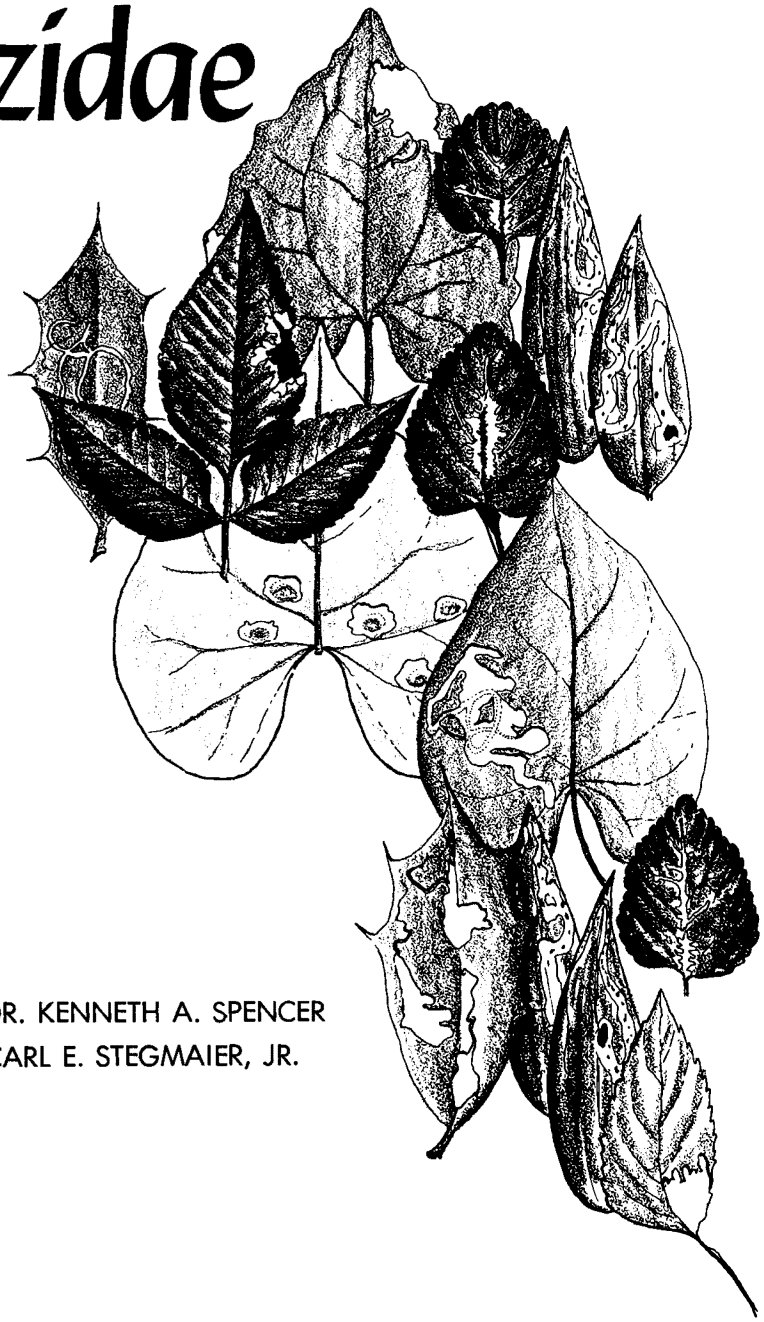
ARTHROPODS OF FLORIDA

AND NEIGHBORING LAND AREAS

VOLUME 7

Agromyzidae of Florida

With a Supplement on Species from the Caribbean



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FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

DOYLE CONNER, COMMISSIONER

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FOREWORD

The family Agromyzidae consists of small to minute flies whose larvae are stem, seed, and leaf miners of a wide assortment of plants. Some species may cause moderate to serious damage to plants of economic importance. In Florida leaf mining agromyzids have caused substantial economic loss in commercial fields of tomatoes and corn. Commercial plantings of melons, beans, and chrysanthemums in southern Florida may be significantly damaged by agromyzid leaf miners in some years. Many other crop plants, ornamentals and flowering annuals are damaged to a lesser extent in Florida. An ornamental plant widely used in landscaping, *Ilex vomitoria,* frequently is made so unsightly by agromyzid leaf miners as to be virtually unsaleable. The authors of this bulletin have stated that at least 150 species of Agromyzidae are known to feed on plants of economic importance.

Experimental work done over many years at Florida agricultural experiment stations to develop effective controls for agromyzid miners on various crops yielded erratic, inconsistent data which were puzzling to the investigators. The taxonomic, ecological, and life history studies over the past several years by Spencer and Stegmaier have provided an explanation for experimental and applied control studies which had produced confusing results. Their studies have shown that often what had been thought to be a single species attacking a wide variety of host plants actually was a complex of several species, some of which are highly specific to a particular group of plants. In some instances the species attacking a host plant in one part of Florida proved to be different from the species attacking the same host in another part of the state, and controls effective on one might prove to be ineffective against the other. The authors have noted that "Sudden mass outbreaks of leaf-mining activity by relatively unknown species may occur at any time on plants which have not been known to suffer substantial damage . . . their potential to cause serious damage to a number of cultivated plants is ever present and, with favorable conditions, one or another species may at any time develop as a serious pest. . . . Damage from leaf-mining activity can be severe, frequently reaching destructive levels, or at least weakening younger plants and causing an appreciable reduction in crop yields." A notable example is the alfalfa blotch-miner, *Agromyza frontella* (Rondani), a European species which, in its native land, has been of little economic importance. Introduced accidentally into the eastern United States a few years ago, this species, unchecked by its natural enemies, has rapidly developed into a major pest of alfalfa. Heavily infested fields of alfalfa appear almost whitish due to the heavy mining of the foliage by the alfalfa blotch-miner.

Prior to the work by Spencer and Stegmaier, less than a dozen species of agromyzids were recorded from Florida, and virtually all of those which produced a serpertine trail in foliage of various kinds of plants had been considered to be caused by a single species, *Liriomyza pusilla* (Meigen). As recently as 1959, Frick, in his synopsis of North American species, specifically mentioned only two species as occurring in Florida. More than 80 species of agromyzids now have been recorded from Florida by Spencer and Stegmaier. *Liriomyza pusilla* has not been found to occur in Florida! In fact it has been shown that this is a European species that does not even occur in North America.

Often there is a direct relationship between economic crops and some of their weed relatives. These weed plants may serve as reservoirs for the agromyzids which attack commercial crops and ornamentals, so

that the control of these insect pests may involve the control of their weed hosts. Field studies by the junior author have shown that agromyzid populations have been maintained on weed hosts, although usually at lower levels, during seasons when preferred crop hosts were not being grown. Also related to this is the important consideration that parasites of the agromyzids may be maintained on agromyzid populations attacking weed hosts, whereas these parasites may be inadvertently destroyed in commercial crops by systematic spraying for control of agromyzids and other insect pests. Experimental work is needed to determine whether certain weeds are more harmful as reservoirs of agromyzid crop pests than beneficial as reservoirs for the parasites which attack the agromyzids.

A generalization can be made concerning the Agromyzidae and about problems which they cause that is true of many other groups of insects and the problems associated with them. In many ways Florida's insect problems are unique. We in Florida cannot rely on the work done by investigators in other states to solve our problems to the same degree that is true in, say, Indiana, Illinois, or Ohio. Many of the economic insects which occur in Florida react differently here than in other areas where they occur. When farther north some might have only a single generation a year. Under Florida conditions, they may have two to several generations a year, with resulting differences in what would be required to control them. Length and timing of the life cycle of many species are different in Florida from what they are in other parts of the range of the species, and they may differ in one part of Florida from another. Florida's insect fauna is derived in part from the more northern parts of the Nearctic Region and in part from the subtropical regions of Central America and the West Indies. As a result Florida often must solve its own problems with little reliance upon the work done in other states.

Basic information is still very meager for many groups of Florida arthropods. This was certainly true of the Agromyzidae until the studies made by Spencer and Stegmaier, which were partially supported by the Florida Department of Agriculture and Consumer Services. The need for a comprehensive reference dealing specifically with Florida agromyzids has become apparent to those concerned with the problems which they cause. Pertinent information relevant to Florida is virtually absent in the literature. The only recent extensive treatment of the Agromyzidae of any part of North America is Spencer's 1969 bulletin on the Agromyzidae of Canada. This study, financed by the Canada Department of Agriculture, more than doubled the number of species known to occur in Canada and yielded considerable valuable data on host relationships, biology, and life histories. Since little of this is directly applicable to Florida, the prime need for this publication is obvious.

It is our hope that this bulletin will stimulate further careful studies of the Agromyzidae of Florida. Despite the good work done by Spencer and Stegmaier, much remains to be learned about leaf, stem, and seed mining agromyzids of our state, especially in the central and northern areas.

The senior author, Dr. Kenneth Angus Spencer, is the world's foremost authority on the family Agromyzidae. Like many others who have made noteworthy contributions to arthropod taxonomy and have earned reputations as leading authorities on various groups, Spencer's interest in insects began as an avocation rather than as a vocation. Born in Cheam, Surrey, England on 15 March 1916, he obtained his early education at Whitgift School, Croydon and later graduated with honors in German and French from London University. In September 1939 he volunteered for Field Service Corps as a Probationary Private, was commissioned in light infantry in 1940. From 1941 to 1945 he was attached to the Intelligence Corps and served at Divisional and Corps Headquarters in the Middle East, Italy and Germany. During 1945-7 he was a Political Adviser with the Military Government in Berlin with the rank of Major.

From 1948 through 1951 he held various short-term positions in education and translation, including some time in Greece with

the United Nations Balkans Commission. From 1952 to 1957 he was employed as Export Manager by Crosfield Electronics Ltd., working with electronic controls for the printing industry. He was on the Board as Sales Director from 1957 through 1969. During this period he traveled throughout the world, appointing and controlling agents in some 30 countries.

During much of this period Spencer was developing as an avocation his interest in Agromyzidae, and during 1949-50 he translated from German into English Professor E. M. Hering's famous work, *Biology of Leaf Miners*. From 1951 through 1969 he collected and studied Agromyzidae in Africa, India, Philippines, Ceylon, Australia, Brazil, Colombia, Canada, Florida and throughout Europe. During this period he published some 70 papers, including regional and generic revisions and finally a major bulletin, *The Agromyzidae of Canada and Alaska*. During 1966 he held a temporary appointment as Visiting Professor in the Department of Entomology, University of Alberta, Edmonton, and during 1966-67 he served as a Research Associate of the Canada Department of Agriculture, Ottawa. In 1968 he was appointed a Research Associate of the Florida State Collection of Arthropods, Gainesville. He is a member of several professional organizations including the British Entomological and Natural History Society and the Royal Entomological Society, London. During 1968-70 he presented seminars on Agromyzidae at the University of Florida, Harvard University, Cornell University Wayne State University, and the University of Alberta. He received the Doctor of Science degree in 1970 from London University and became attached to the Department of Entomology, Oxford with a Natural Environment Research Council grant to prepare an *Identification Handbook of the British Agromyzidae*. He recently completed a book on world species of Agromyzidae of economic importance and spent five weeks in Venezuela during April and May 1972 studying agromyzid pests of commercial crops.

The junior author, Carl Edward Stegmaier, Jr., like the senior author, began his interest in the Agromyzidae as an extracurricular activity on his personal time. For many years he has served as a Plant Quarantine Inspector with the U. S. Plant Quarantine Service in Miami, helping to safeguard the U. S. from the introduction of plant pests from foreign countries. During his off-duty hours, as a Research Associate of the Florida State Collection of Arthropods, Mr. Stegmaier has made extensive collections of leaf, stem, and seed mining Agromyzidae throughout all seasons in recent years, primarily in southern Florida. From many wild and domestic plant hosts he has made numerous rearings of agromyzids, keeping careful records of all of his findings. This bulletin is based in large part on the field and laboratory work done by Mr. Stegmaier, while the taxonomic work is primarily that of the senior author. Virtually all of our present knowledge of the life histories and of the parasites of Florida agromyzids is based upon the collections and rearings of Mr. Stegmaier.

Carl was born 18 January 1921 in Kansas City, Kansas. He attended Kansas Junior College during 1946-47, received his B. Sc. in Entomology from Kansas State University in 1949 and the M. Sc. in Entomology from the same university in 1950. He is a member of Gamma Sigma Delta honorary fraternity, Kansas Entomological Society, Florida Entomological Society, Georgia Entomological Society, and the Entomological Society of Washington. He served in the Medical Detachment, 161st Field Artillery, Kansas National Guard during 1938-40 and in the U. S. Marine Corps from 1940 to early 1946, receiving the Wake Island Expeditionary Medal and an Asiatic-Pacific Ribbon Presidential Unit Citation. He was captured on Wake Island, for 45 months was a Japanese prisoner of war, and eventually was discharged as a Disabled American Veteran. While a prisoner he studied the Japanese language, self taught, and was used as an interpreter to liberate Chinese prisoners on Hokkaido, Japan after the end of World War II. He is a Trustee of the Miami Museum of Science and Natural History, and during 1965-66 he served as Chairman of the Sub-

tropical Branch of the Florida Entomological Society. For many years he has been an active Boy Scout counsellor. His current entomological interests cover all leaf, stem, and seed mining insects, their life history and ecology, and in recent years he has discovered many species new to Florida, new to North America, and new to science, notably in the orders Diptera, Lepidoptera, and Hymenoptera.

Howard V. Weems, Jr.
Editor

Bureau of Entomology
Division of Plant Industry
Florida Department of Agriculture
28 April 1972

THE AGROMYZIDAE OF FLORIDA WITH A SUPPLEMENT ON SPECIES FROM THE CARIBBEAN[1]

by

Kenneth A. Spencer
and Carl E. Stegmaier, Jr.

Introduction

American literature prior to 1966 contains only a few scattered records of Agromyzidae in Florida, and these identifications are in most cases doubtful. Even Frick (1959) in his valuable synopsis of North American species specifically mentions only two species as occurring in Florida.

Near the end of 1962 the junior author commenced a detailed program of rearing Agromyzidae from leaf mines, stems and flower heads, mainly in the greater Miami area. Thousands of specimens were obtained from many hundreds of separate rearings and from identified host plants. Most of this material was sent to the senior author in London for identification, and over 250 letters were exchanged between the two authors between 1962 and 1968.

A preliminary paper describing 13 new species discovered by Stegmaier was published by Spencer (1966c). Ten shorter papers, mainly giving new information on host plants and parasites, were published by Stegmaier in 1966 and 1967. Forty-six species were confirmed in Florida from the material collected by Stegmaier in this period.

Following an invitation from the Division of Plant Industry, Gainesville, and with additional financial support from the University of Florida, the senior author spent three weeks in Florida in October 1968, mainly in field work, accompanied most of the time by the junior author. Several collecting trips were made in the Gainesville area and also to Cedar Key to the west and Torreya State Park in the northwest. Collections were made by the authors in the Orlando and Okeechobee areas and also along the keys as far as Big Pine Key. Finally, some useful collecting was done in the Homestead area, with one visit through the Everglades to Flamingo in the company of Dr. D. O. Wolfenbarger, of the University of Florida Subtropical Experiment Station. The additional knowledge of the geography, climate and flora of Florida obtained during this visit has proved invaluable in the preparation of this paper, and the senior author wishes to express his deepest gratitude to everyone who provided such generous assistance and hospitality during his stay in Florida. Particular thanks are due to Mr. H. A. Denmark and Dr. H. V. Weems Jr. who formally sponsored his visit and general support for the entire study.

The basis for this paper has been provided by the detailed, patient and time-consuming field work and rearings carried out by the junior author. Without this foundation a

[1]Manuscript completed June 1969 and slightly revised at a later date.

paper of this scope would not have been possible. The taxonomic work, including the descriptions of new species and genera, was done by the senior author. Personal opinions expressed are his, and the responsibility is his for any inaccuracies the paper may contain.

At an early stage in the study of the Florida Agromyzidae, the Neotropical affiliations of many species became apparent. The additional material now examined and the more detailed study which has been possible have confirmed the southern origin of a substantial part of the Florida agromyzid fauna. In order to obtain a clearer understanding of this southern element, the original conception of this paper has been expanded, and all available material from the Caribbean area, including an important collection from Costa Rica, has been studied. For convenience the Caribbean species are treated separately in a Supplement on p. 133. However, an equally, if not more, important part of the fauna clearly has reached Florida from the north; further collecting in northern Florida, particularly in the panhandle, will be necessary before the full extent of this northern element can be established. The origin of the Florida Agromyzidae is analyzed in further detail below.

Eighty-six species from Florida in 14 genera are discussed. Of these, 25 are described as new and 17 are new to the state; five species are characterized briefly but are not formally described due to the lack of adequate material. Two new genera and an additional 38 new species from the Caribbean are described. The distribution of Florida Agromyzidae by genera is shown in Table 1.

Table 1. Genera of Florida Agromyzidae

	Previously known	New	New to Florida	Undescribed	Total
Agromyzinae					
Agromyza	2	—	1	1	4
Japanagromyza	3	1	1	—	5
Melanagromyza	12	6	2	1	21
Ophiomyia	3	4	—	1	8
Sub-total	20	11	4	3	38
Phytomyzinae					
Phytobia	—	—	—	1	1
Cerodontha					5
Dizygomyza	—	3	—	—	(3)
Icteromyza	—	—	1	—	(1)
Cerodontha	1	—	—	—	(1)
Calycomyza	9	5	3	1	18
Amauromyza	1	—	—	—	1
Nemorimyza	1	—	—	—	1
Liriomyza	6	2	1	—	9
Pteridomyza	—	—	1	—	1
Haplomyza	1	1	—	—	2
Phytoliriomyza	—	2	1	—	3
Phytomyza	—	1	6	—	7
Sub-total	19	14	13	2	48
Total	39	25	17	5	86

Materials and Methods

1. MATERIAL EXAMINED

Material has been studied from the following sources: Carl E. Stegmaier, Jr.: Mostly reared specimens from the greater Miami area but including some material collected by other entomologists at various localities throughout the state and submitted to the junior author for rearing.

American Museum of Natural History, New York (Dr. P. Wygodzinsky): An important collection from the Bahamas made by the Van Voast - A.M.N.H. Expedition to the Bahama Islands in 1953. The collectors were E. B. Hayden, L. Giovannoli and G. B. Rabb.

British Museum (Natural History), London (Mr. B. Cogan): Some undetermined material from St. Vincent; also lectotype of *Liriomyza sorosis* (Williston).

Canadian National Collection, Ottawa (Dr. J. F. McAlpine, Mr. G. Shewell): Valuable material from Florida, Jamaica, the Cayman Islands and the Dominican Republic, collected during several expeditions between 1952 and 1966.

Commonwealth Institute of Entomology, London (Dr. R. W. Crosskey): Material from Antigua, Barbados and Trinidad, collected mainly by Dr. F. D. Bennett of the Commonwealth Institute of Biological Control.

Deutsches Entomologisches Institut, Eberswalde, D.D.R. (Dr. habil. G. Morge): A large and important collection from Costa Rica made by H. Schmidt in 1933.

Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville (Dr. H. V. Weems Jr.): Unidentified material from Florida and Puerto Rico.

Prof. S. W. Frost: Personal collections made at the Archbold Biological Station, Highlands County, Florida, in the winter and spring of several seasons between 1959 and 1969.

Dr. E. Rohdendorf, Prague: A small but interesting collection made in Cuba in 1968.

(United States) National Museum of Natural History, Washington, D.C. (Mr. G. C. Steyskal): An important collection from the island of Dominica made by Dr. W. W. Wirth in 1965, participating in the Bredin-Archbold-Smithsonian Biological Survey of Dominica; also unidentified material from Florida, Cuba and Puerto Rico. Further species from the USNM collection requiring special study were made available through the kindness of Mr. Steyskal, Systematic Entomology Laboratory, U.S.D.A.

Our thanks are due the institutions and entomologists cited above who provided such generous assistance, not only with material but also with valuable supplementary information.

Fresh material collected by the authors in October 1968 throughout Florida from Torreya State Park to the keys, although somewhat limited owing to the lateness of the season has proven to be of considerable value.

2. DESCRIPTIONS

The descriptions of new species and the diagnosis given in all cases for previously described species have been kept brief. For all species, except where males are unknown, illustrations have been provided of the male genitalia, and it is considered that these, rather than lengthy, detailed descriptions, will be more important to future workers for purposes of identification, particularly in the critical cases in which the adults cannot be separated reliably on the basis of external characters alone. All illustrations have been drawn by the senior author's wife, to whom thanks are due for the great care taken in the preparation of these accurate drawings.

Host plants and brief biological details are given when known. Authorities for plants are not cited in the general text but are included in the host list. The distribution both within Florida and throughout the range of the species is cited for each species. Affiliations and relationships are discussed where relevant.

Under "Material examined," the material cited is normally limited to that seen from Florida and the Caribbean, but in a few cases additional material is mentioned, where this is of some special significance.

3. DIAGNOSTIC CHARACTERS (Fig. 1-3)

(a) External morphology. The terms referred to in the descriptions will be familiar to any dipterist. However, for the benefit of other entomologists who may not be fully conversant with the terminology used and who may be encouraged to take an interest in the Agromyzidae, a brief glossary is given below, and most characters referred to are indicated in figures 1-3. Abbreviations used are shown in brackets.

acrostichals (acr) : minute hairs lying between the two lines of dorso-central bristles (Fig. 1J).

arista: slender, bristle-like process arising from dorsal surface of third antennal segment (Fig. 1-A).

cheek: membranous area immediately below eye, not always clearly separable from the jowl which extends below to the margin of the head (Fig. 1-B).

coxa (e) : first or basal section of leg (Fig. 1-V).

dorso-central bristles (dc) : paired bristles lying along center of mesonotum, varying in number from two to six; the strongest, at the rear, are considered here as the first (Fig. 1-K).

face: area from just above antennae to margin of mouth (Fig. 3-B).

facial keel: raised ridge dividing base of antennae, frequently strongly developed in genus *Ophiomyia* (Fig. 2-B).

femur: third section of leg (the color frequently is important). (Fig. 1-W).

fore-tibial bristle: lateral bristle on fore tibia sometimes occurring in *Japanagromyza* and *Melanagromyza,* and in male of *Nemorimyza posticata.*

frons: rectangular area between rear of head (vertex) and the lunule and laterally between the orbits (Fig. 3-A).

haltere: knoblike, modified hind wing, functioning as a balancing organ, only found in Diptera (the color can be of significance). (Fig. 1-P).

humerus (pl. humeri) : the shoulders or anterior angles of the mesonotum anterior to the notopleural triangle (Fig. 1-M).

jowl: membranous area below the eye (the width and shape frequently are of importance). (Fig. 1-C)

lunule: semicircular sclerite above antennae and adjoining lower margin of frons.

mesonotum: dorsal area of the thorax, bearing the important dorso-central bristles and acrostichals (the color is important in many species) (Fig. 1-L).

mesopleuron: large rectangular area below the notopleural area (the color is important in most genera of the Phytomyzinae). (Fig. 1-N).

notopleural area: triangular area on side of thorax immediately below the transverse suture of the mesonotum (Fig. 1-O).

ocellar triangle: triangular plate on the upper half of frons bearing the three ocelli above and with the apex sometimes greatly extended toward the margin of the lunule (Fig. 1-C).

orbital bristles (Fig. 1-D).

upper (ors) : one to three strong, normally reclinate bristles on upper half of orbits.

lower (ori) : one to four partially incurved or reclinate bristles on lower half of orbits.

orbital setulae: row(s) of minute hairs on orbits normally between eye margin and orbital bristles (Fig. 1-E).

orbit(s) : narrow plates between eye margin and frons bearing the orbital bristles and orbital setulae; varying in width

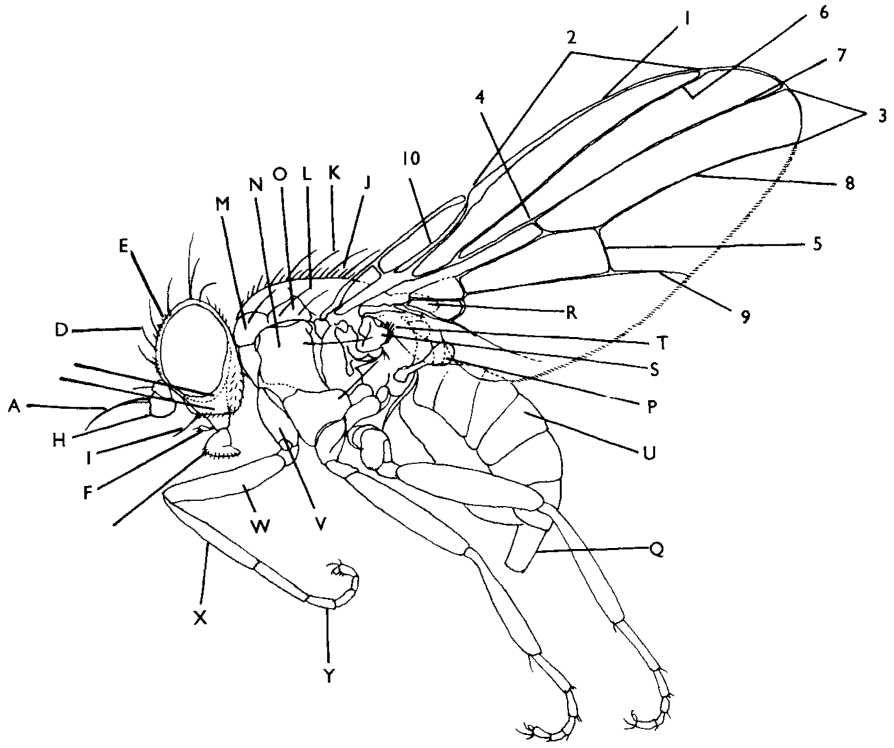
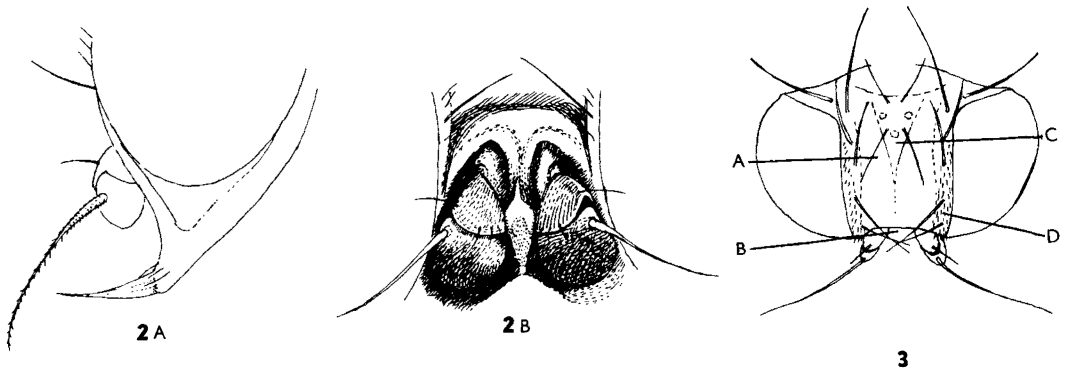


Fig. 1. Side view of typical Agromyza sp. (After Sasakawa, 1961: Fig. 7)

Legend:

A	arista	M	humerus	1	costa
B	cheek	N	mesopleuron	2	second costal section
C	jowl	O	notopleuron	3	fourth costal section
D	orbital bristles	P	haltere	4	first cross-vein
E	orbital setulae	Q	ovipositor sheath	5	second cross-vein
F	palp	R	scutellum	6	R 1
G	proboscis	S	squamae	7	R 4+5
H	third antennal segment	T	squamal fringe	8	M 1+2
I	vibrissa	U	tergites	9	M 3+4
J	acrostichals	V	coxa	10	sub-costa
K	dorso-central bristles	W	femur		
L	mesonotum	X	tibia		
		Y	tarsi		



Figs. 2, 3. 2A, vibrissal fasciculus in *Ophiomyia* sp.; 2B, facial keel in *Ophiomyia* sp.; 3, head from above showing: A, frons; B, lunule; C, ocellar triangle; D, orbits.

and sometimes raised or broadened (Fig. 3-D).

ovipositor sheath: cylindrical structure into which the retractable ovipositor is withdrawn (Fig. 1-Q).

palps: paired processes adjoining mouthparts (Fig. 1-F).

pre-scutellar bristles (prsc): pair of bristles present in some genera lying at center rear of mesonotum.

proboscis: feeding organ, greatly elongated in some species (cf. *Ophiomyia haydeni,* Fig. 130). (Fig. 1-G).

scutellar bristles: normally two pairs of strong bristles on scutellum (one pair only in subgenus *Cerodontha*).

scutellum: hind, dorsal section of the thorax (Fig. 1-R).

squama (pl. squamae): inner lobe of wing membrane behind the wing base (the color is frequently of significance). (Fig. 1-S).

squamal fringe: fringe of hairs on the squamae (the color is an important specific character). (Fig. 1-T).

tarsus: fifth section of the leg (itself divided into five sections). (Fig. 1-Y).

tergite(s): membranous dorsal sclerites of abdomen (Fig. 1-V).

tibia: fourth section of the leg (Fig. 1-X).

trochanter: second segment of the leg, between the coxa and femur.

vibrissa: usually strong bristle at lower, inner corner of jowl (Fig. 1-I).

vibrissal fasciculus: fused group of vibrissal bristles found in males of most species of *Ophiomyia* (Fig. 2A).

wing (Fig. 1:1-10)

costa: first longitudinal vein, forming upper margin of wing and normally conspicuously thickened, either to the termination of vein R4+5 or M1+2, (Fig. 1:1).

second coastal section: section of costa lying between apex of veins R1 and R2+3, (Fig. 1:2).

fourth costal section: section of costa lying between apex of veins R4+5 and M1+2, (Fig. 1:3).

first cross-vein) Fig. 1:4
second cross-vein) Fig. 1:5
vein R1) Fig. 1:11
vein R2+3) Fig. 1:6
vein R4+5) Fig. 1:7
vein M1+2) Fig. 1:8
vein M3+4 (M4)) Fig. 1:9
sub-costa) Fig. 1:10

(b) Male genitalia. No attempt has been made to include full and detailed descriptions of genitalia. Owing to the complex nature of these structures descriptions which will be meaningful to subsequent workers are difficult to prepare. Illustrations of significant characters are of greater value, and these have been included for all species.

The aedeagus itself, particularly the distal section or distiphallus, shows an immense variety of form and remarkably little specific variation. In most cases a positive identification can be made from the aedeagus alone, but other structures of diagnostic importance are the ninth sternite (Fig. 25, 285), the surstyli and general configuration of the epandrium (particularly in *Japanagromyza,* cf. Fig. 37, 40) and the cerci (Fig. 249, 477).

Frick (1952) and Nowakowski (1962) have given detailed descriptions of male genitalia.

aedeagus: the intromittent organ or penis, consisting basically of four sections, the basiphallus, mesophallus, hypophallus and distiphallus.

aedeagal apodeme: long, rod-like structure to which the more flexible aedeagus is articulated (Fig. 264).

basiphallus: basal section of aedeagus, which may be entire (Fig. 107) or divided into two asymmetrical arms (Fig. 157, 317).

cerci: paired, external appendages of the epandrium, sometimes bearing stout bristles (Fig. 37B, 357) or one or more long hairs (Fig. 249, 477).

distiphallus: distal section of the aedeagus,

normally consisting of paired tubules of varying size and shape (Fig. 161, 317) which sometimes may be partially fused (Fig. 269, 453) or, in *Ophiomyia,* highly asymmetrical (Fig. 136, 144).

epandrium: ninth tergite, frequently of distinctive shape (Fig. 32).

hypandrial apodeme: elongate extension sometimes found at apex of ninth sternite (Fig. 96, 339).

hypophallus: ventrally directed, membranous appendages articulated to mesophallus which can be minute (Fig. 321), absent or greatly enlarged (Fig. 317).

mesophallus: median section of aedeagus (Fig. 161, 206), of relatively secondary importance diagnostically.

ninth sternite: highly modified, terminal, ventral sclerite of abdomen, lying internally between the aedeagal apodeme and the aedeagus (Fig. 71, 333).

sperm sac: membranous structure lying within the abdomen, connected by long seminal duct to the distiphallus (Fig. 335).

surstylus: external structure at lower corners of epandrium, frequently of characteristic shape and bearing distinctive hairs or bristles (Fig. 19, 334).

4. HOLOTYPE LOCATIONS

Where known the location of holotypes is cited for all species. The abbreviations used are as follows:

AMNH—American Museum of Natural History, New York.

BM—British Museum (Natural History), London.

CNC—Canadian National Collection, Ottawa

DEI—Deutsches Entomologisches Institut, Eberswalde, German Democratic Republic

FSCA—Florida State Collection of Arthropods, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville

MCZ—Museum of Comparative Zoology, Cambridge, Massachusetts.

Paris—Musée d 'Histoire Naturelle, Paris

USNM—(United States) National Museum of Natural History, Washington, D.C.

Vienna—Naturhistorisches Museum, Vienna.

Holotypes of new species described by the senior author from material collected by Stegmaier or personally will be retained temporarily in the senior author's collection, but eventually will be deposited in the USNM.

Biology

All Agromyzidae are feeders on plant tissue, and the few records suggesting otherwise can only be the result of inaccurate observation. The egg is laid beneath the epidermis at the appropriate oviposition site, and normally the young larva emerges within some days and instinctively feeds to form a channel or mine within the plant which, in most cases, will be entirely characteristic of the species concerned. The period of larval feeding can vary from about one week to several months. This feeding period is dependent in part on temperature, which can cause minor variations, but is essentially a fundamental aspect of the life cycle. Species which have a number of generations in quick succession will feed rapidly, while those with only a single generation per year normally feed more slowly and in some cases intermittently throughout the colder winter months.

Pupation normally takes place on the ground, the larva either falling from the plant and transforming after some hours or transforming immediately on leaving the leaf and falling to the ground as a puparium. A few leaf miners pupate within the leaf at the end of the mine, and most seed feeders and stem borers pupate within the plant at the feeding site. The duration of pupation varies greatly with the species and may be as short as 10 days or as long as 6-10 months.

The Agromyzidae are well known as leaf miners. However, all parts of the plant are attacked, including stems, seeds and more rarely roots and in the case of trees, young twigs. Of the 86 species recorded in Florida, at least some of the host plants of 66 species are known. Of these, 45 are leaf miners, 12

are feeders in seed heads or seed pods, eight are internal stem borers and one forms stem galls.

Host selection has been discussed by Spencer (1965d). Most Agromyzidae are either monophagous, that is, limited in their choice of host to a single plant or more often several species within the same genus, or they are oligophagous, feeding on a number of genera within a single family or on several related families of the same order. Very few species are truly polyphagous, feeding on a wide range of unrelated hosts. An example of a strictly monophagous species is *Phytomyza vomitoriae* Kulp which is restricted to the single host, *Ilex vomitoria*; *Japanagromyza viridula* (Coq.) feeds only on *Quercus*, but on a number of different species. Typical oligophagous species are *Liriomyza commelinae* (Frost) on *Commelina* and *Tradescantia; Melanagromyza ruelliae* on *Blechum, Ruellia* and *Stroebilanthes*, all genera of the Acanthaceae; and *Amauromyza maculosa* (Malloch) on a number of genera of Compositae. Of the 66 species in Florida of which the host plant or host plants are known, 34 are monophagous and 28 oligophagous. Only four species are truly polyphagous—*Liriomyza blechi* sp.n., *L. munda* Frick, *L. schmidti* (Aldrich) and *L. trifolii* (Burgess).

The characteristic form of the leaf mine is a substantial aid in identifying Agromyzidae. Although individual mines may show considerable variation, the essential pattern remains constant for each species. The main types of mines are linear or serpentine (Fig. 274, 307) or blotchlike, approximately circular (Fig. 231) or more irregular, with short offshoots (Fig. 183). In many cases the larva forms a short linear mine in the first instar, and after the first moult the feeding instinct changes and it then forms a blotch mine, which may completely envelop the earlier linear section. The part of the leaf which is mined frequently is of significance. Most mines are formed on the upper surface, in the area of the palisade parenchyma; more rarely, very shallow mines are made immediately beneath the epidermis of the leaf, as in *Liriomyza schmidti* (Aldrich), or in a few species the larva feeds exclusively on the lower leaf surface, in the spongy parenchyma. Some mines are invariably associated with the margin of the leaf; others occur exclusively along the midrib or possibly one of the stronger lateral veins, as in *Ophiomyia camarae* Spencer (Fig. 124). *Ophiomyia* sp. (*Lantana*) is obviously a distinct species, also feeding on *Lantana camara*, forming a long, narrow, serpentine mine which winds irregularly across the leaf (Fig. 151). The arrangement of frass in the mine frequently is characteristic; this may be deposited in single, widely-spaced pellets, it may be in more or less continuous strips or all frass may be excreted immediately prior to pupation at the end of the mine, to which the puparium is sometimes firmly glued (Fig. 220).

World Distribution

Over 1700 species of Agromyzidae are known in 32 genera. The family is distributed throughout the world, and the habitats range from Arctic tundra to the tropics. The greatest proliferation of species occurs in temperate areas of the northern hemisphere where approximately 70% of the described species are found. The family is well represented also in subtropical areas, particularly of South America, but in the Old World tropics the number of species is reduced radically. There is a total lack of knowledge about Agromyzidae in equatorial areas of the Amazon basin, and it will be of interest to establish whether the pattern there conforms with that found in the tropics elsewhere.

The distribution of the main genera varies significantly between temperate and tropical areas. *Phytomyza*, the largest genus with 400 species, which is dominant in the Palaearctic and Nearctic Regions, is reduced to only a few species in the tropics and the southern hemisphere. *Liriomyza*, which is the third largest world genus with 230 species, is similarly reduced in the Ethiopian, Oriental and Australian regions, but is better represented in the Neotropical region. The dominant genus in the tropics is *Melanagromyza* with some 300 species, and it is interesting to note that this is the largest genus in Florida.

Relationships of Florida Agromyzidae

1. BACKGROUND

Before attempting to analyze the present distribution of the Florida Agromyzidae, it is necessary to discuss briefly the geological past of Florida, since the various changes in sea level and climate which have occurred in the peninsula since the end of the Pliocene have been the main determining factors in forming the existing pattern of distribution.

Although the Agromyzidae almost certainly have existed as a family since the Eocene (Spencer, 1969a: 13) and early Tertiary distribution must be considered in any discussion of the family on a worldwide basis, in the case of Florida the end of the Pliocene can be conveniently taken as the starting point. In the past the transition from Pliocene to Pleistocene has been placed at one million years ago; however, latest research (Hopkins, 1967: 460) indicates that the major climatic fluctuations which marked the beginning of the Pleistocene started at least three million years ago. Florida existed throughout most of the Pliocene as a somewhat abbreviated peninsula lying slightly to the west of its present position (Cooke, 1945). The climate would have been temperate and there may have been elements of tropical flora in the south as found today, surviving from the very much warmer climate of the early Tertiary. Agromyzidae would have been present, with all the main genera and probably some modern species represented. Throughout the Pleistocene, with the advances and subsequent retreats of ice over large parts of North America and accompanying falls and rises in sea level, the land area and climate of Florida underwent major changes which dramatically influenced its flora and fauna. The greatest rises in sea level occurred in the earlier periods of the Pleistocene, and a high water terrace—the Brandywine—270 feet above sea level has been detected. On at least four occasions, sea level has risen 100 feet or more above its present level. It is generally accepted, on the basis of both geological and biogeographical evidence, that although a considerable part of the land area of Florida was submerged at these times, a number of substantial islands, corresponding approximately to the high ground in central Florida, existed throughout the Pleistocene. Many endemic species of both animals and plants are found today in areas believed to be the sites of these former Pleistocene islands.

The last, or Wisconsin, glaciation commenced about 100,000 years ago. Recent temperature measurements, based on fossil Foraminifera obtained from deep sea sediments from a number of Caribbean and Atlantic cores (Suess, 1956) indicate that cooling began about 85,000 years ago and reached a minimum 15,000 years ago. This temperature minimum corresponds with the furthest advance of the Wisconsin ice sheet, which covered the whole of Canada and northern parts of the United States. Although the ice was remote from Florida, there was without question a significant cooling of the climate and apparently also (Dillon, 1956) an appreciably higher rainfall. Evidence of the cooler climate is provided by the discovery of pollen of cold weather plants, such as fir, spruce and larch in a bog in Marion County, Florida (Neill, 1957: 178), and pollen analysis from a number of other Pleistocene localities in North Carolina and Texas indicates similar more northerly vegetation. Fossil Pleistocene mammals include many species, either now extinct but with definite northern affiliations or still living but with the southern limit of their range far to the north of Florida (Simpson, 1931).

The retreat of the entire flora and fauna of North America before the Wisconsin ice sheet would have resulted in crowding towards the south, which must inevitably have affected even Florida. The cooler and wetter climate of Florida would have been entirely suitable for the numerous temperate elements previously based some hundreds of miles to the north and it is certain that many such species of Agromyzidae, together with their host plants, would have been present in Florida at the peak of the Wisconsin glaciation 15,000 years ago.

Neill (1957), in his admirably lucid ac-

count of the historical biogeography of Florida, discusses four main patterns of present-day distribution which appear to be the direct result of conditions prevailing during the Pleistocene.

First, endemism in Central Florida: the Brandywine sea, although inundating most of the peninsula, almost certainly left a substantial island in Polk County with several smaller islands extending northward to Marion County. Further islands may have existed also on the high ground to the north and west of the central Florida region. Many central Florida endemics occur in areas of Rosemary scrub and high pine which form the normal succession to coastal dunes; such species include lizards, skinks, snakes, the Florida jay, beetles, crickets, flies and many plants. Some endemics are closely related to mainland forms, others appear not to be related to anything now living in North America. It remains an open question whether these species reflect rapid speciation in their isolated island environment or whether they are relicts, with the populations elsewhere now extinct.

Secondly, isolated colonies of northern species in the panhandle: it is postulated that such populations are relicts, surviving in suitable areas far south of the present range of species which, having moved south during Wisconsin time, have subsequently retreated again to the north. Such species include a number of plants, many of which, like *Aquilegia, Caltha* and *Thalictrum,* are favored hosts of Agromyzidae in more temperate areas to the north.

Thirdly, species present on the southern mainland and lower Keys but not on the upper Keys: owing to subsidence of the west coast, the lower Keys became isolated from the mainland, probably before the Key Largo coral islands developed. Today, species of rats, snakes, lizards, turtles, toads and also the white-tailed deer occur on the lower Keys and the mainland but not on the upper Keys.

Fourthly, extension of western grassland to the east: during a past period of low rainfall a prairie type flora, such as is found today in Texas and Arizona, was able to extend its range to the east, and remnants of this flora reflecting dry conditions still exist on parts of the west coast and the lower Keys, such as Big Pine Key. Cactus thicket is the typical plant association of these areas, with many characteristic species of animals and insects. Agromyzidae are not numerous in such conditions, but I have seen an undescribed species mining *Opuntia* in Brazil, and it is possible that some specialized species might occur on plants characteristic of these dry areas.

In general, in view of the high degree of mobility of small, light insects such as Agromyzidae, which can easily be windborne over long distances, even though their power of active flight may be limited, the old Pleistocene barriers which are still detectable in the distribution of less mobile animals, probably have little direct influence on the distribution of the Agromyzidae in Florida today, which rather will largely reflect local ecological conditions. The degree of frost is a critical factor preventing the spread of many plants of West Indian origin, and their associated agromyzids, further northward in Florida than their present limits. Nevertheless, this brief review of distribution patterns still reflecting Pleistocene conditions seems desirable, since isolated instances involving Agromyzidae still may be detectable.

A glance at the substantial list of central Florida endemic plants (Harper, 1949), which includes no less than 427 species (as understood by Small, 1933), shows that numerous genera are represented which provide known hosts for Agromyzidae. These include *Ageratum, Asclepias, Baptisia, Clinopodium, Croton, Erythrina, Indigofera, Lupinus, Physalis, Quercus, Salix, Sium, Vicia* and *Viola.* One cannot help wondering whether any pre- or early Pleistocene agromyzids occur on the endemics in these genera!

The noticeable lack of endemics among the tropical flora present in the southern tip of the peninsula strongly supports the view that the tropical element was entirely eliminated during the peak of the Wisconsin. A gradual warming followed the cold peak, but a number of minor advances in the ice also occurred subsequently. It is therefore prob-

able that the tropical element in southern Florida succeeded in establishing itself—or re-establishing itself—since it was certainly present during long periods of the Eocene and later Tertiary—only during the past 2,000 to 3,000 years. It is during this relatively short period, geologically speaking, that the flora and fauna of Florida as we know them today have taken shape.

Ledin (1951) has analyzed the composition of the Compositae of southern Florida. No less than 66% of the 125 species recorded also occur to the north of Florida, either in the southeastern or northeastern United States. However, 46% occur in the West Indies, and it is interesting to reproduce the detailed breakdown of tropical Florida Compositae in the various islands and areas to the south, as given by Ledin:

West Indies	46%
Cuba	38%
Bahamas	32%
Dominican Republic	25%
Haiti	21%
Puerto Rico	18%
Jamaica	18%
Virgin Islands	14%
Trinidad	16%
Mexico	22%
Central America	27%
South America	16%

It is noteworthy that more species occur in Cuba than in the Bahamas. Seeds of many tropical plants from the West Indies are carried by birds to Florida which lies on their regular migration route. Many seeds are windborne, and apparently following hurricanes it is not uncommon to discover previously unrecorded plants of West Indian origin. A few plants also will have reached Florida from the south by sea. Once a subtropical flora became established in southern Florida, it is not difficult to conceive its gradual colonization by the constant influx of windborne agromyzids. Darlington (1936) gives an interesting account of the potential of hurricanes to sweep up and carry relatively large and heavy animals over long distances. Certainly every hurricane reaching Florida from island areas to the south must bring with it a multitude of seeds and small insects, including Agromyzidae. It seems certain that virtually all species of plants and insects of southern origin which have reached southern Florida without man's aid have arrived in this way over water, rather than overland via the coastal strip of the Gulf States. The actual source area of these southern species is discussed further below. The 86 species of Agromyzidae now recorded in Florida can be conveniently split into four distinct groups: 1. Species of northern origin; 2. Species of southern origin; 3. Species occurring both to the North and South; and 4. Species restricted to Florida. These groups are shown in detail in Table 2.

2. SPECIES OF NORTHERN ORIGIN (GROUP 1)

There are 23 species present both in Florida and in areas to the north which are certainly of northern origin, representing 27% of the total. However, in the opinion of the authors this figure does not accurately reflect the actual numbers of such northern species which are almost certainly present on a far greater scale and will quickly be revealed by further collecting. Fourteen of the species listed in Groups 3 and 4 of Table 2 are also probably of northern origin.

Nemorimyza posticata (Meigen) and *Phytomyza plantaginis* Robineau-Desvoidy, which are present in the Miami area, are far to the south of their normal range. They presumably reached southern Florida during the Wisconsin and have managed to adapt themselves to sub-tropical conditions, when other less tolerant species have retreated to the north.

Pteridomyza hilarella (Zetterstedt), recorded from Duval County and Gadsden County, is an essentially northern species and is clearly at the extreme southern limit of its range in northern Florida. *Phytomyza thalictrivora* Spencer recorded from Jackson County, hitherto has been known only from Alberta. It probably occurs continuously to the north together with its food plant, *Thalictrum* spp., but, as previously mentioned (p. 10), *Thalictrum* occurs in isolated relict patches in the panhandle, and it is possible that *P. thalictrivora* has survived in Florida in the same way.

Most of the other northern species need

Table 2. Florida Agromyzidae grouped by origin and present distribution

Group 1 Northern origin (occurring also in North)	Group 2 Southern origin (occurring also in South)	Group 3 species occurring both in North and South	Group 4 species limited to Florida
Agromyza parvicornis Loew	*Japanagromyza aequalis* Spencer	*Melanagromyza minimoides* Spencer	*Agromyza* sp.—N.
A. proxima Spencer	*J. inaequalis* (Malloch)	*M. viridis* (Frost)	*Japanagromyza desmodivora* Spencer—S.
A. varifrons Coquillett	*J. perpetua* sp.n.	*Ophiomyia lantanae* (Froggatt)	*Melanagromyza chaptaliae* Spencer—S.
Japanagromyza viridula (Coquillett)	*Melanagromyza bidentis* Spencer	*Cerodontha (Cerodontha) dorsalis* (Loew)	*M. erechtitidis* Spencer—S.
Melanagromyza virens (Loew)	*M. caerulea* (Malloch)	*Calycomyza ipomaeae* (Frost)	*M. heliotropii* sp.n.—S.
Cerodontha (Icteromyza) longipennis (Loew)	*M. caribbea* sp.n.	*C. jucunda* (Wulp)	*M. miamensis* sp.n.—S.
Calycomyza ambrosiae Frick	*M. floridensis* Spencer	*C. lantanae* Frick	*Melanagromyza* sp. (*Sida*)—S.
C. majuscula Frick	*M. floris* Spencer	*C. malvae* (Burgess)	*Ophiomyia lacertosa* sp.n.—N.
C. menthae Spencer	*M. lippivora* Spencer	*Amauromyza maculosa* (Malloch)	*O. obstipa* sp.n.—N.
C. promissa Frick	*M. marellii* (Brèthes)	*Liriomyza munda* Frick	*Phytobia* sp.—N.
C. solidaginis (Kaltenbach)	*M. minima* (Malloch)	*Phytoliriomyza imperfecta* (Malloch)	*Cerodontha (Dizygomyza) frosti* sp.n.—N.
Nemorimyza posticata (Meigen)	*M. parvella* sp.n.		*C. (Dizygomyza) iridophora* sp.n.—N.
Liriomyza brassicae (Riley)	*M. ruelliae* Spencer		*C. (Dizygomyza) pecki* sp.n.—N.
L. trifolii (Burgess)	*M. splendida* Frick		*Calycomyza durantae* sp.n.—S.
L. trifoliearum sp.n.	*M. vectabilis* sp.n.		*C. minor* sp.n.—N.
Pteridomyza hilarella (Zetterstedt)	*M. wedeliae* sp.n.		*C. stegmaieri* Spencer—S.
Haplomyza minuta (Frost)	*Ophiomyia camarae* Spencer		*Calycomyza* sp. (*Elephantopus*) —N.
Phytomyza ilicicola Loew	*O. gentilis* sp.n.		*Liriomyza blechi* sp.n.—S.
P. opacae Kulp	*O. haydeni* sp.n.		*Haplomyza philoxeri* sp.n.—S.
P. plantaginis Robineau-Desvoidy	*O. lippiae* Spencer		*Phytoliriomyza floridana* sp.n.—N.
P. thalictrivora Spencer	*Ophiomyia* sp. (*Lantana*)		*Phytomyza orlandensis* sp.n.—N.
P. verticillatae Kulp	*Calycomyza hyptidis* Spencer		
P. vomitoriae Kulp	*C. melantherae* Spencer		
	C. mikaniae sp.n.		
	C. obscura sp.n.		
	C. sidae sp.n.		
	Liriomyza archboldi Frost		
	L. commelinae (Frost)		
	L. marginalis (Malloch)		
	L. schmidti (Aldrich)		
	Phytoliriomyza pilosella sp.n.		
23 (27%)	31 (36%)	11 (13%)	21 (24%)

no special comment. Many range far to the north, in some cases reaching Canada.

3. SPECIES OF SOUTHERN ORIGIN (GROUP 2)

Thirty-one species, representing 36% of the total, can be placed in this group, in which the known distribution is limited to Florida and one or other areas to the south. Of species limited to Florida probably nine can be added to the list of southern species which would increase the percentage to 44%. This high percentage is certainly somewhat artificial and reflects the intensive collecting of Stegmaier in southern Florida and the relative lack of collecting in the north.

The immediate source areas of these southern species would appear to be Cuba and the Bahamas. Twenty-one species of the 31 confirmed as being of southern origin are recorded also in the Bahamas (Table 4), and represent 70% of the southern Florida species and 56% of the Bahamas species; only six of the southern Florida species are known also in Cuba. However, this again certainly reflects lack of collecting in Cuba and does not necessarily indicate that these species have reached Florida only from the Bahamas and not directly from Cuba. In view of its substantially greater land area, it seems probable that more species have reached Florida from Cuba than from the Bahamas. Seventeen species present both in Florida and in other areas of the Caribbean, including also Costa Rica or Venezuela (indicated in brackets) are as follows:

Florida, Dominica	*Japanagromyza aequalis* Spencer
	Melanagromyza caribbea sp.n. (C.R.)
	Ophiomyia gentilis sp.n. (C.R.)
	Japanagromyza perpetua sp.n. (C.R.)
Florida, Bahamas, Dominica	*Calycomyza hyptidis* Spencer
Florida, Jamaica	*Calycomyza obscura* sp.n. (C.R.)
Florida, Bahamas, Jamaica	*Melanagromyza splendida* Frick
Florida, Puerto Rico	*Phytoliriomyza pilosella* sp.n. (C.R.)
Florida, Trinidad	*Melanagromyza bidentis* Spencer (C.R.)
Florida, Grand Cayman	*Melanagromyza lippivora* Spencer
Florida, Venezuela	*Ophiomyia* sp. (*Lantana*) (V.)
Florida, Caribbean (generally distributed)	*Melanagromyza caerulea* (Malloch) (C.R.)
	Melanagromyza floris Spencer (C.R.)
	Melanagromyza minima (Malloch) (C.R.)
	Cerodontha (*Cerodontha*) *dorsalis* LOEW (C.R.)
	Amauromyza maculosa (Malloch) (C.R.)
	Liriomyza schmidti (Aldrich) (C.R.)

The random nature of the distribution of these southern Florida species on islands throughout the Caribbean suggests that most, if not all, are present on all of the larger islands. Collecting in the Caribbean has been extremely fragmentary and in no case undertaken by specialists on the family. A picture, nevertheless, emerges of a number of species of wide distribution on islands throughout the area which also have reached southern Florida. The study of Costa Rican material (together with the few other available records from Central America) reveals the highly significant fact that no less than 12 of the 17 species cited above are known from Central America. This clearly points to Central America as the ultimate source area not only of species populating the Caribbean islands but also of the species of southern origin now established in Florida. This question is discussed further below (p. 133).

4. SPECIES OCCURRING BOTH TO THE NORTH AND SOUTH OF FLORIDA (GROUP 3)

It will be seen from Table 2 that 11 species fall into this category. This does not represent a homogeneous group, and there is no single explanation for the unusually wide distribution of some of these species.

One species, *Melanagromyza minimoides* Spencer, is common in southern Florida as a seed feeder on a number of Compositae.

Two of the main hosts, *Borrichia frutescens* and *Melanthera deltoidea* are of West Indian origin, and it also occurs on *Aster simmondsii*, a Florida endemic; further hosts in Florida are *Helenium nudiflorum* and *Verbesina laciniata*, both of which are of wide distribution further north. On this evidence the species be considered to be of southern origin, and its affinities definitely support this. Two females also have been identified tentatively from British Guiana (Spencer, 1966c: 13). The one puzzling record is from Ohio where it has been reared from seed heads of *Rudbeckia laciniata*. This plant frequently is cultivated, and the most plausible explanation appears to be that it has been introduced into this northern locality.

Phytoliriomyza imperfecta (Malloch) was described from Chile, subsequently has been reported in California and now is recorded in Florida. Another species in this genus, *P. arctica* (Lundbeck), is semi-cosmopolitan and is almost certainly of Tertiary origin, occurring from Greenland to Brazil and from the Canary Islands to Formosa (Spencer, 1969a: 23). It therefore seems probable that *imperfecta* crossed the water gap into South America in the late Tertiary and reached Florida from the north at an early date. Although it is widely distributed, the species is uncommon, and only three specimens are known. *Cerodontha* (*Cerodontha*) *dorsalis* (Loew), feeding on Gramineae, is also clearly an old species. It doubtless reached Florida from the North and has spread via Central America both into South America and also via Cuba or Jamaica to Puerto Rico and Dominica where it is also now recorded.

Melanagromyza splendida Frick and *M. viridis* (Frost) occur widely in the Caribbean, in Florida and also in California. Both are typically southern species which might well have been introduced into California on cultivated composites. *Liriomyza munda* Frick has a similar distribution, but it also is known from the Gulf States. It occurs on a wide range of cultivated and other hosts and could also represent an introduction into California. It has not been recorded in the eastern United States north of Florida.

Calycomyza jucunda (Wulp) and *C. malvae* (Burgess) are known from Cuba and Jamaica, Florida and the northern part of the United States, *malvae* even reaching Toronto. *Calycomyza ipomaeae* (Frost) has an extensive range from Brazil, through the Caribbean to Florida and northward to southern Ontario; *Amauromyza maculosa* (Malloch) is similar, but its distribution appears not to extend north of New York. It would be remarkable if these species had only reached southern Florida after the peak of the Wisconsin and still managed to extend their range so far to the north. It seems more plausible that such species, with an obviously wide climatic tolerance, were present in southern Florida throughout much, if not the whole, of the Pleistocene, survived the Wisconsin in the tip of the peninsula and, as warmer conditions developed, were thus able to extend their range 1000 miles to the north relatively rapidly.

Ophiomyia lantanae (Froggatt) hitherto has been considered as a native of Mexico. However, it occurs widely throughout the Caribbean and is now recorded for the first time in Brazil. It is apparently common in the Gulf States in association with its main host, *Lantana camara*. It is a species which easily could have reached Florida from the south. Whether its present distribution extends continuously from Central America, Mexico and the Gulf States to northern Florida can only be established by further collecting.

5. SPECIES LIMITED TO FLORIDA (GROUP 4)

Twenty-one species are recorded which are only known from Florida. It would be misleading even provisionally to treat these as endemic. The great majority, if not all, will be found with further collecting to occur either to the north or in the West Indies to the south. The probable affiliations are indicated by N. or S. in the list in Table 2.

At most three of the species conceivably might prove to be endemics. *Melanagromyza heliotropii* sp.n. was reared from *Heliotropium leavenworthii*, itself a Florida endemic. *Phytoliriomyza floridana* sp.n., although showing clear affiliations with other species in the genus, is recorded from a locality in

Pasco County which might have been the site of a postulated Pleistocene island. *Phytomyza orlandensis* sp.n. also might have been collected from a former Pleistocene island site. Its nearest known relative is from the Canadian Rockies, and there now might well be a relict population which has speciated in Central Florida. However, the great mobility of the Agromyzidae is a major factor diminishing the probability of such endemic species in Florida. The answer can be provided only by further collecting.

Assuming that in fact no Florida Agromyzidae are truly endemic, a final summary of species of probable northern and southern origin is as follows:

	Number	Percentage
Northern origin	37	43%
Southern origin	49	57%

Economic Importance

At least 150 species of Agromyzidae are known to feed on plants of economic importance. Damage from leaf-mining activity can be severe, frequently reaching destructive levels, or at least weakening younger plants and causing an appreciable reduction in crop yields. Probably the most serious pest is the stemboring species, *Melanagromyza phaseoli* (Tryon), which causes severe economic loss in bean crops throughout the Old World tropics from Africa to northern Australia and the Pacific islands. This species is not known in the Neotropical region.

Cultivated plants in California, particularly melons, beans, alfalfa and tomato suffer serious damage from the leaf miner, *Liriomyza munda* Frick, which was misidentified originally as *L. pictella* Thomson (Oatman and Michelbacher, 1958). *L. munda* has caused similar damage to truck crops in Florida, particularly in the Homestead area, Dade County.

Plants of horticultural importance frequently can be severely disfigured by leaf miners, resulting in a considerable reduction in their market value. *Ilex vomitoria,* which is cultivated in many nurseries in Central Florida, is often severely infested by the host-specific leaf miner, *Phytomyza vomitoriae* Kulp.

Sudden mass outbreaks of leaf-mining activity by relatively unknown species may occur at any time on plants which have not been known previously to suffer substantial damage. The barley crop was recently attacked in this way over wide areas of southern Germany by a species which had hitherto only been known from isolated individuals (Geigenmüller, 1966).

Thus, although the Agromyzidae in most years are not of major economic importance in Florida, their potential to cause serious damage to a number of cultivated plants is ever present, and, with favorable conditions, one or other species may at times develop as a serious pest.

Rearing Agromyzidae

Although the basic elements of the agromyzid fauna of Florida are now known, many other species await discovery in all parts of the state, particularly in counties in the north. It is hoped that this paper will increase interest in the family among entomologists in general, and that at least some workers will be encouraged to collect leaf mines which will certainly be found during the course of any field work and which now can be identified more readily. In this context it is felt that a few brief remarks on collecting and rearing techniques may prove helpful.

Leaf mines. Even empty leaf mines frequently will permit identification of the species concerned, provided the host plant can be identified reliably. With a hand lens it is easy to establish whether or not a leaf mine contains a larva or puparium. If it is empty, a representative sample of mines should be pressed and dried between sheets of newspaper, preferably together with the flower, so that the identification of the plant can be confirmed readily.

If mines still contain living larvae, a portion of the stem containing mined leaves should be kept in a sealed polyethylene bag or glass tube, until the larvae have pupated. It is better not to pick individual leaves, as

these desiccate more rapidly than if still attached to the stem, frequently preventing larvae from completing their feeding and pupating normally.

Puparia obtained in this way should be transferred with a slightly moistened camel-hair brush to the actual rearing container. Glass tubes about 1 inch in diameter and 2 to 3 inches long containing a small layer of dampened sand have been found entirely satisfactory. These require attention every few days, adding a few drops of water when necessary as the sand dries out, or alternatively removing any excess moisture on the sides of the tube which can damage emerging flies. In my experience healthy puparia are not normally attacked by mold, but a number invariably die from other causes, and mold then rapidly develops. When this is seen to be happening, the dead puparia should be removed, before the mold spreads throughout the tube.

Species which pupate in the leaves present a problem, as if the entire leaf or even a small section of it containing the puparium is kept for more than a few days in an enclosed moist atmosphere, mold will develop rapidly on the dead plant tissue, ultimately killing the transforming larva. It is therefore necessary in such cases to remove such puparia from the mines before rearing the adults as described above. This is not always an easy operation, but with experience the puparia normally can be removed without causing them any damage.

Mined leaves from which the larvae have pupated or from which puparia have been removed, should, of course, be pressed in the normal way. Empty pupal cases should be retained together with the adults which have emerged from them or should be appropriately labelled so that later the two can be associated correctly.

The necessity for careful and accurate labelling throughout the rearing process cannot be too strongly emphasized. Whatever system of serial numbering is used, the same reference number or label can be used at six separate stages: 1. the host plant; 2. the polyethylene bag or tube containing the mines in the field or the laboratory; 3. the actual rearing container; 4. pressed mines; 5. emerging adults and empty puparia; 6. any parasites obtained. Mistakes can be made, however carefully one works, particularly when dealing with large amounts of material, but the labelling procedure outlined above, if faithfully carried out, largely eliminates the possibility of incorrectly associating adults and host plants, which can be so misleading for future workers.

Stems and flower heads. When checking stems, larval feeding activity readily can be detected either if the stem is cut across or split lengthwise. By following the feeding track of the larva either down or up the stem, the puparium normally can be found without great difficulty and should then be reared out, as described above. Once it has been established in the field that a given host contains agromyzid puparia, time can be saved by making a random selection of stems, which can be examined in more detail later in the laboratory.

With flower heads and seed pods it is also desirable first to establish that Agromyzidae are present, and a suitably large quantity can be collected for later detailed examination. If time permits, it is desirable to remove the individual puparia from flower heads to prevent their destruction by any developing mold (or desiccation, if kept dry). Also, this procedure ensures correct association of adults with their puparia, as in a number of cases two species may be present in a single flower head (i.e., *Melanagromyza minima* and *M. wedeliae* in *Wedelia*).

Preserving adults. Emerging flies should not be killed too rapidly and should be allowed to live for at least 24 hours to ensure complete hardening and full development of their color. Ideally they should be pinned using micro pins, although gluing either to a stronger pin or a card point can be satisfactory. If time or facilities do not permit this, the specimens should be kept dry in layers of cellulose acetate, either in tubes or pill boxes, containing all relevant data, including locality and date of collection, host plant and emergence date. The greatest care is called for in handling dry specimens to prevent

damage to antennae, bristles, legs, etc. which may all be vital for accurate identification.

Preservation in alcohol is not recommended. Although satisfactory techniques now exist for drying out such specimens, it is a time-consuming process which can be avoided if the necessary attention is given to preserving specimens dry.

Key to Genera of Florida Agromyzidae

1 Subcosta developed throughout its length, coalescing with R1 before reaching costa (Subfamily Agromyzinae) 2

1′ Subcosta becoming a fold distally and ending in costa separately and basad of R1 (Subfamily Phytomyzinae) 5

2 2 pairs of dorso-centrals; if 3 or 4 pairs, halteres black 3

2′ At least 3 pairs of dorso-centrals, pre-scutellars always present; halteres white or yellow ..... *Agromyza* Fallén (p. 18)

3 Either pre-scutellars or fore-tibial bristle present or halteres yellowish .... *Japanagromyza* Sasakawa (p. 23)

3′ Halteres black, pre-scutellars lacking ..4

4 Distinct, frequently bulbous, keel between bases of antennae; male normally with vibrissal fasciculus .... *Ophiomyia* Braschnikov (p. 55)

4′ Antennal bases virtually approximate; vibrissa in male normal .... *Melanagromyza* Hendel (p. 30)

5 Orbital setulae erect or reclinate, or absent 6

5′ Orbital setulae distinctly proclinate ..13

6 Scutellum dark, concolorous with mesonotum 7

6′ Scutellum yellow; vein M 1+2 ending nearest wing tip 12

7 Halteres with knob white or yellow .. 8

7′ Halteres with knob black or at least partially darkened ....*Amauromyza* Hendel (p. 93)

8 Vein R 4+5 ending nearest wing tip.... ..... *Phytobia* Lioy (p. 64)

8′ Vein M 1+2 ending nearest wing tip..9

9 Third antennal segment with a spine, scutellum with only 2 bristles; or lunule conspicuously higher than a semicircle, either narrow or triangular; or lunule conspicuously large and broad, antennal bases widely separated and third antennal segment in male normally greatly enlarged .... *Cerodontha* Rondani (p. 64)

9′ Not so 10

10 Fore-tibia with lateral bristle; abdomen in male conspicuously yellow .... *Nemorimyza* Frey (p. 95)

10′ Only mid-tibia sometimes with lateral bristles, fore-tibia never 11

11 No pre-sutural dc; mesopleura and femora largely black .... *Calycomyza* Hendel (p. 71)

11′ Pre-sutural dc present; antennae and legs yellow ....*Pteridomyza* Nowakowski (p. 110)

12 Second cross-vein lacking; single ors .... *Haplomyza* Hendel (p. 111)

12′ Second cross-vein present; two ors .... *Liriomyza* Mik (p. 96)

13 Costa extending to vein M 1+2; second cross-vein present ....*Phytoliriomyza* Hendel (p. 114)

13′ Costa ending at vein R 4+5; second cross-vein absent .... *Phytomyza* Fallén (p. 117)

SUBFAMILY AGROMYZINAE

GENUS *AGROMYZA* FALLÉN

Agromyza Fallén, 1810:21. Type of genus: *Agromyza nigripes* Meigen, 1830.

The genus *Agromyza* is distributed throughout the world and includes approximately 160 species, but it occurs predominantly in temperate areas of the northern hemisphere. Only a single species is known in Australia and seven in the Neotropical Region. It is not surprising therefore that only four species are recorded in Florida, with a further three from the Caribbean area. In the Nearctic Region to the north 28 species are recorded (Spencer, 1969a).

American workers in the past have included species in *Agromyza* which now are placed in *Japanagromyza*. The five species in couplets 11 to 13 of Frick's (1959) key to *Agromyza* species are in this category. *Agromyza* species invariably have more than two pairs of dorso-centrals, while in *Japanagromyza* (with the single exception of *J. brooksi* Spencer, 1969a from Canada) only two occur.

Key to Florida species of *Agromyza*

1 Third antennal segment reddish orange, frons reddish in front, black behind .... *varifrons* Coquillett

1′ Third antennal segment and frons darker, black or at most brown 2

2 Third antennal segment black; large species, wing length 3.1 mm .... sp. (Florida)

2′ Third antennal segment paler, at least partially brownish 3

3 Aedeagus as in Figs. 4, 5..... ..... *parvicornis* Loew

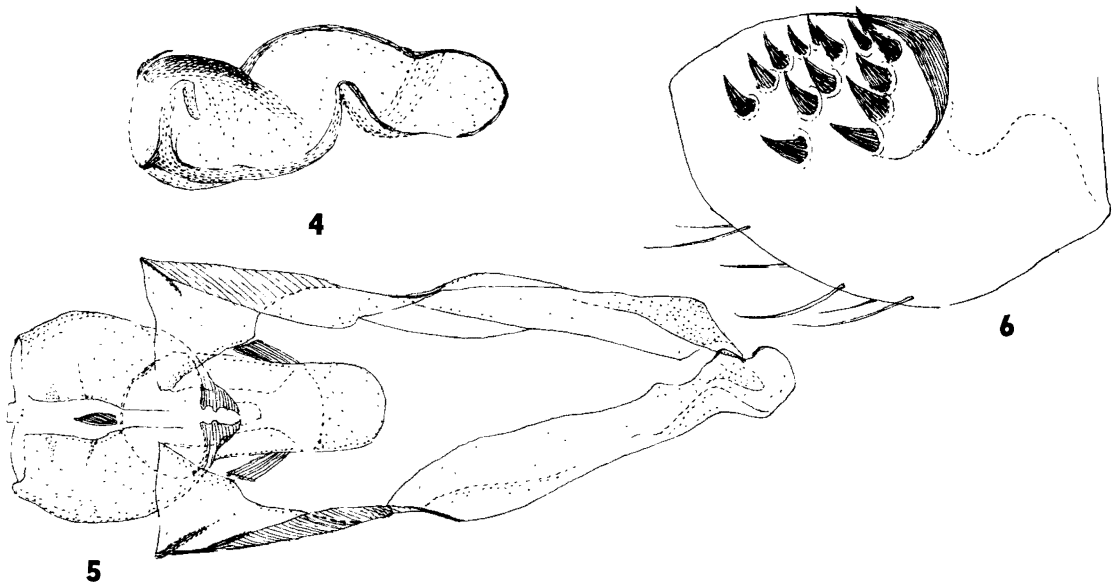
3′ Aedeagus as in Figs. 8, 9..... ..... *proxima* Spencer

Agromyza parvicornis Loew

Fig. 4-7

Agromyza parvicornis Loew, 1869: 49; Spencer, 1869a: 51. Lectotype male from District of Columbia, designated by Frick (1957), in MCZ.

Adult: frons brown, broad, almost twice width of eye, distinctly projecting above eye



Figs. 4-6. *Agromyza parvicornis*: 4, aedeagus, side view; 5, same, ventral view; 6, surstylus.

anteriorly; jowls deeply extended at rear, one-third vertical height of eye; third antennal segment rounded, virtually bare, pale brown, arista distinctly pubescent; mesonotum shining black, with four or five dc, greatly decreasing in size (not two as stated by Frick, 1959: 357); legs black, fore-knees paler, all tibiae distinctly brownish; wing length from 2.5 mm in male to 3.1 mm in female; squamae and margin yellowish-white, fringe either entirely white or slightly darker, ochrous brown.

Male genitalia: aedeagus (Fig. 4, 5) with conspicuously short and broad distiphallus, surstyli (Fig. 6) with a group of some 15 bristles on inner margin.

Host plant/Biology: *Zea mays* and probably other Gramineae.

Distribution: Florida, Alachua Co., Highlands Co., Polk Co.; Washington, DC; Canada: British Columbia, Ontario.

Remarks: *A. parvicornis* belongs to a closely-related group of grass feeders and is well known in the literature as the "corn leaf miner." It is probable that several other species have been confused in the past with the true *parvicornis*.

Examination of the types confirms that one is largely destroyed, but the male lectotype is in perfect condition. The aedeagus is entirely distinctive, and the short, broad distiphallus will permit immediate identification of this species.

The species in Florida feeding on *Echinochloa walteri*, discussed by Spencer (1966c: 1) as *parvicornis*, in fact represented a new species, which was described by Spencer, 1969a:52 as *A. proxima* (cf. p. 19).

Material examined:

Florida: Alachua Co., Gainesville, three males, one female, 9 May 1959, ex leaf mines on *Zea mays* (G.W. Dekle); Highlands Co., Archbold Biological Station, one female, 15 April 1969 (S.W. Frost); Polk Co., Lakeland, one female, no date (G.G. Ainslie).

District of Columbia: Washington, one male (Osten-Sacken), lectotype.

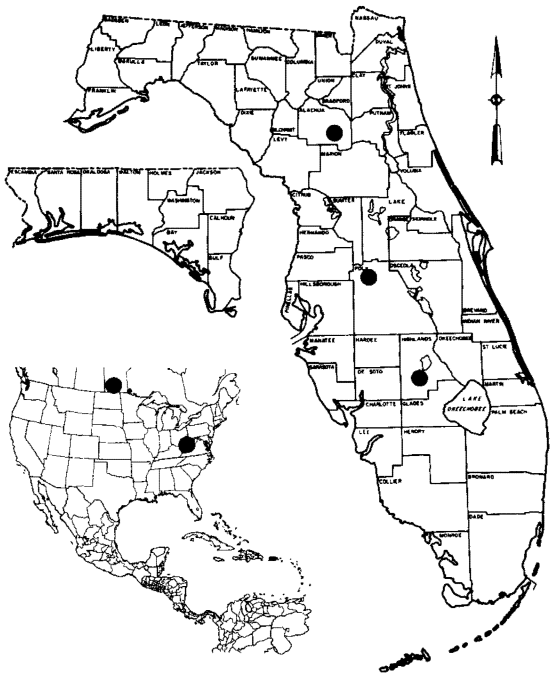


Fig. 7. Distribution of *Agromyza parvicornis*.

Agromyza proxima Spencer

Fig. 8-12

Agromyza proxima Spencer, 1969a: 52. Holotype male from Florida, Dade Co., in USNM.

Adult: wing length 2.4 - 2.7 mm, costa extending strongly to vein M1+2, frons slightly projecting above eye near antennae, jowls deeply extended at rear, ¼ vertical height of eye; third antennal segment rounded, slightly longer than broad, with normal pubescence; frons black or blackish brown; antennae largely black, but first and second segments and third segment on inside more brownish; mesonotum shining black; legs: femora black, tibiae and tarsi only slightly paler, dark brown; squamae pale gray, fringe ochrous brown.

Male genitalia: aedeagus with long, relatively narrow distiphallus, as in Figs. 8, 9.

Puparium: reddish brown, posterior spiracles each with three bulbs, the two processes closely adjoining and on a conspicuous protuberance (Fig. 10); puparium reddish brown, larval mouth parts as in Fig. 11.

Host plant/Biology: *Echinochloa crusgalli, E. walteri, Panicum dichotomiflorum,* larva forming large yellowish leaf mine, many larvae feeding together; pupation externally.

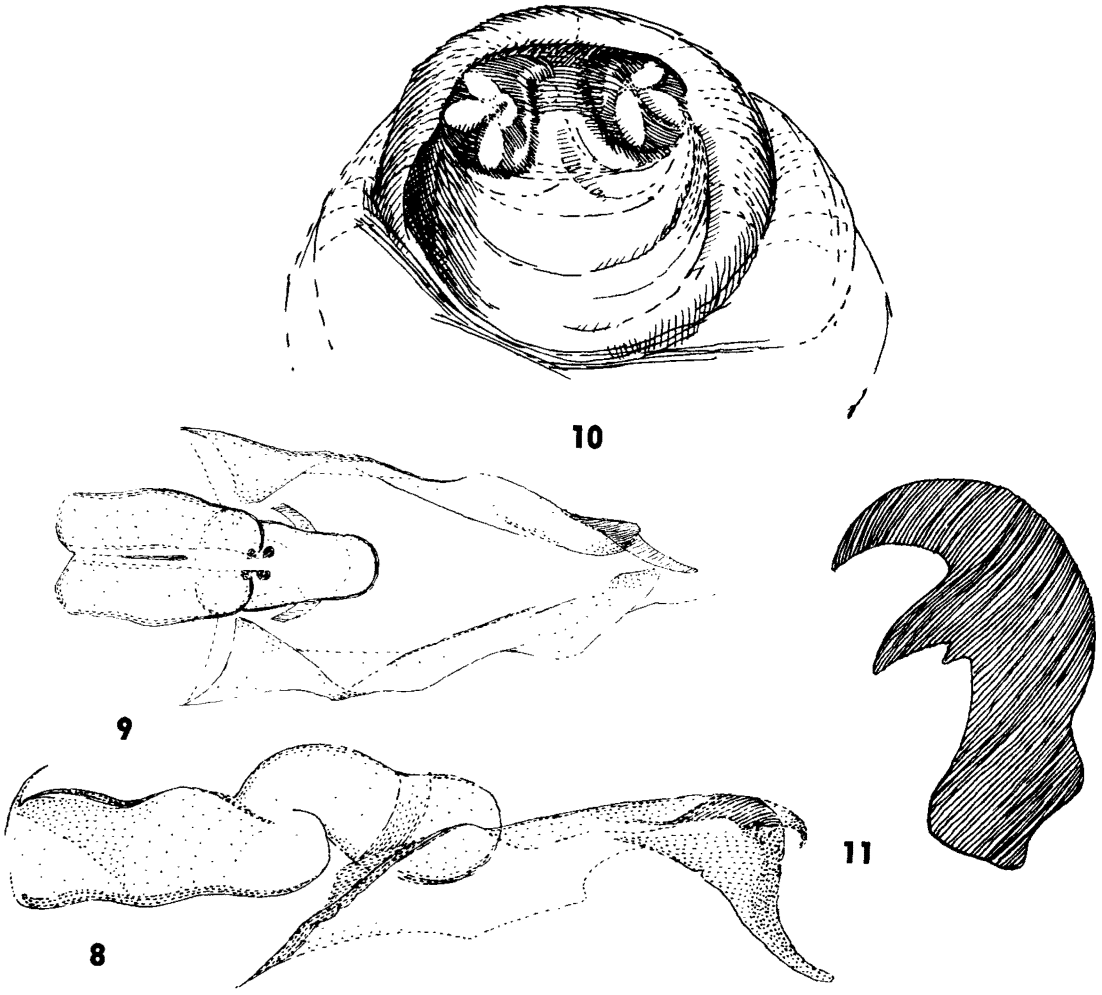
Distribution: Florida, Dade Co., Sweetwater; New York, Kennedy Airport; Canada; Manitoba.

Remarks: This species previously had been confused with *A. parvicornis* Loew (Spencer, 1966c: 1). Only after establishing the true identity of *parvicornis* by examination of the genitalia of the lectotype did it become apparent that the specimens from Sweetwater represented a distinct species. *A. proxima* is extremely close to *parvicornis*, but the third antennal segment is slightly smaller and somewhat darker, and the aedeagus is substantially longer and narrower. The male genitalia normally will provide the only certain means of identification of these species.

Material examined:

Florida: Dade Co., Sweetwater, Tamiami Canal, four males, four females, emerged 3 Aug. 1963 ex leaf mines on *Echinochloa,* collected 24 July 1963 (C.E.S.); New York: Kennedy Airport, leaf mine with dead larvae in *Panicum dichotomiflorum,* 25 Oct. 1965 (K.A.S.).

Canada: Manitoba, 2 mi. East of Forrest, one male, 19 July 1958 (J.G. Chillcott).



Figs. 8-11. *Agromyza proxima*: 8, aedeagus, side view; 9, same, ventral view; 10, posterior spiracles of puparium; 11, larval mouth-parts.

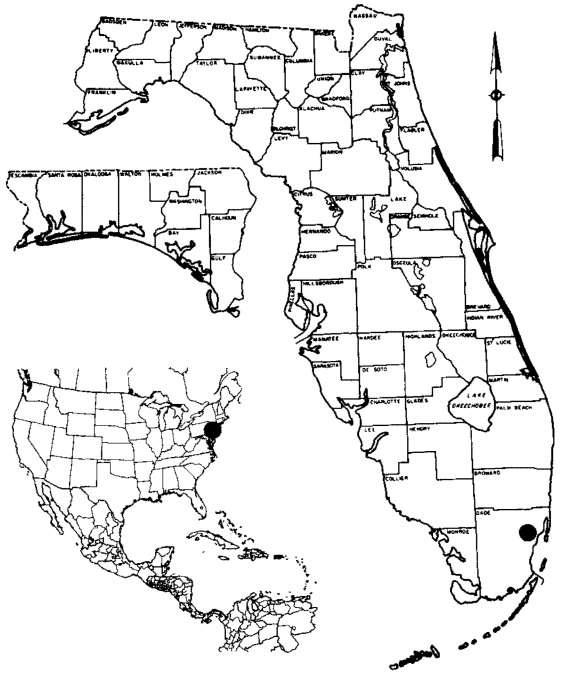


Fig. 12. Distribution of *Agromyza proxima.*

Agromyza varifrons Coquillett

Fig. 13-15

Agromyza varifrons Coquillett, 1902: 189; Spencer, 1966c: 2; 1969a: 59. Holotype female from District of Columbia in USNM.

Adult: frons reddish in front, black behind, all antennal segments conspicuously reddish orange; three pairs of differentiated dc; femora black, knees, tibiae and tarsi distinctly paler; mesonotum moderately shining black; wing length 2.3 mm.

Male genitalia: aedeagus as in Fig. 13, cerci distinctive, bearing group of stout bristles at end (Fig. 14).

Host plant/Biology: *Celtis laevigata* and *C. occidentalis,* larva forming conspicuous blotch mine, pupating externally.

Distribution: Florida, Dade Co., Hialeah; widespread in Eastern United States; Canada; S. Ontario.

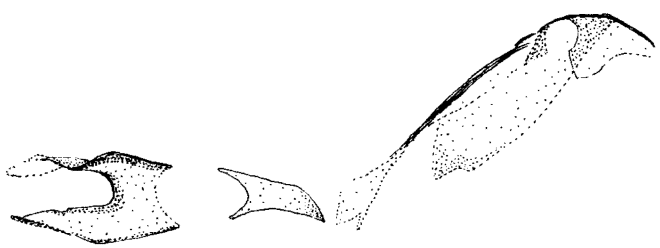
Remarks: The distinctive coloration makes this species readily recognizable. It appears to be widespread with its food plant and no doubt occurs continuously from Florida to S. Ontario where it was found by the senior author at Point Pelee in July 1967, representing the northern limit of its distribution.

A. varifrons is closely related to *A. trebinjensis* Strobl occurring on *C. australis* L. in Europe (Spencer, 1966c: 2).

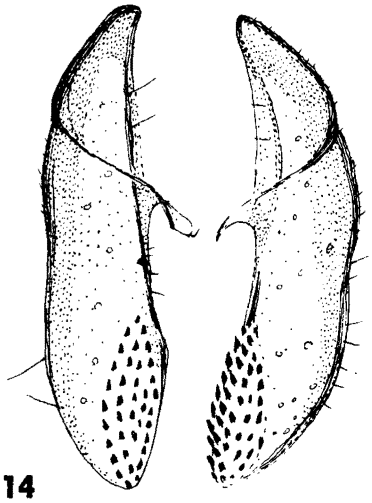
Material examined:

Florida: Alachua Co., Gainesville, one female, 24 March 1966 (F.W. Mead); Dade Co., Hialeah, 6 exx., emerged 5 Oct. 1963 from leaf mines on *Celtis laevigata* collected 22 Sept. (C.E.S.).

Canada: Point Pelee, S. Ontario, one female, 15 July 1966; one female, emerged 4 Apr. 1968 from leaf mine on *Celtis* collected 15 July 1966 (Both K.A.S.).



13



14

Figs. 13, 14. *Agromyza varifrons*: 13, aedeagus; 14, cercus.

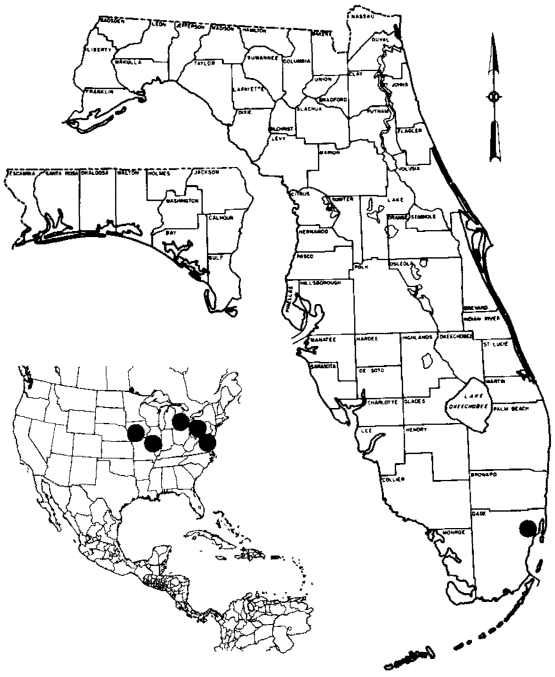


Fig. 15. Distribution of *Agromyza varifrons*.

Agromyza sp. (Florida)

Fig. 16

Highlands Co., Highland Hammock State Park, one female, 10 Oct. 1968 (K.A.S.).

This specimen almost certainly represents an undescribed species, but it seems preferable not to describe it formally until males are available. The essential characters are as follows:

Frons narrow, equal to width of eye, not projecting above eye; jowls narrow, slightly less than one-sixth vertical height of eye; third antennal segment small, round, with distinct patch of short pubescence at end; three dc, greatly decreasing in size; frons and antennae black, mesonotum shining black, all legs black; squamae and fringe silvery white; wing length 3.1 mm.

The only Neotropical species with which this specimen can be compared is *A. venezolana*, but *Agromyza* sp. is substantially larger. In the author's key to Canadian species it would run to *A. albipennis* Meigen (squamal fringe white, all legs entirely black), but it clearly does not represent this species in view of the differently shaped antennae.

GENUS *JAPANAGROMYZA* SASAKAWA

Japanagromyza Sasakawa, 1958: 140. Type of genus: *Agromyza duchesneae* Sasakawa, 1954: 106.

This genus was erected for a small group of species in Japan but also occurs widely in the Oriental-Pacific Region. Later it was found to be present in southern Florida and also widespread in the Neotropical Region (Spencer, 1963a; 1966c). One new species from Florida and four from the Caribbean are described in this paper.

Japanagromyza appears to occupy an intermediate position between *Agromyza* and *Melanagromyza*. The halteres are invariably white or yellow and pre-scutellars are frequently present as in *Agromyza*, but there invariably are only two pairs of dorsocentrals as in *Melanagromyza*. The six species now known in Florida can be distinguished readily on external characters, but

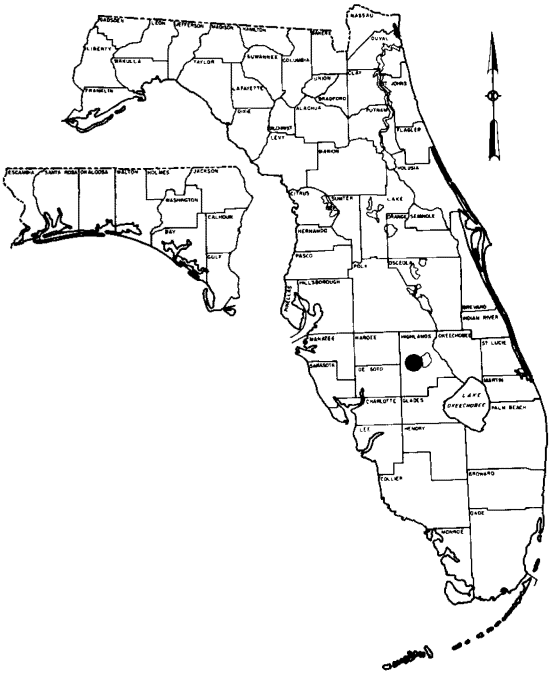


Fig. 16. Distribution of *Agromyza* sp. (Florida).

