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THE MUSCIDAE OF PUERTO RICO (INSECTA: DIPTERA).

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The Muscidae of Puerto Rico

(Insecta: Diptera)

by

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INTRODUCTION

No comprehensive treatise on the family Muscidae of any part of the West Indies is available. Only a few papers, mainly listings, descriptions of new species and scattered economic reports have recorded the West Indian muscid fauna. The works of Wolcott (1923a, 1923c, 1924, 1933, 1936, 1941, 1948, and 1955); Curran (1928); Snyder (1940, 1954a, 1954b, 1957a, 1958a) and Albuquerque (1945, 1953, 1954a, 1954b, 1955, 1956a, 1956b, 1956d, 1958a, 1958b, 1959) have served Puerto Rican zoologists as authoritative works of reference for many years. Wolcott (1948) listed the Puerto Rican insects including the Muscidae, with some annotations on their biology and taxonomy, but little has been added to this subject since then.

Due to the lack of adequate information on the local species in this family, it is apparent that further studies should be pursued. The writer is convinced that bringing together the hitherto scattered information and the search for new taxonomic and morphological data concerning the species would not only be desirable, but a very practical undertaking. Other objectives of the work are:

1) to properly identify the members of the family Muscidae occurring in Puerto Rico;
2) to compile the meager literature on the muscids of the island;
3) to bring up-to-date the synonymy of the local muscid species;

4) to clarify old concepts, as well as bring up some new pertinent facts about the general morphology and other general characteristics of the family, including the biology of some species in this group;

5) to provide keys to facilitate the identification of genera and species;

6) to make the present study available for use as guide for future investigations of this group, not only in Puerto Rico, but also in the other West Indian Islands, and

7) to provide Puerto Rican entomologists and interested students with the methods and techniques of collecting, preserving and mounting specimens for study.

This paper brings together data on 49 recognized species, out of which 38 were previously known from Puerto Rico and 14 were originally described as new to the island. There are 5 new records, as well as 7 new species described herein. Until now, a total of 21 endemic species were known. Another six species are of doubtful occurrence. Keys for the separation of subfamilies, genera and species are also included. The 49 species discussed here belong to 26 genera. Considering that the West Indian muscid fauna (Table 1) is so poorly known, it is not possible at present to compare our local forms with those of any of the adjacent islands.

Holotypes and allotypes are presently deposited in the insect collection of the Agricultural Experiment Station of the University of Puerto Rico at Río Piedras. At the end of this study, primary type

and paratypes, when available, will be deposited in the insect collection of the National Museum of Natural History, Washington, D.C.

REVIEW OF LITERATURE

A review of the literature indicates that the first paper dealing with the muscids of Puerto Rico was written by Stahl (1882) in which he listed only Musca domestica. This was followed by Röder (1885), recording four species: Musca domestica, Morellia violacea (now known as M. flavicornis), Stomoxys calcitrans and Ophyra aenescens. Two years later, Gundlach (1887) in his "Apuntes para la fauna Puerto-Riqueña" again listed Röder's records.

Coquillett (1900) recorded seven muscids from the island, including Bithoracochaeta viaricornis (as a new species of Coenosia). Aldrich (1905) listed 11 muscid species from Puerto Rico. Smyth (1919a, 1919b, 1921) gave a full account of the remedies against Haematobia irritans, then known as H. serrata. Merrill (1915) reported on the life history, bionomics, parasites, predators and commensals of Haematobia irritans (as H. serrata) in the Guánica region, this being the most complete account for this species in Puerto Rico. Wetmore (1916) reported Morellia flavicornis (=Pyrellia centralis) as food of the bird species Blacicus blacoi, now known as Cantopus latirostris blancoi. Colón (1919) gave a summary of what was then known about Haematobia irritans, then listed as a Hyperosia species. Catoni (1923) recorded H. irritans as one of the insects attacking domestic animals. Dickmans (1927) reported the abundance of H. irritans on the south coast of Puerto Rico.

The first taxonomic work of value on the Muscidae of Puerto Rico was written by Curran (1928), who gave keys to the genera and 12 species

of flies, and included the original description of Neodexiopsis rex.

Wolcott (1923a), in a preliminary list of the insects of Puerto Rico, mentioned 23 muscoid species in three different families. Of these only 16 are now included in the family Muscidae, the remainder in several other families. Morellia basalis (=M. scapulata) was listed by Wolcott (1923b) as food of the Puerto Rican lizards Anolis pulchellus, A. krugii and A. cristatellus. Wolcott (1936) reported 38 species of flies in three different families. Of these, 10 species are now included in the families Calliphoridae and Sarcophagidae. Wolcott (1941) added notes on three species, listing Cochliomyia macellaria under the family Muscidae, a species which is now placed in the family Calliphoridae. Wolcott (1948) published the most extensive list of the muscids of the island, recording 38 species which he placed in four different families: 7 in Muscidae, 18 in Anthomyidae (including 2 now considered synonymous), 2 in Scatophagidae and 3 in Sarcophagidae. The records of Calythea crenata, Graphomya basalis as G. maculata, Lispe rufitibialis, Coenosia flavipes and Neomuscina tripunctata are probably misidentifications. The monotypic genus Scenetes was described by Malloch (1936) from Puerto Rican and Cuban material. The USDA Agricultural Experiment Station at Mayagüez in its anonymous (1938) annual report listed Muscidifurax raptor as reared from a Musca domestica puparium collected at Hormigueros. This was the first record for this parasitic species from the island.

Séguy (1937) listed Neodexiopsis rex from Puerto Rico and also 13 other species from the West Indian islands. Bartlett (1939) discusses the

introduction into Puerto Rico of beneficial insects to aid in the control of the horn fly. Musca domestica was the only muscid recorded by Ramos (1946) from Mona Island.

Pérez (1951) also mentioned the house fly in his investigations relative to the food of Rana catesbeiana in Puerto Rico. Seago (1954) in his revision of the pusio group of the genus Fannia, listed F. pusio and F. trimaculata from Puerto Rico.

Snyder (1940), in his review of the genus Myospila, cited M. obsoleta from Puerto Rico and other West Indian islands. Snyder (1954a, 1954b) reported Lispe nasoni and Cyrtoneurina rescita, respectively. Snyder (1957a) treated 11 species of Neodexiopsis, which he considered a valid genus; 10 were new. Snyder (1958a), in the review of the ovata group of the genus Neodexiopsis, gave notes on the male and female of his previous species, N. cavalata, and described Neodexiopsis priscipagus.

Pimentel (1955) studied the effect of ants on fly control in Puerto Rico. He attributed 91% control of Musca domestica and other filth-breeding species to ants, primarily to the fire ant, Solenopsis geminata.

Legner, Bay & McCoy (1965) studied the predators and parasites of muscids and other Diptera in Puerto Rico. They discovered six hymenopteran parasites in more or less permanent breeding sites. One undescribed species of Diapriidae and five Pteromalidae were involved.

Maldonado Capriles & Navarro (1967) recorded Cyrtoneurina rescita, Gymodia debilis and Spilogona sp. as new to Puerto Rico and erroneously cited Synthesiomyia nudiseta as new to the island. They also listed the Neodexiopsis species previously described by Snyder in 1957a and 1958a,

giving notes on other species.

The Muscidae from the West Indies are recorded in Table 1. Of the 110 species listed, 99 are in Pont's (1972 and 1974) catalogues. Forty-eight of these are listed from Puerto Rico. All other records were obtained from the literature in general and from material examined by the author.

MATERIALS AND METHODS

Material Studied

The writer's collection and the collections of the Puerto Rico Agricultural Experiment Station, Río Piedras, the University of Puerto Rico, Mayagüez, the National Museum of Natural History, Washington, D.C., and the American Museum of Natural History, New York have served as a basis for this study.

Keys are provided to the subfamilies and genera as well as the species, some of these being adapted to the Puerto Rican forms.

Descriptions are given for all the genera and species. These are based on specimens of both sexes, when both are known. The total length is computed in terms of minimum and maximum for both sexes separately, whenever possible. I have used numerals in describing numbers of setae for economy of space and also to bring them to attention as contrasting characters with other species. The descriptions of species recorded from Puerto Rico, but not available for study, were taken from the literature. In the same manner, the more important nomenclatorial changes and works on biology and distribution from the revisions of different groups and the Puerto Rican literature in general were obtained, and used for each genus and species discussed.

I have limited the citation of synonymy to the more important contributions dealing with genera and species occurring in the Americas, with special emphasis on those which appeared after the Séguy (1937) world catalogue.

A binocular microscope was used to make the drawings. The photos were courtesy of Mr. Luis Villafañe of the former Perinatal Laboratory, U.S. Public Health Service, at San Juan, Puerto Rico. In their preparation, Kodak contrasting process ortho film was used.

In describing species, the length of a bristle or a section of a wing, the width and length of head and other head parts as well as thoracic stripes or size of abdominal markings were compared in size to easily recognized adjacent characters in the species under examination.

A strongly illuminated white surface was used as a background to better distinguish the length of aristal hairs as well as other parts, but hairlike ocular setae, when present, as well as body colors were most easily distinguished when seen against a dull background.

Abbreviations

Most of the host plants and some animals are cited by their scientific names only. Abbreviations are used for the names of individuals who collected or donated specimens to the author, thus:

EM: Emilio Medina

GR: Gaspar Rivera

JAR: José Antonio Ramos

JGT: José García Tudurí

JMC: Jenaro Maldonado Capriles

LFM: Luis Felipe Martorell

LM: Luis Medina

PM: Pedro Medina

SMG: Silverio Medina Gaud

Abbreviations are also used for the following institutions that loaned material for this study, or, for places in which specimens were collected:

AES: Agricultural Experiment Station

AESb: Agricultural Experiment Substation

AMNH: American Museum of Natural History, New York

NMNH: National Museum of Natural History, Washington, D.C.

Additional abbreviations are used for some of the geographical regions cited throughout the text:

ASUS: America South of United States

NA: North America

PR: Puerto Rico

USA: United States of America

VI: Virgin Islands

WI: West Indies

Some descriptive terms are abbreviated thus:

cat.: catalogue

coll.: collection

descr.: description

distr.: distribution

f: female

fig(s).: figure(s)

For.: forest

gen.: genus, genera or generic

I.C.Z.N.: International Commission of Zoological Nomenclature

Is.: Island

K: kilometer

l.c.: locus cited

m: male

monog.: monograph

Nat.: National

n. sp.: new species

orig. des.: original designation

P.R. Acc. No.: Puerto Rico Accession Number

Rd.: road

rec.: record

redescr.: redescription

rev.: revision

spp.: species

subg.: subgenera, subgenus

Abbreviations used in the illustrations can be found on the page preceding the plate in which they are used.

Collecting and Rearing Techniques

Muscid flies are widely distributed in Puerto Rico. Flies frequenting human and domestic animal dwellings, flowers, fruits, shrubs and other sorts of vegetation as well as in nearby creeks and rivers were collected using a standard insect net or a small killing tube. The Malaise insect trap was also used with excellent results (see Table 2).

The Tindale (1962) method for field preservation of Lepidoptera, using chlorocresol for the preservative, was used successfully and kept the flies completely relaxed for more than six months. Other standard methods of collecting and handling of specimens were also employed. All specimens were separated and properly labelled for identification and numbers were assigned to the collection data for the corresponding group of specimens in the collection of the author.

Flies can be artificially reared by collecting infested material: i.e., rotting fruits, flowers, forest floor litter, animal carcasses and dung, bringing it to the laboratory for rearing. Some species actually live in the nests and under the skin of some birds and in wasp nests. Collection of these sources frequently produces immature specimens. Material from these sources was brought to the laboratory and reared in wooden and saran rearing cages and/or containers with adequate moisture and substrate.

Mounting Techniques

There is scarcely any part of the external structure of a muscid that may not provide some characters of taxonomic value. The chaetotaxy of the body, as well as the characters present in the wings, mouth and genitalia, are very important in the taxonomy of Muscidae. Whenever possible, each leg of a pair should be examined. It is therefore important, when pinning a specimen or mounting any part of it on a slide, to insure that every part of it will be accessible to examination.

Adult flies, as well as parts used in the taxonomic portion in this

thesis, were pinned, pointed, and/or mounted on slides, using standard methods. If a specimen has been allowed to become "wet" from prolonged contact with killing or relaxing agents, the normal pollinose pattern is partly or entirely destroyed. As a result care should be taken to avoid wetting. This condition can usually be remedied by a prolonged immersion in a degreasing agent such as dioxane or xylene. Assis-Fonseca (1968) recommended cigarette lighter fluid, which he has used with excellent results. I have used cellosolve with good results, not only for this purpose but for cleaning specimens covered with moth and butterfly scales.

Mounting material from alcohol

Mounting Diptera which have been preserved in alcohol requires extreme care and proper handling in order to produce good dry mounts. The methods described by Sabrosky (1957) and Vockeroth (1966) give good results but are time consuming, and expose the worker to the irritating and toxic vapors of ethyl acetate. Sabrosky's (1966) method is the better, gives excellent results and should be consulted for a detailed explanation of the method.

Preparing and mounting mouth parts

The mouth parts of muscid flies were dissected for further study. Dry specimens were first placed in a relaxing chamber. The heads were removed and cleared by soaking in a cold or hot solution of 10% sodium (NaOH) or potassium hydroxide (KOH). Dark or black specimens were cleared using the Deonier (1971) method, which consisted of adding two to

ten drops or more of 30% hydrogen peroxide over and around the head as it floated on the surface of the cold NaOH or KOH, a method also employed in the preparation of terminalia. Close observation indicated when they were sufficiently bleached and decolorized. Heating the solution hastened this process, but the use of a cold solution, especially when treating more than one specimen, provided more time for observation and thus better specimens. After they were processed, some of them were dissected and mounted in Canada balsam. Individual heads were transferred to a small quantity of glycerin in a depression slide for microscope study. After examination, the head was placed in a microvial containing glycerine.

Mounting wings

Where sufficient material permitted, wing slides were prepared, following standard methods.

Genitalia preparation

The identification of many species is based solely on genital characters. Proper preparation of these critical parts assists in the interpretation of morphological variation as well as the correct identification.

The genitalia must be cleared and, if necessary, bleached, employing the techniques described for the preparation and mounting of mouth parts.

Gurney et al. (1964) should be consulted for a more detailed account on the preparation, study and storage of insect genitalia in

microvials.

Labelling

Each specimen must be labelled with standard labels designed for this purpose. All slides must also be labelled, but they must be oven-dried at 50°C for at least 10 days before they can be cleaned. All data from the collection label of the pinned specimen from which the wing was removed were copied onto the slide label.

THE FAMILY MUSCIDAE AND ITS ECONOMIC IMPORTANCE

The family Muscidae contains about 5,000 described species. Adults of most genera are predaceous, saprophagous, scatophagous or zoophagous. They are also commensals or feed on the blood of living animals. The larval habits are more or less similar to those of the adults, many being pests at this stage of their life cycle.

Flies have been man's companion since long ago. Today it is recognized that they constitute one of the greatest public health hazards, and the extermination or control of fly populations is essential for the prevention of many serious and widespread diseases. Effective control depends upon the accurate recognition of species, as well as on a thorough understanding of the dynamics of fly populations. Most of the flies of medical and veterinary importance belong to the subfamilies Muscinae and Stomoxyiinae.

There are at least six ways by which muscid flies can be of medical and agricultural importance. They can affect human welfare by annoying, biting, causing myiasis, by mechanical and biological transmission of diseases, and by attacking and damaging plants directly.

Flies, especially the domestic species, are a serious threat to individual efficiency. People, during their working hours, are annoyed and bothered by their presence. Biting flies disrupt a pleasant outside rest, a picnic or any recreational activity of mankind.

Most flies do not bite, but those which do cause serious trouble,

especially the stable fly which sometimes is common around human habitations and whose bite can be quite severe. Flies which bite domestic animals can produce severe lesions, high fever and even general disability as well as a decrease in milk production in the case of dairy cattle.

Many species of flies are capable of laying eggs or larvae on the flesh of mammals and other animals. The larvae thus deposited can invade the flesh of the host producing a condition known as myiasis. Wild animals (rabbits and deer) as well as domestic ones (especially cattle and sheep) are attacked. Human myiasis, while not common, occurs in many parts of the world.

Muscid flies, especially the house fly and other domestic species, have filthy habits which make them efficient mechanical vectors of pathogenic organisms. Flies carry disease-causing organisms in: 1) their mouth parts, 2) their body and leg setae, 3) through their vomitus, 4) on the sticky pads of their feet, and 5) through the intestinal tract by means of their feces. Diseases transmitted mechanically by domestic flies include typhoid, cholera, bacillary dysentery, infantile diarrhea, amoebic dysentery, giardiasis, pinworm, roundworm, shipworm, hookworm and tapeworm.

Many flies, particularly the biting types, are involved in the biological transmission of disease, including some of the most serious and commonest of vector-borne diseases such as the African sleeping sickness and leishmaniasis which cause the death of many people in different parts of the world. Other diseases have been experimentally transmitted

by muscids. In addition, flies transmit diseases to domestic animals.

Certain groups of muscid flies are pests of wild as well as cultivated plants. Their larvae cause damage by mining the foliage, as well as invading roots, bulbs and fruit tissues.

EXTERNAL MORPHOLOGY OF THE MUSCIDAE

This family consists of cyclorrhaphous flies of medium to small size (2 to 12 mm in length), usually with gray bodies, but metallic blue, yellowish, black or green tones are also found.

The adult muscids may be separated from the other suborders and families of Diptera by the presence of a lateral longitudinal seam on the second antennal segment; the thorax normally with a complete transverse suture on the dorsum; the postscutellum not well-developed; and the meron bare or with only weak setulae.

The generic as well as the specific descriptions of Muscidae in this work and the characters used in the keys are based mainly on visible external characters, but illustrations of the male and female genitalia of the new species are given at the end of this work. The presentation of the gross external morphology of the Muscidae is based mainly on Puerto Rican material, and may differ in various respects from the muscid fauna of other regions. It is essentially an interpretative synthesis of the contributions of Osten Sacken (1881, 1884), Comstock & Needham (1898), Curran (1934), Snodgrass (1935, 1957, 1960), Comstock (1940), Crampton (1942), Bonhag (1949, 1951), Ferris (1950), Roback (1951), Downes (1955), Emden & Hennig (1956, 1970), Knight (1970, 1971), Knight & Laffoon (1970a, 1970b, 1970c, 1971) and Laffoon & Knight (1971).

The external morphology of the muscids is in most respects similar to that of the tachinids and calliphorids. The majority of the important characters in these two families are of equal importance in the

muscids. Several terms applied or used for structures and parts in these dipterous families can be applied to muscids, in this way correlating and homologizing them with other Calyptrates and with structures of lower Diptera.

The different colors and density of dusting or pollinosity on the sclerotized surfaces of the majority of species provides a pattern of stripes, spots, and tessellations. They can be used as specific characters when the specimen is in good condition.

The position and pattern of certain setae are definitely fixed. The names of those setae most commonly used and accepted by dipterists are used in this paper. The setae offer excellent characters to distinguish genera and species groups in the subfamilies.

Head

The main characters of the head are given in Plates I, II, III and VIII, Figs. 1-11, 24 and 27-30. The head of muscids at the generic and specific level offer quite interesting characters of great value in the classification of this family. The outline of the head when viewed from the front is nearly circular, being slightly wider than high, and less regular in the female than in the male. Viewed in profile the outlines differ greatly in the two sexes, especially in those species with dichoptic eyes. In general, in the female the line from the vertex to the base of the antennae is almost at right angles to the

line from the vertex to the occipital foramen. The face is almost perpendicular, having a slight tendency to be retreating. In the male head, the vertical angle is somewhat acute, the antennae are situated about half way down from the vertex, the face is retreating, giving the epistome a protruding appearance, and the minor axis is only two-thirds the length of the major axis.

The posterior aspect of the head (Plate I, Fig. 3) is essentially the same in both sexes, showing distinct sclerites and sutures, while the anterior portion shows regions which are variable in the two sexes. There are five sutures arising from points on the occipital foramen. Two of these arise from the two dorsal angles of the foramen, two from two ventral angles and one from the middle of the dorsal margin. The two sutures arising from the dorsal angles of the foramen are the occipital sutures. These extend upward to the vertex and then around the compound eyes. The two lateral halves of the head thus formed are the postgenae (paracephala).

The suture which arises from the middle of the dorsal margin of the occipital foramen extends about one-third the distance towards the vertex and forks, each fork disappearing in a faint, almost indistinguishable suture which turns downward at an acute angle to meet the foramen at the base of the occipital suture. This is the coronal suture. The two triangular areas thus formed are the postoccipital sclerites, a part of the occiput.

The two sutures which start from the ventral angles of the foramen are the postoccipital sutures (basal sutures). These extend downward,

meeting a fold just above the oral margin, and become indistinct. The somewhat irregular, six-sided area cut off from the postgenae (paracephala) by these sutures is the postocciput (metacephalon). The vestiture of the occiput shows more or less distinct regions of which one is very clearly defined. This is a region just back of the compound eyes, the posterior eye orbit, set off from the rest by a row of the prominent short setae. Generally there is a small patch of fine setae at the base of each postocciput while the occiput is generally bare, except for the postinterocular setae. The metacephalon is divided into two lateral regions by the vestiture, with the occipital foramen in the center.

Viewing the head from the front the most striking difference between the sexes is that the eyes of the males, in the majority of the species reported in this work, are more or less closely approximated (holoptic) on the frons, while in the female they are widely separated (dichoptic). In two subfamilies, Lispinae and Coenosiinae, and in certain species of the Phaoninae and Muscinae, the eyes of the males are quite or almost as widely separated as in the females. The eyes are generally bare, as in Musca, but may be haired, as in some species of Calythea, Cymnodia and Graphomya. Except for a considerable narrowing in the male, the anterior regions of the head in both sexes are homologous.

The antenna (Plates III and VI, Figs. 8-11 and 18-19) shows no distinct sexual differences. The scape, or first segment, is the smallest, being short, collarlike and slightly compressed laterally. There are two or more small to large setae on the anterior surface. This segment

appears to be immovably attached to the head. The pedicel or second segment is longer, is attached to the first by a movable joint and bears a ring of setae on its anterior surface. The flagellum or third segment is the largest, twice as long as the second in most cases, somewhat round to laterally compressed. It is attached to the pedicel by immovable parts fitting together like saw-teeth. In addition to the three-segmented arista, this segment bears sense organs consisting of openings leading to small internal cavities. Each opening is protected by a ring of setae pointing outward. This segment also appears to be porous and spongelike, the pores being much smaller than the openings to the sense organ. All three segments are covered with short, fine pubescence. The width, length and color of the antenna, especially of the flagellum, are frequently used as a yardstick for comparing the size of other head characters. The flagellum is very long in the genera Scenetes and Neomuscina, short in Coenosia.

The arista (Plate III, Fig. 8) has three movable segments and is located dorsally on the flagellum. The first two segments are short and cylindrical; the second about twice as long as the first. The third segment is long, somewhat larger at the base and tapering from the basal third into a fine hairlike tip. The arista arises dorsally and sub-basally in the Muscidae. It is described as pubescent when the rays are so extremely short that they only give it an unshaven appearance. In cases where the rays are longer, distinctly and individually seen, then the arista is said to be hairy or plumose. The characters of the arista have considerable taxonomic value in the family Muscidae. It may

be bare as in the genera Atherigona, Gymnodia, Phyllogaster and Synthesiomyia; hairy or plumose as in Cyrtoneurina, Graphomya, Lispe, Morellia, Musca, Myospila, Neomuscina, Phaonia and Neomusca; plumose in its basal half in Scenetes; long with short rays at the middle in Scatophaga; pubescent in Calythea, Coenosia, Euryomma, Fannia and Neodexiopsis; pubescent in its basal half in Ophyra or shortly plumose mainly at the base in Bithoracochaeta, Hylemya (Craspedochaeta) and Lispe; or it can be hairy or plumose on the dorsal surface and bare on the ventral surface as in Stomoxys and Haematobia.

The chaetotaxy of the head (Plate I, Fig. 1) is of the greatest importance throughout the whole of the Muscidae being rather constant within species and providing useful characters for defining groups and separating species. The head bears numerous setae in definitely fixed positions. Some of these are relatively stout and large. The terminology applied here to the setae is determined by their position on the surface of the head and is similar to the most commonly accepted system.

The groups of head setae most commonly used in describing muscids are the interoculars (frontals and verticals of authors), parainterocularis, parafacials, interocellars, postocellars, upper oculars, oculars (ocular and orbital bristles of authors) and postinteroculars. Their number, relative size, presence or absence and direction of inclination are very important at the generic and specific levels.

At the extreme vertex of the head in both sexes there is a heavily sclerotized, slightly raised, almost equilateral triangle with its apex directed towards the base of the antennae. This is the ocellar triangle.

It bears three or four pairs of setae, generally called the ocellars or interocellars. The anteriors are usually directed forward (proclinate), very rarely absent and the posterior pair is generally upright or directed backward (reclinate). The postocellar setae are located just behind the ocellar setae and extend behind the posterior ocelli. Behind these setae there is sometimes a pair of divergent postinterocular setae.

The vertex bears two pairs of large ocular setae. They are usually divergent, called the outer and inner ocular pair. They are more or less located behind the upper and lower corner of the eyes. The upper ocular setae form a short, well-developed row bordering the back part of the compound eyes. The oculars are usually proclinate or divergent, situated on the upper part of the parafrontalia between the front and orbit.

There is a region below the ocellar triangle and above the base of the antennae, known as the frons (front, frontalia or frontal vitta of authors). In the males of many Muscidae this is triangular in shape with its apex directed upward and is known as the frontal triangle. In the females, the frons is broad, somewhat rectangular; in the Anthomyiinae, some species bear one or two pairs of setae, the interoculars, referred to as the cruciate setae. They are located just below the ocellar triangle and directed forward or they may be cruciate.

On each side of the frons, bordering the compound eyes, there is a narrow region which extends from the vertex to the base of the antennae, where it is cut off by an oblique division line. This area is the

parafrontalia or parafrontal plate sometimes bearing minute or short hairlike setae known as the parainteroculars. The interocular setae are those situated along the inner edge of the parafrontalia. They generally form a longitudinal row between the frons and parafrontalia. They have been incorrectly called the parafrontals. Below the parafrontalia are narrow regions which follow the orbit posteriorly. These regions are the genae and may be bare, pubescent or bear microsetulae.

At the base of the frons and just above the base of the antennae, there is a triangular invagination, the lunule, through which an eversible sac, the ptilinum, protrudes when the fly is emerging from the puparium. From this invagination the ptilinal suture extends downward on each side, ending just below the tip of the third antennal segment. The eversible sac extends the entire length of the suture and a slight line of demarcation extends from the tip of the suture to the oral margin. The lower margin of the lunule is formed by the upper margin of the sclerite which bears the antennae. This sclerite is cut off from the head capsule by a suture mostly concealed by the antennae. This suture, however, follows the vibrissal ridge, below the antennae, and then encircles the oral margin. It shows distinct regions including the epistome, though no setae are present, and corresponds closely to the face or faciala. The faciala, as used here, is that region which lies between the gena and the ptilinal suture and bears the oral vibrissae and facial setae. Between the parafrontalia and the lower edge of the head is the genal area. Some authors divide this area into three regions, the gena proper on the upper part, the bucca and the cheeks. This is properly the ventral

portion of the adult head capsule lying between the compound eyes and continuing forward without a break to the ventral surface of the proboscis. This area can be covered with long setae and setulae along the oral margin. For the general discussion of the insect head, Snodgrass (1935) and Matsuda (1965) must be consulted.

Mouth parts

The mouth parts of several species of the Muscidae have been studied in detail by Bletchley (1953), Giles (1905), Haussen (1903) and Stephens & Newstead (1907) but a detailed study of the mouth parts which could be a possible aid in classification of the family in general has not been made.

The main external parts of the muscid's mouth (Plate II, Fig. 6) are the labium, the hypopharynx and the labrum epipharynx. These parts are modified to form different mouth types. In the Muscidae at least three mouth types are recognized: the piercing, in *Stomoxys calcitrans* (Plate II, Fig. 7) and *Haematobia irritans*; the sponge or sucking, most commonly found in *Musca domestica* (Plate II, Fig. 6); and the rasping-sucking, as occurs in *Neodexiopsis* spp., *Lispe* spp. and *Cyrtoneurina rescita*.

The proboscis (haustellum of authors) is suspended from a more or less conical membranous projection on the lower part of the head known as the rostrum (basiproboscis of authors). The rostrum is covered with a tough membrane continuous with the integument of the proboscis. The anterior wall of the rostrum contains one or two clypeal plates and

also supports the maxillary palpi. Palpal shape, size and color are important classificatory aids. The subfamily Lispinae is separated from the other subfamilies by its spatulate or flat shaped palp; the palp is elongate and somewhat spatulate in Neomusca, internally grooved and very long in Haematobia, somewhat arcuate and with an internal furrow or groove in Atherigona, cylindrical in Synthesiomyia and very short or small in Ophyra and Stomoxys. The relative size of the palp as well as the difference in color are used in the differentiation of species in other groups.

The external mouth parts lead to a passageway that traverses the proboscis. The true mouth is located at the juncture of the proboscis and the rostrum.

The terminal portion of the proboscis, the labellum (the oral disc or oral sucker of authors) consists of two distinct broad lobes termed the labella. The labellae in most nonbiting species are large and soft. The two oral lobes can be flexed upward against the sides of the proboscis or spread out flat to form a broad disc, the so-called oral sucker, by which liquid may be collected and conveyed to the food meatus (channel) of the proboscis. Between each labellum is the central or prestomal cavity leading to the alimentary canal. This is more or less surrounded by the so-called discal sclerite, which is roughly horseshoe-shaped with the open side anterior. Each labellum bears, on its ventral surface, a number of more or less parallel transverse ridges, called pseudotracheae or canaliculi, that serve as food conductors. The canals are kept open, and their flexibility preserved, by minute chitinous circular rings in

their walls, forked at one end and simply expanded at the other, leaving an open line along the exposed surfaces of the grooves and entrance holes at their own forked extremities. A detailed study of the labellum of the different muscid species may show anatomical details which may help in the separation of species or genera.

The proboscis is retractile and when withdrawn is seen to bend sharply at two points, that is, where the proboscis joins the rostrum and where the rostrum joins the head. All parts except the oral sucker are usually fitted within the head capsule, and occasionally the oral sucker follows the same pattern. In biting forms like Stomoxys and Haematobia, this part is usually rigid and projecting, though it may be slightly retractile into a pouch in the head wall.

At the mesal ends of the intermediate canaliculi is an armature of intercanalicular spines or toothlike processes, three rows of them on each labellum, and, in addition, flanking the open ends of the canals themselves is a pair of small canalicular teeth. These are also known as the prestomal or labellar teeth. They may be well-developed, somewhat large and conspicuous in predatory muscids. They are quite large in most Coenosiinae, as in Neomuscina (Spilopteromya), Scatophaga, Stomoxys and Haematobia. Correspondingly, with these thick and pointed teeth, in the flies with predatory and blood-sucking habits, the proboscis and its posterior sclerite (mentum) are heavily sclerotized. They cover an extensive area, reaching a maximum in the genera Stomoxys and Haematobia. The number, size, shape and arrangement of these teeth is suspected to vary in different muscid groups, but a detailed study is necessary to

reach final conclusions regarding their use in the classification of the family. The prestomal or labellar teeth give many of the nonbiting muscids a means of rasping, scraping or even puncturing the feeding surface as has been found among some Neodexiopsis species.

In the genera Stomoxys and Haematobia it is the labium that forms the piercing organ (Plate II, Fig. 7); the prementum (the theca of authors) is drawn out into a long, rigid shaft. The labellae, instead of being soft, spreading lobes as in most of the muscids, are reduced to a pair of small hard plates at the tips of the prementum, armed internally with eversible teeth. The prestomal teeth form the cutting organs. The labrum and the hypopharynx are contained within the gutter of the labium forming a strong piercing shaft. The beak-like proboscis, when not in use, projects forward from the lower part of the head.

Thorax
(Plate IV, Figs. 12 and 13)

Of the thoracic segments, the first and last are greatly reduced, the mesothorax forming the greater part of the whole. The dorsum of the thorax, with the exception of the humeri, is the mesonotum. The humeri or humeral callosities are the upper portions of the pronotum. Anterior to the base of the wings a suture crosses the mesonotum. This is the transverse suture which separates the anterior region or prescutum from a posterior region, the scutum. Above the halteres, another suture (the scutoscutellar) crosses the mesonotum separating the scutum from a posterior, somewhat triangular region, the scutellum.

The prothorax is indistinct when viewed from the side, being represented by three visible sclerites. Of these three, the humeri is the most conspicuous. This is an irregularly shaped sclerite like a mushroom in general outline. Humeral setae of different sizes, varying from one to three, are located on this sclerite near the dorsal margin. Below this sclerite and separated from it by a distinct suture, is the preepisternum. This is also irregularly shaped and bears three setae near its ventral margin, just above the base of the prothoracic coxa. Anterior to these two sclerites, another can be noted laterally, but it can be better studied from an anterior view.

The anterior view of the prothorax shows the parts mentioned above. The prodorsum forms the dorsal rim of the foramen and an articulation with the head. At the two lower angles of the foramen are triangular sclerites, which have anterior projections. These are the condyles which articulate with the head. Between the condyles is a rounded, somewhat shield-shaped sclerite which has been termed the sella. This articulates with the lower part of the occipital foramen of the head.

Below the sella and the condyles, and between the coxae, the prosternum is seen as a somewhat shield-shaped sclerite, extending posteriorly to meet the sternopleurite. The prosternum may be bare or setose at its edge. It is of value at the generic level in the subfamily Limnophorinae. The prosternum is bare in Gymnodia and Spilogona; it is hairy on the sides in Limnophora.

The mesonotum bears two distinct rows of large, strong dorsocentral setae which diverge slightly posteriorly. Each row consists of several

setae which run from the prescutum to the scutum. In the Muscidae, there is a row on each side, generally divided into the presutural or anterior dorsocentrals on the prescutum and those on the scutum, being the postsutural or posterior dorsocentrals. The presutural dorsocentrals vary from one in Bithoracochaeta, Coenosia and Limnophora to two in Lispe, while the postsutural dorsocentrals vary from one or two in Bithoracochaeta, three in Neodexiopsis and Coenosia and four in Lispe, Limnophora and Gymnodia.

Between the rows of dorsocentrals are usually several rows of acrostichal setae which are never very symmetrical and variable in number. There are two rows in Bithoracochaeta, four irregular rows in Limnophora and Gymnodia, six to seven irregular rows in Phaonia and Cyrtoneurina, or they may be absent in some Neodexiopsis species. In most of the species treated here there are only one or two pairs of well-developed prescutellar acrostichal setae. On each side of the prescutum, close to the humerus, is a strong seta, known as the posthumeral or sublateral. Near the posterior angle of the prescutum is a strong presutural seta. On the sides of the prescutum, on the notopleura next to the notopleural suture, are two strong pairs of notopleural setae.

In addition to the setae mentioned above, there are two to three outside of each row of dorsocentrals, the intra-alars. Below and somewhat anterior to the intra-alars, on the sides above the wing base, are located one or two supra-alar setae. In some of the Anthomyiinae there are three of this type. Posterior to these, located on the side and dorsum of the postalar callosities, are the postalar setae.

The scutellum in the muscids is subhemispherical, cut off by an impressed line from the mesonotum. The color, presence or absence and size of its setae are used as a subfamily character as well as a specific character. There are ventral, hairlike setae in some Anthomyiinae, none in others. Most of the setae of the scutellum are small except for one strong pair, located at the anterior angles of the scutellum and a still larger pair located on the posterior border of the apex. The apical scutellars are a pair located almost on the margin of the scutellum, a term often applied to the subapical scutellars when placed almost laterally. The discal or basal scutellars are the setae on the disc of the scutellum. Generally they are a single, well-developed pair, sometimes accompanied by a smaller one located on the dorsum on each side of the median line, slightly behind its middle. The size of the apicals and subapical serve as specific characters among different species of Neodexiopsis.

The study of Downes (1955) on the Sarcophagidae serves as a basis for the application of most of the pleural terminology (Plate IV, Fig. 13) to the Muscidae in this work. The number and presence or absence of setae, including the hairlike ones, as well as their size and arrangement on various portions of the pleuron, are of generic or specific importance in many muscids.

Posterior to the propleuron and below the prescutum is a large, irregularly shaped sclerite. It is the largest of the pleural sclerites and is separated from the posterior portion of the mesopleuron by a strong mesopleural suture. This arises from the base of the wing and extends

irregularly to the middle coxa. The sclerite formed by this suture is made up of the mesepisternum fused with part of the mesokatepisternum (sternopleuron of others) and proepimeron. The mesanepisternal suture imperfectly divides this sclerite dorsoventrally, the dorsal portion being the mesanepisternum (the mesopleuron of others) and the ventral portion being the mesokatepisternum. In the upper anterior corner of the mesanepisternum is the anterior spiracle. Behind the upper portion of the mesopleural suture is an irregular pentagonal sclerite which has a short suture starting into it from the dorsal border near the wing base. This suture indicates the fusion of two sclerites, the anterior being the pleural wing process and the posterior the anepimeron. Below the anepimeron and behind the lower section of the mesopleural suture is another irregular, five-sided sclerite which is divided by two faint sutures into three parts. The whole sclerite is the meron according to Bonhag (1949) or the hypopleuron of Comstock (1940) and Curran (1934) or the meropleurite of Crampton (1942) and Snodgrass (1935) and forms the posterior ventral sclerite of the mesothorax. The posterior dorsal sclerite, the katatergite of the mesothorax, is located in front of the halteres and is divided into two portions by a slight transverse suture. This sclerite extends to the anterior portion of the scutellum and is known as the pleurotergite.

Immediately below the scutellum is an exceedingly convex sclerite, which extends laterally to the pleurotergite and is known as the mediotergite. Below the mediotergite is the metepimeron which bears the halteres. Between the anepimeron and the halter is a raised somewhat

rounded area with a middle ridge, called the katatergite. Back of the meron is a long, slender sclerite in an oblique position, the metepisternum, which is divided at the upper end by a suture making two divisions in it. Below the anatergite and posterior to the metepisternum there is a sclerite of similar shape, the mesepimeron. Surrounded by the katatergite, the meron, the metepisternum and the metepimeron, is the posterior spiracle.

There are membranous portions of the thorax near the base of the wings, which allow freedom of movement of four small plates, the basalarites, two at the base of the wings and two posterior, above the anepimeron. The first two basalarites are known as the basal plates, the other two as the subalar plates. Above the subalar plates is a triangular, more or less distinct, region extending toward the scutellum. This is the posterior notal wing process, known also as the juxtascutellum or scutellar bridge.

The chaetotaxy of the pleurites is similar in both sexes. The propleuron is bare in most muscid species, but some have a few setae in the middle. There are also some setae on the lower margin. The shape of the spiracles as well as their vestiture and the stigmatal setae on their lower margin serve as classificatory characters in this group. The mesanepisternum always has a row of stout setae near its posterior margin and is also more or less covered by setulae.

The mesokatepisternum bears the mesepisternal setae (sternopleurals). There is only one mesepisternal seta in Haematobia, Stomoxys and Scatophaga, two in Phaonia, Graphomya, and Euryomma and three in most

(or other) muscids. In most coenossiine members the mesepisternal setae form an equilateral triangle. The mesokatepisternum is more or less covered with setulae and large setae on its posterior portion just in front of the mesocoxae. The coxal sclerite next to the mesokatepisternum has a row of four strong setae.

Next to the anepisternum and below the wing base is the mesanepimeron (the pteropleuron of other authors). This region is bare in most muscids or may have a series of setae on its upper hind margin in Stomoxys, Morellia, Musca, Lispe, Neomusca, Scatophaga, Cyrtoneurina and Neomuscina (Spilopteromya). These setae are the anepimerals or pteropleurals of many dipterists.

The hind upper margin of the meron bears a group of setae in the Tachinidae and Sarcophagidae. In the Muscidae they are generally absent, but three or four microsetulae may be present, the beret hairs of Emden (1941), Snyder (1954a) and Dodge (1955). These are generally located in front of or below the hind spiracle on the mesokatepimeron. They occur in front of the spiracle in Synthesiomyia, Stomoxys, Graphomya, and Calythea, and below in Neomuscina (Spilopteromya), Graphomya, and Limnophora. Microsetulae may be present also on a small sclerite above the coxa, the metepisternum, (the pre-episternum III of Snyder (1954b) and sternite 3 of other authors). They are present in Morellia, Musca domestica and Lispe. The small sclerite behind the metepisternum which comes close to the first abdominal segment is called the metepimeron and is generally bare. The roundish area above and in front of the

hind spiracle, the katatergite, may be bare or villous and is variable in color.

