The taxonomy and biology of the Nearctic species of Homoneura (Diptera: Lauxaniidae)

by

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INTRODUCTION AND REVIEW OF LITERATURE

Introduction

The family Lauxaniidae includes 126 recognized genera (Stuckenberg, 1971) and approximately 1,500 species in the world (Schumann, 1965; Hennig, 1973). Lauxaniids are widely distributed in all zoogeographic regions and are especially abundant in the tropics. The adults are small, variously marked and colored flies that rarely exceed 6 mm. in length. The diagnostic characters for this acalyptrate family include the absence of the oral vibrissae, the convergence of the postocellar (postvertical) bristles, the presence of the dorsal preapical bristles, usually on all the tibiae, and the wing venation with the costa entire, the subcosta complete and the anal vein (Cu_1+1A) short, not extending to the wing margin.

Although the adults may be found almost anywhere, they usually occur in moist, shaded habitats where at times they may be present in large numbers. They are commonly observed on low vegetation and become increasingly active in the late afternoon and early evening. Some species are attracted to lights, drawn to baits, and collected from traps.

The immature stages are known for only a few species, probably because they are evidently of slight economic importance. The larvae have been reported as being saprophagous, living in fallen leaves, straw, rotting wood, bird nests, and decaying vegetation. A few species have been reported to be phytophagous, living in the root collars, stems, and leaves of clover (Trifolium), in the ovaries of violets (Viola), and in the leaf-like phylloclades of prickly pear (Opuntia) (Miller, 1970).

Recently Stuckenberg (1971) divided the 126 genera of the family into 2 sections: one, containing the genera having a homoneuriform costa; the other, containing the genera with a sapromyziform costa. The homoneuriform costa, as found in Homoneura, has small, black, robust setae (costal setulae) that reach or very nearly reach the apex of the 3rd vein (R_{4+5}) and stop abruptly. The sapromyziform costa, as found in Sapromyza, has the costal setulae that do not reach the apex of the 3rd vein, but rather diminish in size and stop between the 2nd and 3rd veins. For the 19 genera with a homoneuriform costa, which also lack a discal mesopleural bristle, Stuckenberg proposed the subfamily Homoneurinae, type genus Homoneura Wulp, 1891.

Homoneura is the largest of the 23 genera recorded by Shewell (1965) for America north of Mexico. Trypetisoma is the only other Nearctic genus having the homoneuriform costa. According to Stuckenberg (1971) this genus is unique in the family in having both homoneuriform and sapromyziform species. The adults of Trypetisoma are easily distinguished by their dark color and highly patterned wings (Arnaud, 1968). Homoneura are light yellow to light brown and at most have partially patterned wings.

More than 35 years have passed since Malloch & McAtee (1924) and Shewell (1938) provided the only comprehensive treatments of the Nearctic species from eastern North America. The present study is an attempt to further the knowledge of the Nearctic species of Homoneura by a study of all material available to the author, an evaluation of all previously proposed names for Nearctic species, and the presentation of descriptions, figures, and other pertinent information for all species for which

adequate material exists. The objectives of this study are to improve the existing keys and distribution records for adults, to present life history information for any reared species, and to contribute to the systematics of this cosmopolitan genus.

Review of Literature

The taxonomic literature on Homoneura dates from 1820, when Fallén described Sapromyza interstincta and S. notata from southern Sweden. The genus Homoneura was erected by Wulp in 1891 for a black species from Java which he named H. picea. This species belongs to a small group of 4 or 5 Oriental species which are not sufficiently well differentiated from the great mass of pale colored species, such as those found in the Nearctic and other regions, to be considered generically distinct (Malloch, 1940). In 1904 Meijere described another genus and species from Java, Drosomyia picta, which Malloch (1927d) referred to Homoneura. Hendel (1908) in his Genera Insectorum quoted Wulp's description of the genus and the Latin description of H. picea. Hendel also pointed out the mistake in Meijere's 1904 paper that D. picta belonged to Sapromyza, not to Drosophilinae. In the same year Meijere (1908) synonymized both D. picta and H. picea, referring them to Sapromyza. Later, Meijere (1910) placed S. picea and picta in Lauxania (Sapromyza, Minettia). Meijere sometimes used one or more generic names within parentheses in his species descriptions.

In 1920 Malloch inadvertently used the generic name Sapromyzosoma in connection with his description of Sapromyza citreifrons (Malloch, 1923).

Therefore, Malloch in his later paper described the new genus with S. citreifrons as its type. Unfortunately, Sapromyzosoma was preoccupied by Lioy (1864), and Hendel (1925) gave the new name Mallochomyza to Sapromyzosoma Malloch. In this same paper Hendel erected a new genus, Cnematomyia, with Lauxania quinquevittata Meijere, 1910, as its type. Hendel placed this new genus in his key to the known lauxaniid genera of the world, but did not give a generic description. In 1926 Malloch examined a specimen of H. picea Wulp, which evidently was not the type (Malloch, 1927c). He concluded that his Sapromyzosoma was a synonym; therefore, so was Mallochomyza Hendel. Furthermore, Malloch (1927d) referred L. quinquevittata and picta to Homoneura.

Upon examining much of the Oriental and Pacific Islands material, Malloch (1927b, 1927c, 1929a, 1940) erected 9 subgenera: Euhomoneura, Xenohomoneura, Chaetohomoneura, Neohomoneura, Homoneura Wulp (sensu stricto), Griphoneuroides, Poecilomyza, Minettioides, and Solomonia. To these 9 subgenera Hendel (1933) added 1, Tarsohomoneura, from North America. Stuckenberg (1971) in his Old World Genera of Lauxaniidae presented a key to all the subgenera, but he did not recognize Tarsohomoneura because he thought it was based on characters of the males only. Shewell (in press) in his catalog of the Oriental region elevated the subgenus Poecilomyza to the generic level. He also gave Drosomyia subgeneric status. Therefore, there are presently 10 subgenera.

The genus in its broadest sense is found world-wide except from New Zealand (Harrison, 1959) and Central and South America (Shewell, pers. com.) and is most common in the Orient. The major, recent

taxonomic papers on Homoneura for the Oriental region began with Frey's (1927) key to the Philippine species under Mallochomyza and Homoneura. Malloch (1929a) presented the most comprehensive key to 143 species of Oriental Homoneura. Hennig (1941) cataloged 37 Formosan species and Shewell (in press) cataloged 161 species for the entire Oriental region.

Many of the Pacific Islands species also occur in the Oriental and Australian regions. Six Samoan species of Homoneura were presented in a key by Malloch (1929b); 12 species from western Polynesian and Melanesian Islands by Curran (1936); and 17 species from the Solomon Islands by Malloch (1940).

A key to the Australian Homoneura was given by Malloch (1927a) and included 16 species. At present the Australian region contains approximately 56 described species belonging to Homoneura (McAlpine, pers. com.).

The only major work for the Ethiopian region was a key presented by Curran (1938) containing 14 Homoneura. Now there are 23 species reported from this region (Stuckenberg, pers. com.).

In his family monograph for the Palaearctic region, Czerny (1932) presented a key to 34 species. More recent lists of Homoneura have been compiled by Frey, Tiensuu & Storå (1941) for Finland, Kloet & Hincks (1945) for Great Britain, and Shtakel'berg (1958) for the Soviet Baltic Republics. Keys for 2 areas have been given by Collin (1948) for Great Britain and Shtakel'berg (1970) for the European region of the Union of Soviet Socalist Republics. To date there are 44 species reported from the Palaearctic region (Shewell, pers. com.).

The 1st Homoneura species described from North America was H. americana (Wiedemann, 1830). Additional North American species were described by Macquart (1843), Loew (1861), Coquillett (1898), Melander (1913), Johnson (1914), Malloch (1914, 1915, 1920), and Shewell (1939, 1940). Becker (1895) described the only Holarctic species, H. lamellata. Major contributions to the taxonomy of North American Homoneura have been a key to 28 species of eastern United States by Malloch & McAtee (1924) and a key to 16 species of eastern Canada by Shewell (1938). The western species were listed by Cole (1969), but his did not add any new information to the 30 species recorded by Shewell (1965) in the catalog for North America. In 1966, Shewell reported the introduction of an oriental species, H. unguiculata, into southeastern United States. Therefore, 31 species have been recorded for the Nearctic region.

There have been no collection records or literature reports of Homoneura occurring in Mexico or Greenland. Furthermore, Shewell (pers. com.) has neither seen nor collected any specimens from Mexico, even at high altitudes.

Illustrations of adult Homoneura have been confined chiefly to the male terminalia, wings and legs (Johnson, 1914; Malloch & McAtee, 1924; Malloch, 1929a; Czerny, 1932; Curran, 1934; Shewell, 1938, 1971). The internal anatomy has been completely neglected.

Meijere (1909) was the first to report rearing a species of Homoneura. He reared a Palaearctic species, H. notata (Fallén, 1820), from rotting tree leaves. Miller (1970) reared H. americana from decaying tree leaves of black cherry (Prunus serotina) and sugar maple (Acer saccharum);

Miller & Foote (1975, in press) presented the only life cycle information and descriptions of the immatures: egg, larval instars and puparium. McDonald, Heed & Miranda (1974) have reported the rearing of a new species of Homoneura from decaying leaves of the California Bay tree (Umbellularia californica).

Stewart & Leonard (1916) used H. bispina adults in attempts to transmit the bacterium (Erwinia amylovora), which causes fire blight, to apple seedlings. However, no seedlings became infected.

An extensive literature search revealed that only 10 Nearctic species, H. americana, birdi, bispina, conjuncta, fraterna, incerta, lamellata, mallochi, philadelphica and tenuispina, have been recorded in various ecological studies of the adults associated with certain habitats (Shelford, 1913; Sanders & Shelford, 1922; Weese, 1925; Blake, 1927; Smith, 1928; Bird, 1930; Smith-Davidson, 1932; Adams, 1941; Jones, 1946; Dowdy, 1947; Shelford, 1951; Judd, 1960). Shewell (1938) stated that Homoneura are sometimes taken on both pink and white spiraea (Spiraea latifolia and S. tomentosa) which grow in swampy ground especially in the late summer when the bloom is over. Adams (1941) also reported a Homoneura sp. from the herb, shrub and tree strata of a deciduous forest in Tennessee. Edwards (1972) reported a Homoneura sp. collected from the arthropod fallout on snow patches in central Alaska.

Remm (1972, 1974) has presented the only ecological articles solely devoted to lauxaniids. She listed the habitats and flight periods for 6 Palaearctic species and the Holarctic species, H. lamellata, from the Soviet Baltic Republics.

MATERIALS AND METHODS

This study was based on the examination of almost 8,000 Nearctic specimens of Homoneura. The material was from all of the 49 continental states and the District of Columbia of the United States of America and the 10 provinces and 2 territories of Canada. The only main political regions in the Nearctic not represented were Mexico and Greenland.

Material Studied

Letters requesting the loan of all determined Nearctic Homoneura, undetermined lauxaniid adults and any immature specimens were sent to most institutional collections in North America. Requests for type and comparative materials were also sent to 9 institutions in Europe. More than 14,500 specimens were received from 55 North American and 7 European institutions. Adults were determined at least to genus using, primarily, Curran's (1934) key to the genera of North America. No immature specimens and only a few adults with associated puparia were received.

Responses came from the Canadian provinces of Alberta, Ontario and Quebec and from all the continental states of the United States of America, except Alabama, Georgia, Mississippi, New Jersey, Rhode Island, South Carolina, Tennessee and West Virginia. Institutions from the following states responded but had no holdings of Homoneura: Alaska, Delaware, Louisiana, Maine, Missouri, New Mexico, North Dakota, Oregon, Vermont and Virginia. None of the 3 institutions written to in

Mexico responded. I did not send for material from Greenland, because I have not seen any literature citations of lauxaniids occurring there.

Travel was required to study the holotypes, syntypes, cotypes and lectotypes of D. W. Coquillett, J. R. Malloch and A. L. Melander at the United States National Museum, Washington, D. C., of G. E. Shewell at the Canadian National Collection, Ottawa, Ontario, and of J. R. Malloch at the Illinois Natural History Survey, Urbana. All the Malloch types at the Illinois Natural History Survey were in good order and their data agreed with Frison's (1927) list of the insect types in the collection.

The remaining North American type material of C. W. Johnson and H. Loew was loaned by the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. The Zoological Museum of Humboldt University, Berlin, loaned the Palaearctic type of H. lamellata (Becker) and the Hungarian Natural History Museum, Budapest, loaned the Oriental syntypes of H. unguiculata (Kertesz).

All of the existing types were examined except H. americana (Wiedemann), which would not be loaned by the Natural History Museum, Vienna, H. fratercula (Malloch), which could not be located in the United States National Museum, and H. philadelphica (Macquart), which could not be located in J. Macquart's collection at the National Museum of Natural History, Paris.

I have retained some representatives of most of the species for future study as well as most of the reared material. The bulk of these specimens will be eventually deposited in the United States National Museum and Canadian National Collection. Some reared specimens are also

available in the insect collections of Iowa State University, Ames, and Kent State University, Kent, Ohio.

The cooperation and courtesy of the curators and other responsible persons of the institutions listed below made possible the loan of the material for this study. An educational institution or agency, having a state or province in its proper name, has, in most cases, the state designated by the 2-letter ZIP Code abbreviation of the United States Postal Service or the standard abbreviation of the Canadian province. The abbreviation following each institution is used to denote the collection from which specimens were borrowed:

Academy of Natural Sciences of Philadelphia, D. C. Rentz (ANSP)
University of Alberta, M. A. Abraham (UALTA)
American Museum of Natural History, P. Wygodzinsky (AMNH)
University of Arizona, F. G. Werner (UAZ)
University of Arkansas, E. P. Rouse (UAR)
British Museum of Natural History, B. H. Cogan (BMNH)
California Academy of Sciences, P. H. Arnaud, Jr. (CAS)
California Department of Agriculture, M. S. Wasbauer (CADA)
University of California, Berkeley, E. I. Schlinger (UCAB)
University of California, Davis, R. O. Schuster (UCAD)
University of California, Los Angeles, J. N. Belkin (UCALA)
University of California, Riverside, S. Frommer (UCAR)
Canadian National Collection, G. E. Shewell (CNC)
Carnegie Museum, G. Wallace (CM)
Colorado State University, T. O. Thatcher (COSU)
Connecticut Agricultural Experimental Station, K. A. Welch (CTAES)
Cornell University, L. L. Pechuman (CU)
Field Museum of Natural History, M. Prokop (FMNH)
Florida State Collection of Arthropods, H. V. Weems, Jr. (FSCA)
Frost Entomological Museum, Pennsylvania State University, K. C. Kim (FEM)

Zoological Museum, Helsinki, B. Lindeberg (ZMH)

Zoologisches Museum, Humboldt Universität, Berlin, H. Schumann (ZMHU)

Hungarian Natural History Museum, L. Papp (HNHM)

University of Idaho, W. F. Barr (UID)

Illinois Natural History Survey, D. W. Webb (INHS)

Institut Royal des Sciences Naturelles de Belgique, P. Vanschuytbroeck (IRSNB)

Iowa State University, R. E. Lewis (IASU)

Kansas State University, H. D. Blocker (KSSU)

Kent State University, B. A. Foote (KSU)

University of Kentucky, P. H. Freytag (UKY)

Los Angeles County Museum of Natural History, C. L. Hogue (LACM)

Lovell Insect Museum, University of Louisville, C. V. Covell, Jr. (LIM)

Lyman Entomological Museum, Macdonald College, V. R. Vickery (LEM)

University of Maryland, F. E. Wood (UMD)

Miami University, Oxford, D. L. Deonier (MUO)

University of Michigan, R. D. Alexander (UMI)

University of Minnesota, P. J. Clausen (UMN)

Montana State University, N. L. Anderson (MTSU)

University of Montréal, M. Coulloudon (UM)

Museum of Comparative Zoology, Harvard University, J. C. Scott (MCZ)

University of Nebraska, B. C. Ratcliffe (UNE)

Nevada State Department of Agriculture, R. C. Bechtel (NVSDA)

University of New Hampshire, R. L. Blickle (UNH)

New York State Museum, J. A. Wilcox (NYSM)

North Carolina State University, D. A. Young (NCSU)

Northern Michigan University, G. D. Gill (NMIU)

Ohio State University, C. A. Triplehorn (OHSU)

Oklahoma State University, W. A. Drew (OKSU)

Pennsylvania Department of Agriculture, K. Valley (PADA)

Pomona College, L. Benson (PC)

Purdue University, A. Provonsha (PU)

Raymond M. Miller (RMM)

Snow Entomological Museum, University of Kansas, G. W. Byers (SEM)
South Dakota State University, E. U. Balsbaugh, Jr. (SDSU)
Naturhistoriska Riksmuseet, Stockholm, P. I. Persson (NRS)
University of Texas, Austin, M. R. Wheeler (UTXA)
Texas A & M University, H. R. Burke (TXAMU)
United States National Museum, P. D. Hurd, Jr. (USNM)
Utah State University, W. J. Hanson (UTSU)
Washington State University, W. J. Turner, M. T. James (WASU)
Naturhistorisches Museum Wien, R. Lichtenberg (NMW)
University of Wisconsin, L. J. Bayer (UWI)
University of Wyoming, R. J. Lavigne (UWY)

Insect label data For species represented by only a few examined specimens, the complete collection data are given. Where specimens were collected from several localities in 1 state or province, only the total number of each sex and number of localities, along with their depositories, are given. Data are given in the following form: number of specimens, sex (m, f or ?, if sex was not determined), locality, date, name of collector, biological information and lending institution. Common and scientific names of plants were checked against those used by Fernald (1950), Munz (1974) and Rydberg (1922).

Study of Specimens

Adult specimens were studied with the aid of a stereo dissecting microscope with 15 to 90 magnifications. Pictures of antennae, head, thorax, legs, wings and genitalia were taken from dissected specimens placed in glycerin on microscope or depression slides. After photography at 7.5 to 30 magnifications with a stereo dissecting microscope and a compound microscope, the dissections were stored in terminalia

microvials with glycerin and pinned under the specimen. Work prints for the plates were touched-up to improve the contrast of the characteristic structures.

Methods of studying terminalia Specimens selected for study of the genitalia were placed in a relaxing chamber for up to 24 hours. All or part of the abdomen was removed by means of fine scissors or forceps. Terminalia were placed in a 5-10% solution of potassium or sodium hydroxide and heated gently for several minutes. The time required for clearing varied with the condition of the terminalia and with the species. After passing the terminalia through glacial acetic acid and distilled water, they were placed in a small drop of glycerin in a depression slide for microscopic examination and photography. The terminalia were permanently stored in glycerin in 4.5 X 10.5 mm. polyethylene vials with silicone rubber stoppers placed on the specimen pin.

Measurements Measurements for each species were based on 20 males and 20 females or all those available and made with an ocular micrometer. Body length was measured from the face to the apex of the abdomen; in some cases this measurement had to be approximated because of missing antennae or curled abdomens. Wing length was measured from the tegula to the wing apex (Fig. 7a). The gena-eye fraction was the vertical distance between the row of subgenal facial setae and lower edge of the compound eye divided by the vertical distance between the upper and lower edges of the compound eye (Fig. 3a). The parafacial-face fraction was the horizontal distance of 1 parafacial divided by the horizontal distance of the face measured through approximately their middles (Fig. 3b).

Collecting and Rearing Techniques

Field-collected larvae and substrata were placed in petri dishes and kept moist. Puparia were placed on moist peat moss under a rearing jar. As adults emerged they were held for several days to allow for complete sclerotization and pigmentation. Immature stages were killed in KAAD solution and preserved in approximately 80% ethanol. Empty puparia were placed in No. 5 gelatin capsules and pinned under the adults, which were mounted on paper points.

Field-collected or reared adults were sexed and paired and placed in breeding containers (6 X 9 cm.) fashioned from baby food jars. The bottoms of the jars had been removed and replaced with single pieces of nylon mesh held in position by rubber bands. The tops were inverted and each was pressed into the bottom of a small (5 cm. diameter) plastic petri dish containing a layer of moistened peat moss. The nylon mesh on top allowed undisturbed observations of adult behavior under the stereo dissecting microscope. Adult food consisted of a small pellet of a mixture of honey and Brewer's yeast appressed to the inside of each jar about 1 inch below the nylon mesh top. The rearings were inspected frequently to observe adult and larval habits, record length of stadia and retrieve cast exuviae and puparia. A Percival Growth Chamber, set on long-day (15 hours daylight), was used to maintain some of the rearings with more natural, optimum conditions of long-day, 80° F maximum day and 60° F minimum night (26.5° C and 15.5° C) temperatures and relatively constant humidity.

TERMINOLOGY

The terminology used to describe the head, thorax, abdomen, legs and wings of adults (see ABBREVIATIONS) follows that used by Shewell (1966, 1971) and Stuckenberg (1971). The homologies of the terminalia for all the diverse forms found in the Lauxaniidae have not been satisfactorily worked out and a uniform terminology applied successfully. In describing the male genitalia or hypopygium, I have followed the terminology of Stuckenberg (1971) and to a lesser extent Griffiths (1972) and Kim & Cook (1966). For further comparisons of genitalic terminology and lauxaniid terminology, I have referred to Steyskal (1957), Hennig (1948), Shewell (1938) and Malloch & McAtee (1924) (see ABBREVIATIONS):

Genitalia - 9th abdominal segment or andrium.

Epandrium - abdominal T9.

Surstyli - processes fused to the ventral edges of epandrium (usually present and constant specific structures).

Terminal Processes - paired structures medial to the cerci and surstyli (present in a number of species and constant specific structures).

Hypandrium - abdominal S9.

Aedeagus - intromittent organ (bilobed, tubular and usually large).

Aedeagal Apodeme - structure articulated with base of aedeagus (free anteriorly).

Gonopods - paired posterior processes at base of aedeagus (may be present or absent).

Gonopod Processes - subbasal or basal, small processes on the gonopods (may be present or absent).

Ring Sclerite - dorsally curved sclerite connecting the bases of the gonopods (may be evident or weak).

Cerci - terminally paired appendages (sometimes very long, with long, apical bristles).

In order to bring some consistency in the use of terms referring to setation, the following are defined as I use them:

Chaetotaxy - arrangement of setae, usually the bristles on the head and thorax.

Setae (=hairs) - the small cuticular processes having alveoli and covering the integument.

Setulae - small, robust setae that are usually quite conspicuous, as those found on the costal margin of the wing (=costal setulae) (Figs. 7, 9, 11).

Ctenidium (=comb) - a row of setulae, as found on the apical half of the anteroventral surface of the fore femora.

Weak Bristles - distinctly longer and usually larger than setae, but averaging 1/2 the length of bristles.

Bristles (=macrochaetae) - distinctly the longer and larger cuticular processes with alveoli.

Fine Bristles (=long, soft hairs) - long as bristles, but fine as setae, most conspicuous on the antero- and posteroventral surfaces of the hind legs of males of some species.

Spurs - spine-like, bristles, at the joints of appendages, as those at the apices of the mid-tibiae (Fig. 6).

[Note: The category "weak bristles" is somewhat subjective and used most often to describe the condition of the presutural dorsocentral bristles].

Spines - large, immovable cuticular processes lacking alveoli.

Spinules - very small, robust spines.

[Note: The term "costal spinules" is not preferred because these are "setulae" having associated alveoli].

Arista - the specialized, dorsobasal, 3-segmented bristle on the 3rd antennal segments, with or without setae.

Plumose - the longest, basal setae distinctly longer than distal setae and the width of the bases of the aristae, decumbent apically.

Long Plumose - the longest setae greater than the width of the 3rd antennal segments.

Plumose (=long haired) - the longest setae 1/2 to the width of the 3rd antennal segments.

Short Plumose (=subplumose) - the longest setae 1/3rd-1/2 the width of the 3rd antennal segments, slightly decumbent apically.

Pubescent - the longest, basal setae not distinctly longer than the distal setae and equal, or less than, the width of the bases of the aristae, usually straight apically.

Long Pubescent - the longest setae 1/4th-1/3rd the width of the 3rd antennal segments, approximately equal to the width of the bases of the aristae, occasionally slightly decumbent apically (Figs. 1, 2).

Short Pubescent (=micropubescent) - the longest setae less than 1/4th the width of the 3rd antennal segments, less than the width of the bases of the aristae, straight apically.

Bare (=naked) - devoid of setae.

[Note: The categories "short plumose" and "long pubescent" (=short haired) are sometimes very subjective in certain species where both categories appear to be present. Examination of a long series of specimens is desirable, because the aristae are often broken and setation damaged or matted.]

ABBREVIATIONS

Geographical Names

AK	Alaska	NC	North Carolina
AL	Alabama	ND	North Dakota
ALTA	Alberta	NE	Nebraska
AR	Arkansas	NH	New Hampshire
AZ	Arizona	NJ	New Jersey
BC	British Columbia	NM	New Mexico
CA	California	NS	Nova Scotia
CAN	Canada	NV	Nevada
CO	Colorado	NWT	Northwest Territories
CT	Connecticut	NY	New York
DC	District of Columbia	OH	Ohio
DE	Delaware	OK	Oklahoma
FL	Florida	ONT	Ontario
GA	Georgia	OR	Oregon
IA	Iowa	PA	Pennsylvania
ID	Idaho	QUE	Quebec
IL	Illinois	PEI	Prince Edward Island
IN	Indiana	RI	Rhode Island
KS	Kansas	SASK	Saskatchewan
KY	Kentucky	SC	South Carolina
LA	Louisiana	SD	South Dakota
MA	Massachusetts	TN	Tennessee
MAN	Manitoba	TX	Texas
MD	Maryland	USA	United States of America
ME	Maine	UT	Utah
MI	Michigan	VA	Viginia
MN	Minnesota	VT	Vermont
MO	Missouri	WA	Washington
MS	Mississippi	WI	Wisconsin
MT	Montana	WV	West Virginia
NA	North America	WY	Wyoming
NB	New Brunswick	YT	Yukon Territory

General and Leg Notation

General

a	anterior	monog.	monograph
ad	anterodorsal	Mt(s).	Mountain(s)
av	anteroventral	n.	new, north
aut.	automatic	Natl.	National
cat.	catalog	ne.	northeast
cm.	centimeter(s)	no(s).	number(s)
Co.	County	nr.	near
coll.	collection, collector	nw.	northwest
d	dorsal	orig.	original
des.	designation	p.	page(s)
descr.	description	Pk.	Park
distr.	distribution	pl	posterolateral
e.	east	Pl(s).	Plate(s)
ed(s).	edition, editor(s)	pers. com.	personal communication
f	female(s)	preocc.	preoccupied
Fig(s).	Figure(s)	pv	posteroventral
For.	Forest	rec.	record(s)
ft.	feet	S	abdominal sternite
gen.	genus	s.	south
introd.	introduced	se.	southeast
Is.	Island(s)	sp., spp.	species
km.	kilometer(s)	St.	State
m	male(s)	subg.	subgenus
m.	meter(s)	sw.	southwest
mi.	mile(s)	syn.	synonym
mm.	millimeter(s)	T	abdominal tergite
misident.	misidentified	var.	variety
mon.	monotype	w.	west

Legs (Figs. 5, 6, 8, 12-23)

L1 F1 T1 TS1	fore leg, femur, tibia, tarsus
L2 F2 T2 TS2	mid-leg, femur, tibia, tarsus
L3 F3 T3 TS3	hind leg, femur, tibia, tarsus

Wing, Chaetotaxy and Genitalia Notation

Wing (Fig. 7)

t	tegula
h	humeral crossvein
r-m	anterior "
m	posterior "
Sc	subcostal (=auxiliary) vein
R_1	1st longitudinal vein
R_{2+3}	2nd " "
R_{4+5}	3rd " "
M_{1+2}	4th " "
M_{3+4}	5th " "
Cu_1+1A	6th " "
2A	7th " "
al	alula (=alar lobe)
c	calypter (=upper squama)

Chaetotaxy (Figs. 3, 4)

acr	acrostichal
aor	anterior orbital
dc	dorsocentral
hum	humeral
ia	intra-alar
iv	inner vertical
mp	mesopleural
np	notopleural
oc	ocellar
ov	outer vertical
pa	postalar
ph	posthumeral (=presutural)
por	posterior orbital
pp	propleural
prsc	prescutellar
pvt	postvertical (=postocellar)
sa	supra-alar
sc	scutellar
st	sternopleural

Genitalia (Figs. 24-32)

ae	aedeagus (=phallus)
aeap	aedeagal apodeme (=phallapodeme)
cer	cercus (=valvulae medialis, proctiger)
ep	epandrium (=periandrium)
gp	gonopod (=gonopod)
gpp	gonopod process (?pregonite)
hy	hypandrium
hya	hypandrial apodeme
plsp	posterolateral sternal (S5) process
rs	ring sclerite (?interparameral sclerite)
s	spermatheca
sur	surstylus (=telomere, valvulae lateralis, superior forceps)
tp	terminal process (=inferior forceps)

REMARKS ON KEYS AND DESCRIPTIONS

An attempt has been made to list all references to species of Homoneura, based on Nearctic specimens, in the bibliographical synonymies of the species. These include all citations to descriptions, keys, collection records, catalogs, distributions, figures, name changes, and biological and ecological information. It is probable that a few Nearctic references have been overlooked. In the case of the 1 Holarctic and the 1 introduced Oriental species, only selected references from the Palaearctic and Oriental regions have been cited.

Some individual collection records have been the basis of several separate reports in the literature, later authors often merely repeating earlier published data. These references have also been included along with the citation to the original work. Furthermore, if the specimens on which the collection records were based have been examined and found to be misidentified, they are noted under both the originally named species and the correctly named species.

The bibliographic synonymies of the genus include references to family monographs, named subgenera, subgeneric keys and regional catalogs. Because Homoneura (sensu lato) is a large, morphologically diverse genus, only a general description of Nearctic Homoneura follows the generic synonymy, which is followed by a brief world generic diagnosis, adapted from Stuckenberg (1971).

To provide some preliminary orientation to the genus, a key to the 3 Nearctic subgenera and 9 species groups of the subgenus Homoneura is included. A diagnosis and discussion follow each subgenus and

species group. The characters included in the general description of Nearctic Homoneura and in the diagnoses are not repeated again in the following species diagnoses and descriptions.

A diagnosis is provided for each taxon to distinguish it from the other known Nearctic Homoneura species. A discussion follows the diagnosis comparing the species to similar and related forms. Descriptions are given for new species and to new type-species designations. In most cases, the descriptions of new species can also be applied to their close relatives (subgenus or group members) and distinguished by the characters mentioned in the diagnoses and discussions. Descriptions of species represented by a long series have been based on at least 10 specimens, but all available specimens were examined and the variations noted were included in the descriptions.

Initial use of the keys and descriptions will require familiarization with the notations employed for the head and thoracic chaetotaxy, wing, leg and genitalic characters employed in this study (see ABBREVIATIONS). The species size category is based on the size ranges of individuals: small, 2.5-3.5 mm.; medium-sized, 3.25-4.25 mm.; large, 4-5.5 mm.

A word of caution is warranted about the use of wing spot condition and pattern in the keys. Teneral specimens are very pale yellow, usually having collapsed heads and legs and whitish, rather than yellowish, wings. The teneral, spotted species and weakly spotted species may not have the wing membrane of the spot distinctly darkened, but, using low magnifications and white backgrounds, the locations on the veins indicating

where spots would normally be present are darker than the rest of the veins, e.g. H. occidentalis. Moreover, individuals may have additional or sometimes missing spots on 1 wing with the other wing having the normal maculation, e.g. H. lamellata.

The use of general body color for a species is unsatisfactory because older specimens tend to be darker and specimens become darker when killed although certain species are evidently lighter yellow than others. Furthermore, the abdomens are sometimes discolored due to material present in the intestines and to the reddish-colored testes of the males of some species.

GENUS HOMONEURA

Homoneura Wulp, 1891

Homoneura Wulp, 1891: 213-214; Pl. 12, Fig. 15 [head], Fig. 16 [wing]. Type-species: Homoneura picea Wulp (mon.).

Drosomyia Meijere, 1904: 114; Pl. 8, Fig. 30 [head], Fig. 31 [wing]. Type-species: Drosomyia picta Meijere (mon.).

Homoneura; Hendel, 1908: 48. [monog. of family]

Drosomyia; Hendel, 1908: 48. [monog. of family]

Sapromyza; Meijere, 1908: 137. [syn. Drosomyia Meijere]

Sapromyza; Meijere, 1908: 142. [syn. Homoneura Wulp]

Sapromyzosoma Malloch, 1920: 127 (as subg. of Sapromyza, nec Lioy, 1864). Type-species: Sapromyza citreifrons Malloch (mon.).

Sapromyzosoma; Malloch, 1923: 51. [gen. descr.]

Sapromyzama; Malloch & McAtee, 1924: 24. [error, occurring in heading of descr. of occidentalis in some reprints]

Chematomyia Hendel, 1925: 107. Type-species: Lauxania quinquevittata Meijere (orig. des.).

Mallochomyza Hendel, 1925: 112 (n. name for Sapromyzosoma Malloch, preocc. Lioy, 1864). Type-species: Sapromyza citreifrons Malloch (aut.).

Homoneura; Malloch, 1926: 46. [syn. Sapromyzosoma Malloch, viz. Mallochomyza Hendel]

Homoneura; subg. Euhomoneura Malloch, 1927b: 419. Type-species: Lauxania ornatipennis Meijere (orig. des.).

Homoneura; subg. Xenohomoneura Malloch, 1927b: 419. Type-species: Homoneura testacea Malloch (orig. des.).

Homoneura; subg. Chaetohomoneura Malloch, 1927c: 106. Type-species: Lauxania semibrunnea Meijere (orig. des.).

Homoneura; subg. Neohomoneura Malloch, 1927c: 107. Type-species: Sciomyza orientalis Wiedemann (orig. des.).

Homoneura; subg. Homoneura, Malloch, 1927c: 109. [sensu stricto] Type-species: Homoneura picea Wulp (aut.).

Homoneura; subg. Griphoneuroides Malloch, 1929a: 58. Type-species: Griphoneura testaceipes Kertesz (orig. des.).

Homoneura; subg. Minettioides Malloch, 1929a: 65. Type-species: Lauxania parvinotata Meijere (orig. des.).

Homoneura; Czerny, 1932: 9-11. [monog. of Palaearctic spp.]

Homoneura; subg. Tarsohomoneura Hendel, 1933: 76-77. Type-species: Sapromyza americana Wiedemann (orig. des.).

Homoneura; subg. Solomonia Malloch, 1940: 138. Type-species: Homoneura leveri Malloch (orig. des.).

Homoneura; Hennig, 1941: 140-141. [cat. of Formosan spp.]

Homoneura; Shewell, 1965: 697-699. [cat. of NA spp.]

Homoneura; Stuckenberg, 1971: 532. [syn. Cnematomyia Hendel]

Homoneura; subg. Tarsohomoneura, Stuckenberg, 1971: 533. [unrecognized]

Homoneura; Stuckenberg, 1971: 533-534. [key to World subg.]

Homoneura; subg. Drosomyia, Shewell (in press). [n. status]

Homoneura; Shewell (in press). [cat. of Oriental spp.]

Description [Nearctic] Body length 2.5-5.5 mm.; wing length 2.75-4.5 mm. Light yellow to brownish-yellow, with various degrees of whitish pollinosity, especially laterally and ventrally.

Head dull yellow, usually slightly higher than long. Frons flat to swollen (buccate), about as long as wide and 1/2 width of head, sides parallel; ocelli yellow to reddish-brown. Frontal orbital bristles set in usually narrow, shining plates. Eyes oval, slightly higher than wide, dark red, bare. Genae 1/2-1/6th height of eyes. Face subshining, somewhat concave, flat or slightly convex; parafacials dull, about 1/3rd-1/2 width of face at middle. First antennal segments short, not as long as 2nd, bare at apices below; 3rd antennal segments elongate-oval, less than twice as long as wide; aristae light brown to black, yellowish at base, short pubescent to plumose. Palpi and mouthparts yellow. Head chaetotaxy black: 1 oc proclinate, almost parallel; 1 aor and 1 por reclinate; 1 iv convergent; 1 ov divergent; 1 pvt convergent.

Thorax subshining; chaetotaxy black: 0+3 dc or 1+3 dc, presutural dc weak to strong, increasing in size posteriorly; 2-6 rows of acr, inner rows setae, sometimes weak bristles or as strong as 1 prsc; 2 sc, apical pair convergent; 1 hum; 1 ph; 1 sa; 2 pa; 0 ia; 1 pp, weak; 2 np; 1 mp; 2 st, anterior approximately 2/3rds length of posterior.

Legs yellow; some tarsomeres, especially TS3 in subgenus Tarsohomoneura, black. All tibiae with preapical d bristles; T2 usually with 2 unequal apical spurs. F1 usually with preapical av row of well-developed setulae (ctenidium); F3 with or without preapical ad, av, and pv bristles.

Wings yellowish, with or without brown spots or darkened areas on veins. Venation normal; black costal setulae extending to R_{4+5}, except

in subgenus Mallochomyza. Halteres yellow.

Adbomen yellow; terga subequal in length, except T6 up to twice the length of T5 in males and T7 up to twice the length of T6 in females of several species. Males of many species have p1 extensions of S5, which vary specifically in shape. Male genitalia have specific differences in size and shape of surstyli, when present; bilobed, tubular aedeagi; gonopods and terminal processes, when present. Female genitalia usually lack characters useful in specific discrimination; 2+1 spermathecae. Cerci usually yellow, except dark or black in some species, elongated in some males, modified in some females, with long apical bristles in some species.

Diagnosis [World] Head oval, usually somewhat higher than long; frons not very broad, without many small setae; face flat, somewhat concave or slightly convex, without swellings or projections; 2nd antennal segments without thumb-like projections; 3rd antennal segments not elongate and narrowed distally; oc proclinate; aor well-developed, reclinate; 1 mp; usually with av F1 ctenidium; anal lobe of wing present.

Key to Subgenera of Nearctic Homoneura

1. Small, robust setae on costa (costal setulae) ending abruptly, slightly before or slightly beyond 3rd vein (R_{4+5}) (Figs. 7, 9) 2

   Costal setulae diminishing 2/3rds distance before R_{4+5} (Fig. 11) . . . . . H. (Mallochomyza), p. 28
   [1 Nearctic species - H. (M.) citreifrons, p. 29]

2. 2nd hindtarsal (TS3) segments at least partially black and/or marginal cells clouded . . . H. (Tarsohomoneura), p. 33
   [key to 7 Nearctic spp., p. 34]

   2nd TS3 segments yellow and wings with at most only apex of marginal cells clouded . . . . . H. (Homoneura), p. 58
   [key to 9 groups of 32 spp. and to 10 spp., p. 58]

SUBGENUS MALLOCHOMYZA

Homoneura (Mallochomyza) Hendel, 1925, NEW STATUS

Malloch (1920) inadvertently used the generic name Sapromyzosoma in connection with his description of Sapromyza citreifrons (Malloch 1923). In his 1923 paper he described the new genus, Sapromyzosoma, with Sapromyza citreifrons Malloch as its type. However, Sapromyzosoma was preoccupied by Lioy (1864), and Hendel (1925) gave the new name Mallochomyza for Sapromyzosoma Malloch.

The character that Malloch (1923) used to distinguish Sapromyza from Sapromyzosoma was the situation of the costal setulae: in Sapromyza, the costal setulae become weaker after the 2nd vein (R_{2+3}) and disappear before the apex of the 3rd vein (R_{4+5}); in Sapromyzosoma, the costal setulae continue to the apex of the 3rd vein, where they cease abruptly. Sapromyzosoma was said to be a synonym of Homoneura by Malloch, 1926.

Unfortunately, Malloch evidently did not check the costal setulae in the type, S. citreifrons, because it definitely has the costal setulae ending before the apex of the R_{4+5}, as in Sapromyza. This situation is found in all specimens of citreifrons that I have examined. Because Shewell (1971) has described other species of Homoneura with the costal setulae ending before the R_{4+5}, I have decided to leave citreifrons in Homoneura and give new status to Mallochomyza.

Diagnosis Mallochomyza can be distinguished by the following combination of characters: 1) costal setulae diminishing beyond apex of R_{2+3} and ending approximately 2/3rds of the distance to apex of R_{4+5} (Fig. 11); 2) 1 fine, long, basal pv F2 bristle; 3) 1 strong T2 spur (Fig. 6).

Discussion Some small specimens of H. incerta occasionally possess only 1 strong pv T2 spur. However, incerta always has the costal setulae ending at the apex of the R_{4+5} and the basal pv F2 bristle only weakly developed.

Homoneura (Mallochomyza) citreifrons (Malloch)

(Fig. 1, 5, 6, 10, 11, 24, 32)

Sapromyza (Sapromyzosoma) citreifrons Malloch, 1920: 127 [descr. - IL].
Malloch, 1923: 51 [note, citreifrons type for Sapromyzosoma n. gen.].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - MD].
Hendel, 1925: 112 [Mallochomyza n. name for Sapromyzosoma Malloch, preocc. Lioy, 1864].
Johnson, 1925a: 255 [coll. rec. - ME, NH, MA].
Johnson, 1927: 216 [coll. rec. - ME].
Procter, 1938: 344 [coll. rec. - ME, same as Johnson, 1927].
Shewell, 1938: 133, 135 [key], 139 [coll. rec. - QUE]; 134 (Pl. 12), Fig. 37 [genitalia, m], 138 (Pl. 14), Fig. 61 [wing, f], Fig. 64 [wing, m].
Procter, 1946: 398 [coll. rec. - ME, same as Johnson, 1927 and Procter, 1938].
Shewell, 1965: 698 [cat., distr. - ONT, to ME, s. to IL and n. GA].

Diagnosis This small, yellow species is easily recognized by having the costal setulae ending before the apex of the R_{4+5}, 1 strong, basal pv F2 bristle, 1 strong T2 spur and yellow to light brown, long pubescent aristae and 2nd antennal setae (Fig. 1).

Discussion Individuals of citreifrons exhibit strong sexual dimorphism: in the males the head is usually circular in profile, with the frons greatly inflated; head and thoracic bristles are brown with those on the face, palpi, forecoxae, pv surface of F1, mid-coxae, base of F2 and venter of st yellow to light brown and very long; av F1 ctenidium indistinct, with undifferentiated, widely spaced setae (Fig. 5); wings usually with the apical R_{2+3} spots at most only weakly developed (Fig. 10). Females have the head distinctly oval, higher than wide; head and thoracic bristles black, with facial and leg bristles yellow to brown, but not as long as in the males; av F1 ctenidium of 5-8 weak, widely spaced setulae; wings have well-developed apical R_{2+3} spots (Fig. 11).

Shewell (1938: p. 138, Fig. 61) figured the same wing for females of both citreifrons and conjuncta. Of the females that I have examined, both species can easily be distinguished by citreifrons having the apical R_{2+3} and preapical R_{4+5} spots separated (Fig. 11), while they are usually fused in conjuncta (Fig. 42). The presence of 2 T2 spurs and the absence of preapical av F3 bristles also separates conjuncta and citreifrons.

The male genitalia and cerci are very small in citreifrons (Fig. 24). The surstyli are broad, moderately long lobes and the terminal processes are small, posteriorly-directed arms with 4-5 minute, black setulae.

Types Holotype: male, Savanna, Illinois, VI-13-1917, J. R. Malloch (INHS). Paratypes: 5m, Cobden, Illinois, V-9-1918, J. R. Malloch (INHS, USNM).

Specimens examined 159 (37m, 122f) from 56 eastern NA localities:

CT 3m, 8f, 2 localities (USNM).
GA 1f, Black Rock Mt. St. Pk., VII-4-1953, M. R. Wheeler (UTXA).
IA 3f, Ledges St. Pk., Boone Co., V-31-1950, J. L. Laffoon (IASU); 1f, Spring Brook St. Pk., Guthrie Co., VI-9-1973, W. B. Stoltzfus (IASU).
IL 1f, White Heath, V-15-1938, J. C. Dirks (INHS); 1m, holotype (INHS); 5m, paratypes (INHS, USNM).
IN 1m, Turkey Run St. Pk., V-11-1957, J. F. McAlpine (CNC).
KY 2f, TWL, Jefferson Co., VI-8-1954, P. J. Christian (LIM).
MD 4f, 2 localities (USNM).
MI 1f, Mackinac, VII-5-1910, M. C. Van Duzee (CAS); 1f, Douglas Lake, IV-28-1949, W. Porter (IASU).
MO 1f, Columbia, VII-7-1967, F. D. Parker, Malaise trap (USNM).
NC 1f, Highlands, VI-1-1957, W. R. M. Mason, 3000 ft. (CNC); 1m, Highlands, Macon Co., VI-21-1958, J. L. Laffoon, at light (IASU).
NH 1f, White Mts., VII-7-1936, A. L. Melander (USNM).
NY 3m, 6f, 3 localities (CAS, CU).
OH 1m, 12f, 6 localities (FSCA, KSU, OHSU, RMM).
ONT 10f, 8 localities (CAS, CNC, USNM).
PA 2m, Inglenook, V-31-1914 (PADA).
QUE 19m, 68f, 19 localities (CNC, UM).
VA 1m, Falls Church, VI-1-1958, W. W. Wirth, light trap (USNM).
WI 1m, Dane Co., VI-11-1954, C. R. Hartley (UWI).

Remarks This species has also been reported from Massachusetts and Maine (Johnson, 1925a, 1927; Procter 1938, 1946), but I have not seen specimens from these states. I have examined 1 female in poor condition [Black Moshannon, PA, VI-13-1948, S. W. Frost (FEM)] that is very similar to citreifrons. It has the M_{1+2} section between r-m and m heavily bordered (Fig. 32), while this section is clear in citreifrons (Fig. 11). This may represent a new species; however, the wing venation seems somewhat aberrant, and a series of these specimens, especially with a male, would be necessary before deciding the status of this specimen.

Biology The flight period for this fairly common species extends from late April to late July with most collections dating from late May to mid-June. One specimen each has been taken from a cedar swamp, at a light, from a light trap and from a Malaise trap. Many specimens were swept from basswood (Tilia americana). Adults have been recorded at elevations of 800 to 3,000 ft. (243 to 914 m.).

In early June, 1968, rearings were attempted from adults collected from the herbage and fern fronds in a mesic woods near a seepage area in Kent, Ohio. Although the females laid a number of eggs, most were inviable and those larvae that did hatch died in a few weeks without further development. By the end of July all the adults had died in the laboratory and no others were collected in intensive sweeping of the habitat in July, August and September.

This information, along with the last collection record being July 30 (Ontario), suggests that this species is rather short-lived compared with other species of Homoneura and most likely is univoltine.

SUBGENUS TARSOHOMONEURA

Homoneura (Tarsohomoneura) Hendel, 1933, NEW STATUS

Hendel (1933) described this subgenus after examining the type specimen of Homoneura americana (Wiedemann) and comparing it with species described by Johnson (1914) and Malloch (1914). He based the new subgenus on the conspicuous, black TS3 segments and also the enlargements or dilations of the 2nd and 3rd TS3 segments of the males. He placed H. ornatipes (Johnson), melanderi (Johnson), houghii (Coquillett), americana (Wiedemann) [compedita (Loew)] and disjuncta (Johnson) [similata (Malloch)] in this subgenus and designated Sapromyza americana Wiedemann, 1830, as its type.

Stuckenberg (1971) did not recognize this subgenus because he thought it was only based on characters of the male. However, the corresponding black TS3 segments also occur in the females, although not dilated. Males of melanderi and ornatipes have 2 dilated and blackened TS3 segments and 3 segments adorned with long, black, clavate bristles. Males of americana and houghii have distinctly dilated, black, 2nd TS3 segments, while these segments are only slightly enlarged in disjuncta and johnsoni.

Diagnosis Members of Tarsohomoneura can be distinguished by the following combination of characters: 1) 2nd TS3 segments at least partially black, except in sheldoni; 2) well-developed apical R_{2+3}, preapical and apical R_{4+5}, and apical M_{1+2} spots, marginal cells uniformly clouded or apical R_{2+3} and preapical R_{4+5} spots usually fused and

forming a complete or interrupted band with the heavily bordered m, except in disjuncta which usually has small spots and no wing bands; 3) acr not much longer than thoracic setae, in 4 rows; 4) at most weak preapical av and pv F3 bristles; 5) male genitalia similar, especially the terminal processes.

Discussion Even though sheldoni seldom has the 2nd TS3 segments black, I have included it in the Tarsohomoneura because it agrees with all of the other characters of the subgenus. H. conjuncta is similar to the species of Tarsohomoneura by having wing maculations similar to american and johnsoni, aristae long pubescent, and a row of very weak preapical av F3 bristles; it differs by having the inner acr rows of weak bristles, distinctly longer than the thoracic setae, lacking dark TS3 segments and males with differently shaped terminal processes.

Key to Species of the Subgenus Tarsohomoneura

1. Marginal cells uniformly clouded, except sometimes paler centrally (Figs. 33-38) 2

   Marginal cells only clouded apically (Figs. 39-41) 5

2. 2nd TS3 at most slightly blackened (Fig. 8); costal margin clouded from humeral crossvein (h) to apex (Fig. 33) . . . . . sheldoni, p. 43

   2nd TS3 at least partially blackened; costal margin clouded from auxiliary vein (Sc) or 1st vein (R_1) to apex 3

3. 3rd TS3 black (Figs. 22, 23) . . . . . ornatipes, p. 38

   3rd TS3 pale 4

4. 2nd TS3 black on apical 2/3rds (Figs. 20, 21), apex of TS1 usually black; 1 strong preapical ad F3 bristle present . . . . . melanderi, p. 35

   2nd TS3 entirely black (Figs. 14, 15), apex of TS1 pale; preapical ad F3 bristles absent . . . . . houghii, p. 40

5. Preapical ad F3 bristles present; males with fine av T3 bristles near apex; 2nd TS3 as wide as long (Fig. 12) . . . . . [compedita] americana, p. 48

   Preapical ad F3 bristles absent; males lack fine T3 bristles; 2nd TS3 not greater than 1/2 as wide as long 6

6. Apical R_{2+3} spots usually subequal to preapical R_{4+5} spots and usually not in line with m, bordering of m narrowed posteriorly (Fig. 40); weak presutural dc often present; cerci of males deeply excavated on mesal margins (Fig. 30) . . . . . [similata] disjuncta, p. 45

   Apical R_{2+3} spots usually twice as large as preapical R_{4+5} spots and both in line with m, forming an interrupted wing band, bordering of m only slightly narrowed posteriorly (Fig. 41); 1 strong presutural dc usually present; cerci of males not deeply excavated on mesal margins (Fig. 31) . . . . . johnsoni, p. 54

Homoneura (Tarsohomoneura) melanderi (Johnson)

(Figs. 20, 21, 27, 35)

Sapromyza melanderi Johnson, 1914: 21 [descr. - MA]; Pl. III, Fig. 4 [TS3, m], Fig. 5 [TS3, f], Fig. 6 [wing].
Malloch & McAtee, 1924: 20 [key].
Johnson, 1925a: 255 [coll. rec. - MA].
Johnson, 1930: 149 [coll. rec. - MA].
Shewell, 1938: 133 [key], 140 [coll. rec. - QUE]; 136 (Pl. 13) Fig. 44 [genitalia, m], 138 (Pl. 14) Fig. 63 [wing].
Ouellet, 1941: 135 [coll. rec. - QUE].
Shewell, 1965: 699 [cat., distr. - AK to QUE, s. to SD and NJ].
Cole, 1969: 373 [distr. - AK].