J. perpetua, which occurs from Costa Rica throughout the Caribbean to southern Florida, cannot be satisfactorily separated from *J. bennetti,* which is known from Antigua, Barbados and Puerto Rico, except by the male genitalia. Several other species groups found both in the Neotropical and Oriental Regions show significant differentiation only in the genitalia.

Species in this genus feeding on cultivated crops such as *Phaseolus* and *Vigna* must be considered as of potential economic importance. Young plants will be weakened, if not destroyed, by the large blotch mines produced by the larvae.

Key to Florida *Japanagromyza* species

1 Pre-scutellars lacking 2
1′ Pre-scutellars present 3
2 Mesonotum distinctly greenish ..... *perpetua* Spencer
2′ Mesonotum primarily mat grayish black, only faintly greenish ..... *desmodivora* Spencer
3 Mesonotum predominantly black; large species, wing length 2.8 - 3 mm ..... *viridula* (Coquillett)
3′ Mesonotum greenish 4
4 Upper orbital bristle shorter than lower ..... *inaequalis* (Malloch)
4′ Upper orbital bristles equal 5
5 Frons brown ..... *aequalis* Spencer
5′ Frons mat black .... *perpetua* Spencer

Japanagromyza aequalis Spencer

Fig. 17-23

Japanagromyza aequalis Spencer, 1966c: 3. Holotype male from Florida, Dade Co. in USNM.

Adult: two strong, equal ors; jowls narrow, one-twelfth vertical height of eye; third antennal segment distinctly covered with short, white pilosity, arista only slightly pubescent; two strong dc, frequently short third also present; pre-scutellars well developed; wing length 2 - 2.4 mm; fore-tibia with one, mid-tibia with two lateral bristles; frons uniformly brown, ocellar triangle and orbits distinctly shining black, mesonotum greenish or coppery black, moderately shining; squamae and fringe, also halteres entirely white.

Male genitalia: aedeagus membranous basally, chitinized at sides towards distiphallus, this short, extending only slightly beyond end of chitinization (Fig. 17); ninth sternite rounded, without apodeme, as in *J. desmodivora* (Fig. 25), side arms unusually broad, upcurved at end (Fig. 18), surstyli curving inward, not downward, without bristles (Fig. 19); cerci without internal bristles but with 5 or 6 short black teeth grouped at end (Fig. 20); epandrium with distinctive narrow extension toward cerci (Fig. 21); sperm sac very small, blade linear.

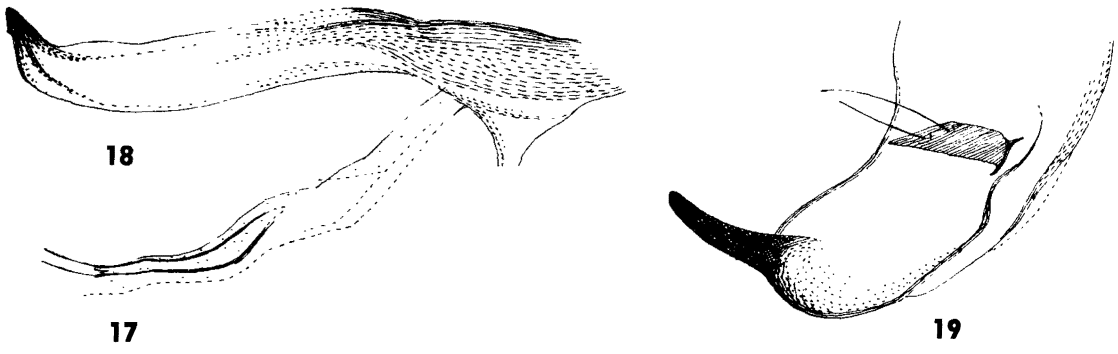


Fig. 17-19. *Japanagromyza aequalis*: 17, aedeagus, side view; 18, ninth sternite, side view; 19 surstylus.

Puparium: pale, straw coloured, posterior spiracles each with three bulbs on widely-separated, well-defined protuberances (Fig. 22).

Host plant/Biology: *Vigna luteola* (=*repens*), larva forming whitish blotch mine, pupating externally.

Distribution: Florida, Hialeah; Bahama Is.; Dominica.

Remarks: This species is readily distinguishable from *J. inaequalis*, which occurs on the same food plant, by the stronger dorsal orbital bristle, the paler brown frons and the distinctive pilosity on the third antennal segment; the male genitalia and pupal characters also are entirely distinct.

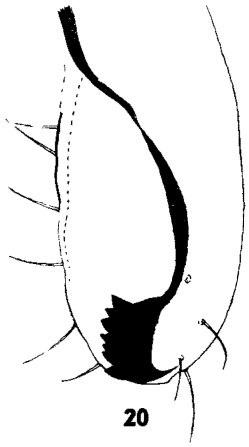
The distribution of this species clearly indicates its West Indian origin; it almost certainly will be found to occur elsewhere in the Caribbean area.

Material examined:

Florida: Dade Co., Hialeah, two males, one female, 10 Oct. 1963 ex leaf mines on *Vigna luteola* leg. 30 Sept. 1963; four males, two females, 12 Nov. 1963 ex leaf mines leg. 25 Oct. 1963 (all C.E.S.).

Bahamas: Berry Is., Little Harbour Cay, one female, 1 May 1953; Darby Is., Exuma Cay, one female, 18 Jan. 1953 (E.B. Hayden and L. Giovannoli).

Dominica: Layou River mouth, one male, 6 Feb., one female, 9 Jan. 1953 (W.W. Wirth).



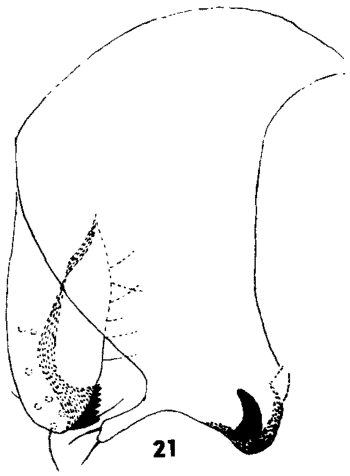
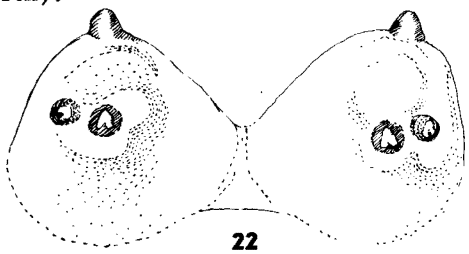


Fig. 20-22. *Japanagromyza aequalis*: 20, cercus; 21, epandrium; 22, posterior spiracles of puparium.



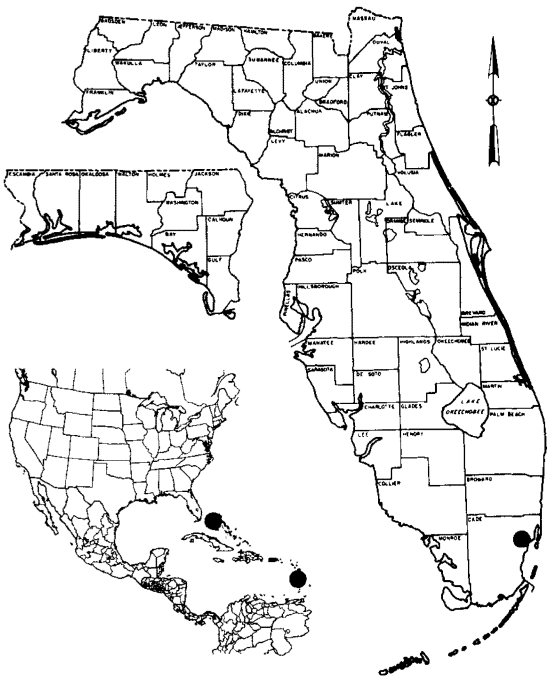


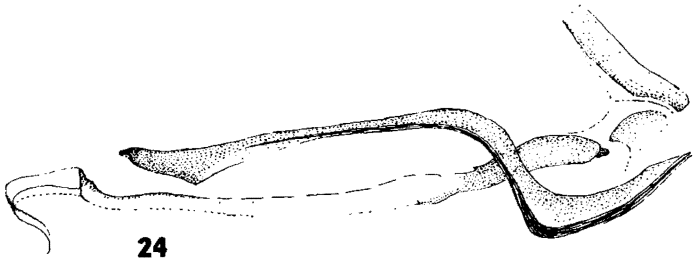
Fig. 23. Distribution of *Japanagromyza aequalis*.

Japanagromyza desmodivora Spencer

Fig. 24-30

Japanagromyza desmodivora Spencer, 1966: 4. Holotype male from Florida, Dade Co. in USNM.

Adult: two strong, equal ors, jowls narrow, one-tenth vertical height of eye; third antennal segment rounded above, flatter below; arista largely bare; two dc, pre-scutellars lacking; wing length from 1.9 mm in male to 2.2 mm in female; fore-tibia with one, mid-tibia with two lateral bristles; frons mat, brownish black, orbits darker black, slightly shining; mesonotum largely mat, grayish black, occasionally faintly greenish, abdomen more obviously gray green; squamae and fringe silvery white, halteres white.

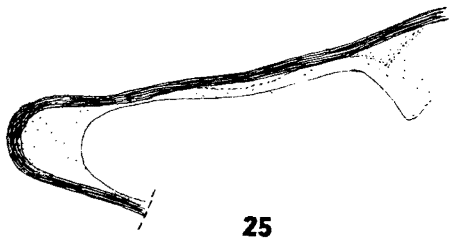


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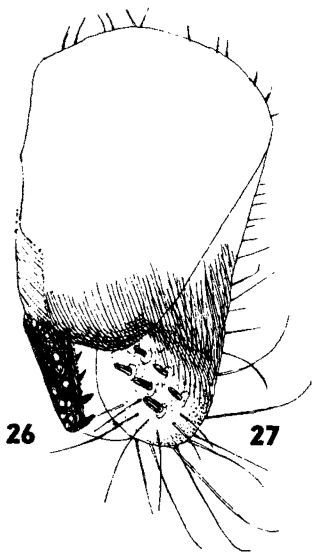
Male genitalia: aedeagus as in Fig. 24, basiphallus and base of distiphallus chitinized but area between entirely membranous, distal tubule short, also membranous; ninth sternite as in Fig. 25, without apodeme; surstyli (Fig. 26) short but stout, with some 12 spines; cerci (Fig. 27) with some 20-25 strong spines and unusually long hairs at end; sperm sac as in Fig. 28.

Host plant/Biology: *Desmodium tortuosum*, larva forming irregular blotch mine, greenish when fresh, becoming white or brownish with age; puparium orange brown, deeply segmented, posterior spiracles each with three slightly raised bulbs (Fig. 29) lying immediately adjacent to the anal depression.

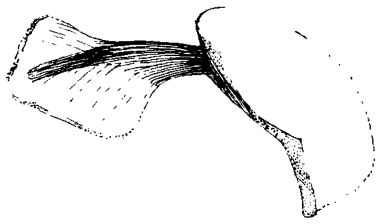
Distribution: Florida, Miami; ?Colombia, Bogotá.



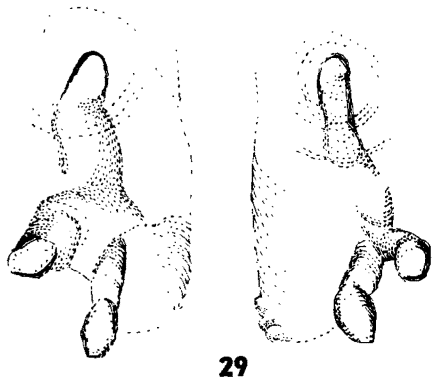
25



26 27



28



29

Figs. 24-29. *Japanagromyza desmodivora*: 24, aedeagus, side view; 25, ninth sternite; 26, surstyli; 27, cercus; 28, sperm sac; 29, posterior spiracles of puparium.

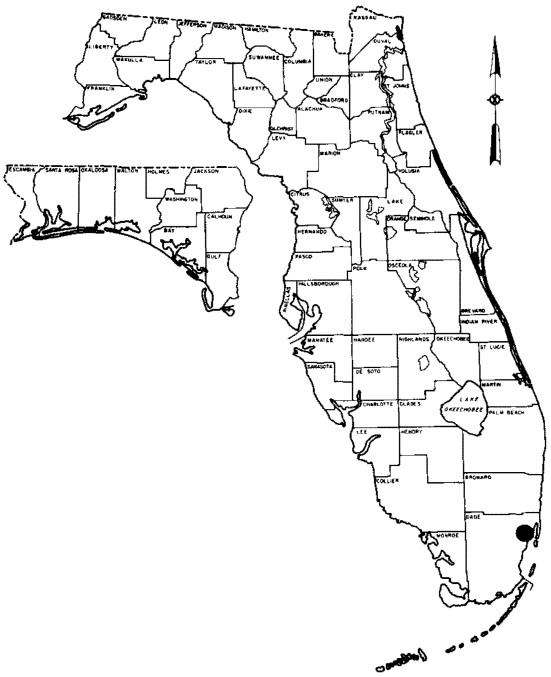


Fig. 30. Distribution of *Japanagromyza desmodivora*.

Remarks: This species consistently lacks pre-scutellars and the very long hairs on the cerci are distinctive. *J. propinqua* (cf. Fig. 353) has similarly long hairs on the cerci but pre-scutellars are in this species well developed.

Empty leaf mines found on *Desmodium* near Bogotá are possibly referable to *J. desmodivora*.

Material examined:

Dade Co., Miami, four males, eight females, early Nov. 1963 ex leaf mines on *Desmodium tortuosum* collected 17 Oct. 1963; five males, three females, 13 Oct. 1963 ex leaf mines collected 26 Sept. 1963 (all C.E.S.).

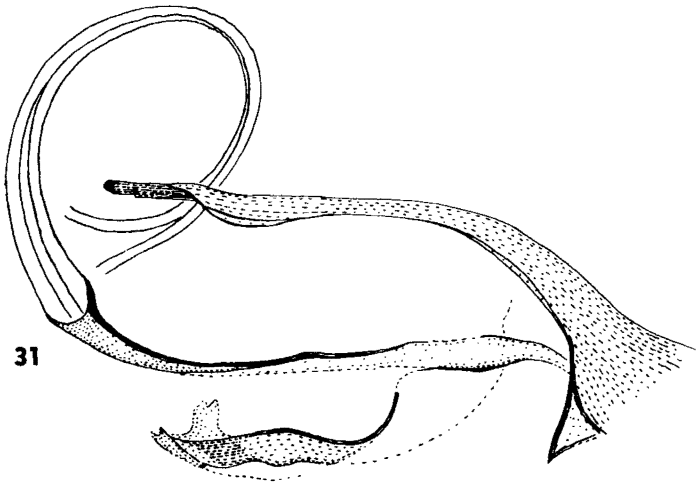
Japanagromyza inaequalis (Malloch)

Fig. 31-35

Agromyza inaequalis Malloch, 1914a: 89; Shewell, 1953: 463; Frick, 1957: 199; 1959: 355. Holotype female from Puerto Rico in USNM.

Japanagromyza inaequalis, Spencer, 1963a: 302; 1966c: 5.

Adult: medium-sized species, wing length normally 2.3 - 2.4 mm; upper orbital bristle always distinctly shorter than lower; frons mat black, more rarely brownish; lunule whitish gray; third antennal segment large, distinctly longer than broad, arista slightly pubescent; mesonotum mat greenish gray, more rarely faintly bluish, more shining from behind, with two strong dc and normally a pair of well-developed pre-scutellars (sometimes weak, present on one side or



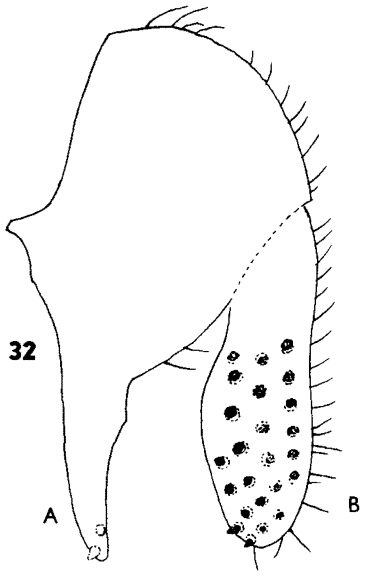


Fig. 31, 32. *Japanagromyza inaequalis*: 31, aedeagus (Dominica); 32, epandrium with A, surstylus and B, cercus.

greatly reduced, similar to acr); legs black, fore-tibia with one weak lateral bristle, mid-tibia with two stronger ones; abdomen shining greenish or faintly bluish; squamae and fringe white; halteres white.

Male genitalia: aedeagus as in Fig. 31, mesophallus strongly chitinized, distiphallus pale, paired tubules forming a regular coil lying below aedeagal apodeme; distinct but irregularly chitinized hypophallus present; ninth sternite with distinct hypandrial apodeme; surstyli (Fig. 32A) elongate, directed ventrally (not projecting inward), bearing from two to five strong spines; cerci with 20 or more internally-directed spines (Fig. 32B).

Host plant/Biology: *Vigna luteola* (=*repens*), larva forming conspicuous greenish white blotch mine (Fig. 33), pupating externally; puparium oval, dark brown, posterior spiracles each with three bulbs (Fig. 34).

Distribution: Florida, Dade Co., Highlands Co.; Dominica, Puerto Rico.

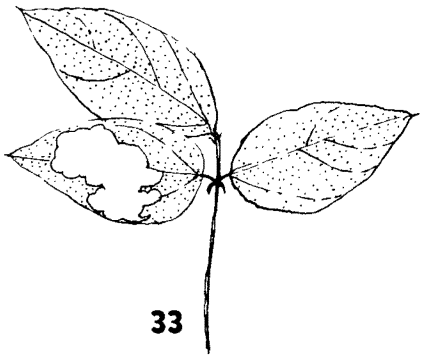
Remarks: This species is readily distinguishable by the shorter upper orbital bristle. In the larval and pupal stages it is immediately separable from *J. aequalis* which forms similar mines on the same host by the differently arranged posterior spiracles and pale, straw-colored puparium in *aequalis* (cf. Fig. 22). The distinctive character of the male genitalia is the well-chitinized hypophallus, which is not present in any other species in this region.

The new record of this species from Dominica suggests that it probably is widespread throughout the Caribbean area.

Material examined:

Florida: Dade Co., Hialeah, two females, 17 April and 8 Dec. 1963, one male, Nov. 1965, all ex leaf mines on *Vigna luteola* (C.E.S.); Miami, Fairchild Tropical Garden, two males caught on host plant, 17 Oct. 1968; two males emerged 8 Nov. from leaf mines leg. 17 Oct. 1968 (K.A.S. and C.E.S.); Highlands Co., Archbold Biological Station, one female, 28 Jan. 1965, ex *Vigna* sp. (S.W. Frost).

Dominica: Layou River mouth, one male, two females, 18-24 March 1965 (W.W. Wirth).



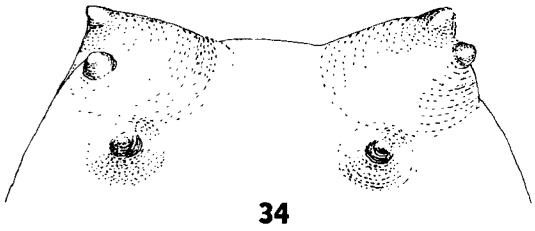


Fig. 33, 34. *Japanagromyza inaequalis*: 33, leaf mine on *Vigna luteola;* 34, posterior spiracles of puparium.

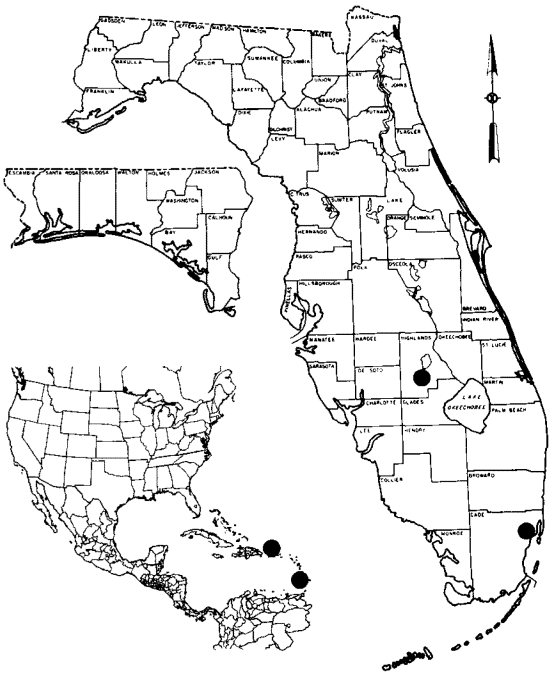


Fig. 35. Distribution of *Japanagromyza inaequalis.*

Japanagromyza perpetua Spencer, sp.n.

Fig. 36-38

Head: frons equal to width of eye; two equal ors, two similar ori, the lower incurved; orbital setulae sparse, reclinate; jowls narrow, one-tenth vertical height of eye; arista with distinct pubescence (detectable at magnification X38).

Mesonotum: two strong dc, acr in some ten rows; pre-scutellars present (though sometimes weak).

Legs: fore-tibia with one, mid-tibia with two lateral bristles.

Wing: length from 1.9 to 2.4 mm, last section of vein M4 two-thirds penultimate, first cross-vein before midpoint of discal cell.

Color: frons mat black, orbits slightly more shining, lunule silvery; mesonotum greenish black, only moderately shining; abdomen more strongly shining green; veins dark brown to black, wing base yellowish, squamae and fringe whitish yellow; halteres white.

Male genitalia: aedeagus as in Fig. 36A, basiphallus and mesophallus uniformly but weakly chitinized, distiphallus entirely membranous, forming coil below aedeagal apodeme, ninth sternite rounded, without hypandrial apodeme (Fig. 36B.); surstyli and cerci as in Fig. 37A, B, cerci with numerous stout bristles internally, surstyli extending downward, not inward.

Holotype male, Dominica, Cabrit Swamp, one male, 23 Feb. 1965, light trap (W.W. Wirth); paratypes: Dominica, one female, same data as holotype; Florida, Alachua Co., Gainesville, one male, 10 Dec. 1949 (G.S. Walley); Monroe Co., Key Largo, one male,

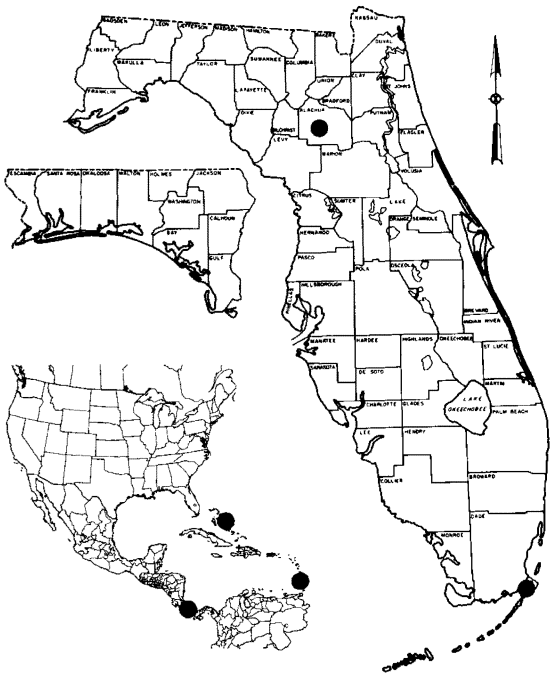
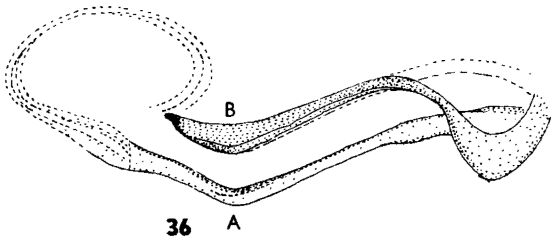
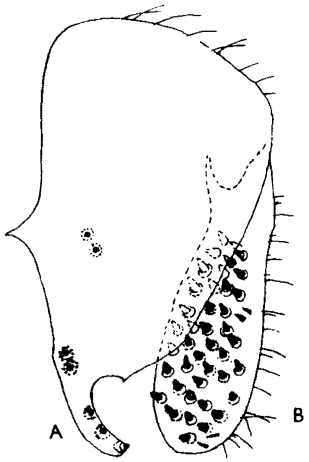


Fig. 38. Distribution of *Japanagromyza perpetua*.

one female, 4 Sept. 1955 (F.W. Mead); Bahamas, Eleuthera Is., Hatchet Bay (nr. Alicetown), one male, 2 April 1953 (E.B. Hayden & L. Giovannoli); Costa Rica, La Caja, 8 km W. of San José, seven males, 1930 (Schmidt); Puerto Rico, Mayaguez, two males, 15-16 Feb. 1914. Holotype and one paratype in USNM, further paratypes in AMNH, CNC, DEI, FSCA and senior author's collection. There is a further long





Figs. 36, 37. *Japanagromyza perpetua*: 36 A, aedeagus, B, ninth sternite; 37, epandrium with A, surstylus and B, cercus.

series of both males and females with the same data as the paratypes from Costa Rica, but these are in poor condition and are not formally being treated as paratypes.

Remarks: This species is very close to *J. bennetti,* known from Antigua and Barbados, but the longer distiphallus, the lack of a hypandrial apodeme in the ninth sternite and the more pubescent arista represent slight but constant differences.

Although the only record from Florida is from Gainesville, it seems certain that the species eventually will be found in southern Florida.

J. perpetua is immediately recognizable from *J. inaequalis* (Mall.) by the two equal ors.

The male from Puerto Rico, Loiza, 13 March 1933 (Faxon, Mills, Anderson) briefly discussed by Spencer (1963a: 305 and Fig. 15A-D) clearly represents *perpetua.* This particular specimen apparently entirely lacked pre-scutellars but the male genitalia as illustrated agree exactly with those of the additional material now examined. *J. perpetua* is therefore included also in couplet 5 to cover such cases where the pre-scutellars may be absent.

A male from Puerto Rico, San Juan, Guayama, 11 June 1933 (A.S. Mills) was originally considered to represent *perpetua.* However, the pair of internal bristles in the epandrium present in all specimens of *perpetua* which have been examined, are replaced by a group of six bristles, the chitinization of the distiphallus does not end abruptly before dividing into the apical tubules, and other minor differences in the genitalia indicate that this specimen represents a distinct species. Additional material is awaited before this will be formally described.

Japanagromyza viridula (Coquillett)

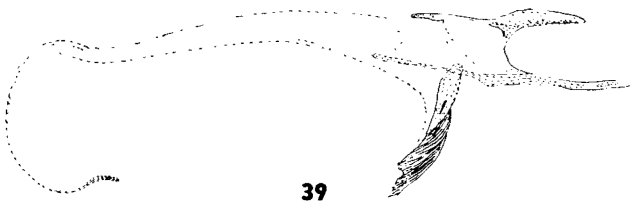
Fig. 39-41

Agromyza viridula Coquillett, 1902: 190. Type series in USNM.

Japanagromyza viridula, Spencer, 1966c: 3; 1969a: 63.

Adult: medium-sized species, wing length 2.8 - 3.0 mm, costa extending strongly to vein M1+2, first cross-vein well before midpoint of discal cell; frons not projecting above eye, mat black, lunule conspicuously silvery; orbital bristles strong, third antennal segment large; two dc, a strong pair of pre-scutellars; fore-tibia with one strong lateral bristle, mid-tibia with two; mesonotum moderately shining blackish, abdomen conspicuously green; squamae and fringe silvery; halteres white.

Male genitalia: aedeagus as in Fig. 39, with long straight distiphallus and well developed hypophallus; ninth sternite with elongated hypandrial apodeme; surstyli (Fig. 40A) projecting downward, long, straight, with about ten strong bristles toward end and another group at upper corner; cerci (Fig. 40B) without bristles.



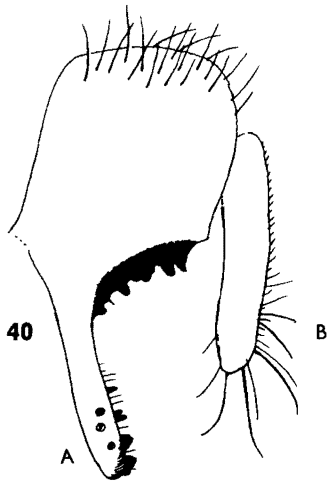


Fig. 39, 40. *Japanagromyza viridula*: 39, aedeagus; 40, epandrium with A, surstylus and B, cercus.

Host plant/Biology: *Quercus rubra* and probably other *Quercus* spp., larva forming an upper-surface blotch, pupating externally.

Distribution: Florida, Alachua Co.; widespread in Eastern U.S. to Gulf of Mexico; Canada: Ontario, Nova Scotia. New to Florida.

Remarks: In his description Coquillett refers to five specimens from District of Columbia, Massachusetts, Georgia and two from Puerto Rico. The specimens from the first three localities almost certainly are conspecific and represent *viridula*. It is virtually certain, however, that the two specimens from Puerto Rico represent one of the other closely related species now known to occur on that island.

Material examined:

Florida: Alachua Co., Gainesville, one male, 20 April 1967 (W.W. Wirth).

GENUS *MELANAGROMYZA* HENDEL

Melanagromyza Hendel, 1920: 120; Spencer, 1966a: 3-60; 1969a: 64. Type of genus *Agromyza aeneoventris* Fallén, 1823a: 4.

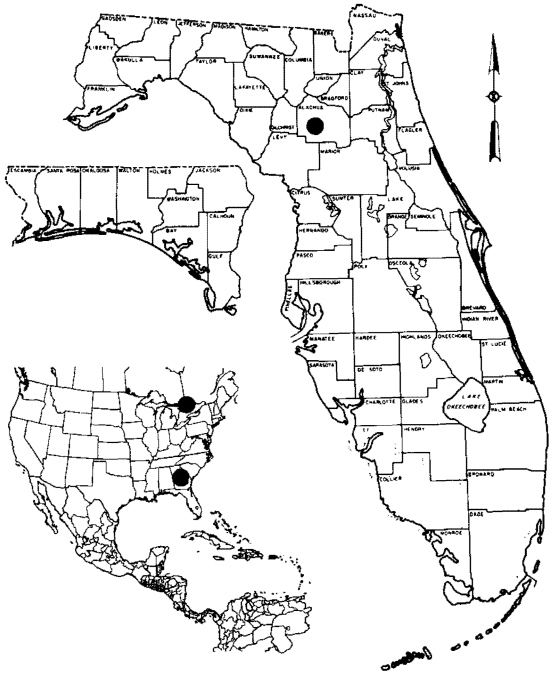


Fig. 41. Distribution of *Japanagromyza viridula*.

This is the second largest genus of the Agromyzidae with 280 described species. It is the dominant genus in both the Old and New World tropics but is also well represented in more temperate areas of both northern and southern hemispheres (South Africa); it does not penetrate into the Arctic. With 21 species it is the largest genus in Florida. The entire Nearctic Region has only 27 species.

The majority of world species are internal stem borers, and this group is well represented in Florida with seven species. The largest group in Florida, however, are the feeders in seed heads, with nine species. The biology of two species, *M. caribbea* and *M. parvella*, has not been definitely established, but they are almost certainly leaf miners related to *M. crotonis* (p. 153). This difference in feeding habit, supported by differences in male genitalia, suggests that these species may not be monophyletic with the stem borers and seed feeders (which certainly are) but further study will be required before a new genus can justifiably be erected for this group. *M. marelli* is an isolated species forming stem galls on *Alternanthera*.

Six new species are described below and two further species are new to Florida.

There are many complexes in this genus in which it is impossible to separate individual species on external characters. The male genitalia, however, provide a reliable means of identification, and the larval/puparial spiracles are also normally distinctive. Most species are host specific, but many are oligophagous and occur on closely related genera in the same family. One such species in Florida is *M. bidentis* feeding in seed heads of *Bidens* and *Verbesina*. *M. splendida* is truly polyphagous, being a stem borer in *Ambrosia, Bidens, Erechtites, Flaveria, Gaillardia, Helianthus* and *Lactuca* in the Compositae and in *Apium* and *Daucus* in the Umbelliferae.

In the past *M. virens* has been considered as a polyphagous species occurring on a wide range of hosts, but it now seems clear that such records refer to other species, and the confirmed hosts are only *Eupatorium* and *Heterotheca*.

Key to Florida *Melanagromyza* species

1 Squamal fringe pale, whitish 2
1′ Squamal fringe dark, brownish or black 13
2 Ocellar triangle brilliantly shining 3
2′ Ocellar triangle at most moderately shining 5
3 Jowls deep, one-quarter eye height ..... *viridis* (Frost)
3′ Jowls narrower, one-seventh to one-twelfth eye height 4
4 Ocellar triangle black, mesonotum brilliantly shining blackish green ..... *heliotropii* Spencer
4′ Ocellar triangle greenish blue, mesonotum strongly shining green, blue or greenish blue ..... *ruelliae* Spencer
5 Arista bare 6
5′ Arista appearing at least slightly pubescent 10
6 Orbits conspicuously widened, orbital setulae in numerous rows 7
6′ Orbits narrow, normal 8
7 Orbits exceptionally wide, each up to one-third width of frons; orbital setulae conspicuously proclinate above, more reclinate below; mesonotum distinctly mat viewed from front .. *virens* (Loew)
7′ Orbits less pronounced; orbital setulae shorter, less numerous; mesonotum more shining ..... *splendida* Frick
8 Jowls narrow, one-eighth height of eye; small species, wing length 2 mm 9
8′ Jowls broader, one-quarter to one-fifth height of eye ..... *lippivora* Spencer
9 Orbital setulae entirely reclinate; eye bare in both sexes ..... *floris* Spencer
9′ Orbital setulae proclinate on inner row; eye pilose in male .... *chaptaliae* Spencer
10 Fore-tibial bristle strongly developed, large species, wing length 2.6 - 3.4 mm.. ..... *caerulea* (Mall.)
10′ Fore-tibial bristle weak or absent .. 11
11 Eye in male bare 12
11′ Eye in male pilose .... *vectabilis* Spencer
12 Orbital setulae minute, similar to pubescence of arista .... *floridensis* Spencer
12′ Orbital setulae long, substantially longer than pubescence of arista .... *miamensis* Spencer
13 Mesonotum or abdomen greenish or coppery 14
13′ Mesonotum and abdomen black 18
14 Orbital setulae in two rows, inner row proclinate, outer reclinate; eye slightly pilose in male; wing length 2.3 mm .. 15
14′ Orbital setulae in single row, reclinate 16
15 Jowls broad, one-fifth height of eye; orbital setulae relatively long; aedeagus as in Fig. 55, 56 ..... *erechtitidis* Spencer
15′ Jowls narrow, one-tenth height of eye; orbital setulae conspicuously short; aedeagus as in Fig. 117, 118 .... *wedeliae* Spencer
16 Very small species, wing length not more than 1.9 mm 17
16′ Slightly larger species, wing length up to 2.2 mm; mesonotum more mat, greenish; aedeagus with slight gap between basiphallus and distiphallus complex (Fig. 86); ovipositor slightly elongated ..... *minimoides* Spencer
17 Mesonotum predominantly bluish black; long gap between basiphallus and distiphallus (Fig. 84), ovipositor greatly elongated (Fig. 83) .. *minima* (Mall.)
17′ Mesonotum predominantly greenish black; basiphallus and distiphallus adjoining (Fig. 42); ovipositor not elongated ..... *bidentis* Spencer
18 Jowls exceptionally broad, one-quarter vertical height of eye .... *marellii* (Brèthes)
18′ Jowls narrower, at most one-fifth eye height 19
19 Frons relatively broad, one and a half times width of eye; mesonotum appearing mat viewed from front, moderately shining from behind .. *caribbea* Spencer
19′ Frons narrower, equal to width of eye; mesonotum brilliantly shining black .... *parvella* Spencer

Melanagromyza bidentis Spencer

Fig. 42-44

Melanagromyza bidentis Spencer, 1966c: 7.

Holotype male from Dade Co. in USNM.

Adult: very small species, wing length 1.6 to 1.9 mm; orbital setulae in single row, reclinate; jowls narrow, one-eighth height of eye; eye bare in both sexes; arista long, bare; mesonotum shining blackish green, abdomen greenish coppery; squamae gray, fringe black; in female ovipositor sheath not significantly elongated.

Male genitalia: aedeagus as in Fig. 42, 43, basiphallus adjoining distiphallus.

Host plant/Biology: *Bidens pilosa, Verbesina,* larva feeding and pupating in seed heads; puparium whitish yellow, posterior spiracles black, strongly chitinized, separated by about three times own diameter, each with an ellipse of about ten bulbs around a strong black horn, essentially as in *M. minimoides* (cf. Fig. 89).

Distribution: Florida, Dade Co., Monroe Co.; Costa Rica, Guyana, Trinidad.

Remarks: This very small species is immediately distinguishable from *M. floris,* which also feeds in *Bidens* seed heads, by the dark squamal fringe. It is perhaps surprising to find two such very similar species feeding in the same way on the same host. More detailed study is necessary to establish any possible differences in the ecology of the two species.

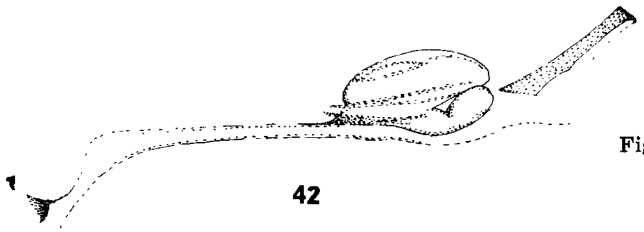
M. bidentis most closely resembles *M. minima* and *M. minimoides* which also have the squamal fringe dark. It is generally slightly smaller. In the female the ovipositor sheath is slightly less elongate than in *minimoides*; it is immediately distinguishable from *minima* in which the ovipositor is conspicuously elongate (Fig. 83). The larval spiracles are generally similar in all three species.

M. bidentis is common in southern Florida, and with records from Costa Rica, Guyana and Trinidad, it will be surprising if it does not occur generally throughout the Caribbean area.

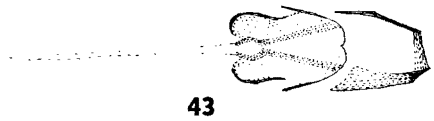
Material examined:

Florida: Dade Co., Miami area, many specimens reared from seed heads of *Bidens pilosa,* Sept. 1963 and 1964 (C.E.S.); Hialeah, one male, two females, 28 Sept. 1963 ex seeds *Verbesina laciniata* leg. 20 Sept. 1963 (C.E.S.); Homestead, three males, two females, 12 Oct. 1968 (K.A.S.); Monroe Co., Key West, one female, 9 May 1967 (B.V. Petersen).

Costa Rica: San José, one male, one female, 5 July 1915 (H. Schmidt).



42



43

Fig. 42, 43. *Melanagromyza bidentis*: 42, aedeagus, side view (Homestead); 43, same, ventral view.

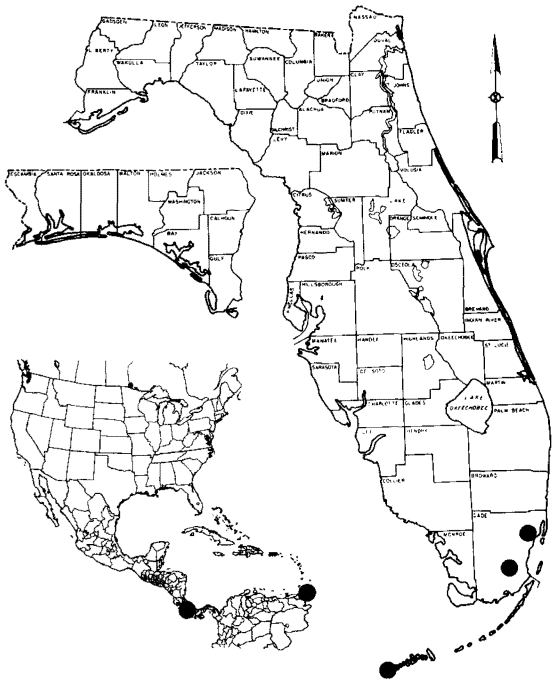


Fig. 44. Distribution of *Melanagromyza bidentis.*

Guyana: Mazaruni, two males, 14 Aug. and 15 Sept. 1937 (Richards & Smart).

Trinidad: St. Augustine, one female, on flowers *Bidens pilosa,* No. 136 (F.D. Bennett); Balandra, one male, one female, 25 Aug. 1968 (C.I.B.C.).

Melanagromyza caerulea (Malloch)

Fig. 45-47

Agromyza caerulea Malloch, 1913: 322. Holotype female from Mexico in USNM.

Melanagromyza caerulea, Frick, 1952a: 378; 1959: 363; Spencer, 1963a: 307.

Adult: large, greenish blue species, wing length from 2.6 mm in male to 3.4 mm in female; frons equal to width of eye, not projecting above eye in profile; jowls narrow, eye in male conspicuously pilose; third antennal segment with conspicuous pubescence; mesonotum shining bluish green, sometimes entirely greenish; fore-tibia with strong lateral bristle; abdomen green; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 45, 46, distiphallus with conspicuous chitinized process at end.

Host plant/Biology: *Ipomoea* spp., larva feeding in seeds; posterior spiracular processes separated by two to three times own diameter, each with an ellipse of nine bulbs, without central horn.

Distribution: Florida, Dade Co.; Costa Rica, Cuba, Dominica, Grand Cayman, Jamaica, Mexico, Puerto Rico. New to Florida.

Remarks: This is a large, distinctive species which is widespread throughout the Caribbean area, occurring locally in great numbers. The life history has been discussed in some detail by Bailey and Plank (1940) on Puerto Rico. The only record from Florida is the single puparium found at Miami, but the identity of this is not in doubt. There has been doubt in the past about the locality of the holotype. Malloch mentions in his description that the specimen bears a label reading "S.J. Allende" and states that he was unable to find this locality on available maps. Frick (1957: 200) refers to the collector as S.J. Allende. There is a Villa Allende immediately east of the Isthmus of Tehuantepec, and I suggest that this is the locality referred to, and S.J. are the initials of the collector.

Frick in the same paper synonymises *M. plumiseta* (Malloch) from Puerto Rico with *M. caerulea.* In his description Malloch (1913: 324) gives the wing length of *plumiseta* as 2 mm which is substantially smaller than any known specimens of *caerulea.* Frick also mentions that the pubescence of the arista is significantly shorter than in the type of *caerulea.* I therefore cannot now accept this synonymy, and the exact identity of *plumiseta* must remain in abeyance pending further study.

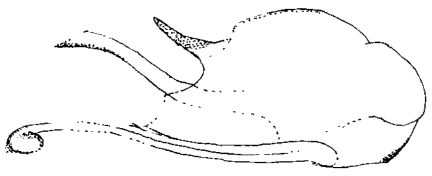
The specimen from Okeechobee has the eye entirely bare (normally weakly pilose in female, strongly so in male) but it agrees in all other respects so exactly with typical *caerulea* that I feel its identity is not in doubt.

Material examined:

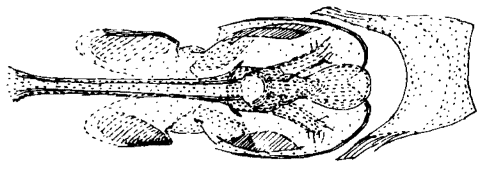
Florida: Dade Co., Miami, puparium ex seed of *Ipomoea triloba,* autumn 1967 (F.D. Matthews); Okeechobee Co., Okeechobee, one female, 11 Oct. 1968 (K.A.S. & C.E.S.).

Dominica (W.I.): Clarke Hall, ten males, seven females, in Malaise trap, 21-31 Jan. 1965 (W.W. Wirth).

Grand Cayman: George Town, 53 specimens, 5-30 March 1965 (J.R. McLintock).



45



46

Figs. 45, 46. *Melanagromyza caerulea*: 45, aedeagus, side view; 46, same, ventral view.

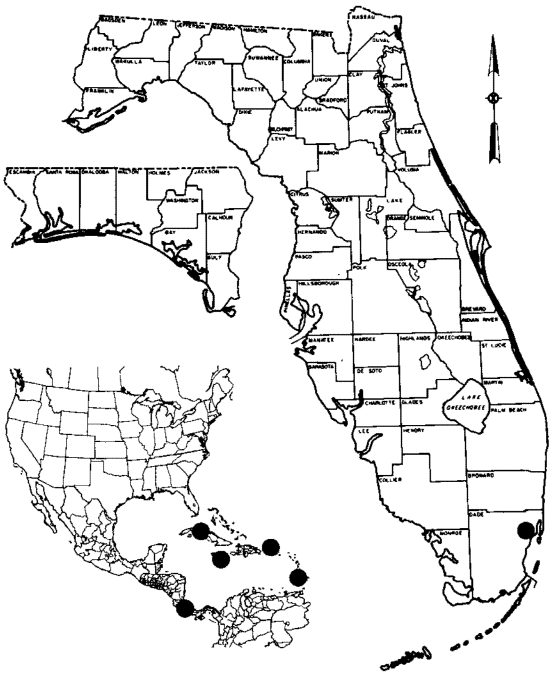


Fig. 47. Distribution of *Melanagromyza caerulea*.

Melanagromyza caribbea Spencer, sp.n.

Fig. 48-50

Head: frons relatively broad, one and a half times width of eye, not projecting above eye in profile; orbits inconspicuous, with two equal ors and two slightly more slender ori, partially incurved; orbital setulae minute, sparse, reclinate; jowls narrow, rounded, one-eighth vertical height of eye; eye large, oval, upright; third antennal segment small, round, arista long, bare.

Mesonotum: two strong dc, acr somewhat sparse, in about six rows, extending slightly beyond level of second dc.

Wing: length 1.7 mm in male, last section of vein M3+4 short, in ratio 13:20 with penultimate in holotype, 12:19 in paratype, first cross-vein slightly beyond midpoint of discal cell.

Color: frons sooty black, ocellar triangle and orbits normally only weakly shining, rarely more so; mesonotum appearing mat viewed from front, more shining from behind; squamae gray, fringe black.

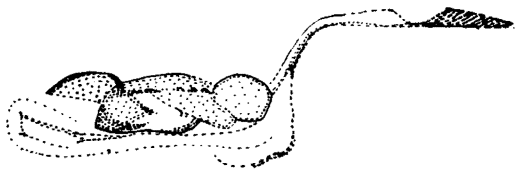
Male genitalia: aedeagus as in Fig. 48, 49; surstyli with a row of fine bristles along inner margin and some longer hairs at lower corner.

Host plant/Biology: unknown.

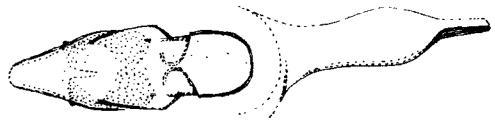
Holotype male, Florida, Pinellas Co., Tarpon Springs, 14 April 1952 (O. Peck); paratypes: Costa Rica, Higuito, San Mateo, one male, no date (Pablo Schild); Dominica, Clarke Hall, two males, one female, 11-20 Jan. 1965; one male, 21-31 March 1965; Grande Savane, one male, 1 Feb. 1965 (all W.W. Wirth). Holotype in CNC, paratypes in USNM, A.M.N.H. and senior author's collection.

Remarks: This is a small leaf-mining species in the *crotonis* (Frost) group, and a positive identification of individual specimens will normally only be possible from the examination of male genitalia. It is clearly widespread throughout the Caribbean area and has almost certainly reached southern Florida from Cuba. The specimen referred to by Spencer (1963a: 311) as distinct from *crotonis* (Frost) now is included above as a paratype of *caribbea*.

A female from Paradise Key, 23 Jan. 1931 (S.W. Frost) is tentatively referred to this species but is not included as a paratype.



48



49

Figs. 48, 49. *Melanagromyza caribbea*: 48, aedeagus, side view; 49, same, ventral view.

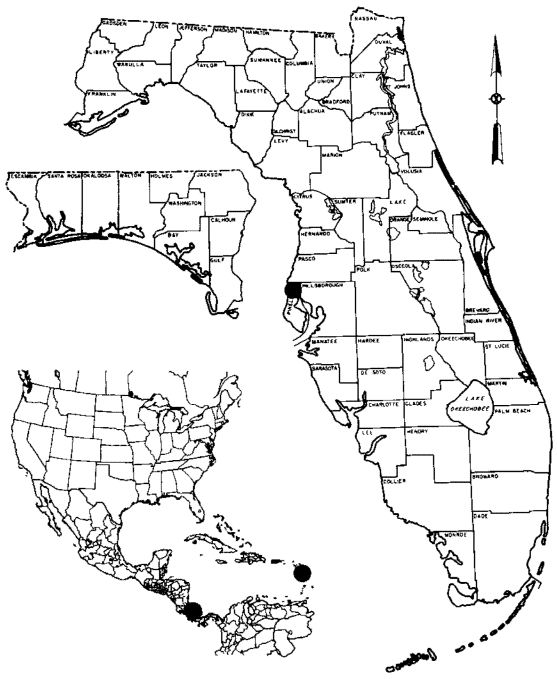


Fig. 50. Distribution of *Melanagromyza caribbea.*

Melanagromyza chaptaliae Spencer

Fig. 51-54

Melanagromyza chaptaliae Spencer, 1966c: 8. Holotype male from Florida, Dade Co. in USNM.

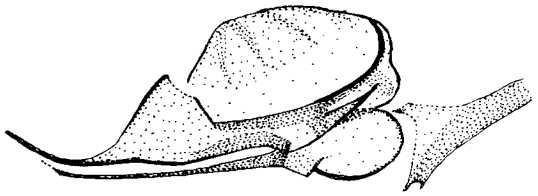
Adult: frons equal to width of eye, not projecting above eye in profile; four orbital bristles, the lower slightly weaker; orbital setulae well developed, mainly reclinate, but a partial, second, inner row present in front, incurved or proclinate; lunule small but slightly higher than semicircle; jowls narrow, about one-tenth vertical height of eye, deepest in center; eye distinctly pilose in male; third antennal segment small, round, with distinct whitish pubescence, arista appearing almost bare; mesonotum, with two dc, acr rather sparse, in only six rows, shining greenish coppery, abdomen more mat; squamae and fringe silvery white, margin slightly differentiated, yellowish brown.

Male genitalia: aedeagus as in Fig. 51, 52; ninth sternite essentially triangular, hypandrial apodeme slightly extended; surstyli rounded at end, with a fringe of short hairs; sperm sac unusually large, as long as ninth sternite.

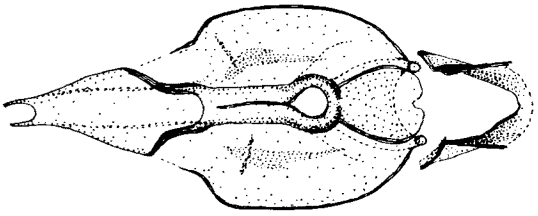
Puparium: pale orange yellow, not deeply segmented, with relatively broad bands of minute black tubercles at segment borders; posterior spiracles (Fig. 53) on long projections, each with a strongly chitinized ellipse of nine regular bulbs around the stout but short, black central horn.

Host plant/Biology: *Chaptalia dentata,* larva feeding as internal stem-borer, pupating in stem.

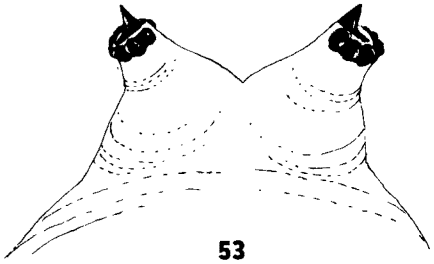
Distribution: Florida, Dade Co.



51



52



53

Figs. 51-53. *Melanagromyza chaptaliae*: 51, aedeagus, side view; 52, same, ventral view; 53, posterior spiracles of puparium.

Remarks: The distinctive characters of this species are the narrow jowls, bare arista, second row of partially proclinate orbital setulae and pilose eye in the male. However, a reliable identification may not be possible without confirmation from the male genitalia.

Although *M. chaptaliae* is so far only known from southern Florida, it probably occurs elsewhere to the south.

Material examined:

Florida: Dade Co., Homestead, six males, two females, 3 Nov. 1964 ex seed heads of *Chaptalia dentata* collected 22 Jan. 1964 (C.E.S.).

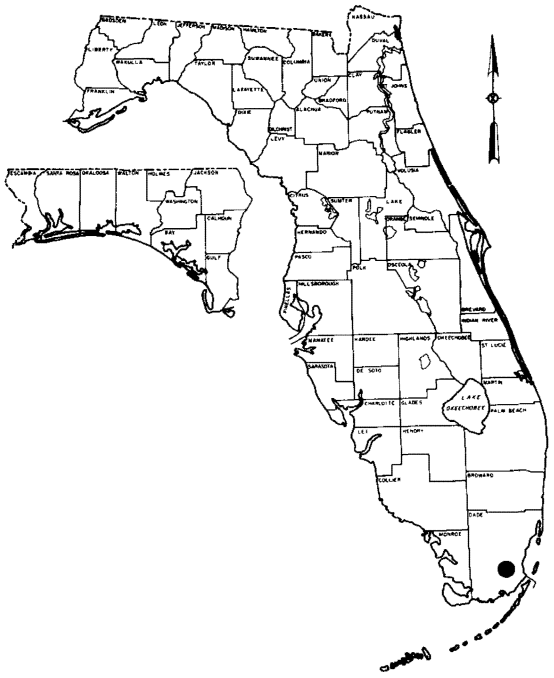


Fig. 54. Distribution of *Melanagromyza chaptaliae.*

Melanagromyza erechtitidis Spencer

Fig. 55-57

Melanagromyza erechtitidis Spencer, 1966c: 10. Holotype male from Florida, Dade Co., in USNM.

Adult: medium-sized species, wing length 2.1 - 2.3 mm; frons not projecting above eye, two ors, two weaker ori; orbital setulae in two rows, rather long, outer row reclinate, inner largely proclinate; jowls broad, one-fifth vertical eye height; eye in male with slight pilosity at level of ors; third antennal segment small, arista scarcely pubescent; orbits and ocellar triangle only weakly shining; mesonotum blackish, weakly shining, greenish or coppery; squamae gray, fringe black.

Male genitalia: aedeagus as in Fig. 55, 56.

Puparium: yellowish orange, posterior spiracles scarcely raised above anal segment, each process with a ring of 12 bulbs around the rudimentary central horn, the two processes separated by three times their own diameter.

Host plant/Biology: *Erechtites hieracifolia,* larva feeding in flower-heads.

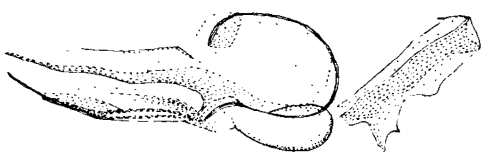
Distribution: Florida, Dade Co., Hialeah.

Remarks: This species closely resembles *M. wedeliae* but is distinguishable by the broader jowls, longer orbital setulae and the male genitalia, which although of the same general form as in *wedeliae,* are distinctively different.

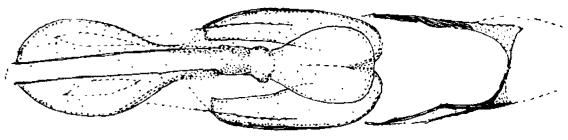
The larval characters are very similar to those found in *M. viridis.*

Material examined:

Florida: Dade Co., Hialeah, three males, two females, 15 April 1964, ex seeds of *Erechtites hieracifolia;* nine males, six females, 6-10 Feb. 1964 ex same host, leg. 31 Jan. 1964 (all C.E.S.).



55



56

Figs. 55, 56. *Melanagromyza erechtitidis*: 55, aedeagus, side view; 56, same, ventral view.

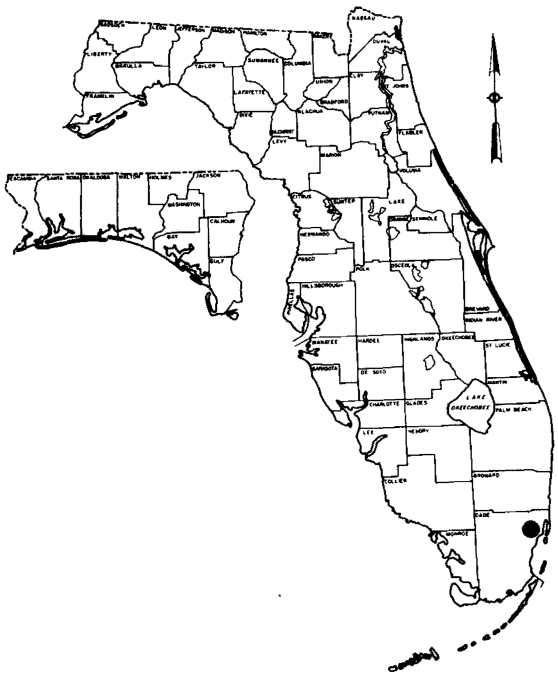
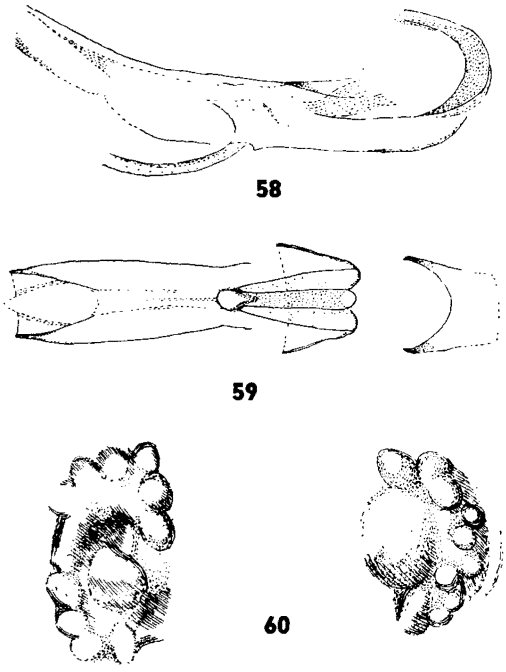


Fig. 57. Distribution of *Melanagromyza erechtitidis*.



Figs. 58-60. *Melanagromyza floridensis*: 58, aedeagus, side view; 59, same, ventral view; 60, posterior spiracles of puparium.

Melanagromyza floridensis Spencer

Fig. 58-61

Melanagromyza floridensis Spencer, 1963a: 312. Holotype male from Dominican Republic, in USNM.

Adult: medium sized, shining greenish species, wing length 2.2 mm; frons little wider than eye, not projecting above eye in profile; jowls narrow, one-tenth vertical height of eye; eye bare in both sexes, arista distinctly pubescent.

Male genitalia: aedeagus as in Fig. 58, 59; ninth sternite with broad side arms and greatly elongated hypandrial apodeme.

Host plant/Biology: *Desmodium tortuosum* and probably other spp., larva feeding and pupating in single seed within the pod; puparium pale orange, posterior spiracular processes separated by slightly more than own diameter, each with an ellipse of 10-12 irregular bulbs surrounding the small central scar (Fig. 60).

Distribution: Florida, Dade Co. and Highlands Co.; Bahamas, Dominica, Dominican Republic, Guyana.

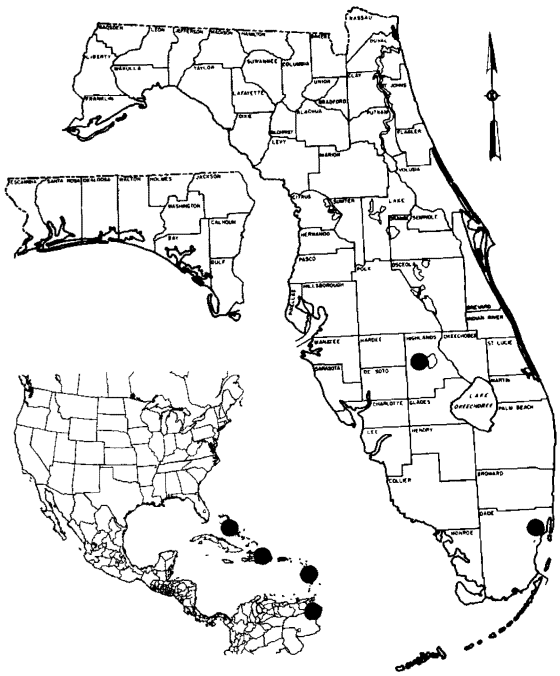


Fig. 61. Distribution of *Melanagromyza floridensis*.

Remarks: This species closely resembles *M. floris* but is immediately distinguishable by the more pubescent arista.

The new records from the Bahamas and Dominica cited below further confirm the probability that this species occurs throughout the Caribbean area. It doubtless has reached southern Florida from Cuba, although it has not yet been recorded there.

Material examined:

Bahamas: New Providence Is., Nassau, one male, 3 Jan. 1953 (L. Giovannoli).

Dominica: Grande Savane, one male, 1 Feb. 1965 (W.W. Wirth).

Florida: Dade Co., Hialeah, many specimens, 11 July 1963, ex seeds *Desmodium tortuosum* (C.E.S.); Highlands Co., Highlands Hammock State Park, six males, ten females, 11 Oct. 1968 (K.A.S. and C.E.S.).

Melanagromyza floris Spencer

Fig. 62-64

Melanagromyza floris Spencer, 1963a: 313; 1966c; 10. Holotype male from Mexico in USNM.

Adult: small greenish species, wing length 1.75 to 2mm; frons equal to width of eye, not projecting above eye in profile, mat black; orbits not conspicuously differentiated; four equal orbital bristles, the ors reclinate, the ori somewhat incurved; orbital setulae in regular row, reclinate; ocellar triangle large, apex extending to level of lower ors, weakly shining, lunule distinctly higher than semicircle; jowls narrow, one-eighth vertical height of eye; eye in both sexes bare; third antennal segment with slight pubescence, arista fine, bare; mesonotum distinctly mat greenish viewed from front, more shining from behind; abdomen shining green; squamae and fringe white; halteres dark brown.

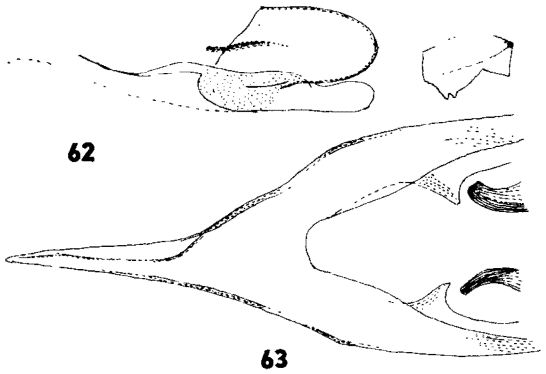
Male genitalia: aedeagus as in Fig. 62; ninth sternite distinctively elongated (Fig. 63); surstylus large, semicircular, with row of short spines in front and longer hairs behind.

Host plant/Biology: *Bidens pilosa, Calendula* sp., larva feeding and pupating in seed head; puparium whitish.

Distribution: Florida, Dade Co., Hendry Co., Highlands Co., Martin Co., Monroe Co., Sarasota Co.; Bahamas, Costa Rica, Cuba, Jamaica, Mexico, Puerto Rico, Trinidad.

Remarks: The distinctive characters of this species are the narrow jowls, bare arista and eye bare in both sexes.

It is widespread throughout the Caribbean area, and the species was found in great numbers in southern Florida in October 1968 in association with *Bidens,* particularly on the Keys.



Figs. 62, 63. *Melanagromyza floris*: 62, aedeagus, side view; 63, ninth sternite.

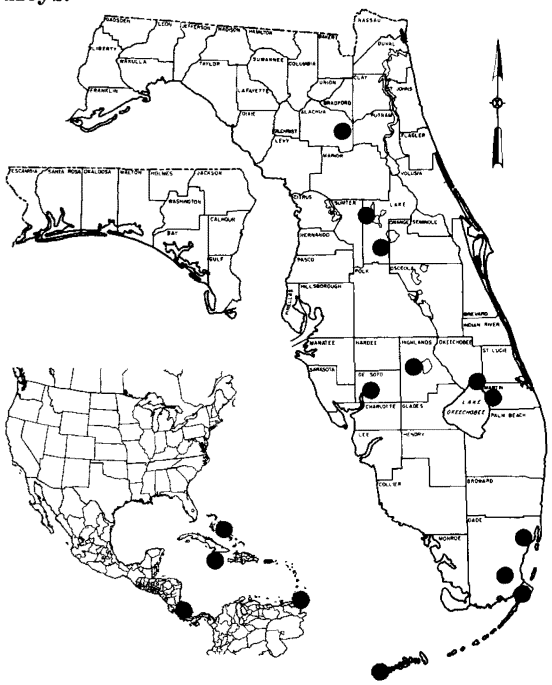


Fig. 64. Distribution of *Melanagromyza floris.*

Material examined:

Bahamas: Abaco Cays, Andros Is., Berry Is., Eleuthera Is., Grand Bahama Is., Great Abaco Is., Long Is., Mayaguana Is., New Providence Is., North Bimini Is., Rum Cay, 44 males, 46 females.

Florida: Alachua Co., Hawthorne, one female, 8 Oct. 1968 (K.A.S.); Dade Co., Miami area, Sept. to Dec. 1962-1967, many specimens reared from seed heads of *Bidens pilosa* (C.E.S.); Homestead, four males, fourteen females, 12-14 Oct. 1968 (K.A.S. and C.E.C.); Hendry Co., Clewiston, one female, 29 Dec. 1950 (H. V. Weems, Jr.); Highlands Co., Highlands Hammock State Park, eight females, 11 Oct. 1968 (K.A.S. and C.E.S.); Sebring, one male, 11 Dec. 1953 (H. V. Weems, Jr.); Lake Co., Leesburg, one male, two females, 10 Oct. 1968 (K.A.S. and C.E.S.); Lake Louisa, south of Clermont, one male, 10 Oct. 1968 (K.A.S.); Martin Co., Port Mayaca, three males, 11 Oct. 1968 (K.A.S. and C.E.S.); Monroe Co., Key Largo to Bahia Honda Key, eleven males, nine females, 14-15 Oct. 1968 (K.A.S. and C.E.S.); Key West, two males, 9 May 1967 (B. V. Petersen), Okeechobee Co., Okeechobee, two males, 11 Oct. 1968 (K.A.S. and C.E.S.).

Jamaica: Duncans, one male, 23 Aug. 1966 (H.F. Howden & E.C. Becker).

Trinidad: St. Augustine, one male, Oct. 1959; Manzanilla, one female, Oct. 1959.

Melanagromyza heliotropii Spencer, sp.n.

Fig. 65-67

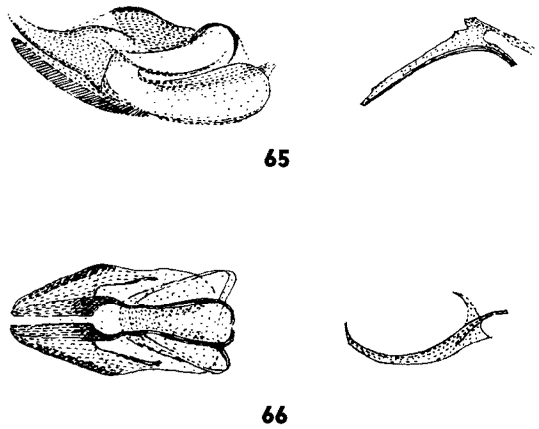
Head: frons relatively broad, one and a half times width of eye, not projecting above eye in profile; two equal ors, two slightly weaker ori, orbital setulae short, sparse, reclinate; ocellar triangle large, apex extending to level of upper ors; jowls narrow, about one-seventh height of eye, eye bare in both sexes; third antennal segment and arista appearing virtually bare.

Mesonotum: two strong dc, acr in about eight rows, some extending behind level of first dc.

Legs: mid-tibiae with two lateral bristles.

Wing: length from 2.2 to 2.3 mm, last section of vein M3+4 somewhat variable but generally only slightly shorter than penultimate.

Color: frons mat black, ocellar triangle brilliantly shining black, orbits moderately so; mesonotum strongly shining blackish with distinct greenish tinge, abdomen from moderately to brilliantly shining green; squamae and fringe white.



Figs. 65, 66. *Melanagromyza heliotropii*: 65, aedeagus, side view; 66, same, ventral view.

Male genitalia: aedeagus as in Fig. 65, 66; surstyli strongly projecting inward, fringed with short bristles and a few hairs.

Host plant/Biology: *Heliotropium leavenworthii*, larva feeding as internal stem borer and pupating in stem; puparium whitish, posterior spiracles weakly chitinized, each with an ellipse of four or five large bulbs around a weak black horn, separated by almost three times their own diameter.

Holotype male, Florida, Dade Co., Hialeah, emerged 23 Jan. to 1 Feb. 1967 ex stem of *Heliotropium* leg. 11 Jan. 1967; paratypes: four females, same data; Hialeah, one male, one female, 13 Nov. 1964 ex stem same host leg. 2 Nov. 1964 (all C.E.S.). Holotype in USNM, paratypes in senior author's collection.

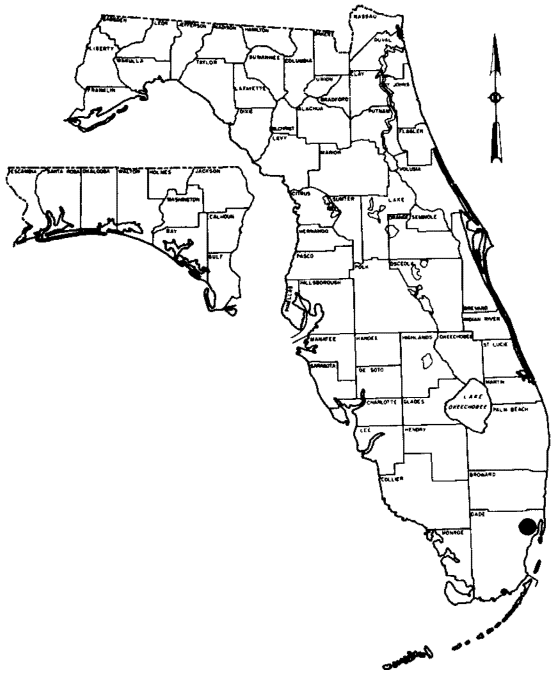


Fig. 67. Distribution of *Melanagromyza heliotropii*.

Remarks: This species is readily distinguishable by the shining, black ocellar triangle and the narrow jowls. The small number of bulbs on the larval posterior spiracles is unusual but the species is otherwise entirely typical of the genus.

Melanagromyza lippivora Spencer

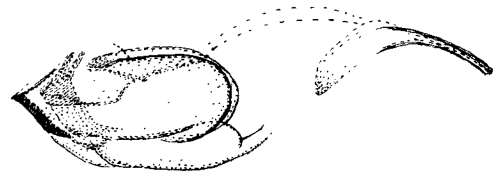
Fig. 68-74

Melanagromyza lippivora Spencer, 1966c: 11. Holotype male from Florida, Dade Co. in USNM.

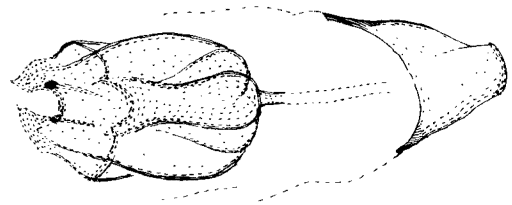
Adult: small black species, wing length from 1.75 to 2.2 mm; frons slightly wider than eye, not projecting above eye in profile; two equal ors, three equal, inclined ori; orbits pronounced, occasionally slightly raised at level of antennae; jowls broad, one-quarter vertical height of eye, cheeks forming conspicuous ring below eye; eye bare in both sexes; third antennal segment small, without distinctive pubescence, arista swollen at base, fine beyond, bare; mesonotum with two strong dc, with two or three substantially smaller bristles between second dc and suture; mid-tibia with one weak bristle; costa extending to vein M1+2, first cross-vein just beyond midpoint of discal cell; last section of vein M4 variable, either equal to or two-thirds length of penultimate; color: frons mat black; ocellar triangle only weakly, orbits and cheeks more strongly shining; mesonotum largely mat black, only faintly shining; abdomen variable, either entirely black or with very faint greenish or coppery reflections but never obviously shining green; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 68-70; ninth sternite somewhat square, with short hypandrial apodeme (Fig. 71); surstyli (Fig. 72) with a few short teeth on inner margin.

Puparium: entirely white or faintly reddish, anal segments conspicuously bending ventrally (Fig. 73); posterior spiracular processes separated by own diameter, each with a ring of nine well-defined bulbs, without trace of central horn or scar.



68



69



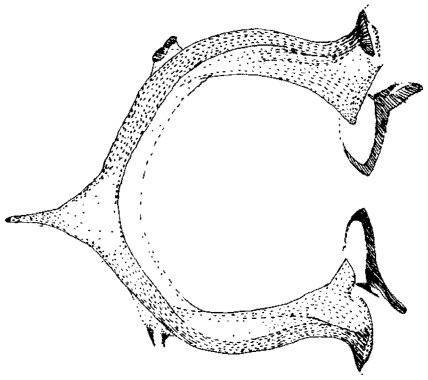
70

Fig. 68-70. *Melanagromyza lippivora*: 68, aedeagus, side view (Florida); 69, same, ventral view; 70, aedeagus, side view (Grand Cayman).

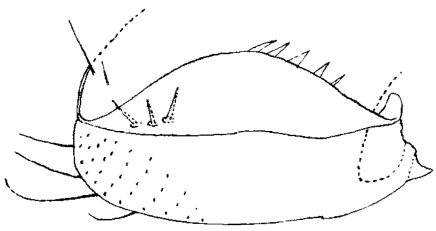
Host plant/Biology: *Lippia nodiflora*, larva feeding and pupating in stem.

Distribution: Florida, Dade Co. and Levy Co.; Grand Cayman.

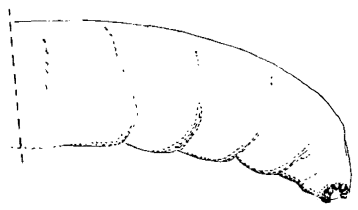
Remarks: The distinctive characters of this species are the broad jowls, entirely black coloration and white squamae and fringe. It has hitherto only been known from the type series from Hialeah, and the new records given below from Levy Co. and from Grand Cayman are of considerable interest. It seems certain that the species has reached Dade Co. from the south, and there is almost certainly continuity of distribution northward to Levy Co.



71



72



73

Fig. 71-73. *Melanagromyza lippivora*: 71, ninth sternite; 72, surstylus; 73, puparium.

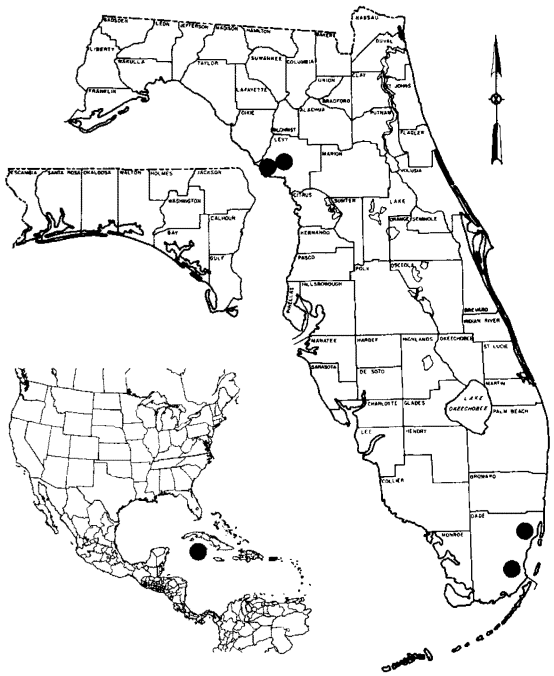


Fig. 74. Distribution of *Melanagromyza lippivora*.

Material examined:

Florida: Dade Co., Hialeah, three males, one female, 10 June 1963; two females, 18 June and 29 July 1963 ex stems *Lippia nodiflora* (all C.E.S.); Homestead, one male, 4 Apr. 1952 (J. R. Vockeroth); Levy Co., Gulf Hammock, one male, 25 April 1952 (O. Peck); Otter Creek, two males, 2 Oct. 1968 (K.A.S.).

Grand Cayman: Georgetown, two males, 15-30 March 1965 (J.R. McLintock).

Melanagromyza marellii (Brèthes)

Fig. 75-78

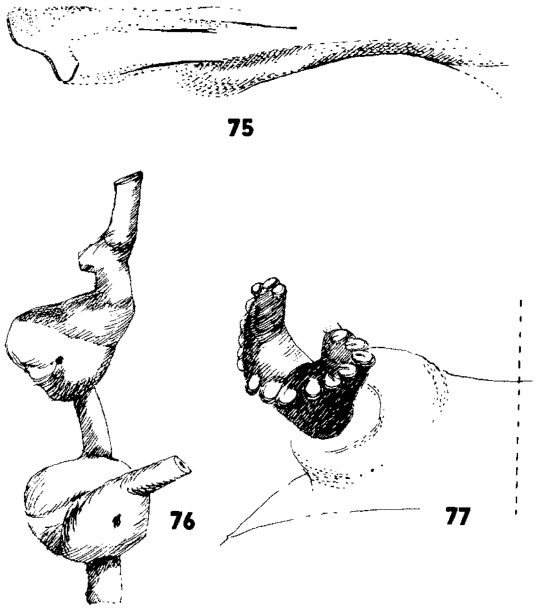
Agromyza marellii Brèthes, 1920. Type series from Brazil, location not known.

Melanagromyza marellii, Spencer, 1963a: 317.

Adult: medium-sized black species, wing length from 2.3 to 2.7 mm; frons not significantly projecting above eye, orbital setulae numerous, in two rows; jowls deep, one-quarter vertical height of eye; eye bare in both sexes; frons mat black, ocellar triangle and orbits only weakly shining; mesonotum and abdomen mat black; squamae pale gray, fringe dark, ochrous to black.

Male genitalia: aedeagus as in Fig. 75, with a conspicuous chitinized process distally.

Host plant/Biology: *Achyranthes* (=*Alternanthera*) *philoxeroides,* larva forming conspicuous stem galls (Fig. 76); posterior spiracles of puparium as in Fig. 77.



Figs. 75-77. *Melanagromyza marellii*: 75, aedeagus, side view (Key West); 76, stem-gall on *Achyranthes philoxeroides*; 77, posterior spiracles of puparium (76 and 77, Brazil).

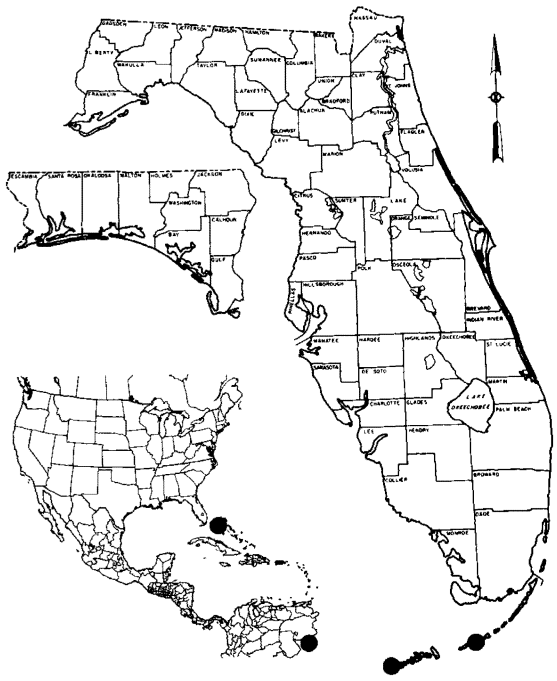


Fig. 78. Distribution of *Melanagromyza marellii.*

Distribution: Florida, Monroe Co.; Argentina, Brazil, Bahama Is. New to Florida.

Remarks: The series from the Bahamas and the two specimens from Florida are substantially smaller than the specimens previously examined from Argentina and Brazil (Spencer, 1963a: 317), in which the wing length of the male was 2.7 mm. None of the long series from the Bahamas has the wing length greater than 2.3 mm. It is also now apparent that the squamal fringe is not consistently entirely black. In some cases it is paler ochrous brown, and the squamae are pale gray. However, the very deep jowls, uniformly black coloration, and the entirely distinctive genitalia confirm the identity of these specimens.

Material examined:

Bahama Islands: Andros, Mangrove Cay, five males, thirteen females, 26 April 1953; Eleuthera, New Portsmouth, Rock Sound, one male, 28 March 1953 (all E.B. Hayden).

Florida: Monroe Co., Key West, one male, Nov. 1950 (N.L.H. Krauss); Vaca Key, one male, 26 Nov. 1961 (J. G. Chillcott).

Melanagromyza miamensis Spencer, sp.n.

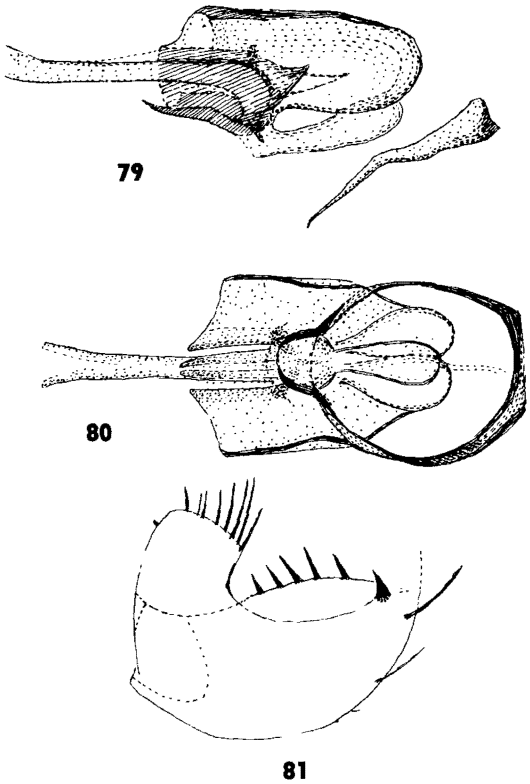
Fig. 79-82

Head: frons equal to width of eye, not projecting above eye in profile; orbits narrow, with two ors and two ori, lower ori incurved (others broken, strength and inclination not detectable); orbital setulae long, all reclinate; lunule small, narrow; jowls deepest in center but very narrow, one-eleventh vertical height of eye; eye bare in male; third antennal segment small, rounded, arista distinctly pubescent.

Mesonotum: two strong dc, acr in some 10 rows, rather long.

Wing: length in male 2.4 mm, last section of vein M3+4 half length of penultimate, first cross-vein just beyond midpoint of discal cell.

Legs: fore-tibia without lateral bristle, mid-tibia with two.



Figs. 79-81. *Melanagromyza miamensis*: 79, aedeagus, side view; 80, same, ventral view; 81, surstylus.

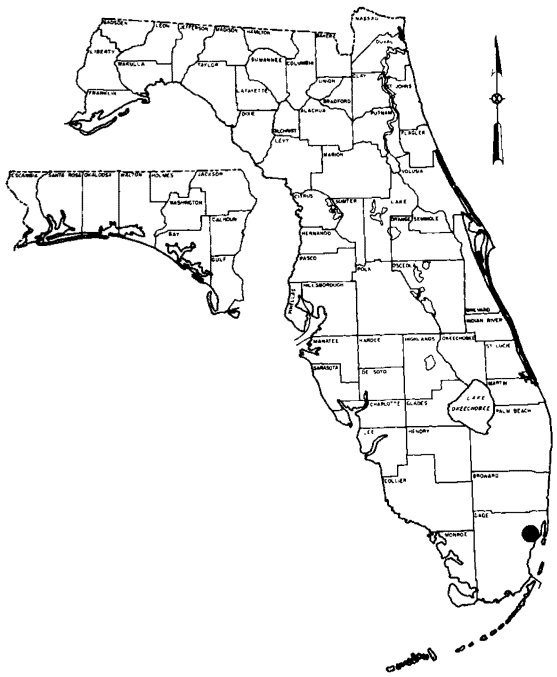


Fig. 82. Distribution of *Melanagromyza miamensis*.

Color: frons mat black, orbits and ocellar triangle only moderately shining; mesonotum largely shining black, but with faint greenish tinge, abdomen green; squamae and fringe silvery white.

Male genitalia: aedeagus as in Fig. 79, 80; surstyli narrow, with about six spines, also a distinctive row of spines along inner margin of epandrium (Fig. 81); ninth sternite with broad side-arms and extended hypandrial apodeme, exactly as in *M. floris* (Fig. 63).

Host plant/Biology: apparently seed feeder in orchid, specimen labelled "orchid-larva destroys bloom."

Holotype male, Florida, Dade Co., Miami, ex flower head of orchid, 192?, (G. Moznette), in USNM.

Remarks: Although this species very closely resembles *M. floridensis* on external characters, the genitalia of the two species are entirely distinct.

Exact details of the biology of *M. miamensis* are not available. Over 30 genera of *Orchidaceae* occur in southern Florida, and further study of this family as potential hosts of Agromyzidae is clearly desirable.

Melanagromyza minima (Malloch)

Fig. 83-85

Agromyza minima Malloch, 1913: 328. Holotype male from Trinidad in USNM.

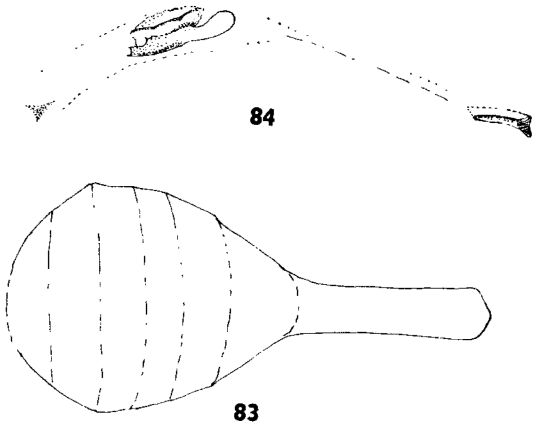
Melanagromyza minima, Shewell, 1953: 468; Frick, 1957: 200; 1959: 364; Spencer, 1963a: 317; 1966c: 12.

Melanagromyza longicaudalis Spencer, 1963a: 316; Spencer, 1966c: 12. Holotype female from Jamaica in author's collection.

Adult: very small species, wing length 1.9 to 2 mm; male essentially as in *M. bidentis,* mesonotum appearing slightly more blackish, faintly greenish or bluish viewed from behind; squamae gray, fringe black; female distinctive, with abnormally elongated ovipositor sheath (Fig. 83).

Male genitalia: aedeagus (Fig. 84) with exceptionally long gap between basiphallus and distiphallus complex, with small, variable area of chitinization beyond.

Host plant/Biology: *Wedelia paludosa* and *W. trilobata,* possibly *Eupatorium odoratum,* larva feeding and pupating in seed heads. Fifty flower heads of *W. paludosa* from Miami contained more than 50 larvae or puparia, from which 13 adults were obtained. Puparium essentially as in *M. minimoides* (cf. Fig. 89).



Figs. 83, 84. *Melanagromyza minima*: 83, ovipositor sheath of female; 84, aedeagus, side view.

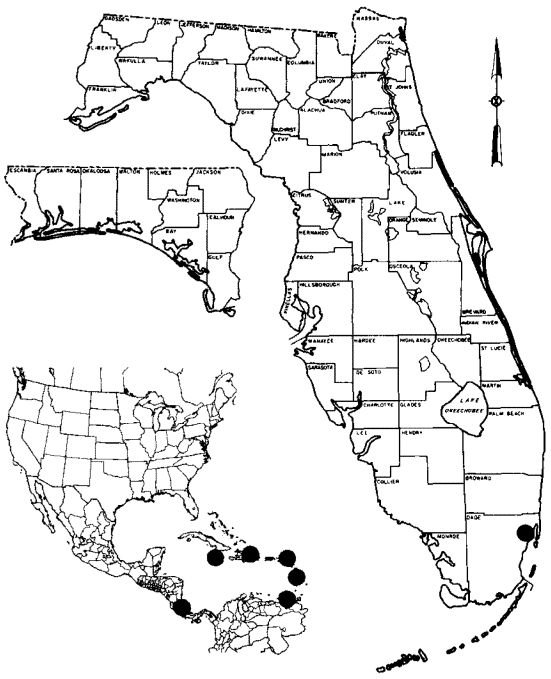


Fig. 85. Distribution of *Melanagromyza minima.*

Distribution: Florida, Dade Co.; Antigua, Costa Rica, Dominica, Dominican Republic, Jamaica, Trinidad.

