern, posterior pronotum and lateral margins of dorsum covered with yellowish-gray pollen; scutellum flat and finely wrinkled, with little hair, gray pollinose over median and with polished black spots laterally; legs black; tarsi reddish-brown; femora with white hairs; tibiae with white bristles beneath; wings hyaline with a faint grayish tinge on distal half; abdomen convex, black and subpolished, first segment with pollinose spots laterally, segments 2 to 7 with white pollinose bands on caudal margin, bands interrupted on segments 2 to 5 and nearly entire on segments 6 and 7. Length 7.5-10 mm.

Habitat Preference.—Blanton (1939) reports *C. lutatius* as always in open sunshine and alighting on tree trunks and stumps of conifers. McAtee and Banks (1920) state that this species is usually collected about piles of cordwood.

Michigan Distribution.—Nine specimens of *C. lutatius* were examined from these counties: Midland, Lapeer and Cheboygan. Wilcox and Martin (1936) report this species distributed from New York westward through Ontario and Michigan. McAtee and Banks (1920) have found this species in Virginia and Maryland. Bromley (1931) reports this species from central Ohio.

Flight Range.—30 May to 11 July. Wilcox and Martin (1936) report nearly the same dates for the known range with the majority of dates in mid June.

Cyrtopogon marginalis Loew

Cyrtopogon marginalis Loew, 1866. Cent., 7:60.

Diagnosis.—First two antennal segments black, apex of second and third reddish-yellow, apex of third and style blackish, fine white pile on antennal segments one and two; frons and front with fine white pile; mystax black laterally and on oral margin, mesally with fine white hair; thoracic dorsum with grayish to brownish pollinose pattern except posterior part from posterior pronotum to scutellum which is polished black, pile on polished area black, otherwise short and whitish; scutellum polished black with white pile; femora black, reddish at apices; with long white pile, yellowish ventrally and black apically; tibiae reddish and darker apically, black pile on inner side and white pile on outer side; tarsi reddish; basitarsus often yellowish; protarsi of male more slender than female and wholly bright yellow with yellow bristles and pile; bristles of tibiae and tarsi of mesoleg and metaleg black; wings hyaline, yellowish basally, grayish apically; abdomen black and polished, segments 2 to 5 with an interrupted white pollinose band on posterior portion nearly touching caudal margin mesally, posterior margins of segments with white pile, remainder is black pilose and tufted on segments 2 to 4. Length 11-12 mm.

Habitat Preference.—Bromley (1946) reports this species from white pine woodlands. It alights on stones, fences, tree trunk bases or dried logs in open sunny situations. Blanton (1939) reports similar habits for this species.

Michigan Distribution.—Eight specimens of *C. marginalis* show this distribution for Michigan: Keweenaw Co., Isle Royale, 27 June to 8 August, D. E. Bixler, R. W. Hodges; Baraga Co., "Sand Plains," 6 June 1959, Wayne Yoder; Midland Co., 20 May 1942, R. R. Dreisbach.

Wilcox and Martin (1936) report this species occurs from New York and New Hampshire southward to Virginia. Curran (1924) reports it occurs westward to Lake Nipigon, Ontario. Bromley (1931) tentatively recorded *marginalis* as occurring in Ohio but it has never been taken.

Flight Range.—15 May to 1 September with majority of dates in June for the known range of *C. marginalis* (Wilcox and Martin, 1936).

Cyrtopogon varans Curran

Cyrtopogon varans Curran, 1923. Can. Entomol. 55:141.
Cyrtopogon varans Curran, 1924. Can. Entomol. 56:279.

Diagnosis.—First two antennal segments black with black hair; third segment yellow, darker basally, style dark; frons whitish pollinose with fine golden to pale yellow bristles above and black bristles on oral margin and below antennae; front nearly bare in female, polished black; front whitish pollinose or tomentose in male; thoracic dorsum with gray and brown pollinose pattern, lateral areas of mesonotum polished black; scutellum quite convex, smooth, and covered with long fine black hair, middle of base narrowly pollinose; proximal two-thirds of protibia and three-fourths of meso- and metatibia and base of tarsal segments reddish, remainder of all legs black except yellow apical tip of femora; all bristles and hair black; venter of all tarsi, protibia and apex of metatibia with very dense golden pile; wings hyaline and infuscated at crossveins and furcations in center of wing; male abdomen black and subpolished with long fine golden bristles on lateral areas of segment 1, most of segments 2 to 4 and caudal margin of segments 5 to 7; extensive yellow pollinose areas on dorsum of segments 2 to 4; median pollinose spot on segment 5; segments 5 to 7 with lateral posts of pollen; female abdomen black and subpolished, with scattered short pale yellow hair, fine pale yellow hairs laterally on segments 1 to 4; pollinose areas limited to large lateral triangular spots of pale yellow pollen. Length 15 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—*Cyrtopogon varans,* a rare species, is known only from Keweenaw Co., Isle Royale, 3-7 August 1936, R. R. Dreisbach (six specimens) and Daisy Farm, 1-3 July 1965, D. E. Bixler (four specimens). Wilcox and Martin (1936) record only two other specimens known; Gaspe, Quebec, 4 September 1914, C. H. Young; Macdiarmid, Ontario, 21 June 1923, N. K. Bigelow.

Cyrtopogon vulneratus Melander

Cyrtopogon vulneratus Melander, 1923. Psyche 30:118-119.

Diagnosis.—Antennae black; frons and front covered with dense golden tomentum, a bare spot between antennae and anterior ocellus; mystax black with yellow facial hair; thoracic dorsum tomentose except at caudal margin; anterior portion of mesonotum golden gray and median caudal portion blackish-gray; notal hairs are black and sparse; scutellum black, convex and shining with a trace of yellow pollen at base, black marginal hairs present but sparse; femora black; tibia and tarsi reddish except apex, hairs on legs are largely whitish, bristles black; two strong yellow bristles near middle of anterior side of hind femora, inner side of pro- and metatibia with dense deep golden pubescence; wings broad and hyaline, yellowish toward base, slight infuscation about the crossveins; abdomen slender and shining, segment 1 and 2 tufted with white pile, segment 2 less dense; segment 3 and 4 with short brownish yellow hair; segments 5 to 7 and hypopygium with black hair; golden pollen laterally on posterior margins of segments 2 to 5.

Habitat Preference.—Unknown.

Michigan Distribution.—*Cyrtopogon vulneratus* has not been collected in Michigan but may occur in the eastern part of the Upper Peninsula. This uncommon species has been collected in Coniston, Ontario, 27 July by H. S. Parish and in Kearney, Ontario, 26 July 1911, by M. C. Van Duzee.

Genus **DASYLECHIA** Williston

Dasylechia Williston, 1907. Jour. New York Entomol. Soc. 15:1.

Generic Diagnosis.—This genus contains a single species, *D. atrox.* This species differs from all other North American Laphriini in having an antennal style, enlarged second palpal segment and a short truncate proboscis. Hull (1962) considers this species a phylogeront—i.e. a very ancient taxon.

Dasylechia atrox (Williston)

Hyperechia atrox Williston, 1884. Trans. Amer. Entomol. Soc. 11:28.

Diagnosis.—Large robust very densely yellow pilose species; mystax occipital hairs, vertex, mesonotum, scutellum, coxae, meso- and metafemora are all yellow pilose.

Habitat Preference.—This species is extremely rare. Only thirteen specimens have been collected in all North America. Bromley (1936a) recorded the observations of C. F. Walker who had collected two specimens at Ohio State University. Both flies were collected while they circled Mr. Walker's head. These flies were extremely sluggish and unwary and were easily captured. The location was an open pasture with oak, hickory and maples on gravelly morainic soil. An additional specimen in the Charles Dury collection at Ohio State University has *Melissodes bimaculata* (Lepeletier) (Apidae) as prey and an attached note "In an open grove, resting on an exposed branch, in rather low ground."

Michigan Distribution.—*Dasylechia atrox* has been collected only once in Michigan: Ingham Co., Lansing, 27 August 1888, collector unknown, male. This fly was recorded as having a small beetle as prey. Unfortunately nothing is known of the beetle.

This species has been collected from New York, New Jersey, Pennsylvania, Ohio, Kansas, Iowa and Utah. Most of the specimens have been collected in Ohio.

Flight Range.–Bromley (1931, 1934c, 1936a, 1947) records 7 June to 29 August as flight dates for *D. atrox* within Ohio. The greatest number of specimens have been taken in July.

Genus **DIOCTRIA** Meigen

Dioctria Meigen, 1803. Illig. Mag., Pt. 2:270.

Generic Diagnosis.–The genera *Taracticus* and *Ecthodopa* resemble *Dioctoria* and specimens are often labeled as such in collections. *Taracticus* has a small, curved apical protibial spur on medial side. *Echthodopa* and *Dioctria* lack protibial spurs. These two genera are separable by characters given in the key.

KEY TO SPECIES OF *DIOCTRIA*

1. R_{2+3} wing vein reaching wing margin at or below apex of wing; second anal cell and alulae reduced . . . . . *D. baumhaueri* Meigen
1′. R_{2+3} wing vein reaching wing margin before apex of wing; second anal cell and alulae well developed 3
2. Mesonotum entirely pollinose; posterior margin of mesopleura pollinose. . . . . *D. propinqua* Bromley
2′. Mesonotum with a shining black spot on each side; posterior margin of mesopleura bare . . . . . *D. albius* Walker

Dioctria albius Walker

Dioctria albius Walker, 1849. List. Pt. 2:301.

Diagnosis.–Antennae black with black hair, segment 3 subequal in length to segments 1 and 2; frons golden yellow pollinose; mystax black; palpi with white hair basally and brown apically; scutellum flattened, polished, bare, with erect long marginal hair; femora with denticles and white pile beneath; R_{2+3} reaches anterior margin of wing before apex; second anal vein and alulae well developed; wings dark. Length 9-11 mm.

Habitat Preference.–*Dioctria albius* usually occurs within forests or the edges of forests alighting on large shrubs or low trees (Cockerell, 1894).

Michigan Distribution.–Only two specimens of *D. albius* have been taken in Michigan: Marquette Co., Huron Mountains, 2 July 1919, A. W. Andrews. Bromley (1931, 1950a) reported the species from central Ohio and Florida. Wilcox and Martin (1941) record specimens from New York and Ontario westward to Wisconsin. They also report that E. A. Back has taken this species from Virginia, North Carolina, Georgia and Florida.

Flight Range.–Wilcox and Martin (1941) record 4 June to 28 July as flight dates for this species.

Dioctria baumhaueri Meigen

Dioctria baumhaueri Meigen, 1820. Sys. Beschr. bek. eur. zweifl Insekten. 2:245.

Diagnosis.–Antennae black with black hair, segment 3 subequal to segments 1 and 2; frons silvery white; mystax sordid white; palpi with pale yellow hair; scutellum convex with short recumbent pile over entire scutellum; femora without denticles and with white pile; R_{2+3} reaching margin at or below apex; second anal vein and alulae reduced. Length 12-14 mm.

Habitat Preference.–*Dioctria baumhaueri* is an introduced species from Europe. It was first found in Boston, Mass., in 1916. Since then it has spread over much of northeastern North America.

Blanton (1939) reports *D. baumhaueri* being often found along fence rows and in old fields with "large bushes such as wild cherry."

This species congregates about flowering bushes and feeds on small Diptera and Hymenoptera attracted to the flowers. It has been collected associated wtih *Prunus, Philadelphus* and *Hamamelis* when in flower. The habitat is usually mesic and close to a forest or several large trees. Often this species is taken in nurseries. The flies are often very abundant in particular areas and as many as one hundred may be collected in a single day. The flies rest on twig tips or leaves three to seven feet above the ground.

This species was observed on two occasions on flowering mock orange (*Philadelphus*). Several hundred *baumhaueri* were observed on a bush approximately ten feet tall which contained several hundred blossoms. *D. baumhaueri* was seen everywhere over the bush, darting out after small flies and hymenopterans. No cannibalism or mating was observed at any time. Over a two day period, nearly all of the blossoms fell from the bush and less than ten specimens of *baumhaueri* could be found indicating that they disperse if prey is not readily available.

Michigan Distribution.—One hundred and twenty-three specimens of *D. baumhaueri* show this county distribution: Houghton, Schoolcraft, Clinton, Eaton, Ingham, Oakland, Kalamazoo, Branch, and Monroe.

Flight Range.—30 May to 5 August with the majority of dates in June.

Dioctria propinqua Bromley

Dioctria propinqua Bromley, 1924. Occ. Pap. Boston Soc. Nat. Hist. 5:125.

Diagnosis.—Antennae black with golden hair, antennal segment 3 longer than segments 1 and 2; frons golden yellow pollinose; mystax in male golden yellow, black in female; palpi with yellow hair; scutellum flattened and bare; femora without denticles, with scattered golden hair; R_{2+3} reaches anterior wing margin before apex of wing; male wings yellowish on basal portion. Length 9-11 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Only a single specimen of *D. propinqua* is known from Michigan: Baraga Co., T12N R35S S31, 30 July 1935, C. Steinback. Wilcox and Martin (1941) report this uncommon species from Nova Scotia, New York, and Massachusetts. All specimens were taken from 12 to 30 July.

Genus DIOGMITES Loew

Diogmites Loew, 1866. Berliner Ent. Zeitschr. 10:21.

KEY TO THE SPECIES OF *DIOGMITES*

1. Abdomen constricted between the second and third segments . . . . . *D. neoternatus* (Bromley)
1′. Abdomen not constricted between segments 2
2. Orbital, postvertical and bristles of first abdominal segment black. 3
2′. Orbital, postvertical and bristles of first abdominal segment white, yellow or red-brown 4
3. Abdomen, mesonotum and legs reddish-brown . . . . . *D. basalis* (Walker)
3′. Abdomen black, mesonotum dark brown, legs yellowish . . . . *D. platypterus* (Loew)
4. Mesonotum golden with three conspicuous black stripes; central stripe shading into red anteriorly, not divided longitudinally and not reaching the pronotum; lateral stripes divided into anterior and posterior spots. . . . . *D. misellus* (Loew)
4′. Mesonotum dark brown with golden border and three black stripes or one central black stripe with indistinct lateral stripes; central stripe divided longitudinally and reaching the pronotum; lateral stripes when present, incompletely divided . . . . . *D. discolor* (Loew)

Diogmites basalis (Walker)

Dasypogon basalis Walker, 1851. Diptera, 1:95.

Diagnosis.—Antennae yellow with stout black bristles, segment 2 with two large bristles longer than the segment, segment 3 with 5 or more black bristles laterally; mystax pale yellow; palpi with black hair, some yellow hair apically; mesonotum without strongly contrasting black lines, dorsum more concolorous; hairs and bristles of coxae partly or wholly black, abdominal tergum 1 with 7 lateral bristles and long fine hair. Length 17-29 mm.

Habitat Preference.—Bromley (1931, 1950c) reports *D. basalis* is usually found in fields and meadows where tall weeds are especially abundant. Usually these areas are moist. In some areas, this species is quite common in gardens. Prey is usually any aculeate Hymenoptera or occasionally *Eristalis* (Syrphidae). McAtee and Banks (1920) also record it feeding on a spider. This species commonly alights on twigs or grasses very close to the ground. Occasionally it is a pest at apiaries.

Bromley (1950c) states that *D. basalis* is becoming increasingly scarce. At one time it was especially common in the flower and vegetable gardens of New England but now is very seldom found.

Michigan Distribution.—Only a single specimen has been collected: Ingham Co., East Lansing, 9 August 1935, C. W. Sabrosky. Bromley (1931, 1936, 1950c) records this species from New England westward to Iowa and south to North Carolina and Kentucky. This species is commonly collected in southern Ohio and especially in the Ohio River valley. Artigas (1966) has also recorded this species from Colorado.

Flight Range.—Bromley (1931) records 3 July to 2 Sept. as flight dates for *D. basalis* in southern Ohio. McAtee and Banks (1920) report July to 19 Sept. for Washington, D.C., and *in copulo* on 1 Sept.

Diogmites discolor Loew

Diogmites discolor Loew, 1966. Cent., 7:37.

Diagnosis.—Antennae orange with stout black bristles, segment 2 with two large bristles, one subequal in length to the segment, segment 3 with 3 to 6 black bristles on outer side; mystax sordid light yellow to pale orange; palpi with black hair, dark brown apically and some brownish yellow on the base; mesonotum with narrow median black stripe, split and fading to reddish brown anteriorly, tapering acutely and fading posteriorly, lateral stripes indistinct and dark brown; hairs and bristles of coxae pale; abdominal tergum 1 with lateral orange brown bristles and fine black hair. Length 17-22 mm.

Habitat Preference.—Bromley (1946, 1947, 1950c) states *D. discolor* is found in swales and brushy pastures near the edges of woods. Sometimes this species is common in flower gardens and is occasionally a pest in apiaries. It feeds almost exclusively on aculeate Hymenoptera. McAtee and Banks (1920) list these insects as prey; *Leptalea* sp. (Formicidae), *Vespula vulgaris* (Linnaeus), *V. maculifrons* (Buysson) (Vespidae) and *Anthophora furcata terminalis* Cresson (Apidae).

Ritcher (1940) found that larvae of this species were a significant predator on *Phyllophaga* (Scarabeidae) pupae. He estimated that 12% of the available *Phyllophaga* pupae were destroyed by this asilid. He states that over 40 (asilid) larvae were found in the soil attacking pupae in the pupal cells over a two year period. The evidence presented is circumstantial and there is room for doubt as to whether these larvae are truly carnivorous.

Michigan Distribution.—*Diogmites discolor* has not been collected within Michigan but undoubtedly occurs in the southeastern part of the state for the species has been taken in Henry Co., Ohio. Bromley (1936b) gives the distribution of this species as southern Connecticut westward to Missouri and south to North and South Carolina, Artigas (1966) adds Alabama and Kentucky to this distribution.

Flight Range.—Within Ohio, Bromley (1931) lists 18 July to 31 August with the majority of collection dates in late July. For Washington, D.C., McAtee and Banks (1920) record 24 June to 16 September with copulation dates in late July and August.

Diogmites misellus Loew

Diogmites misellus Loew, 1866. Berlin. Entomol. Zeitschr. 10:22.

Diagnosis.—Antennae with black bristles, segment 2 with 1 large bristle subequal to the segment, segment 3 with 3 bristles on lateral margin; mystax sordid white; palpi with yellow hair; mesonotum with contrasting black lines, median line fades into red anteriorly; hairs and bristles of coxae pale; abdominal tergum 1 with 5, lateral, pale yellow, bristles. Length 14-17 mm.

Habitat Preference.—Blanton (1939) reports *D. misellus* found along fence rows sitting on the ground or green foilage. Bromley (1946) reports this species common to dry fields and pastures. We have found this species in dry sandy areas and nearly always associated with grasses. It flies about 6 to 7 inches above the ground. Generally this fly either lands on the ground or on grass stems, quite commonly within 20 feet of the edge of a tree line or forest edge.

Bromley (1946) has observed that *D. misellus* has the unique habit of picking worker ants off grass stems. Its prey is mostly small Diptera and Hymenoptera.

Michigan Distribution.—Eleven specimens of *D. misellus* show this distribution: Newaygo Co., T12N R12W S2, 25 August 1967, N. T. Baker; Newaygo Co., 30 June 1944, R. R. Dreisbach; Kalamazoo Co., Gull Lake Bio. Sta. 28 July-27 August, R. L. Fischer. Bromley (1931, 1936b, 1950c) gives the distribution of this species as New England west to Ohio and southward to Texas and Florida.

Flight Range.—For Connecticut, Bromley (1946) gives 22 July to 27 August with the majority of dates in early August.

Diogmites neoternatus (Bromley)

Deromyia neoternatus Bromley, 1931. Entomol. Soc. Amer. Ann. 24:433.

Diagnosis.—Antennae with black bristles, segment 2 with one pair large bristles less than length of the segment, segment 3 lacking bristles on lateral margin; mystax white; palpi with all black hair apically and some yellow basally; mesonotum with strongly contrasting black lines, median line is split anteriorly; hairs and bristles of coxae pale; abdominal tergum 1 with 4 large stout bristles. Length 18-29 mm.

Habitat Preference.—Bromley (1931, 1950c) reports *D. neoternatus* from moist bushy woods or fields, frequently in partial shade. When disturbed, it will fly directly through blackberry thickets to escape. It has been taken at light.

Michigan Distribution.—Only one specimen of *D. neoternatus* has been collected in Michigan: Van Buren Co., Paw Paw Lake, 5 August 1906, E. Liljeblad. Bromley (1936b) states that this species occurs from Ohio westward to Nebraska and southward to Florida and Texas. Martin and Wilcox (1965) and Bromley (1950a) give the distribution as Indiana to Colorado and southward to Texas and Florida. Martin (1965) gives the same distribution.