Diagnosis This small species is characterized by having the marginal cells uniformly clouded, the apices of the 1st and 2nd TS3 segments black and the presence of a strong preapical ad F3 bristle. H. melanderi is similar to ornatipes, but ornatipes has the 2nd and 3rd TS3 segments black and lacks preapical ad F3 bristles.

Discussion H. melanderi has the marginal cells broadly clouded from the Sc to the apex of the wing. The apical R_{2+3} and preapical R_{4+5} spots are fused, but usually not in line with the m (Fig. 35). Males of both melanderi and ornatipes have a pair of long, black, clavate bristles near the apices of the first 3 TS3 segments. The apices of the 1st and 2nd TS3 segments are expanded and black in melanderi (Fig. 20), while the apices of the 2nd and 3rd are enlarged and black in ornatipes (Fig. 22). Males of melanderi also possess a very strong preapical ad F3 bristle and some fine, long, weak bristles at the apex of T3. Males of melanderi also lack surstylar extensions and the cerci are elongate with very strong, long, apical bristles (Fig. 27).

Females of melanderi have the apices of the 1st and apical halves of the 2nd TS3 segments black, as in the males, but not expanded (Fig. 21). Some females do not have the apices of the 1st TS3 segments distinctly dark. In these cases they can be confused with females of houghii; however, houghii can be distinguished by having at least 2/3rds of the apices of the 2nd TS3 segments black (Fig. 15) and by a definite wing band from the apical R_{2+3} spots to the bordered m (Fig. 34).

Types Holotype: male, Providence, Massachusetts, VI-24-1904, C. W. Johnson (MCZ 13231) [left wing missing]. Allotype: female, same data as holotype (MCZ). Paratypes: 1m, same data as holotype (MCZ); 1m, 1f, Eastham, Massachusetts, VI-27-1904, C. W. Johnson (MCZ); 2m, Barnstable, Massachusetts, VII-5-1904, C. W. Johnson (ANSP, MCZ); 1m, Nantucket, Massachusetts, VII-4-1906, J. A. Cushman (MCZ); 1m, Nantucket, Massachusetts, VIII-15-1911, H. T. Fernald (USNM).

Remarks According to Johnson's (1914) description there should be 1 paratype from Nantucket collected on VIII-7-1911 by H. T. Fernald. Furthermore, now there are 2 additional specimens marked as paratypes.

Specimens examined 184 (116m, 68f) from 46 northern NA localities:

AK	1m, 1f, 3 mi. s. Tok, VII-14-1948, R. I. Sailer (USNM).
ALTA	2m, 5f, 4 localities (CNC, UALTA).
BC	4m, 3f, 2 localities (CNC).
CO	2m, Rist Canon, VII-13-1898 (COSU).
MA	26m, 13f, 9 localities (AMNH, CTAES, CU, MCZ, USNM); m, holotype (MCZ); f, allotype (MCZ); 6m, paratypes (ANSP, MCZ, USNM).
MAN	2m, 1f, 2 localities (CNC).
MI	14m, 4f, 2 localities (UMI).
MN	1m, Eaglesnest, VI-14-1959, W. V. Balduf (USNM); 1m, 5 mi. se. Pequot Lakes, IX-4-1948, J. L. Laffoon (IASU).
MT	2f, 6 mi. w. Libby, VI-29-1967, S. P. Whitney (CNC, KSU).
NJ	4m, 6f, 2 localities (AMNH, MCZ).
NY	4m, 3f, 4 localities [Long Is.] (CM, USNM).
ONT	10m, 6f, 5 localities (AMNH, CNC).
QUE	21m, 17f, 5 localities (AMNH, CNC, UM).
SD	2m, 2f, 2 localities (SDSU, USNM).
WI	1m, 4f, Wood Co., Griffith St. Nursery, VII-8-1947, VI-26-, VII-31-1948, R. D. Shenefelt (UWI).

Biology The flight period for this fairly common and widespread species extends from early May (New York) through early September (Minnesota) with most collection records being made in the months of July and

August. Pairs in copula have been taken on July 4 (Quebec), July 17 (Michigan), August 16 (Massachusetts) and August 24 (Quebec). Adults have been recorded on tundra, from Quercus borealis (northern red oak), non-wilting Q. ellipsoidalis (northern pin oak), hybrid poplar, spruce-sand community and from elevations of 1,750 and 2,200 ft. (533 and 670 m.).

Homoneura (Tarsohomoneura) ornatipes (Johnson)

(Figs. 22, 23, 26, 37)

Sapromyza ornatipes Johnson, 1914: 20-21 [descr. - MA]; Pl. III, Fig. 1 [TS2, m], Fig. 2 [TS3, f], Fig. 3 [wing].
Malloch & McAtee, 1924: 20 [key].
Johnson, 1925a: 255 [coll. rec. - MA].
Shewell, 1938: 133 [key], 140 [note]; 134, (Pl. 12) Fig. 41 [genitalia, m].
Shewell, 1965: 699 [cat., distr. - se. QUE, MA, NY, NC, n. GA.

Diagnosis This medium-sized species is characterized by having the marginal cells uniformly clouded and the 2nd and 3rd TS3 segments black. H. ornatipes is similar to melanderi, but ornatipes has most of the 2nd and 3rd TS3 segments black, while melanderi has the apices of the 1st and 2nd TS3 segments black.

Discussion H. ornatipes has the marginal cells broadly clouded from the R_1 to the apex of the wing. The apical R_{2+3} and preapical R_{4+5} spots and bordered m are fused, forming broad bands (Fig. 37). Males of both ornatipes and melanderi possess 1 pair of long, black, clavate bristles near the apices of the first 3 TS3 segments. The apices of the 2nd and 3rd segments are enlarged and black in ornatipes (Fig. 22), while the apices of the 1st and 2nd are expanded and black in melanderi

(Fig. 20). Males of ornatipes lack strong preapical ad F3 bristles and fine av bristles at the apex of T3, as found in melanderi. Males of ornatipes have broad, rounded, lobe-shaped surstyli and cerci with apical bristles not as long as melanderi (Figs. 26, 27). Females of ornatipes have the 2nd and 3rd TS3 segments almost completely black, as found in the males, but not expanded (Fig. 23).

Types Holotype: male, Mt. Everett, Massachusetts, VI-27-1912, C. W. Johnson (MCZ 27060). Allotype: female, same data as holotype (MCZ). Paratypes: 1m, 2f, same locality as holotype, VI-27,28-1912 (MCZ, USNM); 1f, Bashbish Falls, Massachusetts, VI-28-1912, C. W. Johnson & J. A. Cushman (MCZ).

Specimens examined 70 (39m, 31f) from 15 northeastern and eastern NA localities:

CT	1f, Salisbury, VI-19-1935, S. H. Plumb (CTAES).
GA	2m, Rabun Bald, Rabun Co., VIII-9-1957, C. J. Durden (CNC).
MA	1f, Mt. Everett, VI-28-1912, C. W. Johnson (MCZ); m, holotype (MCZ); f, allotype (MCZ); 1m, 3f, paratypes (MCZ, USNM).
ME	1m, Mt. Katahdin, VII-1-6-1968, D. M. Wood, 2400 ft. (CNC).
NC	8m, 8f, 3 localities (CNC, FSCA, IASU).
NJ	1m, N. Yersey [sic], Belfrage (NRS).
NY	1m, Cold Spring Harbor, Long Island, VII-21-1930 (AMNH).
PA	1m, Spring Gr., VI-12-1945, (USNM). 1f, Columbia Co., VII-3-1928, H. Kahl (CM).
QUE	21m, 14f, Park Reserve, Kam. Co., VII-9-1957, G. E. Shewell, W. R. M. Mason, 950 ft., sweeping Kalmia angustifolia (AMNH, BMNH, CNC, UTXA).
TN	1m, Coal Creek, VI-23-1915, A. H. Sturtevant, on wet leaves (USNM); 1m, 2f, Table Mt. Pine Heath, Great Smoky Mts. Natl. Pk., VII-19-1947, R. H. Whittaker, 3500 ft. (USNM).
VA	1m, 1f, Mt. Lake, Giles Co., VI-26,30-1962, J. G. Chillcott, 3800 ft. (CNC).

Biology The flight period for this uncommon species extends from early May through mid-August with most adults having been collected in July and August. Adults have been recorded at a light during heavy rain, on wet leaves, sweeping Kalmia angustifolia (dwarf laurel) and from 950 to 6,000 ft. (274 to 1,829 m.) in elevation. Whittaker (1952) collected several specimens of ornatipes [unpublished] in an open stand of pines, with a highly developed ericaceous shrub stratum and rather sparse herb stratum, which was on an open southwest slope at 3,500 ft. (1,067 m.) in Tennessee.

Homoneura (Tarsohomoneura) houghii (Coquillett)

(Figs. 14, 15, 28, 34, 36, 38)

Sapromyza houghii Coquillett, 1898: 277 [key, descr. - MA].
Aldrich, 1905: 585 [cat., distr. - MA].
Johnson, 1910: 798 [coll. rec. - NJ].
Melander, 1913: 67 [key. distr. - MA].
Johnson, 1914: 21-22 [note, coll. rec. - MA, CT, RI, NJ, VA]; Pl. III, Fig. 10 [TS3, m], Fig. 11 [wing].
Britton, 1920: 202 [coll. rec. - CT].
Malloch & McAtee, 1924: 20 [key], 23 [coll. rec. - MD].
Johnson, 1925a: 255 [coll. rec. - MA, RI, CT].
Johannsen, 1928: 848 [coll. rec. - NY].
Johnson, 1930: 149 [coll. rec. - MA].
Shewell, 1938: 133 [key], 140 [coll. rec. - QUE]; 136 (Pl. 13) Fig. 46 [genitalia, m], 138 (Pl. 14) Fig. 60 [wing].
Ouellet, 1941: 135 [coll. rec. - QUE].
Brimley, 1942: 28 [coll. rec. - NC].
Procter, 1946: 399 [coll. rec. - ME].
Steyskal, 1947: 72 [distr. - TN, QUE, ME, MA, RI, CT, NY, NJ, VA, MD, NC, MI, SD].
Shewell, 1965: 698 [cat., distr. - s. SASK to PEI, s. to SD and GA,
Cole, 1969: 373 [distr. - SASK].

Diagnosis This medium-sized species is recognized by having the 2nd TS3 segments black and broadly clouded marginal cells, which are

occasionally interrupted centrally.

Discussion Both houghii and americana have similar black 2nd TS3 segments, but these segments in the males of houghii are about 2/3rds as wide as long (Fig. 14), whereas in americana they are about as wide as long (Fig. 12). The black 2nd TS3 segments of the females of houghii are very similar to those of the females of americana, johnsoni and disjuncta (Figs. 15, 13, 17, 19), but the broadly clouded marginal cells are present in houghii, while absent in the others. The costal clouding is very similar to melanderi with the clouding beginning with the Sc and extending to the apex of the wing. H. houghii usually has a complete band from the apical R_{2+3} spot to the bordered m (Fig. 34), which is distinctly interrupted in melanderi (Fig. 35). Some specimens of houghii have the costal clouding interrupted centrally between the r-m and the R_{2+3} and m bands (Fig. 36).

The male genitalia of houghii and americana are very similar, but the aedeagi and cerci are smaller in houghii (Figs. 28, 29) and the T3 lacks fine, apical av bristles (Figs. 12, 14).

Type Holotype: female, New Bedford, Massachusetts, G. de N. Hough (USNM 4084).

Remarks The type specimen is a female; not a male as reported in Coquillett's (1898) description.

Specimens examined 220 (123m, 97f) from 74 northern and eastern NA localities:

CT 4m, 2f, 5 localities (CTAES, SEM, USNM).
DC 1f, Rock Creek, VI-15-1913, R. C. Shannon (USNM).
GA 1f, V-4-1957 (CNC).
MA 15m, 12f, 12 localities (CNC, MCZ, UM, USNM).
MD 10m, 4f, 4 localities (CNC, USNM).
ME 11m, 6f, 3 localities (CAS, CM, OHSU).
MI 1m, 3f, 2 localities (SEM).
MN 1f, 5 mi. se. Pequot Lakes, Crow Wing Co., VII-4-1957, J. L. Laffoon (IASU).
NC 12m, 7f, 4 localities (CNC, USNM).
NJ 5m, 1f, 3 localities (AMNH, CNC, MCZ, USNM).
NS 1f, Halifax, VII-1967, N. L. H. Krauss (USNM).
NY 30m, 40f, 13 localities [mostly from Long Is.] (AMNH, CNC, CU, NYSM, USNM).
OH 1f, 4 mi. e. Kent, VI-29-1964, B. A. Foote (KSU); 1m, 1 mi. n. Kent, VI-16-1965, W. B. Stoltzfus (KSU).
ONT 2m, 7f, 2 localities (CNC).
PA 1m, 2f, 3 localities (ANSP).
PEI 4m, 4f, 3 localities (CNC, USNM).
QUE 12m, 5f, 5 localities (AMNH, CNC, UM).
RI 1m, Washington, VI-9-1912, A. L. Melander (USNM).
SASK 1f, St. Victor, VI-27-1955, J. R. Vockeroth (CNC).
SD 1f, Sylvan Lake, VII-19-1924 (SDSU).
VA 13m, 5f, 6 localities (CNC, MCZ, USNM).
WV 1m, Cheat Mts., VI (CM).

Remarks Steyskal (1947) also reported this species from Tennessee. I have also examined a female from California [Packers Gulch, Del Norte Co., X-18-1959, Hobart, Haig & Anderson, ex Frick in bitter cherry (CADA)] that is very similar to houghii (Fig. 38), although somewhat larger. Since it is far outside the known range of houghii, there is a strong possibility that it is a new species. A male from the far west would help decide the status of this specimen.

Biology The flight period for this fairly common and widespread species extends from the beginning of May to mid-October. Adults have been collected from a salt marsh, at 4,600 to 4,872 ft. (1,402 to 1,480 m.) in elevation, at light and from Malaise traps. H. houghii

has also been collected in a Narcissus field and Malloch & McAtee (1924) reported specimens visiting flowers of Ceanothus americanus (New Jersey tea) and Lyonia [Xolisma] ligustrina (maleberry). Adults have been collected mostly during the summer months of June, July and August. Specimens in copula have been collected on May 30 (Virginia) and August 13 (Quebec), and Malloch & McAtee (1924) reported adults in copula on June 4 and July 14 (Maryland).

Homoneura (Tarsohomoneura) sheldoni (Coquillett)

(Figs. 8, 25, 33)

Sapromyza sheldoni Coquillett, 1898: 277 [key, descr. - NY].
Aldrich, 1905: 586 [cat., distr. - NY].
Melander, 1913: 67 [key].
Johnson, 1914: 22 [note, coll. rec. - ME, MA].
Malloch & McAtee, 1924: 20 [key].
Johnson, 1925a: 255 [coll. rec. - ME, MA].
Criddle, 1926: 104 [coll. rec. - ONT].
Johannsen, 1926: 159 [coll. rec. - NY].
Blake, 1927: 33, 34 [adult ecology - ME].
Johnson, 1927: 216 [coll. rec. - ME].
Johannsen, 1928: 848 [coll. rec. - NY].
Procter, 1938: 344 [coll. rec. - as Johnson, 1927].
Shewell, 1938: 135 [key], 140 [coll. rec. - ONT, QUE]; 134 (Pl. 12) Fig. 38 [genitalia, m], 138 (Pl. 14) Fig. 62 [wing].
Procter, 1947: 399 [coll. rec. - as Johnson, 1927].
Judd, 1960: 248 [adult ecology - ONT].
Shewell, 1965: 699 [cat., distr. - s. ONT, s. QUE, NY, ME, MA].

Diagnosis This small species only occasionally exhibits slight darkening of the 2nd TS3 segments, but agrees with all the other characters of Tarsohomoneura. The broad clouding of the marginal cells begins slightly beyond the h and extends to the apex of the wing (Fig. 4). This is a distinctive character because all of the other species with costal clouding have it beginning at the Sc or R_1.

Discussion Approximately 10% of the specimens examined exhibited a distinct darkening on the apical half of the dorsum of the 2nd TS3 segments (Fig. 8). This darkening is not black, but about the same color as the apices of the last TS1, TS2 and TS3 segments. A number of specimens had faintly darker 2nd TS3 segments, while most had no evidence of darkening.

The male genitalia are very similar to the other species of the subgenus, but the aedeagi and cerci are the smallest of the group (Fig. 25).

Type Holotype: female, Oswego, New York, VIII-1-1895, C. A. Sheldon (USNM 4083).

Specimens examined 241 (89m, 152f) from 22 northeastern NA localities:

MA	2m, 1f, Wellesley, VII-11-1909, Van Duzee (CAS).
ME	1m, 5f, 3 localities (CNC, MCZ, USNM).
MI	6m, 6f, 3 localities (SEM).
NH	1m, Durham, IX-9-1924, P. R. Lowry (UNH).
NY	6m, 7f, 4 localities (ANSP, CU, USNM); f, holotype (USNM).
ONT	68m, 124f, 5 localities (CNC, USNM).
QUE	2m, 7f, 5 localities (AMNH, CNC, UM).
WI	3m, 2f, Squaw Lake, Vilas Co., VIII-18-1954, J. L. Laffoon (IASU).

Biology The flight period for this rather uncommon species begins in early June and extends to mid-September, being most commonly collected in July and August. Adults have been recorded on leather-leaf and associated with bogs. A large number of adults was collected by Malaise traps from Mer Bleue, Ontario, during July and August. Judd (1960) found adults of this species in the Chamaedaphnetum calyculatae (leather-leaf) association in an ecological study of Byron Bog in southwest Ontario. Blake

(1927) found adults "on decaying organic matter," associated with plants along the edges of a pond-bog near Pamola Pond, Mount Ktaadn [Mt. Katahdin], Maine.

Homoneura (Tarsohomoneura) disjuncta (Johnson)

(Figs. 18, 19, 30, 40)

Walker, 1849: 987 [coll. rec. - NS, as philadelphica, MISIDENT.].
Walker, 1871: 144 [coll. rec. - NS, same as Walker, 1849].
Johnson, 1913: 80 [coll. rec. - FL, as compedita [=americana], misident. - see Johnson, 1914: 22].
Sapromyza disjuncta Johnson, 1914: 22 [descr. - RI, MA, CT, NY, NJ, PA, ME, FL; paratype - NH, =johnsoni, MISIDENT.]; Pl. 3, Fig. 12 [TS3, m], Fig. 13 [wing].
Sapromyza similata Malloch, 1914: 30 [descr. - IL, MI, NJ, DC, MD, NC]; Pl. II, Fig. 2 [wing], Fig. 4 [TS3, m], Fig. 17 [head, m].
disjuncta, Weiss, 1915: 107 [coll. rec. - NJ].
Headlee, 1916: 484 [coll. rec. - NJ].
similata, Gibson, 1919: 119 [coll. rec. - QUE].
disjuncta, Britton, 1920: 202 [coll. rec. - CT, same as Johnson, 1914].
Malloch & McAtee, 1924: 20 [key; similata, syn.]; 23 [coll. rec. - MD].
Johnson, 1925a: 255 [coll. rec. - ME, MA, CT, RI].
Johnson, 1925b: 96 [coll. rec. - NH].
Criddle, 1926: 104 [coll. rec. - ONT, QUE].
Hallock & Parker, 1926: 18 [coll. rec. - NJ].
Johnson, 1927: 216 [coll. rec. - ME].
Johannsen, 1928: 848 [coll. rec. - NY].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
Brimley, 1938: 380 [coll. rec. - NC].
Procter, 1938: 344 [coll. rec. - ME, same as Johnson, 1927].
Shewell, 1938: 135 [key]; 139 [coll. rec. - ONT, QUE]; 136 (Pl. 13) Fig. 43 [genitalia, m], 138 (Pl. 14) Fig. 59 [wing].
Procter, 1946: 398 [coll. rec. - ME, same as Johnson, 1927].
Shewell, 1965: 698 [cat., distr. - s. ONT to NS, s. MO and FL].

Diagnosis This medium-sized species does not have the marginal cells uniformly clouded throughout. The apical R_{2+3} spots are usually subequal to the preapical R_{4+5} spots below and are usually much beyond the

line with the bordered m (Fig. 70). The bordering of the m is usually narrowed posteriorly, while johnsoni does not have the bordering distinctly narrowed posteriorly (Fig. 40). Usually disjuncta possesses a weak presutural dc, while johnsoni usually has a strong one. Preapical ad F3 bristles are absent in disjuncta, as are the fine T3 bristles in males which are characteristic of americana.

Discussion H. disjuncta usually has the apices of TS3 segments 3 and 4 dark dorsally (Figs. 18, 19); they are usually pale in johnsoni (Figs. 16, 17). The male genitalia are large, with lobe-like surstyli and cerci deeply excavated on the inner margins (Fig. 30). Also the apices of the cerci have 2-3 long, strong bristles and the others are strong, dense and black, whereas johnsoni has these apical bristles not as strong, dense or as black (Fig. 31).

Types Holotype: male, Washingtion, Rhode Island, VI-19-1912, C. W. Johnson (MCZ 14553). Allotype: female, Buttonwoods, Rhode Island, VI-15-1912, C. W. Johnson (MCZ) [head missing]. Paratypes: 1m, Tiverton, Rhode Island, VII-31, C. W. Johnson (MCZ); 1m, Cambridge, Massachusetts, VI-24, C. W. Johnson (MCZ); 1f, Mt. Tom, Massachusetts, IX-22, C. W. Johnson (MCZ); 1f, Boston, Massachusetts, VI-6, C. W. Johnson (MCZ); 1?, Dedham, Massachusetts, IX-4-1905, C. W. Johnson (MCZ) [head & abdomen missing]; 1m, Philadelphia, Pennsylvania, VI-20-1896, C. W. Johnson (MCZ); 1f, Frazer, Chester Co., Pennsylvania, VII-24-1893, C. W. Johnson (MCZ); 1f, Branford, Connecticut, VIII-11-1904, H. L. Viereck (MCZ); 2m, Darien, Connecticut, V-27, VI-11-1912, C. W. Johnson (MCZ); 1f, Connecticut, C. R.

Osten Sacken (MCZ); 1f, New York, C. R. Osten Sacken (MCZ); 1m, [unknown locality], C. R. Osten Sacken (MCZ); 1f, Ithaca, New York, VII-23-1905, C. W. Johnson (MCZ); 1f, Wildwood, New Jersey, VIII-12, C. W. Johnson (MCZ); 2f, Norway, Maine, S. J. Smith (MCZ); 1f, Jacksonville, Florida, A. T. Slosson (MCZ) [in poor condition].

Remarks One male paratype [Bretton Woods, New Hampshire, VI-25-1913, C. W. Johnson (MCZ)] was misidentified by Johnson (1914), and I have designated this specimen a paratype of johnsoni. Some of Malloch's (1914) paratypes of similata at the United States National Museum have been mislabeled as cotypes. Furthermore, only 3 of the 14 paratypes from the collection of W. L. McAtee could be located.

Specimens examined 362 (167m, 194f, 1?) from 100 eastern NA localities:

CT 1m, 2f, 2 localities (CTAES); 2m, 2f, 3 localities, paratypes (MCZ).
DC 2f, 2 localities (MCZ, NRS); 1m, 2f, paratypes [similata] (USNM).
FL 1f, paratype (MCZ).
GA 1f, Atlanta, VIII-27-1941 (USNM).
IA 2m, 2 localities (IASU).
IL 8m, 11f, 5 localities (INHS, USNM); f, holotype [similata] (INHS); 2m, 7f, paratypes [similata] (CNC, INHS).
IN 11m, 3f, 3 localities (CU, PU).
KS 1m, 1f, Onaga, V-30-1901 (OHSU).
MA 5m, 7f, 6 localities (ANSP, MCZ, INHS, USNM, UTXA); 1m, 2f, 1?, 3 localities, paratypes (MCZ).
MD 1m, 2f, 2 localities (USNM).
ME 2f, paratypes (MCZ).
MI 3f, 2 localities (SEM, UMI); 1m, lectoallotype [similata] (INHS).
MN 9m, 4f, 7 localities (ANSP, UMN).
MO 1f, Lithium, VI-29-1955, M. R. Wheeler (UTXA).
NB 2f, VIII-8-1938 (CNC).

NC 3m, 2f, Highlands, V-26-VI-10-1951 (CNC).
NJ 3m, 2f, 5 localities (ANSP, MCZ, OHSU, USNM); 1m, paratype [similata] (INHS); 1m, 1f, 2 localities, paratypes (MCZ).
NS 1m, VIII-6-1958 (CNC).
NY 25m, 26f, 14 localities (AMNH, CAS, CU, MCZ, NYSM, PADA, USNM); 2f, paratypes (MCZ).
OH 3f, 3 localities (OHSU, USNM).
ONT 30m, 34f, 10 localities (CAS, CM, CNC, UALTA, USNM, WASU).
PA 54m, 62f, 8 localities (ANSP, CM, PADA, USNM); 1m, 1f, 2 localities, paratypes (MCZ).
QUE 2m, 5f, 4 localities (UM).
RI 1m, holotype (MCZ); 1f, allotype (MCZ); 1m, paratype (MCZ).
SC 1m, Clemson College, VII-8-1934, J. G. Watts (CU).
TN 2f, Knoxville, A. H. Sturtevant (USNM).
VA 1m, Great Falls, VII-9-1925, A. L. Melander (USNM).
WI 1m, 4f, 4 localities (OHSU, UWI).

Biology The flight period for this common species begins mid-May and extends through early November with individuals being fairly common during June, July and August. Specimens have been collected from sand dunes, sand bars, forests, flowers of dogwood (Cornus) and from Solanum (nightshade). Several specimens have been taken in Malaise traps, light and black light traps. Many specimens have been collected at lights and attracted to windows.

Homoneura (Tarsohomoneura) americana (Wiedemann)

(Figs. 2, 12, 13, 29, 39)

Sapromyza americana Wiedemann, 1830: 453 [descr. - NA, as Brasil, error].
Sapromyza compedita Loew, 1861: 347 (Cent. 1, no. 76) [descr. - PA].
Osten Sacken, 1878: 196 [cat., distr. - PA].
Keen, 1885: 55 [coll. rec. - PA].
Smith, 1890: 399 [coll. rec. - NJ].
Johnson, 1892: 37 [coll. rec. - NJ].
Townsend, 1892: 302 [key, distr. - PA].
americana, Lynch Arribalzaga, 1893: 262 [key], 291 [descr., after Wiedemann, 1830].
compedita, Lynch Arribalzaga, 1893: 263 [key], 295 [descr., after Loew, 1861].

Williston, 1894: 197 [distr. - USA, Pacific coast, KS].
Slosson, 1895a: 7 [coll. rec. - NH].
Johnson, 1900: 689 [coll. rec. - NJ].
Chagnon, 1901: 14 [coll. rec. - QUE].
Aldrich, 1905: 585 [cat., distr. - PA, NJ, QUE, NH, Pacific coast].
Johnson, 1910: 798 [coll. rec. - NJ, same as Johnson, 1900].
Johnson, 1913: 80 [coll. rec. - FL, =disjuncta, misident., see Johnson, 1914: 22].
Melander, 1913: 67 [key, distr. - QUE, ONT, ME, NH, NJ, Pacific coast, MA, PA, IL, TX, MI, WI, TN, SD; Pacific coast distr. ERROR].
Johnson, 1914: 21 [note]; Pl. 3, Fig. 7 [TS3, m], Fig. 8 [TS3, f], Fig. 9 [wing].
Malloch, 1914: 30 [note], 31 [coll. rec. - IL, VA, MD]; Pl. II, Fig. 5 [TS3, m], Fig. 6 [wing].
Winn & Beaulieu, 1915: 152 [coll. rec. - QUE].
Britton, 1920: 202 [coll. rec. - CT].
Malloch & McAtee, 1924: 20 [key], 23 [coll. rec. - MD].
Johnson, 1925a: 255 [coll. rec. - ME, NH, VT, MA, RI, CT].
Criddle, 1926: 104 [coll. rec. - NS, QUE, ONT].
Johnson, 1927: 216 [coll. rec. - ME].
Johannsen, 1928: 848 [coll. rec. - NY].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
americana, Hendel, 1933: 76-77 [americana, type locality NA, not Brasil; compedita, syn.].
compedita, Felt & Chamberlain, 1936: 58 [coll. rec. - NY].
Brimley, 1938: 380 [coll. rec. - NC].
Procter, 1938: 344 [coll. rec. - ME, same as Johnson, 1927].
Shewell, 1938: 135 [key], 139 [coll. rec. - NS, QUE, ONT]; 134 (Pl. 12) Fig. 39 [genitalia, m], 138 (Pl. 14) Fig. 55 [wing].
Procter, 1946: 398 [coll. rec. - ME, same as Johnson, 1927].
Dowdy, 1947: 432 [adult ecology - MO].
Chagnon, 1952: 29 [coll. rec. - QUE].
americana, Shewell, 1965: 698 [cat., distr. - SD to NS, s. to TX and GA].
Miller & Foote, 1975: 314-316 [adult biology - OH].
Miller & Foote (in press) [descr. of immature stages].

Diagnosis This medium-sized species does not have the marginal cells uniformly clouded. The apical R_{2+3} spots are usually twice as large as the preapical R_{4+5} spots below. Both spots are fused and usually in line with the bordered m forming interrupted wing bands (Fig. 39). H. americana is easily separated from disjuncta and johnsoni by the presence

of at least 1 strong preapical ad bristle, which is absent in the other 2 species.

Discussion This species usually does not possess presutural dc bristles, which are commonly present in disjuncta and johnsoni. Males of americana typically have 3 erect, strong, preapical ad F3 bristles and females at least 1 regular-sized bristle. Males have the 2nd TS3 segments mostly black and as wide as long (Fig. 12), while johnsoni and disjuncta have these segments not greater than 1/2 as wide as long (Figs. 16, 18). Females of americana have the 2nd TS3 segments almost entirely black, but not expanded (Fig. 13).

The male genitalia are large, with the cerci not deeply excavated on the inner margins and usually 3 strong apical bristles, which are only slightly longer than the rest of the apical bristles (Fig. 29). Males of disjuncta and johnsoni have the strong apical bristles much longer than the other apical bristles (Figs. 30, 31).

Type Holotype: male, Am. bor., Winthem, [C. R.] Wiedemann coll. (NMW).

Remarks According to Wiedemann (1830), he described a female from Brasil, but Hendel (1933) reported the type was actually a male from North America. The type was not available for personal examination from the Natural History Museum, Vienna, but R. Lichtenberg (pers. com.) compared it with some representative males of americana, disjuncta and johnsoni, which I sent her. The type was labeled Americae borealis and was a male, which proved to be the same species that has been called americana.

Specimens examined 796 (360m, 436f) from 258 central and eastern NA localities:

AL 1m, 1f, Monte Sano St. Pk., Huntsville, V-23-1965, J. G. Chillcott (CNC).
CT 7m, 5f, 8 localities (AMNH, CTAES, CU, USNM).
DC 3m, 3f, 3 localities (MCZ, USNM).
DE 1f, Newark, VII-23-1954, C. A. Triplehorn (OHSU).
FL 1f, Miami Beach, VII-12-1946 (USNM).
GA 3m, 4f, 6 localities (CNC, NRS, USNM, UTXA).
IA 2m, 7f, 5 localities (IASU).
IL 40m, 33f, 19 localities (AMNH, INHS, UTXA).
IN 2m, 1f, Lafayette, VII-11-1926, J. M. Aldrich (USNM).
KS 1f, Onaga (USNM).
KY 1f, TWL, Jefferson Co., VI-8-1954, P. J. Christian (LIM).
MA 32m, 17f, 15 localities (CAS, CU, IRSNB, LACM, MCZ, UM, USNM, UTXA).
MD 8m, 36f, 8 localities (ANSP, CNC, UMD, USNM).
ME 5m, 11f, 6 localities (CNC, CU, OHSU, USNM).
MI 15m, 19f, 19 localities (CNC, INHS, SEM, UMI, USNM).
MN 5m, 21f, 7 localities (IASU, UMN).
MO 3m, 3f, 4 localities (CU, USNM, UTXA).
NC 3m, 3f, 3 localities (CNC).
NFL 1f, Corner Brook, VII-1967, N. L. H. Krauss (USNM).
NH 3m, 6f, 6 localities (CAS, UNH, USNM).
NJ 19m, 17f, 25 localities (AMNH, ANSP, CU, INHS, PADA, USNM).
NS 3m, 1f, 3 localities (CNC, CU).
NY 42m, 69f, 28 localities (AMNH, CAS, CM, CNC, CU, INHS, NMIU, NYSM, PADA, USNM).
OH 8m, 9f, 9 localities (FSCA, KSU, OHSU): 6m, 4f, Kent, reared 1967-1968, R. M. Miller, biological note nos. 6725, 6826, 6826.5, 6827, 6828 (CNC, KSU, RMM); 1m, 1f, Kent, reared 1964 & 1972, B. A. Foote, biological note nos. 6422, 7210 (KSU).
ONT 6m, 4f, 6 localities (BMNH, CNC, UM, USNM).
PA 39m, 24f, 22 localities (ANSP, CM, FEM, FSCA, MCZ, PADA, PC, USNM); 3m, 3f, syntypes [compedita], Loew coll. (CNC 2086, MCZ 1619).
QUE 48m, 56f, 12 localities (AMNH, CNC, CU, UM, USNM).
TN 2m, 5f, 4 localities (CNC, USNM).
TX 1f, Austin (USNM).
SC 1m, CCC Camp F2, Oconee Co., V-16-1936, J. N. Todd (CU).
SD 1m, Canton, VI-16-1924 (SDSU).
TN 2m, 5f, 4 localities (CNC, USNM).
TX 1f, Austin (USNM).
VA 35m, 32f, 15 localities (ANSP, CNC, FSCA, IASU, MCZ, USNM).
WI 14m, 31f, 13 localities (UWI).
WV 6m, 9f, 4 localities (CM, USNM).

Remarks This is one of the most widespread eastern species. Johnson (1925a) also reported americana from Rhode Island and Vermont. Williston (1894), Aldrich (1905) and Melander (1913) also listed this species from the Pacific coast, but this does not refer to americana. I have seen only 1 specimen of Tarsohomoneura from the Pacific coast and it is discussed under H. houghii.

Biology The flight period of this very abundant species begins in early May in the southern part of its range and lasts to the beginning of October in Quebec. Individuals collected in the southern part of the range are more common in June and July, while those in the northern part are also frequently collected in August. Adults have been recorded on Ceanothus (redroot), Fraxinus americana (white ash), poplar (Populus), Prunus serotina (black cherry) and many species of Quercus (oak). Dowdy (1947) collected a specimen of americana in mid-June from the herb stratum of an oak-hickory forest near Jefferson City, Missouri. Whittaker (1952) collected 2 females [unpublished] in the last half of June from a red oak-pignut hickory forest in Tennessee. Specimens have also been collected from the blossoms of Vaccinium stamineum (a type of blueberry), Aruncus (goat's beard) and Rubus alleghenensis (a type of blackberry). Several specimens have been taken at lights and many from Malaise traps. Specimens in copula were collected on VI-9 and VI-21 (Ohio). Specimens have been collected from 1,000 to 4,000 ft. (305 to 1,219 m.) in elevation.

One female [Islip Long Island, New York, VI-27-1931 (CU)] has a label reading, "bred from Hieracium venosum" (rattlesnake-weed or poor robin's plantain). It is unfortunate that there is no further information or the puparium. I suspect that it was reared from decaying leaves of the plant. Foote (pers. com.) reared 1 specimen from the decaying leaves of Sassafras albidum (white sassafras) on XII-25-1972 at Kent, Ohio (KSU).

Miller & Foote (1975) presented biological observations on americana reared in the laboratory from field-collected adults and immature stages. Furthermore, Miller & Foote (in press) presented descriptions of the egg, larval and pupal stages. Larvae and 1 puparium were collected in early May and additional larvae in late May from moist to wet decaying leaves of sugar maple (Acer saccharum) and black cherry (Prunus serotina) in a floodplain forest in Ohio (Miller, 1970). Adults began emerging in late May, continuing through mid-June, and rearings were initiated using these and field-collected adults. Reared males (4) lived 40-64 days; females (3), 60-80 days. The preoviposition period for the reared females ranged from 23-35 days, and they laid 72-204 eggs, averaging 1-4 eggs per day. Hatching took place in 2-22 days, although some took longer. The 3 larval stadia lasted 4-10, 5-17 and 6-38 days, respectively; and the total larval period required 15-65 days. The prepupal period was approximately 48 hours. The pupal period for males was 10-12 days; for females, 12-13 days. The total time required to complete a life cycle was 55-65 days. This species is probably at least bivoltine with larvae and pupae as the overwintering stages.

Homoneura (Tarsohomoneura) johnsoni, NEW SPECIES

(Figs. 16, 17, 31, 41)

Johnson, 1914: 22 [coll. rec. - NH; as paratype of disjuncta, MISIDENT.].

Diagnosis This small species does not have the marginal cells uniformly clouded throughout. The apical R_{2+3} spots are usually twice as large as the preapical R_{4+5} spots below and both are usually in line with the bordered m forming an interrupted wing band (Fig. 41). The bordering of the m is only slightly narrowed posteriorly, while disjuncta has the bordering distinctly narrowed posteriorly (Fig. 40). Usually johnsoni has a strong presutural dc and disjuncta usually has a weak one. Preapical ad F3 bristles are absent in johnsoni (Figs. 16, 17), as well as the fine T3 bristles in males characteristic of americana.

Discussion H. johnsoni usually has the TS3 segments 3 and 4 pale dorsally; these are distinctly darkened apically in disjuncta (Figs. 18, 19). The male genitalia have small, lobe-like surstyli and the cerci are not as deeply excavated on the inner margins as disjuncta (Figs. 30, 31). The cerci usually have 3 long, strong bristles apically, while the others are weaker and not as dense or dark, as are found in disjuncta.

Description Total length 3-3.5 mm.; wing length 3-3.5 mm. Pale brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to americana and disjuncta.

Frons flat in profile, slight angle with facial plane; por usually equidistant between iv and aor. Face flat, about 1/3rd width of face at middle. Genae approximately 1/6th height of eyes. Aristae long pubescent. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por, ov and pvt.

Thoracic chaetotaxy: 1+3 dc, presutural dc usually strong, greater than 1/2 length of anterior postsutural dc; acr of 4 rows of setae, occasionally anterior, inner pairs slightly more developed.

Legs with av F1 ctenidium of 8-12 closely spaced setulae; F3 with a row of weak preapical av bristles, without preapical pv and ad bristles. Male TS3 pale yellow; 2nd segment slightly swollen, black, about 1/2 as wide as long. Second TS3 of female not expanded, almost entirely black. Dorsal apices of TS3 segments 3 and 4 at most slightly darkened; tarsomere 5 distinctly darkened.

Wings yellowish with r-m and m broadly bordered; apices of R_{2+3}, R_{4+5} and M_{1+2} distinctly spotted; preapical R_{4+5} spots usually 1/2 size of R_{2+3} apical spots and in line with the m forming an interrupted band.

Male terminalia: al corners of T6 ending in medially directed, pointed processes, which help retain aedeagi; T7 with strong apical bristles; surstyli small, rounded lobes on the al corners, a few strong bristles immediately dorsad and with a small truncate lobe with very short apical setae; terminal processes broadly rounded anterolaterally, many short setulae dorsad, and narrow, curved, posteriorly-directed arms with 3-4 apical bristles; aedeagi moderately long; cerci moderately long, slightly excavated medially, with usually 3 long bristles apically. Females appear to lack genitalic characters useful in taxonomic discrimination; cerci yellow.

Types Holotype: male, Simcoe, Ontario, VI-20-1939, G. E. Shewell (CNC). Allotype: female, same data as holotype (CNC). Paratypes: 10m, 10f, same data as holotype (CNC); 5m, 5f, Britannia, Ontario, VI-20-1947, G. E. Shewell, associated with Cornus stolonifera (CNC); 5m, 1f, 5 mi. s. Kent, Ohio, V-25-1962, B. A. Foote (USNM); 1m, Bretton Woods, New Hampshire, VI-25-1913, C. W. Johnson (MCZ) [as paratype of disjuncta]; 1f, Riverton, New Jersey, VII-7, C. W. Johnson (MCZ).

Remarks This species is dedicated to Charles W. Johnson for his introductory work on the species of the subgenus Tarsohomoneura.

Specimens examined 228 (119m, 109f) from 56 north central and northeastern NA localities:

IL 1m, Havana, V-31-1933, C. O. Mohr (INHS).
MD 1f, Laurel, VI-2-1965, Malaise trap (CNC).
ME 1m, 3f, 3 localities (CM, OHSU, USNM).
MI 5m, 3f, 8 localities (CNC, IASU, UCAR, UMI).
MN 1m, 6f, 4 localities (UMN).
NH 1m, paratype (MCZ).
NJ 1m, Old Bridge, VI-11-1966, M. A. Dayrus (CU); 1f, paratype (MCZ).
NS 1m, 2f, Truro, VII-4, VIII-12-1913, R. Matheson (CU).
NY 1m, 2f, 3 localities (CU, NYSM).
OH 2m, 6f, 3 localities (FSCA, OHSU); 5m, 1f, paratypes (USNM)
ONT 56m, 32f, 6 localities (CNC); m, holotype (CNC); f, allotype (CNC); 15m, 15f, 2 localities, paratypes (CNC).
PA 2m, 6f, 4 localities (CM).
PEI 1m, 1f, VII-1967, N. L. Krauss (USNM).
QUE 9m, 5f, 8 localities (UM).
SASK 7m, 8f, 3 localities (CNC).
SD 5m, 12f, 3 localities (SDSU).
VA 5m, 4f, 2 localities (CNC, IASU).
WV 1f, Cranberry Gls., VIII-19-1957, H. V. Weems, Jr., on Spiraea (FSCA).

Biology The flight period for this fairly common species begins in late May and extends through mid-August, with most specimens having been collected in June. One specimen was collected from Juneberry (Amelanchier) and 1 from Spiraea, while many specimens were collected associated with Cornus stolonifera (red osier). A few specimens have been taken in Malaise traps and 1 each at a window, in floodplain woods and at 2,800 ft. (853 m.) in elevation. Adults in copula have been collected on June 20 (Ontario) and July 24 (Quebec).

SUBGENUS HOMONEURA

Homoneura (Homoneura) Wulp, 1891

Malloch (1927c) was the first to use the subgenus Homoneura for the type, picea, and 4 closely related oriental species. The subgenus contains the bulk of the species of Homoneura, s. lat. This diverse assemblage of species probably can be subdivided into many groups which may eventually be elevated to subgenera or distinct genera.

Diagnosis Homoneura, s. str., can be distinguished from the other subgenera by the following combination of characters: 1) costal setulae ending abruptly at apices of R_{4+5}; 2) M_{1+2} not curved forward at apices; 3) 0 ia; 4) T2 without row of p bristles; 5) 2nd TS3 segments not darkened.

Discussion Nearctic Homoneura, s. str., lack uniformly clouded marginal cells, possess 0+3 dc or 1+3 dc, and have 2 or 3 apical T2 spurs.

Key to Groups and Ungrouped Species of the Subgenus Homoneura

1. Wings maculated, apical and preapical spots occasionally rudimentary, represented by dark areas on the veins with faint bordering on adjacent membrane 2

   Wings immaculate, without indications of apical and preapical spots, or at most crossveins (r-m and m) darkened and faintly bordered 10

2. R_{4+5} with 2, occasionally 3, spots between r-m and apex (Figs. 43-47) 3

   R_{4+5} with at most 1 spot on this section (Figs. 42, 48-54, 56) . . 5

3. Preapical av F3 bristles present; parafacials 1/3rd width of face at middle; 0+3 dc . . fraterna group, p. 61
[key to 3 spp., p. 62]

Preapical av F3 bristles absent; parafacials 1/2 width of face at middle; usually 1+3 dc 4

4. Aristae long pubescent (Fig. 69); at most a weak presutural dc, close to suture; preapical d T3 slightly longer than width of T3 at its insertion [males with 2 large, ovate, heavily setulated appendages on venter of abdomen (Fig. 93)] . . . . . [deceptor, armata, cactifera] lamellata, p. 76

Aristae short plumose (Fig. 70); 1 strong presutural dc, well-removed anteriorly from suture; preapical d T3 shorter to subequal width of T3 at its insertion (Fig. 85) . . . . . occidentalis group, p. 79
[key to 2 spp., p. 79]

5. R_{4+5} with 1 preapical spot about mid-way between r-m and apex; apical spots distinct (Figs. 42, 48-51, 53) 7

R_{4+5} without any spot on this section; apical spots usually weak (Figs. 52, 54, 56) 6

6. Presutural dc very strong, well-removed anteriorly from suture . . . . . shewelli, p. 137
[see setitibia group, p. 136]

Presutural dc at most weak, close to suture . . . . wheeleri, p. 175
[see aequalis group, p. 169]

7. Genae 1/4th height of eyes; L3 trochanters with many dense setae (Fig. 86) . . . . . trochantera, p. 132
[see trochantera group, p. 132]

Genae 1/6th height of eyes; L3 trochanters with only sparse setae 8

8. Presutural dc weak; acr weak; aristae long pubescent (Fig. 68) . . . . . conjuncta, p. 85

Presutural dc absent or strong; acr strong, about size of prsc (Fig. 4); aristae plumose (Fig. 72) 9

9. 1+3 dc, presutural dc strong; 4 rows acr . . . philadelphica, p. 88

0+3 dc, 2 rows acr . . . . . incerta group, p. 95
[key to 3 spp., p. 96]

10. 2 or 4 acr rows, inner rows weak to strong bristles; 3rd antennal segments concolorous (Figs. 67-77) 11

    6 acr rows of setae; 3rd antennal segments slightly browned apically (Fig. 78) . . . . . unguiculata, p. 105

11. r-m and m broadly bordered (Fig. 58); genae 1/6th height of eyes . . . . . nubila group, p. 107 [key to 3 spp., p. 108]

    r-m and m at most darkened, with adjacent membrane faintly clouded; genae at most 1/5th height of eyes 12

12. Frons distinctly swollen; parafacials approximately 2/3rds width of face at middle 13

    Frons at most slightly swollen; parafacials usually at most 1/2 width of face at middle 14

13. Aristae short pubescent (Fig. 67); 2 apical T2 spurs; L3 trochanters with numerous black setulae ventrally [black setulae also on basal 1/2 of F3 in males (Fig. 83) and several on dorsum of cerci in females (Fig. 106)] . . . . . littoralis, p. 115

    Aristae long pubescent (Figs. 74-75); usually 3-4 apical T2 spurs; L3 trochanters with only sparse setae [anterior T2 claw of males recurved, longer than posterior claw (Figs. 81, 82). . . . . harti group, p. 117 [key to 3 spp., p. 118]

14. Parafacial 1/2 or greater than width of face at middle 15

    Parafacial less than 1/2 width of face at middle . . . . . 21 [facial ridge absent]

15. A slight, broad ridge present on ventral 1/3rd of face; 5th TS3 segments usually brown dorsally (Fig. 88) 20

    Facial ridge absent; 5th TS3 segments yellow 16

16. av F1 ctenidium of 3-5 indistinct, very weak setulae . bakeri, p. 126

    av F1 ctenidium of 6-20 usually distinct, well-developed setulae (Figs. 79, 80) 17

17. L3 trochanters with dense setulae ventrally (Fig. 84) [usually weaker in females] 18

    L3 trochanters with at most distinct dark setae ventrally 19

18. Aristae short pubescent (Fig. 73) . . . . . inaequalis, p. 127

    Aristae plumose (Fig. 77) . . . . . setula, p. 129

19. r-m and m lightly bordered (Fig. 57); L3 trochanters with distinct black setae ventrally (Fig. 86); preapical T3 subequal to width of T3 . . . californica, p. 134
    [see trochantera group, p. 131]

    wings immaculate (Fig. 63); L3 trochanters with only sparse setae; preapical T3 longer than width of T3 at its insertion . . . . . setitibia group, p. 136
    [key to 4 spp., p. 136]

20. r-m and m at most slightly darkened (Fig. 64); genae 1/4th height of eyes . . . . . [seticauda] tenuispina, p. 145
    [p1 corners of T6 with group of black bristles in males (Fig. 117); small, black, oval cerci in females (Fig. 118)]

    r-m and m usually lightly bordered (Figs. 60, 62); genae 1/3rd height of eyes . . . . . bispina group, p. 150
    [small, black, flattened cerci in females (Fig. 124)]
    [key to 5 spp., p. 151]

21. r-m and m at most slightly darkened (Fig. 9); 5th TS3 segments yellow; presutural dc strong, well-removed anteriorly from suture . . . . . cilifera, p. 167
    [female unknown]

    r-m and m lightly bordered (Figs. 7, 61); 5th TS3 dark dorsally; presutural dc usually not well-developed and close to suture . . . . . aequalis group, p. 168
    [key to 7 spp., p. 169]

Homoneura fraterna Group

Many early North American collection records belonging to this group were named notata Fallén, a Palaearctic species. The 1st record was 2 specimens collected in Wisconsin by Thure Kumlien (Wulp, 1867). These specimens are extant at the Museum in Leiden, but they were to fragile to be sent for examination (Helsdingen, pers. com.). The collection records referring to notata could also belong to lamellata.

Diagnosis This group of 3, medium-sized species possesses the following combination of characters: 1) distinct central and preapical spots in addition to the apical spots (Fig. 46); 2) presutural dc absent; 3) strong preapical av and ad F3 bristles present; 4) parafacials 1/3rd the width of the face at middle; 5) preapical T3 bristle subequal to width of T3 at its insertion.

Discussion This group is similar to the occidentalis group in having distinct central and preapical spots, genae about 1/5th height of eyes, and aristae short plumose. However, in addition to the diagnostic characters given above, the fraterna group differs in having strong acr bristles, 5th TS2 and TS3 segments brown dorsally and males with well-developed gonopods and terminal processes, with pl S5 processes absent.

The males of birdi, fraterna and pernotata can be separated by differences in the genitalia. Females of pernotata can usually be separated from the other 2 species by having the S9 heavily sclerotized. Females of birdi and fraterna can not be separated with confidence at this time.

Key to Species of fraterna Group

1. Anterior angle of surstyli with a large, outer, ventrally-directed spine, without an inner spine at posterior angle (Fig. 91); S9 of female mostly sclerotized (Figs. 92) . . . . . pernotata, p. 63

   Anterior angle of surstyli with an outer lobe, bearing several small spines and a large, inner, ventrally-directed spine at posterior angle (Figs. 89, 90); S9 of female with a few sclerotized areas 2

2. Male terminal processes with 2 posteriorly-directed arms (Fig. 89) . . . . . fraterna, p. 67

Male terminal processes with 2 posteriorly-directed arms and 1 ventrally-directed arm (Fig. 90) . . . birdi, p. 71

Homoneura (Homoneura) pernotata (Malloch)

(Figs. 91, 92)

Sapromyza pernotata Malloch, 1920: 128 [descr. - IL].
Malloch & McAtee, 1924: 20 [key]; Pl. 2, Fig. 24 [inferior forceps, m], Fig. 26 [genitalia, m].
Johannsen, 1926: 159 [coll. rec. - NY, several as fraterna, MISIDENT.].
Criddle, 1928: 100 [coll. rec. - MAN, =fraterna, MISIDENT.].
Johannsen, 1928: 848 [coll. rec. - NY, same as Johannsen, 1926].
Bird, 1930: 404, 440 [adult ecology - MAN, =birdi, MISIDENT.].
Shewell, 1938: 133 [key], 140 [coll. rec. - QUE, ONT, MAN, BC]; 138 (Pl. 14) Fig. 57 [wing].
Ouellet, 1941: 135 [coll. rec. - QUE, some fraterna and birdi].
Chagnon, 1952: 29 [coll. rec. - QUE].
Shewell, 1965: 699 [cat., distr. - s. SASK to NS, s. to WI, IL and NY].