Remarks: This small species is closely related to *M. bidentis* and *M. minimoides.* In the male a reliable identification normally will be possible only from the male genitalia; the extended aedeagus reflects the unusually long ovipositor, which makes the females immediately distinguishable from the other two species in this group.

The only confirmed host is *Wedelia.* The females obtained on Jamaica were showing great interest in the flowers of *Eupatorium odoratum,* and this must be considered as a possible host. However, experience shows that catching flies on foliage or flowers of a plant is not a reliable indication that this is the host.

With confirmed records now known from Antigua, Costa Rica, Dominica, Jamaica, Florida and Trinidad, this species no doubt occurs widely throughout the Caribbean area.

Material examined:

Florida: Dade Co., Miami, three males, three females, 26 Aug. 1964 ex seed heads

of *Wedelia trilobata* leg. 18 Aug. 1964 (C.E.S.); Fairchild Tropical Garden, six males, seven females, 17 Oct. to 10 Nov. ex seed heads of *W. paludosa* leg. 16 Oct. 1968 (K.A.S. & C.E.S.).

Antigua: two females, Feb. 1964 (F.D. Bennett).

Costa Rica: La Caja, 8 km. W. of San José, one male, one female, 1930 (Schmidt).

Dominica: Clarke Hall, four males, six females, 11-20 Jan. 1965, Malaise trap (W.W. Wirth).

Dominican Republic: Dist. Nacional, one female, 7 Aug. 1967; San Cristobal Prov., one male, 8 Aug. 1967 (both L.H. Rolston).

Jamaica: Mount Diavolo, two females, 13 Dec. 1958, on flowers of *Eupatorium odoratum* (K.A.S.).

Melanagromyza minimoides Spencer

Fig. 86-90

Melanagromyza minimoides Spencer, 1966c: 13. Holotype male from Dade Co. in USNM.

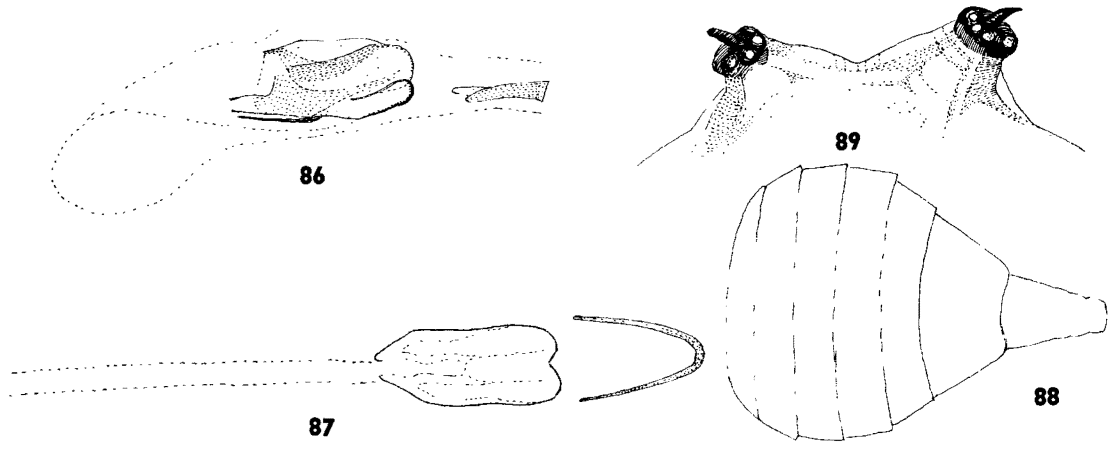
Adult: small greenish species, wing length 1.9 to 2.2 mm; frons approximately equal to width of eye, not projecting above eye in profile; four orbital bristles, normally equal, orbital setulae reclinate; ocellar triangle large, moderately shining, apex extending slightly beyond level of lower ors; jowls one-sixth vertical height of eye; eyes bare in both sexes; arista only minutely pubescent; head black, mesonotum blackish-green, slightly shining particularly when viewed from rear, abdomen more brilliantly shining green; squamae gray, margin and fringe blackish brown.

Male genitalia: aedeagus as in Fig. 86, 87, with small but distinct gap between U-shaped basiphallus and chitinized distiphallus complex; ovipositor only slightly elongated, as in Fig. 88.

Host plant/Biology: *Aster simmondsii, Borrichia frutescens, Helenium nudiflorum, Melanthera deltoidea, Rudbeckia laciniata, Verbesina laciniata,* larva feeding and pupating in seed head; puparium whitish yellow, posterior spiracular processes (Fig. 89) strongly chitinized, black, appreciably projecting beyond anal segment, separated by three times own diameter, each consisting of a ring of nine bulbs around a well-developed horn.

Distribution: Florida, Alachua Co., Brevard Co., Dade Co. and Seminole Co.; Ohio, Kent.

Remarks: This species closely resembles *M. bidentis* and *M. minima*, particularly in the dark squamae and fringe; in the female it is readily distinguishable from *M. minima* by the shorter ovipositor sheath (cf. Fig. 83). In the male genitalia there is a small



Figs. 86-89. *Melanagromyza minimoides*: 86, aedeagus, side view; 87, same, ventral view; 88, ovipositor sheath of female; 89, posterior spiracles of puparium.

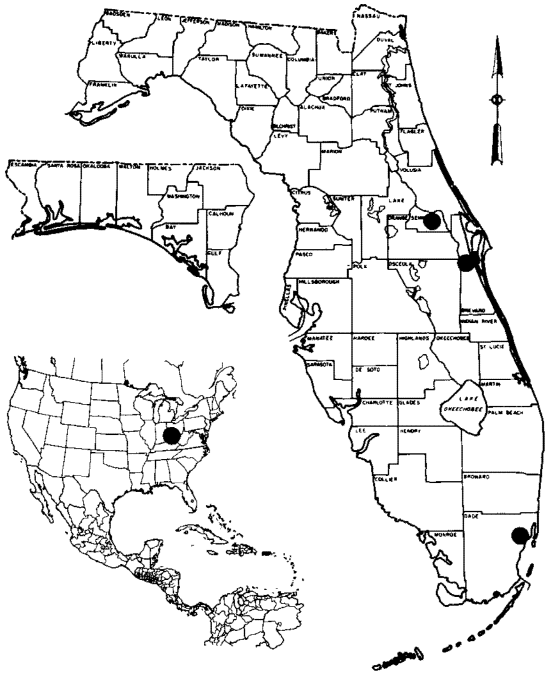


Fig. 90. Distribution of *Melanagromyza minimoides*.

but consistent gap between the basiphallus and distiphallus complex which provides the only satisfactory means of identifying the males.

Some of the main hosts of this species, such as *Borrichia* and *Melanthera,* are of West Indian origin. It is also closely related to the two southern species *M. bidentis* and *M. minima* and is almost certainly itself of southern origin. The series reared from *Rudbeckia* in Ohio may well represent an introduction, as this host is widely cultivated as an ornamental.

Material examined:

Florida: Dade Co., Hialeah, 26 Nov. and 2 Dec. 1963, many specimens ex seeds of *Aster simmondsii* (C.E.S.); Miami, Dodge Is., 15 specimens, 4-19 March ex seed heads of *Borrichia frutescens* leg. 2 March 1966 (C.E.S.); Miami, Watson Is., two males, 21-24 Feb. 1963 ex seeds *Melanthera deltoidea* leg. 18 Feb. 1964 (E.W. Golsen); Hialeah, three males, 10-14 Feb. 1964 ex seeds *Verbesina laciniata* leg. 2 Feb. 1964 (C.E.S.); Brevard Co., Rockledge, one male, one female, 29 Jan. 1964, ex seeds *Melanthera deltoidea* (G.W. Desin); Seminole Co., Geneva, one male, 9 March 1964 ex seeds of *Helenium nudiflorum* (G.W. Desin).

Ohio: 7 miles N. of Kent, one male, four females, 17 Sep. 1965 ex seeds of *Rudbeckia laciniata* (K.R. Valley).

Melanagromyza parvella Spencer, sp.n.

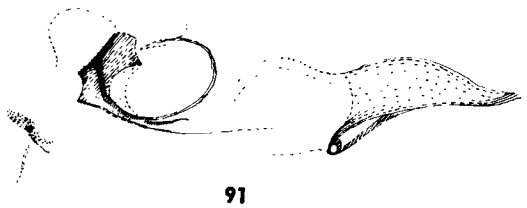
Fig. 91-93

Head: frons equal to width of eye, not projecting above eye in profile; orbits narrow but shining, with two equal ors and two slightly weaker ori, the lower incurved; orbital setulae sparse but long, in single row, all reclinate; jowls rounded, deepest in center below eye, not extended at rear, one-sixth vertical height of eye; eye large, oval, upright; third antennal segment small, round, arista long, bare.

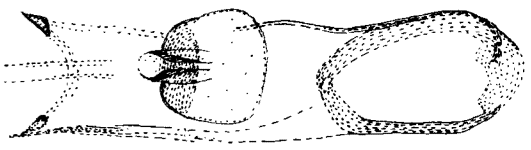
Mesonotum: two strong dc, acr numerous, in about eight rows, not extending beyond second dc.

Wing: length in male 2 mm, last section of vein M3+4 shorter than penultimate, in ratio 17: 22; first cross-vein just beyond midpoint of discal cell.

Color: frons sooty black, orbits distinctly, ocellar triangle brilliantly shining black;



91



92

Figs. 91, 92: *Melanagromyza parvella*: 91, aedeagus, side view; 92, same, ventral view (Homestead).

mesonotum and abdomen brilliantly shining black; squamae dark gray, margin and fringe black.

Male genitalia: aedeagus distinctive, as in Fig. 91, 92, ninth sternite with rounded side arms and fine, extended hypandrial apodeme, surstyli with a row of fine bristles along inner margin and some longer hairs at lower corner.

Host plant/Biology: unknown.

Holotype male, Florida, Dade Co., Homestead, University of Florida Sub-tropical Experiment Station, 2 May 1967 (B.V. Petersen); paratypes: Bahama Is., New Providence, Nassau, four males, 16 April 1953 (E.B. Hayden). Holotype in CNC, paratypes in AMNH and senior author's collection.

Remarks: This small species has the mesonotum distinctly more shining than in the related species *crotonis* (Frost), *alternantherae* Spencer and *caribbea* sp.n. However, completely reliable identification will only be possible from the male genitalia, which are entirely distinctive.

This species probably has reached the Bahamas and southern Florida from Cuba.

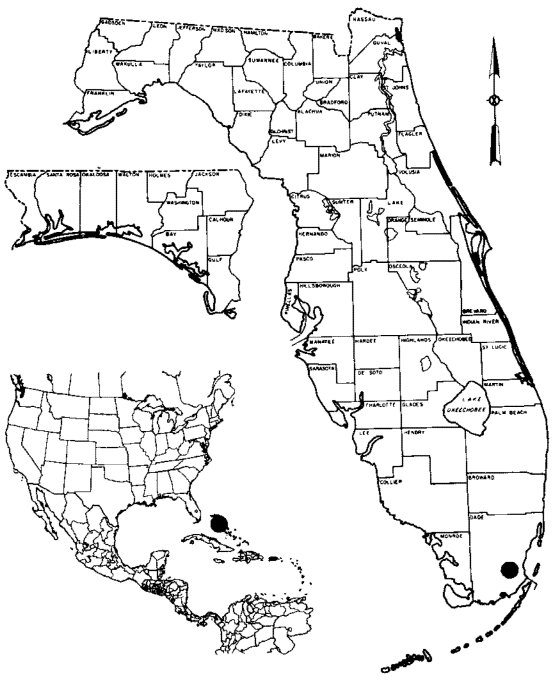


Fig. 93. Distribution of *Melanagromyza parvella.*

Melanagromyza ruelliae Spencer

Fig. 94-99

Melanagromyza ruelliae Spencer, 1966c: 14.

Holotype male from Florida, Dade Co., in USNM.

Adult: small to medium-sized greenish species, wing length from 1.9 to 2.4 mm; frons not projecting above eye, jowls narrow, one-twelfth vertical height of eye; orbital setulae numerous, partially in two rows, those nearest eye margin reclinate, the inner row proclinate; eye with conspicuous patch of pilosity above; ocellar triangle enlarged, conspicuous, shining, greenish or bluish; mesonotum strongly shining, greenish or bluish, abdomen shining green; squamae and fringe white; halteres black.

Male genitalia: aedeagus pale, weakly chitinized, as in Fig. 94, 95; ninth sternite (Fig. 96) with greatly elongated hypandrial apodeme; surstyli (Fig. 97) not greatly extending inward, with up to 20 spines along inner margin.

Puparium: bright orange; posterior spiracles separated by slightly more than own diameter, each with an ellipse of seven irregular bulbs around a small central scar (Fig. 98), distinctly protruding above anal segment.

Host plant/Biology: *Ruellia brittoniana, R. caroliniensis, Blechum pyramidatum, Stroebilanthes* sp., larva feeding and pupating in seed head.

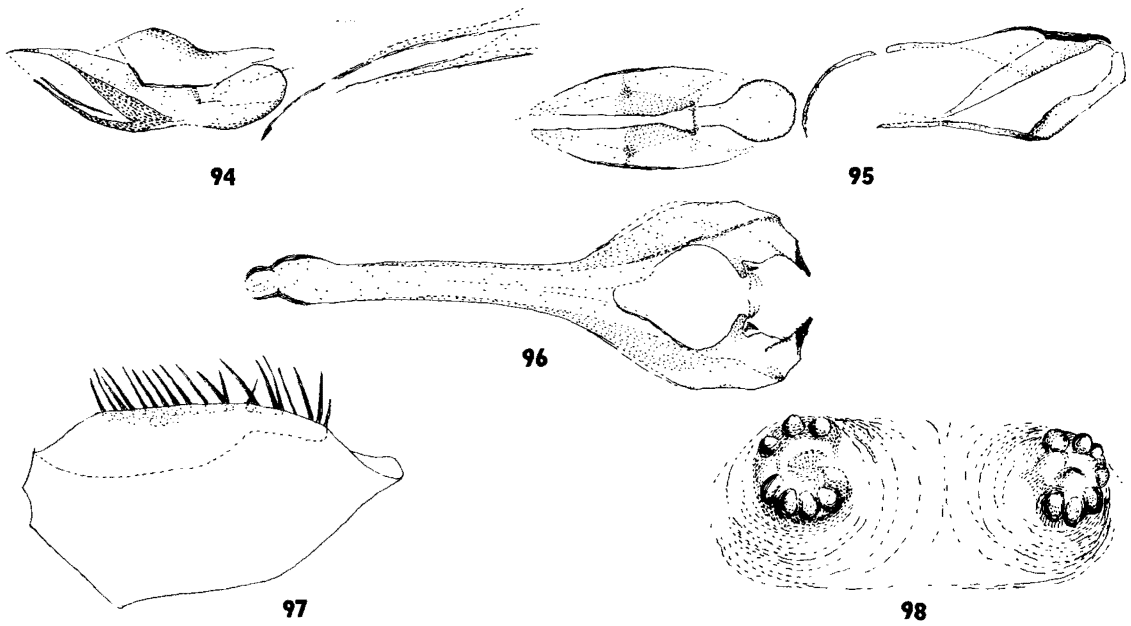
Distribution: Florida, Dade Co., Miami area; Bahamas, New Providence Is.

Remarks: The conspicuously shining greenish or bluish ocellar triangle makes this a distinctive species.

Material examined:

Florida: Miami, nine males, three females, 26 Aug. and 28 Sept. 1963, ex *Ruellia brittoniana*; Hialeah, one male, one female, 15 Nov. 1964 ex *R. caroliniensis*; three males, five females, 28 April to 7 May 1964 ex *Blechum pyramidatum*; two males, 8 Aug. 1964 ex *Stroebilanthes* sp. (all C.E.S.); Everglades, nr. Mahogany Hammock, one male, 2 Dec. 1961 (J.G. Chillcott).

Bahamas: New Providence Is., Nassau,



Figs. 94-98. *Melanagromyza ruelliae*: 94, aedeagus, side view; 95, same, ventral view; 96, ninth sternite; 97, surstylus; 98, posterior spiracles of puparium.

two males, one female, 16 April 1953 (E.B. Hayden).

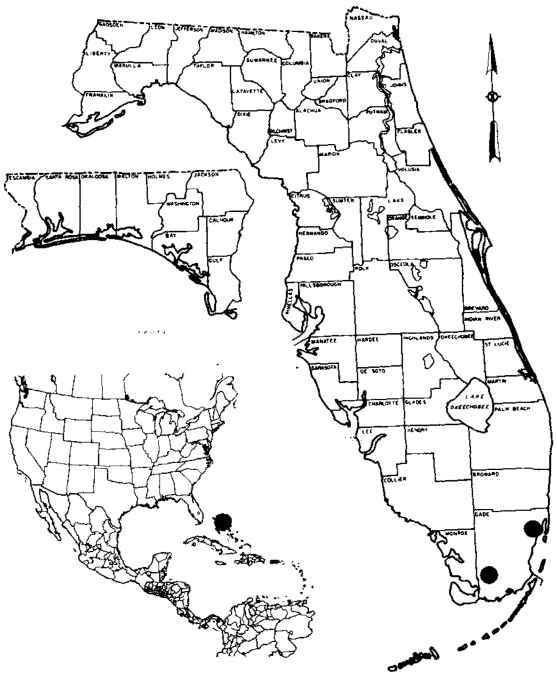


Fig. 99. Distribution of *Melanagromyza ruelliae*.

Melanagromyza splendida Frick

Fig. 100-105

Melanagromyza splendida Frick, 1953b: 207.

Holotype male from Hawaii ex *Apium graveolens* in USNM.

Adult: medium-sized species, wing length from 2.2 mm in male to 2.7 mm in female; mesonotum shining blackish green, not mat even viewed from front; orbits conspicuously widening at midpoint, but always less than one-third width of frons, with several rows of short setulae, the inner rows erect or partially proclinate, those nearest eye margin reclinate; ocellar triangle and orbits distinctly shining; eye in male pilose above; arista bare; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 100, 101, tubular process of mesophallus adjoining and not extending behind main process above; surstyli bending inwards fringed with short hairs or weak bristles which lie at right angles to aedeagal apodeme (Fig. 102).

Host plant/Biology: In Florida *Ambrosia*, *Bidens*, *Erechtites*, *Flaveria*, *Gaillardia*,

Gnaphalium, Tagetes; in California *Helianthus*; in Hawaii *Apium, Lactuca;* in Mexico "carrot"; larva feeding as internal borer in stem or base of large leaves; puparium yellowish, posterior spiracles separated by twice own diameter, pale, weakly chitinized, each with an ellipse of seven to nine bulbs around a central scar representing a rudimentary horn (Fig. 103, 104).

Distribution: Florida, Alachua Co., Dade Co., Highlands Co., Lake Co., Okeechobee Co.; California, Michigan; Bahamas; Hawaii; Jamaica; Mexico.

Remarks: This species has in the past been confused with *M. virens* (Loew). It was synonymized with *virens* by Spencer (1963a: 322) but was resurrected following study of additional material by Spencer (1969a: 76).

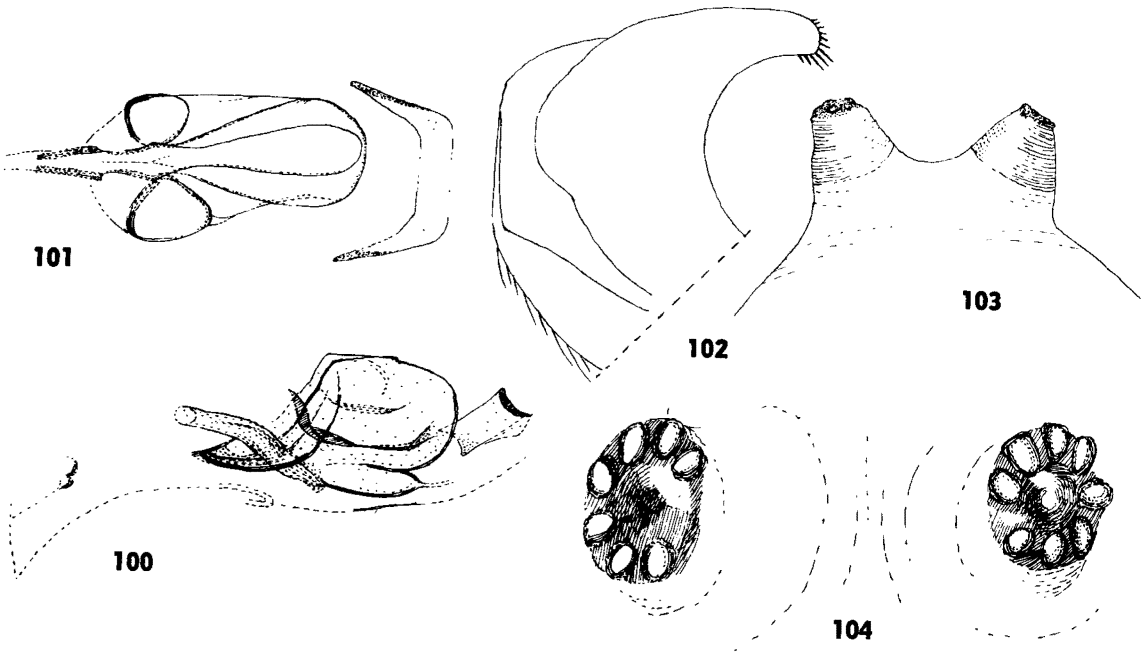
The characteristic feature of both species is the conspicuous widening of the orbits, which bear numerous rows of setulae, some being proclinate and others reclinate. The two species are very similar, but the widening of the orbits is less pronounced, and the orbital setulae are generally shorter and less numerous in *splendida.* Furthermore, the mesonotum is more distinctly shining in *splendida.* Small but constant differences in male genitalia and also in the posterior spiracles of the puparium confirm the distinctness of the two species (cf. Fig. 100-104 and 109-113).

The only known hosts in Florida are Compositae, but *M. splendida* has been recorded in Mexico on Umbelliferae (*Daucus* sp.), and the type series from Hawaii is also from Umbelliferae (*Apium graveolens*). Frick (1953b: 208) refers specimens from *Cucurbita* and *Ipomoea* to *splendida,* but these records require confirmation.

M. splendida is common in Florida and the Bahamas, and the records from Mexico, California and Michigan suggest that it occurs widely throughout the United States. The specimen recorded below from Michigan had been identified by American workers as *virens,* and there is little doubt specimens from other localities have been similarly misidentified. The species presumably has been introduced into Hawaii.

Material examined:

Florida: Alachua Co., Gainesville, two females, 2 and 9 Oct. 1968 (K.A.S.); Dade Co., Hialeah, one male, 21 Apr. 1964 ex stem of



Figs. 100-104. *Melanagromyza splendida*: 100, aedeagus, side view; 101, same, ventral view; 102, surstylus; 103, 104, posterior spiracles of puparium.

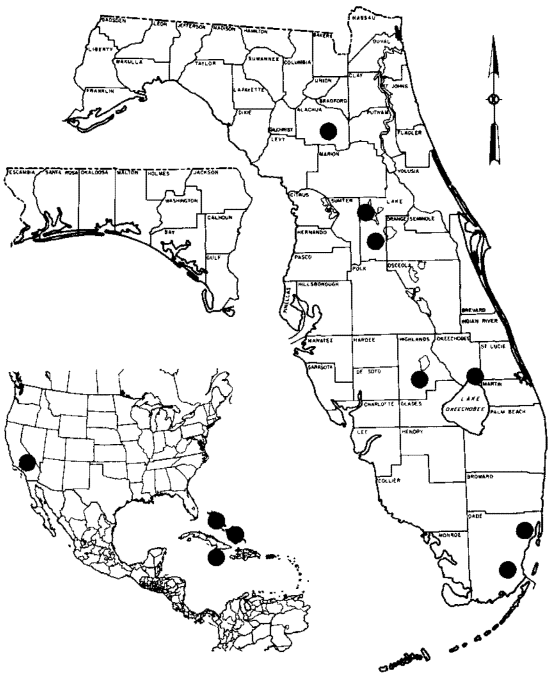


Fig. 105. Distribution of *Melanagromyza splendida*.

Ambrosia artemisiifolia (C.E.S.); same locality and host, three males, four females, 21 Feb. 1966; one female, emerged 2 March 1966 ex stem of *Gnaphalium spathulatum* leg. 21 Feb. 1966 (C.E.S.); two females, 13 June and 18 Oct. 1963 ex stems of *Tagetes* sp. (C.E.S.); Miami, empty pupal case in stem of *Bidens pilosa*, 6 July 1963 (C.E.S.); Hialeah, one male, 22 March 1963, ex stem of *Flaveria linearis* (C.E.S.); Hialeah, empty pupal cases in stems of *Gaillardia pulchella*, 14 Apr. 1964 (C.E.S.); Hialeah, one female, 20 Apr. 1964 ex stem of *Erechtites hieracifolia* (C.E.S.); Homestead, two males, one female, 12-13 Oct. 1968 (K.A.S.); Highlands Co., Archbold Biological Station, one male, two females, 24 Apr. 1967 (B.V. Petersen); Lake Co., Lake Louisa, S. of Clermont, one male, 10 Oct. 1968 (K.A.S. and C.E.S.), Leesburg, three females, 10 Oct. 1968 (K.A.S. and C.E.S.); Okeechobee Co., one female, on *Bidens*, 11 Oct. 1968 (K.A.S. and C.E.S.).

California: Santa Paula, one male, 8 Aug. 1966, ex stem of *Helianthus*.

Michigan: Detroit, one male, 7 Sept. 1933 (G.C. Steyskal).

Bahamas: Abaco Cays, Andros Is., Berry Is., Eleuthera Is., Great Abaco Is., Long Is., Mayaguana Is., New Providence Is., North Bimini Is., 16 males, 21 females, 30 Dec. 1952 - 9 May 1953 (E.B. Hayden & L. Giovannoli); Bimini Is., two males, 22-31 Jan. 1968, light trap (G.M. Stokes).

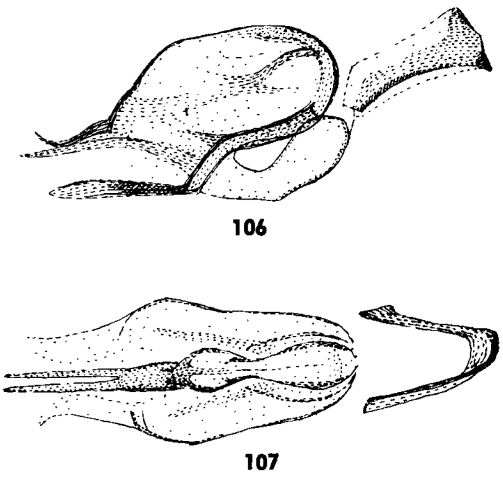
Hawaii: Kamuela, one male, 5 Dec. 1950 ex celery (*Apium graveolens*), paratype; Oahu, Kumia, one male, Sept. 1951 (D.E. Hardy).

Jamaica: Rio Cobre Gorge, one male, two females, 21-26 Dec. 1958, ex stem of unidentified composite (K.A.S.); Duncans, one female, 23 Aug. 1966 (H.F. Howden & E.C. Becker); Good Hope, one female, 8 Aug. 1966 (H.F. Howden).

Melanagromyza vectabilis Spencer, sp.n.

Fig. 106-108

Adult: small, green species, wing length 2.3 mm; frons only slightly wider than eye, jowls narrow, one-tenth height of eye; eye in male with conspicuous pilosity above; arista distinctly pubescent; mesonotum shining green, with faint coppery reflections, abdomen green or coppery; squamae and fringe white.



Figs. 106, 107. *Melanagromyza vectabilis*: 106, aedeagus, side view; 107, same, ventral view (New Providence).

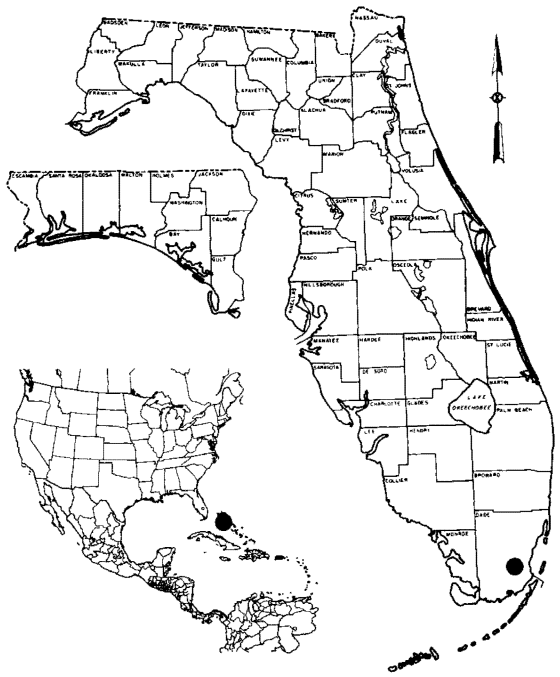


Fig. 108. Distribution of *Melanagromyza vectabilis*.

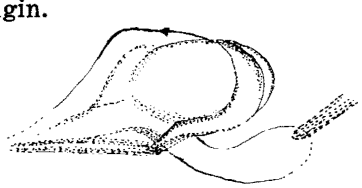
Male genitalia: aedeagus as in Fig. 106, 107; ninth sternite broadly fused at apex, with slightly extending hypandrial apodeme; surstyli conspicuously projecting inwards, with slender bristles at end, no bristles along inner margin.

Host plant/Biology: unknown.

Holotype male, Florida, Dade Co., Homestead, 12 Oct. 1968 (K.A.S.); Bahamas, New Providence Is., 2 miles E. of Nassau, one male, one female, 14 April 1953 (E.B. Hayden). Holotype in USNM, paratypes in AMNH.

Remarks: This is one of the complex group of shining green species which can only satisfactorily be identified by the male genitalia.

The range of this species extending from S. Florida to the Bahamas suggests a southern origin.



109

Melanagromyza virens (Loew)

Fig. 109-114

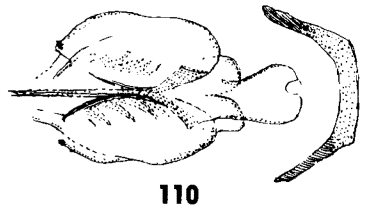
Agromyza virens Loew, 1869: 46. Lectotype female from District of Columbia, designated by Frick, 1957: 200, in MCZ.

Melanagromyza virens, Frick, 1952a: 380; 1957: 200; 1959: 367; Shewell, 1953: 465; Spencer, 1963a: 322; 1969a: 76.

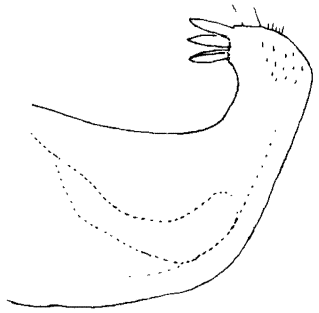
Melanagromyza heterothecae Spencer, 1966c: 10. Holotype male from Florida, Dade Co., in USNM.

Adult: medium-sized species, wing length from 2.2 to 3 mm; mesonotum blackish green, distinctly mat viewed from front, more shining greenish from behind; orbits unusually broad, each up to one-third width of frons, thickly covered in setulae in several rows, the inner rows proclinate, those nearest eye margin reclinate; eye in male conspicuously pilose above; arista appearing bare; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 109, 110, tubular process of mesophallus separate from and extending behind main process above; surstyli (Fig. 111) conspicuously projecting inward, with a group of three to six



110



111

Fig. 109-111. *Melanagromyza virens*: 109, aedeagus, side view; 110, same, ventral view; 111, surstylus.

bristles at end, lying parallel to base of aedeagal apodeme; ninth sternite as in Fig. 112.

Host plant/Biology: *Eupatorium capillifolium, Heterotheca subaxillaris* only confirmed hosts, larva feeding as internal stem-borer, pupating in stem; puparium whitish yellow, posterior spiracles pale, weakly chitinized, separated by slightly more than own diameter, each with an ellipse of about eight well-defined bulbs around a minute black horn (Fig. 113).

Distribution: Florida, Alachua Co., Dade Co., Leon Co., Monroe Co.; District of Columbia; Canada: British Columbia, Ontario, Quebec.

Remarks: *M. virens* belongs to the large and difficult group of medium-sized greenish species. The exceptionally broad orbits with several rows of both proclinate and reclinate setulae producing a typical criss-cross effect, make this a distinctive species. However, confusion can arise with *M. splendida* which also has these characters but to a lesser degree. It can now also for the first time be recorded that the orbits may be broader and the orbital setulae longer and more numerous in the male than in the female. This is clearly apparent in the series containing both sexes reared from *Eupatorium capillifolium* listed below. In view of this sexual dimorphism a reliable identification of individual caught females may be problematic.

The name *virens* has been widely used in American literature in the past, but it is now clear that all such records must be treated as doubtful and requiring confirmation. Malloch (1913: 321) records specimens reared from *Ambrosia* which almost certainly refer to *splendida*. Frick (1959: 367) casts doubt on Malloch's identifications and further states that no reared specimens are known. The conception of *virens* as a highly polyphagous species must therefore now be treated with reserve. The only confirmed hosts are *Eupatorium capillifolium* and *Heterotheca subaxillaris*, both southern species. Specimens from farther north in the United States and from Canada obviously have different hosts, but it now seems probable that these also will be Compositae.

Material examined:

Florida: Alachua Co., Gainesville, two females, 5 Oct. 1968 (K.A.S.); Dade Co., Hialeah, one male, 18 July 1962, ex stem of *Heterotheca subaxillaris* (C.E.S.); four males, two females, 22 June 1963 ex stems of *Eupatorium capillifolium* leg. 1 June 1963 (C.E.S.); Leon Co., Havana, one female, 4 Oct. 1968 (K.A.S.); Monroe Co., Cape Sable, two males; three females, 31 March 1953 (W.R.M. Mason).

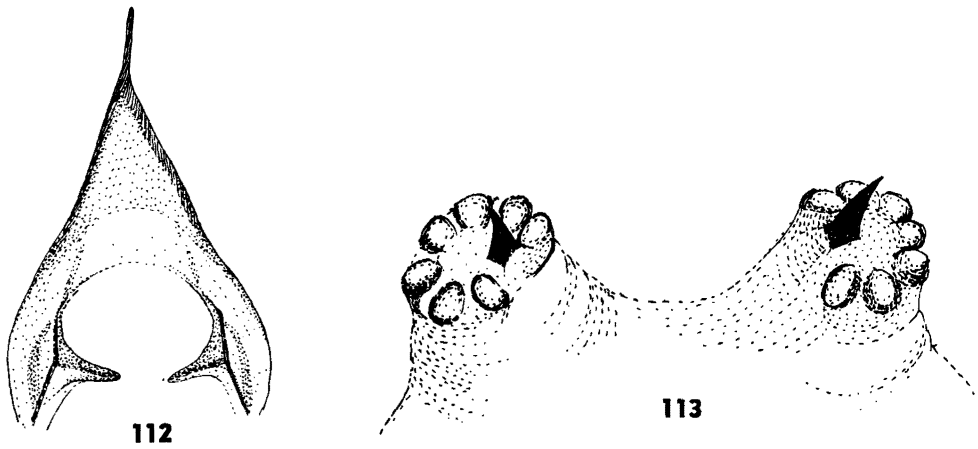


Fig. 112, 113. *Melanagromyza virens*: 112, ninth sternite; 113, posterior spiracles of puparium (*Eupatorium capillifolium*).

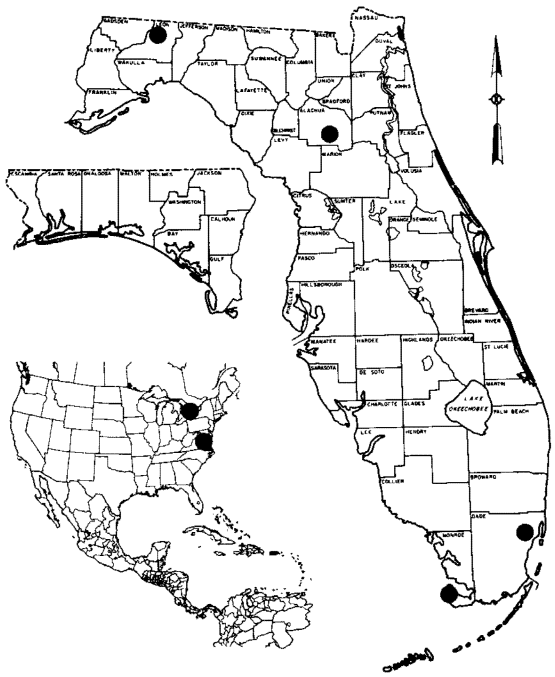


Fig. 114. Distribution of *Melanagromyza virens*.

Melanagromyza viridis (Frost)

Fig. 115-116

Agromyza viridis Frost, 1931: 277. Holotype male from California in USNM.

Melanagromyza viridis, Frick, 1952a: 380; Spencer, 1966c: 15.

Melanagromyza helianthi Spencer, 1963a: 314; 1966c: 15.

Adult: medium-sized species, wing length 2.4 mm; frons relatively broad, one and a half times width of eye; two ors, two incurved ori; orbital setulae slender, in single row, reclinate; jowls conspicuous, deepest in front, almost one-quarter vertical height of eye; eye with patch of short hairs in male, bare in female; lunule distinctive, broad, higher than semicircle; orbits and ocellar triangle brilliantly shining, black; mesonotum shining, greenish or coppery, abdomen similar; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 115; ninth sternite triangular, with narrow, extended hypandrial apodeme (essentially as in *M. floris*, cf. Fig. 63); surstyli with row of fine hairs along inner margin.

Puparium: pale, straw colored, posterior spiracular processes scarcely raised, widely separated, by two or three times own diameter, with an ellipse of about 10 well-defined bulbs around a well-developed central horn.

Host plant/Biology: *Calendula, Helianthus, Tithonia, Zinnia,* larva feeding in flower heads.

Distribution: Florida, Dade Co., Miami area; California, Mexico, Cuba.

Remarks: The deep, forwardly-projecting jowls, high lunule and shining black ocellar triangle and orbits make this a distinctive species.

It seems probable that the population in the Miami area has reached Florida from

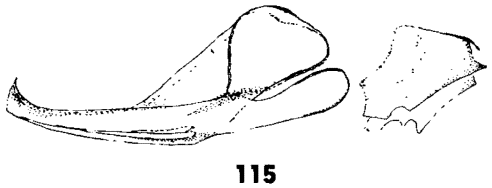


Fig. 115. *Melanagromyza viridis*: 115, aedeagus.

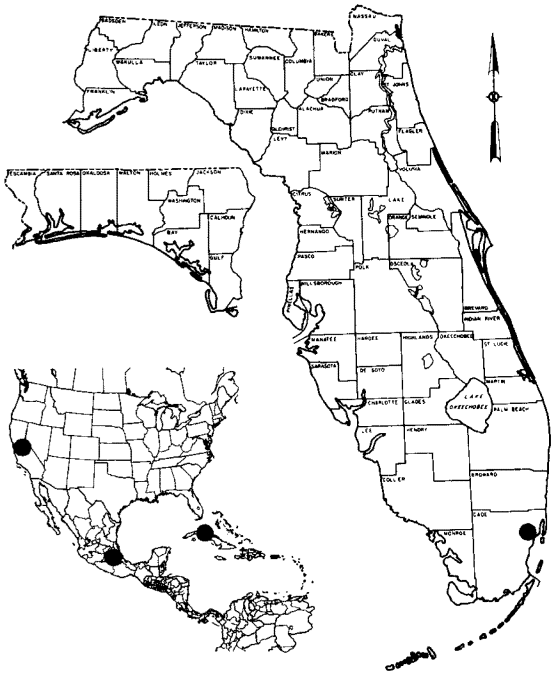


Fig. 116. Distribution of *Melanagromyza viridis*.

Cuba, rather than via the Gulf states from Mexico and California.

Material examined:

Florida: Dade Co., Hialeah, two males, two females, emerged 4 May 1964 ex flowers of *Calendula officinalis* leg. 27 April 1964 (C.E.S.); four males, two females, 31 July 1963, ex seeds of *Tithonia rotundifolia* leg. 3 July 1964 (C.E.S.); North Miami, one male, one female, 22 March 1967, ex seeds of *Helianthus debilis* (C.E.S.).

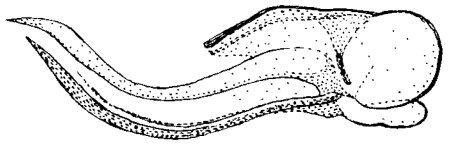
Melanagromyza wedeliae Spencer, sp.n.

Fig. 117-119

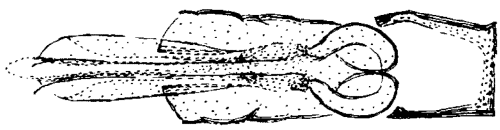
Head: frons narrow, equal to width of eye, not projecting above eye in profile; two equal, reclinate ors, two slightly weaker, incurved ori; orbital setulae fine but numerous, in two rows, those nearest eye margin reclinate, the inner row largely proclinate; lunule semicircular, normal; eye in male with patch of white hairs at level of ors; jowls narrow, deepest in center below eye, one-tenth vertical height of eye; third antennal segment small, rounded, with fine, normal pubescence, arista long, appearing bare.

Mesonotum: two strong dc, acr numerous, in about 12 rows.

Wing: length in male 2.2 mm, last section of vein M3+4 short, half length of penultimate, first cross-vein just beyond midpoint of discal cell.



117



118

Figs. 117, 118. *Melanagromyza wedeliae*: 117, aedeagus, side view; 118, same, ventral view.

Color: frons mat black, orbits and ocellar triangle moderately shining; mesonotum appearing mat when viewed from front but more shining, blackish with a faint greenish tinge, viewed from rear; abdomen shining greenish; squamae gray, margin and fringe black.

Male genitalia: aedeagus as in Figs. 117, 118, ninth sternite with greatly elongated hypandrial apodeme, surstyli with row of fine hairs along inner margin.

Host plant/Biology: *Wedelia paludosa, Senecio confusus*, larva feeding in flower heads.

Holotype male, Florida, Dade Co., Miami, Fairchild Tropical Garden, emerged 17 Oct. ex flower heads of *Wedelia paludosa* collected 16 Oct. 1968 (K.A.S.); paratypes: Miami International Airport, one male, one female, 10 Jan. 1969, ex flower heads of *Senecio confusus* (C.E.S.); Monroe Co., Marathon Key, five males, five females, 22 March 1967 "ex stems" *Senecio confusus* (det. Langdon) leg. 21 March (J. Novak, K. Valley and D. Trelka). Twenty further specimens in the same series from Marathon can be treated as paratypes but have not been mounted or so labelled.

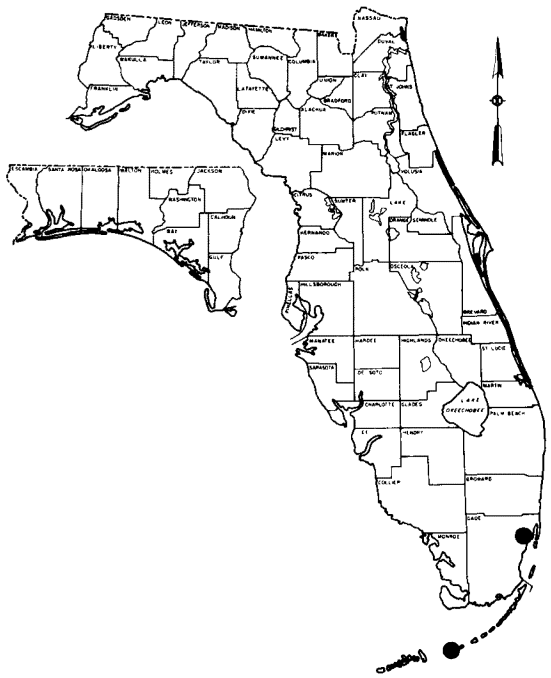


Fig. 119. Distribution of *Melanagromyza wedeliae*.

Remarks: This species very closely resembles *M. erechtitidis,* but differences in the depth of the jowls and of the length of the orbital setulae, together with differences in the genitalia, satisfy me that the two are distinct, though certainly sister species. The most distinctive character is the coloration of the squamae, which are pale gray with a black margin and fringe.

Unidentified *Melanagromyza* species

1. Hialeah, one unemerged male, leg. 2 April 1964 ex stem of *Verbena scabra* (C.E.S.).

This appears to represent an undescribed species. The posterior spiracles of the puparium each bear ten bulbs, without a central horn; the two processes are separated by twice their own diameter.

2. Hialeah, one female, 4 Feb. 1963, ex stem (?) of *Sida* sp. (C.E.S.).

This is an entirely black species, with a conspicuously black squamal fringe; the wing length is 1.9 mm. It runs to couplet 18 in the key on p. 31 but is clearly distinct both from *marellii* and also from *parvella* and *caribbea.* However, it is not considered desirable to describe this species until additional material is available.

GENUS *OPHIOMYIA* BRASCHNIKOV

Agromyza Fallén, subgenus *Ophiomyia* Braschnikov, 1897. Type of subgenus: *maura* Meigen (misidentified as *pulicaria* Meigen).

Ophiomyia Braschnikov, Hendel, 1920: 128.

Seven species have been known in this genus from the Neotropical Region, including southern Florida. Nine further species are now described, four from Florida and five from Dominica and the Bahamas. The genus occurs throughout the world and now comprises 115 species. The Nearctic Region has 24 species, but with further collecting the genus will probably be found to have an even greater number of species in the Neotropical Region.

Distinctive characters of the genus are the characteristic vibrissal fasciculus in the male (present in all species in Florida except *haydeni*) and the conspicuous facial keel dividing the base of the antennae. The halteres are normally brown or black. The majority of species form external stem mines, pupating in the mine, but some are leaf miners.

Key to Florida *Ophiomyia* species

1 Squamal fringe white 2
1′ Squamal fringe black 3
2 Jowls narrow, one eighth height of eye; last section of vein M3+4 short, two thirds penultimate; proboscis conspicuously elongated ..... *haydeni* Spencer
2′ Jowls broader, one fifth eye height; last M3+4 section only slightly shorter than penultimate; proboscis short, normal ..... *lippiae* Spencer
3 Vibrissal corner acute, forming angle of at most 60° 4
3′ Vibrissal corner approximately 80° to 90°; facial keel broad, conspicuously raised; vibrissal fasciculus long, not substantially tapering (Fig. 138) ..... *lantanae* (Froggatt)
4 Facial keel conspicuously raised 5
4′ Facial keel flatter, only slightly raised ..6
5 Squamal fringe black; large species, wing length 2.4 mm ..... *lacertosa* Spencer
5′ Squamal fringe paler, brownish; smaller species, wing length 2 mm ..... *obstipa* Spencer
6 Vibrissal fasciculus long, uniformly curving (Fig. 120) ..... *camarae* Spencer
6′ Vibrissal fasciculus shorter, with distinct bend at end (Fig. 126) .. *gentilis* Spencer

Ophiomyia camarae Spencer

Fig. 120-125

Ophiomyia camarae Spencer, 1963a: 326; 1966c: 6. Holotype male from Trinidad in BM.

Adult: very small species, wing length 1.6 mm, last section of vein M3+4 only slightly shorter than penultimate; ocellar triangle and orbits only moderately shining; jowls in

center one-sixth vertical height of eye, conspicuously projecting forward, forming angle of between 45° and 60° (Fig. 120); vibrissal fasciculus long, broad at base; facial keel narrow, virtually linear; mesonotum shining black; squamae gray, fringe black.

Male genitalia: aedeagus as in Figs. 121, 122, highly asymmetrical; surstyli as in Fig. 123.

Host plant/Biology: *Lantana camara*, larva feeding mainly along midrib, with offshoots along lateral veins (Fig. 124); Stegmaier (1966e) gives three photographs of the leaf mines; pupation in leaf.

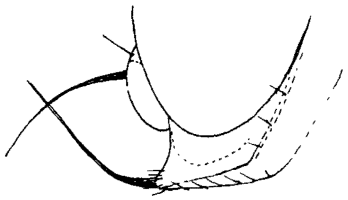
Distribution: Florida, Dade Co., Monroe Co.; Trinidad.

Remarks: the leaf mines of this species are entirely distinctive. However, the adults closely resemble *O. gentilis*, but the genitalia of the two species are entirely distinct.

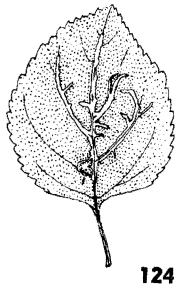
Material examined:

Florida: Dade Co., Hialeah, two males, eight females, emerged 17 April 1963 ex leaf mines on *Lantana* leg. 5 April 1963 (C.E.S.); Homestead, two females, 14 Oct. 1968, caught on *Lantana* (K.A.S.).

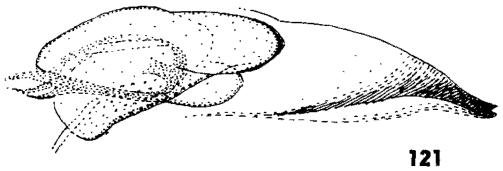
Trinidad: Curepe, ten males, two females, July 1962, ex *Lantana*; Brigart Hill, one female, April 1969 (all F.D. Bennett).



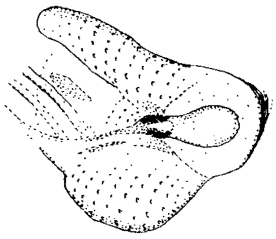
120



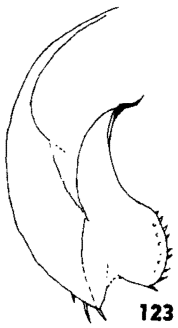
124



121



122



123

Figs. 120-124. *Ophiomyia camarae*: 120, head; 121, aedeagus, side view; 122, same, ventral view; 123, surstylus (all Hialeah); 124, leaf mine on *Lantana camara*.

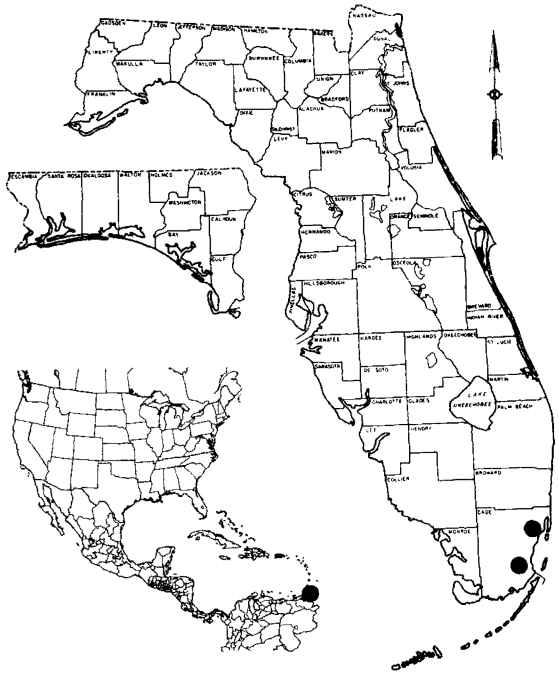


Fig. 125. Distribution of *Ophiomyia camarae*.

Ophiomyzia gentilis Spencer, sp.n.

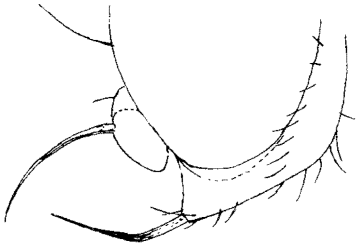
Fig. 126-129

Adult: jowls about one-fifth vertical height of eye, distinctly projecting forward, forming angle of about 60° in front, vibrissal fasciculus slender, with distinctive bend, rather than uniformly curving (Fig. 126), facial keel narrow but slightly raised and widening below base of antennae; ocellar triangle conspicuously shining; mesonotum shining black, acr appearing sparse; wing length 1.6 - 1.75 mm in male, last and penultimate sections of vein M3+4 equal or last section slightly shorter; squamae pale gray, fringe brownish black.

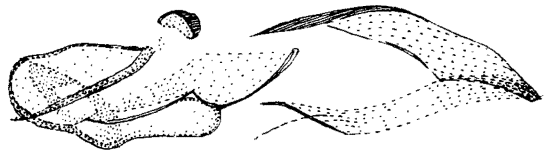
Male genitalia: aedeagus as in Fig. 127, 128, with conspicuous chitinized process above.

Host plant/Biology: unknown.

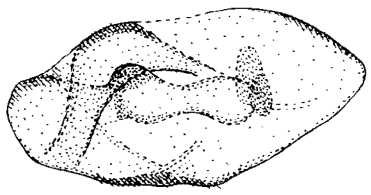
Holotype male, Dominica, Clarke Hall, 21-31 Jan. 1965 (W.W. Wirth); paratypes: Florida, Dade Co., Miami, one male, 10 Sept. 1963 (C.E.S.); Costa Rica, La Caja, 10 km W. of San José, one male, 1930 (Schmidt).



126



127



128

Figs. 126-128. *Ophiomyia gentilis*: 126, head; 127, aedeagus, side view; 128, same, dorsal view.

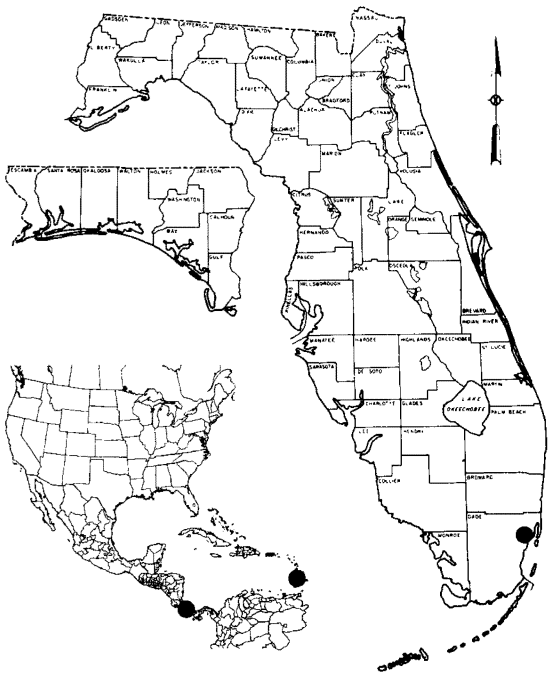


Fig. 129. Distribution of *Ophiomyia gentilis*.

Holotype in USNM, one paratype in DEI, one in senior author's collection.

Remarks: The form of vibrissal fasciculus, the brilliantly shining ocellar triangle and the narrow facial keel are distinctive characters of this species. The male genitalia are entirely characteristic and are identical in the three type specimens.

With records of this species from Costa Rica, Dominica and Miami, it is obviously widespread throughout the Caribbean area.

Ophiomyia haydeni Spencer, sp.n.

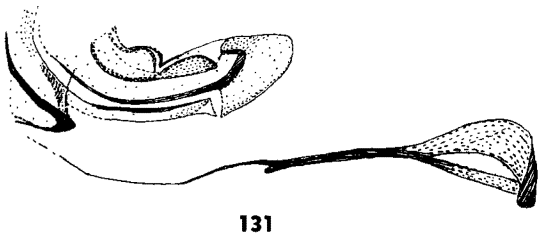
Fig. 130-133

Head: frons not projecting above eye; two equal ors, two ori equally long as ors but slightly more slender; orbital setulae long, sparse, reclinate behind, incurved or proclinate below lower ori; jowls deepest in center below eye, one-seventh vertical height of eye, vibrissa in male strong but normal (not several hairs fused into a fasciculus); facial keel conspicuously raised below base of antennae

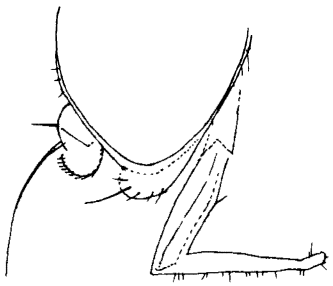
but of medium width; proboscis greatly elongated, both labellae and mediproboscis narrow, of equal length (Fig. 130).

Mesonotum: two strong pairs of dc; acr in up to 10 rows in front but none reaching level of first dc.

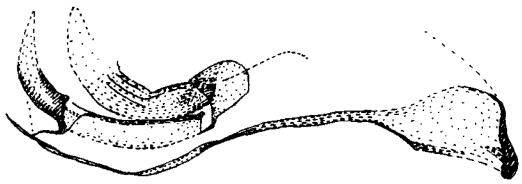
Wing: length in male 1.9 mm, costa extending strongly to vein M1+2, last section of M3+4 shorter than penultimate, in ratio 13:18, first cross-vein at midpoint of discal cell.



131



130



132

Figs. 130-132. *Ophiomyia haydeni*: 130, head; 131, aedeagus (Bahamas); 132, aedeagus (Florida).

Color: ocellar triangle and orbits weakly shining, mesonotum only moderately shining black; squamae whitish gray, margin brown, fringe white.

Male genitalia: aedeagus as in Fig. 131; ninth sternite essentially as in *O. buscki* (cf. Spencer, 1963a: fig. 42D); aedeagus of male from Flamingo, Florida as in Fig. 132.

Host plant/Biology: unknown.

Holotype male, Bahamas, Andros Is., Mangrove Cay, 26 April 1953 (E.B. Hayden); paratypes: Eleuthera Is., New Portsmouth (Rock Sound), one male, 28 March 1953; Florida, Monroe Co., Flamingo, one male, 1-5 Dec. 1961 (Munroe, Holland and Chillcott). Holotype in AMNH, paratypes in CNC and senior author's collection.

Remarks: This species closely resembles *O. buscki* (Frost) from the Panama Canal Zone but both aedeagus and surstyli are sufficiently different to justify considering it as distinct. Characters in common with *buscki* are the normal vibrissa, raised facial keel, elongated mouth parts, white squamal fringe

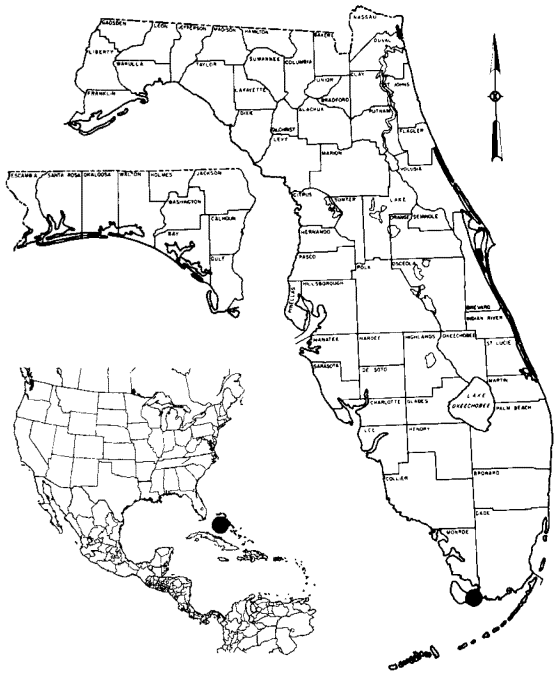


Fig. 133. Distribution of *Ophiomyia haydeni*.

and general form of the aedeagus and ninth sternite.

Specimens from Argentina and Brazil reared from stem mines on *Alternanthera philoxeroides* were treated by Spencer (1963a: 325) as identical with *buscki* from Panama. Although the two populations are closely related, it is now considered that there must be doubt as to whether they are identical. Frick's (1959: Fig. 46) illustration of the head of *buscki* shows a strong vibrissal fasciculus. In view of this it is necessary for the genitalia of the male holotype to be examined to clarify the identity of *buscki*, both in relation to the specimens from Argentina and Brazil and also in relation to *O. haydeni* from the Bahamas and Florida.

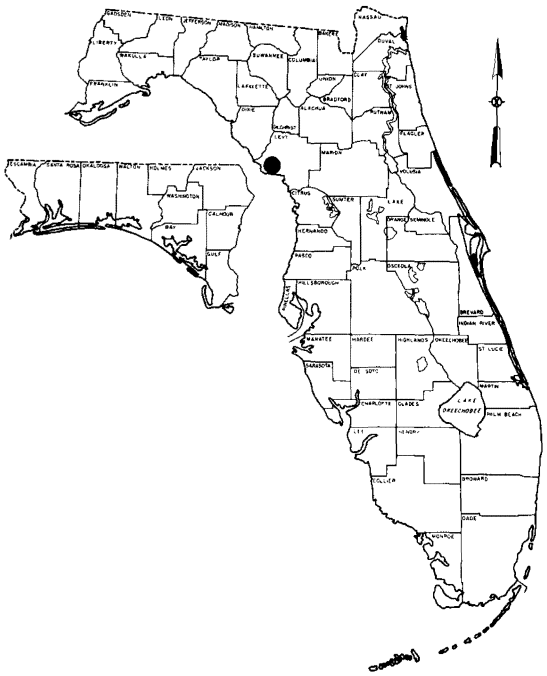


Fig. 137. Distribution of *Ophiomyia lacertosa*.

Ophiomyia lacertosa Spencer, sp.n.

Fig. 134-137

Head: jowls distinctly projecting forward, forming angle of about 60° in front, about one-sixth vertical height of eye; cheeks broad, more than half width of jowls; vibrissal fasciculus in male stout at base, regularly curving, short (Fig. 134); facial keel of medium width, conspicuously raised above base of antennae, with a distinct furrow centrally.

Mesonotum: acr appearing sparse, in about six rows.

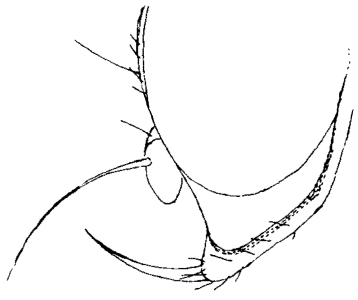
Wing: length 2.4 mm, last section of vein M3+4 little shorter than penultimate.

Color: ocellar triangle and orbits moderately shining; mesonotum entirely shining black; squamae dark gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 135, 136.

Host plant/Biology: unknown.

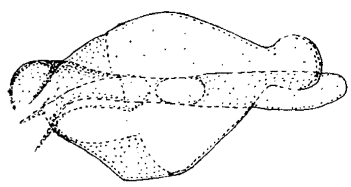
Holotype male, Florida, Levy Co., Gulf



134



135



136

Figs. 134-136. *Ophiomyia lacertosa*: 134, head; 135, aedeagus, side view; 136, same, ventral view.

Hammock, 23 April 1952 (O. Peck), in CNC.

Remarks: The form of head in this species somewhat resembles that in *O. arguta*, but the vibrissal fasciculus is substantially shorter; the facial keel is more pronounced in *lacertosa*. The entirely black squamal fringe is a further distinguishing character. *O. lacertosa*, with wing length of 2.4 mm, is one of the larger species.

Ophiomyia lantanae (Froggatt)

Fig. 138-141

Agromyza lantanae Froggatt, 1919: 665; Aldrich, 1923: 262. No types extant.

Ophiomyia lantanae, de Meijere, 1925: 253; Frick, 1952a: 382; 1959: 370; Spencer, 1963a: 328; 1963b: 324.

Agromyza longicauda Curran, 1928: 65.

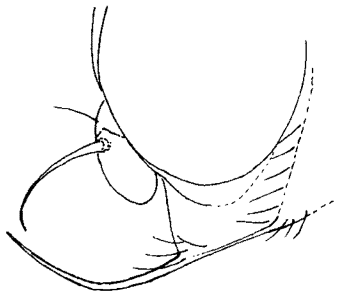
Adult: small species, wing length 1.9 - 2.2 mm; frons not projecting above eye, jowls about one-fifth vertical eye height, not greatly projecting forward, forming an angle of 80°, rather flat below, vibrissal fasciculus in male strong but narrow at base (Fig. 138), keel dividing antennae pronounced, broad and raised but somewhat variable; mesonotum distinctly mat, almost brownish black, squamae gray, fringe black.

Male genitalia: aedeagus as in Fig. 139, 140.

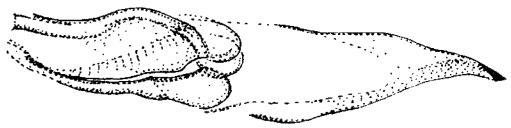
Host plant/Biology: *Lantana camara*, larva feeding in the seed heads, either on the pulp of the immature berries or eating out the actual seed, where pupation takes place.

Distribution: Florida, Alachua Co., Dade Co., Lake Co.; Hawaii; Brazil, Costa Rica, Cuba, Mexico, Panama, Puerto Rico, Trinidad; East Africa, Australia, Ceylon, India, Malaya, Singapore.

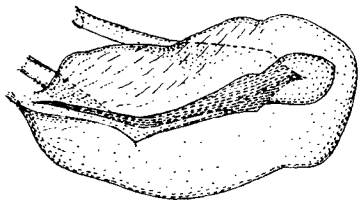
Remarks: This species normally occurs in abundance in association with its main food plant, *Lantana camara*. There is no evidence whether it also feeds on other *Lantana* species, but it may do so. *O. lantanae* is native to Mexico and Central America but is widespread throughout the Caribbean area. It occurs throughout most of Florida.



138



139



140

Figs. 138-140. *Ophiomyia lantanae*: 138, head; 139, aedeagus, side view; 140, same, ventral view.

Lantana has been widely introduced in Africa, much of Asia and Australia and probably *O. lantanae* was originally introduced inadvertently with the seeds. The fly subsequently has been deliberately introduced into India and Kenya in an attempt to control the spread of *Lantana*, which has spread over large areas in much of the Old World tropics and Australia.

O. lantanae closely resembles *O. legitima* but is distinguishable by the broader, more raised facial keel and mat mesonotum (brilliantly shining black in *legitima*).

Material examined:

Florida: Alachua Co., Gainesville, one female, 9 Oct. 1968 (K.A.S.); Lake Co., Leesburg, one male, one female, 10 Oct. 1968 (K.A.S. and C.E.S.).

Costa Rica: La Caja, 8 km W. of San José, one male, 7 Nov. 1930 (Schmidt).

Brazil: Porto Alegre, one male, two females, 4 March 1969, on *Lantana camara* (K. Hurley).

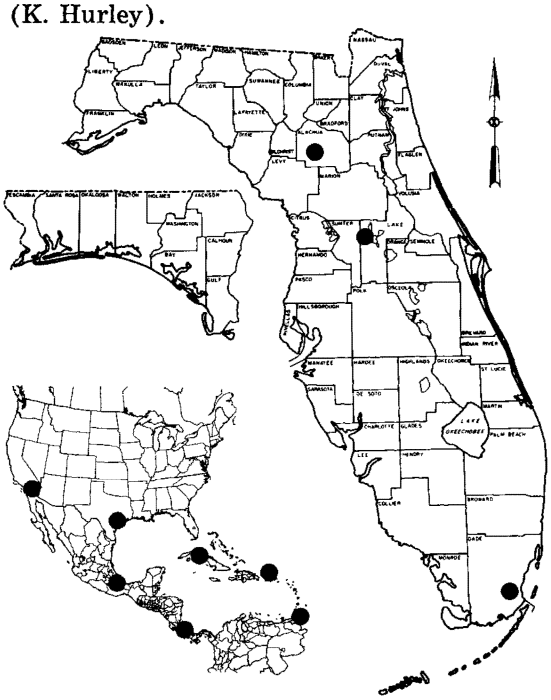


Fig. 141. Distribution of *Ophiomyia lantanae.*

Ophiomyia lippiae Spencer

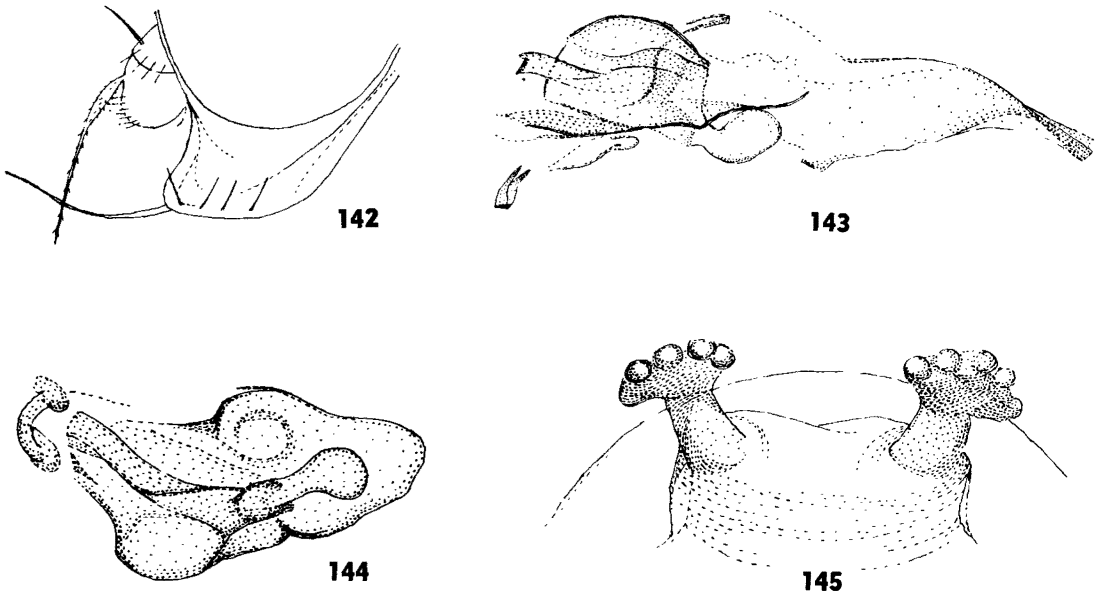
Fig. 142-146

Ophiomyia lippiae Spencer, 1966c: 6. Holotype male from Florida, Dade Co. in USNM.

Adult: very small species, wing length from 1.5 to 1.9 mm, squamal fringe white; jowls broad, one-fifth vertical height of eye, lower margin straight, vibrissal corner scarcely projecting forward, forming angle of approximately 90°; vibrissal fasciculus in male long, slender, uniformly curving (Fig. 142); facial keel distinctly bulbous between base of antennae; mouthparts not elongated, normal; mesonotum conspicuously shining black, acr in some eight to ten rows; last section of vein M3+4 only slightly shorter than penultimate, in ratio 12:15; squamae white, margin pale brownish yellow, fringe normally silvery white, more rarely ochrous.

Male genitalia: aedeagus highly asymmetrical, as in Fig. 143, 144.

Host plant/Biology: *Lippia nodiflora,* larva reported to be seed feeder, but this



Figs. 142-145. *Ophiomyia lippiae*: 142, head; 143, aedeagus, side view; 144, same, ventral view; 145, posterior spiracles of puparium.

is possibly a stem miner, pupating in the upper part of the stem; puparium pale, yellowish white, posterior spiracles on short, raised stalks, each process with five bulbs (Fig. 145).

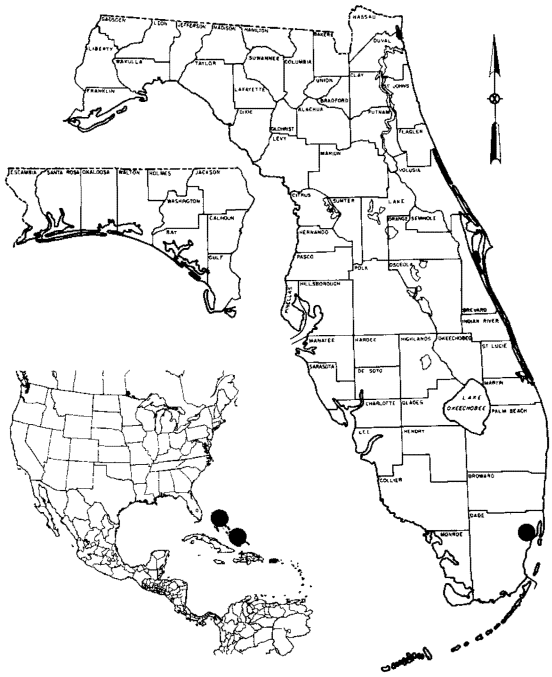


Fig. 146. Distribution of *Ophiomyia lippiae*.

Distribution: Florida, Dade Co., Miami; Bahamas.

Remarks: This species resembles *O. buscki* in having a white squamal fringe, but the jowls are deeper, the mouth parts are normal (greatly elongated in *buscki*), and it is generally smaller.

The new records from the Bahamas given below suggest that this species has reached Florida from the south.

Material examined:

Bahamas: Cat Is., McQueen, one male, 23 Jan. 1953; Great Inagua Is., Mathew Town, five males, four females, 31 Jan. 1953 (E.B. Hayden & L. Giovannoli).

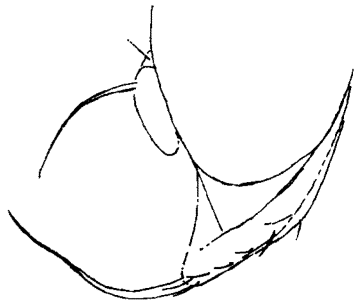
Florida: Miami, four males, nine females, emerged 26 Aug. 1963 "ex seeds" of *Lippia nodiflora* leg. 24 Aug. 1963; two females, 18-24 July 1963 (all C.E.S.).

Ophiomyia obstipa Spencer, sp.n.

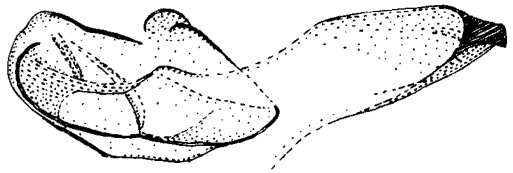
Fig. 147-150

Adult: small species, wing length 2 mm; jowls deep (Fig. 147), one-quarter height of eye, forming angle of 60° or less in front; vibrissal fasciculus slightly thickened at base, becoming very fine at end and distinctively bending in center; ocellar triangle brilliantly shining black, orbits slightly less so; facial keel between antennae narrow but well defined; mesonotum shining black; squamae pale-gray, margin and fringe grayish black.

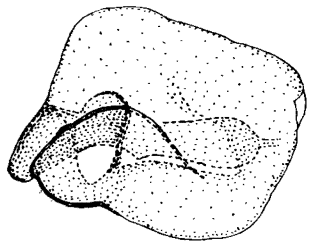
Male genitalia: aedeagus as in Fig. 148, 149, distiphallus highly asymmetrical.



147



148



149

Figs. 147-149. *Ophiomyia obstipa*: 147, head; 148, aedeagus, side view; 149, same, dorsal view.

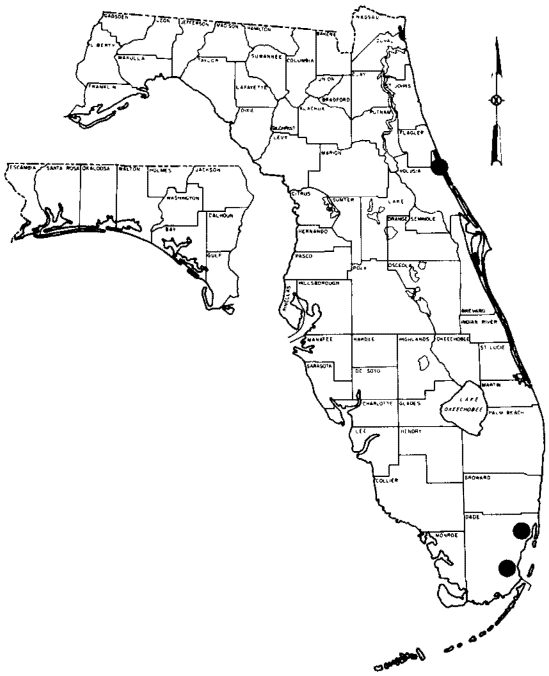


Fig. 150. Distribution of *Ophiomyia obstipa.*

Host plant/Biology: unknown.

Holotype male, Florida, Dade Co., Hialeah, 8 March 1964; paratypes: same locality, two males, 5 Oct. 1964, caught on *Verbena*; one male, 31 Oct. 1964, caught on *Borreria terminalis* (all C.E.S.); Homestead, one male, 4 April 1952 (J.R. Vockeroth); Volusia Co., Ormond Beach, one female, 3 Oct. 1960 (R.E. Woodruff). Holotype in USNM, further paratypes in CNC, FSCA and senior author's collection.

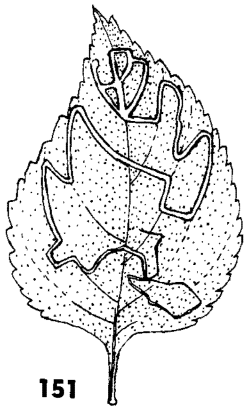


Fig. 151. *Ophiomyia* sp. (Lantana): leaf mine.

Remarks: This species is distinguishable by the deep, acute-angled jowls and the distinctive vibrissal fasciculus. It is possible that the host is one of the plants on which specimens were caught, but this is not certain, as experience has shown that Agromyzidae frequently rest on any convenient foliage which may not be associated with their host plant.

Ophiomyia sp. (*Lantana*)

Fig. 151-152

An undescribed species forming long, narrow, pale greenish linear mines (Fig. 151) on *Lantana camara*, pupating in the leaf, is not uncommon in the Miami area, and I have seen similar mines at Caracas, Venezuela, 3 Dec. 1958. It is to be hoped that eventually males of this species can be reared, so that its status can be clarified.

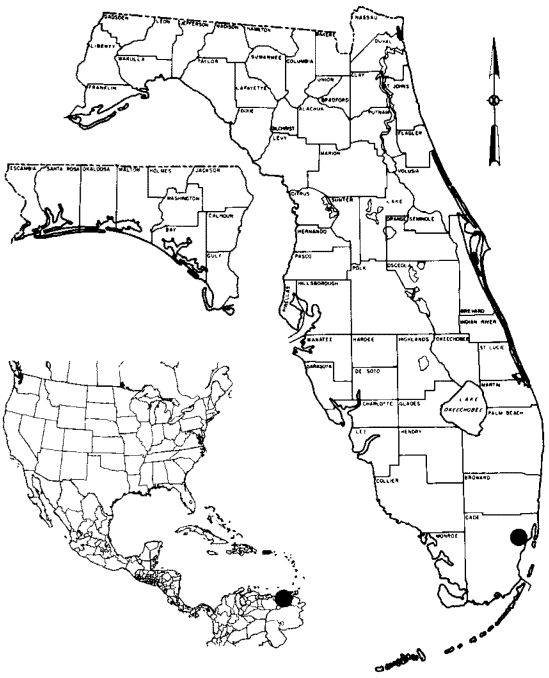


Fig. 152. Distribution of *Ophiomyia* sp. (Lantana).

SUBFAMILY PHYTOMYZINAE

GENUS *PHYTOBIA* LIOY

Phytobia Lioy, 1864: 1313; Spencer, 1966d: 142; 1969a: 101. Type of genus: *Agromyza errans* Meigen, syntypes in Paris and Vienna.

This genus consists of large species, and those whose life history is known all feed as cambium borers in the twigs of trees. The species occur throughout the world except Australia and provide the largest species in the family, with wing length up to 6.5 mm. They can be mistaken easily for *Agromyza* species, but the male genitalia will always reveal their correct identity.

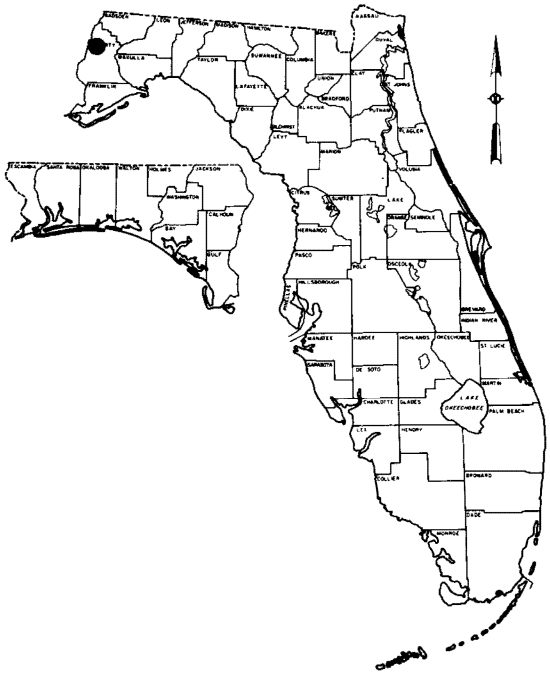


Fig. 153. Distribution of *Phytobia* sp.

The genus is about equally represented in the Neotropical and Nearctic Regions. Only a single species from Torreya is known in Florida, and none of obvious southern origin are known in the south.

Phytobia sp.

Fig. 153

Florida: Liberty Co., Torreya State Park, one female, 29 April 1952 (O. Peck), in CNC.

Remarks: In view of the many similar species in this genus, it is unfortunately not possible to make a positive identification of this single female. It closely resembles *P. betulivora* Spencer (1969a: 103) recorded from District of Columbia and Ontario, feeding as a cambium borer in *Betula nigra*. The reddish frons and antennae and six slender orbital bristles are characters in common, but the mesonotum of the Florida specimen is distinctly more black (gray in *betulivora*), and it is also somewhat smaller, with wing length of 3.5 mm (4.3 in male of *betulivora*). It therefore seems very probable that it represents an undescribed species, but more material will be necessary before this can be decided.

GENUS *CERODONTHA* RONDANI

Cerodontha Rondani, 1861: 10; Nowakowski, 1962: 100; 1967: 633-661; Spencer, 1969a: 109. Type of genus: *Chlorops denticornis* Panzer.

This genus was originally restricted to the small group of species having a conspicuous spine on the third antennal segment and only one pair of scutellar bristles. *C. dorsalis* is a well-known North American species with these characters.

Nowakowski (1962) later expanded the generic concept to include the sub-genera *Dizygomyza, Poemyza* and *Icteromyza* included by Hendel (1931-6) in the genus *Dizygomyza* and by Frick (1952a) in *Phytobia*. *Cerodontha* is now a large genus of over 130

species of world-wide distribution. The larvae feed exclusively on *Monocotyledoneae,* in the families Gramineae, Cyperaceae, Juncaceae and Iridaceae.

Cerodontha is well developed in the Nearctic and Palaearctic Regions, and several species occur in the arctic tundra. Only nine species hitherto have been known in the Neotropical Region, but this number will increase substantially with further collecting. Five species are now recorded in Florida, three *Dizygomyza* species being described as new, and one, *C.* (*Ict.*) *longipennis,* is new to the State.

Key to Florida *Cerodontha* species

(including *Cer.*(*Diz.*) *puertoricensis* from Puerto Rico

1 Third antennal segment with conspicuous spine at upper corner; only single pair of scutellar bristles ..... (*Cerodontha*) *dorsalis* (Loew)

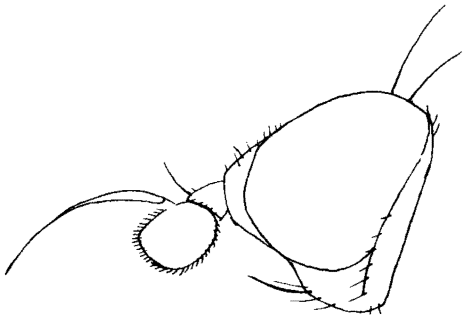
1′ Third antennal segment without spine, though sometimes greatly enlarged in male; two pairs of scutellar bristles 2

2 Frons and orbits yellow ..... (*Icteromyza*) *longipennis* (Loew)

2′ Frons and orbits darker, brown or black.. ..... (*Dizygomyza*) 3

3 Lunule broad, semicircular; third antennal segment enlarged in male 4

3′ Lunule higher than semicircle, V-shaped; third antennal segment in male normal .. .. *puertoricensis* Spencer



154

Fig. 154. *Cerodontha* (*Diz.*) *frosti*: head (female).

4 Notopleural triangle yellow .... *pecki* Spencer

4′ Notopleural triangle black 5

5 Frons brown above, black below, orbits brownish; lunule higher than semicircle .. .. *iridophora* Spencer

5′ Frons uniformly pale brown, orbits black; lunule semicircular .... *frosti* Spencer

Subgenus *Dizygomyza* Hendel

Dizygomyza Hendel, 1920: 130; Spencer, 1969a: 113. Type of subgenus: *Agromyza morosa* Meigen.

This is the largest subgenus in *Cerodontha,* and three new species are described below. The males are normally characterized by the greatly enlarged third antennal segment. Host plants are found in the families Gramineae, Cyperaceae and Iridaceae.

Cerodontha (Dizygomyza) *frosti* Spencer, sp.n.

Fig. 154, 155

Head (Fig. 154): frons broad, 1½ times width of eye; orbits conspicuously differentiated, widening and strongly projecting above eye anteriorly; ors missing, relative strength not detectable, orbital setulae reclinate behind, upright or proclinate in front; lunule broad, semicircular, jowls small, about one-fifth height of eye; third antennal segment enlarged, conspicuously pubescent.

Mesonotum: 3+1 dc, pre-sutural weak; acr sparse, in about five rows; prescutellars well developed (one absent).

Wing: length in female 2.5 mm, costa extending strongly to vein M1+2, last section of vein M3+4 slightly longer than penultimate in ratio 25:20, first cross-vein at midpoint of discal cell.

Color: frons pale brown, orbits strikingly differentiated, black; lunule brownish gray;

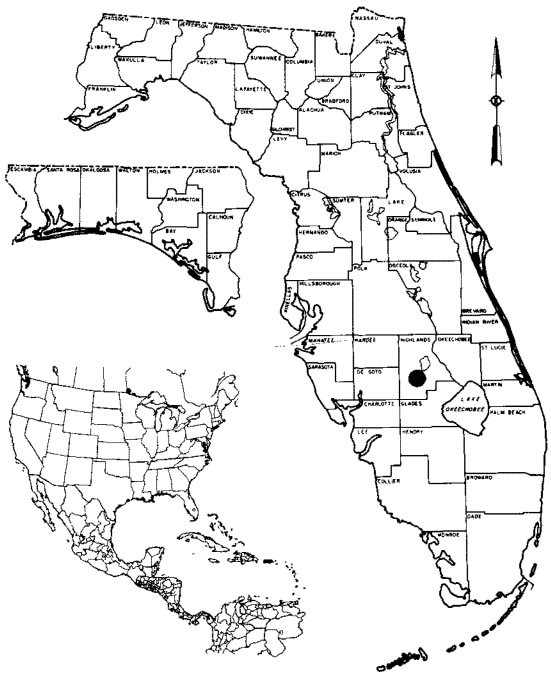


Fig. 155. Distribution of *Cerodontha (Diz.) frosti.*

all antennal segments black; mesonotum mat black; upper margin and hind-corner of mesopleura orange-yellow, pleura otherwise black; legs black, but all knees distinctly yellow; abdomen shining black, squamae and fringe yellowish.

Host plant/Biology: unknown.

Holotype female, Florida, Highlands Co., Archbold Biological Station, 28 Nov. 1959 (S.W. Frost), in USNM.

Remarks: The coloration of the head and the enlarged, pubescent third antennal segment in the female make this a distinctive species.

Cerodontha (Dizygomyza) iridophora Spencer, sp.n.

Fig. 156-159

Head (Fig. 156): frons broad, twice width of eye, normally slightly projecting above eye in profile (not so in one of six specimens examined); two ors, three (rarely four) weaker, largely incurved ori; orbital setulae conspicuously long in front, reclinate; orbits broad, inner margin parallel to eye, lunule large, distinctly higher than semicircle; jowl deeper at rear, at midpoint about one-eighth height of eye; third antennal segment greatly enlarged in male, shortly pubescent, in female normal.

Mesonotum: 3+1 dc, third and fourth equal; acr in some six rows, pre-scutellars well developed.

Wing: length from 2.2 mm in male to 2.5 in female; last section of M3+4 shorter than penultimate, slightly variable but normally in ratio 20 : 25; first cross-vein slightly beyond midpoint of discal cell.