The postalar declivity, also known as postalar depression or supra-squamal ridge, is the area behind the wing base. It is generally bare in most muscids, but in the genera Morellia and Neomusca there is a tuft of setulae on this region.

The infrasquamal setulae on the anatergite are typical of the Sarcophagidae and other Calyptratae but they are absent in the Muscidae.

Wings

The wings show no difference in structure in the two sexes. In general, the costal vein extends to the tip of the fourth vein, and is weakly pectinate. At the tip of the auxiliary vein, the costa is broken and a short to long seta, which may be weak or stout, is located at the basal side of the break. At the base of the costal vein there are two scales, the humeral plates, which have been called the tegulae or epaulets. These lie over the base of the vein; the uppermost one has been called the tegula or epaulet and the lower one the sub-tegula or subepaulet. These are of some use in the classification of some flies and could probably be used in the Anthomyiinae.

The wing veins (Plates V, XVI-XIX, Figs. 14 and 63-88) are the costal (C); the subcostal (Sc); the radial (R) or vein 1; radial two plus three (R_{2+3}) or vein 2; radial four plus five (R_{4+5}) or vein 3; the medial one plus two (M_{1+2}) or vein 4; the medial three plus cubital one (M_3+Cu_1) or vein 5; the cubital two plus anal one (Cu_2+A_1) or vein 6; and the second

anal (A_2) or vein 7. In addition, there are several other very short cross veins; the numeral (h) between C and Sc; the radiomedial (r-m) between R and M and the mediocubital (m-cu) between M and Cu. In the majority of the species the four principal long veins, R_1, R_{2+3}, R_{4+5} and M_{1+2}, run more or less straight to the wing margin, but in the greater part of the members belonging to the subfamily Muscinae and in a few species of Phaoniinae, vein R_{4+5} is more or less strongly curved forward in its apical section. The terminology used for naming the veins follows the Comstock-Needham system with mention of the numbers system used by many dipterists. The veins in general serve in classification both at the generic and subfamily levels. The anal vein (Cu_2+A_1) reaches the wing margin in the subfamilies Fucellinae and Anthomyiinae but does not in others; the second anal vein (A_2) is short and straight in the subfamily Lispinae and others. In the Fanniinae, A_2 is short and bent in such a way that if it is prolonged, it will bisect or cross vein 6 (Cu_2+A_1).

The presence or absence of setulae on the upper and lower margins of the subcosta, and in the remigium (stem vein or node of authors) at R_{2+3} and R_{4+5} veins are important at the specific, generic or subgeneric levels. The subcosta is almost entirely setulose on the upper side in Scenetes, bare in other species; setulae present on R in Neomuscina (Spilopteromya), Stomoxys, Musca and in Morellia and on the R node in Myospila, setulose in R_{2+3} and R_{4+5} at the basal node in Myospila, and on upper and lower side of R_{4+5} in Graphomya, Cyrtoneurina and Scenetes; vein R_{4+5} setulose on lower side after the node in Helina; setulose on

upper and lower side in Limnophora; vein R_{4+5} with setulae on almost all its length on the upper side; lower side with setae basally only in Scenetes and Cyrtoneurina.

A few attempts have been made by Lower (1951) and Hamrum (1957) to use the sensory organs present on the wing veins in the classification of dipterous families. These sensoria of different shapes, size and number are present in the wing veins of the Muscidae. Ventral sensilla occur on subcostal vein at the first or basal fourth section, at the second and at the third; there is also one on the dorsal and one ventral sensillum on the fourth or apical section. Sensilla are present dorsally on R stem; in the second radial section with two proximal parallel series and a distal series and an isolated sensillum subapically on the second radial section. There are two dorsal sensilla apically on vein R_1, as well as a dorsal sensilla on vein R_{4+5}; one proximal, two to three, sometimes four, distal on r-m and one dorsal on r-m. The sensilla characters do not often provide a means of separating species but their number and position are characters which can be explored. Families and subfamilies of Diptera may be separated on the basis of sensillial characters (Hamrum 1957).

Microscope slides are desirable in a study of these characters, but even by this method, and employing the best mounting technique, the exact number of these sensoria on some vein sections, is not well seen or accurately determined.

The maculation, spots or bands or darker color covering the wing veins and membrane are rare in the Muscidae but when present serve in

the differentiation of species in the genera Morellia, Cyrtoneurina (Plate XVIII, Figs. 75 and 77) and Hylemya (Craspedochaeta) (Plate XVIII, Fig. 76) among Puerto Rican species.

The calypters (the squamae of some authors) are two basal lobes of the posterior margin of the forewing between the wing base and the alula. When the wing is pulled forward, the calypters are plainly seen, the upper one being the anterior or distal calypter and the lower, the posterior or proximal. The upper calypter is round and larger than the lower one which is roughly triangular in Anthomyiinae, strap-like in Scatophaginae, enlarged and transverse on the caudal margin and contiguous to the border of the scutellum in the Muscinae. There is a fringe of long fine setulae on each calypter which seems to arise from a thickened border of the membrane.

The halters are modified, reduced, drumstick-shaped hindwings located on each side of the metanotum and are considered highly specialized sense organs. Although considered to be rudimentary wings, they are far from being vestigial organs. They consist of three parts (Plate IV, Fig. 13): a thick base, the scabellum; a slender stemlike section, the pedicel (stalk or petiole of other authors); and a thick distal end, the capitellum (knob of other authors).

Legs

The three pairs of legs are similar in structure and may show sex differences among muscid species. The general structure of the legs is similar to that of other calyptrate flies and requires no special consideration except for the nomenclature of the setal arrangement. The chaetotaxy of the legs (Plates VI, VII and VIII, Figs. 15-17, 20-23 and 25-26) is of great importance at the specific, generic and subgeneric level throughout the Muscidae. The system of setal arrangement was first proposed by Grimshaw (1905). The exact position of a seta, or a row of setae, must be fairly accurately determined in accordance with the generally accepted terminology of Huckett (1924). Following his system, all legs are assumed to be stretched horizontally from the body. The periphery of a transverse section of any segment is divided into eight imaginary parts (see Plate VI, Fig. 15) which, reading from the top clockwise for the left legs, counter clockwise for the right legs, are named: dorsal, posterodorsal, posterior, posteroventral, ventral, anteroventral, anterior and anterodorsal.

All parts of the legs (Plate VI, Fig. 17) with the exception of the coxae and trochanters are covered with more or less short to coarse pubescence or setulae arranged in more or less regular rows. In some species parts of the legs may be bare. The metathoracic legs show a great variety of characters in shape and chaetotaxy which are quite useful in the differentiation of species. The tibia is the part most used in classification; among males it shows a peculiar arrangement of setae of different forms and sizes. These characters are quite evident among

two Puerto Rican genera, Neodexiopsis and Fannia.

Abdomen

The abdomen consists of 10 segments divided by dipterists into the preabdomen (the first 5 segments) and the remainder, the postabdomen or hypopygium. When viewed dorsally the abdomen appears to be composed of four segments in the female and five in the male. There is, however, an imperfect suture which separates the first and second tergites dorsally, and a plate which indicates the first segment as being distinct from the second ventrally.

The male abdomen differs from the female in shape, number of segments and form of the sternites. In general shape it is somewhat oval, the anterior end produced laterally, the posterior end blunt. Generally, it is about twice as long as broad and the segments, with exception of the first and last, are about equal in width. The female abdomen is about the same size as that of the male, but more pointed posteriorly, the second and fifth segments being the longest.

Ventrally (Plate X, Fig. 35) the first segment is indicated by a short, wide, ventral plate, the first ventral sternite, connected to the dorsal tergite by a membrane, the abdominal pleuron. The presence of setulae on the first abdominal sternite among the Limnophorinae serves as a basis, with other characters, to separate the genus Gymnodia from Limnophora. The second segment is produced into a ring at its anterior margin. The third and fourth sternites in both sexes are simple, rather long, and narrowed slightly posteriorly in the female, but almost square

in the male. The fifth sternite in the female resembles the third and fourth, but the fifth sternite of the male is of a different shape, generally being produced posteriorly into two long branches between which the forceps and genitalia lie when extended. The shape and vestiture of the fifth sternite have been used in classification at the specific level. Spiracles are visible on all five segments when viewed ventrally.

The postabdomen (Plates IX-XV, Figs. 31-62) is the modified posterior portion of the abdomen which mainly includes the genital segments. The genital segments are barely visible in either sex from above, and what appears to be the sixth segment in the male is the first genital segment. This is more apparent from the ventral view. There are two genital segments in the male. The postabdomen is somewhat reduced and modified, it is rotated and deflexed. The modification and the circumversion includes the whole hypopygium according to Griffith's (1972) latest evidence. In the postabdomen the sixth, seventh, eighth, and ninth segments are asymmetrical, while the tenth remains symmetrical and is generally sclerotized.

The genital opening of the male is accepted to be between the ninth and tenth sternites. The male ninth sternite is called the hypandrium. Its proximal end is sometimes produced into a rodlike process, the hypandrial apodeme. The ninth tergite is called the epandrium and is always trough-shaped. On its hind margin the epandrium usually carries two pairs of appendages, termed valvulae mediales and valvulae laterales. The valvulae mediales, when fused into an unpaired structure, are sometimes called mesolobus. The valvulae laterales are considered by

some authors to be the styli (dististyli) and are so designated.

A rod-shaped sclerite on the inner wall of the epandrium connecting the valvulae laterales with the hypandrium has been named the processus longus, also connecting rod or bacilliform sclerite (Crampton, 1942) or epipleural rod (Graham-Smith, 1938).

The copulatory organ itself shows as rather a complicated structure. It is almost universally called the aedeagus (phallus of Snodgrass) and can be divided in two distinct parts, a proximal portion called the theca (phallobase of Snodgrass, phallophore or basiphallus of Crampton) and a distal portion called the phallus (aedeagus of Snodgrass). Emden & Hennig (1970) proposed the term distiphallus as a useful designation.

On the dorsal surface of the theca a spinelike process is frequently found. It has been termed spinus, spinus titillatorius, gonacanthus or epiphallus.

A proximal, continuous, sclerous rod on the ventral basal margin of the basiphallus has been called the apodeme. Emden & Hennig (1970) are of the opinion that this term should not be used since there are other apodemes on the hypopygium. They designated this part as the phallapodeme.

Two pairs of appendages are found at the sides of the aedeagus. These have been named the anterior gonapophyses, or palpi genitalium, the posterior gonapophyses which also have been termed the parameres or harpes. The exact identity of these structures is uncertain so the terms of Crampton, praegonite and postgonite, will be referred to, especially for those who use the term paramere..

The shape, markings and setae on the male genitalia are used for species differentiation in many muscids.

The postabdomen in the female (Plates IX-XII, Figs. 31-44) is reduced and slender. The terminal abdominal segments in the female always form an ovipositor. The genital opening is situated between the eighth and ninth sterna. In most of the species the postabdomen is membranous and is drawn into the preabdomen. In the genera Scenetes, Cyrtoneurina and Lispe it is quite chitinous and very small when compared with those having membranous genitalia. The tenth or last segment consists of a ventral plate and a dorsal plate, which bears a pair of cerci. The anus is on the tenth segment. Hardly any terms have been coined for the individual parts of the ovipositor. The tip of the pointed tube is somewhat compressed in most Muscidae. The markings, shape and number of sclerites and setae are quite distinct and can be used in species differentiation.

For the most part the abdomen in both sexes is covered with setulae which are shorter and less dense along the median dorsal line. The first tergite in the female has no distinct setae, while the same segment in the male has a few setae along the posterior margin. All the rest of the segments have marginal setae, those at the sides being longer and stronger than those near the median line. The sternites have only a few setae at the margins and a sparse covering of setulae toward the center.

SYSTEMATIC TREATMENT

There are four or five catalogues concerning Diptera that may be consulted in studying this family. Those of Osten Sacken (1878) and Aldrich (1905) are very limited in scope and completed at the time only for the area south to and including Panamá and the West Indies. The catalogue of Stone et al. (1965) will be of great help. The world catalogues, especially those of Séguy (1937, 1952) and the recent catalogues of Pont (1972, 1974) for the families Muscidae and Anthomyiidae in the catalogue of the Diptera of America South of United States, are the leading works for any person working with this family.

No comprehensive catalogue of Neotropical Diptera has been published until recently; a task formerly undertaken by the Departamento de Zoología; Secretaria da Agricultura, São Paulo and now by the Museu de Zoología, Universidad de São Paulo and issued in fascicles. The Townsend (1892) Catalogue of the Calyptrate Muscidae covered only South American species. Catalogues of local areas or countries, e.g. Ortiz (1946) for Chile, and faunal studies such as the Diptera of Patagonia and South Chile by Malloch (1934) and articles that appeared in Biologia Centrali Americana, may be important contributions for large areas, but they are limited in scope. Articles dealing with the muscid fauna in the West Indies and South America are evidently few when compared with other areas, rare exceptions being Albuquerque (1945, 1953, 1954a, 1954b, 1955, 1956a, 1956b, 1956c, 1956d, 1958a, 1958b, 1959), Malloch (1934, 1936) and Snyder (1940, 1941, 1949a, 1949b, 1954a,

1954b, 1957a, 1957b, 1958a, 1958b).

In classifying the Puerto Rican species of the Muscidae (sensu lato), I have followed a combination of systems, but mostly that used by Stone et al. (1965). I have included the subfamilies Scatophaginae, Anthomyiinae and Fucelliinae (all Anthomyiidae) with Muscidae. The North American Diptera Catalog by Stone et al. (1965) and the recent catalogues of the Diptera of the Americas South of the United States by Pont (1972, 1974) have these groups separated into two distinct families, Anthomyiidae and Muscidae. The biology of some species will be discussed under the pertinent species of economic importance. In this system 11 subfamilies are recognized. The 56 recorded Puerto Rican species have been assigned to 26 genera. In this work only 49 species are recognized by the author, the others are considered as misidentifications and of doubtful occurrence in the island.

Systematic List of Puerto Rican Muscidae
(sensu lato)

I. Subfamily Scatophaginae

1. Scatophaga stercoraria (L.)

II. Subfamily Fucelliinae

2. Fucellia tergina (Zetterstedt) (doubtful occurrence in P.R.)

III. Subfamily Anthomyiinae

3. Hylemya (Craspedochaeta) confusa Albuquerque (new record)

4. Calythea crenata (Bigot) (probably a misidentification)

5. Calythea minuta Medina Gaud, n. sp.

IV. Subfamily Coenosiinae

6. Neodexiopsis cavalata Snyder

7. Neodexiopsis crassicrurus Snyder

8. Neodexiopsis crispiseta Snyder

9. Neodexiopsis discolorisexus Snyder

10. Neodexiopsis ditiportus Snyder

11. Neodexiopsis drewryi Medina Gaud, n. sp.

12. Neodexiopsis ebenifemur Snyder

13. Neodexiopsis flavipes (Williston)

14. Neodexiopsis maldonadoi Snyder

15. Neodexiopsis medinai Snyder

16. Neodexiopsis micans Snyder

17. Neodexiopsis neoflavipes Snyder

18. Neodexiopsis priscipagus Snyder

19. Neodexiopsis puertoricensis Medina Gaud, n. sp.

20. Neodexiopsis rex Snyder

21. Neodexiopsis wolcotti Medina Gaud, n. sp.

22. Bithoracochaeta leucoprocta (Wiedemann)

23. Bithoracochaeta varicornis (Coquillett)

24. Atheriogona (Acritochaeta) orientalis Schiner

V. Subfamily Lispinae

25. Lispe nasoni Stein

26. Lispe rufitibialis Macquart (misidentification, doubtful occurrence in P.R.)

27. Lispe serotina Wulp

VI. Subfamily Limnophorinae

28. Spilogona sp.

29. Gymnodia arcuata (Stein)

30. Gymnodia debilis (Williston)

31. Limnophora corvina (Giglio-Tos)

32. Limnophora laffooni Medina Gaud, n. sp.

33. Limnophora narona (Walker)

VII. Subfamily Mydaeinae

34. Helina borinquensis Medina Gaud, n. sp.

35. Helina yunquensis Medina Gaud, n. sp.

36. Myospila obsoleta (Brauer & Bergenstamm)

VIII. Subfamily Fanniinae

37. Fannia femoralis (Stein) (misidentification)

38. Fannia pusio (Wiedemann)

39. Fannia trimaculata (Stein) (new record)

40. Euryomma sp. (new record)

IX. Subfamily Phaoniiae

41. Ophyra aenescens (Wiedemann)

42. Scenetes cardini Malloch

43. Cyrtoneurina rescita (Walker)

X. Subfamily Muscinae

44. Graphomya stipata (Walker)

45. Graphomya maculata (Scopoli) (doubtful occurrence in P.R.)

46. Synthesiomyia nudiseta (Wulp)

47. Neomuscina (Spilopteromyia) farri (Dodge) (new record)

48. Neomuscina tripunctata (Wulp) (misidentification, doubtful occurrence in P.R.)

49. Neomusca obscura (Wulp)

50. Neomusca pici (Macquart)

51. Morellia basalis (Walker)

52. Morellia maculipennis (Macquart)

53. Morelia ochricornis (Wiedemann) (misidentification, doubtful occurrence in P.R.)

54. Musca domestica L.

XI. Subfamily Stomoxyiinae

55. Haematobia irritans (L.)

56. Stomoxys calcitrans (L.)

Key to the Muscidae Subfamilies

1. Katepisternals 1-3; frons equally wide in both sexes and always without cruciate interfrontal bristles; lower calypter strap-like, never projecting beyond upper; scutellum without fine, erect hairlike setulae on lower surface; propleuron usually with fine, pale hairlike setulae in center and with 2 or 3 sternopleurals; scutellum bears only 2 strong setae well behind apex; costal spine lacking . . . Scatophaginae

Katepisternals 2-6; frons in male usually less than 1/3 of head width, or when broad (as in female) usually with cruciate interfrontal setae; lower calypter frequently projecting beyond upper; propleura bare or with fine, black hairlike setulae in

center; scutellum with a strong apical seta; costal spine frequently well-developed . . . 2

2. Sixth vein (Cu_2+A_1) very short, seventh vein (A_2) curved strongly forward so that it would bisect vein 6 (Cu_2+A_1) only a little beyond the end of the latter if extended to wing margin. . . Fanniinae

Sixth vein (Cu_2+A_1) not unusually short, vein 7 (A_2) never curved so that it would bisect vein 6 (Cu_2+A_1) . . . 3

3. Sixth vein (Cu_2+A_1) continuous or reaching posterior margin of wing . . . 4

Sixth vein (Cu_2+A_1) neither continuous nor reaching posterior margin of wing . . . 5

4. Costal vein with several equally large, but rather short, stout spine-like bristles on lower costal margin; scutellum without hairlike setulae beneath; frons of both sexes about 1/3 of head width, with cruciate interfrontals . . . Fucellinae

Costal vein without spinelike setae on under surface; distal part of costal margin with thornlike setae; scutellum usually with fine, erect hairlike setulae on ventral surface . . . Anthomyiinae

5. Anepimeron with a loose assemblage of hairlike bristles near center above caudal katepisternal setae; palpi conspicuously dilated (spatulate); frons in both sexes 1/3 maximum width of head and without cruciate setae; parafacialia usually with setulae . . . Lispinae

Anepimeron without hairlike setae or if present, palpi not conspicuously dilated and/or frons in male not 1/3 width of head . . . 6

6. Presutural dorsocentral setae 1 pair; if (rarely) more than 1 pair, then the anterior pair is shorter than 1/2 length of posterior pair; frons in both sexes similarly bristled and broad; with a pair of recurrent upper orbitals (parafrontals); lower stigmatal setae usually curved downward; katepisternal setae usually arranged in an equilateral triangle or nearly so . . . Coenosiinae

Presutural dorsocentrals 2 or more pairs, the anterior pair more than 1/2 length of posterior pair; katepisternals not arranged in an equilateral triangle . . . 7

7. Proboscis strongly chitinized, slender and elongate, not retractile, held straight in repose, adapted for piercing or blood-sucking; arista plumose above, bare or pubescent on the ventral side; fourth wing vein (M_{1+2}) rounded on its proximal part . . . Stomoxyiinae

Proboscis not as above, labellum functional, sponge type; arista similar above and below . . . 8

8. Lower calypter enlarged at apex, sub-transverse on caudal margin and widened basally so that its inner margin touches the anterior and/or basal lateral angle of the scutellum . . . Muscinae

Lower calypter not as above, usually semicircular or rounded at apex . . . 9

9. Hind tibia without posterodorsal setae, or if present they are not longer than anterodorsal setae . . . 10

Hind tibia with one or more conspicuous posterodorsal setae as long or longer than anterodorsal setae; meron bare or with few scattered setulae; fourth wing vein (M_{1+2}) rectilinear or curved; proboscis fleshy, expanded; normally 3 strong latero-scutellars; arista plumose, at least 2 orbitals present . . . Phaoniinae

10. Prealar and frontal cruciate setae absent; aristal rays not longer than 1/2 width of third antennal segment; fourth wing vein (M_{1+2}) never running straight to wing margin; abdominal marks when present usually subtriangular, trapezoidal or subquadrate, rather linear or spots . . . Limnophorinae

Prealar setae present; cruciate interfrontal setae may be absent, but if present in Myospila, then more than one strong, hind katepisternal seta; aristal rays longer than 1/2 width of third antennal segment; fourth wing vein (M_{1+2}) running straight to wing margin; anal vein not extending to wing margin; anepimeron without an isolated seta on upper margin . . . Mydaeinae

Subfamily Scatophaginae

This subfamily can be recognized from other subfamilies by the following characters: second antennal joint with distinct and complete longitudinal seam; eyes broadly separated in both sexes; parafacialia flat; gena bare; head without cruciate frontal setae, but with incurved lower orbital setae (except in Hydromyza in which all setae are very short); body covered with pollinosity or fine villosity; scutellar suture interrupted in the middle; lower squama straplike, upper squama well-developed; sixth vein (Cu_2+A_1) running to wing border; no strong costal spine at end of first wing vein; thoracic chaetotaxy formed by acrostichal hairlike setae except the well-developed prescutellars; 1-2 presutural and 4 postsutural dorsocentrals; intra-alars, supra-alars and postalars present. Abdomen with six visible segments.

The subfamily Scatophaginae, also known as the Cordiluridae, Scatomyzidae and Scopeumatidae, is an interesting group because almost all of the genera exhibit certain characters of the more specialized Muscinae. Most genera also retain certain primitive characters such as the less obviously fused first and second abdominal segments. Both sexes are dichoptic and thoracic squamae are vestigial.

Biology: The biology of most species is known. Séguy (1952) reported them from an extreme variety of habitats, and included phytophagous, saprophagous, coprophagous and zoophagous members. Zoophagous forms mainly hunt small insects. The phytophagous species are known to be leaf and stem miners. The members of the tribe Delinini are probably

all leaf miners in plants of the families Orchidaceae, Liliaceae and in (Japan) Commelinaceae. Hydromyza has been reported by Welch (1914) to feed on water plants in the larval stage. Several genera of the tribe Scatophagini feed on a variety of plants, some Scatophaga larvae feed on rotten seaweed, many breed in dung and all adults are probably predatory on small insects as reported by Hobby (1931).

A scatophagid larva has a cylindrical body, rigid and without setae. The head is very small and retractile, with mouth hooks well-developed. The last abdominal segment is truncated with six or eight fleshy tubercles with sensory organs.

Scatophagid flies are very common in humid habitats like swampy, boggy or marshy places. They occur on the flowers and foliage of plants, and frequent the excrement of many vertebrates.

Geographic distribution: The Scatophagids are present in all the zoogeographical regions, but they are mainly from the Nearctic and Palaearctic. Few tropical (Scatophaga, Cordilura, and Gimnomera), Oriental (Cordilura), Australian (Scatophaga) or Ethiopian (Delina) forms have been reported.

The most widely distributed and common species are those of the genus Scatophaga, especially S. stercoraria, which, as its name indicates, is essentially a "dung fly". Other genera are strictly boreal in distribution. Further collecting may yet disclose the presence of some unrecorded species in tropical America.

Genus Scatophaga

Scatophaga Meigen, 1803

Scatophaga Meigen, 1803: 277 (as Scathophaga). Type-species, Musca merdaria Fabricius (mon.) = stercoraria (Linnaeus)

Scopeuma Meigen, 1800: 36. Type species, Musca merdaria Fabricius (Coquillett, 1910: 604 = stercoraria (Linnaeus). (Suppressed by the International Commission of Zoological Nomenclature, 1963: 339).

Scatomyza Fallen, 1810: 15. Type-species, Musca scybalaria Linnaeus (Lucas in d'Orbigny, 1848: 411)

Scopeuma: Séguy, 1952: 84. (cat; key, world spp.; summary of hosts and larval habits).

Scatophaga: Vockeroth, 1961: 296. (I.C.Z.N. - 18 decision to conserve name spelling).

Scatophaga: Vockeroth, 1965: 837. (cat. of NA spp.).

Occiput swollen dorsally; epistome protruding. Body completely covered with setulae. Very large vibrissae, some smaller setae nearby. Proboscis black, thick, more or less laterally compressed; palp yellow or whitish, shorter than proboscis in extended position, covered by short fine pilosity (long at base), small black setae on apex. Arista bare, pubescent or ciliated. One prealar; propleurals and stigmatic setae absent or little differentiated from adjacent pilosity; 1 very short katepisternal. Some species have pilosity on anepimeron, prosternum and katatergite. Fore femur without anteroventral bristles; fore tibia without short, strong, ventral setulae; anteroventral preapicals

not well-developed; one long posterior seta; anterior setae vestigial or absent. Midfemur with row of small, slender setae, or anteromedian setae not well-developed. First wing vein (R_1) bare; vein 6 (Cu_2+A_1) reaching the border. Abdomen covered with fine villosity, dense in female, not so in male, prostrate or recumbent, bordered by strong marginal setae in female. Frontal vitta red, orange or yellow, halter red. Male hypopygium without long setae. The color, size and density of the setulae, pruinosity and acrostichal chaetotaxy are variable from species to species.

Biology: Predaceous, zoophagous, occasionally saprophagous or coprophagous, on the excrement of large vertebrates. Adults hunt insects that live in the same habitat, rarely in flowers under full sun light.

The yellowish-white eggs are elongated with a hard, smooth, finely reticulate shell; the apical and ventral part provided with two wing-shaped prolongations extending to or a little beyond the middle.

The larval body is soft, spineless, sluggish, inactive, cylindrical and whitish with transparent integument. Head small, retractile; antenniform organs biarticulate, placed on two great conical apophyses; mandibles robust, intermediate piece rectangular. Prothoracic spiracle protruding, bearing nine to sixteen fingerlike projections. Last abdominal segment surrounded by 9-12 conical tubercules, those at the superior edge partially reduced or absent. Posterior spiracle protruding or not. Anterior edge of abdominal segment armed with microscopic spines.

The geographic distribution for the majority of the species is the Northern Hemisphere where some species are well-distributed. Some rare species are found in cold regions in mountains of the Southern Hemisphere.

Scatophaga stercoraria Linnaeus (Plate XVIII, Fig. 78)

Musca stercoraria Linnaeus, 1758: 599 (descr. - Sweden).

merdaria Fabricius, 1794: 344 (Musca). (descr. - Germany).

Scatophaga exotica; Coquillett, 1900: 257 (coll. rec. - Culebra, PR and Hispaniola).

Wolcott; 1923a: 227 (coll. rec. - Culebra, PR and Hispaniola, same as Coquillett, 1900).

Wolcott; 1936: 369 (coll. rec. - Culebra, PR and Hispaniola same as Coquillett, 1900 and Wolcott, 1923a).

Scopeuma stercorarium; Wolcott, 1948: 497 (coll. rec. - Culebra, PR and Hispaniola, same as Coquillett, 1900 and Wolcott, 1923a and 1936).

Séguy, 1952: 92.

exotica; Wolcott, 1948: 497 (Scopeuma). (coll. rec. - Culebra, PR and Hispaniola, same as Coquillett, 1900).

Scatophaga stercoraria; Vockeroth, 1965: 838 (cat., distr. - Sweden; S. Alaska to Nfld., s. to s. Calif., Mexico, and Ga.; also Haiti, Europe, Asia).

Male length 6.0 to 7.0 mm, body blackish-brown, covered with golden pollinosity; antenna black; palp same color as body; frontal vitta reddish-brown. Thoracic dorsum with two narrow parallel dark-brown

vittae with traces of lateral vittae. All setae black; most of body densely covered with long, golden pilosity. Wing and squamae with a yellowish-brown tinge; halter yellow, reddish-brown at base.

Arista shortly ciliated at mid 1/3; oral vibrissae stout; peristome with 3-4 large and 3 small setae; palp with small black setae at apex, others yellow; eyes bulging; 6 frontal setae; no interfrontal; an irregular, sometimes double, row of small hairlike setae; parafacialia bare; gena covered with long, golden, hairlike pilosity; outer vertical small; inner vertical as long or longer than oral vibrissae; a row of well-developed postoculars; inner ocellar stout, reclinate; 4-6 postocellar pairs, hairlike; 1 postvertical pair of stout diverging setae.

Humerals 2: 1 sublateral; 1 posthumeral; acrostichal hairlike (1 prescutellar pair well-developed); 2 presutural and 3 postsutural dorsocentrals; 2 notopleurals with numerous setulae in this region; 1 prealar; 2 intra-alars; 1 supra-alar; 2 postalars; scutellars: 1 subbasal pair, a smaller pair above, somewhat lateral to subbasal; 1 apical pair, ventral part bare.

Prosternum bare; propleuron and lower stigmatal area with long hairlike pilosity; 1-2 long blackish mesanepisternals and a smaller one; 1 katepisternal, long, stout at upper hind edge; anepimeron covered with long, yellow, hairlike pilosity; anatergite and katepimeron bare; meron, epimeral and episternal areas bare.

Humeral wing plate with small black setulae; costa basally with several long setae, 2 rows of very short spinelike setae aside from rows of short setae. All veins bare; R_{4+5} bending a little backward near tip,

almost parallel to M_1+_2; Cu_2+A_1 reaching border of wing; r-m with a dark brown spot or cloud; m-cu very close to wing margin; lower calypter straplike, upper well-developed with long pilosity on border. Abdominal tergites and sternites with no special markings, densely covered with long pilosity.

Female length 5.0 to 6.0 mm. Color and structure almost identical to male, except that body pilosity is not so dense as in male, more grayish in color, especially abdomen and femora.

Specimens examined: 16 (9m, 7f) from the West Indies (Haiti) and 4 U.S.A. states:

WEST INDIES:	
HAITI	1m (without abdomen) Kenscoff (as P.R. Acc. No. 6-48); 2f, (as P.R. Acc. No. 7-48); Feb. 1, 1948, G. N. Wolcott
United States of America:	
Iowa	6m, 4f, 3 localities
Idaho	1m, Victor; May 11, 1958; G. F. Knowlton
Tennessee	1m, Sevier Co., Mt. Collins, North slope, 5,900, St. Smoky Mts.; June 25, 1958; J. L. Laffoon
Virginia	1f, Madison Co., Whiteoak Canyon, South slope of Stony Man, 3,500 ft.; July 22, 1961, R. J. Gagné

Remarks: The Coquillett (1900) report of *S. exotica* from Culebra Island, PR, is probably *S. stercoraria*. Wolcott (1923a, 1936, 1948) gave the same Coquillett record and reported the species as common on fresh dung at higher elevations in Hispaniola.

Subfamily Fucellinae

This group of flies is characterized by having the eyes separated by a broad frons; cruciate frontals present in both sexes; two pairs of presutural dorsocentrals, the anterior pair sometimes short, never absent or hairlike; katepisternals not disposed in an equilateral triangle; scutellum without setae on its lower basal 1/2; squamae very small and equal; costal wing vein with microsetae on the basal portion; pretarsus of hind legs with one or many basal setae on the ventral face. Fourth longitudinal wing vein (M_{1+2}) straight on its apical section.

This subfamily is recorded from Culebra Is. (Puerto Rico) by Wolcott (1936, 1948) from Fucellia maritima now known as F. tergina (Zetterstedt). Pont (1974) also reported this species from Puerto Rico, Bermuda, Perú, Argentina, Chile, Juan Fernández Islands, the Nearctic and Western Palaearctic Regions, and Atlantic Ocean Islands. I think this is in error since I have been unable to collect specimens belonging to this subfamily in Puerto Rico.

Subfamily Anthomyiinae

The flies of this subfamily can be recognized from those belonging to other subfamilies by the bare or villous eyes, holoptic in male, dichoptic in female; head with one pair of cruciate interfrontals in female; antenna ordinarily short; arista bare, pubescent or largely bristly; palpi not or only slightly broadened; scutellum with erect, apical, hairlike setae beneath; lower calypter smaller than upper

longitudinal wing vein 6 (Cu_2+A_1) prolonged to edge of wing, more or less distinct, vein 4 (M_1+$_2$) curving backward; 2-4 katepisternals; anepimeron bare on disc, at most with isolated hind setae on upper margin; hind tibiae with at least 2 long posterodorsals, hind protarsus with one ventral basal seta.

Male internal forceps with branches united to form a more or less ciliated plate.

Female oviduct ordinarily elongated, weak, most often or frequently without spines.

Remarks: The biology of members of this subfamily is practically unknown. The majority of the species inhabit the northern hemisphere; they are hydrophilous, saprophilous or coprophilous. Some genera have phytophagous members and two genera are parasites of hymenopterous insects.

Key to the Genera of Subfamily
Anthomyiinae

1. Meron with some small, hairlike setae in front of and behind spiracle; oral margin protruding beyond vibrissae; hind tibia with 1 anterodorsal, without posterodorsals, with a short stout mid seta; mid tibia with 1 anterior and 2 posterior setae . . . *Calythea* Schnabl & Dziedzicki

   Meron bare; oral margin not unusually produced; vibrissal area with only few accessory setulae; hind tibia generally with 3-4 or more anterodorsals, more than 2 posterodorsal setae . . . *Hylemya* (*Craspedochaeta*) (Macquart)

Genus Hylemya (Craspedochaeta)

Hylemya (Craspedochaeta) Macquart, 1851a

Craspedochaeta Macquart, 1851a: 241; 1851b: 268. (as genus)

Type species: Anthomyia punctipennis Wied., 1830 (by original designation).

Melinia Ringdahl, 1929: 270. Type-species, Aricia pullula Zetterstedt (orig. desc.)

Hylemyia Séguy, 1937: 69-70 (cat., key world gen., summary of hosts and larval habitats).

Hylemyia (Craspedochaeta): Huckett, 1946: 110-111 (rev. as subg. of Hylemya, key & cat. of SA spp.)

Hylemyia: Ortiz, 1946: 155 (cat. of Chilean sppl)

Hylemyia (Craspedochaeta): Albuquerque, 1959: 10 (cat. of Brasilian spp.).

Hylemya (Craspedochaeta): Huckett, 1965: 855 (cat. of NA spp., as subg. of Hylemya).

Craspedochaeta: Pont, 1974: 2 (as gen.) (cat. of ASUS spp.)

Male with a pair of small interfrontal setae. Male and female with cruciate frontals; postocellars in females stout, never smaller than internal postverticals. Aristal rays never longer than length of third antennal segment. Two presutural and 3 postsutural dorsocentrals; 2 short acrostichal rows; prealar setae present. Scutellum with short, hairlike setulae beneath at apex; 2 fore and 2 hind katepisternals. Mid tibia without anteroventrals; 2 posterodorsal. Hind tibia with series of short setae on posterior half; 3 posterodorsals; 3-4 anterodorsals

and 1 apical posteroventral. Anal vein (Cu_2+A_1) reaching border of wing.

Hylemya (Craspedochaeta) confusa (Albuquerque) (Plate XVIII, Fig. 76)

Hylemyia [sic] (Craspedochaeta) confusa: Albuquerque, 1959: 19, (desc.)

Fig. 30 (wing, m), Fig. 31 (wing, f); Figs. 32-36 (genitalia, m)

Craspedochaeta confusa: Pont, 1974: 2 (cat., distr. - Brazil: Guanabara, Río de Janeiro).

Male length 4.5 mm. Black with chestnut pollinosity, lighter in female. Thoracic dorsum with 5 vittae; wing with 5 spots.

Frontal vitta dark-brown, pollinose, depending on light or angle in which it is seen. Antenna and arista brown, second antennal segment (pedicel) almost yellow apically. Anterior orbit, parafacialia and facialia with silvery pollinosity in light; posterior orbit with cinereous pollinosity; brown stripes on superior part of parafacialia best seen in reflected light. Posterior part of head cinereous with light-brown tones. Proboscis and palp brown. One median and two lateral thoracic vittae. The vittae run from apex of pronotum, coinciding with short acrostichal setae and ending a little before level of insertion of third pair of postsutural dorsocentrals. Lateral vittae longer than middle vitta that runs from base of posthumeral seta, coinciding with presutural setae and bifurcating near suture; one branch coincides with intra-alars and other with prealar and supra-alar, both branches unite at base of humeri and end at base of postalar callus, coinciding with posthumeral, presuturals, intra-alars and postsupra-alars. Scutellum with cinereous-brown pollinosity and a median dark-brown band. Pleural areas

with brown-cinereous pollinosity, dark-brown at superior posterior angle of mesopleura. Wing slightly brownish with spots distributed as follows: one at stigma, one at joint of veins R_{2+3} and R_{4+5} (touching the discoidal cell), one at r-m cross vein and one at each extremity of posterior transverse vein. Calypter yellowish-white; halter yellow. Legs brown; tibia lighter, apex black; claws brown; pulvilli yellowish. Abdomen with brownish pollinosity. Male first tergites with a median elongated spot, dark-brown, other tergites with a median and 2 lateral spots. Female tergites show only median vitta. Fifth sternite uniformly brown. Thoracic and abdominal setal insertion with a brown halo.

Eyes sparsely and shortly ciliated, with anterointernal facets differentiated from the others. Eyes united, coherent or separated by a space that, in the straighter part, is less than width of anterior ocellus. Frontal setae 3 pairs, limited to anterior half of front and a very small pair shortly below the anterior ocellus. Frontal vitta with a pair of cruciate interfrontal setae, just below ocellar triangle. Ocellar triangle somewhat protruding with a pair of proclinate interocellars longer than internal postvertical; 3 hairlike, diverging postocellars bigger than converging internal postverticals; inner vertical proclinate, convergent and similar to superior pair of frontal setae. Anterior orbit wide anteriorly, narrow posteriorly. Antenna broad, long and reaching epistome. Third antennal segment about twice length of second which has a seta. Antenna inserted at level of middle of eyes. Arista shortly plumose, longest rays slightly less than length of third antennal segment

at apex. Parafacialia and gena long; the gena approximately as wide and long as third antennal segment at apex. Vibrissae inserted at oral margin; peristome with 1-2 proclinate setae; palp clavate.

Two presutural and 4 postsutural dorsocentrals; acrostichals with only prescutellar pair developed; 2 intra-alars; 1 supra-alar; 2 post-alars (first one small); 2 notopleurals; 5 mesanepisternals (1 seta at anterior angle); 2:2 katepisternals, one small, anterior, inferiorly located; 2 prothoracic and 2 spiraculars (interior one small); scutellum with hairlike setae beneath and apically scutellars: 1 basal pair, 1 apical pair, 1 preapical (smaller than basal). Lower calypter measuring about twice the upper; halter with capitellum larger than aperture of posterior spiracle.

Costal wing vein with 1 stout seta at costal break. Anterior cross vein (r-m) situated at middle of long discoidal cell. Posterior transverse wing vein (m-cu) sinuous. Anal vein reaching wing edge.