Diagnosis H. pernotata is easily separated from birdi and fraterna by differences in genitalia: surstyli with only an outer, ventrally-directed spine and S9 of female usually highly sclerotized.

Discussion Males of birdi and fraterna have an inner, ventrally-directed spine at the posterior angle of the surstyli (Figs. 89, 90), absent in pernotata, and terminal processes without an arm at right angles. The female S8 is broadly triangular, almost twice as wide as S10, and S9 is usually heavily sclerotized (Fig. 92). Females of birdi and fraterna possess a triangular S8, about as wide as S10, and only certain areas of S9 and S10 are sclerotized.

Types Holotype: male, Cedar Lake, [Lake County], Illinois, VIII-4-1906, tamarack gr. [bog] (INHS). Paratype: male, same data as holotype (INHS).

Specimens examined 174 (83m, 91f) from 76 north central and northeastern NA localities:

ALTA 1m, Grand Prairie, VII-25-1961, A. R. Brooks (CNC).
CT 2m, 3f, 3 localities (AMNH).
IL 1m, 3f, Antioch, VIII-1-1930, Frison, Knight & Ross (INHS); 1m, IL, Belfrage (NRS); m, holotype (INHS); 1m, paratype (INHS).
MA 1m, 1f, Petersham, VII-30-1926, A. L. Melander (USNM).
MAN 4m, 6f, 5 localities (CNC).
ME 2f, Orono, VII-27-, VIII-17-1958 (USNM).
MI 6m, 8f, 11 localities (CNC, CU, IASU, OHSU, SEM, UMI).
MN 11m, 12f, 9 localities (UMN).
MT 1m, 3f, 3 localities (KSU).
NH 2m, 1f, 3 localities (INHS, UNH, USNM).
NJ 1m, Ramsey, VI-8-1921 (AMNH); 2m, Ramsey, VI-21-1941, W. J. Gertsch (AMNH).
NS 1m, 3f, Kentville, VIII-6-1958, J. R. Vockeroth (CNC).
NY 5m, 4f, 6 localities (AMNH, CAS, CU, UMN, USNM).
OH 16m, 12f, 4.5 mi. e. Kent, reared 1967-1969, R. M. Miller, biological note nos. 6723, 6724, 6823.5, 6824, 6825, 6828.5, 6924, 6925 (CNC, KSU, RMM).
ONT 9m, 9f, 11 localities (AMNH, CNC, IASU).
PA 2m, 2 localities (PADA, SEM).
QUE 6m, 16f, 8 localities (CNC,UM).
SASK 3m, Kenosee Lake, VIII-18-1955, C. D. Miller, A. R. Brooks (CNC).
WI 6m, 8f, 5 localities (AMNH, NRS, SEM, UWI).

Biology The flight period for this widespread and fairly common species begins at the end of May and extends through October, with the species most commonly collected in the months of July and August. Adults have been recorded from the following habitats: tamarack bogs, flood-plain communities near tamarack bogs, alder-birch, poplar-birch associes, in a marsh, seep area at 5,000 ft. (1,524 m.) and from forest floors. Shewell (1938) reported taking this species by sweeping basswood

(Tilia americana) and Spiraea. Several of the examined specimens have been collected from Malaise traps.

Most rearings of pernotata were initiated using adults that were collected from a stand of skunk cabbage (Symplocarpus foetidus) growing in a lowland deciduous woods at Renocera Marsh, 4.5 mi. (7.2 km.) east of Kent, Ohio. Several rearings were also initiated using adults reared from larvae collected in late winter and early spring from decaying leaves of sugar maple (Acer saccharum) and alder (Alnus sp.).

Field-collected males lived 23-73 days in the laboratory; females, 31-134 days. Reared males (8) lived 47-121 days; females (7), 36-127 days. The premating period for 2 reared females was 10 and 25 days with oviposition beginning 6 and 2 days later, respectively. Mating was observed twice in nature and in the laboratory and occurred in the morning or late afternoon and evening. The male was situated dorsally and faced in the same direction as the female, with his head near the midpoint of the female's thorax. The male's foretarsal claws were hooked on the sutural ridge between the notopleuron and mesopleuron, just anterior to the posterior np bristle of the female. His mid-tarsal claws were hooked on the costal margin of the female's wing base. The hindtarsi were appressed on the female's half-outstretched wings or were placed on the sides of her abdomen. The male appeared to use his hindtarsi to balance himself on the female's wings, but kept slipping. He used hopping movements in order to maintain the copulatory position. When the male's hindtarsi were appressed to the sides of the female's abdomen, the female's wings were held upright, while his were held together. Intermittently he

released the grasp of his hindtarsi and then made quick hitting motions on the sides of her abdomen. The foretarsi were also released periodically and quick taps were made on her thorax. The male's fore and hindtarsi alternated in this slapping motion. Occasionally the female used her hindtarsi to agitate the male's genitalia. The pair remained in one place, except if greatly disturbed. Mating lasted 45 and 60 minutes in the laboratory.

The preoviposition period for 10 reared females ranged from 16-40 days. In the breeding jars, eggs were usually deposited singly on and in moist peat moss and underneath and between decaying tree leaves in the late afternoon and early evening. Field-collected females laid 165-582 eggs each, averaging 4-10 eggs daily. Reared females deposited 101-303 eggs each, averaging 4-6 eggs daily. The incubation period was usually 3-16 days, although some individuals required longer. Larvae mined and fed on decaying lettuce and tree leaves of maple and alder. The larval stadia were highly variable, and the extended periods required for development resulted in high mortality in the rearing dishes. Second instars were collected in the field from January through the beginning of April, when 3rd instars were found exclusively. In the laboratory rearing dishes of decaying leaves, 2nd instars molted to 3rd instars in 2-5 days. The 3rd-instar stadia ranged from 11-18 days, except those collected in mid-April which molted in 5-6 days. For the completely laboratory reared adults the total larval period ranged from 44-101 days. The prepupal period was approximately 48 hours and pupal period was 10-14 days.

The total time required to complete a life cycle in the laboratory varied from 86-124 days, indicating that in northeastern Ohio this species is at least partially bivoltine. In nature, probably most ecolsion takes place in the autumn with the overwintering stages as quiescent 1st-instar larvae. Development becomes more rapid in the early spring with puparia being formed in May.

B. A. Foote (pers. com.) collected 2 gravid females in late June from herbage of a coniferous-deciduous woods, with the litter of Populus trichocarpa (western balsam poplar) abundant on the forest floor, at the University of Montana Biological Station, 20 mi. (32.2 km.) east of Big Fork, Montana. Some larvae hatched and fed for a while on rotting lettuce, but no pupae were obtained.

Homoneura (Homoneura) fraterna (Loew)

(Fig. 89)

Sapromyza fraterna Loew, 1861: 347 (Cent. 1, no. 77) [descr. - PA].
Osten Sacken, 1878: 196 [cat., distr. - PA].
Smith, 1890: 399 [coll. rec. - NJ].
Townsend, 1892: 302 [key, distr. - PA].
Lynch Arribalzaga, 1893: 262 [key], 293-294 [descr., after Loew, 1861].
Johnson, 1900: 689 [coll. rec. - NJ].
Aldrich, 1905: 585 [cat., distr. - PA, NJ].
Cockerell, 1905: 251 [coll. rec. - NM, probably =arizonensis].
Johnson, 1910: 798 [coll. rec. - NJ].
Cole, 1912: 156 [coll. rec. - CA, =occidentalis, MISIDENT.].
Gibson, 1912: 106 [coll. rec. - QUE].
Melander, 1913: 68 [key, distr. - Europe, NH, NY, PA, NJ, CA, WA; Europe distr. refers to notata, CA & WA distr. refer to occidentalis].
Walker, 1913: 395 [coll. rec. - ONT].
Winn & Beaulieu, 1915: 152 [coll. rec. - ONT].
Britton, 1920: 202 [coll. rec. - CT].
Malloch & McAtee, 1924: 20 [key], 23 [coll. rec. - VA, MD]; Pl. 2, Fig. 18 [genitalia, m], Fig. 20 [inferior forceps, m], Fig. 21 [genitialia, m, ventral view].

Johnson, 1925a: 254 [coll. rec. - ME, NH, VT, MA, RI, CT].
Weese, 1925: 23, 24, 31 [adult ecology - IL].
Criddle, 1926: 104 [coll. rec. - ONT].
Johannsen, 1926: 159 [coll. rec. - NY, some =pernotata, MIS-IDENT.].
Johnson, 1927: 216 [coll. rec. - ME].
Criddle, 1928: 100 [coll. rec. - MAN, =birdi & pernotata, MIS-IDENT.].
Johannsen, 1928: 848 [coll. rec. - NY, some =pernotata, MIS-IDENT.].
Procter, 1938: 344 [coll. rec., same as Johnson, 1927].
Shewell, 1938: 133 [key], 139 [coll. rec. - ONT, QUE].
Procter, 1946: 398 [coll. rec., same as Johnson, 1927].
Steyskal, 1947: 72 [cistr. - TN, ONT, QUE, MAN, entire New England, NY, NJ, PA, VA, MD, MI, IL, CA, WA; CA & WA distr. refer to occidentalis].
Shewell, 1965: 698 [cat., distr. - s. MAN to s. QUE, s. to KS and NC].

Diagnosis The anterior angle of the surstylus of fraterna and birdi lacks the outer, ventrally-directed spine, present in pernotata, but has an outer lobe and a slightly curved, ventrally-directed, inner spine at its posterior angle (Figs. 89, 90, 91). The terminal process in fraterna has 2 arms; while in birdi it has 3 arms. Females of pernotata have a highly sclerotized S9, while fraterna and birdi appear to be very similarly lightly sclerotized.

Discussion The outer lobe of the surstylus in fraterna has a medially-directed spine at its anterior angle, no spines ventrally and a very strong, medially-directed spine at its posterior angle. The outer lobe in birdi usually has small, medially-directed spines at its anterior, ventral and posterior angles. The terminal processes in fraterna have 2 tapering, posteriorly-directed arms and no ventrally-directed arm, while in birdi there is 1 long, narrow, ventrally-directed arm and 1 large and 1 small, narrow, posteriorly-directed arms. The aedeagus lack lateral,

basal spines characteristic of pernotata and birdi (Fig. 91c).

Types Lectotype: male, Pennsylvania, C. R. Osten Sacken, Loew coll. (MCZ 1681). Lectoallotype: female, same data as lectotype (MCZ 1681).

Specimens examined 139 (85m, 54f) from 55 north central and northeastern NA localities:

CT	4m, 2f, 2 localities (USNM).
IA	15m, 5f, 7 localities (IASU); 1m, 2f, Woodman Hollow St. Pk., Webster Co., reared 1972, R. M. Miller (RMM); 3m, 3f, Red Haw St. Pk., 1 mi. se. Chariton, reared 1975, R. M. Miller (RMM).
IL	1m, 3f, Elizabeth, VII-7-1917 (INHS); 3m, 19f, Urbana, VII-20-1920, C. P. A., cottonwoods (INHS).
KY	1m, TWL, Jefferson Co., VI-8-1954, P. J. Christian (LIM). 4m, Lake Cumberland St. Pk., Russell Co., VIII-20-1962, D. L. Deonier, taken at forest edge (IASU).
MA	1m, Brookline, Suffolk Co., VII-4, C. W. Johnson (MCZ).
MAN	3m, 1f, 3 localities (CNC).
MD	2m, 2 localities (USNM).
MI	1m, 1f, N. Manitou Is., VIII-3-1957, R. E. Beer (SEM).
MN	5m, 3f, 4 localities (IASU, UMN).
NY	5m, 3f, 4 localities (CM, CU).
OH	1m, 1f, Kent State University Woods, Kent, reared 1969, R. M. Miller (RMM).
ONT	6m, 1f, 6 localities (CNC, USNM).
PA	1m, South Gibson, Susq. Co., VIII-6-8-1917, J. C. Bradley (CU); m, lectotype (MCZ); f, lectoallotype (MCZ).
QUE	16m, 7f, 8 localities (CNC, UM).
VA	3m, 3 localities (CNC, IASU, USNM).
WI	5m, 1f, 5 localities (UWI).
WV	1m, 2f, Cheat Mts. (CM); 2m, Cranberry Glades, Pocahontas Co., VII-16-1955, W. W. Wirth, C. W. Sabrosky (USNM).

Remarks Since this species is widely distributed, most of the collection records, even the isolated female captures and records of H. notata, probably refer correctly to fraterna. Johnson (1925a) reported this species from Rhode Island and I have seen females that are probably

fraterna from all of the New England states. Shewell (1965) recorded the southern limit of distribution of fraterna as North Carolina, from whence I have seen only females, and Kansas, but I have not seen specimens from this state. Steyskal (1947) collected this species in Tennessee, but I have seen only 1 female from that state. I have also recorded 1 female from South Dakota (IASU) and 1 from Idaho (SEM).

Biology The flight period for this common species begins in mid-May and extends through September, with the species most commonly collected in the months of July and August. Adults have been recorded from the following habitats: forest edge, forest floor, near a tamarack bog, spruce-sand community from burr oak, powerline scrub, moist ash woods, oak forest and cottonwoods. One specimen examined was collected from a Malaise trap. Weese (1925) recorded this species as fairly abundant throughout the study period of June 1 to September 1 in the herb stratum of an elm-maple forest in Illinois. Whittaker (1952) collected 1 female [unpublished] from the herb and shrub-low tree stratum in a gray beech forest in Tennessee.

At the end of January, 1969, 1 2nd-instar larva of fraterna was discovered among the wet, fallen leaves of the Kent State University Woods, Kent, Ohio. Sugar maple (Acer saccharum), red maple (Acer rubrum) and choke cherry (Prunus viginiana) were common near an old tamarack bog. A male emerged at the end of February. The prepupal period was approximately 48 hours and the pupal period, 13 days. Another 2nd instar was collected from the same site at the beginning of April, 1969. A female emerged in mid-May.

Eggs deposited by a female collected in August, 1972, at Woodman Hollow State Park, Iowa, were used to initiate a laboratory rearing. Most larvae hatched and fed on decaying lettuce and tree leaves. First and 2nd instars were still found in the rearing dishes in early October. One 2nd instar molted in 15 days and 11 days later pupariated. The prepupal period was approximately 48 hours. Three adults emerged in mid-November with the pupal periods lasting 14 and 15 days.

At the end of March, 1975, a number of 2nd and 3rd instars were collected among the fallen leaves of a lowland woods at Red Haw State Park, Iowa. The larvae were feeding mainly on the decaying leaves of sugar maple. Two males and 3 females emerged at the beginning of May. The preoviposition period for 1 female was 20 days. This species probably has 1 generation per year with the early larval instars as the overwintering stage.

Homoneura (Homoneura) birdi NEW SPECIES

(Figs. 46, 76, 90)

Gibson, 1918: 120 [coll. rec. - MAN, as notata, MISIDENT.].
Criddle, 1928: 100 [coll. rec. - MAN, as fraterna, MISIDENT.].
Bird, 1930: 404, 440 [adult ecology - MAN, as pernotata, MISIDENT.].

Diagnosis The anterior angle of the surstyli of birdi and fraterna lacks the outer, ventrally-directed spine of pernotata, but has an outer lobe and a slightly curved, ventrally-directed, inner spine at its posterior angle (Figs. 89-91). The terminal processes of birdi have 3 arms, while in fraterna they have only 2 long arms. Females of pernotata have

a highly sclerotized S9, while birdi and fraterna appear to be similar and lightly sclerotized.

Discussion The outer lobe of the surstyli of birdi shows considerable variation in shape and in combinations of small, medially-directed spines at its anterior, ventral and posterior angles. The outer lobe of fraterna has a medially-directed spine at its anterior angle, and a very strong, medially-directed spine at its posterior angle, but lacks ventral spines. The terminal processes of birdi have 1 long, narrow, ventrally-directed arm, subequal to 1 long, narrow, posteriorly-directed arm and 1 smaller, narrow, posteriorly-directed arm immediately dorsad of the longer posterior arm (Fig. 90b). The terminal processes of fraterna have 2 tapering, posteriorly-directed arms and no ventrally-directed arm (Fig. 89b). The aedeagi of birdi and pernotata have a pair of mediolateral spines, absent in fraterna.

From a long series collected at Bay's Branch Area, Iowa, there is variation in the outer lobe of the surstyli that is very similar to fraterna and the terminal processes similar to birdi. On the basis of the similarity in terminal processes and not being able to reliably separate the females of the variation, birdi, or fraterna, I have included this variation in birdi. Specimens with this variation also appear to be larger, approximately 3.5 mm., while Canadian material is smaller, approximately 3 mm.

Description Total length 2.75-3.5 mm.; wing length 3.2-3.7 mm. Yellow, with sparse whitish pollinosity laterally and ventrally. Similar to fraterna and pernotata.

Head almost 1.5 times higher than long. Frons flat in profile, slight angle with facial plane; por equal distance between aor and iv. Face slightly convex; parafacials about 2/3rds width of face at middle. Genae about 1/5th height of eyes. Aristae short plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt slightly shorter than aor.

Thoracic chaetotaxy: 0+3 dc, acr bristle-like, in 2 regular rows. Legs yellow, except dorsal surface of apical tarsomeres of L2 and L3 brown. F1 av ctenidium with 11-13 closely spaced setulae; F3 with 1 strong preapical av bristle.

Wing yellowish with 7 brown spots: r-m, m, apical R_{2+3}, central and preapical and apical R_{4+5}, and apical M_{1+2}.

Abdomen subshining. Male: T7 slightly longer than T6; surstyli and terminal processes as described above; gonopods very long; aedeagi large, with a pair of mediolateral spines; cerci moderately long, yellow, with slightly longer bristles apically. Female: anterolateral corners of S9 and S10 with rounded sclerotized areas; cerci yellow, with long bristles.

Types Holotype: male, Aweme, Manitoba, VIII-5-1924, R. D. Bird (CNC). Allotype: female, same locality as holotype, VIII-6-1924, R. D. Bird (CNC). Paratypes: 1m, 1f, Birtle, Manitoba, VIII-6-1928, R. D. Bird (AMNH); 3m, 3f, North Branch, Ontario, VII-18-1960, S. M. Clark

(CNC).

Remarks This species is named in honor of Ralph D. Bird for his contributions to the early study of biotic communities.

Specimens examined 106 (56m, 50f) from 24 north-central NA localities:

IA	28m, 29f, 4 localities (CNC, IASU); 5m, 9f, Bay's Branch Area, Guthrie Co., reared 1972-1973, R. M. Miller (CNC, RMM).
MAN	6m, 5f, 5 localities (CNC); m, holotype (CNC); 1f, allotype (CNC); 1m, 1f, paratypes (AMNH).
MN	8m, 1f, 8 localities (UMN).
ONT	3m, 1f, 3 localities (CNC); 3m, 3f, paratypes (CNC).
VA	1m, Clator Lake St. Pk., Pulaski Co., VI-12-1971, W. H. Robinson (USNM).

Biology The flight period of this rather uncommon species extends from June through August with most collection records in the months of July and August. The species has been collected from the following habitats: basswood-maple, poplar-birch associes and a floodplain community near a tamarack bog.

Bird (1930) collected this species [as "pernolata"] from the tree-top, shrub and herb strata of a mature poplar (Populus tremuloides) stand in the Aspen Parkland of central Canada. This species was one of the most abundant insects in the tree-top collections. I have examined several specimens collected by Bird and all have proved to be birdi, although the records may be mixed because females were collected and fraterna and pernotata also occur in Manitoba.

In June, 1972, some rearings of the variation birdi were initiated using adults collected in a small, lowland stand of cottonwood (Populus

deltoides), black cherry (Prunus serotina) and silver maple (Acer saccharinum) in the middle of a cornfield at Bay's Branch Area, Iowa. The females of 1 rearing deposited many eggs on the decaying lettuce and leaves provided as larval substrate. However, it was not until the 1st of September when 1st instars were noted. Second instars were observed the beginning of October and 3rd instars by the end of October. Two adults from a 2nd rearing emerged in October, 3 from the 1st rearing in November, 1 in February and 1 in March.

Field-collected males lived 38-54 days in the laboratory; females, 40-56 days. Reared males (2) lived 32-67 days; females (3), 35-66 days. The premating period for 1 reared female was 13 days and oviposition began that afternoon. One mating was observed briefly one morning and was very similar to pernotata. The preoviposition period for the 3 reared females was 13-25 days. In the late afternoon and early evening eggs were laid singly on the peat moss and decaying leaves. One reared female laid 210 eggs, averaging 5 eggs daily.

At the end of May, 1973, a number of additional larvae were collected from the decaying leaves at Bay's Branch Area. The larvae fed on the decaying black cherry and silver maple leaves. The prepupal period was approximately 48 hours with the pupal period for males ranging from 10-11 days and females, 11-12 days. Two males and 5 females emerged from June 8 to June 23.

From the laboratory and field information, it appears that this species is univoltine with quiescent larvae as the overwintering stage.

Homoneura lamellata incertae sedis

Homoneura (Homoneura) lamellata (Becker)

(Figs. 44, 69, 93)

Sapromyza lamellata Becker, 1895: 204 [descr. - Polen.; type locality =POLAND, not Russia].
Slosson, 1895b: 320 [coll. rec. - NH, as notata, MISIDENT.].
McGillivray [Macgillivray], 1903: 13 [coll. rec. - NY, as notata, MISIDENT.].
Sapromyzosoma deceptor Malloch in Malloch & McAtee, 1924: 20 [key], 24 [descr. - NH].
Johnson, 1925a: 255 [coll. rec. - ME, NH, MA].
Johnson, 1927: 216 [coll. rec. - ME].
Bird, 1930: 404, 440 [adult ecology - MAN].
lamellata, Czerny, 1932: 15-16 [redescr., distr. - n. Austria, Russia], Fig. 14 [genitalia, m, ventral view].
deceptor, Procter, 1938: 344 [coll. rec. - ME, same as Johnson, 1927].
Homoneura armata Shewell, 1939: 264-265 [descr. - ALTA].
cactifera Shewell, 1940: 86 [n. name for armata Shewell, preocc. Malloch, 1925: 320].
deceptor, Procter, 1946: 398 [coll. rec. - ME, same as Johnson, 1927].
armata, Strickland, 1946: 166 [coll. rec. - ALTA].
lamellata, Shewell, 1965: 698 [cat., distr. - YT to e. QUE, s. to MA, Holarctic; deceptor Malloch, armata Shewell, cactifera Shewell, synonyms].
Cole, 1969: 373 [distr. - ALTA].
Shtakel'berg, 1970: 201 [key, distr. - central w. Europe].
Shewell, 1971: 8 [note, distr. - Mongolia, Russia, n. Austria, CAN, ne. USA].
Remm, 1972: 122 [adult ecology - Estonia, Finland, Leningrad region].

Diagnosis This species is related to the Nearctic fraterna and occidentalis groups but differs from both by possessing only a weak preapical av F3 bristle and from the occidentalis group by the aristae being pubescent (Fig. 69) rather than short plumose (Fig. 70). H. lamellata is also closely related to the Palaearctic notata Fallén; both species having the same wing pattern and chaetotaxy, except notata has the

apical spots somewhat more distinct, aristae short plumose and 5-7, stout, preapical pv F3 bristles in males.

Discussion Males of lamellata are easily recognized by the rather large, elongate-oval, ventral plates (lamellae) arising on the p1 corners of T5 and S5 (Fig. 93), which are strongly setulose apically.

H. lamellata has at most a weakly developed presutural dc, close to the suture and about 1/2 the anterior postsutural dc, while the fraterna group lacks a presutural dc and the occidentalis group has a very strong presutural dc, well-removed anteriorly from the suture and about the same size as the anterior postsutural dc. H. lamellata also has a higher frequency of an additional central spot occurring between the r-m and preapical and apical R_{4+5} spots (Fig. 44). This condition usually occurs in only 1 wing, the other showing the normal maculation.

Type Holotype: male, Polen., J. Schnabl coll. (ZMHU).

Remarks The type locality is Poland, not Russia as Becker's (1895) description stated (Schumann, pers. com.). According to Becker's description and Czerny's (1932) redescription, there was also supposed to be a female (allotype) that is now evidently lost, although there is another male from Schnabl's collection at the Zoological Museum of Natural Science, Humboldt University, Berlin. Several specimens from the Zoological Museum, Helsinki, were also compared with Nearctic material.

Specimens examined 172 (74m, 98f) from 67 northern NA localities:

AK 1m, 2f, 3 localities (KSU, USNM).
ALTA 8m, 15f, 8 localities (CNC, KSU, UALTA); 1m, Edmonton, VI-24-1937, E. H. Strickland [holotype of armata] (CNC 4902); 1f, Edmonton, VI-10-1937, E. H. Strickland [allotype of armata] (CNC 4902).
BC 13m, 13f, 11 localities (AMNH, CNC).
CO 1f, Estes Pk., VII-11-1934, A. L. Melander (USNM).
ID 1m, Kootenai Co., 12 mi. n. Coeur d'Alene, VII-1-1959, G. W. Byers (SEM).
MAN 2m, 1f, 3 localities (CNC).
ME 1m, Mt. Katahdin, VII-4-1968, D. M. Wood (CNC).
MI 4m, 2f, 5 localities (CNC, UMI, USNM).
MN 1f, Eaglesnest, VI-14-1959, W. V. Balduf (INHS).
MT 1f, 9 mi. n. Swan Lake, VII-19-1964, K. Valley (KSU).
NH 1m, 1f, Benton, VII-6-1931, A. L. Melander (USNM); 1f, White Mts., [H. K.] Morrison (ZMHU 7586); 1f, White Mts., Morrison [holotype of deceptor] (USNM 26390); 1f, same data as holotype [paratype of deceptor] (USNM).
NY 1f, Adirondack Mts., Axton, VII-12-22-1891, A. D. MacGillivray & C. O. Houghton (CU).
ONT 7m, 4f, 6 localities (CAS, CNC).
QUE 3m, 5f, 6 localities (CAS, UM).
SASK 26m, 44f, 8 localities (CNC).
SD 1m, 3f, 3 localities (SDSU, USNM).
WI 1m, Rusk Co., T35N R7W B30, VI-15-1953, light trap, R. H. Roberts (UWI).
YT 4m, 3 localities (CNC).

Remarks Johnson (1925a) also reported this species from Massachusetts and the specimens in H. K. Morrison's collection marked "White Mts." were mostly taken on Mt. Washington, New Hampshire. Slosson (1895b) reported notata, which most likely was lamellata, taken in the alpine region or above 5,500 ft. (1,676 m.) on the summit of Mt. Washington.

Biology This widespread, fairly common species has been collected most frequently in June and July, during the flight period from late May through late August. Remm (1972) reported the flight period beginning in early June and extending through early August in the Soviet Baltic Republics. She also reported the species to be rare and found in damp

forests. On the other hand, Shewell (1971) stated that lamellata appears to be commoner in the prairies and has been taken in numbers in thickets of Aspen (Populus) in southern Saskatchewan. Bird (1930) collected a male in the tree-top stratum of a mature poplar stand in southern Manitoba. Specimens examined included several collected from 2,200 to 2,600 ft. (671 to 792 m.) in elevation in British Columbia and 1 each, from a light trap, Malaise trap and on Epilobium (a type of primrose).

Homoneura occidentalis Group

Early western collection records referring to notata and fraterna belong to this group, and probably to the more common occidentalis.

Diagnosis The 2 small species of this group can be distinguished by the following combination of characters: 1) 1 strong presutural dc present; 2) a short preapical d T3 bristle present; 3) distinct central, preapical and apical spots, except M_{1+2} weak (Figs. 43, 47); 4) parafacials 1/2 width of face at middle; 5) preapical av and ad F3 bristles absent.

Discussion This group is also distinguishable from the fraterna group by having tarsi yellow and males with p1 S5&6 processes.

Key to Species of occidentalis Group

1. Preapical d T3 bristle usually greater than 1/2 diameter of T3 at its insertion; aedeagi rounded apically . . arizonensis, p. 83

   Preapical d T3 bristle no more than 1/2 diameter of T3 at point of its insertion; aedeagi pointed apically . . . . . [nudifemur] occidentalis, p. 80

Homoneura (Homoneura) occidentalis (Malloch)

(Figs. 45, 47, 85, 94)

Baker, 1904: 32 [coll. rec. - CA, NV, as notata, MISIDENT.].
Cole, 1912: 156 [coll. rec. - CA, as fraterna, MISIDENT.].
Melander, 1913: 68 [key, distr. - CA, WA, as fraterna].
Woodworth, 1913: 137 [insect guide - CA, as notata].
Sapromyza occidentalis Malloch, 1920: 127 [descr. - CA].
Malloch & McAtee, 1924: 20 [key].
Sapromyzosoma nudifemur Malloch in Malloch & McAtee, 1924: 21 [key], 24 [descr. - BC; Sapromyzama, as found in some reprints, error]. NEW SYNONYMY.
Criddle, 1926: 104 [coll. rec. - BC].
Knowlton, Harmston & Stains, 1939: 11 [coll. rec. - UT, =knowltoni, MISIDENT.].
occidentalis, Knowlton, Harmston & Stains, 1939: 11 [coll. rec. - UT, =arizonensis, MISIDENT.].
Steyskal, 1947: 72 [distr. - CA, WA, as fraterna].
nudifemur, Foxlee, 1957: 37 [coll. rec. - BC].
Shewell, 1965: 699 [cat., distr. - s. BC; as var. of occidentalis].
occidentalis, Shewell, 1965: 699 [cat., distr. - CA, s. BC, UT, AZ, NM].
nudifemur, Cole, 1969: 373 [distr. - BC].
occidentalis, Cole, 1969: 373 [distr. - BC to CA, e. to UT and NM].

Diagnosis This species differs from lamellata and the fraterna group by the presence of a very strong presutural dc bristle. H. occidentalis can be separated from the closely related arizonensis by possessing a very small preapical d T3 bristle, which is no more than 1/2 the diameter of T3 at its point of insertion and at most only slightly longer than the suberect T3 setae (Fig. 85).

Discussion Identification of this species is sometimes difficult due to the variation in the wing spot pigmentation, which is similar to the situation found in H. wheeleri. Some spots are represented by darkened areas on the veins or only faint membrane clouding in the positions

corresponding to the normal spot development (Fig. 47). These individuals may be teneral specimens, while others have the normal brown spots (Fig. 45).

Specimens without any apparent wing spots caused Malloch (1924) to describe the species nudifemur. In his description he mentions the presence of a dark part on the 3rd vein (R_{4+5}) beyond the outer cross-vein (m). Shewell (1965) suspected the possible synonymy and lowered nudifemur to varietal status.

Males of occidentalis can be readily distinguished from arizonensis by the apex of the aedeagus being distinctly narrowed and pointed rather than broadly pointed (Figs. 94, 95). Also, the bifid pl S5&6 process has its larger posterior extension bluntly pointed rather than rounded. The dorsal and posteroventral setae of the male cerci are subequal, whereas arizonensis has much longer setae apically.

Types Lectotype: male, Pasadena, California, J. M. Aldrich (USNM 26253). Allotype: female, same data as lectotype (USNM). Paratypes: 4m, same data as lectotype (USNM); 1m, Laguna Beach, southern California, C. F. Baker (USNM).

Remarks The holotype of this species is evidently lost at the United States National Museum and the remaining 7 specimens mentioned by Malloch (1920) were all labeled as paratypes. Therefore, I have considered these specimens as a syntype series and have designated 1 male as the lectotype and the sole female I have relabelled as the allotype.

Specimens examined 297 (210m, 87f) from 77 western NA localities:

AZ 1m, Santa Maria, VI-22-1940, E. D. Ball (USNM).
BC 1m, 1f, Robson, VII-26-1947, H. R. Foxlee (CNC); m, Kaslo, VI-23, R. P. Currie [holotype of nudifemur] (USNM 40876); 1m, Kaslo, VII-7, R. P. Currie [paratype of nudifemur] (USNM).
CA 178m, 68f, 62 localities (AMNH, CAS, CDA, CM, CNC, CU, LACM, MCZ, OHSU, OKSU, PC, SEM, UCAB, UCAD, UCAR, USNM, UTXA, WASU); m, lectotype (USNM); f, allotype (USNM); 5m, paratypes (USNM).
ID 3m, 4f, Moscow, VII-24-1925, C. L. Fox (CAS); 2m, 25 mi. e. Boise, Ada Co., VII-6-1968, A. R. G. Hins, sweeping alongside Cinch Creek (UID).
OR 1m, Corvallis, VII-5-1965, D. J. Borror (OHSU); 1m, Grande Ronde River, N. Imbler, Union Co., VII-19-1936, G. Ferguson (CU).
UT 11m, 10f, 5 localities (CNC, UTSU).
WA 3m, 3f, 4 localities (USNM, WASU).

Remarks Baker (1904) reported notata from the mountains near Claremont, California and in Ormbsy County, Nevada. I have seen many of Baker's specimens from Claremont and all have proved to be occidentalis. I have not examined any specimens from Nevada, but suspect that they are also occidentalis. Cole's (1912) collection record of fraterna belongs to occidentalis, as this is the only spotted species that I have seen from Laguna Beach, California.

Biology This species is very common in California and its flight period begins at the end of April and extends through the end of October, with the adults being most common during June, July and August. Some adults have been recorded from Salix (willow), Shamel ash (Fraxinus sp.), peach (Prunus persica), avocado (Persea sp.), Grindelia camporum (tarweed), Physalis ixocarpa (ground cherry) and Helianthus annuus (common sunflower). Specimens examined also included 2 taken in Malaise traps

and at light.

Homoneura (Homoneura) arizonensis NEW SPECIES

(Figs. 43, 70, 95)

Cockerell, 1905: 251 [coll. rec. - NM, as notata, MISIDENT.].
Knowlton, Harmston & Stains, 1939: 11 [coll. rec. - UT, as occidentalis, MISIDENT.].

Diagnosis This species differs from lamellata and the fraterna group by the presence of a very strong presutural dc bristle. H. arizonensis can be separated from the closely related occidentalis by having the preapical d T3 bristle greater than 1/2 the diameter of T3 at the point of its insertion and distinctly longer than the appressed T3 setae.

Discussion This species is generally slightly smaller than occidentalis and all the specimens that I have examined have well-developed maculations (Fig. 43). Males can be readily distinguished from occidentalis by the apex of the aedeagus being rounded rather than pointed (Figs. 94, 95). Also, the pl S5&6 process has its larger posterior extension broadly rounded rather than pointed. The posteroventral setae of the males' cerci are twice as long as the dorsal setae, while these setae are subequal to the dorsal ones in occidentalis.

Description Total length 2.75-3.25 mm.; wing length 3-3.5 mm. Brownish-yellow with whitish pollinosity laterally and ventrally. Similar to occidentalis.

Frons flat in profile, rounded into facial plane; por placed slightly closer to iv than aor. Face flat; parafacials about 1/2

width of face at middle. Genae about 1/5th height of eyes. Aristae short plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong and well in front of suture; acr weak bristles, in 2 regular rows.

Legs with av F1 ctenidium with 7-9 closely spaced setulae; F3 without preapical av, pv or ad bristles. T3 with small preapical d bristle, longer than 1/2 width of T3 at point of its insertion and longer than appressed T3 setae.

Wings with r-m, m, apical R_{2+3}, central and preapical R_{4+5}, apical R_{4+5} and weak apical M_{1+2} spots.

Abdomen of male with T6 twice the length of T5; S2 about 3 times as large as S3; S5&6 bifid, with larger posterior processes rounded; aedeagus rounded apically; surstyli foot-shaped, toe directed posteriorly; cerci with posteroventral setae twice as long as dorsal setae.

Types Holotype: male, Southwestern Research Station, 5 mi. sw. Portal, Arizona, V-23-VI-5-1967, 5400 ft. (1646 m.), Malaise trap, C. W. Sabrosky (USNM). Allotype: female, same locality as holotype, VI-1967, black light, C. W. Sabrosky (USNM). Paratypes: 2m, same data as holotype (USNM); 1m, same locality as holotype, IX-5-25-1965, C. W. Sabrosky, Malaise trap (USNM); 1m, same locality as holotype, VI-5-9-1972, W. W. Wirth, Malaise trap (USNM); 1f, same locality as holotype, VI-22-1950, O. L. Cartwright, sweeping (USNM); 5m, 4f, same locality as holotype, V-22-

1965, V. Roth, Malaise trap (UCAR); 4m, 2f, Big Bend National Park, Oak Spring, Texas, V-1-1959, J. F. McAlpine, 4500 ft. (1372 m.) (CNC).

Specimens examined 89 (32m, 57f) from 27 southwestern USA localities:

AZ	5m, 7f, 6 localities (CNC, SEM, UAZ, UTXA); m, holotype (USNM); f, allotype (USNM); 9m, 5f, paratypes (UCAR, USNM).
CA	1m, Darwin Falls, 4 mi. w. Panamint Springs, Inyo Co., VII-13-1962, J. A. Litsinger (UWI); 2f, Blythe, V-1-1955, W. R. Richards (CNC); 4f, Andreas Can., O[sic]-20-1951, A. H. Sturtevant (USNM); 2f, Morongo, IX-26-1944, A. L. Melander (USNM).
NM	4m, 13f, 5 localities (CNC, USNM, UTXA).
TX	4m, 2f, paratypes (CNC).
UT	8m, 14f, 11 localities (CNC, UTSU).

Biology The flight period for this rather uncommon species ranges from early May to late September. Adults have been collected at elevations of 4,500 and 5,400 ft. (1,372 and 1,646 m.). Specimens examined included 1 collected at black light and many taken in Malaise traps. One specimen was collected on apricot (Prunus armeniaca).

Homoneura conjuncta incertae sedis

Homoneura (Homoneura) conjuncta (Johnson)

(Figs. 42, 68, 100)

Sapromyza conjuncta Johnson, 1914: 22-23 [descr. - RI, MA, VT, NJ].
Weiss, 1915: 107 [coll. rec. - NJ].
Headlee, 1916: 484 [coll. rec. - NJ].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - DC, VA]; Pl. 2, Fig. 22 [genitalia, m; =H. (Tarsohomoneura) sp.?].
Johnson, 1925a: 255 [coll. rec. - VT, MA, RI].
Hallock & Parker, 1926: 18 [coll. rec. - NY].
Johannsen, 1926: 159 [coll. rec. - NY].
Johannsen, 1928: 848 [coll. rec. - NY].

Smith, 1928: 491 [adult ecology - IL].
Shewell, 1938: 135 [key], 139 [note, coll. rec. - QUE, ONT]; 134 (Pl. 12), Fig. 35 [genitalia, m], 138 (Pl. 14), Fig. 61 [wing].
Shewell, 1965: 698 [cat., distr. - s. ONT & QUE, s. to IL & SC].

Diagnosis This small species has apical R_{2+3}, preapical and apical R_{4+5}, apical M_{1+2} spots and bordered r-m and m. H. conjuncta also has a weak presutural dc and aristae long pubescent.

Discussion This species is related to the subgenus Tarsohomoneura in lacking preapical av F3 bristles and having a wing pattern similar to americana and johnsoni with the apical R_{2+3} and preapical R_{4+5} spots usually fused (Figs. 39, 41, 42). However, conjuncta lacks the black TS3 segments, possesses acr of weak bristles and different terminal processes.

The male genitalia of conjuncta are small and similar to citreifrons, although conjuncta lacks surstylar extensions and has foot-shaped terminal processes (Fig. 100). H. citreifrons has broad, lobed surstyli and arm-shaped terminal processes (Fig. 24).

Malloch & McAtee (1924: Pl. 2, Fig. 22) presented a figure of a male hypopygium that is not conjuncta. Shewell (1938) suggested that there may be 2 closely related species involved, but I have not seen any specimens with genitalia that match the figure. However, the many long spines, which are usually not extended, at the tip of the aedeagus are characteristic of aedeagi in the subgenus Tarsohomoneura.

Types Holotype: male, Buttonwoods, Rhode Island, VI-18-1912, C. W. Johnson (MCZ 7875). Paratypes: 1m, Auburndale, Massachusetts, VIII-2, C. W. Johnson (MCZ); 1m, 1f, Manomet, Massachusetts, VII-26-27-1905, C. W. Johnson (USNM, MCZ); 1f, Jamesburg, New Jersey, VII-4-1894 (MCZ); 1f, Avalon, New Jersey, VI-8 (USNM); 1m, Amsdem, Vermont, VII-10-1908 (MCZ).

Remarks According to Johnson's (1914) list of the paratypes, there should be 1 more from Blue Hill, Massachusetts, which I could not locate.

Specimens examined 125 (49m, 76f) from 67 eastern NA localities:

DC	1f, Washington, V-20-1912, D. W. Coquillett (USNM).
IA	1f, Spring Brook Lake St. Pk., Guthrie Co., VI-9-1973, R. M. Miller (IASU); 1f, Ledges St. Pk., Boone Co., V-31-1950, J. L. Laffoon (IASU).
IL	4m, 13f, 9 localities (INHS, USNM, UTXA).
IN	1m, Lafayette, VII-4-1914, A. L. Melander (USNM).
MA	3f, 3 localities (MCZ, USNM); 2m, 1f, 2 localities, paratypes (MCZ, USNM).
MD	1m, Laurel, V-26-1965, Malaise trap (CNC).
MN	4m, 2f, 5 localities (IASU, UMN).
NJ	2f, Vineland, VII-1954, M. R. Wheeler (UTXA); 2f, 2 localities, paratypes (MCZ).
NY	1m, 6f, 5 localities (CAS, CU, NYSM).
OH	7m, 7f, 7 localities (KSU, MOU, OHSU).
ONT	12m, 16f, 7 localities (CNC).
PA	7m, 7f, 4 localities (ANSP, CM, USNM).
QUE	3m, 5f, 5 localities (CNC, UM).
RI	1m, holotype (MCZ).
SC	2m, Aiken, VI-13-1957, J. R. Vockeroth (CNC).
VA	2m, 5f, 4 localities (IASU, MCZ, USNM).
VT	1m, paratype (MCZ).
WI	1m, 2f, 3 localities (UWI).
WV	1f, Cranberry Glades, Pocahontas Co., VII-16-1955, C. W. Sabrosky (USNM).

Biology The flight period for this commonly collected species extends from early May to late August with collection records indicating

that conjuncta is more common in June and July. One adult has been associated with cottonwoods (Populus deltoides) and a number with Cornus stolonifera (red osier) and Juneberry (Amelanchier). Smith (1928) classified conjuncta as a seasonal sub-influent (noticeably affects community by their abundance during part of the year) in the vernal society (April 26 to May 29) of 2 red oak-maple climax forests in Champaign County, Illinois.

Homoneura philadelphica incertae sedis

Homoneura (Homoneura) philadelphica (Macquart)

(Figs. 3, 4, 53, 80, 96)

Sapromyza philadelphica Macquart, 1843: 348 (1843: 191) [descr. - NA].
Walker, 1849: 987 [coll. rec. - GA, =fuscibasis, MISIDENT.; NS, =americana, MISIDENT.].
Osten Sacken, 1858: 77 [cat., distr. - GA, NS].
Walker, 1871: 144 [coll. rec. - NS, =americana, MISIDENT.].
Osten Sacken, 1878: 196 [cat., distr. - Atlantic states].
Brodie & White, 1883: 56 [coll. rec. - CAN].
Wulp, 1883: 56 [coll. rec. - QUE, =incerta, MISIDENT.].
Keen, 1885: 55 [coll. rec. - PA].
Smith, 1890: 399 [coll. rec. - NJ].
Townsend, 1892: 302 [key, distr. - NA].
Lynch Arribalzaga, 1893: 261 [key], 286-287 [note, descr. after Macquart].
Slosson, 1895a: 7 [coll. rec. - NH].
Harrington, 1900: 134 [coll. rec. - ONT].
Johnson, 1900: 689 [coll. rec. - NJ].
Aldrich, 1905: 586 [cat., distr. - Atlantic states, QUE, NH, NJ].
Crevecoeur, 1906: 95 [coll. rec. - KS].
Washburn, 1906: 81 [coll. rec. - MN].
Johnson, 1910: 798 [coll. rec. - NJ].
Melander, 1913: 68 [key, distr. - QUE, NH, MA, NJ, PA, LA, IL, SD].
Shelford, 1913: 239, 257 [note on ecology - IL].
Winn & Beaulieu, 1915: 152 [coll. rec. - QUE].
Britton, 1920: 202 [coll. rec. - CT].
Malloch & McAtee, 1924: 21 [key], 23 [distr. - MD], Pl. 2, Fig. 19 [genitalia, m].

Johnson, 1925a: 255 [coll. rec. - ME, NH, VT, MA, CT].
Johnson, 1925b: 96 [coll. rec. - NH].
Weese, 1925: 31 [adult ecology - IL].
Criddle, 1926: 104 [coll. rec. - QUE].
Johannsen, 1926: 159 [coll. rec. - NY].
Johnson, 1927: 216 [coll. rec. - ME].
Johannsen, 1928: 848 [coll. rec. - NY].
Smith, 1928: 491, 494 [adult ecology - IL].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
Smith-Davidson, 1932: 310, 326 [adult ecology - IL].
Curran, 1934: 316, Fig. 4 [wing].
Brimley, 1938: 380 [coll. rec. - NC].
Procter, 1938: 344 [coll. rec. - ME, same as Johnson, 1927].
Shewell, 1938: 135 [key], 140 [coll. rec. - QUE, ONT; note]; 134 (Pl. 12) Fig. 40a, 40b [genitalia, m], 136 (Pl. 13) Fig. 58 [wing].
Osborn & Knull, 1939: 256 [coll. rec. - OH].
Procter, 1946: 399 [coll. rec. - ME, same as Johnson, 1927].
Shelford, 1951: 189 [adult ecology - IL].
Shewell, 1965: 699 [cat., distr. - SD & s. MAN to se. CAN & ME, s. to LA & GA].
Shewell, 1966: 213 [note on aristae].

Diagnosis This medium-sized species is readily recognized by having apical R_{2+3}, preapical and apical R_{4+5}, apical M_{1+2} spots and bordered r-m and m (Fig. 53). It also has 1+3 dc, a strong preapical av F3 bristle and plumose aristae.

Discussion This species is related to the incerta group having similar maculation and with the base of R_{4+5} infuscated as in fuscibasis (Fig. 49, 53). H. philadelphica is easily separated by the strong presutural dc and only short, pointed surstyli (Figs. 96-99). Some specimens have 1-4 marginal setae between the sc bristles (Fig. 4), rather than these areas usually being devoid of setae.

Shewell (1938: 134, Figs. 40a, 40b) figured and discussed some of the variations in the inferior forceps (=terminal processes). As far as I have been able to determine, these are individual variations that I could

not correlate with the presence or absence of marginal setae on the scutellum or any other character. Most specimens do not possess the extra setae, and the forms having them seem to occur where there are large numbers of the species present. I have collected and reared many specimens, with and without the marginal scutellar setae, from Renocera Marsh, 4.5 mi. (7.2 km.) east of Kent, Ohio, and have also examined several specimens from Ontario, Minnesota and New York.

Shewell (1966) noted the philadelphica is the only Nearctic species in which the plumosity of the aristae approaches the length found in the introduced oriental species, H. unguiculata. However, the plumosity of the aristae of fuscibasis and crickettae is as long as in philadelphica.

Redescription Total length 3.5-4 mm.; wing length 3.5-4.7 mm. Brownish-yellow, with very sparse whitish pollinosity. Similar to fuscibasis.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face flat; parafacials about 1/3rd width of face at middle. Genae about 1/6th height of eyes. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, shorter than succeeding dc, not far removed anteriorly from suture; 1+4 acr, as strong as prsc, with 2 incomplete outer rows of setae.

F1 av ctenidium of 12-15 closely spaced setulae; F3 with strong preapical ad and av and without pv bristles.

Wings yellowish with both r-m and m bordered brown; apical R_{2+3},

preapical and apical R_{4+5} and apical M_{1+2} spots brown; base of R_{4+5} infuscated.

Male genitalia: surstyli short and bluntly pointed on al angle; gonopods moderately long and curved posteriorly; terminal processes vary slightly, but basically club-shaped, with approximately 6 minute setulae apically; aedeagus moderately large; cerci medium-sized, with some longer bristles apically.

Type Neotype: male, Philadelphia, Pennsylvania, VII-20-1893, C. W. Johnson (MCZ).

Remarks The type of Sapromyza philadelphica Macquart has evidently been lost at the Museum National d'Histoire Naturelle, Paris (Tsacas, pers. com.).

Specimens examined 1209 (588m, 621f) from 296 central and eastern NA localities:

AR	1m, Washington Co., VIII-12-1965, E. P. Rouse (UAR).
CT	9m, 12f, 9 localities (AMNH, CU, IASU, MCA, USNM).
GA	20m, 22f, 4 localities (ANSP, CNC, CU, MNW, SEM, USNM).
IA	103m, 72f, 21 localities (IASU, USNM); 15m, 9f, 4 localities, reared 1971-1975, R. M. Miller (RMM).
IL	28m, 34f, 21 localities (AMNH, ANSP, CAS, INHS, NRS, PC, USNM, UTXA).
IN	8m, 2f, 5 localities (FSCA, IASU, PU, USNM).
KS	1f, Onaga, Crevecoeur (USNM).
KY	2m, Lexington, VII-27, VIII-7-1894, H. Garman (UKY).
LA	1m, Opelousas, IV-1897 (USNM).
MA	9m, 1f, 4 localities (IRSNB, USNM).
MAN	9m, 4f, 4 localities (CNC).
MD	4m, 5f, 5 localities (CM, CNC, USNM).
ME	10m, 21f, 6 localities (CU, MCZ, OHSU, USNM).
MI	12m, 12f, 12 localities (CU, SEM, UMI, USNM).
MN	19m, 13f, 15 localities (ANSP, IASU, NCSU, UTXA).
MO	1m, Atherton, VIII (USNM).

NC 6m, 5f, 5 localities (AMNH, CNC, IASU, NCSU, UTXA).
ND 1f, Trail Co., VIII-14-1923, A. A. Nichol (UMN).
NH 5m, 7f, 6 localities (AMNH, UNH, USNM, ZMHU).
NJ 13m, 16f, 9 localities (AMNH, ANSP, BMNH, CM, CU, INHS, MCZ, USNM).
NS 1f, Kentville, VIII-6-1958, J. R. Vockeroth (CNC).
NY 60m, 61f, 28 localities (AMNH, BMNH, CAS, CM, CNC, CU, MCZ, NYSM, UMN, USNM).
OH 44m, 44f, 15 localities (CNC, CU, FSCA, KSU, OHSU, UMN); 47m, 55f, 4.5 mi. e. Kent, reared 1967-1969, R. M. Miller, biological note nos. 6721-22, 6820-22, 6920-33 (CNC, RMM).
ONT 33m, 33f, 23 localities (AMNH, BMNH, CAS, CNC, CU, MNW, USNM).
PA 56m, 78f, 36 localities (ANSP, CM, CSU, CU, FEM, MCZ, PADA, PC, SEM, USNM, ZMHU); 1m, neotype (MCZ).
QUE 36m, 68f, 19 localities (AMNH, CNC, UALTA, UM).
SD 1m, Waubay, VII-26-1924, H. C. Severin (SDSU).
TN 6m, 8f, 4 localities (CNC, CU, USNM).
VA 13m, 17f, 12 localities (CNC, IASU, INHS, MCZ, USNM, UTXA).
VT 3f, 3 localities (MCZ, PU, USNM).
WI 11m, 11f, 12 localities (ANSP, IASU, SEM, UWI).
WV 5m, 5f, 4 localities (CM, INHS).