Flight Range.—Bromley (1931) gives 22 July to 18 August for Ohio.

Diogmites platypterus Loew

Diogmites platypterus Loew, 1866. Berlin. Entomol. Zeitschr. 10:36.

Diagnosis.—Antennae yellow, segment three longer than segment one plus two, segment three with few short black hairs on basal half; mystax yellow; mesonotum dark brown, often with two faint dark lines centrally which reach the pronotum, lateral lines very

indistinct or missing; coxae yellow or brownish-yellow with black bristles; abdomen black without pattern or spots, black bristles on first abdominal segment. Length 20-28 mm.

Habitat Preference.—Artigas (1966) states this species is usually found in low, moist, protected areas.

Michigan Distribution.—No specimens of *D. platypterus* have been taken within Michigan but they undoubtedly will in the southwestern corner of the state. Artigas (1966) found several specimens distributed within Indiana (Stark Co.). Interestingly, Bromley never recorded the species from Ohio and never regarded its presence there as a possibility.

Genus **ECTHODOPA** Loew

Ecthodopa Loew, 1866. Berliner Entomol. Zeitschr. 10:16.

Ecthodopa pubera Loew

Ecthodopa pubera Loew, 1866. Cent. 7, 27:15.

Diagnosis.—Antennae black, elongate, segment 3 longer than segments 1 plus 2, style distinct and about one-fourth as long as segment 3; frons and occiput pale golden pubescent; front polished black; male mystax golden; female mystax and often pile of entire body pale white; palpi yellow haired; coxae with long pale hair; pile and bristles of legs are pale; all wing veins are infuscated. Length 11.5-13 mm.

Habitat Preference.—Hull (1965) reports this species from low growing foliage at the edge of woodlands.

Michigan Distribution.—Only one specimen of *E. pubera* has been collected in Michigan: Monroe Co., Monroe, 12 June 1949, G. Steyskal. Martin and Wilcox (1965) give the distribution as South Dakota to Washington and southward to Wyoming and Nebraska. Several specimens have been examined from Dane Co., Wisconsin, so it is quite possible that this species may be collected either in the western part of the upper peninsula or in lower part of the lower peninsula of the state.

Genus **HOLCOCEPHALA** Jaennicke

Holcocephala Jaennicke, 1867. Senckenb. Naturf. Gesell. Abhandl. 6:359.

KEY TO SPECIES OF *HOLCOCEPHALA*

1. Scutellum gray pollinose; frons brown below to white pollinose above . . . . . *H. calva* (Loew)
1′. Scutellum pale yellow or golden yellow pollinose; frons completely brown or yellow pollinose, without white pollen 2
2. Abdomen bright yellow pollinose; occipital hairs pale golden . . *H. abdominalis* (Say)
2′. Abdomen dark brown pollinose with paler incisures; occipital hairs white . . . . . *H. fusca* Bromley

Holcocephala abdominalis (Say)

Dasypogon abdominalis Say, 1823. Jour. Acad. Sci. Phil. 3:50.

Diagnosis.—Frons golden yellow pollinose; occiput is gray pollinose; mystax and occipital hairs are pale golden; thorax with dark brownish-black pollinose median stripe and lateral spots, giving way to golden yellow pollen on lateral areas; scutellum is golden yellow pollinose; legs are reddish-brown, with sparse golden pile; apices of tibiae and tarsal segments more or less blackened; femora often black on dorsal side; abdomen bright yellow pollinose. Length 9 mm.

Habitat Preference.—Bromley (1946) reports *H. abdominalis* from "meadows or moist areas where herbage is rank." It usually alights on the tips of twigs, sedges, grasses and several hundred individuals may be present in a small area.

McAtee and Banks (1920) and Bromley (1950c) state *H. abdominalis* is usually seen perched on grass blade tips in damp situations. Ants, *Solenopsis molesta* Say and *Lasius* sp. and a Ceratopogonid (*Culicoides*) are listed as prey.

This species has been collected inhabiting sedges and grasses on the edge of a marshy lake in Michigan. Several hundred individuals could have been collected quite easily in a short time. The adults sit with their heads up on the tips of sedges and capture Chironomidae and small Tipulidae when they fly near. This robberfly, the "gnat ogre" as dubbed by Hull (1962) then settles on a nearby sedge and consumes its prey. They are readily approached for observation.

Michigan Distribution.—*H. abdominalis* has been collected from these counties: Otsego, Manistee, Wexford, Clare, Arenac, Oceana, Muskegon, Montcalm, Huron, Tuscola, Ottawa, Kent, Clinton, Shiawassee, Genesee, Ingham, Livingston, Calhoun, Washtenaw, Berrien, and St. Joseph. Over three hundred specimens were examined.

H. abdominalis occurs over most of the United States and southern Canada east of the 100th meridian. (Back, 1909; Pritchard, 1938; Bromley, 1950c).

Flight Range.—2 July to 4 September with the greatest majority in late July and early August. McAtee and Banks (1920) report 20 June to 30 October for Washington, D.C.

Holcocephala calva (Loew)

Discocephala calva Loew, 1872. Cent. 10:35.

Diagnosis.—Frons brown below to white pollinose above; occiput is gray pollinose; mystax white; occiput hairs white; thorax with dark brown pollinose median and lateral stripes on mesonotum giving way to silvery gray pollen on lateral areas; scutellum gray pollinose; dark brown legs with sparse white hairs; all femora and tibiae darker on apices; protarsi usually darker than others; abdomen dark brown pollinose and noticeably constricted basally. Length 8-9 mm.

Habitat Preference.—*H. calva* is commonly found in association with *H. abdominalis* but in fewer numbers. Nothing is known of the behavior of this species.

Michigan Distribution.—Seventeen specimens were examined from Clare, Oceana, Shiawassee, Barry, Ingham, Kalamazoo, Cass, St. Joseph and Monroe counties.

Back (1909) records *H. calva* from New England south to Florida and west to Texas. Pritchard (1938) also recorded Kansas and Oklahoma. Bromley (1931) recorded Ohio.

Flight Range.—8 June to 30 August with majority of dates in late July and early August.

Holcocephala fusca Bromley

Holcocephala fusca Bromley, 1951. Amer. Mus. Novitates 1532, p. 10.

Diagnosis.—Frons brown pollinose to light tan above; occiput hairs white; thorax with light brown pollinose median and lateral stripes giving way to yellow-gray pollen on lateral areas; scutellum pale yellow pollinose; legs reddish-brown with sparse white hairs; apices of tibiae, upper surface of femora, and tarsal segments blackened; abdomen dark brown pollinose with paler pollen at incisures. Length 5.5-7 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—*H. fusca* has not been taken in Michgian but probably occurs in the southern part of the state. Bromley (1951) records it from Erie Co. in northern Ohio, and from Texas and Tennessee.

Flight Range.—Bromley (1951) reports 11 July to 15 September as flight dates for *H. fusca* in Ohio.

Genus **HOLOPOGON** Loew

Holopogon Loew, 1847. Linnaea Entomol. 2:473.

KEY TO SPECIES OF *HOLOPOGON*

1. Viewed dorsolaterally, the mesonotum with a tomentous, median, geminate stripe outlined by broad lateral subpolished stripes, small amount of pale tomentum on lateral areas of mesonotum before transverse suture . . . . . *H. vockerothi* Martin
1'. The mesonotum with median tomentose stripe outlined by broad lateral areas of pale tomentum 2
2. Diameter of apical three-fifths of metatibia uniform in diameter or slightly tapering, subequal to diameter of femur . . . . . *H. oriens* Martin
2'. Metatibia clavate, greatest diameter at apex, diameter of femur less than that of tibia . . . . . *H. phaeonotus* Loew

Holopogon oriens Martin

Holopogon oriens Martin, 1959. Amer. Mus. Novitates 1980, p. 22.

Diagnosis.—Frons semi-polished with reddish-brown tomentum; mystax black; thorax dark brown tomentose, broad median stripe confluent with lateral stripes, outlined by light yellowish-brown tomentum and dark brown tomentum posteriorly; wing hyaline and apically broad; distal three-fifths of metatibia about same diameter as femur; dense short hair on venter of tibia bright coppery to yellow; lateral margins of abdominal tergites 1 to 7 brown pollinose, dorsum without tomentose pattern. Length 6 mm.

Habitat Preference.—*Holopogon oriens, H. phaeonotus,* and *H. vockerothi* have recently been recognized as distinct species from *H. guttula* (Martin, 1959). The confusion arose from an incomplete original description by Wiedemann and the variability of *guttula* and *phaeonotus.* Collections generally have these species labeled as *H. guttula.* Habitat information on these species is therefore confused and no distinction as to habitat or behavior can be made.

Martin (1959) reports that most species of *Holopogon* are usually found perching on the tips of dead twigs several feet above the ground. He also states that *oriens, phaeonotus* and *vockerothi* are often collected together. Melin (1923) states that in Sweden species of this genus are usually found near water. Bromley (1946) reports that "*guttula*" is a fairly common species in sunny openings or edges of forests or brushy pastures where it alights on the tips of twigs. He also recorded this species feeding on winged aphids.

Michigan Distribution.—Thirty-four specimens of *H. oriens* were examined from these counties: Oscoda, Wexford, Roscommon, Iosco, Clare, Newaygo, Midland, Kent, Allegan, Ingham, Van Buren, Washtenaw, Wayne, Berrien, Cass, Hillsdale, and Monroe.

Martin (1959) reports the range of this species as New York south to South Carolina and northwestward through Tennessee to Minnesota.

Flight Range.—6 June to 31 August with the majority of dates in late June. Martin (1959) reports 23 April to August with most dates in June for the known range.

Holopogon phaeonotus Loew

Holopogon phaeonotus Loew, 1874. Berlin. Entomol. Zeitschr. 18:366.

Diagnosis.—Frons with brownish-gray tomentum; mystax completely black or gray with black on oral margin; broad median thoracic stripes not geminate, confluent with lateral stripes, no black subshining stripes, lateral pollen of mesonotum varies in density and from brown to gray; wings of males brownish and narrowed at tip; metatibia of males are clothed ventrally and laterally with dense, dark brown hair; wings of female narrow and light brown; metatibia of female with hair faded reddish brown to bright orange brown; brown pollen on lateral margins of each abdominal tergite of male (of tergites 1 to 3 or 4 in female), becoming narrower caudally, occasional specimens have dorsal pollinose stripe on anterior margin of tergites 4 to 6 (4 and 5 in female). Length 6-7 mm.

Habitat Preference.—Refer to *H. oriens.*

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Michigan Distribution.—Twenty-four specimens were examined from these counties: Alger, Cheboygan, Grand Traverse, Crawford, Alcona, Manistee, Wexford, Missaukee, Iosco, Osceola, Newaygo, Midland, Montcalm, Gratiot, Saginaw, Kent, Allegan, Livingston, Washtenaw, Wayne and Monroe. Martin and Wilcox (1965) report this species is distributed from Massachusetts westward to Wisconsin and southward to Florida and Texas. Martin (1959) also reports Quebec, Ontario and New York.

Holopogon vockerothi Martin

Holopogon vockerothi.—Martin, 1959. Amer. Mus. Novitates 1980, p. 31.

Diagnosis.—Frons densely yellowish brown tomentose; mystax blackish brown with some pale hair; thorax brown tomentose, with median geminate stripe divided by a narrow, subshining line and outlined by a subshining lateral black stripe, small pale tomentose spots before transverse suture; wings hyaline; metatibia clavate with dense yellow short hair ventrally, dark reddish brown hair anteriorly and posteriorly; abdominal tergite 1 laterally broadly brown pollinose, tergite 2 laterally brown pollinose, tergite 7 brown pollinose anteriorly. Length 7 mm.

Habitat Preference.—Refer to *oriens.*

Michigan Distribution.—Sixty-eight specimens of *H. vockerothi* were examined from Marquette, Cheboygan, Presque Isle, Grand Traverse, Kalkaska, Oscoda, Crawford, Wexford, Missaukee, Iosco, Mason, Osceola, Clare, Newaygo, Midland, Bay, Kent, Ionia, Allegan, Oakland, Van Buren, Kalamazoo, Jackson, Wayne, Berrien, Cass, Hillsdale and Monroe counties.

Martin (1959) records *H. vockerothi* from Ontario, Quebec and Manitoba southward through New England and Illinois to Georgia and Florida.

Flight Range.—24 May to 25 July with the majority of records in mid June.

Genus **LAMPRIA** Macquart

Lampria Macquart, 1838. Dipteres exotiques 1:60.

Lampria bicolor (Wiedemann)

Laphria bicolor Wiedemann, 1828. Aussereuropäische Zweiflügelige Insekten 1:522.

Diagnosis.—Head black with black pile, except for tuft of appressed white hair on frons at ocular margin; thorax and legs black; hind femora thickened and with double row of acicular tubercles; coxae white haired; abdomen red except for black base of tergite one; genitalia small, reddish, with yellow hair. Length 9-16 mm.

Habitat Preference.—Bromley (1934a, 1950c) reports *L. bicolor* is usually found resting on logs or stumps in open dry woods. This species apparently has a preference for oak trees.

Bromley (1934c) has recorded one specimen with an ichneumonid as prey.

Michigan Distribution.—Only six specimens are known from Michigan: Kalkaska Co., (?) June 1966, L. F. Wilson; Wexford Co., T24N, R9W, S22, 10 August 1965, J. H. Shaddy; Midland Co., 8 July 1944, R. R. Dreisbach; Kalamazoo Co., Augusta, 1 July 1948, coll. ?; Washtenaw Co., Ann Arbor, 31 July 1929, coll. ?, Hillsdale Co., Pittsford, 15 June 1959, G. C. Eickwort.

Bromley (1934a, 1950a) records *L. bicolor* from New York westward to Illinois and southward to Florida and Texas.

Flight Range.—Bromley (1931, 1934c) records June to 20 July for this species in Ohio and for the known range June to 14 September.

Genus **LAPHRIA** Meigen

Laphria Meigen, 1803. Mag. Insectenkunde 2:270.

Generic Diagnosis.—Certain species are recognizable only by male genitalic characters, and modifications of the posterior margins of abdominal tergites 6 and 7. Females of the species of the *canis* complex, *index* complex, *aeatus* complex are, at present, indistinguishable from one another.

Most species of the genus *Laphria* have abdominal segments 1 to 7 unmodified. Segment 8 in all species of *Laphria* is remarkably reduced to a simple ring of narrow sclerotized plates. The hypopygium is made up of the ninth, tenth and eleventh segments (Karl, 1959).

The males of certain species have the apical margin of the sixth and seventh tergite extensively modified. These species belong to three species complexes: *aeatus* complex including *L. aeatus*; *L. disparella* and *L. scorpio*; *canis* complex including *L. canis, L. sicula* and *L. winnemana*; and the *index* complex including *L. index* and *L. ithypyga*. Other species of *Laphria* not examined during the course of this study may belong to one of these complexes or to other complexes.

Males of *Laphria* seem to have three lines of development regarding the sixth and seventh abdominal tergites. The sixth tergite in most of these species has two posterior processes on the caudal margin. In the first group this tergite may be highly convex toward the posterior portion and consequently deflects the hypopygium downward. These species have posterior processes which are heavy, stout and short. Tergite 7 has no protruding processes but is triangular and minutely rugose. *Laphria canis* and *L. disparella* are examples of this type of development.

Species of the *aeatus* complex and *L. index* represent the second line of development. They have a normally shaped tergite 6, except that there are long narrow finger-like processes on the posterior margin. Usually the posterior processes are slightly upturned. The seventh tergite has a single median process which is pointed or slightly bilobate apically.

McAtee (1919) recognized essentially these same phylogenetic groupings except that he does not recognize *L. aeatus* and synonomizes *L. disparella* with *L. canis*. Other phylogenetic groupings of the twenty-three species known to him were also listed. His groupings however were admittedly based preponderantly on genitalic structure and only on external genitalic morphology.

Males of *Laphria* species which have essentially unmodified abdominal tergites constitute the third line of development. This includes most of the species presently within the genus.

All known species of *Laphria* copulate tail to tail facing in opposite directions. These processes on the sixth and seventh abdominal tergites probably function to guide the female's ovipositor into the male's hypopygium. Unfortunately the actual sequence of events involved in coupling has not been observed for any species of *Laphria*.

KEY TO SPECIES OF *LAPHRIA*

1. Abdomen always with considerable amounts of erect long black pile; pile of mesonotum always dense and erect; abdomen broadened beyond the middle and generally ovate in males 2
1′. Abdomen devoid of pile or with yellow or golden pile and very little or no black pile, frequently appressed; mesonotum naked or with more or less appressed pile; abdomen almost always nearly parallel sided in males 14
2(1). Hair on sides of first abdominal segment largely black 3
2′. Hair on sides of first abdominal segment largely yellow 10
3(2). Front and middle legs and joint of metafemora and tibiae densely covered with yellow hair 4
3′. Legs largely black-haired or profemora alone with dense yellow hair 5
4(3). Mesoanepisternal tuft of hair yellow . . . . . *L. huron* Bromley
4′. Mesoanepisternal tuft of hair black . . . . . *L. flavicollis* Say
5(3′). Beard entirely black 6
5′. Beard largely yellow 7
6(5). Mystax entirely yellow 12

6′. Mystax all or largely black . . . . . *L. thoracica* Fabricius
7(5′). Marginal scutellar bristles largely pale; disc of scutellum with black hair or entirely yellow hair 8
7′. Scutellar bristles and hair largely black 9
8(7). Pile of mesonotum uniformly reddish brown; scutellar disc with black hair . . . . . *L. royalensis* Bromley
8′. Pile of mesonotum distinctly yellow; scutellar disc with yellow hair 12
9(7′). Mesonotal pile yellow anteriorly and reddish orange posteriorly . . . . . *L. insignis* (Banks)
9′. Mesonotal pile uniformly concolorous. . . . . *L. posticata* (Say)
10(2′). Scutellar vestiture black; pile on tergite 6 grayish to pale yellow . . . . . *L. cinerea* (Back)
10′. Scutellar vestiture yellow; pile of tergite 6 always black 11
11(10′). Dorsal abdominal pile uniformly black on first three tergites . . *L. flavicollis* Say
11′. Dorsal abdominal pile yellow on first three tergites. . . . . *L. sacrator* (Walker)
12(6). Dorsum of abdomen with entirely black pile. . . . . *L. flavicollis* Say
12′. Dorsum of abdomen with black and yellow pile. 13
13(12′). Pronotal bristles black . . . . . *L. divisor* Banks
13′. Pronotal bristles yellow . . . . . *L. posticata* (Say)
14(1′). Legs distinctively reddish, tibiae somewhat brownish at apex . . *L. sadales* Walker
14′. Legs entirely black 15
15(14′). Ground color of abdomen with a distinct median reddish area superimposed with appressed golden pile which is parted mesally. . . . . *L. gilva Linnaeus*
15′. Ground color of abdomen black or entire caudal end may be reddish brown. .16
16(15′). Abdominal tergites largely covered with reddish or yellowish pile 17
16′. Abdominal tergites nearly bare except for more or less dense hair laterally or with only scattered fine whitish or yellowish pile on anterior margins (canis complex) 27
17(16). Mesonotum uniformly covered with uniform yellow or golden pile (may be shorter anteriorly). 18
17′. Mesonotum with extensive black pile either covering dorsum or anteriorly at the sides. 21
18(17). Mesonotal pile yellow, contrasting with golden or reddish orange pile of abdomen 19
18′ Mesonotal pile golden or reddish orange, concolorous with abdominal pile 20
19(18). With some black bristles on sides of abdominal segment 1. . . . . *L. altitudinum* Bromley
19′. Bristles on sides of abdominal segment 1 entirely yellow or golden . . . . . *L. janus* McAtee
20(18′). Posterior pronotum black haired; beard and coxal hair usually white; abdominal tergite 7 of female mostly black haired . . . . . *L. aktis* McAtee
20′. Posterior pronotum with golden hair; beard and coxal hair yellow; abdominal tergite 7 of female mostly golden haired . . . . . *L. sericea* Say
21(17′). Lighter colored pile of thorax contrasting strongly in color with that of abdomen; yellowish pile on mesonotum becoming denser posterad; pile of abdomen brassy golden distally . . . . . *L. janus* McAtee
21′. Light pile of thorax concolorous with abdominal pile. 22
22(21′). Pale golden pile of mesonotum and abdomen forming a lateral fringe, pile of median areas shorter, sparser and largely black. . . *L. calvescenta* Baker n. sp.
22′. Pale pile covering mesonotum and abdomen at least posteriorly, pile becoming more dense posteriorly 23
23(22′). Pale pile on posterior portion of mesonotum forming a narrow triangle, extending at least to middle; abdominal segment 1 with fine abundant white hair (index complex) 24
23′, Pale pile lacking or forming a narrow fringe or spot on posterior mesonotum never reaching middle; abdominal segment 1 with yellow or golden hair (aeatus complex) 25

24(23). Abdominal tergite 6 with two well defined blunt apical processes; apical processes of the hypandrium convergent . . . . . *L. index* McAtee
24'. Abdominal tergite 6 with a single minute median apical process; apical processes of hypandrium divergent . . . . . *L. ithypyga* McAtee
25(23'). Processes of abdominal tergite 6 of male hooklike or upturned . . . . . *L. aeatus* Walker
25'. Processes of tergite 6 straight and not hooklike 26
26(25'). Abdominal tergite 7 with single median processes upturned at the tip; tergite 6 with two blunt points; mystax yellow haired . . . . . *L. scorpio* McAtee
26'. Abdominal tergite 7 tripartite and rugose; tergite 6 with two heavily sclerotized slightly upturned processes; mystax white haired. . . . . *L. disparella* Banks
27(16'). Hypopygium wider than tergite 6 when viewed from above; tergite 7 triangular, rugose . . . . . *L. canis* Williston
27'. Hypopygium not wider than tergite 6; tergite 7 not rugose 28
28(27'). Tip of hypandrium tapering and bluntly pointed; tergite 7 distinctly keeled (often nearly hidden from view) . . . . . *L. sicula* McAtee
28'. Tip of hypandrium expanded and leaflike; tergite 7 with a small bilobate process . . . . . .*L. winnemana* McAtee

Aeatus Complex

Laphria aeatus Walker

Laphria aeatus Walker, 1849. List of Diptera in the British Museum 2:381.