Color: frons brown in upper half, distinctly black below; orbits brownish, lunule appearing brown viewed from front, dis-

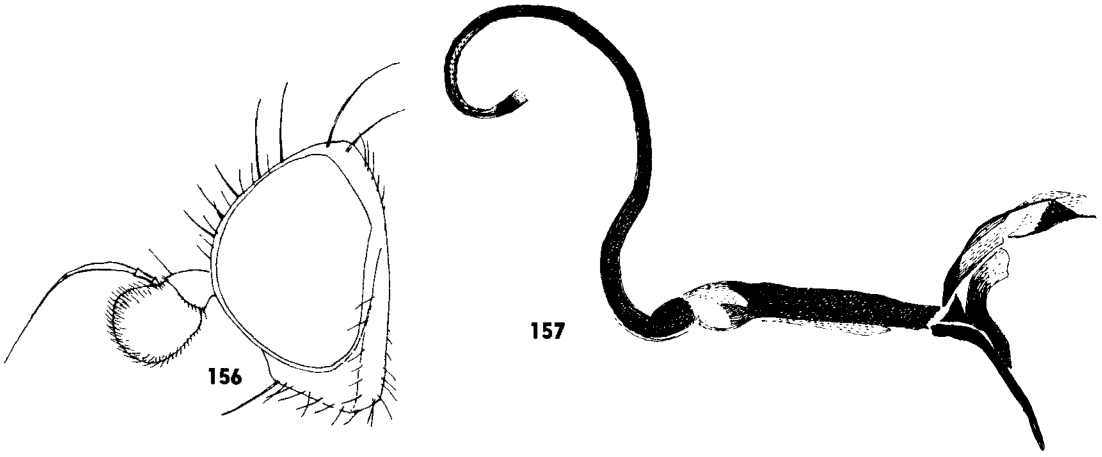
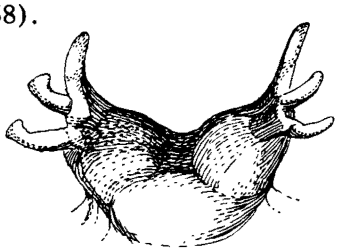


Fig. 156, 157. *Cerodontha (Diz.) iridophora;* 156, head (male); 157, aedeagus.

tinctly silvery viewed from behind; third antennal segment black, first and second partially paler, brownish; mesonotum mat black, pleura black, apart from narrow yellow upper margin of mesopleura; legs: all femora black, with bright yellow knees, tibia and tarsi somewhat paler, more brownish; abdomen shining black; wing base, squamae and fringe bright yellow.

Male genitalia: aedeagus as in Fig. 157, paired distal tubules entirely symmetrical and parallel; surstyli with well-developed group of short spines on inner corner; epandrium with conspicuous knob between base of cerci (cf. Frick, 1959: *Diz. thompsoni*, Fig. 84).

Puparium: dark brown, posterior spiracles arising from projecting base, each with three distinct bulbs, the lower two curving laterally (Fig. 158).



158

Fig. 158. *Cerodontha (Diz.) iridophora*: posterior spiracles of puparium.

Host plant/Biology: *Iris* sp., larva forming irregular whitish leaf mine, pupating toward base of leaf.

Holotype male, Florida, Dade Co., Miami Springs, emerged 23 Dec. 1966 ex leaf mines on *Iris* sp. leg. 8 Dec. 1966; paratypes: one male, same data; three males, one female, emerged 22-29 Dec., leg. 14 Dec. 1966 (all B.K. Dozier). Holotype and one paratype in USNM, two paratypes in FSCA, two in senior author's collection.

Remarks: This species is immediately distinguishable from the only other species in the subgenus known in Florida by the key characters given above. On external characters it closely resembles *Diz. thompsoni* Frick (cf. Spencer, 1969a: 124) mining on *Iris versicolor* in the N.E. United States and eastern Canada. However, in *thompsoni* the mined leaves around the pupation site become conspicuously distorted. The aedeagus

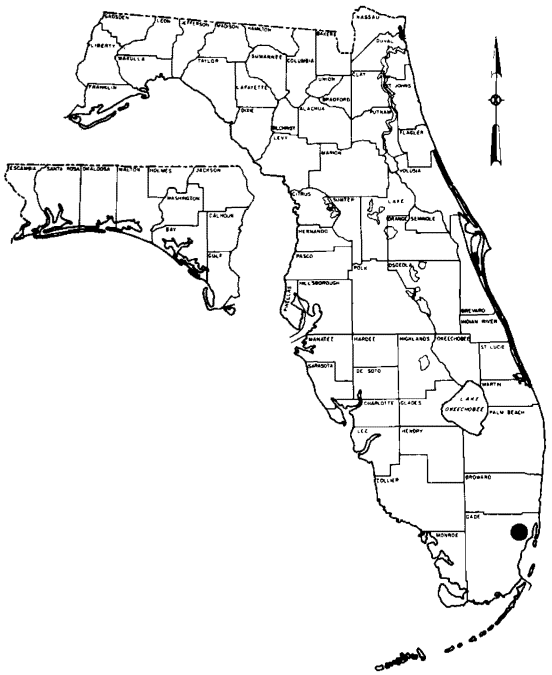
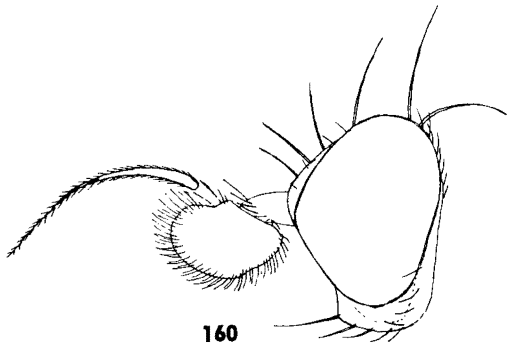


Fig. 159. Distribution of *Cerodontha (Diz.) iridophora.*

of the two species is generally similar (cf. Spencer, 1969a: Fig. 217) but they are readily distinguishable by the form of the posterior pupal spiracles. In *thompsoni* the lower two are closely wrapped around the base of the longer, upper one (an arrangement frequently found in species of this subgenus, cf. Hendel, 1931-6: Fig. 113, 114-*Diz. morosa*), while in *iridophora* the lower two lie free, although curving out laterally.

Diz. iridophora is distinct from two European miners on *Iris*, *D. ireos* R.-D. and *D. iridis* Hendel.



160

Fig. 160. *Cerodontha (Diz.) pecki*: head (male).

Cerodontha (Dizygomyza) pecki Spencer, sp.n.

Fig. 160-162

Head (Fig. 160) : frons broad, twice width of eye, either not projecting above eye or slightly so in front; two slender ors, the upper distinctly stronger, two weak incurved ori; orbital setulae sparse, irregular, at rear upright, a few in front more proclinate; orbits broad, slightly widening anteriorly; lunule broad, semicircular; jowls not extended at rear, about one-sixth eye height; third antennal segment enlarged in both male and female, conspicuously pubescent but pilosity shorter in female.

Mesonotum: 3+1 weak dc, third and fourth equal; acr sparse, in four rows, extending to midway between second and first dc; pre-scutellars present but weak.

Wing: length 1.8 - 1.9 mm, costa extending to vein M1+2, last and penultimate sections of M3+4 equal or last slightly longer; first cross-vein at midpoint of discal cell.

Color: frons brownish, orbits and lunule gray, almost silvery; all antennal segments black; mesonotum conspicuously mat, ash gray; humerus, notopleural triangle and upper hind corner of mesopleura bright yellow or slightly suffused with gray; legs black, fore-knees conspicuously yellow; abdomen basically shining black but front tergites broadly yellow laterally and narrowly so on hind margins; wing base, squamae and fringe bright yellow.

Male genitalia: aedeagus as in Fig. 161, distal tubules conspicuously dilated at apex; ninth sternite U-shaped, side arms narrow, with broad membranous fusion apically; surstyli with two or three short, strong spines on inner corner.

Host plant/Biology: unknown but almost certainly Cyperaceae.

Holotype male, Florida, Alachua Co., Gainesville, 25 April 1952; paratypes: one female, Newnan's Lake, nr. Gainesville, 26 April 1952; DeSoto Co., Fort Ogden, one male, 8 April 1952 (all O. Peck). Holotype and one paratype in CNC, one paratype in senior author's collection.

Remarks: This species is immediately distinguishable from the other species in the subgenus known in Florida by the yellowish sides of the thorax. However, it closely resembles the Holarctic species, *Diz. morosa* (Meigen), which has the same distinctive coloration, but is distinguishable by having only the fore-knees yellow (all knees yellow in *morosa*). *Diz. morosa,* described as *magnicornis* Loew from District of Columbia, is widespread in the north of the United States and has been recorded from eastern Canada (Spencer, 1969a: 121).

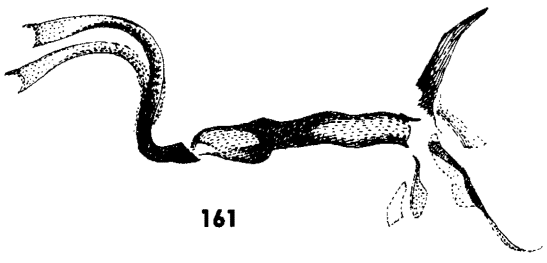


Fig. 161. *Cerodontha (Diz.) pecki*: aedeagus.

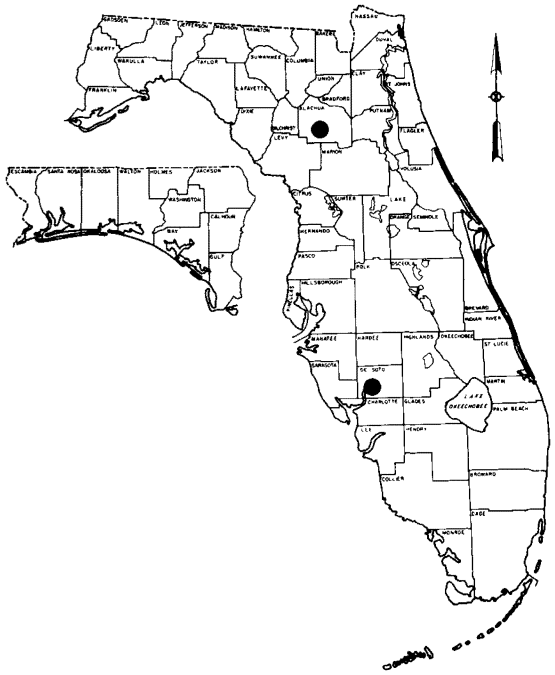


Fig. 162. Distribution of *Cerodontha (Diz.) pecki.*

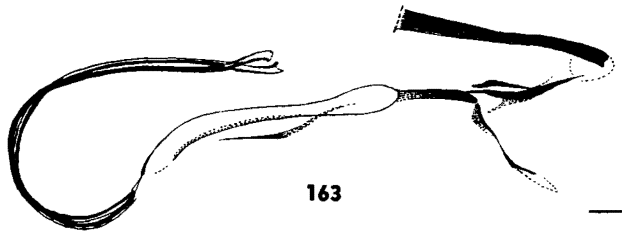


Fig. 163. *Cerodontha* (*Ict.*) *longipennis*: aedeagus.

Subgenus *Icteromyza* Hendel

Icteromyza Hendel, 1931: 51; Spencer, 1969a: 137. Type of subgenus: *Agromyza geniculata* Fallén.

The single species, *I. longipennis,* which occurs widely in North America and also more rarely in the Neotropical Region, is now recorded as new to Florida. The families Cyperaceae and Juncaceae provide the hosts for this subgenus.

Cerodontha (*Icteromyza*) *longipennis* (Loew)
Fig. 163-164

Agromyza longipennis Loew, 1869: 48; Shewell, 1953: 466. Holotype female from District of Columbia in MCZ.

Phytobia (*Icteromyza*) *longipennis* (Loew), Frick, 1959: 386.

Cerodontha (*Icteromyza*) *longipennis,* Spencer, 1969a: 140.

Adult: wing length 2.5 to 3.1 mm; frons not projecting above eye in profile, largely yellow, upper orbits blackish; eye bare, third antennal segment variable, yellowish brown to black, palpi yellow; mesonotum mat gray; femora blackish gray but broadly yellow in apical third.

Male genitalia: aedeagus as in Fig. 163, distal tubules unusually long, slightly expanded at end, mesophallus long and slender.

Host plant/Biology: leaf miner on *Juncus* spp., reared from *J. xiphioides* Meyer by Frick (1959: 387).

Distribution: Florida, Alachua Co.; widespread in northern U.S. and in Canada. New to Florida.

Remarks: This species is immediately recognizable by the combination of the broadly yellow femora and bare eyes. The specimens from Florida are larger than those seen from the northern states and Canada, in which the wing length was at most 2.5 mm.

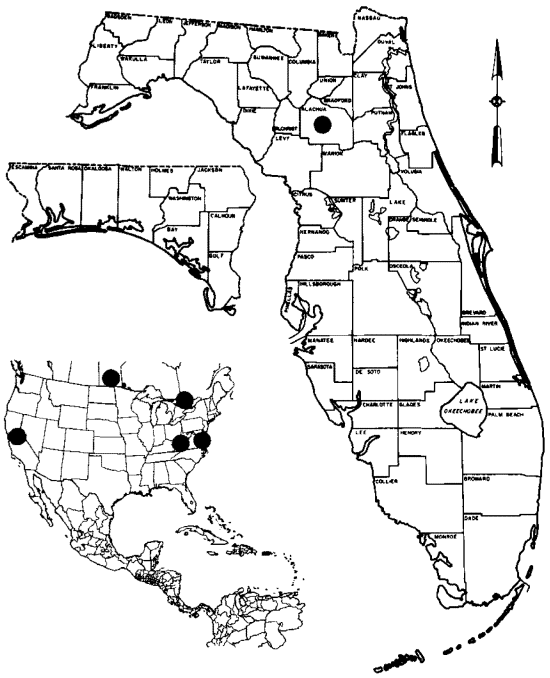


Fig. 164. Distribution of *Cerodontha* (*Ict.*) *longipennis.*

It is generally similar to the Palaearctic species, *I. bohemanni* Rydén, 1951 (=*lineella* Zett., *sensu* Hendel). However, the genitalia of the two species are distinct; in *bohemanni* the distal processes of the aedeagus are conspicuously enlarged and strongly chitinized (Spencer, 1969b: 13).

Ict. longipennis is a species of northern origin and must be near its southern limit in Alachua Co.

Material examined.

Florida: Alachua Co., no locality given, "near a stream," one male, two females, 29 Jan. 1954 (H.V. Weems Jr.).

Subgenus *Cerodontha* Rondani

Cerodontha Rondani, 1861: 10; Spencer, 1969a: 142. Type of subgenus: *Chlorops denticornis* Panzer.

Only the single species, *C. dorsalis,* which occurs widely both in North and South America is known in Florida. Host plants are in the family Gramineae and this species is of potential economic importance as a leaf miner on various cereal crops.

Cerodontha (*Cerodontha*) dorsalis (Loew)

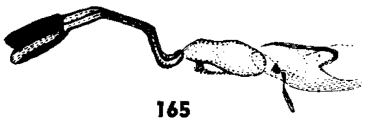
Fig. 165-167

Odontocera dorsalis Loew, 1863: 54; Holotype female from District of Columbia in MCZ.

Cerodontha dorsalis, Melander, 1913: 249; Frick, 1959: 396.

Cerodontha (*Cerodontha*) *dorsalis,* Spencer, 1969a: 143.

Adult: third antennal segment elongate, with conspicuous spine at upper corner; frons, face and jowls orange yellow, third antennal segment black; arista frequently conspicuously broad, appearing flattened; jowls one-third vertical eye height; mesonotum normally yellow adjoining scutellum, black in front and continuing in two bands laterally (Frick, 1959: Fig. 95), in more northern specimens the yellow area may be greatly reduced; acr lacking; wing length 2.4 to 2.7 mm.



165



166

Figs. 165, 166. *Cerodontha* (*Cer.*) *dorsalis*: 165, aedeagus, side view, 166, same, ventral view.

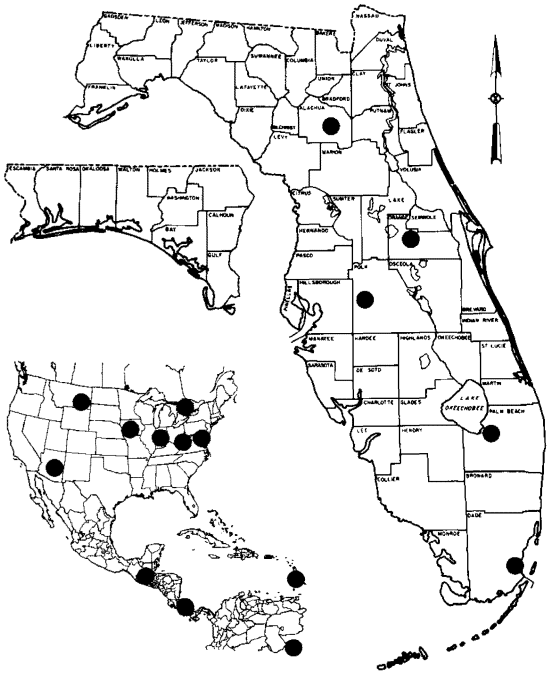


Fig. 167. Distribution of *Cerodontha* (*Cer.*) *dorsalis.*

Male genitalia: aedeagus as in Fig. 165, 166, distal processes large, tubules of distiphallus invariably rotated.

Host plant/Biology: Gramineae, particularly corn (*Zea mays*), larvae feeding mainly in leaf sheath, where pupation takes place.

Distribution: Florida, Alachua, Dade, Orange, Palm Beach and Polk Counties; Brazil, Costa Rica, Dominica (W.I.), Guatemala, Puerto Rico; Canada, widespread in eastern United States; Mongolia.

Remarks: This is the only species in this subgenus known to occur in Florida and is immediately distinguishable by the spine on the third antennal segment.

C. dorsalis shows considerable variation in color, but all so far seen from Florida are of the pale, yellowish form. The darker form occurs in the more northern and western parts of the United States. There is, however, a further species in which the mesonotum is entirely black occurring not uncommonly in western Canada and northwestern United States which has been described as *occidentalis* Sehgal, 1968. It is unlikely that this will be found in Florida.

I have recently seen two undescribed species in this subgenus from Mexico, and others are known from South America (Spencer, 1963a: 330).

Material examined:

Florida: Alachua Co., Gainesville, one female, 15 May 1916, "attacking sorghum" (R. N. Wilson); Dade Co., Biscayne Bay, one male, one female, no date (Mrs. A. T. Slosson); Hialeah, two males, two females, ex *Panicum,* 12 March 1963 (C.E.S.); Orange Co., Orlando, one male, two females, 7-9 Feb. 1918 (G.G. Ainslie); one male, three females, "reared from corn," no date (G.G. Ainslie); Palm Beach Co., Belle Glade, one female, ex *Zea mays,* 10 April 1964 (E.D. Harris); Polk Co., Lakeland, two males, one female, "reared from corn," no date (G.G. Ainslie).

Costa Rica: La Caja, 8 km. W. of San José, two females, 1930 (Schmidt).

Dominica (W.I.): Clarke Hall, three males, five females, 21-31 Jan. 1965; three males, one female, 1-10 March 1965, one female, 11-20 Feb. 1965 (all W.W. Wirth).

GENUS *CALYCOMYZA* HENDEL

Dizygomyza (*Calycomyza*) Hendel, 1931: 65. Type of subgenus: *Agromyza artemisiae* Kaltenbach, 1856, types lost.

Phytobia (*Calycomyza*), Frick, 1952a: 394; 1956: 284-300; 1959: 387; Spencer, 1963a: 337.

Calycomyza, Nowakowski, 1962: 97; Spencer, 1966c: 16; 1969a: 144.

The distinctive characters of this genus are the yellow frons and notopleural area and black scutellum (only exception: *C. obscura* described below, in which both frons and notopleural area are dark). All species have a distinctive patch of bristles on the ventral hind corner of the epandrium (cf. Fig. 217). Many species are extremely similar, and it has not been possible to include the six species of what can be conveniently termed the *malvae* group in the key below. However, the male genitalia in this group are particularly well differentiated, and with caught specimens this will provide the only satisfactory means of identification.

All known species are leaf miners, and most are host specific. If the host plant is known, reared specimens can thus normally be identified without difficulty.

This genus is essentially of Neotropical and Nearctic distribution, with only one of the 49 described species limited to the Ethiopian Region. Five new species from Florida are described below, and two species, *C. menthae* and *C. promissa,* are recorded as new to the State. Four further new species are described from the Caribbean, and other undescribed species have been seen from Costa Rica. It is thus clear that many additional species in this genus await discovery in the Neotropical Region.

Key to Florida *Calycomyza* species

1 Squamal fringe entirely white or yellow 2

1′ Squamal fringe at least partially dark, ochrous to brown or black 6

2 Last section of vein M3+4 4 times length of penultimate; one ors; minute species, wing length 1.1 to 1.25 mm ..... *minor* Spencer

2′ Last section of vein M3+4 at most 2½ times length of penultimate; two ors; larger species 3

3 Third antennal segment rounded 4

3′ Third antennal segment with distinct angle at upper corner ..... *solidaginis* (Kaltenbach)

4 Orbits largely yellow, darkening not reaching upper ors; fore knees yellowish ..... *lantanae* Frick

4′ Orbits dark at least to upper ors; all knees black 5

5 Larval posterior spiracles each with three bulbs; aedeagus as in Fig. 185, 186 ..... *jucunda* (Wulp)

5′ Larval posterior spiracles each with five bulbs; aedeagus as in Fig. 219 ..... *promissa* (Frick)

6 Frons and sides of thorax largely dark.. ..... *obscura* Spencer

6′ Frons and sides of thorax bright yellow 7

7 Last section of vein M3+4 relatively short, less than twice length of penultimate; orbits conspicuously black 8

7′ Last section of vein M3+4 longer, 2 to 2½ times length of penultimate 9

8 Leaf miner on *Mikania* ..... *mikaniae* Spencer

8′ Leaf miner on *Senecio* ..... *majuscula* Frick

9 Larva and puparium with rows of spinules around each segment (Fig. 175); aedeagus as in Fig. 172, 173 ..... *durantae* Spencer

9′ Larva and puparium without such spinules 10

10 Very small species, wing length 1.4 - 1.5 mm; aedeagus as in Fig. 222, 223 ..... *sidae* Spencer

10′ Larger species, wing length 1.6 - 2.2 mm 11

11 Mesonotum distinctly mat black; aedeagus as in Fig. 229, 230 ..... *stegmaieri* Spencer

11′ Mesonotum more obviously shining; squamal fringe brown or black; upper orbits darkened to upper ors ..... *malvae* group

Species in the *malvae* group cannot be satisfactorily identified on external characters. Details of the leaf mine in association withthe host plant, or aedeagus of the male provide the only certain means of identifying the following species in this group:

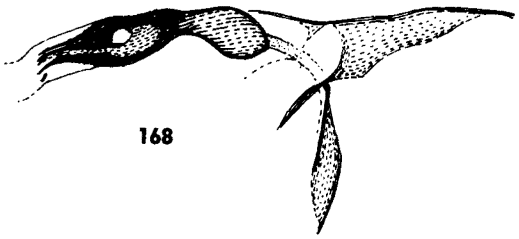
SPECIES	Host plant(s)	Leaf mines	Male genitalia
C. ambrosiae Frick	*Ambrosia artemisiifolia*	Blotch (Fig. 170)	Figs. 168, 169
C. hyptidis Spencer	*Hyptis pectinata*	Stellate blotch (Fig. 179)	Figs. 177, 178
C. ipomaeae (Frost)	*Ipomoea* spp., *Calonyction aculeatum*	Irregular linear-blotch (Figs. 183, A, B)	Figs. 181, 182
C. malvae (Burgess)	*Althaea rosea, Malva, Sida* and other malvaceous genera	Long, serpentine mine (Fig. 199)	Figs. 197, 198
C. melantherae Spencer	*Melanthera deltoidea*	Dark greenish blotch	Figs. 201, 202
C. menthae Spencer	*Hyptis, Mentha, Monarda*	Regular blotch at margin of leaf (Fig. 207)	Figs. 205, 206

Calycomyza ambrosiae Frick

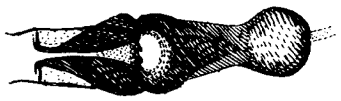
Fig. 168-171

Phytobia (*Calycomyza*) *ambrosiae* Frick, 1956: 299. Holotype male from Nashville, Tennessee in USNM.

Adult: orbits normally dark to upper ors (scarcely so in specimen from Hialeah mentioned below); face largely yellow; mesonotum moderately shining black, acr in about six rows; legs entirely black apart from faintly yellow fore knees; wing length normally slightly less than 2 mm, last section of vein M3+4 just over twice length of penultimate; squamae yellowish gray, fringe black.



168



169

Fig. 168, 169. *Calcomyza ambrosiae*: 168, aedeagus, side view; 169, same, ventral view.

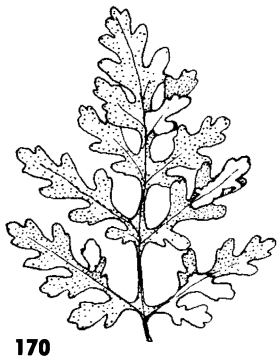


Fig. 170. *Calycomyza ambrosiae*: leaf mine.

Male genitalia: aedeagus distinctive, as in Fig. 168, 169.

Host plant/Biology: *Ambrosia artemisiifolia* and *A. trifida*, larva forming greenish blotch mine (Fig. 170), pupating externally.

Distribution: Florida, Dade Co.; Indiana, Pennsylvania, Tennessee.

Remarks: This species belongs to the difficult group with a dark squamal fringe, in which a positive identification normally will be possible only from examination of the male genitalia.

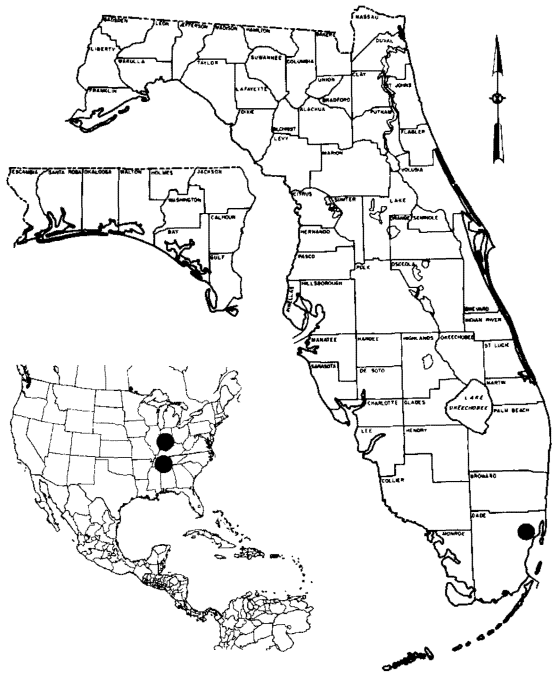


Fig. 171. Distribution of *Calycomyza ambrosiae*.

The available evidence suggests that this is a Nearctic species, which has reached Florida from the north.

Material examined:

Florida: Dade Co., Hialeah, one male, 7 March 1963 (C.E.S.).

Calycomyza durantae Spencer, sp.n.

Fig. 172-176

Adult: frons orange yellow, upper orbits conspicuously darkened, at least to upper ors, normally slightly beyond; two equal ors, two slightly weaker ori, orbital setulae sparse, reclinate; face gray, yellow below; mesonotum shining black, acr in six rows; humerus, notopleural triangle, upper hind corner of mesopleura bright yellow; legs black, only fore knees narrowly yellowish; wing length from 1.6 to 1.9 mm, last section of vein M3+4 twice length of penultimate; squamae yellowish-gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 172, 173.

Host plant/Biology: *Duranta repens*, larva forming upper surface, whitish blotch (Fig. 174), pupating externally; puparium (Fig. 175) reddish brown, with a band of short,



Fig. 172. *Calycomyza durantae*: aedeagus, side view.

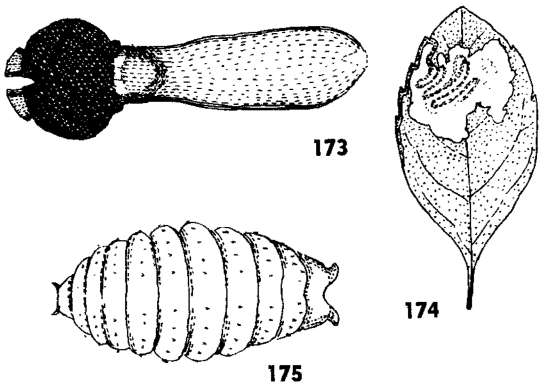


Fig. 173-175. *Calycomyza durantae*: 173, aedeagus, ventral view; 174, leaf mine on *Duranta repens;* 175, puparium.

stout spinules around the center of each segment; posterior spiracles each with three bulbs.

Holotype male, Florida, Dade Co., Miami, Fairchild Tropical Garden, emerged 7 Nov. 1968 ex leaf mine leg. 16 Oct. 1968 (K.A.S.); paratypes: one male, two females, same data (C.E.S.); two males, two females, caught on host, 16 Oct. 1968 (K.A.S. and C.E.S.). Holotype in USNM, paratypes in FSCA and senior author's collection.

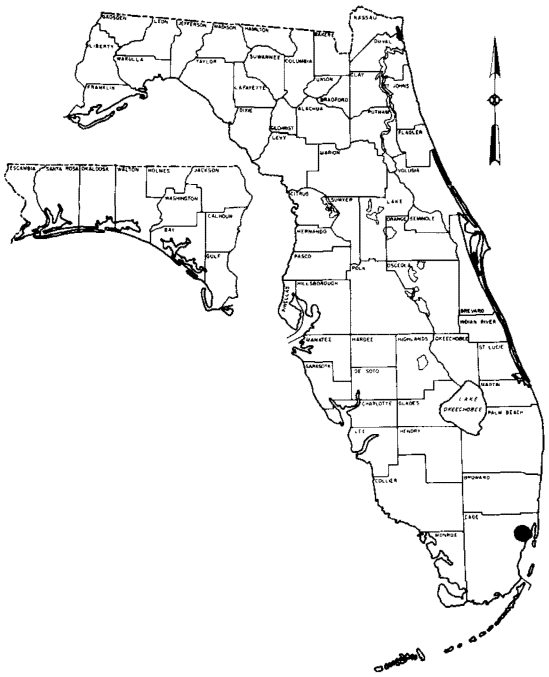


Fig. 176. Distribution of *Calycomyza durantae.*

Remarks: This is now the third species known to form blotch mines on genera of the Verbenaceae. It is distinguishable from *C. lantanae,* feeding on *Lantana* and *Verbena,* by the black squamal fringe and from both *lantanae* and *verbenae* Hering, feeding on *Verbena,* by the darkened upper orbits. The male genitalia of *C. durantae* are entirely distinct.

This is the only species in the genus in which the puparium (and larva) bear bands of spinules around each segment. However, identical structures are found in three *Pseudonapomyza* species—*atra* Mg. (cf. de Meijere, 1926: Fig. 67); *spicata* Malloch and *philippinensis* Spencer (cf. Spencer, 1961: Fig. 33 and 36).

The host plant, *Duranta repens,* is native to the West Indies, Central and South America, and it is therefore clear that *C. durantae* is of southern origin.

Calycomyza hyptidis Spencer

Fig. 177-180

Calycomyza hyptidis Spencer, 1966c: 16. Holotype from Florida, Dade Co., in USNM.

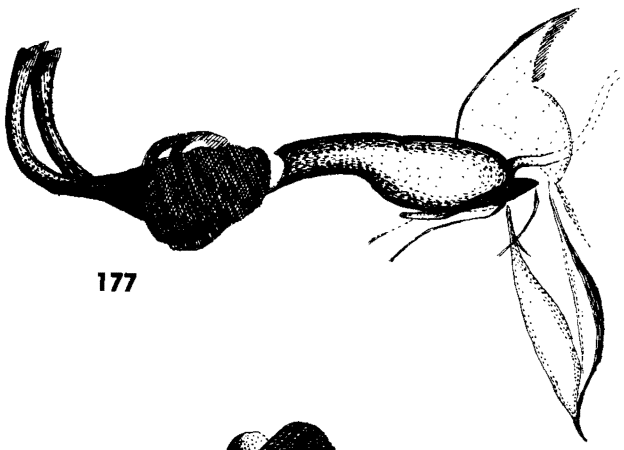
Adult: orbits faintly darkened to upper ors; face grayish in upper half, distinctly yellow below; mesonotum shining black, acr in six rows; squamae yellowish gray, margin and fringe black; legs black but fore knees bright yellow; wing length 2 mm, last section of vein M3+4 slightly over twice penultimate.

Male genitalia: aedeagus distinctive, as in Fig. 177, 178.

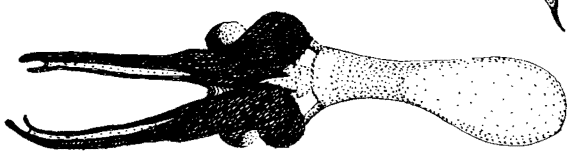
Host plant/Biology: *Hyptis pectinata,* larva forming upper surface, star-shaped blotch, with frass all deposited in center (Fig. 179); pupation externally.

Distribution: Florida, Dade Co., Hialeah; Dominica (W.I.); Brazil.

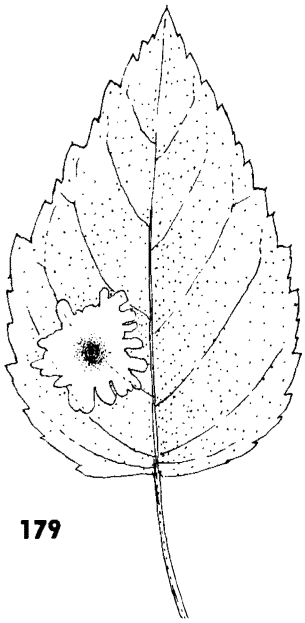
Remarks: This species belongs to the difficult group with the squamal fringe dark, in which a reliable identification of adults can be made only by the male genitalia. The



177



178



179

Figs. 177-179. *Calycomyza hyptidis*: 177, aedeagus, side view; 178, same, ventral view; 179, leaf mine on *Hyptis pectinata*.

stellate leaf mine on *Hyptis* is readily distinguishable from the normal blotch occurring on the same host formed by *C. menthae* Sp.

It now seems clear that the specimen from Brazil, Nova Teutonia, tentatively referred to *C. allecta s. lat.* (Spencer, 1963a: Fig. 53a) represents *hyptidis*. The species presumably occurs in Central America and the Greater Antilles, from where it has reached southern Florida.

Material examined:

Florida: Dade Co., Hialeah, four males, two females, emerged 17 Dec. 1963 ex leaf mines on *Hyptis pectinata*, leg. 26 Nov. 1963; three males, five females, emerged 27 Nov. 1963, ex mines leg. 13 Nov. 1963; five males, one female, emerged 15 Nov. 1964, ex mines leg. 2 Nov. 1964 (all C.E.S.).

Dominica (W.I.): Clarke Hall, one male, 11-20 Jan. 1965; S. Chiltern Est, one male, 20 Feb. 1965 (both W.W. Wirth).

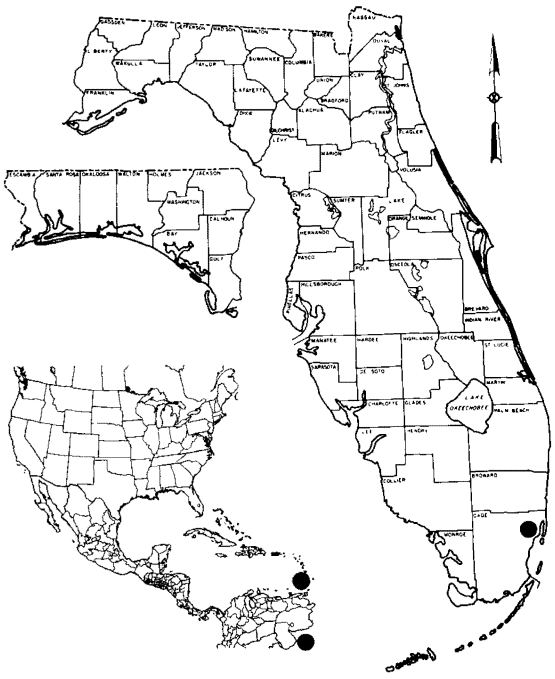


Fig. 180. Distribution of *Calycomyza hyptidis*.

Calycomyza ipomaeae (Frost)

Fig. 181-184

Agromyza ipomaeae Frost, 1931: 74. Holotype male from Puerto Rico ex *Ipomoea* in USNM.

Phytobia (*Calycomyza*) *ipomaeae,* Frick, 1952a: 395; Spencer, 1963a: 345.

Phytobia (*Calycomyza*) *ipomoeae,* Frick, 1957: 203.

Calycomyza ipomaeae, Spencer, 1969a: 150.

Adult: orbits darkened to upper ors, face grayish, more yellow below; mesonotum mat black, slightly more shining from behind, acr in six rows; legs black, with fore knees yellowish; wing length 1.8 to 2.2 mm, last section of vein M3+4 slightly over twice length of penultimate; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus distinctive (Fig. 181, 182), with somewhat elongate, cylindrical tubules of the distiphallus, and mesophallus short, broad.

Host plant/Biology: *Ipomoea* species, occurring commonly in Florida on *I. batatas, I. cathartica* and *I. tiliacea,* also *Calonyction aculeatum,* larva forming irregular linear blotch (Fig. 183A, B), pupating externally; puparium dark brown, posterior spiracles each with three bulbs.

Distribution: Florida, Alachua Co., Dade Co., Monroe Co.; Puerto Rico, Jamaica, Dominica (W.I.); Brazil; Canada: S. Ontario.

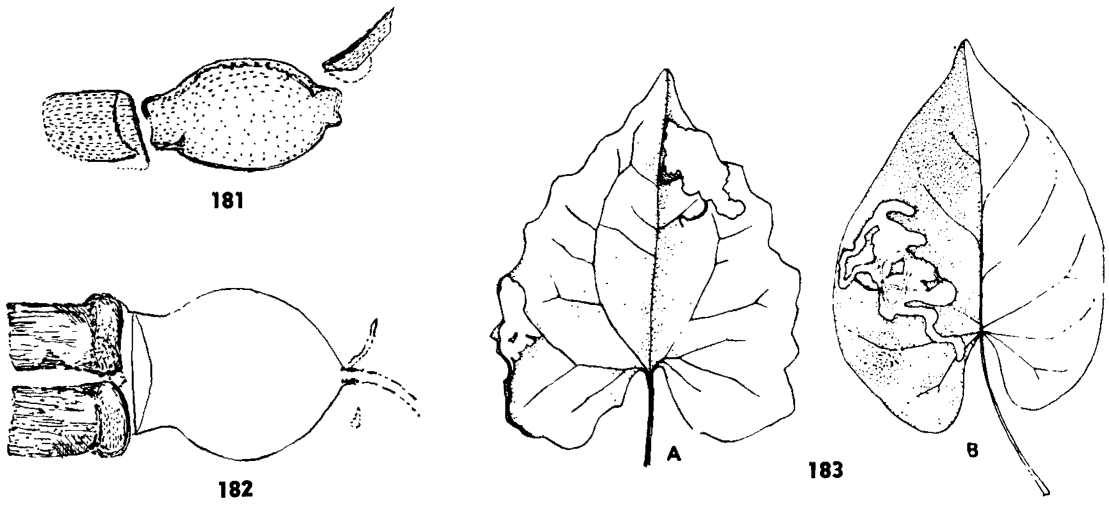
Remarks: This species is not satisfactorily distinguishable on external characters from others in the group having the squamal fringe dark. However, the male genitalia and also the leaf mine on *Ipomoea* are distinctive. The exact host range of this species remains to be established. It was noted while collecting in Florida in October 1968 that certain *Ipomoea* species consistently showed no evidence of this leaf miner.

The mines of *C. ipomaeae* and *C. stegmaieri* frequently occur together on *Calonyction aculeatum,* sometimes on the same leaf. The more linear and generally more irregular form of the mines of *ipomaeae* makes them readily distinguishable from the essentially circular mines of *stegmaieri.* Stegmaier (1967a) gives a number of photographs of mines of *ipomaeae* on *I. tiliacea.*

C. ipomaeae has not been recorded in the United States north of Florida. However, the discovery of this species on *I. pandurata* at Pelee, Ontario (Spencer, 1969a: 150) suggests that it will be present with its host plant throughout the eastern United States.

Material examined:

Florida: Alachua Co., Hawthorne, two males, emerged 20 Oct. 1968 ex leaf mines on



Figs. 181-183. *Calycomyza ipomaeae*: 181, aedeagus, side view; 182, same, ventral view; 183 A, B, leaf mines on *Ipomoea* spp.

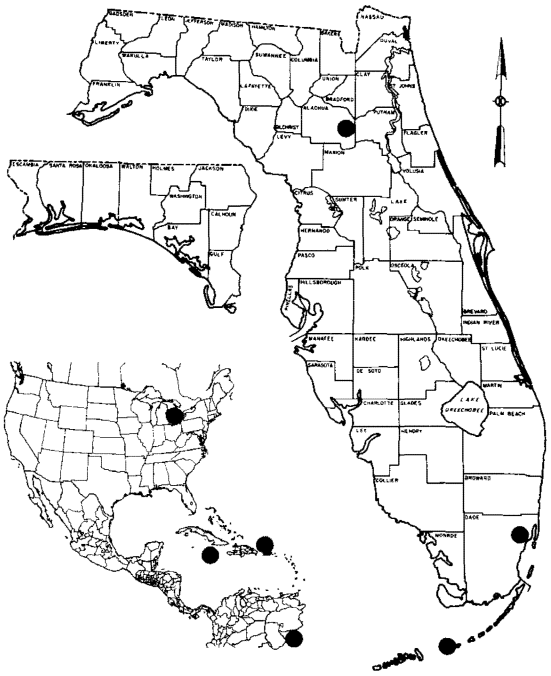


Fig. 184. Distribution of *Calycomyza ipomaeae.*

Ipomoea sp. leg. 8 Oct. 1968 (K.A.S. and C.E.S.); Dade Co., Hialeah, five males, five females, emerged 26 Sept. 1963 ex leaf mines on *I. batatas* leg. 18 Sept. 1963 (C.E.S.); Miami, two females, emerged 28 June 1963 ex leaf mines on *I. tiliacea* leg. 12 June 1963 (C.E.S.); Monroe Co., Marathon Key, West Summerland Key, numerous empty leaf mines on *I. cathartica,* 14-15 Oct. 1965 (K.A.S. and C.E.S.).

Dominica (W.I.): Clarke Hall, one male, 1-20 Jan. 1965 (W.W. Wirth).

Calycomyza jucunda (Wulp)

Fig. 185-188

Agromyza jucunda van der Wulp, 1867: 161. Holotype female from Wisconsin in Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.

Phytobia (*Calycomyza*) *jucunda,* Frick, 1952a: 395; 1956: 288; 1959: 391.

Adult: small species with normal wing length 1.7 mm but according to Frick (1956) varying from 1.5 to 2 mm, orbits conspicuously darkened to upper ors (less frequently somewhat beyond); all antennal segments black, third round; face black in upper half, yellow below; squamae and fringe white.

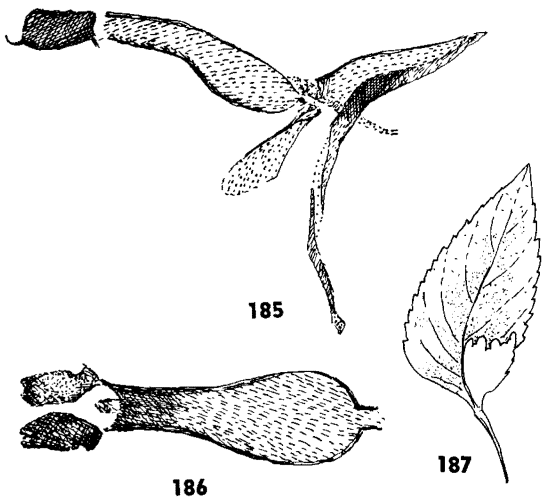
Male genitalia: aedeagus as in Fig. 185, 186.

Host plant/Biology: *Ambrosia, Aster, Bidens, Gnaphalium, Helianthus, Solidago, Xanthium, Zinnia* (Stegmaier, 1967a); larva forming whitish blotch with characteristic irregular offshoots (Fig. 187), puparium attached to pile of frass at center of mine; posterior spiracles of larva each with three bulbs; young leaves become characteristically deformed as a result of the mining activity of the larva.

Distribution: Florida, Alachua Co., Dade Co., Gadsden Co., Highlands Co., Lake Co., Martin Co., Monroe Co., Pascoe Co.; Cuba, Grand Cayman, Jamaica; widespread throughout United States (according to Frick, 1956).

Remarks: The white squamal fringe and entirely round third antennal segment make this a distinctive species. The leaf mines were found to be very common on *Bidens* in Oct. 1968, and the species probably occurs throughout Florida.

Specimens from Jamaica recorded by Spencer (1963a: 344) as *humeralis* (Roser) in fact represent *jucunda.*



Figs. 185-187. *Calycomyza jucunda*: 185, aedeagus, side view; 186, same, ventral view; 187, leaf mine on *Bidens pilosa.*

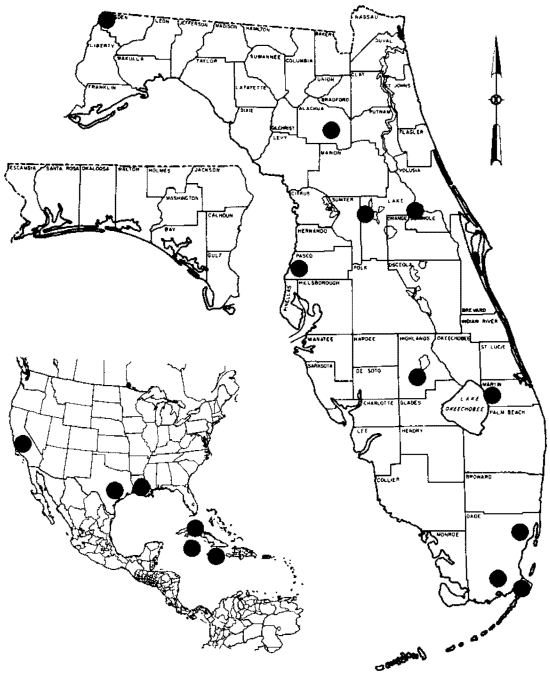


Fig. 188. Distribution of *Calycomyza jucunda*.

Material examined:

Florida: Alachua Co., Gainesville, one female, 26 April 1952 (O. Peck); Hawthorne, one female, 8 Oct. 1968 (K.A.S. and C.E.S.); Dade Co., Hialeah, one male, 1 April 1963, ex *Bidens pilosa* (C.E.S.); one male, 7 March 1963, ex *Ambrosia artemisiifolia* (C.E.S.); Royal Palm Hammock, Everglades, one male, 7 May 1967 (B.V. Petersen); one male, 4 Dec. 1961 (Monroe, Holland and Chillcott); Paradise Key, one male, 30 March 1953 (W. R.M. Mason); Homestead, one male, 4 April 1952 (J.R. Vockeroth); Key Largo, one male, 5-6 Dec. 1961 (E.G. Munroe, G.P. Holland and J.G.T. Chillcott); Gadsden Co., Chattahoochee, one female, 30 April 1952 (O. Peck); Quincy, two males, one female, emerged 15-18 May 1964 ex *Xanthium* sp. leg. 13 May 1964 (D.H. Habeck); Highlands Co., Archbold Biol. Sta., one male, 24 April 1967 (B.V. Petersen); Lake Co., Leesburg, one male, one female, 10 Oct. 1968 (K.A.S. and C.E.S.); Martin Co., Port Mayaca, one female, 11 Oct. 1968 (K.A.S. and C.E.S.); Pasco Co., Moon Lake, one male, 16 April 1952 (J.R. Vockeroth); Seminole Co., Sanford, two males, 12 Jan. 1964, ex *Ambrosia* (G.W. Desin).

Cuba: Havana, one male, one female, March 1968, ex leaf mines on sunflower (C.I.E. No. A. 2217).

Grand Cayman: Georgetown, one female, 15-30 March 1965 (J.R. McLintock).

Jamaica: Mount Diabolo, two females, 13 Dec. 1958 (K.A.S.).

Calycomyza lantanae Frick

Fig. 189-193

Phytobia (*Calycomyza*) *lantanae* Frick, 1956: 287; 1959: 391; Spencer, 1963a: 346. Holotype male ex *Lantana* sp. from Weslaco, Texas in USNM.

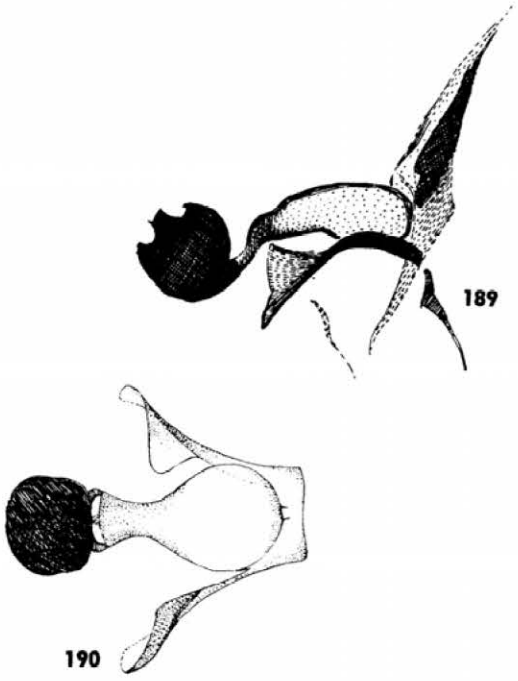
Adult: frons and entire orbits uniformly yellow; two ors and two weaker ori; third antennal segment round, black, first and second paler, partially yellowish; face essentially yellow, at most faintly grayish; mesonotum shining black, acr in six rows; legs black but fore knees distinctly yellow; wing length from 1.5 to 2 mm, second cross-vein slightly over twice length of second; squamae and fringe whitish yellow.

Male genitalia: aedeagus as in Fig. 189, 190, black extensions at rear of distiphallus small, mesophallus conspicuously widening behind.

Host plant/Biology: *Lantana camara, L. involucrata* and possibly other *Lantana* species, *Verbena litoralis* (also according to Frick, 1956 *Lippia helleri* Britt.), larva forming regular upper surface blotch (Fig. 191), pupating externally; puparium reddish brown, posterior spiracles each with three bulbs.

Distribution: Florida, Alachua Co., Dade Co.; Gulf States, Mexico; Bahamas, Trinidad, Venezuela.

Remarks: This species belongs to the small group with the squamal fringe entirely pale. It closely resembles *C. bahamarum,* but this has the squamal fringe partially dark. It is also generally similar to *C. verbenae* Hering, but in this species the squamal fringe is black.



Figs. 189-190. *Calycomyza lantanae*: 189, aedeagus, side view; 190, same ventral view.

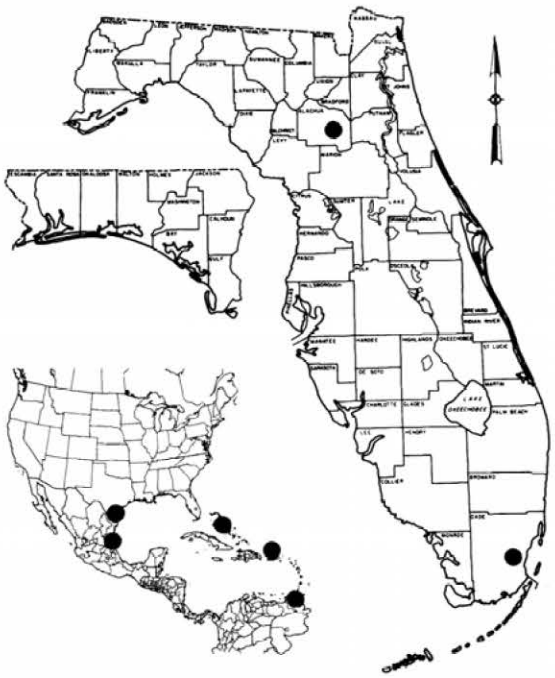


Fig. 193. Distribution of *Calycomyza lantanae*.





Figs. 191-192. *Calycomyza lantanae*: 191, leaf mine; 192, leaf mines on *Lantana camara*.

C. lantanae no doubt occurs widely with its main host, *Lantana camara* but it will be of interest to establish the northern limit of its range.

Material examined:

Florida: Alachua Co., Gainesville, 8 Oct. 1968 numerous empty mines (Fig. 192) on *Lantana camara* (K.A.S.); Dade Co., Homestead, two males, 13 Oct. 1968 (K.A.S.).

A female from Dade Co., Hialeah, 23 June 1965 ex *Lippia stoechadifolia* (C.E.S. and D.H. Habeck) may possibly represent this species.

Bahamas: Abaco Cays, Elbow Cay, Hope Town, one male, 4 May 1953; Berry Is., Little Harbour Cay, one male, 1 May 1953; Rum Cay, near Port Nelson, two females, 16 March 1953 (all E.B. Hayden and L. Giovannoli); Crooked Is., Landrail Point, one female, 5 March 1953 (E.B. Hayden); Mayaguana Is., nr. Abraham Bay, one female, 3 March 1953 (E.B. Hayden).

Trinidad: St. Augustine, two males, two females, June 1962 (F.D. Bennett).

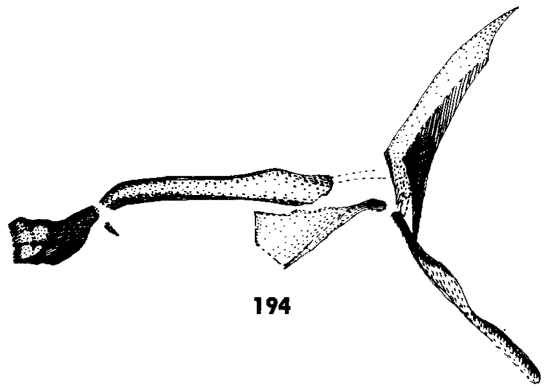
Calycomyza majuscula Frick

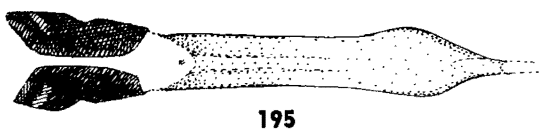
Fig. 194-196

Phytobia (*Calycomyza*) *majuscula* Frick, 1956: 295; 1959: 391. Holotype male from California in USNM.

Calycomyza majuscula, Spencer, 1969a: 150.

Adult: medium-sized species, wing length from 1.75 - 2.5 mm; orbits conspicuously black, at least to lower ors; face dark above, but lower half may be yellow; third antennal segment small, round; mesonotum shining black; legs entirely black; squamae yellow, margin and fringe darker, black or at least brownish.





Figs. 194, 195. *Calycomyza majuscula*: 194, aedeagus, side view (Florida); 195, same, ventral view.

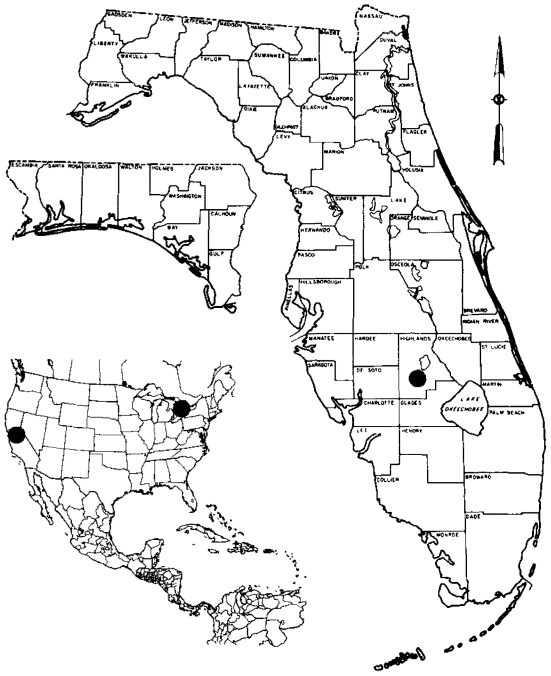


Fig. 196. Distribution of *Calycomyza majuscula*.

Male genitalia: aedeagus as in Fig. 194, 195.

Host plant/Biology: *Senecio lugens* var. *exaltatus* (California), larva forming large, pale-green blotch, frass deposited in few large black pellets; pupation externally.

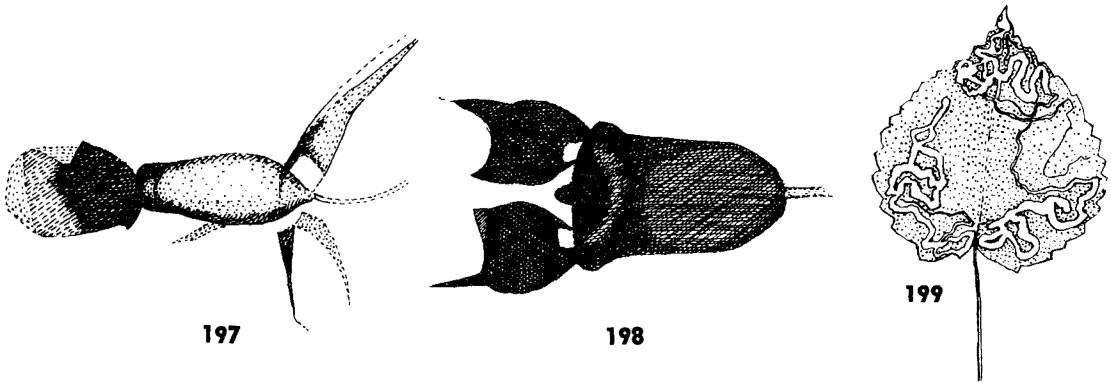
Distribution: Florida, Highlands Co.; California; Canada: Ontario, Saskatchewan. New to Florida.

Remarks: This species is distinctly larger than the species of the *malvae* group, and the last section of vein M3+4 is consistently shorter. It is not satisfactorily distinguishable from *C. mikaniae* on external characters, but the genitalia of the two species are entirely distinct.

Material examined:

Florida: Highlands Co., Archbold Biological Station, one male 15 Feb. 1961 (S.W. Frost).

Canada: Ontario, Marmora, one male, 28 April 1952 (J.F. McAlpine).



Figs. 197-199. *Calycomyza malvae*: 197, aedeagus, side view; 198, same, ventral view; 199, leaf mine on *Abutilon avicennae*.

Calycomyza malvae (Burgess)

Fig. 197-200

Oscinis malvae Burgess, 1880b: 201. Lectotype female from District of Columbia, designated by Frick, 1956: 298, in USNM.

Phytobia (*Calycomyza*) *malvae*, Frick, 1956: 298; 1959: 391.

Calycomyza althaeae Spencer, 1969a: 146, **syn. nov.**

Adult: orbits black to upper ors, this darkening sometimes extending slightly beyond; face blackish but centrally and below variably yellowish; mesonotum moderately shining black; legs entirely black; squamae gray, margin and fringe deep black; wing length from 1.6 to 2 mm.

Male genitalia: aedeagus as in Fig. 197, 198, lateral extensions of distiphallus strongly developed.

Host plant/Biology: *Malva rotundifolia, Abutilon avicennae, Althaea rosea, Sida* spp., larva forming long, narrow, winding linear mine, initially on lower surface but for most part on upper surface (Fig. 199); pupation externally, puparium dark brown, posterior spiracles each with three bulbs.

Distribution: Florida, Dade Co., Gadsden Co., Lake Co.; Bahamas, Jamaica; District of Columbia, New York; Canada: Toronto.

Remarks: This species in the past has been confused with *C. sidae* sp.n. The adults are generally slightly larger than in *sidae;* there are only slight differences in the male genitalia, but the leaf mines of the two species are entirely different. Spencer (1963a: 347) misidentified as *malvae* specimens reared from *Sida* from Florida, although different types of mine on *Sida* were noted, and it was suggested that two species might be involved. Much further material reared in southern Florida was seen later, to which the name *malvae* was applied, and the mines in all cases were of the short, linear-blotch type.

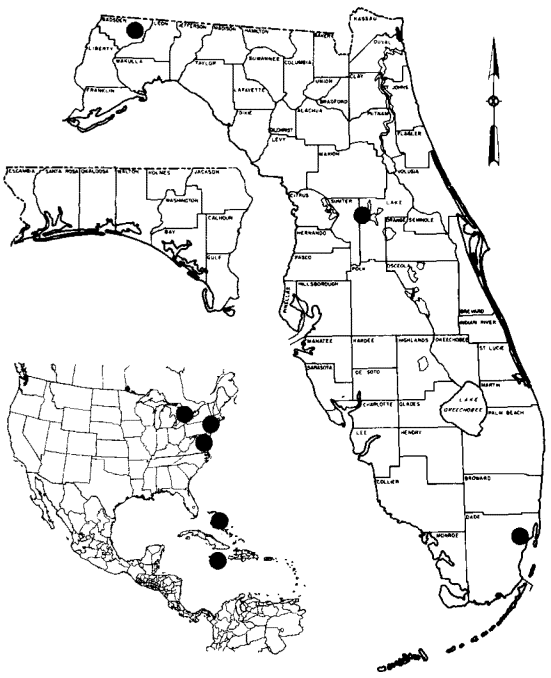


Fig. 200. Distribution of *Calycomyza malvae*.

The conspicuously long, linear mines of what is now accepted as the true *malvae* were only found later on *Althaea rosea* at Toronto. However, in view of the earlier association of the name *malvae* with the species forming the short mines, this species on *Althaea* was considered to represent a new species and was described as *althaeae* sp.n. *C. althaeae* is now formally synonymized with *malvae*.

The description given by Burgess (1880b) is not diagnostic of *malvae*, and it is believed that Frick (1956) had both *malvae* and *sidae* before him when discussing the former species. However, Burgess gives a detailed description of the leaf mine, including the following sentence: "it (the mine) soon presents a most fantastical appearance, especially upon the smaller leaves, where it is looped and knotted and twisted until it is hard to distinguish beginning from end." There can be no doubt to which species this refers.

Material examined:

Florida: Alachua Co., Gainesville, one male, one female, 3 May 1964, ex leaf mines on *Althaea rosea*, leg. 22 April 1964 (D.H. Habeck) ; Dade Co., Homestead, 12 Oct. 1968, empty mines on *Sida rhombifolia* (K.A.S.) ; Gadsden Co., nr. Quincy, one male, 4 Oct. 1968 (K.A.S.) ; Lake Co., Leesburg, 10 Oct. 1968, empty mines on young leaves of *Abutilon avicennae* (K.A.S. and C.E.S.).

New York: Long Island, Amityville, 22 Oct. 1965, empty mines on *Althaea rosea* (K.A.S.).

Canada: Toronto, three males, three females, emerged 24-26 July 1967 ex leaf mines on *Althaea rosea* leg. 14 July 1967 (K.A.S.), type series of *althaeae*.

Bahamas: New Providence Is., Nassau, six males, 3 Jan. 1953 (L. Giovannoli).

Jamaica: Rio Cobre Gorge, one male, 13 Dec. 1958 (K.A.S.).

Calycomyza melantherae Spencer

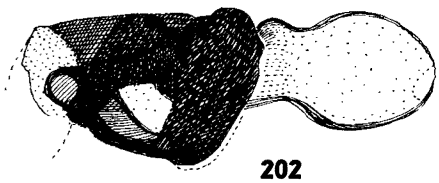
Fig. 201-204

Calycomyza melantherae Spencer, 1966c: 18.

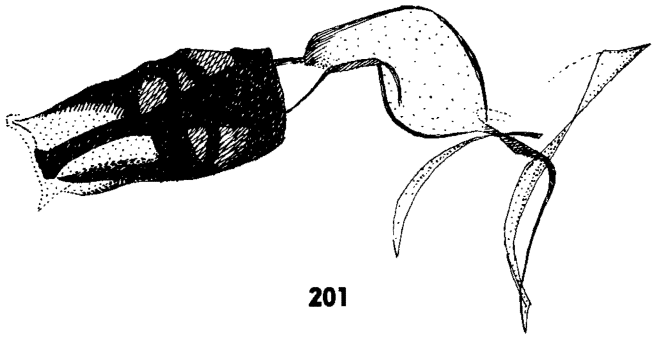
Holotype male from Florida, Dade Co. in USNM.

Adult: orbits black to upper ors; face yellow below, somewhat darkened above; third antennal segment round; mesonotum brilliantly shining black, acr in six rows; legs entirely black, apart from faintly yellow fore knees; wing length 1.7 mm, last section of vein M3+4 twice length of penultimate; squamae gray, fringe black.

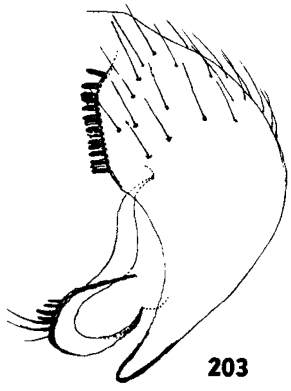
Male genitalia: aedeagus asymmetrical as in Fig. 201, 202; surstyli typical of the genus, as in Fig. 203.



202



201



203

Figs. 201-203. *Calycomyza melantherae*: 201, aedeagus, side view; 202, same, ventral view; 203, surstylus.

Host plant/Biology: *Melanthera deltoidea,* larva forming a regular, primary blotch.

Distribution: Florida, Dade Co.; Bahamas.

Remarks: This species belongs to the difficult group with a dark squamal fringe, in which normally a positive identification will be possible only from examination of the male genitalia.

The host plant, *Melanthera deltoidea,* is of West Indian origin, and the discovery of *C. melantherae* among the material from the Bahamas was to be expected. The species is doubtless of wider distribution in the Caribbean area.

Material examined:

Florida: Dade Co., Miami, one male, emerged 24 Nov. 1963 ex leaf mines on *Melanthera deltoidea* leg. 8 Nov. 1963 (C.E.S.).

Bahamas: Eleuthera Is., James Cistern, one male, 1 April 1953 (E.B. Hayden and L. Giovannoli); New Providence, Nassau, one male, one female, 16 April 1953 (E.B. Hayden).

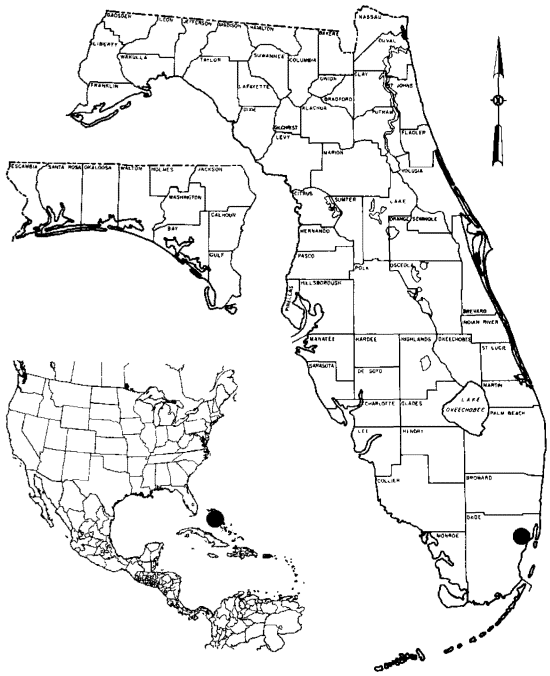


Fig. 204. Distribution of *Calycomyza melantherae.*

Calycomyza menthae Spencer

Fig. 205-208

Calycomyza menthae Spencer, 1969a: 152.

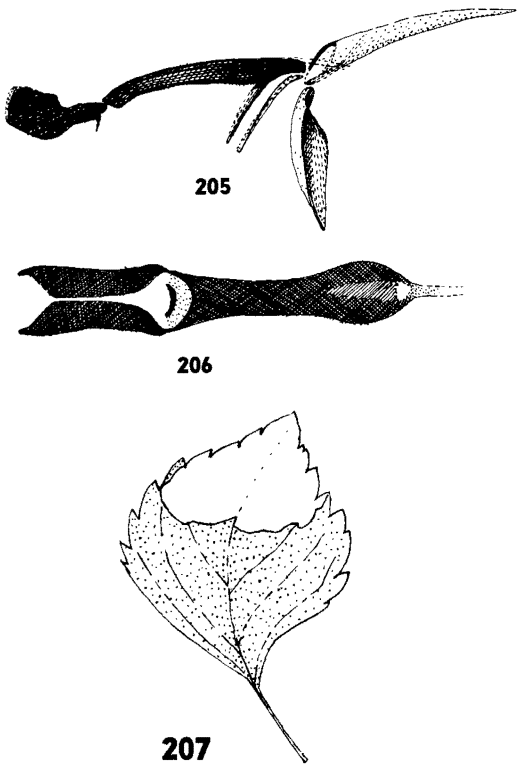
Holotype male from Ontario in CNC.

Adult: orbits black to upper ors or slightly beyond; face black above, yellow in lower half; third antennal segment round; mesonotum moderately shining, acr in six rows; legs entirely black; wing length from 1.9 to 2.2 mm, last section of vein M3+4 2½ times penultimate; squamae yellowish gray, fringe and margin variable, either distinctly dark blackish, or paler, scarcely differentiated from squamae.

Male genitalia: aedeagus as in Fig. 205, 206, the two processes of the distiphallus elongate and clearly divided.

Host plant/Biology: *Monarda punctata, Hyptis mutabilis, Mentha arvensis,* larva forming brownish blotch adjoining margin of leaf, with frass in scattered black pellets (Fig. 207), pupation externally; posterior spiracles of larva each with three bulbs.

Distribution: Florida, Alachua Co.; Canada: Ontario. New to Florida and the United States.



Figs. 205-207. *Calycomyza menthae*: 205, aedeagus, side view; 206, same, ventral view; 207, leaf mine on *Hyptis mutabilis* (Florida).

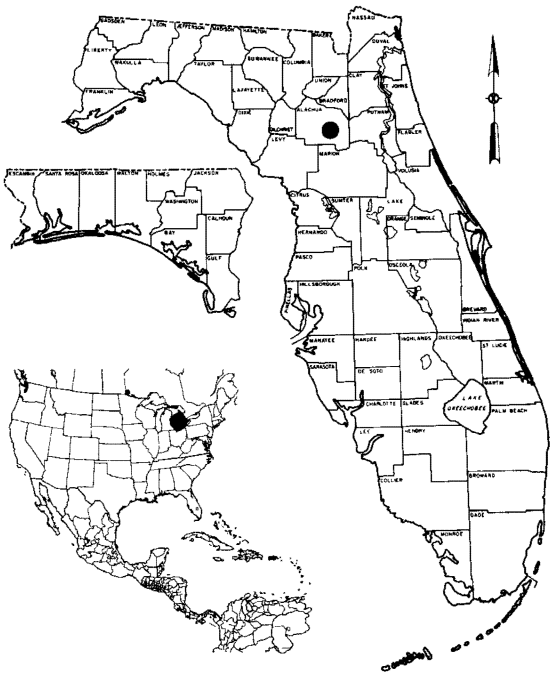


Fig. 208. Distribution of *Calycomyza menthae*.

Remarks: This species is not satisfactorily distinguishable on external characters from others in the group with the squamal fringe dark, but the male genitalia are distinctive.

With the known range now extending from northern Florida to Ontario, it seems certain that the species occurs in association with its host plants throughout the eastern United States. The southern limit of its range remains to be established, but it is of interest that the only species recorded on Labiatae in the Miami area is *C. hyptidis* on *Hyptis pectinata*.

Material examined:

Florida: Alachua Co., Gainesville, numerous mines, mostly empty, but some with larvae, on *Hyptis mutabilis*, 9 Oct. 1968 (K.A.S.); mines also frequent on *Monarda punctata*, 5 Oct. 1968 (K.A.S.); no adults reared.

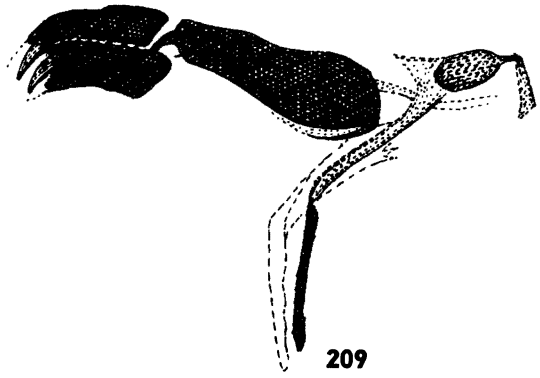
Calycomyza mikaniae Spencer, sp.n.

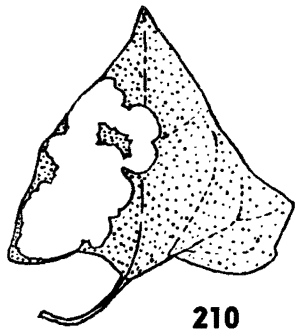
Fig. 209-211

Adult: orbits conspicuously black, extent of darkening slightly variable, normally extending to between upper and lower ori; face grayish above, yellow below; third antennal segment small, round; mesonotum moderately shining black, acr in six rows; sides of thorax distinctly orange yellow; legs entirely black apart from slightly yellowish fore knees; wing length from 1.9 to 2.2 mm, discal cell large, last section of vein M3+4 thus relatively short, normally about 1½ times length of penultimate; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 209, distiphallas distinctly rotated, each apical process ending in short curved tubules.

Host plant/Biology: *Mikania batatifolia*, larva forming whitish, upper surface mine (Fig. 210), initially narrow, linear, later developing into a conspicuous blotch, which





Figs. 209, 210. *Calycomyza mikaniae*: 209, aedeagus; 210, leaf mine on *Mikania batatifolia*.

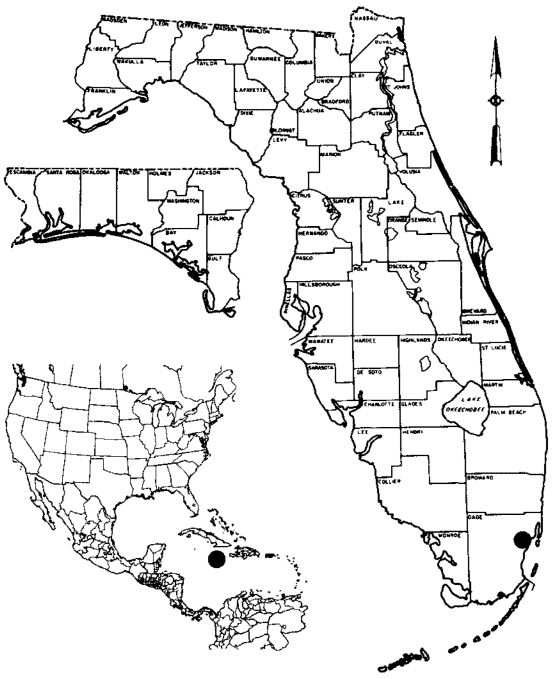


Fig. 211. Distribution of *Calycomyza mikaniae.*

may completely envelope the early linear section; pupation externally, posterior spiracles on distinctively elongated extension, each with three bulbs, the terminal one greatly enlarged and the two smaller ones lying at its base.

Holotype male, Florida, Dade Co., Bear Cut Reef, 11 Nov. 1967 ex leaf mines on *Mikania batatifolia*; paratypes: two males, three females, same data (C.E.S.); Jamaica: Good Hope, one male, 22 Aug. 1966 (H.F. Howden). Holotype in USNM, paratypes in CNC, FSCA, and senior author's collection. Empty leaf mines on same host found at Miami, Fairchild Tropical Garden, 16 Oct. 1968 (K.A.S. and C.E.S.).

Remarks: This is a relatively large species and is also distinguishable by the orange-yellow color of the upper thorax and the short last section of vein M3+4. The posterior spiracles of the larva/puparium also are distinctive.

The host plant is of West Indian origin, and the record from Jamaica clearly indicates that this species has also reached Florida from the south. One species in the genus, however, *M. scandens* (L.) Willd., occurs as far north as Ontario, and if this is an alternative host, it will be of interest to establish the northern limit of *C. mikaniae.*

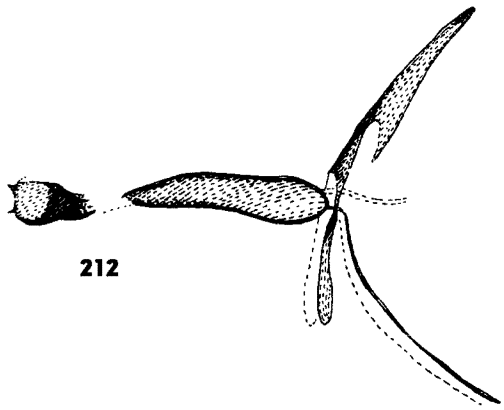
Calycomyza minor Spencer, sp.n.

Fig. 212-214

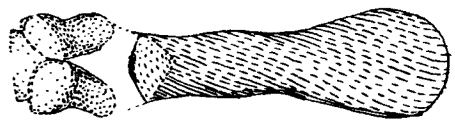
Head: one strong, reclinate ors, two weaker, incurved ori (rarely a weaker, third ori below, sometimes on one side only); orbital setulae minute, sparse, three or four only, reclinate apart from single proclinate setula in front; jowls deep, one-third eye height; third antennal segment somewhat flat above, rounded below, appearing almost angulate at upper corner.

Mesonotum: two strong dc, third substantially weaker; acr in about four rows.

Wing: length from 1.1 mm in male to 1.25 mm in female; discal cell unusually small, with second cross-vein sometimes only slightly distad of first; last section of vein M3+4 long, four times length of penultimate.



212



213

Figs. 212, 213. *Calycomyza minor*: 212, aedeagus, side view; 213, same, ventral view.

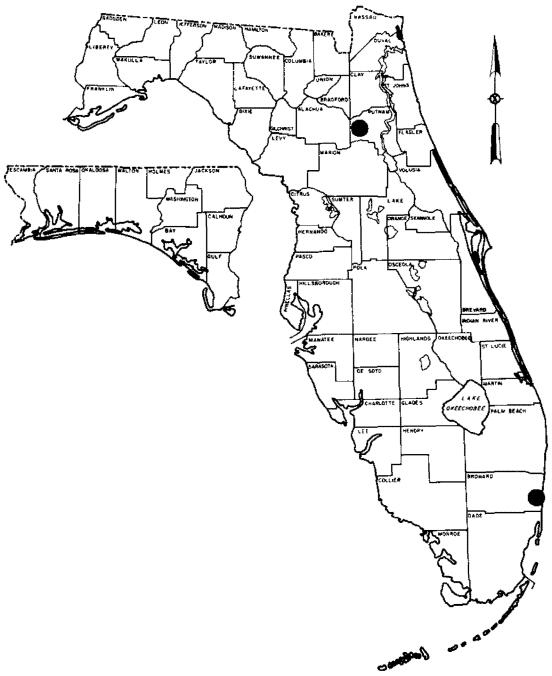


Fig. 214. Distribution of *Calycomyza minor*.

Color: frons and jowls orange yellow, upper orbits conspicuously black, darkening extending to upper ori; all antennal segments black, face grayish, more yellow below; mesonotum moderately shining black; humerus, notopleural triangle and upper hind corner of mesopleura dirty yellow; legs entirely black; squamae and fringe whitish yellow.

Male genitalia: aedeagus as in Fig. 212, 213.

Host plant/Biology: *Erigeron canadensis*, larva forming upper surface blotch, which may completely fill smaller leaves, pupating in mine; puparium blackish brown, posterior spiracles on conical projections, each (apparently) with five bulbs.

Holotype male, Florida, Putnam Co., Camp Bell Ridge, emerged 12 Oct. 1968 ex leaf mine leg. 8 Oct.; paratypes: four males, three females, same data (K.A.S.); Broward Co., Fort Lauderdale, one female, 5 Aug. 1951 (W.W. Wirth). Holotype and paratype in USNM, paratypes in FSCA and senior author's collection.

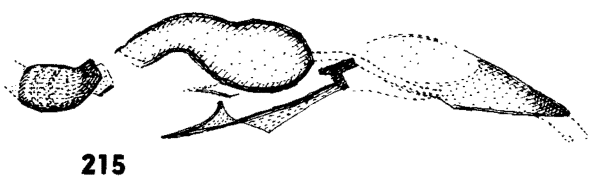
Remarks: This is the smallest known *Calycomyza* and one of the smallest Agromyzidae in the world. It is distinguishable by the presence of only one ors and by the very small discal cell, resulting in the last section of vein M3+4 being four times the length of the penultimate.

With records from Broward Co. and Putnam Co., it seems likely that this species occurs widely throughout Florida, with its range extending at least to adjoining states to the north.

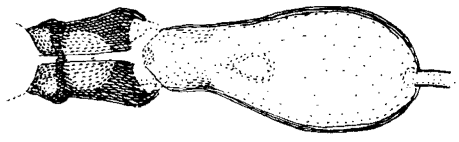
Calycomyza obscura Spencer, sp.n.

Fig. 215-218

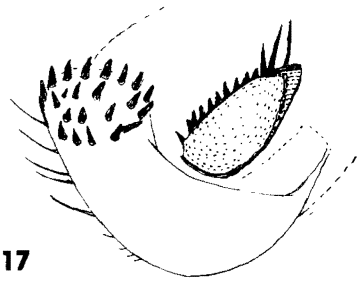
Head: orbits pronounced, slightly raised above frons, though not projecting above eye in profile; two equal ors, two ori, the lower slightly weaker; orbital setulae slight, sparse, reclinate; jowls narrow, one-eighth vertical height of eye, only slightly deeper at rear; third antennal segment small, round, with short upcurved pubescence, arista long, minutely pubescent.



215



216



217

Figs. 215-217. *Calycomyza obscura*: 215, aedeagus, side view; 216, same, ventral view; 217, surstylus.

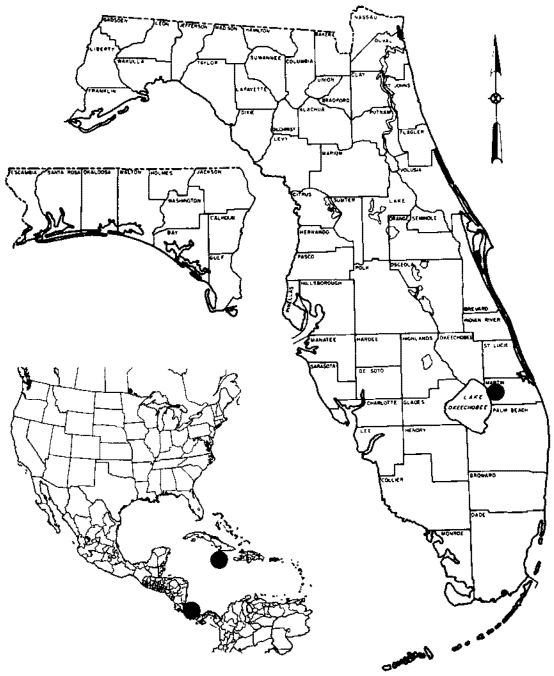


Fig. 218. Distribution of *Calycomyza obscura*.

Mesonotum: three dc, third short, well before suture; acr in eight rows.

Wing: length from 1.6 mm in male to 2 mm in female; last section of vein M3+4 twice length of penultimate.

Color: head somewhat variable, orbits normally weakly shining black, frons slightly paler brownish black; in palest specimens frons brownish yellow; jowls and face varying from black to brownish yellow; antennae entirely black; mesonotum and scutellum shining black; pleura normally entirely black, but in paler specimens particularly females, humerus and notopleural area dull yellowish; legs and abdomen entirely black; squamae gray, fringe jet black; halteres yellow.

Male genitalia: aedeagus distinctive, as in Fig. 215, 216; surstyli with a group of stout bristles and some longer hairs, outer corner of epandrium with conspicuous patch of bristles typical of the genus (Fig. 217); sperm sac with conspicuously broad stalk.

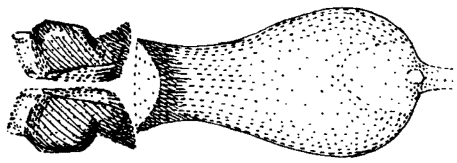
Holotype male, Florida, Martin Co., roadside 10 mi. N. of Port Mayaca (K.A.S.); paratypes: Costa Rica, La Caja, 8 km W. of San José, 8 males, 20 females, 1950 (Schmidt); Jamaica, Good Hope, two females, 8 Aug. 1966 (H.F. Howden). Holotype in USNM, paratypes in CNC, DEI, FSCA and senior author's collection.

Remarks: This is the darkest *Calycomyza* among known world species and on external characters would be considered as belonging to the genus *Praspedomyza*. However, the male genitalia are entirely typical and confirm its correct generic placing in *Calycomyza*.

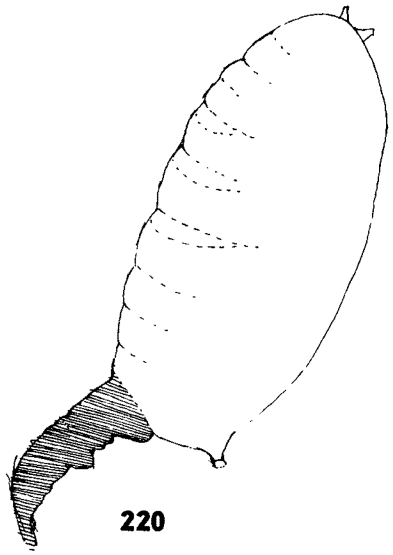
Calycomyza promissa Frick

Fig. 219-221

Phytobia (*Calycomyza*) *promissa* Frick, 1956: 287. Holotype from California ex *Aster chilensis* in California Academy of Sciences, San Francisco.



219



220

Figs. 219, 220. *Calycomyza promissa*: 219, aedeagus; 220, puparium.

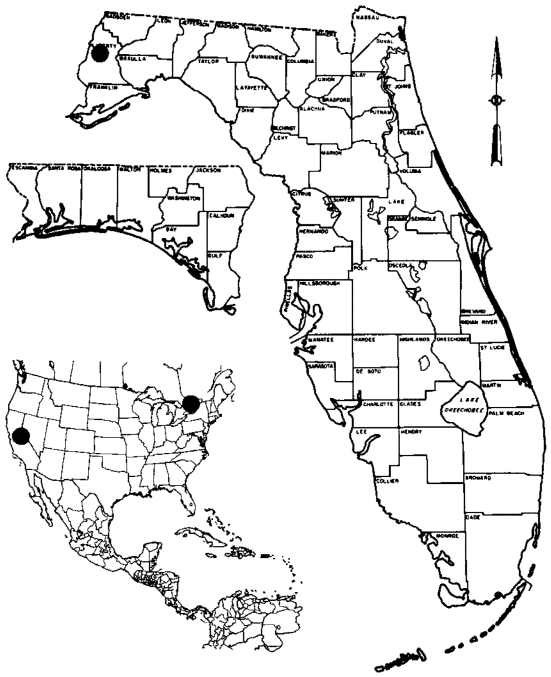


Fig. 221. Distribution of *Calycomyza promissa.*

Calycomyza promissa, Spencer, 1969a: 153.

Adult: upper orbits normally darkened but variable, face black above, yellow below; third antennal segment small, round; mesonotum shining black, acr in six rows; wing length 1.75 to 2.3 mm, last section of vein M3+4 2½ times length of penultimate; squamae yellow, fringe normally similar but sometimes darker, ochrous brownish (not black).

Male genitalia: aedeagus as in Fig. 219, distiphallus distinctly elongated.

Host plant/Biology: *Aster lateriflorus* and other *Aster* spp., larva forming white blotch which is generally circular but irregular at edges; puparium attached to a raised pile of frass in center of mine (Fig. 220); posterior spiracles of larva/puparium each with a circular arrangement of five to eight bulbs.

Distribution: Florida, Liberty Co.; California, Ontario. New to Florida.