Biology The flight period of this very common and widespread species begins in early May and extends through late October with most collection dates being from the summer months of June, July and August. Several adults have been collected at lights, in light traps, at light during a heavy rain and from elevations up to 6,600 ft. (2,012 m.). Specimens have been recorded from cottonwood (Populus deltoides), Tilia americana (basswood), Fraxinus nigra (black ash), Carya ovata (shagbark hickory), Taxus canadensis (ground hemlock) and a species of Urticaceae (the nettle family).

Adults have also been associated with the following habitats: dry creek beds, along rivers, meadows, prairies, marshy ponds, powerline scrub, forest floors, near tamarack bogs, maple-elm floodplain community, oak-chestnut, alder-birch, poplar-birch and spruce-yellow birch (Betula

lutea) associations. Shelford (1913) recorded philadelphica as common in the field stratum of a white oak-red oak-hickory association and listed this species in the herbs of the beech-maple climax near Chicago, Illinois. Weese (1925) reported that this species was collected on June 26 from the herb stratum of an elm-maple forest near the University of Illinois, Urbana. Smith (1928) classified philadelphica as a seasonal influent (importantly affects community by their abundance during part of the year) in the estival society (May 29 to July 19) and as a seasonal sub-influent (noticeably affects community during part of the year) in the vernal (April 26 to May 29) and serotinal (July 19 to September 6) societies of 2 red oak-maple climax forests in Champaign County, Illinois. Using these same 2 red oak-maple climax forests, Smith-Davidson (1932) showed that this species responded to the variability in weather conditions by attaining its maximum abundance during the summer of 1926, which was much wetter than the summer of 1925. Shelford (1951) listed philadelphica along with incerta in his work on the fluctuations of forest animal populations in east central Illinois. Whittaker (1952) collected 5 specimens [unpublished] from late June to mid-July in Tennessee: 1 from the sparse herb stratum of an eastern hemlock forest; 3 from the herb and shrub-low tree strata of a gray beech forest; and 1 from the shrub and herb strata of a cove forest of mixed deciduous trees in a ravine.

A number of adults were reared from larvae collected from leaf litter, mostly decaying sugar maple leaves (Acer saccharum) from various locations around Iowa (Red Haw State Park, Pilot Mound State Forest, Ledges

State Park and Bay's Branch Area) from 1971 to 1975. Larvae were collected at the end of December, end of March, middle of April and May. Adults reared from larvae collected in winter began emerging in mid-April in the laboratory; those from larvae collected in mid-April began emerging in mid-May; while the 1 collected in mid-May emerged in early June.

During 1967 to 1969 a few rearings of philadelphica were initiated using adults collected in great abundance from a stand of skunk cabbage (Symplocarpus foetidus) growing in a lowland deciduous woods at Renocera Marsh, 4.5 mi. (7.2 km.) east of Kent, Ohio. A number of rearings were also initiated using adults reared from larvae collected in late winter and early spring from decaying leaves of sugar maple and alder (Alnus).

Field-collected males lived 44-137 days in the laboratory; females, 54-110 days. Reared males lived 53-156 days; females, 55-141 days. The premating period for 7 reared females was 10-36 days with oviposition beginning about 2 days later. Mating was observed 6 times in the laboratory and occurred in late afternoon and evening. Mating position and behavior was similar to that described for pernotata. Mating lasted 2-4 hours.

The preoviposition period for reared females ranged from 12-42 days. In the breeding jars, eggs were usually deposited in clusters of 4-5 on and in moist peat moss and underneath and between decaying tree leaves in the late afternoon and early evening. Field-collected females laid up to 10 eggs each per day, while 1 reared female laid 13 eggs per day. The incubation period was usually 3-13 days, although some individuals re-

quired longer time. Larvae mined and fed on decaying lettuce and tree leaves of maple and alder. The larval stadia were 6-16 days for 1st instars, 3-13 for 2nd instars and 9-20 for 3rd instars. First instars were collected in the field from January through mid-April, while 2nd and 3rd instars were collected in late April and May. The prepupal period was approximately 48 hours and the pupal period was 10-13 days.

The total time required to complete a life cycle in the laboratory varied from 90-131 days, indicating that in northeastern Ohio this species is at least partially bivoltine. In nature most ecolsion probably takes place in the autumn with the overwintering stages as quiescent 1st-instar larvae. Development becomes more rapid in the early spring with puparia being formed in May.

Homoneura incerta Group

Diagnosis This group of 3 species can be separated by the following combination of characters: 1) apical R_{2+3}, preapical and apical R_{4+5}, apical M_{1+2} spots and bordered r-m and m; 2) 0+3 dc; 3) 2 rows of strong acr; 4) genae 1/6th height of eyes; 5) parafacials 1/3rd width of face at middle.

Discussion This group is closely related to philadelphica, which obviously differs by the strong presutural dc bristle; otherwise, it could easily belong to the incerta group. Females of the incerta group can be very hard to distinguish especially when incerta females are large specimens and the apical R_{2+3} spots are not distinctly darker than the other spots. Presence of preapical av F3 bristles is variable as probably the

infuscated bases of the R_{4+5} in fuscibasis and crickettae.

Key to Species of incerta Group

1. Apical R_{2+3} spots much darker, more conspicuous and usually larger than other wing spots (Fig. 51); 1 strong presutural acr; small genitalia (Fig. 97) . . . incerta, p. 96

   Apical R_{2+3} spots not more conspicuous or larger than others (Figs. 49, 50); 2 strong presutural acr; large genitalia (Figs. 98, 99) 2

2. Base of R_{4+5} usually infuscated; long, simple gonopods . . . . . fuscibasis, p. 101

   Base of R_{4+5} not infuscated; bifurcate gonopods . . . . . crickettae, p. 103

Homoneura (Homoneura) incerta (Malloch)

(Figs. 51, 72, 97)

Wulp, 1883: 56 [coll. rec. - QUE, as philadelphica, MISIDENT.].
Sapromyza incerta Malloch, 1914: 36-37 [descr. - MD, DC, IL].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - MD].
Johnson, 1925a: 255 [coll. rec. - MA].
Criddle, 1926: 104 [coll. rec. - QUE, ONT].
Johannsen, 1926: 159 [coll. rec. - NY].
Johnson, 1927: 216 [coll. rec. - ME].
Johannsen, 1928: 848 [coll. rec. - NY].
Petch & Maltais, 1932: 159 [coll. rec. - QUE].
Procter, 1938: 344 [coll. rec. - ME].
Shewell, 1938: 135 [key], 140 [coll. rec. - QUE, ONT]; 134 (Pl. 12) Fig. 42 [genitalia, m], 138 (Pl. 14) Fig. 56 [wing].
Jones, 1946: 186, 188 [adult ecology - IL].
Procter, 1946: 349 [coll. rec. - ME, same as Procter, 1938].
Dowdy, 1947: 432 [adult ecology - MO].
Shelford, 1951: 189, 191, 206 [adult ecology - IL].
Shewell, 1965: 698 [cat., distr. - s. MAN to se. CAN and NH, s. to MO and n. GA].

Diagnosis This small species can be recognized by its distinctly larger and darker apical R_{2+3} spots and only 1 strong presutural acr.

Diagnosis This small species can be recognized by its distinctly larger and darker apical R_{2+3} spot (Fig. 51). H. incerta can be separated from the larger crickettae and fuscibasis by having only 1 strong presutural acr.

Discussion This species is most closely related to crickettae and fuscibasis by having 3 strong postsutural dc, a strong preapical av F3 bristle and aristae plumose (Fig. 72). Both crickettae and fuscibasis are usually larger than 3.5 mm., have 2 strong presutural acr and all wing spots pigmented equally. The male genitalia of incerta have short, posteriorly hooked surstyli; moderately long, straight gonopods; long, somewhat foot-shaped terminal processes, crenulated dorsally; very long aedeagi and small cerci (Fig. 97).

Types Lectotype: female, Plummers Island, Maryland, VIII-10-1912, W. L. McAtee (USNM). Allotype: male, Washington, District of Columbia, IX-2-1907, W. L. McAtee (USNM) [left hindleg & wings missing]. Paratypes: 2f, same locality as lectotype, VIII-17-1912, W. L. McAtee (USNM); 1f, Aldridge, Illinois, VIII-11-1891, C. A. Hart & Shiga [Acc. No. 17212] (INHS).

Remarks The 3 females from Plummers Island at the United States National Museum were all labeled cotypes. Therefore, I selected the female in the best condition and designated it the lectotype. According to Malloch's (1914) description, there was supposed to be a male paratype at the Illinois Natural History Survey. Frison (1927) only listed the female from Aldridge; so the male must be lost.

Specimens examined 434 (195m, 239f) from 191 north central and eastern NA localities:

CT	5m, 5f, 3 localities (USNM).
DC	2m, 5f, 2 localities (COSU, OHSU); 1m, allotype (USNM).
GA	4m, 1f, 2 localities (ANSP, CNC).
IA	10m, 34f, 7 localities (IASU); 1m, Stone St. Pk., reared 1972, R. M. Miller (RMM); 2m, 2f, Red Haw St. Pk., reared 1974, 1975, R. M. Miller (RMM).
IL	2m, 4f, 4 localities (FMNH, INHS); 1f, paratype (INHS).
IN	2m, 3f, 4 localities (PU, USNM).
KY	12m, 1f, Lake Cumberland St. Pk., Russell Co., VIII-20-1962, D. L. Deonier, taken at forest edge (IASU).
MA	9m, 9f, 9 localities (IRSNB, MCZ, MU, SEM, USNM).
MAN	2m, 4f, 2 localities (CNC).
MD	5m, 7f, 5 localities (ANSP, MCZ, USNM); 1f, lectotype (USNM); 2f, paratypes (USNM).
ME	3m, 5f, 5 localities (CU, OHSU, USNM).
MI	8m, 17f, 12 localities (CNC, IASU, SEM, UMI).
MN	4m, 6f, 6 localities (IASU, UMN).
MO	1m, 2f, 3 localities (PU, USNM).
NC	3m, 5f, 4 localities (AMNH, CNC, FSCA, IASU).
NH	5m, 3f, 6 localities (CU, UNH, USNM, ZMHU).
NJ	1f, Princeton, X-1, A. H. Sturtevant (USNM).
NS	1f, Shelburne, VIII-10-1958, J. R. Vockeroth (CNC).
NY	18m, 17f, 21 localities (AMNH, CAS, CM, CU, IASU, NYSM, USNM).
OH	19m, 7f, 9 localities (FSCA, IASU, OHSU, UMN); 2m, 3f, Kent, reared 1968, 1972, R. M. Miller, B. A. Foote (RMM, KSU).
ONT	13m, 11f, 8 localities (AMNH, CAS, CNC, USNM).
PA	8m, 14f, 17 localities (ANSP, CM, CU, FEM, FSCA, IASU, PADA, USNM).
QUE	13m, 26f, 15 localities (AMNH, CNC, IRSNB, NRS, UALTA, UM).
SD	6m, 1f, Newton Hills St. Pk., Lincoln Co., VII-29-1967, S. Medina Gaud, J. L. Laffoon (IASU).
TN	5m, 1f, 5 localities (IASU).
VA	24m, 23f, 16 localities (CNC, FSCA, IASU, INHS, MCZ, SEM, USNM, UTXA, ZMH).
WI	5m, 17f, 15 localities (IASU, UWI).
WV	1m, 1f, 2 localities (CM).

Biology The flight period of this common species begins in early June and extends through late October, with most collection dates in July and August. Jones (1946) reported the dates of first and last appearances of incerta from the herbs in the William Trelease Woods, a maple-elm woodland, 5 mi. (7 km.) northeast of Urbana, Illinois: first appearance - May 8, 1934; May 24, 1935; June 14, 1937; June 5, 1938; last appearance - September 12, 1934; September 6, 1937. I suspect that the first records for May belong to citreifrons. Shelford (1951) also used this same woods in his study of animal population fluctuations. He concluded that incerta could be used for quantitative studies, but regular collections were too few to constitute good samples, identification difficulties caused gaps in the records, and probably it was this species which declined and disappeared about the middle of the sampling period.

Adults have been collected commonly at lights, many from light traps and 1 from a blacklight trap and 1 from a Malaise trap. Malloch & McAtee (1924) also reported that this species comes to light. Many adults were collected at the edge of a forest and several from a moist ash woods and a maple-elm floodplain community. Specimens have been recorded from Fagus grandifolia (beech), cottonwood (Populus deltoides), honey locust (Gleditsia triacanthos), American elm (Ulmus americana), Tilia americana (basswood or linden), Fraxinus nigra (black ash), Acer saccharum (sugar maple), Carya sp. (hickory) and many species of Quercus (oaks). Dowdy (1947) collected a specimen of incerta in early July from the tree stratum of an oak-hickory forest near Jefferson City, Missouri. Whittaker (1952) collected 5 specimens [unpublished] from late June to mid-

July in Tennessee: 2 from the herb and shrub-low tree strata of a gray beech forest, 1 from the herb-low shrub and high shrub-low tree strata of a red oak-pignut hickory forest, 1 from a shrub community with a layer of heath and 1 from the shrub and herb strata in an open stand of pines.

In mid-September, 1968, a rearing was initiated using a field-collected female from a mesic woods in Kent, Ohio. She laid 222 eggs in 22 days in the laboratory. The eggs were deposited singly on leaves and peat moss in the early evening. The larvae fed on the decaying maple and cherry leaves and lettuce. In mid-November 1 male and in mid-December 2 females emerged. The preoviposition period was 24-26 days, but all eggs laid were evidently inviable. The male lived almost 2 months, 1 female a little more than 2 months and the remaining female 5 months. Foote (pers. com.) reared 1 specimen from the decaying leaves of Sassafras albidum (white sassafras) on December 30, 1972 and another specimen from Acer rubrum (red maple) in the spring of 1973 at Kent, Ohio.

In early August, 1971, a rearing was initiated using field-collected females from an oak woods in Stone State Park, Sioux City, Iowa. The larvae fed on decaying leaves and lettuce and 1 male emerged in mid-November. Its 2nd-instar stadium lasted 9 days; 3rd, 20 days; and pupal period, 10 days. In mid-April, 1974, and mid-March, 1975, late instar larvae were collected from sugar maple leaves in a mesic woods at Red Haw State Park, 1 mile east of Chariton, Iowa. About 1 month later the adults began emerging.

From the known biological information about this species, I suspect that it has only 1 generation a year since it is more common in mid to

late summer. Probably the species overwinters as larvae.

Homoneura (Homoneura) fuscibasis (Malloch)

(Figs. 49, 98)

Walker, 1849: 987 [coll. rec. - GA; as philadelphica, MISIDENT.].
Sapromyza fuscibasis Malloch, 1920: 126 [descr. - IL, MD].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - VA, MD].
Brimley, 1938: 380 [coll. rec. - NC].
Shewell, 1965: 698 [cat., distr. - IL to sw. ONT & NJ, s. to MS & FL].

Diagnosis This large species is very similar to crickettae but has the base of the R_{4+5} infuscated, long, simple gonopods, flattened apically, while crickettae lacks the basal infuscation of R_{4+5} and has short, bifurcate gonopods apically (Figs. 49, 50, 98, 99).

Discussion This species has at least 2 very strong presutural acr and preapical av F3 bristles may be present or absent. H. crickettae also has 2 strong presutural acr and usually possesses a strong preapical av F3 bristle. Some specimens of fuscibasis do not have distinct infuscations at the bases of the R_{4+5}, which makes females of fuscibasis, crickettae, and sometimes large specimens of incerta very difficult to separate.

Types Holotype: male, White Heath, Illinois, VII-11-1915, J. R. Malloch (INHS). Allotype: female, Summer, Illinois, VIII-2-1914, C. A. Hart (INHS). Paratypes: 2m, same data as holotype (INHS, USNM); 1m, 2f, same data as allotype (CNC, INHS, USNM); 1f, St. Joseph, Illinois, VI-27-1915 (INHS); 1m, Dubois, Illinois, VIII-8-1917, J. R. Malloch (INHS); 1m,

Urbana, Illinois, IX-15-1891, J. Marten [Acc. No. 17499] (INHS); 2f, Plummers Island, Maryland, VI-28, IX-13-1914, W. L. McAtee (USNM).

Specimens examined 81 (39m, 42f) from 50 eastern NA localities:

FL	5f, 4 localities (FSCA, USNM).
GA	2m, 1f, 3 localities (BMNH, CNC, ZMHU).
IA	1f, Ledges St. Pk., Boone Co., VIII-13-1971, W. L. Kramer (IASU); 2m, 2f, Red Haw St. Pk., reared 1975, R. M. Miller (RMM).
IL	4m, 2f, 4 localities (IASU, INHS, UTXA); 1m, holotype (INHS); 1f, allotype (INHS); 5m, 3f, paratypes (CNC, INHS, USNM).
IN	1m, Lafayette, VII-4-1914, A. L. Melander (USNM).
KY	2m, 1f, Lexington, VIII-7-1894, H. Garman (UKY).
LA	2m, 2f, 2 localities (FMNH, OHSU).
MD	4m, 1f, 4 localities (OHSU, USNM); 2f, paratypes (USNM).
MO	1m, St.Louis, VIII-12-1953, Stalker (UTXA); 1f, Cuivre River St. Pk., Lincoln Co., VIII-26-1961, J. L. Laffoon (IASU).
MS	2m, Oxford, V-1943 (USNM).
NC	1m, 1f, 2 localities (CAS, CNC).
NJ	3m, 2f, 4 localities (AMNH, CU, FEM, MCZ, UTXA).
NY	1m, Montauk, Long Island, VI-9-1953, R. Latham (USNM); 1m, Speonk, Long Island, VIII-12-1954, L. Wilcox (USNM).
OH	3f, 2 localities (KSU, MCZ); 1m, 4f, 4.5 mi. e. Kent, reared 1968, 1969, R. M. Miller (RMM).
ONT	1m, 1f, 2 localities (CAS, CNC).
QUE	1m, 3f, Ste-Anne Sorel, VII-26-1950, A. Robert (UM).
TN	2m, 3f, 3 localities (CNC).
VA	2m, 3f, 4 localities (IASU, MCZ, USNM).

Biology The flight period of this uncommon species begins in late April (Louisiana) and extends to mid-October (Florida). One adult has been collected from Fagus grandifolia (beech) and 1 at a light.

In the spring of 1968 and 1969, larvae were collected from the leaf litter, mostly Acer rubrum (red maple), at Renocera Marsh, 4.5 miles east of Kent, Ohio. Five adults emerged in the latter half of May. In late March, 1975, larvae were collected from decaying leaves of Acer saccharum (sugar maple) at Red Haw State Park, 1 mile east of Chariton, Iowa. Four

adults emerged in the latter half of April. This species is probably univoltine, with larvae being the overwintering stage.

Homoneura (Homoneura) crickettae NEW SPECIES

(Figs. 50, 99)

Diagnosis This medium-sized species is very similar to fuscibasis, but lacks the infuscated base of the R_{4+5} and males have short, bifurcate gonopods.

Discussion This species has at least 2 very strong presutural acr, as does fuscibasis, and usually has a strong preapical av F3 bristle, which fuscibasis may or may not possess. Males of crickettae also have small, broadly pointed surstyli, while they are moderately long and mesally curved in fuscibasis (Figs. 98, 99). The terminal processes and aedeagi of both species are very similar. Females of crickettae can be easily confused with females of fuscibasis and sometimes large specimens of incerta.

Description Total length 3.5-4 mm.; wing length 3.6-4 mm. Brownish-yellow, with very sparse whitish pollinosity. Similar to fuscibasis.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face slightly convex; parafacials about 1/3rd width of face at middle. Genae about 1/6th height of eyes. Aristae plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 0+3 dc; 2+3 acr, presutural acr about as strong as prsc, with 2 outer rows of setae.

F1 av ctenidium of 9-11 closely spaced setulae; F3 with preapical ad, with or without av, and without pv bristles. Wings yellowish with r-m and m bordered brown; apical R_{2+3}, preapical and apical R_{4+5} and apical M_{1+2} spots brown.

Male surstyli small, broadly pointed; terminal processes large, curving posteriorly, with small setulae apically; gonopods short, bifurcate at tip; aedeagi large; cerci medium-sized.

Types Holotype: male, Berks Co., No. 2, French Creek Park, Pennsylvania, VII-3-1958, G. W. Byers & party (SEM). Allotype: female, same data as holotype (SEM). Paratypes: 2m, 2f, same data as holotype (RMM, SEM); 2m, 1f, collection data unkown [2936, 2937, 2939], G. N. Hough (FMNH, USNM).

Remarks This species is named after my wife's surname. The collection records for Hough's specimens have been lost (Kethley, pers. com.).

Biology Nothing is known about the biology of this rarely collected central eastern species.

Homoneura unguiculata incertae sedis

Homoneura (Homoneura) unguiculata (Kertesz)

(Figs. 78, 104)

Lauxania (Minettia) unguiculata Kertesz, 1913: 100-101 [descr. - Formosa]; Fig. 3b [head], Figs. 3d, e, f [genitalia, m].
Malloch, 1929a: 51 [key]; Pl. 6, Fig. 91 [genitalia, m].
Frost, 1964: 157 [coll. rec. - FL, as Homoneura sp.].
Frost, 1966: 250 [coll. rec. - FL, as ungiculata, ERROR].
Shewell, 1966: 212-213 [redescr. - FL, SC, introd.].

Diagnosis This small, clear-winged species can easily be separated from all other Nearctic Homoneura by having 6 rows of acr setae rather than 2 or 4 rows and the apex of the 3rd antennal segments light brown (Fig. 72) rather than unicolorous, yellow-orange. Also the plumosity of the aristae is longer than any other Nearctic species.

Discussion Shewell (1966) in his redescription of unguiculata stated that the av F1 ctenidium is inconspicuous and sometimes absent. However, all the material that I have examined possessed a ctenidium of 9-12 weak setulae.

The male genitalia are small and very different from other Nearctic Homoneura (Fig. 104) possessing characteristic shiny, light brown, recurved claw-like surstyli. The cerci of the female are dark brown.

Types Lectotype: male, Takao, Formosa, VI-13-1907, [H.] Sauter (HNHM). Paratypes: 1f, Takao, Formosa, III-24-1907, 300 meters, Sauter (HNHM); 5f, Takao, Formosa, VI-13-, VI-24-, XI-8-, XII-3-1907, Sauter (HNHM); 2f, Yentempo, Formosa, V-19-1907, Sauter (HNHM); 1m, 5f, Koshun, Formosa, IX-, X-1908, I-1909, Sauter (HNHM); 3m, 4f, Tainan, Formosa, IV-, V-1912, Sauter (HNHM); 1f, Taihoku, Formosa, IV-1912, Sauter (HNHM).

Remarks During transit many of the 23 syntypes were badly damaged. Of the 5 males and 18 females, only 1 male, which I designated as the lectotype, and 10 females remained in good condition. Specimens from Hawaii were also compared to Oriental and Nearctic material.

Specimens examined 68 (40m, 28f) from 26 southeastern USA localities:

AL	4m, Kushla, V-20-1956, A. H. Sturtevant (LACM, USNM).
FL	18m, 18f, 16 localities (CNC, FEM, FSCA, IASU, KSU, USNM, WASU).
GA	2m, 3f, Stone Mt., DeKalb Co., XI-11-1953, Dodge (USNM).
NC	1m, Mt. Pisgah, VII-17-1958, D. A. Young (NCSU); 1f, Raleigh, IX-17-1961, H. D. Blocker (NCSU).
SC	15m, 6f, 6 localities (CNC, NCSU, USNM).

Remarks H. unguiculata is widespread in the Oriental region and has immigrated to Hawaii (Hardy, pers. com.). The earliest Nearctic record is April 14, 1952, from Elfers, Florida. Specimens were collected the following year in Georgia and 4 and 5 years later in South Carolina and North Carolina, respectively. Perhaps it can be said that the species is migrating northward from Florida, but it seems as likely that this species has been in this general area for a number of years with the collection records indicating where most of the active collecting has taken place.

Biology Since unguiculata is cosmopolitan, it is probably an opportunistic species that breeds in a wide variety of decaying plant materials. Adults have been collected in light traps, Steiner, Malaise and stickyboard traps and sweeping weeds, at Bidens pilosa (a type of burmarigold) and Celtis laevigata (a type of hackberry). Shewell (1966)

reported that during intensive collecting at Highlands, North Carolina, unguiculata was taken only on the few excursions to elevations below 1,000 feet (305 m.) and 1 of the paratypes was collected at 300 meters.

From the Nearctic collection records the species seems to be fairly common in early spring and again in the fall. However, specimens have been collected in every month of the year in Florida, where it the species is probably multivoltine.

Homoneura nubila Group

Diagnosis This group of 3, large species possesses the following combination of characters: 1) r-m and m strongly bordered; 2) a strong preapical av and ad F3 bristle; 3) 1+3 dc, presutural dc strong and well-removed anteriorly from the suture; 4) genae 1/6th height of eyes; 5) parafacials 1/3rd width of face at middle.

Discussion This group also has aristae short plumose and 5th TS3 segments yellow. The males of the 3 species of this group can be separated by characters of the T3 and genitalia. Females of the 3 species cannot be distinguished at this time. Furthermore, it is not uncommon to collect more than 1 of these species in the same habitat.

Key to Species of nubila Group

1. Male T3 with a fringe of long, fine, erect av bristles 2

   Male T3 with only appressed setae [S5 with apical fringe of strong setae] . . . . . nubila, p. 108

2. Male L3 basitarsi with a fringe of long, fine, av bristles [S5 with apical fringe of black setulae]. . . nubilifera, p. 111

Male L3 basitarsi with only short setae [S5 without any differentiated apical setae]. . . . . aldrichi, p. 113

Homoneura (Homoneura) nubila (Melander)

(Fig. 101)

Minettia nubila Melander, 1913: 66 [key], 74 [descr. - IL, KS, OR; OR as var. =setula, MISIDENT.].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - VA].
Shewell, 1965: 699 [cat., distr. - IL, sw. ONT, KS, AR, NC, VA].

Diagnosis Males of nubila are separable from males of nubilifera and aldrichi by the absence of a fringe of long, fine, erect av T3 bristles and the presence of foot-shaped surstyli.

Discussion The T3 and L3 basitarsi of males have only short setae and S5 has some larger setae, but not distinct setulae, as found in nubilifera. The surstyli and terminal processes of nubila are foot-shaped, with the toe of the former directed anteriorly and that of the latter directed posteriorly (Fig. 101).

Types Lectotype: female, Lawrence, Kansas, J. M. Aldrich (USNM 49927). Paratype: female, Chicago, Illinois, VIII-10-1901 (USNM).

Remarks Although I have not been able to distinguish the females of this group, I have selected the Kansas specimen as the lectotype because all the males that I have examined from that state are what has previously been called nubila. The Illinois specimen could be any 1 of the 3 species.

Specimens examined 129 (69m, 60f) from 41 central and eastern NA localities:

AR 1m, Arkansas, VIII-10-1907 (UAR); 1m, Howard Co., V-13-1935, W. F. Turner, swept from peach (USNM).
IA 15m, 13f, 3 localities (IASU); 1m, 2f, Bay's Branch Area, Guthrie Co., reared 1973, R. M. Miller; 1m, Red Haw St. Pk., 1 mi. e. Chariton, reared 1975, R. M. Miller (RMM).
IL 9m, 4f, 6 localities (INHS, USNM); 1f, paratype (USNM).
IN 1m, Dubois Co., VI-29-1937, Ferdinand (PU).
KS 23m, 27f, 10 localities (CM, CNC, IASU, KSSU, LIM, OHSU, USNM); 3m, 7f, 2 mi. sw. Jennings, reared 1972, R. M. Miller (RMM); 1f, paratype (USNM).
MO 1m, 1f, 2 localities (USNM); 6m, 5f, Blackjack, reared 1933, R. B. Swain, ex artichoke trash (CNC, USNM).
NE 1m, Hershey, VIII-5-1972, R. M. Miller (IASU); 1m, Lincoln, VI-13-1903, W. D. Pierce (UNE).
OK 3m, 3 localities (OKSU).
ONT 1m, 1f, Pt. Pelee, IX-8-9-1954, G. S. Walley (CNC).
VA 1m, Arlington, VII-8-1936, J. R. Malloch (USNM).

Remarks Shewell (1965) reported this species from North Carolina, but I have seen only 1 female (USNM) from there. I have also seen 1 female from Texas (UTXA), which is probably nubila, because this species is apparently more widely distributed, especially southward, than aldrichi or nubilifera.

Biology The flight period of this relatively common species extends from mid-May to mid-October, with collection records indicating that it is more common in late summer and early fall. Adults have been recorded from peach (Prunus persica), on tree trunk, on hickory (Carya sp.) and along a river. Several specimens examined were collected from Malaise traps.

At the beginning of December, 1932, R. B. Swain collected some artichoke (Cynara scolymus) trash at Blackjack, Missouri. Evidently

larvae were feeding on the decaying leaves, etc., and in mid-March adults began to emerge.

In mid-July, 1972, rearings were initiated using adults collected in a lowland woods along a stream near Jennings, Kansas. The field-collected males lived 33-43 days; females, 40-51 days. There was no apparent diapause, although some ecolsion took longer than 1 week. Larvae fed on decaying lettuce and decaying tree leaves, but development varied. By the end of September the rearing dishes contained all 3 instars. Adults began emerging at the end of October and through mid-November. Two adults emerged in December and finally 1 in mid-January. Laboratory reared males (2) lived 81-130 days; females (5), 43-141 days. The preoviposition period for 2 females was 17 and 30 days. A pair was observed for a few minutes mating in the late morning. Their behavior was very similar to described in other species of Homoneura. The prepupal period was approximately 48 hours. The pupal period for reared males was 11-12 days; females, 14-15 days.

At the end of May and the beginning of June, 1973, some 3rd-instar larvae were collected from leaf litter and plant debris at Bay's Branch Area, Iowa. There were a few cottonwoods (Populus deltoides), mulberry (Morus spp.) and boxelder (Acer negundo) present in this low area at the edge of a reservoir. Adults emerged at the beginning and end of June.

Near the end of March, 1975, several 3rd instars were collected from leaf litter at Red Haw State Park, Iowa. One male of nubila emerged in mid-May along with a few males of nubilifera and several females.

Since no distinct diapause was observed, this species is probably univoltine in the northern latitudes and bivoltine in the southern part of its range, with quiescent larvae during dry and cold periods.

Homoneura (Homoneura) nubilifera (Malloch)

(Fig. 102)

Sapromyza nubilifera Malloch, 1920: 126 [descr. - IL].
Malloch & McAtee, 1924: 21 [key], 23 [coll. rec. - MD]; Pl. 2, Fig. 23 [genitalia, m].
Shewell, 1965: 699 [cat., distr. - IL, IN, TN, MD].

Diagnosis Males of nubilifera are separable from aldrichi and nubila by having a fringe of long, fine, av TS3 bristles and S5 with an apical fringe of black setulae.

Discussion The male genitalia of nubilifera are similar to aldrichi, but differ by having the surstyli broader and the terminal processes foot-shaped, rather than fan-shaped (Figs. 102, 103). The cerci of nubilifera have long, dense setae at the apex, while those of aldrichi have long, dark, evenly-spaced setae at the apical margin.

Types Holotype: male, Monticello, Illinois, VI-21-1914, C. A. Hart & J. R. Malloch, along Sangamon River (INHS). Allotype: female, same data as holotype, VI-28-1914 (INHS). Paratypes: 1m, same data as holotype (INHS); 2m, Mahomet, Illinois, VII-6-1914, C. A. Hart & J. R. Malloch, along Sangamon River (INHS); 2m, 2f, Urbana, Illinois, VI-17-1916, C. A. Hart & J. R. Malloch, forestry (INHS); 2m, Urbana, Illinois, VI-20-1915, C. A. Hart & J. R. Malloch (CNC, INHS); 1f, Urbana, Illinois,

VI-23-1916, C. A. Hart & J. R. Malloch (INHS).

Specimens examined 43 (31m, 12f) from 18 central and eastern USA localities:

IA	5m, 3f, 6 localities (IASU); 3m, 3f, Stone St. Pk., Sioux City, reared 1971, R. M. Miller; 3m, Red Haw St. Pk., 1 mi. e. Chariton, reared 1975, R. M. Miller (RMM).
IL	3m, 3 localities (INHS, USNM, UTXA); m, holotype (INHS); f, allotype (INHS); 7m, 5f, paratypes (CNC, INHS).
IN	5m, Lafayette, VII-13,-23, J. M. Aldrich (CNC, USNM).
KY	1m, Lexington, VIII-6-1920, H. Garman (UKY).
MD	1m, Plummers Is., VI-8-1914, Schwarz & Shannon, at light, (USNM).
MO	1m, Atherton, VIII-20-1922, C. F. Adams (PU).
TN	1m, Hamilton Co., VI-30-1939, from peach (USNM).

Biology The flight period for this uncommon species extends from early June to mid-September, with most specimens having been collected in July and August. Adults have been recorded from peach (Prunus persicus), forests and along a river. One specimen examined was collected from a Malaise trap and another at light.

At the beginning of August, 1971, a rearing was initiated using adults collected in a mesophytic woods at Stone State Park, Sioux City, Iowa. By early September most larvae had hatched and 3rd instars were observed by the end of the month. Larvae fed on decaying tree leaves and lettuce in the laboratory. Adults emerged from mid-October to the end of the month. The prepupal period was approximately 48 hours. The pupal period for reared males (5) was 11-14 days; females (3), 11-12 days.

In mid-April, 1974, and towards the end of March, 1975, 3rd instars were collected in leaf litter at Red Haw State Park, Iowa, along with some larvae of nubila. Three males and 7 females emerged, beginning in

mid-April. The prepupal period was approximately 48 hours and 1 male emerged in 10 days.

From the relatively fast development in the laboratory rearings, it is probable that at least some members start a 2nd generation in the fall. Quiescent larvae are the overwintering stage.

Homoneura (Homoneura) aldrichi NEW SPECIES

(Figs. 58, 71, 103)

Malloch & McAtee, 1924: 23 [coll. rec. - MD, 1 as nubilifera, MISIDENT.].

Diagnosis Males of aldrichi are separable from nubila and nubilifera by lacking differentiated setae on the apex of S5 and lacking long, fine, av bristles on L3 basitarsi.

Discussion The male genitalia of aldrichi are similar to nubilifera, but differ by having the surstyli narrower and the terminal processes fan-shaped, rather than foot-shaped (Figs. 102, 103). The cerci of aldrichi have long, dark, evenly-spaced setae at the apical margins, while nubilifera have long, dark, dense setae at the apices.

Description Total length 4-4.5 mm.; wing length 3.5-4 mm. Yellow, with whitish pollinosity. Similar to nubila and nubilifera.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor, aor set closer to antennal bases than por. Eyes 1/4th higher than wide. Face flat; parafacials about 1/3rd width of face at middle. Genae about 1/6th height of eyes. Aristae plumose.

Head chaetotaxy: aor shorter than por, approximately 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong and well in front of suture; acr inner 2 rows, strong, outer 2 rows, setae usually complete.

Legs pale yellow with av F1 ctenidium of 10-16 widely spaced setulae; F3 with a strong preapical av and ad bristle; T3 of males with fringe of long, fine, av bristles on apical half.

Wings yellow with r-m and m broadly and distinctly infuscated, brown. Male: surstyli narrow and rounded apically, apex posteriorly-directed; gonopods long and linear; terminal processes fan-shaped posteriorly with marginal setae; cerci with long, dark, evenly-spaced setae at the apical margin. Female: cerci yellow, with long, dark setae.

Types Holotype: male, Lafayette, Indiana, VII-11, J. M. Aldrich (USNM). Paratypes: 2m, same data as holotype (USNM); 2m, same data as holotype except VII-23 (USNM); 1f, same data as holotype except, VII-12 (USNM); 5m, 5f, Pilot Mound State Forest, Boone County, Iowa, VI-23-1972, R. M. Miller (CNC, USNM).

Remarks This species is named in honor of its collector, John M. Aldrich, and his contribution to the study of the Diptera. It must be noted that female paratypes may prove to be different species, as Aldrich also collected nubilifera at Lafayette and I collected nubila at Pilot Mound State Forest.

Specimens examined 19 (13m, 6f) from 6 central and eastern USA localities:

AR 1m, Fayetteville, VIII-10-1907 (UAR).
IA 1m, Ledges St. Pk., Boone Co., VII-28-1972, W. B. Stoltzfus (IASU); 5m, 5f, paratypes (CNC, USNM).
IN 1m, holotype (USNM); 4m, 1f, paratypes (USNM).
MD 1m, Cabin John Bridge, VI-14-1913, R. C. Shannon (USNM).

Biology The flight period for the rare species, from the collection records, begins in mid-June and ends mid-August, but probably extends through September.

In late June a rearing was attempted using adults collected from a very small ravine covered with cottonwood (Populus deltoides) and black raspberry (Rubus sp.) at Pilot Mound State Forest, Iowa. The larvae fed on decaying lettuce and tree leaves and 2 puparia were formed in October and November but no adults emerged. This species is probably univoltine.

Homoneura littoralis incertae sedis

Homoneura (Homoneura) littoralis (Malloch)

(Figs. 83, 105, 106)

Sapromyza littoralis Malloch, 1915: 47 [descr. - MI].
Malloch & McAtee, 1924: 22 [key].
Johnson, 1925a: 256 [coll. rec. - VT].
Criddle, 1926: 104 [coll. rec. - QUE, ONT, MAN].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
Shewell, 1938: 135 [key], 140 [coll. rec. - QUE, ONT, MAN]; 136 (Pl. 13) Fig. 45 [genitalia, m].
Osborn & Knull, 1939: 256 [coll. rec. - OH].
Chagnon, 1952: 29 [coll. rec. - QUE].
Shewell, 1965: 698 [cat., distr. - n. ALTA to PEI, s. to NY].
Cole, 1969: 373 [distr. - ALTA].

Diagnosis This large, clear-winged species is characterized by having aristae short pubescent, a swollen frons with the parafacials 2/3rds the width of the middle of the face and small eyes with the genae 1/2 their height. Males are unique in having setulae on the venter of the L3 trochanters and basal surface of the F3 (Fig. 83); females are unique in having some dorsal setulae on the cerci (Fig. 106).

Discussion This species is most similar to the harti group, but can be separated by having 2 apical T2 spurs, while species in the harti group usually have 3-4. Males of harti group lack setulae on the T3 trochanters and F3 and have pointed aedeagi, while the aedeagi are rounded apically with a small, anteriorly-directed point in littoralis (Fig. 105).

Types Lectotype: male, South Haven, Michigan, VII-14-1914, C. A. Hart, sweeping on the lake shore (INHS). Lectoallotype: female, same data as lectotype (INHS). Paratypes: 1m, 1f, same data as lectotype (INHS).

Specimens examined 374 (191m, 183f) from 66 north central and northeastern NA localities:

ALTA 1m, McMurray, VI-6-1953, G. E. Ball (CNC).
CO 1m, Reggen, VI-16-1936, R. Swain (COSU); 1m, Keenesburg, VI-11-1961, W. R. M. Mason, sandhills (CNC).
IA 1f, Ames, V-26-1952, M. L. Fairchild (IASU); 1f, Lime Springs, VI-24-1972, R. R. Pinger, Jr. (IASU).
IL 10m, 15f, 4 localities (INHS, USNM).
MA 5m, 13f, 2 localities (FSCA, USNM, UTXA).
MAN 13m, 16f, 7 localities (CNC, USNM).
MI 13m, 30f, 15 localities (SEM, UMI, UNMI); 1m, lectotype (INHS); 1f, lectoallotype (INHS); 1m, 1f, paratypes (INHS).
MN 2m, 1f, 3 localities (IASU, UMN, USNM).
ND 1m, McLeod, VI-20-1939, D. G. Denning (UMN); 1m, Leonard, V-24-1939, D. G. Denning (UMN).

NE 6m, 5f, Valentine, V-8-1950, Hicks, Slater & Laffoon (IASU).
NJ 2f, Seaside Park, VII-1915, VI-1916, C. W. Johnson (MCZ).
NS 53m, 13f, Sable Is., VII-1-13-1967, D. M. Wood (CNC).
NY 2m, 7f, Cold Springs Harbor, Long Is., VI-25, VII-9,13-1931, C. H. Curran (AMNH, CNC).
OH 1m, Sandusky, Cedar Point, VI-8-1902, J. S. Hine (OHSU).
ONT 30m, 27f, 10 localities (CAS, CNC, OHSU, UCALA, USNM, UTXA).
PA 1m, 2f, 2 localities (FEM, PADA).
QUE 41m, 42f, 5 localities (AMNH, UCALA, UM, UTXA).
SASK 1m, 1f, Hatton, VI-11-1929, K. M. King, R. Glen (CNC); 1f, Great Sand Hills, W. Swift, V-27-1939, A. R. Brooks (CNC).
SD 5m, 3f, Lake Campbell, Vi-20-1935, A. B. Peterson & D. E. Herreman (SDSU).
WI 1f, Devils Lake, VII-7-1933, A. L. Melander (USNM); 1f, University of Wisconsin Campus, Madison, VII-15-1915, A. C. Burrill (UWI).

Remarks Johnson (1925a) reported this species from Vermont and Shewell (1965) included the Prince Edward Island, from which I have not seen specimens.

Biology The flight period for this abundant species begins early in May and extends through mid-September being most commonly collected in June and July. Specimens have been collected in copula June 29 (Manitoba), July 6 (Massachusetts) and August 9 (Michigan); Shewell (1938) reported pairs in copula on July 14 and 15 (Quebec). Adults have been collected from Elaeagnus commutata (silverberry), sand dunes and quite commonly along lake shores.

Homoneura harti Group

Diagnosis This group of 3, medium-sized to large, clear-winged species is characterized by the following combination of characters: 1) a swollen frons, with genae 1/2-1/3rd height of eyes; 2) parafacials approximately 2/3rds width of middle of face; 3) 1+3 dc, presutural dc

strong, well-removed anteriorly from the suture; 4) aristae long pubescent; 5) preapical av and ad F3 bristles present; 6) usually 3-4 distinct apical T2 spurs present.

Discussion The wings of this group are large and immaculate (Figs. 65, 66). The males are also characterized by having the anterior L2 claws enlarged and slightly recurved (Figs. 81, 82) and genitalia are very similar, with specific differences in the p1 S5 processes. The females have the T7 about twice as large as T6 and cylindrical, very small cerci (Fig. 136).

Key to Species of harti Group

1. Setae of head, 2nd antennal segments, hypopygium and cerci yellow or light brown 2

   These setae the usual dark brown or black . . . . psammophila, p. 123

2. Genae 1/2 height of eyes . . . . . harti, p. 118

   Genae 1/3rd height of eyes . . . . . ocula, p. 121

Homoneura (Homoneura) harti (Malloch)

(Figs. 135, 136)

Sapromyza harti Malloch, 1914: 32 [descr. - IL]; Pl. II, Fig. 3 [head], Fig. 7 [abdomen, f], Fig. 8 [abdomen, m], Fig. 14 [F3, m].
Malloch & McAtee, 1924: 21, 22 [key].
Criddle, 1928: 100 [coll. rec. - ONT].
Shewell, 1965: 698 [cat., distr. - s. ALTA to s. ONT, IL, WY, KS, OK].
Cole, 1969: 373 [distr. - ALTA, WY].

Diagnosis This large, clear-winged species can be separated from the closely related ocula by having the genae 1/2 the height of the eyes,

rather than 1/3rd, and from psammophila by having 2nd antennal setae light brown rather than black.

Discussion The male genitalia are similar except for the p1 S5 processes being broad and expanded in ocula, foot-shaped in psammophila, while being narrowed in harti (Figs. 133-135). The cerci of females with pale setae only.

Types Lectotype: male, Quincy, Illinois, VIII-12-1889, C. A. Hart, swept from sand bar [Hart Acc. No. 553] (INHS). Lectoallotype: female, same data as lectotype (INHS). Paratypes: 1m, same data as lectotype (INHS); 2f, Quincy, Illinois, VIII-7-1889, C. A. Hart, sweeping willow & Xanthium [Hart Acc. No. 544] (INHS).

Specimens examined 342 (142m, 200f) from 82 central NA localities:

ALTA	2m, 3f, 3 localities (CNC, UALTA).
AR	5m, 3f, 2 localities (UAR).
CO	7m, 16f, 5 localities (CNC, COSU, IASU); 3m, 7f, 6 mi. e. Castle Rock, reared 1972, R. M. Miller (RMM).
IA	8m, 5f, 5 localities (IASU).
IL	30m, 34f, 7 localities (CAS, IASU, INHS); 1m, lectotype (INHS); 1f, lectoallotype (INHS); 1m, 2f, paratypes (INHS).
IN	1f, Gibson Co., VI-6-1958 (PU).
KS	7m, 13f, 11 localities (MCZ, OHSU, SEM, USNM).
MAN	2m, 3f, 2 localities (CNC, USNM, UTXA).
MI	1m, 5f, 5 localities (IASU, UMI).
MN	1f, Isanti Co., VI-13-1938, D. G. Dunning (UMN).
MT	1f, Powderville, VI-15-1916, R. Kellogg (USNM).
NE	3m, 9f, 7 localities (CNC, IASU, MCZ, OHSU, UNE, USNM, UTXA).
NM	35m, 38f, White Sands Natl. Monuement, Otero Co., VI-20-1947, C. P. Stroud, near picnic area, sweeping poplars (WASU).
OH	2f, Lucas Co., VI-24-1934, M. Auten (OHSU).
OK	11m, 15f, 5 localities (OKSU).
ONT	5m, 9f, 5 localities (AMNH, CAS, CNC).
SD	14m, 20f, 7 localities (IASU, SDSU).

TX 2m, 1f, 2 localities (USNM).
WI 2m, 5f, 2 localities (UWI).
WY 3m, 6f, 6 localities (AMNH, IASU, UWY).

Biology The flight period for this abundant species begins in mid-May and extends to mid-October with specimens most commonly collected during the months of June, July and August. Several adults have been collected from willow (Salix), locust (Robinia) and cotton (Gossypium herbaceum); and 1 female each from wheat (Triticum aestivum) and melons (Cucurbita). Many adults have been collected from sand dunes and also associated with Elaeaganus commutata (silverberry) and Betula occidentalis [=frontinalis] (water birch). Numerous specimens have been collected from poplars (Populus).

In early July, 1972, rearings were initiated using adults collected from tall grass in a lowland pasture near Castle Rock, Colorado. Eggs were laid singly on decaying lettuce and leaves. Ecolsion and larval stadia, expecially the 3rd instar, were highly variable. Larvae exhibited strong negative phototactic responses and burrowed immediately when uncovered. They seemed to prefer feeding on freshly decaying lettuce and even the Brewer's yeast-honey mixture provided as food for adults. Adults began emerging in the laboratory on November 1. Mating was observed only once, briefly. The male was situated dorsally and faced in the same direction as the female, with his head near the mid-point of the female's thorax. His foretarsal claws were hooked on the suture ridge between the notopleuron and mesopleuron, just anterior to the posterior np of the female. The recurved, anterior mid-tarsal claws were hooked to the base of his mates wing and the hindtarsi were appressed on the half-outstretched

wings.

The preoviposition period for 3 reared females ranged 32-45 days. The total larval period for 1 specimen was approximately 85 days. The prepupal period lasted 48 hours and the pupal period for 10 reared adults ranged 14-16 days. Adults lived up to 142 days in the laboratory. The time required to complete a life cycle for 1 rearing was 130 days.

Laboratory rearings indicated that this species is probably at least partially bivoltine, especially in the southern part of its range. There was no diapause evident in the rearings.

Homoneura (Homoneura) ocula NEW SPECIES

(Figs. 65, 74, 81, 133)

Diagnosis This large, clear-winged species can be separated from the closely related harti and psammophila by the genae being 1/3rd the height of the eyes, rather than 1/2.

Discussion The male genitalia are similar except for the p1 S5 processes being narrowed in harti and foot-shaped in psammophila, while being broad and expanded in ocula (Figs. 133-135). H. ocula is most similar to harti in size, possessing 3-4 distinct apical T2 spurs and pale yellow to light brown head setae.

Description Total length 4-4.5 mm.; wing length 4-4.5 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to harti and psammophila.

Frons swollen in profile; por equidistant between iv and aor, set in

narrow shining plates. Parafacials about 2/3rds width of face at middle. Genae approximately 1/3rd height of eyes. Head setae pale yellow to light brown; aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc subequal to iv; por subequal to ov; pvt shorter than aor.

Thorax brownish-yellow, subshining, covered with whitish pollinosity. Chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows weak bristles, 2 incomplete outer rows setae.

Legs yellow with av F1 ctenidium of 8-11 closely spaced, weak setulae; F3 with 1-4 preapical av, 1 ad and 0 pv bristles. T2 with 3-4 apical spurs, a and pv approximately 1/3rd and 2/3rds of av, respectively.

Wings yellowish, immaculate. Male p1 S5 processes broad, expanded lobe; T6 about 1.5 times longer than T5; surstyli arm-shaped, narrowed posteriorly, crenulated apically; aedeagi pointed apically; cerci short; light yellow to pale brown setae on epandrium and cerci. Female: T7 cylindrical, about 1.5 times longer than T6; cerci very small, yellow, with light brown setae.

Types Holotype: male, Fredonia, Arizona, VI-4-1951, G. F. Knowlton (USNM). Allotype: female, same data as male (USNM). Paratypes: 1m, 2f, Indian Creek, San Juan Co., Utah, VII-27-1938, G. F. Knowlton & F. C. Harmston (UTSU); 1m, Moab, Utah, VI-25-1938, G. F. Knowlton & F. C. Harmston (RMM); 1f, Fort Duchesne, Utah, VII-21-1953, G. F. Knowlton (USNM); 1f, Syracuse, Utah, VI-7-1933, G. F. Knowlton (UTSU); 1f, 10 mi. se. Vernon, Wasatch National Forest, Utah, VII-8-1972, R. M. Miller (RMM); 1f, 2 mi. se. DeBeque, Colorado, VII-9-1972, W. B. Stoltzfus (IASU); 1f, Zion Canyon, Utah, VI-17-1919 (UTSU).

Biology The flight period for this rare, central western species begins in early June and extends through late July. Its range overlaps with psammophila, but it is evidently not associated with sand dune habitats as is psammophila. H. ocula probably occurs in grass-shrub habitats near water as does harti in central and eastern North America.

Homoneura (Homoneura) psammophila NEW SPECIES

(Figs. 66, 75, 82, 134)

Diagnosis This medium-sized, clear-winged species can be distinguished generally by its smaller size, 2nd antennal setae being black (Fig. 75), rather than light brown, and males possessing a row of weak premarginal bristles on the lateral aspects of T6, which is not as developed in harti or ocula.

Discussion H. psammophila has the usual black setal coloration, whereas harti and ocula have yellow to light brown setae, especially on the head and cerci, with only the bristles distinctly black. The male genitalia are similar except for the p1 S5 processes being a simple, narrowed lobe in harti, a broad, expanded lobe in ocula and a somewhat foot-shaped struture in psammophila (Figs. 133-135).

Description Total length 3.25-4.25 mm.; wing length 3.5-4 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to harti and ocula.

Frons swollen in profile; por equidistant between iv and aor. Face slightly concave; parafacials about 2/3rds width of face at middle.