Fore femur with a series of anterodorsals and anteroventrals. Anterior side with 2 rows, somewhat developed, strongest at base. Postero-ventral side with a row of long, fine posteroventrals on basal 1/2. Tibia with one anterior submedian seta. Posterodorsal side with one small seta inserted below anterior seta; 1 dorsal; 1 anterodorsal and 1 anteroventral at apex. Pretarsus with one strong basal ventral seta, claws strong, large; pulvilli whitish cream, large, pad-like. Mid femur with a series of setae at midbasal and 1 preapical on anterior side. Posterior side with 2 preapicals inserted in oblique line; a series of strong posteroventrals located at mid basal part. Tibia with one

anterior seta inserted at end of apical 1/3; 2 posterodorsals and 2 posteriors, last one inserted below anterior; 1 apical at dorsal, posterior, posterodorsal, posteroventral and ventral side. Pretarsus without a basal ventral seta; claws and pulvilli as in the fore tarsi. Hind femur with 2 series of anterodorsals; 3 preapicals; a series of strong anteroventrals, starting a short distance beyond base; 2 dorsal preapicals and 1 on posterior side; a series of spaced, post-vertical setae, the median ones are slightly strong. Tibia with 4 anterodorsals and 4-5 anteroventrals. Posterior side with a series of small setae; 1 dorsal, 1 anterodorsal, 1 anterior, 1 anteroventral, 1 posterodorsal and 1 posteroventral. Pretarsus with one strong basal ventral seta. Claws and pulvillus similar to the anterior pairs.

Abdominal first sternite hairy; tergites with a series of lateral and apical marginals. Male description translated from Albuquerque (1959).

Female length 4.5 (3.9 to 4.7) mm. Eyes separated by a space with parallel sides that at level of anterior ocelli measures about 2.5 times maximum length of head. Frontal vitta with pair of cruciate setae inserted at level of second pair of anterior frontal setae. Four pairs of frontal setae: first pair anteriorly converging, second, proclinate and last two reclinate. Ocellar triangle large, long and attaining level of insertion of first posterior pair of frontal setae. Ocellars stout, diverging and similar to cruciate interfrontals. Inner vertical setae reclinate, stout, measuring about 1.5 times the outer verticals, diverging and stouter than any frontals; postvertical converging and similar to

diverging postocellars. Anterior orbits long and measuring less than twice the parafacialia at middle. Mid femur with a stout basal anteroventral; mid tibia with a basal anteroventral seta. Posterior side of hind tibia bare. Abdomen with chaetotaxy similar to male, but more narrow.

Female color as in male except with 3 distinct vittae on thoracic notum; frontal vittae with brown pollinosity depending on light; wing with 3 dark spots; stigmatic wing spot absent, a light spot at apex of R node strongly pigmented; abdominal tergites with only a median vitta.

Specimens examined: (4f) from 1 Puerto Rican locality:

Cayey	2f, Henry Barracks (now a Univ. PR Regional College); Apr. 12-14, 1969 1f, Nov. 19, 1969 1f, Nov. 21-22, 1969, Malaise trap

Genus Calythea

Calythea Schnabl & Dziedzicki, 1911

Calythea Schnabl & Dziedzicki, 1911: 111 (as subg. of Pegomyia).

Type-species, Musca albicinata Fallen (Mon.) = nigricans (Robineau-Desvoidy)

Fallacia Stein, 1916: 28. Type-species, Fallacia limnophora Stein.

Calythea: Séguy, 1937: 145 (monog. of family)

Calythea: Albuquerque, 1953: 535 (cat. of Brasilian spp.)

Calythea: Huckett, 1965: 865 (cat. of NA spp.)

Calythea: Pont, 1974: 2 (cat. of ASUS spp.)

Eye bare or pilose, contiguous; arista almost bare. Meron bare or setulose. Sixth wing vein reaching wing margin; lower calypter large,

1.5 times larger than the upper. Mesanepisternum largely hairy; meron with mesokatepimeral setulae. Fore tibia with an anterior, hind tibia with only one external seta; a single long seta beyond middle of postero-dorsal surface. Abdomen short and broadened, tergites adorned with 3 basally connected black subtriangular marks at anterior margin.

The genus Calythea can be recognized among the Neotropical Anthomyiinae by the following characters: eyes contiguous, bare or pilose; prosternum and meron in front of and behind spiracles with short, hairlike setae. Only one species is present in Puerto Rico.

Calythea minuta Medina Gaud, n. sp. (Plate I, Figs. 1 and 2; Plate VI, Fig. 16; Plate IX, Figs. 31 and 32, Plate XIII, Figs. 45, 46 and 47; Plate XVII, Fig. 72).

Diagnosis: This species can be differentiated from C. comis, its closest relative, by the thoracic markings and from C. crenata by its bare eyes. In C. crenata the eyes are pilose.

Description: Male length 3.1 mm (holotype). Black in general color; frontal vitta, antenna and palp black; parafacialia silvery pollinose, fused with silvery area of notopleuron; gena black to dark-brown. Pronotum with a silvery area basally running parallel to the notopleural suture; humeri, notopleuron, apex of scutellum and postalar callus, silvery. Mesopleuron with 3 basal silvery areas almost fused. Wing hyaline; halter and calypter yellow, apical half of upper calypter dark. Legs black, pulvillus pale yellow. Abdominal segments 1, 2 and 4 with a pair of silvery white, almost triangular spots, segments 3 and

4 with laterally and superiorly prolonged spots.

Eyes bare, contiguous shortly below anterior ocellus. Frontal vitta narrow on upper part, 5 pairs of frontal setae; 1 ocellar pair, long proclinate; 1 postocellar pair equal to inner postvertical; 1 inner long and thin vertical proclinate seta, 1 outer vertical diverging; gena straight with a group of microsetae inverted upward. Antenna almost reaching epistome, second segment one-half the size of third, with 2 dorsal setae, apical one about 1 1/2 times length of second segment; arista pubescent, notably at basal half; palp claviform.

Two or 3 humerals; 1 posthumeral; 1 lateral; 2 presuturals and 3 postsutural dorsocentrals; 2 notopleurals; 1 acrostichal (prescutellar only); 1 prealar; 2 supra-alars; 3 intra-alars and 2 postalars. Scutellars: 1 basal, 1 apical and 1 preapical pair. Prosternum pilose; 1 anterior and 3 posterior katepisternals; 4 mesanepisternals; 2 prothoracic; meron with few hairlike setulae; mesokatepimeron with hairlike setae. Halter capitellum bigger than posterior circular spiracular aperture. Vein R_{4+5} slightly curved before apex, posterior transverse (m-cu) straight.

Fore femur setose; fore tibia with 1 submedian anteroventral and 1 preapical dorsal seta; pretarsus with 1 well-developed basal ventral seta; pulvillus very large. Mid femur with 1 row of anteroventral setae, biggest at base; midtibia with 1 seta almost at anterior half and 2 posteriors; mid pretarsus longer than fore pretarsus. Hind femur with 2 anteroventral rows, 1 long and stout and 1 long and fine; 2 dorsal preapicals; 1 posteroventral row long and well-separated, smaller toward

apex; tibia with 1 anterodorsal, 1 anteroventral and 1 long, stout mid seta; 1 dorsal preapical; tarsi and pulvilli identical to fore tarsi.

Abdomen clothed with many setulae; first and second segment with long apical seta, terminal segment with apical and discal setae.

Female length 2.3 to 3.1 mm, allotype (3.1 mm). Pale-brown with silvery-gray pollinosity; frontal vitta golden or yellowish-brown (teneral specimens) to dark-brown. Thoracic central vitta broad, ferruginous, extending to middle of scutellum; two lateral vittae more or less coalesced, of same color; a narrow blackish vitta extending laterad of dorsocentrals to scutellar angles; another vitta on side of prothorax, divided at the transverse suture into two separate vittae, extending near the scutellar angles. These dark bands which end at the scutellar angles give it a W-shaped marking of a brown-ferruginous color, remainder of scutellum gray-cinereous. Wing with a brownish tinge; halteres yellow, capitellum large; calypters almost equal in size, lower slightly projecting, yellowish.

Ocellar triangle very short; eyes well-separated; 3-5 frontal pairs. Frontal vitta with a pair of converging interfrontals. Last three superior frontal setae reclinate and diverging. Ocellar setae long and very well-developed. Inner vertical converging, outer vertical diverging; 1 postvertical very short. Vibrissae stout with somewhat smaller setae placed very closely above and below it. Two humerals; 1 sublateral; 1 posthumeral; 2 notopleurals; 2 acrostichal rows of same size; 1 presutural and 3 postsutural dorsocentrals; 1 prealar; 2 supra-alars; 1

postalar; 1 apical and 1 subbasal pair; 1:2 katepisternals, upper posterior one long, well-developed, others very thin and weak, interspersed with many microsetulae; prosternum hairy at sides; scutellum with erect, short, hairlike setulae beneath; 3 mesanepisternals, 2-3 weak anepimeral setae, smaller than in male; 3 metepimerals very small, above hind coxae.

Legs blackish-brown (brown in teneral specimens). Fore femur with a dorsal and ventral row of setae stoutest at apex; fore tibia with 1 anteroventral row of well-developed basal ventral setae. Mid femur with 1 anteroventral row, largest at base; 1 apical anterior and 1 anterodorsal well-developed; mid tibia with 1 anterior subbasal; 2 posteriors; 1 posterodorsal. Hind femur with 1 row of stout anteroventrals, larger apically; 1 anterodorsal row; 2-3 strong dorsal preapicals; hind tibia with 1 anterodorsal; 1 median anteroventral; 1 long posterodorsal; 1 dorsal and 1 preapical.

Types examined: Holotype: male, collected at Mayagüez (Acc. No. 144-1917); VIII-24, 1917: R. H. van Zwaluwenburg (NMNH). Allotype: female, (no. 2) collected at Río Piedras; along riverbed of Río Piedras; Apr. 25, 1965, Emilio Medina (NMNH).

Paratypes: 27 specimens (21m, 6f) from St. Croix, USVI and 6 Puerto Rican localities.

Arecibo - 3f, Cambalache For.; on mixed vegetation by roadside; June 16, 1965 and Aug. 18, 1965; S. Medina Gaud

Barranquitas-Orocovis - 1f, Rd. 143, K. 2.7; on mixed vegetation by roadside; Aug. 17, 1965; S. Medina Gaud

Isabela - 1f, Guajataca For.; at light; July 22, 1955; J. A. Ramos & J. Maldonado C.

Mayaqüez - 4m, Acc. No. 144-1917; VIII-24, 1917; R. H. van Zwaluwenburg

Río Piedras - 1m, Acc. No. 581-16; June 18, 1916; E. G. Smyth; 1m, 1f riverbed of Río Piedras; April 25, 1965; Emilio Medina

St. Croix, V.I. - 15m, Orange grove; (Lot. No. 41-20612) swarming; from No. 12760; USVI-41; H. A. Beatty

Subfamily Coenosiinae

This group of muscids can be differentiated from the other subfamilies by the following characters: frontal vitta of subequal width in both sexes, more or less broad (slightly narrower in some female specimens without the cruciate interfrontals or proclinate orbitals, present in Bithoracochaeta); 1 or 2 strong and conspicuous, reclinate, interfrontal setae, if 2 are present they are well-separated and never divergent. Parafacialia bare; mentum heavily sclerotized but shorter than the head and only slightly tapering to apex; proboscis short; palpi not expanded; arista pubescent or slightly plumose.

Not more than 1 stout, sometimes with 2 weak or 1 moderate and 1 stout, presutural dorsocentrals; 3 postsutural dorsocentrals, sometimes 2-3 weak and 2 strong. Ventral surface of scutellum without fine, short, erect, hairlike setae. Thorax with 2 humerals, 3 katepisternals generally in an equilateral triangle (4 in Bithoracochaeta in 2:2 arrangement); basal-scutellar weak if present. Sixth vein (Cu_2+A_1) not reaching wing

margin; apical half of subcosta distinctly curved forward; costal spines usually indistinct; veins (except costa) always bare. Inner margin of lower calypter more or less strongly diverging from sides of scutellum, apex rounded or almost triangularly pointed. Katepisternals usually in an equilateral triangle. Lower prostigmatal setae usually curved downward, sometimes weak or absent.

Remarks: Séguy (1937) and Emden (1940) recorded the adult as a predator on other insects such as tipulids, dolichopodids and sciarids. Nematocera play an important part in the prey records of Coenosiinae. In this respect the group must be regarded as essentially beneficial.

Little is known of the larvae which seem to be largely scavengers or predators, except for some species of *Atherigona* s. str. which are phytophagous.

Key to the Genera of Coenosiinae

1. Thorax with two pairs of postsutural dorsocentrals; hind tibia with 1 posteroventral, 1 posterodorsal, 1 anterodorsal and 1 anterior seta at middle; basal segment of hind tarsus with a long seta near base on ventral surface . . . *Bithoracochaeta* Stein

   Thorax with three pairs of postsutural dorsocentrals; hind tibia with at most three median setae . . . 2

2. Thorax with one pair of presutural dorsocentrals . . . 3

   Thorax with the presutural dorsocentral very short, barely distinguishable from the dorsal setulae; fore femur without

continuous series of setae on posteroventral surface . . . *Atherigona* Rondani

3. Hind tibia with 1 posterodorsal, 1 anterodorsal and 1 anteroventral seta at middle, the first two very long, the last sometimes weak or absent. Fore tibia without an anterodorsal in either sex, the mid femur with a series of strong anterior setae which does not extend much beyond middle. Hind femur with 3 pre-apical setae, 1 anterodorsal, 1 dorsal and 1 posterodorsal to dorsal . . . *Neodexiopsis* Malloch

Hind tibia with 1 anteroventral and 1 anterodorsal seta which are not nearly contiguous at bases; hind tarsus usually without a setula at base on ventral surface of basal segment . . . *Coenosia* Meigen

Genus *Neodexiopsis*

Neodexiopsis Malloch, 1920

Dexiopsis Stein, 1898: 259 (nec. Pokorny (1893: 533), rev. USA spp.)

Neodexiopsis Malloch, 1920: 162 Type-species, *Dexiopsis basalis* Stein (orig. des.)

Xenocoenosia Malloch, 1920: 162 Type-species, *Coenosia calopyga* Loew (orig. des.)

Coenosia (*Neodexiopsis*): Huckett, 1934: 73 (as subg. of *Coenosia*, rev. of NA spp.)

Coenosia: Malloch, 1934: 210 (in part) (desc., key to Patagonia and S. Chile spp.)

Neodexiopsis: Séguy, 1937: 193 (monog. of family)

Neodexiopsis: Snyder, 1957a: 207 (desc. and key to PR spp.)

Neodexiopsis: Snyder, 1958a: 1 (rev. New World spp.)

Coenosia (Neodexiopsis): Huckett, 1965: 873 (cat. NA spp. distr.)

Plumispina: Albuquerque, 1954c: 177 Type-species, longipilis Albuquerque (orig. des.). Synonymized by Pont, 1972: 45

Paradexiopsis: Albuquerque, 1955: 391 Type-species, vittiventris Albuquerque (orig. des.). Synonymized by Pont, 1972: 45

Neodexiopsis: Pont, 1972: 45 (cat. of ASUS spp.)

The species belonging to this group have a broad head, relatively large eyes, and the abdomen in the male is proportionately shorter and broader than in other groups. In addition, the abdomen usually has a dorsocentral vitta and traces of paired spots as in Coenosia sensu stricto.

This group, as redefined by Huckett (1934), differs from other Coenosia Meigen, (sensu lato), in having 3 preapicals on hind femur: 1 anterodorsal, 1 dorsal and 1 posterodorsal to posterior seta. The position of the third seta is variable, always situated on either the posterodorsal or posterior surfaces in combination with 2 other apical setae which are situated somewhere between the anterodorsal and dorsal surfaces. The position of these setae will distinguish this group from its nearest relatives, the genera Limosia R-D and Coenosia Meigen, sensu stricto.

All species of the genus Neodexiopsis in Puerto Rico possess certain characters which are given here to avoid repetition in the descrip-

tions: head higher than long; 6 pairs of frontal setae, last pair reclinate, the anterior and median pair long, and with the other pairs shorter, disc of scutellum clothed with sparse setulae; 2 notopleurals; 1 presutural and 3 postsutural dorsocentrals; fore femur with a row of posterodorsal setae; fore tibia with a median posterior seta; mid tibia always with a median posterior and usually with a median anterior to anterodorsal seta; hind femur with a complete row of anterodorsal setae and usually with at least an anteroventral setula opposite the strong terminal anterodorsal seta; wings without dark shadows adjacent to any vein; the posterior cross vein never strongly sigmoid; all veins except costa bare. The ventral portion of the third abdominal tergites in males, which is adjacent to the shiny area of the second tergite, is clothed with a variable number of setulae. These setulae are conspicuously shorter and usually more upright than the remaining decumbent setulae clothing the third tergite. Other characters which will aid in the separation of both sexes are: the absence of a median posterodorsal seta on the hind tibiae; anterior ocellar setae longer and stronger than posterior pair; fore femur with short, clothing setulae at the base of the anteroventral surface somewhat stouter and slightly longer than the adjacent clothing setulae, and females of some species have raptorial fore legs with setae often continued to the apex.

Snyder (1957a) found that some Puerto Rican species have an atypical arrangement of the katepisternals. These setae are not quite in their typical arrangement forming an equilateral triangle; he also found the

presence of a single postsutural intra-alar seta on each side, and the absence of a second propleural and stigmatal seta. Snyder continues, stating that these characters, coupled with the extreme modification of certain leg setae, as well as femoral and tibial shape in some of the species, doubtless represents extreme evolutionary trends in isolated insular populations. He suggested that more extensive collections from other Caribbean islands will be necessary before the relationship of these aberrant Puerto Rican species can be rationalized with those of North and South America.

The main characters separating Neodexiopsis from other Coenosiinae genera are the presence of preapical anterodorsal, dorsal and posterodorsal setae, and a posterior seta on the hind femur, coupled with two pairs of well-developed postsutural intra-alars and 3 pairs of postsutural dorsocentrals.

Remarks: The members of this genus inhabit grassy and short vegetation. Most species of Neodexiopsis are usually more numerous in this type of cover where the soil is moist and is adjacent to the margins of dense stands of trees. Collecting in this type of environment often yields teneral specimens of both sexes, but mature males can frequently be found on stems of bushes or even trunks of trees at the margin of forests. Most of the Puerto Rican species have been collected at higher elevations, especially in the rain forest. The Caribbean National Forest, better known as El Yunque, has yielded almost all the species found in Puerto Rico. This area is wet almost every day of the year and in large areas only short, scanty vegetation is found as ground cover.

Some other species occur in the mossy forest at the East Peak of this region. Several species apparently are predaceous, since I have collected them with prey in their mouth parts.

The key to the species of Neodexiopsis has been adapted and expanded in part from Synder (1957a). His characters involving intra-alar and distal mesofemoral setae did not hold for all specimens of N. crispiseta and N. micans examined.

Key to Puerto Rican Neodexiopsis species

1. Apical scutellars more than 3/4 as long as subbasals . . . 2

   Apical scutellars less than 3/4 length of subbasals . . . 9

2. One pair of postsutural intra-alars; fore coxae yellow; third antennal segment dark below arista; palpi dark with some light shading; proboscis dark; male legs yellow; 1 posterodorsal hind tibial seta below the other three; female with distal 1/4 of all femora darkened, tibiae and tarsi dark; 2 anterodorsals and 1 dorsal preapical on hind tibia . . . N. rex Curran

   Two pairs of postsutural intra-alars . . . 3

3. Fore coxa gray or black and same color as adjacent pleura . . . 4

   Fore coxa yellow and much lighter than adjacent pleura . . . 6

4. One anteroventral seta on hind tibia . . . 5

   No anteroventral seta on hind tibia; 1 dorsal and 2 anterodorsals on hind tibia; no dorsal thoracic longitudinal stripes . . . N. drewryi Medina Gaud n. sp.

5. Four setae on hind tibia (1 mid and 1 apical anterodorsal, 1 anteroventral and 1 middorsal); indistinct longitudinal thoracic stripes; posterior parafrontal pair reclinate . . .
   N. ditiportus Snyder

   Five setae on hind tibia (2 anterodorsals, 1 anteroventral, 1 dorsal, 1 posterodorsal), the posterodorsal setae almost at same level as basal anterodorsal; distinct longitudinal thoracic stripes; median parafrontals cruciate . . . *N. puertoricensis* Medina Gaud n. sp.

6. Third antennal segment dark; 1 long median and 1 short preapical anterodorsal; 1 middorsal hind tibial seta; female legs mostly fuscous; male legs mostly yellow with black tarsi . . .
   N. discolorisexus Snyder

   Third antennal segment yellow; female with four preapical hind tibial setae (2 anterodorsals, 1 dorsal, 1 posterodorsal); male hind tibia with a row of long posteroventral to ventral setae and numerous long, slightly curled, anterior anterodorsals and dorsal hairlike setae . . . 7

7. Anal wing angle truncate, pronounced, with a long, shallow incision on concavity along the basal 1/2 of posterior margin . . . 8

   Anal wing angle rounded and posterior margin without an incision . . . *N. medinai* Snyder

8. Antennal third segment fuscous, fulvous on basal 1/3 to 1/2, entirely fulvous in female; anal angle of hind wing with a very long thumblike extension with a very deep incision . . . N. priscipagus Snyder

Antennal third segment entirely fulvous, wing basal angle truncate, but a shallow incision along the basal 1/2 of posterior margin . . . N. cavalata Snyder

9. One pair of presutural intra-alars . . . 11

Two pairs of postsutural intra-alars . . . 10

10. Palp, antenna and legs mostly fuscous; mid tibia with a median anterior and posterior seta at same place; 1 apical anterodorsal longer than apical posterodorsal; 1 preapical and 1 mid anterodorsal, 1 anterior, 1 mid dorsal and 1 mid and 1 preapical posterodorsal hind tibial seta . . . N. maldonadoi Snyder

Palp, antenna (third segment orange in both sexes) and legs yellow; mid tibia with short, stiff setae, with one mid anterior and 1 posterior seta; 1 apical anterodorsal and 1 posterodorsal only slightly differentiated from the clothing setulae; 1 preapical and 1 mid anterodorsal and 1 mid dorsal seta on hind tibia . . . N. neoflavipes Snyder

11. Tibia bowed apically and clublike; antenna and legs fulvous . . . 12

Tibia not bowed or clublike; antenna fuscous, legs variable in color . . . 13

12. Hind tibia with 4-5 long posterior setae along its entire length, most slightly curved apically; 2-3 slender anterodorsals and

12. Hind tibia with 4-5 long posterior setae along its entire length, most slightly curled apically; 2-3 slender anterodorsals and posterodorsals, a row of many long posteroventrals; 10 or more long anterodorsals not extending onto tarsi; mid tibia with 4-5 long, posterior, hairlike setae and 1 long anterodorsal and very short posterodorsal seta . . . N. micans Snyder

Hind tibia slightly bent on basal 1/5; 1 anterodorsal seta on basal 1/4; a row of 5-6 long, curled, hairlike anteroventrals; a row of long curved posterodorsals, posterior and posteroventrals. No curly, hairlike setae extending onto tarsi . . . N. crassicrurus Snyder

13. Hind tibia and tarsus with dense, curly, hairlike setae; tibia not bowed; setae of male long and hairlike; basal 1/3 of third antennal segment lighter than distal 2/3 . . . N. wolcotti Medina Gaud n. sp.

Hind tibia without dense, curly, hairlike setae; if curled or crinkled hairs are present, they are only apical . . . 14

14. Legs and antenna fuscous; hind tibia with 1 long middorsal setae; 1 long anterodorsal seta basal to the middle; 1 shorter anterodorsal; no anteroventrals or posterodorsals . . . N. ebenifemur Snyder

Legs yellow or mostly yellow; antenna fuscous; hind tibia not as above . . . 15

15. Legs yellow, antenna fuscous, hind tibia with 1 anterior, 1 posterodorsal and 2 anterodorsal setae (1 on apical 1/3 and 1 on apical 1/2) and1 seta at middle, all setae long, curled or crinkled apically . . . N. crispiseta Snyder

Legs yellow except dark, apical, dorsal, brown area of femora, tarsi with a brownish tinge; hind tibia with 1 dorsal to anterodorsal long seta at middle, 1 at 3/4 on dorsal to posterodorsal side and 1 preapical on dorsal to anterodorsal side . . . N. flavipes (Williston)

Neodexiopsis cavalata Snyder (Plate XIX, Fig. 84)

Neodexiopsis cavalata Snyder, 1957a: 224 (descr. - PR)

Snyder, 1958a: 9 (rev. New World Neodexiopsis)

Pont, 1972: 45 (cat., distr. PR: El Yunque)

Male length 2.9 mm. Yellow pruinose; very narrow frontal triangle; frontal vitta black pruinose; parafrontalia, parafacialia and gena white pruinose when viewed from the front, otherwise yellowish. Third antennal segment bright yellow; arista dark brown, almost black, light at base; first and second antennal segments almost black, covered on top by whitish-silvery pollinosity; palp yellowish-brown basally; yellow at tip; black microsetae at tip and underneath. Thoracic dorsum cinereous, rusty-brown central, wide vitta running to scutellar base; lateral vitta not discernible as such but a black spot on and around the pre- and post-sutural dorsocentrals; also a postsutural vitta at inter-alar site; posthumeral brownish spot; thoracic pleuron black, covered with cinereous pruinosity, some reddish reflections. All legs yellow. Wing hyaline, tinged with light brown; calypter white, tinged with yellow at edge; halteres yellow (absent on holotype). Abdominal terga 1+2 yellow, with light brown spot at middle; median dorsocentral dark brown vitta on terga 3 to 5, with bluish-red reflections; lateral spots dark brown.

Arista shortly plumose to tip; oral vibrissae strong, cruciate, long; 6 slender peristomal setae; 5 labellar teeth; palp small; eyes widely separated; parafacialia bare, very narrow; outer vertical very small, undeveloped; inner vertical larger than vibrissae and third frontal pair; postocular row short, well-developed; inner ocellar slender, small; 1 postocellar, very small; postvertical little longer than anterior interocellar.

Acrostichals, 2 quite distinct rows with 1 pair anteriorly and 1 pair posteriorly longer than the others; 1 humeral; 1 short sublateral; 1 posthumeral; 2 intra-alars, 1 supra-alar; 2 postalars; scutellars: 2 subbasals longer than apicals, about 3/4 or little more than the length of subbasals.

Prosternum bare; propleuron bare at middle, 2 setae at lower end, 1 seta small; 2 stigmatals (1 upward and 1 smaller downward); 3 anepisternals and 1 seta short at top; few hairlike setulae; mesokatepisternum with katepisternals in an equilateral triangle, stout; 2 interspersed hairlike setulae; 2-3 additional setae ventrally located, all other pleural area bare.

Fore coxa with 9 bristles in two anterior rows; anterior to ventral apical edge with a row of yellowish, hairlike setulae; fore femur with indistinct row of yellowish hairlike anterior setae; a row of posterodorsal to dorsal stout setae; apical half with a row of stout setae below these on basal 1/3, 2 stout erect setae on posterior side; a row of setae on posteroventral side with 2 to 3 setae longer than the others; a row of short anteroventrals, longer on basal half; 1 subapical

on anterior side; tarsus with 1 basal seta on ventral side. Mid coxa with 6-7 setae on anterodorsal to anterior side running almost to anteroventral side, varying in size; mid femur with 1 row of well-developed posteroventrals; 1 anteroventral row with the apical half larger and slender; mid tibia with 1 submedian very long, anterior, stout seta; 1 slender posterior at middle; apically 1 ventral very long seta, stouter than the anteroventral and posterodorsals. Hind coxa with 3 setae on anterior to dorsal side, with several apicals and anteroventrals hind femur with 1 long anterior at base of apical 1/3; 2 subapical anterodorsals, 1 behind the other; 1 subapical dorsal; 1 row of slender anteroventrals; hind tibia with rows of very long setae along all the sides; longest seta almost the length of tibia, setae slightly curved, becoming larger apically on anterior side; rows of very long setae along all the surface on anterodorsal and dorsal side; ventral rows somewhat longer than the clothing setulae; anteroventral side with short setae on subapical 1/3 and 1 long, thick, apical seta.

Wing with a wide lobe at anal angle; humeral plate with 5 setae on upper edge; all veins except costa bare; R_{4+5} ending a little before wing tip; r-m straight.

Abdominal tergum 3 with strong setae laterally; fourth with stout setae laterally and 1 in front of abdominal lateral spot; fifth with 4 strong discal setae, 2 strong apicals at spot, 1 on each side; sterna not seen in holotype specimen since tergum extends to ventral part covering the sterna.

Males are readily distinguished from those of other species in the

ovata group by the very long, crinkly, hairlike setae on the anterior and anterodorsal to dorsal surfaces of the hind tibia, the longest of which are subequal to the hind tibial length.

Female length 3.75 mm; very similar to the male and also to the female of N. medinai; differing from the latter in having the third antennal segment entirely fulvous yellow; acrostichals more numerous; tips of mid and hind femur not darkened.

Posterior margin of wing with a shallower incision and the anal angle not as distinctly truncate as in male. Both sexes, therefore, differ from N. medinai which has no traces of a posterior incision and has the anal margin distinctly rounded in both sexes.

Females lack the long hairs, but possess a characteristic anterior seta at the basal 1/3 of the hind tibia and have the posterior margin of the wing more incised than females of any other species in the ovata group, but the incision is less distinct than in the male.

Remarks: This species belongs to the ovata group as characterized by Snyder (1958a). The males have the anal area of the wing modified into a posterior, thumblike extension or with a prebasal incision on the hind margin adjacent to the anal area and in having a small portion of the lower part of the second, and often the third, visible tergite devoid of pruinescence and therefore glossy. The females of the ovata group lack a thumblike extension of the anal area of the wings and do not have glossy areas on the sides of the second and third visible tergites, nor are any of the tergites usually modified in shape. Specimens of this sex are often difficult to associate with the group; but the more

angular bend of the anal region of the wing will usually distinguish them from allied Neodexiopsis species.

Specimens examined: 31 (21m, 10f) from 4 Puerto Rican localities:

Cayey-Guayama	1m, Rd. 15, K 22.7; on vegetation mainly Bidens pilosa; XI-1, 1964, SMG
Luquillo	1m, holotype (NMNH), Caribbean Nat. For., El Yunque, March 22, 1954, J. Maldonado & S. Medina; 1m, 2f, at Molinderos Rd. 191; 2,000 ft. alt., on vegetation by roadside; April 28, 1965, SMG; 1m, ibid, but on road by Catalina nurseries; on vegetation mainly Ipomoea rubra and Solanum torvum; Nov. 8, 1964, SMG, PM, & E. Molinary; 2m at El Verde Field Station, Oct. 25-26, 1968; 1m, Dec. 6, 1968; 1m, Dec. 7, 1968; 1f, Feb. 11, 1969; 5m, 1f, Mar. 20, 1969; 1m, Mar. 21,1969; 1m, 2f, Mar. 22, 1969; 1f, Mar. 23, 1969; 1f, Mar. 24, 1969; 1m, Mar. 28, 1969, Malaise trap
Maricao	1f, allotype (NMNH), Insular For., April 30, 1953, light trap, JAR
Villalba	3m, Caribbean Nat. For., Toro Negro Unit, Doña Juana For., Rd. 564, K 4.8; 2870 ft. alt., on vegetation on forest floor, Aug. 17, 1965, SMG; 1m, at K 5.7; 2800 ft. alt., at entrance to recreational area; 1m, 1f, ibid, but on Rd. 143, K 4.2, on mixed vegetation of forest floor.

Neodexiopsis crassicrurus Snyder

Neodexiopsis crassicrurus Snyder, 1957a: 218 (descr. - PR)

Pont, 1972: 45 (cat., distr. PR: El Yunque)

Male length 2.8 mm. Parafacialia, anterior part of gena and bucal area yellow, covered with silvery pruinosity; frons and parafrontalia black with silvery pruinosity; edge of frons brown; first and second antennal segments black; tips of second and basal 1/2 of third segment

yellow, apical 1/2 of third segment black., yellow beneath and inner part extending almost to apex; oral vibrissae black; peristomials yellow; palp yellow with yellow pilosity. Thoracic dorsum black with cinereous pruinosity, some rusty-brown on dorsum; narrow central dorsal vitta visible only in front, merging at middle with the rusty-brown color of dorsum; darker areas around setae; legs yellow, mid and hind coxa dark basally. Wing hyaline, brownish tinged; calypter whitish; halter yellow; apices of fifth tarsal segment, claws and pulvilli black. Abdominal dorsal vitta ferruginous-brown; first + second and third tergites yellow, fourth and fifth almost black, part of tergites extending on venter yellow; when seen from the back, abdomen has cinereous areas extending in a wide band laterally from the central vitta; shiny areas laterally on all segments.

Arista almost bare, very minutely pilose; oral vibrissae short; peristomials very short; palp somewhat bent and flat at apex; eyes widely separated; postocular row very short; 1 inner ocellar short; 1 postvertical pair as long as inner front ocellar.

Acrostichals 1 irregular row; 2 humerals (1 quite small); 1 sublateral; 1 long posthumeral; 1 very short intra-alar; 1 stout supra-alar; 2 postalars, inner short, outer very long; scutellars, discal (subbasals) very long and stout, apicals very small.

The legs are folded together in the holotype and all parts are not easily seen. Fore coxa with few setulae on dorsal part; fore femur with a row of posterodorsals, 1 larger than the others; 1 short posterior setula; 1 row of posteroventals, which are short, black, thick and

larger on apical 1/2; 1 row of anteroventrals; fore tibia with 1 long dorsal preapical; 2 long, thin and bent apical posteriors; a row of long, slender posteroventrals. Mid coxa with 2 strong anterior to anterodorsals on anterior to ventral side; mid femur with 1 short seta at end of basal third on anterior side; 1 row of short, black posteroventrals; 1 row of short anteroventrals, close together. Mid tibia thickened or somewhat swollen on basal 1/2; 1 large anterior subbasal; 1 long seta on swollen portion and 1 row of long, erect hairlike anterodorsals and several dorsal rows; 1 long seta and other smaller posterodorsals on swollen portion of mid tibia. Hind femur with 1 row of short anteroventrals; hind tibia slightly bent on basal fifth; with several long curved posteroventral setae; 4 posterodorsals on basal 1/2; 4-6 setae on posterior part irregularly placed and 6-7 long anteroventrals.

Costal wing setae very short; R_4+_5 vein ending almost at wing tip; M_1+_2 diverging from R_4+_5 ending almost parallel; r-m almost straight; m-cu slightly sinuate.

Abdomen subcylindrical in shape; first + second terga with 4 large, stout setae at side, interspersed with shorter ones; third and fourth with 2 dorsal, somewhat lateral, long setae; fifth with 4 distal and 6 apical, long setae; sixth with short, thin setae.

Female length 3.2 mm. Generally resembling male but without the modified face and oral margin. Tibia and femora not unusually modified in shape or setae. Frons grayish-brown pruinose. Fulvous area of antenna limited to base of third and apex or more of second segment; palpi yellow. Legs yellow: tarsi brownish.

Frontal triangle extending narrowly to base of antenna; in profile parafacialia and parafrontalia mostly obscured, their juncture clearly visible. Cheeks as high as width of third antennal segment. Palpi slender, not bent apically.

Thorax chaetotaxy and markings as in male, except apical scutellar setae scarcely differentiated; only 1 propleural seta present.

Fore femur with a row of short, weak anteroventrals on basal 8/10 but with the usual anteroventral and posteroventrals; posterior surface shiny; fore tibia with a long median posterior, a shorter preapical mid dorsal and apical posterodorsal and posteroventrals, the latter 2 about two times as long as fore tibia diameter. Mid femur with sparse, uniformly distributed clothing setulae; a strong and weak median anterior bristle, a slender ventral and a single posterior preapical; mid tibia with a long median anterior and 1 long and 1 short median posterior; the apical anterodorsal absent, the posterodorsal setae short. Hind femur shiny, with 2-3 short anteroventral and posteroventral hairlike setae on basal 3/4 and with short interspersed setulae; clothing setulae very sparse or absent on most of anterior and posterior surfaces. Abdomen and hind tibia as in female of N. micans.

Specimens studied: 2 (1m, 1f) from 1 Puerto Rican locality:

Luquillo	1m, holotype (NMNH); 1f, allotype (NMNH); El Yunque, March 20-22, 1954, J. Maldonado & S. Medina

Neodexiopsis crispiseta Snyder

Neodexiopsis crispiseta Snyder, 1957a: 215 (descr. - PR)

Pont, 1972:45 (cat., distr. - PR)

Male length 3.1 mm. Frontal vitta reddish-brown; parafrontalia and gena with reddish tinge, covered with silvery-white pollinosity; lower part of parafrontalia yellowish, upper part dark, antennal segments 1 and 2 black, extreme apex of second yellow, third dark brown (absent in type); arista black with a light area on end of basal 1/5; oral vibrissae dark; peristome with yellow, hairlike setae; palp yellowish-white. All legs yellow; coxa with whitish pruinosity; dorsum of mid and hind femur dark brown apically; apical tarsal segments 2 and 3 brownish. Wing hyaline, brownish tinge; halter yellow; calypter white, yellowish tinge at edge or rim. Abdominal terga one through three and all sterna yellow; dorsal median vitta dark brown.

Arista pilose almost to top; oral vibrissae cruciate, stout; peristome with hairlike setae; only 4 labellar teeth present; eye bare, widely separated postocular setae short but well-shown; inner ocellar as short as one of the frontal interspersed setae; 2 postocellars, very short, minute; 1 pair of postverticals as long as inner ocellar; 1 pair of setae on occipital region.

Acrostichals 1 irregular, sparse row; 2 prescutellars; 1 humeral, another very small one on inner side; 1 sublateral, very small, hairlike; 1 posthumeral, long, stout; 1 intra-alar; 1 supra-alar; 2 postalars; scutellum with 1 subbasal pair of stout, very long setae, 3 times the length of apical cruciate seta, and 1 short hairlike seta.

Prosternum bare; propleuron bare in middle with 2 small setae; 2 hairlike, diverging stigmatals; 2 long and 2 short anepisternals; 3 katepisternals in an equilateral triangle, other setulae hairlike; remainder of pleural area bare.

Fore coxa with 2 rows of anterior, long, light yellow setae; fore femur with 2-4 dorsals on apical 1/2; 1 row of well-developed posterodorsals on apical 1/2; 2 long posterior setae at end of basal 1/3; a row of long setae interspersed with shorter ones on posteroventral side; fore tibia with 1 preapical posterodorsal and 1 posteroventral setae, both hairlike and apically curled; 1 median posterior at 1/2; 1 short mid dorsal seta; fore tarsi with 2 basal ventrals. Mid coxa with 2 anteriors, 3-4 yellow and 2-3 dark brown posteriors; mid femur with anterior clothing setulae; 2 rows of erect setae, short on basal half; 1 basal short and 1 subapical curved posterior; 1 row of sparse, long, hairlike posteroventrals; 1 lateral row of hairlike setae; 1 hairlike anteroventral row, longest on basal 1/2; mid tibia with 1 submedian long and apical hairlike anterior seta; 1 long, hairlike subapical posterodorsal; 1 median long, hairlike, posterior curled at tip; 1 long almost apical, hairlike posteroventral; 1 dark ventral apical and 1 short apical anterodorsal. Hind coxa with 2-3 short, black anterodorsals; hind femur with 2 rows of anterodorsals; 1 long, hairlike anterior, crinkled at apex; 1 basal and 2-3 dorsal on apical 1/3; 1 row of long, hairlike, curled apical posteroventrals; hind tibia with 1 median and 1 subapical anterior seta; 1 submedian on anterodorsal and dorsal side; 1 long posterodorsal at middle, hairlike, crinkled at apex; 1 subapical

posterior and 1 apical anteroventral.

Wing as in other described species.

Abdomen of holotype broken, glued on label; very short, ovoid. Terga 1 + 2 with several stout setae on sides; 3 with lateral setae on dark spot; 4 with 2 lateral median setae, each one placed on dark spots; 5 with distal and apical row of setae; 6 with 2 apicals at middle of tergum.

Female 4.3 mm long. Head dark, grayish pruinescent; frons brownish pruinescent, gena with reddish to fulvous reflections; antenna fuscous, base of third and apex of second segments narrowly fulvous; palpi pale yellow with fringe of slender, yellow, hairlike setae on lower margin. Thorax dark, obscurely grayish pruinescent and with a trace of 3 narrow brown vittae in acrostichal and dorsocentral planes. Legs yellow; fore femur with purplish-brown area, apex of mid and hind femora and at base of mid coxa with a cloudy posterodorsal area; tarsi progressively more brownish from first to fifth segments.

