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A study of Utah phoridae diptera

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A STUDY OF UTAH PHORIDAE: DIPTERA

A thesis submitted to the

Department of Zoology and Entomology

of

Brigham Young University

In partial fulfillment

of the requirements for the degree of

Master of Science

by

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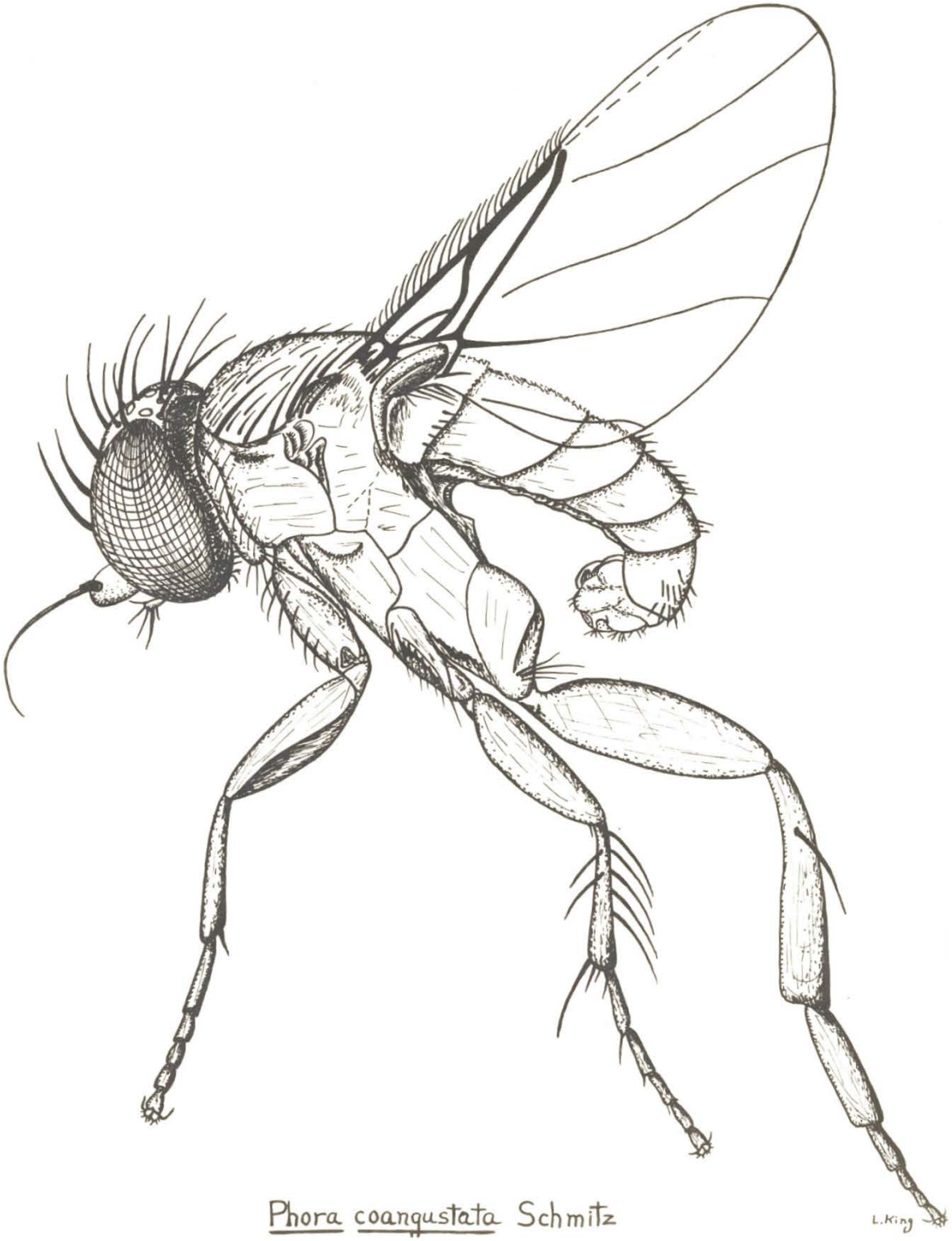

Phora coangustata Schmitz

L. King

ABSTRACT

This study was undertaken to determine the present status in Utah of the Dipterous family Phoridae, and to report which genera and species are found there. The work was done with the thought in mind of furthering the knowledge of this little-known family in Utah.

In order to secure information about the family the writer studied entomological literature and specimens obtained from the entomological collections of the Brigham Young University and Utah State Agricultural College. Personal collecting in various areas of Utah was also done.

During the study it was found that there were six genera and twenty-one species correctly identified from Utah. The six genera found were: (1) Phora, (2) Puliciphora, (3) Hypocera, (4) Borophaga, (5) Chaetoneurophora, and (6) Megaselia. Of these genera only two were found to contain more than two species, Phora with six and Megaselia with twelve. Puliciphora and Borophaga both contain two species each, while Chaetoneurophora has one. Hypocera actually has no species since the specimen reported to the writer was identified to the genus only.

Megaselia is the only genus to have been reported in the literature, and two species of Megaselia are the only species which have been recorded. The remainder of genera and species, i.e. five genera and

nineteen species are written in this study as new records for the state of Utah.

Keys to the genera and species of phorids are included to enhance ease of identification. A list of specimens of incomplete and questionable identification is also included in the appendix to serve as a basis for further study.

TO MY WIFE

In appreciation of her encouragement and patience and of the many wonderful things she has done to make this work possible.

ACKNOWLEDGMENTS

The writer wishes to extend thanks to everyone who has, in any way, assisted in the completion of this thesis.

Deepest appreciation must go to Dr. Vasco M. Tanner, the writer's special committee chairman, who not only suggested the research problem but who has also given freely of his time and knowledge. It was largely through his assistance that completion of this thesis was possible.

Sincere thanks to Dr. Bertrand F. Harrison, the writer's special committee member. His constructive criticism and suggestions have greatly improved the final analysis of this study.

Finally, gratitude must also be expressed at this time to Drs. G. F. Knowlton and D. W. Davis of the Utah State Agricultural College. They have been of much assistance by allowing the writer to use facilities at their disposal. The specimens borrowed from them have been very important in making this study more complete.

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DEFINITIONS OF ILLUSTRATION LABELS

Al	anterolateral bristle
ant	antenna
Antl	antial bristle
ap	anal protuberance
ar	arista
fr	frons
l.i.	lobus inferior
l.s.	lobus superior
Ml	mediolateral bristle
mp	mesopleura
oc	ocellus (pl. ocelli)
Occp	occipital bristle
Ocr	occellar bristle
P.A.	post-antennal bristles
pal	palpi
Pl	posterolateral bristle
P.O.	pre-ocellar bristle
S.A.	supra-antennal bristle
wb	wing base
Wing veins	see discussion of family
1st row	first row reclinate bristles
2nd row	second row reclinate bristles
3rd row	third row reclinate bristles

INTRODUCTION

The purpose of this study is to determine the present status of the family Phoridae (Diptera) in Utah, and to report which genera and species are known to inhabit the state.

This study was begun in the spring of 1955 and continued to August 1956. A personal collection of specimens was made by the writer during this time. The specimens collected were deposited in the entomological collection of the Brigham Young University at Provo, Utah.

A study was made of the specimens already in the entomological collections of the Brigham Young University and of the Utah State Agricultural College at Logan, Utah, together with the writer's specimens. Reference is made to a few additional phorids not collected or observed. The source of this information is listed in "Literature Cited." Whenever the specimens are referred to as being in one of the collections a "B" designates those in the Brigham Young University collection, and an "A" designates those in the Utah State Agricultural College collection.

The family as it is now known to occur in Utah is represented by a small number of species and of individuals. This smallness of numbers is due probably to several factors. On the one hand, there may be very few of these flies in Utah due to a lack of suitable environmental conditions. They frequently inhabit moist shady well-vegetated areas, but

Utah, as a whole, is somewhat arid in nature and does not provide an optimum environment. However, there are areas scattered throughout the state, especially in the mountains, where the environment is more suitable for phorids to live. On the other hand, knowledge of the flies maybe limited due to inadequate collections. These flies are very small in size, about one to three millimeters in length. Their small size plus their habits of living in heavily vegetated places are good reasons why they are not often noticed and collected.

Very little work has been done on the Phoridae of Utah and to the knowledge of the writer no work has been done at all on the family as a group. There has been general distributional work done on some members of the family. Knowlton and Kordos (1951) reported Megaselia sp. as being at American Fork, Corinne, Farmington, Honeyville, from August to September. Knowlton and Hanson (1953) reported Megaselia sp. as being collected in Midvale on August 15, 1952. Finally, Knowlton, Harmston and Stains (1939) reported the occurrence of Megaselia borealis (Malloch) at Snowville, September 13, 1930 and Megaselia iroquoiana (Malloch) at Hooper, Utah, September 3, 1937. The latter species was reared from the larvae of the tomato fruitworm, Heliothis obsoleta F.

A different approach was employed here in writing descriptions of species. The approach was to take one morphological character at a time and discuss it, then another and another, etc. in outline form rather than the standard paragraph form. This was done with the thought that this procedure should make classification simpler when one character was

being compared on different specimens (or species) at the same time. In addition, it should make the reading of the descriptions easier for those unfamiliar with these flies. Another thought incorporated in the descriptions was to pick certain morphological characters and follow them throughout all species of the family. It will be noted however that a few exceptions to this procedure do occur.

All of the drawings are original, except figures 17, 27, 28, 29, and 30. Whenever possible the descriptions are those of the writer. However, as with the above mentioned figures, it was found necessary to rely on previous work due to the lack of numbers and of good specimens. This was also the case where male and female descriptions were used when only the opposite sex was available. Rather than single out specific instances for reference credit in the descriptions, the writer prefers to acknowledge credit generally at this time. This is because of the many varied and brief instances where references could be made.

Generally speaking, in the genus Phora the works of Schmitz (1950) and Schmitz and Wirth (1954) should be given credit for supplying various pointed remarks and missing facts i.e., variations in numbers of tibial bristles, in lengths of bodies, in wing veins and hairs and so on. A similar situation holds true for the genus Megaselia and the works of Brues (1903) and Malloch (1912).