Genae approximately 1/2 height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc subequal to iv; por subequal to ov; pvt shorter than aor.

Thorax brownish-yellow, subshining, covered with sparse whitish pollinosity. Chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows of weak bristles, 2 incomplete outer rows setae.

Legs yellow with av F1 ctenidium of 8-11 closely spaced, weak setulae; F3 with 1-4 preapical av, 1 ad and 0 pv bristles. T2 usually with only 2 distinct apical spurs.

Wings yellowish, immaculate. Male: p1 S5 processes foot-shaped, small toe directed anteriorly; T6 about 1.5 times longer than T5; a row of weak premarginal bristles about 1/2 length of marginal row on lateral aspect of T6; surstyli arm-shaped, narrowed posteriorly, crenulated apically; aedeagi pointed apically; cerci short, with short, light, apical setae. Female: T7 cylindrical, about 1.5 times longer than T6; cerci very small, yellow, with brown setae.

Types Holotype: male, 8 mi. (12.8 km.) southwest of Jericho, Juab Co., Utah, VII-9-1971, C. A. Toft, on Psoralea lanceolata, in shifting-dunes habitat (USNM). Allotype: female, same data as holotype (USNM). Paratypes: 15m, 7f, same data as holotype (CAS, CNC, IASU, USNM); 8m, 3f, St. Anthony, Idaho, VI-23-1961, W. F. Barr, sand dunes, sweeping Psoralea lanceolata (UID).

Specimens examined 74 (44m, 30f) from 13 central western USA localities:

CO	1m, Great Sand Dunes, Alamosa Co., VII-20-21-1954, H. E. & M. A. Evans (COU).
ID	4m, 10f, 3 localities (UID); 8m, 3f, paratypes (UID).
UT	13m, 8f, 5 localities (IASU, KSU, UTSU); 1m, holotype (USNM); 1f, allotype (USNM); 15m, 7f, paratypes (CAS, CNC, IASU, USNM).
WY	1m, Powder River, VIII-1-1950, R. R. Dreisbach & R. K. Schwab (USNM); 1m, 1f, near Douglas, VII-22-1973, W. B. Stoltzfus (IASU).

Biology The flight period for this rather uncommon species begins in early June and extends to early August. Most of the collection records indicate that this species is associated with sand dune habitats and Psoralea lanceolata (a type of bread-root or Indian turnip).

In the summer of 1971, a long series of specimens collected on Psoralea lanceolata in shifting sand dunes habitats near Jericho, Utah was received from Cathie A. Toft. According to her observations (pers. com.) the flies infested only the plants which were infected with an orange rust (Uromyces psoraleae var. typica Arth.). This rust is specific to P. lanceolata in the Great Basin west of Colorado. When the flies were present, they were found in large numbers. She never found the flies on any Psoralea except in Juab Co., but did find the rust-infected plants in other places.

I suspect that this species has only 1 generation per year and probably occurs only at specific times when the rust is present on the Psoralea and which might serve as a food source for the adults.

Homoneura bakeri incertae sedis

Homoneura (Homoneura) bakeri NEW SPECIES

(Fig. 59, 108)

Diagnosis This small species is closely related to setitibia by having 2-4 strong, preapical av F3 bristles. However, it is easily distinguished by having the av F1 ctenidium of 3-5 very weak setulae, similar to that found in citreifrons (Fig. 5) and the r-m and m lightly bordered.

Discussion T7 of males is distinctly humped dorsally, as in inaequalis (Figs. 107, 108). The male genitalia of bakeri are very similar to trochantera (Fig. 109), but the long, linear cerci and pointed aedeagus easily distinguishes bakeri. The male genitalia of bakeri are also similar to knowltoni (Fig. 115), but the pl S5 processes have minute apical setulae in knowltoni, while bakeri has small serrations apically. Females of bakeri are separable by the heavily setose S8 and S9 and moderately long and apically darkened cerci.

Description Total length 3-3.25 mm.; wing length 3.2-3.4 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to knowltoni and trochantera.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face slightly concave; parafacials about 1/2 width of face at middle. Genae about 1/4th height of eyes. Aristae long pubescent. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from the suture; acr with 2 inner rows of weak bristles, 2

incomplete outer rows of setae.

Legs yellow, with av F1 ctenidium of 3-5 widely spaced, very weak setulae; F3 with 2-4 strong av, with ad and without pv bristles. Wings yellowish with slightly darkened crossveins.

Male: p1 S5 processes somewhat fan-shaped, weakly serrated marginally; T6 about twice as long as T5; surstyli foot-shaped, with toe directed posteriorly; aedeagus long, tubular, pointed apically; cerci very long, narrowed posteriorly, with apical setae slightly longer than others and brown. Female: T7 cylindrical, slightly longer than T6; S8 and S9 heavily setose; cerci moderately long, dark apically, with dense brown setae.

Types Holotype: male, Laguna Beach, Southern California, C. F. Baker [genitalia preserved in glycerin in microvial] (USNM). Allotype: female, Pasadena, California, J. M. Aldrich (USNM). Paratype: 1f, Big Sur, Monterey Co., California, VIII-23-1951, W. H. Lange (UCAD).

Remarks This species is named after its collector Charles F. Baker for his early contribution to California Diptera.

Biology Evidently nothing is known about the biology of this very rarely collected, Californian species.

Homoneura inaequalis incertae sedis

Homoneura (Homoneura) inaequalis (Malloch)

(Figs. 73, 107)

Sapromyza inaequalis Malloch, 1914: 32 [key], 35-36 [descr. - IL]; Pl. II, Fig. 16 [head, f].
Malloch & McAtee, 1924: 21 [key].
Shewell, 1965: 698 [cat., distr. - s. BC, ALTA and SASK].
Cole, 1969: 373 [distr. - BC, ALTA, SASK].

Diagnosis This small species can be recognized by having the r-m and m lightly bordered, the aristae short pubescent (Fig. 73), L3 trochanters possessing setulae ventrally and lacking a strong preapical av F3 bristle.

Discussion This species is similar to setula, but can be distinguished by the plumose aristae of setula. Males also have a dorsal T7 hump, as found in bakeri, and possesses unique, small, pl S5 processes which bear 6-8 strong setulae (Fig. 107).

Types Holotype: male, Urbana, Illinois, V-9-1911, C. A. Hart [Acc. No. 16287] (INHS). Allotype: female, Urbana, Illinois, V-28-1911, C. A. Hart [Acc. No. 15693] (INHS).

Specimens examined 39 (17m, 22f) from 20 north central NA localities:

ALTA	4m, 6f, 6 localities (BMNH, CNC).
BC	2f, Vernon, VI-9-1937, H. Leech, on leaves of Crataegus (CNC).
IA	1f, Stone St. Pk., Sioux City, VI-17-1957, J. L. Laffoon (IASU); 1m, 1f, Bay's Branch Area, Guthrie Co., VI-8-1972, R. M. Miller (RMM).
IL	1m, holotype (INHS); 1f, allotype (INHS).
KS	1f, Riley Co., V-6 (SEM).
MI	1m, 1f, Midland Co., V-30-1935, G. Steyskal (USNM).
SASK	9m, 9f, 6 localities (CNC).
SD	1m, Winner, VII-3-1924 (SDSU).

Remarks I have also examined 1 female from Arizona [SW Research

Station, 5 mi. (8 km.) sw. Portal, V-23-VI-5-1965, C. W. Sabrosky, 5,400 ft. (1,646 m.), Malaise trap (USNM)] that is very similar to inaequalis, but has slightly larger eyes. Since it is far outside the known range of inaequalis, there is a good possibility that it is a new species. A male from this area would help decide the status of this specimen.

Biology The flight period for this uncommon species begins in early May and extends through late July, with most collection records in June. Two females have been collected on the leaves of Crataegus (red haw or hawthorn).

Homoneura setula incertae sedis

Homoneura (Homoneura) setula NEW SPECIES

(Figs. 55, 77, 84, 111)

Melander, 1913: 74 [coll. rec. - OR, as var. nubila, MISIDENT.].
Cole & Lovett, 1921: 323 [list - OR, same as Melander, 1913].

Diagnosis This medium-sized species has both r-m and m narrowly bordered with brown (Fig. 55). It can be recognized by having the aristae plumose (Fig. 77), L3 trochanters possessing setulae ventrally and lacking strong preapical av F3 bristles (Fig. 84).

Discussion This species is similar to inaequalis in having L3 trochanters with setulae, but inaequalis has aristae short pubescent. Males of setula have large, fan-shaped, strongly crenulated, pl S5 processes and small gonopods (Fig. 111). Superficially the genitalia are similar to those found in the trochantera group (Figs. 109, 110).

Description Total length 3-3.5 mm.; wing length 3-3.5 mm. Brownish-yellow, with very sparse whitish pollinosity. Similar to inaequalis and trochantera.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face flat; parafacials about 1/2 width of face at middle. Genae about 1/4th height of eyes. Aristae plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows weak bristles; 2 incomplete outer rows setae.

Legs yellow, with L3 trochanters with black setulae ventrally; av F1 ctenidium of 6-9 closely spaced setulae; F3 with preapical ad, weak row of av and without pv bristles. Wings yellowish with both r-m and m narrowly bordered brown.

Male: p1 S5 processes fan-shaped, strongly crenulated marginally; T6 about twice length of T5; surstyli arm-shaped, narrowed posteriorly, minutely crenulated apically; gonopods small, linear; aedeagus rounded apically; cerci long, narrowed posteriorly, with apical setae longer than other setae. Female: T7 cylindrical, longer than T6; cerci dark.

Types Holotype: male, Colton, California, VII-5-1951, J. C. Hall (CAS). Allotype: female, same data as holotype (CAS). Paratypes: 5m, 1f, same data as holotype (UCAD); 3m, 1f, Big Tujunga Cn., Los Angeles Co., California, VII-19-1952, R. X. Schick (UCALA); 2m, 1f, American River, Sacramento, California, VI-15-1966, M. S. Wasbauer (CADA); 1m, 1f, Almota,

Washington, VI-24-1911, A. L. Melander (USNM); 1m, 1f, Mt. Diablo, Washington, VII-1937, M. A. Cazier (AMNH).

Specimens examined 29 (17m, 12f) from 14 western USA localities:

CA	4m, 3f, 6 localities (CADA, CAS, UCAB, USNM, UTXA); 1m, holotype (CAS); 1f, allotype (CAS); 10m, 3f, paratypes (CADA, UCAD, UCALA).
OR	1f, Hood River, J. M. Aldrich (USNM).
WA	2f, 2 localities (USNM, WASU); 2m, 2f, paratypes (AMNH, USNM).

Biology This uncommon species has a flight period beginning the end of May and extending through mid-September with most collection records in June and July. One specimen has been collected at 3,000 ft. (914 m.). Several adults have been collected along rivers.

Homoneura trochantera Group

This is a tentative grouping of 2, medium-sized Californian species which are very closely related.

Diagnosis This group can be distinguished by the following combinations of characters: 1) L3 trochanters with black setae ventrally (Fig. 86); 2) av F1 ctenidium of 6-8 weak, widely spaced setulae (Fig. 79); 3) preapical av F3 bristles absent and ad bristles weak; 4) preapical d T3 bristle about 2/3rds width of T3 at its insertion.

Discussion The male genitalia are very similar to setula, but setula possesses small gonopods, which are present in the trochantera group. The small preapical d T3 bristles are similar to the situation in the occidentalis group.

Key to Species of trochantera Group

1. Wings maculated (Fig. 48) . . . . . trochantera, p. 132
[see couplet 7, p. 59]

Wings with only r-m and m bordered (Fig. 57) . . californica, p. 134

Homoneura (Homoneura) trochantera NEW SPECIES

(Figs. 48, 79, 86, 109)

McDonald, Heed & Miranda, 1974: 79 [larval ecology - CA; as Homoneura n. sp.].

Diagnosis This medium-sized species is characterized by having both r-m and m broadly bordered with brown; apical R_{2+3}, preapical and apical R_{4+5}, and apical M_{1+2} spots with brown. It can also be distinguished from californica by having aristae short plumose rather than plumose.

Discussion The male genitalia of trochantera and californica are very similar, although the pl S5 processes are more fan-shaped and have stronger crenulations in trochantera (Figs. 109, 110).

Description Total length 3-3.5 mm.; wing length 3-3.4 mm. Brownish-yellow, with very sparse whitish pollinosity. Similar to californica.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face nearly flat; parafacials about 1/2 width of face at middle. Genae about 1/5th height of eyes. Aristae short plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por, aor = ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong; acr with 2 inner rows weak bristles, 2 outer rows setae.

Legs yellow, with L3 trochanters with 3-5 black setae ventrally; av F1 ctenidium of 6-10 widely spaced, weak setulae; F3 usually with weak preapical ad and av bristles; T3 with preapical d bristle about 2/3rds width of T3 at its insertion. Wings yellowish with r-m and m bordered brown; apical R_{2+3}, preapical and apical R_{4+5}, and apical M_{1+2} spots brown, usually with apical R_{2+3} spot large and distinct and others, especially M_{1+2}, may be weak.

Male: p1 S5 processes broad, somewhat fan-shaped, strongly crenulated anteriorly, sharply pointed posteriorly; T6 slightly longer than T5 and with slightly stronger marginal bristles; surstyli arm-shaped, narrowed posteriorly, serrated apically; aedeagus slightly pointed apically; cerci long, narrowed posteriorly, with apical setae longer than other setae. Female: T7 cylindrical, longer than T6; S8 and S9 heavily setose; cerci black.

Types Holotype: male, Big Dalton Dam, Los Angeles County, California, VII-13-1950, W. C. Bentinck (CAS). Allotype: female, same data as holotype (CAS). Paratypes: 1m, 3f, same data as holotype (UCAB); 3m, 3f, Snow Crest Camp, San Bernadino County, California, IX-12-1953, E. I. Schlinger (UCAD); 5m, 1f, Muir Woods, Marin County, VIII-30-1908, J. C. Bradley (CNC, CU); 11m, Big Sur, California, X-5-1946, A. L. Melander (USNM).

Specimens examined 84 (52m, 32f) from 29 far western USA localities:

CA 29m, 24f, 23 localities (CAS, CNC, CU, LACM, UCAB, UCAD, UCALA, USNM, UTXA); m, holotype (CAS); f, allotype (CAS); 20m, 7f, paratypes (CNC, CU, UCAB, UCAD, USNM); 1m, 5 mi. w. Lake Berryessa, Napa Co., reared 1973, J. F. McDonald (RMM).

OR 1m, Kerby, IX-18-1934, A. L. Melander (USNM).

Biology The flight period for this relatively common species begins in late April and extends through mid-October. Several adults have been collected from Aralia californica (spikenard) and from Malaise traps.

McDonald, Heed & Miranda (1974) reared this species from larvae found in fermenting leaves of the California Bay (Umbellularia californica) that were collected in early February, 1973, from Napa County, California. In early April McDonald sent me 1 puparium within a leaf for examination; the adult had emerged by the time it was received.

I would suspect that this species has 1 generation per year with the larvae as the overwintering stage.

Homoneura (Homoneura) californica NEW SPECIES

(Figs. 57, 110)

Diagnosis This small species is characterized by having both r-m and m bordered with brown (Fig. 57), but lacking apical spots as found in trochantera (Fig. 48). H. californica can also be separated by having plumose aristae, rather than short plumose as found in trochantera.

Discussion The male genitalia of californica and trochantera are very similar, although the pl S5 processes are not as fan-shaped and with

weaker crenulations in californica and the aedeagus of californica is more rounded than trochantera (Figs. 109, 110).

Since the wing pattern of both species is the strongest difference, californica could be a variation of trochantera, but there are no indications along the veins where normal spots might occur.

Description Total length 2.75-3.25 mm.; wing length 3-3.3 mm. Brownish-yellow, with very sparse whitish pollinosity. Similar to trochantera.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face nearly flat; parafacials about 1/2 width of face at middle. Genae about 1/5th height of eyes. Aristae plumose. Head chaetotaxy: aor shorter than por, 1/2 iv; oc = por; aor = ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong; acr with 2 inner rows weak bristles, 2 outer rows setae.

Legs yellow, with L3 trochanters with 3-5 black setae ventrally; av F1 ctenidium of 6-10 widely spaced, weak setulae; F3 usually with weak preapical ad and av bristles; T3 with preapical d bristle about 2/3rds width of T3 at its insertion. Wings yellowish with r-m and m bordered brown.

Male: pl S5 processes linear, somewhat fan-shaped, weakly crenulated anteriorly, sharply pointed posteriorly; T6 slightly longer than T5 and with slightly stronger marginal bristles; surstyli arm-shaped, narrowed posteriorly, serrated apically; aedeagus rounded apically; cerci long, narrowed posteriorly, with apical setae longer than other setae. Female

unknown.

Types Holotype: male, Forest Home, California, VIII-26-1944, A. L. Melander [genitalia preserved in glycerin in microvial] (USNM). Paratype: male, Dark Canyon, California, VII-10-1949, M. R. Wheeler (USNM).

Biology Evidently nothing is known about the biology of this very rarely collected, Californian species.

Homoneura setitibia Group

Diagnosis This group of 4, small to medium-sized species can be distinguished by the following combination of characters: 1) a row of at least weak preapical av and 1 strong preapical ad F3 bristles; 2) preapical d T3 bristle longer than width of T3 at its insertion; 3) 1+3 dc, presutural dc strong, well-removed anteriorly from the suture; 4) 5th TS3 segments yellow.

Discussion This somewhat artificial grouping of species has basically similar male genitalia, long, linear cerci and marginal T6 bristles longer than those of T5. H. setitibia and utahensis are very closely related having similar chaetotaxy.

Key to Species of setitibia Group

1. Wings with r-m and m bordered and apical spots usually weak; additional weak bristles adjacent mp. . . shewelli, p. 137 [see couplet 6, p. 59]

   Wings immaculate or at most r-m and m darkened; only setae adjacent mp. 2

2. Preapical row of av F3 bristles at most weak . . . knowltoni, p. 139

   Preapical row of av F3 bristles strong 3

3. Preapical d T3 bristle 4 times longer than width of T3 at its insertion in males, slightly longer than T3 in females . . . . . [praeapicalis] setitibia, p. 142

   Preapical d T3 bristle 2 times longer than width of T3 at its insertion in males, subequal to T3 in females . . . . . utahensis, p. 143

Homoneura (Homoneura) shewelli NEW SPECIES

(Figs. 56, 116)

Diagnosis This medium-sized, weakly spotted species is unique by having 1-3 additional, weak bristles adjacent to and about 1/3rd the length of the mp.

Discussion The r-m and m of shewelli are lightly bordered and there are slight indications of apical R_{2+3}, R_{4+5} and M_{1+2} spots (Fig. 56), similar to those found in wheeleri (Fig. 52). H. wheeleri does not possess a presutural dc, whereas shewelli has a strong presutural dc.

The male genitalia have p1 S5 processes that are more rounded apically and lobe-like in shewelli (Fig. 116), while they are somewhat foot-shaped in the other species of the group (Figs. 113-115); females have distinct black cerci, while they are yellow in the other species.

Description Total length 3.5-4 mm.; wing length 3.75-4 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to setitibia and utahensis.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face slightly concave; parafacials about 1/2

width of face at middle. Genae about 1/4th height of eyes. Aristae short plumose. Chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows weak bristles, 2 incomplete outer rows setae; 1 mp, with 1-3 additional, adjacent smaller bristles, 1/3rd length of mp. Legs yellow, with av F1 ctenidium of 8-11 widely spaced, weak setulae; F3 with preapical ad, without preapical av or pv bristles. Wings yellowish with r-m and m bordered with light brown; apices of R_{2+3}, R_{4+5} and M_{1+2} clouded or at least darkened; most of the ultimate sections of M_{1+2} darkened.

Male: T6 slightly longer than T5, with marginal T6 bristles slightly longer than T5 bristles; pl S5 processes lobe-like, slightly knobbed posteriorly, with 4-5 widely spaced, minute setulae apically; surstyli long, evenly tapering and curved posteriorly to blunt tips, which are minutely serrated apically and have a small ventrally-directed spine; aedeagus long, tubular, rounded apically; cerci long, basally with dense, short, dorsal setae, apically with longer setae. Female: T7 cylindrical, slightly longer than T6; cerci black, with long, black setae.

Types Holotype: male, Jumping Pd. Cr., 20 mi. (32 km.) w. Calgary, Alberta, VIII-8-1962, K. C. Herrmann (CNC). Allotype: female, same locality as holotype, VII-3-1962, K. C. Herrmann (CNC). Paratypes: 1f, same data as holotype (CNC); 1m, same locality as holotype, VII-3-1962, K. C. Herrmann (CNC); 1f, Robson, British Columbia, VII-26-1947, H. R. Foxlee (CNC); 1m, Vernon, British Columbia, VIII-10-1947, H. B.

Leech, on cicadellid-infested Populus trichocarpa (CAS); 1m, 10 mi. (17 km.) n. McCall, Idaho, VII-14-1962, B. A. Foote (RMM); 1m, Wilson Creek, Nye Co., Nevada, IX-12-1963, R. C. Bechtel, elevation 7,800 ft. (2,377 m.), light trap (NVSDA); 1f, Blacksmith Fork Canyon, Cache Co., Utah, VIII-14-1965, W. J. Hanson, Malaise trap (UTSU); 1m, 1f, Green Canyon, Cache Co., Utah, VIII-1-3,7-1967, W. J. Hanson, Malaise trap (USNM); 1f, Mendon Cold Springs, Cache Co., Utah, IX-3-1965, W. J. Hanson, Malaise trap (RMM); 1f, Bear River R. S., Summit Co., Utah, VIII-5-12-1971, Knowlton & Hanson, Malaise trap (UTSU); 1m, Heber, Utah, VII-5-1949, F. C. Harmston (CNC); 1m, Heber, Wasatch Co., Utah, VIII-18-1966, G. R. Knowlton (UTSU); 1f, Willard Basin, Weber Co., Utah, VIII-10-1967, K. J. Capelle, Malaise trap (UTSU).

Remarks This species is named in honor of Guy E. Shewell for his many contributions to the systematics of Lauxaniidae.

Biology The flight period for this uncommon western and northwestern species begins in mid-June and extends to mid-September. One specimen has been recorded from a light trap at 2,377 m. and several from Malaise traps. One specimen was probably attracted to the oozing sap of a cicadellid-infested, western balsam poplar.

Homoneura (Homoneura) knowltoni NEW SPECIES

(Figs. 63, 115)

Knowlton, Harmston & Stains, 1939: 11 [coll. rec. - UT, as nudifemur, MISIDENT.].

Diagnosis This medium-sized, clear-winged species is related to the other species of the setitibia group, but lacks strong, preapical av F3 bristles.

Discussion Males of knowltoni are easily distinguished by the board, fan-shaped pl S5 processes and the sharply angled and medially-directed distal ends of the surstyli (Fig. 115). Males of the other species have somewhat foot-shaped pl S5 processes.

Description Total length 3.5-4 mm.; wing length 3.5-3.8 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to setitibia, utahensis and shewelli.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face nearly flat; parafacials approximately 1/2 plumose. Chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows of weak bristles, 2 incomplete outer rows of setae. Legs yellow, with av F1 ctenidium of 9-11 widely spaced setulae; F3 with weak preapical ad, without preapical av or pv bristles. Wings yellowish, immaculate.

Male: T6 slightly longer than T5, with marginal T6 bristles 1.5 times longer than T5 bristles; pl S5 processes fan-shaped, with 4-5 widely spaced, minute setulae apically; surstyli short, arm-shaped, narrowed ventrally, sharply angled posteriorly and weakly serrated apically; aedeagus long, tubular, rounded apically; cerci long, linear, basally with dense,

short, dorsal setae, apically with longer setae. Female: T7 cylindrical, longer than T6; cerci yellow, with long, black setae.

Types Holotype: male, Delta, Millard Co., Utah, VI-19-1968, G. F. Knowlton (USNM). Allotype: female, same data as holotype (USNM). Paratypes: 1m, 1f, same data as holotype (UTSU); 5m, 2f, Ft. Davis, Texas, VI-6-1951, M. R. Wheeler (CNC, UTXA); 7m, 1f, Colton, California, VII-5-1951, J. C. Hall (CADA, UCAD); 3m, 2f, 5 mi. (8 km.) sw. Portal, Southwestern Research Station, Arizona, IX-5-25-1965, C. W. Sabrosky, 5,400 ft. (1,646 m.), Malaise trap (USNM).

Specimens examined 86 (50m, 36f) from 38 western USA localities:

AR	1m, Hot Springs, VI-24, H. S. Barber (USNM).
AZ	12m, 3f, 7 localities (SEM, UAZ, UCAR, USNM, UTXA); 3m, 2f, paratypes (USNM).
CA	1m, 2f, 3 localities (CADA, UCAR, USNM); 7m, 1f, paratypes (CADA, UCAD).
CO	2m, 6f, 2 mi. (3.2 km.) sw. DeBeque, VII-9-1972, R. M. Miller, W. B. Stoltzfus (IASU, RMM).
KS	1m, Hamilton Co., F. H. Snow, 3,350 ft. (1,020 m.) (SEM).
TX	1f, Big Bend Natl. Pk., V-1959, J. F. McAlpine, oak spring, 4,500 ft. (1,372 m.) (CNC); 5m, 2f, paratypes (CNC, UTXA).
UT	23m, 17f, 22 localities (AMNH, BMNH, CNC, SEM, USNM, UTSU); 1m, holotype (USNM); 1f, allotype (USNM); 1m, 1f, paratypes (UTSU).
WY	1f, Lone Tree, VIII-4-1932, G. F. Knowlton & M. J. James (UTSU).

Remarks This species is named after its collector George F. Knowlton and for his introductory work on the insects of Utah.

Biology The flight period for this common species begins as early as mid-April and extends through September in the southwestern part of its range. A number of of specimens have been recorded from Malaise traps at

elevations from 3,350 to 5,400 ft. (1,020 to 1,646 m.). One specimen has been collected in an ultraviolet light trap and 1 female was collected from Yucca brevifolia (Joshua Tree).

Homoneura (Homoneura) setitibia Shewell

(Fig. 113)

Snow, 1903: 219 [coll. rec. - KS, as tenuispina, MISIDENT.].
Homoneura praeapicalis Shewell, 1939: 264 [descr. - ALTA, SD; preocc. Malloch, 1925: 320].
setitibia Shewell, 1940: 86 [n. name for praeapicalis].
Strickland, 1946: 166 [coll. rec. - ALTA].
Shewell, 1965: 699 [cat., distr. - s. ALTA, SD, KS].
Cole, 1969: 373 [distr. - ALTA].

Diagnosis This small, immaculated, but with darkened crossveins, species is closely related to utahensis by having a preapical row of 4-6, strong av F3 bristles. Males have the preapical d T3 bristle 4 times longer than width of T3 at its insertion and females have it slightly longer than the T3, whereas utahensis males have the preapical d T3 bristle only 2 times as long and females have it subequal to the width of T3 at its insertion.

Discussion This species has the preapical row of av F3 bristles much longer than utahensis and similar to bakeri. H. bakeri can be distinguished by its weak av F1 ctenidium, while setitibia has a well-developed ctenidium. Males of setitibia have the toe of the foot-shaped pl S5 processes more pointed than utahensis and have a small ventrally-directed spine at the apex of the surstyli, similar to shewelli (Figs. 113-114, 116).

Types Holotype: male, Lethbridge, Alberta, VI-9-1926, J. E. Revell (CNC 4901). Paratypes: 4m, Brookings, South Dakota, VI-26-1936, H. C. Severin (CNC, SDSU).

Specimens examined 29 (12m, 17f) from 15 central and northwestern NA localities:

ALTA	1m, holotype (CNC).
CO	3f, 3 localities (AMNH, COSU).
IA	1m, Ledges St. Pk., Boone Co., reared XII-24-1971, R. M. Miller, taken as larva ex leaf litter, adult emerged II-20-1972 (RMM).
KS	4m, 6f, 3 localities (MCZ, KSSU, SEM, USNM).
NE	2m, 4f, 3 localities (IASU, RMM, UNE).
SD	2f, Vermillion, VI-26-1935, H. C. Severin (SDSU); 4m, paratypes (CNC, SDSU).
WY	1f, nr. Douglas, VII-22-1973, W. B. Stoltzfus (IASU); 1f, 12 mi. (19.3 km.) e. Gillette, VIII-29-1962 (UNE).

Biology The flight period for this infrequently collected species begins in late May and extends to late August. One specimen was collected from an ultraviolet light trap, a few from elevations of 3,350 and 3,600 ft. (1,020 and 1,097 m.) and several from sand dunes in Kansas.

One adult was reared from larvae collected in leaf litter, predominantly silver maple (Acer saccharinum), found along the Des Moines River, Iowa, in late December. I suspect that larvae are probably the overwintering stage of this univoltine species.

Homoneura (Homoneura) utahensis NEW SPECIES

(Fig. 114)

Diagnosis This small, immaculated, but with darkened crossveins, species is closely related to setitibia, but has a weaker preapical row

of 4-6, av F3 bristles. Males of utahensis also have the preapical d T3 bristle only 2 times as long as the width of T3 at its insertion and females subequal to the width of the T3, whereas setitibia males have this bristle 4 times as long as width of the T3 and females subequal to T3 width.

Discussion Males of utahensis have the toe of the pl S5 processes more pointed and surstyli without the apical, ventrally-directed spine, while setitibia has the toe more rounded and possesses the spine (Figs. 113, 114). Marginal T5 and T6 bristles are not as strong as in setitibia.

Description Total length 2.75-3.5 mm.; wing length 3.3-3.75 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to setitibia.

Frons flat in profile, rounded into facial plane; por equidistant between iv and aor. Face slightly concave; parafacials approximately 1/2 width of face at middle. Genae about 1/4th height of eyes. Aristae short plumose. Chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, well-removed anteriorly from suture; acr with 2 inner rows of weak bristles, 2 complete outer rows of setae. Legs yellow, with av F1 ctenidium of 8-11 closely spaced, strong setulae; F3 with a row of 4-6, strong preapical av bristles; preapical d T3 bristle subequal to width of T3 at its insertion. Wings yellowish, with r-m and m darkened.

Male: T6 slightly longer than T5, with marginal T6 bristles only slightly longer than T5 bristles; pl S5 processes somewhat foot-shaped,

with 4-5 widely spaced, minute setulae apically and posteriorly-directed toe pointed; surstyli long, evenly tapering and curved posteriorly to blunt tips, which are minutely serrated apically; aedeagus long, rounded apically, rather spatulate anteriorly; cerci long, with longer setae apically. Female: T7 cylindrical, slightly longer than T6; cerci yellow.

Types Holotype: male, Logan, Cache Co., Utah, VII-22-1964, D. W. Davis, ultraviolet light [genitalia preserved in glycerin in micro-vial] (USNM). Paratypes: 1m, Pinto, Washington Co., Utah, VIII-5-1965, G. F. Knowlton (UTSU); 1m, Zion's Canyon, Utah, VI-18-1918 (UTSU); 1m, Salt Lake City, Utah, VIII-5-1944, Orient. Surv., Peach (USNM); 1f, Miles City, Montana, VII-22-1915 (UMT).

Biology The only additional collection information about this rarely collected, central western species is that the holotype was collected from an ultraviolet light trap.

Homoneura tenuispina incertae sedis

Homoneura (Homoneura) tenuispina (Loew)

(Figs. 64, 117, 118)

Sapromyza tenuispina Loew, 1861: 349 (Cent. 1, no. 80) [descr. - NE].
Osten Sacken, 1878: 196 [cat., distr. - NE].
Townsend, 1892: 301 [key, distr. - NE].
Lynch Arribalzaga, 1893: 259 [key], 274 [descr. after Loew, 1861].
Snow, 1903: 219 [coll. rec. - KS, =setitibia, MISIDENT.].
Aldrich, 1905: 586 [cat., distr. - NE].
Cockerell, 1905: 251 [coll. rec. - KS].
Tucker, 1907: 104 [coll. rec. - KS, CO; CO coll. rec. =fratercula, MISIDENT.].
Melander, 1913: 69 [key, distr. - NE, Mexico].

Sapromyza seticauda Malloch, 1914: 32 [key], 34 [descr. - IL]; Pl. II, Fig. 9 [abdomen, m], Fig. 12 [wing], Fig. 14 [T3, m]. NEW SYNONYMY.
Malloch & McAtee, 1924: 22 [key], 24 [coll. rec. - MD].
Criddle, 1926: 104 [coll. rec. - ONT].
Shewell, 1938: 137 [key], 140 [coll. rec. - ONT].
Strickland, 1938: 205 [coll. rec. - ALTA].
Shewell, 1965: 699 [cat., distr. - s. ALTA, se. Canada, IA, IL, MO, MD, VA].

Remarks Collection records before Malloch (1914) could refer to any of a number of clear-winged species with 1+3 dc. Melander (1913) reported this species from Mexico, but I have not located or seen any Homoneura species from there.

Diagnosis This medium-sized, clear-winged species is closely related to the bispina group in possessing 1+3 dc, with the presutural dc strong, well-removed anteriorly from the suture, a facial ridge, usually dark 5th TS3 segments, parafacials 1/2 the width of the middle of the face and preapical av, ad and pv F3 bristles. However, tenuispina differs in having usually immaculate wings (Fig. 64), rather than the r-m and m bordered (Fig. 60), and the genae 1/4th the height of the eyes, rather than 1/3rd the height.

Discussion Males also possess the following: a fringe of long, weak pv F3 bristles; a fringe of long, conspicuous av T3 bristles on basal half; pl S5 processes large, broadly triangular, setose almost the entire length; pl angles of T7 darkened, with a conspicuous tuft of dense bristles; surstyli small, pointed processes on al angles; gonopods moderately long, slightly curved posteriorly, with small, ventrally-pointed, basal gonopod processes; terminal processes small, slender narrowing distally,

with a few conspicuous, black granulations apically and long, fine setae ventrally; cerci small, almost circular (Fig. 117). Females have black cerci, with a few long lateral setae and a concave basal, mesoventral margins (Fig. 118).

Type Holotype: male, Nebraska, [C. R. Osten Sacken], H. Loew coll. [head missing] (MCZ 1686).

Remarks Apparently Malloch (1914) did not check Loew's type when he described seticauda, and what he called tenuispina is a new species, mallochi. According to Malloch's description of seticauda, there was supposed to be an allotype at the Illinois Natural History Survey. Since Frison (1927) did not list any types, other than the male holotype, and Malloch (1914) did not list any paratypes, the female labeled paratype at the American Museum of Natural History could be the allotype.

Specimens examined 295 (143m, 152f) from central and eastern NA localities:

ALTA 1f, Lethbridge, VI-26-1923, W. Carter, clover blossom (CNC).
AR 1m, Desha Co., V-10-1971, Kirkton, pecan grove (UAR).
IA 90m, 75f, 18 localities (CNC, IASU); 11m, 15f, Ledges St. Pk., Boone Co., reared 1972, R. M. Miller (RMM).
IL 24m, 46f, 13 localities (AMNH, INHS, USNM, UTXA); 1m, Havanna, VII-14-1910 [holotype of seticauda] (INHS); 1f, Havanna, VII-14-1910 ["paratype" of seticauda] (AMNH).
IN 1m, Lafayette, VII-4-1914, A. L. Melander (USNM).
KS 6m, Lawrence, VI-9-1899, H. Kahl (CM); 1f, Douglas Co., VI, E. S. Tucker (SEM).
KY 3f, 3 localities (LIM, UKY).
MD 1m, 1f, Plummers Is., V-30-1913, R. C. Shannon (USNM).
MO 2m, 2f, 2 localities (USNM, UTXA).
NE 1f, Lincoln, VI-6-1913, G. W. Denning (UNE); 1m, holotype (MCZ).

OH	1f, Scioto Co., VI-15-1964, P. H. Freytag (UKY); 1f, Columbus, R. C. Osburn (OHSU).
OK	1m, Flint, VI-19-1937, Standish-Kaiser (OKSU).
ONT	3m, 3f, Ottawa, VII-9-1946, G. E. Shewell (CNC).
QUE	1f, St. Anne's, VII-31-1923 (AMNH).
VA	1m, Great Falls, VII-9-1926, J. R. Malloch (USNM).

Biology The flight period of this very common species begins in early May and extends through late August, with most specimens having been collected in June. One male was collected in a pecan (Carya illinoensis) grove, 1 on a tree trunk and 1 female on a clover (Trifolium) blossom. Several specimens were collected from Malaise traps and many have been collected along rivers and streams.

In late December, 1971, many larvae were collected from leaf litter from along the Des Moines River in Ledges State Park, Iowa. The larvae were feeding on the decaying leaves of silver maple (Acer saccharinum), which were being skeletonized, while leaves of cottonwoods (Populus deltoides) were not skeletonized. Adults began emerging in late January, but all attempts at laboratory rearing were unsuccessful.

In early June, 1972, many adults were collected from the grass and herbage under young willows (Salix) and poplars (Populus) along a small stream in Pammel Woods on the Iowa State University Campus at Ames, Iowa. Most adults were observed sitting on the leaves of plants, such as Galium (bedstraw) and Ambrosia artemisiifolia (common ragweed). While aspirating about 25 specimens into a vial, a sweet smelling odor, somewhat similar to bananas, was noticed, and upon closer examination was coming from the vial of collected tenuispina. In the laboratory 5 pairs were placed in a rearing jar and again the odor was detected. This odor was most likely a

pheromone as most of the pairs were mating at this time. Some other specimens were sexed and separated and then after a few hours 1 pair each was placed in 4 rearing jars. The following are the observations of the courtship behavior of 1 pair.

The male approached the female and walked around her, without using any noticeable wing or leg displays. Then he faced her and they brushed their antennae together. He quickly turned sideways to her, twisted his abdomen 45 degrees, so the venter faced her, and extended his genitalia. The female remained motionless, except for her antennae moving in the direction of his exposed abdomen and genitalia. This lasted about 20 seconds and then he quickly moved around to her posterior and attempted to mount her. When she resisted, he repeated the previous sequence of events and again mounted her. This time copulation took place and mating lasted for about 5 minutes. The banana-like odor was detectable throughout the courtship, and probably came from some openings just posterior to the last abdominal sternite which are usually covered by the tip of the aedeagus. Mating positions and behavior were similar to that described for pernotata.

Females began laying eggs the day after they were placed in the rearing jars. Some larvae hatched and began feeding on decaying maple leaves, but only a few developed to the 3rd instar and no pupae were formed. One successful rearing was obtained from adults collected in late June, 1972, at Bay's Branch Area, Iowa. Many larvae hatched and began developing on decaying maple leaves, but very few reached the 3rd instar. Only 1 adult emerged in late October.

This species probably has only 1 generation a year since adults have not been collected in September or October. The larvae overwinter among decaying tree leaves.

Homoneura bispina Group

Until Malloch (1914) described more clear-winged Homoneura, all earlier collection records referred to Loew's (1861) bispina and tenuispina. There is also the possibility that Say's (1829: 177) Sapromyza connexa may have been a Homoneura as Melander (1913: 69) stated that connexa is probably the female of bispina and Coquillett identified a few specimens of bispina as connexa. However, Say's type has been destroyed and as Malloch (1914: 35) pointed out, a number of species belonging to the various, clear-winged species of the setitibia, bispina and aequalis groups could fit Say's description, if connexa does belong to the Homoneura. Say's description is brief and Shewell (1965: 706) listed connexa as an unplaced species; questionably in the Homoneura. If connexa belongs to Homoneura, the eastern collection records [Fletcher, 1905: 78 (ONT); Johnson, 1910: 798 (NJ); Johnson, 1913: 80 (FL)] probably can be referred to the bispina group and the 1 western record [Baker, 1904: 31 (CA)] probably belongs to bakeri or californica.

Diagnosis The 5, medium-sized to large species in this group are characterized by the following combination of characters: 1) a slightly produced, broad ridge on lower 1/3rd of face; 2) parafacials 1/2 width of middle of face; 3) genae 1/3rd height of eyes; 4) wings immaculate, except for darkened crossveins; 5) aedeagi with an apical, antero-

medial flap; 6) cerci of females small, with basal 2/3rds dark brown or black, dorsally flattened, and with pale yellow, somewhat mesally-directed and upturned, pointed apices (Fig. 124).

Discussion Males of this group usually have T3 with long, fine bristles, except mallochi, as well as av and pv fringes on the F3 of some of the species. H. tenuispina males are very similar to bispina males in possessing basal gonopod processes and having the apical, anteromedial flap on the aedeagus; however, females of tenuispina do not have the flattened cerci. Females of the bispina group cannot be readily distinguished at this time using cerci or genitalic characters.

Key to Species of bispina Group

1. Males with basal gonopod processes pointed; females with T7 less than 1/2 length of T6 2

   Males with basal gonopod processes forked; females with T7 at least 1/2 length of T6 3

2. Apical 1/3rd of 5th TS3 segments dark brown or black (Fig. 88); males without T3 fringes . . mallochi, p. 154

   Apices of TS3 at most light brown (Fig. 87); males with pv T3 fringe of fine bristles . . . . . imitatrix, p. 152

3. Males with strong preapical pv F3 fringes; pl S5 processes finger-like, rounded apically (Fig. 122) . . . . . fratercula, p. 158

   Males without or at most with very weak pv F3 bristles; pl S5 processes not as above 4

4. Males usually without pv F3 bristles; pl S5 processes triangular, pointed apically (Fig. 123) . . . . . bispina, p. 159

   Males usually with a weak pv F3 bristle; pl S5 expanding and truncate apically (Fig. 121). . truncata, p. 164

Homoneura (Homoneura) imitatrix (Malloch)

(Figs. 87, 119)

Sapromyza imitatrix Malloch, 1920: 128 [descr. - NJ].
Malloch & McAtee, 1924: 22 [key], 23 [coll. rec. - DC, MD]; Pl. 2, Fig. 28 [genitalia, m].
Johnson, 1925a: 256 [coll. rec. - CT].
Hallock & Parker, 1926: 18 [coll. rec. - NJ].
Brimley, 1938: 380 [coll. rec. - NC].
Britton, 1938: 74 [coll. rec. - CT].
Shewell, 1965: 698 [cat., distr. - NJ, CT, s. to LA and FL].

Diagnosis This medium-sized species can be distinguished by having at most only the apices of the 5th TS3 segments light brown (Fig. 87), males with basal gonopod processes pointed and females with T7 shorter than 1/2 T6.

Discussion Males of imitatrix possess a long fringe of fine av and pv F3 bristles, with strong preapical av, pv and ad F3 bristles, and a fringe of fine pv T3 bristles. This is similar to males of fratercula, except fratercula does not have the pv F3 fringe extending the entire length of the F3. The male genitalia of imitatrix are very similar to mallochi, but most noticeably the surstyli are very short, fairly broad, mesoventrally-curved hooks in imitatrix, while absent in mallochi. H. imitatrix also has the pl S5 processes usually twice the width of the gonopods and the apical setae of the cerci evenly spaced (Fig. 119). H. mallochi has the pl S5 processes usually equal to the width of the gonopods and the apical setae of the cerci dense (Fig. 120). Females have the cerci usually brown basally, not black.

Types Holotype: male, Clementon, New Jersey, V-30-1895, C. W. Johnson (USNM). Allotype: female, Anglesca, New Jersey, VII-19-1891, C. W. Johnson (USNM). Paratypes: 1m, same data as holotype (USNM); 1m, Riverton, New Jersey, VII-7, C. W. Johnson (USNM); 1f, DaCosta, New Jersey, VI-4, C. W. Johnson (USNM).

Remarks The paratypes from Riverton and DaCosta, New Jersey, were not labeled; so I have relabeled them.

Specimens examined 56 (34m, 22f) from 29 eastern and south central USA localities:

AR	7m, 4f, 2 localities (CNC, UAR, USNM).
DC	2m, 2f, 2 localities (USNM).
FA	1f, Monticello, III-20-1919, W. A. Hoffman (USNM); 1f, Torreya St. Pk., IV-29-1952, O. Peck (CNC).
GA	1m, Pine Mt., Rabun Co., V-4-1957, W. R. M. Mason (CNC).
IL	3m, 4f, 2 localities (INHS).
IN	1m, Saint Meinrad, Spenser Co., VI-7-1969, G. W. Byers (SEM).
LA	3m, 3f, Bossier Parish, V-10-1938, swept from peach (CNC).
MD	1m, Cabin John, VI-20-1931, A. L. Melander (USNM).
MO	1f, Lithium, VI-29-1955, M. R. Wheeler (UTXA).
NC	1m, Herford Co., VI-9-1895, C. W. Johnson (MCZ); 1m, Pettigrew St. Pk., VI-3-1969, D. A. Young (NCSU).
NE	1m, Nebraska, C. R. Osten Sacken (MCZ) [syntype of bispina, MISIDENT.].
NJ	2m, 2 localities (ANSP, PADA); 1m, holotype (USNM); 1f, allotype (USNM); 1m, 1f, paratypes (USNM).
NY	1m, New York, N. Banks (MCZ).
PA	1m, Swathmore, Delaware Co., VI-2-1912, E. T. Cresson, Jr. (ANSP); 1m, Swathmore, VI-11-1905 (ANSP).
TX	2f, College Station, IV-3-1930, J. C. Gaines (CNC); 1f, College Station, V-11-1935, H. J. Reinhard (CNC); 2m, 1f, College Station, VI-1,17-1951, H. J. Reinhard (TXAMU).
VA	4m, 4 localities (MCZ, OHSU, USNM).

Remarks Johnson (1925a) and Britton (1938) have also reported this species from Connecticut.

Biology The flight period for this uncommon species begins in mid-March in the southern part of its range and extends through mid-July, with most specimens having been collected in May and June. There have been 2 separate collections of a number of specimens from peach (Prunus persica) and 1 male has been collected from soybeans (Glycine max). One male from Virginia was labeled "in coita on June 4th."

Homoneura (Homoneura) mallochi NEW SPECIES

(Figs. 60, 120)

Sapromyza tenuispina, Malloch, 1914: 32 [key], 36 [descr., coll. rec. - IL]; Pl. II, Fig. 10 [S5, m]. MISIDENT.
Sanders & Shelford, 1922: 313 [adult ecology - IN].
Malloch & McAtee, 1924: 22 [key], 24 [coll. rec. - VA, MD]; Pl. 2, Fig. 27 [superior forceps, m].
Johnson, 1925a: 255 [coll. rec. - NH, MA, RI].
Johnson, 1930: 149 [coll. rec. - MA].
Brimley, 1938: 380 [coll. rec. - NC].
Shewell, 1965: 699 [cat., distr. - NE to NH, s. to TX and NC].

Diagnosis This medium-sized species can be separated by having at least the apical 1/3rd of the 5th TS3 usually dark brown or black, males with short fringes of av and pv F3 bristles and without pv F3 fringes, and females with T7 shorter than 1/2 T6.

Discussion The male genitalia of mallochi are very similar to imitatrix, but mallochi lacks distinct surstyli, which are evident in imitatrix, and the width of the pl S5 processes is usually twice that of the gonopods at the middle in imitatrix, while almost equal in mallochi (Figs. 119, 120). The medium-sized terminal processes and the long, pointed basal gonopod processes are very similar in both species. Females

of mallochi and imitatrix can be separated by the cerci usually being black basally, not brown as in imitatrix.

Decription Total length 3.3.5 mm.; wing length 3.5-4 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to imitatrix.

Frons slightly swollen in profile, rounded into facial plane; por equidistant between iv and aor, set in narrow, shining plates. Face flat, with a slightly produced, broad ridge on lower 1/3rd; parafacials about 1/2 width of face at middle. Genae about 1/3rd height of eyes. Aristae long pubescent. Chaetotaxy: aor slightly shorter than por, 1/2 iv; por slightly shorter than ov; oc slightly longer than ov; pvt subequal to aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong and well-removed from suture; acr with 2 rows of weak bristles. Legs yellow, except apical 1/3rd of 5th TS1, TS2, and especially TS3 segments dark brown or black. F1 av ctenidium of 10-14 closely spaced setulae; F3 with a strong preapical av and ad, occasionally weak pv bristles; males also have a short fringe of weak, fine av and pv bristles. Wings yellowish, with r-m and m darkened and lightly bordered; calypters with light brown, marginal setae distally, before junction of alar lobes.

Male: p1 S5 processes long, rounded apically, with sparse setae, width subequal to gonopod width at middle; T7 twice as long as T6; distinct surstylar extensions absent, with broadly produced lobes on the av and pv angles; terminal processes medium-sized, posteriorly-curved, with minute setulae apically and sparse, fine setae ventrally; gonopods long, broadly curving posteriorly, with moderately long, brown, pointed basal gonopod processes; aedeagus large, tubular, bilobed, rounded apically,

with an apical, anteromedial flap that covers the distal groove between the lobes; cerci short, with dense apical setae, and concave ventrally. Female: T7 shorter than T6; cerci short, basal 2/3rds dark brown or black, dorsally flattened, with yellow, somewhat mesally-directed and upturned, pointed apices, and with some fine, long, weak bristles laterally.

Types Holotype: male, Potomac River, Fairfax Co., Virginia, VI-7-1955, C. W. Sabrosky (USNM). Allotype: female, same data as holotype (USNM). Paratypes: 3m, 1f, same data as holotype (USNM); 1m, 4f, Odin, Illinois, V-28-1910, in a meadow, C. A. Hart (INHS); 5m, Springbrook St. Pk., Guthrie Co., Iowa, VI-9-1973, R. M. Miller, W. B. Stoltzfus (CNC, IASU); 5m, Cabin John, Maryland, VI-20-1931, A. L. Melander (USNM).

Remarks This species is named for John R. Malloch and for his valuable studies of Homoneura.

Specimens examined 64 (40m, 24f) from 31 north central and eastern USA localities:

IA	3m, 2f, 3 localities (IASU); 5m, paratypes (CNC, IASU).
IL	3m, 6f, 4 localities (INHS, UTXA); 1m, 4f, paratypes (INHS).
IN	1m, Saint Meinrad, Spenser Co., VI-7-1969, G. W. Byers (SEM); 1f, Marion, VII-29-1953, H. D. Stalker (UTXA).
KS	1m, Baldwin (OHSU).
KY	1f, Barbourville, V-1-1965, R. E. White (FSCA); 1m, Louisville, V-25-1953, P. J. Christian (LIM).
MD	2m, 1f, 3 localities (USNM); 5m, paratypes (USNM).
MI	1m, Van Baron Co., VI-11-1949, R. Namba (USNM); 1f, Little Bear Lake, Grand Junction, VII-15-1914 (INHS).
NC	1m, 1f, Willard, V-10-1936, F. S. Blanton (CU); 1f, Highlands, Macon Co., VI-21-1958, J. L. Laffoon (IASU).
NE	1m, C. R. Osten Sacken (MCZ).
NY	1f, Ithaca, VII-13-1917 (INHS).

OH	1f, Ironton, V-27-1899, J. S. Hine (OHSU); 1m, Kent, reared 1967, R. M. Miller (RMM).
PA	1m, Dauphin Co., Hummelstown, V-27-1961, E. U. Balsbaugh, Jr. (PADA).
VA	10m, 2f, 2 localities (CNC, IASU, USNM); 1m, holotype (USNM); 1f, allotype (USNM); 3m, 1f, paratypes (USNM).
WV	2m, Kenova, V-28-1899, J. S. Hine (OHSU).

Remarks Johnson (1925a, 1930) also reported this species from New Hampshire, Massachusetts and Rhode Island. Shewell (1965) gave its southern distribution as Texas, which probably belongs to imitatrix.