Diagnosis and Discussion.—This species is closely related to *L. disparella* Banks and to *L. scorpio* McAtee. These three species have the following in common: mystax of black bristles on lower half of frons, with yellow or white erect hair on inner part and decumbent yellow or white hair on ocular margin; beard white; occiput gray pollinose with black bristles; vertex and palpi shining black with black bristles; thorax black with predominately black vestiture, with sparse golden pile on median of mesonotum; pleura grayish to yellowish pollinose; tuft of bristles before halteres yellow with a few black bristles dorsally; halteres usually light brown; scutellum with fine appressed golden pile; coxae silvery white pollinose with long white hair; legs black with black bristles and white hair on first two pair of legs and on base of third; abdomen black with reddish golden pile becoming dense laterally and caudally, golden bristles on sides of segment 1; genitalia of male black with black hair.

Distinction between *aeatus, disparella* and *scorpio* can be difficult because of the similarity in morphology and vestiture. Comparison of the patterns of vestiture of the mystax, mesonotum, scutellum and abdomen will separate these species.

In *aeatus* the lateral decumbent pile of the mystax is golden yellow. The mesonotum is covered mostly with fine black hair but golden hair is sparsely scattered about the entire mesonotum and becomes much more numerous before the scutellar margin. The entire posterior pronotum is brown pollinose. The scutellum has fine appressed golden hair with black and golden brown marginal bristles. The abdomen is uniformly covered with reddish gold appressed pile combed into a divergent pattern. The male has a pair of hooklike processes projecting from the caudal margin of the tergite 6. Tergite 7 has a median pointed process.

In *disparella* the lateral decumbent hair of the mystax is dull yellow and somewhat lighter in the female. The mesonotum is black haired and with a distinctly denser tuft of long black bristles on the humeral callosity. Golden hair is scant on the mesonotum except for a narrow fringe on the scutellar margin. The posterior pronotum has a median shining spot without pollen. The scutellum is finely golden haired with more black marginal bristles than *aeatus* or *scorpio*. Abdominal pile is brownish yellow or orange and erect and most dense on the apical and lateral portion of each segment. Apical segments are almost completely covered with pile. Females are generally more densely haired than males. The posterior processes of the tergite 6 of the male are relatively small compared to *scorpio* and *aeatus*. Tergite 7 is not pointed or hooked but relatively unmodified.

In *scorpio* the mystax of the male has decumbent golden pile laterally, while the entire mystax of the female is white to very pale yellow. The mesonotum is scantly haired with mostly black hair and with the golden hair becoming more decumbent posteriorly and forming a somewhat indistinct triangle just above the scutellar margin. The black hair of the posterior pronotum is not as dense or as strong as in *aeatus* and *disparella*. The posterior pronotal swellings are without pollen in the center. Margin of scutellum with brassy golden bristles. The abdomen is covered with erect golden pile becoming more decumbent and more dense on the posterior portions of each segment and the abdomen as a whole. The mesonotal and abdominal pile of *scorpio* is lighter in color than that of *aeatus*. Males of *scorpio* have the posterior processes of the tergite 6 relatively short and strong. Tergite 7 has a strong, hooked median process. Length of *aeatus* 12-15 mm., *disparella* 13-16 mm., *scorpio* 14-17 mm.

Habitat Preference.–Unknown.

Michigan Distribution.–A single specimen of *L. aeatus* has been collected in Kalkaska Co., 29 June 1946, R. R. Dreisbach. Bromley (1934c) records this uncommon species from Macdiarmid, Ontario, flying from 12 June to 29 of June. Martin and Wilcox (1965) also give Hudson Bay and Alberta.

Laphria disparella Banks

Laphria dispar Banks, 1911. Can. Entomol. 43:130 (preocc. Coquillet, 1898).

Laphria disparella Banks, 1913. Proc. Entomol. Soc. Washington 18:52 (new name for *dispar* Banks).

Laphria canis var. *disparella* McAtee, 1918. Ohio Jour. Sci. 19:167.

Laphria canis Martin and Wilcox, 1965. *In* Stone, A., et al., A Catalog of the Diptera of American North of Mexico. Agr. Res. Serv., Agric. Handbk No. 276. Washington, D.C. p. 389 *In pars.*

Martin and Wilcox (1965) give *L. disparella* as a synonym of *Laphria canis* due to the fact that these species are very similar in morphology and especially genitalic morphology. These species belong to different species complexes and are easily separable on the basis referred to previously under *L. aeatus* or by characters given in the key to species.

Habitat Preference.–Unknown.

Michigan Distribution.–The uncommon *L. disparella* has been collected only twice: Chippewa Co., 27 August 1941, R. R. Dreisbach; Keweenaw Co., Isle Royale, 3 August 1936, R. R. Dreisbach. McAtee (1918) and Bromley (1934c) report the range of this species as Pennsylvania and New York.

Flight Range.–McAtee (1918) and Bromley (1934c) report 6 June to 10 August as flight dates for *L. disparella.*

Laphria scorpio McAtee

Laphria scorpio McAtee, 1918. Ohio Jour. Sci. 19:163.

Habitat Preference.–Unknown.

Michigan Distribution.–Only three specimens of *L. scorpio* have been collected in Michigan: Dickinson Co., 12 August 1953, R. R. Dreisbach; Kalamazoo Co., Gull Lake Bio Sta. 5 and 25 July 1967, R. L. Fischer.

Johnson (1925) and Bromley (1934c) have reported this species only from the New England states.

Flight Range.–Johnson (1925) lists 3 July to 1 August for the known flight range of *L. scorpio.*

Laphria aktis McAtee

Laphria aktis McAtee, 1918. Ohio Jour. Sci. 19:152.

Diagnosis.—Mystax of fine white bristles in male and mostly black in female; beard whitish; bristles of vertex, occiput and palpi black; pronotum with black bristles; mesonotum with fine thick decumbent yellowish golden pile and fine black bristles on anterior and lateral margins; pleura brownish pollinose with fine white hair and occasionally a few black hairs toward dorsum; halteres yellowish brown; scutellum with fine yellow or golden hair and many yellow marginal bristles; coxae grayish pollinose, with white hair; legs black with black and white hairs intermixed, white hair is more prevalent on first two pair of legs; abdomen with thick golden erect pile; female with black hairs and bristles on segment 7 to apex; genitalia black with black hair. Length 17-21 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—A single specimen of *L. aktis* has been collected from Wayne Co., 30 May 1959, R. R. Dreisbach. Bromley (1934c) records this species from northeastern and central Ohio in Coshocton and Summit counties. McAtee (1918) reports this species from Pennsylvania to Ohio and southward from Pennsylvania to North Carolina.

Flight Range.—McAtee (1918) reports 25 May to 27 June as flight dates for the known range of *L. aktis.*

Laphria altitudinum Bromley

Laphria altitudinum Bromley, 1924. Occ. Pap. Boston Soc. Nat. Histo. 5:126.

Diagnosis.—Mystax black, especially below, with golden bristles medially, smaller paler yellow hairs dorsally and laterally; beard black, occasionally entirely yellow hairs of occiput and vertex black with some yellow; palpi black haired, yellow hair at base; pronotal bristles black; mesonotum covered with pale yellow pile, with black hairs on posterior pronotum scutellum with pale hair and bristles; pleura brown pollinose; black hair and yellow bristles in front of wings; long yellow tuft of hair in front of haltere; coxae tan pollinose with long pale yellow bristles and some black hair; legs black with black hair, with some light hair on protibia; abdomen with reddish yellow hair, black hair on all of tergites 1 and 8 and on sides of tergite 2 and sometimes 3; genitalia black with black and some yellow hair. Length 16-24 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—*L. altitudinum* has been collected only twice; Mackinaw Co., Cut River, 19 July 1921, Sherman Moore; Schoolcraft Co., Manistique, 2 August 1915, A. W. Andrews. Bromley (1934c) reports this beautiful but uncommon species from Maine, New Hampshire and New York.

Flight Range.—Bromley (1934c) reports 16 June to 30 July for the known range of *L. altitudinum.*

Laphria calvescenta Baker, new species

(Figs. 3 and 4)

This beautiful species, black with golden pile on sides of thorax and abdomen gives the specimen a bald appearance. It is described from a single male specimen.

Male: Mystax of dense black bristles with some shorter yellow bristles at top of mystax and longer yellow bristles just under antennae, white decumbent featherlike hair in concavity of frons; vertex brown pollinose with black and yellow hairs; occiput gray pollinose with dense black bristles; palpi black with black and gold bristles; thorax black with dense golden vestiture except pronotum and shining dorsum of mesonotum densely black haired, brown pollinose anteriorly between posterior pronotal swellings, along

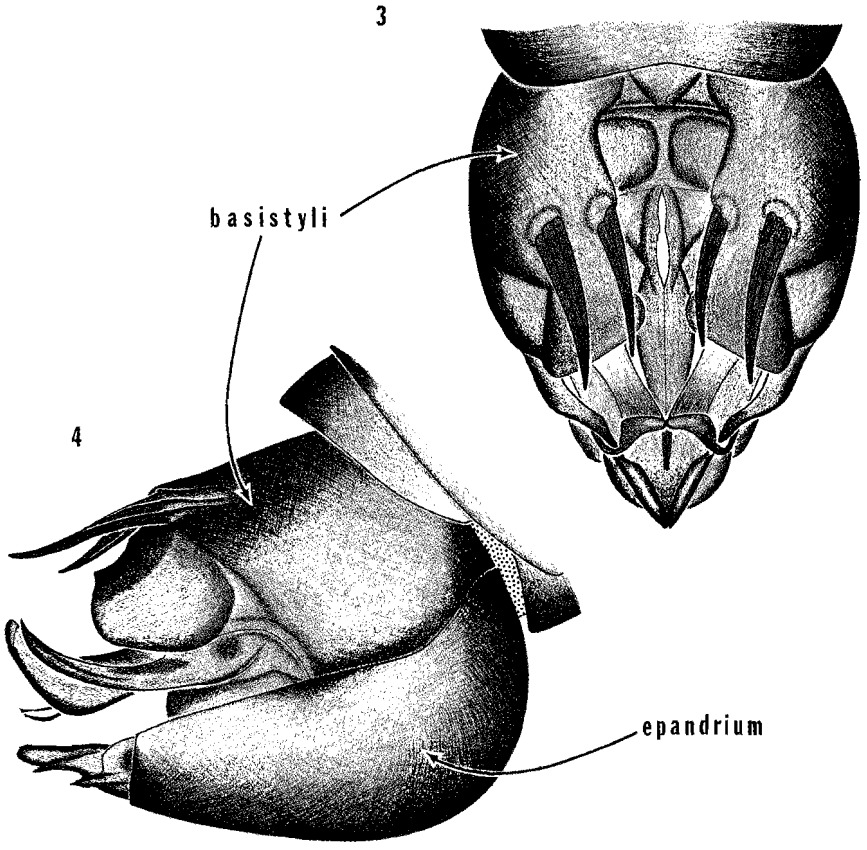

Fig. 3. Dorsal view of male genitalia of *Laphria calvescenta* Baker, new species.
Fig. 4. Lateral view of male genitalia of *Laphria calvescenta* Baker, new species.

notopleural suture and margin of scutellum; pleura brown pollinose; legs black, with some black pile and with dense golden pile becoming less dense on rear legs; coxae gray pollinose; coxae, femora and basal half of tibiae golden pilose, rest of leg with black pile; venter of protibia with very dense, short golden pubescence; wing fumose in apical half, venation normal with small vestige of sectoral vein present; abdomen with golden pile laterally around perimeter, dorsum with short black pile except for two narrow golden spots anteriorly on each segment; genitalia black basally, apex of basistyli (hypandrium?) brown with golden and some black hair; length 18 mm. Holotype: Male, Isle Royale, Keweenaw Co., 8 August 1957, Ronald W. Hodges.

Nagatomi (1964) attempted to find a diagnostic difference between *Laphria, Choerades* and *Bombomima.* He found no apparent distinction between *Laphria* and *Bombomima. Laphria* and *Choerades* however, seemed to have definite genitalic differences. *Laphria calvescenta* however, has characters which are either *Laphria* or *Choerades* (according to Nagatomi, 1964). Nagatomi (1964) judged from figures of *Laphria* genitalia (Bromley, 1946) that several species of *Choerades* exist in the U.S.A.

Hull (1962) states that *Choerades* differs from the other genera within Laphriini primarily by the male genitalia. He states that the diagnostic difference is the presence of

a posterodorsal process more or less knifelike and sometimes clearly composed of fused or semifused bristles. This process is located on the epandria. The fused bristles of *Laphria calvescenta* are located on the hypandrium. Since *Choerades* is not proven to occur in North America, it seems prudent to retain *calvescenta* in *Laphria*. Martin (1965) has also discussed the problems with the generic distinction between *Laphria* and *Bombomima* and for his reasons as well, *L. calvescenta* is currently retained in *Laphria*.

Female.–Unknown.

Habitat.–Unknown.

The holotype is deposited in the Entomology Museum at Michigan State University.

The Greek name Laphria (Λαγρία) was proposed by Meigen (1803). *Laphria* was the name applied to Artemis, the Greek Goddess of chase. Later the name came to mean spoils of war. The specific name of *calvescenta* is derived from a latin adverb "calvescentis" which is translated "becoming bald," referring to the bald appearance of the mesonotum and abdomen.

Canis Complex

Laphria canis Williston

Laphria canis Williston, 1884. Trans. Amer. Entomol. Soc. 11:59.

Diagnosis and Discussion.–*Laphria canis* is closely related to *L. sicula* McAtee and *L. winnemana* McAtee. These three species have these characters in common: mystax black with small white bristles medially and decumbent white hair at ocular margin; beard white or grayish white; occiput and vertex with black pile, occasionally white hair will be present at ocular margin of vertex; palpi black haired; pronotal bristles black; mesonotum with scattered small fine white or pale yellow hairs, black hair sparse and slightly longer; scutellum with fine white hair and black marginal bristles; pleura grayish white, pollinose; tufts of hair in front of wings and halteres black; coxae whitish pollinose with white hair; legs black with fine white and black hair and black bristles, first two pair of legs with white hair more dense; abdomen black with a fringe of white hair on each segment; genitalia black, with black and some white hair. Length of *L. canis* 7-12 mm., *L. sicula* 12-16 mm., *L. winnemana* 8-13 mm.

These three closely related species are difficult to separate. Often, *Laphria canis* and *L. sicula* and *L. winnemana* are confused in museum collections. The structure of the male genitalia and of tergites 6 and 7 will distinguish the males. The females are not distinguishable, except that when females are associated with males of the *canis* complex, the females of *sicula* have relatively more and longer whitish pile on the tibiae.

Tergite 6 of *L. canis* is highly convex posteriorly and has two heavy stout posterior 'knuckle-like' processes which are widely set apart. Tergite 7 is tripartite and always visible in dorsal view. The posterior processes on tergite 6 apparently articulate with tergite 7 and both are minutely rugose.

Tergite 6 of *L. sicula* is likewise highly convex posteriorly but has smaller, narrower smooth posterior processes. The seventh is keeled mesally and ends in a distinct point. Often the hypopygium is strongly turned dorsad and hides the seventh tergite. It may be necessary to relax the specimen and pull the genitalia down in order to observe the seventh tergite.

Tergite 6 of *winnemana* is not convex and has two small, smooth processes which are set close together and are longer than wide. Tergite 7 is keeled medially and ends in a small bilobate point which apparently articulates with the processes on tergite 6. The hypopygium is usually held more horizontal than in *L. canis* or *L. sicula*.

Habitat Preference.–Blanton (1939) and Bromley (1931, 1934c, 1946) report that *L. canis* is commonly found in mesic forests alighting on shrubs in sunny openings. The species has been collected in Michigan in dense, wet forests with very thick shrub and herbaceous undergrowth. Often a lake or stream is in close proximity.

Michigan Distribution.—Fifteen specimens of *L. canis* were examined from these counties: Alger, Cheboygan, Kalkaska, Gladwin, Isabella, Midland, Saginaw, Ingham and Washtenaw. Bromley (1934c) reported *L. canis* also from Wayne and Huron counties. Bromley (1934c) reported this species from New York, Pennsylvania, Ohio, Illinois and Georgia. McAtee (1918) also reported Maryland and Virginia.

Flight Range.—4 June to 31 August with majority of dates in early July.

Laphria sicula McAtee

Laphria sicula McAtee, 1918. Ohio Jour. Sci. 19:165.

Habitat Preference.—Unknown.

Michigan Distribution.—Thirty-six specimens of *L. sicula* were examined from Keweenaw, Ontonagon, Alger, Dickinson, Mackinac, Charlevoix, Ogemaw, Clare, Isabella, Midland, Saginaw, Clinton, Shiawassee, Lapeer, Ingham, Oakland and Kalamazoo. Bromley (1934c) and McAtee (1918) report this species distributed from Maryland and Virginia west to Illinois.

Flight Range.—30 May to 14 August with majority of dates throughout July.

Laphria winnemana McAtee

Laphria winnemana McAtee, 1918. Ohio Jour. Sci. 19:168.

Habitat Preference.—Unknown.

Michigan Distribution.—Alcona Co., 3 July 1948, R. R. Dreisbach; Missaukee Co., 8 July 1945, R. R. Dreisbach; Gladwin Co., 14 June 1953, R. R. Dreisbach; Ottawa Co., Nottawa, 30 May 1941, R. R. Dreisbach; Clinton Co., 9 September 1950, R. R. Dreisbach; Shiawassee Co., 4 July 1951, R. R. Dreisbach; Ingham Co., 16 July 1969, N. T. Baker; Berrien Co., Grand Mere, 13 August 1969, N. T. Baker. Bromley (1934c) has recorded Alger Co., 30 July 1910, W. S. McAlpine. McAtee (1918) records this species from Maryland, Pennsylvania, and Virginia. Bromley (1931, 1934c) lists Michigan, Pennsylvania and North Carolina.

Flight Range.—McAtee and Banks (1920) give 27 June to 12 August with most dates in July over the known range.

Laphria cinerea (Back)

Dasyllis cinerea Back, 1904, Can. Entomol. 36:289.

Diagnosis.—Mystax mostly grayish-yellow with black on oral margin; beard grayish pilose; occiput and vertex with gray and some black hair; palpi with black hair; thorax light grayish yellow pilose except for fine black hair and bristles on lateral margins of mesonotum and scutellum; coxae grayish yellow pilose; legs black with short black hair and bristles apically, predominately grayish yellow long pile on femora and tibiae; abdomen shining black and nearly bare on dorsum of segments 1 to 4, laterally with grayish yellow pile and some shorter black hair, segments 5 to 7 completely grayish yellow pilose; genitalia black with grayish-yellowish pile. Length 10-16 mm.

Habitat Preference.—Bromley (1931, 1934c) reports *L. cinerea* from hot dry sandy locations alighting on stumps and logs of conifers. Frequently it is attracted to freshly cut pitch pine and other hard pines.