Frons at vertex 1/5 of greatest head width, parallel sided. Gena 0.5-0.6 higher than the width of third antennal segment. Anterior and posterior ocellars subequal, about 1/2 as long and strong as the rather long and strong anterior frontals; inner and outer verticals scarcely longer than the setulae in postocular row. Third antennal segment 2.6 times longer than second. Palpi very slightly enlarged apically; other head parts as in male.

Setulae in acrostichal series short, sparse, prescutellar pair scarcely differentiated. Apical scutellars 0.6-0.7 as long as subbasals.

Thorax otherwise as in male.

Fore femur with an irregular double row of very short, spinulose anteroventrals on basal half, fore tibia with a median posterior and anteroventrals almost 3/4 the length of fore tibia; mid dorsal and apical posteroventral conspicuously shorter, the latter 1.5 times as long as diameter of fore tibia. Mid femur with a row of slender ventral to posteroventrals, the 2-3 near the median, 1/2-2/3 the length of mid femur; with a median anterior seta, a few much shorter basal ones, 1 beyond; 2-3 posterior preapicals; mid tibia with a long, submedian anterior and posterior seta; apical anterodorsal not differentiated, apical posterodorsal longer than tibial diameter. Hind femur with 3-4 widely spaced, slender anteroventrals; the one at apical 1/3 longer than the others and more dorsally situated, a short seta opposite the terminal one in anterodorsal series; with 3-4 posteroventrals on median half, the median one the longest. Hind tibia with a long anterior seta on basal 1/3, an equally long anterodorsal, slightly beyond middle, a very short preapical anterodorsal, scarcely as long as hind tibia diameter; mid dorsal seta as long as the anterior and inserted at middle of hind tibia, distinctly basal to the long anterodorsal.

Specimens examined: 2 (1m, 1f) from one Puerto Rican locality:

Luquillo	Caribbean Nat. For., 1m, holotype (NMNH) Mar. 20-22, 1954, J. Maldonado & S. Medina, with label as *Neodexiopsis crispaseta* but in Snyder (1957a) publication appears as *N. crispiseta*, 1f, on road 191, 1,380 ft., on Mt. Britton road; on mixed vegetation by roadside; Apr. 28, 1965, SMG

Neodexiopsis discolorisexus Snyder

Neodexiopsis discolorisexus Snyder, 1957a: 212 (descr. - PR)

Pont, 1972: 45 (cat., distr. - PR)

Male length 3.3 mm. Head black, covered with white silvery pruinosity; frontal vitta darker; frontal triangle reddish-gray; antenna black, apex of second segment with white to yellowish pruinosity especially on dorsum; arista black; palp brownish-black with black setulae; peristome with row of black setulae, whitish setulae only ventrally behind haustellum.

Thorax black, covered with a cinereous pruinosity, except for light ferruginous brown band; thoracic pleuron black, covered with cinereous pruinosity. Wing hyaline, tinged with brown.

Abdominal terga 1 + 2 and 3 yellow; 4, 5 and 6 black except for apex of terga on ventral side. Abdominal sterna yellow except fifth sternite which is dark brown-black. Dark-black vitta extending from first, second and fifth tergites dorsocentrally, laterally in third and fourth abdominal segment covering almost all terga, except for posterior lateral parts which are covered by cinereous pruinosity.

Arista shortly plumose; frontal triangle very narrow, reaching frontal suture; oral vibrissae stout, long; eyes widely separated, bare; 5 frontal bristles, first and third stout, second and fourth, hairlike, fifth pair reclinate, stout and large; inner verticals the strongest and stoutest pair; postoculars form a short stout row; inner ocellar, hairlike, half the size of postvertical; 1 or 2 very small, hairlike postocellars; postverticals 1 pair, strong.

Acrostichals 2 irregular rows; a long prescutellar pair; 1 stout presutural and 3 stout postsutural dorsocentrals; 1 humeral, a very small one at inner side; 1 very small sublateral; 2 notopleurals; 2 intra-alars, half the size of the posterior postalar; 1 supra-alar; 2 postalars; 1 subbasal, strong, stout and long.

Prosternum bare; propleuron bare at middle, 2 upward directed setae, upper twice the lower in size; 2 stigmatals as the propleurals, diverging; 4 anepisternals with several very small hairlike setulae. Katepisternals: 3 in an equilateral triangle, 3 very small, hairlike ones in between; 4 stout setae on lower part of mesokatepisternum; katatergite villous, all other pleural areas bare.

Fore coxa with several irregular rows of setae; most prominent are 4 setae at edge on anterior side; fore femur with only clothing setulae on anterior side; several rows of setae on dorsal side, 1 row of prominent posterodorsals; several posterior irregular rows somewhat longer than clothing setulae; 7 long posteroventrals; fore tibia with 1 subapical dorsal, 1 posterodorsal subapical, 1 median long posterior and 1 subapical short posteroventral; fore tarsus with 1 ventral at base. Mid coxa with 6 strong anteriors; mid femur with 2 mid stout anterior, clothing setulae somewhat large, subapical posterodorsal one stouter than the other; 6 posteroventrals, one strongly curved at middle; mid tibia with 1 preapical posterodorsal; 1 median stout and 1 apical posterior; apically 1 long anteroventral and 1 anterior. Hind femur with 4 stout anterodorsals on apical half; 1 preapical posterodorsal; 1 apical posterior, a row of 5-6

setae on posteroventral side, 2 at middle, stout; hind tibia with 1 stout anterior at middle; 1 subapical dorsal and 1 apical, stout anteroventral.

Humeral wing plate with a row of 3-6 setae at upper edge; all veins bare except costa (C); r-m and m-cu straight; right calypter and left halter missing on holotype.

Abdominal terga 1 + 2 with several groups of setae on lateral edge; 3 with 1 laterally placed; 4 with 1 large lateral; 5 with discal and apical setae; 6 with 2 small bristles on upper and 2 larger bristles on lower part.

Female length 4.5 mm. Allotype much darker in color than male; head as in holotype. Antenna black; apical dorsum of second segment with silvery-white pruinosity. Thoracic lateral vitta confluent with intra-alar vitta postsuturally; dorsocentral vitta confluent posteriorly with central vitta about middle of metanotum. Abdominal tergites 1 + 2 yellow laterally and below, also a narrow part of tergite at sides toward venter. Sternites yellow, otherwise as in male, outer part much darker. Legs much darker in the male; first coxa brownish-red with light whitish villosity; all other coxae and femur-tibial joints with yellow to reddish areas.

Specimens examined: 115 (34m, 81f) from 13 localities in Puerto Rico:

Adjuntas	1f, paratype, Feb. 13, 1954, J. Maldonado & S. Medina, and 1f, paratype at Guilarte Peak, Feb. 13, 1954, J. Maldonado & S. Medina
Cayey	5m, 9f, Guayama Rd. 15, K 22.7 on vegetation mainly Bidens pilosa; XI-1 1964, SMG & EM; 1 specimen sucking a psychodid; 1f, at same road, K 12.6, swept from grass

Cayey	2m, 1f, Salinas Rd. 1, K 70.8, near location called "El Peñón del Collao", 2,000 ft. alt.; on Malvaviscus grandiflorus leaf; II-26, 1965, SMG
Ciales	5m, 3f, Jayuya Rd. 144, K 12.4, 2,700 ft.; on vegetation along roadside; VI-16, 1965, SMG
Comerío	1f, Bayamón Rd. 167, K 15; on vegetation mainly Bidens pilosa; II-7, 1965, SMG & LM
Luquillo	1f, Caribbean Nat. For., El Yunque, Mar. 20-28, 1954, J. Maldonado Capriles; 1f, at Rd. 191, K 14.7; on vegetation mainly Bidens pilosa and Wedelia trilobata; XI-8, 1964, SMG, PM & E. Molinary; 3m, 2f, on road by Catalina nurseries at spot called "Vista Las Cabezas", on vegetation Panicum barbinode, Nov. 8, 1964, SMG, PM & E. Molinary, 2m, 3f, on road by Catalina Nurseries on vegetation mainly Ipomoea rubra, Nov. 8, 1964, SMG, PM & E. Molinary; 3f, ibid., K 29.4, in lowlands taken on Pangola grass, near river; Jan. 10, 1965, SMG; 2f, ibid., K 17.2, 2,150 ft. at spot called "Vista La Sierra"; on vegetation, mainly Panicum barbinode; Jan. 10, 1965, SMG; 1m, ibid., K 19.4, 2,000 ft., on mixed vegetation by roadside; Jan. 10, 1965, SMG; 1f, ibid., K 7.5, 1380 ft.; on mixed vegetation by roadside; Apr. 28, 1965, SMG, and 1f, Apr. 1966, JMC, and 1m, at El Verde Field Sta., Oct. 25-26, 1968; 2m, 2f, Oct. 28-29, 1968; 1f, Dec. 4, 1968; 1m, 1f, Dec. 5, 1968; 1f, Dec. 7, 1968; 4f, Dec. 18-19, 1968; 4f, Dec. 22, 1968; 6m, 16f, Dec. 25-26, 1968; 1f, Feb. 16, 1969; 1f, Feb. 22, 1969; 1f, Mar. 17, 1969, and 1f, Mar. 26, 1969, Malaise trap
Maricao	1m, Sept.-Oct., 1950, M. Santiago; 1f, from Mayagüez to Maricao For., Rd. 105, K 10.8, 850 ft.; on mixed vegetation by roadside; Apr. 30, 1965, SMG; 1f, ibid., but at K 20, 1,180 ft. on Bidens pilosa; Apr. 30, 1965, SMG. 1f, paratype, 1f at State For., July 5, 1953, JMC.
Naranjito	2f, Barranquitas Rd. 152, K. 20.1; on vegetation mainly Bidens pilosa, Sida carpinifolia and Pepo moschata; II-7, 1964, SMG & EM.

Río Piedras	2f, along riverbed of Río Piedras; Apr. 25, 1965, EM
Utuado	1f, Bo. Caguana Rd.; swept from grass; Nov. 29, 1964, SMG. 1f, Río Abajo For. Rd. 621; in habitat with Wedelia trilobata and Sida carpinifolia; Feb. 29, 1965, SMG; 1f, on Calladium colacasia covered creek bank, and 1m, at K 3.8; 1,160 ft.; rocky and muddy area near swimming pool; Aug. 18, 1965, SMG
Villalba	1m, 1f (in copula); Caribbean Nat. For. - Toro Negro Division, at Doña Juana area; Rd. 143, K 4.2, 3,000 ft. on mixed vegetation at forest floor; VI-16, 1965, SMG
Yauco	1m, holotype; 1f, allotype and 2m, 6f, at Lares Rd. K 22; at light; July 18, 1953, J. A. Ramos & J. Maldonado

Neodexiopsis ditiportus Snyder

Neodexiopsis ditiportus Snyder, 1957a: 221 (descr. - PR)

Pont, 1972: 45 (cat., distr. - PR)

Male length 3.0-3.25 mm. Head black, with gray pruinosity; frontal vitta black; frontal triangle, parafrontalia, parafacialia and gena cinereous pruinescent; frontal triangle extending up to middle of frontal vitta; parafrontalia very narrow. Antenna black, covered with cinereous pollinosity; arista brownish-black on basal third; palp black. Thorax black, dorsum with traces of reddish-brown, narrow vittae in dorsocentral area, dorsal vitta on acrostichal area wider than dorsocentral, not reaching scutellum. Calypter white; halter yellow. Legs black, apices of coxa, femur and tibia yellowish-brown. Abdominal terga dark, sparsely gray to greenish-gray pruinescent with extensive dark area covering most of dorsum except for lateral basal grayish pruinescent area.

Arista very shortly plumose; oral vibrissae cruciate, well-developed, 2 small setae above; peristome with several short setae; 5 labellar teeth; palp somewhat swollen at apex with short black setulae, eyes bare, widely separated; 1 row of short, well-developed postoculars; inner ocellar stout, as long as third frontal; 2-3 very minute postocellars; 1 post-vertical, well-developed, diverging, as long as first frontal.

Prosternum bare; propleuron bare at middle; 2 propleurals on lower edge, outer one hairlike; inner one stout; 2 diverging stigmatals, lower one smaller; 4 anepisternals, other small setulae in front along this area; 3 katepisternals in an equilateral triangle, 4-5 setulae in this area; anepimeron and anatergite bare; katatergite with short villosity at ridge; other pleural areas bare.

Two acrostichal rows, 3 rows on lower half of metanotum; 1 long (outer) and 1 short (inner) humeral; 1 sublateral; 1 long posthumeral; no prealars; 2 intra-alars; 1 supra-alar; 2 postalars; scutellars; 2 subbasals almost of same length as the 2 apicals, several setulae on dorsum.

Fore coxa with 1 anteroventral and 1 anterior row of setae; fore femur with clothing setulae only on anterior side, posterior to dorsal row, larger on basal half; 1 stout basal posterior row; 1 posteroventral row (with 4-5 long setae); setulae, larger on basal part of anteroventral side; 1 dorsal; 1 subapical; 1 almost apical posterodorsal and 1 basal ventral setae. Mid coxa same as fore coxa; mid femur with 4 setae in a row up to a little over half of femur, last one larger on anterior side; 1 subapical posterodorsal; 1 subapical posterior; 1 row of short

anteroventrals, larger at apex; mid tibia with 1 long anterior near middle; 1 long posterior at middle; 1 long anteroventral; 1 almost apical posterodorsal; 1 posterior; 1 posteroventral, the longest. Hind coxa as others; hind femur with 6-7 anteriors, longer on apical half, last one placed on the anterodorsal side; 1 dorsal subapical; 2 long preapical anteroventrals, 4 other short setae on basal half; hind tibia with 1 median to anterodorsal seta; 1 apical anterodorsal; 1 dorsal near middle; 2 stout posteroventrals, one at each side of middle tibia as seen in female allotype; 1 submedian and 1 preapical anteroventral. The holotype has the legs glued to the pointer, only outer pair of legs fairly seen.

Costal vein of wing with 1 costal seta basally, 1 central row of short spinelike setae flanked by an upper and lower row of setae, those on upper side somewhat thicker than one on lower side, this row of setae attaining R_{2+3} vein. All other wing veins bare. Abdomen ovoid; first tergite (1+2) almost subshiny.

Female length 3.30 to 3.75 mm; very similar to male except having widest part of frons opposite strong pair of median parafrontals; frons then narrowed to vertical width at base of antennae. Third antennal segment narrower, usually not more than 3.8 times length of pedicel.

Tibiae except fore tibia bare, usually concolorous with femora. Femoral and tibial setae longer and stronger than others. Grayish pruinescent areas on basolateral portions of abdominal tergites somewhat more extensive than in male.

Snyder (1957a) stated that this species is very similar to the widespread Nearctic and Neotropical N. rufitibialis Stein, but differs in

various characters and colors of some parts.

Specimens examined: 179 (73m, 116f) from 16 Puerto Rican localities:

Aguas Buenas	2m, 1f, "Casa de Cursillos"; 1,200 ft. on glass door barrier; Oct. 20, 1964, SMG & LFM; 1m, Oct. 13, 1964; 1f, Oct. 26, 1964; 1m, Jan. 11, 1965; 2m, SMG; VI-23, 1965, LFM & SMG; 4f, July 7, 1965, SMG; 2m, 2f, Aug. 2, 1965, SMG
Arecibo	1f, Bo. Cercadillo Rd. 682; on mixed vegetation by roadside; Feb. 11, 1965, SMG; 2m, 8f, in habitat with Wedelia trilobata and Sida carpinifolia; Feb. 29, 1965, SMG; 2m, Cambalache For.; on mixed vegetation near ground; June 16, 1965, SMG
Barranquitas	1f, Orocovis Rd. 143, K. 2.7; on mixed vegetation by roadside; Aug. 17, 1965, SMG
Cayey	2m, Guayama Rd. 15, K 12.6 swept from grass; SMG; 7m, 5f, at K 22.7; on vegetation mainly Bidens pilosa; XI-I, 1964, SMG & EM
Ciales	3f, Jayuya Rd. 144, K 12.4; 2,700 ft.; on vegetation along roadside; VI-16, 1965, SMG
Guayama	1f, Guavate For., Rd. 179; K 9.6; Nov. 1, 1964; on vegetation mainly Sida carpinifolia and Wedelia trilobata; SMG & EM
Isabela	1m, taken in a plantation of Carica papaya; Nov. 6, 1964, SMG, GR, & RB
Jayuya	1f, Puntita; July 1962, JMC
Luquillo	1f, paratype; Caribbean Nat. For., El Yunque; Apr. 1960, J. Maldonado C.; 7m, 8f, at Rd. 191, K 14.7; on vegetation mainly Bidens pilosa and Wedelia trilobata; XI-8, 1964, SMG, PM & EM; 5m, by Catalina nurseries on vegetation mainly Ipomoea rubra and Solanum torvum; Nov. 8, 1964, SMG, PM & E. Molinary; 15f, at spot called "Vista Las Cabezas"; on vegetation mainly Panicum barbinode; SMG, PM & E. Molinary; 2m, on vegetation by roadside, Apr. 28, 1965, SMG; 1m, at 2,000 ft.; 1f, at K 6.4 at 1,140 ft.; 3f, at K 19.4 on road 191; 2,000 ft. on

	mixed vegetation by roadside; Jan. 10, 1965; 1m, 2f, at K 29.4, taken in lowlands on Pangola grass near river; 1m, at K 17.2 at 2,150 ft. at spot called "Vista La Sierra"; 1f, at El Verde Field Sta., Oct. 25-26, 1968; 1f, Dec. 22, 1968; 1f, Dec. 27, 1968; 1m, Dec. 30, 1968; 1f, Feb. 14, 1969; 1f, Feb. 16, 1969; 1f, Mar. 20, 1969; 1f, Mar. 24, 1969; 2f, Apr. 4, 1969; 2f, Apr. 5, 1969; Malaise trap
Maricao	2f, Insular For.; at light; Apr. 30, 1953, JAR; and 1m, July 1960, JMC
Mayagüez	1f, Mar. 1960, JMC; 1f, June 1962, JMC; 3f, Mayagüez-Maricao For. Rd. 105, K 4.4, 420 ft. on Paspalum millegrana; VI-30, 1965, SMG; 1m, 1f, at K 10.8; 850 ft.; on mixed grasses by roadside; Mayagüez-Lajas Rd. 116, 2f, K 193.8; on mixed grasses by roadside; July 21, 1965, GR
Naranjito	3m, 8f, Barranquitas Rd. 152, K 20.1; on vegetation mainly Bidens pilosa, Sida carpinifolia and Pepo moschata; II-7, 1964, SMG
Río Piedras	2m, AES; in inflorescence of Chrysolidacarpus lutescens; May 2, 1965, SMG & EM; 1m, 1f, in ditch habitat with Commelina longicaulis and Caladium colocasia; 2f, at Urb. San Gerardo; on shore vegetation by small pond; Aug. 9, 1965, EM
Utuado	4m, Barrio Caguana Rd.; swept from grasses; Nov. 29, 1964, SMG; 1m, 3f, Río Abajo For.; Rd. 621, K 5.2, 1,100 ft.; near Peace Corps Camp, on vegetation by creek; 2f, at K 3.8, 1,160 ft.; at rocky and muddy area near swimming pool, Aug. 18, 1965, SMG
Villalba	5m, 11f, at the Caribbean Nat. For., Toro Negro Unit; Doña Juana For. Rd. 564, K 5.7; 2,800 ft. at entrance to recreational area; on vegetation forest floor; Aug. 17, 1965, SMG
Yauco	5m, 10f, paratypes, Lares Rd. K 22; July 18, 1953, J. A. Ramos & J. Maldonado, at light and 1f at K 29, Jan 20, 1954, J. Maldonado & S. Medina

Neodexiopsis drewryi Medina Gaud, n. sp. (Plate VII, Fig. 22; Plate VIII, Fig. 27; Plate X, Figs. 35 and 36).

Diagnosis: This black species is differentiated from other species by its dark brown to black coxae, two pairs of postsutural intra-alars; one dorsal and 2 anterodorsals on hind tibia and by the absence of thoracic longitudinal stripes.

Description: Female length 2.8 to 3.5 mm. Black with a reddish-brown tinge; frontal vitta brown pollinose; buccal cavity with whitish or silvery pollinosity; palp dark brown. Thoracic dorsum covered with reddish-brown pruinescence; pleuron cinereous gray; calypter whitish-cream with dark brown border; halter base yellowish-brown, capitellum yellow. Coxa dark brown with gray cinereous pruinosity; femur black; tibia and tarsus brown. Abdominal terga gray cinereous with brownish-red tinge at apex; wide at middle extending to base.

Arista plumose on basal half only, rays very minute; oral vibrissae cruciate, well-developed; 1 row of peristomials; palp small. Frontal setal pairs 1, 3, 5 and 6 well-developed; pair 6 stoutest of head; 1 and 3 cruciate; 2 and 4 hairlike; 5 and 6 reclinate; inner and outer vertical small, about same size; 1 stout ocellar pair as long as first frontal pair; 1 pair of very short postverticals; 1 postocular row, several occipitals more or less in a row.

Acrostichals in 2 irregularly scattered rows; 1 humeral stout, 1 small on inner side; 1 sublateral and 1 post humeral; 2 intra-alars; 1 supra-alar and 2 postalars; 1 discal scutellar.

Prosternum bare; 2 propleurals, posterior one stouter than anterior;

2 stigmatals; upper stouter than lower; 4 anepisternals, 3 and 4 stout, surrounded by several setulae; katepisternals with few setulae in the katepisternal area, 3 setae ventrally in a vertical row.

All coxae with anterior to ventral rows of setae; fore femur with 1 dorsal row; setae stoutest at apical half; 1 ventral row stoutest at middle; tibia with 1 preapical dorsal; 1 preapical posterior and 1 preapical posteroventral; 1 mid posteroventral seta. Mid femur with 1 stout anterior near base of apical third; 4 erect, stout ventral to posteroventral setae; mid tibia with 1 apical anterior; 1 stout mid anterodorsal; 1 short mid posterior to posterodorsal bristle; 1 posterior preapical, 1 apical posteroventral and 1 apical ventral. Hind femur with 1 stout, erect anterior at base of apical 1/3 and 1 preapical anterodorsal; 1 preapical anterior; 1 anterodorsal row; 1 preapical dorsal; 1 preapical posterodorsal; 1 ventral to posterodorsal row; tibia with 1 very stout anterodorsal near middle; 1 short preapical anterodorsal; 1 dorsal at base of apical third and 1 apical anteroventral.

Abdominal terga 1 + 2 with row of erect setae at middle; tergite 3 with 1 stout seta at side; tergite 4 with 2 stout setae laterally placed midway on tergite; tergum with 2 stout setae at side. Sterna with setulae especially at sides.

Remarks: The writer has named this species in honor of Dr. George E. Drewry, Ecologist of the Puerto Rico Nuclear Center at The Rain Forest Project located at the Caribbean National Forest-El Verde Field Station, in recognition of his great interest in collecting muscid specimens as well as other insects.

Types: Holotype: female, Luquillo, Caribbean National Forest, El Verde Field Station; Malaise trap; Dec. 18, 1968; George E. Drewry. Paratypes; 4f, same data as holotype but collected on Dec. 31, 1968; Jan. 16, 1969; Feb. 14, 1969 and Feb. 16, 1969, respectively. Malaise trap; George E. Drewry.

Neodexiopsis ebenifemur Snyder

Neodexiopsis ebenifemur Snyder, 1957a: 220 (descr.- PR)

Pont, 1972: 45 (cat., distr. PR)

Female length 3.1-3.3 mm. Head black, parafacialia and gena grayish pruinose, frons brownish pruinose; arista black, light brown at extreme base; a light rim at extreme apex and base of second and third antennal segments; palp light brown, black setulae at apex. Thorax dark (almost black with gray to brownish (red tinged) pruinosity over dorsum), brown vitta only discernible presuturally at extreme apex. Wing hyaline, tinged with light yellow-brown; calypter light yellow; halter fulvous yellow, missing in holotype. Legs black, basal portion of tibia dark yellow to brown; the basal posterior surface of hind femur and sometimes base of fore and mid femur shiny black; remainder of femur sparsely grayish pruinescent. Abdomen black with grayish pruinosity; terga 1 + 2 with a band at base and apex, and a grayish band somewhat narrow at middle and at sides of central vitta. Broad median brown vitta from segments 3 to 5; subtriangular band on third and fourth segment coalesced to mid band extending apically and laterally, forming a basal narrow grayish stripe; pleura yellow; sternum brownish.

Arista very minutely pilose; second antennal segment with 1 short dorsal seta; oral vibrissae stout, cruciate; peristome with few short setae; labellar teeth present; palp with large setulae at apex. Eyes bare, well-separated; postocular row short, well-developed; inner ocellar not subequal as Snyder (1957a) stated in his publication; first & second frontal pair small, hairlike as second frontal seta; postocellar very small, hairlike; 1 postvertical well-developed, as long as first frontal pair; 1 occipital; other setae absent.

Prosternum bare; propleural bristle as in other species; 2 stigmatals, lower one hairlike; very small; 4 anepisternals; 3 katepisternals in an equilateral triangle; katatergite shortly villous, all other pleural areas bare.

Two small presutural acrostichal setae, 2 long prescutellars and a few minute setae postsuturally; 1 long (outer) and 1 very small (inner) humeral; quite small sublateral about 1/3 size of posthumeral; no prealar; 1 intra-alar plus 1 quite small one anteriorly placed; 2 postalars, first one small; 1 long, stout, subbasal scutellar; 2 apical scutellars about 1/3 to 1/2 in size of subbasal.

Fore coxa with usual rows of setae; fore femur with clothing setulae on anterior side; 1 row of stout bristles, longest on apical half on posterodorsal side; 1 long posteroventral seta at apex of basal 1/3, 4 in a row on apical half; 1 more or less uniform anteroventral row; fore tibia with 1 preapical dorsal seta; 1 long posterior at middle; 1 preapical; 1 apical posterodorsal and 1 posteroventral; tarsus with 1

ventral basal seta longer than the others. Mid coxa as in other species with 4-5 setae; mid femur with 2 large setae more or less at middle; 1 row of short anterodorsals; 1 subapical posterodorsal; 1 subapical posterior; 5 stout setae placed on posteroventral side, longer at apex; 1 row of short anteroventrals; mid tibia with 1 anterior submedian; 1 seta at center placed more to the posterodorsal side; 1 apical anterior; 1 apical ventral, (the longest of apicals), 1 short posteroventral and 1 short posterodorsal. Hind coxa as others with 2-3 setae; femur with 1 anterodorsal row of sparse setae slightly longer at middle; 1 stout posterodorsal row, 3 posterior setae at center and 3 apical dorsals; 1 posteroventral row with 1 very long subapical, 1 ventral row with very short setae; 1 anteroventral row with 1 long apical seta; hind tibia with 1 long subapical just above middle; 1 shorter anterodorsal; 1 long dorsal at center; and 1 long posteroventral to ventral apical seta.

Wing with 1 long basal costal bristle, all other veins bare; m-cu cross vein slightly sinuate at middle. Abdomen somewhat elongate.

Specimens examined: (2 specimens): 2f from 1 Puerto Rican locality:

Luquillo	1f, holotype, 1f, paratype, Caribbean National Forest, El Yunque, Mar. 20-22, 1954, J. Maldonado & S. Medina

Neodexiopsis flavipes (Williston)

Coenosia flavipes Williston 1896: 370 (descr. - PR)

Coquillett, 1900: 255 (coll. rec. - PR & St. Thomas)

Curran, 1928: 89 (coll. rec. - PR: Matrullas-Orocovis)

Wolcott, 1936: 368 (coll. rec. - PR, St. Thomas)

Wolcott, 1948: 496 (coll. rec. - PR, St. Thomas)

Neodexiopsis flavipes: Pont, 1972: 46 (cat. rec. - Jamaica, St. Vincent Is., PR)

Male length 3.1 mm. Body dark, shiny, with grayish pruinosity. Head dark; palp and occiput light brown; antennal first and second segments brown, third brownish-black; arista black, light brown at base; palp brownish. Legs yellow, except dark brown area dorsally at apex of femur; tarsi with brownish tinge. Halter yellow, reddish-brown at base, calypter whitish-cream. Abdominal first (1+2), second and third segments yellowish laterally, almost brown on dorsum.

Arista long, pubescent; oral vibrissae stoutest of head bristles, cruciate; peristome with cruciate stout setae, 2 setulae at base; palp with short black setulae; eyes bare, widely separated, 1 row of well-developed postoculars; 1 inner ocellar well-developed, as long as postverticals; 1 pair of occipitals.

Acrostichals irregularly placed; 2 small humerals (1 lacking); 1 sublateral (missing); 1 posthumeral; 1 long prealar; 1 intra-alar; 1 supra-alar; 1 postalar; scutellars, 1 subbasal and 1 apical pair. Prosternum bare, 1 propleural and 1 stigmatal seta; 6 mesanepisternals (1 very stout); 3 katepisternals (hind one stoutest), several small setulae in the katepimeron; other pleural areas bare.

Fore femur with several rows of setulae on anterior side, dorsal to posterodorsal row with 5 very stout setae, several rows of setulae on posterior side; ventral to posteroventral row with 5 stout setae; fore tibia with 1 long mid-posterior; 1 preapical dorsal; 1 preapical postero-

dorsal; 1 apical posterior. Mid femur covered with many setulae, with 3 to 4 stout anterior setae; 4 to 5 long, thin ventral setae; mid tibia with 1 mid-posterior and 1 anterior on base of apical third, 1 apical dorsal, 1 preapical posterodorsal and 1 apical anterior. Hind femur with 1 anterior, 1 dorsal and 1 preapical dorsal to anterodorsal seta. All tibiae setulose; pulvilli large, padlike; claws microsetulose.

Abdomen with long setae laterally on first (1+2) and third tergites, apically on fourth, 1 on apex and base of fifth.

Specimens examined: Redescribed from a single male specimen collected at Matrullas (Orocovis) on Feb. 21, 1932; S. T. Danforth. This specimen was identified by Curran as *Coenosia flavipes* and is deposited in the AMNH in New York. Several setae and the left hind tibia and mid leg are missing.

Neodexiopsis maldonadoi Snyder

Neodexiopsis maldonadoi Snyder, 1957a: 227 (descr. - PR)

Pont, 1972: 46 (cat. - distr. - PR)

Female length 3.0 mm. Head black; frontal vitta, parafrontalia, parafacialia and gena with yellowish pruinosity; sides of frontal triangle with reddish-brown reflections extending to the border; antenna black with silvery pruinosity on dorsum of pedicel; arista black; palp black at apex, brown at base. All tibiae, apex of fore femora, coxotrochanteral unions and metatarsi bright yellow. Wing hyaline but tinged with brownish-yellow; calypter concolorous with wing, with yellow rim; halter yellow at base. Abdominal terga dark, covered with a grayish

pruinosity; with a median, brown vitta on dorsum of all tergites, lateral spots on segments 3 and 4, a very small one on 1+2; sterna yellowish-brown.

Head flat in front, short in depth; frontal vitta almost square, very slightly narrowed apically; frontal triangle not well-defined. Arista shortly plumose; oral vibrissae stout, cruciate with 1 very short seta above; 5-6 peristomials; labellar teeth present; eyes bare, widely separated, row of well-defined postoculars; 1 inner ocellar pair a little longer than first frontal; 2 small, hairlike postocellars; 1 well-developed, diverging postvertical and occipital pair; other setae absent.

Prosternum bare; 2 propleurals and 2 stigmatals as previously described for other species; 4 anepisternals in an equilateral triangle; all other pleural areas bare.

Two acrostichal rows: 1 long and 1 small humeral; 1 sublateral; 1 posthumeral; prealar absent, intra-alar about 2.5 times the size of postalar or supra-alar and as long as posterior postalars, the last one long and stout; scutellars: 1 subbasal pair more than 2 times the length of apical scutellar; 1 small pair apically; other clothing setulae on dorsum.

Fore coxa as in other species; fore femur with 2 apical dorsals; 5 stout posterodorsals on basal half; 1 row of short posteriors; 3-4 stout, long apical posteroventrals; 1 anteroventral row somewhat larger on basal half; fore tibia with 1 preapical dorsal; 1 preapical postero-dorsal and 1 posterior at middle; 1 apical anteroventral to ventral;

tarsus with 1 basal ventral seta. Mid coxa with strong row of setae, 4 rows on dorsal part and 4-5 anteroventral setae; mid femur with 4 anterior rows, 1 of them longer than others; 1 subapical posterodorsal; 1 strong subapical posterior; 2-3 erect on ventral side; 4 short anteroventrally on basal 0.5, then 1 long erect; mid tibia with 1 seta anteriorly at middle; 1 preapical on anterodorsal and 1 on posterodorsal side; 1 mid posterior; 1 apical anterior; 1 posteroventral; 1 anteroventral, the longest of all apicals. Hind coxa as in other species; hind femur with 1 row of anterior to anterodorsals; 1 dorsal preapical and 1 posterodorsal; 1 row of short posteroventrals with 1 long seta at middle and a shorter one at basal half; 1 row of anteroventrals with 1 long seta near apex; hind tibia with 1 stout anterior above middle of tibia; 1 preapical anterodorsal and 1 dorsal almost at center and 1 preapical and 1 posterodorsal above center; 1 long apical, almost ventrally.

Wings as in other species except that costal setae and spinelike seta are stout up to costal break, with 2 somewhat short but thicker and stouter, spinelike setae at end of the break; all other parts as previously described; halter and capitellum missing in holotype.

Abdominal terga (first + second) with a patch of setae laterally, somewhat larger in center of patch, third and fourth with 1 long bristle laterally at middle, placed on lateral spot; fifth with 4 discals, longer than the apicals.

Specimens examined: 4 (4f) from the Caribbean Nat. For., Luquillo, PR:

Luquillo — 1f, holotype (NMNH), Caribbean Nat. For. (El Yunque), Mar. 20-22, 1954, JMC; 3f, El Verde Field Sta. one each on Dec. 5, 1968; Dec. 25-26, 1968; and Dec. 28-29, 1968, Malaise trap

Neodexiopsis medinai Snyder

Neodexiopsis medinai Snyder, 1957a: 223 (descr. - PR)

Pont, 1972: 46 (cat. distr. - PR)

Male length 3.0 mm. Head dark with grayish pruinosity and yellowish reflections. Third antennal segment yellow, the others black, base of arista pale brown; peristomial setulae dark, yellow beneath. All legs yellow including prosternum and small area surrounding coxae and halteres; calypter white, with light yellow tinge on rim. Abdomen yellow, except for blackish-cinereous covered dorsum of third, fourth and fifth tergites, more intense on fourth and fifth; central brownish vittae on first-fifth; lateral spots of same color on third to fifth.

Arista long, shortly plumose; oral vibrissae long; peristome with 3 short setae; labellar teeth present; palp with short setulae at apex; eyes bare, widely separated; 1 row of postoculars; 1 inner ocellar, short, as long as postvertical; 2-3 hairlike postocellars; 1 pair of short postverticals and 1 pair of occipitals.

One irregular acrostichal row; 1 long and 1 small humeral; 1 small sublateral; 1 posthumeral; 2 intra-alars; 1 supra-alar; 2 postalars, last one the longer; 1 subbasal little longer than apical; apical pair almost equal, about 3/4 size of subbasal. Katatergite villous, shortly

so at ridge; pleuron otherwise as in previous species; metathoracic spiracle round; no visible setulae or villosity. One wing is missing, the other is glued to the side of point mount of the type.

Legs glued to the mounting point; 2 posterior and 1 anterior seta on middle leg. Hind femur with 2 anterior long and 2 anterodorsal hairlike setae placed a little beyond middle and 1 near apex on anterior and anterodorsal side; 3 posteroventrals, longer than the others; posteroventral row short. Rows of long, hairlike setae curved apically, longest one as long as length of tibia.

Female length 3.5 mm; head as in male; but third antennal segment with extensive dark areas at apex continued basally along dorsal surface. Tips of mid and hind femur with a very small brownish area, a faint posterodorsal cloud on fore femur.

Abdominal dorsum mostly grayish, sides and venter of tergites mostly yellowish, dorsum of first (1+2) and fourth with elongate, median, brown subtriangular spot.

Posterior ocellar of head distinctly longer and stronger than anterior setae. Apical scutellar as long as subbasals. Fore femur with 3 irregular rows of anteroventral setulae on basal half, more spinulose than in male; fore tibia with stronger setae. Median anterior seta of mid femur somewhat more ventrally situated; 2 strong preapicals on posterior side. Hind femur with anteroventral setulae longer than in male with numerous short, interspersed spinulose setulae; preapicals more anteroventrally situated than in male, clearly differentiated from apical anteroventral; with 2-4 distinct posteroventrals on median 1/2-3/4. Hind

tibia with strong anterior seta on basal 1/3; with a long median anterodorsal, some adjacent clothing setulae slightly longer and more erect than usual; preapical anterodorsal 3/4 as long as the median situated at apical 1/3; 1 long dorsal, situated slightly beyond center.

Abdomen more pointed than in male, not dorsocentrally thickened.

Specimens examined: 8 (1m, 7f) from 3 Puerto Rican localities:

Luquillo	1m, holotype (broken); 1f, allotype (NMNH), Caribbean Nat. For., El Yunque; Mar. 20-22, 1954, J. Maldonado & S. Medina. 1f, ibid., on Rd. 191, K 29.4, lowland, taken on Pangola grass, near river; Jan. 10, 1965, SMG; 1f, on K 19.4 at 2,000 ft.; on mixed vegetation by roadside, Jan. 10, 1965; SMG; 1f, ibid., but collected at Molinderos Rd. in Apr. 28, 1965; 1f, ibid., road 191, K 14.7, XI-8, 1964, on vegetation mainly Bidens pilosa and Wedelia trilobata; SMG, EM, & E. Molinary.
Río Piedras	1f, AES; on fruit of Mangifera indica; July 7, 1965, SMG
Villalba	1f, Caribbean Nat. For., Toro Negro Unit, Doña Juana Forest Rd. 564, K 4.8; 2,870 ft.; on vegetation on forest floor; Aug. 17, 1965, SMG

Neodexiopsis micans Snyder

Neodexiopsis micans Snyder, 1957a: 213 (descr. - PR)

Pont, 1972: 46 (cat., distr. - PR)

Male length 2.7 mm. Head dark, frontal vitta and parafrontalia dark-brown pruinose; parafacialia and gena yellow with a brown tinge, covered with silvery pruinosity; frontal triangle light brown, narrow; antenna black, apex of segment 2, base and inner half of 3, yellow; arista dark brown, bare; proboscis yellowish-brown; palp yellow; all body setae yellow; oral vibrissae dark; peristomial hairlike setae

yellow. Thoracic dorsum dark, covered with cinereous pruinosity; central dorsal vitta very pale brown, almost indistinguishable, more noticeable on mesothorax. All legs yellow, glossy; tarsi yellow to very dark on apical segment. Wing tinged very light brown; calypter, pale yellow; halter dark yellow at base. Abdomen with a dorsal central black vitta along segments 1 + 2 and 3, coalesced in black fourth segment; segment 1 + 2 glossy-yellow with a gray pruinescence in basal 1/4 next to or followed by another glossy dark area on next basal 1/4; third dark-brown to black dorsal vitta on apical third widened and coalesced toward apex; fourth glossy-black with a cinereous dorsal band on apical 2/3; fifth and sixth glossy-black; lateral extension of terga yellow; sterna yellow.

Arista bare; eyes widely separated; 6 frontal pairs of setae; pairs 1, 3, 5 & 6 stout, 3 cruciate, 2 and 4 hairlike; outer vertical convergent; inner vertical short, as long as inner ocellar; 2 postocular rows; 1 very minute postocellar pair.

Acrostichals 1 single row; 1-2 very small humerals; 1 small sub-lateral; 1 very long posthumeral; 1 long prealar; 2 very short intra-alars; 1 supra-alar; 1 postalar; scutellars: 1 long subbasal pair, 1 very small at base, 1 apical pair very small. Prosternum bare; 1 single pro-pleural and stigmatal seta; 2 stout and 3 very small mesanepisternals; 3 katepisternals almost in an equilateral triangle and 2 setulae in the katepimeron, other pleural areas bare.