Biology The flight period for this uncommon species begins in early May and extends through early August, with most adults having been collected in May and June. In Sanders & Shelford's (1922) study of an Indiana pine-dune animal community, this species was collected in the early morning from shrubs of willow (Salix), dogwood (Cornus) and sandcherry (Prunus) on July 13 and August 14.

In early July, 1967, a rearing was initiated from a gravid female collected from the herbage in a mesic woods near a seepage area in Kent, Ohio. The female laid only about 25 eggs in the 3 weeks before she escaped. Eggs were deposited singly on and partially in peat moss. Larvae did not readily hatch; so after 4 months some larvae were excised from the chorions. Larvae fed on decaying lettuce and leaves. The 1st instar ranged 6-15 days, 2nd, 8-13 days and 12 days for the sole surviving 3rd instar. The prepupal period lasted approximately 48 hours and 1 male emerged 12 days later. The male lived 52 days in the laboratory.

This species is probably univoltine with larvae overwintering.

Homoneura (Homoneura) fratercula (Malloch)

(Figs. 88, 122)

Tucker, 1907: 104 [coll. rec. - CO, as tenuispina, MISIDENT.].
Sapromyza fratercula Malloch, 1920: 128 [descr. - MT].
Malloch & McAtee, 1924: 22 [key]; Pl. II, Fig. 25 [genitalia, m].
Criddle, 1926: 104 [coll. rec. - NS, QUE, ONT, MAN].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
Shewell, 1965: 698 [cat., distr. - s. to ALTA to s. ONT, s. to NE and GA, as fraterculus, ERROR].
Cole, 1969: 373 [distr. - MT, ALTA].

Diagnosis This medium-sized species is distinct in having at least the apical 1/3rd of the 5th TS3 segments usually black and well-developed preapical av, ad and pv F3 bristles, except pv weak in females. Males also have forked basal gonopod processes and pl S5 finger-like, with rounded apices (Fig. 122); females with the T7 at least 1/2 length of T6.

Discussion Males also have well-developed apical fringes of av and pv F3 bristles and basal fringes of fine av and pv T3 bristles. They can easily be separated from bispina and truncata, which lack the pv F3 fringes and at most have a very weak pv F3 bristle.

Types Lectotype: male, Powderville, Montana, VI-15-1916, R. Kellogg [genitalia preserved in glycerin in microvial] (USNM). Paratype: 1m, same data as holotype, M. Hanna (INHS).

Remarks The holotype is missing at the United States National Museum and 1 of the paratypes has been designated as the lectotype.

Specimens examined 75 (51m, 24f) from 30 north central NA localities:

ALTA 1m, Medicine Hat, ?-14-1956, E. E. Sterns (CNC).
CO 19m, 11f, 5 localities (BMNH, COSU, IASU, NMW, SEM).
IA 3m, 1f, 4 localities (AMNH, IASU).
IN 1m, Dunes, VII-19-1933, A. L. Melander (USNM).
KS 1m, Riley Co., Clearwater, VI-21 (KSSU).
MAN 3m, 1f, Awema, V-29-1926, R. D. Bird (CNC).
MI 1m, 2f, Marquette, VII-31-1968, G. D. Gili (UNMI).
MN 1m, Kandiyohi Co., VI-26-1938, H. E. Milliron (UMN).
MT 1m, 1f, 2 localities (MTU, UTXA); 1m, lectotype (USNM); 1m, paratype (INHS).
NE 8m, 2f, 5 localities (CNC, IASU, UNE, USNM, UTXA).
ONT 5m, 6f, 3 localities (CNC).
SD 4m, 3 localities (SDSU).
WY 1m, Platte Co., VIII-9-1950, D. G. Denning (UWY).

Remarks Criddle (1926) reported this species from Nova Scotia, but Shewell (1965) did not include this in its distribution and I have not examined any specimens from there.

Biology The flight period for this uncommon species begins in early June and extends through mid-September, with the adults having been most commonly collected in June and July. One specimen was collected at 4,000 ft. (1,219 m.) in Nebraska. I collected many specimens from a grassy, lowland pasture in Colorado, along with harti and aequalis.

Homoneura (Homoneura) bispina (Loew)

(Figs. 62, 123, 124)

Sapromyza bispina Loew, 1861: 348 (Cent. 1, no. 79) [descr. - NE].
Osten Sacken, 1878: 196 [cat., distr. - NE].
Townsend, 1892: 301 [key, distr. - NE].
Lynch Arribalzaga, 1893: 263 [key], 294-295 [descr., after Loew (1861)].
Johnson, 1900: 689 [coll. rec. - NJ, as bispinosa, error].
Aldrich, 1905: 584 [cat., distr. - NE, NJ].
Johnson, 1910: 798 [coll. rec. - NJ].
Melander, 1913: 69 [key, distr. - MA to KS].
Malloch, 1914: 32 [key], 34-35 [note, coll. rec. - IL], Pl. II, Fig. 11 [S5, m].

Gibson, 1915: 143 [coll. rec. - ALTA].
Winn & Beaulieu, 1915: 152 [coll. rec. - QUE, as bispinosa, error].
Stewart & Leonard, 1916: 156 [adult ecology - NY].
Malloch & McAtee, 1924: 22 [key], 23 [coll. rec. - MD, VA].
Johnson, 1925a: 255 [coll. rec. - ME, MA, RI, CT].
Johnson, 1925b: 96 [coll. rec. - ME].
Criddle, 1926: 104 [coll. rec. - ALTA].
Johannsen, 1928: 848 [coll. rec. - NY].
Bird, 1930: 435 [adult ecology - MAN].
Petch & Maltais, 1932: 64 [coll. rec. - QUE, as bispinosa, error].
Britton, 1938: 74 [coll. rec. - CT].
Shewell, 1938: 137 [key], 139 [coll. rec. - NS, QUE, ONT, MAN, ALTA]; 134 (Pl. 12), Fig. 36 [genitalia, m].
Strickland, 1938: 205 [coll. rec. - ALTA].
Adams, 1941: 218, 222, 225 [adult ecology - TN].
Shewell, 1965: 698 [cat., distr. - s. ALTA to NS, s. to KS and NC].
Cole, 1969: 373 [distr. - ALTA].

Diagnosis This large species is distinct in having at least the apical 1/3rd of the 5th TS3 segments usually black and well-developed preapical av and ad, with weak pv F3 bristles, usually absent in males. Males also have forked basal gonopod processes and p1 S5 processes triangular (Fig. 123); females have the T7 at least 1/2 the length of T6 (Fig. 124).

Discussion This species is generally the largest of the group with their abdomen slightly longer than the thorax and knob-like terminally in males, elongate and narrow in females. Males have well-developed apical fringes of long, fine av F3 bristles and basal fringes of av and pv T3 bristles. They can easily be separated from fratercula, which has well-developed preapical pv F3 bristles and pv F3 fringe of bristles.

Types Lectotype: female, Nebraska, H. Loew coll. [head missing] (MCZ 1678). Paratypes: 1f, Nebraska, H. Loew coll. [head missing] (MCZ 1678); 1f, Nebraska, H. Loew coll. (CNC 2087).

Remarks Upon examining Loew's syntype series, the 1 male specimen was imitatrix. In order to maintain the stability of the name of this very common species, I selected the female in the best condition and the one I suspect to be bispina, by its larger size, and designated it as the lectotype. The male was considered to be a misidentified paratype. It must be noted, however, that females of bispina and fratercula cannot be distinguished at this time.

Specimens examined 800 (387m, 413f) from 189 central and eastern NA localities:

ALTA	4f, Lethbridge, VII-8-1923, H. E. Gray (UALTA).
CT	1f, Storrs, VI-6-1931, A. L. Melander (USNM); 1m, S. Meriden, V-15-1915, H. L. Johnson (BMNH).
DC	1m, 1f, Rock Creek Pk., VII-29-1928 (USNM).
IA	123m, 138f, 32 localities (AMNH, IASU, UCALA, USNM); 3m, 3f, Ledges St. Pk., Boone Co., reared 1971-1972, R. M. Miller (USNM).
IL	89m, 83f, 21 localities (AMNH, CM, INHS, USNM).
IN	2m, 6f, 5 localities (PC, PU).
KS	1f, 5f, 4 localities (OHSU, KSSU, SEM, UAR).
KY	1f, Louisville, V-29-1954, P. J. Christian (LIM).
MAN	6m, 8f, 4 localities (CNC).
MA	3m, 7f, 7 localities (CAS, FMNH, FSCA, USNM).
MD	2m, 6f, 4 localities (USNM).
MI	13m, 10f, 12 localities (CNC, NRS, SEM, UMI, USNM).
MN	8m, 1f, 7 localities (IASU, UAR, UMN).
ND	1m, Fargo, VII-20-1918 (USNM); 1f, Bismarck, VI-14-1918 (USNM).
NE	2m, Columbus, VI-14-1940, A. L. Melander (USNM); 1f, lectotype (MCZ); 2f, paratypes (CNC, MCZ).
NJ	16m, 15f, 5 localities (AMNH, ANSP, CM, MCZ, USNM).
NS	6m, 1f, 2 localities (CNC).
NY	5m, 12f, 10 localities (AMNH, CAS, CU, INHS, MCZ).

OH	8m, 14f, 8 localities (FSCA, KSU, OHSU); 9m, 8f, Kent, reared 1968-1970, R. M. Miller (CNC, RMM, USNM).
OK	2f, 2 localities (AMNH, OKSU).
ONT	38m, 27f, 19 localities (AMNH, CNC, USNM).
PA	10m, 10f, 10 localities (ANSP, CM, CU, PADA, USNM, UTXA).
QUE	17m, 17f, 8 localities (AMNH, CNC, UM).
SD	12m, 15f, 10 localities (IASU, SDSU, UAR).
VA	5m, 8f, 3 localities (IASU, USNM).
WI	3m, 5f, 7 localities (IASU, INHS, UWI).
WV	3m, 2f, 2 localities (CM).

Remarks Collection records of females could be referred to fratercula, especially those from the western and central localities. Johnson (1925a) also reported this species from Maine and Rhode Island. Shewell (1965) reported bispina south to North Carolina; however, I have seen only 1 female (USNM) from there, and it could easily be truncata.

Biology The flight period for this very abundant and widely distributed species begins in mid-May and extends through late August, with most specimens being collected in June and July. One specimen was taken on cottonwoods (Populus deltoides), 2 in a Narcissus field, 2 from peach (Prunus persicus), 1 from seeding cantaloupe (Cucumis melo cantalupensis), and many from Iris and sandbar willow (Salix interior). One specimen was collected from a drainage ditch and many from along rivers.

Stewart & Leonard (1916) used adults of bispina in unsuccessful attempts to transmit the bacterium (Erwinia amylovora) causing fire blight to apple seedlings. Bird (1930) collected 1 specimen in late August from the herb stratum of a Salix petiolaris (a type of willow found in meadows and swales) consocies of an aspen parkland in central Canada. Shewell (1938) reported sweeping adults from reeds (Phragmites communis) on river banks with Camptoprosopella spp. (Lauxaniidae).

Adams (1941) collected bispina in the herb stratum of a sugar maple-elm forest from late May to mid-August and in the shrub stratum from late July to mid-August in Tennessee.

In late December, 1971, a number of larvae, along with larvae of tenuispina, were collected in the leaf litter, mainly silver maple (Acer saccharinum), along the Des Moines River in Ledges State Park, Boone Co., Iowa. Males and females began emerging in early February and stopped by mid-February.

During 1968 and 1969 rearings were initiated using adults collected from the grass and low herbage in a mesophytic woodland near a small stream at Kent, Ohio. Females usually laid eggs singly or occasionally in clusters of up to 5, averaging 3-5 eggs per day, at night. Most eggs were partially buried in the peat moss and only some placed on leaves or twigs. Ecolsion took place sporadically and only in a few eggs. Eggs were than transfered to a refrigerator for 3-4 weeks and hatching took place in a few days after being returned to room temperature. The 1st-instar stadium lasted 6-9 days, 2nd, 22-35 days, and 3rd, 17-29 days. The prepupal period was approximately 48 hours and pupal periods ranged 11-13 days for both males and females. The preoviposition period for 3 reared females was 20-45 days, with the premating period for 1 female 21 days.

Mating was observed a few times in the laboratory in the late evening and only 1 lasted for 45 minutes. Mating positions and behavior was similar to that described in pernotata. The pairs were fairly active and some were noted to easily break up if disturbed.

Reared males and females lived up to 135 and 126 days, respectively. Field-collected males and females lived 115 days, except 1 male, which lived 150 days. Because of the egg diapause, this species is univoltine, with larvae overwintering.

Homoneura (Homoneura) truncata NEW SPECIES

(Fig. 121)

Diagnosis This medium-sized species may be distinguished by having at least the apical 1/3rd of the 5th TS3 segments usually black and well-developed preapical av and ad, with weak pv F3 bristles. Males also have forked basal gonopod processes, which are yellow, not brown as in fratercula and bispina, with an anterior lobe on the anterior hooks and pl S5 processes slightly expanded and truncate apically (Fig. 121); females have the T7 at least 1/2 the length of T6.

Discussion Males have well-developed apical fringes of long, fine av F3 bristles and basal fringes of av and pv T3 bristles. They can easily be separaed from fratercula, which has well-developed preapical pv F3 bristles and pv fringe of T3 bristles. Females of truncata are not readily separable from bispina and fratercula at this time.

Description Total length 3-3.5 mm.; wing length 3.5-4 mm. Brownish-yellow, with sparse whitish pollinosity. Similar to bispina and fratercula.

Frons slightly swollen in profile, rounded into facial plane; por equidistant between iv and aor, set in narrow, shining plates. Face flat, with a slightly produced, broad ridge on lower 1/3rd; parafacials about 1/2 width of face at middle. Genae about 1/3rd height of eyes. Aristae short plumose. Chaetotaxy: aor slightly shorter than por, 1/2 iv, por slightly shorter than ov; oc longer than ov; pvt subequal to aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong and well-removed anteriorly from suture; acr with 2 rows of weak bristles. Legs yellow, except apices of 3rd, 4th and 5th TS1, TS2 and TS3 segments, which are dark brown or black, especially the apical 1/3rd of 5th TS3. F1 av ctenidium of 14-19 closely spaced setulae; F3 with a strong preapical av and ad, occasionally weak pv bristles, males also have a short fringe of weak, fine av bristles; T3 of males with basal av and pv fringes of fine bristles. Wings yellowish, with r-m and m darkened; calypters with light brown, marginal setae distally, before junction of alar lobes.

Male: pl S5 processes long, expanded and truncate apically, with sparse setae, twice the width of the gonopods at middle; T7 twice as long as T6; surstyli small, narrow lobes at av angles; terminal processes very small, posteriorly-directed, with about 6 small, black setulae apically and some sparse, fine setae dorsally and ventrally; gonopods moderately long, curving posteriorly, with short bifurcate, basal gonopod processes with an anteriorly-produced lobe on anterior hook; aedeagus large, tubular, bilobed, rounded apically, with a long, apical anteromedial

flap covering the distal groove between the lobes; cerci short, with dense apical setae, and concave ventrally. Female: T7 subequal to T6; cerci short, basal 2/3rds dark brown or black, dorsally flattened, with yellow, somewhat mesally-directed and upturned, pointed apices, and with some fine, long, weak bristles laterally.

Types Holotype: male, Lake Junaluska, North Carolina, V-23-1954, H. V. Weems, Jr. (USNM). Allotype: female, same data as holotype (USNM). Paratypes: 3m, same data as holotype (FSCA, RMM); 1m, 5f, Highlands North Carolina, V-9-1957, W. R. M. Mason, Horse Cove, 3,000 ft. (914 m.) (CNC); 3m, Pine Mt., Rabun Co., Georgia, V-15-1951, W. R. M. Mason, 1,400 ft. (437 m.) (CNC); 1m, Ono, Pennsylvania, VI-7-1940, A. L. Melander (USNM).

Biology The flight period for this rarely collected southeastern and central eastern species begins in early May and extends through mid-June, although I suspect adults are probably on the wing through August. Adults have been collected at elevations of 1,400 ft. (914 m.) and 3,000 ft. (437 m.).

Homoneura cilifera incertae sedis

Homoneura (Homoneura) cilifera (Malloch)

(Figs. 9, 112)

Sapromyza cilifera Malloch, 1914: 32 [key], 33 [descr. - IL]; Pl. II, Fig. 15 [T3, m].
Malloch & McAtee, 1924: 22 [key], 23 [coll. rec. - MD].
Shewell, 1965: 698 [cat., distr. - IL, MD].

Diagnosis This medium-sized, clear-winged species is characterized by having parafacials 1/3rd width of face at middle and 5th TS3 segments yellow. The males are characterized by having long, fine, irregular fringe of pv F3 bristles, with a conspicuous subbasal bristle and long, fine fringes of av and pv T3 bristles; females are unknown.

Discussion This species is probably closely related to the aequalis group in having the parafacials 1/3rd the width of face at middle, but the L3 chaetotaxy of males is more developed, as found in the bispina group; the strong presutural dc and presence of pl S5 processes is more characteristic of the bispina and setitibia groups; and males are somewhat similar to tenuispina in having the pl angles of T7 slightly produced.

Males of cilifera have the S5 medially divided, somewhat quadrate, with anteromesal margin concave for the reception of the tip of the aedeagus, and with short, finger-like, pl S5 processes, sparsely setose; T7 twice as long as T6; gonopods moderately long, only slightly curved posteriorly, with pointed, mesally-directed, basal gonopod processes; surstyli short, mesally-curved hooks on av angles; terminal processes large, broadly curving posteriorly, with black granulations and fine setae apically; cerci small, oval, slightly darkened (Fig. 112).

Type Holotype: male, Urbana, Illinois, V-24-1888, C. A. Hart, swept from box elder [Acc. No. 14376] (INHS).

Specimens examined 2m from 2 middle eastern USA localities:

IL 1m, Danvers, V-27-1932, T. H. Frison (INHS); 1m, holotype (INHS).

Remarks I was unable to locate the specimen that Malloch & McAtee (1924) reported from Maryland [Plummers Is., V-9-1914], but I feel that it is probably a valid record because of the distinctive males of this species.

Biology This very rarely collected species has only been collected in May, which may be the reason for its apparent scarcity. The holotype was swept from box elder (Acer negundo).

Homoneura aequalis Group

Diagnosis This group of 7, medium-sized species, is characterized by the following combination of characters: 1) 1+3 dc or 0+3 dc, increasing in length posteriorly, presutural dc, if present, always closer to anterior postsutural dc than distance between other postsutural dc and close to suture; 2) acr as strong as prsc bristles; 3) parafacials 1/3rd width of middle of face; 4) genae 1/4th-1/5th height of eyes; 5) wings immaculate, except for darkened r-m and m; 6) 5th TS3 segments dark dorsally; 7) aedeagi broadly curved ventrally and upturned posteriorly; 8) cerci darkened in both sexes, only apically dark in males.

Discussion This group can be easily distinguished from the bispina and setitibia groups by the parafacials being 1/3rd rather than 1/2 width of the middle of face and the presutural dc, if present, close to the suture, not well-removed anteriorly and not as strong as the anterior postsutural dc. Also males of the aequalis group lack p1 S5 processes; females are not readily distinguishable by genitalic characters, but some species have the S9 and S10 sometimes partially or completely darkened.

All of the new species, except wheeleri, were named for the specific different shapes of the terminal processes. These differences may eventually prove to be only variations of a polymorphic species, which could have South Dakota as a common focus. However, many more specimens of this rather uncommon group need to be examined to obtain additional variations or series demonstrating character constancy.

Key to Species of aequalis Group

1. 1+3 dc, presutural dc as strong as posterior presutural acr; males with ring sclerite yellow 2

   0+3 dc, 1-3 weak presutural dc usually smaller than posterior presutural acr; ring sclerite dark brown 3

2. pv F3 bristles present; terminal processes flattened distally in lateral view, with black granulations apically; subbasal gonopod processes posteriorly-directed (Fig. 125) . . . . . aequalis, p. 170

   pv F3 bristles absent; terminal processes club-shaped distally in lateral view, with black granulations dorsally; basal gonopod processes mesally-directed (Fig. 128) . . . . . clavata, p. 173

3. Weak apical spots or veins darkened (Fig. 52); subbasal gonopod processes absent (Fig. 126) . . . . . wheeleri, p. 175

   r-m and m at most darkened (Fig. 61); basal or subbasal gonopod processes present 4

4. Males with fine, long, basal pv T3 setae; females with many long, black setae on p1 S8 corners (Fig. 130) . . . . . media, p. 177

Males with only usual appressed setae on T3; females with only usual apical row of long, black setae on S8 . . . , 5

5. Males with defined surstylar extensions; terminal processes flattened apically 6

Males lacking surstylar extensions; terminal processes not flattened apically (Fig. 127) . . . . . curva, p. 179

6. Males with terminal processes narrow, spoon-shaped in dorsal view (Fig. 131) . . . . . severini, p. 181

Males with terminal processes broad, fan-shaped in dorsal view (Fig. 132) . . . . . flabella, p. 183

Homoneura (Homoneura) aequalis (Malloch)

(Figs. 7, 125)

Sapromyza aequalis Malloch, 1914: 32 [key]; 36 [descr. - IL].
Malloch & McAtee, 1924: 22 [key, coll. rec. - VA].
Johnson, 1925a: 256 [coll. rec. - VT].
Criddle, 1928: 100 [coll. rec. - MAN, SASK; MAN coll. rec. - mallochi, MISIDENT.].
Petch & Maltais, 1932: 65 [coll. rec. - QUE].
Shewell, 1965: 698 [cat., distr. - SASK, SD, NE, VT, VA].
Cole, 1969: 373 [distr. - SASK].

Diagnosis This species can be distinguished by the presence of av, ad and pv F3 bristles and 1+3 dc, with a strong presutural dc close to the suture. The males have the ring sclerite yellow and apically flattened terminal processes.

Discussion This species is most similar to clavata, but males have well-developed and females weak pv F3 bristles, whereas distinct pv bristles are absent in both males and females of clavata. The male

genitalia of aequalis are characterized by the following: aedeagus broadly curved and upturned posteriorly; gonopods slender, with short, apically flattened, posteriorly-directed, subbasal processes; ring sclerite not darkened; terminal processes short, sharply elbowed posteriorly in lateral view, flattened apically in dorsal view, with black granulations and some fine setae ventrally (Figs. 125). The terminal processes of aequalis are very similar to severini, except they are not as expanded apically and lack the thin ventromesal extensions (Fig. 131). Females usually have yellow S9 and 10, which is usually partially brown or black in the other species of the aequalis group.

Type Holotype: male, Algonquin, Illinois, VIII-8-1895, W. A. Nason [genitalia preserved in glycerin in microvial] (INHS).

Remarks Malloch (1914) designated 1 male paratype, which upon dissection, belongs to curva.

Specimens examined 93 (42m, 51f) from 24 central, north central and northwestern NA localities:

CO 6m, 10f, 6 mi. (9.6 km.) e. Castle Rock, VII-10-1972, R. M. Miller, W. B. Stoltzfus (IASU); 1m, Hayden, VIII-8-1965, G. F. Knowlton (UTSU); 10m, 30f, 6 mi. e. Castle Rock, reared 1972-73, R. M. Miller (CNC, RMM, USNM).

IA 7m, Bay's Branch Area, Guthrie Co., VI-29-1972, R. M. Miller, W. B. Stoltzfus (IASU); 2m, Iowa Lakeside Laboratory, Dickinson Co., VII-18-1959, J. L. Laffoon (IASU).

IL 1f, Freeport, VII-2-1917 (INHS); 1f, Chicago, VII-24-1899 (PC); m, holotype (INHS).

KS 1m, Riley Co., VII-1-1952, L. O. Warren (UAR).

MN 1m, se. Houston Co., V-23-1936, H. R. Dodge (UMN).

NE 2m, Chadron, VIII-2-1950, M. R. Wheeler (UTXA); 2m, 3f, 1 mi. (1.6 km.) s. Hershey, VII-5-1972, W. B. Stoltzfus, R. M. Miller (IASU).

SASK 1m, Saskatoon, VIII-15-1939, A. R. Brooks [homotype] (CNC); 2f, Willow Branch, VII-29-1955, A. R. Brooks (CNC).
SD 6m, 4f, 9 localities [includes 5 paratypes of severini] (AMNH, CNC, SDSU).
UT 1m, Corinne, VII-1-1915, A. Wetmore (USNM); 1m, Wanshin, VIII-8-1938, G. F. Knowlton & G. S. Stains (UTSU).
WY 1m, Ten Sleep, VIII-18-1950, M. R. Wheeler (UTXA); 1m, Ucross, VII-10-1947, R. E. Pfadt (PU).

Remarks I have not examined any aequalis from the east and suspect that Malloch & McAtee's (1924) collection record for Virginia and Johnson's (1925a) collection record for Vermont probably refers to another species in the aequalis group, perhaps curva.

Biology The flight period for this rather common species begins in late May and extends through late August. No biological data have been reported for this species.

In early July, 1972, rearings were initiated using adults collected from the tall grass in a lowland pasture near Castle Rock, Colorado. Eggs were laid singly on decaying lettuce and tree leaves. Ecolsion and larval stadia, especially the 3rd instar, were highly variable. Larvae fed on decaying lettuce and tree leaves. Adults began emerging in the laboratory in mid-November. The premating period for 4 reared females was 8-28 days. Mating was observed 6 times in the laboratory and occurred in the early and late afternoon. Mating position and behavior was similar to that described in pernotata. The pairs remained in 1 place and mating usually lasted 1 hour.

The preoviposition period for 8 reared females ranged from 7-25 days. The prepupal period lasted 48 hours and the pupal periods for 17 reared adults ranged 9-13 days. Adults lived 34-115 days in the laboratory.

Three generations were reared in the laboratory and there was no indication of diapause. The species is probably at least bivoltine in nature.

Homoneura (Homoneura) clavata NEW SPECIES

(Fig. 128)

Diagnosis This species has 1+3 dc, with a strong presutural dc close to the suture and males with the ring sclerite yellow, as is found in aequalis, but can be distinguished by the absence of pv F3 bristles.

Males of clavata have the terminal processes somewhat club-shaped distally in lateral view, with black granulations dorsally and sparse, fine setae ventrally; while these in aequalis are flattened distally in lateral view, with black granulations apically and some fine setae ventrally. Also clavata has mesally-directed, pointed, basal gonopod processes, while aequalis has posteriorly-directed, flattened, subbasal processes (Figs. 125, 128).

Discussion The club-shaped terminal processes of clavata are unique in the aequalis group. Females can be distinguished from other females in the group by the absence of pv F3 bristles.

Description Total length 3.25-3.75 mm.; wing length 3.5-4 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to aequalis.

Frons flat in profile, slight angle with facial plane; por equidistant between iv and aor. Face nearly flat; parafacials about 1/3rd width of face at middle. Genae approximately 1/4th height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc = ov; pvt = aor.

Thoracic chaetotaxy: 1+3 dc, presutural dc strong, close to suture; acr with 2 inner rows strong bristles, 2 outer rows setae, usually complete. Legs yellowish, with av F1 ctenidium of 10-12 closely spaced setulae; F3 with preapical av and ad, without pv bristles. Wings yellowish, with r-m and m darkened.

Male: T6 slightly longer than T5; small, rounded, lobe-like surstylar extension; terminal processes somewhat club-shaped laterally, with black granulations dorsally and sparse, fine setae ventrally; gonopods broad, moderately long, with short, narrow, pointed, mesally-directed basal processes; ring sclerite not darkened; aedeagus large, moderately curved ventrally, upturned posteriorly; cerci short, brown apically, with long apical setae. Female: S9 and 10 partially black; cerci black, with long, apical setae.

Types Holotype: male, Lake Andes, South Dakota, VI-30-1924, H. C. Severin [genitalia mounted on paper point under specimen] (CNC). Paratypes: 1m, 3f, same data as holotype (CNC, SDSU); 1m, Ottawa, Ontario, VII-19-1946, G. E. Shewell (CNC).

Remarks The holotype and 2 paratypes from South Dakota were originally designated paratypes of severini by Shewell (1939).

Biology Nothing is known about the biology of this very rare, north central species.

Homoneura (Homoneura) wheeleri NEW SPECIES

(Figs. 52, 54, 126)

Diagnosis This partially-spotted species is readily distinguishable by having at most weak presutural dc and 1-3 additional, weak bristles adjacent to the mp.

Discussion The wings of this species are similar to shewelli with both having the r-m and m bordered and the apices of R_{2+3}, R_{4+5} and M_{1+2} clouded, or at least darkened (Figs. 52, 56). However, shewelli possesses a strong presutural dc and the aedeagus is similar to the aequalis group, although wheeleri does not possess any basal or subbasal gonopod processes (Fig. 126).

Remarks I have also examined 2 females collected from Wyoming [Daniel, VIII-15-1950, M. R. Wheeler (CNC, USNM)] that are very similar to wheeleri, except they are conspicuously maculated (Fig. 54) and are slightly larger. This situation may be similar to the wing-spot condition found in some occidentalis that have the wing spots weakly developed. Although I suspect that these represent a new species, the collection of a male with well-developed wing spots would help clarify the status of these specimens.

Description Total length 2.75-3.25 mm.; wing length 3.2-3.5 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to severini and shewelli.

Frons flat in profile, slight angle with facial plane; por equidistant between iv and aor. Face slightly concave; parafacials about 1/3rd width of face at middle. Genae approximately 1/5th height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc = por and ov; pvt shorter than aor.

Thoracic chaetotaxy: 0+3 dc, 1 or more very weak presutural dc near suture; acr with 2 inner rows strong bristles, 2 outer rows setae, incomplete. Legs yellow, with av F1 ctenidium of 9-12 closely spaced setulae; F3 with preapical av and ad and with very weak pv bristles. Wings yellowish, with r-m and m bordered brown and apices of R_{2+3}, R_{4+5} and M_{1+2} clouded brown or at least darkened; apical half of ultimate section of M_{1+2} darkened.

Male: sursylar extensions small, mesally-directed processes at av angles; terminal processes somewhat foot-shaped laterally, scoop-shaped and flattened dorsally, with black granulations apically, fine setae ventrally, and small, apically, flattened, posteriorly-directed, subbasal processes; gonopods narrow, moderately long, evenly curved posteriorly, without subbasal processes; aedeagus large, broadly curved ventrally, upturned posteriorly; cerci short, brown and with short, dense, apical setae. Female: cerci black, with long, apical setae.

Types Holotype: male, Slide Lake, Wyoming, VIII-14-1951, M. R. Wheeler [genitalia preserved in glycerin in microvial] (USNM). Allotype: female, Kemmerer, Wyoming, VIII-14-1950, M. R. Wheeler (USNM). Paratypes: 1m, same data as holotype (UTXA); 2m, 1f, State Bridge, near Bond, Colorado, VI-24-25-1961, C. H. Mann, elevation 7,000 feet (2,133 m.), dry river bed and bank (CNC); 1m, Delaney Lakes, w. Walden, Jackson Co., Colorado, VIII-13-1968, P. H. Freytag, on Salix (RMM).

Remarks This species is named for its collector, the noted dipterist, Marshall R. Wheeler.

Biology The biological data for this rarely collected species indicates that it is found at moderate elevations near water sources and associated with willows.

Homoneura (Homoneura) media NEW SPECIES

(Figs. 129, 130)

Diagnosis This species is distinguished by having 0+3 dc, with 1-2 weak presuturals shorter than posterior presutural acr. Males can be distinguished by possessing some long, basal, pv T3 setae and the females possessing many, long, black setae on the p1 corners of S8 (Fig. 130).

Discussion The terminal processes are expanded and flattened apically and scoop-shaped (Fig. 129), a condition which is intermediate to the spoon-shaped processes of severini and fan-shaped processes of flabella.

Description Total length 3-3.5 mm.; wing length 3.3-3.6 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to severini and flabella.

Frons flat in profile, slight angle with facial plane; por equidistant between iv and aor. Face nearly flat; parafacials about 1/3rd width of face at middle. Genae approximately 1/4th height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc = ov; pvt = aor.

Thoracic chaetotaxy: 0+3 dc, with 1-2 very weak presutural dc less than length of presutural acr; acr with 2 inner rows strong bristles, 2 outer rows of setae. Legs yellow, with av F1 ctenidium of 10-13 closely spaced setulae; F3 with preapical av, ad and pv bristles; T3 of male with some longer, basal pv setae. Wings yellowish, with r-m and m darkened.

Male: small, lobe-like surstylar extensions on al and pl corners; terminal processes large, flattened, posteriorly-curving, with apical, black granulations and fine, ventral setae, slightly expanded apically in dorsal view; gonopods broad, moderately long, with long, narrow, posteriorly-directed subbasal processes; ring sclerite darkened; aedeagus large, broadly curved ventrally, upturned posteriorly; cerci short, apically brown setae. Female: S8 with dense, long setae, in 2 or more marginal rows on the pl corners; S9 and 10 slightly darkened apically; cerci dark, with long, apical setae.

Types Holotype: male, Whiterocks, Duchesne Co., Utah, VII-11-1972, W. J. Hanson & G. F. Knowlton (USNM). Allotype: female, same data as holotype (USNM). Paratypes: 1f, Cache Co., Blacksmith Fork Canyon, Utah, VII-11-14-1964, W. J. Hanson, Malaise trap (UTSU); 1f, Cache Co., Blacksmith Fork Canyon, Utah, VII-26-1972, G. F. Knowlton (UTSU); 1f, Duchesne, Utah, IX-3-1937, G. F. Knowlton & F. C. Harmston, in meadow (UTSU); 1f, 4 mi. (6.4 km.) s. Manila, Daggett Co., Utah, VIII-18-1963, N. & B. Marston (KSSU); 1m, 6 mi. (9.6 km.) s. Castle Rock, Colorado, VII-10-1972, R. M. Miller (RMM); 1m, Elk Point, South Dakota, VI-20-1924, H. C. Severin [paratype of severini] (CNC); 1m, Elk Point, South Dakota, VI-12-1925, H. C. Severin [paratype of severini] (SDSU).

Biology The flight period for this very uncommon, central western species begins early in June and extends through early September. One female has been collected in a Malaise trap and 1 in a meadow.

Homoneura (Homoneura) curva NEW SPECIES

(Figs. 61, 127)

Diagnosis This species can be distinguished by having 0+3 dc, with 1-2 weak presutural dc shorter than posterior presutural acr; males with the terminal processes being long and broadly curved upward distally, not dorsoventrally flattened and lacking surstylar extensions (Fig. 127). Females are not readily distinguishable from severini and flabella.

Discussion In males of curva the short, narrow, posteriorly-directed basal gonopod processes are somewhat similar to severini (Figs. 127, 131).

Description Total length 3-3.5 mm.; wing length 3.3-3.5 mm. Brownish-yellow, with whitish pollinosity laterally and ventrally. Similar to severini.

Frons flat in profile, slight angle with facial plane; por equidistant between iv and aor. Face nearly flat; parafacials about 1/3rd width of face at middle. Genae approximately 1/5th height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc = ov; pvt = aor.

Thoracic chaetotaxy: 0+3 dc, with 1 or 2 very weak presuturals less than length of presutural acr; acr with 2 inner rows strong bristles, 2 outer rows setae, usually complete. Legs yellow, with av F1 ctenidium of 12-14 closely spaced setulae; F3 with preapical av, ad and pv bristles. Wings yellowish, with r-m and m darkened.

Male: without surstylar extensions; terminal processes long, broadly curved upward, with black granulations apically and sparse, fine setae ventrally; gonopods broad, moderately long, with short, narrow, posteriorly-directed basal processes; ring sclerite black; aedeagus large, broadly curved ventrally, upturned posteriorly; cerci short, apically brown, with long apical setae. Female: cerci black, with long, apical setae.

Types Holotype: male, Mica, Washington, VII-14-1918, A. L. Melander (USNM). Paratypes: 3m, same data as holotype (USNM); 1m, Urbana, Illinois, VI-28-1889, C. A. Hart [Hart 514] (INHS); 7m, Ottawa, Ontario, VII-18-19-1946, G. E. Shewell (CNC).

Specimens examined 23 (21m, 2f) from 12 northwestern and north-central NA localities:

ALTA 1m, 1f, Macleod, IX-2-1928, O. Bryant (CAS); 1m, Lethbridge, VII-28-1923, H. E. Gray (UALTA).
BC 1m, Swan Lake, VII-29-1917, A. L. Melander (USNM).
IA 1m, 1f, Pilot Mound St. For., Boone Co., VIII-30-1971, R. M. Miller (IASU); 1m, Bay's Branch Area, Guthrie Co., reared VI-9-1973, R. M. Miller (RMM).
ID 1m, Chatcolet, VIII-1915, A. L. Melander (USNM).
IL 1m, Urbana, VI-20-1915 (INHS); 1m, paratype [paratype of aequalis] (INHS).
MAN 1m, Transcona, VII-26-1927, C. S. Brooks [paratype of severini] (CNC).
ONT 7m, paratypes (CNC).
SD 1m, Yankton, VI-21-1924, H. C. Severin [paratype of severini] (SDSU).
WA 1m, holotype (USNM); 3m, paratypes (USNM).

Biology The flight period for this uncommon, northern species begins early in June and extends through early September. One male emerged in late June from decaying leaves of silver maple (Acer saccharinum) and cottonwood (Populus deltoides) collected in early June, 1971, from a low wet area at Bay's Branch Area, Iowa.

Homoneura (Homoneura) severini Shewell

(Fig. 131)

Homoneura severini Shewell, 1939: 265-266 [descr. - NWT, BC, MAN, SD].
Shewell, 1965 [cat., distr. - NWT, s. AK and YT to n. MAN, s. to UT, MN, and s. ONT].
Cole, 1969 : 373 [distr. - AK, UT].
Griffiths, 1972: 94 [note - examined genitalia, m].

Diagnosis This species is characterized by having 0+3 dc, with 1-3 usually weak presutural dc shorter than posterior presutural acr. Males can be distinguished by the terminal processes being narrow and spoon-shaped apically (Fig. 131).

Discussion The terminal processes of severini are not as expanded apically as media or flabella, with black granulations and flattened apically, with fine, black setae ventrally. The surstyli are ventral lobes, curving mesally. Gonopods are rather small, with short, narrow, posteriorly-directed subbasal processes (Fig. 131).

Types Holotype: male, Cameron Bay, Great Bear Lake, Northwest Territories, VII-22-1937, T. N. Freeman (CNC 4903). Allotype: female, same locality as holotype, VII-12-1937, T. N. Freeman (CNC). Paratypes: 1m, 1f, Fairmont, BC, VII-28-1926, A. A. Dennys (CNC).

Remarks The remaining 14 paratypes originally designated by Shewell (1939) belong to aequalis, clavata, curva and media.

Specimens examined 23 (13m, 10f) from 13 north central and northwestern NA localities:

AK	2f, Camp 327, Alaskan Eng. Comm., J. M. Aldrich (USNM).
ALTA	7m, 5f, 5 localities (CAS, CNC).
BC	1m, Loon Lake, Selkirk Mts., VII-14-1908, J. C. Bradley (CU); 1m, Toad R. Lodge, Alaska Hwy., VII-20-1969, E. E. MacDougall, 4500 ft. (CNC); 1m, 1f, paratypes (CNC).
MAN	1m, Eastern Cr. nr. Churchill, VII-9-1952, J. G. Chillcott (CNC).
NWT	1m, holotype (CNC); 1f, allotype (CNC).
SASK	1m, Christopher Lake, VII-8-1959, A. & J. Brooks (CNC).
YT	1f, 14 mi. (22.5 km.) e. Dawson, 1300 ft. (396 m.), VIII-3-1962, P. J. Skitsko (CNC).

Biology The flight period for this uncommon species begins early in July and extends through mid-August. A few specimens have been collected at elevations of 1,300 to 6,000 ft. (396 to 1,829 m.). One specimen was collected in a meadow and 1 from a Malaise trap.

Homoneura (Homoneura) flabella NEW SPECIES

(Fig. 132)

Diagnosis This species is distinguished by having 0+3 dc, with 1-2 weak presutural dc shorter than posterior presutural acr; males with terminal processes being broad and fan-shaped apically (Fig. 132).

Discussion The terminal processes of flabella are the greatest expanded (together as wide as the epandrium) of all the species of the aequalis group and closely resemble media and severini. H. media has the terminal processes somewhat smaller, scoop-shaped, and lacks surstylar extensions, while severini has the terminal processes smaller, spoon-shaped and possesses ventral surstylar extensions, as does flabella (Figs. 130-132).

Description Total length 3-3.5 mm.; wing length 3.3-3.6 mm. Brownish-yellow with whitish pollinosity laterally and ventrally. Similar to media and severini.

Frons flat in profile, slight angle with facial plane; por equidistant between iv and aor, set in narrow, shining plates. Parafacials about 1/3rd width of face at middle. Genae with approximately 1/4th height of eyes. Aristae long pubescent. Chaetotaxy: aor shorter than por, 1/2 iv; oc = ov; pvt = aor.

Thoracic chaetotaxy: 0+3 dc, with 1-3 very weak presutural dc less than length of presutural acr; acr with 2 inner rows strong bristles, 2 outer rows setae, usually complete. Legs yellow, with av F1 ctenidium of 7-14 closely spaced setulae; F3 with preapical av, ad and pv bristles. Wings yellowish, with r-m and m darkened.

Male: surstyli large, ventral lobes, curving mesally and small, pointed processes at p1 corners; terminal processes large, flattened, posteriorly-curving, with ventroapical, black granulations and fine ventral setae, fan-shaped in dorsal view; gonopods broad, moderately long, with long, narrow, posteriorly-directed subbasal processes; ring sclerite darkened; aedeagus large, broadly curved ventrally, upturned posteriorly; cerci short, apically with black setae. Female: S9 and 10 at least partially darkened; cerci, dark, with long, apical setae.

Types Holotype: male, Ottawa, Ontario, VII-19-1946, G. E. Shewell (CNC). Paratypes: 10m, same data as holotype (CNC, USNM); 3m, 1f, Ninette, Manitoba, VI-14-1958, J. F. McAlpine, ex Salix sp. (CNC); 2m, 1f, Great Deer, Saskatchewan, IX-18-1948, J. R. Vockeroth (CNC).

Specimens examined 11 (9m, 2f) from 6 northern CAN localities:

ALTA	1m, Pincher, VII-10-1941, E. H. Strickland (UALTA); 1m, 15 mi. (24.1 km.) e. Morley, VIII-10-1962, K. C. Herrmann (CNC).
MAN	3m, 1f, paratypes (CNC).
ONT	1m, holotype (CNC); 10m, paratypes (CNC, USNM).
QUE	1m, New Richmond, VIII-6-1954, J. E. H. Martin (CNC).
SASK	2m, 1f, paratypes (CNC).

Biology The flight period of this very uncommon species begins in mid-June and extends through mid-September.

ECOLOGY OF NEARCTIC HOMONEURA

The following is a discussion of the generalized ecology of 17 species based on the biological observations and rearings conducted at Kent, Ohio, 1967-1969, and at Ames, Iowa, 1971-1975. Also included are the only 2 previously reported rearing records of americana (Miller & Foote, 1975) and trochantera (McDonald, Heed & Miranda, 1974) (Table 1).

The flight period for most species begins in late May and may extend through October, with specimens being most commonly collected in June and July. Courtship behavior has been observed and described in only 1 species, tenuispina, which evidently has a pheromone associated with it. The premating period of several species has been recorded and extends 8-36 days after emergence of the female. Mating in nature and in the laboratory has been noted and described for several species. It took place in the morning, late afternoon and early evening and lasted 5 minutes to a few hours. The mating position and behavior were similar to those described in pernotata.

The preoviposition period ranged 7-52 days. Eggs were usually deposited singly, occasionally in clusters of up to 5, on and in moist peat moss and underneath and between decaying tree leaves in the late afternoon and early evening. Fecundity varied greatly with the individual, but there is at least a potential of laying up to 10 eggs daily and 600 eggs during the female's egg-laying period. The incubation period varied from 2 days to several weeks or more, probably because of genetic variability or a weak diapause. In 1 species, bispina, there was the indication of a rather strong diapause, which could be broken by exposing

Table 1. Life Cycle Data for 19 Species of *Homoneura*.

Species	Larval Microhabitat	Larval Food (decaying)	Premat. Period (days)	Preovip. Period (days)	Incub. Period (days)	Larval Period (days)	Pupal Period (days)	No.Gen. per Year	Rearing Record (state)
aequalis	ND[a]	lettuce & leaves	8-28	7-25	ND	ND	9-13	2+	CO
aldrichi	ND	lettuce & leaves	ND	ND	ND	ND	ND	1	IA
americana	rotting? vegetation	*Hieracium venosum*	ND	ND	ND	ND	ND	ND	NY
	leaf litter	*Sassafras albidium* *Acer saccharum* *Prunus serotina*	ND	23-35	2-22+	15-65+	10-13	2	OH
birdi	leaf litter	*Acer saccharinum* *Prunus serotina*	13	13-25	ND	ND	10-12	1	IA
bispina	leaf litter	*Acer saccharinum*	ND	ND	ND	ND	ND	ND	IA
	leaf litter	*Acer saccharum*	21	20-45	Diapause	45-73+	11-13	1	OH
citreifrons	ND	lettuce & leaves	ND	ND	7+	ND	ND	1	OH
fraterna	leaf litter	leaves	ND	ND	ND	ND	13	ND	OH
	leaf litter	*Acer saccharum*	ND	20	ND	ND	14-15	1	IA
fuscibasis	leaf litter	*Acer rubrum* *Acer saccharum*	ND	ND	ND	ND	ND	1	OH, IA

harti	ND	lettuce & leaves	ND	32-45	ND	85	14-16	1-1/2	CO
incerta	leaf litter	Sassafras albidium Acer rubrum Acer saccharum	ND	24-26	ND	ND	10	1	OH, IA
mallochi	ND	lettuce & leaves	ND	ND	26-40+	8	12	1	OH
nubila	rotting vegetation	Cynara scolymus	ND	ND	ND	ND	ND	ND	MO
	ND	lettuce & leaves	ND	17-30	ND	ND	11-15	1-1/2	KS, IA
nubilifera	ND	lettuce & leaves	ND	ND	ND	ND	10-14	1-1/2	IA
pernotata	leaf litter	Acer saccharum Alnus sp.	10-25	16-40	3-16+	44-101+	10-14	1+	OH
philadelphica	leaf litter	Acer rubrum Alnus sp. Acer saccharum	10-36	12-52	3-13+	18-49+	10-13	1-1/2	OH, IA
setitibia	leaf litter	leaves	ND	ND	ND	ND	ND	1	IA
tenuispina	leaf litter	Acer saccharum	ND	ND	ND	ND	ND	1	IA
trochantera	leaf litter	Umbellularia californica	ND	ND	ND	ND	ND	1	CA
severini	leaf litter	leaves	ND	ND	ND	ND	ND	1	IA

[a] ND: not determined.

the eggs to cold temperatures for a few weeks. Hatching in nature may be stimulated by the cool, fall temperatures, which also triggers leaf fall and provides new food for the larvae.

The 1st instars fed on decaying lettuce (Lactuca sativa) and mined the epidermal layers of decaying tree leaves. Second instars continued to mine leaves; 3rd instars were more commonly found between decaying leaves skeletonizing them. Larval stadia were highly variable with the total larval period lasting 15-101 or more days.

Larvae of Homoneura exhibit the primitive compost-feeding habit (Oldroyd, 1964); however, they are specialized in mining and feeding on decaying fallen leaves, with the possible exception of harti, which seems to have habits more similar to the ancestral vegetable debris feeder. Although most larvae can be considered true leaf miners, they are a specialized saprophytic group and not phytophagous (Hering, 1951). Moreover, Miller & Foote (1975) suggested the possibility that the larvae may be utilizing yeasts, fungi and bacteria. Larvae have been collected and reared from the decaying leaves of 7 genera of 5 plant families: Aceraceae (Acer - 3 spp.); Compositae (Hieracium, Cynara); Corylaceae (Alnus); Lauraceae (Sassafras, Umbellularia); Rosaceae (Prunus). Miller & Foote (1975) reported that larvae of americana preferred decaying leaves of maple and cherry over alder, elm, oak and beech. In nature the overwintering stage is the quiescent larva and field-collected larvae are mainly from leaves of Acer saccharum and saccharinum (sugar and silver maple).

Pupariation takes place in the late spring, usually within the mined decaying leaves. The prepupal period lasts approximately 48 hours and pupal period ranges 10-16 days, with males sometimes emerging 1 day before the females. A number of pupal parasites were reared from field-collected larvae of at least 5 undetermined species of Homoneura in Ohio and Iowa: Kleidotoma (Tetrarphoptra) sp. and Glauraspidia (Rhoptromeris) sp. (Cynipidae).

Adults collected early in the season lived 2-4 months in the laboratory; reared adults 1-3 months. Most species have 1 generation per year with probably a partial 2nd generation; more generations per year are more common in the southern parts of a species range.

Ecological studies on the adults of 10 named, eastern species have been conducted with species having been collected mainly from the herb and occasionally the shrub and tree strata of mesophytic, deciduous forests (Table 2). One species, sheldoni, is evidently associated with plants of sphagnum bogs (Blake, 1927; Judd, 1960). At certain times in the early summer, species can be very common in some areas, especially near swamps and along streams. Adults can be found sitting on the undersides of low vegetation and in the leaf litter in the early morning and evening; in the late afternoon they are active and commonly seen on the upper surfaces of the leaves.

Cole (1969) listed 11 species with western distribution, but only 1, occidentalis, is restricted to west of the Rocky Mountains. Many of the new species are from the west which now has 9 more species, many of which are known from only a few specimens. There are also some collection

Table 2. Adult Ecological Studies of Homoneura.

species	strata	stand	state	reference
americana [compedita]	herb	white oak-shagbark hickory	MO	Dowdy (1947)
	herb-low shrub, high shrub-low tree	red oak-pignut hickory	TN	[a]Whittaker (1952)
birdi [as pernotata]	herb, shrub, tree	cottonwood	MAN	Bird (1930)
bispina	herb	willow	MAN	Bird (1930)
	herb, shrub, tree	sugar maple-American elm	TN	[a]Whittaker (1952)
conjuncta	herb?	red oak-sugar maple	IL	Smith (1928)
fraterna	herb	American elm-sugar maple	IL	Weese (1925)
	herb, shrub-low tree	gray beech	TN	[a]Whittaker (1952)
incerta	tree	white oak-shagbark hickory	MO	Dowdy (1947)
	herb	sugar maple-American elm	IL	Jones (1946); Shelford (1951)
	herb, shrub-low tree, herb-low shrub	gray beech	TN	[a]Whittaker (1951)
	high shrub-low tree	red oak-pignut hickory	TN	[a]Whittaker (1951)
	shrub, herb	table-mountain pine heath	TN	[a]Whittaker (1951)
lamellata [deceptor]	tree-top	cottonwood	MAN	Bird (1930)
mallochi [tenuispina]	shrub	Jack pine-willow	IN	Sanders & Shelford (1922)
ornatipes	shrub, herb	table-mountain pine heath	TN	[a]Whittaker (1951)
philadelphica	herb	oak-hickory, beech-maple	IL	Shelford (1913)
	herb	American elm-sugar maple	IL	Weese (1925); Shelford (1951)
	herb?	red oak-sugar maple	IL	Smith (1928); Smith-Davidson (1932)
	herb	eastern hemlock	TN	[a]Whittaker (1952)
	herb, shrub-low tree	gray beech	TN	[a]Whittaker (1952)
	shrub, herb	mixed mesophytic	TN	[a]Whittaker (1952)

[a]Species records unpublished.

records of isolated females that probably represent new species. It is quite probable that additional species will be found in the west, which has not been intensively collected and specimens are ephemeral in occurrence. Furthermore, Cole stated that endemic species of Diptera can be found in each of the western states, and perhaps relatively more of these local forms in California, where many barriers would have isolated them during past ages, or where there are distinctive habitats, such as sand dunes along the Pacific Ocean coastline.