Michigan Distribution.—Two specimens of *L. cinerea* have been taken in Schoolcraft Co., Doyle Township, 13 July 1915, W. S. McAlpine; and two additional specimens by window pane trap from Oscoda Co., Luzerne, 28 June 1966, L. F. Wilson. Bromley (1934c) reports it from Mackinac Co., Naubinway, 7 June 1922, S. Moore. Bromley (1934c, 1950a) reports this species to be a species of the Atlantic seaboard and occurs

from New York and Massachusetts southward to Florida and Mississippi. Bromley (1931) recorded this species as possibly occurring in Ohio, but was never reported in his subsequent publications.

Flight Range.—Bromley (1934c) reports 7 June to 16 July as flight dates for *L. cinerea* in the northern part of its range.

Laphria divisor (Banks)

Dasyllis divisor Banks, 1917. Bull. Brooklyn Entomol. Soc. 12:54.

Diagnosis.—Mystax densely yellow, the lower portion black haired; beard yellow; vertex, upper occiput and palpi with black hair; occiput of female with a few yellow hairs; pronotal bristles black; mesonotum and scutellum with yellow hair; pleura with fine brown pollen, tuft in front of wings with long fine black hair, tuft in front of halteres yellow; halteres usually yellow but may be blackish brown; coxae yellow haired; legs black with black hair, femora and first two pair of tibia usually with some yellowish pile on outer side; legs of female with sparse yellow hair; abdomen with black hair, posterior portion of the tergite 4 (sometimes), 5 and 6 yellow pilose, female abdomen with denser yellow pile on fourth tergite, hair on sides of first tergite mostly black but with a tuft of yellow hairs; genitalia black with black hair. Length 11-18 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Twelve specimens were examined from these counties: Keweenaw, Alger, Chippewa, Midland, Livingston, Oakland, Washtenaw, Wayne, St. Joseph and Monroe.

Banks (1917) and Bromley (1934c) reports *L. divisor* from New England westward to Ohio and Illinois and southward from New England to North Carolina.

Flight Range.—30 May to 3 August with majority of dates in mid-June.

Laphria flavicollis Say

Laphria flavicollis Say, 1824. Long's Expedition to the St. Peter's River, vol. II, Appendix No. 374, p. 2.

Diagnosis.—Mystax of dense yellow hair with the lower portion black; beard yellow in male, black in female; vertex, upper occiput and palpi with black hair; pronotal bristles black with a few yellow bristles; mesonotum and scutellum with light yellow hair; pleura brown pollinose; tuft of hair in front of wings fine and black, tuft of hair in front of halteres yellow; coxae with yellow hair in male, black hair in female; legs black, femora and first two pair of tibiae usually with a variable amount of yellow hair intermingled with the black, female legs usually entirely black pilose; abdomen shining black with long fine scattered black hair, side of first tergite black haired but often with considerable yellow hair and bristles; genitalia black with black hair, may have yellow hair intermingled. Length 11-20 mm.

Habitat Preference.—Bromley (1931, 1934c, 1946, 1950c) reports *L. flavicollis* is usually found in sunny places resting on foliage in or at the edge of a forest. Often it alights on stumps or logs or woodpiles.

This species has been collected in sunny openings along roads or at the edges of forests where undergrowth is luxuriant and thick. It is most numerous in fairly mesic situations found near a body of water. Oddly, it has not been collected on logs or stumps as reported by Bromley but always on foliage three to four feet above the ground. This species flies very fast and does not remain in any one area very long. Its flight is remarkably like that of a bumblebee. It nearly always alights on leaves in areas of dappled sunlight.

Bromley (1934c) lists several medium sized beetles and these insects as prey *L. flavicollis: Apis mellifera* Linn. (Apidae), sp. *Nephrotoma* sp. (Tipulidae), *Chrysops* sp. (Tabanidae), *Eristalis* sp. (Syrphidae), *Muscina* sp. (Muscidae), *Lygus* sp., *Euschistus* sp. and *Podisus* sp. (Pentatomidae).

Michigan Distribution.—One hundred thirty-five specimens of *L. flavicollis* were examined from these counties: Keweenaw, Houghton, Ontonagon, Marquette, Alger, Schoolcraft, Luce, Mackinac, Cheboygan, Charlevoix, Antrim, Otsego, Benzie, Gd. Traverse, Manistee, Wexford, Alpena, Roscommon, Ogemaw, Iosco, Lake, Oscoda, Clare, Mecosta, Midland, Bay, Huron, Muskegon, Gratiot, Saginaw, Ionia, Clinton, Shiawassee, Lapeer, Ingham, Livingston, Oakland, Kalamazoo, Barry, Washtenaw and Hillsdale.

Bromley (1934c, 1950a) and Martin and Wilcox (1965) give the distribution of *L. flavicollis* as New England and Quebec westward to Iowa and southward to Florida and Texas.

Flight Range.—3 May to 10 August with the greatest majority of dates in the latter half of June and early July.

Laphria gilva (Linnaeus)

Asilus gilvus Linnaeus, 1958. Systema Naturae, Edition 10, p. 605.

Diagnosis.—Mystax black with some short white hairs in dorsal portion; beard white; bristles of occiput and vertex black; palpi black with white hair; pronotum, mesonotum and scutellum with black hair and bristles; usually some white hair at margin of scutellum; pleura with scattered brown pollen and tufted with fine black hair; coxae with long white hair; legs black with black and some white hair; abdomen black with black hair but with a median reddish brown ground color and a reddish gold appressed pile parted in the center and combed into a divergent pattern on segments 3, 4 and 5 and occasionally on segments 2 and 6; hair of segment 1 uniformly white; genitalia black with black hair. Length 16-32 mm.

Habitat Preference.—Bromley (1946) reports that *L. gilva* is often taken on pine stumps and logs. Andrews (1918) has taken this species resting on maple foliage. Melin (1923) states that *L. gilva* occurs in sunny clearings of coniferous forests with *Epilobium, Senicio,* shrubs and heather. It generally rests on vertical objects like pine trunks, fences, stumps, or large stones. This species will often return to the same station time after time unlike most other species in the genus. In the proper habitat it may become very numerous.

Melin (1923) and Schmid (1969) have both written comprehensively on the behavior of *L. gilva.* These flies are usually found head down on the south side of trees from two to fifteen feet above the ground. They apparently prefer to sit in direct sunshine, and were found on the shaded side of the tree only when disturbed or feeding on prey.

Schmid (1969) and Melin (1923) report that adults of *L. gilva* mate frequently and apparently without any courtship behavior. When a male spots a female hovering near the ground, he flies downward from the tree and knocks the female to the ground. Coupling occurs in a tail to tail position followed by flight to a nearby tree with the male being dragged behind the female. The female assumes the uppermost position on the side of the tree, the male in a head down position. Copulation usually lasted one-half hour or more. Separation after copulation is initiated by either sex. The male usually attempts to fly and the female uses a combination of thoracic push-ups and abdominal flexures to force the female genitalia downward and away from the male genitalia.

Schmid (1969) reports that females of *L. gilva* deposit their eggs in the litter layer close to the base of a conifer in South Dakota. Six to twelve eggs are deposited in a single site and usually in several sites before resting. A single fly would often make several ovipositing forays in a single hour, resting between forays. The female apparently selects sites for oviposition by hovering about two inches above the ground. After turning 180° and alighting the eggs are laid. This same species in Sweden according to Melin (1923) oviposited only two or three eggs, and often oviposited on the tree trunk as well as the litter layer about the base of the tree.

Cannibalism was never observed for *L. Gilva* by either Schmid (1969) or Melin (1923). Schmid (1969) aptly pointed out that asilids do not necessarily pierce the harder parts of the exoskeleton to subdue their prey but may penetrate the abdomen or other softer parts of the body. *L. gilva* attacks flying *Dendroctonus ponderosae* Hopkins (Scolytidae) and pierces the softer abdomen rather than the much harder mesonotum.

Michigan Distribution.—*Laphria gilva* is rather uncommonly collected in Michigan: Marquette Co., 20 July 1949, G. D. Gill (six specimens); Chippewa Co., Whitefish Point, 30 June 1913, A. W. Andrews (three specimens); Marquette Co. Huron Mts., 1 July 1920, A. S. Andrews; Dickinson Co., Mich. Biol. Survey no. 714, 27 July 1909, J. Hine, Gd. Traverse Co., Fife Lake, 28 Aug. 1969, G. Manley. This species is the only holarctic species of Asilidae known. McAtee (1918) and Bromley (1934c) report this species from the New England states and Canada across the continent to Washington and southward along the Rockies into Colorado.

Flight Range.—Although 5 June to 27 July represent flight dates for *L. gilva* within Michigan, it is probably based on inadequate records. Schmid (1969) reports that in South Dakota *L. gilva* was flying from early July to mid-September.

Laphria huron (Bromley)

Bombomima huron Bromley, 1929. Can. Entomol. 61:159.

Diagnosis.—Mystax black with few yellow hairs in middle; beard, palpi, vertex and occiput with black pile; pronotal bristles black; all thoracic pile excluding the legs is yellow; pleurae brownish pollinose; coxae with yellow and some black hair; legs black with black hair, outer side of profemora and tibiae and apex of mesofemora and outer side of mesotibiae densely yellow pilose, some yellow hair on apex of metafemora; abdomen black with black hair except tuft of yellow hair on each side of tergite 2; genitalia black with black hair, yellow-brown hair laterally on epandria. Length 16-20 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Eight specimens of *L. huron* were examined from these counties: Houghton, Gogebic, Marquette, Dickinson, Alger, Mackinac and Barry. Bromley (1934c) also reported this species from Alger, Mackinac and Marquette counties and from several localities in Ontario and the New England states.

Flight Range.—2 June to 12 July.

Index Complex

Laphria index McAtee

Laphria index McAtee, 1918. Ohio Jour. Sci. 19:164.

Diagnosis and Discussion.—This species is very closely related to *L. ithypyga.* There are no discernible differences between these two species except in the distinct male genitalia and tergites 6 and 7. Both *L. index* and *L. ithypyga* have: Mystax black with smaller white hairs intermingled and with decumbent white hair laterally; beard white; occiput and vertex with black and some white hairs; palpi with black bristles; pronotal hair black; mesonotum with blue-black ground color and fine scattered yellow and white hairs and with a distinctive narrow triangle of golden pile on posterior portion reaching more than half the length; tuft in front of wings with few black bristles and long fine white hair; tuft in front of halteres sordid white; pleura whitish pollinose with fine white hair; coxae with white hair; legs black with black and white hair intermingled, white hair most abundant on first two pair of legs; abdomen with thin white hair on sides, second segment with a triangle of golden-red pile caudally, remaining segments covered with thick golden red pile combed into a divergent pattern; genitalia black with black hair.

The hypopygium of *L. index* is tilted upward toward the dorsum of the abdomen much more than *L. ithypyga* and the apex of the basistylus bears two processes which are convergent. The apical processes of *L. ithypyga* are not as well developed as *L. index* and are divergent.

Tergite 7 of *L. index* is drawn to a point medially and tergite 6 has two fingerlike processes on its caudal margin. Tergite 6 of *ithypyga* does not have posterior processes and tergite 7 is only slightly keeled. Length of *L. index* 12-20 mm. and *L. ithypyga* 11-17 mm.

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Habitat Preference.—Bromley (1931, 1934c, 1946) states that *L. index* is found in mixed mesophytic woodlands and usually alights in the sunlight on foliage, tree trunks or logs. It flies swiftly and is quite active.

This species has been collected along the edges of roads through rather wet forests where it usually alights, head downward, on tree trunks two to three feet above the undergrowth. *L. index* will feed or rest on the same sunlit station on a tree trunk for several hours. Individuals have likewise been observed making capture flights for mates from the same station.

Michigan Distribution.—Examination of twenty-eight specimens of *L. index* showed this distribution: Alger, Delta, Emmet, Cheboygan, Grand Traverse, Alcona, Manistee, Missaukee, Mecosta, Midland, Bay, Huron, Clinton, Livingston, Oakland, Kalamazoo and Washtenaw.

Bromley (1934c) and McAtee (1918) record this species from Quebec and the New England states westward to Iowa and south to central Ohio.

Flight Dates.—29 May to 1 August with the greatest majority of dates in mid-June.

Laphria ithypyga McAtee

Laphria ithypyga McAtee, 1918. Ohio Jour. Sci. 19:165.

Habitat Preference.—One of the two known Michigan specimens has been collected in a Malaise Trap. The trap location was approximately twenty feet from the edge of a forest. The soil was very sandy with mosses scattered about on the ground. Plants of the area included: *Pteridium aquilinum, Cassandra calycullata, Quercus velutina, Carya* sp., *Liatrus spicata, Rumex acetocella, Lespedeza capitata, Lespedeza caroliniana* and *Helianthus* sp. Species closely related to *ithypyga* are usually in much more mesic situations. This immediate area was quite close to a generally much more mesic habitat.

Michigan Distribution.—*L. ithypyga* has been collected only twice within Michigan: Livingston Co., E. S. George Reserve, 1 August 1967, N. T. Baker; Midland Co., 30 June 1960, R. R. Dreisbach. This rare species has been collected from Pennsylvania, Maryland, New Jersey, Wisconsin, and Tennessee.

Flight Range.—McAtee (1918) records 4 June to 4 August for the known range of this species.

Laphria insignis (Banks)

Dasyllis insignis Banks, 1917. Bull. Brooklyn Entomol. Soc. 12:54.

Diagnosis.—Mystax with lower portion black, upper portion yellow; beard and occiput yellow haired; vertex black haired; palpal bristles black; pronotal bristles yellow; mesonotum yellow haired on anterior part, posterior part thickly bright red pilose; scutellum with black hair and bristles, may be yellow in occasional specimen; tuft in front of wings fine and black; tuft in front of halteres yellow; procoxae and mesocoxae yellow haired, metacoxae black haired; legs black with black hair and with more or less yellow hair intermingled especially on proleg and mesoleg; abdomen black with black hair on tergites one and two median anterior portion of third, densely yellow pilose on remainder; genitalia black with black hair. Length 13-18 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Twelve specimens were examined from these counties: Keweenaw, Alger, Schoolcraft, Chippewa and Mackinac. Bromley (1934c) also listed this species from Schoolcraft and Mackinac counties.

This uncommon species is reported from Ontario, Labrador and California (Bromley, 1934c; Martin and Wilcox, 1965), although the Californa record is probably questionable.

Flight Range.—4 June to 28 July with the majority of dates in early July.

Laphria janus McAtee

Laphria janus McAtee, 1918. Ohio Jour. Sci. 19:153.

Diagnosis.—Mystax light yellow with black hairs on lower portion, some decumbent hairs at ocular margin; beard yellow; vertex and occiput with black hair; palpi yellow hair apically and black hair basally; pronotal bristles black; mesonotum with fine black and yellow hairs on anterior half, posterior half with dense gray-yellow pile; tuft in front of wing black; tuft in front of haltere dense, long yellow; coxae with pale yellow hair; legs black with mostly black hair, some yellow hair on caudal side of femora; abdomen black with fine erect bright reddish golden pile becoming dense caudally, the first three tergites less densely and lighter pilose with dorsum nearly bare, sides of tergite 1 with fine light yellow hair; genitalia black with yellow hair. Length 15-20 mm.

Habitat Preference.—Unknown. Bromley (1934c) lists *Cicindela longilabris* Say as the only recorded prey for this species.

Michigan Distribution.—Thirty-five specimens of *L. janus* were examined from these counties: Isle Royale, Keweenaw, Ontonagon, Gogebic, Dickinson, Delta, Mackinac, Grand Traverse, and Wexford.

Bromley (1934c), Johnson (1925) and McAtee (1918) give the distribution of this species as the New England states and Quebec westward across North America to British Columbia and Washington and southward along the Rocky Mountains to Colorado. Bromley states *L. janus* is restricted to mountainous areas.

Flight Range.—6 June to 6 August with the majority of dates in early July.

Laphria posticata Say

Laphria posticata Say, 1824. Long's Expedition to Saint Peter's River, vol. II, Appendix, p. 374.

Diagnosis.—Mystax yellow except on oral margin which is black; beard yellow in male, black in female; vertex with yellow and some black bristles; occiput with yellow hair; palpal bristles yellow with some black intermingled; pronotum and mesonotum with yellow hair; scutellum with black hair, yellow and some black marginal bristles; pleura with fine black hair; tufts of hair in front of wings and halteres with long, fine yellow bristles; coxae yellow haired; legs black with black hair, femora and tibia more or less yellow-haired particularly on first two legs, females usually with much more black hair; abdomen black, tergites 1 and 2 and median portion of tergite 3 and tergites 6 to 8 black haired, sides of tergites 3 to 5 completely yellow-haired; hair at sides of tergite 1 with black bristles, long yellow hair and many small black hairs; genitalia black and black haired. Length 12-18 mm.

Habitat Preference.—Bromley (1934c) reports that *L. posticata* is almost invariably associated with white pine stumps and logs. It flies with a loud buzz and feeds mostly on small flying beetles such as small Elateridae, *Hyperplatys* sp. (Cerambycidae), *Macrodactylus* sp. (Scarabaeidae), *Aphodius* sp. (Scarabdeidae), *Anomala* sp. (Scarabaeidae) and on ichneumonid, *Amblyteles* sp.

L. posticata has been reared from larvae found in white pine stumps. Andrews (1918) reports this species is often taken resting on maple foliage. McAtee and Banks (1920) report this species on *Ceanothus* flowers.

Michigan Distribution.—Sixty-nine specimens of *L. posticata* were examined from: Isle Royale, Keweenaw, Marquette, Schoolcraft, Menominee, Chippewa, Mackinac, Cheboygan, Alpena, Grand Traverse, Kalkaska, Oscoda, Manistee, Wexford, Missaukee, Roscommon, Lake, Clare, Gladwin, Newaygo, Mecosta, Midland, Allegan, Ingham, Washtenaw. Bromley (1934c) and Johnson (1925) report the known range of this species is from the New England states and Quebec westward to Manitoba and Wisconsin.

Flight Range.—29 May to 15 August with the majority of dates near the end of June.

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Laphria royalensis (Bromley)

Bombomima royalensis Bromley, 1950. Univ. Mich. Mus. Zool. Occ. Pap. 527, 5 p.

Diagnosis.—Mystax brownish yellow above, lower portion black; beard yellow; vertex and occiput with reddish pile; palpal hairs black; pronotal bristles yellow or reddish; mesonotum uniformly yellowish or reddish yellow; scutellum with black hair and pale yellow bristles, female has dark red or black marginal bristles; tuft in front of wings fine and black; tuft in front of halteres sordid yellow; coxae with yellow hairs intermingled; abdomen with yellowish red pile from tergite 3 to apex, sides of tergite 1 with black hairs and a few yellow hairs; genitalia black with black hair and some pale hair on dorsum of hypandrium. Length 12-15 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Three specimens of *L. royalensis* were examined from Michigan: Isle Royale, 3 August 1936, C. W. Sabrosky; Isle Royale, 11 August 1957, R. W. Hodges; Alger Co., 28 July 1916, W. S. McAlpine. Bromley (1950b) recorded this species from Schoolcraft Co., Floodwood, 10 July 1915, J. S. Rogers; Mackinac Co., Naubinway, 27 June 1922, S. Moore; Mackinac Co., Bois Blanc Island, 18 June 1935, C. F. Walker. The type locality of this species is Isle Royale, Keweenaw Co., Michigan.

Laphria sacrator Walker

Laphria sacrator Walker, 1849. List of Diptera in the British Museum, 2:382.

Diagnosis.—Mystax yellow, black on oral margin; beard black; occiput with black hair and some yellow hair; vertex with long yellow hair; palpal hairs black; pronotal bristles black; mesonotum and scutellum densely yellow pilose; tufts of hair in front of wings and halteres densely yellow; first two pair of coxae densely yellow-pilose, third pair with several gold hairs; legs black, first two pair densely yellow pilose, third pair mostly black haired with yellow hair at apices of femora and dorsal side of tibiae, base of dorsum of metafemora usually has fine reddish hair; abdomen densely yellow pilose on segments one to three, remainder black haired, sides of first tergite with fine black hair and larger yellow hair and black bristles; gentalia black, reddish brown basally with mostly black hair and some brown hair laterally and apically. Length 15-20 mm.

Habitat Preference.—Bromley (1934c) states that *L. sacrator* is usually collected in association with white pine. He has collected it in sunny openings along brooks flowing through forests of white pine, hemlock, sugar maple and black and white birch. It alights on foliage in full sunlight.

Michigan Distribution.—Approximately seventy specimens of *L. sacrator* were examined from these counties: Houghton, Gogebic, Marquette, Dickinson, Alger, Schoolcraft, Chippewa, Cheboygan, Charlevoix, Benzie, Otsego, Kalkaska, Alcona, Iosco, Oscoda, Clare, Midland, Clinton, Oakland and Washtenaw. Bromley (1934c) gives the New England states and Quebec south to North Carolina as the known distribution of this species.