Fore femur bare on anterior side; 1 posterodorsal row; 2 posterior setae on basal 1/4; 3 long posterodorsals on apical third; 1 ventral row on

apical 1/3; 1 short ventral row; fore tibia with 1 dorsal on apical 1/4; 4 long posterior setae; 7 long, hairlike posteroventrals. Mid femur very long with 1 anterior seta almost at middle; 1 dorsal on apical 1/4; 3 ventrals on basal 3/4; mid tibia slightly bowed and thickened on apical 3/4 with 1 anterior seta on apical 1/4; 2 rows of thin, short, dorsal setae and 4-5 posterior setae; 1 apical ventral seta; 1 antero-to-antero-ventral apical seta. Hind femur very long, as long as length of abdomen, with many short, thick erect setae on all sides, 1 preapical dorsal seta; 1 posterior seta somewhat bigger than one on apical 1/4; hind tibia slightly bowed and thickened at middle, many long, hairlike setae on all sides, more numerous on anteroventral to posteroventral side. Costal wing spine and setae well-developed up to a little beyond vein 2 (R_{2+3}). Abdominal segment 1 + 2 dorsum with 4 - 5 stout setae on side; 1 short seta on side of third.

Female length 3.0 mm. More robust than male, same color as male but darker, covered with a gray pollinosity; proboscis dark brown to black, palpi yellow; antenna black, extreme dorsal apex light yellow; frontal vitta black pruinose; parafrontalia, parafacialia silvery pruinose; gena yellow with light pruinosity. Thoracic tergum central vitta dark brown, wide; lateral vitta at dorsocentral plane somewhat coalesced near pre-scutellar suture, an additional vitta at intra-alar plane. Abdominal terga 1-6 with central brown vitta and a lateral, somewhat subtriangular brown spot at apex. Fore femur with a longitudinal brown band, extreme apex of mid and hind femur brown; all tarsi much darker than in male.

Fore femur with 1 long, thin seta on basal 1/3; 1 ventral row;

fore tibia with 1 dorsal preapical seta; 1 posterodorsal preapical; 1 posterior (the longest) a little beyond center; an apical posteroventral. Mid femur with 1 long seta near apical half; 1 short preapical posterodorsal seta; 1 preapical posterior; 1 ventral row; mid tibia with 1 long, stout anterodorsal almost at center; 1 long, stout posterodorsal at level of anterodorsal; 1 apical dorsal; 1 posterodorsal shorter than dorsal; 1 posterior; 1 ventral seta, long; 1 anteroventral. Hind femur with 1 anterior preapical; 1 anterodorsal row; 1 dorsal to posterodorsal preapical; 1 preapical posterior; 3 long well-spaced ventral bristles; 1 long anteroventral seta on apical 1/3; hind tibia with 1 long anterodorsal at apex of basal half, 1 short, dorsal preapical; 1 long posterodorsal near basal half and 1 long anteroventral seta.

Specimens examined:	32 (13m, 19f) from the Caribbean National Forest, Luquillo, Puerto Rico:
Luquillo	1m, holotype; 1f, allotype; Caribbean Nat. For., (El Yunque), Mar. 20-22, 1954, J. Maldonado, labelled as *N. micare*, but in publication by Snyder (1957a) appears as *N. micans*; 1f, East Peak, Dec. 31, 1968; 2m, 7f, Feb. 27, 1969; and 10m, 10f, Mar. 1, 1969, malaise trap

Neodexiopsis neoflavipes Snyder

Neodexiopsis neoflavipes Snyder, 1957a: 225 (descr. - PR)

Pont, 1972: 46 (cat. dist. - PR)

Male length 2.8 mm. Head dark; parafacialia densely yellow; frons yellowish-gray; occiput grayish pruinescent; gena yellowish anteriorly, blending into gray posteriorly. Antenna bright fulvous to orange; first aristal segment orange, others dark brown; palpi fulvous with a few short,

dark apical setulae.

Thorax dark, densely grayish to greenish-gray pruinescent, a narrow brown median vitta, a much fainter one along planes of dorsocentrals, posthumerals and intra-alars. Legs entirely yellow to fulvous yellow. Wing hyaline; calypter whitish-hyaline; halter yellow. Abdomen yellow with an extensive shiny dark area on sides of third and fourth tergites. Dorsum of fourth darkened, grayish-pruinescent with a pair of round, dark spots; third with a pair of smaller preapical spots.

Parafrontalia slightly differentiated from frontal vitta, a faint, narrow, complete frontal triangle best seen in dorsal view. Frons at vertex 0.30 of head width, parallel sided. Anterior and posterior ocellar setae short, half as long as the anterior frontals; the latter distinctly shorter than median frontals; inner and outer verticals short, distinct, not quite as long as postocellars. In profile, juncture of parafacialia projecting anteriorly a distance equal to 3 times the greatest aristal diameter, parafacialia narrowed, equal to greatest aristal diameter beneath. Gena half as high as width of third antennal segment. Antenna inserted opposite middle of eye, terminating slightly above lower margin; segment 3 two times longer than second; longest rays of arista equal to greatest aristal diameter; palpi slender with few short apical setulae.

Acrostichals sparse, irregularly biserrate; 2 intra-alars; apical scutellars 0.20-0.25 as long as subbasals. Lower stigmatals and propleurals duplicated. Lower stigmatal somewhat closer to posterior than to anterior stigmatal. Fore femur, normal, fore tibia with a very short

posterior at center; mid dorsal close to apex; apical posterodorsal and posteroventral hairlike, 1.5-2.0 times as long as fore tibia diameter. Complete row of 7-9 pale ventral to posteroventrals on mid femur, very slender, as long as diameter of mid femur; no anterior setae; 2 posterior preapicals; mid femur with few very short anteriors and posteriors at middle, scarcely longer than mid tibial diameter; apical anterodorsal and posterodorsal only slightly differentiated from clothing setulae. Complete row of short, fine anteroventrals on hind femur, not quite as long as diameter of hind femur, apical one stronger and darker than others, situated opposite the terminal seta in anterodorsal row; posteroventral surface with few clothing setulae at base slightly longer than usual; hind tibia with median and preapical anterodorsals about as long as hind tibial diameter; mid dorsal longer, situated on apical 1/3; wing costal spines and setulae short.

Abdomen short, somewhat ovoid, dorsoventrally thickened.

Female length 3.0-3.2 mm; similar to male; frons and gena more grayish and pruinose; parafrontalia and frontal triangle very distinct. Stout postocellars and vertical setae.

Thoracic vitta broader; legs as in male, all tibial setae longer and stronger. Median anterior seta of mid femur stout; a series of short setae, more anterodorsally, some situated on basal 0.40, terminating in 9 slightly longer setae. Hind femur with 4-5 widely spaced anteroventrals, numerous short, interspersed setulae; 3-4 posteroventrals on basal half.

Abdomen more pointed than in male; yellow, without shiny spots.

Each tergite except fourth with a grayish-brown apical band on dorsum becoming more extensive from first to third tergites, covering most of third, extending ventrally onto sides of all tergites. Second and third tergites with a median stripe; third with distinct paired brown spots as in male. Fourth tergite yellow apically, brownish-gray basally, with paired brown spots as in male.

Specimens examined: 86 (25m, 61f) from 9 localities in Puerto Rico:

Aguas Buenas	1m; "Casa de Cursillos"; 1,200 ft.; on glass door barrier; Nov. 17, 1964, SMG & LFM; 3f, Jan. 11, 1965, 2f, June 23, 1965, SMG & LFM; 2f, Aug. 2, 1965, SMG; 2f, Oct. 13, 1964, SMG & LFM; and 5f, Oct. 20, 1964.
Arecibo	1f, 1m; Cambalache For.; on mixed vegetation near ground; July 16, 1965; and Aug. 18, 1965, respectively, SMG
Cayey	1m; Henry Barracks; June 19, 1952, F. S. Blanton; 1f, Peñon del Collao; at light; JAR & J. Maldonado; 2f; Cayey-Salinas Rd. K 70.8; on Malvaviscus grandiflorus, near spot called "El Peñon del Collao", 2,000 ft.; Feb. 26, 1965, SMG; 4f; Cayey-Guayama, Rd. 15, K 22.7; on vegetation mainly Bidens pilosa; XI-1, 1964, SMG & EM.
Ensenada	1f, Sept.-Nov. 1960, A. Avilés
Luquillo	1m, holotype; 1f, allotype; 4f, paratypes (NMNH) Caribbean Nat. For.; El Yunque; Mar. 20-21, 1954, J. Maldonado & S. Medina; 1f, Apr. 1960, JMC; 1f, at El Verde Field Sta., Oct. 28-29, 1968; 1f, Dec. 18-19, 1968; 1f, Jan. 22, 1969; 1m, Jan. 23, 1969; 7m, 7f; Mar. 17, 1969; 4m, 4f; Mar. 18, 1969; 3m, 2f, Mar. 22, 1969; 1f, Mar. 24, 1969; 1f, Apr. 7, 1969; Malaise trap; and 3f, at East Peak, Feb. 27, 1969, Malaise trap

Naranjito	2m, 2f; Barranquitas, Rd. 152, K 20; on vegetation mainly Bidens pilosa, Sida carpinifolia and Pepo moschata; II-7, 1964, SMG & EM
Río Piedras	1m; Urb. San Gerardo; on shore vegetation by small ponds; Jan. 22, 1965, EM & PM; 1m, 3f; Aug. 9, 1965, EM, at AES; 2f, on wet shaded area under Ficus benjamina tree; July 5, 1965, SMG, and 1m, 2f; collected on fruits of Mangifera indica; July 7, 1965, SMG
Trujillo Alto	1f, Loíza Lake; mixed vegetation by lake shore; Feb. 22, 1965; EM
Utuado	1f, Río Abajo For., Rd. 621; in habitat with Wedelia trilobata; Feb. 29, 1965, SMG; 1m, at K 5.2; 1,000; near Peace Corps Camp on vegetation by creek; Aug. 18, 1965, SMG

Neodexiopsis priscipagus Snyder

Neodexiopsis priscipagus Snyder, 1958a: 20 (descr. - PR)

Pont, 1972: 47 (cat., distr. - PR)

Male length 2.9 mm. Head gray pruinescent except for a blackish region on frontal vitta; frontal triangle yellowish-gray. Antennae fuscous, fulvous on basal 0.2 to 0.33 of third segment, usually fulvous area more extensive on inner surface; palpi yellow. Thorax black, grayish pruinescent; with a well-defined median brown stripe and a narrower one in area of dorsocentrals, running presuturally and becoming gradually obscured postsuturally; a complete, broad irregular stripe in planes of posthumerals presuturally and in supra-alar to intra-alar planes post-suturally. Legs with a dark linear posterodorsal stripe on fore femur and apical spot on mid and hind femora, an irregular dark area on coxae, remainder of legs fulvous yellow. Wings hyaline, veins fulvous yellow.

Abdomen black, grayish pruinescent, with a linear brown stripe and a pair of brown spots on second to fourth tergites; shiny, small, black areas laterally on second tergite.

Frons at vertex 1/3 of head width, parallel sided; gena as high as width of third antennal segment which is two times longer than second. Longest aristal rays 0.33 to 0.40 width of third antennal segment.

Wing with thumblike extension, somewhat long with a very deep incision.

Fore femur with 4 posteroventrals in a row; 1 posterodorsal row larger apically; fore tibia with 1 mid posterior to posteroventral bristle; 1 preapical dorsal; 1 apical posterior; 1 apical ventral. Mid femur with a short median anterior setula and with 2 to 4 slender ventral to posteroventral bristles and 2 posterior preapicals; mid tibia with submedian anterior to anterodorsal seta longer than the posterior one, 1 apical anteroventral smaller than the apical ventral one, 1 apical posterodorsal. Hind femur with 1 dorsal preapical; 5 anterior to anterodorsals in a row; 1 posteroventral row; the intervening setulae on anterior surface well-differentiated from the clothing setulae on the ventral and posterior surface; hind tibia with 1 long preapical; 1 mid posterodorsal and 1 preapical posterodorsal; 1 apical anteroventral and 1 mid anteroventral seta.

Female length 3.3 mm. Head as in male but antenna entirely fulvous yellow; ocellars much smaller and very thin; arista brown, base yellow. Only thoracic central vitta well-differentiated. Legs entirely yellow.

Abdominal terga 1 + 2 and third yellow; fourth and fifth with lateral shiny dark brown area. Apical scutellars 1/3 size of basals.

This species belongs to the ovata group of Snyder (1958a). It can be separated from N. cavalata, the other member of this group in Puerto Rico, by its longer thumblike extension of hind anal angle of the wing.

Described by Snyder (1958a) from a holotype male, with label reading "2-26-34, P. Viejho". P. Viejho refers to a suburb of San Juan, P.R., near Guaynabo, called Pueblo Viejo. The collector's name is not known.

Specimens examined: 2 (1m, 1f) from only one locality in Puerto Rico:

Utuado	1m, 1f, Río Abajo Forest; on rocky and muddy area near swimming pool; Aug. 18, 1965, SMG

Neodexiopsis puertoricensis Medina Gaud, n. sp. (Plate VII, Fig. 23; Plate XI, Figs. 39 and 40; Plate XIV, Figs. 51, 52 and 53)

Diagnosis: This species is differentiated from related taxa by its dark brown color and by having one anteroventral seta, 2 anterodorsals, 1 dorsal and 1 posterodorsal seta and by its distinct longitudinal thoracic stripes.

Description: Male length 2.5 to 2.9 mm (type 2.5). Dark brown covered with whitish cinereous pruinosity. Frontal vitta dark brown with ferruginous pruinosity; frontal triangle golden to ferruginous pruinose running almost to frontal suture; parafrontalia, parafacialia and gena whitish to golden pruinose. Antenna dark brown. Palp brown, lighter on basal half with black setulae; haustellum dark brown, shiny. Thoracic

dorsum cinereous with brown central vitta and thin lateral vitta extending up to prescutellar suture; thoracic pleuron dark, covered with cinereous pruinosity. Calypter whitish; halter reddish-brown at base; capitellum yellow. Legs with coxa and femur dark brown; extreme apices of femur and base of tibia light brown; tibia reddish-brown; tarsi yellowish-brown. Abdomen dark brown, almost black, shiny; basally with lateral gray bands on terga 3 to 6, lateral band covering apical half of tergites.

Arista shortly plumose, rays very minute, oral vibrissae stout, cruciate, long; peristomium greatly sclerotized; largest peristomial setae less than 1/3 size of oral vibrissae. Six frontal setae: 1, 3, 5 and 6 well-developed; 6 stoutest of setae on head; 2 and 4 small; 5 and 6 reclinate. Inner and outer vertical small, about same size; 2 post-ocular rows, second irregular; 1 ocellar pair as long as fifth frontal reclinate pair; 2 postocellars (microsetulae); 1 postvertical very short.

Acrostichals: 2 central regular rows and 2 lateral irregular rows; 2 presutural and 3 postsutural dorsocentrals; 1 outer stout and 1 inner short humeral; 1 sublateral; 1 posthumeral; 2 notopleurals; 2 intra-alars; 2 supra-alars; 2 postalars (1 very short); scutellars: 1 discal, same size as apical; 1 apical and several setulae on dorsum.

Prosternum bare; 2 propleurals, inner one stouter; 2 stigmatals, 5 anepisternals, 2, 3 and 5 stoutest; several setulae on mesanepisternum, more numerous on anepisternal area. Katepisternals stout, almost in an equilateral triangle; mesokatepimeron with several setulae near the katepisternals and several ventral setae.

All coxae with several anterior to ventral rows of setae; fore femur

with 1 dorsal row of setae; 1 basal, stout, posterior seta; 1 postero-ventral row, tibia with 1 dorsal preapical; 1 mid posterior to postero-ventral and 1 posterior preapical; 1 apical posteroventral. Mid femur with 1 mid anterior stout seta; 2 preapical dorsals; 1 ventral row with 3 erect stout setae on basal half; tibia with 1 anterodorsal near base of apical 1/3; 1 mid posterodorsal to posterior seta and 1 short apical posterodorsal; 1 apical posteroventral; 1 apical ventral; 1 apical antero-ventral. Hind femur with 1 anterodorsal row; 1 dorsal and 1 posterior preapical and 1 ventral row of setae; tibia with 1 mid and 1 preapical anterior to anterodorsal; 1 anterior at 0.40 and 1 dorsal preapical; 1 mid posterodorsal, 1 stout and 1 short apical anteroventral seta.

Abdomen covered with many setulae; terga 1 + 2 with lateral row of setae at middle of segment; tergum 3 with apical row larger at sides; 1 or 2 stout setae laterally at apex of lateral dark spots; tergum 4 with apical row, 2 large bristles at base of spot; tergum 5 with row at middle of tergite.

Female length 3.8 to 4.8 mm. Generally resembling male except antenna brown; light brown to yellow at extreme apex of second segment and base of third. Palp light brown to yellow on apical half, with black setulae. Legs with coxae and femora dark brown; apices of femora and base of tibiae yellowish-brown. Abdomen gray cinereous with brownish-red band at middle of terga 3 to 6; brownish-red lateral band covering apical half of tergites, sternites brown.

Arista shortly plumose, rays very minute, seen on basal half only; 2 propleurals; 3-4 stigmatals (2 and 4 from top stouter); mesokatepimeron

with 5 to 6 setulae near the katepisternals and 7 ventral bristles (5 in a vertical row).

Remarks: Named after the island of Puerto Rico.

Types: Holotype: male, Luquillo, Caribbean National Forest, El Verde Field Station; Oct. 28-29, 1968, Malaise trap. Allotype: female, same data as holotype but collected on April 5, 1969, G. E. Drewry. Paratypes: 1m, 10f, same data as holotype but 3f collected on Oct. 25-26, 1968; 1f, Dec. 7, 1968, (sucking a Mycetophilid); 1m, 2f, Dec. 22, 1968; 1f, Feb. 14, 1969; 1f, Mar. 20, 1969; 1f, Apr. 4, 1969, and 1f, Apr. 6, 1969, all collected by G. E. Drewry.

Neodexiopsis rex Curran (Plate XIX, Fig. 88)

Neodexiopsis rex Curran, 1928: 88 (descr. - Luquillo Nat. For., PR)

Wolcott, 1936: 369 (coll. rec. - Luquillo Nat. For. (El Yunque) PR)

Séguy, 1937: 194 (cat., distr. - Luquillo Nat. For. (El Yunque) PR)

Wolcott, 1948: 497 (coll. rec. - Luquillo Nat. For. (El Yunque) PR)

Snyder, 1957a: 210 (redesc., key, rec. - Luquillo Nat. For. (El Yunque) PR)

Pont, 1972: 47 (cat., ASUS - distr. - Luquillo Nat. For., PR)

Male length 3.7 mm. Head black, with dense silvery-gray pruinosity; frontal vitta brownish-gray pruinose; frontal triangle narrowly complete. Parafacialia obscured below; yellow setulae on lower margin of gena and

posterior portion of head. Antenna dark; yellowish on basal 1/3 to 1/2 and apex of pedicel, all densely gray pruinescent; arista dark, subshiny; palp light brown to dark yellow. Thorax black, densely bluish-gray to grayish pruinescent; presuturally with a trace of 3 brown vittae becoming expansive, subconfluent, blending postsuturally into a darkened area along intra-alar plane. Legs yellow, tarsi and limited dorsal apical area of middle and hind femora brownish. Wing hyaline with a very faint brownish tinge; calypter white; halter yellowish-white. Abdomen fulvous yellow, with dense grayish pruinosity; dorsum of first 2 tergites subshiny yellow, with a dense grayish pruinose triangular area at basilateral corner of all tergites; third and fourth tergites mostly darkened dorsally, subshiny; many long yellow hairs on lower inner margins. Basal hypopygial segment grayish pruinose.

Frons at vertex 0.27 of head width, gradually widened to 0.30 at base of antennae. Juncture of parafacialia 0.50-0.80 as long as greatest width of third antennal segment; cheeks half as high as width of third antennal segment. Anterior ocellar about half as long as postocellars, the latter subequal to the anterior parafrontals; inner verticals subequal to postocellars; outer vertical about 2 times longer than setulae in postocular row. Antennae inserted opposite dorsal 0.40 of eyes, extending almost to opposite their lower margin; third segment 3 times longer than pedicel; longest rays of arista, slightly longer than greatest aristal diameter.

Setulae on humeri and anterior declivities of mesonotum normal; acrostichals irregularly biserrate, prescutellar scarcely differentiated;

1 intra-alar; stigmatals and propleurals with a very slender duplicating seta. Apical scutellars as long as subbasals; katepisternals in an equilateral triangle.

Fore femur normal, few short basal anteroventrals, not spinulose. Fore tibia with 1 posterior at middle; 1 dorsal at center slightly longer than posterodorsal, the former inserted only slightly basad of the latter and both longer than fore tibial diameter; apical posteroventral about half the length of posterodorsal. Mid femur with a series of slender apically curved anteroventrals, those on basal 1/2 longer than femur diameter and others stout, as long as femur diameter where situated; with 5-6 stronger ventrals, 3-4 basally are the longest; with 1-2 slender anteriors almost at middle; 2 preapical posteriors. Mid tibia with anterior and 1 posterior at center; apical anterodorsal not differentiated, apical posterodorsal only slightly longer than mid tibia diameter. Hind femur with a row of slender, apically curved anteroventral and posteroventral setae, several longer than femur diameter, others subequal to diameter where situated, no distinct apical anteroventrals opposite the terminal one in anterodorsal row. Hind tibia with 1 anterodorsal and 2 posterodorsal setae at middle; 1 dorsal situated on apical 1/4; preapical anterodorsal at middle and about half as long as mid dorsal and 2 times longer than tibial diameter. Wing costal spines and setulae short.

Abdomen elongate, somewhat broadened at middle, dorsoventrally thickened apically, triangular areas at basilateral corner of all tergites largely devoid of clothing setulae; with very short, dense,

decumbent clothing setulae on dorsum of tergites.

Female length 4.5 mm. Head as in male; pruinescence more cinereous gray, fulvous area of antenna reduced to base of third segment; thoracic pruinescence more cinereous gray, vitta narrower, better defined post-suturally than in male. Preapical brownish area on femur darker, more extreme than in male. Abdominal tergum not extensively yellow; only basilateral angles of first and second tergites fulvous, sparsely gray pruinescent, remainder of dorsum of these tergites subshining black; a median broad subtriangular, subshining spot on third abdominal tergum; lateral areas densely gray pruinescent, with a narrow, dark longitudinal vitta.

Anterior parafrontals distinctly longer than those behind it. Fore femur with anteroventrals stouter, not spinulose; fore tibia with hind dorsal and apical posterodorsal and posteroventral shorter and stouter. Mid femur with 3-4 short anteroventrals on basal half and 4 widely separated ventrals to anteroventrals; a strong median anterior; 3-4 shorter ones basally. Hind femur with short anteroventrals, stouter, less numerous than in male, with some shorter, almost spinulose, interspersed setulae. Fore tibia as in male, median posterodorsal absent.

Specimens examined:	42 specimens (6m, 36f) from two localities in Puerto Rico:
Luquillo	2m, 3f; Caribbean Nat. For. (El Yunque), Mar. 20-22, 1954, J. Maldonado & S. Medina; and 1m, holotype, 11-18-1925 F. 51113A (sic). These specimens were used by Snyder (1957a) in the description of this species. 1m, Mar. 20-22, 1954, J. Maldonado & S. Medina; 1f *ibid.*, but collected in Apr. 1960 by JMC; 1f, at El Verde

	Field Sta.; Oct. 25-26, 1968; 1f, Dec. 6, 1968, 1f, Dec. 12, 1968; 5f, Dec. 18-19, 1968 (1f sucking a Sciarid); 1f, Dec. 22, 1968; 2m, 16f; Dec. 25-26, 1968; 1f, Mar. 22, 1969; and 1f, Mar. 26, 1969; Malaise trap
Villalba	4f, Caribbean Nat. For., Toro Negro Unit; Rd. 564, K 4.8; 2,780 ft. (Doña Juana For.); on vegetation on forest floor; Aug. 17, 1965, SMG

Neodexiopsis wolcotti Medina Gaud n. sp. (Plate VII, Figs. 20 and 21; Plate XI, Figs. 37 and 38; Plate XIV, Figs. 54, 55 and 56)

Diagnosis: This species can be differentiated from related taxa by having most body parts yellow and by having hind tibiae and tarsi with dense, curly, hairlike setae.

Description: Male length 3.2 mm. Frontal vitta and buccal cavity with whitish to light gold pollinosity; interfrontal area dark brown pollinose; frontal triangle golden pollinose; antennal segments 1 and 2 dark brown, apex of 2 and all of 3 lighter yellow on basal 1/3; arista dark brown, light yellow at base; oral vibrissae light brown; a row of light yellow peristomial setae; palp very light yellow; proboscis yellow to light brown; hairlike setulae below proboscis and gena yellow. Thorax gray to cinereous, dorsal vitta dark brown on mesopleuron; lateral blotches dark brown on mesopleuron; dark halo around all setae; most of the setae on thoracic pleuron yellow to yellowish-brown. All legs yellow, most setae on legs yellow to light brown. Wing infuscated; light yellow halter, dark at base; calypter light yellow. Abdominal terga yellow except for dark brown central vitta and extensive dark brown lateral area on third, fourth and fifth; dark brown basal band on dorsum of 1 + 2;

cinereous pollinosity on third, fourth and fifth; sterna yellow.

Arista pubescent, short; eyes separated; 5 frontal pairs, first pair almost touching; second hairlike, small, third cruciate, fourth hairlike, fifth reclinate; outer vertical very short, 2 very short postocular rows; inner vertical very long, stoutest of head setae, somewhat converging; 1 postvertical pair very short. One very small acrostichal pair; 1 prescutellar pair, well-developed. One presutural and 3 postsutural dorsocentrals; 1 stout humeral and 1 very small, 1 sublateral very small; 1 stout posthumeral; 2 notopleurals; 2 intra-alars; 1 supra-alar; 1 postalar; scutellars: 1 discal pair, very long and 1 very small apical pair, less than 3/4 size of discal. Prosternum bare in middle, 2 small reclinate setae; 2 stigmatal setae: 1 reclinate, 1 proclinate; 4 anepisternals; 3 katepisternals not in an equilateral triangle and 3 small setulae; all other areas bare. Fore femur bare on anterior surface; 3-4 dorsals on apical half; 5-6 posteroventrals; fore tibia with 1 dorsal preapical; 1 preapical and 1 posterior seta almost at middle; 1 preapical posteroventral. Mid femur almost bare, shiny; 3 posteroventrals and 3 anteroventrals on basal 1/3; mid tibia swollen on apical half with 1 long black seta on apical 1/3 and 1 long apical on anterior side; 1 long apical dorsal; 1 apical posterodorsal; 3 black, stout posterior setae on apical 1/3; 1 long ventral apical. Hind femur with 4-5 short, erect, yellow anterodorsals; hind tibia somewhat swollen at middle, with rows of long light brown hairlike setae on all sides; hind tarsus with long, hairlike setae as on tibia on anterodorsal to dorsal side, longer at basal

tarsal segments. Wing costal spines well-developed. Terga 1 + 2 with lateral rows of large setae at middle of segments.

Female length 3.2 to 4.0 mm. Almost identical in color to male except its proboscis is light brown; body more deeply cinereous than in male; all setae on legs dark brown to black; hind tibia lacking the rows of long setae, somewhat twisted at apex. Hind femur with 1 row of setae from anterior to anterodorsal, 1 long seta at apical 1/3 near anteroventral side; 2 dorsals on apical 1/3, 1 preapical posterior seta; 4-5 long setae well-spaced along the ventral side; 1 row of setae on anteroventral side; hind tibia with 1 long anterior seta almost at middle and 1 anterior on apical 1/5; 1 long dorsal; 1 long apical anteroventral; tibia somewhat thickened at middle. Fore femur with many short setae on basal half on anterodorsal to ventral side; 1 row on dorsal side somewhat stouter than others; 1 row of long dorsal setae; fore tibia with 1 posterior seta about twice in length that of male. Mid femur with 2 preapicals on posterior side well-developed; 1 anterior seta almost at middle; 4-5 erect, long setae on basal 3/4; mid tibia with 1 long seta almost at middle; 1 long posterior almost at middle, apically 1 anterior; 1 long ventral and 1 posteroventral; 1 dorsal and 1 posterior preapical.

Remarks: The species is named after the late Dr. George N. Wolcott, Entomologist and Head of the former Department of Entomology (now Department of Crop Protection) of the Agricultural Experiment Station of the University of Puerto Rico, in recognition of his contributions to the entomology of Puerto Rico.

Types: Holotype: male, Luquillo; Caribbean National Forest, El Verde Field Station; Malaise trap; Mar. 28, 1969. Allotype: female, same data as above but collected on Mar. 22, 1969. Paratypes: 2f, ibid., but Mar. 22, 1969 and Apr. 6, 1969, respectively. Six specimens ibid., but 1f collected on Mar. 22, 1969; 2f, Mar. 23, 1969 and 3f, Apr. 6, 1969, respectively.

Genus Bithoracochaeta

Bithoracochaeta Stein 1911

Bithoracochaeta Stein, 1911: 177 Type-species: Anthomyia despecta Walker (orig. desc.) = leucoprocta (Wiedemann)

Cariciella Malloch, 1920: 162. Nomen nudum

Bithoracochaeta Malloch, 1921b: 106 (synopsis of gen. of subfamily)

Bithoracochaeta Curran, 1928: 87 (key to PR spp.)

Bithoracochaeta Huckett, 1934: 60 (rev. NA spp.)

Bithoracochaeta Malloch, 1934: 225 (cat. of Chile and Patagonia spp.)

Bithoracochaeta Séguy, 1937: 189 (monog. of family)

Bithoracochaeta Albuquerque, 1956d: 1 (cat. of world spp.)

Bithoracochaeta Huckett, 1965: 874 (cat. of NA spp.)

Bithoracochaeta Pont, 1972: 36 (cat. of ASUS spp.)

Antenna short and acuminate; eyes not as well-separated in male as in female. One presutural and 2 postsutural dorsocentrals. Scutellum with apical setae not too stout. Lower calypter about 1.5 longer than the upper calypter. Fore tibia with one median anteroventral seta; hind tibia with 1 anterodorsal, 1 anteroventral, 1 posterodorsal and 1

posteroventral seta, respectively, the posteroventral seta may be absent in some species; 3 katepisternals (sometimes 4).

This genus is apparently distributed in parts of Mexico, on the islands of the Caribbean Sea, in the states bordering the Gulf of Mexico and the Atlantic Ocean, as well as in parts of South America.

Key to the species of Bithoracochaeta

1. Antennal segments 2 and 3 yellow; palp yellowish-brown; legs mostly black; femora dark brown, apex yellow; tarsi, bases and apices of tibiae reddish to yellow . . . B. varicornis (Coquillett)

   Antenna black; palp brown; legs mostly yellow, brownish-black coxa and dorsal vitta on fore femur, apical 1/3 of mid femur and apical spot on hind femur . . . B. leucoprocta (Wiedemann)

Bithoracochaeta leucoprocta (Wiedemann)

Anthomyia leucoprocta Wiedemann, 1830: 433 (descr. - WI)

Anthomyia despecta Walker, 1852: 364 (descr. - "Brazil")

Coenosia antica Walker, 1852: 367 (descr. - US)

Coenosia pininculina Thomson, 1868: 599 (descr. - Brazil: Guanabara, Río de Janeiro)

Limnophora rufipes Bigot, 1885: 272 (descr. - Mexico)

Hydrophoria calopus Bigot, 1885: 275 (descr. - Mexico)

Coenosia femoralis Wulp, 1896: 345 (descr. - Mexico: Orizaba, Chilpancingo in Guerrero, Mexico City and Vera Cruz)

Caricea insignis Stein, 1898: 257 (descr. - USA, Florida)

Anthomyia antica Stein, 1901: 186 (descr. - USA)

Coenosia insignis Stein, 1904: 483 (coll. rec. - USA, Florida)

Coenosia despecta Stein, 1910: 76 (coll. - rec. America)

Bithoracochaeta despecta Wolcott, 1923a: 227 (coll. rec. - PR)

Huckett, 1934: 61 (rev. key to NA spp.)

Wolcott, 1936: 369 (coll. rec. - PR)

Wolcott, 1948: 496 (coll. rec. - PR)

Bithoracochaeta leucoprocta Curran, 1928: 87 (coll. rec. - PR)

Huckett, 1934: 61 (rev. key to NA sp.)

Malloch, 1934: 175, 225 (coll. rec. - Chile & Patagonia)

Wolcott, 1936: 369 (coll. rec. - PR)

Blanchard, 1937: 43 (coll. rec. - Argentina)

Séguy, 1937: 190 (monog. - key cat., dist.)

Wolcott, 1948: 496 (coll. rec. - PR)

Huckett, 1965: 874 (coll. rec. - WI, Central America, Brazil & US: Texas, Florida, Oklahoma to North Carolina)

Albuquerque, 1956d: 1 (coll. rec. - Brazil)

Pont, 1972: 36 (cat. dist. - PR, Cuba, Jamaica, Venezuela, Guyana, Perú, Brazil, Paraguay, Uruguay, Argentina & US)

Male length 3.4 to 3.7 mm. Black, covered with gray pruinosity; antenna covered with silvery pubescence, second segment almost yellow; arista dark brown; frons black pruinose; palpi brown. Notum with a wide rusty-brown central vitta coalesced on mesonotum with 2 lateral vittae on dorsocentral area, central vitta extending to base of scutellum, the 2 most lateral brown vittae coalesced with the dorsocentral vitta in the

pronotum extending backward and laterally up to basal lateral part of scutellum. Legs yellow except brownish-black coxae and dorsal spot at tip of fore, mid and hind femora. Halter yellow, reddish tinged at base. Calypter yellowish-white; wing with smoky-brown tinge. Abdomen with dorsal central brownish-black vitta coalesced with transverse vitta on apical half across the entire tergite, well-shown on segments 2 to 4; central vitta of segment 5 only widened apically.

Five frontals, second very weak, about half of the first in size, first and third cruciate; fourth and fifth reclinate; 1 small, slender, proclinate interocellar pair; 1 reclinate internal vertical pair; 1 small external vertical pair. Vibrissae very well-developed with 1 pair above and 2 pairs of setulae below.

One humeral pair; 1 lateral; 1 posthumeral; 1 presutural and 2 postsutural dorsocentrals; 2 notopleurals; scutellars: 1 preapical pair, 1 well-developed pair subbasal; prosternum bare; 1-2 propleurals; 1-2 stigmatals; mesanepisternum with 3 very stout setae interspersed with 3 weak, thin ones; 3 katepisternals in an equilateral triangle, a macroseta between them.

Fore femur with a row of short anterodorsals, posterior row larger basally than apically, posteroventral to ventral row of 5 very long, erect setae; fore tibia with 1 very long posteroventral a little beyond middle part of tibia; 1 large preapical posterior and 1 posteroventral; 1 anterodorsal and 1 dorsal preapical; first tarsal segment with ventral well-developed seta basally. Mid femur with anterodorsal and anteroventral row of short stout setae; 2 stout, parallel preapical posterior setae

and 2 stout anterior setae on apical half; ventral row with 4 very large, stout setae interspersed with smaller ones; mid tibia with 1 long anterior anteroventral a little beyond middle of tibia; 1 posterior as long as and stouter than previous one; 1 anterior apical, 1 apical ventral and 1 apical posteroventral; 1 apical posterior. Hind femur with conspicuous row of setae, biggest setae at base, an anteroventral row with a large seta on apical 1/3; 2 apical anterodorsals; 1 posterodorsal; 4 stout posteroventrals with very short intermediate ones; hind tibia with 1 anterior; 1 anterodorsal; 1 posterior posteroventral absent, close to middle; preapically 1 anterior and 1 dorsal seta, 1 apical ventral; hind tarsi with a well-developed ventral seta basally on first segment.

Abdomen covered with many clothing setulae; tergites 4 and 5 with a median and 1 apical transverse row of setae stouter and longer than the others.

Female length 3.7 to 4.5 mm. Identical to male in color; except larger brownish-black band on dorsal part of fore femur and larger spots on mid and hind femora.

Specimens examined:	11 (2m, 3f, 6 sex unknown) from Cuba and 5 Puerto Rican localities:
Adjuntas	1f, Guilarte Peak; Feb. 13, 1954, J. Maldonado & S. Medina
Corozal	1f, 1-1-10; G. N. Wolcott (as *B. despecta* and without head)
Isabela	1m, Guajataca For.; Jul. 22, 1955; collected at light; Ramos & Maldonado

Luquillo	1m, El Yunque; Mar. 20-22, 1954, J. Maldonado & S. Medina
Utuado	1f, Río Abajo For.; Rd. 621; by Caladium colocasia covered creek bank; Feb. 29, 1965, SMG
CUBA, WI	6 specimens from Coquillett collection (NMNH)

Bithoracochaeta varicornis (Coquillett) (Plate XVI, Fig. 66)

Coenosia varicornis Coquillett, 1900: 256 (descr. - PR: Bayamón, Aguadilla, Utuado, Fajardo, Arroyo, Vieques Is.)

Aldrich, 1905: 562 (cat. - distr. PR)

Stein, 1919: 162, 178 (cat. - distr. PR)

Wolcott, 1923a: 226 (coll. rec. - PR)

Wolcott, 1936: 368 (coll. rec. - PR)

Séguy, 1937: 219 (cat. key to spp., distr.)

Bithoracochaeta varicornis Curran, 1928: 88 (coll. rec. - PR)

Malloch, 1934: 327 (coll. rec. - Chile & Patagonia)

Wolcott, 1936: 369 (coll. rec. - PR)

Huckett, 1934: 61 (rev. key to NA spp.)

Wolcott, 1948: 496 (coll. rec. - PR)

Albuquerque, 1956d: 10 (cat., distr. - NA)

Pont, 1972: 37 (cat., distr. - PR: Aguadilla, Arroyo, Bayamón, Fajardo, Utuado and Vieques Is.)

Male length 3.2 to 4.0 mm. Antenna yellow except segment 1 which is dark brown, almost black; arista dark brown. Facial ridge yellowish when viewed from the front. Palp yellowish-brown with black setae. Frontal vitta black pruinose; when viewed from the front it looks silvery-white

pollinose; frontal triangle whitish; parafrontalia silvery pollinose; ocellar triangle light ferruginous.

Thorax dark brown to black covered with cinereous pollinosity; a broad central vitta extending to near apex of scutellum, a narrow one at each side, central one reaching very close behind suture; additional vittae at sides of humeri, running to middle of metathorax. Femora dark brown with yellow apices; tarsi and tibia yellow. Calypter white; halter pale yellow.

Abdomen gray pruinose, terga 1 + 2 with spots almost coalesced on dorsum, not distinct as on terga 3 and 4; a dorsocentral vitta, brownish-dark on terga 3 - 5; lateral dark spots on 3 and 4 from middle extending to apex.

Arista shortly plumose on basal half; pedicel with a short black seta on dorsal part. Oral vibrissae very large; 3 quite distinct peristomials below antenna, 1 short one above; facial ridge bare or 1 seta above oral vibrissae; palp rodlike, somewhat broad at apex. Eyes separated by 4 times the distance between the posterior ocelli; 4 frontal pairs of setae: first and third cruciate, very long; second, hairlike; fourth, reclinate, small. Narrow frontal triangle extending as a line to frontal suture. Outer vertical very short, not differentiated; inner vertical long, stout, as long as or longer than frontals; 1 row of short postoculars; front inner ocellars 1 pair, long, thin, proclinate; 1 posterovertical.

Acrostichals 2 rows, short; 1 presutural and 2 postsutural dorsocentrals; 1 long outer, 1 long inner humeral; 1 short sublateral; 1 long

posthumeral; 2 notopleurals; 1 small intra-alar; 1 supra-alar; 2 postalars; 1 pair discal scutellars and a lateral slender, short pair, 1 cruciate subapical pair; prosternum and propleuron bare, 2 propleurals at lower edge, 1 longer than the other; 2 diverging stigmatals; mesanepisternal, only 1 can be seen on type but on one paratype there are 4, long and stout; 6-9 microsetulae in front of these, and 2 groups of setae each; mesokatepisternal, 1 or 2 on type, 4 very strong and a row of 4-5 interspersed setae extending ventrally in paratypes; katatergite very shortly pilose, whitish-yellow.