Remarks: This species belongs to the small group with a pale squamal fringe; it closely resembles *C. jucunda,* which also feeds on Compositae but is immediately distinguishable in the larval and puparial stage by the five to eight bulbs on the posterior spiracles (three in *jucunda*).

It is clearly a species of northern origin and is probably at the extreme southern limit of its range in the Torreya State Park.

Material examined:

Florida: Liberty Co., Torreya State Park, numerous mines with puparia on *Aster lateriflorus,* 4 Oct. 1968 (K.A.S.).

Calycomyza sidae Spencer, sp.n.

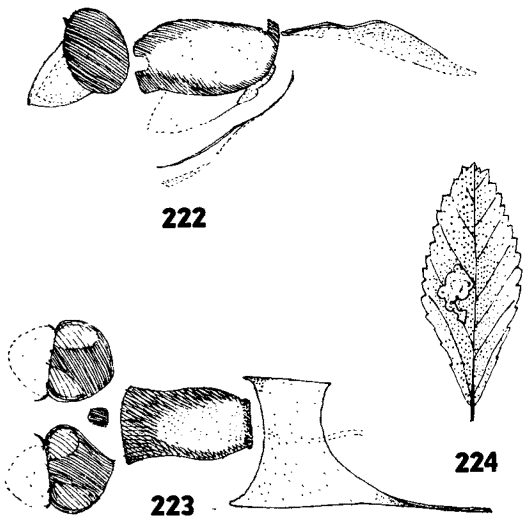
Fig. 222-225

Head: frons yellow, orbits black to upper ors or just below; all antennal segments black, face predominantly yellow, but sometimes slightly darkened, grayish; jowls yellow, extended at rear.

Thorax: mesonotum shining black; two strong dc, with a third very much smaller one close to second; acr in four or five rows; humerus, notopleural triangle and hind corner of mesopleura bright yellow, pleura otherwise black.

Wing: length from 1.4 to 1.5 mm; discal cell small, last section of vein M3+4 2½ times length of penultimate; wing base yellowish, squamae yellowish gray, margin and fringe dark, brown to blackish.

Legs: almost completely black, though fore knees possibly faintly yellowish.



Figs. 222-224. *Calycomyza sidae*: 222, aedeagus, side view; 223, same, ventral view; 224, leaf mine on *Sida* sp.

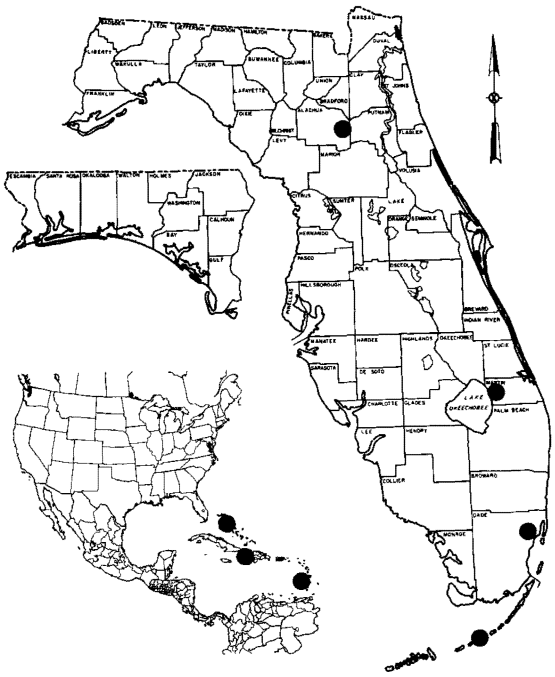


Fig. 225. Distribution of *Calycomyza sidae.*

Male genitalia: aedeagus as in Fig. 222, 223, membranous extensions of paired processes of distiphallus weak.

Host plant/Biology: *Sida* spp., larva forming short, irregular, linear blotch mine with frass arranged in conspicuous black strips (Fig. 224) ; puparium pale, yellowish brown, posterior spiracles each with three bulbs.

Holotype male, Florida, Dade Co., Hialeah, 3 Aug. 1963 ex leaf mine on *Sida cordifolia* (C.E.S.) ; paratypes: one male, two females, same data; Homestead, one male, 12 Oct. 1968 (K.A.S.) ; Hialeah, two females, 4 Feb. and 1 Oct. 1963, ex *Sida* sp. (C.E.S.) ; Martin Co., Port Mayaca, one male, 11 Oct. 1968 (K.A.S.) ; Monroe Co., West Summerland Key, two males, 15 Oct. 1968 (K.A.S. and C.E.S.) ; Bahamas, Eleuthera Is., Governor's Harbour, one male, 31 March 1953 (E.B. Hayden and L. Giovannoli) ; Dominica (W. I.), Clarke Hall, one male, 21-31 March 1965 (W.W. Wirth) ; Dominican Republic, La Vega Prov., one male, 4 Aug. 1967 (L.H. Rolston). Holotype and paratypes in USNM, further paratypes in FSCA, AMNH, CNC and senior author's collection.

Remarks: This species previously has been misidentified as *malvae* (Burgess). However, it appears that the true *malvae* is the species forming the long, narrow mines known from southern Florida to Ontario. The short, irregular mines of *sidae* are only known so far from Florida. The species probably is more widely distributed, but its exact range remains to be established.

C. sidae is generally somewhat smaller than *malvae,* and the squamal fringe is frequently somewhat paler, more brown than black. The male genitalia are similar in the two species, but the membranous extensions of the distiphallus are weaker. The puparia are paler, more yellowish. The short leaf mines of *sidae* are immediately distinguishable from the long, narrow mines of *malvae.*

Calycomyza solidaginis (Kaltenbach)

Fig. 226-228

Agromyza solidaginis Kaltenbach, 1869: 196. Types from Germany ex *Solidago virgaurea* lost.

Dizygomyza (*Calycomyza*) *solidaginis,* Hendel, 1931-6: 59.

Phytobia (*Calycomyza*) *solidaginis,* Frick, 1953a: 70; 1956: 292; 1959: 392.

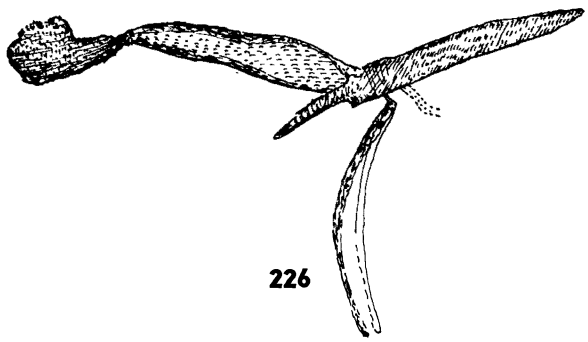
Calycomyza solidaginis, Spencer, 1969a: 155.

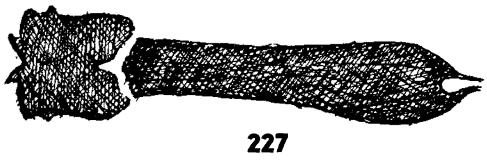
Adult: upper orbits conspicuously black, face largely yellow, at most upper half grayish; third antennal segment distinctly angulate at upper corner; mesonotum shining black; legs entirely black; wing length 1.6 to 2 mm, last section of vein M3+4 slightly more than twice length of penultimate; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 226, 227.

Host plant/Biology: *Solidago* spp., larva forming upper surface linear blotch, pupating in mine on pile of black frass.

Distribution: Florida, Dade Co.; widespread throughout the United States (Frick, 1959: 392) ; Canada: Ontario, Quebec; Europe. New to Florida.





Figs. 226, 227. *Calycomyza solidaginis*: 226, aedeagus, side view; 227, same, ventral view.

Remarks: This species belongs to the small group with a pale squamal fringe. Distinguishing characters are the conspicuously black orbits, angulate third antennal segment and yellow face.

C. solidaginis is a common Holarctic species. It probably occurs in northern Florida and is presumably at the southern limit of its range in Dade Co.

Material examined:

Florida: Dade Co., Hialeah, two males, 5 March 1963 ex leaf mines on *Solidago* sp. (C.E.S.).

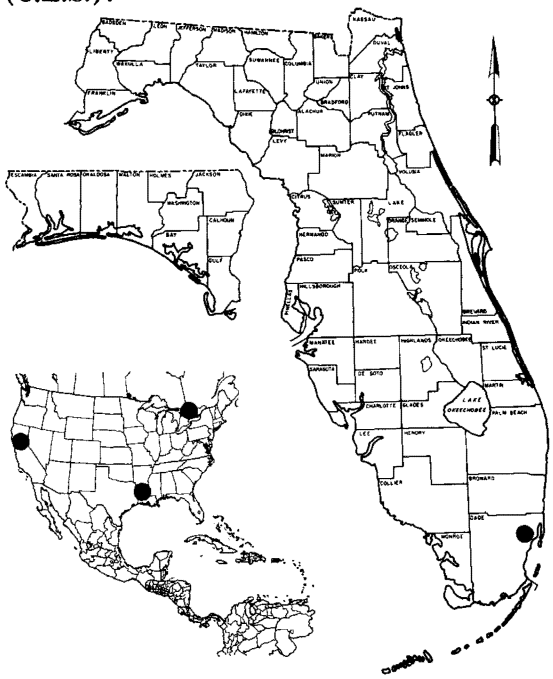


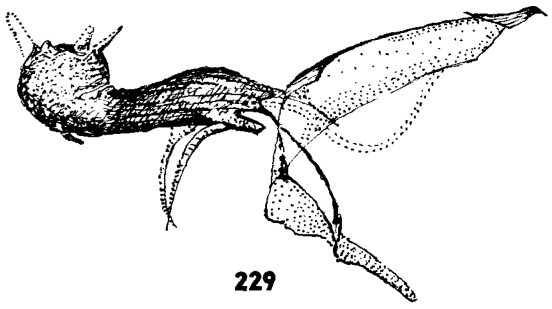
Fig. 228. Distribution of *Calycomyza solidaginis*.

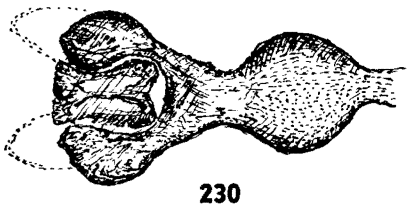
Calycomyza stegmaieri Spencer

Fig. 229-232

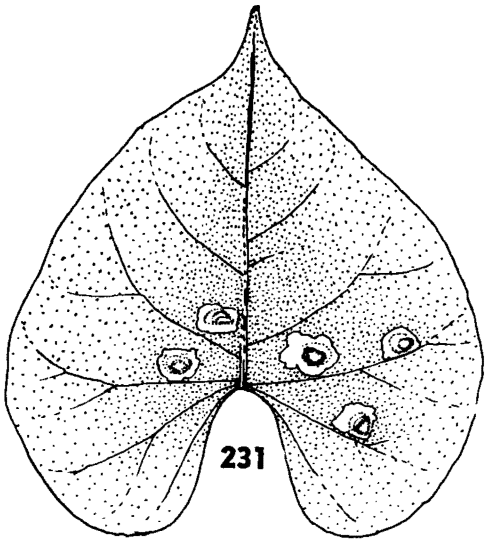
Calycomyza stegmaieri Spencer, 1966c: 18. Holotype male from Florida, Dade Co. in USNM.

Adult: orbits darkened at least to upper, normally to lower ors; third antennal segment small, round; face grayish, but yellow below; mesonotum mat black, acr sparse, in only four or five rows; legs almost entirely black, only fore knees faintly yellowish; wing length 1.6 mm, last section of vein M3+4





Figs. 229-231. *Calycomyza stegmaieri*: 229, aedeagus, side view; 230, same, ventral view; 231, leaf mines on *Calonyction aculeatum*.



slightly more than twice length of penultimate; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus distinctive, as in Fig. 229, 230.

Host plant/Biology: *Calonyction aculeatum*, larva forming circular blotch, with strips of black frass deposited in an almost regular spiral (Fig. 231); pupation externally.

Distribution: Florida, Dade Co., Lake Co., Okeechobee Co.

Remarks: This species is distinguishable from others in the group with a dark squamal fringe by the largely mat mesonotum and sparse acr.

With records only from southern Florida, it is probable that this species is of West Indian origin.

Material examined:

Florida: Dade Co., Hialeah, four males, 29 Oct. 1963 ex leaf mines on *Calonyction aculeatum*; five males, seven females, 6-10 June 1963 ex same host leg. May 1963 (all C.E.S.); Homestead, empty mines on same host, 13 Oct. 1968 (K.A.S.); Lake Co., Leesburg, one male, 10 Oct. 1963, also numerous empty mines (K.A.S.); Okeechobee Co., 2 males south of Okeechobee, 11 Oct. 1968, empty mines on same host (K.A.S.).

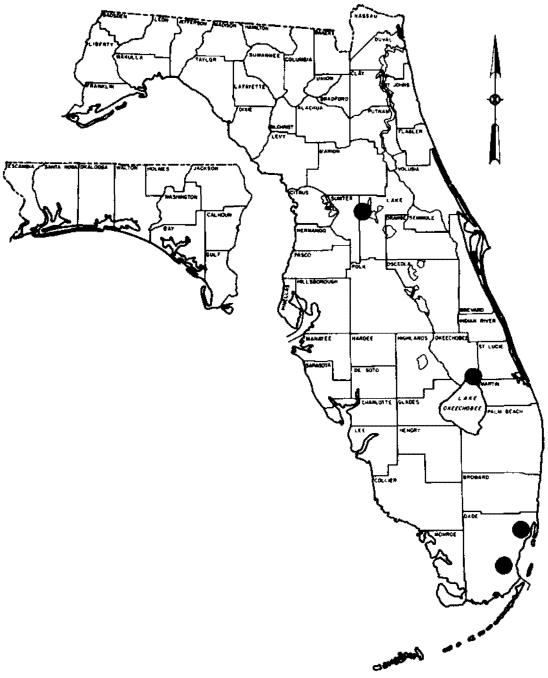


Fig. 232. Distribution of *Calycomyza stegmaieri*.

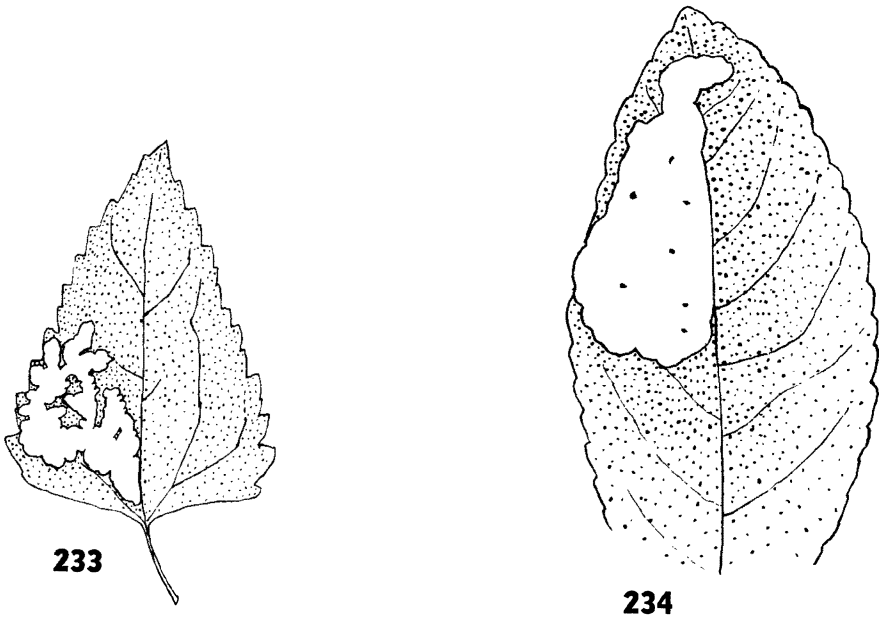
Leaf mines of unidentified *Calycomyza* species

Fig. 233-235

Ageratum conyzoides L. Gadsden Co., nr. Quincy, 4 Oct. 1965 (K.A.S.). An upper surface, irregular, whitish blotch (Fig. 233), pupation externally (K.A.S.).

Elephantopus elatus Bertol. Putnam Co., Camp Bell Ridge, 20 miles east of Gainesville, 8 Oct. 1968 (K.A.S.), mostly already empty, a few larvae still feeding. Linear during first larval instar, then developing into a large greenish white upper surface blotch (Fig. 234), pupation externally. From the size of the puparia, this is clearly the largest species known in Florida and will almost certainly prove to be undescribed.

Eupatorium rotundifolium L. Alachua Co., Gainesville, grounds of D.P.I., 5 Oct. 1968 (K.A.S.), mostly already empty, a few larvae still feeding. An upper surface, whitish blotch, pupation externally. This possibly represents *C. eupatorivora* described from Jamaica (p. 184).



Figs. 233, 234. Leaf mines of: 233, *Calycomyza* sp. on *Ageratum conyzoides;* 234, *Calycomyza* sp. on *Elephantopus elatus.*

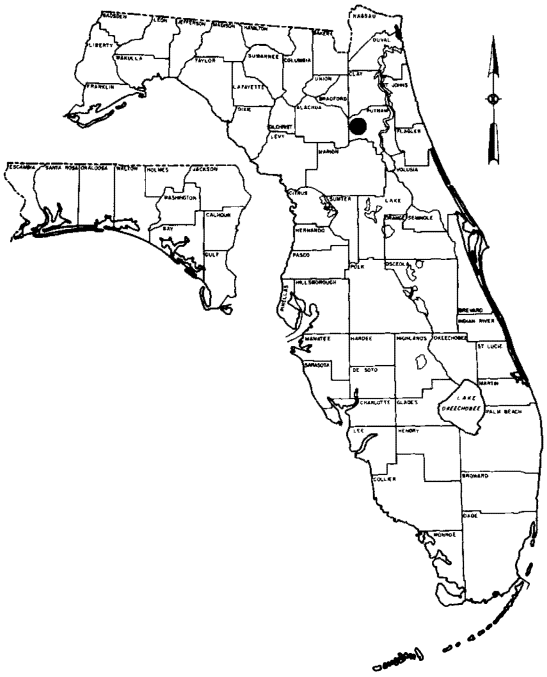


Fig. 235. Distribution of *Calycomyza* sp. (*Elephantopus*).

GENUS *AMAUROMYZA* HENDEL

Dizygomyza (*Amauromyza*) Hendel, 1931: 59. Type of subgenus (now genus): *Agromyza lamii* Kaltenbach, 1858, types from Germany ex *Ballota* and *Lamium* lost.

Dizygomyza (*Cephalomyza*) Hendel, 1931: 32, Spencer, 1969a: 157. Type of subgenus: *Dizygomyza luteiceps* Hendel, 1920: 133. Holotype female in Vienna.

Dizygomyza (*Trilobomyza*) Hendel, 1931: 71, syn. nov. Type of subgenus: *Agromyza flavifrons* Meigen, 1838: 184. Holotype female in Paris.

Amauromyza, Nowakowski, 1962: 97; Spencer, 1969a: 157.

From the synonymy given above it will be seen that in the past there has been confusion regarding both the type of the genus and also regarding the relationship of Hendel's subgenera *Cephalomyza* and *Trilobomyza* to *Amauromyza*.

Kaltenbach's (1858: 78) description of *Agromyza lamii* is brief, as follows: "glänzend schwarz; Flügelwurzel, Schwinger und der Hinterrand des letzten Hinterleibsringes gelb; Knie bräunlichgelb." Although Hendel identified *lamii* as an entirely black species, with black halteres (in fact *morionella* Zetterstedt, cf. Spencer, 1966b: 296), there can be no doubt that Kaltenbach's description refers to the species commonly found on *Ballota, Lamium* and other genera of Labiatae which was subsequently described by Hendel as *labiatarum*. The type of the subgenus *Trilobomyza, flavifrons* Meigen, is congeneric with *labiatarum*, and *Trilobomyza* is therefore synonymized with *Amauromyza* herewith. Hendel's subgenus *Cephalomyza* was synonymized with *Amauromyza* by Spencer (1969a: 157) in view of the virtual identity of the genitalia of the type of the subgenus, *luteiceps* Handel, with species of what may conveniently be called the *abnormalis* Malloch group of *Amauromyza*.

From the preliminary study of the genitalia of species in *Amauromyza*, it is apparent that there are at least five species groups, represented by the following species: *lamii* (Kalt.), *abnormalis* (Malloch), *carlinae* Hering, *morionella* (Zetterstedt) and finally, the one species occurring in Florida, *maculosa* (Malloch). Further study embracing all world species known in the genus will be necessary to decide whether some, at least, of these groups deserve separate subgeneric status.

A. maculosa has the divided, tubular distiphallus occurring in *carlinae* Hering and also in a new species mining *Leonurus* in Europe, which will be described shortly. However, it is differentiated from all species so far examined by having surstyli entirely divided from the epandrium (Fig. 238).

Amauromyza maculosa (Malloch)

Fig. 236-240

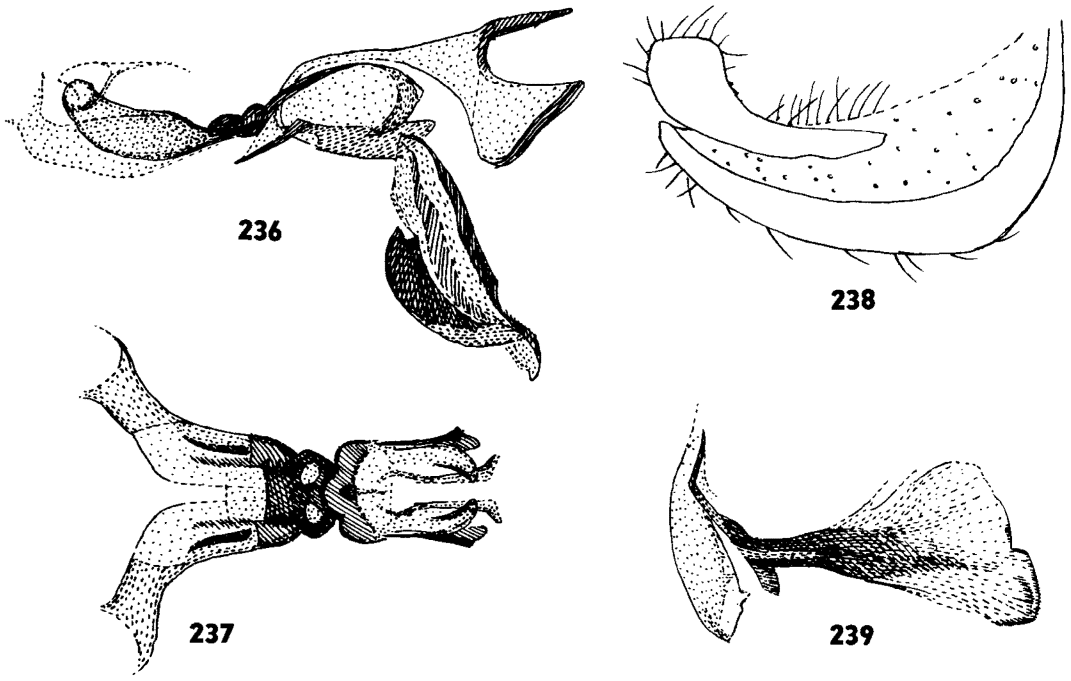
Agromyza maculosa Malloch, 1913: 302. Holotype female from Jamaica, New York, in USNM.

Phytobia (*Amauromyza*) *maculosa*, Frick, 1952a: 393; 1959: 378; Spencer, 1963a: 336.

Adult: head entirely black, mesonotum shining black, with 3+1 strong dc; pleura and legs entirely black; squamae and fringe silvery white; halteres variegated, primarily white, but knob with conspicuous black area above; wing length 2.3 - 2.5 mm.

Male genitalia: aedeagus as in Fig. 236, 237; ninth sternite with broad side arms, rounded at end but with rudimentary hypandrial apodeme; surstyli divided by complete suture from epandrium (Fig. 238); sperm sac with bowl-shaped base (Fig. 239).

Host plant/Biology: oligophagous on Compositae, known hosts in Florida include *Baccharis, Bidens, Chrysanthemum, Emilia, Erechtites, Eupatorium, Gaillardia, Gnaphalium, Helianthus, Melanthera, Senecio, Sonchus, Tagetes* (Stegmaier, 1967b: 99), larva forming conspicuous blotch mine, pupating externally.



Figs. 236-239. *Amauromyza maculosa*: 236, aedeagus, side view; 237, same ventral view; 238, surstylus; 239, sperm sac.

Distribution: Florida, Alachua Co., Dade Co., Highlands Co., Palm Beach Co., Seminole Co.; Bahamas, Barbados, Bermuda, Cuba, Grand Cayman, Jamaica; Costa Rica; Argentina, Brazil, Venezuela; Hawaii; northern limit of range New York State.

Remarks: This is a striking species, immediately recognizable by the variegated color of the halteres. The large blotch mines can be confused with those of *Nemorimyza posticata,* but there is no possibility of confusing the adults.

Within the genus it is an isolated species, as clearly indicated by the surstyli divided from the epandrium. This suggests a long period of isolation in South America, with extension of its range to the north since the end of the Pleistocene.

Material examined:

Florida: Alachua Co., Hawthorne, two males, emerged 24 Oct. 1968 ex leaf mines on *Bidens pilosa* leg. 8 Oct. 1968 (K.A.S. and C.E.S.); Gainesville, leaf mines on *Bidens* 2 Oct. 1968 (K.A.S.); Dade Co., Hialeah, one

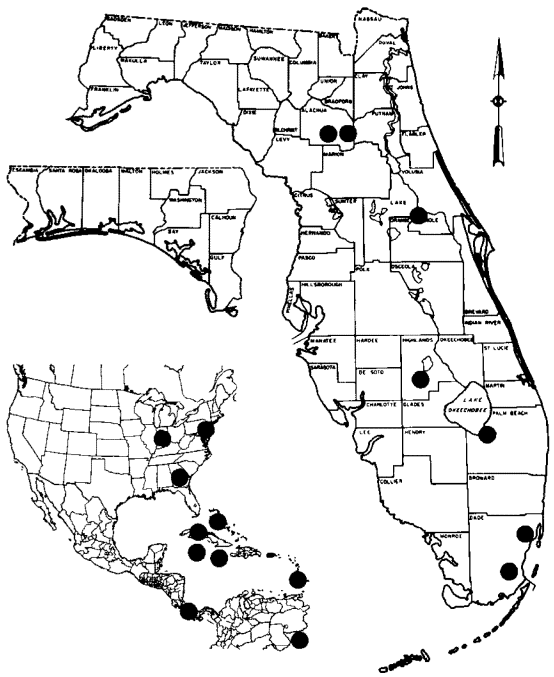


Fig. 240. Distribution of *Amauromyza maculosa.*

male, 12 Feb. 1963 ex *Baccharis halimifolia* (C.E.S.); Hialeah, one female, emerged 2 Nov. 1964 ex leaf mine on *Melanthera deltoidea* leg. 16 Oct. 1964 (C.E.S.); Hialeah, two females, emerged 10 April 1964 ex *Helianthus annuus* leg. 26 March 1964 (C.E.S.); Homestead, one male, one female, 14 Oct. 1968 (K.A.S.); Highlands Co., Archbold Biol. Station, two males, one female, 23 April 1967 (B.V. Petersen).

Bahamas: Andros Is., Mangrove Cay, two females, 26 April 1953 (E.B. Hayden).

Barbados: Norwood, one male, Aug. 1964 (C.I.E. No. A 50).

Costa Rica: La Caja, 8 km W. of San José, one female, 1930 (Schmidt).

Cuba: Havana, three males, one female, 15 Feb. to 15 May 1968 ex leaf mines on *Aster* sp., *Bidens pilosa, Emilia sonchifolia* and *Parthenium hysterophorus* (Rohdendorf).

Dominica (W.I.): Clarke Hall, nine males, four females, 21 Feb. - 31 March, 1965, Layon R. mouth, one male, 6 Feb. 1965; S. Chiltern Est, one female, 20 Feb. 1965 (all Malaise and light traps, W.W. Wirth).

Grand Cayman: Georgetown, one male, one female, 15-30 March 1965 (J. R. McClintock).

Jamaica: Hardwar Gap, 4000 ft. two males, 6 July 1966; Irish Town, one male, three females, 28 Aug. 1966; Duncans, one female, 23 Aug. 1966 (H. F. Howden and E. C. Becker); Yellaha, Blue Mts., one female, 27 Feb. 1931 (AMNH).

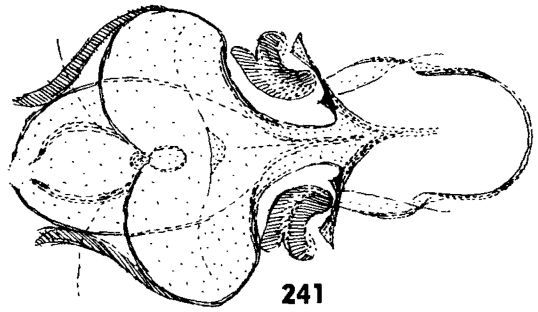


Fig. 241. *Nemorimyza posticata*: aedeagus.

GENUS *NEMORIMYZA* FREY

Nemorimyza Frey, 1946: 42. Type of genus *Agromyza posticata* Meigen.

Nemorimyza posticata (Meigen)

Fig. 241, 242

Agromyza posticata Meigen, 1830: 172. Holotype male from Germany in Paris.

Dizygomyza (*Dendromyza*) *posticata*, Hendel, 1931-6: 30.

Phytobia (*Nemorimyza*) *posticata*, Frick, 1959: 377.

Nemorimyza posticata, Frey, 1946: 42; Nowakowski, 1962: 97; Spencer, 1969a: 161.

Adult: large species, wing length from 2.7 mm in male to 3.3 mm in female; frons and antennae black, lunule conspicuously silvery; legs black, with fore knees yellow; fore tibia with one lateral bristle, mid-tibia with two; abdomen with front tergites yellow in male, entirely black in female; squamae white, fringe silvery.

Male genitalia: aedeagus distinctive, as in Fig. 241.

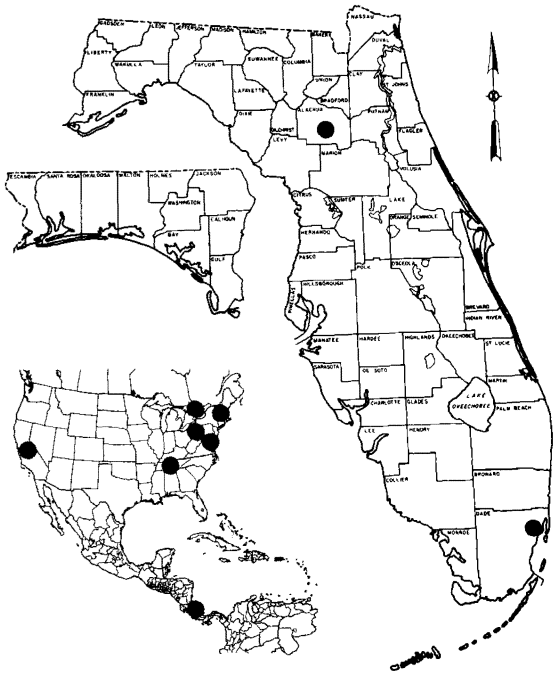


Fig. 242. Distribution of *Nemorimyza posticata*.

Host plant/Biology: larva forms blotch mine on *Aster, Baccharis, Solidago* and probably other Compositae.

Distribution: Florida, widespread in United States; Costa Rica; Canada, Europe, Japan.

Remarks: This is an isolated species with very distinctive genitalia which appear to justify its inclusion in a monotypic genus.

The males are readily recognizable by the largely yellow abdomen. The silvery lunule and fore-tibial bristle are also distinctive characters.

Although the only confirmed specimens from Florida are from Dade Co., the species certainly also occurs widely in northern Florida.

The specimen from Costa Rica is of considerable interest and presumably represents a relict Pleistocene population now isolated in the mountains of Central America, comparable to *Calycomyza artemisiae* (Kalt.) which occurs at a high altitude near Bogotá, Colombia (Spencer, 1969a: 146).

Material examined:

Florida: Alachua Co. (no locality given), one female, 13 March 1950; Dade Co., Miami, Fairchild Tropical Garden, 3 males, 4 females, emerged 11-12 Nov. 1968 ex leaf mines on *Baccharis halimifolia* collected 15 Oct. 1968 (K.A.S.); Hialeah, 3 males, 1 female, 19 Feb. 1963, ex leaf mines on *Solidago tortifolia* (C.E.S.).

Costa Rica: La Caja, 8 km W. of San José, one female, 1930 (Schmidt).

GENUS *LIRIOMYZA* MIK

Liriomyza Mik, 1894: 284. Type of genus: *Liriomyza urophorina* Mik.

This is the third largest genus in the world with 233 described species. It is dominant in northern temperate areas and is greatly reduced in the Ethiopian and Oriental Regions. In the Neotropical Region it is better represented, and only *Melanagromyza* is substantially larger. In Florida nine species are now recorded, of which two are described below as new. *L. sorosis* has been recorded previously from Florida but is now restricted to St. Vincent; *L. marginalis,* previously synonymised with *sorosis,* is now resurrected.

All species in Florida have the typically yellow scutellum and are readily recognizable by this character, combined with the reclinate orbital setulae and costa extending to vein M1+2. Two species, *L. munda* and *L. trifolii,* are highly polyphagous, and both have large, flourishing populations in southern Florida. *L. munda* in some years causes serious damage as a leaf miner on truck crops, in particular beans and tomatoes.

Key to Florida *Liriomyza* species

(Including *L. sorosis* from St. Vincent)

1 Mesonotum in center adjoining scutellum partially yellow 2

1′ Mesonotum in center black to margin of scutellum 6

2 Mesonotum uniformly mat black (Fig. 267) ..... *schmidti* (Aldrich)

2′ Mesonotum brilliantly shining black or paler brownish, at least in center 3

3 Black of mesonotum centrally nearly reaching margin of scutellum (Fig. 255); third antennal segment with conspicuous pubescence, in male greatly enlarged ..... *commelinae* (Frost)

3′ Black of mesonotum centrally separated by wide yellow area from margin of scutellum; third antennal pubescence slight, normal 4

4 Cerci with 6 long hairs at end (Fig. 477) ..... *sorosis* (Williston)

4′ Cerci with a single slender hair at end (Fig. 249) 5

5 Distiphallus short, broad (Fig. 260); dark areas of mesonotum either black or paler, brownish; anterior spiracles of puparium black (Fig. 262) ..... *marginalis* (Malloch)

5′ Distiphallus longer, more slender (Fig. 248); dark areas of mesonotum always shining black; anterior spiracles of puparium paler, brown (Fig. 250) ..... *blechi* Spencer

6 Femora conspicuously darkened, blackish; pupation in leaf mine ..... *trifoliearum* Spencer

6′ Femora yellow; pupation externally .. 7

7 Mesonotum brilliantly shining black 8

7′ Mesonotum mat, grayish black .... *trifolii* (Burgess)

8 Third antennal segment with conspicuously long pubescence ..... *archboldi* Frost

8′ Third antennal pubescence slight, normal 9

9 Orbits normally at least slightly darkened, black or brownish; aedeagus as in Fig. 252, 253 ..... *brassicae* (Riley)

9′ Orbits entirely yellow; aedeagus as in Fig. 264, 265 ..... *munda* Frick

Liriomyza archboldi Frost

Fig. 243-246

Liriomyza archboldi Frost, 1962: 51-3; Spencer, 1965a: 32. Holotype male from Florida, Highlands Co., in coll. S.W. Frost.

Adult: orbits entirely yellow, vti on yellow ground, vte just on black; four orbital bristles, the lower incurved and weaker; orbital setulae sparse, reclinate, all antennal segments yellow, third small, round, with conspicuously long pubescence; mesonotum brilliantly shining black, hind corners broadly yellow, acr in four rows; sides of thorax largely yellow, mesopleura black along front and lower margin (Frost, 1962: Fig. 1); wing length up to 1.8 mm in male, 2 mm in female, first cross-vein just beyond mid point of discal cell, last section of vein M3+4 twice length of penultimate; coxae and femora yellow, tibiae and tarsi distinctly darker, brownish; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 243, 244; surstyli with two strong bristles (Fig. 245).

Host plant/Biology: *Bidens pilosa,* larva forming blotch mine (further details not recorded).

Distribution: Florida, Alachua Co., Highlands Co., Lake Co., Monroe Co.; Bahamas.

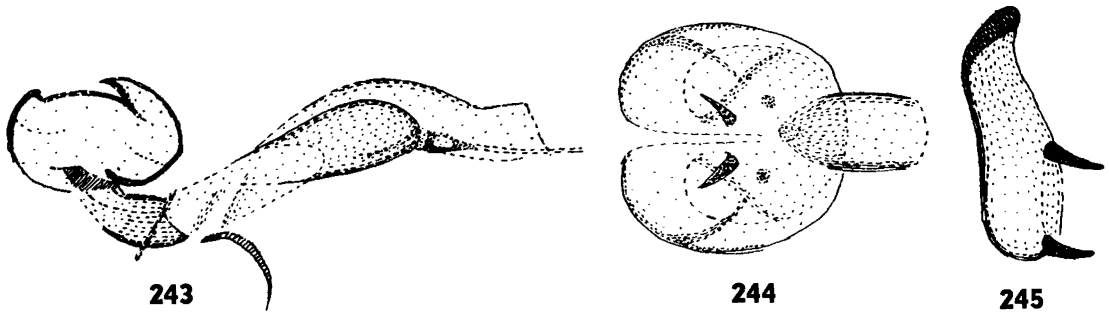
Remarks: The shining black mesonotum, pubescent third antennal segment and slightly infumed wings are the distinctive characters of this species.

Prof. Frost included in his type series five specimens reared from leaf mines on *Pisum sativa* but later (private communication) considered there was doubt whether these were conspecific with the holotype and other paratypes taken at light. Later he finally established the host plant by rearing two specimens from *Bidens pilosa.*

The reference by Spencer (1963a: 354) to *archboldi* was a misidentification for *L. trifolii.*

Material examined:

Florida: Alachua Co., Gainesville, one female, 7 Oct. 1968 (K.A.S.); Newnan's Lake, one male, three females, 26 April 1952 (O. Peck); Dade Co., Florida City, two females, 30 March 1953 (W.R.M. Mason); Homestead, one male, 28 March 1952, two females, 3 April 1952 (J.R. Vockeroth); Key Largo, two females, 5-6 Dec. 1961, at light (E.G. Munroe, G.P. Holland and J.G.T. Chillcott); Highlands Co., Archbold Biological Station, one male, 5 Jan. 1960; one male, 9 Nov. 1959,



Figs. 243-245. *Liriomyza archboldi*: 243, aedeagus, side view; 244, same, ventral view; 245, surstylus.

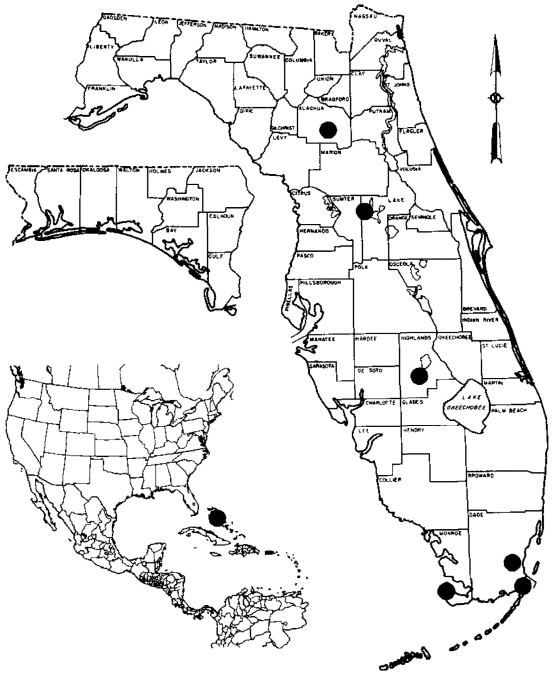


Fig. 246. Distribution of *Liriomyza archboldi.*

both paratypes; two males, 7 Feb. 1964, ex blotch mines on *Bidens pilosa*; one male, same locality, 9 Feb. 1967 (all S.W. Frost); Lake Co., Leesburg, one female, 10 Oct. 1968 (K.A.S. and C.E.S.); Monroe Co., Cape Sable, one female, 31 March 1953 (W.R.M. Mason).

Bahamas: New Providence Is., 2 miles E. of Nassau, one female, 14 April 1953 (E.B. Hayden).

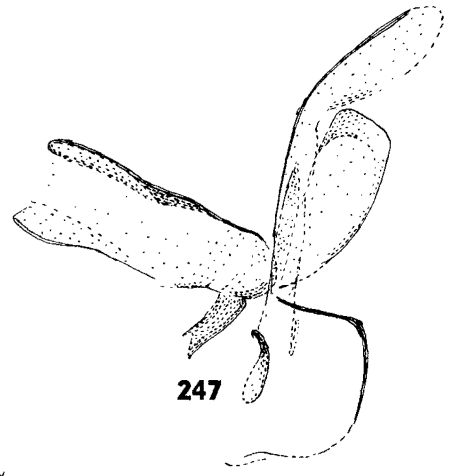
Liriomyza blechi Spencer, sp.n.

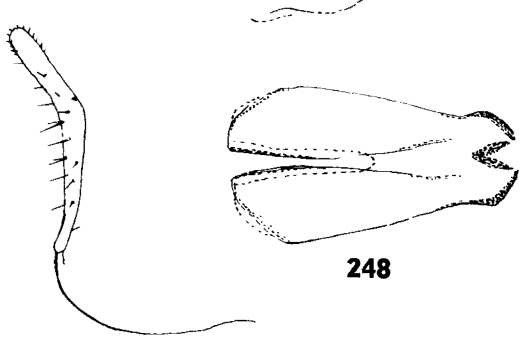
Fig. 247-251

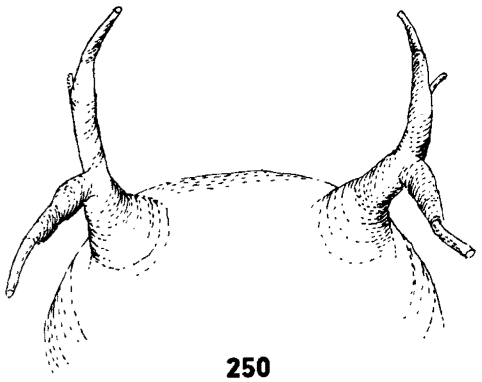
Head: two strong, equal ors, two ori, the lower somewhat weaker; orbital setulae sparse, in single row, reclinate; jowls slightly deeper at rear, about one-sixth vertical eye height; third antennal segment round, arista long, equal to height of eye, conspicuously pubescent.

Mesonotum: chaetotaxy variable, either three dc, with the pre-sutural strong or 3+1, with the third and fourth substantially weaker than the second; acr in four rows, a few hairs usually extending to the yellow area at the level of the first dc.

Wing: length from 1.8 to 2 mm, last section of vein M3+4 variable, but normally 1½ times length of penultimate.







Figs. 247-250. *Liriomyza blechi*: 247, aedeagus, side view; 248, distiphallus, ventral view; 249, cercus; 250, anterior spiracles of puparium.

Color: frons and entire orbits yellow, both vt on yellow ground; face, all antennal segments and palps yellow; mesonotum shining black centrally and with two black lateral bands extending between the first and second dc on one side and the supra-alar and postalar bristles on the other but not reaching the scutellum, yellow central area adjoining scutellum extending forward to midway between first and second dc; pleura almost entirely yellow, sternopleura with black or brownish triangle on lower two-thirds; legs: coxae and femora bright yellow, tibiae and tarsi slightly darker, brownish; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 247, 248, distiphallus similar to that of *sorosis*, longer, narrower than in *marginalis*; hypophallus relatively simple, less complex than in *sorosis*; surstyli and epandrium generally as in *marginalis* (cf. Fig. 261), with distinctive chitinized bar on inner corner of epandrium; sperm sac with narrow blade and wing-like extensions of base, as in *marginalis*; cerci with single long hair at end (Fig. 249).

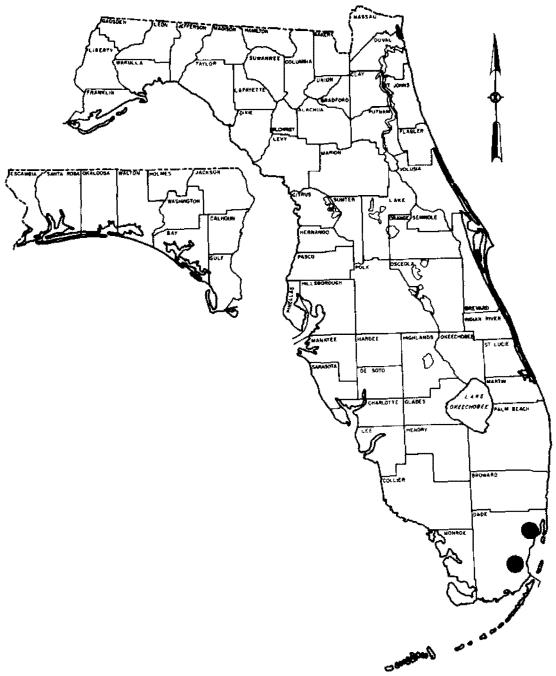


Fig. 251. Distribution of *Liriomyza blechi*.

Host plant/Biology: *Blechum pyramidatum*, a number of larvae feeding together forming a mine primarily along the mid rib with irregular extensions into the leaf blade; pupation in leaf, with anterior spiracles projecting through the epidermis; anterior spiracles (Fig. 250) brown, with base short and arms of the divided sections relatively long; posterior spiracles each with three bulbs, the outer two conspicuously elongate, the two processes widely separated.

Holotype male, Florida, Dade Co., Miami, 11 July 1963 ex leaf mine on *Blechum pyramidatum* (C.E.S.); paratypes, one male, three females, same data; Homestead, one male, five females, caught on same host, 13 Oct. 1968 (K.A.S.). Holotype and paratype in USNM, further paratypes in FSCA and senior author's collection.

Remarks: This species (Stegmaier, 1967c) previously has been identified as *sorosis* (Will.), but the more detailed examination of the male genitalia which has now been undertaken clearly indicates that *sorosis* and the species occurring commonly on *Blechum* are distinct.

L. blechi cannot be distinguished from *sorosis* on external characters. It also closely resembles *L. marginalis*, but the mesonotum appears to be consistently shining black (sometimes yellowish brown in *marginalis*), the orbital bristles appear to be somewhat stronger and the arista slightly longer and more pubescent. However, the latter characters are not constant and cannot be used as a reliable guide for separating the species. The aedeagus, particularly in ventral view (cf. Fig. 248, 260), shows a distinctive difference in the two species. However, the most obvious difference is apparent in the puparial (larval) spiracles (cf. Fig. 250, 262).

I have examined specimens reared from *Heliotropium, Lippia, Plantago* and *Spigelia* which closely resemble *blechi* but there are slight differences both in genitalia and the puparial spiracles, and more detailed study is required, particularly of the biology, including fresh leaf mines, before deciding on the exact status of these specimens.

Liriomyza brassicae (Riley)

Fig. 252-254

Oscinis brassicae Riley, 1884: 322. Holotype female from Missouri in USNM.

Liriomyza brassicae, Frick, 1952a: 402; 1959: 402; Spencer, 1963a: 356; 1969a: 170; Stegmaier, 1967e.

Liriomyza hawaiiensis Frick, 1952b: 513; Spencer, 1963a: 356; Sasakawa, 1964: 431; holotype female ex *Cleome* (Capparidaceae) in coll. Hawaiian Sugar Planters' Association.

Liriomyza bulnesiae Spencer, 1963a: 360, **syn. nov.** Holotype male from Venezuela in author's collection.

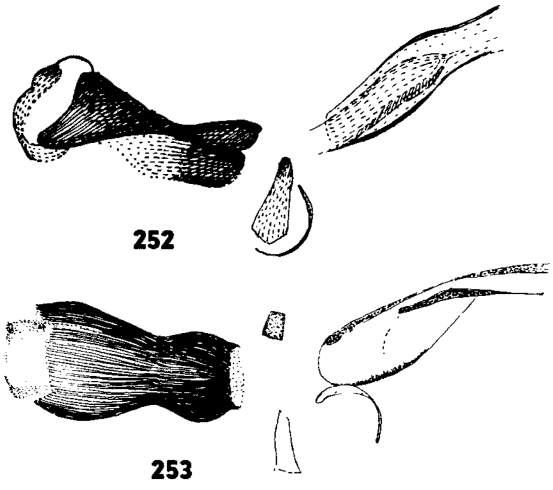
Adult: very small species, wing length from 1.25 mm in male to 1.5 mm in female, discal cell small, last section of vein M3+4 2½ times length of penultimate; frons yellow, orbits variable, from entirely black to entirely yellow, most frequently with slight browning between orbital bristles and eye margin; all antennal segments yellow; mesonotum brilliantly shining black, acr in four rows; sides of thorax largely yellow, but mesopleura black along front and lower margins; legs: coxae and femora yellow, tibiae and tarsi slightly darker, brownish; squamae yellow, margin and fringe black.

Male genitalia: aedeagus as in Fig. 252, 253; surstyli with one strong, curving spine at end and a very much smaller one behind (Sasakawa, 1964: Fig. 1D, as *hawaiiensis*); sperm sac with narrow stalk and greatly enlarged blade.

Host plant/Biology: Cruciferae: in Florida *Brassica, Lepidium;* Capparidaceae: *Cleome;* Tropaeolaceae: *Tropaeolum*; also more rarely Leguminosae: *Pisum*; larva forms narrow, whitish, upper surface serpentine mine, with frass in conspicuous black strips, pupation externally; puparium pale yellowish, posterior spiracles each with three bulbs.

Distribution: Florida, Alachua Co., Dade Co.; widespread in United States; cosmopolitan.

Remarks: The distinctive characters of this species are the variable darkening of the orbits and the shining black mesonotum. The paler form, with the orbits entirely yellow occurs most commonly in the Pacific area and S.E. Asia, and I have seen specimens from Hawaii, Micronesia, Australia and Singapore. This form was described as *hawaiiensis* Frick and was synonymised with *brassicae* by Spencer, 1963a. Sasakawa



Figs. 252, 253. *Liriomyza brassicae*: 252, aedeagus, side view, ex *Cleome,* Miami; 253, same, ventral view.

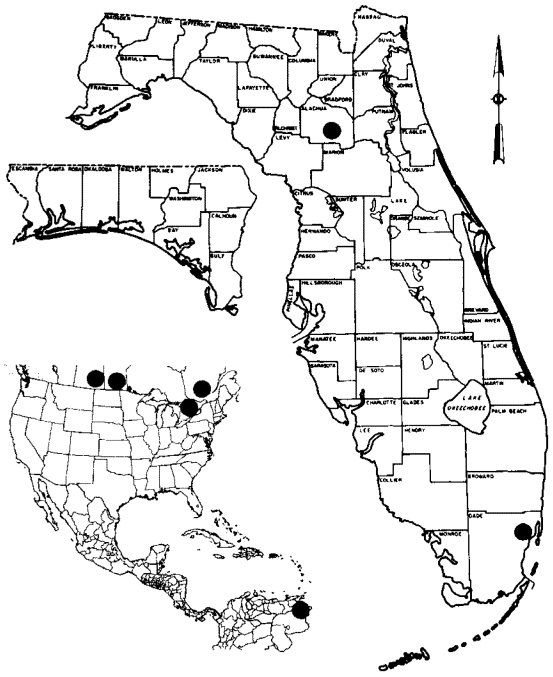


Fig. 254. Distribution of *Liriomyza brassicae.*

(1964), in a brief review of Hawaiian *Liriomyza* species, continued to treat *hawaiiensis* as distinct from *brassicae,* stating: "The present study confirms the distinctness of *hawaiiensis,*" and "*hawaiiensis* is clearly separated from *brassicae* by the characteristic male terminalia." He proceeds to describe the genitalia, but this description applies exactly to all specimens of *brassicae* I have examined—from Australia, Ethiopia, Europe, Florida, Kenya, Rhodesia, Venezuela and West Africa. No attempt is made to discuss the differences in the genitalia of *brassicae* and *hawaiiensis.* I am therefore convinced that *hawaiiensis* was correctly synonymised with *brassicae.* The form of aedeagus is entirely characteristic and very distinct from any other species in the genus.

L. brassicae closely resembles *L. munda,* one of the commonest species in southern Florida. The only distinguishing character appears to be the faint darkening of the orbits in *brassicae.* In doubtful cases the male genitalia will permit immediate separation of the two species.

Liriomyza bulnesiae was described by Spencer (1963a) from specimens caught at the Botanical Gardens, Caracas, on a tree, *Bulnesia arborea,* which was covered with silvery epidermal mines. It was assumed that these specimens were associated with these leaf mines, I am now satisfied from reexamination of the specimens, and particularly from the male genitalia, that this species is in fact, merely *L. brassicae,* with which *bulnesiae* is now formally synonymised.

It seems probable that the leaf mines on *Bulnesia* can be referred to *L. schmidti.*

Material examined:

Florida: Alachua Co., Gainesville, five specimens, emerged 18 April 1964 ex *Brassica napus* leg. 8 April 1964 (D.H. Habeck); Dade Co., Hialeah, 12 March 1963 ex *Brassica campestris* (C.E.S.); 17-19 March 1963 ex *Brassica rapa*; four males, 13 March 1963 ex *Brassica campestris* (C.E.S.); 17-19 March 1963 ex *Brassica rapa*; four males, 13 March 1963 ex *Cleome spinosa* (C.E.S.); Miami, two males, two females, 20 Jan. 1963 ex *Lepidium virginicum* (C.E.S.); North Miami, two males, one female, 6 Feb. 1963 ex *Brassica oleracea* var. *botrytis* (C.E.S.); Hialeah, leaf mines on *Tropaeolum major,* March 1963 (C.E.S.).

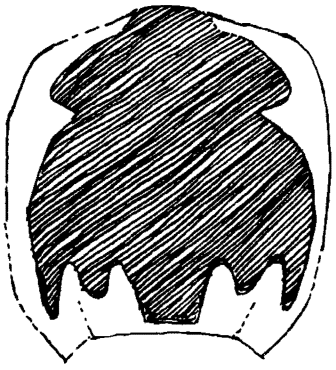
Liriomyza commelinae (Frost)

Fig. 255-258

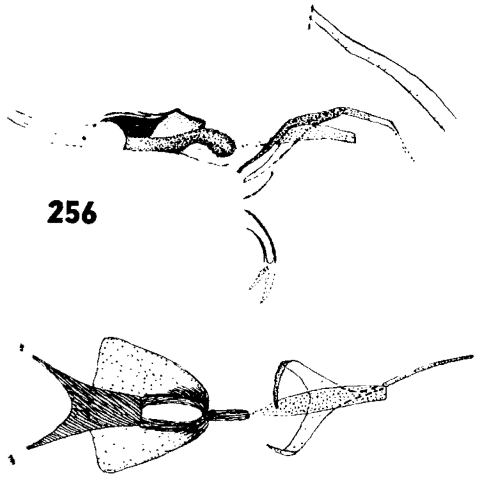
Agromyza commelinae Frost, 1931: 72. Holotype male from St. Vincent in USNM.

Liriomyza commelinae, Frick, 1952a: 402; 1959; 403; Silva and Oliveira, 1952: 293; Spencer, 1963a: 361; Stegmaier, 1966d: 147.

Adult: frons, including entire orbits bright yellow, both vt on yellow ground; third antennal segment either yellow or somewhat



255



256

257

Figs. 255-257. *Liriomyza commelinae*: 255, mesonotum; 256, aedeagus, side view; 257, same, ventral view.

darkened, brownish, in male greatly enlarged, in both sexes conspicuously pubescent; mesonotum brilliantly shining black, with large yellow area at hind corners (Fig. 255), acr in four rows; sides of thorax largely yellow, mesopleura without any dark markings; legs: coxae and femora bright yellow, tibiae and tarsi only slightly darker, faintly brownish; wing length 1.6 to 1.8 mm; squamae and fringe black.

Male genitalia: aedeagus as in Fig. 256, 257.

Host plant/Biology: *Commelina diffusa, C. elegans* and certainly other *Commelina* species, also *Tradescantia fluminensis,* larva forming long white linear mine, with frass deposited in widely-spaced, conspicuous black lumps; blackish brown puparium remains in leaf at end of mine; four photographs of leaf mines have been given by Stegmaier (1966d).

Distribution: Florida, Brevard Co., Dade Co., Lake Co., Volusia Co.; Cuba, Jamaica, St. Vincent; Argentina.

Remarks: This species is immediately recognizable by the distinctive markings of the mesonotum and in the male by the enlarged third antennal segment. It is also unusual in having a black puparium and in pupating in the mine.

L. commelinae is clearly of neotropical origin, and it will be of interest to establish its northern limit in Florida.

Material examined:

Florida: Brevard Co., Courtenay, three males, 3 Sept. 1964, ex *Commelina* sp. (G.W. Desin); Dade Co., Miami Springs, 18 Aug. 1962, specimens ex *C. diffusa* (B.K. Dozier); Hialeah, 27 Aug. 1962, 15 Nov. 1965, 27 Dec. 1965, specimens ex *Commelina* spp. (C.E.S.); Lake Co., Leesburg, nr. Lake Harris, empty leaf mines 10 Oct. 1968 (K.A.S. and C.E.S.); Volusia Co., Seville, leaf mines on *Tradescantia fluminensis,* 17 Feb. 1968 (C.R. Roberts).

Cuba: Havana, one male, one female, 6 Dec. 1967 ex *Commelina elegans* (E. Rohdendorf).

Jamaica: Rio Cobre Gorge, one male, five females, emerged 29 Dec. 1958 - 2 Jan. 1959 ex *C. elegans* leg. 13 Dec. 1958 (K.A.S.).

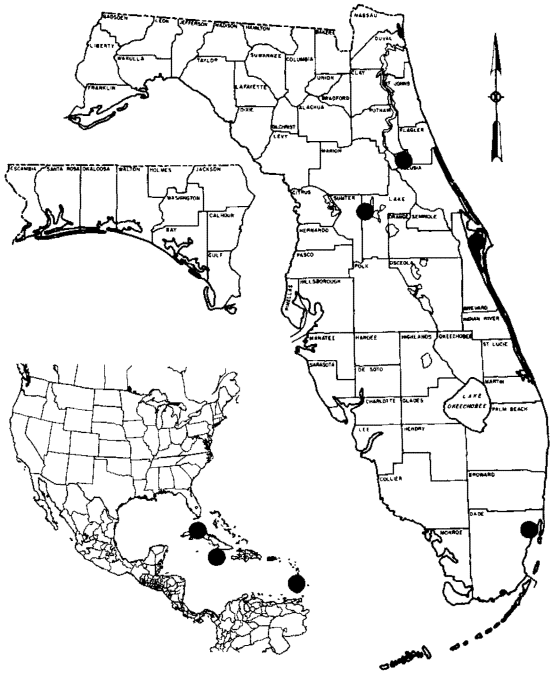


Fig. 258. Distribution of *Liriomyza commelinae.*

Liriomyza marginalis (Malloch)

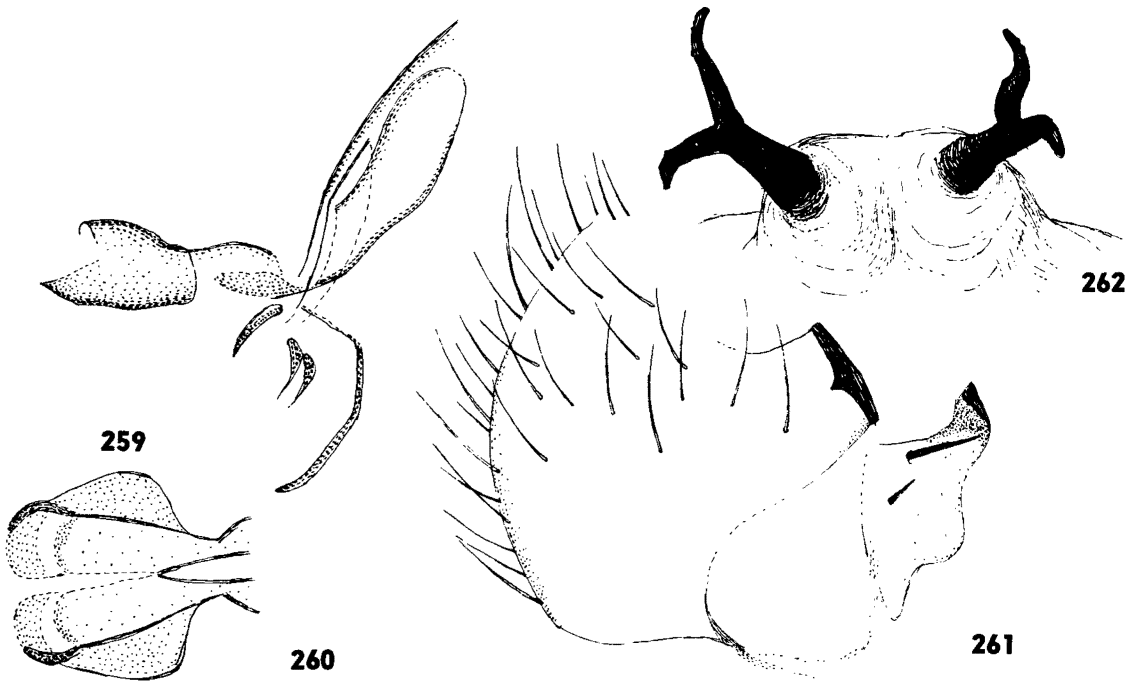
Fig. 259-263

Agromyza melampyga var. *marginalis* Malloch, 1913: 283. Holotype male ex *Paspalum* from South Carolina in USNM.

Liriomyza marginalis, Frick, 1952a: 404; 1959: 407; Spencer, 1963a: 370.

Adult: essentially as in *L. blechi* (p. 98); frons and orbits uniformly yellow, both vt on yellow ground; all antennal segments yellow; mesonotum variable, with either 3+1 or 2+1 dc and dark areas either entirely shining black or central area yellowish brown, with lateral bands becoming black behind; large area adjoining scutellum always yellow; wing length 1.8 to 1.9 mm, last section of vein M3+4 variable but about one and a half times length of penultimate.

Male genitalia: aedeagus as in Fig. 259, 260, mesophallus longer, more slender than in *sorosis* and *blechi,* distiphallus shorter, broader, hypophallus less complex; surstyli and epandrium as in Fig. 261, chitinized bar



Figs. 259-262. *Liriomyza marginalis*: 259, aedeagus, side view; 260, distiphallus, ventral view; 261, surstylus and epandrium; 262, anterior spiracles of puparium.

on lower corner of epandrium distinctive; cerci with single slender hair at end, as in *blechi* (cf. Fig. 249).

Host plant/Biology: *Paspalum* spp. and possibly other Gramineae, larva forming essentially linear mine, pupating in leaf; anterior spiracles of puparium projecting through epidermis, base of each divided section relatively long (Fig. 262), upper divisions shorter than in *blechi*; posterior spiracles each with three bulbs, only one distinctly elongate, the two processes more closely adjoining than in *blechi*.

Distribution: Florida, Alachua Co., Dade Co., Levy Co., Marion Co.; South Carolina; Bahamas, Dominica (W.I.), Jamaica; Brazil.

Remarks: Malloch described this species as doubtfully distinct and merely as a variety of *melampyga* (a leaf miner on *Impatiens*, cf. Spencer, 1969a: 178) which has hitherto been confused with *sorosis*. Frick (1959: 407) treated *marginalis* as distinct from *sorosis*, associating the latter with the species mining *Plantago*. He attempted to differentiate the species on differences in the chaetotaxy of the mesonotum and on the striking color differences which occur in the mesonotum. Spencer (1963a: 370) found in the considerable material examined that there was variation in both these characters and, failing to detect any significant differences in the genitalia, synonymised *marginalis* with *sorosis*. Examination of the lectotype of *sorosis* shows that there are substantial differences in the genitalia from any other specimens examined, and the name *sorosis* is therefore now restricted to the type series from St. Vincent.

In the 50 specimens examined from Dominica only four have the mesonotum centrally pale, and in all others the dark areas are entirely shining black. Both dark and pale specimens have been reared from *Paspalum*. The aedeagi of the pale and black specimens are identical, and it is thus established that the color differences of the mesonotum are not of specific significance.

Although both *marginalis* and *sorosis* have the same unique form of epandrium and surstyli, it is now found that there are constant differences in the aedeagus of *marginalis* both from *sorosis* and also from the species

occurring commonly on *Blechum pyramidatum* described earlier as *blechi* sp.n. Differences between both anterior and posterior spiracles of *marginalis* and *blechi* are even more apparent than differences in the genitalia. It appears therefore that *blechi, marginalis* and *sorosis* represent three distinct species in a closely related group.

Specimens bred from *Digitaria sanguinalis* and from *Panicum miliaceum* have the mesonotum shining black, but the genitalia do not entirely agree with those of *marginalis*. More material will be required before it is possible to decide whether these represent a further species in this complex. The senior author has critically examined specimens bred by Stegmaier (1967c) from the further grasses *Eleusine indica* and *Euchlaena mexicana*, and the exact identity of these remains to be established.

Material examined:

Florida: Alachua County, Cross Creek, one male, 9 Oct. 1968 (K.A.S.); Hawthorne, numerous mines on *Paspalum* sp. 8 Oct. 1968 (K.A.S. and C.E.S.); Dade Co., Hialeah, one female, emerged 4 Dec. 1963 ex leaf mine on *Paspalum ciliatifolium* leg. 5 Nov. 1963 (C.E.S.); Levy Co., Otter Creek, one male, one female, emerged 10 Oct. 1968 ex mines on *Paspalum* sp. leg. 2 Oct. 1968 (K.A.S.).

Jamaica: Rio Cobre Gorge, one male, emerged 30 Dec. 1958 ex mine on Gramineae (*?Paspalum* sp.) leg. 13 Dec. 1958; two males, caught 13 Dec. 1958 (all K.A.S.).

Dominica (W.I.): 25 males, 25 females, 11 Jan. - 10 March 1965 (W.W. Wirth).

Bahamas: Eleuthera Is., Hatchet Bay (nr. Alicetown), one male, 2 April 1953 (E.B. Hayden and L. Giovannoli); San Salvador Is., nr. Cockburn Town, one female, 18 March 1953 (L. Giovannoli and G.B. Rabb).

Further specimens from Berry Is., Crooked Is., New Providence Is., North Bimini Is., Turks and Caicos Is. (L. Giovannoli, E.B. Hayden and G.B. Rabb) are probably referable to this species.

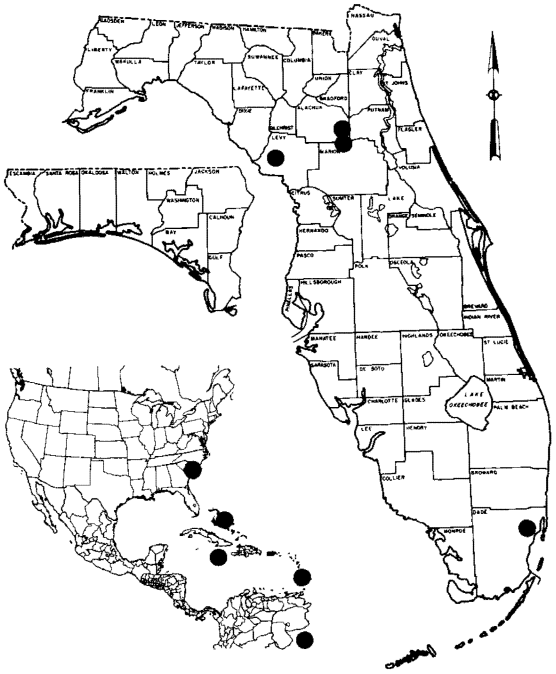


Fig. 263. Distribution of *Liriomyza marginalis*.

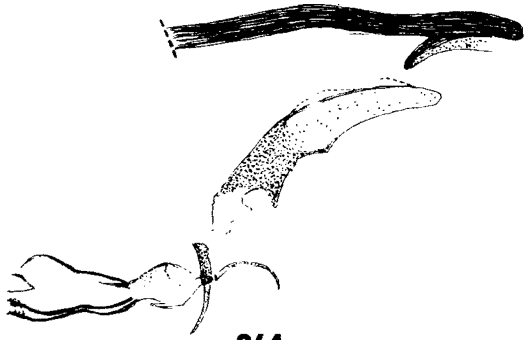
Liriomyza munda Frick

Fig. 264-266

Liriomyza munda Frick, 1957: 60; 1959: 407; Steyskal, 1964: 388; Spencer, 1963a: 362 (as *guytona*); 1965a: 36. Holotype male from California in USNM.

Liriomyza guytona Freeman, 1958: 344.

Adult: very small species, wing length from 1.3 mm in male to 1.65 mm in female;



264



265

Figs. 264, 265. *Liriomyza munda*: 264, aedeagus side view; 265, same, ventral view.

frons and all antennal segments bright yellow; orbits yellow but hind margin of eye black, with vte on black ground and vti at margin of black and yellow; mesonotum brilliantly shining black; mesopleura largely yellow but variably black on lower half; legs: coxae and femora bright yellow, tibiae and tarsi only slightly darker, more brownish.

Male genitalia: aedeagus as in Fig. 264, 265.

Host plant/Biology: a highly polyphagous species, with records in Florida (Stegmaier, 1966b) on Compositae, Cruciferae, Cucurbitaceae, Euphorbiaceae, Leguminosae, Malvaceae, Passifloraceae, Plantaginaceae, Solanaceae and Umbelliferae; larva forms short, narrow upper surface linear mine, with frass in small black strips at alternate sides of the channel; pupation externally; posterior spiracles of puparium each with three bulbs.

Distribution: Florida, Alachua Co., Collier Co., Dade Co., De Soto Co., Monroe Co., Palm Beach Co.; Alabama, California, Tennessee, Texas; ?Hawaii; Bahamas, Cuba, Jamaica; Venezuela.

Remarks: This is one of the commonest species in southern Florida. It probably occurs throughout the State, but it appears to be present on a much smaller scale in the north. In the Homestead area in some years mass outbreaks on tomatoes and other truck crops can cause significant damage.

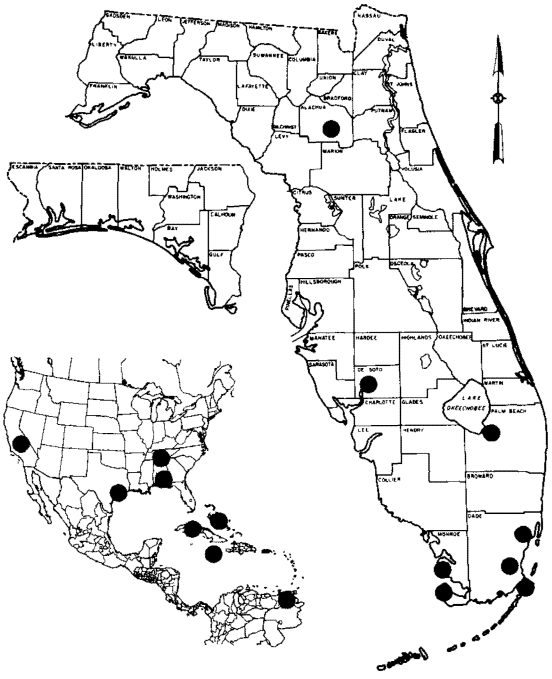


Fig. 266. Distribution of *Liriomyza munda*.

L. munda is clearly widespread throughout the Caribbean area. It is common in California and apparently also in the Gulf States, but the northern limit of its range remains to be established. It may also be present on Hawaii.

L. munda closely resembles *L. brassicae*, and adults of the two species may be difficult to distinguish, although the orbits are normally distinctly darkened in *brassicae*. It is immediately distinguishable from *trifolii* by the brilliantly shining black mesonotum and the darker upper corner of the orbits.

Material examined:

Florida: Alachua Co., Gainesville, one male, 25 April 1952 (O. Peck); Collier Co., Naples, one male, 16 Jan. 1961, ex watermelon (W.C. Adlerz); Dade Co., Hialeah - Miami, numerous specimens ex *Brassica rapa, Cajanus, Cassia, Cucumis* spp., *Cucurbita pepo, Ricinus communis, Bauhinia* sp., *Phaseolus* spp., *Vigna* spp., *Passiflora pallida, Plantago* sp., *Cestrum diurnum, Lycopersicum esculentum, Solanum nigrum, Hydrocotyle umbellata,* 1962-1964 (C.E.S.); Homestead, one male, two females, 28 March 1952 (G.S. Walley); Miami, Fairchild Tropical Garden, two males, 17 Oct. 1968 (K.A.S. and C.E.S.); DeSoto Co., Fort Ogden, male, 8 April 1952 (O. Peck); Monroe Co., Key Largo, two males, 31 March 1952 (J.R. Vockeroth); Cape Sable, one male, 31 March 1953 (W.R.M. Mason); Palm Beach Co., Belle Glade, two males, one female, ex *Pisum,* 29 Feb. 1961 (W.G. Genung).

Bahamas: Berry Is., Little Harbour Cay, one male, 1 May 1953; Cat Is., The Bight, one male, one female, 22 March 1953; Eleuthera Is., Hatchet Bay, two females, 2 April 1953; North Bimini Is., Alicetown, 30 Dec. 1952 (E.B. Hayden, L. Giovannoli & Rabb).

Cuba: Havana, one male, two females, ex *Parthenium hysterophorus,* 3-20 March 1968 (E. Rohdendorf).

Jamaica: Kingston, seven males, four females, 12 Dec. 1958, ex *Moringa oleifera* (K.A.S.).

Venezuela: Tocoron, Aragua, two males, two females, ex potato, 14 March 1961 (J. Hernandez); Guacara, one male, two females, ex black bean, 22 March 1961 (E. Doreste).

Liriomyza schmidti (Aldrich)

Fig. 267-271

Agromyza schmidti Aldrich, 1929: 80. Holotype male from Costa Rica in USNM.

Liriomyza schmidti, Frick, 1952a: 405; 1959: 409; Spencer, 1963a: 367; Stegmaier, 1966c: 119.

Adult: very small species, wing length 1.25 to 1.35 mm, last section of vein M3+4 from twice to 2½ times length of penultimate; frons and orbits entirely yellow, vti on yellow ground, vte at margin of black; jowls, face, antennae entirely yellow; mesonotum mat, grayish black in front, with central rectangular area adjoining scutellum yellow (Fig. 267); 3+1 developed dc, with a small fifth beyond, acr in four rows, normally not extending beyond black area; sides of thorax largely yellow but sternopleura black with yellow upper margin; legs: coxae and femora entirely yellow, tibiae and tarsi slightly darker, brownish; abdomen with tergites yellow laterally and on hind-margins; squamae and fringe dark.

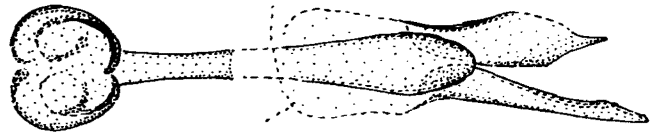
Male genitalia: aedeagus as in Figs. 268, 269, distinctly elongated, surstyli with three stout spines (Fig. 270).

Host plant/Biology: *Gliricidia maculata* (Leguminosae) in Costa Rica, larva making "serpentine mines;" in Florida *Albizzia lebbek, Bauhinia purpurea, Stizolobium deeringianum* (Leguminosae), *Bougainvillea spectabilis* (Nyctaginaceae), *Passiflora caerulea* (Passifloraceae), larva forming irregular, upper surface, epidermal mines which are characteristically silvery, pupating externally; puparium brown, posterior spiracles each with three similar, minute bulbs on a short conical projection.

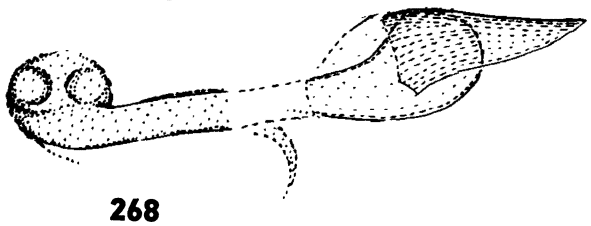
Distribution: Florida, Alachua Co., Dade Co., Gadsden Co., Hillsborough Co., Monroe Co.; Bahamas; Costa Rica; Jamaica.



267



269



268



270

Figs. 267-270. *Liriomyza schmidti*: 267, mesonotum; 268, aedeagus, side view (Florida, ex *Bauhinia*); 269, same, dorsal view (New Providence); 270, surstylus.

Remarks: This species belongs to the group with a yellow patch on the mesonotum adjoining the scutellum. It is readily distinguishable from the other species in this group known in Florida, *L. commelinae, L. marginalis* and *L. blechi* by the smaller size and mat grayish black mesonotum.

In addition to the host plants given above, Stegmaier (1966c) cites six further hosts in the families Apocynaceae, Euphorbiaceae, Liliaceae (*Smilax* sp.) and Rubiaceae on which leaf mines were found possibly referable to this species but from which no adults were reared. Spencer obtained larvae on *Smilax* sp., Gainesville, 6 Oct. 1968 but unfortunately also failed to rear any adults; however, examination of the puparia suggests that the species in this case definitely is *schmidti.*

It should perhaps be pointed out that the aedeagus of the paratype (Spencer, 1963a: Fig. 88a) is slightly more elongate and the distiphallus slightly smaller than in specimens from the Bahamas and Florida. However, the aedeagus is not considered to be of specific significance at this stage.

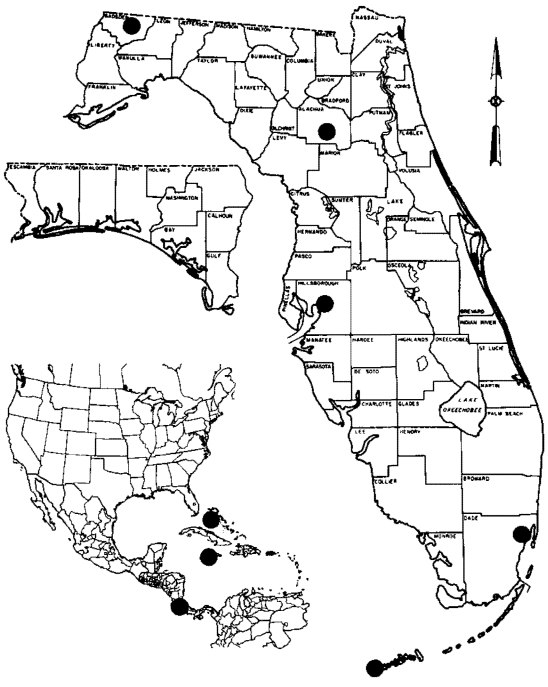


Fig. 271. Distribution of *Liriomyza schmidti.*

Material examined:

Bahamas: New Providence Is., Nassau, one male, 16 April 1953 (E.B. Hayden).

Florida: Alachua Co., Gainesville, larvae feeding on *Smilax* sp., 8 Oct. 1968 (K.A.S.); Dade Co., Miami, two males, two females, 17 Oct. 1962 ex *Albizzia lebbek* (C.E.S.); Hialeah, two males, four females, May 1963 ex leaf mines on *Bauhinia purpurea* leg. 28 April 1963 (C.E.S.); Miami, one male, one female, emerged 20 Oct. 1963 ex leaf mines on *Bougainvillea spectabilis* leg. 9 Oct. 1963 (C.E.S.); Hialeah, one female, emerged 23 July 1963 ex leaf mine on *Passiflora caerulea* leg. 12 July 1963 (C.E.S.); Gadsden Co., near Quincy, empty leaf mines on *Smilax* sp., 4 Oct. 1968 (K.A.S.); Hillsborough Co., Turkey Creek, empty leaf mines on *Albizzia* sp., 11 Dec. 1968 (D.A. Vaughan).

Jamaica: Kingston, Botanical Gardens, empty leaf mines on *Bougainvillea* sp., 12 Dec. 1958 (K.A.S.).

Liriomyza trifoliearum Spencer, sp.n.

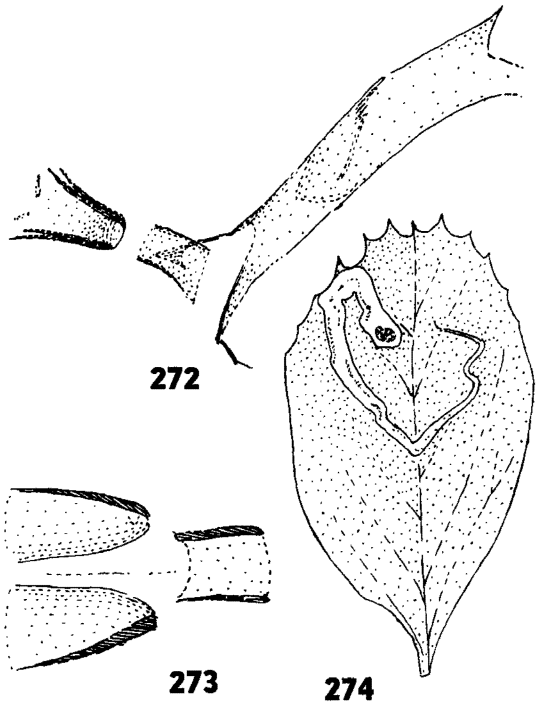
Fig. 272-275

Head: frons not projecting above eye in profile, but orbits well differentiated; two equal ors, two ori, the lower slightly weaker, incurved; orbital setulae sparse, in single row, reclinate; jowls deep, extended at rear, up to one-third height of eye; third antennal segment small, round, arista short, only weakly pubescent.

Mesonotum: 3+1 strong dc, third and fourth equal; acr in four rows.

Wing: length from 1.8 mm in male to 2.2 mm in female, last section of vein M 3+4 twice length of penultimate, first crossvein at midpoint of discal cell.

Color: frons orange yellow, orbits normally slightly darkened to lower ors, both vt on black ground; third antennal segment variable, virtually black in darkest specimens, more normally brownish yellow; meso-



Figs. 272-274. *Liriomyza trifoliearum*: 272, aedeagus, side view; 273, same, ventral view; 274, leaf mine on *Medicago sativa* (New York, enlarged).

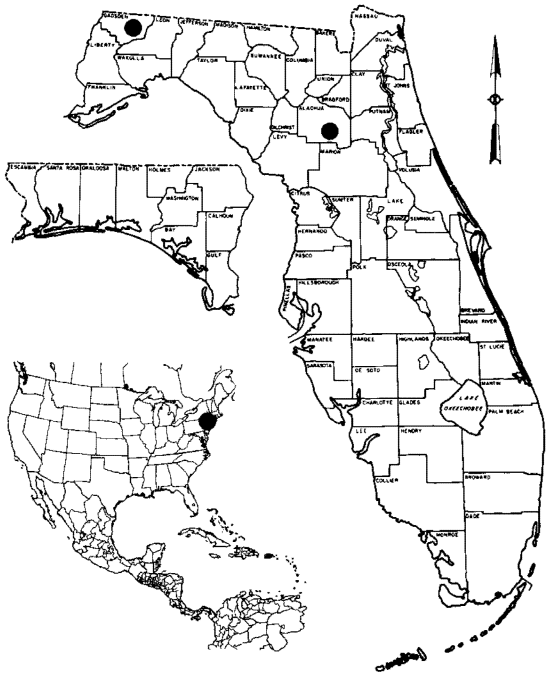


Fig. 275. Distribution of *Liriomyza trifoliearum*.

notum moderately shining black; mesopleura largely black, narrowly yellow along upper margin; legs: coxae, tibiae and tarsi black, femora basically yellow, particularly below, but variably darkened, possibly appearing largely black; abdomen shining black, all tergites with linear yellow hind margins; squamae gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 272, 273, surstyli with one strong bristle on inner corner.

Host plant/Biology: *Trifolium incarnatum*, *T. repens* and *Medicago sativa*, larva forming whitish, upper surface linear mine (Fig. 274), normally pupating externally, rarely in leaf; frass is deposited in conspicuous, isolated black lumps; puparium dark orange yellow.

Distribution: Florida, Alachua Co., Gadsden Co.; New York.

Material examined:

Holotype male, Florida, Gainesville, one male, 24 April 1964, ex leaf mine on *Trifolium repens*; paratypes: three males, four females, emerged 11-15 April 1964 ex leaf mines on *T. incarnatum* leg. 8 April; Gadsden Co., Quincy, one female, 13 May 1964 ex same host (all D.H. Habeck); New York, Ithaca, three females, 18 July, 24 Sept. and 2 Nov. 1968, caught on *Medicago sativa*; three males, three females, emerged 5-10 June 1969 ex alfalfa; five females, 28 May-9 June, caught on alfalfa (all A.G. Wheeler). Holotype and paratypes in USNM, further paratypes in FSCA, Cornell University, and senior author's collection.

I have also seen a series of 12 specimens reared from alfalfa at Ithaca (A.G. Wheeler) in the USNM.

Remarks: The largely black legs and mesopleura make this species immediately distinguishable from all others known in Florida. It is distinctly darker than *langei* Frick which occurs commonly in California and is widespread in South America. The species was previously misidentified as *pictella* Thomson (Spencer, 1966c: 19), which must now again be considered as restricted to its type locality in California.

L. trifoliearum is named from the subdivision *Trifolieae* of the *Papilionatae* which provide the only known host plants.

Liriomyza trifolii (Burgess)

Fig. 276-279

Oscinis trifolii Burgess, 1879: 201. Neotype male from Indiana, designated by Spencer, 1965a, in USNM.

Liriomyza trifolii, Frick, 1952a: 405; 1959: 410; Spencer, 1963a: 354 (as *archboldi* Frost); 1965a: 37; 1969a: 188.

Adult: orbits entirely yellow, both vt on yellow ground; all antennal segments bright yellow, third with inconspicuous pubescence; mesonotum blackish gray, distinctly mat, acr in three or four rows in front, reduced to two rows behind, yellow patch at each hind corner adjoining scutellum; mesopleura with black patch extending along lower margin; abdomen with tergites variably yellow laterally and on hind margins; legs: coxae yellow, femora largely so but with slight, variable brownish striation; tibiae and tarsi darker, brown; wing length from 1.25 mm in male to 1.9 mm in female, discal cell small, last section of vein M 3+4 three times length of penultimate.

Male genitalia: aedeagus as in Fig. 276, 277, surstyli (Fig. 278) with single strong spine and several hairs at end.

Host plant/Biology: a highly polyphagous species, with records in Florida (Stegmaier, 1966a) on Caryophyllaceae, Chenopodiaceae, Compositae, Cucurbitaceae, Leguminosae, Amaryllidaceae (as Liliaceae), Malvaceae, Solanaceae, Umbelliferae, Zygophyllaceae; also Gramineae (*Avena*); larva forms upper surface linear mine, pupating externally; posterior spiracles of puparium each with three bulbs.

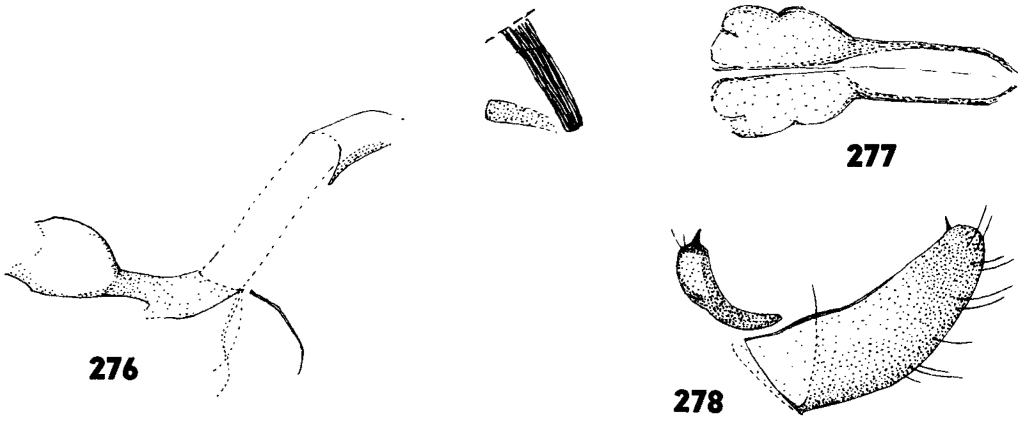
Distribution: Florida, Collier Co., Dade Co., DeSoto Co., Gadsden Co., Highlands Co., Monroe Co., Palm Beach Co., Seminole Co.; District of Columbia, Indiana; Canada: Ontario; Bahamas.