Flight Range.—14 June to 20 August with the majority of dates in early July.

Laphria sadales Walker

Laphria sadales Walker, 1849. List of the Diptera in the British Museum, 2:378.

Diagnosis.—Mystax black with some yellow hair in center; beard white or very pale yellow; occiput and vertex with black hair; palpi with black and some yellow hair; pronotal hair black; mesonotum and scutellum with fine, scattered, short golden hair; marginal bristles of scutellum pale gold; tufts of hair on pleura black and scant; pleura polished with spots of white pollen; coxae black and white pollinose with white hair; legs distinctly reddish for most part, tarsi black, femora with light yellow hair, tibiae with yellow and black hairs and bristles; abdomen black with scattered fine golden pubescence; genitalia small, black, with black and some yellow hair. Length 9-15 mm.

Habitat Preference.—Bromley (1934c) states that this species is characteristically found in mountainous regions, and is usually associated with white pine. It usually alights on stones or sticks along paths or roads. Bromley records it feeding on *Rhagio mystaceus* Macquart (Rhagionidae).

L. sadales has not been collected in Michigan in association with white pine, but in usually fairly well established habitats exhibiting some disturbance. Plants which it has characteristically been associated with include: *Plantago regale, Salix* sp., *Solidago canadensis, Solidago rigida, Erigeron annuvs, Quercus nigra, Alnus rugosa, Juncus,* sp. *Rubus parviflorus, Equisetum* sp., *Scirpus* sp., *Acer rubrum, Chrysanthemum leucanthum, Heiracium aurantiacum, Prunella vulgaris,* and *Pteridium aquilinum.*

Michigan Distribution.—Twenty-eight specimens of *L. sadales* were examined from these counties: Isle Royale, Keweenaw, Baraga, Dickinson, Alger, Schoolcraft, Cheboygan, Montmorency, Grand Traverse, Crawford, Roscommon, Clare, Gladwin, Mecosta and Midland. Bromley (1934c), Johnson (1925) and McAtee (1918) have recorded this species from Quebec and the New England states across the continent to British Columbia and Washington and southward into California.

Flight Range.—12 June to 16 August with majority of dates in early July.

Laphria sericea Say

Laphria sericea Say, 1825. Jour. Acad. Nat. Sci. Phil. 3:4.

Diagnosis.—Mystax black with variable amounts of light yellow hair, some specimens entirely yellow, some decumbent light yellow hair laterally; beard pale yellow; occiput and vertex with black hair and some yellow bristles; palpi with black or yellow hair; pronotal bristles black; mesonotum with thick golden pile except lateral and anterior fringe of black hair; scutellum with thick golden pile and yellow marginal bristles; tuft in front of wings with fine short black hair and longer yellow hair and bristles; tuft in front of halteres with long fine yellow bristles; coxae with pale yellowish hair; legs black with black and pale yellow hairs intermingled, yellow hair most dense on first two pairs of legs; abdomen golden pilose, sides of tergite 1 with gold hair and bristles; genitalia black and elongate with black or yellow bristles. Length 17-24 mm.

Habitat Preference.—Bromley (1934c) states that *L. sericea* occurs in sunny glades of forests alighting on foliage or stumps or logs.

Dr. Irving Cantrall has taken this species by sweeping close to a pure stand of *Pinus strobus.* Around the immediate area were *Poa* sp., *Solidago* sp., *Elymus* sp., *Cornus* sp., *Prunus* sp., *Fraxinus* sp., and *Populus* sp.

In addition, it has been collected in deep mature mesic woods of *Pinus strobus,* with *Quercus alba, Pteridium aquilinum, Morus* sp., *Prunus* sp. and *Oryzopsis asperifolia* as associated plants. The area was a rather mesic situation with sandy soil and many mature trees. Large stumps and logs were present in various stages of decay.

The flies were alighting on foliage usually less than two feet high in areas of dappled sunlight, never in large patches of direct sunlight. They are very active and fly swiftly when disturbed. One specimen, a male was taken with a small elaterid, *Hemicrepidius* as prey. McAtee and Banks (1920) record this species feeding on *Nicagus obscurus* Leconte (Lucanidae). Bromley (1934c) reports *sericea* feeding on these insects: *Nicagus* sp. (Lucanidae), *Dichelonyx* sp. (Scarabaeidae), *Neoitamus orphne, Panorpa* sp. (Panorpidae), and a small pyralid moth.

Michigan Distribution.—Thirty-one specimens of *L. sericea* were examined from these counties: Cheboygan, Benzie, Iosco, Gladwin, Huron, Clinton, Livingston, Oakland, Washtenaw, and Wayne.

It is interesting to note that the most closely related Michigan species, *L. altitudinum,* has been collected only in the Upper Peninsula while *L. sericea* is confined to the Lower Peninsula.

McAtee (1918), Bromley (1934c) and Johnson (1925) reports *L. sericea* from the

Atlantic seaboard from New York to Florida and westward to Illinois. Bromley (1934c) reports a single isolated record from Colorado.

Flight Range.—28 May to 24 August with the majority of dates in late June and early July. McAtee and Banks (1920) report 23 May to 16 June for Washington, D.C.

Laphria thoracica Fabricius

Laphria thoracica Fabricius, 1805. Systema Antilatorum, 158:10.

Diagnosis.—Mystax black with yellow hair medially and dorsally; beard black; hair of vertex varies from black with little yellow to nearly all yellow; occipital hair black with some yellow; palpi with black bristles; mesonotum densely yellow pilose, often somewhat bald in center; scutellum with black hair and bristles; coxae with yellow hair; legs brownish black with mostly black hair and yellowish or reddish hair intermingled; abdomen black and entirely black haired or with varying amounts of yellow pile on tergites 2 to 4, hair on sides of tergite 1 mostly black; genitalia black or reddish black with black hair. Length 15-20 mm.

Habitat Preference.—Bromley (1931, 1934c) states *L. thoracica* is found along sunny edges of woods or brushy pastures and in the vicinity of logs and stumps. Often it is found resting or flying about logs and stumps or foliage of elm, maple, and birch. It is found most often in mesic situations. It flies slowly with a loud buzz. If the collector moves slowly in the proper habitat this species will sometimes fly toward and alight on one's clothing.

Larvae of *L. thoracica* have been reared from apple, *Liriodendron tulipifera* and *Pinus* sp. These logs and stumps were dead and quite moist (Bromley 1934c). Bell (1921), recorded a large number of specimens at flowering sumac (*Rhus* sp.). They were feeding on the large numbers of insects attracted to the sumac flowers.

L. thoracica is an excellent mimic of *Bombus impatiens* Cresson and *B. vagans* Smith but is not known to feed upon them. Usually this species feeds on slow flying beetles, an occasional honeybee and in one instance a seventeen year cicada, *Magicicada septendecim* Linnaeus (Cicadidae) (Bromley, 1934c).

Michigan Distribution.—Examination of eighty-one specimens of *L. thoracica* showed this distribution: Alger, Cheboygan, Benzie, Manistee, Gladwin, Isabella, Midland, Bay, Oceana, Montcalm, Tuscola, Sanilac, Ionia, Shiawassee, Genesee, Barry, Eaton, Ingham, Livingston, Oakland, Kalamazoo, Calhoun, Washtenaw, Wayne, Berrien, St. Joseph, Branch, Lenawee, and Monroe.

Bromley (1934c, 1950b) and Johnson (1925) and McAtee (1918) record this species from New England south to Florida and eastward to Minnesota, Kansas and Mississippi.

Flight Range.—21 May to 23 July with majority of dates in early June.

Genus LASIOPOGON Loew

Lasiopogon Loew, 1847. Linnaea Entomol. 2:508.

KEY TO SPECIES OF *LASIOPOGON*

1. Ground color of legs reddish-brown, femora with blackened medial area; mystax white . . . . . *L. terricola* Johnson
1′. Ground color of legs black; mystax black with some pale hairs 2
2. Bristles of meron and lateral bristles on abdominal segment 1 mostly black. . . . . *L. tetragrammus* Loew
2′. Bristles of meron and lateral bristles mostly white. . . . . *L. opaculus* Loew

Lasiopogon opaculus Loew

Lasiopogon opaculus Loew, 1874. Berl. Entomol. Zeitschr. 18:367.

Diagnosis.—Mystax black, occasionally with few pale hairs below; legs black; tibia with long, fine, erect, blackish-brown hair, protibia with ventral, dense, short, bright yellow pile; thoracic dorsum brownish pollinose with median and lateral stripes surrounded by lighter pollen, medium stripe occasionally geminate; abdomen black, entirely gray pollinose on segment 1, remainder of segments except last gray with broad brown pollinose areas on anterior dorsum of each segment, last segment black polished with black pile and no pollen. Length 8-9 mm.

Habitat Preference.—Bromley (1946) states that this species is usually found alighting on stones along edges of gravelly woods.

Michigan Distribution.—Ten specimens of *L. opaculus* were examined from these counties: Oakland, Ionia, Genesee and Midland. Cole and Wilcox (1938) report the known distribution of this species is from Maryland westward to Illinois and south to North Carolina. Bromley (1931) reported this species from Ohio.

Flight Range.—15 May to 11 June with the majority of dates in late May.

Lasiopogon tetragrammus Loew

Lasiopogon tetragrammus Loew, 1874. Berl. Ent. Zeitschr. 18:368.

Diagnosis.—Mystax black, occasionally with some pale hairs below; legs black; tibia with fine, black, suberect hair; protibia with dense, ventral, short, yellow pile; thoracic dorsum with a distinct brown, median, geminate stripe, lateral stripes shorter and of same color, semi-polished between the median and lateral stripes, black stripe extending forward to posterior pronotum; abdomen black, the entire first segment, caudal and lateral margins of remaining segments gray pollinose, except last segment which is highly polished and without pile or pollen. Length 9 mm.

Habitat Preference.—Bromley (1946) states *L. tetragrammus* occurs on sandy beaches of large rivers and usually on bare sandy areas. It has been found in Michigan associated with grassy fields at the edges of floodings and lakes where the plant growth was generally no taller than two to three inches. Most specimens were within a few feet of the waters edge and generally had landed on small sticks or litter washed up on shore by wave action. No feeding behavior was observed.

Michigan Distribution.—Twelve specimens of *L. tetragrammus* were examined from these counties: Presque Isle, Oscoda, Iosco, Gladwin, Midland, and Wayne. Cole and Wilcox (1938) record the New England states as the known distribution of this species. Bromley (1931, 1934b, 1936a, 1947, 1950c) did not record this species from Ohio and did not regard its presence there as a possibility.

Flight Range.—7 May to 20 June with most specimens collected in middle May.

Lasiopogon terricola (Johnson)

Lasiopogon terricola Johnson, 1900. Entomol. News 11:326.

Diagnosis.—Mystax of fine, white hair; legs reddish-brown; tibiae with fine, white, recumbent hair, femora with wide, median, blackened area; protibia lacking ventral dense short yellow pile; thoracic dorsum yellowish-brown pollinose fading to grayish-yellow posteriorly, darker brown pollen around the posterior pronotal areas; abdomen polished black, thinly white pilose, finely punctate, excluding the first, all segments with caudal margins and lateral areas with a brown ground color. Length 5-7 mm.

Habitat Preference.—Back (1909) reports *L. terricola* is an early spring species found on low damp ground. Bromley (1946) reports it from gravelly or sandy areas along streams, alighting on small stones and pebbles.

Michigan Distribution.—Only one specimen of *L. terricola* has been collected in Michigan: Kent Co., 17 May 1959, R. R. Dreisbach. Cole and Wilcox (1938) report this species

from New Jersey and Virginia and westward to Indiana and North Dakota and northward to Alberta, Canada. Bromley (1931) reported this species from Hocking Co., Ohio.

Flight Range.—Cole and Wilcox (1938) report 28 April to 17 June as the flight dates for this species over its known range. The majority of specimens were collected in early and middle May. Bromley (1931) reports three specimens collected on 17 June in Central Ohio.

Genus **STICHOPOGON** Loew

Stichopogon Loew, 1847. Linnaea Entomol. 2:499.

KEY TO SPECIES OF *STICHOPOGON*

1. Abdomen uniformly silvery white pollinose; length 6-8 mm. . . . . *S. argenteus* (Say)
1'. Abdomen trifasciate with gray, black and brown pollinose areas; length 9.5-14 mm . . . . . *S. trifasciatus* (Say)

Stichopogon argenteus (Say)

Dasypogon argenteus Say, 1822. Jour. Acad. Sci. Phil. 3:51.

Diagnosis.—Completely covered with silvery white pollen; mystax extends upward on face; abdomen moderately covered with silvery white pollen and fine white, recumbent hair. Length 6-8 mm.

Habitat Preference.—Back (1909), Blanton (1939) and Bromley (1946, 1950a) state that *S. argenteus* is found in abundance on sand dunes and beaches of the coast and large inland lakes. This species almost always alights on the sand.

We have taken *S. argenteus* in abundance on the sandy shores and sand dunes of the Great Lakes. They are usually not found on actively moving sand dunes but on beaches or dunes where vegetation has stabilized the sand and are usually taken in reasonably close proximity to water. On occasion they will be found close to the shoreline but only when there is very little wind and prey is available. In these situations, this species has been found associated with the following species of plants: *Lithospermum croceum, Populus tremuloides, Artemesia absintheum, Ammophila breviligulata, Andropogon gerardi, Rhus radicans, Juniperus virginiana, J. communis, Arctostaphyllos uvi-ursae* and *Coreopsis lanceolata.*

S. argenteus typically fly about 2-3 inches above the sand and alight directly on the sand and not on vegetation or stones. Mating occurs throughout the day in areas protected from wind. The male mounts the female dorsally during copulation and when disturbed they will fly together and land two to three feet away. They have been observed to feed on Chloropidae and small Chironomidae and attempt to capture small Pompilidae.

This species is often found in a habitat similar to that inhabited by *S. trifasciatus* but with denser vegetation. They do not usually occur together but will if there is protection from the wind and prey is available to both.

Michigan Distribution.—Forty-four specimens of *S. argenteus* were examined from these counties: Leelanau, Grand Traverse, Oceana, Oakland, Van Buren and Berrien. Wilcox (1936) records this species from the Atlantic States westward through Illinois, to Kansas and Colorado and possibly California. Bromley (1950a) did not record it from Florida.

Flight Range.—17 June to 6 August with the majority of specimens taken in mid July.

Stichopogon trifasciatus (Say)

Dasypogon trifasciatus Say, 1822. Jour. Acad. Sci. Phila. 3:51.

Diagnosis.—Covered with gray pollen but with trifasciate abdomen; mystax confined to single dense row of bristles on oral margin; abdomen trifasciate with gray, brown and

black pollinose areas and with fine white or brown recumbent bristles. Length 9.5-14.5 mm.

Habitat Preference.—Blanton (1939) and Bromley (1946, 1950c) state that *S. trifasciatus* is always found in sandy habitats such as beaches near lakes or gravel pits or sand plains. Lavigne and Holland (1969) report this species in Wyoming from very rocky pebbly areas or sandy areas both of which support very different types of vegetation. His data show that this species has nearly always been found near natural drainages and he suggests that perhaps a relatively moist habitat is needed for larval development.

We have collected this common species in large numbers from sandy or gravelly areas but only occasionally associated with natural drainages such as streams or gullies. The substrate is usually moist and in full sunlight. In these situations, the following species of plants have been associated: *Ammophila* sp., *Juniperus communis, J. virginiana, Arenaria stricta, Pinus strobus, Arctostaphyllus uvi-ursae, Quercus alba,* and *Acer rubrum.*

Lavigne and Holland (1969) state that this species always rests on sand, rocks or other objects resting on the sand. In Michigan we have never found *S. trifasciatus* resting on anything except light colored sand.

Lavigne and Holland (1969) state this species appears to be quite "nervous" when foraging and frequently changes position, especially when prey is sighted. Pursuit and capture occurs when prey flies by and lands upon the ground. Capture occurs almost as soon as prey lands. The robberfly then returns to its original foraging site to consume its prey. The prey is manipulated with all six tarsi while the asilid is hovering above its forage site. Our observations on this species' behavior agree completely with those of Lavigne and Holland (1969).

Bromley (1946) reports this species commonly feeds on small grasshoppers and on small spiders. Lavigne and Holland (1969) recorded that the largest numbers of prey were dipteran, but Hymenoptera, Arachnids and Homoptera were also recorded as occasional prey.

Michigan Distribution.—Nearly 200 specimens were examined from these counties: Luce, Chippewa, Mackinac, Emmet, Cheboygan, Charlevoix, Leelanau, Benzie, Grand Traverse, Kalkaska, Crawford, Manistee, Roscommon, Iosco, Osceola, Clare, Isabella, Midland, Oceana, Muskegon, Montcalm, Saginaw, Clinton, Ottawa, Genesee, Allegan, Livingston, Van Buren, Kalamazoo, and Berrien.

Back (1909), Wilcox (1936), and Bromley (1950c), report this species covers the United States but do not include any part of Canada.

Flight Range.—17 June to 15 August with the majority of collections made in mid July.

Genus TARACTICUS Loew

Taracticus Loew, 1872. Berliner Entomol. Zeitschr. 16:64.

Taracticus octopunctatus (Say)

Dioctria 8-punctata Say, 1823. Jour. Acad. Sci. Phil. 3:49.

Diagnosis.—Black; halteres, femora, tibiae except apices of metatibia and bases of tarsal segments yellow; all bristles and pile are pale white or yellow; antennal segment 3 more than twice the length of segments 1 plus 2 together; frons whitish to goldish pollinose; mesonotum with three golden pollinose stripes; abdomen black, polished, punctate, with a silvery white spot on posterolateral margins of segments 2 to 5; tip of male abdomen and genitalia red.

Habitat Preference.—Bromley (1931, 1946) states that *T. octopunctatus* occurs in mixed mesophytic woodlands and brushy pastures. It usually alights on shrubbery and herbage in sunny openings or margins of forests.

Michigan Distribution.—Monroe Co., Petersburg, 15 June 1959, G. C. Eickwort; Monroe Co., T7S, R6E, S2, 24 July-14 August, James B. Truchan; Ionia Co., 14 June 1957, R.

R. Dreisbach; Monroe Co., 8 June 1962, R. R. Dreisbach. Back (1909), Pritchard (1938) and Martin and Wilcox (1965) give a distribution which covers the United States east of the 105th meridian.

Flight Range.—Bromley (1931, 1936a) reports 24 June to 1 August for *T. octopunctatus* in central Ohio. McAtee and Banks (1920) report the species as being fairly common and occurring from 30 May to 4 August for Washington, D.C.

ASILINAE

This subfamily is easily recognized in Michigan by: antennae always with a slender terminal arista (which is plumose in Ommatini); palpi are one-segmented; R_1 cell closed; alulae, pulvilli and empodia well developed; abdomen generally attenuated and never ovate; male genitalia well developed and of various sizes; species range from 10 mm to 25 mm.

The genus *Asilus* presently contains many species which are not congeneric with the type species *Asilus crabroniformis* Linnaeus. *Asilus sericeus* is the only known species in North America which may belong in the genus *Asilus* (Martin, 1965). The status of *sericeus* remains uncertain. Most, if not all, of the other species presently in *Asilus* are awaiting generic reassignment. Hine (1909) based his species groups on recognizable genera but retained all species in the genus *Asilus*. Later workers subsequently raised some of Hine's species groups to generic rank but left other groups within *Asilus*. This resulted in a conglomerate of species known only from the types and having no generic limits. Of the Michigan Asilini, only *Asilus auricomus* Hine and *Asilus piceus* Hine do not presently have generic status. Hine (1909) included these two species in his *Cerdistus* group. Hull (1962) is the only worker to recognize *Cerdistus* as a valid genus. Martin (personal communication, unpublished) now recognizes *Cerdistus*. Whether *A. auricomus* Hine and *A. piceus* Hine belong to *Cerdistus* will depend on examination of type material and of genitalic morphology.

Asilus sensu strictu has patches of bristles on tergites 2 and 3 and bristles along the posterior margins of tergites 2 and 3 (Martin, personal communication). Hull (1962) mistakenly states that abdominal bristles are characteristically restricted to tergite 1 but may rarely be present on tergite 2. Hull (1962) also states that a few species of *Asilus* sensu strictu are found in North America but does not specifically identify which species. For these reasons the key to tribes and genera has been constructed to identify those species whose generic status is known from those in *Asilus* sensu latu.