Fore coxa with 4-5 well-developed rows of setae on anterior to anteroventral sides; fore femur with 1 dorsal to posterodorsal row of short, erect setae; 2 stout posterior rows, 1 stout seta near base; 1 posteroventral row, longer at apex on apical half; very short ventral rows; fore tibia with 1 long anterior preapical row running to anteroventral side; 1 long seta at middle; 1 long preapical anterodorsal; 1 long preapical dorsal and 1 posterodorsal of the same size; fore tarsus with long rows of setae longer than the setae on tibia; fore tarsus ventrally at base with a comblike patch of short, appressed setae, with 1 seta longer than the others. Mid coxa with 6-7 stout setae, comblike, on ventral to anterior side; mid femur with 1 row of short but distinct setae; 1 short preapical on posterodorsal side; 1 row of long, erect posteroventrals, longest at middle; 1 row of very short anteroventrals, somewhat differentiated at middle; mid tibia with 1 very long seta at middle as long as half of tibia length; 1 very long posterior at middle, 1 thick posteroventral; 1 short posterodorsal and 1 thick apical anteroventral;

mid tarsus as above, but without long basal ventral setae. Hind coxa with 1 strong dorsal seta, apically on anterior side a comblike patch of long setae, number cannot be detected exactly on type because the specimen is mounted with the legs appressed together. Hind femur with 1 anterior very short row; 1 long anterodorsal row, on basal 2/3; 1 apical dorsal to posterodorsal; 1 row of 4 posteriors on basal 1/3, 1 row of long posteroventrals, longest bristles at middle, about half the length of the femur; 1 row of short anteroventrals, longest on basal 2/3; hind tibia with 1 long seta above middle of tibia; 1 long anterodorsal at middle as long or little longer than half of tibial length; 1 long posterodorsal at center; 1 long posteroventral above middle at same level as the posterodorsal; 1 preapical dorsal; 1 long preapical anterodorsal; 1 almost ventral apical seta; tarsus as with mesothoracic leg but with claws with short setulae dorsally.

Wing humeral plate with 1 long seta on upper margin; C-vein with 2 rows of short setae, only 1 long basally at inner and 1 at outer edge; vein R_{4+5} ending below wing tip, almost parallel to R_{2+3}; M_{1+2} ending below wing tip, r-m cross vein straight; m-cu almost straight, slightly sinuate or bent on lower part; calypters white, lower one very large, about twice the upper one.

Abdominal tergum 3 with a short, stout seta anteriorly on dark spot; tergum 4 with a strong macroseta anteriorly on spot; fifth with a discal and apical row of strong setae; sixth with 2 lateral short, slender setae; sterna 2-5 with rows of fairly long lateral setae, longest at

apex with interspersed smaller ones; sternum 5 almost V-shape at apex; sixth with microsetae at apical edge.

Female length 3.8 to 4.5 mm. Almost exactly as the male except the coloration and markings are somewhat darker. Antenna black with silvery pubescence, a white reflection on dorsum of second segment; postocellar longer than in male.

Specimens examined: 105 (32m, 59f and 14 specimens - sex undetermined) from 34 localities in Puerto Rico:

Aguadilla	2 specimens, paratypes; Jan. 1899; Aug. Busck
Adjuntas	1m, June 8-13, 1915
Aibonito	2f, June 1-3, 1915; and 1f, on 14-17, 14 (sic)
Arecibo	2f, June 24-26, 1915 (1 specimen without head)
Arroyo	1 specimen, paratype, Feb. 1899; Aug. Busck
Barceloneta	1m, at Plazuela sugarcane mill; on inflorescence of Setaria geniculata; May 6, 1965, SMG
Bayamón	2 specimens, paratypes, Jan. 1899; Aug. Busck and 1m, 1f; at Urb. Sierra Bayamón; on mixed vegetation by sidewalk; June 27, 1965, EM
Canóvanas	1m, Loíza Aldea Rd. 187, Jan. 22, 1969, SMG
Castañer	2m, 7f; at Limani AESb, Feb. 7, 1969; 3f, Feb. 10, 1969, and 1m, 2f; Feb. 11, 1969; Malaise trap
Coamo Springs	3f, July 17-19, 14; C. H. Curran Coll. Acc. 31144
Corozal	1 specimen, 1-1-20; G. N. Wolcott; 1m, Jan. 15, 1969, and 1f, Jan. 16, 1969, Malaise trap
Dorado	1f, on black light trap at sugarcane field, Feb. 12, 1964, SMG, 2m, 2f; at Dorado Riviera Hotel; swept from grass; Nov. 22, 1964, SMG & FR

Ensenada	1 specimen, Dec., 1960, A. Avilés
Fajardo	1 specimen, paratype; Feb. 1899; August Busck
Fortuna	1m, at AESb; Nov. 21-22, 1968, Malaise trap
Guánica	1m, Insular For.; July 6, 1953, JAR & JM, at light
Guayama	3m, 4f; on Guavate For. Rd. 179; on vegetation mainly Sida carpinifolia and Wedelia trilobata; Nov. 1, 1964, SMG & EM
Guayanilla	1m, Sept.-Nov. 1960, E. Murphy
Gurabo	1f, AESb, Nov. 4-5, 1968, and 1m, Nov. 11, 1968, Malaise trap
Jayuya	1f, 1-5 1915; C. H. Curran Coll., Acc. 31144
Luquillo	1m, Caribbean Nat. For. (El Yunque); Mar. 20-22, 1954, JM & SM; 2m, 2f; on Rd. 191, K 19.4; 2,000 ft.; on mixed vegetation by roadside; Jan. 10, 1965, SMG; 1m, at Molinderos Rd.; Apr. 28, 1965, SMG; 1m at Mount Britton Rd.; Apr. 28, 1965, SMG
Manatí	2m, 2f; June 27-29, 1915 (1 specimen from C. H. Curran Coll., Acc. 31144)
Mayagüez	1f, 1 specimen sex undetermined, Sept.-Nov. 1960, E. Murphy
Naguabo	1 specimen, grapefruit leaf; X-21-32; Anderson Mills & Faxon; San Juan No. 3351
Patillas	1f, Maunabo Rd. K 107.8, Aug. 27, 1968, SMG; 1m, and on same date as above but on K 109.8
Peñuelas	1 specimen, Sept. 1960, M. Santiago
Río Piedras	1m, 1f; Urb. San Gerardo; Feb. 20, 1965, taken on window, EM; 1m, 6f; along shore of a small pond; Jan. 24, 1965, EM & PM; 2f, at AES in ditch habitat with Commelina longicaulis, on Paspalum humboltianum; 1m, 1f and on Bos taurus; May 2, 1965, SMG & EM; 2f at AES; in wet, shaded area under Ficus benjamina tree; July 5, 1965, SMG; 4f along riverbed of Río Piedras; Apr. 25, 1965, EM

San Juan	1m, 1f; Feb. 11-14, 14; Acc. 31144; from C. H. Curran collection
Santurce	(As San Turce) 1f, 1.1. 1914
Toa Baja	2f, Toa Valley; on Panicum barbinode; Feb. 10, 1963, SMG
Trujillo Alto	1m, at Loíza Lake; on mixed vegetation by lake shore; Feb. 22, 1965, EM
Utuado	1m, Dos Bocas Lake, Rd. 146; Feb. 29, 1965, SMG
Vieques Is.	1m, holotype No. 4375 as Coenosia varicornis (NMNH); Feb. 1, 1899; Aug. Busck and 3 specimens, paratypes same data as type
Yabucoa	1m, 2f; at sugarcane mill; among mixed grasses, Panicum barbinode, Digitaria sanguinalis, Paspalum millegrana and Axonopus compressus; May 14, 1965, SMG

Remarks: All type specimens mounted on left side, legs folded, but still the most important characters are visible for a diagnosis. Some specimens lack wings, tibiae and tarsi.

Genus Atherigona

Atherigona Rondani, 1856

Atherigona Rondani, 1856: 97 Type-species; Coenosia varia Meigen (orig. des.)

Acritochaeta Grimshaw, 1901: 41 (as gen.) Type-species: pulvinata Grimshaw (mon.) = orientalis Schiner

Atherigona Schnabl & Dziedzicki, 1911: 181 (rev. - subfamily)

Atherigona Stein, 1913: 529 (rev. gen. of Anthomyiidae)

Atherigona Aldrich, 1921: 93 (rev. American spp.)

Atherigona Malloch, 1921b: 106 (gen. synopsis of subfamily Coenosiinae)

Atherigona Ramachandra Rao, 1924: 330 (larval characters and habits)

Atherigona Huckett, 1936: 187 (rev. NA spp.)

Atherigona Séguy, 1937: 224 (monog. of family)

Atherigona Emden, 1940: 97 (larval and adult habits and characteristics of spp.)

Atherigona Bohart & Gressitt, 1951: 110 (habits, distr. - Guam)

Atherigona (Acritochaeta) Hennig, 1952: 62 (rev. - Kleiden Sunda Is.)

Atherigona (Acritochaeta) Huckett, 1965: 857 (cat. of NA spp.)

Atherigona Snyder 1965: 239 (rev. - Micronesia spp.)

Atherigona Pont, 1972: 24 (cat. of ASUS spp.)

Head frontal vitta without cruciate setae. Eye bare, almost square to subrectangular in profile, elongate with almost parallel sides. Frontal vitta broad, more or less equal in both sexes. Antennal segment 3 anteriorly angular, large prominent, at least 3 times longer than pedicel. Arista almost bare, very shortly pubescent. Reclinate parafrontals, 1 pair adjacent to ocellar triangle. Palpus very stout, as long as proboscis.

Thorax with prominent humeri with 2 large humerals; 1 presutural and 3 postsutural dorsocentrals not very well-differentiated, except the last 2 postsuturals; 3 katepisternals almost in an equilateral triangle; 1 prealar indistinguishable, very short or absent; wing anterior cross vein (r-m) ending before the end of the first (R_1) vein, barely beyond end of S; costa (C) somewhat bowed before tip of S, widening cell C, vein 6 (Cu_2+A_1) not reaching wing margin. Lower calypter much exceeding upper one.

Hind femur with 1 or 2 subapical anteriors, without strong posteriors. Fore femur with posteroventrals restricted to distal 1/3.

Male hypopygium protruding. Penis dilated and trifoliate at apex in Atherigona s. str.

The genus Atherigona has been divided into 2 subgenera, Atherigona and Acritochaeta. The subgenus Acritochaeta was described as a genus by Grimshaw in 1901 with the sole species, A. pulvinata, now considered a junior synonym of orientalis Schiner. Stein (1913) at first regarded the group as a genus, but later (1919) he reduced it to a subgenus of Atherigona. Malloch (1923b), based on the nature of the secondary sexual characters, refrained from recognizing the group. Ramachandra Rao (1924), in studying the habits of some of the Indian species of Atherigona, found that they could be placed satisfactorily in two distinct groups according to their larval habits, thereby supporting the proposed division of the genus into two groups on the basis of the presence or absence of certain adult male characters.

Emden (1940) recognized three very well-defined groups, the first two of which are recognized in the male sex, among other characters, by the lack of the long-stalked trifoliate process of the superior forceps which is invariably present in the third group to which Atherigona s. str. belongs. All the species which possess this process have modified palpi in the male and most of them have, in the same sex, an unpaired knob-shaped, bilobed, bifurcate or tridentate process on the fifth abdominal tergite which he named the hypopygial prominence, which is directed below and backward.

The larvae of the third group, (Atherigona s. str.), so far as known, are phytophagous, boring mainly in stems of grasses, and often very noxious to cereal crops, according to Emden (1940). Adult males are readily recognized by the characteristic trifoliate processes and hypopygial prominence of the genitalia. The palpi are small, often subclavate, with basal, long, hairlike setulae. Females have relatively small palpi which are usually distinctly curved, being sickle-shaped according to Emden (1940) and Snyder (1965).

The larvae of the first two groups (Acritochaeta) are usually predaceous or scavengers in organic matter and decaying fruits respectively. Although numerically fewer in species than Atherigona s. str., members are more diverse structurally and at least four subgroups are known. At least one group is known in the subtropics of North America as well as in the New World tropics. This group is represented in the fauna of Puerto Rico and other West Indian islands by Atherigona (Acritochaeta) orientalis Schiner. The group is defined as species of Atherigona s. lat. in which the male has a shallow dorsal impression on the distal region of fore femur, the male genitalia lack a trifoliate genitalic process and the hypopygial prominence, and both sexes have relatively large and scarcely curved palpi.

Atherigona (Acritochaeta) orientalis Schiner (Plate XIX, Fig. 87)

Atherigona orientalis Schiner, 1868: 295 (descr. - Nicobar Is., Tellnschong)

Coenosia excisa Thomson, 1868: 560 (descr. - Burma (Ross Is.))

Atherigona trilineata Stein, 1900: 157 (descr. - New Guinea, Friedrick Wilhelmshafen (=Madang))

Acritochaeta pulvinata Grimshaw, 1901: 42 (descr. - Hawaii, Olao)

Atherigona varia Malloch, 1921b: 107 (misidentification of A. varia Meigen)

Ahterigona pulvinata Aldrich, 1921: 94 (coll. rec. - Cuba, Florida, Cook Is., Fiji, Hong Kong, Brazil, Mexico, Panamá, Dominican Republic, Galápagos Is., Charles Is. and Hawaii, Honolulu, list of hosts)

Wolcott, 1923a: 226 (coll. rec. PR)

Antherigona excisa Wolcott, 1936: 368 (coll. rec. - PR)

Séguy, 1937: 225 (cat. distr. - world)

Wolcott, 1941: 117 (coll. rec. - PR, same as Wolcott, 1936)

Wolcott, 1948: 495 (coll. rec. - PR, same as Wolcott, 1936 and 1941)

Tucker, 1952: 351 (coll. rec. - Barbados)

Snyder, 1965: 245 (coll. rec. - Micronesia (except Gilbert Is.)); 202 (Fig. 4b, (head); 243, 240 (key), 245 (Fig. 14c (palpi); 246 (Fig. 15c (leg male))

Atherigona (Acritochaeta) orientalis Huckett, 1936: 191 (rev. gen. subfamily Coenosiinae, NA)

Huckett, 1965: 875 (cat. distr. - Nicobar Is.; US: California to Georgia and Florida; Burma (Ross Is.) and Hawaii

Atherigona orientalis Beatty, 1944: 151 (coll. rec. - St. Croix)

Bohart & Gressitt, 1951: 111 (coll. rec. - Guam)

Miskimen & Bond, 1970: 70 (coll. rec. - St. Croix)

Pont, 1972: 24 (cat. distr. - Nicobar Is.; Tellnschong; Mexico; El Salvador; Panamá; Bermuda Is.; VI; PR; Barbados; Cuba; Colombia; Ecuador; Perú; Venezuela; Brazil; Galápagos Is.; Ross Is.; New Guinea; Madang and Hawaii)

Male length 2.7 to 3.7 mm. Back of head, mesonotum and most of pleura black in ground color, remainder yellow. Head with sparse to dense gray pruinescence. Antenna blackish apically, fulvous basally; frontal vitta fulvous; palp long, brown to brownish-yellow.

Thoracic dorsum generally dark in male, with 3 darker but narrow longitudinal vittae. Humeri, apex and dorsolateral margins of scutellum pale yellow to yellow. Wing hyaline; calypter white; halter pale yellow. Legs mostly yellow, except fore femur with apical dark area, which is narrow in the male and broad in the female. Mid and hind tibia fulvous to light brown with fuscous bands in Puerto Rican material.

Abdomen mostly yellow with sparse gray pruinosity; brown to dark brown dorsal spots on first apparent tergum to fourth which are more extensive and subshiny than those on one; spots on fourth concolorous and with indications of a longitudinal median vitta.

Third antennal segment about four times longer than the pedicel; arista shortly pubescent. Palp long; several stout, upcurved postoculars. Mesonotum with rather coarse and scattered small setae; scutellars: 1 long apical pair, 2 lateral pairs, and 1 small discal seta; the lower katepisternals almost below the hind one but not approximate to it. Fore femur apically with a tuft of short microsetae; fore tibia without setae;

mid tibia with 1 small posterior seta near middle; hind tibia with 1 small and 1 stout anteroventral; and 1 posterodorsal. Claws and pulvilli short.

Wing vein 3 (R_{4+5}) curving backward before tip, thus ending very slightly behind the extreme apex; cross vein m-cu almost straight.

Abdomen broad near base; first two segments large, dorsally the second visible tergite broad on its deflected edges.

Female length 3.4 to 4.0 mm. General color as in male but fore legs much more infuscated, only the coxae and base of femora yellow; tarsi black. Fore femur without tuft of microsetae; palpus widened and considerably blackened, prominent. Abdominal coloration similar to that of male, with 4 pairs of almost triangular brown spots on first and second segments, two other pairs smaller, roundish, black, with a trace of a dark median stripe.

Third-instar larva: length 8.0 to 9.0 mm (distended). White to very pale yellow in color with dark brown to black posterior spiracle protuberances. Prothoracic spiracles of the same color as the body, with five papillae. Body segmentation very distinct, each segment ventrally at the junction with two creeping welts bearing tiny spinelike projections or welts forming comblike or broken rows. Mouth hooks separated, close together, dental sclerite prominent; hypostomal and cephalopharyngeal sclerites not fused, united but with a distinct separation groove; cephalopharyngeal groove wide, short, not elongate, extending to about half the distance of the cephalopharyngeal sclerite; ventral cornu

about 1/3 longer than dorsal cornu; cornua with short vertical flare.

Puparium: Length 4.1 to 5.0 mm. Color light-to-dark-brown; barrel-shaped. The anterior end disk consisting of 3 concentric or circular bands, each one with many concentric thickenings; the central band bears the anterior spiracles and mouth in the center. During the emergence of the fly, the anterior central band pops up. Segmentation visible, the whole puparium is finely transversely wrinkled. Posterior spiracles on dark brown protuberances, flat, with three C-shaped spiracular slits encircled by a dark brown to almost black ring; anal opening sinuous, surrounded by a strong chitinous border.

Habits: Adults have been observed feeding on or visiting fresh to decaying plant and animal material including human and animal species. Snyder (1965) reported it as one of the most abundant species of flies on screened windows in Natal, Brazil.

Bohart & Gressitt (1951) reported that the larvae may be predaceous on *Dacus* spp. and *Limnophora plumiseta*. Apparently this species is not an obligate predator since it is known to breed in a great variety of decaying material upon which the adults also feed.

This species belongs to a group in which the males have a very well-developed depression or concavity on the upper side of the fore femur near its apex. This is the only species of that group in which there are no exceptional developments of the leg armature and the wings have no markings.

Specimens examined: 207 (87m, 107f and 13 sex unidentified) from 22 localities in Puerto Rico, Cuba and the Dominican Republic:

PUERTO RICO:

Aguirre	2f, sugarcane mill; Nov. 27-28, 1968, Malaise trap
Arecibo	1f, Cambalache For.; on mixed vegetation near ground, June 16, 1965, SMG
Barceloneta	1m, 1f; (San Juan No. 3295); on corn leaf; Dec. 12, 1932, Anderson & Mills
Bayamón	1f, Tres Palmas (#46-13356); reared, inside corn ear; VIII-1946, K. Young
Camuy	1f, Guajataca, Rd. 119, K 9; on grass along roadside; Sept. 3, 1968, SMG
Cayey	1m, 1f; Salinas, Rd. 1, K 80; Nov. 22-25, 1968; and 2f, Nov. 26, 1968; Malaise trap. 2f, Carite For.; Dec. 27-30, 1968, Malaise trap
Corozal	2m, 1f, AESb; Jan. 15, 1969; 1f, Jan. 16, 1969; 1f, Jan. 17, 1969; 1m, 4f, Jan. 19, 1969; 3f, Jan. 20, 1969; and 1f, Jan. 24, 1969; Malaise trap
Dorado	1m, 1f; Dorado Riviera Hotel Farm; swept from grass, Nov. 22, 1964, SMG & FR
Ensenada	3f, Sept.-Nov., 1960; and 1 specimen, Dec. 1960; A. Avilés
Fortuna	4m, 4f; AESb; Nov. 15-18, 1968; 2m, 1f; Nov. 19, 1968; and 2f, Nov. 21-22, 1968; Malaise trap
Gurabo	1m, 1f; AESb; Nov. 7, 1968; and 2f, Nov. 8, 1968; Malaise trap
Humacao	5m, 2f; Naguabo Rd. 3, K 81.6; on flowers of *Lagerstroemia speciosa*; Jul. 16, 1965, GR & JGT

Isabela	2m; (San Juan No. 1223); on string bean pods; 14m, 7f; AESb; in a Carica papaya plantation; Nov. 6, 1964, SMG, RB & GR. 1f, on leaf of Gossypium (cotton), many leaves of the plants were aphid-infested, and 1m, 4f; reared from immature taken on rotting fruit of Carica papaya; Nov. 11, 1964; and 2m, 1f; Jan. 23, 1969; 1f; Jan. 24, 1969; 4m, 2f; Jan. 25, 1969; and 2m, 1f; Jan. 27, 1969; all in Malaise trap
Juncos	12m, 12f; sugarcane mill; Clitoria ternatea leaves; May 20, 1965, SMG
Mayagüez	1m, mandarin; F. H. B. (San Juan No. 281); I-12, 1926; 1f, July, 1943, JAR; and 1f, on Aug. 1-31, 1953, JMC
Río Piedras	1f, P.R. Acc. No. 857-1914; July 31, 1914, T. H. Jones; 4m, 8f; Acc. No. 129-16; reared from decaying eggplant on 4-10-1916; RTC, 1f, Acc. No. 437-16, 7-21-16, R. T. Cotton; 1f, AES; on Dyctiosperma album; Sept. 9, 1964, SMG; and 3m, 9f on AES; reared from rotting fruit of Artocarpus communis (breadfuit); and 3m, 5f, July 7, 1965, on fruit of Mangifera indica
Salinas	1f, June 5, 1961, JMC
San Juan	(San Juan No. 2176); 2m, dasheen root; Mar. 30, 1932, Anderson, 1 specimen San Juan, reared on corn in 1936; on green corn ears, 2 specimens as San Juan 9558, VI-20-49, bearing number 44-10280; 3 specimens; from an unidentified weed, VI-22-50, bearing numbers N.Y. 112605 and 50-9316; all at NMNH
Santa Isabel	3m, 3f; reared in lab. from rotten fruit of Solanum torvum; May 11, 1970, JMC
Toa Baja	2m, 2f; Toa Valley; taken over rat carcass; May 5, 1965, SMG
Yabucoa	1m, 1f; at sugarcane mill; among mixed grasses, Panicum barbinode, Digitaria sanguinalis, Paspalum milegrana and Axonopus compressus; May 14, 1965, SMG

CUBA, WI

Havana	1m, 1f; F. H. B. No. N.Y. 5510; ex tomato; 2 specimens, J. M. Aldrich collection (as Atherigona pulvinata)
Isle of Pines	3 specimens, Nova Gerona, VI-29-50, Berg & Link; 1 specimen, Santa Fe, VI-29-50, Berg & Link
DOMINICAN REPUBLIC, WI	1f, S. Frnsco. (=San Francisco) Mts.; 4-9-05, Aug. Busck

Remarks: Recorded from Puerto Rico by Wolcott (1923a, 1936, 1941 and 1948) from decaying eggplant, oranges, string beans and tomatoes; Anacardium occidentale, resting on mandarin oranges, from kernels of corn, and from roots of Caladium colocasia; from Barbados by Tucker (1952) reared from cotton bolls infested with pink boll-worm, also possibly from rotten tubers of cassava, Manihot utilissima.

Aldrich (1921) recorded it from Cuba; Florida (in bell peppers and tomatoes), Cook Ils. (in avocado); Fiji (decaying fruit); Hong Kong (chili peppers); Brazil; Mexico (rotten oranges and tangerines); Panamá; Dominican Republic; Galápagos Is. (Charles Is.) and Honolulu, Hawaii, (alligator pear, bell peppers, umbrella tree nuts and lily bulbs).

Bohart & Gressitt (1951) recorded it from Guam in fresh and old carrion, rotten potatoes, Dacus-infested cucurbits, cracked and rotting tomatoes, bread-fruit, rotting ears of corn, rotting coconut meat, juice and fibers, rotting green papaya, excrement, and attacking larvae of Dacus cucurbitae and Limnophora plumiseta.

Snyder (1965) recorded it from Micronesia (except Gilbert Is.) from light trap, rotten male sago palm, reared from bread fruit, on garbage

dump, human feces, dead marine worm in log, and beating ferns.

Subfamily Lispinae

The members of this subfamily can be distinguished by the presence of a group of setulae located at center of the anepimeron (sometimes reduced to 2-3 short ones) and 1 upper fore mesokatepisternal. Eyes equally separated in both sexes; usually 4 frontals, 2 of which are reclinate; 1 inner and 1 outer vertical pair; without cruciate frontals or proclinate upper orbitals; parafacialia usually with setulae; palpi conspicuously dilated or expanded at the apex; proboscis short; arista with 10-14 rays above and sometimes only 4 beneath; thoracic squama projecting; longitudinal wing vein short. Thorax with 2 presutural and 3-4 postsutural dorsocentrals; 2-3 katepisternals; scutellars: 1 lateral and 1 apical pair, basals very weak if present.

Remarks: The larvae so far as known are aquatic, and the adults frequent the shores of rivers and bodies of water according to Séguy (1923) and Johannsen (1935).

Geographic distribution: Found in the Palaearctic and the Nearctic Regions. There are more species in Africa and the southern part of Asia than in tropical or South American regions.

Genus *Lispe*

Lispe Latreille, 1796

Lispe Latreille, 1796: 169 Type-species: *Musca tentaculata* de Geer (sub. mon. Latreille, 1802: 462)

Lispa Aldrich, 1913: 126 (rev. NA spp.)

Lispa Curran, 1928: 90 (key to PR spp.)

Lispe Malloch, 1934: 227 (cat. of Chile and Patagonia spp.)

Lispa Séguy, 1937: 181 (monog. of family)

Lispe Snyder, 1954a: 1-40 (rev. of Nearctic, spp.)

Lispe Snyder, 1965: 260 (rev. of Micronesia spp.)

Lispe Huckett, 1965: 988 (cat. NA spp.)

Lispe Pont, 1972: 33 (cat. ASUS spp.)

Eyes widely separated in both sexes. Interocular space without cruciate setae. Face vertical and quadrangular; 1 or 2 strong vibrissae. Parafacialia often hairy above vibrissae and below anterior parafrontals. Palpi projecting, enlarged and spatulate distally. Antennal segment 3 oval-cylindrical; arista ciliated on the upper half only, villous below; 2 presuturals and 3 or 4 postsutural dorsocentrals; 2-3 katepisternals, if 3, the third is sometimes hairlike. Wings (Plate XVI, Fig. 65), without reflections or colored transparencies; wing veins 6 and 7 subequal in length, subparallel and extending almost to margin of wing. Lower squamae projecting. Abdomen as long as wing. In males, the tarsi of some species show particular deformations or bear special appendices.

Lispe is one of the more easily recognized genera of Muscidae by its rather large and either suddenly or gradually apically dilated palpi and setulose anepimeron. Most Nearctic species possess one or more hairlike setae on metepisternum.

Snyder's (1954a) studies of certain characters of the terminalia of both sexes led him to segregate the Nearctic species of Lispe into 3

distinct groups, and to correlate the presence or absence of certain bristles on the tibia with some genitalic characters.

Remarks: The larva is amphibious or aquatic and zoophagous, with the body tough and bare.

Adults are commonly found along with ephydrids in the environments noted above. The complete life cycle of no species has been fully studied or described, and in only a few Holarctic and Palaearctic species have one or more of the larval instars been figured. Lamborn (1920) and Cuthbertson (1937) have reported that adults of several African species are predaceous on *Anopheles* larvae, pupae and emerging adults. It is possible that one or more of the Puerto Rican species may have similar habits, though I did not observe it in the species collected.

Adults are cautious and exhibit great skill in avoiding capture and they blend quite well with the general background. I suspect that there are more *Lispe* in Puerto Rico than the two species reported here, and more specialized collecting along margins of brackish pools and edges of fresh-water on land should yield more species.

Key to the species of *Lispe*

1. Legs entirely dark brown to black, hind tibia with 3 anterodorsal (2 about middle and 1 preapical), 1 dorsal preapical and 1 apical anteroventral setae . . . *L. serotina* Wulp

   Legs dark brown except for yellow to yellowish-red tibia and apex of femora; hind tibia with 1 anterodorsal, 1 anteroventral and 1 stout, preapical dorsal seta . . . *L. nasoni* Stein

Lispe nasoni Stein

Lispe nasoni Stein, 1898: 280 (descr. NA - USA: South Dakota, Illinois, Georgia)

Séguy, 1937: 184 (cat. distr., summary of hosts and larval habits)

Snyder, 1954a: 16 (cat. distr. - US, Canada, Cuba, PR, VI)

Huckett, 1965: 878 (cat. distr. - Bahama Is., USA: S. Dak., Ill., Ga., s. to Calif. and Fla.; Alaska to Quebec

Pont, 1972: 34 (cat. distr. - Bahama Is., VI, Cuba, PR, NA)

Lispa rufitibialis Coquillett, 1900: 256 (misidentification; coll. rec. - PR)

Wolcott, 1923a: 226 (misidentification; coll. rec. - PR; Culebra Is.)

Curran, 1928: 90 (misidentification; coll. rec. - PR)

Wolcott, 1936: 369 (misidentification; coll. rec. - PR; same as Wolcott, 1923a)

Lispa masonica Aldrich, 1913:142 (rec. - distr. NA)

Lispe rufitibialis Wolcott, 1948: 496 (misidentification, coll. rec. - PR, same as Wolcott, 1923a, 1936)

Male length 5.4 to 5.8 mm. Reddish-brown to ferruginous; antenna dark brown, apex of second segment, pedicel and arista ferruginous or reddish-brown; palpi yellow. Frontal vitta dark brown with reddish-brown (ferruginous) frontal triangle. Parafrontalia and parafacialia golden pollinose. Legs dark brown except for yellow to yellowish-red tibiae and apex of femora.

Thorax blackish-brown with gray to cinereous pruinosity; fine, rather faint, brownish vittae, laterally almost coalesced, median one most distinct, extending to scutellum. Wing with brownish tinge; halteres yellowish; calypter white with a yellowish tinge.

Abdomen brownish-black on dorsum, gray pruinescent on remainder; terga 3 and 4 with a narrow, gray-yellow to white, central band, faint in terga 1 and 2, coalesced with transverse apical band of same color, somewhat wider at sides; outer basal edge of tergum, grayish-yellow to white; segment 5 with apical half of the same color; sixth grayish-yellow, pruinose.

Frontal triangle extending to base of antennae. Parafacialia setulose with a dorsal, middle and ventral group of setulae. About 6 setae on parafrontalia. Interocellar as large as first cruciate frontal pair; one stout inner and outer vertical seta. Series of very minute parafrontals; about 4 small postocellar microsetae; 1 upper and 1 lower pair of orbitals.

Thorax with 2 pairs of humerals; 2 pairs of sublaterals; 2 presutural and 4 postsutural dorsocentrals, the anterior 2 pairs small; 2 notopleurals; 1 supra-alar; 2 postalars; 2 subapical scutellars very long, stout, and subbasally located. Mesanepisternals: 3 stout and 4 slender shorter ones; 4 very distinct katepisternals, stout, upper 2 about twice the length of the other two; anepimeral setae normal; meron with several microsetae; mesokatepimeron bare; a very strong stigmatal seta, 2 very weak ones above and 1 below these; 2 well-developed propleurals; metathoracic posterior spiracle with posterior rim

setulose and 2-3 large black setae. Mesanepisternum with numerous crinkled setulae on the upper part.

Fore coxa ventrally with two rows of very stout setae, apex of coxa with a transverse row of short setae; fore femur with 1 posterodorsal row and 1 posterior to posteroventral row of setae; fore tibia with 1 posterior seta at 0.40 and 1 posteroventral preapical, 1 anterior to anterodorsal at 0.40 and 1 preapical. Mid femur with 2 apical, stout, posterodorsal to posterior setae; a row of anterior to anteroventrals; two setae very long near middle, one stout anterior near middle, mid tibia with anterior to anterodorsal at basal third; 1 stout posterior at 0.40; stout, apical dorsal, posteroventral, ventral and anteroventral. Hind femur with a well-developed row of anterodorsals, 3 to 5 stout anteroventrals on basal half and 2 or 3 posteroventrals; hind tibia with 1 anterodorsal row of bristles, 1 stout at 0.40; 1 anteroventral at 0.35 and 1 long, stout dorsal preapical.

Abdominal setae inserted in small spots. Fifth segment with apical row of strong setae; third and fourth with 1 or 2 lateral, strong groups of setae.

Female length 5.3 to 6.3 mm. Similar to male but darker and stouter.

Specimens examined:	36 (22m, 11f and 3 sex unidentified) from 9 localities in Puerto Rico, Cuba and Virgin Islands (St. Thomas)
Aguas Buenas	1m, 1f; "Casa de Cursillos"; 1,500 ft.; VI-23, 1965, SMG & LFM; 1m, ibid., but on Aug. 2, 1965, SMG

Añasco	1f, Col. Tres Hermanos; on wet soil at a sugarcane field; Mar. 2, 1970, LFM & SMG
Castañer	1m, Limani AESb, Feb. 7, 1969; 1m, 4f; Feb. 10, 1969, and 3m, 2f; Feb. 11, 1969; Malaise trap
Cayey	1m, Salinas Rd. 1, K 80; Nov. 27, 1968, Malaise trap
Fajardo	1 specimen (NMNH), Feb. 1899, Aug. Busck, originally identified as Lispa rufitibialis, later correctly identified by Snyder as L. nasoni
Fortuna	2f, AESb; Nov. 15-18, 1968; Malaise trap
Isabela	1m, AESb; Jan. 25-26, 1969; Malaise trap
Mona Is.	1m, IV-1935, AMC Expd., identified as Lispe rufitibialis
Río Piedras	1m, along riverbed of Río Piedras; Apr. 25, 1965, EM; and 1f ibid., but in ditch habitat with Commelina longicaulis and Caladium colocasia; May 2, 1965, SMG & EM
CUBA	6m, Havana; Baker, from J. M. Adrich collection
VIRGIN ISLANDS	3m, 2 specimens (lack abdomen), St. Thomas, 3 mi. from C.A.; swept from grass; May 31, 1917, Harold Morrison; 2m, Charlotte Amalie; June 2, 1917 (92) Harold Morrison

Lispe serotina Wulp

Lispe serotina Wulp, 1896: 342 (descr. - Mexico: Veracruz, Atoyac)

Pont, 1972: 34 (cat. distr. - Mexico, PR, Guyana, Brazil, Paraguay)

Lispa rufitibialis Coquillett, 1900: 256 (misidentification, coll. rec. - PR)

Wolcott, 1923a: 226 (misidentification, coll. rec. - PR)

Curran, 1928: 90 (misidentification, coll. rec. - same as Wolcott 1923a)

Wolcott, 1936: 369 (misidentification, coll. rec. - same as Wolcott, 1923a)

Lispa edwardsi Malloch, 1934: 278 (descr. - Paraguay, Encarnación)

Lispe rufitibialis Wolcott, 1948: 496 (misidentification, coll. rec. - PR)

Male length 3.8 to 4.5 mm. A small species with much the appearance of L. nasoni Stein. Head black, frontal triangle slightly brown pollinose; antenna black, palp brownish-yellow. Anterior half of orbits, upper third of parafacialia and gena yellow pollinose, remainder of parafacialia and gena white pollinose. Thoracic pleuron quite densely gray pollinose on sides. Wing hyaline; squama yellowish-white, knob of halter brownish-yellow; legs black. Abdominal tergites with very large, shiny black pair of spots, separated by a narrow, grayish-white, dusted mark. The anterior lateral angles of each tergite densely white pollinose.

Palp only slightly dilated. Frontalia about 1/3 the head width, with the usual bristles, slightly wider at middle. Parafacialia narrow, with one series of fine hairs.

Two presutural and 4 postsutural dorsocentrals, anterior two pairs behind suture much reduced in size; 1:2 katepisternals.

Fore tibia with 1-2 short anterodorsals and 1 posterior almost at 0.25 (the longest); mid femur attenuated apically, with 1 anterior at 0.40 and 2 preapical posteriors; mid tibia with 1 anterodorsal and 1 posterior beyond middle. Hind femur with 1 long, fine ventral seta about 0.25 from

base, 1 shorter and 1 stronger anterodorsal just before middle; 1 anteroventral and 1 short preapical posteroventral; hind tibia with 3 anterodorsals (2 about center and 1 preapical) and 1 apical anteroventral.

Wing rather small; first posterior cell slightly narrowed apically.

Abdomen short and stout; fifth tergite with 4 apical and 2 lateral strong bristles.

L. serotina is distinguished from the other species by the entirely dark brown to black legs and the different chaetotaxy of the femora and tibiae.

Female length 4.5 to 5.4 mm. Similar to male, darker and stouter.

Specimens examined: 12 (4m, 8f) from 7 localities in PR:

Aguas Buenas	1m, 1f; "Casa de Cursillos", on glass door; Aug. 2, 1965, SMG
Añasco	1f, VII-3, 1917; H. Van Zwaluwenburg, (from J. M. Aldrich collection)
Castañer	1m, Limani AESb; Feb. 10, 1969; Malaise trap
Fajardo	1f, Feb. 1899; Aug. Busck, (identified by Snyder as L. edwardsi)
Fortuna	1m, 4f; AESb; Nov. 15-18, 1968; Malaise trap
Isabela	1f, AESb; Jan. 25-26, 1969; Malaise trap
Vieques Is.	1m, Feb. 1899, Aug. Busck

Subfamily Limnophorinae

The members of this subfamily are distinguished by having aristal rays not longer than half the width of third antennal segment. Frontal cruciate setae absent. Lower calypter not enlarged mesad so as to impinge on base of scutellum, caudal margin usually semicircular. Hind tibia without posterodorsal setae, or if present they are not longer than anterodorsals; prealar absent. Dorsum of thorax with central vitta always very dark, almost black; abdominal marks when present usually subtriangular, trapezoidal or subquadrate, not only linear or spots.

Key to the Genera of Limnophorinae

1. Radial vein absolutely bare, even on nodose junction, prosternum bare . . . 2

   Radial vein with setulae at least at node; prosternum setulose at sides; frons in male much narrower than in female, without distinct vertical setae; first abdominal sternite bare; first wing vein without setae or macrotrichia . . . *Limnophora* R.-D.

2. Head in profile almost occupied by the eyes, almost obscuring the parafrontalia, parafacialia and gena; eyes in male practically touching frons; frontal setae absent for the whole distance where the eyes are so approximated; basal abdominal sternite setulose, abdominal marks not arcuate; hind tibia with

a short but distinct apical anterodorsal seta . . .

Gymnodia R.-D.

Head in profile with the parafrontalia, parafacialia and gena distinct; eyes in male seldom nearly touching on frons and when so, frontal bristles continuous very nearly to ocellar triangle; abdominal marks not arcuate; basal abdominal sternite usually bare, but if setulose, then eyes of male subcontiguous or separated by less than twice the distance across posterior ocelli inclusive . . . Spilogona Schnabl & Dziedzicki

Genus Gymnodia

Gymnodia Robineau-Desvoidy, 1863

Gymnodia Robineau-Desvoidy, 1863: 365 Type-species, pratensis Robineau-Desvoidy (mon.) = polystigma (Meigen)

Eulimnophora Malloch, 1920: 145 (descr. - NA spp.)

Gymnodia Séguy, 1937: 257 (as subg. of Limnophora, cat., key world gen.)

Gymnodia Huckett, 1965: 884 (cat. of NAS Mex. spp.)

Gymnodia Pont, 1972: 24 (cat. of ASUS spp.)

This genus is distinguished by the shape of the head, parafrontalia narrow and flattened about middle, in the same plane as the face, consequently practically invisible in profile. Eyes large, contiguous in male, occupying almost the whole head in profile. Frontal setae absent where the frons comes together; gena narrow. Frontal vitta rounded, only narrowly visible in profile on male; 4 acrostichal rows, outer row

composed of stout setae. Prosternum bare. Two presutural and 4 postsutural dorsocentrals. Wing veins R_{4+5} and M_{1+2} converging toward tip of wing. Legs slender and sparingly setose; one posterior seta on mid tibia, one anteroventral and 1 anterodorsal on hind tibia; one preapical seta on all tibiae. First abdominal sternite setulose.