Rather than make the illustrations conform to a certain scale the writer preferred to make the majority of them of relative size to each other within characters, i.e., wing of Puliciphora nudipalpis (fig. 7) and

wing of Chaetoneurophora caliginosa (fig. 8) or right arm of genital forceps* of Phora americana (fig. 20) and right arm of forceps of Phora tripliciseta (fig. 22).

The main sources used for identification of the specimens (in addition to those previously identified correctly) were papers by Brues (1903), Malloch (1912), Curran (1934), Schmitz (1950) and Schmitz and Wirth (1954).

A list of incompletely and questionably identified phorids is included in the appendix to serve as a basis for further investigation. The major portion of these specimens belong to the genus Megaselia, a genus much in need of revision and further work.

---

*May also be called right arm of hypopygium.

FAMILY CHARACTERISTICS*

The Phoridae are small yellow, brownish, or black flies with a somewhat large and arched thorax. Because of the arched thorax they are often called the "hump-backed" flies (frontis).

They are commonly found in heavily vegetated areas where there is usually abundant shade and moisture. They may be found along grassy stream banks, in meadows and along shady lanes. Many of these flies have been taken from windows (Malloch, 1912). Few phorids have been found together at one time, however, some have been seen dancing through the air in swarms.

Some species of Phoridae live in ant nests, either as parasites, symbionts or commensuls. There are also phorids which are found around decaying vegetation and animals (even on exhumed human bodies, Malloch, 1912). In Utah one species, Megaselia iroquoiana (Malloch), has been reared from the larvae of Heliothis obsoleta F., the tomato fruit worm (Knowlton, Harmston and Stains, 1939).

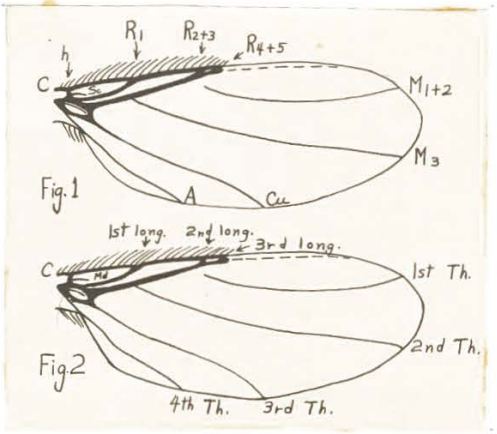
From the above discussion it can be seen that the habits of Phoridae are quite diversified and unusual. For more detailed discussion and data on the habits of phorids see Brues (1903) and Malloch (1912).

---

* Refers to family in general not specifically to Utah members unless otherwise stated.

In addition to the few morphological characters previously mentioned there are others quite distinctive within the family as well. Some of the more important characters are the wing veins, legs (bristles, shapes, etc.), genitalia, antennae, frontal and thoracic bristles.

The phorids have a rather unique wing venation (figs. 1, 2, 27, 28, 29). The wing veins consist of two different types, the large thickened veins at or near the anterior edge of the wings (when the wings are held at right angles and horizontal to the body), and the thin-lined veins on the apical and posterior portions of the wings. The large veins run more or less parallel to the anterior and posterior margins of the wings. They are in general about half the wing length (figs. 1, 2, 7, 8). The thin veins run at more or less oblique angles to the wing margins with their proximal ends near or connecting to the large veins and their distal ends at or near the apical and posterior wing margins.



Two methods of naming the phorid wing veins are that employed by Comstock (1950), the "Comstock-Needham System" and that by

Malloch (1912) and others (figs. 1 and 2). Keys to the lettering follow.

"Comstock-Needham System"

a, anal vein; C, costa; Cu, 1st cubital vein; h, humeral cross vein; M_{1+2}, fused first and second medial veins; M_3, third medial vein; R_1 first radial vein; R_{2+3} and R_{4+5}, fused second and third and fused fourth and fifth radial veins, respectively; Sc, subcostal vein.

Malloch, etc.

Md, mediastinal vein; C, costa; 1st- 2nd- 3rd long., first second and third longitudinal veins; 1st-2nd-3rd-4th Th, first, second, third and fourth thin veins.

The "Comstock-Needham System" will be employed in this work and since some writers prefer the other method it was felt necessary to include it to help avoid confusion.

The wings are fairly large and very thin and delicate. They may be absent as in females of Puliciphora, but when present they range from clear to dusky or darkened.

There is some variation in the wing venation of the family with the different veins being absent in various genera and species. The subcostal, R_{2+3} (fig. 7) and anal veins are those most frequently absent.

A comb-like row (or rows) of bristles usually occurs on the anterior margin of the costal vein and is somewhat distinctive among various species. The costal divisions are rather distinctive in certain cases also, such as M. vulgata, M. divergens, and M. difficilus. They include two or three portions of the costal vein which are made by the intersecting radial veins. Division I extends from the humeral crossvein to the intersection of vein R_1 with the costal vein, while division II extends from

the termination of division I to the intersection of vein R_{2+3}, if present. If absent, then division II extends to apex of costa or intersection of R_{4+5}. In genera where vein R_{2+3} is present the costa is divided in three, division III extending from end of II to intersection of R_{4+5}.

The legs are usually large and long (frontis), especially the hind or metathoracic pair, and enable the flies to readily jump and hop about. They have large laterally flattened femora (fig. 15) and tarsal segments which are often dilated (fig. 14), a specific character within different genera. The tibiae are of importance primarily because of the long stout bristles or spines they may or may not possess; especially is this true of Phora (fig. 3) and Chaetoneurophora (fig. 10).

Some parts of the genitalia (arm of hypopygium, etc.) have good distinguishing taxonomic characters. A few parts of the male genitalia of some members of the genus Phora are shown in figures 13, 16, 18, 19, 20, 21, 22, 23, 25, and 26 (labeling after Schmitz and Wirth, 1954).

The hypopyguim, which in certain Diptera, is the last abdominal segment with its inner copulatory organs, is modified into clasping organs in the genus Phora for mating purposes. These clasping portions are shown in part in the above mentioned drawings. It will be noted that the right and left sides of the hypopyguim are very different from each other. The differences serve as useful taxonomic characters on the species level, this being especially true of the parts called right and left arms of the genital forceps in the foregoing figures. Male Megaselia genital structures are shown in figure 4 for comparison. Also those of a female

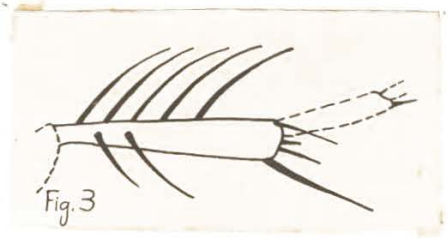


Fig. 3

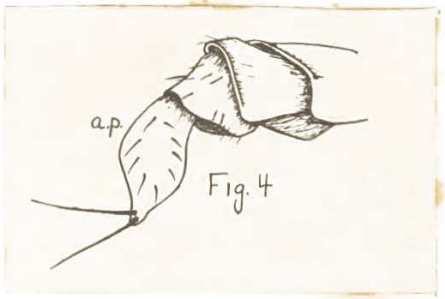


Fig. 4

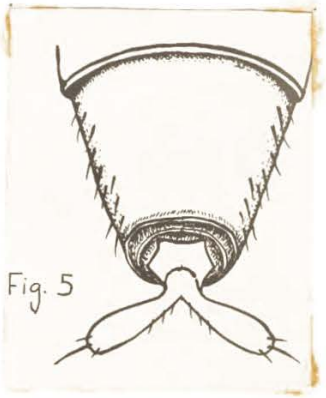


Fig. 5

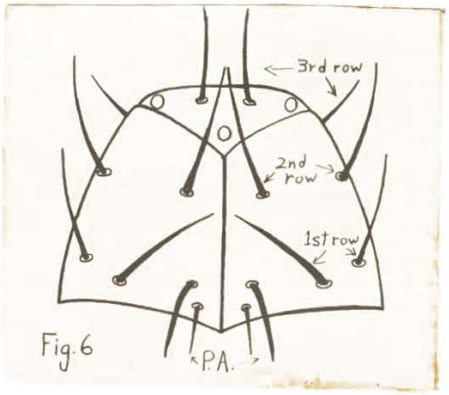


Fig. 6

Phora are shown in figure 5.

The antennae are rather different from those of other flies in that they appear to be a single globular or conical segment. In reality they consist of three separate segments, the first of which is quite small and the second is more or less enclosed in the third. The third segment is a large readily visible ball- or cone-like structure which obscures the other two. A three-jointed arista may be found at the terminal end or, more frequently, on the dorsal surface of the third segment. It is a long filamentous bristle which is useful in the determination of some species.

The frontal bristles, which occur on the frons or front of the head between the eyes, are generally used as generic or specific characters for identification purposes. Their arrangement is useful because of the diversity between genera and also species (figs. 6, 9, 11, 12, 24, 32).

The thoracic bristles are also useful taxonomic instruments due to their varied arrangements, especially on the pleurae (fig. 31) and scutellum.

THE GENERA

To date the genera definitely found in Utah are: (1) Phora, (2) Puliciphora, (3) Hypocera, (4) Borophaga, (5) Chaetoneurophora, and (6) Megaselia.

From all evidences found by the writer only the genus

Megaselia has been reported as being found in Utah in entomological or other literature. The remaining genera appear as new records reported for the state even though most of them have been identified for some time.

The Utah genera as a whole fit into two large groups, the first has vein R_{2+3} absent (fig. 7) while in the second group this vein is present (fig. 8). The genera of each group are listed in the key to the genera which follows.