The Nearctic species can be divided into 2 large groups with some common morphological characters which can be somewhat correlated to habitat. The basically eastern and northern species of the Tarsohomoneura, conjuncta, philadelphica and incerta, fraterna, nubila and aequalis groups have large eyes (gena-eye height: 1/4th-1/6th, narrow parafacials (parafacial-face width: 1/3rd) and males without posterolateral sternite 5 processes. This group is usually associated with the eastern temperate deciduous and northern boreal forests. Furthermore, most species have maculated wings, which perhaps is an adaptation to shaded habitats, as large eyes might be to help increase vision. Usually the more heavily patterned species are found in darker forests, while species with only the crossveins spotted are found in the lighter ecotones and successional zones of grass and deciduous trees.

The other group is generally western and characterized by having wide parafacials (parafacial-face width: 1/2-2/3rds), males possessing posterolateral sternite 5 processes and usually small eyes (gena-eye height: 1/2-1/4th). Only the species of the trochantera and occidentalis

groups, along with lamellata, are the exceptions by having large eyes (1/4th-1/5th); most of these species have patterned wings and are probably associated with more shaded habitats. The rest of the species in this group have at most darkened crossveins or very weak apical spots: tenuispina, bakeri, setula, inaequalis, littoralis and bispina, setitibia and harti groups. Only some species of the bispina group, harti and littoralis seem to be basically eastern, but their ranges extend westward into the Great Plains of central North America. These species are found quite commonly on the periphery of woodlands near streams and sand dunes. They also appear to be more active fliers than the rather sluggish species found in the more shaded, wooded habitats. The possession of small eyes is probably correlated to the widened parafacials and the frons being slightly to distinctly swollen anteriorly. The reduced wing maculation is probably a selective adaptation making species living in open habitats less obvious to potential predators, while maculations on wings could serve to break up the conspicuous yellowish wings of species in shaded habitats. Cole (1969) pointed out that western species of Diptera are, in some instances, related to North and Central European forms. H. occidentalis and arizonensis appear to be closely related to the Holarctic lamellata, as so might be trochantera.

The only species, besides the obviously different, introduced, oriental unguiculata, which do not fit into either of the main groups are citreifrons and cilifera. H. citreifrons is closer to the eastern group by the males lacking posterolateral sternite 5 processes, but has generally small eyes (1/4th), swollen frons and wide parafacials (1/2),

especially in the males. H. cilifera possesses the posterolateral sternite 5 processes, generally small eyes (1/4th), but has narrow parafacials (1/3rd).

Sexual dimorphism occurs in a number of species: in the subgenus Mallochomyza, males of citreifrons have larger heads, longer, paler bristles and fainter wing patterns than the females. In the subgenus Tarsohomoneura, males of all the species, except sheldoni, have at least the 2nd hindtarsal segments dilated and black and in the case of ornatipes and melanderi also highly ornamented with long, clavate bristles. The females have the corresponding segments black but not dilated or ornamented. In the subgenus Homonuera, males of many species exhibit increased length and development of setae and bristles on the hindfemora, hindtibiae and hindtarsi. This occurs mainly in the nubila, setitibia and bispina groups and a few of the ungrouped species, such as bakeri and cilifera. Also the males of inaequalis and setula have the setae usually found on the venter of the hindtrochanters strongly developed as setulae. This condition is most developed in littoralis, which also has many setulae on the basal half of the venter of the hindfemora. When the male is in the mating position, these setulae are placed against the dorsum and sides of the female's abdomen and probably enable the male to firmly hold onto the female in the open habitats and shorelines of ponds and lakes where this species occurs. Males of the harti group have the anterior mid-tibial claw enlarged and slightly recurved. This claw is hooked on the base of the female's wing during mating, and probably helps the male remain mounted in the relatively unprotected sand dune and open

grassland habitats occupied by members of this group.

A number of these dimorphic characters are obviously functional and correlated with certain habitats, while others are evidently sensory, functioning in attracting the female. This is probably the case in the Tarsohomoneura species. It is quite probable that certain other morphological characters may be correlated to particular habitats. Further ecological relationships to specific habitats for other species, especially the western ones, await more detailed observation. Moreover, additional larval rearing information would be invaluable in determining the exact ecological role of Homoneura.

ILLUSTRATIONS

The figures are lateral views of the left side, legs are anterior views and exceptions are noted. Unlabeled arrows on the figures point out characters referred to in the text. For explanation of the labeled arrows, see ABBREVIATIONS.

The locality for each illustrated specimen is indicated after the figure number and all of these specimens have been labeled "specimen photographed." The scale of magnification is the following:

antennae - 4.3X
head - 2.7X
thorax - 1.8X
legs - 2.7X
  L1 close up (Fig. 5) - 9.0X
wings - 1.4X
  wing apices (Figs. 7b, 9b, 11b) - 6.0X
genitalia - 3.5X
  plsp and genitalia close ups - 9.0X

Plate I. Introduction: head, thorax and wings

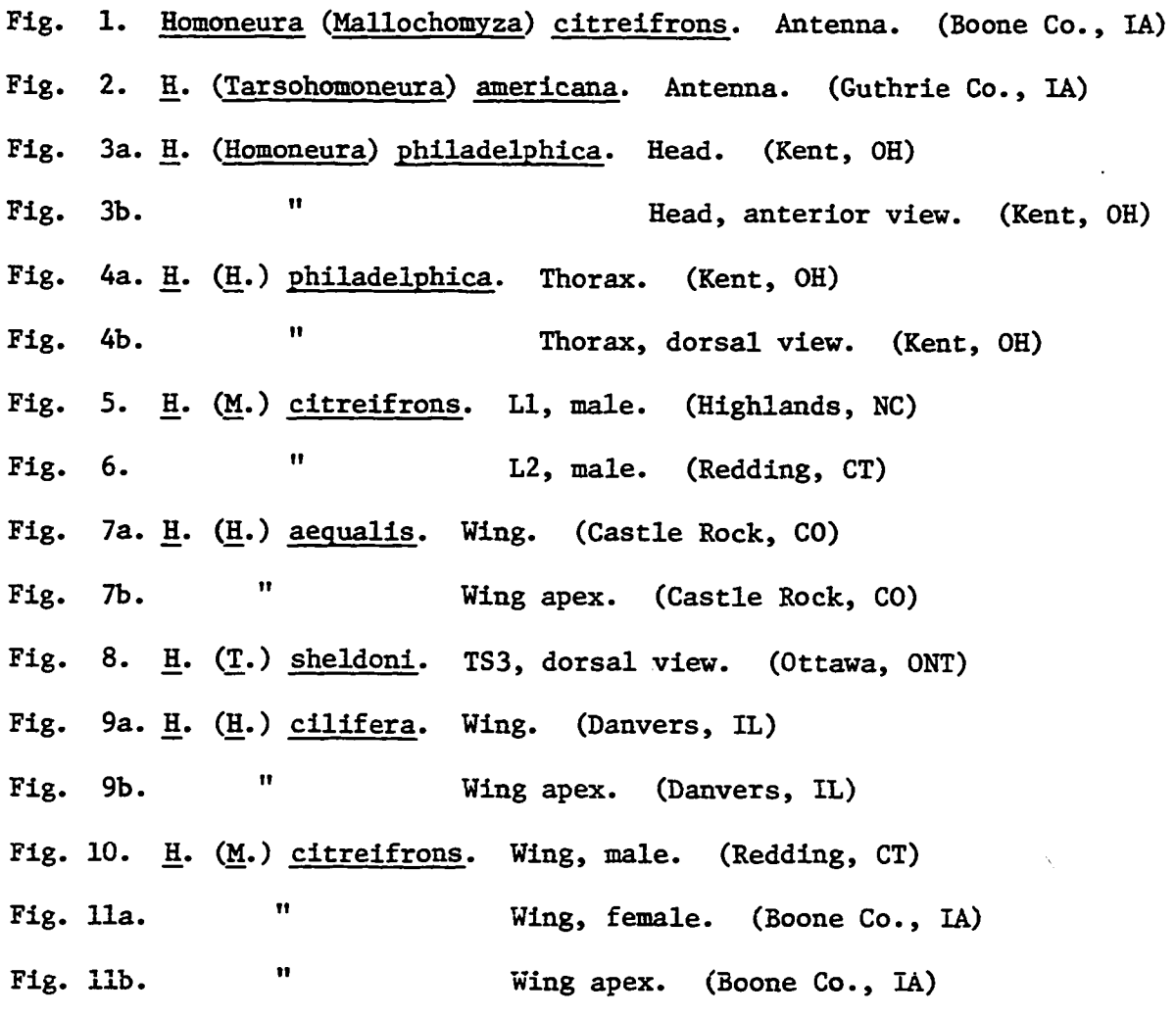


Fig. 1. Homoneura (Mallochomyza) citreifrons. Antenna. (Boone Co., IA)

Fig. 2. H. (Tarsohomoneura) americana. Antenna. (Guthrie Co., IA)

Fig. 3a. H. (Homoneura) philadelphica. Head. (Kent, OH)

Fig. 3b. " Head, anterior view. (Kent, OH)

Fig. 4a. H. (H.) philadelphica. Thorax. (Kent, OH)

Fig. 4b. " Thorax, dorsal view. (Kent, OH)

Fig. 5. H. (M.) citreifrons. L1, male. (Highlands, NC)

Fig. 6. " L2, male. (Redding, CT)

Fig. 7a. H. (H.) aequalis. Wing. (Castle Rock, CO)

Fig. 7b. " Wing apex. (Castle Rock, CO)

Fig. 8. H. (T.) sheldoni. TS3, dorsal view. (Ottawa, ONT)

Fig. 9a. H. (H.) cilifera. Wing. (Danvers, IL)

Fig. 9b. " Wing apex. (Danvers, IL)

Fig. 10. H. (M.) citreifrons. Wing, male. (Redding, CT)

Fig. 11a. " Wing, female. (Boone Co., IA)

Fig. 11b. " Wing apex. (Boone Co., IA)

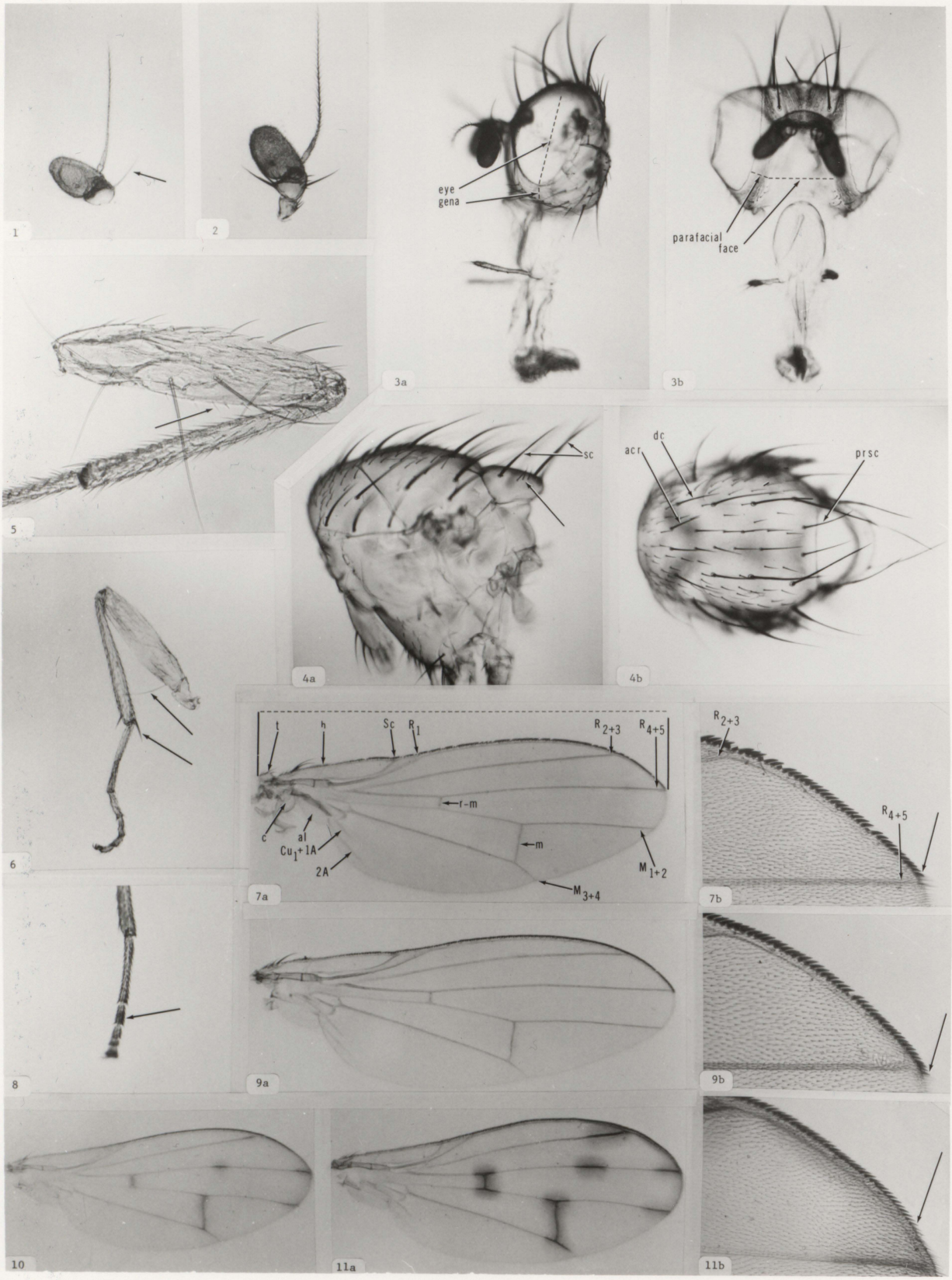

1
2
eye
gena
3a
parafacial
face
3b
5
sc
4a
acr
dc
prsc
4b
6
t
h
Sc
R1
R2+3
R4+5
r-m
m
c
a
Cu1+1A
2A
M1+2
M3+4
7a
R2+3
R4+5
7b
8
9a
9b
10
11a
11b

Plate II. Hindlegs of subgenus Tarsohomoneura

Fig. 12. H. americana. Male. (Guthrie Co., IA)

Fig. 13. " Female. (Guthrie Co., IA)

Fig. 14. H. houghii. Male. (Lincoln Co., ME)

Fig. 15. " Female. (Lincoln Co., ME)

Fig. 16. H. johnsoni. Male. (Simcoe, ONT)

Fig. 17. " Female. (Simcoe, ONT)

Fig. 18. H. disjuncta. Male. (Ithaca, NY)

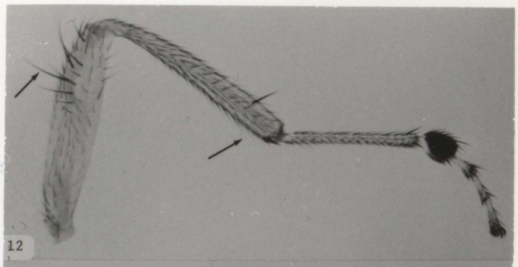
Fig. 19. " Female. (La Trappe, ONT)

Fig. 20. H. melanderi. Male. (Wood Co., WI)

Fig. 21. " Female. (Provincetown, MA)

Fig. 22. H. ornatipes. Male. (Mt. Katahdin, ME)

Fig. 23. " Female. (Kam. Co., QUE)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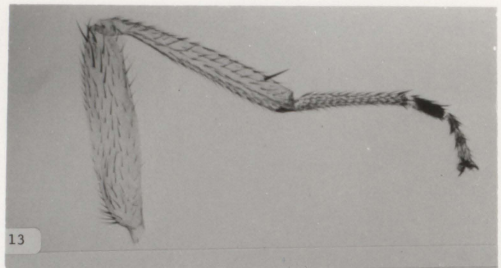
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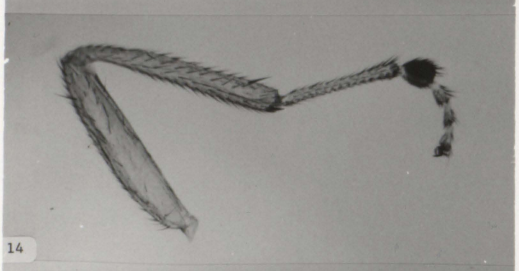
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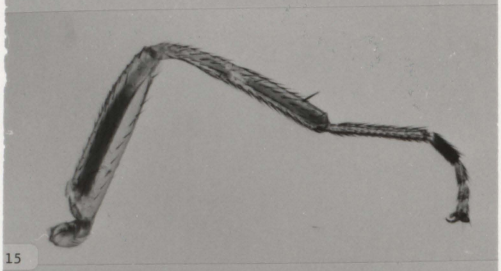
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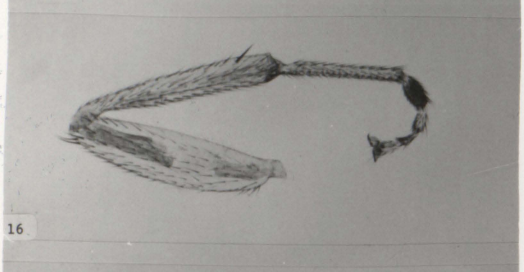
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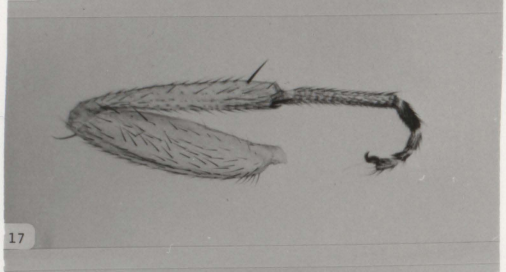
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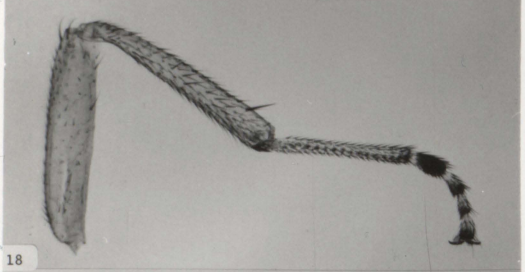
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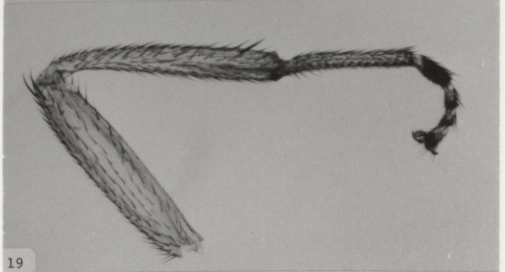
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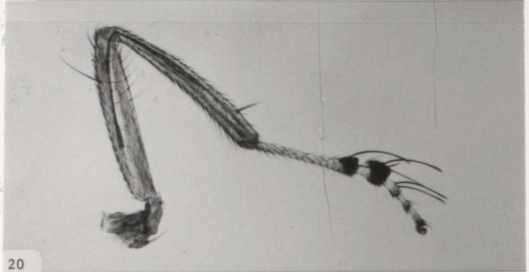
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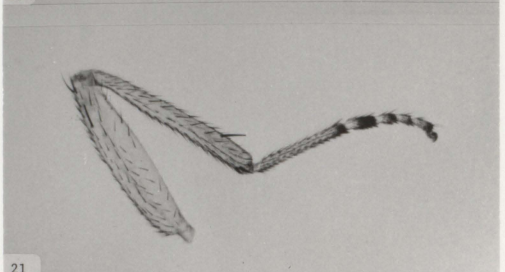
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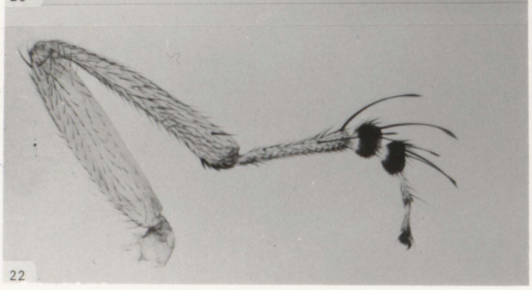
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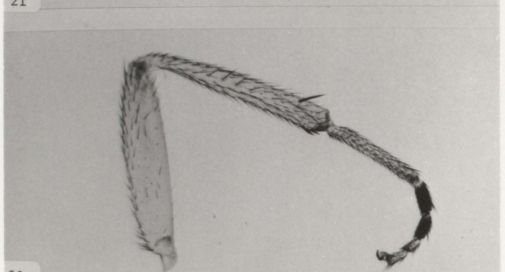
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Plate III. Male genitalia of subgenera Mallochomyza and Tarsohomoneura

Fig. 24a. H. (M.) citreifrons. (Highlands, NC)

Fig. 24b. " Surstylus and terminal process. (Highlands, NC)

Fig. 25a. H. (T.) sheldoni. (Squaw Lake, WI)

Fig. 25b. " Terminal process. (Mer Bleu, ONT)

Fig. 26a. H. (T.) ornatipes. (Kam. Co., QUE)

Fig. 26b. " Surstylus. (Mt. Katahdin, ME)

Fig. 27a. H. (T.) melanderi. (Wood Co., WI)

Fig. 27b. " Terminal process. (Rist Canon, CO)

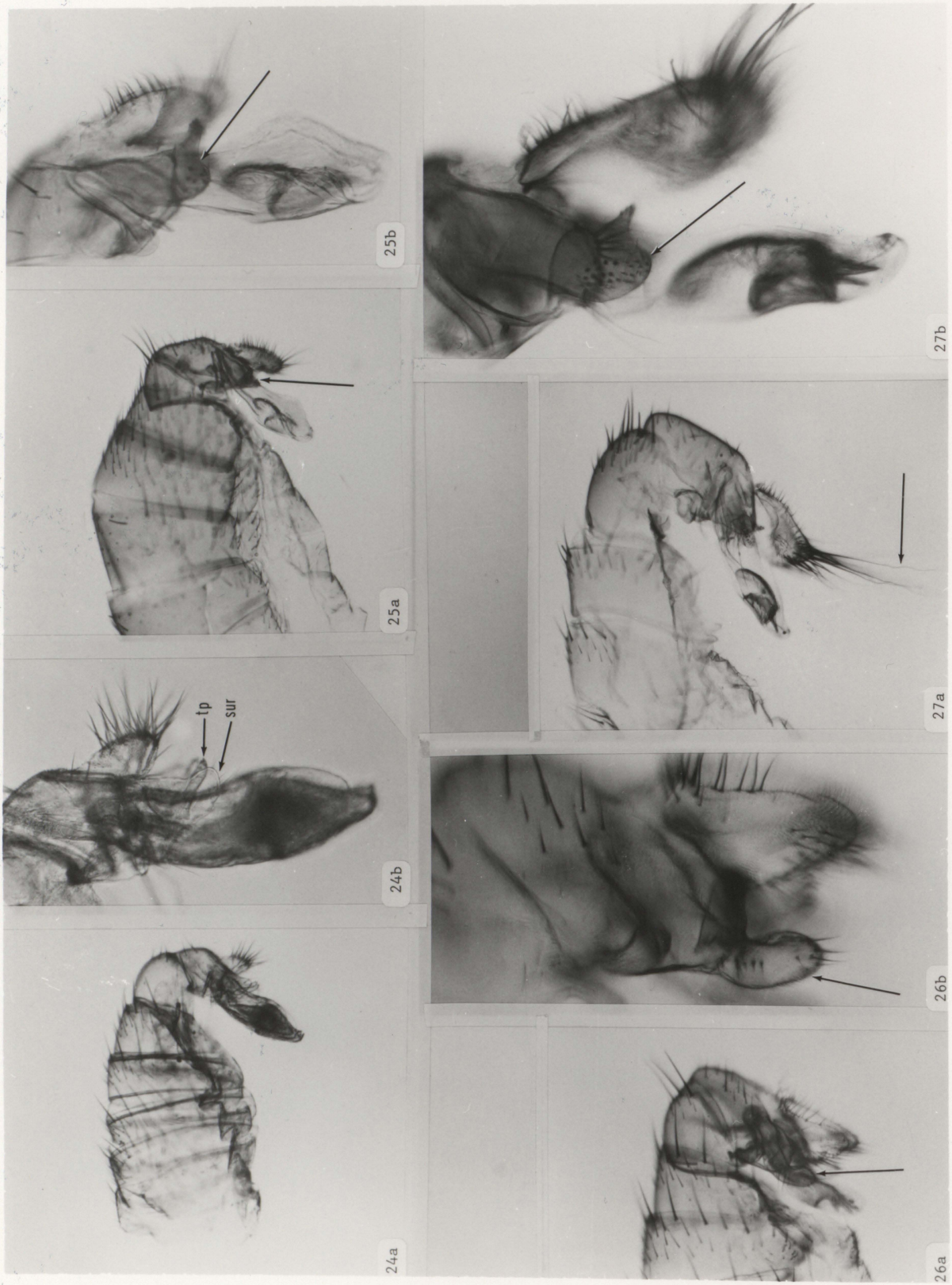

25b
25a
tp
sur
24b
24a
27b
27a
26b
26a

Plate IV. Male genitalia of subgenus Tarsohomoneura

Fig. 28a. H. houghii. (Lincoln, ME)

Fig. 28b. " Terminal process. (Lincoln, ME)

Fig. 29a. H. americana. (Guthrie Co., IA)

Fig. 29b. " Terminal process. (Berthierville, QUE)

Fig. 30a. H. disjuncta. (Ithaca, NY)

Fig. 30b. " Surstylus and terminal process. (Ithaca, NY)

Fig. 31a. H. johnsoni. (Simcoe, ONT)

Fig. 31b. " Terminal process. (Perrin Lake, MI)

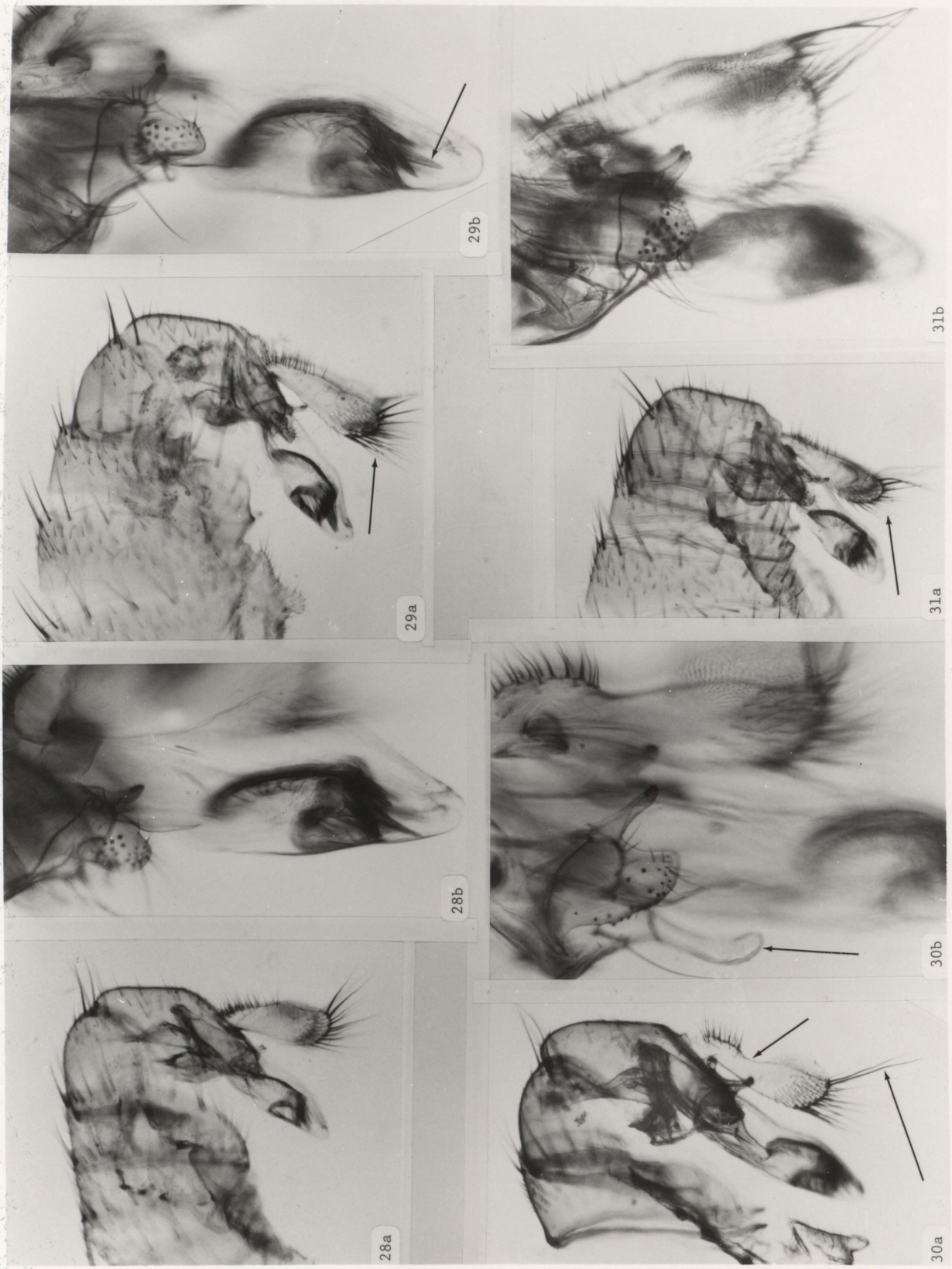

28a
28b
29a
29b
30a
30b
31a
31b

Plate V. Wing patterns of subgenera Mallochomyza and Tarsohomoneura

Fig. 32a. H. (M.) citreifrons? Female, left wing. (Black Moshannon, PA)

Fig. 32b. " Female, right wing. (Black Moshannon, PA)

Fig. 33. H. (T.) sheldoni. (Mer Bleu, ONT)

Fig. 34. H. (T.) houghii. (Laurel, MD)

Fig. 35. H. (T.) melanderi. (Wood Co., WI)

Fig. 36. H. (T.) houghii. (Suffolk Co., NY)

Fig. 37. H. (T.) ornatipes. (Park Reserve, ONT)

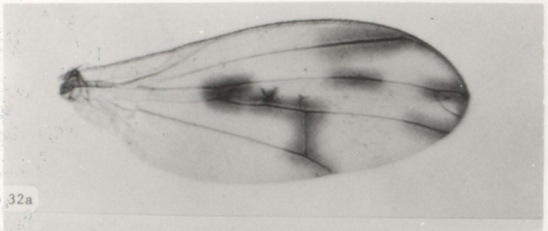
Fig. 38. H. (T.) houghii? (Del Norte Co., CA)

Fig. 39. H. (T.) americana. (Guthrie Co., IA)

Fig. 40. H. (T.) disjuncta. (Pittsburg, PA)

Fig. 41. H. (T.) johnsoni. (Brittania, ONT)

Fig. 42. H. (H.) conjuncta. (Oxford, OH)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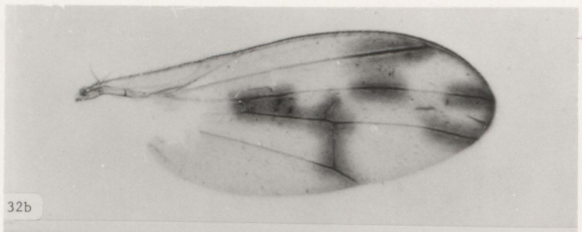
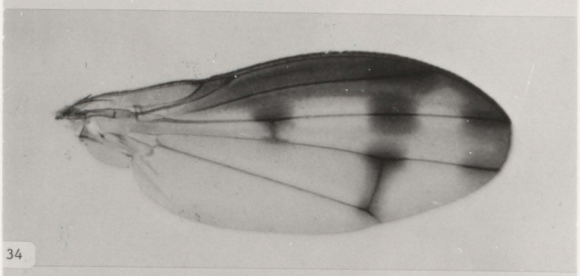

32b


33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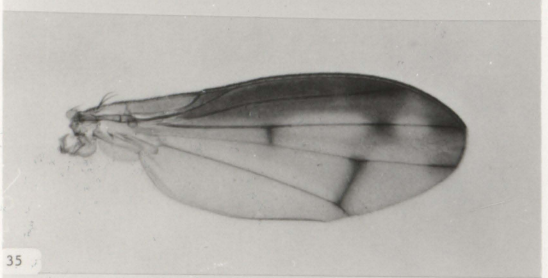
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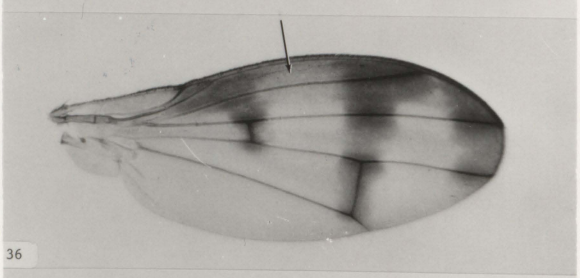
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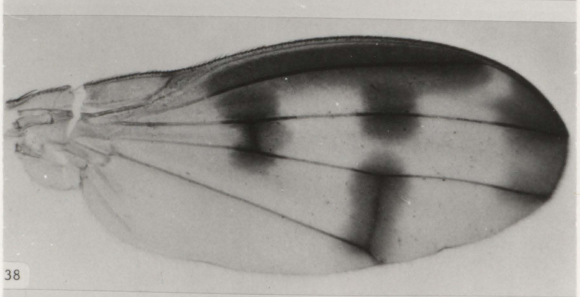
37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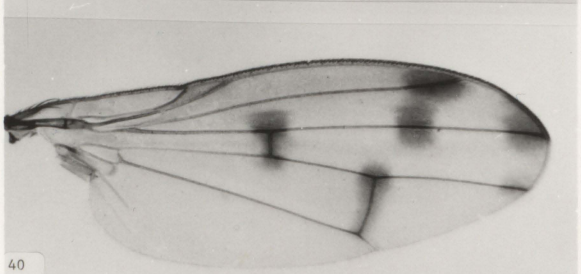
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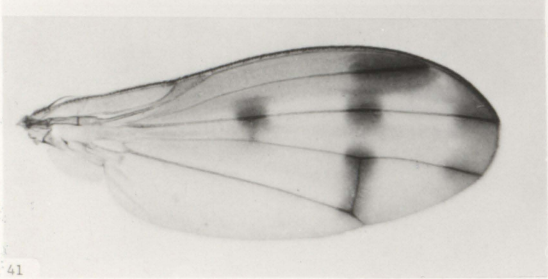
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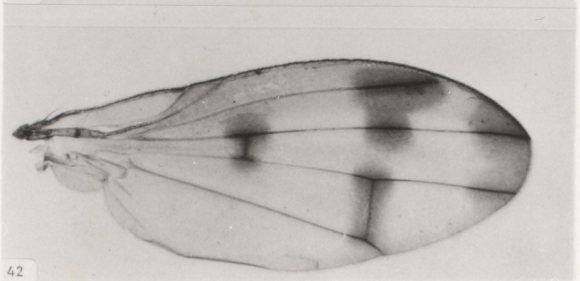

42

Plate VI. Wing patterns of subgenus Homoneura

Fig. 43. H. arizonensis. (Portal, AZ)

Fig. 44. H. lamellata. (Kananaskis, ALTA)

Fig. 45. H. occidentalis. (Warner Hot Springs, CA)

Fig. 46. H. birdi. (Boone Co., IA)

Fig. 47. H. occidentalis [nudifemur]. (Grande Ronde, OR)

Fig. 48. H. trochantera. (Tanbark Flat, CA)

Fig. 49. H. fuscibasis. (Boone Co., IA)

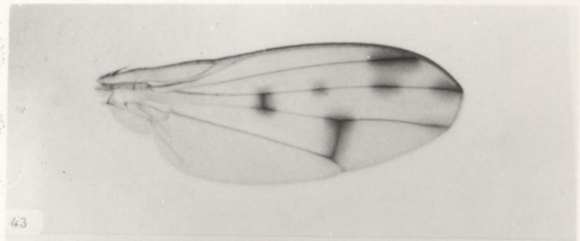
Fig. 50. H. crickettae. (Berks Co., PA)

Fig. 51. H. incerta. (Dover, OH)

Fig. 52. H. wheeleri. (State Bridge, CO)

Fig. 53. H. philadelphica. (Kent, OH)

Fig. 54. H. wheeleri? (Daniel, WY)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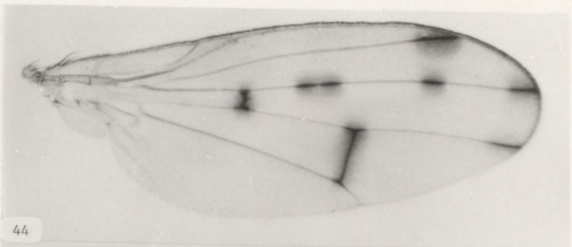
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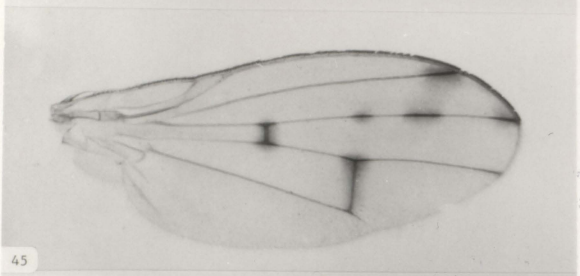
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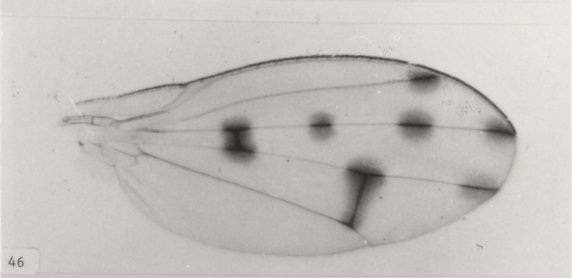
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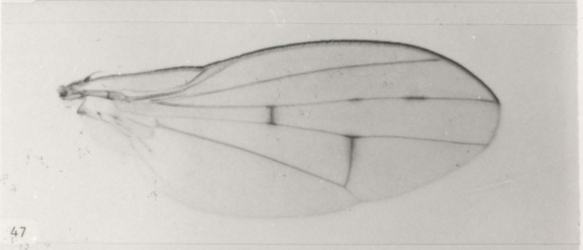
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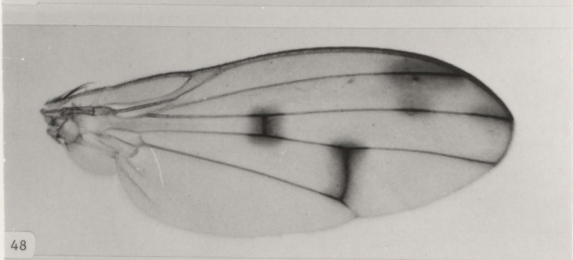
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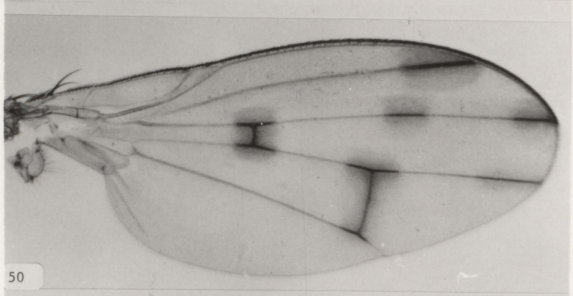
49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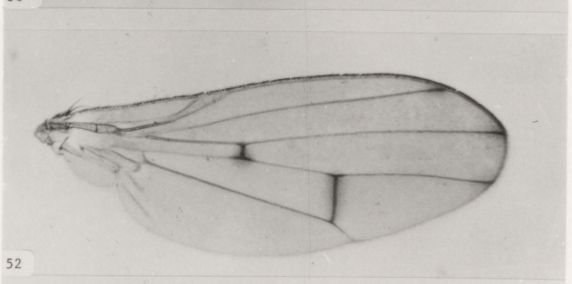
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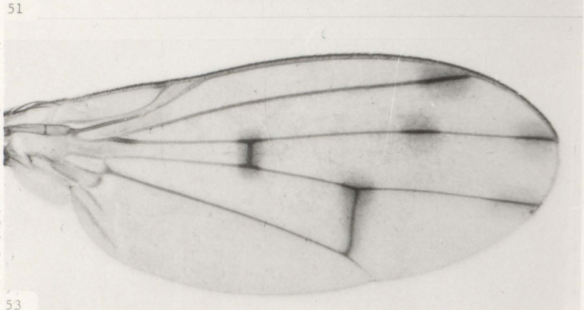
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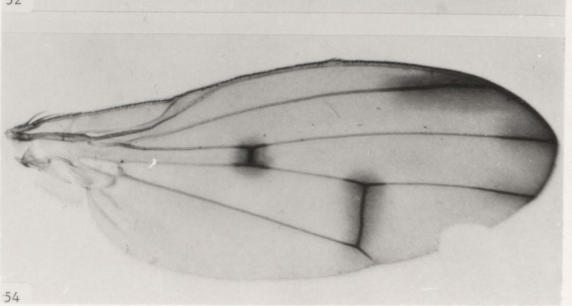

54

Plate VII. Wing patterns of subgenus Homoneura

Fig. 55. H. setula. (Cajon, CA)

Fig. 56. H. shewelli. (Vernon, BC)

Fig. 57. H. californica. (Dark Canyon, CA)

Fig. 58. H. aldrichi. (Boone Co. IA)

Fig. 59. H. bakeri. (Pasadena, CA)

Fig. 60. H. mallochi. (Guthrie Co., IA)

Fig. 61. H. curva. (Guthrie Co., IA)

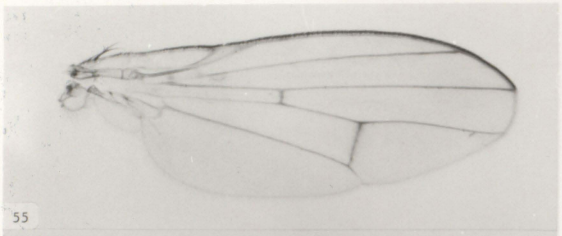
Fig. 62. H. bispina. (Jewell, IA)

Fig. 63. H. knowltoni. (Washington, UT)

Fig. 64. H. tenuispina [seticauda]. (Guthrie Co., IA)

Fig. 65. H. ocula. (Moab, UT)

Fig. 66. H. psammophila. (Juab Co., UT)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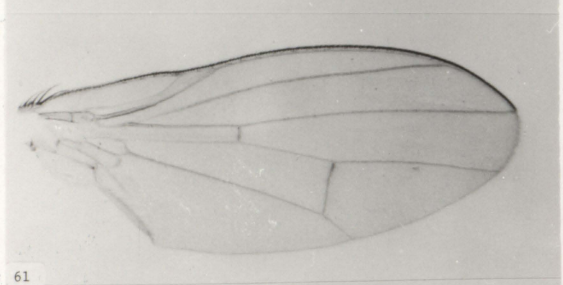
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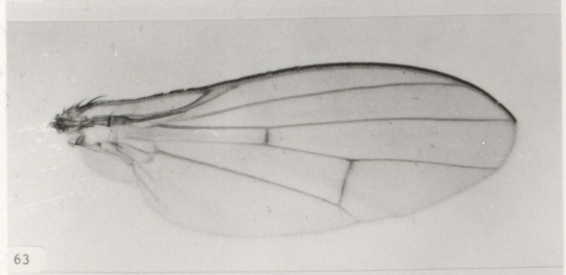
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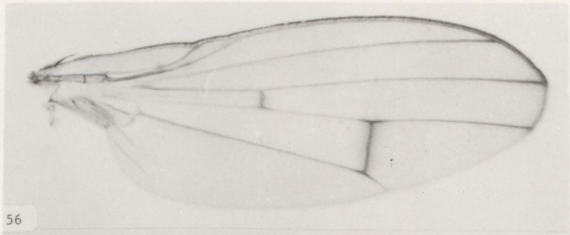
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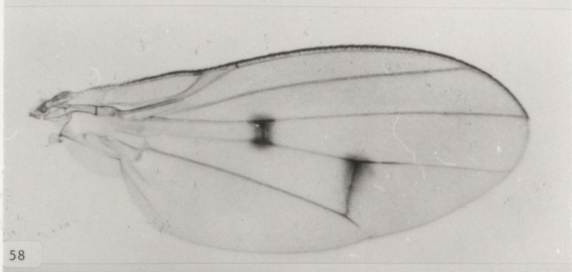
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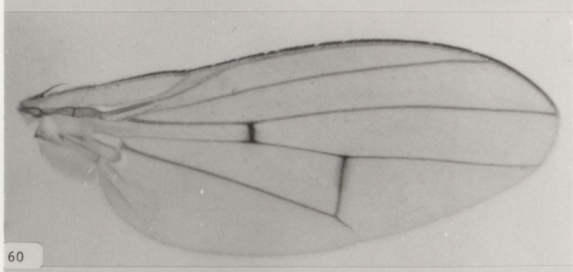
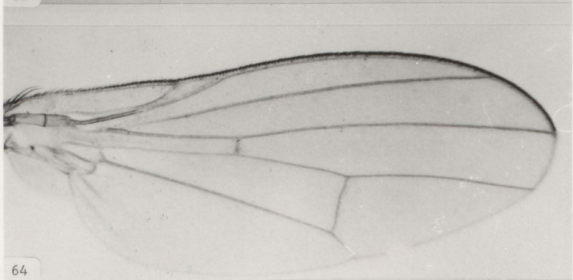

60


62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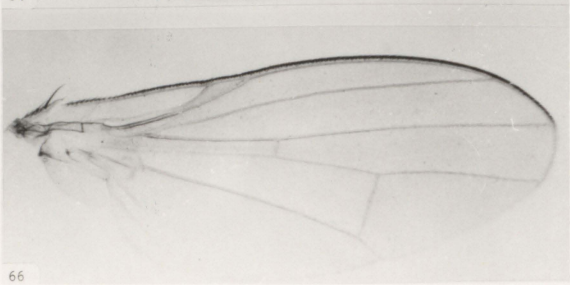
66

Plate VIII. Antennae and legs of subgenus Homoneura

Figs. 67-78. Antennae.

Figs. 79-88. Legs.

Fig. 67. H. littoralis. (Sable Is., NS)

Fig. 68. H. conjuncta. (Guthrie Co., IA)

Fig. 69. H. lamellata. (Kananaskis, ALTA)

Fig. 70. H. arizonensis. (Portal, AZ)

Fig. 71. H. aldrichi. (Boone Co., IA)

Fig. 72. H. incerta. (Sioux City, IA)

Fig. 73. H. inaequalis. (Guthrie Co., IA)

Fig. 74. H. ocula. (San Juan Co., UT)

Fig. 75. H. psammophila. (Juab Co., UT)

Fig. 76. H. birdi. (Shilo, MAN)

Fig. 77. H. setula. (Colfax, CA)

Fig. 78. H. unguiculata. (Coral Gables, FL)

Fig. 79. H. trochantera. L1. (Tanbark Flat, CA)

Fig. 80. H. philadelphica. L1. (Kent, OH)

Fig. 81. H. ocula. TS2, ventral view. (Fredonia, AZ)

Fig. 82. H. psammophila. TS2, ventral view. (Juab Co., UT)

Fig. 83. H. littoralis. L3. (Barnstable Co., MA)

Fig. 84. H. setula. L3. (Cajon, CA)

Fig. 85. H. occidentalis. L3. (Berkeley, CA)

Fig. 86. H. trochantera. L3. (Tanbark Flat, CA)

Fig. 87. H. imitatrix. L3. (College Station, TX)

Fig. 88. H. fratercula. L3. (Castle Rock, CO)

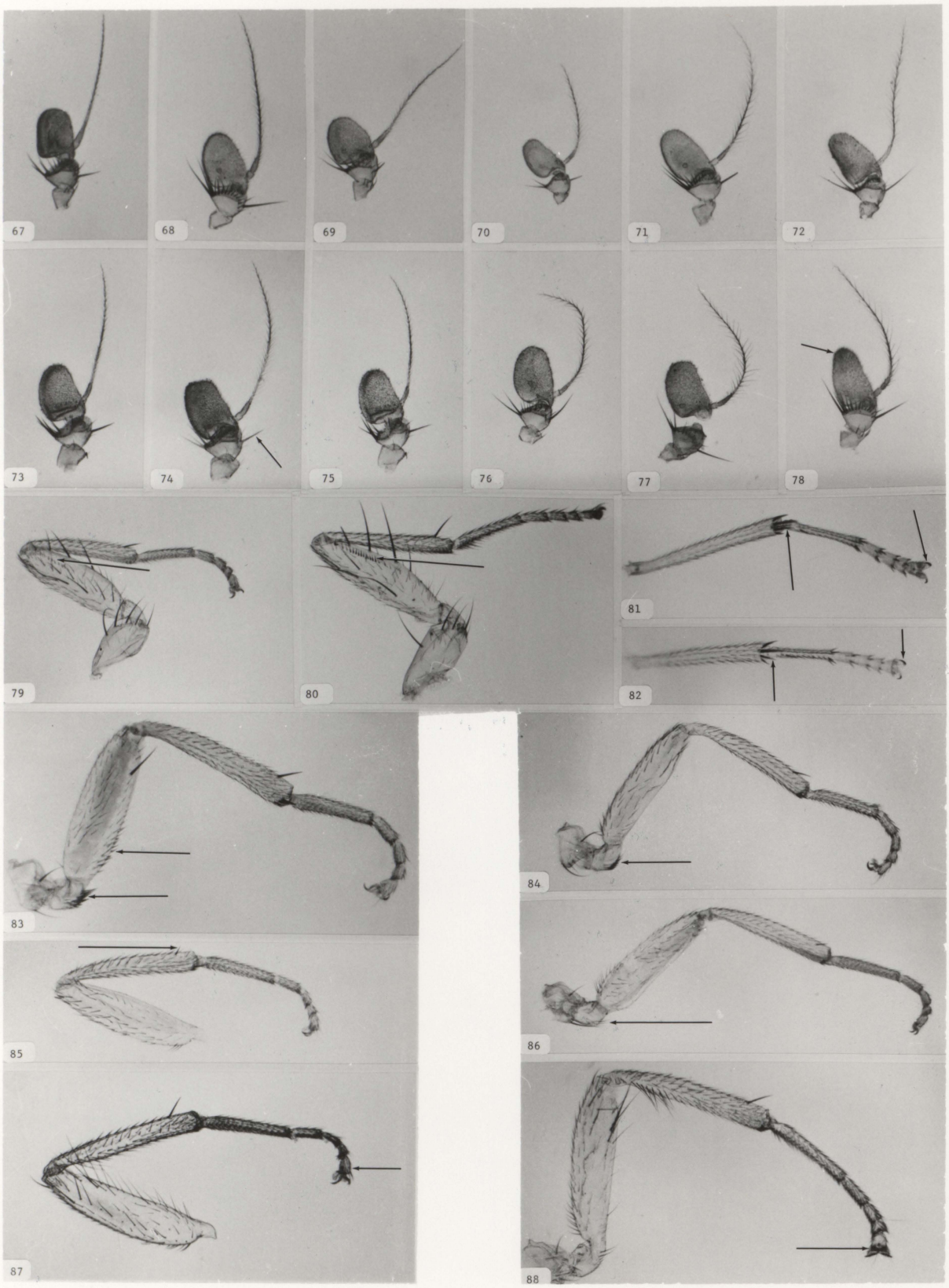
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Plate IX. Male genitalia of *fraterna* group

Fig. 89a. *H.* (*H.*) *fraterna*. (Sioux City, IA)

Fig. 89b. " Surstylus and terminal process. (Chariton, IA)

Fig. 90a. *H.* (*H.*) *birdi*. (Brittle, MAN)

Fig. 90b. " Surstylus and terminal process. (North Branch, MAN)

Fig. 90c. " Terminal process. (Boone Co., IA)

Fig. 91a. *H.* (*H.*) *pernotata*. (Kent, OH)

Fig. 91b. " Surstylus and terminal process. (Kent, OH)

Fig. 91c. " Aedeagus, ventral view. (Kent, OH)

Fig. 92. " Female, dorsal view. (Kent, OH)

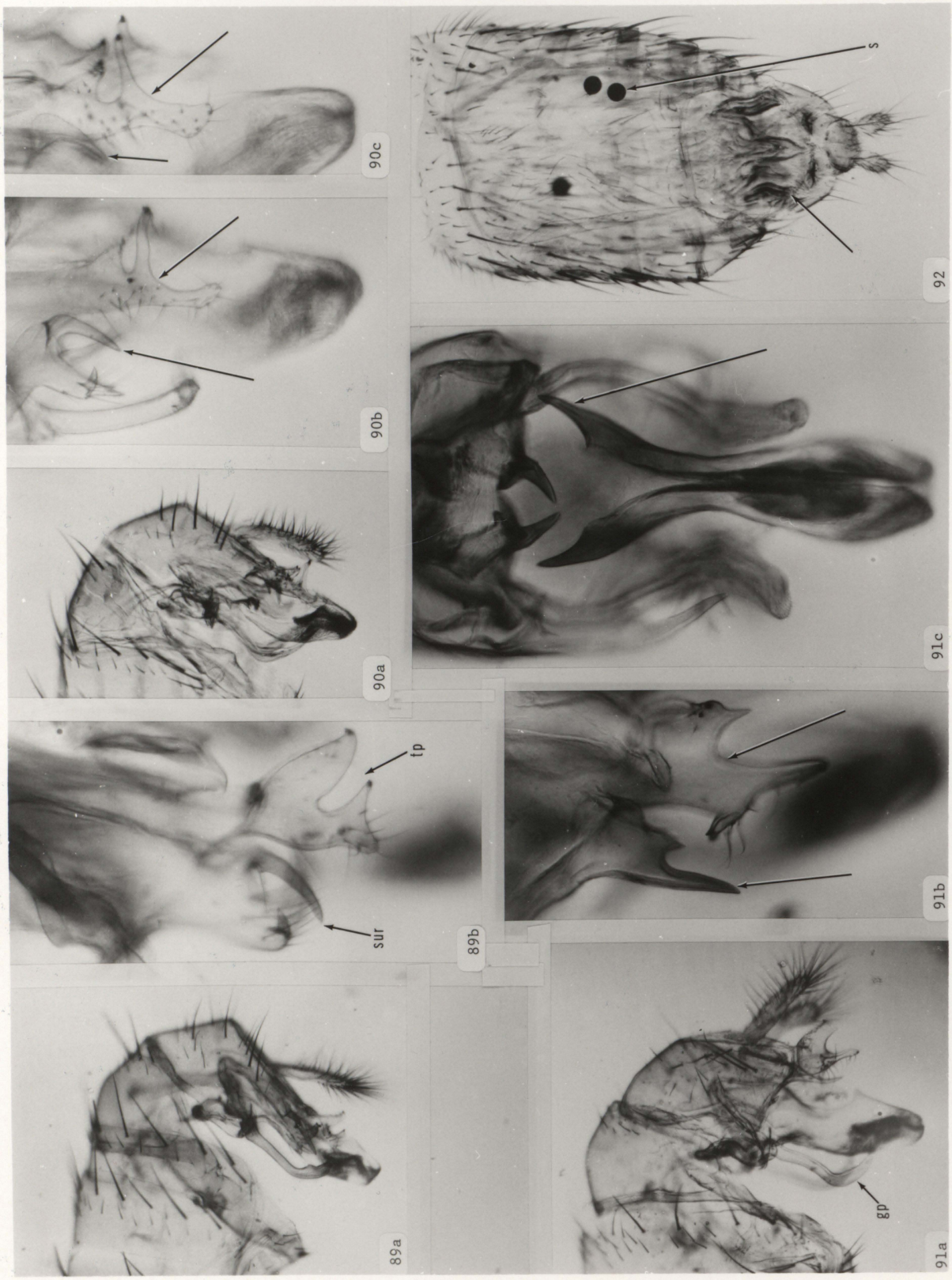

89a
89b
90a
90b
90c
91a
91b
91c
92
sur
fp
gp
s

Plate X. Male genitalia of *occidentalis* group, et al.