Key to the species of *Gymnodia*

1. Antennal segment 3 tinged reddish-brown; palp yellowish basally to reddish-brown apically; mid tibia with 1 mid posterior, 1 long, stout ventral and anterior apical seta . . . *Gymnodia debilis* (Williston)

   Antennal segment 3 black; palp black, mid tibia with 1 mid posterior, 1 apical dorsal, 1 anterior, 1 very long ventral and 1 short posteroventral . . . *Gymnodia arcuata* (Stein)

Gymnodia arcuata (Stein)

Limnophora arcuata Stein, 1898: 201 (descr. - USA, Georgia)

Coquillett, 1900: 256 (coll. rec. - PR)

Aldrich, 1905: 546 (cat. distr. - NA & PR)

Wolcott, 1923a: 226 (coll. rec. - PR)

Curran, 1928: 91 (coll. rec. - PR)

Séguy, 1937: 260 (cat. distr. - world)

Wolcott, 1948: 495 (coll. rec. - PR)

Huckett, 1965: 884 (cat. distr. - Canada & US)

Pont, 1972: 24 (cat. distr. - Mexico, Perú, Bolivia, Brazil, Chile, NA, Hawaii)

Eulimnophora arcuata Malloch, 1920: 145 (coll. rec. - NA)

Limnophora (Gymnodia) arcuata Huckett, 1932: 55 (rev. distr. - NA)

Eulimnophora (Limnophora) arcuata Wolcott, 1936: 368 (coll. rec. - PR)

Gymnodia arcuata Séguy, 1937: 258 (cat., distr. - world)

Male length 2.7 to 3.3 mm. Antenna black with silvery pruinosity; arista dark brown with yellowish band. Gena black pruinose, whitish pruinose when viewed from the back. Peristomial and buccal ridge reddish-brown, palp black. Frontal triangle narrow, reddish-brown. Almost all dorsum of rusty-brown color; 3 broad dorsal vittae, coalesced at middle, only visible at front and near scutellum, central vitta running almost to tip of scutellum. Upper calypter white, lower one yellowish; halter yellow. Abdomen covered with cinereous pruinosity.

Arista almost bare, very minutely pilose; pedicel with 2 small, short dorsal bristles. Oral vibrissae stout, cruciate; peristomial setae very small; palp with very long setae on ventral side. Eyes almost holoptic, separated by twice diameter of anterior ocellus. Frontals: 7 pairs up to middle of frontal vitta, first pair almost touching at tip, as long or little longer than vibrissae; others absent; outer vertical hairlike, not well-developed; inner vertical hairlike; 1 postocular row, very minute; 2 pairs of inner ocellars on frons, proclinate, second pair stouter, longer; 3 hairlike postocellar pairs; 1 postvertical pair, very small.

Acrostichals: 4 irregular rows; 2 presutural and 4 postsutural

dorsocentrals; 2 humerals; 1 sublateral; 1 long posthumeral; 2 notopleurals; no prealars; 1 stout and 1 hairlike intra-alar; 1 supra-alar; 2 postalars; 1 subbasal and 1 somewhat lateral scutellar; 1 apical cruciate pair; clothing setulae on dorsum of scutellum somewhat longer at apex.

Prosternum bare; propleuron bare at middle, 1 long seta at lower edge and 4 hairlike ones; 1 strong upward stigmatal, several hairlike at base; 4 katepisternals (2:2), upper one of the pair on hind margin the longest, lower one of front pair not so well-differentiated; 10 setae below in 2 rows; 6 stout anepisternals, 1 on upper edge at front, small with many clothing setulae; katatergite with yellow villosity; all other parts of mesopleura bare.

Fore coxa with 1 anterior and 1 almost anteroventral row of setae; fore femur with 1 stout row of setae on anterodorsal, posterodorsal, posterior and posteroventral to ventral side, longest at apex; other long setulae at basal half; fore tibia with 1 dorsal preapical and 1 very short posteroventral; fore tarsus with 1 ventral basal seta. Mid coxa with 6 anterior setae, first two stoutest; mid femur with 1 anterior central row somewhat longer; 1 stout preapical posterodorsal; 1 stout posterior row, several posterior basal setae; 3-5 erect ventrals; mid tibia with 1 posterior seta at middle; 1 apical dorsal; 1 anterior; 1 ventral (the longest) and 1 short posteroventral. Hind coxa with 3 anterodorsals; 1 anteroventral row, inner setae largest; hind femur with row of well-developed setae running from anterior to anterodorsal side; 1 apical dorsal; 1 anteroventral row, the 3 nearest apex stout, very

long; hind tibia with 1 anterodorsal and 1 anteroventral at middle; 1 dorsal apical and 1 apical anteroventral.

Humeral wing plate with short setulae; 4 black distinct basal setae on outer edge of costa; vein R_{4+5} diverging at tip, ending at wing tip; vein M_{1+2} diverging downward at tip, ending well below wing tip; r-m straight; m-cu slightly bent at middle; lower calypter protruding for about 0.50 the length of the upper.

Abdominal terga 1 + 2 with many long setulae at sides, complete row at apex; third with discal setae at sides, complete row at apex; fourth with 4 discal setae at sides, complete row at apex; fifth with complete discal row at sides, complete row at apex; sixth with row of somewhat long setulae. Sternum 1 setulose at front edge; second and third setulose at sides; fourth setulose at sides and at middle; fifth setulose, indented at middle forming round lobes; six with short, hairlike pilosity. Dorsal arcuate markings easily seen in third and fourth sterna, wide basally toward edges from center. All setae on dark brown spots.

Female length 2.5 to 3.5 mm. Almost identical to male except ferruginous color of thoracic dorsum; dorsal vitta not reaching dark scutellum; grayish pruinosity all over dorsum and pleuron; one vitta on each side of dorsal vitta; very narrow vitta in line of dorsocentrals; discal setae quite small on scutellum. Tergum 3 with arcuate marks, pale but easily visible; fourth with marks easily visible but not in a solid mark; fifth with spot-like marks at side of center. Sternum 4 with more setulae at middle than in male.

Specimens examined: 279 (105m, 170f, 4 sex undetermined) from 16 localities in Puerto Rico and 2 in the United States of America:

Aguadilla	1m, Nov. 1936, J. Labadie
Aguas Buenas	15m, 45f, Casa de Cursillos; at glass door; 1,200 ft.; I-22-1965, SMG & LFM; 47m, 47f on VI-22-1965; 1m, June 27, 1965, 15m, 40f, Aug. 2, 1965, SMG; 3m, 11f, Oct. 13, 1965, SMG & LFM; 4m, 9f, Oct. 20, 1965; 1m, 1f, Oct. 26, 1965; 1m, Nov. 17, 1965, SMG & LFM
Arecibo	1m, 1f, Cambalache For., on mixed vegetation near ground; June 16, 1965, SMG
Arroyo	1 specimen, Feb. 1899; Aug. Busck
Bayamón	2f, Urb. Sierra Bayamón; on mixed vegetation by sidewalk; June 27, 1965, EM
Dorado	1m, at Dorado Beach Resort area; Urb. Costa de Oro; swept from grass; Nov. 22, 1964, SMG
Georgia, USA	2f, Tifton; Oct. 16, 96; J. M. Aldrich, NMNH No. 41919
Guayanilla	1m, Sept.-Nov., 1960, E. Murphy
Isabela	8m at AES; on leaf of cotton, *Gossypium* spp., many leaves on the plant were aphid infested; Nov. 6, 1964, SMG
Lajas	2m, Sept.-Nov., 1960, R. Cotte
Louisiana, USA	2 cotypes (as *Limnophora arcuata*), Opelousa, NMNH No. 4119; March, 97 (sic), J. M. Aldrich
Luquillo	1f, P.R. Caribbean Nat. For., El Yunque, on road by Catalina nurseries; on vegetation mainly *Ipomoea rubra*; Nov. 8, 1964, SMG, PM & EM. 1f at Rd. 191 K 17.2; 2,150 ft.; at spot called "Vista La Sierra"; Jan. 10, 1965, SMG
Mayagüez	1 specimen, Jan. 1899; Aug. Busck; 1m at light; Aug. 3-4, 1965, JAR, 1m, Sept.-Nov., 1960, E. Murphy

Naranjito	1f at Barranquitas Rd. 152, K 20.1; on vegetation mainly Bidens pilosa, Sida carpinifolia and Pepo moschata; 11-7-1964, SMG
Río Piedras	2m, 3f, along riverbed of Río Piedras; Apr. 25, 1965, EM; 3f at AES; May 2, 1965, SMG & EM; and 1f under Mangifera indica tree; July 7, 1965, SMG
Toa Baja	1m, Toa Valley; taken in flight over rat carcass; May 5, 1965, SMG
Utuado	1f, Río Abajo For., Rd. 621; in habitat with Wedelia trilobata and Sida carpinifolia; Feb. 29, 1965, SMG
Yauco	1f, Lares Rd., K 22; July 1965; JAR & JM

Gymnodia debilis (Williston) (Plate XVII, Fig. 70)

Limnophora debilis Williston, 1896: 369 (descr. - St. Vincent, VI)

Aldrich, 1905: 547 (cat., distr. - NA)

Eulimnophora dorsovittata Malloch, 1920: 146 (descr. - NA spp.)

Limnophora (Gymnodia) debilis Huckett, 1932: 54 (coll. rec. - NA spp.)

Maldonado & Navarro, 1967: 57 (coll. rec. - PR)

Gymnodia debilis Séguy 1937: 258, 262 (cat., world spp., keys)

Huckett, 1965: 884 (cat., distr. - St. Vincent, Jamaica & USA)

Pont, 1972: 24 (cat., distr. - USA, St. Vincent Is., Mexico, Jamaica, PR & Venezuela)

Male length 4.5 to 5.7 mm. Color dark to light brown; frontal vitta silvery white; small, dark brown triangle below ocelli; parafacialia with brownish blotch; antennal segment 3 tinged reddish-brown, dark at apex; aristal segment 3 with light brown band just beyond base. Palp yellowish basally to reddish-brown apically. Thorax dark, covered with grayish

pollinosity; grayish-white with tinge of yellowish-brown pollinosity in some areas; broad central reddish-brown vitta, extending almost to scutellum tip, very wide basally; a well-visible dorsolateral vitta in line with the pro- and postsutural dorsocentrals, a small lateral vitta on mesothorax coalesced with dorsolateral vitta and the transverse suture; another lateral vitta running from the basal, lateral posthumeral to the mesothorax. Legs almost black to dark brown; femur-tibial joints yellowish; tibia with a yellow-brown tinge. Wings with a grayish-brown tinge; calypters white; halter very light yellow, a brownish tinge basally. Abdomen with a yellowish tinge in ground color, dorsum covered with grayish-white pollinosity, subtriangular dark spots on third and fourth abdominal segments; spots on fifth very opaque; first abdominal segment (1 + 2) with dark parallel areas running centrally from apex backward and laterally; all abdominal setae set on dark spots.

Eyes nearly contiguous below ocelli, separated by twice the distance between the 2 frontal setae in the same row; 6 to 8 frontal pairs, first frontal pair cruciate; 1 interocellar, as long as first pair of cruciate frontals; 5 small postocellar pairs, inner and outer vertical not differentiated from the orbitals. Second antennal segment with 2 stout dorsal setae, apical one the largest. Palp covered with long black setae thicker and shorter toward apex.

Two presutural and 4 postsutural dorsocentrals, decreasing in size from base to apex; 2 humerals, the outer pair the longer and stouter with sometimes a small third one; 1 sublateral; 1 posthumeral; 2 notopleurals; acrostichals: 4 to 5 irregular rows (only prescutellar well-developed);

2 intra-alars, front pair well-developed; 1 supra-alar; 1 postalar. Scutellars: 1 apical and 1 subbasal pair; dorsum with several rows of setulae along the reddish-brown vitta; several small setulae near subbasals. Propleural setae very stout, with 4 additional setulae; 1 long and stout, reclinate stigmatal seta, several setulae below it; 7 mesanepisternals, 3 are longer and stouter than the others; a well-differentiated seta on the front upper corner, all other parts covered with setulae; anepimeron bare, mesokatepisternum setulose; 3 well-developed katepisternals, upper hind one the longest and stoutest. Prosternum bare; meron bare; katatergite covered with yellow villosity.

Fore femur with 1 row of stout anterodorsals, 3 rows of anterior setae, a row of very stout anteroventrals, ventral row with short setulae in basal half; fore tibia with 1 prominent apical dorsal seta. Mid femur with a posterior row of setae, 3 apicals stronger and longer than the others; several anterior rows, 1 row with longer and stouter bristles; 1 ventral row of setae, basal half most developed; mid tibia with 1 posterior at center; 1 long, stout, ventral and anterior apicals; hind femur with a prominent row of anterodorsals; 2-3 well-developed and stout apical anteroventrals; hind tibia with 1 anteroventral and 1 anterodorsal; 1 apical dorsal seta.

Abdomen covered with clothing setulae, stout setae laterally and apically on segments 3 and 4; 2 rows on segment 5.

Female length 4.7 to 5.2 mm. Similar in color and structure to male except for eyes which are well-separated, parafrontalia with few setulae. Frontal vitta black pruinose with long frontal triangle; 6 frontal pairs;

1 upper and 1 lower orbital pair; outer verticals diverging, 1 inner converging pair, 1 postvertical pair; 1 long interocellar pair as long as verticals; 3 postocellar pairs, very short. Abdominal subtriangular dark spots more extensive; seta on dorsum of pedicel much shorter.

Specimens examined:	259 (87m, 140f and 32 sex undetermined) from 14 localities in Puerto Rico, 1 in Dominican Republic and 1 in Dominica
Adjuntas	1f, June 8-13, 1915; 1m, June 26, 1915
Aguas Buenas	5m, 11f, Casa de Cursillos; on glass door; 1,200 ft.; Oct. 20, 1964, SMG & LFM: 3f, Oct. 26, 1964; 1m, 4f, I-II, 1965; 15m, 52f, VI-23, 1965; 2f, June 27, 1965, and 7m, 13f, Aug. 2, 1965, SMG
Barranquitas	1f, Orocovis, Rd. 143, K 2.7; on mixed vegetation by roadside; Aug. 17, 1965, SMG
Ensenada	1 specimen, reared from cow manure; 3-28-36, J. L. Dozier, Bishop No. 24416
Humacao	51m, 32f, Naguabo Rd. 3, K 81.6; on flowers of Lagerstroemia speciosa; July 16, 1965, GR and JGT
Isabela	2f, Guajataca For.; at light; July 22, 1965, Ramos & Maldonado
Lajas	1m, 2f, Cartagena Lagoon; Jan. 20, 1954, JMC, and 1 specimen reared from cow manure; 3-30-36, H. L. Dozier, Bishop No. 24496
Manatí	2 specimens, on human excreta; June 29, 1920, G. N. Wolcott
Mayagüez	1m, Dec. 1964, Ricardo Jorge
Mona Is.	1f, Feb. 21-16, 14 (sic)
Ponce	1 specimen, V-1936, sheep manure, Bishop No. 24496, on cow manure, VI-36, 4 specimens with Bishop No. 24506, 3 specimens; 1 specimen with No. 24505

Río Piedras	4m, 1f, P.R. Acc. No. 743-14; July 15, 1914, T. H. Jones, 3f as Acc. No. 25-17; R. T. Cotton; and 1m, 10f, along riverbed of Río Piedras; Apr. 25, 1965, EM
Salinas	1f, 1 specimen sex undetermined, Peñón del Collao; Aug. 5, 1953, JAR & JM
Yabucoa	1f, at sugarcane mill; among mixed grasses, *Panicum barbinode*, *Digitaria sanguinalis*, *Paspalum milegrana*, *Axonopus compressus*; May 14, 1965, SMG
DOMINICAN REPUBLIC, WI	15 specimens, sex undetermined, VI-13-18, (NMNH)
DOMINICA, WI	6 specimens, sex undetermined, Clarke Hall, Est.; Bredin-Archbold-Smithsonian Biol. Surv. to Dominica; on human feces; May 16, 1966, G. Steyskal, (NMNH)

Genus *Limnophora*

Limnophora Robineau-Desvoidy, 1830

Limnophora Robineau-Desvoidy, 1830: 517 Type-species, *palustris* Robineau-Desvoidy (Coquillett, 1910: 561)

Leucomelina Macquart, 1851a: 234 Type-species, *pica* Macquart (orig. des.)

Microchylum Macquart, 1851a: 229; 1851b: 256 Type-species, *vittatum* Macquart (orig. des.)

Brachiophyra Giglio-Tos, 1893: 9 Type-species, *effrons* Giglio-Tos (orig. des.) = *normata* Bigot

Limnophora Collin, 1921: 95 (monog. of British spp.)

Limnophora Curran, 1928: 90 (rev. - PR spp.)

Limnophora Huckett, 1932: 25, 105, 279 (rev. NA spp.)

Limnophora Séguy, 1937: 250 (monog. of family)

Limnophora Huckett, 1965: 885 (cat. of NA spp.)

Limnophora Pont, 1972: 28 (cat. of ASUS spp.)

Frontal vitta wide in female; touching just below ocellar triangle in male; ocellar triangle extended to anterior margin. Arista practically bare or with very short rays, not longer than length of antennal segment 3. Oral margin, or juncture of parafacials with parafrontals, or both sometimes distinctly protruding. Thorax with 2 presutural and 3 to 4 postsutural dorsocentrals; prealar ordinarily absent; 2-3 katepisternals never disposed in an equilateral triangle; inferior katepisternal weak or absent in female. Wing node or third vein (R_{4+5}) or both with basal microsetulae on either dorsal or ventral or both sides; anal vein not reaching the margin; costal spines weak or absent; veins 3 and 4 parallel or converging, if converging the fourth vein with slight forward curve at apex (Plate XVII, Fig. 74). Mesonotum covered with white-gray pruinosity, sometimes interspersed by black or gray-black, the median band sometimes reaching apex of scutellum. Prosternum with lateral setulae; the prosternum larger and more distinctly triangular than in Gymnodia. Hind tibia without external setae. Abdomen black with white or gray markings, basal abdominal sternite bare (some species with few setulate); last tergite with yellow or golden reflections.

The genus Limnophora has been divided and grouped into different subgenera by Collin (1921) and Séguy (1937). Séguy preferred to make a general list and lump together all the species into only one genus, Limnophora (sensu lato).

All members of the genus, as far as they are known, frequent streams and other bodies of water in the adult stage. The larvae are aquatic.

Key to the species of Limnophora

1. Two presutural and 3 postsutural dorsocentrals, if 4 (in females) then second is half in size or smaller when compared with the others. Thoracic notum with 2 faint cinereous areas parallel to the central vitta on prothorax, becoming a distinct and large U-shaped cinereous area on mesonotum running from last postsutural dorsocentral across base of prescutellar suture . . . L. laffooni Medina Gaud n. sp.

   Two presutural and 4 postsutural dorsocentrals, thoracic notum with a distinct, central broad brown, dark brown or ferruginous vitta, bordered by a narrow pale brown or brick-red tinge; a lateral vitta of the same color running from side of humeri and bifurcating shortly after mesothoracic suture, the two vittae coming close together shortly before prescutellar suture, wide whitish-gray pruinosity between these stripes . . . 2

2. Calypters in both sexes white to yellowish-white, margin darker; longest aristal hairs shorter than greatest aristal diameter . . . L. corvina (Giglio-Tos)

   Calypter smoky brown on male, especially on apical third and border, white to yellowish-white in female; longest aristal hairs longer than greatest aristal diameter . . . L. narona (Walker)

Limnophora corvina (Giglio-Tos)

Leucomelina corvina Giglio-Tos, 1893: 7 (descr. - Mexico)

Giglio-Tos, 1896: 19 (coll. rec. - Mexico)

Stein, 1918: 235 (coll. rec. - Europe)

Wolcott, 1948: 496 (coll. rec. - PR)

Limnophora corvina Wolcott, 1923a: 226 (coll. rec. - PR)

Wolcott, 1936: 369 (coll. rec. - PR, same as Wolcott, 1923a)

Séguy, 1937: 261 (monog. - world spp.)

Pont, 1972: 28 (coll. rec. - Mexico, PR, Perú, Brazil, Chile)

Male size 3.5 to 4.8 mm. Dark brown in general color, almost black, with cinereous pruinosity. Frontal triangle dark brown pruinose. Parafrontalia, parafacialia, facial cavity and gena with dense whitish-gray to silvery pollinosity. Antenna dark brown, almost black. Thorax with a central dark brown vitta with a brick red tinge, a whitish-gray pruinose vitta running parallel to the side of central vitta, interrupted near base of scutellum, lateral broad vitta of same color as central vitta running to base of wing, other vitta extending to base of scutum and laterally to coalesce at base of wing, leaving an almost triangular, elongate area between these vittae above wing. Extensive cinereous pruinosity on thoracic pleurites, light pruinosity on coxa. Scutellum with broad, central dark mark extending almost to apex and to basal half at sides, remainder of scutellum with a silvery to cinereous color. Calypter white with a brownish tinge, halteres light yellow, with base light reddish-brown. Wings smoky to brownish tinged. Legs

blackish-brown except for light brown pulvilli. Abdomen covered with whitish-gray pruinosity, with a dark brown area at middle of second and fifth abdominal terga, large lateral triangular dark brown areas on third and fourth tergites. Small, dark halo or area around insertion of setae, especially the largest.

Frontal triangle at vertex very narrow; eyes almost contiguous at center. Five to six frontal setae confined to upper cephalic half; 1 interocellar pair; 2 proclinate; 2 small, thin postverticals, 1 external and 1 vertical thin pair almost inconspicuous. Face slightly convex in profile; frons at base and mouth parts somewhat produced. Antennae elongate; arista about twice the length of third antennal segment, with rays little longer than basal thickness of arista.

Two presutural and 4 postsutural dorsocentrals (posterior one stouter); 4 irregular acrostichal rows; 2 humerals; 2 notopleurals; 2 sublaterals (1 pre- and 1 post-notopleural suture); 2 stout intra-alars; 1 stout prealar; 1 supra-alar; 2 postalars; scutellars: 1 apical cruciate pair, 1 small basal, 1 stout subbasal pair; 1:2 katepisternals, upper pair stout, interspersed with many setulae; 5 stout mesoanepisternals; katatergite with large yellow villosity. Wing vein 3 (R_{4+5}) with setulae on dorsal and ventral sides and at node; vein R_{2+3} and R_{4+5} subparallel, apically a small bend upward. Fore femur with stout row of setae from dorsal to ventral side; anterodorsal, anterior and ventral rows stouter; fore tibia bare at middle, 1 apical dorsal and apical posteroventral. Mid femur with 2 anterior to anterodorsal stout setae, 3 stout setae basally on ventral side; mid tibia with mid posterior seta, apically 1 on

posterior, 1 on posteroventral, 1 on anterodorsal and 1 on anteroventral side. Hind femur with 1 anterodorsal row of setae, 1 stout seta on posterodorsal side apically, 2 on anterior side apically; hind tibia with 1 mid anterodorsal, 1 mid anteroventral, 1 apical dorsal and 1 apical anteroventral. Pulvilli as long as claws, padlike, elongate; claws hairy.

Abdominal tergites covered with many clothing setulae and stout setae laterally; 1 row of stout setae apically on third and fourth tergites; 2 rows on fifth; sternites 2 to 5 setulose, 2 large apical setae on sternites 2 to 4.

Female length 4.4 to 4.9 mm. Identical in color to male except for frontal vitta with a blackish pruinosity and frontal triangle of a ferruginous-brown. Abdominal terga 1 + 2 with faint spot at middle, well-marked on 3 and 4, absent in fifth; lateral grayish-white pruinose area at base of terga 2 to 5; on fifth extending to apex. All head setae stouter; outer and inner verticals well-developed. Postverticals present; parafrontal setae very small. Eyes widely separated. Pulvilli small round, half the size of claws.

Specimens examined:	111 (28m, 82f and 1 sex undetermined) from 9 localities in Puerto Rico:
Adjuntas	1 specimen as (San Juan No. 40010); on leaf of sour orange; 4-21-33, Faxon, Mills, Anderson & Oakley
Aguas Buenas	1f, Casa de Cursillos; 1,200 ft.; on glass door; Jan. 11, 1964; 3f, Oct. 13, 1964; 1m, 2f; Oct. 20, 1964; 3f, Oct. 26, 1964; 1m, 2f; Nov. 17, 1964; and 1m, 14f; Aug. 1, 1965, SMG

Dorado	3f, Dorado Riviera Hotel Farm; swept from grass; Nov. 22, 1964, SMG & Freddie Ramos
Humacao	3m, Naguabo Rd. 3, K 18.6; on flowers of Lagerstroemia speciosa; July 16, 1965, GR & JCT
Mayagüez	1m, June, 1962, JMC; 1m, on Mayagüez to Maricao For. Rd. 105, K 20; 1,180 ft.; on Bidens pilosa; Apr. 30, 1965, SMG
Río Piedras	2m, 4f, P.R. Acc. No. 25-17; I-19-17; R. T. Cotton; 12m, 33f, Agr. Expt. Sta.; May 2, 1965, SMG & EM; and 1m, 1f, under Mangifera indica; May 2, 1965, SMG; 3m, 13f, along river bed of river Río Piedras; Apr. 25, 1965, EM
Toa Baja	2f, Toa Valley; taken in flight over rat carcass; May 5, 1965, SMG
Utuado	2m, Río Abajo For., Rd. 621, K 3.8; 1,160 ft.; at rocky and muddy area near swimming pool; Aug. 18, 1957, SMG
Villalba	1f, Caribbean Nat. For., Toro Negro Unit; Doña Juana For. at entrance of recreational area, Rd. 564, K 5.7; 2,800 ft.; Aug. 17, 1965, SMG

Biology: Recorded by Wolcott (1923a, 1936 and 1948) from weeds at Río Piedras; intercepted on orange flowers at Adjuntas and on grapefruit leaf at Barceloneta.

Limnophora laffooni Medina Gaud n. sp. (Plate I, Figs. 4 and 5; Plate VI, Fig. 17; Plate IX, Figs. 33 and 34, Plate XIII, Figs. 48, 49 and 50).

Diagnosis: This species is distinguished from other species of the genus in Puerto Rico by its dark, shiny, brownish-black color, different thoracic notum markings and by having different leg chaetotaxy.

Description: Male length 4.2 to 5.0 mm (type 4.2). Dark, shiny, brownish-black species. Large, white, cinereous, pollinose area on notopleura and a U-shaped marking on mesonotum running from last (apical) postsutural dorsocentral across base of prescutellar suture. Thoracic pleural area covered with cinereous pollinosity. Abdominal central dorsal vitta brown; lateral white-cinereous pollinose areas on terga 3, 4 and 5 on basal half. Halter yellow to reddish-brown at base. Lower calypter light brownish-black, darker at upper edge; upper calypter same as lower but outer basal area yellowish-white. Wing tinged brownish-black, darker at base and at veins.

Arista pubescent; oral vibrissae cruciate; 2 rows of well-developed peristomial setae; 6-8 frontal setae; first pair stoutest, cruciate, last pair very small, close to ocellar triangle; 1 hairlike outer vertical; 1 very thin hairlike inner vertical; 1 postocular row; posterior head area covered with many short setae; 1 interocellar pair as long as first frontal pair; 2-3 small postocellar pairs; 1 small postvertical pair.

Two presutural and 3 postsutural dorsocentrals; several irregular acrostichal rows; 2 humerals; 1 sublateral; 1 posthumeral; 2 notopleurals; 1 prealar; 2 intra-alars; 1 supra-alar; 1-2 postalars. Scutellars: 1 discal pair, 1 cruciate apical pair. Prosternum hairy at sides; 2 stout and 1 very small propleurals; 1 very small stigmatal and 1 stout basal and 1 apical stigmatal seta. Six stout mesanepisternals, 1 stout in front upper margin, area covered with many setulae; 1:2 katepisternals, last upper one on hind area very large; 4 stout setae on lower side of mesokatepisternal area, many setulae on the area; other areas bare.

Fore femur with 1 stout posterodorsal row of setae, 2-3 posterior rows and 1 stout posteroventral row; fore tibia with 1 dorsal preapical and 1 apical posteroventral. Mid femur with 1 large anterior seta at middle; 1 posterodorsal preapical, 4 ventrals on basal 1/3; mid tibia with 1 short apical dorsal, 1 posterodorsal at 0.40 and 0.60; 1 stout apical ventral and 1 apical anteroventral seta. Hind femur with 1 preapical dorsal seta and 3 to 5 anteroventrals on apical 1/2; hind tibia with 1 mid anterodorsal, 1 anteroventral seta at 0.40, and 1 apical dorsal and 1 apical anteroventral seta.

Tarsus with clothing setulae, all pulvilli very large, padlike, elongate; long hairlike empodium.

Wing costal vein with spines reaching a little beyond vein 2; 2-3 setulae at node, 2-3 dorsally at union of R_{2+3} and R_{4+5} and 1 ventrally.

Abdominal terga with large apical setae, many long slender setae on terga 1 + 2.

Female length 3.8 to 4.8 mm. (allotype 4.8). Identical to male except in having frons wide; 2 short reclinate orbitals; interocellar setae little longer than frontal setae and stouter than in male; stout inner vertical different from the interocellar and frontal setae; 2 acrostichal rows; some with 4 postsutural dorsocentrals, if so then second setae 1/2 or smaller in size than on other three. Dorsal markings as in male but a complete, faint lateral vitta in reflected light and having the calypter light yellow with a brownish tinge. Pulvilli small, setulae short.

This species is named after the late Dr. Jean L. Laffoon, professor

of Entomology at Iowa State University for his interest in Diptera and his kind friendship.

Types: Holotype: Male, Luquillo, Caribbean National Forest (El Yunque) at the East Peak, on March 1, 1969, George E. Drewry. Allotype: same data as holotype. Paratypes: 7m, 6f, ibid., but 1m, Feb. 27, 1969; 5m, 6f, Mar. 1, 1969, and 1m, El Verde Field Station; Jan. 22, 1969; Malaise trap.

Limnophora narona (Walker)

Anthomyia narona Walker, 1849: 945 (descr. - USA, Florida)

Anthomyia prominula Thomson, 1868: 550 (descr. - Argentina, Buenos Aires).

Homalomyia dentata Bigot, 1885: 284 (descr. - Mexico)

Limnophora cyrtoneurina Stein, 1898: 202 (descr. - USA - various states)

Limnophora narona Wolcott, 1936: 368 (coll. rec. - PR)

Séguy, 1937: 226 (cat., world distr.)

Wolcott, 1948: 496 (coll. rec. - PR)

Snyder, 1958b: 3 (coll. rec. - Bahamas - Andros Is. & Rum Cay)

Huckett, 1965: 885 (cat., distr. - Bermuda, Bahama Is., Canada and USA)

Pont, 1972: 29 (cat. ASUS, distr. - Mexico, Bermuda, Bahamas, Venezuela, Guyana, Perú, Brazil, Paraguay, Argentina, Chile, NA)

Male size 3.2 to 4.7 mm. Dark brown in general color, covered with dense grayish pruinescence. Frontal triangle brownish-black, Para-

frontalia, parafacialia and gena with dense silvery pruinosity. Thorax with 3 distinct, broad, dark brown vittae bordered by a narrow, pale brown stripe, and interspersed by a wide whitish-gray pruinose area. Legs brown. Wing brownish tinged; upper half of lower calypter with a brownish tinge; upper calypter with upper 2/3 with a brownish tinge, halter orange-brown. Abdomen whitish-gray with dark brown central vitta on second, third and fourth abdominal terga; with a central gray-white spot and a triangular dark brown spot at each side of central spot; fifth with a faint, brown, central vitta.

Frontal triangle at vertex very narrow, eyes almost contiguous at center. Six frontal setae confined to upper cephalic half; 1 inter-ocellar pair proclinate; 2 short or small postverticals; 1 external and 1 inner vertical pair of setae small, but larger than post-orbitals. Face slightly convex in profile; frons at base and mouth parts slightly produced. Antennae elongate; arista with rays little longer than basal thickness of arista.

Two presutural and 4 postsutural dorsocentrals; 4 irregular acrostichal rows; 2 humerals; 2 notopleurals; scutellars: 2 apicals, 1 very strong subbasal pair; 1:2 katepisternals, uppermost of posterior pair very stout and long, interspersed with many setulae. Third wing vein (R_{4+5}) with setulae on dorsal and ventral side; veins R_{2+3} and R_{4+5} subparallel apically. Fore femur with several dorsal, posterior and ventral rows of setae; fore tibia bare at middle. Mid femur with 2 stout apical posterodorsals; mid tibia with a posterior seta at middle, and 1 apical dorsal. Hind femur with 1 anterodorsal and 1 ventral row of stout setae,

4-5 strong apical anteroventrals; 1 strong, short, curved apical dorsal seta; hind tibia with 1 anterior at middle, and 1 anteroventral to ventral.

Female length 4.0 to 4.7 mm. Similar in color to male except frontal vitta with dark brown pruinosity; frontal triangle rusty-brown; calypters white; central thoracic vitta broader, rusty brown; lateral vitta narrow at front of prothorax, widening and dividing into two Y-shaped stripes at thoracic transverse suture. Abdominal markings as in male but not as deep in color. Eyes widely separated; frontal vitta with a series of very fine parafrontals; interocellar very stout, reclinate; inner verticals almost converging, outer verticals diverging; lower and upper orbitals present. Pulvilli small, round, half the size of claws.

Specimens examined:	20 (10m, 10f) from 6 different localities in Puerto Rico:
Cayey	1f, Sept.-Nov., 1960, M. Beauchamp, 3m, 3f on Guayama Rd. 15, K 22.7; on vegetation mainly *Bidens pilosa*; XI-1, 1964, SMG & EM
Jayuya	1f, Puntita; July 1962, JMC
Luquillo	1f, El Yunque; Apr. 1966, JMC
Maricao	1f, State Forest; at light; July 3, 1958, JAR
Río Piedras	1m, May 31, MDL; and 2m at AES; under *Mangifera indica* tree; July 7, 1965, SMG
Yauco	4m, 3f, Lares Rd., K 22; at light; July 18, 1953, JAR and J. Maldonado

Genus Spilogona

Spilogona Schnabl & Dziedzicki, 1911

Limnophora (Spilogona) Schnabl & Dziedzicki, 1911: 141, 152 Type-species, Aricia carbonella Zetterstedt (mon.)

Limnophora (Spilogona) Collin, 1921: 97, 162 (rec. and descr. of British spp.)

Limnophora (Spilogona) Collin, 1930: 257 (rev. of Greenland spp.; illust. of male genitalia)

Limnophora (Spilogona) Huckett, 1932: 56 (rec. & descr. of NA spp.)

Spilogona Snyder, 1957b: 469 (descr. and keys to Neotropical spp.)

Spilogona Huckett, 1965: 879 (cat. of NA spp.)

Spilogona Pont, 1972: 33 (cat. of ASUS spp.)

Head in profile with the parafrontalia, parafacialia and gena distinct; eyes in male seldom nearly touching on frons but when so, frontal setae continuous very nearly to triangle; abdominal marks not arcuate; basal abdominal sternite usually bare but if setulose, then the eyes of male subcontiguous or separated by less than twice the distance across posterior ocelli inclusive. Radial vein absolutely bare, even on nodose junction, shape as in Figure 86 (Plate XIX); prosternum bare.

Specimens of this genus have been recorded from Puerto Rico by Maldonado Capriles & Navarro (1967) but specific determination has not been made yet.

Specimens examined: 5 (5f) from 2 localities in Puerto Rico:

Guayanilla	2f, Sept.-Nov., 1960, E. Murphy
Lajas	3f, Sept.-Nov., 1960, R. Cotte

Subfamily Mydaeinae

The members of this subfamily can be distinguished by having the parafacialia at most setulose half way up from vibrissae to base of antennae, more often almost bare; fourth vein (M_{1+2}) running straight to wing margin, when curved forward at wing tip as in Myospila, arista is plumose and the greatest width of first posterior cell is not more than twice width at apex; cubital vein with at most a few setae at junction with radial vein; anal vein (A_2) not extending to wing margin; median thoracic vitta when present not extending to tip of scutellum; anepimeron bare. Hind tibia without stout, near dorsal setae, though 1 or more posterodorsals may be present; fore femur of males never with apical ventral notch or tooth.

Female frontalia without strong cruciate setae, or if present as in Myospila, then there is more than one strong hind katepisternal; abdomen often with a pair of fixed spots.

The genera Myospila and Helina are the only representatives of this subfamily in Puerto Rico.

Key to the Genera of Mydaeinae

1. Wings with setulae on upper surface of basal node to veins R_{2+3} and R_{4+5}; vein M_{1+2} conspicuously curved forward at apical region, front sternopleural bristles well-developed . . . Myospila Rondani

   Wings with upper surface of basal node to veins R_{2+3} bare; vein M_{1+2} usually straight at apical region, at most only very slightly curved forward at apex, or if strongly curved, then anterior sternopleural absent . . . Helina Robineau-Desvoidy

Genus Helina

Helina Robineau-Desvoidy, 1830

Helina Robineau-Desvoidy, 1830: 493 Type-species: euphemioidea Robineau-Desvoidy (Coquillett 1901: 137) = pertusa (Meigen)

Aricia Robineau-Desvoidy, 1830: 486 (preocc. Savigny, 1822) Type-species, impunctata Robineau-Desvoidy (Coquillett, 1901: 135) = impunctata (Fallén)

Spilogaster Macquart, 1835: 293 Type-species, Musca quadrum Fabricius (Westwood, 1840: 142)

Yetodesia Rondani, 1861: 9 (new name for Aricia Robineau-Desvoidy) Type-species, Aricia impunctata Robineau-Desvoidy (aut.) = impunctata (Fallén)

Mydaea, subg. Spilaria Schnabl, 1911: 96 Type-species, Spilogaster pubescens Stein (Séguy, 1937: 292)

Ariciella Malloch, 1818: 66 Type-species, flavicornis Malloch (orig. desc.) = rubripalpis (Wulp)

Helina Malloch, 1934: 303 (rev. South Chile and Patagonia spp.)

Tritonidis Séguy, 1937: 461 Type-species, Aricia nigrimanus Macquart (orig. des.)

Helina Snyder, 1940: 1 (rev. of gen. Myospila, notes on Helina)

Helina Snyder, 1941: 1 (rev. Neotropical Mydaeini)

Helina Snyder, 1949a: 111 (rev. Nearctic spp.)

Helina Albuquerque, 1956c: 1 (key to Brazilian spp.)

Helina Pont, 1972: 19 (cat. of ASUS spp.)

Eyes bare or pilose, contiguous in male, separated in female; 1 cruciate interfrontal seta in male, arista pubescent or plumose; 1 stout and 1 small presutural and 3 or 4 postsutural dorsocentrals; 1 very short or stout prealar; scutellum with short ventral setulae laterally on basal edge. Prosternum and hypopleuron bare; metepisternum with short hairlike setae or bare, 3 katepisternals. Subcosta (Sc) strongly curved forward at tip; third vein (R_{4+5}) bare dorsally, with 2 or 3 ventral setulae after base or node, veins R_{2+3} and R_{4+5} diverging at apex. Fore tibia with 1 posterodorsal at middle and 1 at 0.40; 1 ventral and 1 posteroventral seta; hind coxa bare at apex above, postalar declivity bare; hind tibia without median posterodorsal bristle (calcar); with 2 anteriors (1 at 0.40 and 1 at 0.50), and 1 anterosorsal seta.

Key to the species of *Helina*

1. Stout, large species; dark brown to black; palp dark brown to black; mid tibia with 1 apical anterior, 1 apical dorsal, 3 posteriors almost at middle, 1 apical posteroventral, 1 apical ventral seta . . . *Helina boringuensis* Medina Gaud, n. sp.

Smaller species; dark brown to black covered with extensive greenish-blue to cinereous pruinosity; palp yellow; mid tibia with 2 apical dorsals, 2 mid posteriors, 2 apical posteroventrals and 1 anteroventral seta . . . *Helina yunquensis* Medina Gaud, n. sp.

Helina boringuensis Medina Gaud, n. sp. (Plate VIII, Figs. 25, 28 and 29; Plate XII, Figs. 41 and 42; Plate XV, Figs. 57, 58 and 59; Plate XIX, Fig. 82)

Diagnosis: This species is easily recognized from *H. yunquensis* by having the palp dark brown to black; and by the mid tibia having 1 apical anterior, 1 apical dorsal, 3 posteriors almost at middle, 1 apical posteroventral and 1 apical ventral seta.