KEY TO THE GENERA

		Page
1.	Wing vein R 2 + 3 absent (fig. 7) 2	
	Wing vein R 2 + 3 present (fig. 8) 5	
2.	Post-antennal bristles reclining back toward vertex of head (figs. 12, 17, 24) or absent; female generally winged 3	
	Post-antennal bristles projecting downward between antennae, at least erect or straight out (fig. 9); female wingless* ..... Puliciphora	26
3.	Post-antennal bristles present 4	
	Post-antennal bristles absent ..... Borophaga	30
4.	Velvety black species, mid tibiae with several (generally more than two) long spines or bristles on basal one- or two-thirds (fig. 3) ..... Phora	14
	Not velvety black species, mid tibiae with only two spines on basal one-third ..... Hypocera	29
5.	Tibiae with bristles or spines other than those at apex (fig. 10), post-antennals reclining (fig. 11) Chaetoneurophora	33
	Tibiae without bristles or spines other than those at apex, post-antennals projecting downward between antennae (fig. 6) ..... Megaselia	36

*For drawing of female see Curran (1934, p. 235).

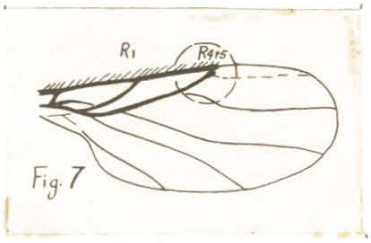


Fig. 7

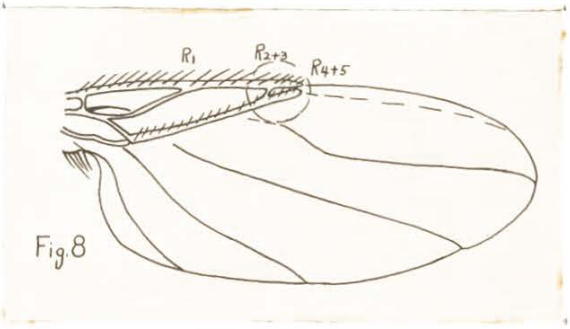


Fig. 8

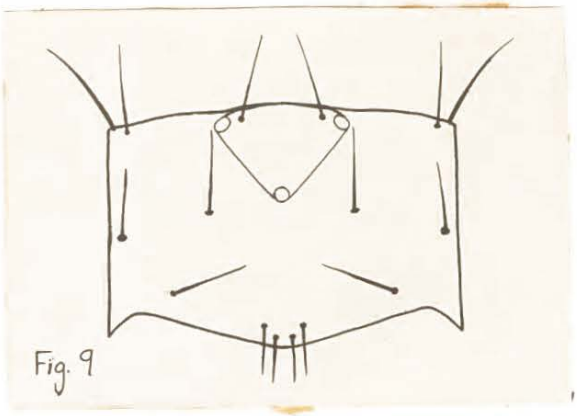


Fig. 9

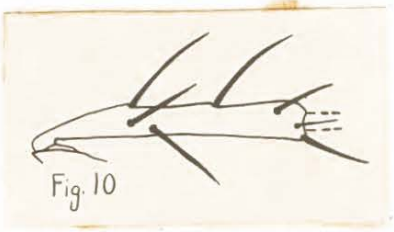


Fig. 10

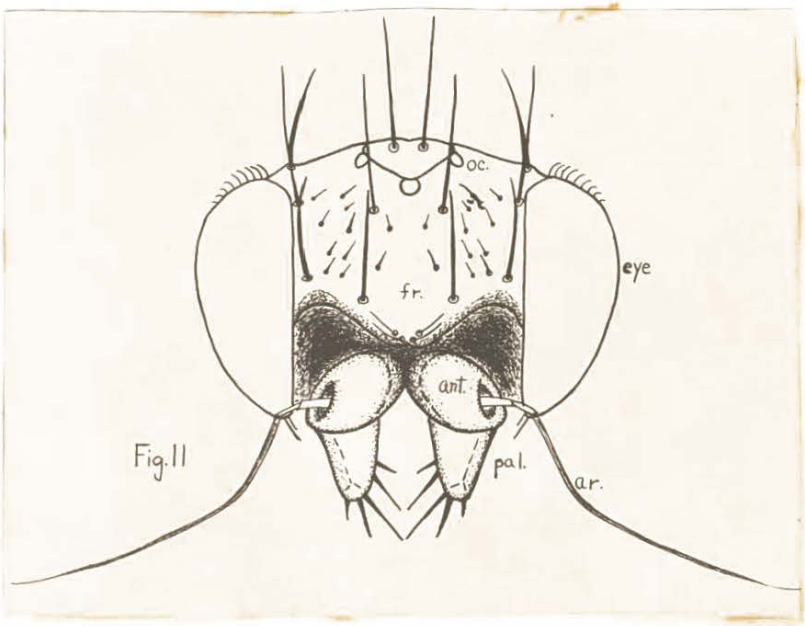


Fig. 11

PHORA Latreille 1796*

The genus Phora may be separated from the other Utah genera by the black velvety appearance of its members. The velvety appearance is rather strikingly contrasted by clear hyaline wings, large light-colored compound eyes and white ocelli.

This genus is rather difficult to work with on the species level because there are so few morphological characters that differ much among the species. There are however a few characters which are quite reliable because of their variation among the species and consistancy within a single species. Some of these more reliable characters are the variations of male genitalia (figs. 18, 19, 20), frontal bristle arrangements (figs. 12, 17, 24), and numbers of tibial bristles.

The females of the genus often vary slightly from the males, with the most constant variations being their less velvety appearance, a wider frons, and a smaller number of dorsal mid tibial bristles. The females are extremely difficult to separate from each other because of their being so much alike, even more so than the males. Consequently most work in this genus has been done on the males.

---

*Phora is the name we know this genus by today. At one time it was considered Trineura by some authorities, with another group represented as Phora. The latter group has been broken up with some of the North American species going to such genera as Chaetoneurophora, Truphenoeura, Paraspiniphora, Megaselia, and Dohrniphora.

Phora is the next largest genus in this study with reference to numbers of species. There are six species of Phora which have been collected and identified to date.

KEY TO THE SPECIES OF PHORA

		Page
1.	Frons parallel sided (fig. 12); right side of hypopygium lengthened into a wide flat process (fig. 13) .... P. aerea	18
	Frons distinctly narrowed toward vertex (figs. 17 and 24); hypopygium not as above 2	
2.	Fore tarsal segments much dilated (fig. 14); ventral projection on hind femur with several short stout bristles (fig. 15); right arm of forceps as in fig. 16 ..... P. montana	19
	Not as above; if fore tarsal segments are dilated then only scarcely to moderately so; a few hairs, but not bristles may be present on femoral projection 3	
3.	Frons with a pair (or two pair) of extra, long bristles between antial and anterolateral bristles (fig. 17), female normal; mid tibiae with three, rarely two, in male (two in female) anterior bristles ..... P. tripliciseta	20
	Frontal bristles normal; mid tibiae with only one or two anterior bristles 4	
4.	Mid tibiae with two anterior bristles 5	
	Mid tibiae with one anterior bristle 6	
5.	Costal cilia long; right arm of hypopygium as in fig. 18 ..... P. coangustata	21
	Costal cilia short to moderately long; right arm of hypopygium as in fig. 19 ..... P. stictica	23
6.	Right arm of hypopygium as in fig. 19 ..... P. stictica*	23
	Right arm of hypopygium as in fig. 20 ..... P. americana	24

* P. stictica appears twice in key because some specimens bear either one or two anterior mid tibial bristles or even one on one tibia and two on the other (Sch. and Wir., 1954).

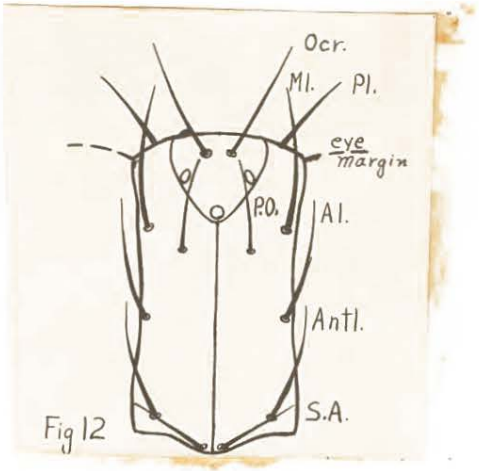


Fig 12

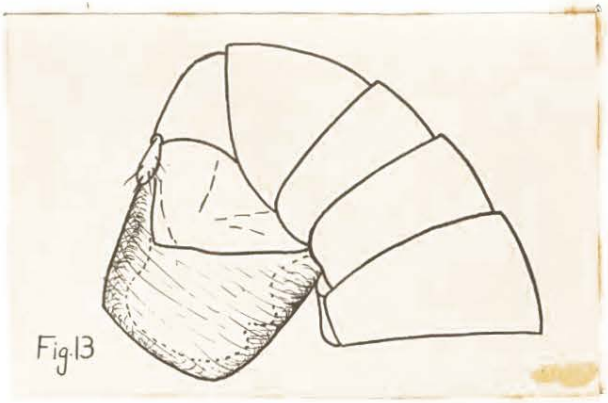


Fig.13


Fig.14

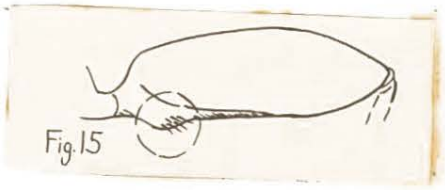


Fig.15

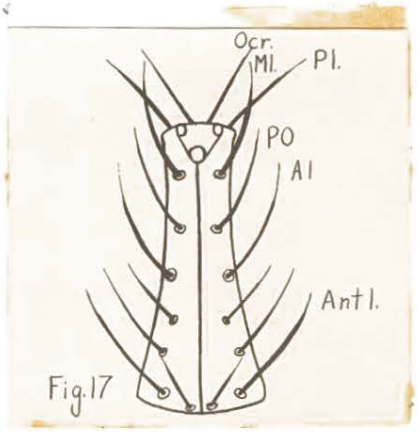


Fig.17

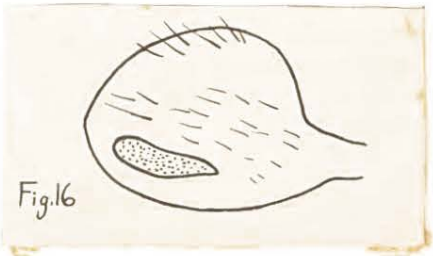


Fig.16

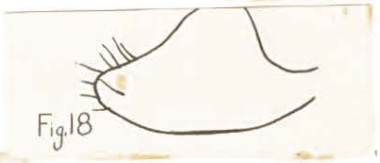


Fig.18

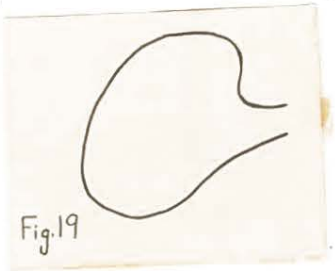


Fig.19

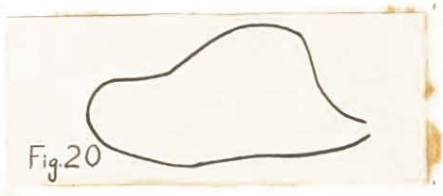


Fig.20

PHORA AEREA Schmitz

I. Color: Velvety black.

II. Length: 1.2 - 2.5 mm. (male), 2 mm. (female).

III. Frons: Rather convex, parallel sided and narrow in male, about one-fourth total head width (fig. 12), somewhat wider in female, about two-sevenths total head width; supra-antennal bristles less than half as long as others; pre-ocellars moved closer to mediolaterals than normal and longer than supra-antennals; small hairs on anterior portion of frons rather short.