Remarks: This species occurs in abundance in southern Florida; it is readily distinguishable from the other equally common species, *L. munda*, by the entirely yellow upper orbits and the distinctly mat, grayish mesonotum. Although the hosts include a wide range of families, the most favored families appear to be Compositae, followed by Leguminosae. *L. trifolii* has a number of hosts in common with *L. munda*, but the leaf mines of *trifolii* are generally longer.

The known northern limit of *trifolii* is Ontario; it appears to be widespread in the Bahamas but is not known elsewhere in the Caribbean nor in South America.

Material examined:

Florida: Collier Co., Immokalee, two males, two females, 3 Sept. 1961, ex *Cucumis* sp. (W.C. Adlerz); Dade Co., Hialeah, numerous specimens, ex *Phaseolus* sp., *Pisum* sp., *Cucumis* sp., *Cucurbita* sp., *Capsicum* sp., *Solanum nigrum, Tribulus terrestris, Baccharis halimifolia, Dahlia* sp., *Erechtites hieracifolia, Eupatorium coelestrinum, Lactuca* sp., *Tagetes* sp., *Zinnia*



Figs. 276-278. *Liriomyza trifolii*: 276, aedeagus, side view; 277, same, ventral view; 278, surstylus.

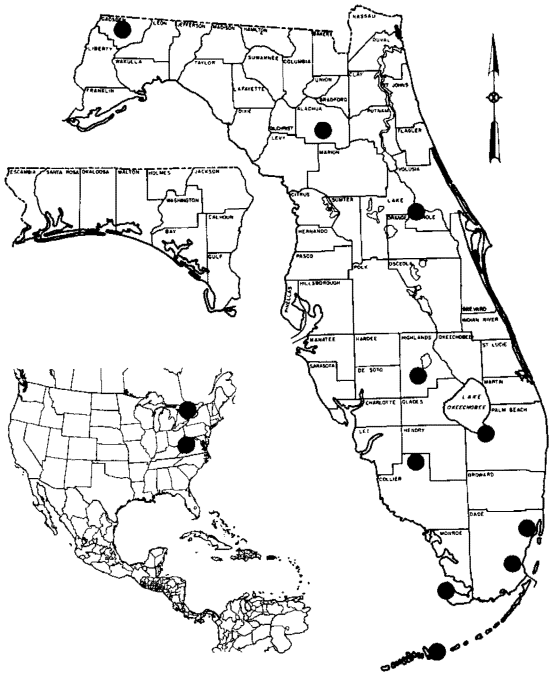


Fig. 279. Distribution of *Liriomyza trifolii.*

sp., Aug. 1962-Sept. 1963 (C.E.S.); Hialeah, one female, 13 March 1963 ex *Avena sativa* (C.E.S.); Miami, specimens ex *Kallstroemia maxima, Bidens pilosa, Flaveria trinervia, Gerbera jamesoni, Tridax procumbens,* Aug. 1962 - May 1963 (C.E.S.); Homestead, nine males, 28 March - 4 April 1952 (G.S. Walley); Florida City, two males, three females, 30 March 1953 (W.R.M. Mason); DeSoto Co., Fort Ogden, two males, 8 April 1952 (O. Peck); Highlands Co., Archbold Biological Station, two males, 3 March 1969 and 4 April 1969 (S.W. Frost); Monroe Co., Cape Sable, one female, 31 March 1953 (W.R.M. Mason); Bahia Honda Key, males and females, ex *Gaillardia aristata,* Aug. 1963 (C.E.S.); West Summerland Key, one female, 15 Oct. 1968 (K.A.S. and C.E.S.); Seminole Co., Sanford, two males, 18 Dec. 1964 ex *Daucus carota* (G. W. Desin).

Bahamas: Andros Is., Berry Is., Eleuthera Is., Great Inagua Is., New Providence Is., Rum Cay, three males, 22 females, 31 Jan - 1 May 1953 (E.B. Hayden and L. Giovannoli).

GENUS *PTERIDOMYZA* NOWAKOWSKI

Pteridomyza Nowakowski, 1962: 97; Spencer, 1969a: 200. Type of genus: *Agromyza hilarella* Zetterstedt, 1848.

This is a monotypic genus erected by Nowakowski for *P. hilarella* on the basis of its aberrant genitalia. On external characters the genus can be recognized by the following combination of characters: orbits in same plane as frons, frons, third antennal segment and legs yellow, mesonotum and scutellum black, 3+1 dc, vein M 1+2 ending nearest wing tip, second cross-vein present.

Pteridomyza hilarella (Zetterstedt)

Fig. 280, 281

Agromyza hilarella Zetterstedt, 1848: 2776. Lectotype female designated by Spencer, 1969a from Sweden in collection of University, Lund, Sweden.

Dizygomyza (Praspedomyza) hilarella, Hendel, 1931-6: 82.

Pteridomyza hilarella, Nowakowski, 1962: 97; Spencer, 1969a: 200.

Agromyza clara Melander, 1913: 265. Holotype male in USNM.

Phytobia (Praspedomyza) clara, Frick, 1952a: 395; 1959: 394.

Agromyza citreifrons Malloch, 1913: 290; Frick, 1952a: 395.

Adult: small, variable species, wing length 2 mm, costa extending to vein M1+2, last M4 section 1½ to 2 times length of penultimate; frons normally bright yellow but sometimes darker above; upper orbits blackish, distinctly projecting above eye towards base of antennae; third antennal segment either yellow or distinctly brownish; mesonotum mat black, with 3+1 dc and acr in four rows; mesopleura and all legs bright yellow; scutellum black.

Male genitalia: aedeagus as in Fig. 280, surstyli bearing a row of 10 strong bristles.

Host plant/Biology: *Pteridium aquilinum,* larva forming whitish mine following edge of a section of a frond, pupating externally.



Fig. 280. *Pteridomyza hilarella*: aedeagus.

Distribution: Florida, Duval Co., Gadsden Co.; widespread in United States; Canada; Europe. New to Florida.

Remarks: This is an isolated species with a predominantly northern distribution, and the two records from Florida represent a significant extension of its range to the south.

Material examined:

Florida: Duval Co., Orange Park, one female, 25 March 1952 (O. Peck); Gadsden Co., Mount Pleasant, one female, 1 May 1952 (O. Peck).

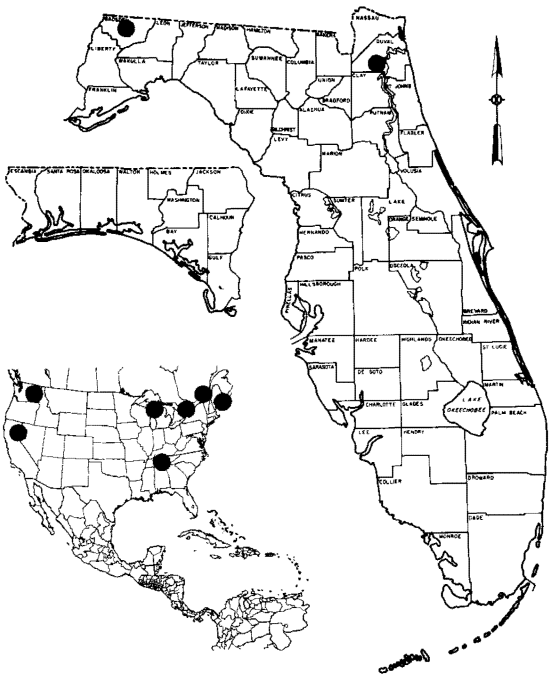


Fig. 281. Distribution of *Pteridomyza hilarella*.

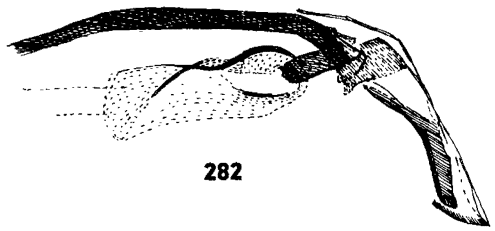


Fig. 282. *Haplomyza minuta* (ex *Amaranthus*): aedeagus.

GENUS *HAPLOMYZA* HENDEL

Antineura Melander, 1913: 219. Type of genus *A. togata* Melander.

Haplomyza Hendel, 1914: 73, nom. nov. for *Antineura* Melander, not Osten-Sacken, 1881; Frick, 1952a: 408; 1953a: 73; 1959: 412; Spencer, 1963a: 373; 1969a: 200.

Frick (1959) differentiated this genus from *Liriomyza* on the basis of four characters: mesonotum mat gray; acrostichals sparse, in two rows; second cross-vein absent; a single reclinate upper orbital. He correctly noted that the male genitalia are distinctively different from those of typical *Liriomyza* species. Spencer (1963a) found that two new species from Brazil do not conform to Frick's definition, having the mesonotum black, largely shining and in one case acrostichals in five rows.

Steyskal is currently revising this genus. There is doubt about the identity of the type of the genus, *togata*, with which *H. minuta* (p.p.) was synonymised by Frick (1953a). Frick differentiated as *togata* the species feeding on *Chenopodium* and as *minuta* that on *Amaranthus*. Pending further clarification by Steyskal, the name *minuta* is therefore retained for the species occurring commonly in Florida on *Amaranthus* species.

The most certain means of differentiating the species of this compact group appears to be from leaf mines and larval or pupal characters. Differences in genitalia are so slight that with the limited material studied, it is not certain that they will provide a reliable method of identification.

Haplomyza minuta (Frost)

Fig. 282, 283

Phytomyza minuta Frost, 1924: 86. Lectotype female from North Dakota in USNM.
Haplomyza minuta Frick, 1953a: 73; Spencer, 1969a: 201 (as *togata* Melander).

Adult: essentially as in *H. philoxeri,* possible points of difference being the slightly stronger dc and consistently paler squamae in *minuta.*

Male genitalia: aedeagus simplified, consisting of two membranous flaps basally, with colorless tubular distiphallus beyond (Fig. 282); ninth sternite elongate (cf. Fig. 285); surstyli with three short teeth-like spines.

Host plant/Biology: *Amaranthus* species, (Stegmaier, 1967d: 197, as *togata* Melander), *Chenopodium album,* larva forming initial upper surface linear mine, which later develops into an irregular blotch, pupating externally; puparium yellowish brown, posterior spiracles each with an ellipse of 9-12 minute bulbs.

Distribution: Florida, Dade Co.; widespread in United States; Canada.

Remarks: This species is not distinguishable on external characters from *H. philoxeri,* but the leaf mine and puparium are entirely different, and there are also small but distinct differences in male genitalia.

Frick (1953a) associated a series reared by him in California from *Chenopodium* with the caught lectotype of *minuta,* and subsequent authors have accepted the species occurring commonly on *Amaranthus* as identical with *minuta* (misidentified as *togata* Melander).

Re-examination of specimens from Canada suggests that they may represent a further species in this complex; they are larger, the third antennal segment is lemon yellow and the mesonotum paler, almost silvery gray.

Material examined:

Florida: Dade Co., Miami, four males, four females, 27 Sept. 1963 ex leaf mines on *Amaranthus gracilis* and *A. spinosus,* leg. 18 Sept. 1963 (C.E.S.); Homestead, one male, 17 Oct. 1968 ex *A. spinosus,* leg. 14 Oct. 1968 (K.A.S.).

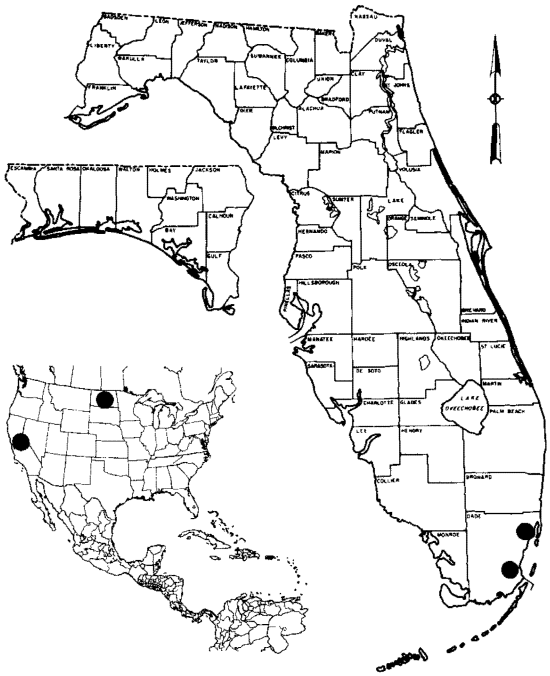


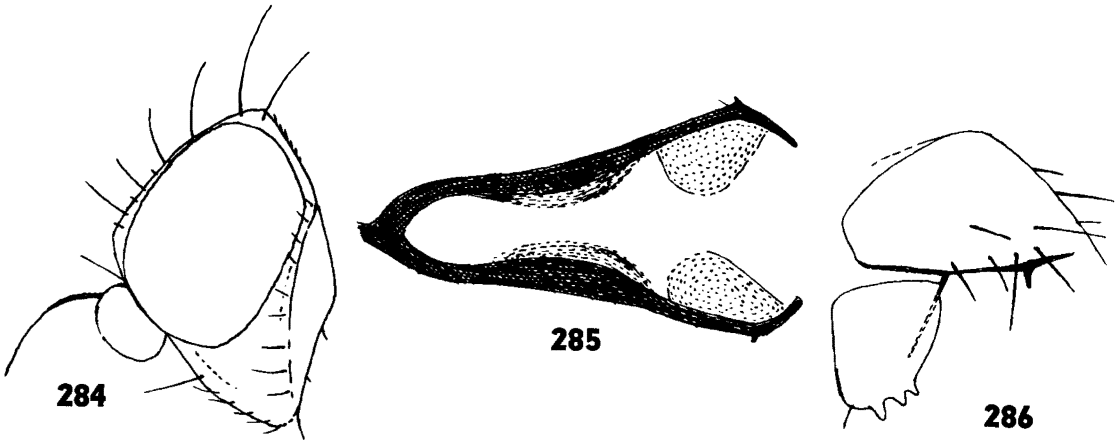
Fig. 283. Distribution of *Haplomyza minuta.*

Haplomyza philoxeri Spencer, sp.n.

Fig. 284-287

Head (Fig. 284): frons orange yellow, upper orbits either similar or grayish, with both vt on dark ground; one reclinate ors, three incurved ori, the lower somewhat weaker; orbital setulae minute, sparse, reclinate; eye somewhat slanting, jowls extended at rear; third antennal segment small, round, orange yellow or slightly brownish; arista short, bare, distinctly thickened at base.

Thorax: mesonotum mat grayish black, with 3+1 dc, the third and fourth small; acr sparse, in two rows; humerus yellow behind, notopleural area yellowish gray, mesopleura grayish below, more yellow above; scutellum yellow centrally, variably grayish black laterally.



Figs. 284-286. *Haplomyza philoxeri*: 284, head; 285, ninth sternite; 286, surstylus.

Wing: length from 1.25 mm in male to 1.5 mm in female; costa extending strongly to vein M 1+2, second cross-vein lacking; squamae silvery white, fringe pale but margin may be darker, distinctly differentiated.

Legs: almost entirely yellow, though tibiae and tarsi possibly slightly darker, more brownish.

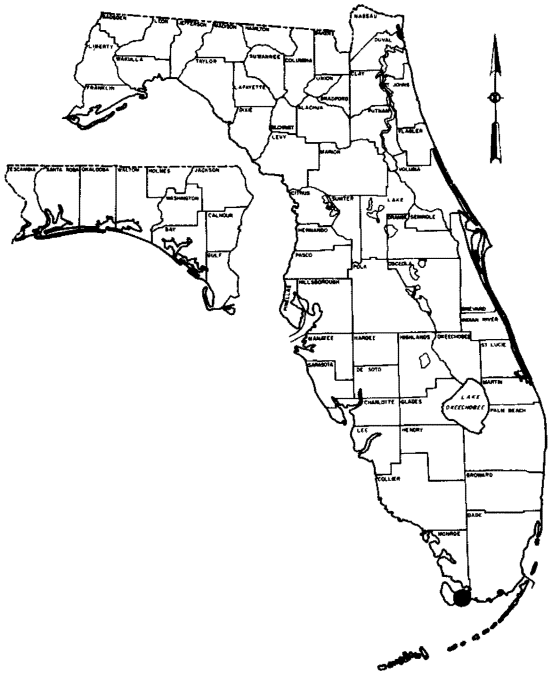


Fig. 287. Distribution of *Haplomyza philoxeri*.

Male genitalia: aedeagus simplified, with basal membranous flaps but without detectable distiphallus; ninth sternite elongate (Fig. 285), surstyli with three reduced, teeth-like bristles and one hair (Fig. 286); sperm sac with blade largely linear.

Host plant/Biology: *Philoxerus vermicularis*, larva forming exit hole and then pupating short distance back in the mine; puparium white, fragile, posterior spiracles each with an ellipse of 9-12 minute bulbs.

Holotype male, Florida, Monroe Co., Flamingo, near camping site, emerged 29 Oct. 1968 ex *Philoxerus vermicularis* leg. 13 Oct. 1968; paratypes: three females, emerged 23-27 Oct., otherwise same data (all K.A.S.). Holotype in USNM, one paratype in FSCA, two in senior author's collection.

Remarks: This species is not satisfactorily distinguishable on external characters from *H. minuta* and there are also only slight differences in genitalia. However, the leaf mines on *Philoxerus*, with pupation internally, and also the white puparium are entirely distinct.

H. philoxeri will be limited to coastal areas in association with its food plant, and the locality where specimens are found normally will give a clear indication as to which of the two species occurring in Florida is represented.

A distinct species occurring in Brazil on *Philoxerus portulacoides* is being described by Steyskal.

GENUS *PHYTOLIRIOMYZA* HENDEL

Liriomyza (*Phytoliriomyza*) Hendel, 1931-6: 203. Type of subgenus: *Agromyza perpusilla* Meigen.

Phytoliriomyza, Frey, 1941: 19; Frick, 1952a: 410; 1959: 413; Spencer, 1965c: 657-663; 1969a: 201.

Xyraeomyia Frick, Spencer, 1965c: 662.

Fifteen world species are known in this genus, with three recorded below in Florida, two of which are new. The scutellum is generally dark, and the orbital setulae are proclinate, differentiating the genus from *Liriomyza.*

Key to Florida *Phytoliriomyza* species

1 Third antennal segment conspicuously pubescent ..... *pilosella* Spencer

1′ Third antennal segment appearing bare.... 2

2 Very small species, wing length 1.3 mm; last section of vein M3+4 one and two-thirds length of penultimate .... *floridana* Spencer

2′ Larger species, wing length up to 1.8 mm; last section of vein M3+4 shorter, at most one and a half times length of penultimate ..... *imperfecta* (Malloch)

Phytoliriomyza floridana Spencer, sp.n.

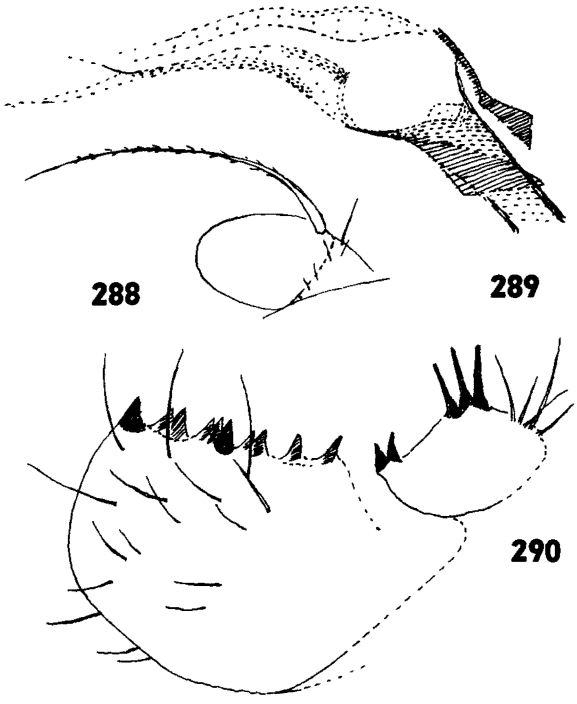
Fig. 288-291

Head: orbits not projecting above eye, with one ors and two ori, orbital setulae minute, sparse, proclinate; eye large, slanting; third antennal segment (Fig. 288) large, narrowing distally, not significantly pubescent, arista long, with slight but distinct pubescence.

Mesonotum: 3+1 strong dc, acr sparse, in two rows, not extending beyond third dc.

Wing: length 1.3 mm, last section of vein M3+4 one and two-thirds length of penultimate, in ratio 15:9.

Color: frons yellowish brown, orbits more grayish; first and second antennal segments yellow, third largely black but slightly yellow toward base; mesonotum and scutellum uniformly mat gray; pleura largely yellow, mesopleura blackish gray in lower third, yellow above; legs: mostly yellow but femora



Figs. 288-290. *Phytoliriomyza floridana*: 288, third antennal segment; 289, aedeagus; 290, surstylus.

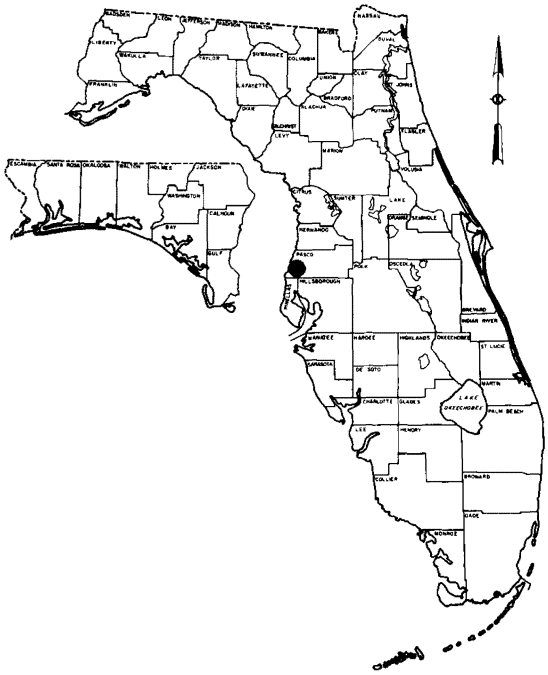


Fig. 291. Distribution of *Phytoliriomyza floridana.*

darker, blackish above; squamae yellowish gray, fringe pale; halteres yellowish brown, the knob distinctly darkened.

Male genitalia: aedeagus as in Fig. 289, distiphallus ending in two broad, pale, asymmetrical tubules; ninth sternite with narrow side arms, U-shaped, surstyli (Fig. 290) with three slender bristles on outer corner and two shorter ones below, inner margin of epandrium with a row of 10 or more stout bristles.

Holotype male, Florida, Elfers, Pasco Co., 16 Apr. 1952 (O. Peck), in CNC.

Remarks: This species closely resembles both *imperfecta* and *pilosella*. The single available specimen is smaller than *imperfecta*, but the two species can only be distinguished reliably by the male genitalia; the larger, virtually bare third antennal segment and the shorter last section of M3+4 make *floridana* more readily distinguishable from *pilosella*.

The broad, asymmetrical tubules of the distiphallus are similar to those of *P. picea* Spencer (1963a:380) from Brazil; the same form also is found in *P. oasis* (Becker) from the Mediterranean area and *P. immoderata* Spencer (1963c:117) from South Africa.

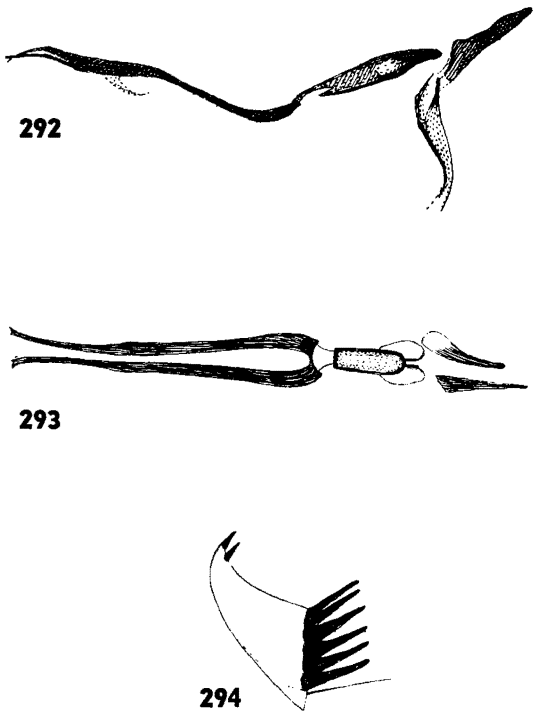
Phytoliriomyza imperfecta (Malloch)

Fig. 292-295

Agromyza imperfecta Malloch, 1934: 475.
Holotype female from Chile in USNM.
Liriomyza imperfecta, Frick, 1952a:403.
Phytoliriomyza imperfecta, Shewell, 1953: 468; Spencer, 1963a:379.

Adult: essentially as in *P. floridana* but larger, with wing length up to 1.8 mm in male; last section of vein M3+4 shorter, 1½ times penultimate.

Male genitalia: aedeagus ending in two distinctive black tubules (Fig. 292, 293), surstyli with a conspicuous comb of black bristles along inner margin and one or two shorter bristles at hind corner (Fig. 294); two stout bristles and about 20 minute ones on inner face of epandrium.



Figs. 292-294. *Phytoliriomyza imperfecta*: 292, aedeagus, side view; 293, same, ventral view; 294, surstylus.

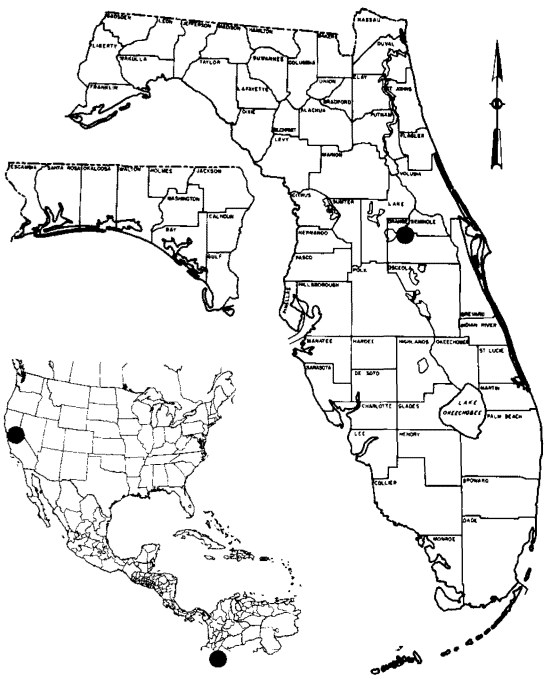


Fig. 295. Distribution of *Phytoliriomyza imperfecta*.

Host plant/Biology: unknown.

Distribution: Florida, Orange Co.; Chile, California. New to Florida.

Remarks: This species closely resembles *P. floridana* but appears to be distinctly larger. The male genitalia are entirely distinctive. The previously known distribution limited to Chile and California was somewhat surprising. The extension of the range to Florida suggests that *imperfecta* may be a widespread, though uncommon, species.

Material examined:

Florida: Orange Co., Orlando, one male, 14 Feb. 1918 (J.M. Aldrich).

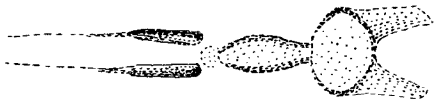
Phytoliriomyza pilosella Spencer, sp.n.

Fig. 296-300

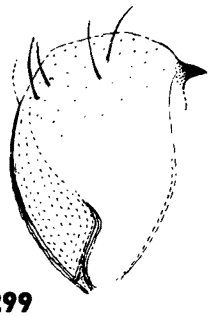
Adult: closely resembling *P. floridana* with only following points of difference: third antennal segment (Fig. 296) small, round, with conspicuously long, whitish upturned pubescence; last section of vein M3+4 twice length of penultimate.

Male genitalia: aedeagus ending in long, paired, coiled tubules (Figs. 297, 298), a single stout black bristle at lower corner of epandrium (Fig. 299), ninth sternite with slender side arms, U-shaped.

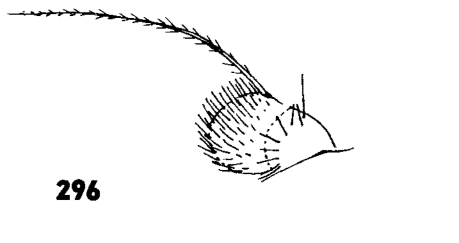
Holotype male, Puerto Rico, El Yunque, 20-22 March 1954 (J. Maldonado & S. Medina); paratypes: one female, same data as holotype; Florida, Dade Co., farm near Royal Palm Hammock, one female, 4 Dec. 1961 (Munroe, Holland & Chillcott); Costa Rica,



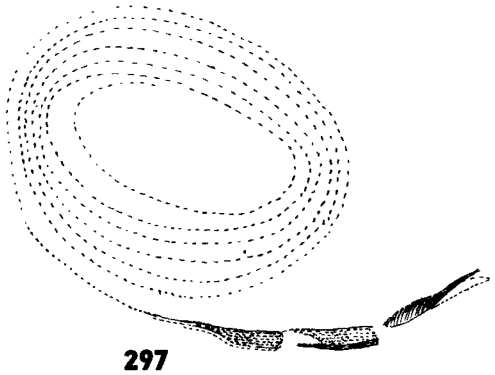
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Figs. 296-299. *Phytoliriomyza pilosella*: 296, third antennal segment; 297, aedeagus, side view; 298, same ventral view; 299, epandrium.

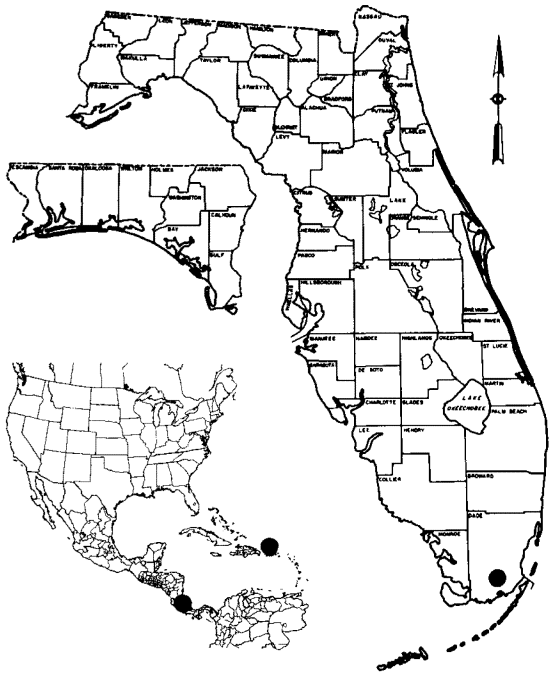


Fig. 300. Distribution of *Phytoliriomyza pilosella*.

La Caja, 8 km. W. of San José, 6 males, 16 females, 1930 (Schmidt). Holotype in USNM, paratypes in USNM, DEI, FSCA and senior author's collection.

Remarks: Although closely resembling both *P. imperfecta* and *P. floridana*, the small, pilose third antennal segment makes this species readily recognizable. The long, coiled aedeagus is as found in *arctica*, but the form of ninth sternite and the chaetotaxy of the epandrium is entirely distinct in the two species.

GENUS *PHYTOMYZA* FALLÉN

Phytomyza Fallén, 1810: 21. Type of genus: *Phytomyza flaveola* Fallén = *obscurella* Fallén, 1823b, by subsequent designation of Coquillett.

This is the largest world genus with 400 species and is dominant in temperate areas of the Nearctic and Palaearctic Regions. Only nine species are known in the Neotropical Region but 68 in the Nearctic Region. Seven species are now recorded in Florida: one is new, and the other six are clearly of northern origin.

Four species in the closely-related complex feeding as leaf miners on *Ilex* species occur in Florida; the adults in some cases cannot be distinguished on external characters, and the key provided by Kulp (1968: 8) has not proved entirely reliable with the material examined by the senior author. Additional characters have been used . . . in the key given below, but a certain identification of individually caught specimens will not be possible with this key alone. The male genitalia show small but constant differences. However, these species can most satisfactorily be identified from the larval leaf mines which are highly characteristic, even though there is overlapping in host plants between some of the species.

The proclinate orbital setulae and termination of the costa at vein R4+5 are the essential characters of this genus, and the second cross-vein is absent in all except a small number of species known from Europe.

Key to Florida *Phytomyza* species

1 Frons yellow 2

1′ Frons dark, brownish or black 3

2 Coxae black; acr in 4 or 5 rows ..... *orlandensis* Spencer

2′ Coxae yellow; acr absent ..... *plantaginis* R.-D.

3 One ors, acr in 2 rows ..... *thalictrivora* Spencer

3′ Two ors, acr in 4-5 rows 4

4 Mesonotum conspicuously gray 5

4′ Mesonotum more obviously black; leaf miner on *Ilex vomitoria* ..... *vomitoriae* Kulp

5 Very small species, wing length from 1.5 mm in male to 1.7 mm in female; mesonotum ash gray; leaf mine essentially linear 6

5′ Larger species, wing length from 1.65 to 2.3 mm; mesonotum paler, silvery gray; leaf mine an irregular linear blotch on *Ilex opaca* (Fig. 303) ..... *ilicicola* Loew

6 Male genitalia: mesophallus conspicuously narrow and elongate (Fig. 318); leaf mine linear, though widening at end (Fig. 319); host plants *Ilex verticillata* and *Ilex* sp. indet. (hard-leaved) ..... *verticillatae* Kulp

6′ Male genitalia: mesophallus shorter, broader (Fig. 306); leaf mine long, narrow, serpentine (Fig. 307); host plant *Ilex opaca* ..... *opacae* Kulp

Phytomyza ilicicola Loew

Fig. 301-304

Phytomyza ilicis Loew, 1863: 54.

Phytomyza ilicicola Loew, 1872: 290, nom. nov. for *ilicis* Loew, not Curtis, 1846; Frick, 1957: 205; 1959: 429; Kulp, 1968: 16; Spencer, 1969a: 246.

Lectotype female designated by Frick, 1957 from District of Columbia ex *Ilex opaca* in MCZ.

Adult: frons black below, normally somewhat paler, more brownish above; orbits yellowish on inner margin, blackish gray adjoining eye, sometimes but not invariably, raised above eye margin; jowls yellowish gray, deepest at rear; all antennal segments black; mesonotum conspicuously pale, silvery grayish in front, somewhat darker at rear, acr in 4 or 5 rows, intra-alar setulae sparse, normally less than ten; wing length from 1.65 mm in male to 2.3 in female, second costal section from 2½ to 3 times length of fourth; legs: coxae and femora black, tibiae pale, yellowish brown, tarsi darker brown; squamae yellowish gray, margin darker, black, fringe dark ochrous to black.

Male genitalia: aedeagus as in Fig. 301, 302, hypophallus large.

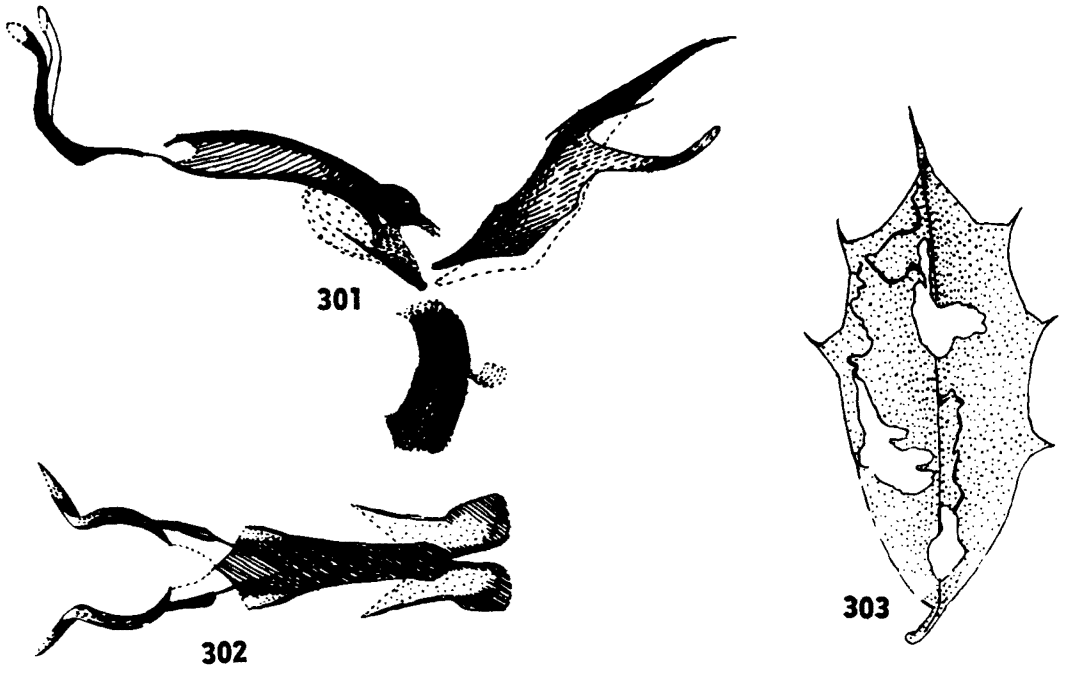
Host plant/Biology: *Ilex opaca,* larva forming first instar linear mine later developing into an irregular blotch (Fig. 303), pupating in mine; the adults emerge in early spring, and the larvae feed slowly throughout the summer, overwintering either in the third instar or in the pupal stage (Kulp, 1968: 19).

Distribution: Florida, Alachua Co., Highlands Co., Volusia Co.; widespread in United States. New to Florida.

Remarks: This is one of the larger species in the group of *Ilex* miners and is distinguishable by the conspicuously pale, silvery gray mesonotum. Before the complex had been clarified by Kulp, Frick (1959) and Spencer (1969a) discussed *ilicicola,* but Frick certainly included *vomitoriae* in his concept, and the specimens seen by Spencer from Ontario in fact represent either *verticillatae* or a further undescribed species.

Kulp states that *ilicicola* has only a single generation, but it will be interesting to establish whether this is invariably so. The specimens recorded below both in January and in March suggest there may be at least two generations in Florida.

Females reared by Prof. Frost ex *Ilex arenicola* at the Archbold Biological Station, Highlands Co., 4 April 1962 almost certainly represent *ilicicola,* but it is desirable that males should be examined in due course to confirm this.



Figs. 301- 303. *Phytomyza ilicicola*: 301, aedeagus, side view; 302, same, ventral view; 303, leaf mine on *Ilex opaca.*

Material examined:

Florida: Alachua Co., Gainesville, four males, two females, 13-15 March 1964 ex leaf mines on *Ilex ?opaca* (L. Mull); two males, three females, 29 March 1969 ex leaf mines on *Ilex opaca* (J.R. Strayer); Volusia Co., De Land, one male, two females, 22 Jan. 1964 ex same host (G.W. Desin).

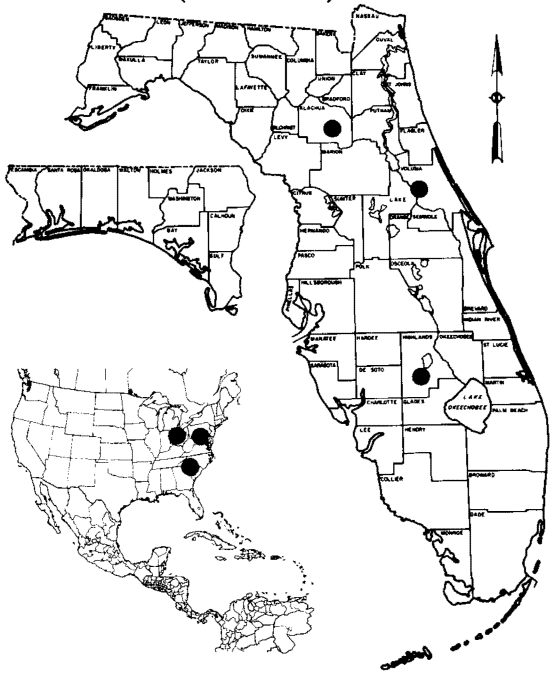


Fig. 304. Distribution of *Phytomyza ilicicola*.

Phytomyza opacae Kulp

Fig. 305-308

Phytomyza opacae Kulp, 1968: 21. Holotype male from Maryland in USNM.

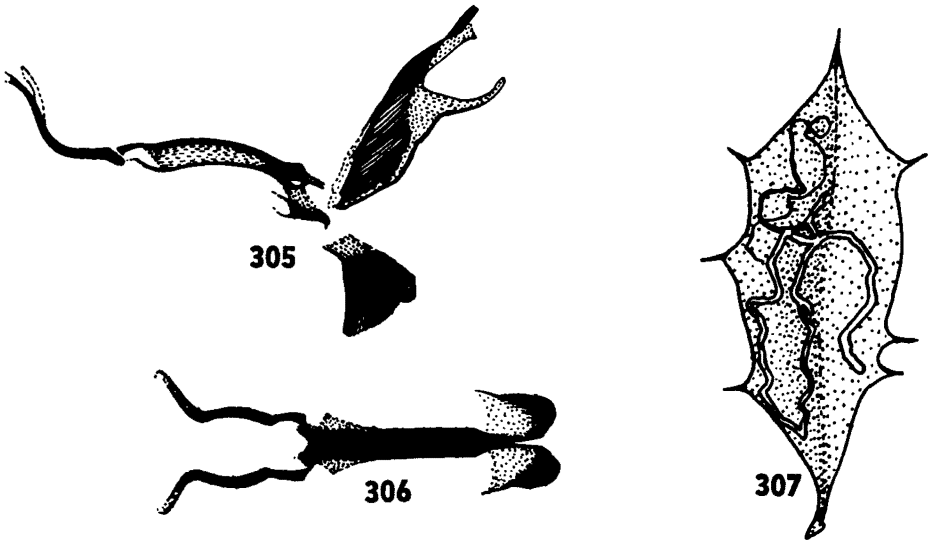
Adult: small species, wing length about 1.7 mm, second costal section 2.2 to 2.6 times length of fourth; jowls gray to brown; mesonotum distinctly gray, acr in four rows; legs: femora black, knees yellow, tibiae and tarsi distinctly yellowish brown.

Male genitalia: aedeagus as in Figs. 305, 306, mesophallus relatively broad, hypophallus of medium size.

Host plant/Biology: *Ilex opaca, I. cumulicola,* larva forming long, narrow, winding linear mine (Fig. 307), pupating in leaf.

Distribution: Florida, Gadsden Co., Liberty Co.; Maryland. New to Florida.

Remarks: This species was recognized as distinct from *P. ilicicola* and others in the group by the distinctive form of leaf mine. Differences in the adults are slight. *P. opacae* is smaller than *P. ilicicola,* and the mesonotum is less conspicuously gray; on external characters it cannot be separated from *P. verticillatae.* However, it is readily distinguishable from *P. vomitoriae,* in which the mesonotum is distinctly more blackish.



Figs. 305-307. *Phytomyza opacae*: 305, aedeagus, side view; 306, same, ventral view; 307, leaf mine on *Ilex opaca* (Florida).

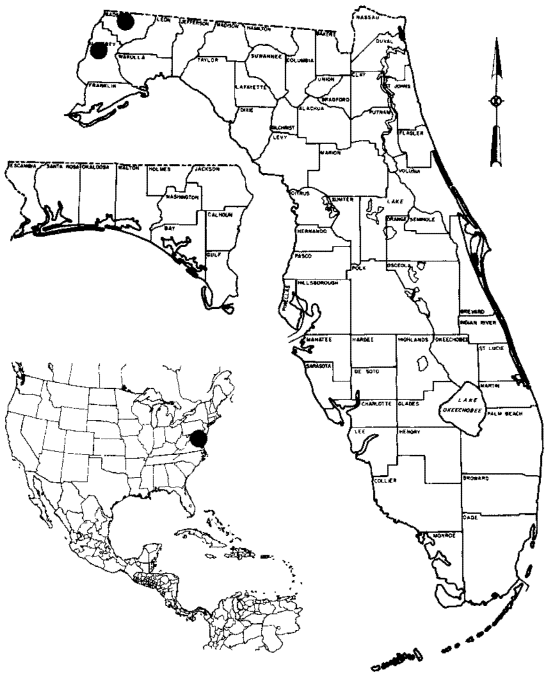


Fig. 308. Distribution of *Phytomyza opacae.*

Old leaf mines were not uncommon in the Torreya State Park and also at the Tall Timbers Experiment Station, Gadsden Co. in October 1968 (K.A.S.).

Material examined:

Florida: Liberty Co., Torreya State Park, two males, two females, emerged 15-17 May 1964 ex leaf mines on *Ilex opaca* leg. 13 May 1964 (C.E.S. and H.V. Weems Jr.); empty leaf mines, 4 Oct. 1968 (K.A.S.); Gadsden Co., Tall Timbers Experiment Station, empty leaf mines, 3 Oct. 1968 (K.A.S.).

Phytomyza orlandensis Spencer, sp.n.

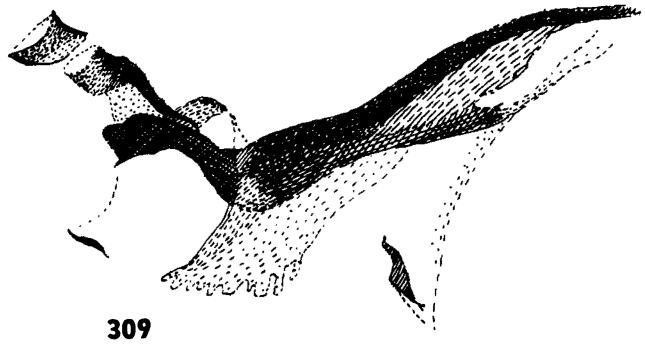
Fig. 309-311

Head: frons twice width of eye, not projecting above eye in profile; two equal, reclinate ors, two largely incurved ori; orbital setulae in single row, proclinate; jowls deepest at rear, between one-quarter and one-fifth vertical height of eye; cheeks forming broad ring below eye; third antennal segment quadrate, distinctly longer than broad, finely pubescent, arista slightly pubescent (missing apart from basal half on one antenna); mouth margin normal, no epistoma present.

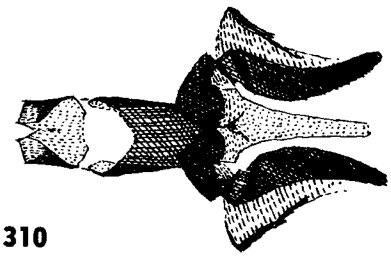
Mesonotum: 3+1 strong dc, acr irregular, in some four or five rows.

Wing: length in male 2.2 mm, second costal section just less than twice length of fourth.

Color: frons yellow, orbits similar but slightly paler; both vertical bristles on black ground; jowls and face yellow though antennal depressions slightly grayish; first and second antennal segments yellowish, third entirely black; palps black; mesonotum and scutellum mat grayish black, sides of thorax essentially similar but humerus and notopleural triangle faintly brownish and upper margin of mesopleura narrowly yellow; legs black, all knees yellow; abdomen brownish black, hind margins of tergites narrowly yellow; squamae and fringe yellow though margin slightly darker.



309



310

Figs. 309, 310, *Phytomyza orlandensis*: 309, aedeagus, side view; 310, same, ventral view.

Male genitalia: aedeagus as in Fig. 309, 310.

Host plant/Biology: unknown; puparium reddish brown, posterior spiracles each with an ellipse of 15-20 minute bulbs.

Holotype male, Florida, Orange Co., Orlando, "6.10.30" (F.S. Blanton), in FSCA.

Remarks: In the author's (1969a) key to Canadian *Phytomyza* species, *P. orlandensis* runs to couplet 36 where it can be differentiated from *P. aquilegiana* Frost and *P. banffensis* Sp. by the following extension:

36 Third antennal segment round ..... *aquilegiana* Frost
— Third antennal segment longer than broad 36a
36a Jowls deep, almost half eye height ..... *banffensis* Spencer
— Jowls narrower, one quarter to one-fifth eye height ..... *orlandensis* Spencer

The male genitalia clearly indicate that *orlandensis* and *banffensis* are sibling species. The distinctive form of aedeagus is not known in any other species. It seems probable that speciation occurred when the ancestral form became divided into isolated populations at some point early in the Pleistocene.

The single available specimen of *P. orlandensis* is mounted together with a puparium (not, however, from which it emerged, as it still contains the remnants of a dead parasite), but unfortunately there is no record of the host from which the species was reared.

Phytomyza plantaginis Robineau-Desvoidy

Fig. 312-314

Phytomyza plantaginis Robineau-Desvoidy, 1851: 404; Hendel, 1931-6: 455; Frick, 1959: 434; Spencer, 1969a: 268. Types from France believed lost.

Adult: frons yellow, orbits distinctly projecting above eye toward base of antennae; third antennal segment large, elongated, black, first and second segments yellow; mesonotum mat gray, acr entirely lacking or at most one or two isolated hairs; legs: forecoxae bright yellow, femora black but all

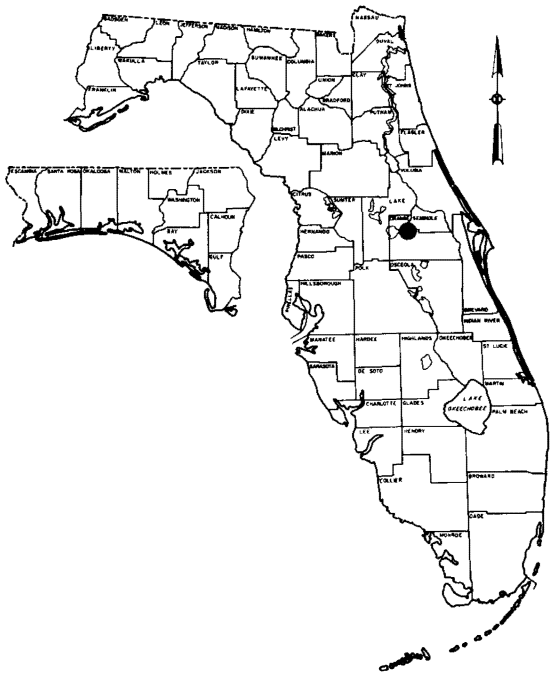
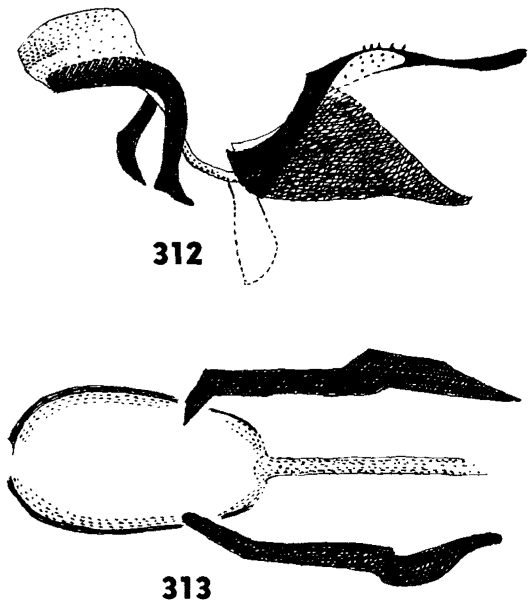


Fig. 311. Distribution of *Phytomyza orlandensis*.



Figs. 312, 313. *Phytomyza plantaginis*: 312, aedeagus, side view; 313, distiphallus, ventral view.

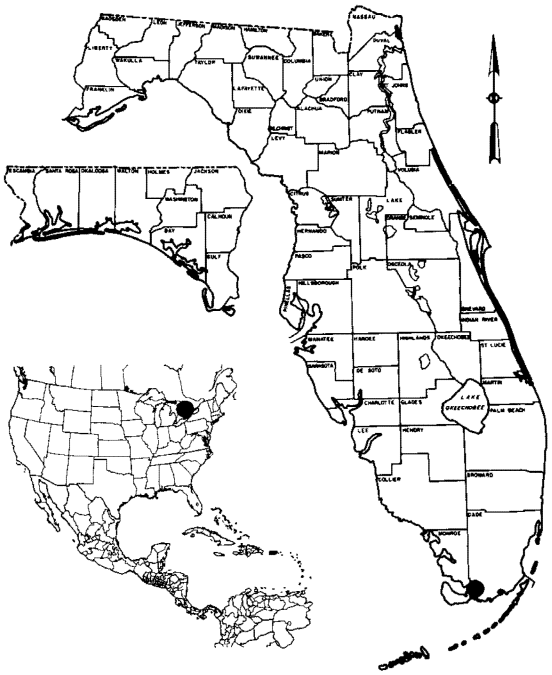


Fig. 314. Distribution of *Phytomyza plantaginis*.

knees yellow; wing length 2.2 mm, second costal section short, 1½ times length of fourth.

Male genitalia: aedeagus as in Fig. 312, 313.

Host plant/Biology: *Plantago major* and other *Plantago* species, larva forming white linear mine, pupating in leaf.

Distribution: Florida, Dade Co., Monroe Co.; widespread in United States; Canada; Europe; Japan. New to Florida.

Remarks: The conspicuous orbits, enlarged third antennal segment, short second costal section and virtual absence of acr make this a distinctive species.

Material examined:

Florida: Dade Co., Monroe Co., Flamingo to Mahogany Hammock, one female, 30 Nov. 1961 (Monroe, Glen, Holland, Chillcott).

Phytomyza thalictrivora Spencer

Fig. 315, 316

Phytomyza thalictrivora Spencer, 1969a: 279. Holotype male from Alberta to be deposited in CNC ex author's collection.

Adult: very small species, wing length 1.65 to 1.8 mm, second costal section 2½ to 3 times length of fourth; frons broad, more than twice width of eye, brownish, orbits shining black; one reclinate ors, one inclined ori; mesonotum shining black, acr sparse, in only two rows; legs entirely black.

Male genitalia: aedeagus as in Fig. 315.

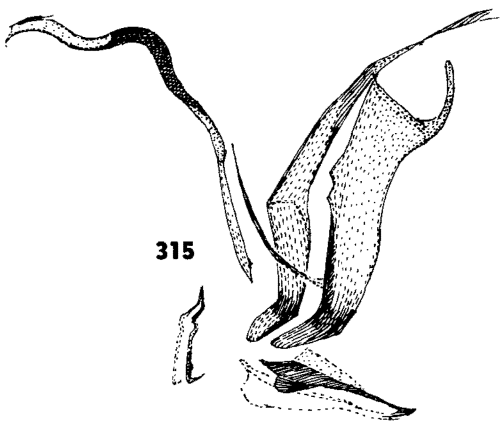


Fig. 315. *Phytomyza thalictrivora*: aedeagus.

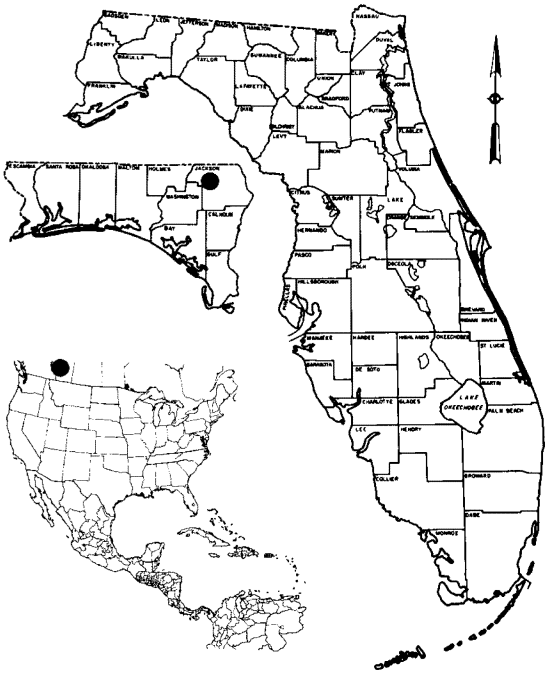


Fig. 316. Distribution of *Phytomyza thalictrivora*.

Host plant/Biology: *Thalictrum* spp., larva forming upper surface linear mine, frass in scattered black grains, pupation externally.

Distribution: Jackson Co.; Canada: Alberta. New to Florida.

Remarks: The single female from Jackson Co. closely resembles the type specimens reared from *Thalictrum venulosum* in Alberta, but there are minor points of difference. The mesonotum is less shining, the dc are somewhat weaker and the second costal section is slightly longer, three times the length of the fourth, as against 2½ times in the types. However, with the limited material available it is not possible to establish whether these differences are of specific significance. The identification of the specimen from Jackson Co. must therefore be somewhat tentative until the status of the Florida population can be further clarified by the examination of male genitalia. However, it is obvious that the host of this population will prove to be one of the *Thalictrum* species known to occur in northern Florida.

Material examined:

Florida: Jackson Co., Florida Caverns State Park, one female, 23 April 1961 (H.V. Weems Jr.).

Phytomyza verticillatae Kulp

Fig. 317-320

Phytomyza verticillatae Kulp, 1968: 23. Holotype male from Maryland in USNM.

Adult: essentially as in *P. opacae* (p. 119).

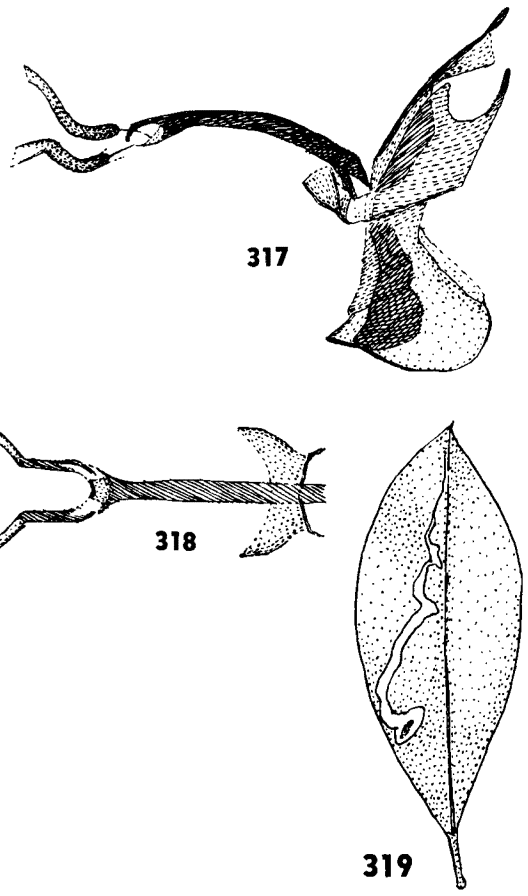
Male genitalia: aedeagus as in Fig. 317, 318, mesophallus conspicuously narrow and elongate, hypophallus greatly enlarged.

Host plant/Biology: *Ilex verticillata* (soft-leaved) and also *Ilex* sp. indet. (hard-leaved), larva forming linear mine which distinctly widens towards end and may become irregularly blotch like (Fig. 319); pupation in mine, with anterior spiracles normally projecting through epidermis.

Distribution: Florida, Martin Co., Volusia Co.; Washington, DC, Maryland; Canada: Quebec. New to Florida.

Remarks: In the color of the mesonotum this species appears to be identical to *P. opacae* and is slightly darker gray than *P. ilicicola*; it is distinctly smaller than the latter species. In the limited material studied, there is no difference in external morphology between *P. verticillatae* and *P. opacae*. Even Kulp, with the extensive material of all species in this group which he studied, failed to detect any reliable differences between these two species, and they were included together in his (1968:8) key.

P. verticillatae can be immediately recognized from its male genitalia, in which the mesophallus is conspicuously narrow and elongate (Fig. 318); the distal tubules of the distiphallus are also relatively short.



Figs. 317-319. *Phytomyza verticillatae*: 317, aedeagus, side view; 318, distiphallus, ventral view; 319, leaf mine on *Ilex* sp. (hard-leaved).

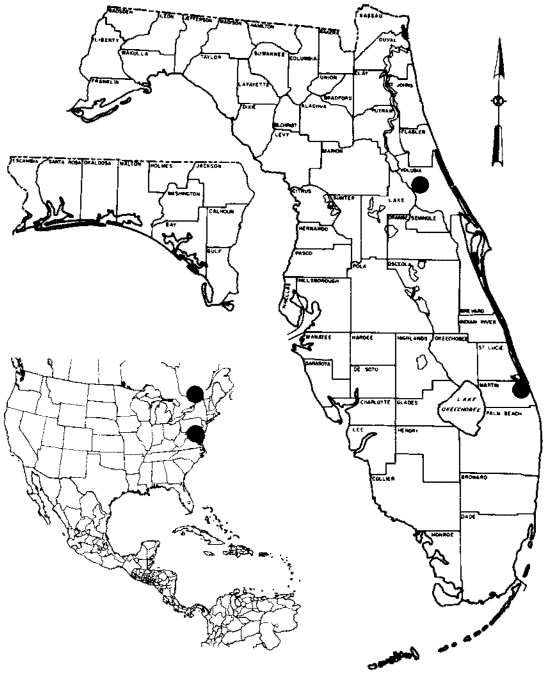


Fig. 320. Distribution of *Phytomyza verticillatae.*

Material examined:

Florida: Volusia Co., Eldridge, one male, 1 Sept. 1964 ex *Ilex verticillata* (G.W. Desin); Martin Co., Port Salerno, leaf mines on *Ilex* sp. (hard-leaved), 29 April 1969 (E.W. Campbell).

Maryland: Bethesda, one male, 15 June 1961, ex *Ilex verticillata* (L.A. Kulp).

Canada: Quebec, Ottawa River, nr. Hull, leaf mines on *Ilex verticillata,* 29 Aug. 1956 (E.M. Hering).

Phytomyza vomitoriae Kulp

Fig. 321-323

Phytomyza vomitoriae Kulp, 1968: 25. Holotype male from Georgia ex *Ilex vomitoria* in USNM.

Adult: frons dark, brownish black, orbits darker, entirely black, normally not projecting above eye margin; jowls predominantly dark, brownish; all antennal segments black, third small, round, bare; mesonotum mat black, faintly dusted with gray, appearing almost brownish at rear; acr in 4 or 5 rows, intra-alar setulae relatively numerous, 15-20; wing length from 1.65 mm in male to 1.9 in female, second costal section at most slightly more than twice length of fourth; squamae yellowish gray, margin and fringe black.

Male genitalia: aedeagus as in Fig. 321, 322, hypophallus minute.

Host plant/Biology: *Ilex vomitoria,* larva forming upper surface linear blotch mine, which may entirely fill small leaves of ½ inch in length or less; puparium brownish black, remaining in mine, with anterior spiracles projecting through epidermis of leaf; with emergences recorded at the end of January and at the end of March, it seems certain there are at least two generations, but the exact life cycle requires further investigation.

Distribution: Florida, Hillsborough Co., Orange Co., Pasco Co., Volusia Co.; Georgia. New to Florida.



Figs. 321, 322. *Phytomyza vomitoriae*: 321, aedeagus, side view; 322, same, ventral view.

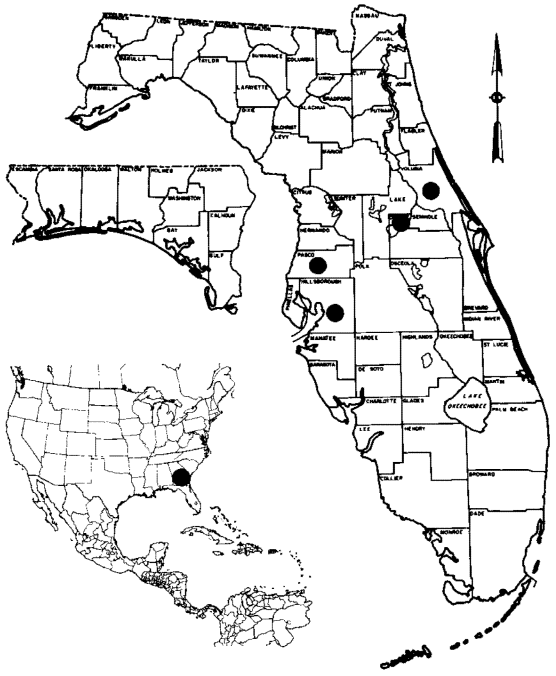


Fig. 323. Distribution of *Phytomyza vomitoriae.*

Remarks: This is a distinctly darker species than *P. ilicicola* and *P. opacae,* from which it is distinguishable not only by the darker mesonotum and tibiae but also by the shorter second costal section.

Material examined:

Florida: Hillsborough Co., Dover, one male, one female, 24 Jan. 1969, ex *Ilex vomitoria*; Plant City, Harrell's Nursery, leaf mines on same host, 11 Oct. 1968; Thonotosassa, leaf mines on same host, 19 Dec. 1968 (all D.A. Vaughan); Orange Co., Apopka, three males, two females, emerged 29 March-3 April ex leaf mines on same host leg. 4 March 1969; Pasco Co., San Antonia, leaf mines on same host, 2 July 1969 (C.B. Williams); Volusia Co., Samsula, C.B.'s Nursery, leaf mines on same host, 28 March 1969 (J.N. Pott).

Leaf mines of unidentified species

Apocynaceae

Vinca minor L. Dade Co., Hialeah, 13 July 1963 (C.E.S.). Silvery epidermal mine. *?Liriomyza schmidti* (Aldrich).

Aristolochiaceae

Aristolochia sp. Dade Co., South Miami, 9 Nov. 1965 (C.E.S.). Silvery epidermal mine. *?Liriomyza schmidti* (Aldrich).

Compositae

Vernonia altissima Nutt. Leon Co., Quincy, 4 Oct. 1968 (K.A.S.). Narrow white linear mine. *?Liriomyza trifolii* (Burg.).

Euphorbiaceae

Acalypha hispida Burm. Dade Co., Miami, 19 July 1963 (C.E.S.). Silvery epidermal mine. *?Liriomyza schmidti* (Aldrich).

Breynia nivosa (W.J. Smith) Small. Monroe Co., Key West, 10 June 1964 (H.V. Weems). Silvery epidermal mine. *?Liriomyza schmidti* (Aldrich).

Gramineae

Lasiacis divaricata (L.) Hitchc. Dade Co., Miami, Brickell Hammock, 14 Nov. 1968 (F.D. Mathews & C.E.S.). Blotch mine with conspicuous black frass. *?Agromyza* sp.

Leguminosae

Centrosema ?virginianum (L.) Benth. Monroe Co., West Summerland Key, 15 Oct. 1968 (K.A.S. & C.E.S.). *?Liriomyza munda* Frick.

Crotalaria lanceolata E. Mey. Alachua Co., Gainesville, 5 Oct. 1968 (K.A.S.). Silvery epidermal mine. *?Liriomyza schmidti* (Aldrich).

Galactia sp. Alachua Co., Gainesville, 8 Oct. 1968 (K.A.S.). Linear blotch mine. *?Japanagromyza* sp.

Rubiaceae

Chiococca alba (L.) Hitchc. Dade Co., South Miami, Sep. 1963 - Jan. 1964 (C.E.S.). *?Liriomyza schmidti* (Aldrich).

Hamelia patens Jacq. Dade Co., Miami, Oct. 1963 (M. Kuck and C.E.S.). *?Liriomyza schmidti* (Aldrich).

Sapindaceae

Cardiospermum microcarpum HBK. Dade Co., Homestead, 12 Oct. 1968 (K.A.S.). Short, white linear mine forming secondary blotch at apex of leaf. *?Liriomyza munda* or sp.n.

Solanaceae

Solanum verbascifolium L. Dade Co., Miami, Brickell Hammock, 14 Nov. 1968. Narrow linear mine. *?Liriomyza munda* or *?Haplomyza verbascifolii* Sp. (cf. Spencer, 1963a: 376).

Tiliaceae

Triumfetta semitriloba Jacq. Dade Co., Hialeah, 10 April 1963 (C.E.S.). Long, narrow linear mine.

Turneraceae

Piriqueta caroliniana (Walt.) Urban. Dade Co., Miami Airport, 27 Jan. 1964 (C.E.S.). Irregular white linear mine with frass in black strips. *?Liriomyza trifolii* (Burg.).

Known Host Plants of Florida Agromyzidae

The larval feeding habit is indicated as follows: F - seed-feeder (flower-head); G - gall-causer; L - leaf miner; SB - stem borer.

Families and genera are arranged alphabetically, as it is felt that this will facilitate reference by entomologists who may not be familiar with current botanical classification.

Pteridophyta		
Polypodiaceae		
Pteridium aquilinum (L.) Kuhn	*Pteridomyza hilarella* (Zett.)	L
Spermatophyta		
Angiospermae		
Monocotyledoneae		
Amaryllidaceae		
Allium cepa L.	*Liriomyza trifolii* (Burg.)	L
Commelinaceae		
Commelina diffusa Burm.	*Liriomyza commelinae* (Frost)	L
Commelina spp.	*Liriomyza commelinae* (Frost)	L
Tradescantia fluminensis Vell.	*Liriomyza commelinae* (Frost)	L
Gramineae		
Avena sativa L.	*Liriomyza* sp.	L
Digitaria sanguinalis (L.) Scop.	*?Liriomyza marginalis* (Mall.)	L
Echinochloa crusgalli (L.) Beauv.	*Agromyza proxima* Sp.	L
E. walteri (Pursh) Heller	*Agromyza proxima* Sp.	L
Eleusine indica (L.) Gaertn.	*?Liriomyza marginalis* (Mall.)	L
Euchlaena mexicana Schrad.	*?Liriomyza marginalis* (Mall.)	L
Lasiacis divaricata (L.) Hitchc.	*?Agromyza* sp.	L
Panicum miliaceum L.	*Cerodontha (Cerodontha) dorsalis* (Loew)	L
P. miliaceum L.	*?Liriomyza marginalis* (Mall.)	L
Paspalum ciliatifolium Michx.	*Liriomyza marginalis* (Mall.)	L
Paspalum spp.	*Liriomyza marginalis* (Mall.)	L
Triticum sp.	*Cerodontha (Cerodontha) dorsalis* (Loew)	L
Zea mays L.	*Agromyza parvicornis* Loew	L
Zea mays L.	*Cerodontha (Cerodontha) dorsalis* (Loew)	L

Iridaceae		
Iris spp.	*Cerodontha* (*Dizygomyza*) *iridophora* Sp.	L
Juncaceae		
Juncus sp.	*Cerodontha* (*Icteromyza*) *longipennis* (Loew)	L
Liliaceae		
Smilax spp.	?*Liriomyza schmidti* (Aldrich)	L
Orchidaceae		
Orchid sp.	*Melanagromyza miamensis* Sp.	F
Dicotyledoneae		
Acanthaceae		
Blechum pyramidatum (Lam.) Urban	*Melanagromyza ruelliae* Sp.	F
Blechum pyramidatum (Lam.) Urban	*Liriomyza blechi* Sp.	L
Ruellia caroliniensis (Walt.) Steud.	*Melanagromyza ruelliae* Sp.	F
R. brittoniana Leonard	*M. ruelliae* Sp.	F
Stroebilanthes sp.	*M. ruelliae* Sp.	F
Amaranthaceae		
Achyranthes (=*Alternanthera*) *philoxeroides* (Mart.) Standl.	*Melanagromyza marellii* (Brèthes)	G
Amaranthus gracilis Desf.	*Haplomyza minuta* (Frost)	L
A. spinosus L.	*Haplomyza minuta* (Frost)	L
Philoxerus vermicularis (L.) Br.	*Haplomyza philoxeri* Sp.	L
Apocynaceae		
Vinca minor L.	?*Liriomyza schmidti* (Aldrich)	L
Aquifoliaceae		
Ilex opaca Ait.	*Phytomyza ilicicola* Loew	L
I. opaca Ait.	*Phytomyza opacae* Kulp	L
I. vomitoria Ait.	*Phytomyza vomitoriae* Kulp	L
Ilex sp.	?*Phytomyza verticillatae* Kulp	L
Aristolochiaceae		
Aristolochia sp.	?*Liriomyza schmidti* (Aldrich)	L
Boraginaceae		
Heliotropium curassavicum L.	?*Liriomyza blechi* Sp.	L
H. leavenworthii Torr.	*Melanagromyza heliotropii* Sp.	SB
Capparidaceae		
Cleome sp.	*Liriomyza brassicae* (Riley)	L
Caryophyllaceae		
Gypsophila sp.	*Liriomyza trifolii* (Burg.)	L
Chenopodiaceae		
Beta vulgaris L.	*Liriomyza trifolii* (Burg.)	L
Spinacia oleracea L.	*Liriomyza trifolii* (Burg.)	L
Compositae		
Ageratum conyzoides L.	*Calycomyza* sp.	
Ambrosia artemisiifolia L.	*Melanagromyza splendida* Frick	SB
Ambrosia artemisiifolia L.	*Calycomyza ambrosiae* Frick	L
Ambrosia artemisiifolia L.	*Calycomyza jucunda* (Wulp)	L
Ambrosia artemisiifolia L.	*Calycomyza ambrosiae* Frick	L
A. trifida L.	*Calycomyza ambrosiae* Frick	L
Aster lateriflorus (L.) Britton	*Calycomyza promissa* Frick	L
A. simmondsii Small	*Melanagromyza minimoides* Sp.	F
A. simmondsii Small	*Calycomyza jucunda* (Wulp)	L
Aster sp., cult.	*Liriomyza trifolii* (Burg.)	L
Baccharis halimifolia L.	*Amauromyza maculosa* (Mall.)	L
Baccharis halimifolia L.	*Nemorimyza posticata* (Mg.)	L
Baccharis halimifolia L.	*Liriomyza trifolii* (Burgess)	L
Bidens pilosa L.	*Melanagromyza bidentis* Sp.	F
Bidens pilosa L.	*M. floris* Sp.	F
Bidens pilosa L.	*M. splendida* Frick	SB
Bidens pilosa L.	*Calycomyza jucunda* (Wulp)	L
Bidens pilosa L.	*Liriomyza archboldi* Frost	L
Borrichia frutescens (L.) DC.	*Melanagromyza minimoides* Sp.	F
Calendula officinalis L.	*Melanagromyza viridis* (Frost)	F

Calendula officinalis L.	*Melanagromyza viridis* (Frost)	F
Calendula officinalis L.	*Amauromyza maculosa* (Mall.)	L
Callistephus chinensis (L.) Nees	*Liriomyza trifolii* (Burg.)	L
Chaptalia dentata (L.) Cass.	*Melanagromyza chaptaliae* Sp.	SB
Chrysanthemum sp., cult. var.	*Amauromyza maculosa* (Mall.)	L
Dahlia sp., cult.	*Liriomyza trifolii* (Burg.)	L
Elephantopus elatus Bertol.	*Calycomyza* sp.	L
Emilia sagittata DC.	*Amauromyza maculosa* (Mall.)	L
Erechtites hieracifolia (L.) Rafin.	*Melanagromyza erechtitidis* Sp.	F
Erechtites hieracifolia (L.) Rafin.	*M. splendida* Frick	SB
Erechtites hieracifolia (L.) Rafin.	*Amauromyza maculosa* (Mall.)	L
Erechtites hieracifolia (L.) Rafin.	*Liriomyza trifolii* (Burg.)	L
Erigeron canadensis L.	*Calycomyza minor* Sp.	L
Eupatorium capillifolium (Lam.) Small	*Melanagromyza virens* (Loew)	SB
E. coelestinum L.	*Liriomyza trifolii* (Burg.)	L
E. odoratum L.	*Amauromyza maculosa* (Mall.)	L
E. rotundifolium L.	*Calycomyza* sp.	L
E. serotinum Michx.	*Liriomyza trifolii* (Burg.)	L
Flaveria linearis Lag.	*Melanagromyza splendida* Frick	SB
F. trinervia (Spreng.) Mohr	*Liriomyza trifolii* (Burg.)	L
Gaillardia aristata Pursh	*Amauromyza maculosa* (Mall.)	L
G. aristata Pursh	*Liriomyza trifolii* (Burg.)	L
G. pulchella Foug. var. *picta* Gray	*Melanagromyza splendida* Frick	SB
G. ciliata (Raf.) Blake	*Liriomyza munda* Frick	L
G. ciliata (Raf.) Blake	*Liriomyza trifolii* (Burg.)	L
Gerbera jamesoni Bolus	*Liriomyza trifolii* (Burg.)	L
Gnaphalium spathulatum Lam.	*Melanagromyza splendida* Frick	SB
G. spathulatum Lam.	*Amauromyza maculosa* (Mall.)	L
G. spathulatum Lam.	*Liriomyza trifolii* (Burg.)	L
Helenium nudiflorum Nutt.	*Melanagromyza minimoides* Sp.	F
Helianthus annuus L.	*Liriomyza trifolii* (Burg.)	L
H. annuus L.	*Calycomyza jucunda* (Wulp)	L
H. annuus L.	*Amauromyza maculosa* (Mall.)	L
H. debilis Nutt.	*Melanagromyza viridis* (Frost)	F
Heterotheca subaxillaris (Lam.) Britt. & Rusby	*Melanagromyza virens* (Loew)	SB
Hymenopappus scabiosaeus L'Hér.	*Liriomyza trifolii* (Burg.)	L
Lactuca canadensis L.	*Liriomyza trifolii* (Burg.)	L
L. sativa L.	*Liriomyza trifolii* (Burg.)	L
Melanthera deltoidea Michx.	*Melanagromyza minimoides* Sp.	F
M. deltoidea Michx.	*Calycomyza melantherae* Sp.	L
M. deltoidea Michx.	*Amauromyza maculosa* (Mall.)	L
M. deltoidea Michx.	*Liriomyza trifolii* (Burg.)	L
Mikania batatifolia DC.	*Calycomyza mikaniae* Sp.	L
Senecio confusus Britton	*Melanagromyza wedeliae* Sp.	F
S. glabellus Poir.	*Amauromyza maculosa* (Mall.)	L
Solidago caesia L.	*Calycomyza jucunda* (Wulp)	L
Solidago tortifolia Ell.	*Nemorimyza posticata* (Mg.)	L
Solidago tortifolia Ell.	*Calycomyza jucunda* (Wulp)	L
Solidago sp.	*Calycomyza solidaginis* (Kalt.)	L
Sonchus asper (L.) Hill	*Amauromyza maculosa* (Mall.)	L
Sonchus asper (L.) Hill	*Liriomyza trifolii* (Burg.)	L
Sonchus oleraceus L.	*Liriomyza trifolii* (Burg.)	L
Synedrella nodiflora L.	*Liriomyza trifolii* (Burg.)	L
Tagetes erecta L.	*Liriomyza trifolii* (Burg.)	L
Tagetes erecta L.	*Amauromyza maculosa* (Mall.)	L
Tagetes patula L.	*Liriomyza trifolii* (Burg.)	L
Tagetes patula L.	*Amauromyza maculosa* (Mall.)	L
Tagetes sp.	*Melanagromyza splendida* Frick	SB
Tithonia rotundifolia Blake	*Melanagromyza viridis* (Frost)	L
Verbesina helianthoides Michx.	*Liriomyza munda* Frick	L

Verbesina laciniata (Poir.) Nutt.	*Melanagromyza bidentis* Sp.	F
Verbesina laciniata (Poir.) Nutt.	*M. minimoides* Sp.	F
Verbesina virginica L.	*Liriomyza munda* Frick	L
Vernonia altissima Nutt.	*?Liriomyza trifolii* (Aldrich)	L
Wedelia paludosa L.	*Melanagromyza minima* (Mall.)	F
Wedelia paludosa L.	*M. wedeliae* Sp.	F
Wedelia trilobata (L.) Hitchc.	*M. minima* (Mall.)	F
Xanthium sp.	*Calycomyza jucunda* (Wulp)	L
Xanthium sp.	*Liriomyza trifolii* (Burg.)	L
Zinnia spp.	*Melanagromyza viridis* (Frost)	F
Zinnia sp.	*Liriomyza trifolii* (Burg.)	L
Zinnia sp.	*Calycomyza jucunda* (Wulp)	L
Convolvulaceae		
Calonyction aculeatum (L.) House	*Calycomyza ipomaeae* (Frost)	L
C. aculeatum (L.) House	*Calycomyza stegmaieri* Sp.	L
Ipomoea batatas Poir.	*Calycomyza ipomaeae* (Frost)	L
Ipomoea cathartica Poir.	*Calycomyza ipomaeae* (Frost)	L
Ipomoea tiliacea (Willd.) Choisy	*Calycomyza ipomaeae* (Frost)	L
Ipomoea triloba L.	*Melanagromyza caerulea* (Mall.)	F
Cruciferae		
Brassica campestris L.	*Liriomyza brassicae* (Riley)	L
B. napus L.	*Liriomyza brassicae* (Riley)	L
B. oleraceus var. *botrytis* L.	*Liriomyza brassicae* (Riley)	L
B. oleraceus var. *capitata* L.	*Liriomyza brassicae* (Riley)	L
B. oleraceus var. *capitata* L.	*Liriomyza munda* Frick	L
B. rapa L.	*Liriomyza brassicae* (Riley)	L
B. rapa L.	*Liriomyza munda* Frick	L
Lepidium virginicum L.	*Liriomyza brassicae* (Riley)	L
Cucurbitaceae		
Cucumis melo L.	*Liriomyza munda* Frick	L
Cucumis melo L.	*Liriomyza trifolii* (Burg.)	L
Cucumis sativus L.	*Liriomyza munda* Frick	L
Cucumis sativus L.	*Liriomyza trifolii* (Burg.)	L
Cucurbita pepo L.	*Liriomyza munda* Frick	L
Cucurbita pepo L.	*Liriomyza trifolii* (Burg.)	L
Cucurbita spp.	*Liriomyza munda* Frick	L
Cucurbita spp.	*Liriomyza trifolii* (Burg.)	L
Euphorbiaceae		
Acalypha hispida Burm.	*?Liriomyza schmidti* (Aldrich)	L
Breynia nivosa (W.J. Smith) Small	*?Liriomyza schmidti* (Aldrich)	L
Ricinus communis L.	*Liriomyza munda* Frick	L
Fagaceae		
Quercus spp.	*Japanagromyza viridula* (Coq.)	L
Labiatae		
Hyptis mutabilis (A. Rich.) Briq.	*Calycomyza menthae* Sp.	L
Hyptis pectinatà (L.) Poir.	*Calycomyza hyptidis* Sp.	L
Monarda punctata L.	*Calycomyza menthae* Sp.	L
Leguminosae		
Albizzia lebbek (L.) Benth.	*Liriomyza schmidti* (Aldrich)	L
Bauhinia purpurea L.	*Liriomyza schmidti* (Aldrich)	L
Bauhinia sp.	*Liriomyza munda* Frick	L
Cajanus cajan (L.) Millsp.	*Liriomyza munda* Frick	L
Cassia occidentalis L.	*Liriomyza munda* Frick	L
Cassia tora L.	*Liriomyza munda* Frick	L
Centrosema ?virginianum (L.) Benth.	*?Liriomyza munda* Frick	L
Crotalaria incana L.	*Liriomyza trifolii* (Burg.)	L
Crotalaria lanceolata E. Mey.	*?Liriomyza schmidti* (Aldrich)	L
Desmodium tortuosum (Sw.) DC.	*Japanagromyza desmodivora* Sp.	L
D. tortuosum (Sw.) DC.	*Melanagromyza floridensis* Sp.	F
Galactia sp.	*?Japanagromyza* sp.	L
Lupinus sp.	*Liriomyza munda* Frick	L

Medicago lupulina L.	*Liriomyza trifolii* (Burg.)	L
Melilotus alba Desr.	*Liriomyza munda* Frick	L
Phaseolus aureus Roxb.	*Liriomyza trifolii* (Burg.)	L
Phaseolus lunatus L.	*Liriomyza munda* Frick	L
Pisum sp.	*Liriomyza trifolii* (Burg.)	L
Pisum sp.	*Liriomyza munda* Frick	L
Stizolobium deeringianum Bort.	*Liriomyza schmidti* (Aldrich)	L
Trifolium incarnatum L.	*Liriomyza munda* Frick	L
Trifolium incarnatum L.	*Liriomyza trifoliearum* Sp.	L
Trifolium repens L.	*Liriomyza trifoliearum* Sp.	L
Vigna luteola (Jacq.) Benth.	*Japanagromyza aequalis* Sp.	L
Vigna luteola (Jacq.) Benth.	*J. inaequalis* (Mall.)	L
Vigna luteola (Jacq.) Benth.	*Liriomyza munda* Frick	L
Vigna sinensis (L.) Endl.	*Liriomyza munda* Frick	L
Malvaceae		
Abutilon avicennae Gaertn.	*Calycomyza malvae* (Burgess)	L
Althaea rosea Cav.	*Calycomyza malvae* (Burgess)	L
Anoda cristata Schlecht.	*Liriomyza munda* Frick	L
Hibiscus esculentus L.	*Liriomyza munda* Frick	L
Malva rotundifolia L.	*Calycomyza malvae* (Burgess)	L
Sida acuta Burm.	*Liriomyza munda* Frick	L
Sida cordifolia L.	*Calycomyza sidae* Sp.	L
Sida rhombifolia L.	*Calycomyza malvae* (Burgess)	L
Sida spp.	*Calycomyza sidae* Sp.	L
Sida spp.	*Melanagromyza* sp.	SB(?)
Nyctaginceae		
Bougainvillea spectabilis Willd.	*Liriomyza schmidti* (Aldrich)	L
Passifloraceae		
Passiflora caerulea L.	*Liriomyza schmidti* (Aldrich)	L
Plantaginaceae		
Plantago sp.	?*Liriomyza blechi* Sp.	L
Plantago sp.	*Liriomyza munda* Frick	L
Plantago spp.	*Phytomyza plantiginis* R.-D.	L
Ranunculaceae		
Thalictrum sp.	*Phytomyza thalictrivora* Sp.	L
Rubiaceae		
Chiococca alba (L.) Hitchc.	?*Liriomyza schmidti* (Aldrich)	L
Hamelia patens Jacq.	?*Liriomyza schmidti* (Aldrich)	L
Sapindaceae		
Cardiospermum microcarpum HBK.		
Solanaceae	*Agromyzid* sp.	L
Capsicum sp.		
Cestrum diurnum L.	*Liriomyza trifolii* (Burg.)	L
C. nocturnum L.	*Liriomyza munda* Frick	L
Lycopersicum esculentum Mill.	*Liriomyza munda* Frick	L
L. esculentum Mill.	*Liriomyza munda* Frick	L
Petunia sp.	*Liriomyza trifolii* (Burg.)	L
Physalis sp.	*Liriomyza trifolii* (Burg.)	L
Solanum melongena L.	*Liriomyza trifolii* (Burg.)	L
S. melongena L.	*Liriomyza munda* Frick	L
S. nigrum L.	*Liriomyza trifolii* (Burg.)	L
S. nigrum L.	*Liriomyza munda* Frick	L
S. tuberosum L.	*Liriomyza trifolii* (Burg.)	L
S. verbascifolium L.	*Liriomyza trifolii* (Burg.)	L
	?*Liriomyza munda* or ?*Haplomyza verbascifolii* Sp.	L
Tiliaceae		
Triumfetta semitriloba Jacq.		
Tropaeolaceae	*Agromyzid* sp.	L
Tropaeolum major L.	*Liriomyza brassicae* (Riley)	L
Turneraceae		

Piriqueta caroliniana (Walt.) Urban	*?Liriomyza trifolii* (Burg.)	L
Ulmaceae		
Celtis laevigata Willd.	*Agromyza varifrons* Coq.	L
Umbelliferae		
Apium graveolens L. var. *dulce* DC.	*Liriomyza trifolii* (Burg.)	L
Daucus carota L.	*Liriomyza trifolii* (Burg.)	L
Hydrocotyle umbellata L.	*Liriomyza munda* Frick	L
Verbenaceae		
Duranta repens L.	*Calycomyza durantae* Sp.	L
Lantana camara L.	*Ophiomyia camarae* Sp.	L
L. camara L.	*O. lantanae* (Froggatt)	F
L. camara L.	*Ophiomyia* sp.	L
L. camara L.	*Calycomyza lantanae* Frick	L
L. involucrata L.	*Calycomyza lantanae* Frick	L
Lippia nodiflora Michx.	*Melanagromyza lippivora* Sp.	SB
L. nodiflora Michx.	*Ophiomyia lippiae* Sp.	F(?SM)
Verbena scabra Dunal	*Melanagromyza* sp.	SB
Zygophyllaceae		
Kallstroemia maxima (L.) T.&G.	*Liriomyza trifolii* (Burg.)	L
Tribulus terrestris L.	*Liriomyza trifolii* (Burg.)	L

SUPPLEMENT:

AGROMYZIDAE FROM THE CARIBBEAN

by

Kenneth A. Spencer

Introduction

Although the primary object of this paper was to review the Agromyzidae of Florida, it seemed appropriate to extend the study to include additional available material from the Caribbean area, since it early became apparent that a substantial proportion of Florida species were clearly of southern origin. Details of the material studied are given on p. 3. Apart from isolated specimens from a number of islands, substantial collections were examined only from the Bahamas, Costa Rica and Dominica.