KEY TO TRIBES AND GENERA OF MICHIGAN ASILINAE

1. Style of antennae plumose; sclerotized post-metacoxal arch present (Ommatini) . . . . . *Ommatius* Wiedemann (p. 84)
1′. Style of antennae not plumose; post-metacoxal arch lacking (Asilini). 2
2. Sectoral vein present; large robust species with an attenuate abdomen . . . . . *Promachus* Loew (p. 87)
2′. Sectoral vein absent. 3
3. R_{4+5} vein reaches wing margin before apex of wing; remnants of sectoral vein never present; large species with long attenuate abdomen. . *Proctacanthus* Macquart (p. 84)
3′. R_{4+5} vein reaches wing margin at or well beyond apex of wing; remnant of sectoral vein present if R_{4+5} reaches wing margin at apex. 4
4. Remnant of sectoral vein present; male genitalia large and project upward from longitudinal axis of body; female ovipositor as long or longer than segments six and seven and laterally compressed. . . . . *Efferia* Coquillet (p. 74)
4′. Remnant of sectoral vein never present; male genitalia project horizontally 5
5. Uppermost occipital bristles almost always strongly proclinate; dorsocentral bristles of mesonotum well developed; male genitalia have large convex epandria; female ovipositor elongate and attenuate, and composed of five segments . . . . . *Neoitamus* Loew (p. 83)

5′. Uppermost occipital bristles straight or slightly curved; genitalia in both sexes generally not as large, ovipositor composed of three segments. 6
6. Lateral areas of abdominal tergites near incisures with uniform vestiture. 7
6′. Lateral areas of abdominal tergites near incisures with bristles stronger than other vestiture 8
7. Body brownish or yellowish; legs brown; frons brown pollinose. . . . . *Asilus sericeus* Say (p. 73)
7′. Body black; legs black; frons polished between antennae and gibbosity . . . . . *Nigrasilus nitidifacies* Hine (p. 84)
8. Abdominal tergites with distinct strong bristles along lateral posterior margins; mesonotal and notopleural bristles strong, large and black, and confined to posterior one-half of mesonotum. . . . . *Machimus* Loew (p. 76)
8′. Abdominal tergites lacking bristles or with weak bristles along lateral posterior margins; mesonotal and notopleural bristles weaker, and often cover more than one-half of mesonotum 9
9. Hind femora yellow only at base; hypopygium twice as wide as segment 8 . . . . . *Cerdistus latipennis* Hine (p. 74)
9′. Hind femora mostly yellow; hypopygium only slightly wider than segment eight. .10
10. Mystax golden to pale yellow with a few black bristles above; preapical bristles of abdominal segments yellow . . . . . *Asilus auricomus* Hine (p. 72)
10′. Mystax largely black with white hairs intermixed; preapical bristles of abdominal segments sordid white . . . . . *Asilus piceus* Hine (p. 72)

Genus ASILUS Linnaeus

Asilus Linnaeus, 1758. Systema Naturae, Tenth edition, p. 605-606.

Asilus auricomus Hine

Asilus auricomus, 1909. Ann. Entomol. Soc. Amer. 2:148.

Diagnosis.—Yellowish gray in color; antennae black, third segment equal in length to segments 1 and 2, style decidedly longer than segment 3; frons narrow with yellowish gray pollen; mystax mostly golden yellow, a few black hairs intermingled; beard gray; legs mostly shining yellow, with gray pollen and yellow hair, tibia with a black spot at the apex of anterior side; abdomen yellowish gray with yellow hairs on the segments and yellow bristles laterally and caudally on each segment; hypopygium ovate in shape, widest apically, blackish basally becoming yellowish distally. Length 14 to 15 mm.

Habitat Preference.—Bromley (1931, 1946) states that *A. auricomus* is found in open woods in areas of oak and mixed mesophytic regions.

Michigan Distribution.—Ten specimens of *A. auricomus* were examined from these counties: Barry, Ingham, Livingston, Kalamazoo, Washtenaw and Monroe.

Bromley (1931) reports this species from Medina Co., Ohio. Hine (1909) and McAtee and Banks (1920) report *A. auricomus* occurs from New Jersey and Virginia westward to Illinois. Martin and Wilcox (1965) report *A. auricomus* from Ohio, Illinois, Connecticut, New Jersey and Pennsylvania.

Flight Range.—All specimens collected within Michigan were collected between 11 August and 25 August. Blanton (1939) states this species occurs through July and August. Bromley (1931, 1946) reports *A. auricomus* to be a "late summer" species and reports 17 August to 22 September.

Asilus piceus Hine

Asilus piceus Hine, 1909. Ann. Entomol. Soc. Amer. 2:149.

Diagnosis.—Generally black species with brown legs; antennae black, third segment equals length of segment 1 and 2, style and third segment same length; frons gray pollinose; mystax of intermixed black and white hairs; beard white; legs brown with light colored

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hair and light and dark bristles; abdomen black, caudal margins with narrow band of gray pollen; hypopygium distinctly notched at upper corner of the apex. Length 15 to 17 mm.

Habitat Preference.—Cockerell (1894) states *A. piceus* is usually found on edges of pine groves usually in the sun. Small winged ants were recorded as prey by Bromley (1946).

N. T. Baker collected a specimen of *A. piceus* in a dry sandy habitat next to a pine planting. The plants in the area were: *Acer saccharum, Populus grandidentata, Prunus serotina, Quercus rubra, Agromonia* sp., *Pteridium aquilinum, Acer rubrum* and *Thuja occidentalis.* This specimen was observed to be fairly active in the field. It would light or perch upon dead leaves or ferns to watch for prey.

Michigan Distribution.—Only four specimens of *A. piceus* have been recorded from Michigan: Grand Traverse Co., Williamsburg, 24 August 1960, R. J. Snider and G. C. Eickwort; Wexford Co., T24N R9W S?, 22 August 1965, J. H. Shaddy (by malaise trap); Newaygo Co., T12N R12W S2, 28 August 1967, N. T. Baker; Iosco Co. Oscoda, 20 August 1934, T. H. Hubbell. Bromley (1934b, 1946) and Hine (1909) recorded this species from Massachusetts and from Lucas Co., Ohio, and notes this rare species is previously recorded only from New England. Bromley also noted this species is usually taken in August.

Asilus sericeus Say

Asilus sericeus Say, 1823. Jour. Acad. Nat. Sci., Phil. 3:48.

Diagnosis.—A large brown pollinose species with brown wings and pale brown legs; antennal segments 1 and 2 yellow-gold, third segment black and much longer than segments 1 and 2 together, style about one-fourth as long as third segment; frons golden pollinose; mystax entirely of yellow bristles and hairs; beard yellow; legs pale brown with black bristles and subappressed gold and black hair; abdomen brown pollinose without bristles before the incisures; 4 to 6 coarse brown bristles laterally on tergite 1; 3 or 4 smaller black bristles laterally on tergite 2; tergite 2 without bristles; hypopygium relatively small, with golden hair and a few black hairs apically. Length 20-28 mm.

Habitat Preference.—Blanton (1939) reports *A. sericeus* is usually found sitting on the ground among bracken ferns at the edges of fields. Bromley (1946) reports it is commonly found in meadows or moist areas where herbage is rank.

Bell (1924) has observed *A. sericeus* preying on other insects and reports that it never takes resting prey but always flying prey. The prey could even walk or crawl in front of the asilid in apparent safety. If the prey started to fly, it was often captured and killed. Bell also reports that some prey, mostly Lepidoptera would fall into vegetation as a means of escape when pursued and if *A. sericeus* was close enough it would dart into the vegetation and make its capture while the prey was falling. This behavior is not unlike other species in this subfamily.

Britton (1927), Bell (1921, 1924) and Bromley (1946) all report that *A. sericeus* has an apparent fondness for Lepidoptera and record *Phyciodes tharos* Drury (Nymphalidae), *Epargyreus tityrus* Fabricius (Hesperiidae), *Strymon titus* (Lycaenidae), *Chrysophaneus* sp. (Lycaenidae), and *Nymphalis* sp. (Nymphalidae) as prey. This common species has never been recorded or observed preying on aculeate Hymenoptera.

Harris (1862) recorded the larvae of *A. sericeus* feeding on the roots of rhubarb and states that when pupated and ready to emerge they burrow their way to the surface of the soil and emerge there. Pupal skins are left sticking vertically out of the soil.

Michigan Distribution.—Fifty-three specimens of *A. sericeus* were examined from: Charlevoix, Montmorency, Alpena, Crawford, Wexford, Roscommon, Ogemaw, Iosco, Clare, Midland, Barry, Ingham, Oakland, Kalamazoo, Washtenaw, Wayne and Cass counties. Hine (1909) states this species is generally distributed over the eastern part of North America from southern Canada westward to Texas and to Kansas.

Flight Range.—13 June to 23 August with one very late record of 13 November 1931 by K. D. Bailey in Oakland Co., Michigan. The majority of dates occur in July and August.

Genus **CERDISTUS** Loew

Cerdistus Loew, 1849. Linnaea, Entomol. 4:74.

Cerdistus latipennis (Hine)

Asilus latipennis Hine, 1909. Ann. Entomol. Soc. Amer. 2:152.

Diagnosis.—Rather dark in color with hairs and bristles nearly all yellow; antennae black, third segment about as long as 1 and 2, style subequal in length to segment 3; frons narrow and golden pollinose; mystax yellowish below and black above; legs with black bristles and yellow hair, abdomen scantly covered with brown pollen, caudal margin of each segment yellow pollinose and preceded on either side by several yellow bristles; hypopygium relatively large and bulbous, distinctly wider than the abdomen, shining black in color; aedeagus a large tube with 2 or 3 microtubes on apex. Length 15 to 17 mm.

Habitat Preference.—Bromley (1931) states that *C. latipennis* is very rare and usually is taken along edges of pine plantings. Habitat is usually very dry.

Michigan Distribution.—A single specimen is known from Michigan: Ingham Co., 30 August 1887, coll. ? Bromley (1931) recorded this species as possibly occurring in Ohio, but it never appeared in subsequent lists. Hine (1909) recorded *C. latipennis* from New York and Massachusetts. McAtee and Banks (1920) recorded the species from Maryland.

Flight Range.—Bromley (1931) lists August. Hine (1909) lists 10 August and 24 August. McAtee and Banks (1920) record 1 September.

Genus **EFFERIA** Coquillett

Efferia Coquillett, 1893. Can. Entomol. 25:175.

KEY TO SPECIES OF *EFFERIA*

1. Palpal hair white . . . . . *E. albibarbis* (Macquart)
1′. Palpal hair black 2
2. Mystax sordid yellow; costal vein of male not dilated. . . . *E. pogonias* (Wiedemann)
2′. Mystax black, with some white bristles; costa of male dilated . . . . . *E. aestuans* (Linnaeus)

Efferia aestuans (Linnaeus)

Asilus aestuans Linnaeus, 1763. Systema Naturae, 11th Edition, p. 413.

Diagnosis.—Mystax black with many white or yellowish hairs below; palpal hairs black; scutellar bristles mostly black with a few whitish, black bristles and black and yellowish white hair on legs; costa dilated in male; with sides of segments 2 to 4 and caudal margin of 4 and all of segments 5, 6 and 7 silvery pollinose. Length 18 to 22 mm. usually, but species may be as little as 14 mm. or as large as 28 mm.

Habitat Preference.—Bromley (1946) reports *E. aestuans* found in fields, pastures, thickets and edges of woods, in almost any dry situation where it alights on nearly any exposed object.

This species is known to feed on a wide variety of insects such as *Philanthus* sp. (Sphecidae), Tenthredinidae, Tachinidae, *Apis mellifera* Linn. (Apidae), Halictidae, *Aedes* sp. (Culicidae), *Musca domestica* Linn. (Muscidae), *Eristalis* sp. (Syrphidae), leafhoppers, small butterflies and moths (Bromley, 1934b, 1946).

McAtee and Banks (1920) report that this species has been observed ovipositing in old cedar posts and on twigs of red cedar (*Juniperus virginiana*) and on the bark of a tulip tree (*Liriodendron*).

In Michigan it has been collected on very dry flat sandy soil associated with: *Pteridium aquilinum, Cassandra calycullata, Quercus velutina, Carya* sp., *Liatrus spicata,*

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Rumex acetocella, Lespedeza capitata, Lespedeza caroliniana, and *Helianthus* sp. In one instance a malaise trap was set up in this habitat. Although a dozen specimens were captured in two days there were often that many or more sitting on top of the trap at one time. This species has also been observed to land on large slow moving objects such as people or livestock and to remain there ten to fifteen seconds and then fly away. Bromley (1934b, 1946) has also reported this rather unique behavior.

Michigan Distribution.—Seventy-seven specimens of *E. aestuans* were examined from these counties: Newaygo, Kent, Shiawassee, Allegan, Barry, Ingham, Livingston, Oakland, Van Buren, Kalamazoo, Jackson, Washtenaw and Berrien. This common species occurs over most of the eastern United States and west to Wyoming, Colorado, New Mexico, and Texas. (Wilcox, 1966)

Efferia albibarbis (Macquart)

Erax albibarbis Macquart, 1838. Diptera exotique ou peu connus. Paris. 1:117.

Diagnosis.—Mystax white; palpal hair white; scutellar hairs and bristles white; black bristles and white subappressed hair on legs; costa not dilated; abdomen of male with segments 1 through 5 and segment 8 gray, 6 and 7 white pollinose, segment 2 with small brown basal spots. Length 13 to 20 mm.

Habitat Preference.—*Efferia albibarbis* has been collected in very sandy but mesic habitats. Occasionally, it is exceptionally numerous in the proper habitat. This species is quite common along the Lake Michigan sand dunes especially where the edge of the forest and dunegrass (*Ammophila breveligulata*) meet. It nearly always rests directly on the sand with which it is well camouflaged.

Michigan Distribution.—Ninety-four specimens of *E. albibarbis* were examined from these counties: Bay, Mecosta, Newaygo, Montcalm, Gratiot, Ottawa, Kent, Clinton, Shiawassee, Genessee, Livingston, Allegan, Van Buren, Kalamazoo, Washtenaw, and Berrien. Hine (1919) and Wilcox (1966) state this species covers the United States and ranges south to Guatemala. No records are known from Canada.

Flight Range.—30 May to 1 September with majority of dates in July. Wilcox (1966) states that for California the species occurs from April to October.

Efferia pogonias (Wiedemann)

Asilus pogonias Wiedemann, 1821. Diptera Exotica Kiliae. 1:198.

Diagnosis.—Mystax yellowish, with a few black bristles below on lateral edge; palpal hair black; scutellar hair and bristles black; black bristles and numerous dark reddish hairs on legs; costa not dilated in male; abdomen of male with segments 6 and 7 white pollinose. Length 18 to 27 mm.

Habitat Preference.—Bromley (1946) reports *E. pogonias* (as *E. barbatus*) from "sand plains," "oak openings," and dry fields in sandy or gravelly areas. Often it is taken in pastures and old fields.

E. pogonias flies with a sharp high pitched buzz and feeds on small insects of all the major orders. Prey is usually smaller than expected from the robustness of the fly. (Bromley, 1946)

Michigan Distribution.—*E. pogonias* has not yet been collected within Michigan but will undoubtedly be collected in the southern part of the state. Wilcox (1966) has recorded this species from New York southward to Virginia and westward to Minnesota and Kansas and Texas. Bromley (1947) reported this species from central Ohio.

Flight Range.—Wilcox (1966) reports *E. pogonias* flying from August to October over its known range.

Genus MACHIMUS Loew

Machimus Loew, 1849. Linnaea Entomol. 4:1.

Tolmerus Loew, 1849. Linnaea Entomol. 4:94.

KEY TO SPECIES OF *MACHIMUS*

1. Hind femora wholly black, very rarely with faint preapical reddish spot on posterior or ventral side 2
1′. Hind femora never wholly black, as described above 7
2. Less than one-half of protibia with yellow or red markings (tibia may appear entirely black on occasional greased specimens) 3
2′. More than one-half of protibia with yellow or red markings 5
3. Tarsi completely black; tibiae with a trace of red at base, appearing completely black in greased specimens . . . . . *Machimus maneei* (Hine)
3′. Tarsi with red or yellow areas; tibiae with basal one-fourth, or more, distinctly red 4
4. Epandria slender and straight (Fig. 6); bases of tibiae usually yellow . . . . . *Machimus virginicus* (Banks)
4′. Epandria stout and decurved at tip (Fig. 10); bases of tibiae usually red. . . . . *Machimus notatus* (Wiedemann)
5. Metatibiae brownish-black; mystax mostly black with white bristles below . . . . . *Machimus sadyates* (Walker)
5′. Metatibiae yellow with black apices; mystax mostly pale 6
6. Median stripe of thorax bipartite; epandria straight ventrally, not narrowed or deflexed apically; dark brown species with tan highlights . . . . . *Machimus novaescotiae* (Macquart)
6′. Median stripe of thorax fused anteriorly; epandria concave ventrally, narrowed and deflexed apically; black species with gray highlights . *Machimus autumnalis* (Banks)
7. Hind femora yellow or reddish with black spot on anterior side; mystax white, frequently with few black hairs dorsally . . . . . *Machimus antimachus* (Walker)
7′. Hind femora black with preapical brownish or reddish band; mystax black with few scattered white hairs 8
8. Ventral side of front femora with abundant long hair, usually sordid white, occasionally black and sordid white mixed, only rarely entirely black; large brownish species . . . . . *Machimus snowii* (Hine)
8′. Ventral side of front femora with bristles rather than long hair 9
9. Inner posterior base of metafemora with a distinct red or yellow spot; bristles on venter of profemora white and weak . . . . . *Machimus erythrocnemius* (Hine)
9′. Inner posterior base of metafemora entirely black; bristles on venter of profemora stout and usually some are black. . . . . *Machimus paropus* (Walker)

Machimus antimachus (Walker)

Asilus antimachus Walker, 1849. List of the specimens of dipterous insects in the collection of the British Museum. 2:454.

Diagnosis.—A light tan and brown species; antennae rather long, black and slender, base of third segment distinctly yellow, style longer than third segment; frons narrow and silvery yellow pollinose; mystax white, an occasional specimen will have some black bristles; beard white; legs completely yellow except black coxae, anterad spot on all femora, apices of metatibia, and apices of tarsal segments all of which are black; abdomen brown and tan pollinose with brown bristles and golden hair; hypopygium longer than segments 7 and 8, epandria black, elongate, straight, with black and golden hair; venter of hypopygium polished. Length 16 to 20 mm.

Habitat Preference.—Hine (1909) and Bromley (1931) report *M. antimachus* common in open weedy areas and pastures. Bromley (1931) has recorded this species feeding on small Bombyliidae.

Michigan Distribution.—Only two specimens of *M. antimachus* have been collected in Michigan: Cheboygan Co., Univ. Mich. Biol. Sta., 4 August 1963, J. R. Dayton; Lenawee Co., T8S R2E S31, 9 July 1969, J. P. Donahue. Hine (1909) reports this species from Ohio, Indiana, Kansas, Virginia and Missouri. Martin and Wilcox (1965) report this species from New York.

Flight Range.—Bromley (1931) reports *M. antimachus* is common in Ohio from 24 June to 22 September with the majority of dates in August.

Machimus autumnalis (Banks)

Asilus autumnalis Banks, 1914. Psyche. 21:131.

Diagnosis.—A black species with gray highlights; antennae black, third segment with sides nearly parallel, style as long as the third segment; frons pale yellowish pollinose and white pollinose on gibbosity; mystax black above and yellowish or yellowish white below; beard white; femora all black, tibiae and metatarsi pale yellowish, with black or blackish apices; abdomen brown with yellowish pollen laterally and posteriorly, with yellow hairs all over; hypopygium relatively large, epandria elongate and thickened, narrowed and deflexed toward tip becoming concave on ventral margin. Length 14 to 15 mm.

Habitat Preference.—The Livingston County specimen of this rather delicate species was collected in a mesic habitat very close to a large swamp. The plants found in the immediate area were: *Quercus alba, Ambrosia artemisifolia, Monarda fistulosa, Calla* sp., *Lonicera* sp., and *Lactuca* sp. The specimen was captured alongside a road leading into an opening at the edge of a very moist forest. Very little sunlight filtered through the tree canopy. The specimen was resting on dead dry leaves laying on the ground.

Michigan Distribution.—Only eight specimens of *M. autumnalis* have been collected within Michigan: Keweenaw Co., 9 July 1935, O. Taboada; Marquette Co., Presque Isle, 18 July 1949, G. D. Gill; Marquette Co., Marquette, 21 July to 6 August, G. D. Gill; Marquette Co., 20 June 1955, R. R. Dreisbach; Midland Co., 29 July 1936, R. R. Dreisbach; Oakland Co., Bloomfield Hills, 1 September 1965, student collection; Livingston Co., E. S. George Reserve, T1N, R3E, S19, 11 August 1957, N. T. Baker.

Bromley (1931) reports *M. autumnalis* from Portsmouth, Scioto Co., Ohio. Banks (1914) described the species from Virginia. McAtee and Banks (1920) record the species from Washington, D.C.