IV. Antennae: Black; normal; arista about same length as frons.

V. Palpi: Black; normal.

VI. Thorax: Dorsum velvety black; dorsal bristles strong, especially the very large ones about wing base and posterior margin; pleurae bare; coxae with few rows of strong bristles or hairs.

VII. Scutellum: Two very long marginal bristles present.

VIII. Legs: Lighter and more brownish than coxae; covered with short hairs, general appearance similar to those of other Phora (Frontis); four last fore tarsal segments slightly flattened or dilated; mid tibiae with three (female) or four or five (male) dorsal bristles or spines; only one anterior mid tibial bristle present; hind tibiae with one anterior bristle.

IX. Wing: Clear; little more than twice as long as broad; costa to half length of wing, division I generally equal to II; costal fringe little longer than width of costal vein, slightly longer in female; thin veins light but all present, also colorless; vein M_{1+2} slightly bent at base, ending in wing margin.

X. Abdomen or Genitalia: Ventral part of hypopygium on right lengthened into a wide flat process (fig. 13), left half much shorter.

XI. Discussion and Data: This species is generally smaller than most members of the genus. However, one large male is present in

the B. Y. U. collection which is nearly 2. 5 mm. long. It is labled Utah Lake, West Side, Agnes Hardy. Also present at the time of this study were one male (A), Logan Canyon, Ut., Aug. 11, 1938, D. E. Hardy and G. S. Stains; also one female (A), Logan Canyon, Ut., Aug. 4, 1938, D. E. and Agnes Hardy. The latter specimen was previously classified as P. aterrima, which has been found not to inhabit North America thus far, though it has been reported many times. Most of the specimens in North America taken for P. aterrima are in reality P. aerea (Schmitz and Wirth, 1954).

PHORA MONTANA Brues

I. Color: Velvety black.

II. Length: At least 2. 5 mm.

III. Frons: Wider anteriorly than at vertex; pre-ocellars placed farther from median ocellus than in P. aerea; supra-antennals less than half as long as large bristles.

IV. Antennae: Black; normal; arista long, about length of frons.

V. Palpi: Black; a little small.

VI. Thorax: Velvety black; strong dorsal bristles with very large long bristles at wing base and posterior margin; pleurae bare, partly shining; coxae shining with rows of bristles on outer margins.

VII. Scutellum: Two large marginal bristles present.

VIII. Legs: All legs very dark red-brown to shiny black, fore legs, especially fore tibiae lighter and yellowish; five to six dorsal mid tibial bristles in male, only two in female; one anterior bristle on both hind and mid tibiae; fore tarsal segments numbers two to five distinctly dilated, as broad as long (fig. 14); hind femora with several short stout bristles on ventral projection (fig. 15).

IX. Wing: Clear with slightly yellowish on anterior basal portion; distinctly more than twice as long as broad; costa just beyond middle of wing length, division I and II almost equal; costal fringe about equal to costal vein width; even thin veins with some color; anal vein light but present; vein M_{1+2} rather strongly bent at base and ending in wing margin.

X. Abdomen or Genitalia: Hypopygium normal size, shining black;

right arm of forceps with narrow neck on anterior third, posterior two-thirds rounded, the dorsal margin extremely convex (fig. 16); left arm with several stout bristles; the upper and lower margins of the lobus inferior end posteriorly in points while the most posterior portion is a rounded thumb-like projection with membranous sinuses on either side (fig. 21).

XI. Discussion and Data: A distinct large species. Two males (A), Logan Canyon, Aug. 7-38, D. E. and A. T. Hardy; one specimen (A), Cedar Breaks, Aug. 31, 1938, G. F. Knowlton. (This specimen has not been seen by the writer.)

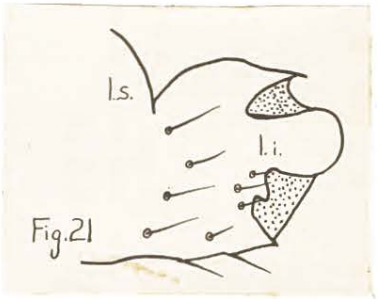


Fig. 21

PHORA TRIPLICISETA Schmitz and Wirth

I. Color: Rich velvety black.

II. Length: 2.25 - 2.8 mm.

III. Frons: Distinctly narrowed toward vertex, vertex about one-half as wide as anterior portion of frons; frons of uniform width in female, male with one or two pair of extra, long bristles between the anterolateral and antial bristles (fig. 17), the pre-ocellars brought into a vertical line with the large lateral and antial bristles; female bristles* of normal number and position but rather shorter than in male. However, the fine hairs are not shortened thus approaching the size of the large bristles; fine hairs in male about one-half the length of the bristles.

IV. Antennae: Black; normal; arista about equal to frons length.

V. Palpi: Black with normal bristles.

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*Female description based on Schmitz and Wirth, 1954, due to lack of specimens.

VI. Thorax: As in other members of the genus.

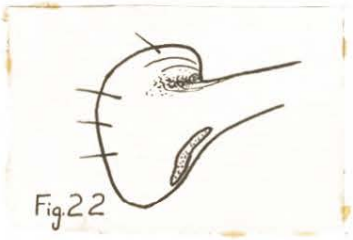
VII. Scutellum: With normal two marginal bristles.

VIII. Legs: Black, fore tibiae and fore tarsi paler (all black in female) as in P. coangustata, male with three (rarely two) anterior mid tibial bristles, female with two (sometimes three); one hind tibial bristle*; eight to eleven dorsal mid tibial bristles in the male, three to four in female; fore tarsal segments slightly broadened, more so in female which also has a reduced end segment.

IX. Wing: Slight yellowish tint basally, rest clear; over twice as long as broad; costa slightly over half wing length (female somewhat shorter than male), divisions I and II about equal; costal fringe long; thin veins pale; anal vein almost shadow-like.

X. Abdomen or Genitalia: Hypopygium black, shining; smaller than normal, half hidden; right and left arms of forceps as in figs. 22 and 23.

XI. Discussion and Data: Five males (B), Aspen Grove, 6-10-55, LaVell King.



PHORA COANGUSTATA Schmitz
(FRONTALIS Schmitz)

I. Color: Rich velvety black.

II. Length: 2.5 - 3 mm.

III. Frons: Narrowing toward vertex in male, in female broader and of more uniform width; males with rather long bristles, female

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*The writer has collected one specimen with two hind tibial bristles, Aspen Grove. 6-55.

shorter; bristles and hairs normal (fig. 24); supra-antennals normal (about one-half large bristle length).

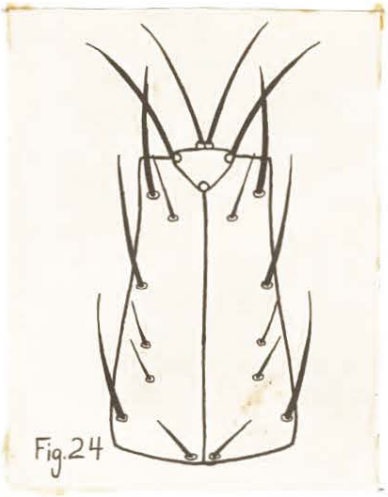
Fig. 24

IV. Antennae: Black; normal; with brownish tinged hairs on anterior end; arista at least as long as frons.

V. Palpi: Black, with strong bristles.

VI. Thorax: As in P. montana.

VII. Scutellum: Two large posterior marginal bristles present.

VIII. Legs: Black, with fore tibiae and fore tarsi paler, fore tibiae somewhat lighter in color on dorsal surface than on inner-ventral surface; two anterior mid tibial bristles*; one anterior hind tibial bristle; male with five to nine posterior mid tibial bristles, female with four (rarely three); fore tarsal segments only slightly dilated, female less so.

IX. Wing: Very slight yellowish tint basally, otherwise clear; over twice as long as broad; costal vein slightly over half wing length (female shorter than male), divisions I and II about equal, if

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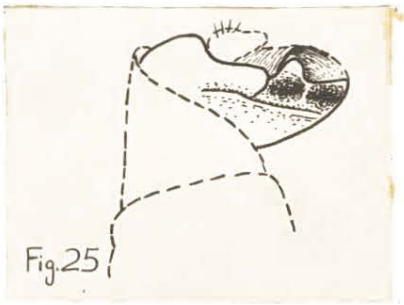
*One specimen has only one anterior bristle on mid tibiae.

any difference I longest; costal fringe moderately long in male, about 2. 5 - 3 times costal vein width; fringe longer in female; thin veins colorless to black, all present; vein M_{1+2} slightly bent at base but straight thereon to wing margin.

X. Abdomen or Genitalia: Hypopygium black, shining; normal size; right arm of forceps with a high arching very convex dorsal margin; basal third constricted somewhat like in P. montana, distal third slightly narrowed also, middle third much wider (fig. 18); left arm as in fig. 25, shaded areas indicated a bi-lobate cavity which Schmitz states occurs in dried specimens (Schmitz 1950).