Evidence from the distribution of species occurring both in Florida and in the Caribbean area has clearly indicated Cuba and the Bahamas as the immediate source areas of the "southern" Florida species, with Central America as the original source area. The distribution of the further species discussed below which occur either on one or more islands or also in Central America reveals the same general pattern of dispersal over the sea.

It is perhaps surprising to find that even today there is not complete agreement about the geological history of the Caribbean area. Some authorities maintain that Cuba and/or Jamaica have been connected by a land bridge to the mainland. On the other hand Darlington (1936) convincingly argues that the entire fauna of the Greater Antilles not only could have reached Cuba or Jamaica over water but that its composition—depauperate, orderly but not homogeneous—definitely indicates over-water dispersal rather than via a land bridge. He postulates the source area of virtually the entire fauna, including also the largest Antillean mammals, as Central America via the extended peninsulas which certainly existed earlier both at Yucatan and Honduras. Simpson (1956), however, shows that the relationships of Antillean mammals are, with few exceptions, with South America, and, with no evidence that the ancestral species ever existed in Central America, assumes dispersal direct from South America. Until late Pliocene the fauna of Central America was wholly Nearctic in origin. The entire mammal fauna of the Antilles can be explained by probably nine original colonizations spread over a period of some 30 million years. This certainly does not appear beyond the bounds of probability. If it is accepted that the whole fauna of the Caribbean islands in such groups as mammals, frogs, lizards, snakes etc. is derived from ancestors which successfully crossed water gaps either from the mainland of Central or South America to Cuba or Jamaica and then over further water gaps from island to island, then clearly these water gaps represent a substantially less significant barrier to the dispersal of mobile, easily windborne insects such as Agromyzidae. The distribution of a number of species discussed below strongly suggests that this is what actually happened.

The previous scattered references to Agromyzidae from the Caribbean were included in a synopsis of Neotropical species

(Spencer, 1963a). In the genera *Japanagromyza, Melanagromyza* and *Ophiomyia,* so many new species have now been described that it has been considered desirable to prepare updated keys for all known Neotropical species, and these are given below. Two new genera, *Geratomyza* and *Nesomyza,* are described, and a revised key to genera of Neotropical species is included.

Species from Costa Rica

Twenty-three species from Costa Rica are discussed in the present paper. It has been shown earlier (p. 13) that 12 of these have reached southern Florida and have been recorded in addition on one or more of the islands. The following further species are present in Costa Rica and on one or more of the islands:

Agromyza venezolana Sp.:Puerto Rico, Bahamas
Melanagromyza eleutherensis sp.n.:Bahamas
Ophiomyia valida sp.n.:Jamaica, Bahamas
Phytobia picta (Coq.) :Cuba, Puerto Rico
Calycomyza meridiana (Hendel): Jamaica, Dominica
Phytomyza loewii (Hendel) :Cuba

The first five are typical Neotropical species and require no special comment. *Phytomyza loewii,* however, is a Nearctic species, feeding as a leaf miner on *Clematis* which was originally described from Washington, DC and subsequently recorded in Quebec (Spencer, 1969a: 251). It has presumably either been present in Central America since the Pliocene or, more likely, has extended its range southward during the Pleistocene, subsequently successfully establishing itself on Cuba.

Lemurimyza costaricensis sp.n. is known only from Costa Rica but appeared of sufficient interest to warrant description in this paper; it is clearly a species of Nearctic origin and is also either a Pliocene relict or has extended its range southward later exactly as did *Phytomyza loewii.*

Phytobia sp. 1 (C.R.) and *Phytobia* sp. 2 (C.R.) are undescribed species which, in the absence of males, are not formally described. This genus is well represented in the Nearctic and Neotropical regions, and it is not possible at this stage to decide the origin of these two species. However, it seems appropriate to record them, as new species in the genus are described below both from Jamaica and Dominica, and it seems established that the genus is well represented in Central America, from which these two new Caribbean species doubtless are derived.

One final species of interest from Costa Rica in *Phytobia rabelloi* Sp., which was described from Brazil and is also now recorded from Ecuador. This is an interesting example of the wide distribution of some Neotropical Agromyzidae, of which further records are given below.

Melanagromyza crotonis (Frost) can also conveniently be mentioned here; it was described from Panama and will almost certainly be present in Costa Rica. It is now recorded both from Cuba and Dominica.

Many additional undescribed species were noted in the Costa Rican material studied, particularly in the genera *Melanagromyza* and *Calycomyza,* but it would have been beyond the scope of this paper to describe these at this time.

Species from the Bahama Islands

Thirty-seven species are now recorded from the Bahamas. These can be divided into four groups as shown in Table 4. The importance of the Bahamas as a source area for Florida immediately becomes apparent from the figure of 21 of the total of 37 Bahaman species which occur in southern Florida. Of these, 13 occur further south in the Caribbean, confirming that the Bahamas have acted as a vital stepping stone for the dispersal of Neotropical species to Florida.

It is virtually impossible at present to be certain which of the species in Group 4 are genuinely endemic. However, other groups of insects do show a remarkably high degree of endemism in the Bahamas. For example,

Table 4. Agromyzidae from the Bahamas

Group 1 Species occurring elsewhere in Caribbean, including Florida	Group 2 Species only in common with Florida	Group 3 Species occurring elsewhere in Caribbean but excluding Florida	Group 4 Species restricted to the Bahamas
Japanagromyza aequalis Sp.	*Melanagromyza parvella* sp.n.	*Agromyza venezolana* Sp.	*Japanagromyza inferna* sp.n.
J. perpetua sp.n.	*M. ruelliae* Sp.	*Geratomyza spadix* (Sp.)	*J. propinqua* sp.n.
Melanagromyza floridensis Sp.	*M. vectabilis* sp.n.	*Melanagromyza eleutherensis* sp.n.	*Melanagromyza bahamensis* sp.n.
M. floris Sp.	*Ophiomyia haydeni* sp.n.	*Ophiomyia valida* sp.n.	*M. felis* sp.n.
M. marellii (Brèthes)	*O. lippiae* Sp.		*M. nassauensis* sp.n.
M. splendida Frick	*Calycomyza melantherae* Sp.		*M. nigrans* sp.n.
Calycomyza lantanae Frick	*Liriomyza archboldi* Frost		*M. strictiva* sp.n.
C. malvae (Burg.)	*L. trifolii* (Burg.)		*M. tempestiva* sp.n.
C. sidae sp.n.			*Ophiomyia arguta* sp.n.
Amauromyza maculosa (Mall.)			*O. ferina* sp.n.
Liriomyza marginalis (Mall.)			*O. solivaga* sp.n.
L. munda Frick			*Calycomyza bahamarum* sp.n.
L. schmidti (Ald.)			
13 (35%)	8 (21%)	4 (10%)	12 (33%)

Table 5. Origin of Bahaman Butterflies

Group 1 Species occurring elsewhere in the Caribbean, including Florida	Group 2 Species only in common with Florida	Group 3 Species occurring elsewhere in West Indies but excluding Florida	Group 4 Endemic species or subspecies
19 (36%)	3 (6%)	14 (27%)	16 (31%)

the analysis of Bahaman butterflies (Rindge, 1952) given in Table 5 shows 16 species or subspecies, representing 31%, to be endemic. In a conspicuous group as well known as butterflies this figure will be little changed with further collecting. Most of the 700 islands of the Bahamas are low and were certainly submerged during at least some of the Interglacials. The poverty of the Bahamas in non-flying animals is largely explained by this fact (Lattin, 1967: 307). Nevertheless, some islands have altitudes of more than 200 ft. above sea level, and the highest, Cat Island, rises to 400 ft. Thus not all land would have been submerged during Pleistocene rises in sea level, and early or even pre-Pleistocene species might have survived on the higher islands. The most obvious probable example is *Melanagromyza felis* sp.n. described, perhaps significantly, from Cat Island; this species is highly aberrant in having a pronounced facial keel and the costa reduced to vein R 4+5 but has genitalia which are entirely typical of *Melanagromyza*.

With the rapid speciation which in any case occurs in such island groups and which has been discussed in the Lesser Antilles by Fennah (1946), adequate time has been available for the evolution of endemics on a number of Bahaman islands. Only further collecting can show which, if any, of the other 11 species with the known distribution restricted to the Bahamas, represent genuine endemics.

Liriomyza trifolii (Burgess) is particularly common in southern Florida and has a range extending northward to Canada, but it is unknown elsewhere in the Caribbean. This is one species which may have reversed the normal trend and extended its range southward from Florida to the Bahamas during the Pleistocene.

Species From Dominica

Among the material studied from Dominica 25 species are represented. Twelve of these are typical Neotropical species and need no special comment, occurring on one or more other islands and probably are widespread throughout the area. It is of interest to record *Calycomyza hyptidis* Sp., as this species hitherto has been known only from southern Florida. The presence of *Cerodontha dorsalis* (Loew) gives further confirmation of the wide distribution of this species.

A most interesting record is of *Phytoliriomyza conjunctimontis* (Frick), previously only known from California. This species presumably was present in Central America during the Pleistocene or even in the late Pliocene and has successfully island-hopped via the Greater Antilles as far as Dominica. Further collecting probably will reveal its presence in Central America, in Cuba or elsewhere.

Nesomyza fusculoides represents a new monotypic genus. It is clearly related to both *Phytoliriomyza* and *Lemurimyza*. Whether it is a relict species of Pleistocene or Pliocene age or has speciated from some Nearctic ancestor is uncertain at this time.

Nine further species are described, so far limited to Dominica. All are typically Neotropical, and most will probably prove to be more widely distributed in the Caribbean.

Species from other Caribbean Islands

In addition to species already discussed, relatively few are recorded to date from only a single island or even only two islands. It is perhaps of interest to list these as follows:

Jamaica, Grand Cayman: *Geratomyza maculata* sp.n.

Antigua, Barbados: *Japanagromyza bennetti* sp.n.

Trinidad, Hispaniola: *Melanagromyza querula* sp.n.

Cuba: *Amauromyza* sp. (Cuba)

Jamaica: *Agromyza* sp. (Jamaica)
Melanagromyza compositoides Spencer (1963a)
M. vulgata sp.n.
Phytobia unica sp.n.

Puerto Rico: *Melanagromyza mallochi* (Hend.)
Cerodontha (*Diz.*) *puertoricensis* sp.n.

St. Vincent: *Liriomyza sorosis* (Will.)
Trinidad: *Melanagromyza eupatoriella* sp.n.
M. simmondsi sp.n.
Phytobia xanthophora (Schiner)

With 77 species recorded here from the Caribbean, it is remarkable in view of the unsystematic and fragmentary collecting which has been undertaken that of these, only 33 are limited to a single island. With 44 species or 57% already known from two or more islands, or one island and the mainland of either Central or South America, it seems clear that a substantially higher proportion will prove to be of wide distribution within the area.

No particular attempt has been made to examine material from Trinidad. It seems probable that the majority of Agromyzidae present on Trinidad which is of recent continental origin will prove to be more generally distributed in South America rather than in the Caribbean.

Species from the Caribbean and also South America

It is worth briefly mentioning the few species present in the Caribbbean and also in South America. The species concerned are:

Agromyza fusca Sp.: Brazil, Dominica
A. venezolana Sp.: Venezuela, Bahamas
Melanagromyza marellii (Brèthes): Argentina, Brazil, Bahamas, Florida
Calycomyza allecta (Mel.): Brazil, Dominica, St. Vincent
C. eupatorivora sp.n.: Brazil, Jamaica
C. hyptidis Sp.: Brazil, Dominica, Florida
C. ipomaeae (Frost): Brazil, Jamaica, Florida
Amauromyza maculosa (Mall.): Brazil, general Caribbean distribution, Florida
Liriomyza marginalis (Mall.): Brazil, Dominica, Jamaica, Florida

In this context it is of interest to include also *Phytobia rabelloi* Sp. present in Brazil and Ecuador and also Costa Rica; and *P. xanthophora* (Schiner) from "South America" and Trinidad. Three of the five species which also reach Florida range far to the north, in one case even reaching Canada. The other six probably will prove to be widely distributed in the Neotropical region.

Key to Genera of Neotropical Agromyzidae

(including the new genera *Geratomyza* and *Nesomyza*, and *Lemurimyza* recorded below as new to the Neotropical Region)

1 Subcosta developed throughout its length, coalescing with R1 before reaching costa (Subfamily Agromyzinae) .. 2
1′ Subcosta becoming a fold distally and ending in costa separately and basad of R1 (Subfamily Phytomyzinae) 6
2 At least 3 pairs of dorso-centrals, prescutellars always present; halteres normally white or yellow, at most brown ..3
2′ 2 pairs of dorso-centrals; if 3 or 4 pairs, halteres black 4
3 Surstyli partially divided from epandrium (Fig. 334); sperm sac with short wings at base (Fig. 335); notopleural area entirely and abdomen partially yellow ..... *Geratomyza* Spencer (p. 140)
3′ Surstyli not divided from epandrium; ninth sternite shorter, with broader side arms; sperm sac without wings at base ..... *Agromyza* Fallén (p. 139)
4 Either pre-scutellars or fore-tibial bristle present or halteres yellowish ....*Japanagromyza* Sasakawa (p. 144)
4′ Halteres invariably black (partially white in *Ophiomyia punctohalterata*), pre-scutellars lacking 5
5 Distinct, frequently bulbous, facial keel dividing base of antennae; male with vibrissal fasciculus; mesonotum and abdomen always black; posterior spiracles of larva on distinct stalks, never with spiracular horn .... *Ophiomyia* Braschnikov (p. 168)

5′ Antennal bases virtually approximate; vibrissa in male normal; mesonotum or abdomen frequently with some metallic coloration, greenish, bluish or coppery; larval posterior spiracles frequently with central spiracular horn (stem borers or seed feeders) ..... *Melanagromyza* Hendel (p. 150)

6 Orbital setulae erect or reclinate, or absent 7

6′ Orbital setulae distinctly proclinate ..18

7 Scutellum normally dark, concolorous with mesonotum; if yellow, vein R 4+5 ending nearest wing tip 8

7′ Scutellum yellow; vein M 1+2 ending nearest wing tip 15

8 Halteres with knob black or at least partially darkened 9

8′ Halteres with knob white or yellow ..10

9 Two (or three) ori; large species, wing length 2.3 - 2.5 mm; face and jowls black ..... *Amauromyza* Hendel (p. 186)

9′ One ori; small species, wing length 1.35 mm; face and jowls yellowish brown ..... *Nesomyza* Spencer (p. 190)

10 Second cross-vein lacking (*H. bullati* group, S. America) ..... *Haplomyza* Hendel

10′ Second cross-vein present 11

11 Vein R 4+5 ending nearest wing tip; scutellum yellow in *P. kallima* group .... *Phytobia* Lioy (p. 174)

11′ Vein M 1+2 ending nearest wing tip 12

12 Third antennal segment with a spine, scutellum with only 2 bristles; or lunule conspicuously higher than a semicircle, either narrow or triangular; or lunule conspicuously large and broad, antennal bases widely separated and third antennal segment in male normally greatly enlarged .. *Cerodontha* Rondani (p. 180)

12′ Not so 13

13 Fore-tibia with lateral bristle; abdomen in male conspicuously yellow ..... *Nemorimyza* Frey

13′ Only mid-tibia sometimes with lateral bristle, fore-tibia never 14

14 Orbits raised above plane of frons; frons dark ..... *Praspedomyza* Hendel

14′ Orbits in same plane as frons; frons yellow (except in *C. obscura*) ..... *Calycomyza* Hendel (p. 181)

15 Orbits largely in plane of frons; frons yellow 16

15′ Orbits broad, raised above plane of frons; frons dark ..... *Metopomyza* Hendel

16 Second cross-vein lacking; single ors .... *Haplomyza* Hendel

16′ Second cross-vein present; normally two ors 17

17 Orbital setulae normally upright or slightly proclinate, rarely slightly reclinate; pre-scutellar area yellow; male genitalia: aedeagus with distinctive chitinized, paired tubules (Fig. 479), epandrium with a conspicuous comb-like arrangement of black spines (Fig. 480).. *Lemurimyza* Spencer (p. 188)

17′ Orbital setulae distinctly reclinate; prescutellar area normally dark, concolorous with mesonotum, more rarely yellow; male genitalia: aedeagus variable, normally pale, scarcely chitinized, never with black tubules as in *Lemurimyza*, epandrium with hairs along inner margin, never black, comb-like process ..... *Liriomyza* Mik (p. 187)

18 Costa extending to vein M 1+2; second cross-vein present ..... *Phytoliriomyza* Hendel (p. 189)

18′ Costa ending at vein R 4+5; second cross-vein absent ..... *Phytomyza* Fallén (p. 192)

GENUS *AGROMYZA* FALLÉN

It is significant that only three species are recorded for the entire Caribbean area, conforming with the poor representation of this genus in the Neotropical Region.

The species from Jamaica briefly discussed below is certainly new but it is felt desirable not to describe it formally until a male is available, permitting more exact clarification of its status.

Agromyza fusca Spencer

Fig. 324-326

Agromyza fusca Spencer, 1963a: 295. Holotype male from Brazil in BM. Dominica: Clarke Hall, one male, 21-28 Feb. 1965 (W.W. Wirth).

This specimen agrees closely with the unique holotype from Brazil, though characteristic darkening of the wings is slightly more extensive and borders the two crossveins, and the halteres are more distinctly black. The genitalia appear to be identical in the two specimens; the aedeagus is shown in Fig. 324, 325.

With the darkened wings and black halteres this is an aberrant and highly distinctive species. The genitalia, however, are entirely typical of the large group of grass-mining species. It seems probable that *A. fusca* is widespread in the Neotropical Region.

Agromyza venezolana Spencer

Fig. 327, 328

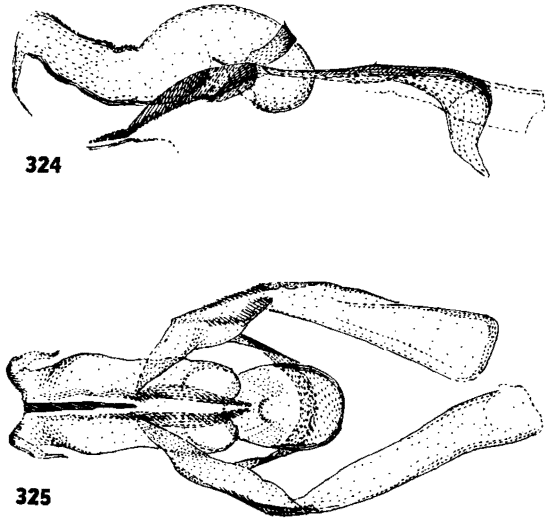
Agromyza venezolana Spencer, 1963a: 299. Holotype male from Venezuela in author's collection.

Bahamas: South Bimini Is., one male, May 1951 (M.A. Cazier and W.J. Gertsch); Grand Bahama Is., West End, one female, 12 May 1953 (E.B. Hayden and G.B. Rabb).

Costa Rica: La Caja, 8 km W. of San José, two males, 1930 (Schmidt).

Puerto Rico: Adjuntas, one male, 8 - 13 June 1915.

Remarks: The genitalia of the males from the Bahamas, Costa Rica and Puerto Rico show only very minor differences from those of the holotype from Venezuela. This appears to be a case of incipient speciation, but



Figs. 324, 325. *Agromyza fusca*: 324, aedeagus, side view; 325, same, ventral view.



Fig. 326. Distribution of *Agromyza fusca*.

it is felt that the four populations at the present time should be treated as a single species. The aedeagus in side view of the specimen from Puerto Rico is shown in Fig. 327.

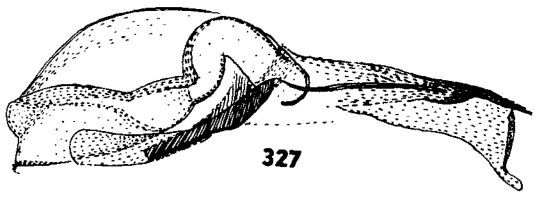


Fig. 327. *Agromyza venezolana*: aedeagus, side view.



Fig. 328. Distribution of *Agromyza venezolana*.



Fig. 329. Distribution of *Agromyza* sp. (Jamaica).

Agromyza sp. (Jamaica)

Fig. 329

A single female from Jamaica, Hardwar Gap, 4000 ft., 10 July 1966 (H.F. Howden & E. Becker) clearly represents an undescribed species, but the formal description should be delayed until a male is available and the genitalia can be examined.

Essential characters of this species are as follows: frons not projecting above eye, 4 strong, equal orbital bristles; jowls narrow in center, one-eighth eye height, not greatly extended at rear; third antennal segment large, somewhat longer than broad, arista long, only finely pubescent; 3+1 strong dc, with a small additional bristle immediately behind suture; wing length 2.75 mm, last and penultimate sections of vein M3+4 equal; color: almost entirely black; frons mat black, all antennal segments black; mesonotum mat black; pleura largely black but hind half of humerus and lower half of notopleural area yellowish; legs black; squamae gray, margin and fringe black.

This species can be included in the following extension to the author's (1963a) key to Neotropical *Agromyza* species:

Second alternative of couplet 3, for 5 read 5a; add new couplet 5a:

5a Strong pre-sutural dc; humerus and notopleural area partially yellowish ..... sp. (Jamaica)
— No pre-sutural, 2 or 3 post-sutural dc .. 5

Geratomyza Spencer, gen. nov.

(Greek geras, old age + myza)

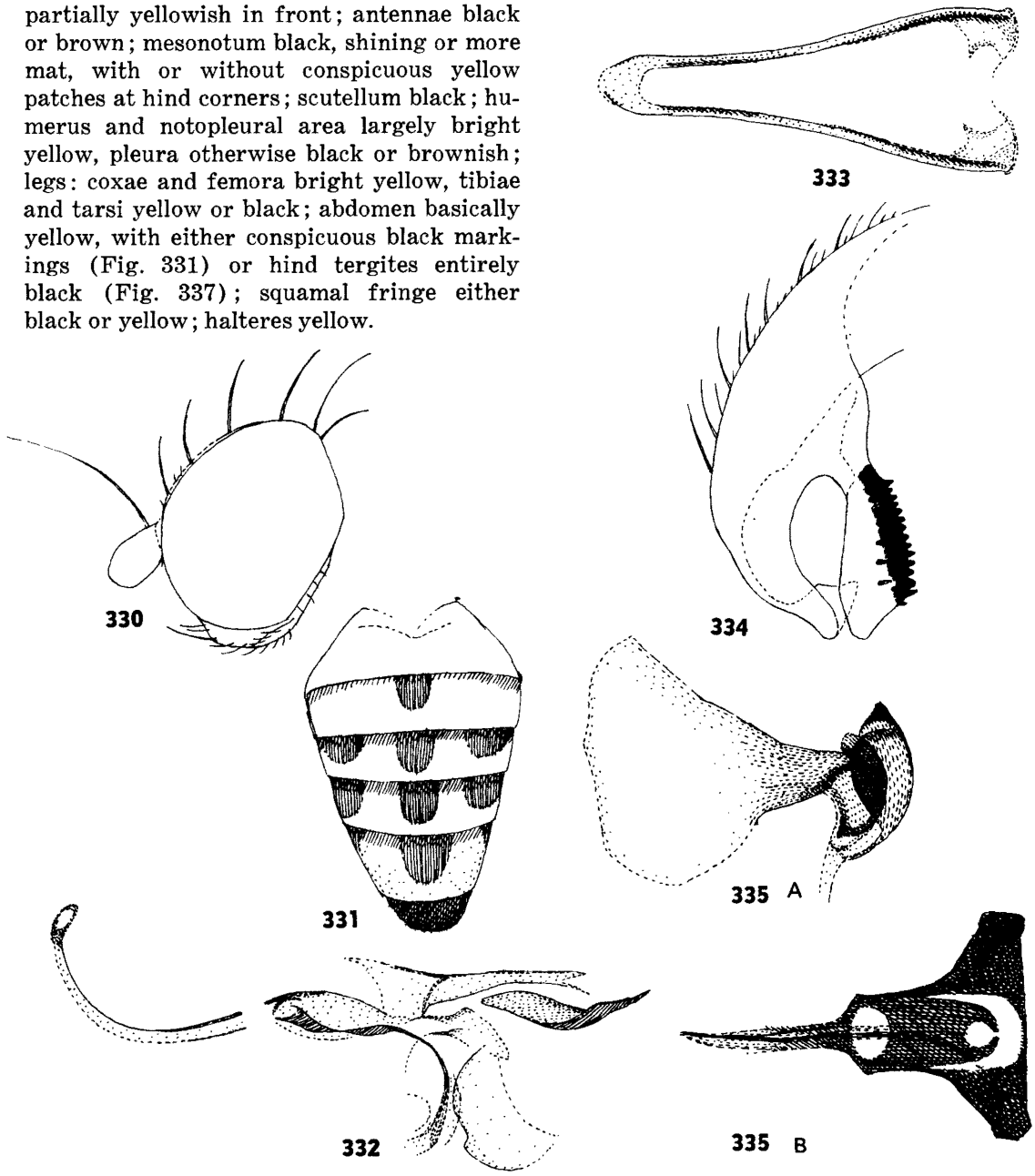
Fig. 330-340

Type of genus *Geratomyza maculata* by present designation.

Adult: small to medium-sized species, wing length 2 to 2.4 mm; sub-costa clearly joining vein R1 before its termination with costa; costa extending to vein M1+2, last

section of M3+4 about two-thirds penultimate; frons not projecting above eye, two strong ors, two ori; orbital setulae sparse, reclinate; two strong dc, with a very small third just beyond second; pre-scutellars well developed; mid-tibiae with two strong lateral bristles; color: frons variable, black or partially yellowish in front; antennae black or brown; mesonotum black, shining or more mat, with or without conspicuous yellow patches at hind corners; scutellum black; humerus and notopleural area largely bright yellow, pleura otherwise black or brownish; legs: coxae and femora bright yellow, tibiae and tarsi yellow or black; abdomen basically yellow, with either conspicuous black markings (Fig. 331) or hind tergites entirely black (Fig. 337); squamal fringe either black or yellow; halteres yellow.

Male genitalia: aedeagus as in Fig. 332, 338, sclerites of basiphallus complex and asymmetrical, well-defined cylindrical mesophallus, distiphallus with long tubule ending in paired processes distally; ninth sternite long, with narrow sidearms, with or without



Figs. 330-335. *Geratomyza maculata*: 330, head; 331, abdomen; 332, aedeagus; 333, ninth sternite; 334, surstylus; 335, sperm sac, A, holotype (Grand Cayman); B, paratype (Jamaica).



Fig. 336. Distribution of *Geratomyza maculata.*

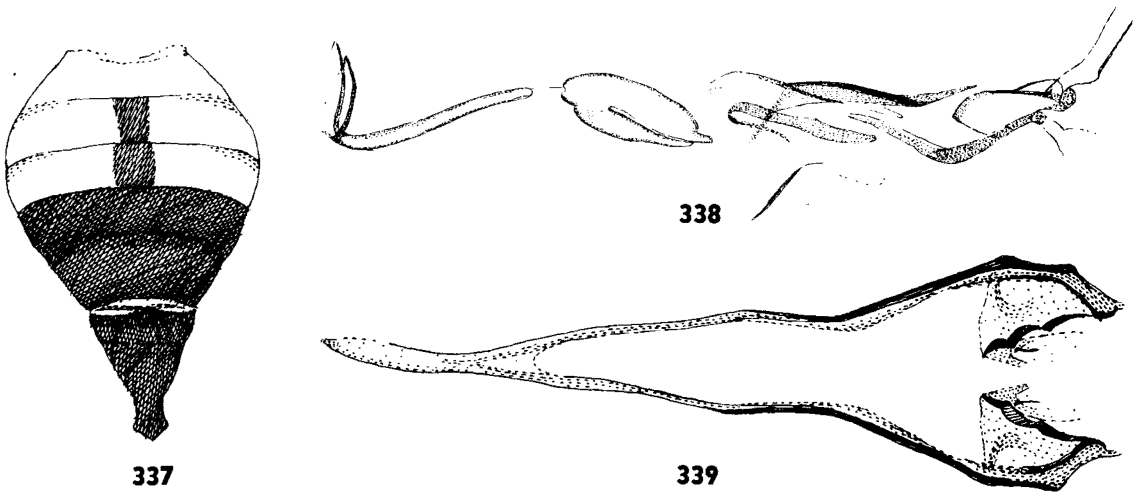


Fig. 340. Distribution of *Geratomyza spadix.*

hypandrial apodeme (Fig. 333, 339); surstyli only narrowly joined to epandrium, covered with short, strong, black bristles (Fig. 334); sperm sac with large blade and short wings at base (Fig. 335a, b).

Host plant/Biology: unknown.

Remarks: In general habitus this genus most closely resembles *Japanagromyza,* particularly in the form of head. However, it is differentiated by the presence of the small third dc and the yellow coloration. The long, narrow ninth sternite is also only found in *Japanagromyza* among the genera of the Agromyzinae. The form of epandrium, however, is more typical of the genus *Agromyza.* The aedeagus, the surstyli and sperm sac are distinctive and justify the erection of a new genus for the two known species—*G. spadix,* originally placed in *Agromyza* and *G. maculata* sp.n. described below.



Figs. 337-339. *Geratomyza spadix*: 337, abdomen (Jamaica); 338, aedeagus; 339, ninth sternite.

Geratomyza maculata Spencer, sp.n.

Fig. 330-336

Head: frons only slightly wider than eye, not projecting above eye in profile (Fig. 330); two strong, equal ors, two ori, the lower only slightly weaker and partially incurved; orbital setulae minute, sparse, reclinate; jowls narrow, one-twelfth eye height, vibrissa strong; eye large, upright; third antennal segment distinctly longer than broad, arista finely pubescent.

Mesonotum: two strong dc, third short, weak, immediately in front of second; acr in eight rows, pre-scutellars well developed.

Legs: mid-tibiae with two strong lateral bristles.

Wing: length in male 2 mm, costa extending to M1+2, last section of M4 two-thirds penultimate.

Color: frons mat black behind, more brownish in front; face brown, jowls yellow or yellowish gray; third antennal segment entirely brownish black or slightly more yellow at base; palps yellow; mesonotum black but mat, dusted with gray, with small yellowish patch at hind corners; humerus black in front, yellow behind, notopleural area entirely yellow, pleura otherwise black; legs: coxae and femora entirely yellow, tibiae bright yellow on fore and middle legs, slightly more brownish on hind legs, tarsi yellowish brown; abdomen essentially yellow but with symmetrical black markings centrally and at sides of tergites, as in Fig. 331; squamae and fringe yellow; halteres yellow.

Male genitalia: aedeagus as in Fig. 332, distiphallus in form of curving tubule with small, paired processes at end; ninth sternite elongate, with narrow side arms, rounded apically in holotype (Fig. 333) but with distinctly elongated hypandrial apodeme in paratype; surstyli with only narrow connection to epandrium (Fig. 334), closely covered with short, black bristles; sperm sac (Fig. 335a, b) with large blade and distinct short wings at base.

Holotype male, Grand Cayman, Georgetown, 15-30 March 1965 (J.R. McLintock); paratype: one male, Jamaica, Duncans, 23 Aug. 1966 (H.F. Howden & E.C. Becker). Holotype in CNC, paratype in senior author's collection.

Remarks: This species is distinguishable immediately from *G. spadix* by the mat black mesonotum and distinctive coloration of the abdomen. The aedeagus is of the same form as in *spadix*, but the distal tubule is longer, and the paired terminal processes are smaller.

Geratomyza spadix (Spencer), comb. nov.

Fig. 337-340

Agromyza spadix Spencer, 1963a:298. Holotype male from Guyana in BM.

Adult: medium-sized species, wing length 2.2 to 2.4 mm; frons mat brown, paler, more yellowish in front; orbital bristles conspicuously strong, orbital setulae slight, sparse; antennal segments brown, arista conspicuously pubescent; jowls narrow, about one-twentieth height of eye, vibrissa strong; palps yellow; two strong dc, very small third immediately in front of second, acr in eight rows, pre-scutellars strong; mesonotum shining black, with large yellow patch at hind corners; humerus black in center, otherwise yellow, notopleural area yellow, other pleura black (in female from Guyana brown); legs: coxae and femora bright yellow, mid- and hind-femora black toward knees, tibiae and tarsi contrasting, dark brown; abdomen mainly yellowish brown but last three tergites black centrally (Fig. 337); squamae yellow, fringe dark brown.

Male genitalia: aedeagus as in Fig. 338, distiphallus with large, paired terminal processes; ninth sternite (Fig. 339) with narrow side arms and extended hypandrial apodeme; surstyli strongly chitinized, with many short black bristles on inner margin.

Remarks: With the additional material now available I am satisfied that this species is not congeneric with the true grass mining *Agromyza* species, and it is transferred herewith to the new genus *Geratomyza*.

The three additional females cited below from the Bahamas and Jamaica agree very closely with the types from Guyana. The mesonotum is similarly brilliantly shining black, but the conspicuous yellow patch at the hind corners is reduced to a mere speck; the femora show the same darkening toward the knees; the abdomen, however, shows some variation, the front and hind tergites being conspicuously yellow and black (Fig. 337) in the Jamaican specimen, somewhat resembling this in one specimen from Berry Is. but being generally darker in the other. It is possible that these specimens represent a further distinct species, but it seems more probable that they are merely minor color variants.

Material examined:

Bahamas: Berry Islands, one female, Fraziers Hog Cay, 30 April 1953 (E.B. Hayden); one female, Little Harbor Cay, 1-4 May 1953 (E.B. Hayden and L. Giovannoli).

Guyana: Tureit, one male, 10 Sept. 1937; one female, 15 Sept. 1937 (Richards and Smart).

Jamaica: Duncans, one female, 23 Aug. 1966 (H.F. Howden and E.C. Becker).

GENUS *JAPANAGROMYZA* SASAKAWA

Four new species from the Caribbean are described below; *J. inferna* and *J. propinqua* from the Bahamas may also be present in southern Florida. Three undescribed species have been seen from Costa Rica, and a further new species reared from *Macroptilium atropurpureum* Urban on Cuba by E. Rohdendorf will be described elsewhere by Rohdendorf. Twenty species are known in the Neotropical Region, but it is already clear that many more await discovery.

The following revised key to Neotropical species includes those described in this paper.

Key to Neotropical *Japanagromyza* species

(including *J. viridula* present in Florida)

1 Knob of halteres dark, brownish black .. *jamaicensis* Spencer
1′ Knob of halteres pale, white or yellow.... 2
2 Pre-scutellars lacking 3
2′ Well-developed pre-scutellars present ..6
3 Mesonotum shining black 4
3′ Mesonotum more mat or with obvious greenish or coppery reflections 5
4 Large species, wing length over 3 mm; arista conspicuously pubescent ..... *aldrichi* (Frick)
4′ Small species, wing length 2 mm; arista largely bare ..... sp. (*Phaseolus*)
5 Mesonotum distinctly greenish; distal tubules of aedeagus long (Fig. 36a); hairs on cerci sparse, short (Fig. 37b).. *perpetua* Spencer
5′ Mesonotum predominantly mat grayish-black, only faintly greenish; distal tubules of aedeagus short (Fig. 24), hairs on cerci conspicuously long (Fig. 27) .. *desmodivora* Spencer
6 Mesonotum predominantly black 7
6′ Mesonotum gray, greenish or coppery black 11
7 Large species, wing length up to 2.8 mm; mesonotum largely mat blackish, with only faintest coppery or greenish reflections; arista bare .. *viridula* (Coq.)
7′ Smaller species, wing length 2 mm 8
8 Mid-tibiae without lateral bristles ..... *centrosemae* (Frost)
8′ One or two mid-tibial bristles present 9
9 Mesonotum largely shining 10
9′ Mesonotum distinctly mat ..... *inferna* Spencer
10 Aedeagus and surstyli as in Fig. 351a, 352a, 353a ..... *propinqua* Spencer
10′ Aedeagus and surstyli as in Spencer (1963a, Fig. 9a,d) ..... *frosti* (Frick)
11 Upper orbital bristle shorter than lower 12
11′ Upper orbital bristles equal 13
12 Very large species, wing length in male 3.1 mm ..... *iridescens* (Frost)

12′ Smaller species, wing length 2.3 to 2.5 mm ..... *inaequalis* (Malloch)

13 Tergites with broad yellow borders; arista conspicuously plumose ..... *currani* (Frost)

13′ Abdomen uniformly greenish 14

14 Frons brown 15

14′ Frons mat black 16

15 Mesonotum largely mat gray ..... sp. (Peru)

15′ Mesonotum more shining greenish ..... *aequalis* Spencer

16 Surstyli projecting downwards (Fig. 37a, 343) 17

16′ Surstyli projecting inward (Fig. 346a, 357) 18

17 Arista slightly but distinctly pubescent; ninth sternite without hypandrial apodeme ..... *perpetua* Spencer

17′ Arista fine, bare; ninth sternite with extended hypandrial apodeme ..... *bennetti* Spencer

18 Arista slightly but distinctly pubescent; ninth sternite with conspicuously elongated hypandrial apodeme (Fig. 345b); cerci with only 4 to 8 spines (Fig. 346b) ..... *inferna* Spencer

18′ Arista fine, bare; ninth sternite with short hypandrial apodeme; cerci entirely covered with a mass of black spines (Fig. 356, 357) ..... *wirthi* Spencer

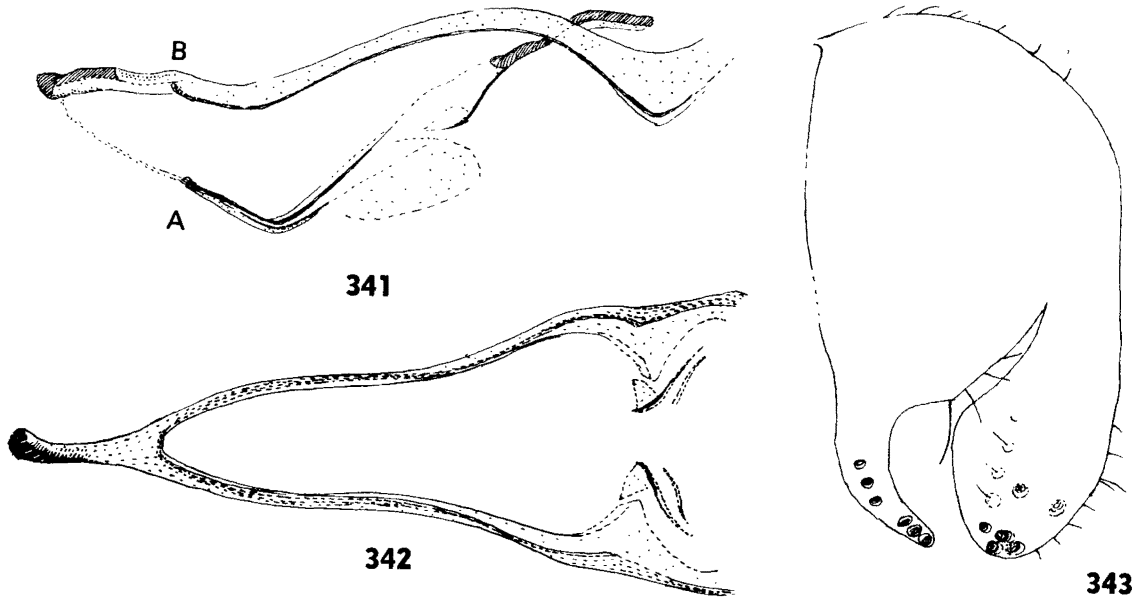
Mel. orbitalis (Frost) was transferred to *Japanagromyza* by Spencer (1963a: 303). However, I now feel there is doubt about the correct generic placing of this species, and it is not included in the key given above.

Japanagromyza bennetti Spencer, sp.n.

Fig. 341-344

Adult: essentially as in *J. perpetua* described below.

Male genitalia: aedeagus as in Fig. 341a consisting essentially of a well-chitinized, flat basiphallus, an elongated, largely membranous mesophallus with a strongly chitinized section at the point of curvature distally and finally the short, upward-curving, membranous distiphallus; ninth sternite (Fig. 341b, 342) V-shaped, with elongated hypandrial



Figs. 341-343. *Japanagromyza bennetti*: 341 A, aedeagus, 341 B, ninth sternite, side view; 342, ninth sternite, ventral view; 343, epandrium with surstylus and cercus.



Fig. 344. Distribution of *Japanagromyza bennetti.*

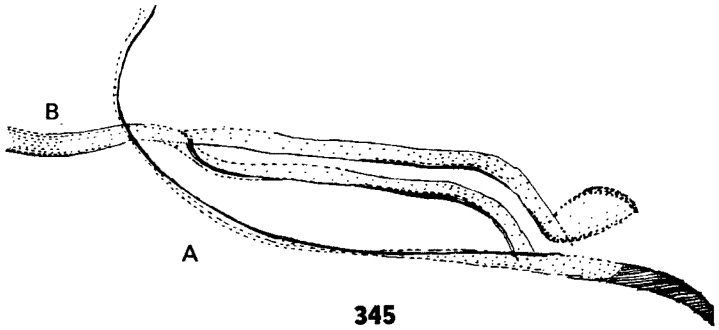


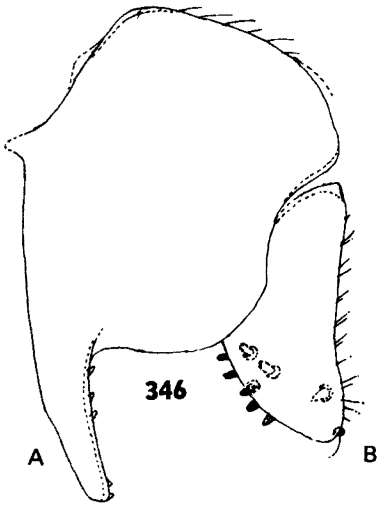
Fig. 347. Distribution of *Japanagromyza inferna.*

apodeme, surstyli extending downward (not inward), with about five short bristles on inner margin (Fig. 343), cerci with about ten short bristles on inner, lower corner.

Holotype male, Barbados, March, 1965; paratypes, seven males, three females, same data; Antigua, one male, two females, Feb. 1964 (all F.D. Bennett); Puerto Rico, Arecibo, one male, 1-4 March 1914. Holotype and nine paratypes in BM, four paratypes in senior author's collection, one in FSCA.

Remarks: This species is distinguishable from *J. perpetua* by the less pubescent arista, the shorter distiphallus and the elongate hypandrial apodeme of the ninth sternite. These differences are slight but constant in specimens from the five localities which have been examined. With geographical overlapping of the two forms in Antigua, Barbados and Puerto Rico on the one hand and the Bahamas and Dominica on the other, it seems correct to consider them as distinct sympatric species rather than as subspecies.





Figs. 345, 346. *Japanagromyza inferna*: 345 A, aedeagus; 345 B, ninth sternite; 346, epandrium with A, surstylus; B, cercus.

Japanagromyza inferna Spencer, sp.n.

Fig. 345, 347

Adult: medium-sized species, wing length in male 2.2 mm; frons mat black, paler brownish adjoining orbits and ocellar triangle; two strong equal ors; arista slightly but distinctly pubescent; mesonotum blackish with faint coppery greenish reflections, distinctly shining from behind, pre-scutellars well developed; fore-tibia with one, mid-tibia with two lateral bristles; abdomen shining blackish coppery; squamae and fringe, also halteres white.

Male genitalia: aedeagus as in Fig. 345a, consisting of simple, distinctly though weakly chitinized tubule, not significantly divided distally; ninth sternite (Fig. 345b) with greatly elongated hypandrial apodeme; surstyli long, projecting downward (Fig. 346a) with five short bristles on inner margin; cerci (Fig. 346b) with about eight stout bristles on lower half.

Host plant/Biology: unknown.

Holotype male, Bahamas, Exuma Cays, Darby Is., 18 Jan. 1953 (E.B. Hayden and L. Giovannoli); paratype: one female, same data. Both in AMNH.

Remarks: This species closely resembles others in this group, but the male genitalia are entirely distinctive.

It seems almost certain that the two specimens referred to by Spencer (1963a:301 and Fig. 10) as "sp. near *frosti*" from Summit, Panama Canal Zone represent *inferna*. However, the senior author has not re-examined these specimens, and they are not treated as paratypes.



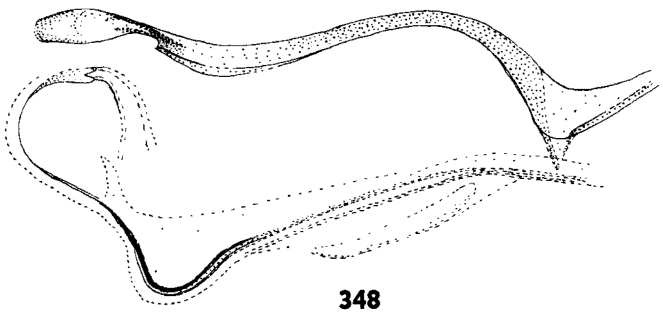
Fig. 350. Distribution of *Japanagromyza iridescens*.

Japanagromyza iridescens (Frost)

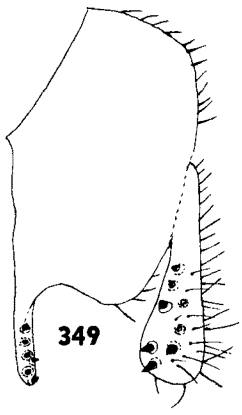
Fig. 348-350

Agromyza iridescens Frost, 1936: 303. Holotype male from Barro Colorado Is., Panama in AMNH.

Frick (1957: 199) synonymised *iridescens* with *inaequalis* (Mall.). Spencer recently examined the holotype of *iridescens* and can confirm that it is a distinct species. It is generally similar to *inaequalis* but is substantially larger, with wing length of 3.1 mm in



348



349

Figs. 348, 349. *Japanagromyza iridescens*: 348, aedeagus; 349, epandrium with surstylus and cercus.

male, the mesonotum is more uniformly green, and the dorsal upper orbital is only slightly, not substantially, shorter than the ventral.

The aedeagus is shown in Fig. 348 and the surstylus and cercus in Fig. 349.

Japanagromyza propinqua Spencer, sp.n.

Fig. 351-354

Closely resembling *J. frosti* (Frick), 1959: 355 [=*Agromyza schmidti* Frost, 1936: 302], with distinct differences in genitalia and following essential characters:

Head: frons approximately equal to width of eye, mat black, orbits slightly more shining; two equal ors, orbital setulae sparse, reclinate; jowls narrow, one-tenth vertical height of eye; arista distinctly pubescent.

Mesonotum: shining black with only faintest coppery reflections; acrostichals in eight rows, pre-scutellars present.

Legs: fore-tibia with one, mid-tibia with two lateral bristles.

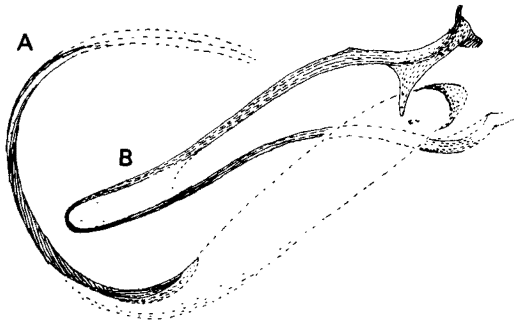
Wing: length 2.2 - 2.3 mm, last section of vein M4 about two-thirds penultimate, first cross-vein just before midpoint of discal cell.

Abdomen: greenish or coppery black.

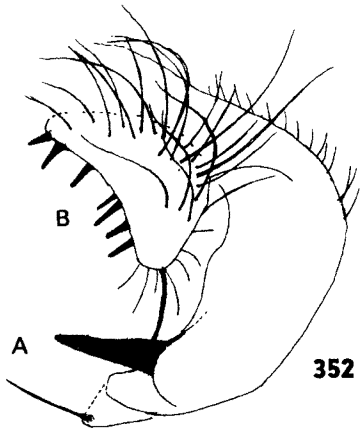
Male genitalia: aedeagus as in Fig. 351a, basiphallus translucent, not sclerotized, distiphallus brown adjoining distal tubules, which are long, curving and also translucent; ninth sternite narrow, U-shaped, fused at apex but without hypandrial apodeme (Fig. 357b); surstyli with one long spine-like projection and two shorter projections (Fig. 352a, 353a); cerci with strong bristles on inner face and very long hairs externally (Fig. 352b, 353b).

Holotype male, Bahamas, New Providence, Nassau, 3 Jan. 1953 (E.B. Hayden and L. Giovannoli); paratypes: Andros Is., Lisbon Creek (nr. South Bight), one male, 28 April 1953 (E.B. Hayden); Berry Is., Little Harbour Cay, one female, 11 May 1953 (E.B. Hayden and L. Giovannoli). Holotype and paratypes in AMNH, further paratypes in senior author's collection.

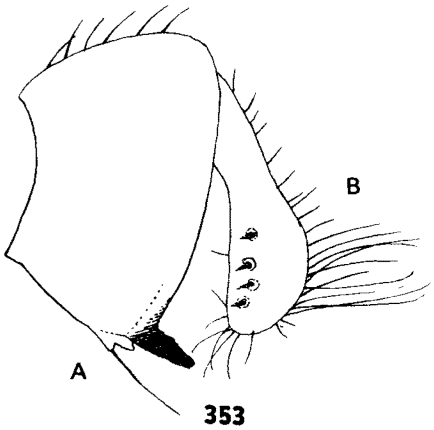
Remarks: The differences in genitalia between this species and *frosti* (Frick) from Costa Rica are significant; *frosti* appears to be somewhat smaller but, with no specimens before the senior author, he is not able to define any external morphological differences between the species.



351



352



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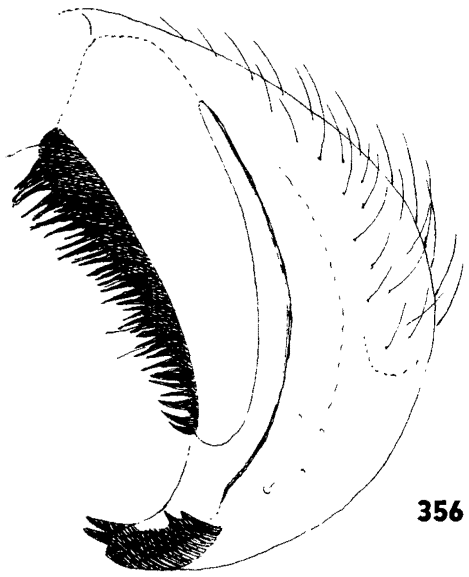
Figs. 351-353. *Japanagromyza propinqua*: 351 A, aedeagus; 351 B, ninth sternite; 352 A, 353 A, surstylus; 352 B, 353 B, cercus.

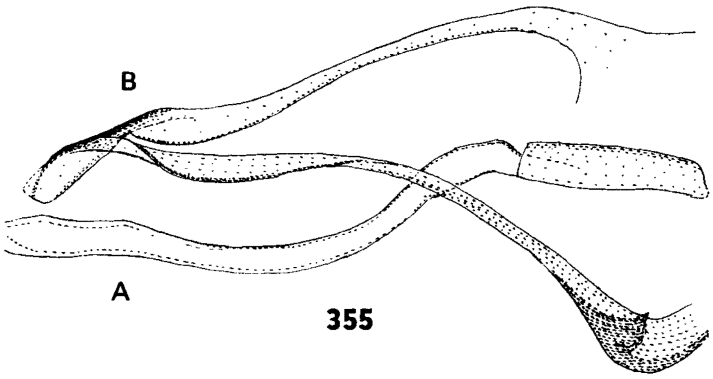
Japanagromyza wirthi Spencer, sp.n.

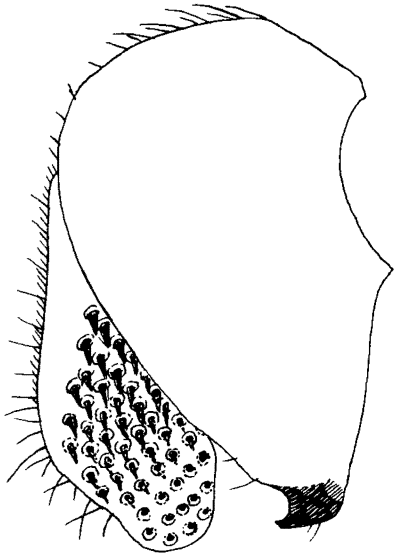
Fig. 355-358

Adult: a small, greenish species, with wing length of 1.9 mm, exactly as in *J. bennetti* described above but with significant differences in male genitalia.

Male genitalia: aedeagus (Fig. 355a) a short, largely membranous tubule, ninth sternite (Fig. 355b) with short, down-curved hypandrial apodeme; surstyli (Fig. 356) curving inward, with black, strongly chitinized area at end, terminating in two strong teeth, cerci entirely covered with a mass of strong black spines; epandrium in side view as in Fig. 357.







Figs. 355-357. *Japanagromyza wirthi*: 355 A, aedeagus; 355 B, ninth sternite (dorso-lateral view); 356, epandrium with surstylus and cercus in ventral view; 357, same, side view.



Fig. 354. Distribution of *Japanagromyza propinqua*.

Holotype male, Dominica, Clarke Hall, 21-31 Jan. 1965, Malaise trap (W.W. Wirth) in USNM.

Remarks: Despite the apparent similarity of this species with *J. bennetti*, the male genitalia, including aedeagus, surstyli and cerci, are so completely different in the two forms that there is no reasonable doubt that they represent distinct species.



Fig. 358. Distribution of *Japanagromyza wirthi.*

GENUS *MELANAGROMYZA* HENDEL

The material studied from the Caribbean has been mainly from Dominica and the Bahamas, with some specimens also from Trinidad and Jamaica. A substantial number of species now recorded on these islands also occur in southern Florida, but 16 new species are described. At least ten further undescribed species have been confirmed in the material examined from Costa Rica but it is not possible to describe these at this time. It is thus clear that many further species in this genus remain to be discovered throughout the West Indies.

Most of the species described below belong to the difficult complex of small to medium-sized greenish species, feeding either as stem borers or seed feeders. In many cases the male genitalia will provide the only reliable means of a positive identification. Three further minute black species related to *M. crotonis—M. eleutherensis, M. nassauensis* and *M. nigrans*—are also described. These species almost certainly will prove to be leaf miners. *M. felis* is an aberrant species with the costa ending at vein R4+5 and lacking the second cross-vein, but the male genitalia are exactly as in typical stem boring species.

A revised key to Neotropical species is given below.

Key to Neotropical *Melanagromyza* species

(including species present in Florida)

0 Costa ending at vein R4+5, second cross-vein lacking ..... *felis* Spencer

0′ Costa extending to vein M1+2, second cross-vein present 1

1 Squamal fringe pale, whitish 2

1′ Squamal fringe dark, brownish or black 33

2 Halteres partially white 3

2′ Halteres entirely dark, brown or black.. 4

3 Halteres largely white, with oval black area on apex of knob; small species, wing length 1.6 mm ..... *halterella* Spencer

3′ Halteres largely black but conspicuously white at fold on lower side of knob; large species, wing length 3.1 to 3.5 mm.. ..... *colombiensis* Spencer

4 Four pairs of developed dc ..... *tetrae* (Malloch)

4′ Two pairs of dc 5

5 Ocellar triangle brilliantly shining .. 6

5′ Ocellar triangle at most moderately shining 8

6 Jowls deep, almost one-quarter eye height ..... *viridis* (Frost)

6′ Jowls narrower, one-seventh to one-twelfth eye height 7

7 Ocellar triangle black, mesonotum shining blackish green .. *heliotropii* Spencer

7′ Ocellar triangle greenish blue, mesonotum strongly shining green, blue or greenish blue ..... *ruelliae* Spencer

8 Arista bare 9

8′ Arista appearing at least slightly pubescent 15

9 Orbits conspicuously widened, orbital setulae in numerous rows 10

9′ Orbits narrow, normal 11

10 Orbits exceptionally wide, each up to one-third width of frons; orbital setulae conspicuously proclinate above, more reclinate below; mesonotum distinctly mat viewed from front .. *virens* (Loew)

10′ Orbits less pronounced; orbital setulae shorter, less numerous; mesonotum more shining ..... *splendida* Frick

11 Jowls narrow, one-eighth height of eye; small species, wing length 2 mm 12
11′ Jowls broader, one-quarter to one-fifth height of eye 13
12 Orbital setulae entirely reclinate; eye bare in both sexes ..... *floris* Spencer
12′ Orbital setulae proclinate on inner row; eye pilose in male .... *chaptaliae* Spencer
13 Mesonotum entirely black, abdomen black or faintly greenish coppery ..... *lippivora* Spencer
13′ Mesonotum and abdomen greenish ..14
14 Aedeagus ending in curved tubules (Spencer, 1963a:Fig. 34) ..... *neotropica* Spencer
14′ Aedeagus bulbous at end (Spencer, 1963a: Fig. 29) ..... *lini* Spencer
15 Exceptionally large species, wing length in male 3.8 mm ..... *simmondsi* Spencer
15′ Smaller species, wing length at most 3.4 mm 16
16 Mesonotum shining black, abdomen greenish or coppery 17
16′ Mesonotum also partially greenish or bluish 18
17 Aedeagus as in Fig. 368 ..... *eupatoriella* Spencer
17′ Aedeagus as in Fig. 378, 379 ..... *mallochi* (Hendel)
18 Mesonotum conspicuously mat, at least viewed from front 19
18′ Mesonotum distinctly shining, even from front 21
19 Large species, wing length 3.1 mm ..... *erigeronis* Spencer
19′ Smaller species, wing length 2 mm 20
20 Eye bare ..... *regalis* Spencer
20′ Eye in male with short pilosity above .. *occulta* Spencer
21 Jowls relatively broad, one-quarter to one-sixth vertical height of eye 22
21′ Jowls narrower, one-tenth vertical height of eye 23
22 Small species, wing length 2 - 2.3 mm .. *peremnis* Spencer
22′ Larger species, wing length 2.7 - 2.9 mm ..... *chenopodii* Spencer
23 Fore-tibial bristle strongly developed; large species, wing length 2.6 - 3.4 mm .. *caerulea* (Mall.)
23′ Fore-tibial bristle, if present, weak ..24
24 Arista plumose 25
24′ Arista with normal pubescence 29
25 Relatively large species, wing length 2.6 mm ..... *setifera* Spencer
25′ Smaller species, wing length 2 to 2.3 mm 26
26 Mesonotum blackish with faint greenish tinge ..... *compositoides* Spencer
26′ Mesonotum more conspicuously shining greenish or bluish 27
27 Frons equal to width of eye 28
27′ Frons broader, up to one and a half times width of eye ..... *tempestiva* Spencer
28 Eye in male bare; mesonotum conspicuously greenish ..... *strictiva* Spencer
28′ Eye in male pilose above; mesonotum greenish black, more mat viewed from front ..... *querula* Spencer
29 Eye in male bare 30
29′ Eye in male pilose 31
30 Orbital setulae minute, similar to pubescence of arista .... *floridensis* Spencer
30′ Orbital setulae long, substantially longer than pubescence of arista ..... *miamensis* Spencer
31 Mesonotum shining green; arista distinctly pubescent 32
31′ Mesonotum blackish green; arista appearing bare ..... *vulgata* Spencer
32 Aedeagus as in Fig. 392, 393 ..... *pavida* Spencer
32′ Aedeagus as in Fig. 106, 107 ..... *vectabilis* Spencer
33 Frons pale in front, reddish ..... *diadema* (Melander)
33′ Frons uniformly dark, brown or black 34
34 Mesonotum and abdomen brilliantly shining blue; large species, wing length 3.4 to 3.8 mm ..... *praeclara* Spencer
34′ Smaller species, wing length at most 2.7 mm..... 35
35 Mesonotum or abdomen greenish or coppery 36
35′ Mesonotum and abdomen black 40
36 Orbital setulae in 2 rows, inner row proclinate, outer reclinate; eye slightly pilose in male; wing length 2.3 mm 37
36′ Orbital setulae in single row, reclinate 38

37 Jowls broad, one-fifth height of eye; orbital setulae relatively long; aedeagus as in Fig. 55, 56 ..... *erechtitidis* Spencer

37′ Jowls narrow, one-tenth height of eye; orbital setulae conspicuously short; aedeagus as in Fig. 117, 118 ..... *wedeliae* Spencer

38 Very small species, wing length not more than 1.9 mm 39

38′ Slightly larger species, wing length up to 2.2 mm; mesonotum more mat, greenish; ovipositor slightly elongated ..... *minimoides* Spencer

39 Mesonotum predominantly bluish black; long gap between basiphallus and distiphallus (Fig. 84); ovipositor greatly elongated ..... *minima* (Mall.)

39′ Mesonotum predominantly greenish black; basiphallus and distiphallus adjoining (Fig. 42); ovipositor not elongated ..... *bidentis* Spencer

40 Mesonotum with three pairs of dc ..... *lacustris* (Mall.)

40′ Mesonotum normal, two pairs of dc ..41

41 Jowls exceptionally broad, one-quarter vertical height of eye ..... *marellii* (Brèthes)

41′ Jowls narrower, at most one-fifth eye height 42

42 Small species, wing length 2.3 mm or less 43

42′ Larger species, wing length 2.3 - 2.7 mm 51

43 Jowls deepest in front ..... *pfaffiae* Spencer

43′ Jowls deepest in center or behind 44

44 Frons relatively broad, one and a half to twice width of eye 45

44′ Frons narrower, equal to width of eye 49

45 Jowls relatively broad, one-fifth height of eye; wing length in male 2.2 mm ..... *bahamensis* Spencer

45′ Jowls narrower, one-sixth to one-twelfth height of eye; smaller species, wing length 1.7 to 2 mm 46

46 Ocellar triangle extended, apex reaching level of upper ori; mesonotum brilliantly shining ..... *nigrans* Spencer

46′ Ocellar triangle not extending below level of lower ors; mesonotum more mat 47

47 Very small species, wing length 1.9-2 mm 48

47′ Slightly larger species, wing length from 2.3 mm in male ..... *dominicana* Spencer

48 Aedeagus as in Fig. 48, 49 ..... *caribbea* Spencer

48′ Aedeagus as in Fig. 381, 382 ..... *nassauensis* Spencer

48″ Aedeagus as in Fig. 365, 366 ..... *eleutherensis* Spencer

49 Mesonotum brilliantly shining black; asdeagus as in Fig. 91, 92 ..... *parvella* Spencer

49′ Mesonotum more mat, at least when viewed from front 50

50 Aedeagus as in Spencer, 1963a: Fig. 16a ..... *alternantherae* Spencer

50′ Aedeagus as in Spencer, 1963a: Fig. 22a ..... *crotonis* (Frost)

51 Orbital setulae sparse, in single row, all reclinate; aedeagus as in Spencer, 1963a: Fig. 35 ..... *nobilis* Spencer

51′ Orbital setulae numerous, in two rows, outer row reclinate, inner row incurved or proclinate; aedeagus as in Spencer, 1963a: Fig. 23 ..... *distincta* Spencer

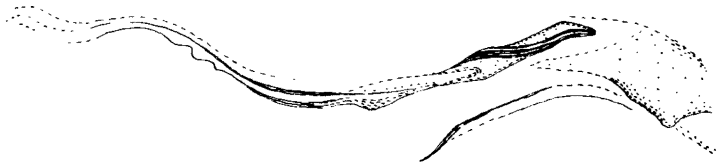


Fig. 359. *Melanagromyza bahamensis*: aedeagus.

359



Fig. 360. Distribution of *Melanagromyza bahamensis*.



Fig. 361. Distribution of *Melanagromyza crotonis*.

Melanagromyza bahamensis Spencer, sp.n.

Fig. 359, 360

Adult: small black species, wing length in male 2.2 mm, closely resembling *M. caribbea* but slightly larger; jowls slightly deeper, one-fifth vertical height of eye; wing with last section of vein M3+4 relatively long, in ratio 15:20 with penultimate.

Male genitalia: aedeagus as in Fig. 359, consisting of long, paired tubules, with the hypophallus well developed; ninth sternite with side arms broadly fused toward apex and short aedeagal apodeme slightly bending ventrally; surstyli only slightly extending inward, bearing a row of short bristles and longer hairs on lower corner.

Holotype male, Bahama Is., New Providence, 2 mi. E. of Nassau, 14 April 1953 (E.B. Hayden), in AMNH.

Remarks: Although *M. bahamensis* closely resembles the species of the *caribbea* group on external characters, it is distinguishable by the deeper jowls and slightly larger size. The male genitalia indicate that it is an aberrant species, not directly related to the *caribbea* group.

Melanagromyza crotonis (Frost)

Fig. 361

Agromyza crotonis Frost, 1936: 313. Holotype male from Panama Canal Zone in USNM.

Melanagromyza crotonis, Frick, 1959: 363; Spencer, 1963a: 310 (Fig. of genitalia).

Dominica: Layou River mouth, one male, one female, 18-24 March 1965; Clarke Hall, one male, 11-20 Jan. 1965 (W.W. Wirth).

Remarks: The specimens from Dominica represent an interesting extension of the range of this species, which hitherto has been known from the Panama Canal Zone and Cuba. As a leaf miner on *Croton* (Euphorbiaceae) it may be expected to occur in southern Florida where 11 *Croton* species are known.

Although *M. crotonis* very closely resembles *M. caribbea* sp.n. (p. 34), the genitalia of the two species are entirely distinct.

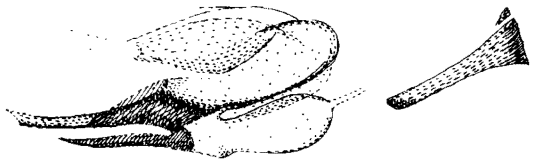
Melanagromyza dominicana Spencer, sp.n.

Fig. 362-364

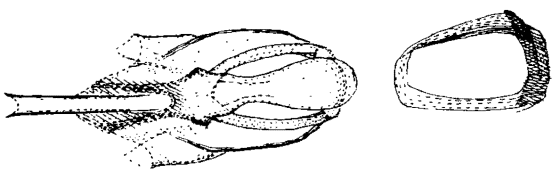
Head: frons equal to width of eye, not projecting above eye in profile, two strong, equal ors, two weaker ori, the lower incurved; orbital setulae relatively long, in single row, jowls deepest in center below eye, one-sixth vertical height of eye, eye large, upright, conspicuously pilose on upper half; third antennal segment small, round, arista long, distinctly pubescent.

Mesonotum: two strong dc, acr numerous, in about ten rows, some extending to first dc.

Wing: length 2.3 mm in male, last section of vein M3+4 little more than half penultimate, in ratio 14:26; first cross-vein slightly before midpoint of discal cell.



362



363

Figs. 362, 363. *Melanagromyza dominicana*: 362, aedeagus, side view; 363, same, ventral view.

Color: frons sooty black, ocellar triangle and orbits weakly shining; mesonotum essentially mat black, with very faint coppery sheen viewed from behind; abdomen mat black; squamae gray, fringe black.



Fig. 364. Distribution of *Melanagromyza dominicana*.

Male genitalia: aedeagus as in Fig. 362, 363 ninth sternite with broad side-arms and slightly extended hypandrial apodeme; surstyli extending inward, with a fringe of about ten hairs.

Host plant/Biology: unknown.

Holotype male, Dominica, Freshwater Lake, 21 Jan. 1965 (W.W. Wirth), in USNM.

Remarks: This is a medium-sized black species, with a dark squamal fringe. It is substantially larger than the group of small leaf mining species related to *crotonis* (Frost) but smaller than the two other entirely black species—*distincta* Spencer from Brazil and *nobilis* Spencer from Colombia.

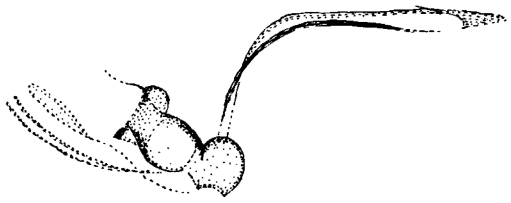
There is at the moment no evidence to suggest whether this species has reached Dominica from Central America via Cuba or directly from the South American mainland to the south.

Melanagromyza eleutherensis Spencer, sp.n.

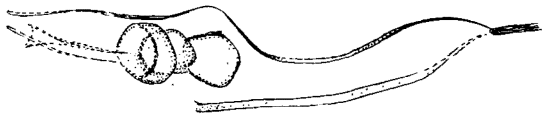
Fig. 365-367

Adult: very small black species, wing length 1.9 mm, essentially as in *M. caribbea*; orbits and ocellar triangle very weakly shining; mesonotum somewhat mat; jowls narrow, one-twelfth height of eye.

Male genitalia: aedeagus as in Fig. 365, 366, symmetrical; surstyli not extended inward, with a row of fine bristles along inner margin and three or four longer hairs at end; ninth sternite with side arms broadly fused at apex.



365



366

Figs. 365, 366. *Melanagromyza eleutherensis*: 365, aedeagus, side view; 366, same, ventral view.

Holotype male, Bahama Is., Eleuthera, Governor's Harbour, 31 March 1953 (E.B. Hayden); paratype: 1 female, same data (E.B. Hayden and L. Giovannoli); Costa Rica, La Caja, 8 km W. of San José, two males, 1930 (Schmidt). Holotype in AMNH, paratypes in DEI and senior author's collection.

Three further females from Eleuthera in imperfect condition are only tentatively referred to this species.

Remarks: The genitalia clearly associate this species with *M. caribbea* and *M. nassauensis*, but the aedeagus is entirely distinctive.



Fig. 367. Distribution of *Melanagromyza eleutherensis*.

Melanagromyza eupatoriella Spencer, sp.n.

Fig. 368-371

Head: frons little more than width of eye, not projecting above eye in profile; two strong, equal ors, two slightly weaker ori; orbital setulae in single row, reclinate; ocellar triangle narrow, elongate, apex extending below level of lower ors; jowls narrow, one-tenth vertical height of eye; eye upright, with patch of short pubescence on upper half in male; third antennal segment small, round, arista conspicuously pubescent.

Mesonotum: two strong dc, acr in about eight rows.

Legs: fore-tibia with one short, lateral bristle, mid-tibia with two.

Wing: length in male 2.4 mm, last section of vein M3+4 shorter than penultimate, in ratio 15:25, first cross-vein just beyond midpoint of discal cell.

Color: frons mat black, orbits and ocellar triangle moderately shining; mesonotum shining black, without any greenish tinge, abdomen shining green; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 368, with conspicuous chitinized areas extending dorsally; ninth sternite with short hypandrial apodeme; surstyli extending inward, fringed with hairs and with about 12 short bristles below and eight longer ones along inner margin (Fig. 369).

Host plant/Biology: *Eupatorium* sp., larva boring in stem; puparium with the posterior spiracular processes separated (distance apart not detectable), with ten distinct bulbs surrounding a shining central scar (Fig. 370).

Holotype male, Trinidad, St. Augustine, Feb. 1954, ex *Eupatorium* stem (F.D. Bennett); paratypes: St. Augustine, one male, 4 Feb. 1967; St. Hollis Reserve, one female, 3 Feb. 1967, both ex same host (R.E. Crutwell). Holotype and one paratype in BM, one paratype in senior author's collection.

Remarks: This species closely resembles *M. mallochi* (Hd.) which is known from stems of *Eupatorium* from Puerto Rico. Mr. G. C. Steyskal recently has examined the holotype of *mallochi* (see p. 158) and noticed that the genitalia are quite distinct from those of the specimen from Trinidad, which was misidentified previously and discussed as *mallochi* by Spencer (1963a: 316). *M. peremnis* from Dominica appears to belong to this same group.

Melanagromyza felis Spencer, sp.n.

Fig. 372-377

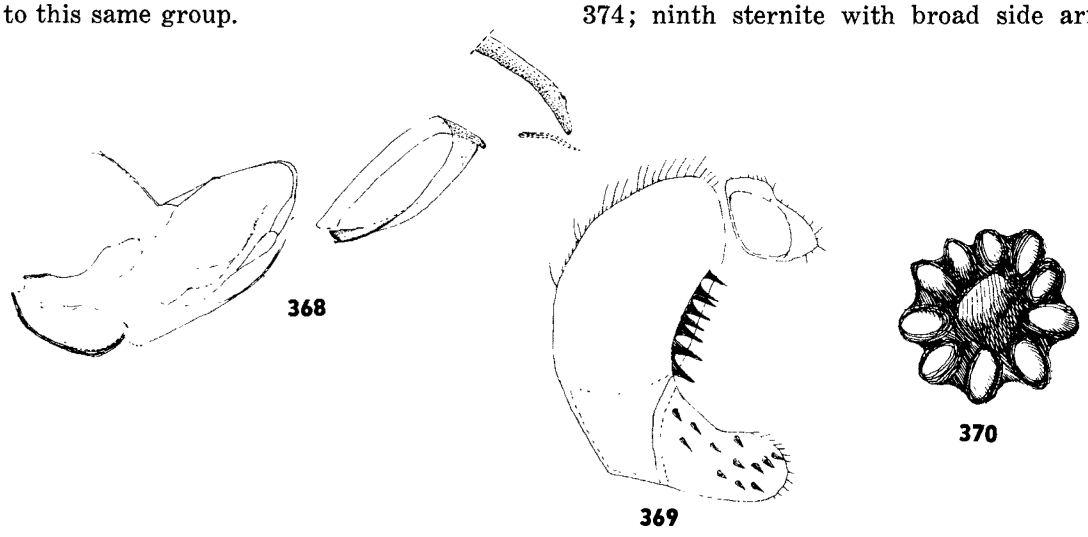
Head (Fig. 372): frons not projecting above eye; two slender ors, the upper slightly weaker, three largely incurved ori; orbital setulae fine, sparse, reclinate; ocellar triangle extended, apex reaching to midway between upper and central ori, jowls narrow, one-twelfth vertical height of eye, only slightly projecting forward; vibrissa weak; third antennal segment unusually small, round, arista short, slender but distinctly thickened at base; facial keel well defined but narrow, virtually linear and scarcely raised.

Mesonotum: first dc strong, normal, second weak, less than half length of first and close to it, at level of post-alar; acr numerous, in about 10 rows, some extending to beyond level of first dc.

Wing: length in male 1.4 mm, costa ending immediately beyond apex of vein R4+5, second cross-vein lacking.

Color: frons mat black, ocellar triangle and orbits moderately shining; mesonotum conspicuously shining black; wing conspicuously pale, whitish, veins R2+3 and R4+5 distinct, brown, veins M1+2 and M3+4 entirely colorless; squamae and fringe silvery white.

Male genitalia: aedeagus as in Fig. 373, 374; ninth sternite with broad side arms,



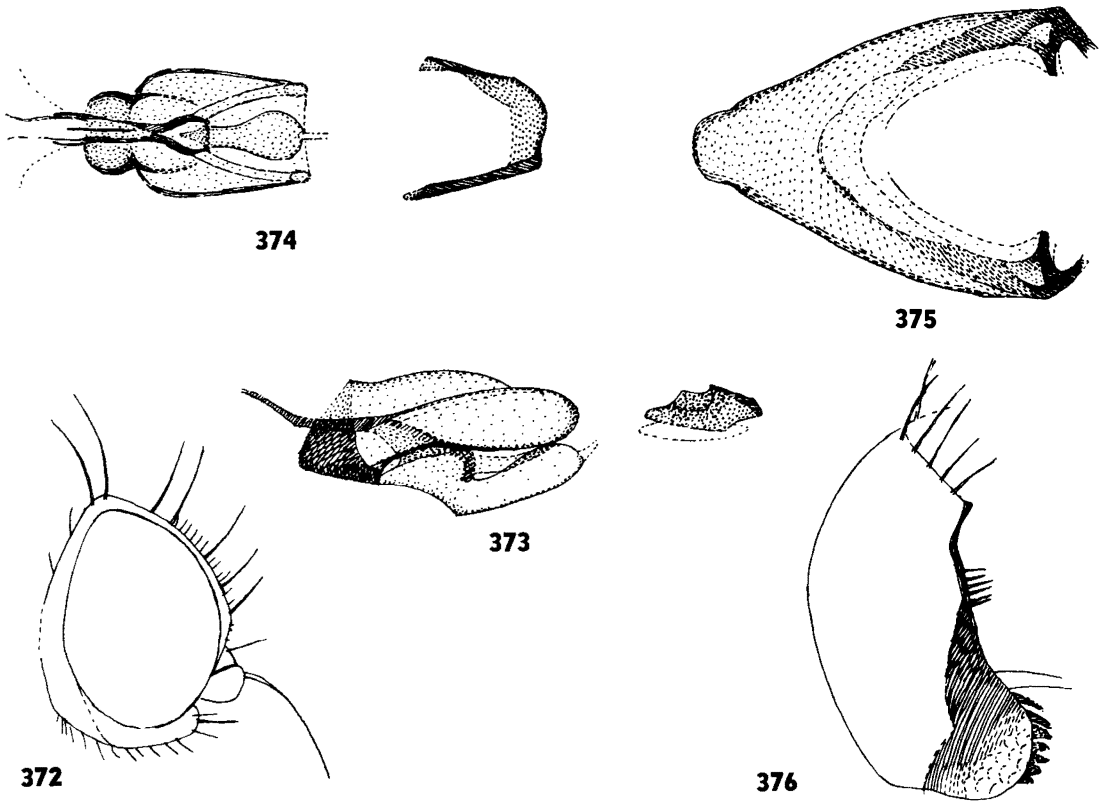
Figs. 368-370. *Melanagromyza eupatoriella*: 368, aedeagus; 369, surstylus; 370, posterior spiracle of puparium.



Fig. 371. Distribution of *Melanagromyza eupatoriella.*



Fig. 377. Distribution of *Melanagromyza felis.*



Figs. 372-376. *Melanagromyza felis*: 372, head; 373, aedeagus, side view; 374, same, ventral view; 375, ninth sternite; 376, surstylus.

fused and rounded at apex (Fig. 375); surstyli (Fig. 376) projecting inward, with about five bristles on inner corner and three at midpoint on inner margin; sperm sac with greatly enlarged blade and distinctive base.

Host plant/Biology: unknown.

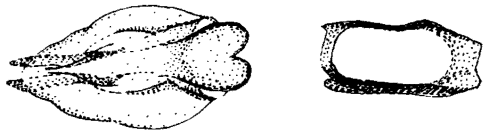
Holotype male, Bahamas, Cat Is., Bennetts Harbour, 24 March 1953 (E.B. Hayden), in AMNH.

Remarks: This species superficially resembles *O. spicatae* Spencer, a stem miner on *Baccharis spicata* in Brazil (Spencer, 1963a: 329). The whitish wings, costa ending at vein R4+5 and the lack of the second crossvein are common to the two species, but in *spicatae* the male has a strong vibrissal fasciculus, the facial keel is broad and raised, the mesonotum is mat, and the second dc is strong and further removed from the first. The genitalia of the two species, however, clearly indicate that they are not closely related. The aedeagus of *felis* is entirely typical of stem-boring *Melanagromyza* species, and the similarity in the wing of *felis* and *spicatae* can only represent convergence. Both the surstyli and sperm sac of *felis* are aberrant, and it clearly occupies an isolated position.

A further species with the identical form of wing is *O. aeneonitens* (Strobl) from Europe (cf. Spencer, 1964: 779). This species also lacks a vibrissal fasciculus, but a significant difference from *felis* is its brilliantly shining ocellar triangle. The aedeagus of *aeneonitens* is not typical of *Ophiomyia,* and its correct generic affiliation requires further investigation.



378



379

Figs. 378, 379. *Melanagromyza mallochi*: 378, aedeagus, side view; 379, same, ventral view.

Melanagromyza mallochi (Hendel)

Fig. 378-380

Agromyza eupatoriae Malloch, 1915: 107. Holotype male from Puerto Rico in USNM.

Agromyza mallochi Hendel, 1923, nom. nov. for *eupatoriae* Malloch, preoccupied by *eupatorii* Kaltenbach, 1874.

Melanagromyza mallochi, Frick, 1952a: 379.

Adult: essentially as in *M. eupatoriella* (p. 155), important characters being the distinctly pubescent arista, conspicuous pilosity on eye, largely black mesonotum, shining green abdomen, conspicuous lateral bristle on fore-tibia and pale squamal fringe; wing length in single male examined: 1.9 mm.

Male genitalia: aedeagus as in Figs. 378, 379.

Host plant/Biology: *Eupatorium odoratum,* larva boring in stem.

Distribution: Puerto Rico.

Remarks: A specimen from Trinidad previously was misidentified as *mallochi* (Spencer, 1963a: 316) and has now been described as *eupatoriella* sp.n. (p. 155). Although both species feed in stems of *Eupatorium* and do not significantly differ in external characters, the male genitalia are quite distinct.



Fig. 380. Distribution of *Melanagromyza mallochi.*

We are grateful to Mr. G. C. Steyskal for pointing out that the senior author's drawing of the aedeagus of the specimen from Trinidad differed from the holotype from Puerto Rico which he had examined.

Although only a single specimen is referred to in Malloch's description, the male now examined has identical data and is certainly conspecific with the holotype.

Material examined:

Puerto Rico: Rio Piedras, one male, 16 July 1914 (T.H. Jones, Ac.No. 775).

Holotype male, Bahama Is., New Providence, Nassau, 3 January 1953 (E.B. Hayden and L. Giovannoli); paratypes: one male, New Providence, 2 mi. E. of Nassau, 14 April 1953 (E.B. Hayden). Holotype in AMNH, paratype in senior author's collection.

Remarks: The genitalia clearly associate this species with *M. caribbea* and *M. eleutherensis,* but the aedeagus is entirely distinctive.

Melanagromyza nassauensis Spencer, sp.n.

Fig. 381-383

Adult: very small black species, wing length 1.9 - 2 mm, not distinguishable on external characters from *M. caribbea* and *M. eleutherensis.*

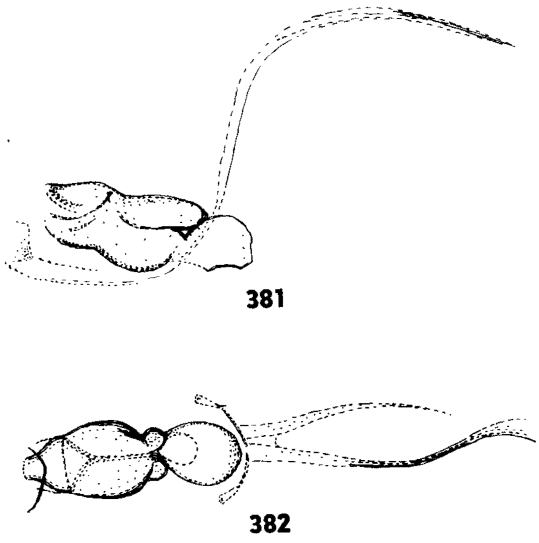
Male genitalia: aedeagus as in Fig. 381, 382, with a small separate process distally, basiphallus exceptionally long; surstyli not extending inward, and with a row of fine bristles along inner margin and some longer hairs basally.

Melanagromyza nigrans Spencer, sp.n.

Fig. 384-386

Adult: very small black species, wing length 1.9 mm; closely resembling *M. caribbea* but ocellar triangle greatly extended, reaching level of upper ori; mesonotum and abdomen brilliantly shining black.

Male genitalia: aedeagus as in Fig. 384, 385, highly asymmetrical; ninth sternite with slender side arms, not greatly fused at apex and only short hypandrial apodeme; surstyli only slightly extending inward, with a fringe of hairs, without bristles.



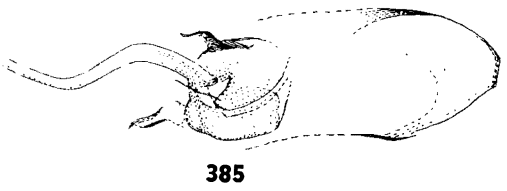
Figs. 381, 382. *Melanagromyza nassauensis*: 381, aedeagus, side view, 382, same, ventral view.



Fig. 383. Distribution of *Melanagromyza nassauensis.*



384



385

Figs. 384, 385. *Melanagromyza nigrans*: 384, aedeagus, side view; 385, same, ventral view.

Holotype male, Bahama Is., Long Island, Clarence Town, 13 March 1953 (E.B. Hayden and L. Giovannoli); paratype: Exuma Cays, Staniard Cay, one male, 13 Jan. 1953 (E.B. Hayden), both in AMNH. A female, now headless, from Exuma Cays, Little Farmers Cay, 17 Jan. 1953, almost certainly represents this species.

Remarks: Although closely resembling the species of the *caribbea* group, *M. nigrans* is distinguishable by the extended ocellar triangle and more shining mesonotum. The asymmetrical aedeagus indicates that *nigrans* occupies an isolated position, although it certainly has evolved in association with the *caribbea* group.



Fig. 386. Distribution of *Melanagromyza nigrans*.

Melanagromyza occulta Spencer, sp.n.

Fig. 387-391

Head: frons equal to width of eye, not projecting above eye in profile; eye with slight but distinct pilosity at level of ors; jowls narrow, one-tenth vertical height of eye; third antennal segment small, round, arista conspicuously pubescent.

Mesonotum: two normal dc (in holotype third dc on one side at level of suture); acr in some eight rows, some hairs extending beyond level of first dc.

Wing: length in male 2 mm, last section of M3+4 short, half length of penultimate.

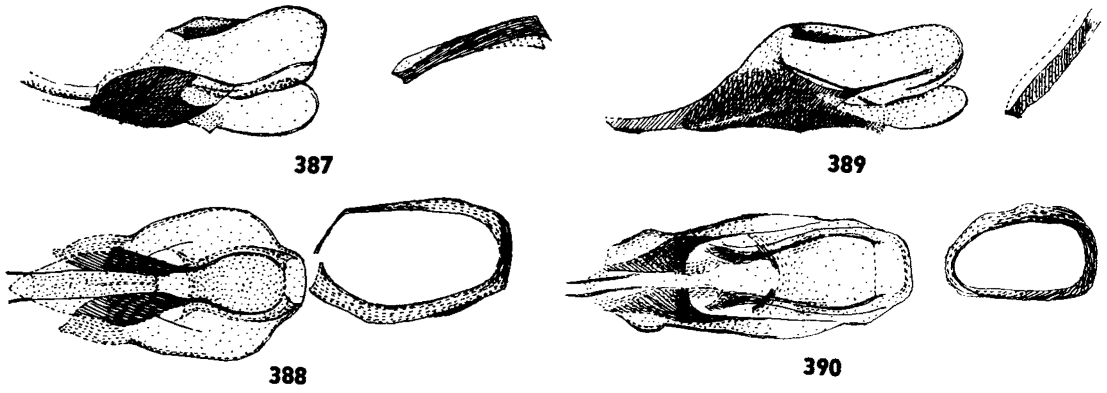
Color: frons mat black, ocellar triangle and orbits only moderately shining; mesonotum appearing mat black from front, slightly shining, blackish green or coppery from behind; abdomen shining, coppery greenish.

Male genitalia: aedeagus of holotype as in Fig. 387, 388, of paratype in Fig. 389, 390.

Host plant/Biology: unknown.

Holotype male, Dominica (W.I.), Fond Figues, 25 Jan. 1965 (W.W. Wirth); paratype: male, Dominican Republic, La Vega Prov., 25 Aug. 1967 (L.H. Rolston). Holotype in USNM, paratype in CNC.