Flight Range.—McAtee and Banks (1920) report 10 August to 30 September for Washington. Bromley (1931) reports 27 August for Ohio. Blanton (1939) reports the species common in September for New York.

Machimus erythrocnemius (Hine)

Asilus erythrocnemius Hine, 1909. Ann. Entomol. Soc. Amer. 2:163.

Diagnosis.—Dark brown species; antennae black, third segment rather wide, style slightly shorter than third segment; frons brown pollinose; mystax mostly of pale yellow bristles with a few black hairs above; beard white; femora black with reddish brown preapical band, venter or profemora with a row of rather weak white bristles; tibiae red usually with a dark marking on middle of anterior side, dark apically; tarsi dark blackish except metatarsi which are reddish; abdomen dark brown to tan and concolorous with thorax, 2 or 3 small bristles on either side before the incisures; hypopygium relatively small, brown or brownish-black in color with gold hairs. Length 11 to 14 mm.

Habitat Preference.—Bromley (1931) reports *M. erythrocnemius* occurs in dry hay fields or meadows where timothy, sorrel and ox-eye daisy grow.

This species has been collected in Michigan in sandy habitats which had extensive amounts of grass approximately eight to ten inches high. The ground was covered with dead dry leaves with which *M. erythrocnemius* blended into very well.

Michigan Distribution.—Twenty-four specimens *M. erythrocnemius* were examined from these counties: Isle Royale, Dickinson, Iron, Schoolcraft, Cheboygan, Otsego, Benzie, Iosco, Midland, Shiawassee, Allegan, Washtenaw, and Wayne. Hine (1909) and Bromley (1950c) report this species from New England south to Florida and west to Montana and Colorado.

Flight Range.—21 May to 15 September with the greatest majority of specimens captured throughout July.

Machimus maneei (Hine)

Asilus maneei Hine, 1909. Ann. Entomol. Soc. Amer. 2:158.

Diagnosis.—A small black species; antennae black with apex of second segment and base of third lightened in color, all segments and style subequal in length; frons with gray pollen; mystax of intermingled gray and black hair; beard white; legs black with a slight reddishness at bases of tibiae, coxae with white hair, femora with some white hair and black bristles, tibia and tarsi with short black hair and prominent bristles; abdomen black with rather long gray hairs especially toward the base, caudal margins of each segment gray pollinose; hypopygium shining black, slender, elevated somewhat on distal half and about as long as abdominal segments 6, 7 and 8 together. Length 10-12 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Five specimens of *M. maneei* have been taken in Michigan: Shiawassee Co., Bath, 24 July 1958, R. A. Scheibner (two specimens); Livingston Co., E. S. George Reserve, 7 July 1939, I. J. Cantrall (two specimens) Livingston Co., E. S. George Reserve, 7 July 1936, Ada Olson. This uncommon species is recorded from North Carolina and Florida by Martin and Wilcox (1965), McAtee and Banks (1920) record it from Virginia, Maryland and Washington, D. C. Bromley never recorded *M. maneei* from Ohio or Connecticut but listed it as a possibility.

Flight Range.—McAtee and Banks (1920) record 23 June to 22 September for the known range with most dates of collection in September.

Machimus notatus (Wiedemann)

Asilus notatus Wiedemann, 1828. Aussereuropaische zweiflugelige Insekten 1:451.

Diagnosis.—This species is closely related to *T. virginicus*. Both *M. notatus* and *M. virginicus* have: generally blackish gray in color; attennae black, segment 2 about as long as segment 1 and 2, style about as long as segment 3; frons gray pollinose, occasionally with a dark median line; mystax with a few black hairs above and numerous pale yellow or white hairs beneath; beard white; legs black except for bases of tibiae; metatarsi may be somewhat reddish; venter of tibia and metatarsi often have area of dense golden pile; abdomen black with narrow white margin caudally on each segment. Length of *notatus*, 14-18 mm., *virginicus*, 15-18 mm.

Distinction of these two species is easily done by comparison of the respective hypopygia. The epandria of *virginicus* (Figure 6) are longer, narrower and not deflexed as in *notatus* (Figure 10). There is a slight prominence on the ventral margin of the epandria in *virginicus* but it is not nearly as well developed as in *notatus*. Also *notatus* is lighter in color and has a somewhat more robust abdomen than *virginicus*.

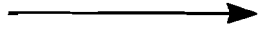

Fig. 5. Ventral view of hypopygium of *Machimus virginicus*.
Fig. 6. Lateral view of hypopygium of *M. virginicus*.
Fig. 7. Aedeagus of *M. virginicus*.
Fig. 8. Ventral view of hypopygium of *Machimus notatus*.
Fig. 9. Aedeagus of *M. notatus*.
Fig. 10. Lateral view of hypopygium of *M. virginicus*.

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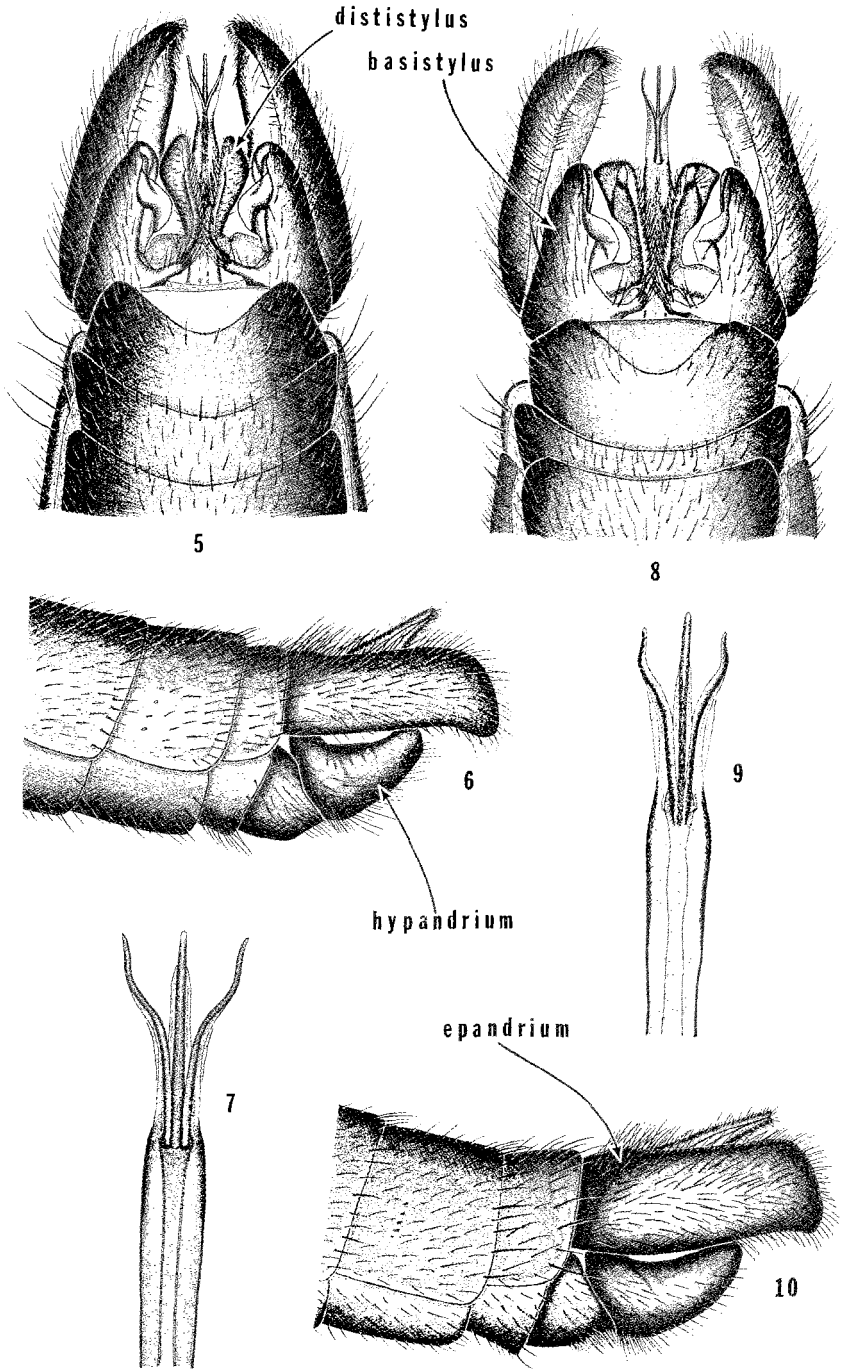
dististylus
basistylus
5
8
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hypandrium
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epandrium
10

Comparison of the internal hypopygial structures of *M. notatus* and *M. virginicus* provide more concrete distinction between the two species. The aedeagus of both species is three-tubed. All three tubes apparently have apical openings. The lateral aedeagal tubes of *notatus* (Figure 9) are nearly parallel while those of *virginicus* (Figure 7) are divergent. The basistyli of both species are very similar except for the basal lobes immediately below the insertion of the dististyles. The basal lobes of the basistyles in *M. virginicus* (Figure 5) are distinctly knobbed while those of *M. notatus* (Figure 8) are distinctly scoop-shaped. Only careful examination will reveal this character since the basal lobes of both species are heavily bristled. *M. virginicus* and *M. notatus* both have processes on the bases of their respective proctigers. *M. notatus* however has relatively larger and flatter processes.

Habitat Preference.—*M. notatus* is the most abundant and ubiquitous asilid in Michigan. It should properly be called the picniker's friend because of its abundance on picnic grounds in many of the state's parks and recreation areas.

This species is nearly always found in well established but disturbed areas along a forest edge. The habitat is open but shaded by large trees. Shrubs are usually rather sparse and not very large. The species is usually most common in more mesic areas.

This species usually alights or rests on nearly anything that is not moving in its habitat. When temperatures are fairly cool however it nearly always rests directly on the ground in full sun. Collected specimens have *Tabanus* sp. (Tabanidae), small Bombyliidae, Sarcophagidae, *Crambus* sp. (Pyralidae), *Callopistria monetifera* Guenee (Noctuidae), *Itame pustularia* Guenee (Geometridae) as prey. McAtee and Banks (1920) report small moths, *Draeculacephala mollipes* Say (Cicadellidae), *Tabanus* sp., Tipulidae, *Nephrotoma ferruginea* Fabricius (Tipulidae) and small Chrysomelid beetles as prey. Bromley (1946) records *Winthemia quadripustulata* Fabricius (Tachinidae) and *Pollenia rudis* Fabricius (Calliphoridae) and *Musca domestica* Linn (Muscidae).

Michigan Distribution.—Approximately four hundred specimens of *M. notatus* were examined from every county in Michigan *except*: Ontonagon, Iron, Isabella, Tuscola, Sanilac, Lapeer, Saint Clair, Macomb, Calhoun and Jackson. This species is known from Maine westward to Kansas and south to Florida and Texas. (Martin and Wilcox, 1965; Bromley, 1950a)

Flight Range.—30 May to 29 August with most dates in July. McAtee and Banks (1920) report 21 May to 20 September for Washington, D.C. Copulation occurs throughout the season.

Machimus novaescotiae (Macquart)

Asilus novae-scotiae Macquart, 1847. Mem. Soc. Roy. des Sci., No. 1846:62.

Diagnosis.—Dark brown species; antennae slender and black, apex of second segment and base of third segment distinctly lighter in color, apex of style yellowish; frons gray pollinose; mystax composed of black hair above and yellowish below (an occasional specimen may have the entire mystax pale yellow); beard white; femora completely black, tibia yellow with black tips, tarsi black with narrow yellow bases on each segment except for mostly yellow metatarsi; abdomen brown pollinose with narrow tan pollinose caudal margin on each segment; hypopygium about as long as abdominal segments 6, 7 and 8. Legnth 14 to 18 mm (Hine, 1909). All Michigan specimens examined were 12 to 15 mm.

Habitat Preference.—Cockerell (1894) reports *M. novaescotiae* to be a woodland species of oak and mixed mesophytic areas. It usually occurs along edges of woods and brushy pastures.

Michigan Distribution.—Only seven specimens of *M. novaescotiae* are known: Gogebic Co., T49 R38W S8, 4 August 1968, N. T. Baker; Marquette Co., Presque Isle, 18 July 1949 and 8 July 1949, G. D. Gill; Iosco Co., Oscoda, 7 April 1937, I. J. Cantrall; Montcalm Co., 16 August 1950, R. R. Dreisbach; Midland Co., 19 July 1936, R. R.

Dreisbach; Monroe Co., T6S R6E S35, 23 July 1965, J. Truchan. Hine (1909) McAtee and Banks (1920) and Bromley (1946, 1950a) report this species from Nova Scotia to Florida. Bromley (1931) also reports it from central Ohio from 18 June to 3 July.

Flight Range.—McAtee and Banks (1920) report the species common in Washington, D.C. and occurs from 14 June to 23 September and in copulation throughout August.

Machimus paropus (Walker)

Asilus paropus Walker, 1849. List of the specimens of dipterous insects in the collection of the British Museum 2:455.

Diagnosis.—A tan or brown species; antennae black, narrowly yellow at apex of second segment and base of third; frons light tan; mystax of dense bristly pale hairs with a few black hairs in upper portion; beard very pale tan color; proleg and mesolegs black except reddish preapical band on femora and middle and apex of tibia and narrow apex of metatarsus and bases of tarsal segments; metaleg similar except base of tibia is black; profemora with close lying hairs and a row of distinct bristles on venter; abdomen covered with scant yellow pollen, caudal margins of segments gray; hypopygium rather small, black and subshining with long pale hair, somewhat curved downward over entire length. Length 13 to 17 mm.

Habitat Preference.—Bromley (1946) reports *M. paropus* common in dry sandy fields and pastures. He also reports it occurs in large numbers in the proper habitat. It has been collected in Michigan in similar situations in association with these plants: *Monarda fistulosa, Lonicera* sp., *Solidago canadensis, Carex pennsylvanica* and *Sanguisorba canadensis.*

Juillet (1961) recorded this species as being important in controlling populations of *Rhyacionia buoliana* Schiff., the European pine shoot moth. Each specimen consumed up to six moths per day. They unfortunately also preyed on the pine shoot-moth parasites as well. McAtee and Banks (1920) record *Epiphragma solatrix* Osten Sacken (Tipulidae) and *Cordulegaster* sp. (Aeschnidae) as prey. Davis (1919) reported that in confinement the larvae of *M. paropus* feed on *Phyllophaga* grubs.

Michigan Distribution.—Seventy-five specimens of *M. paropus* were examined from these counties: Keewanaw, Houghton, Ontonagon, Baraga, Dickinson, Menominee, Schoolcraft, Mackinac, Chippewa, Emmet, Cheboygan, Benzie, Manistee, Wexford, Missaukee, Iosco, Mason, Midland, Bay, Muskegon, Newaygo, Kent, Gratiot, Saginaw, Sanilac, Ionia, Shiawassee, Genesee, Allegan, Ingham, Livingston, Oakland, Kalamazoo, Jackson, Washtenaw and Berrien.

Martin and Wilcox (1965), and McAtee and Banks (1920) and Hine (1909) report this species from New England west to Wyoming and Colorado and south to Virginia.

Flight Range.—16 June to 3 October with the majority of dates in July.

Machimus sadyates (Walker)

Asilus sadyates Walker, 1849. List of the specimens of dipterous insects in the collection of the British Museum 2:453.

Asilus avidus Wulp, 1869. Tijdschr. v. Entomol. 12:82.

Diagnosis.—A somewhat larger blackish species; antennae black, segments 1 and 2 longer than 3, style about as long as segment 3; frons white pollinose; mystax of numerous black hairs above and fewer white or pale hairs below; beard white; femora black; tibia reddish with black markings on the outside; metatarsi reddish with brown apex, tarsal segments otherwise black or brown; abdomen black with white pollinose border on caudal margin of each segment; hypopygium large and longer than abdominal segments 6, 7 and 8. Length 13 to 17 mm.

Habitat Preference.—This species is reported to be quite like *notatus* in habits and habitat by Bromley (1931, 1946). He records *Ormenis pruinosa* Say (Fulgoridae), a small tortricid and the ant, *Formica fusca* Say (Formicidae), as prey. In Michigan *M. sadyates* has been taken in ecotonal areas along edges of forests or in sunny openings of rather mesic areas. This species seems to be more active in the morning than in the afternoon. They have been observed to be cannibalistic. This species is often taken at light.

Michigan Distribution.—One hundred fifty specimens of *M. sadyates* were examined from every county in the Upper Peninsula except Menominee and Mackinac and from these counties in the Lower Peninsula: Emmet, Cheboygan, Charlevoix, Leelanau, Benzie, Manistee, Wexford, Missaukee, Roscommon, Ogemaw, Iosco, Mason, Lake Clare, Gladwin, Huron, Oceana, Newaygo, Mecosta, Isabella, Midland, Muskegon, Montcalm, Ottawa, Kent, Ionia, Shiawassee, Ingham, Livingston, Oakland, Van Buren, Jackson, Wayne, Berrien, St. Joseph and Monroe.

Hine (1909) reports that *M. sadyates* is known from New York south to North Carolina and westward into Ohio and Indiana.

Flight Range.—23 June to 10 October with the greatest majority of dates in mid August. McAtee and Banks (1920) report 10 July to 28 October for Washington, D.C.

Machimus snowii (Hine)

Asilus snowii Hine, 1909. Ann. Entomol. Soc. Amer. 2:160.

Diagnosis.—A large dark brown species; antennae black, third segment long and slender with style about one-half as long; frons golden brown pollinose; mystax mostly of pale yellow bristles with some black above and below on oral margin; beard sordid pale yellow; femora black with a reddish preapical band; protibia and mesotibia reddish with dark ring in center and black apex; metatarsus mostly yellow with black apically; tarsal segments black with yellow only at the base. metatibia mostly dark with narrow yellow area basally; abdomen covered with dark brown pollen, narrow caudal margins of segments lighter in color than rest of abdomen; hypopygium relatively small, very scantly pollinose, with numerous golden hairs. Length 15 to 20 mm.

Habitat Preference.—Bromley (1946) reports *M. snowii* is usually found in wet meadows with luxuriant vegetation. A pyralid moth is listed as prey.

Michigan Distribution.—Seventy-one specimens of *M. snowii* were examined from these counties: Isle Royale, Houghton, Gogebic, Marquette, Menominee, Mackinac, Chippewa, Emmet, Cheboygan, Charlevoix, Antrim, Montmorency, Benzie, Alcona, Manistee, Kalkaska, Wexford, Missaukee, Roscommon, Oscoda, Clare, Gladwin, Newaygo, Mecosta, Midland, Huron, Saginaw, Genesee, Shiawassee, Ingham, Kalamazoo, Jackson, Washtenaw and Berrien.

Hine (1909) examined specimens from nearly all of eastern North America to Kansas.

Flight Range.—3 June to 25 August with the majority of dates in late July and early August.

Machimus virginicus (Banks) NEW STATUS

Asilus virginicus Banks, 1920. Proc. Entomol. Soc. Wash. 22:31.

Diagnosis.—Refer to *T. notatus.*

Habitat Preference.—This species prefers habitats very similar to *T. notatus* with one exception; *virginicus* invariably is found in habitats with a lighter colored substrate such as a white or tan colored sand. Like *notatus* this species is ubiquitous in its distribution and although not as numerically common as *notatus* it is nevertheless difficult to adequately define its habitat because of its ubiquity.

This species has the unique habit of alighting on patches of bright areas. This habit makes it especially susceptible to capture using white cottage cheese cartons and ethylene glycol as pitfall traps.

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Michigan Distribution.—Seventy-five specimens of *M. virginicus* were examined from: Marquette, Cheboygan, Presque Isle, Leelanau, Benzie, Manistee, Wexford, Roscommon, Iosco, Clare, Oceana, Newaygo, Mecosta, Isabella, Midland, Montcalm, Kent, Ionia, Allegan, Eaton, Ingham, Livingston, Wayne, Cass, Hillsdale and Lenawee counties.

McAtee and Banks (1920) record this species from Maryland to Virginia. Bromley (1947) recorded it from central Ohio.

Flight Range.—15 June to 16 September with the greatest majority of dates in late July. McAtee and Banks (1920) record 28 May to 20 July for the known range of *M. virginicus.*

Genus NEOITAMUS Osten Sacken

Neoitamus Osten Sacken, 1878. Smithsn. Inst., Smithsn. Misc. Collect. 16:82.

KEY TO SPECIES OF *NEOITAMUS*

1. Front and middle femora yellow with black stripe on upper side; mystax black or golden or mixed black and gold in male . . . . . *N. flavofemoratus* (Hine)
1′. Front femora black with apical end yellow, middle femora yellow or, rarely, front femora nearly all black; mystax pale golden in male . . . . . *N. orphne* (Walker)

Neoitamus flavofemoratus (Hine)

Asilus flavofemoratus Hine, 1909. Ann. Entomol. Soc. Amer. 2:153.