XI. Discussion and Data: Two male specimens (B), Aspen Grove, Utah Co. Ut., 6-55 LaVell King. One male (B), Utah Lake West Side, Utah Co., Ut., Agnes Hardy.

PHORA STICTICA Meigen

I. Color: Velvety black.

II. Length: 2-3 mm. or more.

III. Frons: Normal, similar to P. montana and coangustata; narrowed toward vertex.

IV. Antennae: Black; normal; arista about as long as frons.

V. Palpi: Black.

VI. Thorax: Dorsal bristles slightly longer than normal, otherwise as in P. montana.

VII. Scutellum: Normal; with the regular two large marginal bristles.

VIII. Legs: Black, fore tibiae and fore tarsi somewhat lighter and more brownish; mid tibial anterior bristles variable from one to two, or even one on one leg and two on the other in one specimen; one anterior hind tibial bristle; five to seven dorsal mid tibial bristles (two to five in female); fore tarsi somewhat broadened especially fourth segment which is about as broad as long.

IX. Wing: Clear, but with yellowish basal tint; about 2.5 times as long as broad; costal vein about one-half wing length, divisions I and II about equal, if any difference I usually, but not always, shortest; costal fringe short to moderately long, up to about twice the costal vein width; thin veins all present and lightly colored; vein M_{1+2} curved at basal third, also usually a slight recurve on apical fourth or fifth.

X. Abdomen or Genitalia: Hypopygium black, shining; normal size; right arm of forceps with basal third constriction, dorsal margin rather convex, distal end bluntly rounded, the whole right arm somewhat spatulate-shaped (fig. 19).

XI. Discussion and Data: One male (A), Woodland, Ut., 8-11-38, G.F. Knowlton, F.C. Harmston.

PHORA AMERICANA Schmitz and Wirth

I. Color: Rich velvety black.

II. Length: 2.1-2.8 mm.

III. Frons: Vertex narrower than anterior portion of frons; bristles normal in number and position (similar to fig. 18), however, shorter than most other members of the genus; fine hairs quite short, about one-fourth as long as bristles (more numerous and longer in female).

IV. Antennae: Black; normal; arista about equal to frons length.

V. Palpi: Black; normal.

VI. Thorax: As in P. montana, with the exception of the fine dorsal hairs which are rather sparse and short.

VII. Scutellum: Normal; two marginal bristles.

VIII. Legs: Black; with usual coloring, occasionally with hind and mid

tibiae and tarsi lighter besides on fore legs; one anterior bristle on both hind and mid tibiae; mid tibiae with four to six dorsal bristles; fore tarsi very slightly broadened and variable; hind femoral projection (fig. 15) with three or four erect hairs (not bristles).

IX. Wing: Slight yellowish tint basally, rest clear; slightly over twice as long as broad; costa half of wing length; divisions I and II about equal; costal fringe moderate; thin veins pale; vein M_{1+2} with slight basal curve then straight to wing margin; anal vein appears as an incomplete shadow or fold.

X. Abdomen or Genitalia: Hypopygium black, shining; right and left arms of forceps as in figs. 20 and 26; left arm actually divided; right arm somewhat similar to P. Coangustata except the posterior end is larger, the middle not so high and convex and with two more or less membranous areas in middle third.

XI. Discussion and Data: Eight males (B) Provo, Utah environs, D. Elmo Hardy.

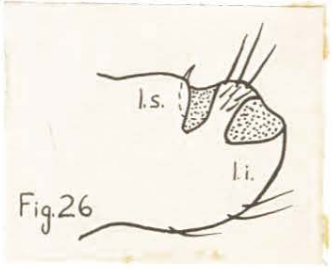


Fig. 26

PULICIPHORA Dahl 1897

Puliciphora is a rather unique genus because it is one of the few genera which contains wingless members. Wingless phorids are always females which often look very different from the males (Curran, 1934, p. 235). None of these wingless females have been taken in Utah and only four males have been taken to date. The four males include two species, P. nudipalpis Malloch and P. palposa Malloch.

The Utah Puliciphora studied are rather small flies which are only one to one-and-one-half millimeters in length. They are brown to brownish black in color and have very long palpi.

KEY TO SPECIES OF PULICIPHORA

		page
1.	Costa to about three-fifths wing length (fig. 7), palpi about as long as head height with short weak bristles. ..... P. nudipalpis	27
	Costa to just beyond one-half wing length (fig. 27), palpi about as long as head height, with long delicate bristles. ..... P. palposa	28

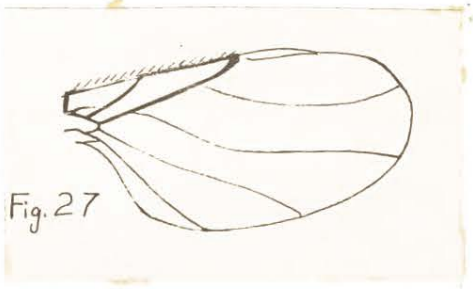


Fig. 27

PULICIPHORA NUDIPALPIS Malloch

I. Color: Brown to brownish black, subshining.

II. Length: 1 - 1.2 mm.

III. Frons: About twice as broad as long in center, with numerous short hairs in addition to regular bristles; four nearly equal post-antennal bristles, which project downward between antennae; first row bristles usually on anterior lateral angle of frons, about one-fourth of the width of frons from eye-margin, strongly incurved.

IV. Antennae: Brownish; normal size; arista distinctly longer than breadth of frons; pubescent, the facial marginal bristles not as strong as in palposa.

V. Palpi: Very long, nearly as long as height of head, not spatulate but broad, nearly parallel sided, their bristles very short and weak.

VI. Thorax: Dorsum brownish, dull, pubescent; scutellum rather small, triangular, with only two marginal bristles; pleurae brown, slightly shining.

VII. Scutellum: Small, triangular; only two marginal bristles.

VIII. Legs: Yellowish; apical spurs on mid and hind tibiae very minute.

IX. Wing: Clear (fig. 7); costa definitely to beyond middle, sometimes to three-fifths wing length; division I distinctly shorter than II; costal fringe microscopic; vein R_{2+3} absent; vein M_{1+2} barely bent at either base or apex; halteres brown.

X. Abdomen: Brownish black, segments subequal, with scattered hairs, those on lateral margins and posteriorly on last two segments longest.

XI. Discussion and Data: Two males (B), B. Y. U. Campus, Provo, Utah., LaVell King; one male (A), Menden, Ut., 6-21-38, D. E. Hardy and G. S. Stains.

PULICIPHORA PALPOSA Malloch

I. Color: Brownish-black, subshining.

II. Length: 1.5 mm.

III. Frons: More than twice as long as broad; only two distinct post-antennal bristles, which are erect and divergent; * a pair of inwardly directed bristles on lateral angles, the second row and ocellar bristles normal.

IV. Antennae: Brownish-black; rather large; arista longer than breadth of frons; distinctly pubescent, a row of bristles on facial margin close to eyes, of which the upper two are strongest and situated very high up close to base of antennae.

V. Palpi: Brown; about as long as height of head, spatulate; with about three or four rather long, widely placed bristles at apical third.

VI. Thorax: Dorsum brownish black, slightly shining, pubescent; pleurae dull brown.

VII. Scutellum: Two bristles which are placed rather far forward.

VIII. Legs: Pitchy; mid and hind tibiae with minute end spurs.

IX. Wing: Infuscated, especially along veins; costa to beyond middle; division I distinctly shorter than II; anal margin more produced than in nudipalpis (fig. 27); vein R_{4+5} slightly dilated at tip; vein M_{1+2} curved both at base and tip.

X. Abdomen: Black; second segment slightly elongated; lateral margins of segments and posterior margins of last two with short hairs.

XI. Discussion and Data: One specimen reported to the writer as present in U.S.A.C. collection. The writer has not seen this specimen but felt it advisable to include its description and wing (fig. 27) based on the work of Malloch (1912).

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* This pair is probably the center pair of the first row and the post-antennals are therefore really absent. Malloch (1912).

HYPOCERA Lioy 1864

Due to the unavailability of proper information and material no description of the genus Hypocera or any member will be made at this time.

The writer has not seen any specimens of Hypocera although one was reported to him as being present in the entomological collection at the Utah State Agricultural College. For this reason it is thought advisable to include this genus in the key to the genera.

The label data on the above specimen are Hypocera (near) vitripennis (Meigen), Logan Canyon, Aug. 1, 1938, D. E. Hardy - G. S. Stains.

BOROPHAGA Enderlein 1924

(=HYPOCERA in part)

Borophaga differs from other Utah genera in that its members lack post-antennal bristles.

Members of the genus Borophaga are rare in the United States as well as Utah. Only two specimens have been taken in Utah, one was B. clavata (Loew), the other was B. femorata (Meigen).

KEY TO SPECIES OF BOROPHAGA

		page
1.	Antennae and palpi yellowish; vein M_{1+2} with large rounded bend (fig. 28); anal vein rather short and incomplete ..... B. clavata	31
	Antennae and palpi black; vein M_{1+2} with sharp bend (fig. 29); anal vein almost complete .....B. femorata	31

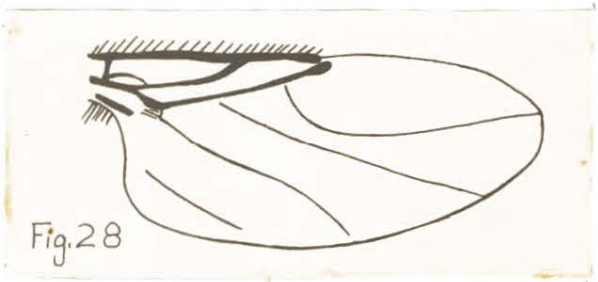

Fig. 28

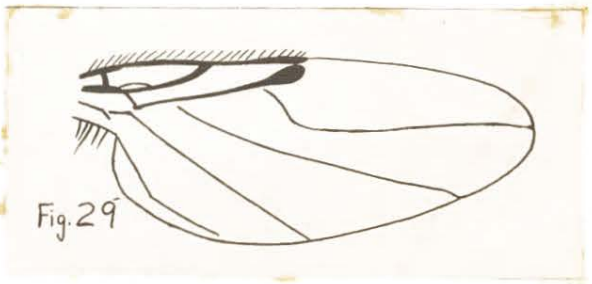

Fig. 29

BOROPHAGA CLAVATA (Loew)

(=HYPOCERA CLAVATA Loew)

I. Length: At least 2.5 mm.

II. Frons: Wide; post-antennals absent.

III. Antennae: Yellowish; arista dorsal, at most subapical.

IV. Palpi: Yellowish.

V. Legs: Mid tibiae with two spines on basal third and one subapical spine near apex; hind tibiae with one spine other than those at apex (fig. 30).