Remarks: The distinctive character of this species is the largely mat, blackish green mesonotum. The aedeagus of the paratype from the Dominican Republic closely resembles that of the holotype from Dominica but differs in minute detail as seen in Fig. 387 - 390. This may represent normal variation or at most incipient speciation. Until additional material is available, it is considered correct to treat the two specimens as representing a single species.



Figs. 387-390. *Melanagromyza occulta*: 387, aedeagus, side view; 388, same, ventral view (Dominica); 389, aedeagus, side view; 390, same, ventral view (Dominican Republic).

Melanagromyza pavida Spencer, sp.n.

Fig. 392-394

Adult: medium-sized, shining greenish black species, essentially as in *M. peremnis*, with following points of difference: frons narrower, equal to width of eye; jowls narrower, one-tenth eye height; eye with thicker, longer, pilosity in male; arista more conspicuously pubescent; fore-tibia apparently lacking lateral bristle; wing length 2.3 mm.

Male genitalia: aedeagus as in Fig. 392, 393; side arms of ninth sternite broad, only slightly fused at apex, with distinct hypandrial apodeme; surstyli projecting inward but with only short bristles at end and only one or two along inner margin.

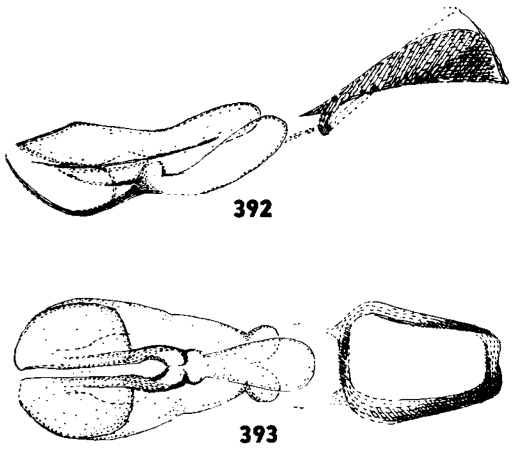
Host plant/Biology: unknown.

Holotype male, Dominica, Clarke Hall, Cocoa Trail, 16 Jan. 1965; paratype: one male, same locality, 16 Feb. 1965 (both W.W. Wirth). Holotype in USNM, paratype in senior author's collection.

Remarks: This is one of the complex group of shining green species, and a positive identification probably will be possible only from the male genitalia.



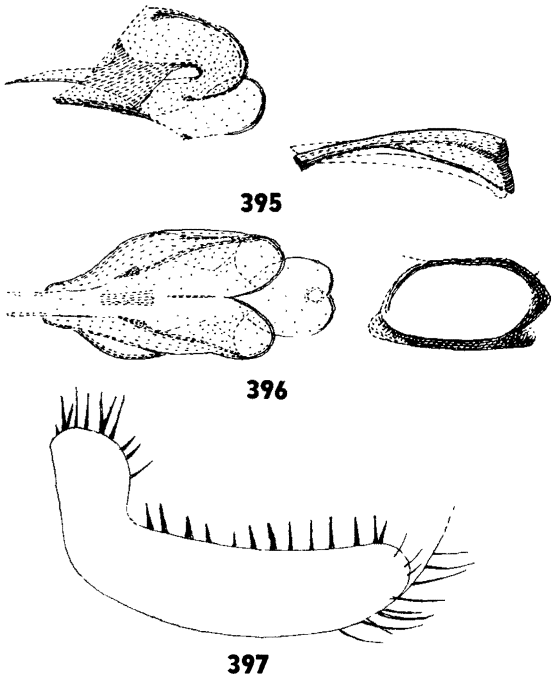
Fig. 391. Distribution of *Melanagromyza occulta*.



Figs. 392, 393. *Melanagromyza pavida*: 392, aedeagus, side view; 393, same, ventral view.



Fig. 394. Distribution of *Melanagromyza pavida.*



Figs. 395-397. *Melanagromyza peremnis*: 395, aedeagus, side view; 396, same, ventral view; 397, surstylus.

Melanagromyza peremnis Spencer, sp.n.

Fig. 395-398

Head: frons one and a half times width of eye, not projecting above eye in profile; orbits pronounced, with two strong ors, two ori, only the lower somewhat weaker; orbital setulae minute, in single row, reclinate; ocellar triangle broad, apex extending to upper ors; jowls deepest in center below eye, relatively broad, one-sixth vertical height of eye; eye with patch of sparse white hairs on upper half; third antennal segment small, round, arista only finely pubescent.

Mesonotum: two strong dc, acr numerous, in eight rows.

Wing: from 1.9 mm in male to 2.2 in female, last section of vein M3+4 slightly more than half length of penultimate, first crossvein slightly beyond midpoint of discal cell.

Legs: fore-tibia with one weak lateral bristle, mid-tibia with one or two, slightly stronger.

Color: frons mat black, ocellar triangle and orbits conspicuously, though not brilliantly shining; mesonotum shining greenish black, abdomen moderately shining, greenish; squamae and fringe white.



Fig. 398. Distribution of *Melanagromyza peremnis.*

Male genitalia: aedeagus as in Fig. 395, 396; ninth sternite with narrow side arms, broadly fused at apex, and only short hypandrial apodeme; surstyli (Fig. 397) conspicuously extending inward, with unusually long hairs or fine bristles, and a row of stronger bristles along inner margin.

Host plant/Biology: unknown.

Holotype male, Dominica, Layou River mouth, 9 Jan. 1965; paratypes: one male, one female, same data (all W.W. Wirth). Holotype and female paratype in USNM, male paratype in senior author's collection.

Remarks: The form of surstyli and also the presence of the fore-tibial bristle suggest a close relationship between this species and *M. eupatoriella* and *M. mallochi.*



Fig. 401. Distribution of *Melanagromyza querula.*

Melanagromyza querula Spencer, sp.n.

Fig. 399-401

Head: frons narrow, equal to width of eye, two equal ors, two equal ori, slightly weaker than ors; orbital setulae slight, sparse, reclinate; jowls narrow, one-tenth height of eye; eye distinctly pilose at level of ors; third antennal segment small, round, finely pubescent, arista conspicuously pilose; ocellar triangle and orbits only weakly shining.

Mesonotum: essentially shining greenish black but appearing somewhat mat viewed from front.

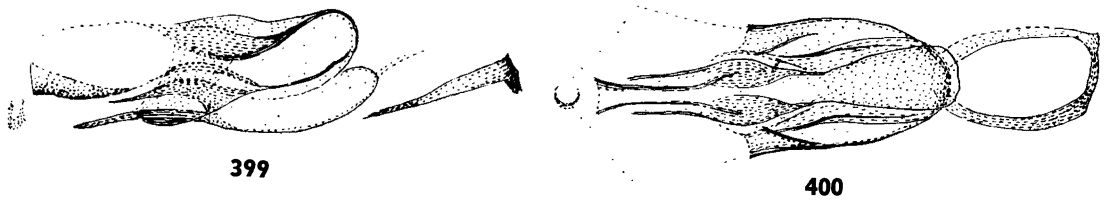
Wing: length in male 2 mm, last section of vein M3+4 shorter than penultimate, in ratio 13:22, first cross-vein at midpoint of discal cell; squamae and fringe white.

Male genitalia: aedeagus distinctive, as in Fig. 399, 400; ninth sternite with side arms broadly fused at apex, V-shaped, with about six strong bristles visible along inner margin and two or three further bristles toward cerci.

Host plant/Biology: unknown.

Holotype male, Trinidad, Manzanilla, 1959 (no collector recorded); paratype: male Dominican Republic, San Juan Prov., 19 Oct. 1967 (L.H. Rolston), both in CNC.

Remarks: This species belongs to a group of small greenish species, which can be satisfactorily distinguished only by the male genitalia. It is close to both *M. strictiva* and *M. tempestiva,* both from the Bahamas, but is



Figs. 399, 400. *Melanagromyza querula*: 399, aedeagus, side view; 400, same, ventral view.

distinguishable by the key characters given in couplets 27-28. The male genitalia of the three species are entirely distinct. With the species recorded from Trinidad and the Dominican Republic, it seems likely that it is widely distributed in the Caribbean area.

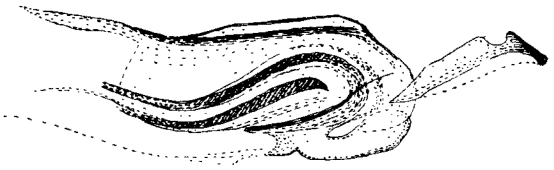
Melanagromyza regalis Spencer, sp.n.

Fig. 402-404

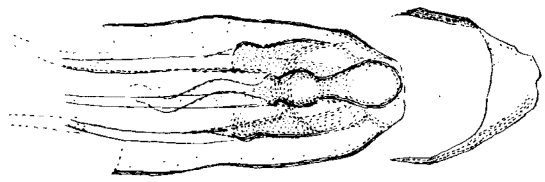
Adult: small, greenish species, wing length 2 mm; essentially as in *M. peremnis,* with following points of difference: frons narrow, equal to width of eye; eye in male bare; jowls narrow, one-tenth vertical height of eye; arista distinctly pubescent; mesonotum distinctly mat, coppery green, shining only when viewed from behind; abdomen brilliantly greenish coppery or entirely coppery.

Male genitalia: aedeagus as in Fig. 402, 403; ninth sternite with narrow side arms and moderately extended hypandrial apodeme; surstyli extending inward, fringed only with fine hairs, without bristles along inner margin.

Host plant/Biology: unknown.



402



403

Figs. 402, 403. *Melanagromyza regalis*: 402, aedeagus, side view; 403, same, ventral view.



Fig. 404. Distribution of *Melanagromyza regalis.*

Holotype male, Dominica, Clarke Hall, 1-10 Feb. 1965; paratype: one male, 11-20 Jan. 1965, Malaise trap (both W.W. Wirth). Holotype in USNM, paratype in senior author's collection.

Remarks: The distinctive characters of this species are the mat coppery-greenish mesonotum, narrow frons and jowls, bare eye and pubescent arista. The male genitalia are entirely distinctive.

Melanagromyza simmondsi Spencer, sp.n.

Fig. 405-407

Head: exceptionally large, frons one and a half times width of eye, not projecting above eye in profile; two strong, equal ors, two slightly weaker ori, largely incurved; orbital setulae fine, short, reclinate, apart from one or two proclinate hairs in front; ocellar triangle large, broad, lunule broad, higher than a semicircle; jowls deepest in center below eye but narrow, one-ninth vertical height of eye; eye oval, upright, in male distinctly pilose above; third antennal segment small, round, arista conspicuously plumose.

Mesonotum: two strong dc, acr unusually numerous, in some 15 rows.

Wing: length in male 3.8 mm, last section of vein M3+4 half penultimate, first crossvein at midpoint of discal cell.

Legs: fore-tibia with one strong lateral bristle, mid-tibia with three or four.

Color: frons mat black, ocellar triangle and orbits only weakly shining; lunule distinctly grayish; mesonotum brilliantly shining greenish black; pleura essentially black but mesopleura with greenish tinge; abdomen shining green; squamae and fringe white, margins yellowish brown.

Male genitalia: aedeagus as in Fig. 405, 406; surstyli projecting inward, with short bristles on upper corner and longer hairs below; ninth sternite with only short hypandrial apodeme.

Holotype male, Trinidad, Paradise Mt., 19 Feb. 1953 (F.J. Simmonds), in CNC.

Remarks: This is one of the largest Neotropical species and is substantially more robust than *M. setifera* Spencer, which also has a fore-tibial bristle and the arista plumose. There is no reason to believe that *M. simmondsi* is endemic to Trinidad, and it no doubt occurs elsewhere in South America.

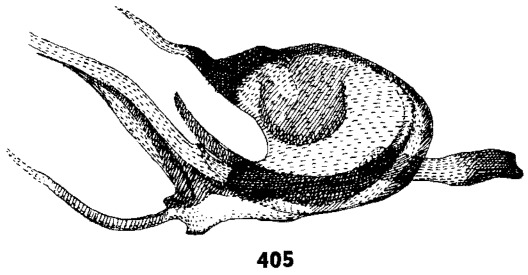


Fig. 407. Distribution of *Melanagromyza simmondsi*.

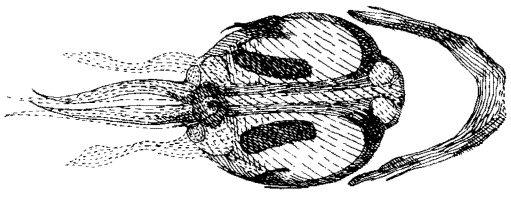
Melanagromyza strictiva Spencer, sp.n.

Fig. 408-410

Adult: small, shining green species, wing length 1.9 to 2 mm; frons equal to width of eye, not projecting above eye in profile; jowls narrow, about one-ninth vertical height of eye; eye bare in both sexes; arista with very conspicuous pubescence, virtually plumose;



405

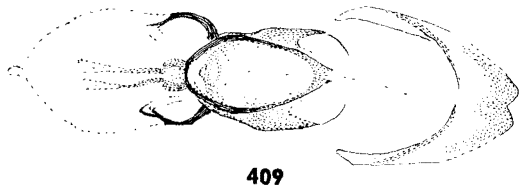


406

Figs. 405, 406. *Melanagromyza simmondsi*: 405, aedeagus, side view; 406, same, ventral view.



408



409

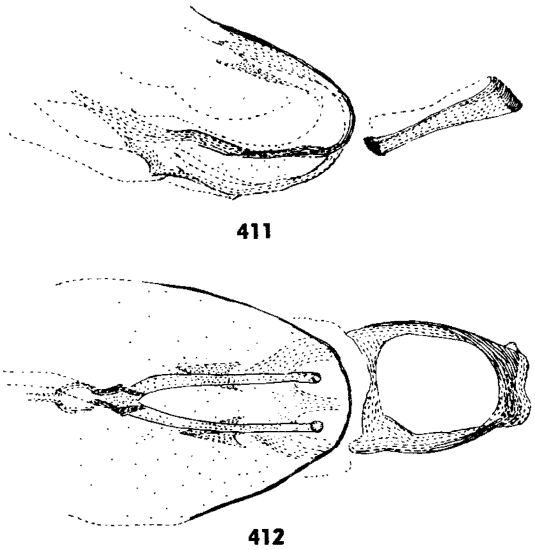
Figs. 408, 409. *Melanagromyza strictiva*: 408, aedeagus, side view; 409, same, ventral view.



Fig. 410. Distribution of *Melanagromyza strictiva*.

mesonotum brilliantly shining greenish or with bluish or coppery tinge, abdomen shining green; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 408, 409; ninth sternite with slightly extended hypandrial apodeme, surstyli conspicuously extending inward, with long hairs at end and very short bristles along inner margin; blade of sperm sac greatly enlarged.



411

412

Figs. 411, 412. *Melanagromyza tempestiva*: 411, aedeagus, side view; 412, same, ventral view.

Host plant/Biology: unknown.

Holotype male, Bahamas, New Providence Is., Nassau, 16 April 1953 (E.B. Hayden); paratypes: one female, same data as holotype; Eleuthera Is., James Cistern, one male, 1 April 1953; New Portsmouth, Rock Sound, one female, 28 March 1953 (both E.B. Hayden and L. Giovannoli); Crooked Is., Landrail Point, one male, 5 March 1953 (E.B. Hayden). Holotype and three paratypes in AMNH, one paratype in senior author's collection.

Remarks: This species belongs to the group of small green species, which can be positively identified only by the male genitalia. With records from three islands, it seems probable that *M. strictiva* occurs widely throughout the Bahamas.

Melanagromyza tempestiva Spencer, sp.n.

Fig. 411-413

Adult: small green species, wing length 2 mm; frons broad, one and a half times width of eye; jowls narrow, one-tenth height of eye; eye in male distinctly pilose above; arista plumose; mesonotum shining green, with faint coppery reflections, abdomen green; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 411, 412; ninth sternite with broad side arms and finely extended hypandrial apodeme; surstyli conspicuously extending inward, fringe with hairs and short bristles, strong, short bristles also along inner margin.

Host plant/Biology: unknown.

Holotype male, Bahamas, Turks & Caicos Is., South Caicos Is., 11 Feb. 1953 (E.B. Hayden and G.B. Rabb), in AMNH.

Remarks: This species belongs to the group of small green species which can be satisfactorily identified only by the male genitalia. It most closely resembles *M. querula* from Trinidad, but the frons is substantially broader and the mesonotum more shining. The genitalia of the two species are entirely distinct.



Fig. 413. Distribution of *Melanagromyza tempestiva*.



Fig. 416. Distribution of *Melanagromyza vulgata*.

Melanagromyza vulgata Spencer, sp.n.

Fig. 414-416

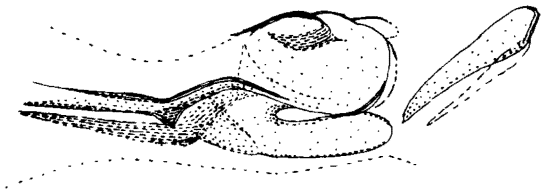
Adult: small, blackish green species, wing length 2.2 mm, frons only slightly wider than eye, orbits relatively broad, though not projecting above eye; jowls narrow, one-tenth vertical height of eye; eye in male with sparse but long pilosity above; arista with very short pubescence, appearing almost bare; mesonotum moderately shining blackish green, abdomen more conspicuously greenish; squamae and fringe white.

Male genitalia: aedeagus as in Fig. 414, 415; ninth sternite broadly fused at apex, without extended hypandrial apodeme; surstyli broadly projecting inward, fringed with fine bristles.

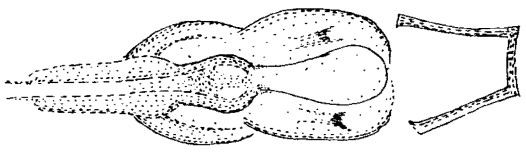
Host plant/Biology: unknown.

Holotype male, Jamaica, Hardwar Gap, 4000 ft, 25 July 1966 (H.F. Howden and E. Becker), in CNC.

Remarks: This is one of the group of small, green species which can be satisfactorily identified only by the male genitalia. It generally resembles *M. compositoides* Spencer (1963a: 310) from Jamaica apart from the arista which is significantly less pubescent.



414



415

Figs. 414, 415. *Melanagromyza vulgata*: 414, aedeagus, side view; 415, same, ventral view.

GENUS *OPHIOMYIA* BRASCHNIKOV

Six new species are described below, five from the Bahamas and one from Dominica. *O. punctohalterata,* previously only known from Guatemala, is now recorded from Costa Rica.

Key to Neotropical *Ophiomyia* species

(including species occurring in Florida, and also *Melanagromyza felis*)

1 Halteres brown or black 2
1′ Halteres brown below, with circular white area above ..... *punctohalterata* (Frost)
2 Last section of vein M3+4 distinctly longer than penultimate, in ratio 20: 12; vibrissal fasciculus long, slender (Fig. 431), facial keel narrow, linear ..... *solivaga* Spencer
2′ Last section of M3+4 normally shorter than penultimate, at most equal 3
3 Squamal fringe white 4
3′ Squamal fringe dark, brown or black 8
4 Second cross-vein lacking, costa ending shortly after vein R4+5 5
4′ Second cross-vein present, costa extending to vein M1+2 6
5 Mesonotum mat black; male with strong vibrissal fasciculus; facial keel broad, raised ..... *spicatae* Spencer
5′ Mesonotum shining black; male with small, normal vibrissa; facial keel narrow, virtually linear ..... *Melanagromyza felis* Spencer
6 Jowls narrow, one-eighth height of eye; last section of vein M3+4 short, two-thirds penultimate; proboscis conspicuously elongated 7
6′ Jowls broader, one-fifth eye height; last M3+4 section only slightly shorter than penultimate; proboscis short, normal ..... *lippiae* Spencer
7 Aedeagus as in Fig. 131, 132 ..... *haydeni* Spencer
7′ Aedeagus as in Spencer, 1963a: Fig. 41b ..... *buscki* (Frost)
8 Vibrissal angle acute, forming angle of at most 60° 9
8′ Vibrissal angle approximately 80° to 90° 16
9 Vibrissal angle acute, less than 45°; vibrissal fasciculus short (Fig. 436); proboscis conspicuously elongate ..... *valida* Spencer
9′ Vibrissal angle 45° to 60°; proboscis short, normal 10
10 Facial keel conspicuously raised 11
10′ Facial keel flatter, normally narrow 12
11 Squamal fringe black; large species, wing length 2.4 mm ..... *lacertosa* Spencer
11′ Squamal fringe paler, brownish; smaller species, wing length 2 mm ..... *obstipa* Spencer
12 Very large species, wing length 3.5 to 4 mm ..... *curvibrissata* (Malloch)
12′ Smaller species, wing length 1.6 to 2 mm 13
13 Jowls broad, one-third vertical height of eye ..... *fasciculata* (Malloch)
13′ Jowls narrower, one-quarter to one-sixth vertical height of eye 14
14 Facial keel broad ..... *arguta* Spencer
14′ Facial keel narrow, little more than linear 15
15 Vibrissal fasciculus long, uniformly curving (Fig. 120) ..... *camarae* Spencer
15′ Vibrissal fasciculus shorter, with distinct bend at end (Fig. 126) ..... *gentilis* Spencer
16 Mesonotum brilliantly shining black ..... *ferina* Spencer
16′ Mesonotum mat, brownish black 17
17 Facial keel broad, conspicuously raised; vibrissal fasciculus long, not substantially tapering (Fig. 138) ..... *lantanae* (Froggatt)
17′ Facial keel broad but low; vibrissal fasciculus shorter, tapering, fine at end (Fig. 425) ..... *legitima* Spencer

Ophiomyia arguta Spencer, sp.n.

Fig. 417-420

Head: jowls conspicuously projecting forward, forming angle of about 60° in front, in center about one-seventh vertical height of eye; vibrissal fasciculus in male strong, broad at base, regularly curving (Fig. 417); cheeks prominent, about half depth of jowls; facial keel slender, only slightly raised, moderately widening below base of antennae.

Mesonotum: acr sparse, in about six rows.

Wing: length 1.6 mm, last section of vein M3+4 normally equal to penultimate, at most slightly shorter.

Color: ocellar triangle and orbits moderately shining black; mesonotum conspicuously shining; squamae pale gray, margin and fringe dark, brownish black.

Male genitalia: aedeagus distinctive, as in Fig. 418, 419.

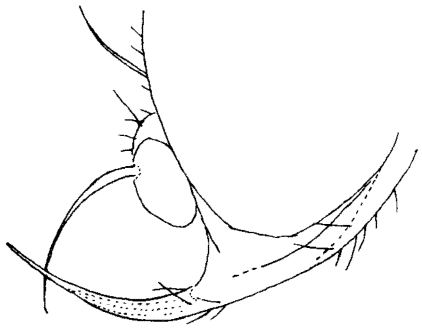
Host plant/Biology: unknown.



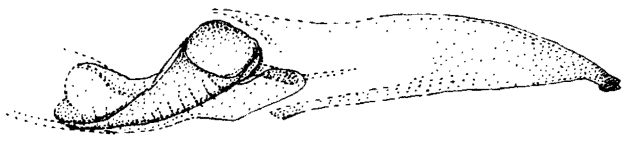
Fig. 420. Distribution of *Ophiomyia arguta*.

Holotype male, Bahamas, Eleuthera Is., Hatchet Bay, nr. Alicetown, 2 April 1953 (E. B. Hayden & L. Giovannoli); paratypes: four males, same data; New Providence Is., 2 miles East of Nassau, one male, 14 April 1953 (E.B. Hayden). Holotype and paratypes in AMNH, two paratypes in senior author's collection.

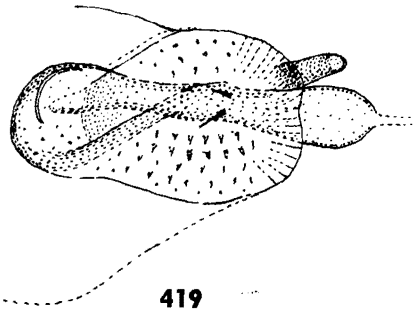
Remarks: This is a particularly small species, distinguishable by the characteristic form of jowl and vibrissal fasciculus.



417



418



419

Figs. 417-419. *Ophiomyia arguta*: 417, head; 418, aedeagus, side view; 419, same, dorsal view.

Ophiomyia ferina Spencer, sp.n.

Fig. 421-424

Head: jowls narrow, about one-sixth vertical height of eye, flat below, not greatly projecting forward, forming angle of 80° in front; vibrissal fasciculus slender, regularly curving (Fig. 421); facial keel distinct, but narrow, virtually linear.

Mesonotum: brilliantly shining black.

Wing: length 2 mm; squamae pale gray, margin and fringe brownish black.

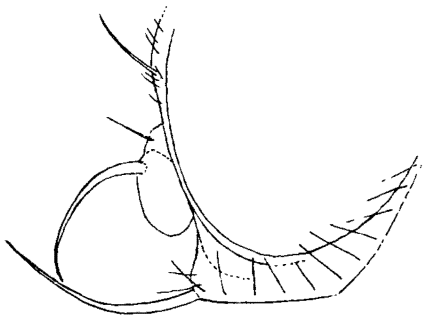
Male genitalia: aedeagus distinctive, asymmetrical, as in Fig. 422, 423.

Host plant/Biology: unknown.

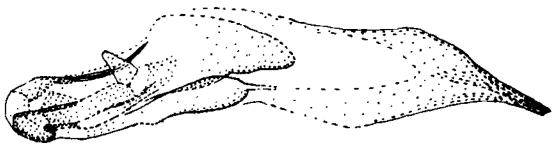
Holotype male, Bahamas, New Providence Is., Nassau, 16 April 1953 (E.B. Hayden); paratypes: Cat Is., McQueen, one male, 23 Jan. 1953 (E.B. Hayden); Eleuthera Is., Hatchet Bay, nr. Alicetown, two males, 1 and 2 April 1953; Exuma Cays, Darby Is., one male, 18 Jan. 1953; Long Is., Clarence Town, one male, 13 March 1953 (all E.B. Hayden and L. Giovannoli). Holotype and three paratypes in AMNH, two paratypes in senior author's collection.



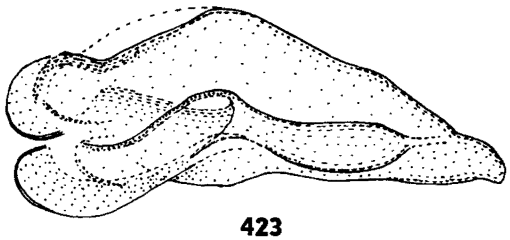
Fig. 424. Distribution of *Ophiomyia ferina*.



421



422



423

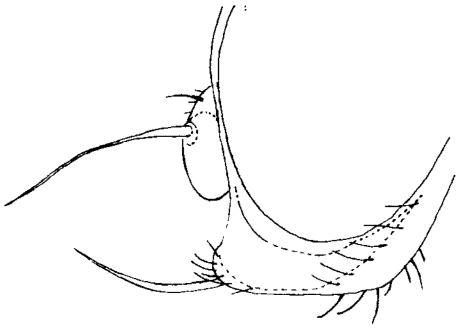
Figs. 421-423. *Ophiomyia ferina*: 421, head; 422, aedeagus, side view; 423, same, dorsal view.

Remarks: This species closely resembles *O. lantanae* in the form of jowl and vibrissal fasciculus, but the jowls are distinctly narrower. The most obvious difference is in the color of the mesonotum, which is shining black in *ferina*, mat brownish black in *lantanae*; in addition the facial keel is substantially narrower in *ferina*. The male genitalia of the two species are entirely distinct.

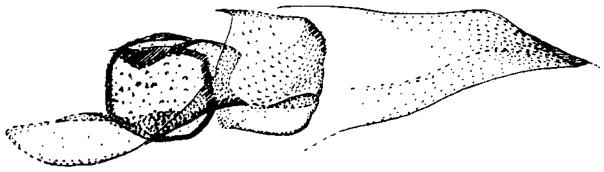
Ophiomyia legitima Spencer, sp.n.

Fig. 425-428

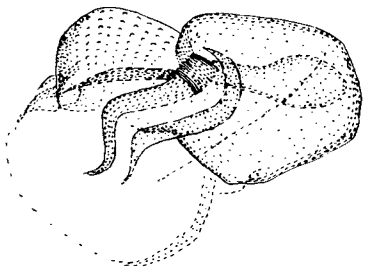
Adult: wing length 1.9 mm, closely agreeing with *O. lantanae* in the important characters of the relatively broad facial keel, vibrissal angle of about 80° and the conspicuously mat mesonotum; only detectable differences are the shorter, more distinctly tapering vibrissal fasciculus (Fig. 425) and



425



426



427

Figs. 425-427. *Ophiomyia legitima*: 425, head; 426, aedeagus, side view; 427, same, dorsal view.

the lower, though similarly broad, facial keel.

Male genitalia: aedeagus highly asymmetrical, entirely distinctive, as in Fig. 426, 427; ninth sternite with finely extended hypandrial apodeme, surstyli projecting inward with about six strong bristles visible along inner margin.

Holotype male, Dominica, Clarke Hall, 11-20 Jan. 1965 (W.W. Wirth); paratypes: two females, 11-20 Jan., one 21-31 Jan. 1965, otherwise same data. Holotype and two paratypes in USNM, one paratype in senior author's collection.

Remarks: Although this species superficially so closely resembles *O. lantanae*, the small detectable morphological differences, coupled with the entirely different male genitalia, confirm that it is distinct.



Fig. 428. Distribution of *Ophiomyia legitima*.

Ophiomyia punctohalterata (Frost)

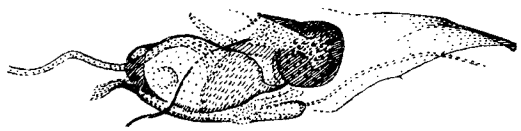
Fig. 429-430

Agromyza punctohalterata Frost, 1936: 311.
Holotype female from Guatemala in USNM.

Ophiomyia punctohalterata, Frick, 1952a: 383; 1959: 371.

Costa Rica: La Caja, 8 km W. of San José, eight males, four females, 1930 (Schmidt).

Remarks: This species has been known only from the two female type specimens



429

Fig. 429. *Ophiomyia punctohalterata*: aedeagus.



Fig. 430. Distribution of *Ophiomyia punctohalterata*.

from Guatemala. The males from Costa Rica have a strong vibrissal fasciculus, and the highly asymmetrical aedeagus is shown in Fig. 429.

Ophiomyia solivaga Spencer, sp.n.

Fig. 431-435

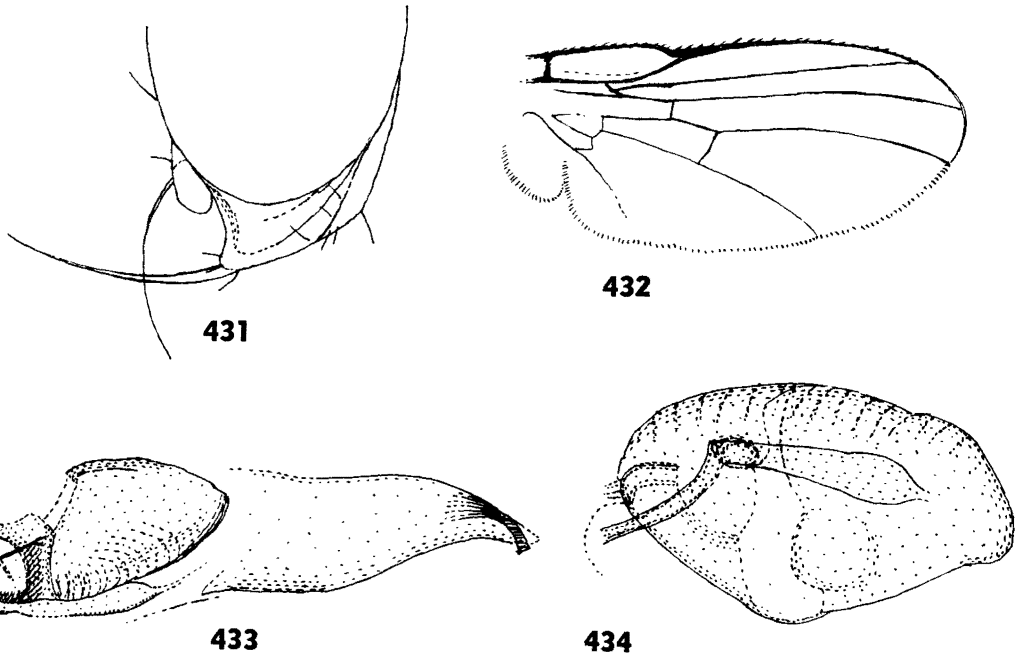
Head: jowls narrow, one-eighth vertical height of eye, not greatly produced in front, forming angle of approx. 80°; cheeks forming narrow ring below eye; vibrissal fasciculus long, slender (Fig. 431); facial keel scarcely detectable, extremely narrow, virtually linear.

Mesonotum: 2 dc, acr numerous, in about 8 rows.

Wing (Fig. 432): length in male 1.75 mm, costa extending to vein M 1+2, last section of M 3+4 distinctly longer than penultimate, in ratio 20:12, first cross-vein at midpoint of discal cell.

Color: ocellar triangle brilliantly shining black, orbits slightly less so; mesonotum shining black; squamae and fringe not visible but almost certainly dark.

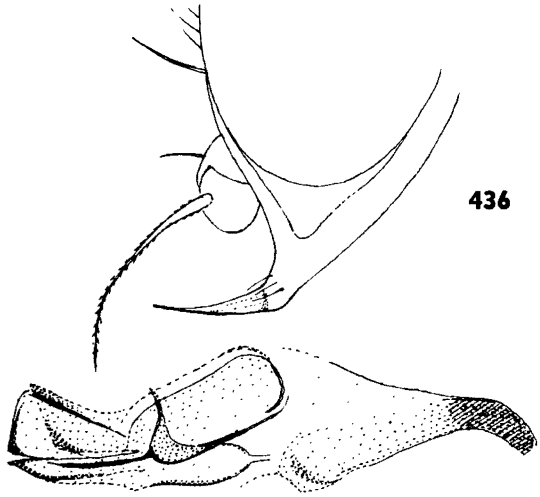
Male genitalia: aedeagus as in Fig. 433, 434.

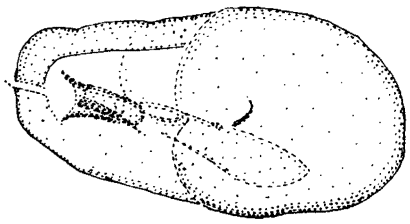


Figs. 431-434. *Ophiomyia solivaga*: 431, head; 432, wing; 433, aedeagus, side view; 434, same, dorsal view.



Fig. 435. Distribution of *Ophiomyia solivaga*.





Figs. 436-438. *Ophiomyia valida*: 436, head; 437, aedeagus, side view; 438, same, dorsal view.

Host plant/Biology: unknown.

Holotype male, Bahamas, Abaco Cays, Elbow Cay, Hope Town, 4 May 1953 (E.B. Hayden & L. Giovannoli), in AMNH.

Remarks: The character immediately distinguishing this species is the long last section of vein M 3+4. The long, slender vibrissal fasciculus and particularly narrow facial keel are distinctive also.

Ophiomyia valida Spencer, sp.n.

Fig. 436-439

Head: jowls conspicuously produced in front, forming angle of less than 45°; cheeks broad, extending at least half distance to lower margin of jowls; vibrissal fasciculus short, broad at base but tapering to fine point (Fig. 436); facial keel of medium width, flat above, slightly more raised below base of antennae; third antennal segment small, arista finely pubescent; mouth parts greatly elongated.

Mesonotum: acr numerous, in about eight rows.

Wing: length from 2 mm in male to 2.2 in female, last section of M3+4 little shorter than penultimate.



Fig. 439. Distribution of *Ophiomyia valida*.

Color: ocellar triangle and orbits only weakly shining; mesonotum mat, distinctly dusted with gray; squamae pale gray, margin and fringe black.

Male genitalia: aedeagus distinctive, as in Fig. 437, 438.

Host plant/Biology: unknown.

Holotype male, Bahamas, Mayaguana Is., nr. Abraham Bay, 3 March 1953 (E.B. Hayden); paratypes: four males, two females, same data; Eleuthera Is., Hatchet Bay, nr. Alicetown, two males, 2 April 1953 (E.B. Hayden & L. Giovannoli); Jamaica, Hardwar Gap, 4000 ft, one male, 25 July, one female, 10 July 1966 (Howden & Becker); Costa Rica, La Caja, 10 km W. of San José, seven males, 1930 (Schmidt). Holotype and paratypes in AMNH, further paratypes in CNC, DEI and senior author's collection.

Remarks: This species resembles *O. coniceps* Malloch (cf. Spencer, 1969a) and *O. praecisa* Spencer, 1969a in the form of head, with the narrow, projecting jowls and short vibrissal fasciculus. The male genitalia indicate that it is the sibling species of *O. praecisa*, known from Alberta (Spencer, 1969a: Fig. 152).

With the known range of *O. valida* extending from Costa Rica to the Bahamas, it almost certainly occurs elsewhere in the Caribbean and may possibly be present in southern Florida.

GENUS *PHYTOBIA* LIOY

Five Neotropical species have been known in this genus (Spencer, 1966d: 142), with *P. dorsocentralis* and *P. picta* being treated as synonyms of *P. xanthophora* (Spencer, 1963a: 333). These two species are resurrected, two new species from Dominica and Jamaica are described, and two further species from Costa Rica are briefly characterized, though the formal description is delayed until males are available. Further undescribed species have been seen from Ecuador and Bolivia. It is thus clear that this genus is well represented both in the Caribbean area and throughout the Neotropical Region.

Key to Neotropical *Phytobia* species

1 Mesonotum and scutellum entirely black 2
1′ Mesonotum and scutellum partially yellow 4

2 Wings clear 3
2′ Wings pictured ..... *kallima* (Frost)

3 Very large species, wing length 4 mm; 3+1 dc ..... sp. 1 (C.R.)
3′ Smaller species, wing length 2.2 mm; 2 post-sutural dc ..... *unica* Spencer

4 Frons and antennae entirely black .. 5
4′ Frons brownish orange in front, antennae similar 10

5 Wings clear ..... *rabelloi* Spencer
5′ Wings pictured 6

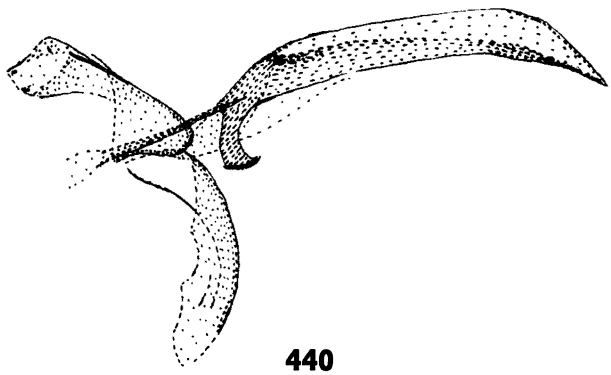
6 Yellow of mesonotum and scutellum bright lemon yellow; dark area of mesonotum largely shining black; aedeagus as in Fig. 453 .. *xanthophora* (Schiner)
6′ Yellow of mesonotum and scutellum paler; dark area of mesonotum less shining or more gray 7

7 Dark area of mesonotum obviously black 8
7′ Dark area of mesonotum distinctly gray (Fig. 443) ..... *matura* Spencer

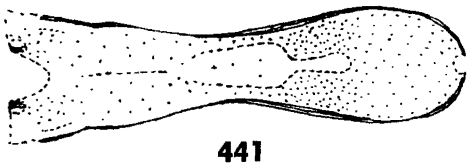
8 Dark area of mesonotum split into two bands at sides 9
8′ Dark area of mesonotum solid, with only narrow semicircle of yellow adjoining scutellum ..... sp.2 (C.R.)

9 Very large species, wing length from 3.25 mm in male to 4 mm in female; aedeagus as in Fig. 440, 441 .... *dorsocentralis* (Frost)
9′ Smaller species, wing length from 2.5 to 3.1 mm; aedeagus as in Fig. 445, 446 ..... *picta* (Coq.)

10 Wings clear; black of mesonotum forming two bands laterally .... *kuhlmanni* Spencer
10′ Wings pictured; black of mesonotum not split into bands laterally .... *lanei* Spencer



440



441

Figs. 440, 441. *Phytobia dorsocentralis*: 440, aedeagus, side view; 441, same, ventral view.

Phytobia dorsocentralis (Frost)

Fig. 440-442

Agromyza dorsocentralis Frost, 1936: 307.
Holotype male from Panama in coll. Frost.
Phytobia dorsocentralis, Frick, 1957: 201; 1959: 376 (as *picta* Coq.).

Costa Rica: La Suiza, one male, April 1922; one male, June; one male, one female (in cop.), no date (all P. Schild); Podrogoso, one male, no date (D.L. Rounds).

Remarks: This species is not distinguishable from *picta* Coq. on morphological characters, apart from its substantially greater size. The wing length is from 3.25 to 3.5 mm in the male to 4 mm in the female. The wing length of the male holotype is given as 3.5 to 4 mm.

The aedeagus of this species is shown in Fig. 440, 441.

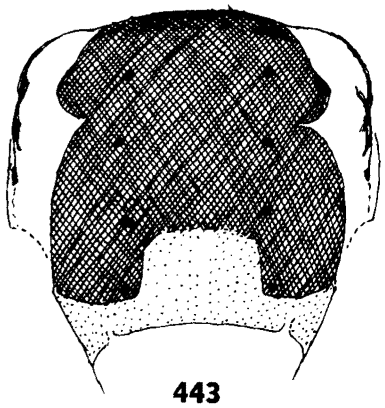


Fig. 442. Distribution of *Phytobia dorsocentralis*.

Phytobia matura Spencer, sp.n.

Fig. 443, 444

Head: frons not projecting above eye in profile; two equal reclinate ors, two slightly incurved ori; orbital setulae sparse, short, reclinate; jowls narrow, about one-twelfth vertical height of eye; mouth margin normal, epistoma little more than linear; third antennal segment round, arista long, only finely pubescent.



443

Fig. 443. *Phytobia matura*: mesonotum.



Fig. 444. Distribution of *Phytobia matura.*

Mesonotum: 3+1 strong dc, acr in about eight rows, extending to midway between first and second dc; pre-scutellars lacking.

Wing: length in female 3.25 mm, costa extending to vein M1+2, last section of M1+2 distinctly shorter than penultimate, in ratio 25:30, first cross-vein just before midpoint of discal cell.

Color: frons mat black, orbits and base of orbital bristles weakly shining; lunule silvery; antennae and face black; mesonotum (Fig. 443) with dark area conspicuously mat gray, lateral dark area not divided into separate bands; rear area of mesonotum and scutellum grayish yellow; notopleural area entirely yellow, humerus yellow behind humeral bristle, black in front; mesopleura largely black, yellow in upper rear corner, pleura otherwise black; legs entirely black, abdomen with brownish yellow ground color, all tergites except first shining black centrally and broadly black at sides, wings clear, squamae yellowish gray, margin and fringe black; halteres yellow.

Host plant/Biology: unknown but almost certainly a cambium borer in tree.

Holotype female, Dominica (W.I.), Clarke Hall, 21-31 Jan. 1965 (W.W. Wirth), in USNM.

Remarks: Differences in color of the mesonotum clearly indicate that this species is distinct from *dorsocentralis, picta* and *xanthophora.* In size it is intermediate between *dorsocentralis,* which is the largest of the group in the Caribbean area and the other two which are distinctly smaller. It is to be hoped that eventually a male can be obtained on Dominica, which will enable its affiliations to be further clarified.

Phytobia picta (Coquillett)

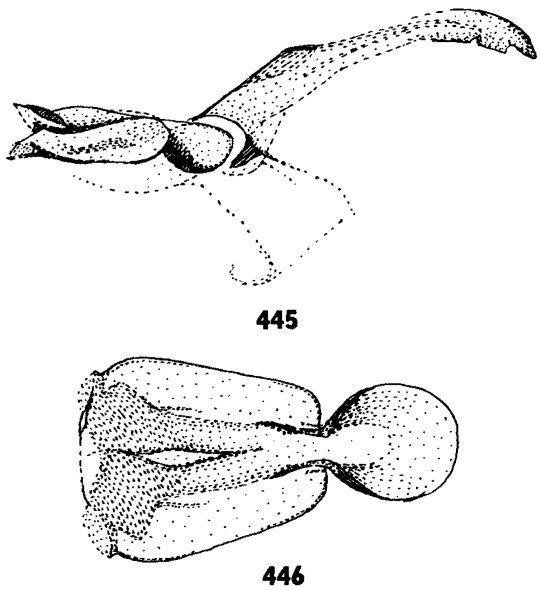
Fig. 445-447

Agromyza picta Coquillett, 1902: 188. Holotype female from Tabasco, Mexico in USNM.

Phytobia picta, Frick, 1957: 201; Spencer, 1963a: 333 (as *xanthophora* Schiner).

Costa Rica: San Mateo, three females, no date (P. Schild); La Caja, 8 km W. of San José, one female, 1936 (Schmidt).

Cuba: Cayamas, one female, no date (Baker).



445

446

Figs. 445, 446. *Phytobia picta*: 445, aedeagus, side view; 446, same, ventral view.



Fig. 447. Distribution of *Phytobia picta.*



Fig. 448. Distribution of *Phytobia rabelloi.*

Puerto Rico: Bayamon, San Juan, one male (abdomen missing), 3 June 1934 (Lesesne and Anderson).

Panama: Matias Hernandez, one male, Nov. 1946 (N.L.H. Krauss).

Remarks: This species in the past has been confused with *xanthophora* Schiner and *dorsocentralis* Frost. The yellow color is paler and the black more shining than in *xanthophora,* and it is substantially smaller than *dorsocentralis.* The wing length of *picta* is from 2.5 to 3.1 mm; in the female holotype it is given as 3 mm.

The aedeagus of the specimen from Panama is shown in Fig. 445, 446. This is of the same general form as in *dorsocentralis* but is distinctively different in detail (cf. Fig. 440, 441).

Phytobia rabelloi Spencer

Fig. 448

Phytobia rabelloi Spencer, 1966d: 145. Holotype male from Brazil in Dep. de Zoologia, São Paulo.

Costa Rica: La Suiza, one female, Aug. 1926 (P. Schild), in USNM.

Ecuador: Coca, Napo R., Napo, 250 m, one female, 30 April 1965 (L. Pena), in CNC.

Remarks: This is a distinctive species, with pictured wings (Spencer, 1966d: Fig. 9), a partially yellow mesonotum and yellow scutellum.

The extension of the range from Mato Grosso, Brazil to Ecuador and Costa Rica is noteworthy.

Phytobia unica Spencer, sp.n.

Fig. 449-452

Head: frons slightly wider than eye, not projecting above eye in profile; two strong, equal ors, two ori, the lower somewhat weaker; orbital setulae in several rows, reclinate; orbits pronounced, distinctly widening at level of ori; jowls narrow, one-eighth vertical height of eye, with strong row of peristomal hairs; third antennal segment small, round, with inconspicuous pubescence, arista fine, appearing bare.

Mesonotum: two dc, second close to first and well behind level of supra-alar; acr numerous, in some 12 rows in front, extending to level of first dc and merging laterally with intra-alar hairs; pre-scutellars lacking.

Wing: length in male 2.2 mm, costa extending to vein M 1+2, vein R 4+5 ending

at wing tip; last section of M 3+4 relatively long but shorter than penultimate, in ratio 17:20.

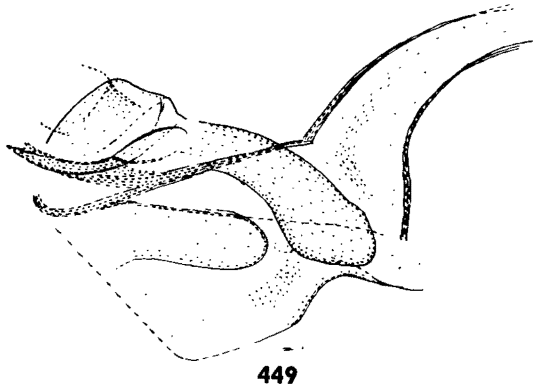
Legs: mid-tibiae with one strongly developed lateral bristle.

Color: entirely dark; frons and orbits brownish black, antennae black; mesonotum conspicuously mat, black; legs entirely black; squamae gray, fringe black; halteres dirty white.

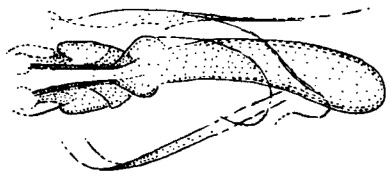
Male genitalia: aedeagus as in Fig. 449, 450, ninth sternite (Fig. 451) unusually elongate, constricted towards apex; surstyli entirely separated by suture from epandrium, thickly covered with short bristles; cerci long; sperm sac with bowl-shaped base.

Host plant/Biology: unknown.

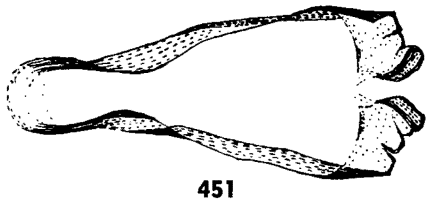
Holotype male, Jamaica, Hardwar Gap, 4000 ft, 29 July 1966 (H.F. Howden and E.C. Becker), in CNC.



449



450



451

Figs. 449-451. *Phytobia unica*: 449, aedeagus, side view; 450, same, ventral view; 451, ninth sternite.



Fig. 452. Distribution of *Phytobia unica*.

Remarks: This species is aberrant in a number of characters, but it seems clearly to belong in the genus *Phytobia*. The presence of only two dc is not known in any other species in the genus, but the senior author has seen one specimen of *picta* Coq. with only three, the third, pre-sutural, being greatly reduced. The aedeagus is distinctive but generally resembles that found in other species; the narrow, elongate ninth sternite is unusual and differs substantially from the broad, rounded form normally occurring in the genus.

Phytobia xanthophora (Schiner)

Fig. 453-454

Agromyza xanthophora Schiner, 1868: 291.
Two female types from "Süd-Amerika" (?Colombia) lost.

Liriomyza xanthophora, Frick, 1952a: 405.

Phytobia xanthophora, Spencer, 1966d: 146.

Trinidad: Verdan Vale, one female, 28, 30 Oct. 1918 (Urich and Morrison), in USNM.

Remarks: There has been considerable confusion in the past about the identity of

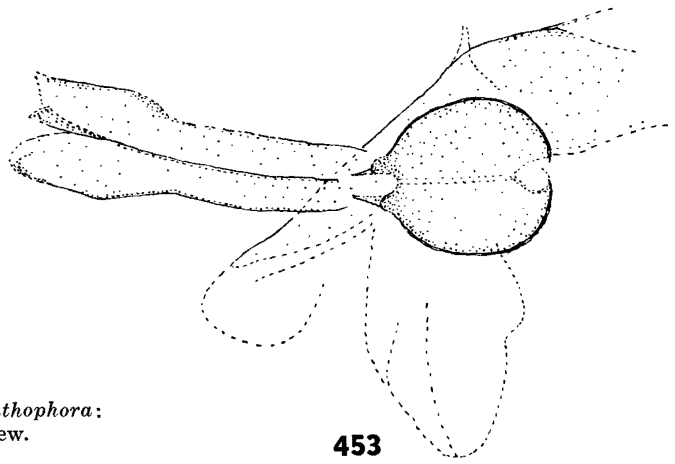


Fig. 453. *Phytobia xanthophora*: aedeagus, ventral view.

453

this species. Malloch (1913: 275) treated it as senior synonym of *picta* Coq. from Mexico. Frick (1957: 201) rejected this synonymy, particularly in view of the loss of the types. The synonymy both of *picta* and of *dorsocentralis* Frost with *xanthophora* was accepted by Spencer (1963a: 333). The aedeagus of a specimen from Brazil accepted as *xanthophora* was illustrated by Spencer (1966d: Fig. 12).

Spencer is now satisfied that the specimen examined from Trinidad represents the true *xanthophora,* and is distinct both from *picta* and *dorsocentralis*. Schiner's description refers to the mesonotum as "glänzend schwarz," the yellow areas are characterized as "schwefelgelb" (sulphurous yellow), the abdomen is yellow, with the last segment black. This species clearly differs in all these characters from the 20 or so other specimens in the group which I have now examined.

In view of the numerous species now found to exist in this group there must be some element of doubt as to whether the specimen from Brazil represents *xanthophora* or a further species, but on balance it is felt that it probably does. It certainly agrees in the shining black mesonotum, bright yellow coloration and size, with wing length 2.6 mm; the color of the abdomen was not recorded and is no longer detectable. The aedeagus of this specimen with the distinctly elongated distal tubules is shown in Fig. 453.



Fig. 454. Distribution of *Phytobia xanthophora*.

Phytobia sp. 1 (Costa Rica)

Fig. 455

Costa Rica: Pedrogosa, one female, no date (D.L. Rounds), in USNM.

Remarks: This is a large dark species, with wing length of 4 mm. The mesonotum and scutellum are uniformly blackish gray, the abdomen is entirely shining black. The frons is black behind but reddish in front, and the antennae are entirely reddish. In

these characters it closely resembles *P. setosa* (Loew) which is not uncommon in the northern half of the United States and Canada (Spencer, 1969a: 107). However, in *setosa* the last section of vein M3+4 is distinctly longer than the penultimate; in the Costa Rican specimen it is distinctly shorter. There is thus no doubt that this specimen represents a new species. However, it is not desirable to describe it formally in the absence of males.

Phytobia sp. 2 (Costa Rica)

Fig. 455

Costa Rica: La Suiza, one female, May 1926 (P. Schild), in USNM.

Remarks: The essential characters of this species are the black frons and antennae, mesonotum shining black with narrow semicircle of yellow adjoining the yellow scutellum, largely black abdomen with tergites narrowly bordered with yellow and wing length of 3.3 mm.

The distinctive coloration clearly indicates that this is an undescribed species, but I think that the formal description should be delayed until males are available.



Fig. 455. Distribution of *Phytobia* sp. 1 and sp. 2 (C.R.).

GENUS *CERODONTHA* RONDANI

Although this genus occurs widely in the Neotropical Region, the number of species known is relatively small. Among the material studied from the West Indies only a single new species, from Puerto Rico, was discovered, and this is described below.

Cerodontha (*Dizygomyza*) *puertoricensis* Spencer, sp.n.

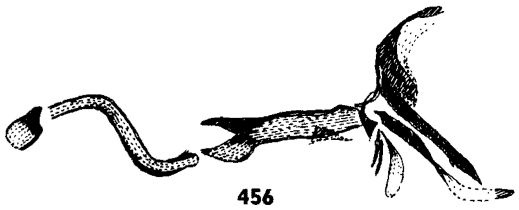
Fig. 456-458

Head: frons slightly wider than eye, not projecting above eye in profile; two equal, reclinate ors, two similar, somewhat incurved ori; orbital setulae sparse, reclinate; jowls narrow, little more than linear, slightly extended at rear, at deepest point one-tenth vertical height of eye, lunule distinctly higher than semicircle but broad at base; third antennal segment small, round.

Mesonotum: 3+1 dc, acr in six rows, only scattered hairs beyond second dc; pre-scutellars well developed.

Wing: length in male 1.9 mm, costa extending strongly to vein M 1+2; last section of vein M3+4 only marginally shorter than penultimate, first cross-vein at anterior third of discal cell.

Color: frons brownish black, orbits only weakly shining, antennae entirely black;



456



457

Figs. 456, 457. *Cerodontha* (*Diz.*) *puertoricensis*: 456, aedeagus, side view; 457, same, ventral view.

mesonotum shining black; sides of thorax essentially black, hind corner of humerus and upper, hind corner of mesopleura faintly yellowish; legs: femora black, tibiae on forelegs and tarsi on all legs paler, yellowish; wing base yellowish, squamae pale gray, margin and fringe black, halteres yellow.

Male genitalia: aedeagus as in Fig. 456, 457; ninth sternite with broad side arms, rounded and largely fused at apex; surstyli with a fringe of four or five weak bristles along inner margin.

Host plant/Biology: unknown.

Holotype male, Puerto Rico, Naguabo, 7-9 March 1914, in FSCA.

Remarks: The only comparable species known in the Neotropical Region is *Cer. (Diz.) angulata* (Loew), but this has a pale squamal fringe, and the male genitalia are distinctively different (Spencer, 1969a: Fig. 193).

The form of lunule in *Diz. puertoricensis* is that found in the group of species for which Nowakowski (1967) erected a new sub genus, *Crastemyza*. However, this subgenus was not accepted by Spencer (1969a: 110).



Fig. 458. Distribution of *Cerodontha (Diz.) puertoricensis*.

GENUS *CALYCOMYZA* HENDEL

This is the second largest genus in the Neotropical Region and is well represented throughout the Caribbean area. Four new species are described below, two from the Bahamas, one from Dominica and one from Jamaica. It is not possible at this time to describe a number of further species which have been confirmed among the material studied from Costa Rica.

The four new species can be included as follows in the senior author's (1963a) key to Neotropical *Calycomyza* species:

C. eupatorivora

Extend couplet 7 as follows:

7 Hind corners of mesonotum broadly yellow 7a
— Hind corners of mesonotum at most narrowly and faintly yellow 8

7a Aedeagus as in Fig. 466, 467 .... *eupatorivora* Spencer
— Aedeagus as in Spencer, 1963a: Fig. 60.. ..... *flavinotum* Frick

C. dominicensis

Amend and extend couplet 14 as follows:

14 Large species, wing length up to 2.5 mm 14a
— Smaller species, wing length not more than 2.2 mm 15

14a First and second antennal segments paler, yellowish .... *artemisiae* (Kalt.)
— First and second antennal segments black ..... *dominicensis* Spencer

C. bahamarum, C. servilis

These two species belong to the *malvae* group and will run to couplet 18; they can only be satisfactorily identified by the male genitalia (see p. 72).

Calycomyza allecta (Melander)

Fig. 459

Agromyza lateralis Williston 1896: 428 (not Macquart, 1835). Lectotype female from St. Vincent, designated by Frick, 1956: 298, in Snow Entomological Collections, University of Kansas.

Agromyza allecta Melander, 1913: 257, nom. nov. for *lateralis* Williston.

Calycomyza allecta, Frick, 1952a: 394; 1956: 298; 1959: 389; Spencer, 1963a: 338.

Dominica (W.I.): S. Chiltern Est, one male, 20 Feb. 1965 (W.W. Wirth).

Remarks: With only females available in the type series, there has been uncertainty about the exact status of this species. Spencer (1963a: Fig. 52, 53) illustrated the entirely different aedeagus of two specimens from Brazil, which appeared to represent this species. However, with no males available from the general type locality, it was uncertain which was the true *allecta.* The aedeagus of the specimen now seen from Dominica agrees almost exactly with the specimen "ex *Bidens pilosa*" from Santos, Brazil and it can therefore now be accepted that this represents the true *allecta* (=*lateralis* Williston).



Fig. 459. Distribution of *Calycomyza allecta.*

Calycomyza bahamarum Spencer, sp.n.

Fig. 460-462

Head: frons equal to width of eye, not projecting above eye in profile; two equal ors, two similar ori; orbital setulae minute but in well-defined row, reclinate; third antennal segment small, round, with distinct pubescence above, second segment normally paler, yellowish; frons and orbits entirely yellow but both vt on black ground; face yellow.

Mesonotum: shining black, acr in four rows.

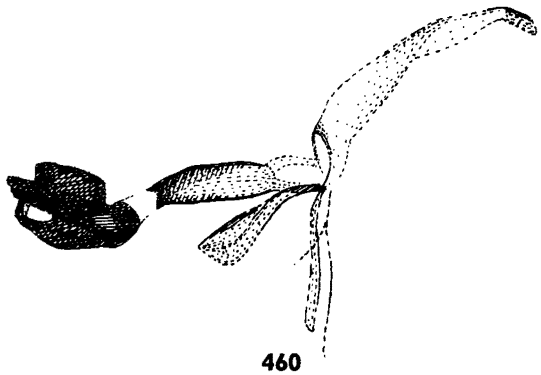
Wing: length in male 1.65 mm, last section of vein M3+4 slightly more than twice length of penultimate; squamae white, fringe distinctly darker, ochrous but not wholly black.

Legs: entirely black.

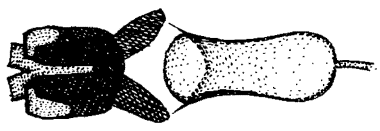
Male genitalia: aedeagus as in Fig. 460, 461.

Host plant/Biology: unknown but probably in Verbenaceae.

Holotype male, Bahamas, Cat Is., McQueen, 23 Jan. 1953 (E.B. Hayden and L. Giovannoli); paratypes: one male, same data as holotype; Long Is., Deadman's Cay, one male, 11 March 1953 (E.B. Hayden);



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Figs. 460, 461. *Calycomyza bahamarum*: 460, aedeagus, side view; 461, same, ventral view.



Fig. 462. Distribution of *Calcomyza bahamarum*.

New Providence Is., Nassau, one male, 3 January 1953 (L. Giovannoli). Holotype and two paratypes in AMNH, one paratype in senior author's collection.

Remarks: This species closely resembles *C. durantae, C. lantanae* and *C. verbenae*, but *C. lantanae* is distinguishable by the entirely yellow squamal fringe, while in *durantae* and *verbenae* the squamal fringe is generally darker, more obviously black rather than ochrous. The aedeagus of *bahamarum* most closely resembles that of *C. verbenae* (cf. Spencer, 1963a: Fig. 70a, b) but, particularly in side view, is entirely distinctive.

Calycomyza dominicensis Spencer, sp.n.

Fig. 463-465

Head: frons narrow, slightly less than width of eye; two strong, equal ors, two ori, the lower distinctly weaker; orbital setulae sparse, mainly reclinate but one or two in front proclinate; third antennal segment ovoid.

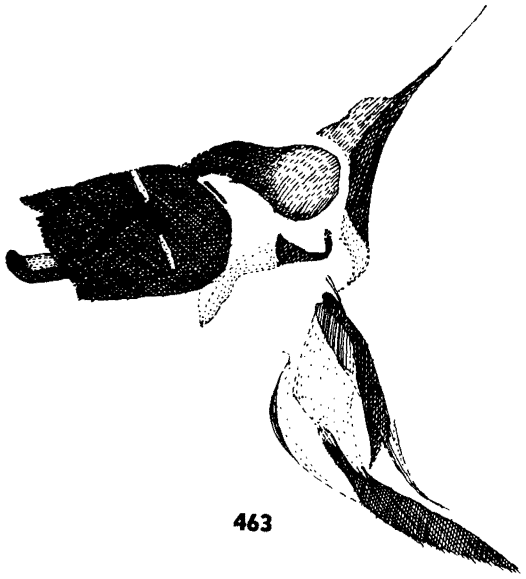
Mesonotum: three dc, the third weak; acr numerous in six to eight rows.

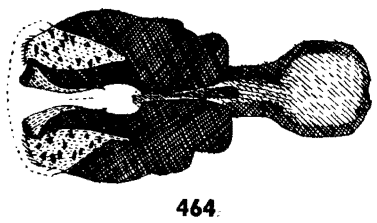
Wing: length from 2.2 mm in male to 2.5 in female, discal cell large, last section of vein M3+4 thus relatively short, one and a half to slightly less than twice length of penultimate.

Color: frons bright yellow, upper orbits only slightly darkened to upper ors, brownish; face yellow, all antennal segments black; humerus, notopleural triangle and hind corner of mesopleura bright yellow, pleura otherwise black; mesonotum entirely black, somewhat mat from front, more shining from behind; squamae yellowish gray, margin and fringe deep black.

Male genitalia: aedeagus distinctive, as in Fig. 463, 464.

Host plant/Biology: unknown.





Figs. 463, 464. *Calycomyza dominicensis*: 463, aedeagus, side view; 464, distiphallus, ventral view.



Fig. 465. Distribution of *Calycomyza dominicensis*.

Holotype male, Dominica (W.I.), Clarke Hall, 11-20 Feb. 1965; paratype female, 21-31 Jan., Malaise trap (both W.W. Wirth), in USNM.

Remarks: This is a conspicuously large species. The only other species of comparable size is *C. eupatorivora* from Jamaica, but this is readily recognizable by the large yellow patches at the hind corners of the mesonotum.

Calycomyza eupatorivora Spencer, sp.n.

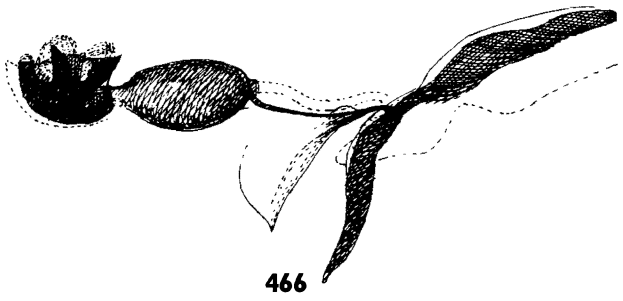
Fig. 466-468

Adult: upper orbits largely yellow, at most faintly brownish to upper ors; two ors, the upper distinctly weaker, three ori, slightly weaker than lower ors; third antennal segment black, ovoid, distinctly pubescent, first and second partially yellowish; face predominantly yellow, at most faintly grayish; mesonotum moderately shining, hind corners broadly yellow but inner post-alar just on black, acr in six rows; humerus, notopleural triangle and hind corner of mesopleura bright yellow; legs black, fore knees conspicuously yellow; wing length 2.3 - 2.4 mm, last section of vein M3+4, about one and a half times length of penultimate; squamae yellow, border slightly darker, fringe black.

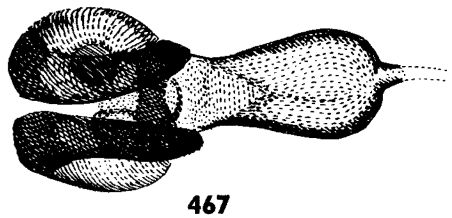
Male genitalia: aedeagus as in Fig. 466, 467.

Host plant/Biology: *Eupatorium odoratum*, larva forming large white blotch; several larvae may feed together, pupation externally; posterior spiracles each with three bulbs, the lower two minute, the third slightly extended.

Holotype male, Jamaica, Mount Diavolo Forest, emerged 27 Dec. 1958 ex leaf mine on *Eupatorium odoratum* leg. 13 Dec. 1958; paratypes: four males, emerged 17 Jan. 1959, otherwise same data; one female, caught on *Eupatorium*, same locality, 13 Dec. 1958 (all K.A.S.), in senior author's collection.



466



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Figs. 466, 467. *Calycomyza eupatorivora*: 466, aedeagus, side view; 467, distiphallus, ventral view.



Fig. 468. Distribution of *Calycomyza eupatorivora*.



Fig. 469. Distribution of *Calycomyza meridiana*.

Remarks: This species was previously confused with *C. flavinotum* Frick, 1956, a Nearctic species occurring in the northern United States and Canada. After examining the genitalia of a Canadian specimen (Spencer, 1969a: Fig. 249, 250), it was realized that the species in Jamaica discussed as *flavinotum* by Spencer, 1963a: 343 was distinct. *C. eupatorivora* is generally smaller, the mesonotum is less shining, the acr are less numerous, the upper ors is weaker, and the yellow patches at the hind corners of the mesonotum are smaller.

Specimens feeding on *Alomia fastigiata* from São Paulo, Brazil and on *Eupatorium odoratum* from Caracas, Venezuela have genitalia which differ only in minor detail of the distiphallus. There is clearly some differentiation in these three populations, but it is not considered justified to treat them as distinct from *eupatorivora* at this stage.

Calycomyza meridiana (Hendel)

Fig. 469

Agromyza meridiana Hendel, 1923: 123, nom. nov. for *meridionalis* Malloch, preoccupied by *meridionalis* Strobl, 1900. Holotype female from Costa Rica in USNM.

Phytobia (*Calycomyza*) *meridiana*, Frick, 1952a: 395; Spencer, 1963a: 348.

Costa Rica: La Caja, 8 km W. of San José, one male, 1 Nov. 1930 (Schmidt); Surrubres, one female, no date (A. Heyne).

Dominica (W.I.): Clarke Hall, one male, 11-20 Jan. 1965 (W.W. Wirth).

Jamaica: "St. And.," Irish Town, one female, 28 Aug. 1966 (H.F. Howden & E. Becker).

Remarks: This species has been recorded previously from Costa Rica and British Guiana. The specimens from Dominica and Jamaica represent the first records for the West Indies and suggest that the species, although not common, apparently is widespread.

Calycomyza servilis Spencer, sp.n.

Fig. 470-472

Adult: orbits brown to upper ors; first and second antennal segments distinctly yellowish, third black, round; face entirely yellow; mesonotum moderately shining black, acr in six rows; legs black apart from yellowish fore knees; wing length 1.9 mm, last section of vein M3+4 slightly over twice length of penultimate; squamae yellowish gray, margin and fringe black.



Figs. 470, 471. *Calycomyza servilis*: 470, aedeagus, side view; 471, same, ventral view.

Male genitalia: aedeagus as in Fig. 470, 471, black apical processes of distiphallus slightly asymmetrical, distinctly rotated to left (viewed from above); arms of hypophallus narrow, strongly chitinized, with membranous connection at rear.

Host plant/Biology: *Eupatorium odoratum*, larva forming leaf mine (details not recorded).

Holotype male, Trinidad, Curepe, emerged 5 March 1967 ex leaf mine leg. 17 Feb. 1967; paratypes: one male, one female, same data (R.C. Crutwell); Dominica (W.I.), Clarke Hall, one male, 11-20 Jan. 1965, Malaise trap (W.W. Wirth). Holotype and paratype in BM, one paratype in USNM and in senior author's collection.

A male from the Dominican Republic, La Vega Prov., 4 Aug. 1967 (L.H. Rolston) closely agrees with the type series, but the apical processes of the distiphallus are substantially shorter; this specimen is not treated as a paratype.

Remarks: On external characters this species cannot be distinguished from others in the group with the squamal fringe dark, but the male genitalia are entirely distinctive.



Fig. 472. Distribution of *Calycomyza servilis*.

GENUS *AMAUROMYZA* HENDEL

A single, somewhat aberrant, species feeding as a leaf miner on *Commelina* has been examined from Cuba.

Amauromyza sp. (Cuba)

Fig. 473

Cuba: Havana, Marianao-Laguito, two males, two females, 6-18 Dec. 1967, ex leaf mines on *Commelina* sp. (E. Rohdendorf).

This is an entirely black species but differs from most species in the genus in having white halteres. The aedeagus (Fig. 473) is typical of many *Amauromyza* species and immediately confirms its correct generic position. This species will be described shortly by Dr. Rohdendorf.

GENUS *LIRIOMYZA* Mik

The number of species in the Caribbean area appears to be strictly limited, and in the considerable material studied no new species have been discovered.

L. sorosis, described from St. Vincent, has in the past been mistakenly identified in Florida and elsewhere in the United States. Examination of the lectotype confirms that this species is distinct from *L. marginalis* which is widespread in the Neotropical Region and from *L. blechi,* described as new from southern Florida.

Liriomyza sorosis (Williston)

Fig. 474-478

Agromyza sorosis Williston, 1896: 429. Lectotype male from St. Vincent, designated by Frick, 1959: 410, in BM.

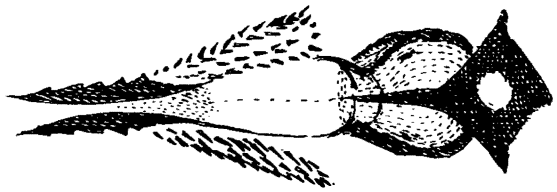
Liriomyza sorosis, Frick, 1959: 410; Spencer, 1963a: 370; 1969a: 187.

Adult: frons and orbits uniformly yellow, both vt on yellow ground; all antennal segments yellow; mesonotum shining black (not "dark brown" as stated by Frick) with broad yellow patch adjoining scutellum bordered by lateral black bands (Frick, 1959: Fig. 124); wing length 1.8 mm, last section of vein M3+4 only slightly longer than penultimate, in ratio 17:15, first cross-vein well before midpoint of discal cell.

Male genitalia: aedeagus in side view as in Fig. 474, distiphallus (Fig. 475) somewhat elongate, hypophallus complex but symmetrical (Fig. 476a), mesophallus broad, short (Fig. 476b); surstyli essentially as in *L. marginalis* (Fig. 261); cerci with six conspicuously long hairs at end (Fig. 477).

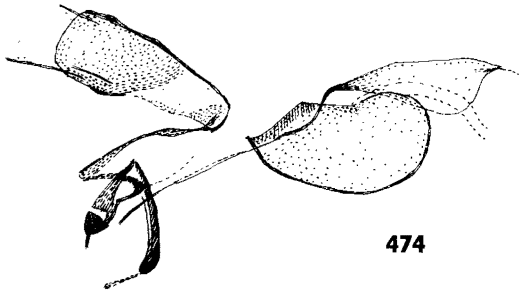
Host plant/Biology: unknown.

Remarks: It previously has been considered that this species is polyphagous on hosts in a number of families, including Gramineae (Stegmaier, 1967c). However, examination of the lectotype shows that there are significant differences in genitalia both from *marginalis,* feeding on *Paspalum* and possibly other grasses, and *blechi* sp.n. which occurs commonly in southern Florida on *Blechum pyramidatum.* The name *sorosis* must therefore for the time being be restricted to the type series from St. Vincent.

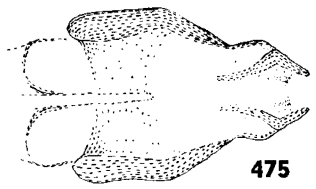


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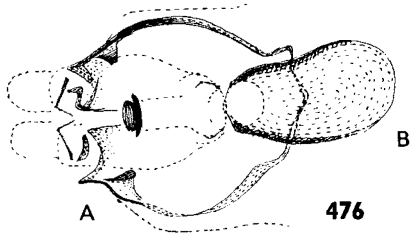
Fig. 473. *Amauromyza* sp. (Cuba): distiphallus, ventral view.



474



475



B

A

476



477

Figs. 474-477. *Liriomyza sorosis*: 474, aedeagus, side view; 475, distiphallus, dorsal view; 476 A, B, hypophallus and mesophallus, ventral view; 477, cercus.



Fig. 478. Distribution of *Liriomyza sorosis*.

The aedeagus of *sorosis* is more elongate and narrower than in *marginalis*; conversely the mesophallus is shorter and broader. The hypophallus is conspicuously complex, and the cerci are unusual in bearing six very long hairs terminally. The genitalia resemble more closely those of *blechi* than of *marginalis*, and it is therefore felt that the host plant will be in the Dicotyledoneae rather than in the Gramineae.

Material examined:

St. Vincent: windward side, one male, 1907 (H.H. Smith), lectotype.

GENUS *LEMURIMYZA* SPENCER

Lemurimyza Spencer, 1965b: 26; 1969a: 193.

Type of genus: *Lemurimyza enormis* Spencer from Madagascar.

This small genus of seven species was erected primarily for the two species, *L. enormis* Spencer from Madagascar and *L. admirabilis* Spencer from Nepal, having the third antennal segment black, a yellow prescutellar area and black halteres. The male genitalia are distinctive. Subsequently it has been found that species with both the third antennal segment and halteres yellow correctly belong in this genus. Four species are known in the Nearctic Region (Spencer, 1969a: 193).

One new species from Costa Rica is described below.

Lemurimyza costaricensis Spencer, sp.n.

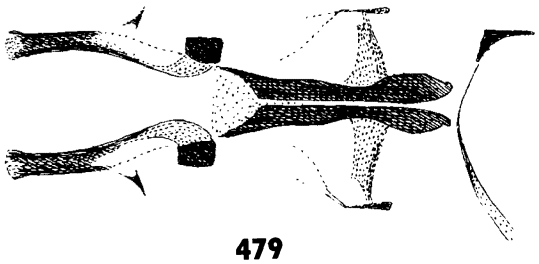
Fig. 479-481

Head: frons not projecting above eye, two equal, reclinate ors, one incurved ori; orbital setulae sparse, reclinate, eye upright, jowls one-fifth vertical height of eye, not significantly extended at rear; third antennal segment oval distally, arista conspicuously pubescent.

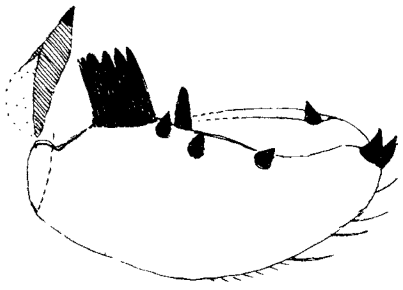
Mesonotum: 3+1 strong dc, acr almost lacking, reduced to three or four isolated hairs.

Wing: length 1.6 mm in male, last section of vein M3+4 only slightly longer than penultimate, in ratio 16:12.

Color: frons and orbits dark, brownish yellow, jowls and face slightly more yellowish; all antennal segments black; mesonotum



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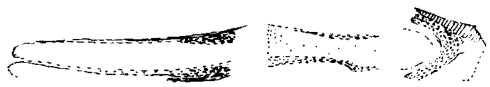


480

Figs. 479, 480. *Lemurimyza costaricensis*: 479, aedeagus; 480, surstylus.



Fig. 481. Distribution of *Lemurimyza costaricensis*.



482



483

Figs. 482, 483. *Phytoliriomyza conjunctimontis*: 482, aedeagus, 483, surstylus.

and scutellum mat, brownish black; humerus, notopleural area and upper third of mesopleura faintly pale, yellowish, pleura otherwise black; legs black; halteres blackish brown.

Male genitalia: aedeagus distinctive, as in Fig. 479; surstyli and epandrium with conspicuous bristles, as in Fig. 480.

Holotype male, Costa Rica, La Caja, 1930 (Schmidt); paratypes: two males, same data. Holotype and one paratype in DEI, one paratype in senior author's collection. Two females from Dominica, Carholm Estate, 7 Feb. 1965 (W.W. Wirth) agree very closely with the holotype and are tentatively referred to this species but are not treated as paratypes.

Remarks: This is the smallest and darkest species known in the genus, but the male genitalia are entirely typical of other, paler species immediately confirming its correct generic position.

GENUS *PHYTOLIRIOMYZA* HENDEL

Five species now are known in the Neotropical Region, including *P. pilosella* described earlier (p. 116) and *P. conjunctimontis* from Costa Rica and Dominica, discussed below, which has hitherto been known only from California.

Phytoliriomyza conjunctimontis (Frick)

Fig. 482-484

Xyraeomyia conjunctimontis Frick, 1952a: 413. Holotype male from Central California in USNM.

Phytoliriomyza conjunctimontis, Spencer, 1965c: 662.

Head: frons not projecting above eye, two ors, the lower weak, one slightly proclinate ori, orbital setulae well defined, proclinate; eye large, slanting, jowls extending at rear, third antennal segment small, round, distinctly pubescent (illustrated by Frick, 1959: fig. 130).

Mesonotum: 3+1 dc, or 2+1 with third reduced to a minute hair slightly beyond second; acr lacking.

Wing: length from 1.25 mm in male to 1.6 in female, second cross-vein absent.

Color: frons, jowls and face dirty yellowish; first and second antennal segments yellow, third darker, blackish but paler on inside; mesonotum mat, ash gray, scutellum similar but with faint trace of yellow centrally; sides of thorax largely pale, but in



Fig. 484. Distribution of *Phytoliriomyza conjunctimontis*.

specimen from Dominica darker above, mesopleura yellow below, merging to gray in upper half; legs: coxae and femora yellow, tibiae and tarsi somewhat darker, brownish; halteres dark, blackish.

Male genitalia: aedeagus as in Fig. 482; surstyli as in Fig. 483, not separated by suture from epandrium.

Host plant/Biology: unknown.

Distribution: Central California: Costa Rica, Dominica.

Remarks: This species hitherto has been known only from the type series from California. The males from Costa Rica and Dominica have genitalia which are virtually identical to those of the paratype Spencer has examined. However, the pleura in the specimen from Dominica are distinctly darker, and the third antennal segment appears to be somewhat smaller; the third dc also is reduced to a minute hair. It is possible that this represents incipient speciation, but it does not seem justifiable to give this specimen separate status.

Material examined:

California: Camp Sacramento, El Dorado Co., one male, one female, 18 July 1948 (K.E. Frick), paratypes.

Dominica: Freshwater Lake, one male, 6 March 1965 (W.W. Wirth).

Costa Rica: La Caja, 8 km West of San José, two males, 1930 (Schmidt).

Nesomyza Spencer, gen. nov.

(Greek Nesos, Island + Myza)

Type of genus *Nesomyza fusculoides* Spencer, sp.n.

Minute black species, wing length 1.35 mm in male; sub-costa developed throughout its length as a fold, joining costa basad of vein R 1; two ors, 1 ori, orbital setulae weakly developed, upright or reclinate; costa extending to vein M 1+2, second cross-vein present, face and jowls yellowish; 3+1 strong dorsocentrals; mesonotum, scutellum and halteres entirely black; male genitalia: aedeagus asymmetrical, with hypophallus strongly developed on one side only (Fig. 485), ninth sternite (Fig. 486) with narrow, unusually widely spaced side arms, U-shaped distally; surstyli separated by complete suture from epandrium, bearing a strongly chitinized comb of six spines lying at right angles to main process (Fig. 487, 488a); epandrium bearing comb of black spines on lower corner (Fig. 488b).

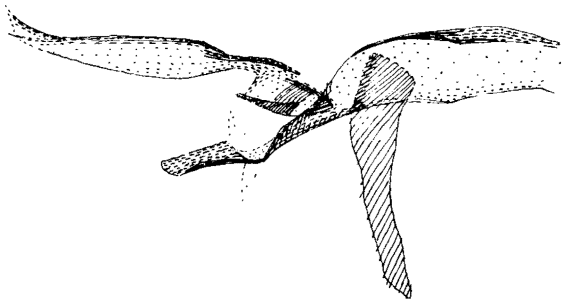
Superficially, *Nesomyza* agrees in the main morphological characters with *Amauromyza* Hendel. However, all known species in the latter genus are substantially more robust, the smallest having a wing length of at least 1.75 mm; there also are invariably two or three ori present. The two genera are not closely related.

This genus appears to be most closely related to *Lemurimyza*. However, the substantially darker coloration supported by significant differences in genitalia preclude the inclusion of *N. fusculoides* in *Lemurimyza*. The reclinate orbital setulae, again supported by differences in genitalia, differentiate *Nesomyza* from *Phytoliriomyza*.

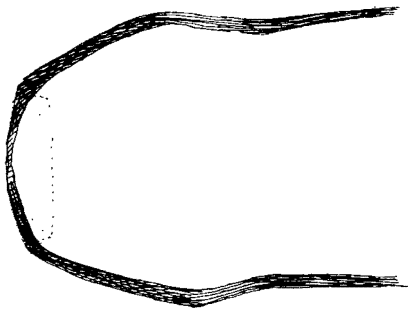
Nesomyza fusculoides Spencer, sp.n.

Fig. 485-489

Head: frons twice width of eye, slightly sunken below orbits in upper half, these not projecting above eye in profile; two ors, the lower slightly weaker, one incurved ori (reduced to minute setula on one side); orbital



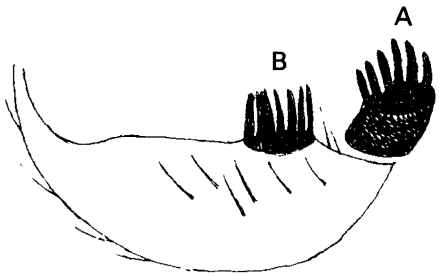
485



486



487



488

Figs. 485-488. *Nesomyza fusculoides*: 485, aedeagus; 486, ninth sternite; 487, surstylus; 488 A, surstylus; 488 B, hind-corner of epandrium.

setulae sparse, three or four only, upright to reclinate; eye large, slightly slanting, minutely setulose, jowls about one-sixth eye height; third antennal segment round, with normal pubescence, arista finely pubescent.

Mesonotum: 3+1 strong dc, acr irregular, in four rows, not extending beyond second dc.

Wing: length 1.35 mm, costa extending strongly to apex of vein M 1+2, last section of M 3+4 only marginally longer than penultimate, first cross-vein at basal third of discal cell.

Color: frons dark brown, orbits somewhat paler, yellowish brown; face and jowls similar to orbits, all antennal segments black; mesonotum and scutellum uniformly mat black, with a slight brownish tinge; pleura and all legs black; squamae dark gray, fringe black; halteres entirely black.



Fig. 489. Distribution of *Nesomyza fusculoides*.

Male genitalia: aedeagus as in Fig. 485, distiphallus in form of flat tubule, hypophallus strongly developed on one side only; ninth sternite (Fig. 486) with narrow, unusually widely spaced side arms, U-shaped distally; surstyli (Fig. 487) separated by complete suture from epandrium, to which they are attached at lower corner (not upper as in related genera), bearing a strongly chitinized comb of six spines lying at right angles to main process (Fig. 488a); epandrium bearing comb of four black spines on lower corner (Fig. 488b).

Holotype male, Dominica (W.I.), Freshwater Lake, 21 Jan. 1966 (W.W. Wirth), in USNM.

GENUS *PHYTOMYZA* FALLÉN

Only eight species hitherto have been known in the Neotropical Region, and examination of many hundreds of specimens from the Caribbbean and Costa Rica has confirmed the almost complete absence of this genus.

It seems probable that *P. loewii* recorded below from Costa Rica and Cuba represents the species described by Frost from Guatemala as *P. centralis*. It unfortunately has not been possible to examine any specimens of *centralis* to confirm this probable synonymy.

Phytomyza loewii Hendel

Fig. 490, 491

Phytomyza clematidis Loew, 1863: 55. Holotype female from District of Columbia ex *Clematis* in MCZ.

Phytomyza loewii Hendel, 1923: 145, nom. nov. for *clematidis* Loew, not Kaltenbach, 1859; Frick, 1959: 430; Spencer, 1969a: 251.

Costa Rica: La Caja, 8 km west of San José, one male, 1930 (Schmidt).

Cuba: Soroa, 300 m., one male, two females, emerged 12-15 March 1967, ex leaf mines leg. 27 Feb. 1967 on *Clematis dioica* (Rohdendorf).

Remarks: The specimens from Costa Rica and Cuba are identical in all respects with those I have seen from District of Columbia and Quebec (Fig. 490). This is a most interesting extension of the range of this Nearctic species, which presumably has reached Cuba from Central America at some time during the Pleistocene.

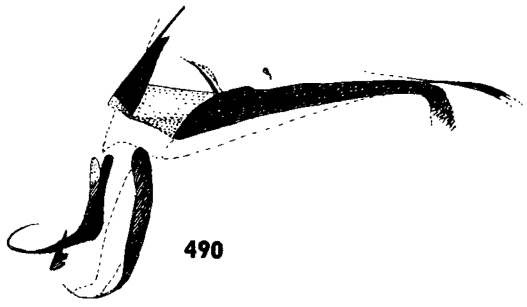


Fig. 490. *Phytomyza loewii*: aedeagus.

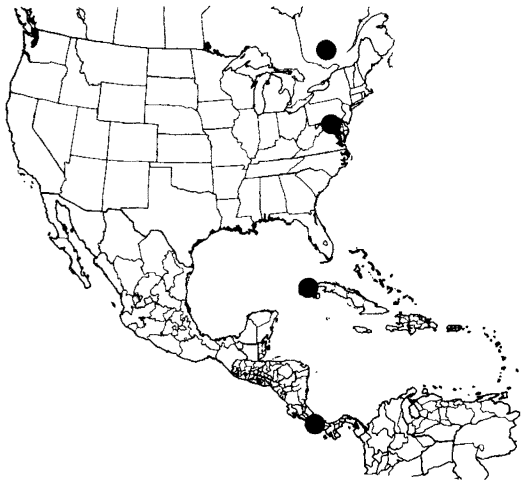


Fig. 491. Distribution of *Phytomyza loewii*.

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