Fig. 93a. *H.* (*H.*) *lamellata*. (Roberval, QUE)

Fig. 93b. " Terminal process. (Roberval, QUE)

Fig. 93c. " Male, ventral view. (Roberval, QUE)

Fig. 93d. " Posterolateral S5 process, ventral view. (Roberval, QUE)

Fig. 94a. *H.* (*H.*) *occidentalis*. (San Diego Co., CA)

Fig. 94b. " Posterolateral S5 process and surstylus. (Corvallis, OR)

Fig. 95a. *H.* (*H.*) *arizonensis*. (Blanding, UT)

Fig. 95b. " Posterolateral S5 process and surstylus. (Portal, AZ)

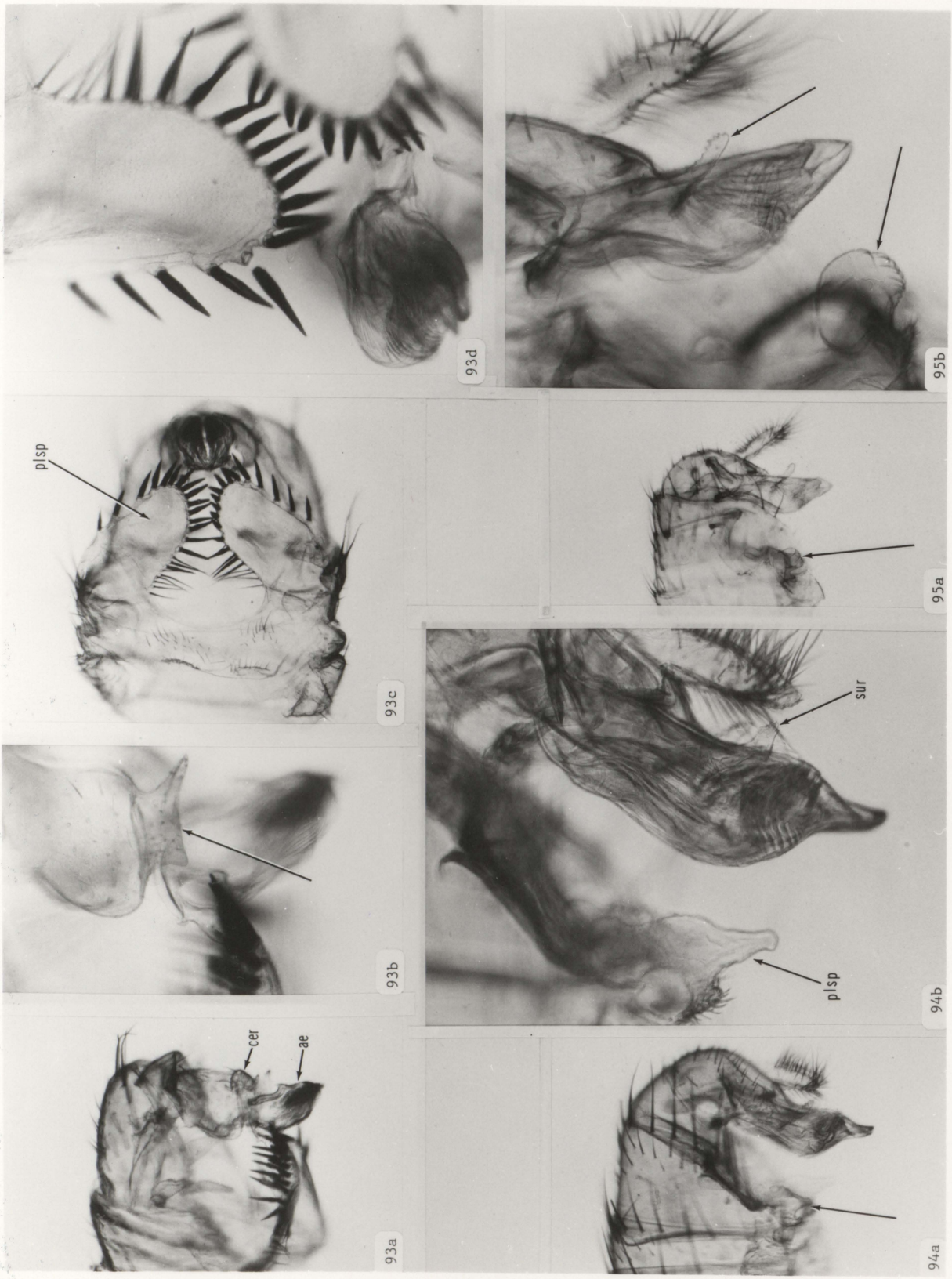

cer
ae
93a
93b
plsp
93c
93d
95b
95a
sur
plsp
94b
94a

Plate XI. Male genitalia of *incerta* group, et al.

Fig. 96a. *H.* (*H.*) *philadelphica*. (Colfax Co., VA)

Fig. 96b. " Gonopod, surstylus and terminal process. (Colfax Co., VA)

Fig. 97a. *H.* (*H.*) *incerta*. (Fulton Co., PA)

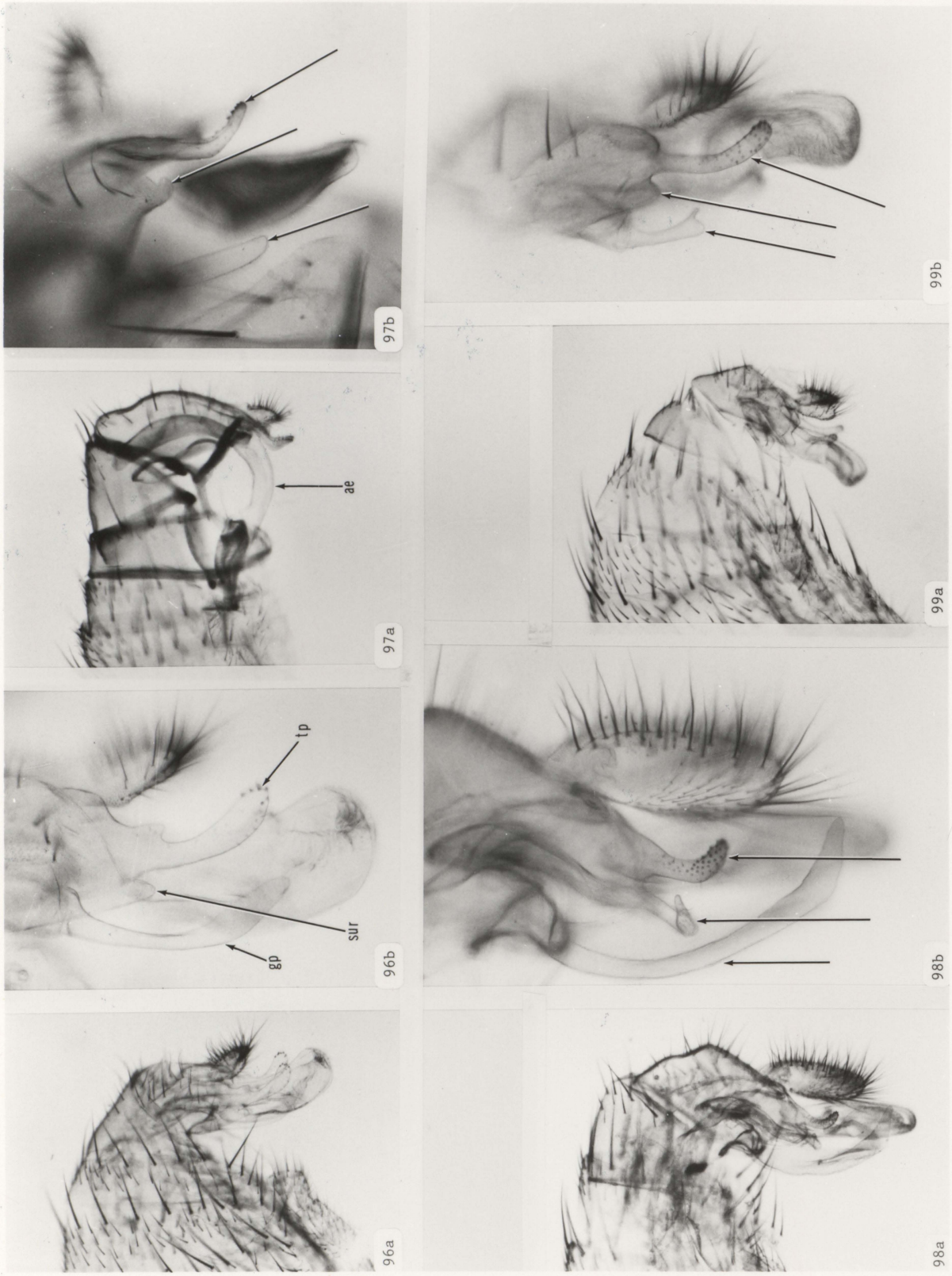
Fig. 97b. " Gonopod, surstylus and terminal process. (Ottawa, ONT)

Fig. 98a. *H.* (*H.*) *fuscibasis*. (Chariton, IA)

Fig. 98b. " Gonopod, surstylus and terminal process. (Chariton, IA)

Fig. 99a. *H.* (*H.*) *crickettae*. (Berks Co., PA)

Fig. 99b. " Gonopod, surstylus and terminal process. (locality unknown)



97b 97a 96b 96a 99b 99a 98b 98a

Plate XII. Male genitalia of nubila group, et al.

Fig. 100a. H. (H.) conjuncta. (Oxford, OH)

Fig. 100b. " Terminal process. (Woolwine, VA)

Fig. 101a. H. (H.) nubila. (Jennings, KS)

Fig. 101b. " Surstylus and terminal process. (Hershey, NE)

Fig. 102a. H. (H.) nubilifera. (Sioux City, IA)

Fig. 102b. " Surstylus and terminal process. (Sioux City, IA)

Fig. 103a. H. (H.) aldrichi. (Lafayette, IN)

Fig. 103b. " Surstylus and terminal process. (Lafayette, IN)

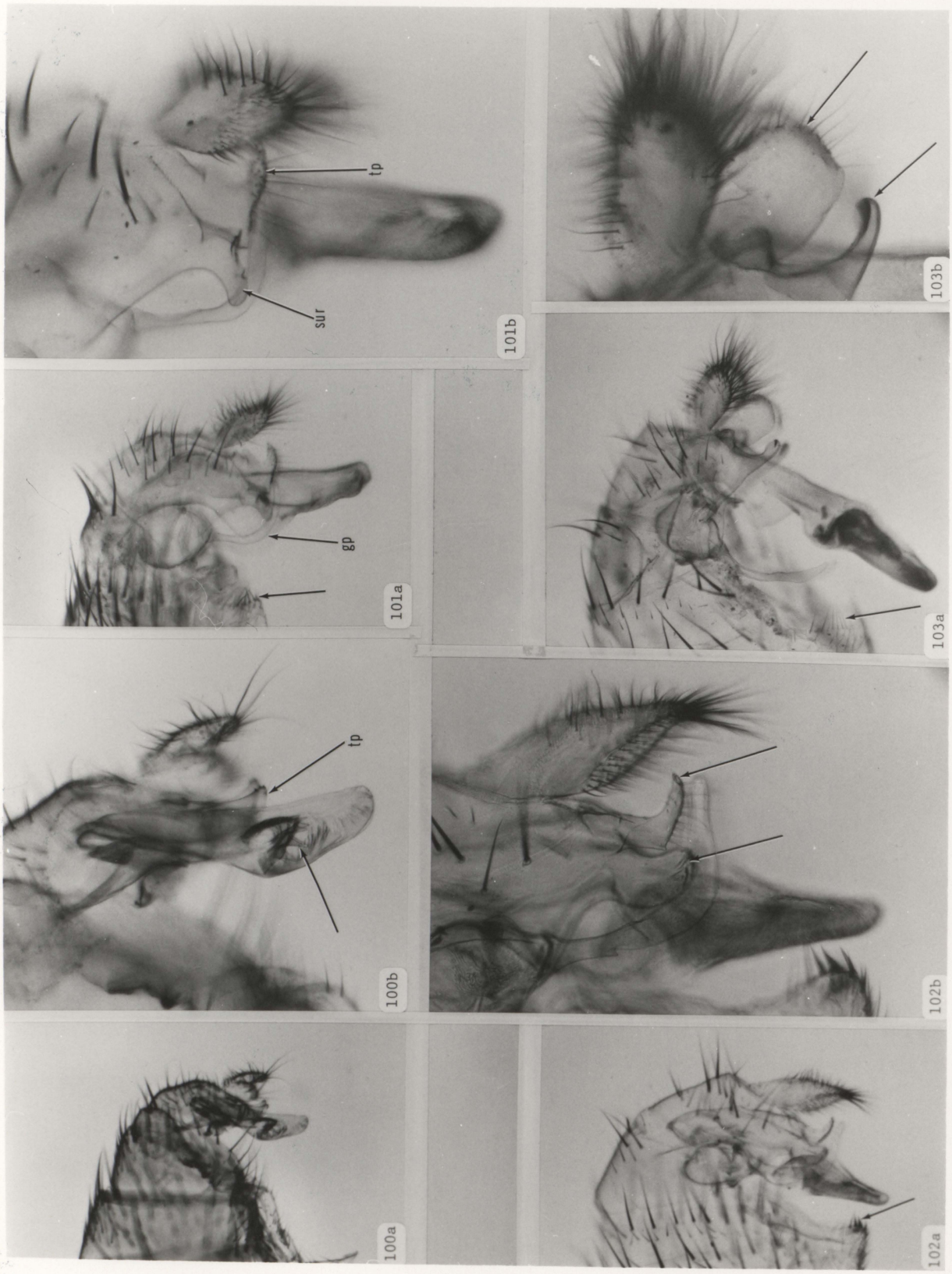

tp
sur
101b
gp
101a
tp
100b
103b
103a
102b
100a
102a

Plate XIII. Male genitalia of ungrouped species

Fig. 104a. H. (H.) unguiculata. (Highlands, FL)

Fig. 104b. " Surstylus. (Coral Gables, FL)

Fig. 105a. H. (H.) littoralis. (Meredosia, IL)

Fig. 105b. " Posterolateral S5 process and surstylus. (Meredosia, IL)

Fig. 106. " Female. (Barnstable, MA)

Fig. 107a. H. (H.) inaequalis. (Guthrie Co., IA)

Fig. 107b. " Posterolateral S5 process and surstylus. (Winner, SD)

Fig. 108a. H. (H.) bakeri. (Laguna Beach, CA)

Fig. 108b. " Posterolateral S5 process and surstylus. (Laguna Beach, CA)

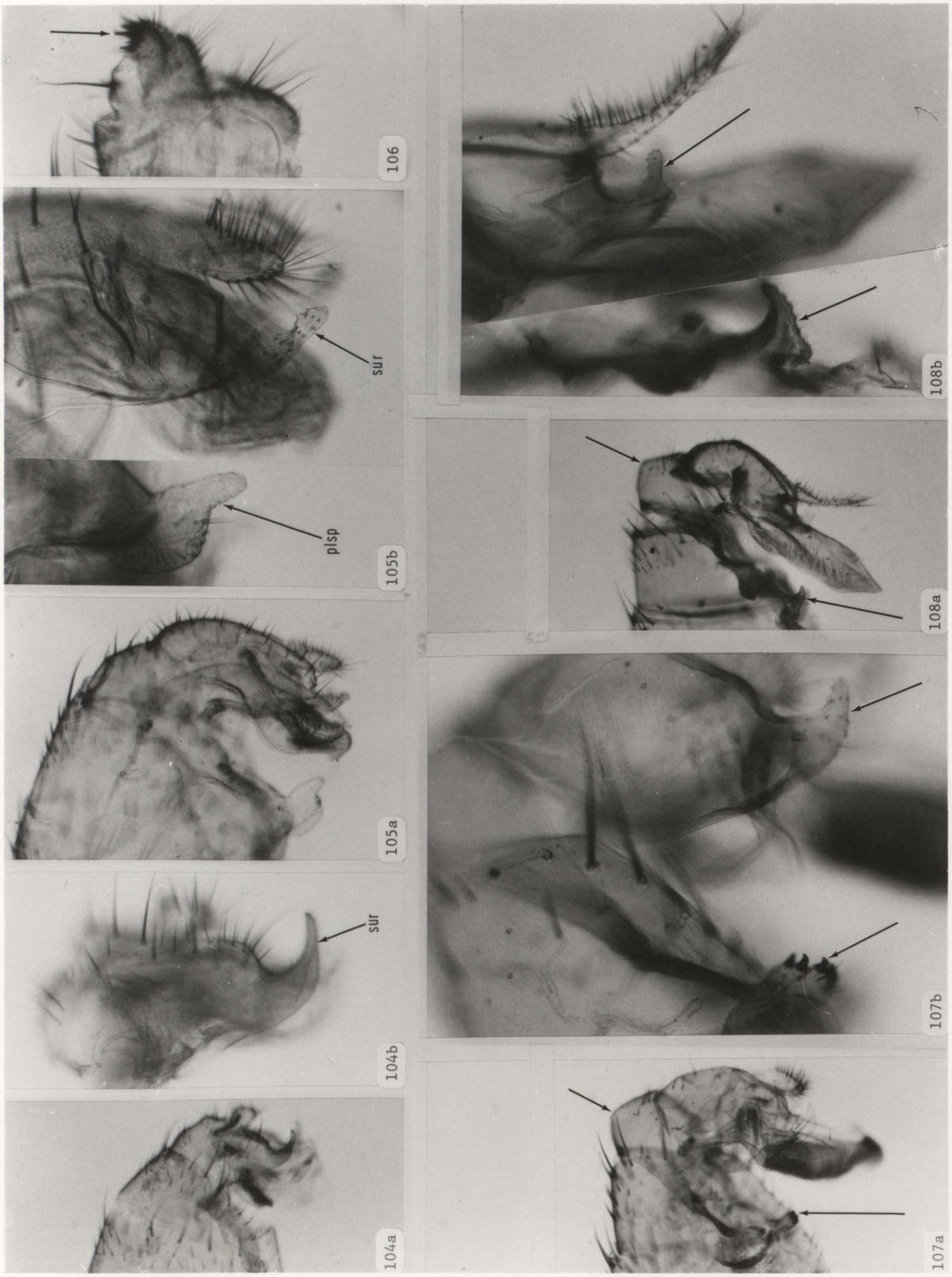

104a
104b
sur
105a
105b
plsp
sur
106
107a
107b
108a
108b

Plate XIV. Male genitalia of *trochantera* group, et al.

Fig. 109a. *H.* (*H.*) *trochantera*. (Tanbark Flat, CA)

Fig. 109b. " Posterolateral S5 process and surstylus. (Tanbark Flat, CA)

Fig. 110a. *H.* (*H.*) *californica*. (Forest Home, CA)

Fig. 110b. " Posterolateral S5 process and surstylus. (Forest Home, CA)

Fig. 111a. *H.* (*H.*) *setula*. (Cajon, CA)

Fig. 111b. " Posterolateral S5 process, gonopod, and surstylus. (Cajon, CA)

Fig. 112a. *H.* (*H.*) *cilifera*. (Danvers, IL)

Fig. 112b. " Posterolateral S5 process, gonopod, and surstylus. (Danvers, IL)

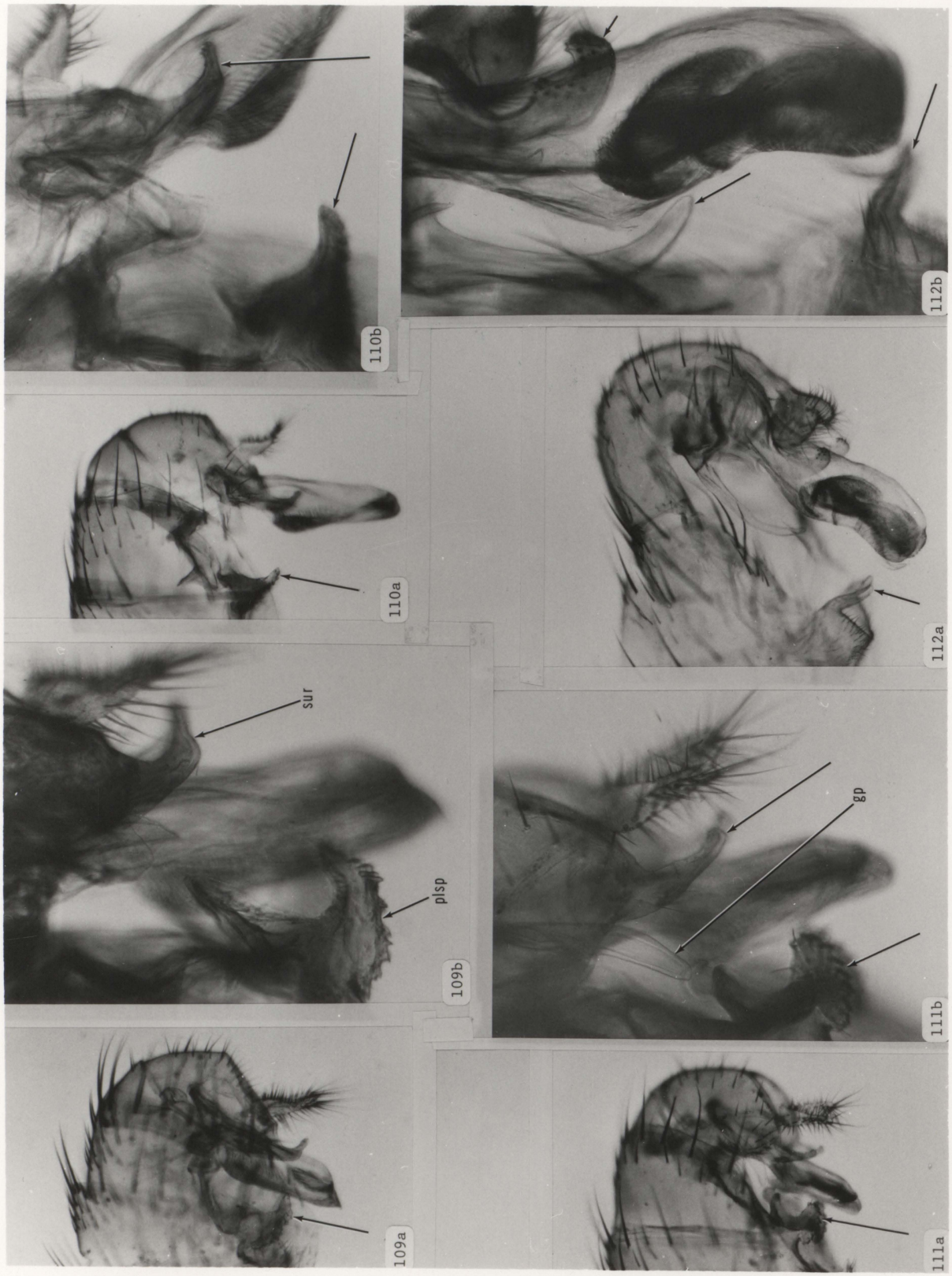

109a
sur
plsp
109b
110a
110b
111a
gp
111b
112a
112b

Plate XV. Male genitalia of setitibia group

Fig. 113a. H. (H.) setitibia. (Hamilton Co., KS)

Fig. 113b. " Posterolateral S5 process and surstylus. (Hamilton Co., KS)

Fig. 114a. H. (H.) utahensis. (Washington Co., UT)

Fig. 114b. " Posterolateral S5 process and surstylus. (Washington Co., UT)

Fig. 115a. H. (H.) knowltoni. (Moab, UT)

Fig. 115b. " Posterolateral S5 process and surstylus. (Ft. Davis, TX)

Fig. 116a. H. (H.) shewelli. (Vernon, BC)

Fig. 116b. " Posterolateral S5 process and surstylus. (Vernon, BC)


113a
sur
plsp
113b
114a
114b
115a
115b
116a
116b

Plate XVI. Male genitalia of bispina group, et al.

Fig. 117a. H. (H.) tenuispina. (Ames, IA)

Fig. 117b. " Posterolateral S5 process, ventral view. (Flint, OK)

Fig. 117c. " Gonopod, gonopod process and terminal process. (Ames, IA)

Fig. 118. " Cerci, female, ventral view. (Jewell, IA)

Fig. 119a. H. (H.) imitatrix. (Pettigrew St. Pk., NC)

Fig. 119b. " Posterolateral S5 process, ventral view. (Clementon, NJ)

Fig. 119c. " Gonopod, gonopod process, surstylus and terminal process. (Howard Co., AR)

Fig. 120a. H. (H.) mallochi. (Guthrie Co.)

Fig. 120b. " Posterolateral S5 process, ventral view. (Guthrie Co., IA)

Fig. 120c. " Gonopod, gonopod process and terminal process. (Guthrie Co., IA)

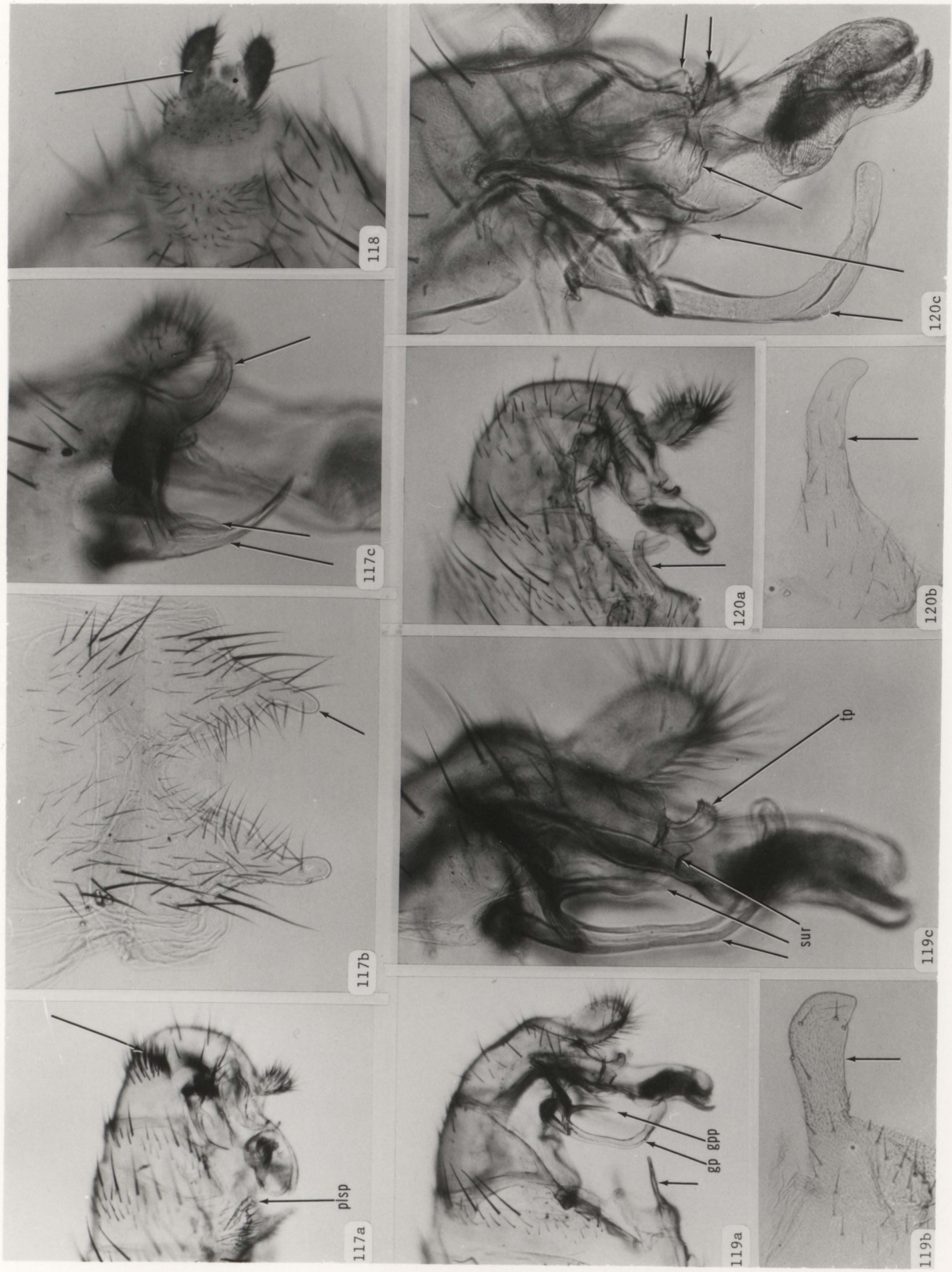

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Plate XVII. Male genitalia of *bispina* group

Fig. 121a. *H.* (*H.*) *truncata*. (Ono, PA)

Fig. 121b. " Posterolateral S5 process, ventral view. (Lake Junaluska, NC)

Fig. 121c. " Gonopod process and terminal process. (Lake Junaluska, NC)

Fig. 122a. *H.* (*H.*) *fratercula*. (Castle Rock, CO)

Fig. 122b. " Posterolateral S5 process, ventral view. (Castle Rock, CO)

Fig. 122c. " Gonopod process and terminal process. (Castle Rock, CO)

Fig. 123a. *H.* (*H.*) *bispina*. (Jewell, IA)

Fig. 123b. " Posterolateral S5 process, ventral view. (Treesbank, MAN)

Fig. 123c. " Gonopod process and terminal process. (Guthrie Co., IA)

Fig. 124. " Cerci, female, ventral view. (Nevada, IA)

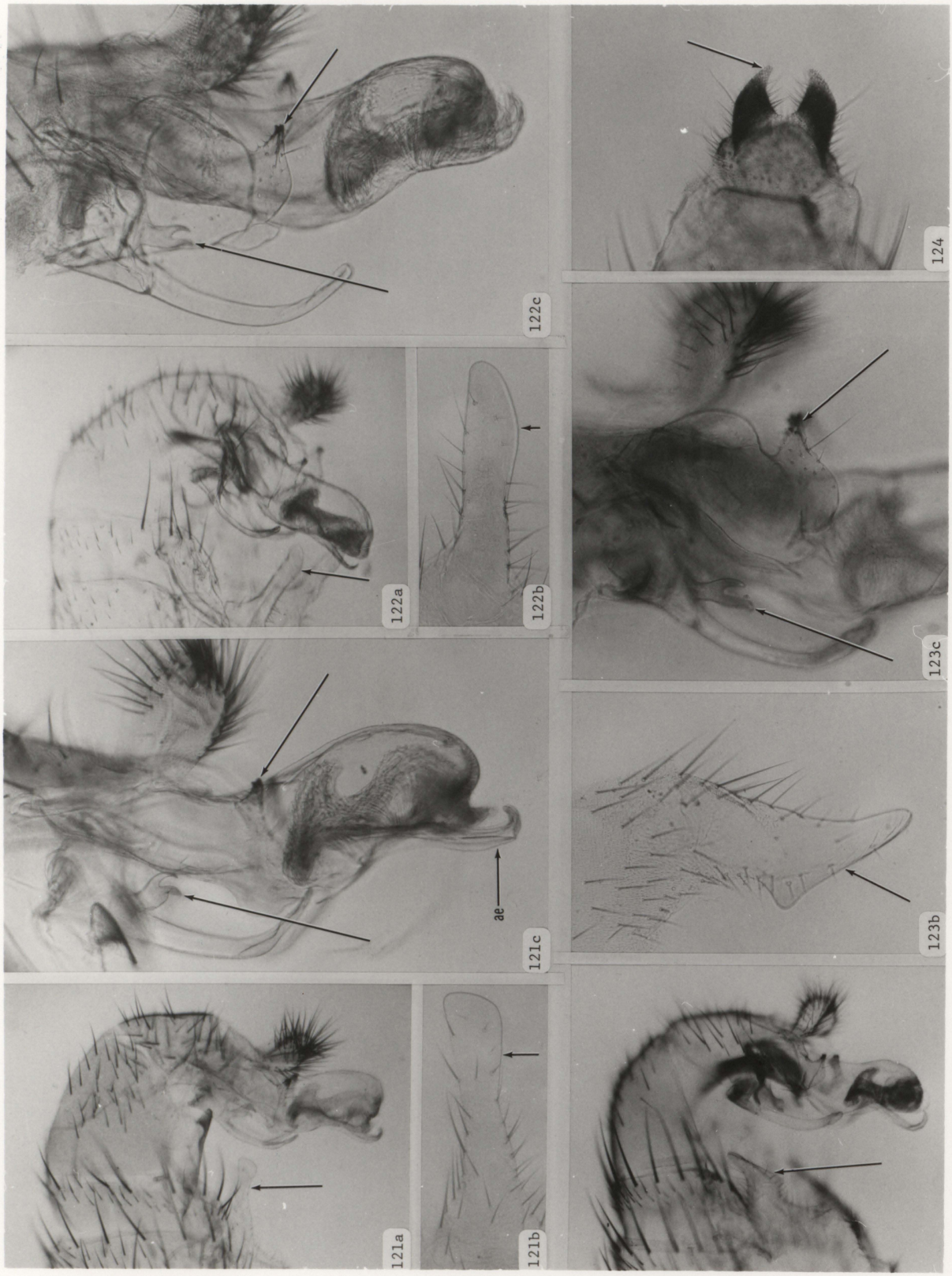
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Plate XVIII. Male genitalia of aequalis group

Fig. 125a. H. (H.) aequalis. Gonopod process and terminal process. (Ucross, WY)

Fig. 125b. " Gonopod process and terminal process, posterior view. (Ucross, WY)

Fig. 126a. H. (H.) wheeleri. Gonopod process and terminal process. (Slide Lake, WY)

Fig. 126b. " Gonopod process and terminal process, posterior view. (Slide Lake, WY)

Fig. 127a. H. (H.) curva. Gonopod process and terminal process. (Guthrie Co., IA)

Fig. 127b. " Gonopod process and terminal process, posterior view. (Guthrie Co., IA)

Fig. 128a. H. (H.) clavata. Gonopod process and terminal process. (Ottawa, ONT)

Fig. 128b. " Gonopod process and terminal process, posterior view. (Ottawa, ONT)

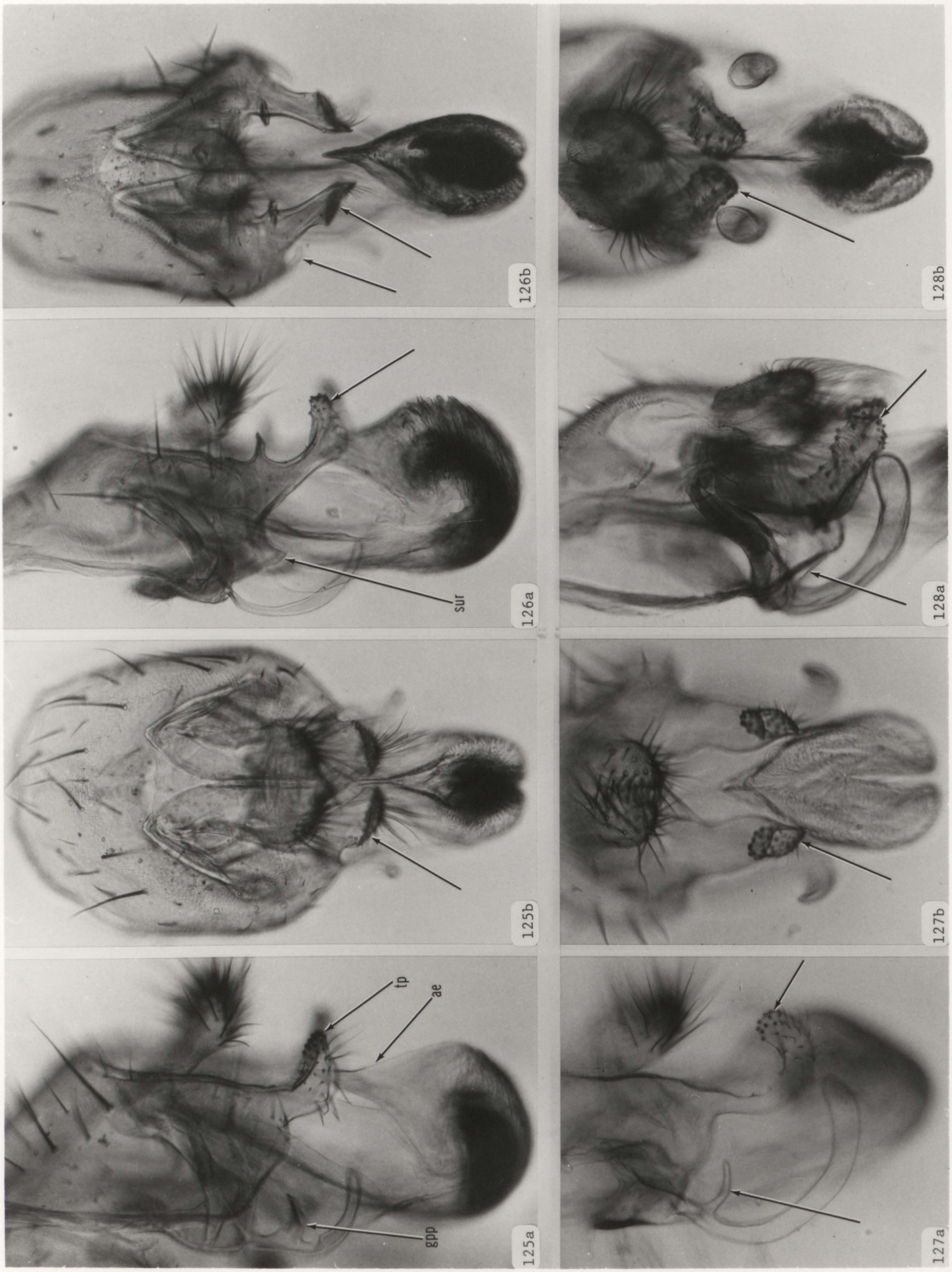
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Plate XIX. Male genitalia of *aequalis* group

Fig. 129a. *H.* (*H.*) *media*. (Duchesne Co., UT)

Fig. 129b. " Gonopod process and terminal process. (Elk Point, SD)

Fig. 129c. " Terminal process, posterior view. (Elk Point, SD)

Fig. 130. " Sternite 8 and cerci, female, ventral view. (Duchesne Co., UT)

Fig. 131a. *H.* (*H.*) *severini*. Gonopod process, surstylus and terminal process. (nr. Calgary, ALTA)

Fig. 131b. " Surstylus and terminal process, posterior view. (nr. Calgary, ALTA)

Fig. 132a. *H.* (*H.*) *flabella*. Gonopod process, surstylus and terminal process. (Pincher, ALTA)

Fig. 132b. " Surstylus and terminal process, posterior view. (Pincher, ALTA)

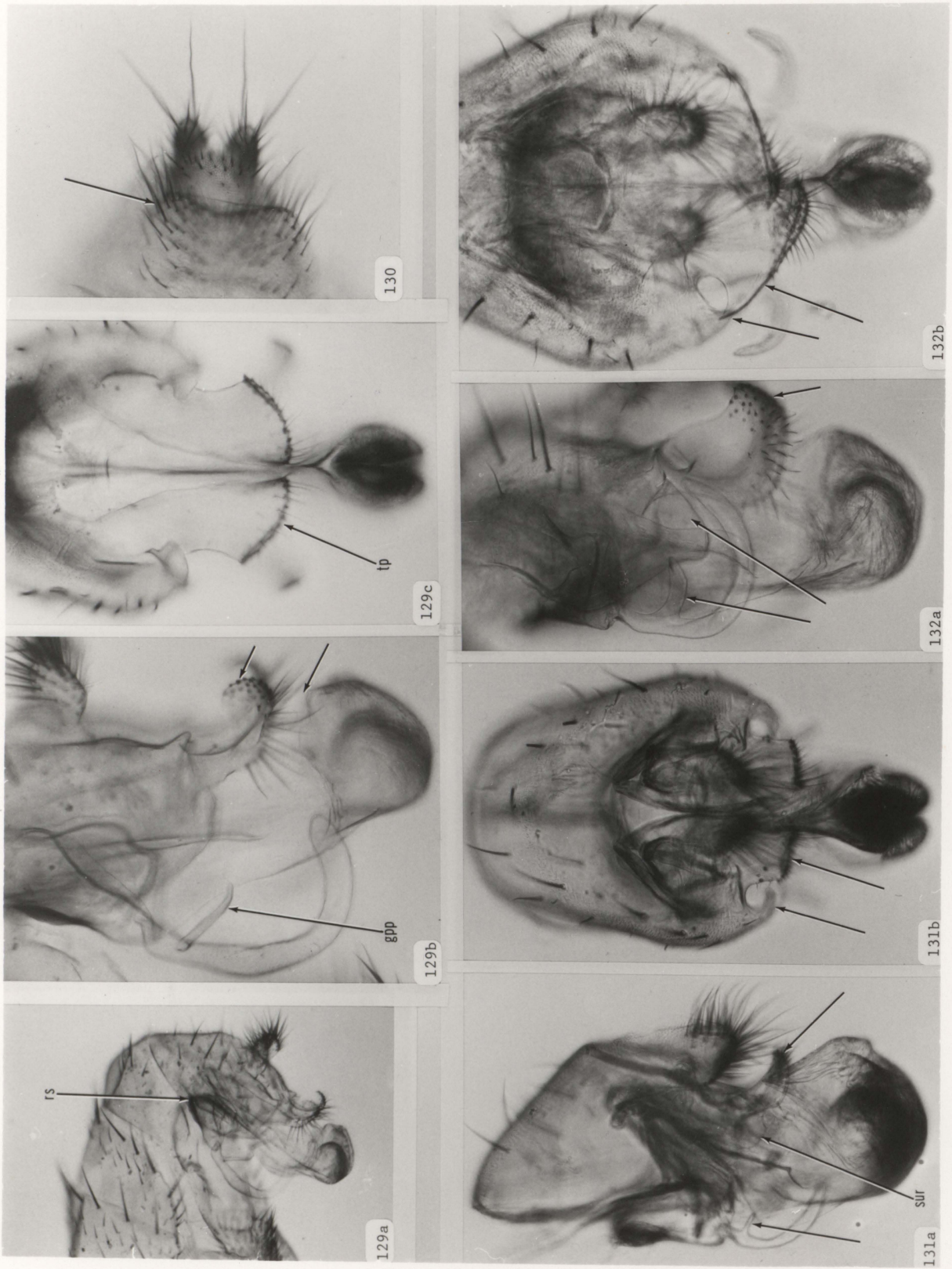
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Plate XX. Male genitalia of *harti* group

Fig. 133a. *H.* (*H.*) *ocula*. (Moab, UT)

Fig. 133b. " Posterolateral S5 process and surstylus. (Fredonia, AZ)

Fig. 134a. *H.* (*H.*) *psammophila*. (Lincoln Co., ID)

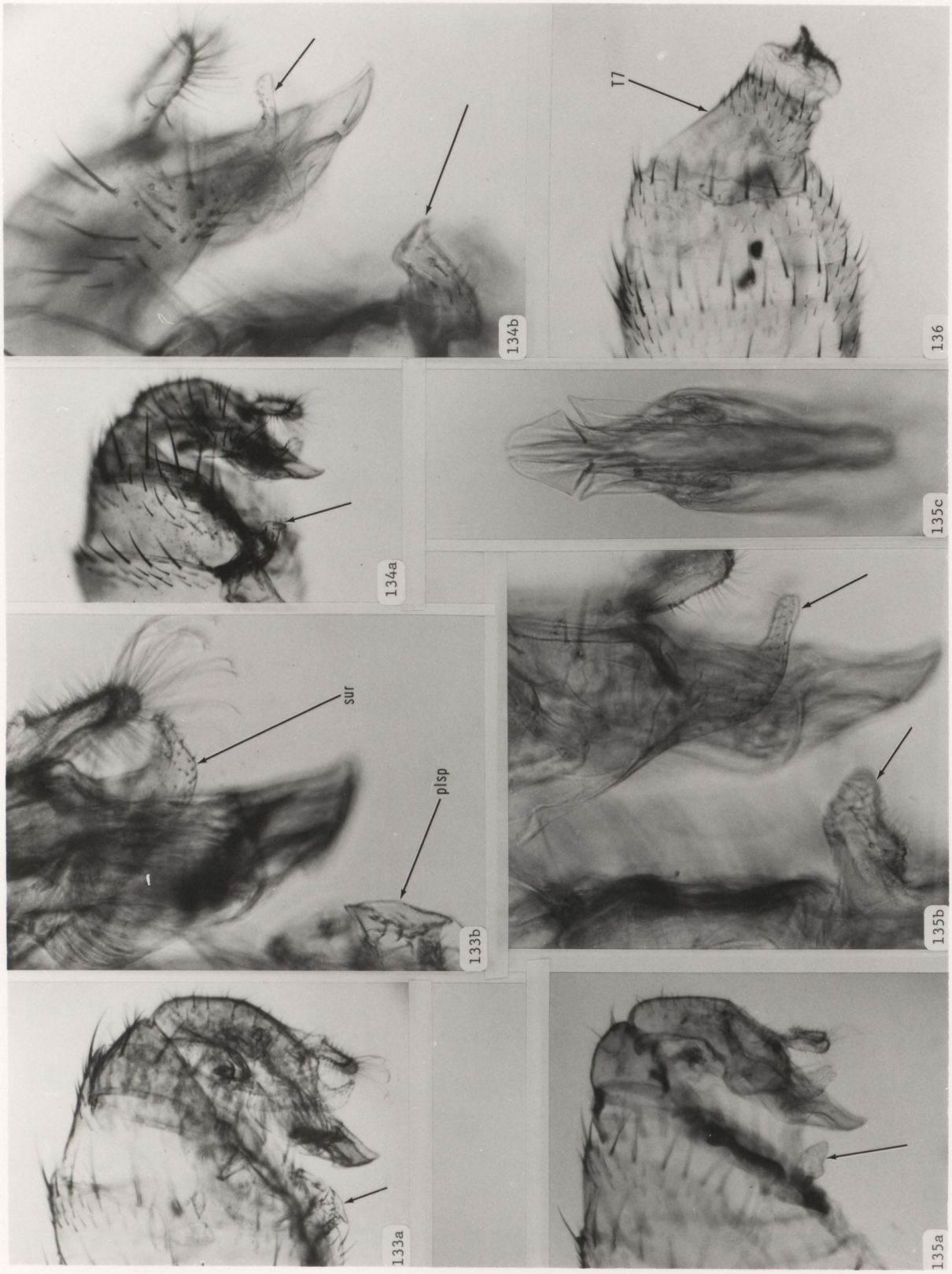
Fig. 134b. " Posterolateral S5 process and surstylus. (Juab Co., UT)

Fig. 135a. *H.* (*H.*) *harti*. (Castle Rock, CO)

Fig. 135b. " Posterolateral S5 process and surstylus. (Meredosia, IL)

Fig. 135c. " Aedeagus, ventral view. (Castle Rock, CO)

Fig. 136. " Female. (Castle Rock, CO)


134b
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