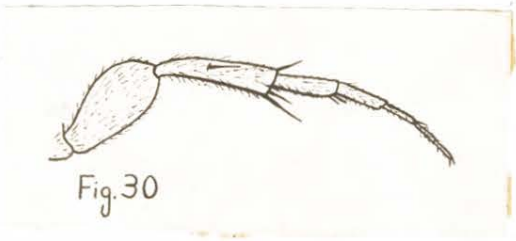

Fig. 30

VI. Wing: Costa about half length of wing; vein R_{2+3} absent; vein R_{4+5} with small knob at apex; vein M_{1+2} with large rounded bend at basal third then straight, gradually moving anteriorly, to apex of wing; anal vein present but not reaching either basal angle of wing or wing margin (fig. 28).

VII. Discussion and Data: One specimen (A), Huntsville, Ut., June 4, 1938, G. F. Knowlton, G. S. Stains. This specimen has not been seen by the writer.

BOROPHAGA FEMORATA (Meigen)

(=HYPOCERA FEMORATA Meigen, H. FLAVIMANA Meigen)

1. Length: At least 2.5 mm.

II. Frons: Wide; post-antennals absent.

III. Antennae: Black; arista dorsal, at most subapical.

IV. Palpi: Black.

V. Legs: Mid tibiae with two spines on basal third and one subapical near apex; hind tibiae with one spine other than those at apex.

VI. Wing: Costa about half length of wing; vein R_{2+3} absent; vein R_{4+5} with a rather large knob at apex; vein M_{1+2} with sharp bend on basal third, then straight to wing tip; anal vein almost reaching basal angle of wing and wing margin (fig. 29).

VII. Discussion and Data: Rare in the United States. One specimen sent to the United States National Museum, data unavailable.

CHAETONEUROPHORA Malloch 1912

(Formerly CHAETONEURA of 1909 which was already preoccupied)

Chaetoneurophora may be separated from other Utah genera, except Megaselia, by the presence of vein R_{2+3} (fig. 8). It may be distinguished from Megaselia by the presence of bristles on the basal portion of the tibia as well as at the apex (fig. 10). In addition, Chaetoneurophora has reclining post-antennal bristles (fig. 11) while Megaselia has downward-projecting post-antennals.

Only one specimen of this genus has been taken in Utah thus far. A single specimen of Chaetoneurophora caliginosa Meigen was taken in Snowville, Utah, May 12, 1930.

CHAETONEUROPHORA CALIGINOSA Meigen

(= URBANA Meigen)

I. Color: Brown.

II. Length: 2.65 mm.

III. Frons: As broad as long; almost half head width; dark red-brown, subshining four nearly equal post-antennals, upper pair almost directly above lower pair; upper three rows of bristles on nearly horizontal and vertical planes, except for medial pair in first row which is slightly lower than lateral pair; fine hairs very short (fig. 11).

IV. Antennae: Brown; arista paler and about twice length of frons.

V. Palpi: Bright lemon yellow; bristles black.

VI. Thorax: Black, portions of pleurae lighter, more brownish and subshining; dorsum with very short, insignificant hairs but long, strong bristles laterally and posteriorly; mesopleurae bare.

VII. Scutellum: Rather wide with four large marginal bristles.

VIII. Legs: Brownish yellow to lighter, overcast by large numbers of small black hairs; fore tibiae with one spine other than apical spines; hind tibiae (fig. 10) with five to six black spines; tarsi rather long, the segments gradually shortening from first to fifth; rows of short black bristles and setulae at angles of tarsi; tarsi and pulvilli small.

IX. Wing: Very slightly dusted; costa not especially thickened; vein R_{4+5} bristly along its entire margin (fig. 8), bristles rather short; vein R_{2+3} present, but rather small and short; vein M_{1+2} with a basal bend, straight almost to wing margin then with a small posterior crook; all thin veins present and yellowish to nearly colorless; halters pale.

X. Abdomen: Black, with posterior margins of segments and parts of genitalia paler; genitalia large; scattered hairs over abdominal segments.

XI. Discussion and Data: Occurs about carrion (Malloch, 1912. p. 424); also taken from a mole's nest (Malloch, 1912. p. 412). One specimen (A), Snowville, Ut., May 12, 1930, G. F. Knowlton.

MEGASELIA Rondani 1856

(=APHIOCHAETA)

Megaselia differs from other Utah genera, except Chaetoneurophora, with the presence of the wing vein R 2 + 3 (figs. 1 and 2). It differs from Chaetoneurophora by lacking tibial bristles other than the terminal ones at the apex. The latter genus has large bristles on the basal third of the tibiae in addition to the apical bristles. Megaselia is one of the only two genera in this study to have downward projecting post-antennal bristles, (figs. 6, 32, 33), whereas in the other genera the post-antennals or supra-antennals are reclining. The other genus to have downward projecting post-antennals is Puliciphora which can easily be separated from Megaselia due to its lack of the wing vein R 2 + 3.

Material, data and specimens gathered indicate that Megaselia is the largest genus in Utah in both numbers of species and of individuals. There are twelve species represented in this study, but it will be noted that possibilities of increasing this number arise when one reviews the "Incomplete or Questionable" list in the appendix. The list contains several specimens of Megaselia which cannot be further identified without more careful study and the acquisition of more recent literature when available.

The genus as a whole needs to be studied carefully and revised. Until this is done it will continue to be a somewhat difficult and confusing genus to work with.

KEY TO THE SPECIES OF MEGASELIA

		Page
1.	Mesopleural bristles absent 2	
	Mesopleural bristles present (fig. 31)..... 6	
2.	Wings darkened and dusky..... M. minor	39
	Wings only slightly dusted or clear..... 3	
3.	Frons broader than long (fig. 32) ..... M. rusticata	40
	Frons longer than broad or about as broad as long 4	
4.	Frons longer than broad; halteres black ..... M. borealis	40
	Frons about as broad as long; halteres yellow..... 5	
5.	Two distinct post-antennal bristles; two large marginal scutellar bristles perhaps two small anterior hairs also present; large wing veins flavous .. M. flavinervous	41
	Four post-antennal bristles; four large scutellar bristles, the anterior pair possibly slightly smaller; large wing veins darker and brownish. .....M. iroquoiana	42
6.	Mesopleurae with one strong posteriorly directed bristle on upper posterior angle (fig. 31), additional small bristles may or may not be present..... M. macrochaeta	43
	Mesopleura with all bristles nearly equal or variable, but no one especially stronger than others 7	
7.	Scutellum with four large marginal bristles (anterior pair may be slightly smaller); yellow species..... M. nigriceps	44
	Scutellum with only two large bristles, there may be two small anterior hairs present; black species.....8	
8.	Costa one-third to two-fifths wing length; division I of costa twice as long as II and III together ..... M. divergens	45
	Costa one-half wing length, division I equal to II and III or slightly longer but not twice as long 9	
9.	Frons parallel sided (fig. 33); broader than long; costal fringe very long ..... M. vulgata	46
	Frons narrowing toward vertex (fig. 6); little if any broader than long; costal fringe of moderate length M. difficilis	47

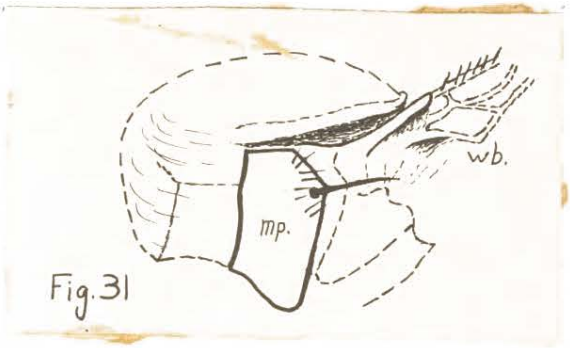

Fig. 31

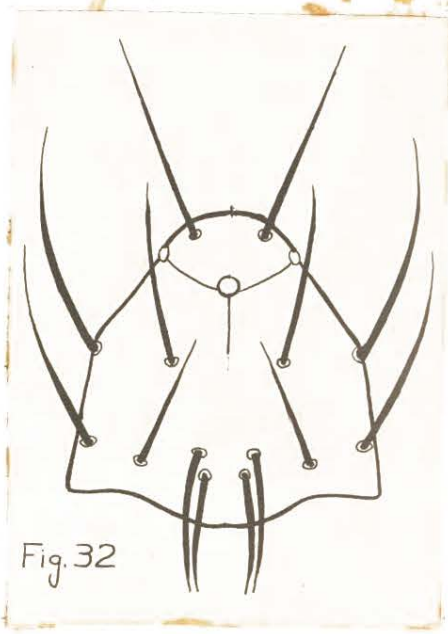
Fig. 32

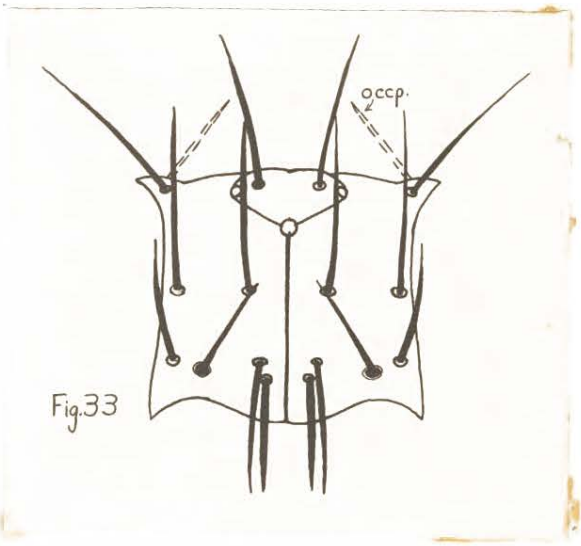

Fig. 33

MEGASELIA MINOR (Zetterstedt)

(= MINUTA Aldrich)

I. Color: Shining black.

II. Length: 1 - 1.5 mm.

III. Frons: Longer than broad; highly polished (less so in female); post-antennal bristles of equal size, upper pair wider apart than lower; center pair of first row bristles somewhat below outer pair and a little further from eye-margin.