Diagnosis.—Mystax of male entirely black or golden, female with few black hairs above and several white below; frons golden or white; profemora yellow with black stripe on upper side; epandria not notched dorsally at apex. Length 12 to 18 mm.

Habitat Preference.—Bromley (1946) reports *N. flavofemoratus* from oak and mixed mesophytic woodlands. It occurs in areas of open woodlands and pastures alighting on the tips of twigs in exposed situations. *Holopogon tibialis* and *Dichelonyx* sp. (Scarabaeidae) have been preyed upon by this species. McAtee and Banks (1920) report Elateridae, *Chrysophila* sp. and *Tipula* sp. as prey. In Michigan, it has been collected in habitats associated with these plants: *Onoclea synsibilis, Cornus canadensis, Quercus rubra, Viola* sp., *Morus* sp., *Juncus* sp., *Pinus strobus, Arelia* sp., *Medeola virginica, Solidago* sp., *Rosa* Sp., *Polygonatum pubescens, Galtheria procumbens, Plantago* sp. and *Carex* sp. The habitat is usually quite wet and protected from wind. At night, specimens have been taken at unfiltered blacklight.

Michigan Distribution.—Eighty specimens of *N. flavofemoratus* were examined from Marquette, Cheboygan, Charlevoix, Antrim, Montmorency, Leelanau, Benzie, Grand Traverse, Manistee, Wexford, Roscommon, Iosco, Mason, Clare, Midland, Bay, Huron, Muskegon, Montcalm, Gratiot, Ionia, Shiawassee, Allegan, Barry, Ingham, Livingston, Oakland, Kalamazoo, Calhoun, Washtenaw and Monroe counties.

Hine (1909) records the species from Quebec and New England south to North Carolina and westward to Illinois.

Flight Range.—1 June to 28 August with majority of dates in mid-July.

Neoitamus orphne (Walker)

Asilus orphne Walker, 1849. List of the specimens of dipterous insects in the collection of the British Museum 2:456.

Diagnosis.—Mystax golden to pale yellowish, without black bristles; frons dull white; profemora mostly black with yellow apex; epandria notched dorsally at apex. Length 12 to 19 mm.

Habitat Preference.—Bromley (1931, 1946) has found *N. orphne* primarily about the edges of woods and thickets alighting on the tips of twigs in exposed situations. *Argyrotoxa semipurpurana* Kraft (Tortricidae) is recorded as prey.

Michigan Distribution.—Seventy specimens of *N. orphne* were examined from these counties: Houghton, Gogebic, Iron, Marquette, Manistee, Delta, Luce, Mackinac, Cheboygan, Otsego, Grand Traverse, Crawford, Wexford, Missaukee, Roscommon, Oscoda, Gladwin, Isabella, Midland, Gratiot, Kent, Clinton, Shiawassee, Ingham, Livingston, Oakland, Kalamazoo, and Washtenaw. Hine (1909) records this species commonly taken from Maine to Illinois and from Quebec to North Carolina. Specimens are also known from Colorado and Montana.

Flight Range.—31 May to 6 August with most dates near the end of June.

Genus **NIGRASILUS** Hine

Nigrasilus Hine, 1908. Can. Entomol. 40:203.

Nigrasilus nitidifacies Hine

Nigrasilus nitidifacies Hine, 1908. Ann. Entomol. Soc. Amer. 2:204.

Diagnosis.—Very dark brownish black species; antennae black, third segment of antennae rather narrow and a little longer than segments 1 and 2 together, style about one-half the length of the third segment; frons bare and shining; gibbosity prominent; mystax of black bristles above and white bristles below; beard white; femora all black with fine white hair and black bristles; tibiae and tarsi dark red becoming black in some areas; metatibia and 3 or 4 black bristles on the front side near the middle; abdomen black dorsally with gray pollinose caudal margins on all segments, not preceded by bristles distinctly different than those on the remainder of the abdomen; hypopygium distinctly different with epandria deflexed upward at about one-half their length and with 2 slightly divergent arms at the apex which resembles a thumb and opposable finger. Martin (1968) figures the aedeagus of *N. nitidifacies.* The median tube of the aedegus is hooked apically and twice as long as the lateral tubes. Length 12 to 15 mm.

Habitat Preference.—Unknown.

Michigan Distribution.—Only a single specimen has been taken in Cheboygan Co., 1 July 1929, Angell. Hine (1909) lists this species known range as British Columbia, Washington and Oregon. These specimens examined by Hine were taken on 2 July and 16 July.

Genus OMMATIUS Wiedemann

Ommatius Wiedemann, 1821. Diptera exotica, pt. 1:213.

Ommatius tibialis Say

Ommatius tibialis Say, 1823. Jour. Acad. Nat. Sci., Phil. 3:49.

Diagnosis.—A black and gray pollinose species; antennae short; third segment pyriform with a long style bearing a ventral row of plumes; costa of male dilated. Length 13 to 17 mm.

Habitat Preference.—Bromley (1946) records this creature as a rather sluggish flier usually found resting on twig tips or tall weeds in moist luxuriant meadows.

Michigan Distribution.—Nineteen specimens of *O. tibialis* were examined from: Kalkaska, Newaygo, Allegan, Livingston, Van Buren, Kalamazoo, Jackson and Monroe counties.

Martin and Wilcox (1965) and Bromley (1950a) give the known distribution of this species as New England south to Florida and Westward to Kansas and Texas.

Flight Range.—13 June to 26 August with most dates throughout July.

Genus **PROCTACANTHUS** Macquart

Proctacanthus Macquart, 1838. Dipteres exotiques, 1:120.

KEY TO SPECIES OF *PROCTACANTHUS*

1. Dorsum of thorax uniformly brown; male genitalia wider than segment 8 . . . . . *P. hinei* Bromley
1'. Dorsum of thorax gray, usually striped with black or brown; male genitalia narrower than segment 8 . . . . . *P. milbertii* Macquart

Proctacanthus hinei Bromley

Proctacanthus hinei Bromley, 1928. Psyche 35:13.

Diagnosis.—Palpi red with pale hair; thoracic dorsum uniformly brown; abdomen orange to brown pollinose; hypopygium longer than segments 7 plus 8. Length 30 to 36 mm.

Habitat Preference.—Bromley (1931, 1946, 1950a) states that *P. hinei* is restricted entirely to sand plains in the vicinity of the coast or along large rivers. The species always alights on the sand and is very active and wary. Prey of this species includes the following bees: *Xylocopa virginica* Drury, *Apis mellifera* Linnaeus, *Bombus* sp., *Psithyrus* sp., and the vespid, *Polistes apachus* Saussure.

This impressive species is quite common in the proper habitat and is invariably found in association with *Ammophila* on the sand dunes along Lake Michigan.

This interesting species is relatively easy to observe because of the contrast with the light colored sand of its habitat. When disturbed, individuals fly three to five feet above the sand in long undulating flights before again landing on the sand or occasionally on a grass stem (*Ammophila*). The abdomen is often curved upward while flying.

In the early morning *P. hinei* sits on the sand with all its legs stretched out and its body closely pressed to the sand. Often it crawls 3 to 4 inches and faces a different direction which is nearly always in the general direction of the sun. As the ambient temperature rises, the flies become more active. Lavigne and Holland (1969) have reported very similar behavior for *Promachus dimidiatus.*

Pupal cases are often found sticking up through the sand. In some areas five to ten could be easily gathered. The pupae are interesting in that the spiracular openings have little operculate covers over them, presumably to keep out sand. Emergence apparently occurs in the morning since this is the time when the majority of pupal cases are discovered and teneral specimens are collected. It may be that emergence is triggered by rising temperatures or light in the morning.

P. hinei is often seen with species of *Bombus* as prey. Specimens captured with prey had usually punctured the thorax at the anterior part of the junction of wing and thorax. If prey was not readily available, the flies often fly slowly just over the top of the *Ammophila* landing on the sand or on stems of the *Ammophila.* After resting a short time they would again fly short flights of 20 to 40 feet. Disturbing *P. hinei* often sent them on flights on which they were lost from sight. On one occasion, a female specimen was found impaled in the thorax on the sharp end of a blade of dune grass. She had been unable to free herself and was merely hanging from the grass and buzzing loudly attempting to escape.

Michigan Distribution.—*P. hinei* is completely restricted to the Lake Michigan sand dunes. Fifty specimens were examined from Mason, Oceana, Van Buren and Berrien counties. This species has also been recorded from New Mexico, Ohio, Kentucky and Florida (Martin and Wilcox, 1965).

Flight Range.—7 July to 17 August with nearly 90% of collection dates in mid-July. Bromley (1931) records 1 July to 28 July for Ohio.

Proctacanthus milbertii Macquart

Proctacanthus milbertii Macquart, 1838. Soc. Roy. des Sci., Mem. 1838 No. 3:124.

Diagnosis.—Palpi black with black hair; thoracic dorsum striped with black or brown; abdomen densely gray pollinose; hypopygium shorter than segments 7 and 8 combined. Length 28 and 40 mm.

Habitat Preference.—This extremely common species, *P. milbertii* has been called the "Missouri Bee-Killer" and the "Boo-Hoo fly." Bromley (1931, 1947, 1950a) reports this species is characteristically found in prairies and plains. It is common in sandy fields and pastures with *Andropogon* and *Solidago* and often in association with *Diogmites discolor* and *Mallophora orcina* in southern areas of the United States. Blanton (1939) has found it resting in open sunlight in open fields, dirt roads and fence rows.

Prey records for *P. milbertii* are very common. Bromley (1949) accumulated 659 prey records and found Lepidoptera and Orthoptera make up 75% of its prey. Honeybees make up only 4% of its prey. This species is known to be cannibalistic. It has been taken in Michigan while feeding on Pentatomidae, *Melanoplus* sp. (Acrididae), Pyralidae, *Bembix* sp. (Bembecidae), *Apis mellifera* Linn. (Apidae), *Cicindela* sp. (Cicindelidae), *Vespula* sp. (Vespidae) and *Proctacanthus milbertii.*

It has been collected in very dry habitats with these plants in association: *Pteridium aquilinum, Cassandra calycullata, Quercus velutina Solidago* sp., *Carya* sp., *Lyatrus spicata, Rumex acetocella, Lespedeza capitata, Lespedeza caroliniana* and *Helianthus* sp. The soil was very sandy and dry with considerable amounts of dead *Solidago* sp., twigs, and dead leaves. The fly blends very well with such a background making observation somewhat difficult. It flies about 6 to 10 inches above the soil and usually lands on soil or twigs but never on dead leaves. As soon as *P. milbertii* lands it freezes and does not move which also helps to camouflage the creature. These flies are quite active as long as the proper habitat is hot and sunny.

When dusk approached, and the sun no longer shone on the habitat of *P. milbertii,* the flies cease all activity. Attempts to discover where they spent the night were nearly futile until it was discovered that the flies were resting in or under dead leaves beneath nearby trees or bushes. When the sun set the flies "entered a stupor" and became very inactive. If disturbed they would buzz their wings for a second or two and then again become inactive. Perhaps the buzzing will frighten a possible predator. The positions these flies may assume are often ridiculous. They appear to be dead. In one instance a male was discovered "standing on his head" and supported only by his front legs. Hull (1962) has also observed this behavior and interpreted it as "death feigning."

Under caged conditions males and females of *P. milbertii* were fed honeybees. Usually a single fly would consume approximately three bees per day. The honeybees were captured in flight and killed immediately by insertion of the hypopharynx into the occiput above the cervix before the asilid lands. *P. milbertii* wrapped all six legs about the honeybee and held it until the bee was dead. Often the fly would land and lay on its side or dorsum. Once the bee is dead the fly would sit upright and occasionally fly for short distances of 3 or 4 feet 3 or 4 times during consumption of the prey.

They have also been observed to follow grasshoppers in flight without capturing them. The fly will follow about 6 inches behind for several yards. When the grasshopper lands, the asilid will turn and fly away.

The point of insertion of the hypopharynx is changed frequently during a single feeding. The first insertion into the back of head is to kill the prey. Thereafter *P. milbertii* will insert the hypopharynx into a thoracic spircle or the membrane at the base of wing or between abdominal tergites or through the membranous area between the abdominal tergites and sternites. The prey is handled with the prolegs much the same as one would roll or turn a barrel. The prey is handled only when the hypopharynx is to be re-inserted. When one *P. milbertii* had attacked and killed another *milbertii,* the method of handling and consumption was nearly the same although the body was punctured many more times. Time for consumption was usually about ten to twenty minutes although a feeding may last an hour or more on occasion. The abdomen is usually slightly swollen basally after feeding but may be swollen for its entire length.

P. milbertii exhibits a very interesting defensive reaction when attacked by another fly. The attacked fly nearly always spreads its legs and wings outward and upward and curves the abdomen upward. Generally the fly turns to face the attacker and then tilts backward allowing it to better fend for itself. Usually the wings are buzzed in short bursts.

Michigan Distribution.—Two hundred and nine specimens of *P. milbertii* were examined from these counties: Marquette, Alger, Menominee, Cheboygan, Benzie, Grand Traverse, Alcona, Manistee, Wexford, Iosco, Lake, Gladwin, Huron, Oceana, Newaygo, Midland, Muskegon, Ottawa, Kent, Ionia, Shiawassee, Genesee, Allegan, Barry, Ingham, Livingston, Oakland, Macomb, Kalamazoo, Jackson, Washtenaw, Wayne, Berrien, St. Joseph, Hillsdale, Lenawee, and Monroe. This species is known to occur over most of North America from coast to coast.

Flight Dates.—19 June to 5 November with most dates occurring in August.

Genus **PROMACHUS** Loew

Promachus Loew, 1848. Linnaea Entomol. 3:390.

KEY TO SPECIES OF *PROMACHUS*

1. Color of tibiae lighter than femora; palpi with yellowish and some black hair . . . . . *P. vertebratus* Say
1′. Tibiae and femora concolorous; palpal hair entirely yellow or entirely black. 2
2. Palpi black haired; abdomen with black and white hair . . . . . *P. bastardii* Macquart
2′. Palpi yellow haired; abdomen covered with yellow hair. . . . *P. fitchii* Osten Sacken

Promachus bastardii Macquart

Promachus bastardii Macquart, 1838. Dipt. Exot. 1:104.

Diagnosis.—Palpi with black hair; mystax yellow; color of tibia concolorous with femora; abdomen black above with a narrow band of white hair on posterior margin of each segment; hypopygium with dense silvery hair on dorsum. Length 21 to 28 mm.

Habitat Preference.—Bromley (1931, 1934c, 1946) states that *P. bastardii* occurs in brushy pastures, along stone fences, and edges of woods and fields. It alights on twigs, posts, stones and tall weeds or other exposed objects. It flies with a high pitched buzz, and can become a pest around apiaries.

Bromley (1931, 1934c, 1946) recorded these insects as prey of *P. bastardii: Eristalis tenax* Linn (Syrphidae), small Tipulidae, *Apis mellifera* Linn. (Apidae), *Tachysphex* sp. (Sphecidae), *Solenius* sp. (Sphecidae), Tiphiidae (*Tiphia* sp.), *Pogonomyrmex barbatum* Smith (Formicdae), *Diogmites symmachus, Canthon* sp. (Scarabaeidae), *Neoclytus* sp. (Cerambycidae), *Leptoglossus phyllopus* Linn (Coriedae), *Menecles insertus* Say (Pentatomidae), *Orphulella* sp. (Acrididae) and its own species.

It has been collected in Michgian in a very old burn area in association with the following plants: *Pinus resinosa, Prunus virginiana, Achillea millifolium, Centaurea* sp., *Agrostis stolanifera, Rhus* sp., *Fragraria virginica, Chrysanthemum,* and *Hypericum perfoliatum*. The habitat was very sandy and dry in full hot sun. The entire area was exposed and near the top of a very large hill. There was a considerable amount of dry dead leaves and twigs on the ground.

Males of *P. bastardii* were observed to fly closely around the limbs of *Pinus resinosa* as if they were in search of something. Males and females flew close to the ground and landed on the litter where they were quite well camouflaged. This species is always well dispersed and never seems to be congregated in one area. Specimens were collected preying on *Callopistra monetifera* Guenee (Noctuidae).

Michigan Distribution.—One hundred and twenty-nine specimens of *P. bastardii* were examined from these counties: Houghton, Baraga, Marquette, Alger, Schoolcraft, Menominee, Luce, Mackinac, Chippewa, Emmet, Cheboygan, Antrim, Otsego, Benzie, Grand Traverse, Wexford, Roscommon, Mecosta, Midland, Huron, Van Buren, Kalamazoo, Wayne and Berrien.

Hine (1911), Bromley (1950a) and Cole and Pritchard (1964) record the distribution of *P. bastardii* from Massachusetts to Kansas and south to Texas and Florida. Bromley (1931) recorded the species as fairly common in Ohio.

Flight Range.—12 June to 27 August with most dates in late July. One copulating pair taken 5 August.

Promachus fitchii Osten Sacken

Promachus fitchii Osten Sacken, 1878. Catalogue of the described Diptera of North America, Smithson. Inst. Smithson. Misc. Coll. 16:234.

Diagnosis.—Palpi with yellow hair; mystax of dense yellow hair; tibia concolorous with femora; abdomen covered with light yellow hair, tan pollinose with bare areas of brown ground color on incisures becoming narrower posteriorly; hypopygium very elongate black, with appressed white hair dorsally, yellow hair laterally and ventrally, some black hair on apex of epandria; aedeagus often exserted beyond apex of hypopygium. Length 25 to 30 mm.

Habitat Preference.—Bromley (1931, 1946) reports *P. fitchii* to be very abundant locally. It occurs in dry hay fields, alighting on grass or weed stalks. Its flight is a high-pitched buzz suggestive of a honeybee or megachilid bee.

Bromley (1946) records *Eristalis* sp. (Syrphidae), *Asilus, Ommatius,* and small Pompilidae as prey. He also reports the larvae feeding on *Phyllophaga* sp. (Scarabaeidae) grubs. Davis (1919) states that *P. fitchii* larvae are predaceous on *Phyllophaga* larvae.

Michigan Distribution.—*P. fitchii* has not been recorded from Michigan yet but probably will be found in the southern part of the lower peninsula. Bromley (1931) recorded this species as possibly occurring in Ohio but subsequently was never taken. Hine (1909) reports this species from Kansas, Nebraska and Missouri, and from Connecticut and Florida.

Flight Range.—Bromley records 30 June to 2 August for Connecticut.

Promachus vertebratus (Say)

Asilus vertebratus Say, 1823. Jour. Acad. Sci. Phil. 3:47.

Diagnosis.—Palpi with yellowish and some black hair; mystax white; tibia much lighter in color than femora; abdomen largely gray pollinose, with pale hairs and with rectangular black markings on anterior half of each segment; hypopygium without silvery hair above. Length 26 to 31 mm.

Habitat Preference.—Bromley (1931, 1947) records *P. vertebratus* as a prairie species which has probably extended its range since clearing of the forests. It often occurs in considerable numbers in clover fields, iron-weed swales and pastures. The larvae and pupae are often found in the soil about cornfields when the soil is plowed. Davis (1919) reports the larvae to be significant predators on *Phyllophaga* grubs. He also reports a three year life cycle is likely. Davis (1919) assumes the larvae to be entirely carnivorous.

Christopher Brand has collected *P. vertebratus* in large numbers in Illinois and reported the habitat to be an old field with *Daucus carota,* tall grasses, *Solidago* sp. *Populus* sp., *Asclepias syriaca* and *Chrysanthemum leucanthemum.* The females were seen ovipositing in unopened flowers of *Daucus carota.* Many specimens were collected in open sandy areas with large concentrations of *Daucus carota* and *Solidago* sp. Many pairs were observed in copulation in early August.

Michigan Distribution.—Only nine specimens of *P. vertebratus* have been taken in Michigan: Eaton Co., Grand Ledge, 13 August 1967, B. Matthews; Ingham Co., Lansing, 9 July 1964, D. Barton; Ingham Co., T3N R2W S19, ? September 1967, J. R. Dayton (by malaise trap); Ingham Co., E. Lansing 10 August 1968, Steve Middleton; Jackson Co., Jackson, 22 August 1963, R. J. Matthews; Wayne Co., Plymouth, 18 August 1959, R. J. Snider (3 specimens). Martin and Wilcox (1965) give the distribution of this species as Ohio, Wisconsin and Illinois westward to Missouri, Kansas and Colorado. Bromley (1931) recorded this species from several localities in Ohio.

Flight Range.—Flight dates are 30 July to 2 September for Ohio.

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