IV. Antennae: Black; arista short, barely as long as frons.

V. Palpi: In male large, black or brown; in female normal, yellow.

VI. Thorax: Deep shining black; pleurae shining black; mesopleurae bare.

VII. Scutellum: Two marginal bristles present.

VIII. Legs: Black but more brownish than body; fore coxae and tips of other coxae in male, and fore coxae and fore legs in female yellowish (one male and female present with very little yellowish in areas mentioned).

IX. Wing: Dusky; costa short of middle in male; costa to middle or short of it in female; division I one-and-one-half times as long as II; costal fringe rather short; vein M_{1+2} nearly straight to slightly bent at base; haltere knobs yellow, pedicels brownish.

X. Abdomen: Shining black, anal protuberance lighter to yellowish; few scattered hairs, mainly laterally and posteriorly; segments nearly equal (one specimen with pale very thin bands on posterior margins of segments).

XI. Discussion and Data: "...bred from cocoons of Cimbex americana (Aldrich)", (Malloch, 1912, p. 413). A small distinct species of deep shining black color. Two males (B), Utah Lake East Side, VII-30-55. One male (B), Provo environs, Utah Co., Ut.

One female (B), Brigham City, Utah, V-56, LaVell King.
One female (B), Aspen Grove, Utah Co., Ut., VI-56, LaVell King.

MEGASELIA RUSTICATA (Malloch)

I. Color: Black, shining.

II. Length: 2 mm.

III. Frons: Definitely broader than long, a few scattered fine hairs in addition to regular bristles; vertex raised (fig. 32); lower post-antennal bristles three-fourths as large as upper pair; center pair of first row nearer to outer pair than to post-antennals and very little below the former which are if anything a trifle lower horizontally than the post-antennal pair.

IV. Antennae: Larger than the normal size; arista one-and-one-half times as long as frons, slightly pubescent.

V. Palpi: Black; of rather large size; strongly bristled.

VI. Thorax: Shining; pleurae with lower half glossy; mesopleurae bare.

VII. Scutellum: Two marginal bristles.

VIII. Legs: Black-brown, no distinct hind tibial setulae.

IX. Wings: Brownish, slightly dusted; costa less than half wing length; division I at least one-and-one-half times as long as II and III together, division III two-thirds as long as II; costal fringe long and delicate on distal two-thirds, short on basal third; thin veins fading toward margin, or complete; vein M_{1+2} slightly bent at base, remainder nearly straight, ending before wing apex; halteres black to yellowish.

X. Abdomen: Dull black; segments nearly equal, all segments with numerous scattered short hairs.

XI. Discussion and Data: One male, Monticello, Ut., May 20, 1938, G. F. Knowlton, F. C. Harmston.

MEGASELIA BOREALIS (Malloch)

I. Color: Black, shining.

II. Length: 1 mm.

III. Frons: Shining, longer than broad, thickly covered with fine hairs in addition to regular bristles; lower pair of post-antennals about one-half as large as upper pair; center pair of first row nearly in a horizontal line with upper post-antennals and little further from eye margin than outer pair; outer pair much higher on frons than center pair.

IV. Antennae: Normal, brown-black; arista thread-like except at base, about one-third longer than frons; slightly pubescent.

V. Palpi: Yellow; normal.

VI. Thorax: Shining; pleurae with lower half glossy brown; meso-pleurae bare.

VII. Scutellum: Two distinct bristles perhaps two fine anterior hairs also present.

VIII. Legs: Yellow; hind femora darker, hind tibial setulae (9-10) very weak and widely spaced.

IX. Wing: Clear; costa just short of middle; division I two times as long as II; division III two-thirds as long as II; costal fringe long and delicate, shorter toward base; vein M1+2 slightly curved at base and ending recurved and much before wing apex; halteres black.

X. Abdomen: Dull black; almost bare; segments nearly equal.

XI. Discussion and Data: Listed in distributional list (Knowlton, Harmston and Stains, 1939) Snowville, September 13, 1930, Knowlton. This specimen has not been seen by the writer.

MEGASELIA FLAVINERVIS (Malloch)

I. Color: Brownish black, slightly shining.

II. Length: 1.5 - 2 mm.

III. Frons: Brown, gray dusted, about as broad as long; only two post-antennal bristles which are fairly large and wide apart; occupying about one-fourth the width of frons; outer pair of first row about horizontal to post-antennals, center pair a little lower

and about equidistant between outer pair and post-antennals.

IV. Antennae: Brownish; of rather small size; arista is little longer than breadth of frons.

V. Palpi: Yellow to brownish; normal.

VI. Thorax: Brownish, slightly shining; pleurae partly dull, partly shining; humeri yellow; mesopleurae bare.

VII. Scutellum: Two large marginal bristles, two minute anterior hairs may also be present.

VIII. Legs: Yellow; tips of hind femora and tips of posterior surfaces of hind tibiae dark brown; mid tibiae with very short setulae; hind tibiae and femora strong, the former with distinct dorsal ridge and distinct setulae which are longest on middle.

IX. Wing: Costa to about two-fifths of wing length; division I three times as long as II; division III one-half as long as II; costa and radial veins flavous or yellowish; costal fringe about as long as vein R_{2+3} and very delicate; vein M_{1+2} nearly straight at base and ending much in front of wing apex; all thin veins very fine but distinct; halteres yellow.

X. Abdomen: Brown, segments subequal, no noticeable bristles present.

XI. Discussion and Data: One male (A), Snowville, Ut., Aug. 12, 1929, G. F. Knowlton.

MEGASELIA IROQUOIANA (Malloch)

I. Color: Black, clearly shining; (male specimens at hand much more yellow especially the legs and lower portions of pleurae).

II. Length: 1.3 - 1.5 mm.

III. Frons: Shining, about as broad as long; lower post-antennal bristles about three-fourths as long as upper pair, both pair about the same distance apart (lower pair little closer), neither pair divergent; central pair in first row lower than the upper post-antennal bristles and as near to them as to the outer pair in first row.

IV. Antennae: Normal; arista pubescent, short, about one-fourth longer than frons.

V. Palpi: Yellow; rather strongly and numerously bristled.

VI.. Thorax: Shining; several additional bristles on posterior margin, but are rather weak; pleurae partly shining; mesopleurae bare.

VII. Scutellum: Four nearly equal bristles, anterior pair a little weaker than posterior pair.

VIII. Legs: Piceous in female (yellow in male); fore coxae, fore legs, mid tibiae, and bases of mid and hind femora yellowish; mid tibial bristles indistinct, those on hind tibia widely placed and weak, very indistinct on basal third.

IX. Wing: Grayish; costa short of middle; division I almost three times as long as II; division III more than one-half as long as II; costal fringe long; vein M_{1+2} leaving radial sector at a point rather beyond the fork of veins R_{2+3} and R_{4+5}, it is slightly bent and running nearly straight to much in front of wing apex; a distinct bristle at base of vein R_{4+5}; halteres yellow.

X. Abdomen: Dull black, more shining towards the apex, bristles on lateral margins of second segment small and indistinct.

XI. Discussion and Data: Two males (A), Hooper Utah, IX-3-6-1937, D. E. Hardy, reared from Heliothis obsoleta pupae.

MEGASELIA MACROCHAETA (Malloch)

I. Color: Yellow, with brownish areas mainly on head and abdomen.

II. Length: 1.5 - 2 mm.

III. Frons: Yellow in female, gradually darkening toward vertex in male; slightly longer than broad; four post-antennals lower pair closer together and about three-fourths as large as upper pair; center pair of bristles of first row converging at tips, placed equidistant between outer pair and upper post-antennals.

IV. Antennae: Yellow, lateral sides in male somewhat brownish; arista distinctly pubescent, longer than frons.

V. Palpi: Yellow, strongly bristled.

VI. Thorax: Yellow, dusky to brownish dorsum in male; pleurae yellow; mesopleurae with one strong posteriorly directed bristle on upper posterior angle, smaller bristles may or may not be present (fig. 31).

VII. Scutellum: Two large marginal bristles along with two anterior, weak hair-like bristles.

VIII. Legs: Yellow, male has brownish area at apex of hind femora; a very large ventral spine at apex of mid tibiae and a smaller one at apex of hind tibiae; hind tibial setulae on dorsal surface, about nine to eleven, large and distinct, especially the terminal one at apex.

IX. Wing: Costa to middle or just short of it; division I longer than II and III together in male but not so in female; division III about one-fourth as long as II; fringe longer than width of costa, about three times width in female; vein M_{1+2} beginning at fork of R_{2+3} and R_{4+5}, slightly curved at base, ending before wing apex; haltere knobs yellow, pedicels darkened to yellow.

X. Abdomen: Yellow to more or less brownish in patches, with scattered short hairs; anal protuberance yellowish (fig. 4).

XI. Discussion and Data: One male (A), Farmington, Utah, VI-19-1937, D. Elmo Hardy. Previously classified as M. scalaris (Loew), however, M. scalaris does not have mesopleural bristles as does this specimen, which is a good distinctive difference (Malloch 1912).

MEGASELIA NIGRICEPS (Loew)

I. Color: Yellow, with brownish abdomen.

II. Length: 3.5 - 4 mm. (specimen at hand is only 2 mm.)

III. Frons: Gray dusted; about as long as broad; four post-antennals, lower about one-half the size of upper; center pair of first row lower than outer pair and slightly closer to upper post-antennals.

IV. Antennae: Brown-black; moderate to slightly small in size; arista pubescent and somewhat longer than frons.

V. Palpi: Yellow; fairly large; strongly bristled.

VI. Thorax: Dorsum yellowish though darkened and dusky; pleurae yellow with brownish areas on mesopleurae and about wing base; mesopleural bristles present and all about the same size or variable, no one strong bristle as in M. macrochaeta.

VII. Scutellum: Four large marginal bristles present, the anterior pair may be smaller but are generally somewhat larger than hair-like bristles of other species.

VIII. Legs: Yellow; tips of hind femora darkened; hind tibial setae distinct, about nine to twelve present.

IX. Wings: Costa to middle or slightly beyond; division I as long as II and III together; III one-third to one-half as long as II; fringe long; origin of third vein at rather beyond fork of R_{2+3} and R_{4+5}, bent at base; halteres clear yellow to a brownish caste.

X. Abdomen: Brownish, base of first segment and posterior end of next to last segment paler and yellowish; ovipositor yellow-orange distally, darkened basally.

XI. Discussion and Data: One female (B), B. Y. U. Campus, Provo, Utah, LaVell King.

MEGASELIA DIVERGENS (Malloch)

I. Color: Black or nearly so.

II. Length: About 1 mm.

III. Frons: Distinctly shining; about one-fourth longer than broad; lower pair of post-antennal bristles nearly as large as upper pair; center pair of bristles of the first row below the outer pair and nearer center of frons, almost in line transversly with upper post-antennals, slightly above but closer to outer pair than to post-antennals.

IV. Antennae: Brownish-black, normal; arista clearly longer than frons, shortly pubescent.

V. Palpi: Yellow, sometimes black; normal.

VI. Thorax: Shining; pleurae partly dusted, partly shining; mesopleural bristles distinct; all about the same length, no one especially large.

VII. Scutellum: Two bristles, sometimes two anterior hairs.

VIII. Legs: Dark red-brown to brown, fore legs lighter; fore tarsi slightly thickened; hind tibiae with minute setulae.

IX. Wing: Costa about one-third to two-fifths wing length; division I twice as long as II and III together; division III a little shorter than II; costal fringe short but strong, increasing in size to half, second half rather uniform in length; vein M_{1+2} slightly bent at base, ending much in front of wing apex; veins M_{1+2} and M_3 diverging apically; halteres black or brown.

X. Abdomen: Black; bare or a few scattered hairs may be present on posterior margins of segments; segments almost equal.

IX. Discussion and Data: One male, Logan Canyon, Ut., Aug. 4, 1938, D. E. Hardy and Agnes Hardy.

MEGASELIA VULGATA (Malloch)

I. Color: Dull black.

II. Length: 1.8 mm. to 2 mm.

III. Frons: Distinctly shining, gray dusted anteriorly; parallel sided; broader than long (fig. 33); lower pair of post-antennal bristles nearly as large as upper pair; center pair in first row a little lower than outer pair but nearer to them than the post-antennals; outer pair nearly in transverse line with upper post-antennals; upper pair of post-antennals higher than center pair of first row.

IV. Antennae: Normal size; brown-black; arista swollen at base, terminal part very thin and bare.

V. Palpi: Dull tawny yellow to brown; rather large, strongly bristled.

VI. Thorax: Dull; pleurae (black and brown, partly shining); mesopleurae bristles rather long and delicate.

VII. Scutellum: Two marginal bristles.

VIII. Legs: Brown (dark), only the anterior pair paler; hind femora and tibiae strong, hind tibial setulae regular and close but not very long; stout, moderate length; distal portion of coxae rather yellow.

IX. Wing: Costa to middle of wing; division I equal to II and III together; division III about one-half as long as II; costal fringe very long; vein M_{1+2} slightly bent at base and ending with a slight upward curve at distinctly in front of wing tip; halteres yellow.

X. Abdomen: Dull black, segments nearly equal, without noticeable bristles but scattered short hairs present; (ovipositor brownish).

XI. Discussion and Data: One female, Brigham Ut., 6-17-1938, D. E. Hardy, G. S. Stains.

MEGASELIA DIFFICILIS (Malloch)

I. Color: Dull brownish black.

II. Length: 1.3 - 2 mm.

III. Frons: Not shining; about as broad as long; narrowing toward vertex; (fig. 6); smaller post-antennals about three-fourths as large as upper larger pair; center pair of first row in horizontal line with upper post-antennals (not outer pair as in M. vulgata).

IV. Antennae: Black; arista paler and more distinctly pubescent than frons.

V. Palpi: Yellow to dark brown.

VI. Thorax: Dorsum dull brownish black, pleurae with upper part dull and lower parts and coxae partly shining; mesopleural bristles present and rather long.

VII. Scutellum: Two fine anterior hairs anteriorly in addition to two large bristles.

VIII. Legs: Yellow to dark brown, the posterior pair darker; hind tibiae not so strong and the setulae less distinct at apex.

IX. Wing: Costa one-half wing length; division I in female hardly as long as II and III; division I in male distinctly longer than II and III; division III about one-half the length of II; costal fringe of moderate length; halteres with knob pale and yellowish, pedicel black.

X. Abdomen: Brownish or dull black, with paler hind marginal bands on segments; segments subequal.

XI. Discussion and Data: This species is similar to many respects to M. vulgata. Two males (B), B. Y. U. campus, Provo, Utah, LaVell King; one male (A), Linwood, Utah, Sept. 6, 1939, G. F. Knowlton - F. C. Harmston.

SUMMARY

The purpose of this study is to determine the present status of the family Phoridae in Utah and to report which genera and species are known to inhabit the state.

The study was begun in the spring of 1955 and continued to August 1956. During this time the writer found that there was very little existing knowledge of the Utah Phoridae, and only a few specimens had been collected there and identified.

Upon investigation of numbers of phorids present in Utah, thus far the writer has found six genera and twenty-one species. From all evidences, Megaselia appears to be the only genus previously recorded as being found in Utah, and it appears that only two species, M. iroquoiana (Mall.) and M. borealis (Mall.) have been previously recorded. Subsequently these facts leave the other five genera and nineteen species as new records for the state.

A list of incompletely and questionably identified phorids is included in the appendix for future reference and study.

APPENDIX

SPECIMENS OF INCOMPLETE OR QUESTIONABLE IDENTIFICATION

Phora species:

Five males (B), Aspen Grove, Ut. Co., Ut. 6-10-55 and 6-55, LaVell King; one male, Provo, Utah environs, D. Elmo Hardy. Two females (B), Aspen Grove, Ut. Co., Ut., 6-56, LaVell King; three females (B), Aspen Grove, Ut. Co., Ut., 6-55 and 6-10-55, LaVell King; one female (B), Aspen Grove, 6-10-55, Vasco M. Tanner; one female (B), Provo, Utah environs, D. Elmo Hardy; one female (A), Miners Basin, LaSal Mts., Ut., July 23, 1938, G. F. Knowlton - F. C. Harmston (previously classified as Borophaga femorata (Meigen).

Megaselia species:

One specimen (B), North Fork, Provo Canyon, D. Elmo Hardy; two specimens (B), North Fork, Provo Canyon, Agnes Hardy; six specimens (B), Provo, Utah, two with no date- four with V-24-55, LaVell King; two specimens (B) Provo, Utah environs, Agnes Hardy; one specimen (B), Spanish Fork, Utah, Agnes Hardy; one specimen (B), Utah Lake, West Side, Agnes Hardy; three specimens (B), Aspen Grove, Ut. Co., Ut., one 6-10-55 others 6-56, LaVell King; three specimens (B), Spanish Fork, Utah, D. Elmo Hardy; two specimens (B), Y Mountain Utah Co., Utah,

Shrub 7-14-44, Sta. 7, Nos. 5346 and 7., C. Lynn Hayward.

M. arcuata (Mall.)?, Provo Environs, Ut. Co., Ut., LaVell King (B), M. borealis (Malloch), Providence, Utah, Oct. 18, 1931, D. M. Hammond (A); M. dyari (Malloch), Logan Canyon, Ut. 5-17-33, Ut. Exp. Sta. G. F. Knowlton (A); M. dyari (Malloch), Spring Hollow, Logan Cany., Ut., Aug. 10, 1938, G. F. Knowlton - G. S. Stains (A); M. minor (Zetterstedt), Spring Hollow, Logan Cany., Ut., Aug. 10, 1938, G. F. Knowlton - G. S. Stains (A); M. rufipes (Meigen), Logan Canyon, Ut., Aug. 4, 1938, D. E. Hardy - Agnes Hardy (A).

M. (near) arcuata (Malloch), Logan Canyon, Ut., VII-8-1938, D. E. Hardy - G. S. Stains (A); M. (near) arizonensis (Malloch), Ogden, Ut., 6-18-1938, G. F. Knowlton (A); M. (near) arizonensis (Malloch)?, Huntington Can., Emery Co., Ut., LaVell King (B); M. sp. (near) borealis (Malloch), reared from H. obsoleta pupae, Logan, Ut., 8-30-1937, Dorst-Harmston (A); M. (near) cheatoneura (Malloch), Spring Hollow, Logan Cany., Ut., Aug. 10-1938, G. F. Knowlton - G. S. Stains (A); M. (near) ciliata (Zetterstedt), Logan Canyon, Ut., 8-7-1938, G. F. Knowlton - D. E. Hardy (A); M. (near) marginalis (Malloch), five specimens, Provo Environs, Utah County, Ut., LaVell King (B); M. (probably) perplexa (Malloch), Providence Can., June 7-33, G. F. Knowlton - T. O. Thatcher (A); M. (near) picta (Lehm.), Garden City, Ut., July 12, 1938, G. F. Knowlton - F. C. Harmston (A); M. (near) pygmaea (Zetterstedt), Logan Canyon, Ut., VII-9-1938, D. E. Hardy - G. S. Stains (A); M. (near) ruficornis (Meigen), Garden City, Ut., July 12, 1938, G. F. Knowlton - F. C. Harmston (A).

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