Description: Male length 5.2 to 6.6 mm (type 6.6). Color dark brown to black; frontal lunule silvery-velvety, white when seen from above, otherwise brown, proboscis, first and second antennal segments brown; third with basal 1/3 and apical rim of second, brownish-yellow; palp dark brown to black. Thoracic dorsum with two black dorsal vittae, dorso-central area coalesced before scutellum to two narrow, almost oval, black vittae on mesothorax, when viewed from top running halfway to center of scutellum; two dark areas on sublateral and posthumeral sides running

laterally to the prealar area and back to postalar area. Thoracic pleuron with silvery-gray pollinosity. Legs dark brown to black, part of coxa and trochanter light brown; tip of femur, base and extreme tip of tibia yellowish-brown. Pulvilli large, padlike, yellow; hairlike empodium yellow. Wing yellowish-brown, veins brown; calypters whitish-cream, upper with basal area dark brown; halter capitellum yellow at apex, remainder brown, basal part yellow cream. Abdomen when viewed from above, tesselated black and white to silvery-velvety when viewed from behind; a central vitta, black, spots at sides, dark.

Eyes almost contiguous, separated by the width of the parafrontalia; second antennal segment with 2 stout setae on dorsal surface, third about 3 times length of second; arista pubescent; oral vibrissae stout, black, cruciate with several microsetae at base; 1 stout peristomial seta; palp slender, rodlike; 6-7 frontal setae, first pair stout, others much smaller; 1 postocular row; inner ocellar stouter and longer than first frontal pair; 3 postocellars; rear part of head covered with microsetae.

Ten or more irregular acrostichal rows; 2 presutural and 3 very stout postsutural dorsocentrals; apical presutural dorsocentral about 3 times the size of front one; 2 humerals (1 stout and 1 very small); 1 small sublateral; 1 very stout posthumeral as long as apical presutural dorsocentrals; 2 notopleurals (the 1 near the humerus as long as humeral); 2 smaller intra-alars; 1 supra-alar; 1 stout postalar as long as prealar; 1 stout discal pair (subbasal); 1 slender basal scutellar, longer than clothing setulae; 1 stout apical pair, a slender pair behind the apical, well-

differentiated from the clothing setulae; several hairlike setulae at edge and ventrally near base of scutellum; dorsum of scutellum entirely covered with clothing setulae. Prosternum bare; 2-3 propleural setae (1 large and stout); 2 stout stigmatals, with many hairlike setae at base; 4-5 stout and 2 smaller anepisternals, several interspersed slender setae; 3 katepisternals, lower thin and smaller; katatergite villosity long, other areas bare. Wing bare except costa, stout spine on costal brake; r-m vein almost straight; m-cu sigmoid.

Fore coxa with 5-6 dorsal setae; femur with 1 dorsal, 1 posterodorsal and 1 posteroventral row; tibia with 1 dorsal, 1 posterodorsal and 1 posterior apical seta; 1 ventral on basal tarsal segment. Mid coxa as before; femur with 1 anterodorsal, 1 dorsal, 1 posterodorsal and 1 posterior subapical near apex; 5 ventrals in a row; tibia with 1 long apical anterior and 1 apical dorsal; 3 posteriors at middle, equidistant; 1 apical posteroventral; 1 long apical ventral. Hind coxa as others, femur with 1 dorsal to posterodorsal row; 1 row with 5-6 stout setae on apical half of tibia and 1 at 0.25; 1 anterodorsal at middle and 1 apical anterodorsal; 1 dorsal and 1 anteroventral apical seta; tarsal claws hairy; pulvilli padlike, very large, empodium hairlike.

Abdominal terga 1 + 2 with 2 lateral preapical stout setae; tergum 3 with 1 at side near apex; fourth with 6 stout setae in a row near apex; with 3 stout setae on dorsal part at middle of fifth and near apex on sixth; sterna 1-5 covered with many clothing setulae, 2 setae near apex.

Female length 4.8 to 6.8 mm (allotype 6.8). Color identical to the male. Eyes widely separated; frontal vitta velvety black; frontal tri-

angle brownish, palp lighter in color (brown); tarsal pulvilli smaller, about half of the size in male.

Types: Holotype: male, Aguas Buenas, Casa de Cursillos; Dec. 9-10, 1968, Malaise trap; Allotype: female, Luquillo, Caribbean National Forest, El Verde Field Station; Dec. 22, 1968, Malaise trap; Paratypes: 8m, 35f, as follows:

Aguas Buenas, 1f, Casa de Cursillos; 1,200 ft.; on glass door barrier; June 27, 1965, SMG.

Castañer, 2m, 3f, Limaní, AESb; Feb. 10, 1969; and 3m, 3f, Feb. 11, 1960, Malaise trap.

Cayey, 1m, 3f, Carite Forest; Dec. 27-30, 1968, Malaise trap; 5f, Henry Barracks; Nov. 15-17, 1968; 3f, Nov. 21-22, 1968; and 1f, Jan. 25-26, 1969, Malaise trap.

Cayey,1m, 3f, Salinas Rd. 1, K 80; Nov. 22-25, 1968; 1f, Nov. 26, 1968; and 1m, 2f, Nov. 27, 1968, Malaise trap.

Corozal, 3f, AESb; Jan. 18, 1969; 1f, Jan. 19, 1968; and 1f, Jan. 20, 1969, Malaise trap.

Gurabo, 3f, AESb; Nov. 10, 1968, Malaise trap.

Isabela, 1f, AESb; Jan. 25-26, 1969; Malaise trap.

Río Piedras, 1f, AES; Oct. 23, 1968, Malaise trap.

Remarks: This species is named after the Indian name for the island of Puerto Rico.

Helina yunquensis Medina Gaud, n. sp. (Plate VIII, Figs. 24, 26 and 30; Plate XII, Figs. 43 and 44; Plate XV, Figs. 60, 61 and 62; Plate XIX, Fig. 85)

Diagnosis: This species is easily distinguished from H. borinquensis by having the body covered with greenish-blue to cinereous pruinosity, yellow palp and by a mid tibia with 2 apical dorsals, 2 mid posteriors, 2 apical posteroventrals and 1 anteroventral seta.

Description: Male length 4.6 to 6.2 mm (type 6.0). Color dark brown to black, covered with a greenish-blue to cinereous pruinosity; parafrontalia, parafacialia and gena silvery pruinose; frontal lunule silvery; antennal segments 1 and 2 dark brown, 2 yellowish on top; 3 yellow at basal 1/3, more so inside, apical 2/3 brown; arista brown, lighter at base; palp yellow. Thoracic dorsum greenish-blue cinereous with 4 dorsal dark brown to black vittae, lateral vitta irregularly defined; thoracic pleuron cinereous in color with bluish tinge. Femora dark cinereous with a bluish-green tinge; apex of femora and base of tibiae yellow to yellowish-brown; pulvilli yellow. Wing with a yellowish-brown tinge; r-m vein with a light brown cloud; m-cu sigmoid with a light brown shade; a stronger yellowish-brown shade at stigma; veins dark brown. Halter capitellum yellow; base reddish-brown. Abdomen greenish-cinereous, central dark brown vitta on abdominal terga 1-6; wide dark brown spot basally on both sides of terga; genitalia yellowish-orange.

Eyes nearly contiguous; frontal vitta very narrow, narrowest point at middle of distance between frontal lunule and ocellar triangle; arista plumose; oral vibrissae well-developed; 1 peristomial row, half the size of

the oral vibrissae; palp narrow, rodlike; 6-7 frontal pairs; 1 short postocular row of setae; 1 inner ocellar pair; 3 postocellar pairs.

Acrostichals: 3-4 irregular, undifferentiated rows, 1 prescutellar pair well-developed; 2 presutural (basal very small) and 3 stout postsutural dorsocentrals; 2 humerals (1 well-developed); 1 sublateral, 1 stout posthumeral; 2 stout notopleurals; 1 short prealar; 2 stout intra-alar, 1 supra-alar and 1 post-alar setae; scutellum: 1 stout discal (subbasal) pair and 1 small discal (basal) pair; 2 stout apical and 2 small subapical pairs; sparse clothing setulae over the scutellum.

Thoracic pleuron with 1 stout and 2 small propleural setae; 1 stout stigmatal, several microsetae near base; 3-4 stout anepisternals, 1 on front upper margin, several scattered microsetulae; 2 katepisternals, some specimens with a thin third one on lower margin, scattered microsetulae over all the area; katatergite covered with silken villosity.

Fore coxa with 5-6 setae on antero-to-ventral side; femur with 1 dorsal, 1 posterodorsal and 1 ventral row of setae; tibia with 1 dorsal, 1 apical posterodorsal and 1 apical posteroventral seta; basal tarsal segment with a ventral tuft of somewhat long setae. Mid coxa like fore coxa, femur with 1 dorsal; 1 posterodorsal; 1 posterior seta and 3 ventrals on basal 1/3; mid tibia with 2 apical dorsals; 2 mid posteriors; 2 apical posteroventrals (1 stout); 1 anteroventral; hind coxa as fore coxa; femur with 1 anterior to anteroventral row; 1 preapical dorsal; 1-3 small ventrals, thin in basal 1/3; 1 anteroventral row with 3-4 stout setae at apex; tibia with 1 anterodorsal at middle and 1 apical; 1 dorsal, somewhat inclined to posterodorsal side, at base of apical 1/5; with a tuft of setae

on posterior side apically, 1 apical dorsal, 1 anteroventral at 0.40 and 1 apical anteroventral. Pulvilli large, padlike, about twice as large as in females. Wing bare except costa, r-m straight; m-cu sigmoid.

Abdominal terga with apical row of long setae on all segments; fifth with apical and median row; sixth with 6-7 at each side, 3 larger; sterna setulose with 2 large apical setae on all sterna except 5 which has 2 laterals on each lobe.

Female length 4.8 to 6.8 mm (type 6.0). Color identical to the male. Eyes are widely separated.

Types: Holotype: male, Luquillo, Caribbean Nat. For., El Verde Field Sta.; Dec. 6, 1968, Malaise trap. Allotype: female, ibid., but Dec. 22, 1968. Paratypes: (3m, 34f) as follows:

Castañer, 2f, Limaní, AESb; Feb. 7, 1969; and 1m, 2f, Feb. 12, 1969, Malaise trap.

Cayey, 2f, Carite For.; Dec. 27-30, 1968, Malaise trap; and 1m, July 29, 1969, black-light trap, R. Bonilla.

Cayey, 1f, Henry Barracks; Apr. 12-14, 1969, Malaise trap.

Luquillo, 1f, Caribbean Nat. For., El Verde Field Sta.; Oct. 28, 1968; 1f, Dec. 7, 1968; 1f, Dec. 11, 1968; 3f, Dec. 22, 1968; 15f, Dec. 25-26, 1968; and 1f, March 20, 1969; Malaise trap; and 1f, July 17-19, 1969; 1f, July 29, 1969; and 1f, Aug. 23, 1969; black-light trap.

Mayagüez, 1m, by house of Dr. G. Miskimen; Feb. 1, 1969, Malaise trap.

Río Piedras, 2f, AES; Nov. 2, 1968, Malaise trap.

Remarks: Named after a mountain locality in the Caribbean Nat. For. where many of the specimens were collected.

Genus Myospila

Myospila Rondani, 1856

Myospila Rondani, 1856: 91 Type-species: Musca meditabunda Fabricius (orig. des.)

Myospila Schiner, 1862: 598 (rev. Austrian spp.)

Myospila Brauer & Bergenstamm, 1889: 156 (monog. of family)

Phasiophana Brauer & Bergenstamm, 1891: 390 Type=species: obsoleta Brauer & Bergenstamm (orig. des.)

Myospila Wulp, 1896: 303 (monog. Central America spp.)

Myospila Aldrich, 1905: 531 (cat. NA spp.)

Myospila Williston, 1908: 343 (manual NA spp.)

Myospila Schnabl & Dziedzikci, 1911: 159(107) (rev. world spp.)

Trichomorellia Stein, 1919: 109 Type-species: cyanea (Macquart) (mon.)

Myospila Curran, 1928: 90 (cat. of PR spp.)

Myospila Séguy, 1937: 352 (cat. world spp.)

Myospila Snyder, 1941: 6 (rev. Neotropical Mydaeini)

Myospila Hennig, 1955: 113 (monog. of Palaearctic spp.)

Myospila Huckett, 1965: 890 (cat. NA spp.)

Myospila Pont, 1972: 26 (cat. ASUS spp.)

Eyes pilose, nearly contiguous in male, separated in female. Two presutural and 4 postsutural dorsocentrals; 3-4 katepisternals. Wing vein R_{4+5} stem with few setulae on dorsal and ventral side; fourth vein (M_{1+2}) curved forward near apex. Mid tibia without internal macrosetae; hind tibia with two anteroventral setae, the first sometimes reduced or

absent. Abdominal tergites 2 and 3 with 2 brown spots, reduced or absent or abdomen dark brown or of a sky blue.

Myospila obsoleta (Brauer & Bergenstamm) (Plate XVII, Fig. 69)

Phasiophana obsoleta Brauer & Bergenstamm, 1891: 390 (descr. - Brazil)

Mydaea mendax Stein, 1911: 87 (descr. - Perú, Urubamba River, S. Carlos and Umuhuankiali)

Myospila obsoleta Curran, 1928: 90 (coll. rec. - PR, Cuba, Haití and Jamaica)

Wolcott, 1936: 368 (coll. rec. - PR)

Séguy, 1937: 354 (coll. rec. - world)

Snyder, 1940: 6 (coll. rec. - Brazil, British Guiana, Costa Rica, Cuba, Haití, Panamá, Santo Domingo and PR)

Wolcott, 1948: 496 (coll. rec. - PR)

Pont, 1972: 27 (cat. dist. - Costa Rica, Panamá, PR, Haití, Cuba, S. Domingo, Jamaica, Venezuela, Guyana, Perú and Brazil)

Male length 5.0 to 6.4 mm. Head black, when viewed from the back; frons black; parafrontalia and parafacialia silvery pruinose; facial cavity and clypeus brown with silvery pollinosity. Antenna yellowish-brown, side of second antennal segment and aristal rays dark brown; palp bare, dark, light brown apically. Thorax black, covered with gray pruinosity seen only in reflected light. Dorsal vitta grayish, dorso-lateral vitta almost invisible, other vittae short, lateral, incomplete. Wing gray-brown tinged, more brownish along veins; calypter light brown,

darker at border; halter yellow; legs dark or fuscous, except reddish-brown tibiae and apices of femora. Abdomen dark, subshiny, covered with a grayish pruinosity seen only in reflected light.

Head almost circular in front view, parafrontalia broadly contiguous; eyes almost contiguous, separated in narrowest part of frons by about twice the diameter of the anterior ocellus. About 11 pairs of frontal setae, pairs 1, 2 and 3 the longest; anterior interocellars subequal to anterior frontals; 2 pairs of posterior ocellars; lower and upper orbitals very small; verticals very small; second antennal segment with 1 long dorsal seta and 2 to 3 short ones in same plane; apical seta as long as first frontal pair; longest aristal rays about half the length of the arista; palp with short to moderately long setae; eye bare.

Thorax with 2 large, well-developed humerals; 1 sublateral; 1 posthumeral; 2 presutural and 4 postsutural dorsocentrals; acrostichals with 7-8 irregular rows; 1 prescutellar pair well-developed; 2 notopleurals; 1 prealar; 2 intra-alars; 2 supra-alars; 1 postalar; scutellars: 1 subbasal and 1 cruciate preapical, 1 pair near the preapical and 1 pair near the subbasal somewhat differentiated from the other clothing setulae. Prosternum bare, 1 very long propleural seta and 4 shorter ones at basal corner; 2 very long stigmatal setae, interspersed with about 12 setulae; 7 well-developed mesanepisternals, interspersed with several other setulae; mesanepisternum setulose, 1 seta larger than others on upper margin; 4 katepisternals, last upper one stout and longest; 12 mesokatepisternals

on lower part; metepisternum with few fine setulae; katatergite with yellow to golden-brown fine setulae. Wing with 2-3 setulae dorsally and ventrally on node (R) of R_{2+3} and R_{4+5} branch.

Fore, mid and hind coxae with anteroventral row of very strong setae interspersed with many other setulae; fore femur with 1 dorsal row of stout setae; several anterior rows and 1 anteroventral row; posterior side almost bare with small setulae; fore tibia with only apicals. Mid femur setulose with 3 conspicuous apical posterodorsals, not all in the same plane (curved at apex); several rows of short anterior setae with somewhat enlarged middle setae, a ventral row of setae with basal 4-5 well-developed; anteroventral row with some basal setae longer than the others; mid tibia with median and submedian posterior, short, thickened setae; long apical anterior and longer central setae. Hind femur with 2 dorsal preapicals; 1 stout anterodorsal row, a ventral to anteroventral row with 3 or 4 preapicals longer than the others; hind tibia with 1 anteroventral; 1 anterior above center of tibia and a row of 4-5 short, thickened anteriors, running from middle to base of tibia; 1 long apical anteroventral.

Abdominal segments with apical, sublateral long setae, segments 3 and 4 with a median and sublateral additional row of setae; segment 5 with apical complete row of very stout setae.

Female length 5.2 to 6.5 mm. Similar to male in color and shape. Frontal vitta very wide, a pair of short interfrontal setae; 6 frontal setae; parafrontalia with a complete row of setulae; postvertical, inner and outer verticals very long, well-developed. Abdomen without

well-defined rows of tergal setae, except for apex of fifth segment. Prothoracic vitta more noticeable than in male; scutellum with a basolateral grayish area when viewed from the back or the side.

Specimens examined:	30 (12m, 18f) from 9 localities in Puerto Rico, 1 in Cuba and 1 in Dominican Republic:
Adjuntas	1m, 11f, June 8-13, 1915; (3 of C. H. Curran Coll., Acc. 31144).
Castañer	1m, Limaní AESb; Feb. 10, 1969, Malaise trap
Cayey	1m, Henry Barracks, Mar. 15, 1969; and 1m, Mar. 17, 1969, Malaise trap
Cayey	1f, Salinas R. 1, K 80; Nov. 26, 1968, Malaise trap
Jayuya	1m, 1-3, 1915
Luquillo	1m, Caribbean Nat. For., El Verde Field Sta.; Dec. 4, 1968; 2m, Dec. 5, 1968; 1m, 1f, Dec. 6, 1968; and 1m, Dec. 25-26, 1968, Malaise trap
Maricao	2f, fish hatchery; VIII, 8-11-61, Flint & Spangler (1 without collector label)
Utuado	1f, Río Abajo For., Rd. 621, K 5.2; 1,100 ft., near Peace Corps camp; on vegetation by creek; Aug. 18, 1965, SMG
Villalba	1m, Caribbean Nat. For., Toro Negro Unit; Rd. 564, K 48; 2,870 ft.; Doña Juana For.; in flight over human feces; Aug. 17, 1965, SMG
CUBA, WI	1f, San Carlos Est., Guantánamo; 4-8, X-13
DOMINICAN REPUBLIC, WI	1m, 1f, S. Frnsco. Mts., St. Domingo; 29-8 and Sept. 05, respectively, Aug. Busck and 1f, St. Domingo; 7-8, Aug. Busck

Subfamily Fanniinae

The females of this subfamily are characterized by having 1 pair of interfrontal setae; parafrontalia broad, convex toward middle of frons, and with 2 pairs of strong orbital setae, lower pair diverging; mesonotum with only 3 posterior dorsocentral setae.

An excellent character in males, except for a few Neotropical species, is the distinct mat of erect hairlike setae on the ventral surface of the mid tibia. It is often reduced on the basal half of the tibia but the hairlike setae are almost always thickened on the apical half.

The subfamily is most easily recognized by the venation of the anal portion of the wing. The sixth vein (Cu_2+A_1) is very short, and the seventh (A_2) curves strongly forward to intersect the first, if extended at or before margin of the wing; the hind tibia with a well-developed, isolated, true dorsal seta in addition to the preapical one.

The larvae are characterized by having a pair of laterodorsal processes on each segment, and 3 pairs on the terminal segment; the body shape is moderately flattened, the terminal segment strongly so. The posterior spiracles are raised on short stalks, and the spiracular slits are reduced to small circular openings. The mouth parts are very similar to those of the Anthomyiinae but the pharyngeal sclerites lack windows and are not flaring.

This subfamily is widely distributed, possibly because of the food habits of the larvae which are for the most part scavengers, feeding in

decaying animal and vegetable matter. Malloch (1934) reported having found some species of these flies in their larval stages living on excrement and debris in the nests of social Hymenoptera, and doing no damage to the larvae of the bees. Chilcott (1958) described two species of Euryomma in which all stages were found in association with colonies of the ant Eciton burchelli. Chilcott (1965) described one new species and stages of Nearctic Fannia species associated with nests of Hymenoptera. The adult flies have a peculiar soaring habit, especially under the shade of trees. MacAlpine & Munroe (1968) recorded the swarming of Fannia species, as well as other flies.

Key to the Genera of Fanniinae

1. Two pairs of presutural dorsocentrals, the stronger pair situated on a level caudad of humerus; first presutural dorsocentral usually over half as long as the second; male without lower orbital setae; imaginary extensions of anal veins meeting well before margin of wing . . . Fannia Robineau-Desvoidy

   One pair of presutural dorsocentrals, situated on a level transverse with caudal margin of humerus; first presutural dorsocentral weak, less than half as long as second; male with lower orbital seta present; imaginary extensions of anal veins meeting at or near margin of wing . . . Euryomma Stein

Genus Fannia

Fannia Robineau-Desvoidy, 1830

Fannia Robineau-Desvoidy, 1830: 567 Type-species: Fannia saltatrix Robineau-Desvoidy (mon.) (= scalaris Fabricius)

Philinta Robineau-Desvoidy, 1830: 568 Type-species: Musca canicularis Linné

Aminta Robineau-Desvoidy, 1830: 569 Type-species: Aminta ludibunda Robineau-Desvoidy

Homaloyia Bouché, 1834: 89 Type-species: Musca canicularis Linné

Myantha Rondani, 1856: 95 Type-species: Musca canicularis Linné by monotypy

Faunia Rondani, 1877: 42 (misspelling of Fannia Robineau-Desvoidy)

Dasyphyma Bigot, 1885: 268 Type-species: Dasyphyma arnata Bigot nec Meigen (=errata Malloch), by monotypy

Homalomya Bigot, 1887a: 29 (misspelling of Homalomyia Bouché)

Gymnochoristomma Strobl, 1900: 613 Type-species: Gymnochoristomma bosnica (Strobl) (=scalaris Fabricius), by monotypy

Fannia Schnabl & Dziedzicki, 1911: 135 (rev. of family)

Steinomyia Malloch, 1912: 656 Type-species: Steinomyia steini Malloch (=scalaris Fabricius), by monotypy

Fannia Malloch, 1913: 621 (notes and descr. - of American spp.)

Fanniosoma Ringdahl, 1932: 160 Type-species: Fanniosoma latifrons Ringdahl (=latifrontalis Hennig), by monotypy

Fannia: Curran, 1934: 397 (rev. key to NA gen. of family)

Beckerinella Enderlein, 1936: 195 Type-speices: Beckerinella pygmaea Enderlein (=parva Stein), by monotypy

Fannia Séguy, 1937: 162 (as subg.) (cat., rev. of world spp.)

Profannia Séguy, 1937: 163 (as subg.) Type-species: Profannia parasitica Séguy, by monotypy

Ivalomyia Tiensuu, 1938: 29 Type-species: Ivalomyia limbata Tiensuu, by monotypy

Fannia Seago, 1954: 1 (rev. of Fannia pusio group spp.)

Fannia Henning, 1955: 18 (rev. of Palaearctic spp.)

Fannia Chilcott, 1960: 43 (rev. of Nearctic Fanniinae)

Fannia Chilcott, 1965: 640 (rev. of spp. associated with nests of Hymenoptera)

Fannia Huckett, 1965: 892 (cat. NA spp.)

Mesazelia Blanchard 1941: 57 Type-species: Trichopoda Blanchard (orig. des.) - Synonymized by Pont, 1972: 3

Fannia Pont, 1972: 3 (cat. ASUS spp.)

Eye nearly contiguous in male, separated in female; male with at most one orbital seta, female with two. Arista almost bare or pubescent. Head with oral margin not protruding. In profile eye very large, gena very narrow; parafacialia, parafrontalia and their juncture almost obscured. Two strong presuturals and 3 postsutural dorsocentrals; 2 katepisternals (1:1); prealar very short or absent; prosternum, propleuron, meron and anepimeron bare. Wing veins bare except costa; costal spines not developed. Calypter moderately large and apically

rounded, upper and lower subequal. Male hind femur of most species somewhat dilated on apical 1/3 with long hairlike setae on ventral side; hind tibia with a dorsal seta near middle. Abdomen broadest before posterior margin of second segment in male, second segment distinctly longer than third in female.

This is the main genus of the subfamily, occurring throughout the world and including well over 200 species, mostly from the Holarctic region.

In all other respects, including life history and ecology, the genus appears to exhibit the entire range of variation of the subfamily.

Key to the species of *Fannia* (males)

1. Hind femur with a distinct ventral preapical swelling or prominence which is visible in direct anterior aspect. Hind tibia with long, soft, ventral hairlike setae . . . *F. pusio* (Wiedemann)

   Hind femur with a series of 7 or 8 straight, closely-placed hairlike anteroventral setae on the middle third; posteroventrally with a row of progressively longer setae beginning near middle and terminating at apical 1/5. Hind tibia not as above . . . *F. trimaculata* (Stein)

Fannia pusio (Wiedemann) (Plate XVII, Fig. 71)

Anthomyia pusio Wiedemann, 1830: 437 (descr. - SA)

Homalomyia femorata Loew, 1861: 42 (descr. - Cuba)

Stein, 1898: 76 (coll. rec. - NA)

Aldrich, 1905: 538 (cat., American spp.)

Limnophora exilis Williston, 1896: 369 (coll. rec. - St. Vincent Is.)

Snyder, 1965: 273 (coll. rec. - Micronesia)

Fannia pusio Malloch, 1913: 623 (coll. rec. - USA, Guadaloupe and Trinidad)

Wolcott, 1936: 369 (coll. rec. - PR)

Séguy, 1937: 173 (cat., world spp.)

Wolcott, 1948: 497 (coll. rec. - PR)

Bohart & Gressitt, 1951: 109 (coll. rec. - Guam)

Seago, 1954: 8 (rev. pusio group, coll. rec. - Maryland to Florida, west to Arizona and Texas in USA, Cuba, PR, Bahamas, Trinidad, Mexico, Guatemala, Hawaii, Guadeloupe and Guam)

Chilcott, 1960: 213 (coll. rec. - New York, New Jersey, same as Seago 1954)

Huckett, 1965: 896 (cat. distr. - SA, the US: from Arizona to Florida, New York to District of Columbia; Cuba and Bermuda)

Pont, 1972: 6 (cat., distr. - Bermuda Is., Mexico, Guatemala, El Salvador, Guadeloupe Is., PR, Cuba, Bahamas, Panamá, Trinidad, Venezuela, Guyana, Chile, NA, Hawaii and Micronesia)

Male length 3.2 to 3.9 mm. A black species, with frontal vitta black, very narrow, widened above antennal base and below ocellar triangle; parafrontalia, parafacialia and facial cavity silvery pruinose; third antennal segment covered with silvery pruinosity; palp dark.

Grayish to ferruginous pruinosity on thoracic dorsum, grayish pruinosity on pleura; wings grayish-hyaline; squama whitish, border with yellow tinge; halter pale yellow at capitellum, brownish basally. Abdomen black with gray pollinosity; first abdominal segment (1 + 2) almost entirely dark brown; whitish tinge at extreme edge and on upper basal part; segments 3, 4 and 5 with a median, dark, wide band partially confluent with posterolateral brown subtriangular areas; segment 5 with faint to well-visible median band partially confluent with brown posterolateral subtriangular areas; pleura 1, 2 and part of 3 and 4 and sterna 1, 2 and 3, yellow.

Eyes bare, closely approximated; 11-13 frontal setae; 1 long anterior interocellar pair; 3 pairs of posterior ocellars, inner and outer not well-differentiated, only slightly longer than postoculars. Second antennal segment with a strong short seta and several other small setulae.

Thorax with 2 presutural and 3 postsutural dorsocentrals, 2 humerals; 1 sublateral; 1 posthumeral; acrostichals triserrate (1 prescutellar pair very long); 2 notopleurals; 2-3 prealars, the first 2 basal ones very small and thick; 2 intra-alars; 1 supra-alar; 1 postalar; scutellars: 1 apical pair cruciate, a small pair behind these; 1 subbasal pair, several short setulae behind these; all other parts bare. One propleural and 1 strong stigmatal seta with small one behind; 6 mesanepisternals, 2 of them are stronger and stouter than the others, interspersed with setulae along these setae on its upper edge; 2 upper katepisternal setae only; mesokatepisternum with several setulae; meron and

anepimeron bare; katatergite with golden villosity.

Fore femur with 1 well-developed posterodorsal row; 2 posterior rows, longest setae apically; 1 anteroventral row with 3-4 long setae near apex; 1 dorsal seta on fore tibia. Mid femur with 2 anterior rows, upper row with 2-4 apicals, longer and displaced toward anterodorsal position, bent at apex; posterior row of setae with apical one longer; ventral to anteroventral row of setae longest toward apex; 1 posteroventral row, with a group of short, thick setae apically. Mid tibia with 1 submedian posterior; 1 long preapical dorsal and 1 short posterior near middle; 1 ventral apical seta. Hind femur with anterior row of short setae, longer apically, several large apical setae on anterior to anterodorsal side; about 10 long, apically-bent, anteroventrals; hind tibia with anteroventral and ventral rows of long, fine setae; 2-3 long apical posteroventrals; 1 long median dorsal seta well-differentiated from the other short ones and a shorter but well-differentiated dorsal apical seta.

Abdomen covered with rows of setulae; apical abdominal segment longer than the others, setae somewhat longer and differentiated laterally; fifth with apical row of long bristles.

Female length 2.9 to 3.7 mm. Similar in color to male; eyes well-separated; frontal vitta black pollinose; frontal triangle gray pollinose, extending up to middle of frons; about 7 frontal pairs; 1 row of parafrontals; well-differentiated lower and upper orbitals; parafacialia with a row of microsetae; interocellar shorter than in male; well-differentiated outer and inner verticals as compared to male. Legs

similar to male except hind femur with 1 dorsal apical seta; 1 anterior to anterodorsal row of setae; 1-2 apical anteroventrals; dorsal setae as in male; 2 short submedian anteroventrals and 1 short anterior seta almost at middle.

Specimens examined: 96 (36m, 56f and 4 sex unidentified) from 13 localities in PR, 1 from Guadeloupe and 1 from Trinidad, WI:

Aguas Buenas	2f, Casa de Cursillos; 1,500 ft.; June 23, 1965, SMG & LFM
Cayey	1f, Carite For.; Dec. 27-30, 1968, Malaise trap; 1m, Henry Barracks; Apr. 13-14, 1969, Malaise trap
Corozal	1f, AESb; Jan. 18, 1969; and 1m, Jan. 19, 1969, Malaise trap
Dorado	1f, Dorado Riviera Hotel Farm; swept from grass; Nov. 22, 1964, SMG & EM
Guayama	1m, 6f, Guavate For., Rd. 179, K 9.6; on carcass of a dog, taken along roadside; Nov. 1, 1964, SMG & EM
Humacao	4m, Naguabo, Rd. 3, K 81.6; on flowers of *Lagerstroemia speciosa*; July 16, 1965, GR & JGT
Isabela	1f, AESb; taken in a plantation of *Carica papaya*; Nov. 6, 1964, SMG, RB & GR; 6m, 1f, on cotton, *Gossypium* spp.; many leaves on plant were aphid infested; Nov. 6, 1964; 1m, Jan. 22, 1969; and 1m, Jan. 23, 1969, Malaise trap
Lajas	1m, Cartagena Lagoon; Jan. 20, 1954, JMC; and 2m at Lajas, Sept.-Nov., 1960, R. Cotte
Mayagüez	16f, Aug. 1-3, 1953, JMC; 1f, Nov. 1960, M. M. Beauchamp; and 3m, 8f, June 1962, JMC; and 1 specimen, Punta Arenas, P.R. 40-63 PAR; 14 Apr. 1963, E. F. Legner

Ponce	1f, Adjuntas; Rd. 10, K 28.6; near rotten leaves and bananas; Sept. 4, 1965, SMG
Río Piedras	2f, along riverbed of Río Piedras, Apr. 25, 1965, EM; 1f, at AES under Mangifera indica tree; July 7, 1965, SMG; 9m, 8f, on inflorescence of Crysalidocarpus lutescens; May 2, 1965, SMG & EM; 5m, on Dyctiosperma album; Sept. 9, 1964, SMG; 1f, at the Biology building; Aug. 21, 1968, SMG; and 1f, Oct. 22, 1968; 1m, Oct. 24, 1968; and 2f, Oct. 25, 1968, Malaise trap
San Juan	1 specimen, No. 3583; on Chalcas exotica leaf; A. S. Mills
Trujillo Alto	2f, Loíza Lake; on mixed vegetation by lake shore; Feb. 22, 1965, EM
GUADALOUPE, WI	1 specimen, July, Aug. Busck
TRINIDAD, WI	1 specimen, 12.6, Aug. Busck

Fannia trimaculata (Stein)

Homalomyia trimaculata Stein, 1898: 176 (descr. - Jamaica)

Fannia trimaculata Malloch, 1913: 623 (coll. rec. - Jamaica and Dominican Republic (as Santo Domingo)

Malloch, 1934: 207 (coll. rec. - Chile)

Séguy, 1937: 175 (cat., distr. - world)

Albuquerque, 1945: 1 (redescr. - distr. - Brazil)

Seago, 1954: 9 (coll. rec. - PR, Brazil, Dominican Republic, Ecuador, Jamaica, Haití, Honduras, Panamá and Venezuela)

Pont, 1972: 6 (cat., distr. - British Honduras, Panamá, PR, Jamaica, Dominican Republic (S. Domingo), Haití, Ecuador, Perú, Venezuela, Brazil, Uruguay, Argentina)

Fannia femoralis Curran, 1928: 89 (misidentification, coll. rec. - PR, Dominican Republic, Haití and St. Croix, VI)

Wolcott, 1936: 369 (misidentification, coll. rec. - PR, St. Thomas and Hispaniola)

Wolcott, 1948: 496 (misidentification, coll. rec. - PR)

Pont, 1972: 4 (doubtful record for PR)

Male length 4.5 to 5.0 mm. Black with metallic reflections. Parafacialia, gena and genal depression covered by dark cinereous pilosity. Antennal segments 1, 2 black, 3 light brown. Palp and proboscis black. Thoracic tergum black with bright reflections, laterally black with light bluish reflections. Abdomen dark-cinereous or gray; terga with a pair of round black spots and a black line between the spots. All coxae dark or gray-black. Wing hyaline, veins dark brown; halter yellow, base dark.

Eyes contiguous; frons at level of anterior ocellar triangle about 0.005 the length of head. Ocellar triangle about 1/5 the length of frons. Ocellars well-developed with small setulae. Inner verticals slightly larger than outer and about double the size of all other postoculars. Posterior part of head pilose. Parafrontalia straight; vibrissae large, with some setulae at base; peristomial more or less developed; pedicel 1/4 the size of third antennal segment, that extends 1/5 the distance between the base of antennae to the level of the large vibrissa which reaches almost to the level of the oral margin; arista slightly pubescent.

Thoracic dorsum covered with setulae. Metathoracic spiracles

smaller than the capitellum of the halter; 2 humerals; 2 posthumerals and 3 setulae nearby; 2 propleurals and some small propleural setulae; 6 to 8 mesopleurals and many small setulae. Two intra-alars; 2 supra-alars; 1 presutural; 1 acrostichal and 1 dorsocentral row. Scutellars: 2 basals (discals), 2 pre-apicals and 2 apicals.

Fore coxa with a dorsal row of setae, largest one near the insertion of the trochanter, a row of well-developed setae at the level of insertion having other interspersed smaller setae; trochanter with some setae and some setulae. Fore femur with 2 small dorsal rows of setae; 4 ventral rows of fine hairlike setae; 3 anterior rows; 2 small rows of posterior hairlike setae not well-developed. Fore tibia with 2 ventral and 2 dorsal rows of short setae, having other much smaller ones on the dorsal and ventral sides; several strong and several long setae near the insertion of the tarsus. Fore tarsus first segment with a dorsal and ventral row of strong setae; 1 anterior and 1 posterior row of hairlike apical setulae; 1 well-developed dorsal row. Second tarsal segment with a row of strong dorsals and a dense pilosity on ventral side. At posterior and anterior side with 3 rows of setae in which the superior and middle bristles are well-developed. Third tarsal segment with a dorsal row of well-developed setae, with a ventral row of hairlike setulae, anterior and posterior sides covered by short setulae; fourth segment similar to third, with some long setulae; fifth segment similar to the others with some setae and several long, hairlike setulae near the insertion of the claws. The tarsal segments have short and strong setae at the level of the articulations. Mid coxa with 9 setae,

some well-developed; trochanter slightly pilose; mid femur with a well-developed ventral row of setae, a group of setae more or less on the basal third; 4 anterior rows of setae (1 hairlike), being somewhat developed at middle; 3 posterior rows of setae, some on basal half well-developed; mid tibia with a dorsal row of short and hairlike setulae; a ventral row of long, hairlike setulae; anterior and posterior side with 4 rows of setae not well-developed; tarsi similar to the others. Hind coxa with about 7 bristles; trochanter with some setae and micro-setulae; hind femur with a dorsal row of hairlike setulae less abundant on ventral side; long hairlike setulae on a basal prominence; 4 anterior rows of setulae and an area free of setulae. Hind tibia with a ventral and dorsal row of hairlike setulae, the ventrals longer and more numerous; 3 anterior rows well-developed; strong setae near the tarsal insertion; hind tarsus with close pubescence on all sides and strong setae near its articulations. Costal vein with about 4 strong, short setae near wing base.

Abdomen covered with long and fine hairlike setulae, well-developed at the lateral margin, the fifth segment with 2 marginal pairs and 2 well-developed lateral pairs.

Female length 4.0 to 4.5 mm. Eyes separated; frons at level of anterior ocelli about 0.27 the length of head. Ocellar triangle about 3/4 the length of the front. Thorax similar to male. Second antennal segment measuring 0.1 the total length of third which extends 0.6 the distance between the base of the antenna to the level of the stout vibrissa.

Abdomen dark cinereous with dark paired sports parallel to the longitudinal stripe; abdomen more voluminous but shorter than in the male.

Specimens examined:	19 (8m) and 11 (sex undetermined) from 2 localities in Puerto Rico, 1 in the Dominican Republic and 1 in Jamaica
Mayagüez	8m, Feb. 15-16, 14; these specimens were originally identified as F. femoralis and as such were listed by Wolcott (1936, 1948), but Seago (1954) revised the pusio group of the genus Fannia and correctly identified them as belonging to F. trimaculata
DOMINICAN REPUBLIC, WI	1 specimen on 6.8-05, Aug. Busck; and 2 specimens from S. Frncsco Mts.; Sept. 5, Aug. Busck
JAMAICA, WI	8 specimens, Coquillett collection

Genus Euryomma

Euryomma Stein, 1899

Euryomma Stein, 1899: 19 Type-species: Anthomyia peregrinum Meigen, 1826, by monotypy)

Euryomma Bezzi & Stein, 1907: 666, 751 (cat. of Palaearctic spp.)

Euryomma Schnabl & Dziedzicki, 1911: 129 (notes on gen., genitalic figures)

Euryomma Stein, 1911: 61 (rev. SA spp.)

Euryomma Stein, 1916: 11, 82 (rev. Europe spp.)

Euryomma Stein, 1919: 95, 135 (rev. world gen.)

Euryomma Séguy, 1923: 256 (monog., France spp.)

Euryomma Séguy, 1937: 180 (cat., - key to gen.)

Euryomma Séguy, 1941: 54 (synopsis of gen., key to spp.)

Euryomma Emden, 1941: 273 (keys to Muscidae of Ethiopian Region)

Euryomma Ortiz, 1946: 157 (rev. of Chile spp.)

Euryomma Hennig, 1955: 14 (rev. Palaearctic spp.)

Euryomma Albuquerque, 1956b: 1 (rev. of spp.)

Euryomma Chilcott, 1958: 725 (rev. of Panamá spp.)

Euryomma Chilcott, 1960: 223 (key to Nearctic spp.)

Euryomma Pont, 1972: 2 (cat. ASUS spp.)

Eye bare in both sexes. Head with oral margin not protruding, male with 2 orbitals, the first posterior frontal pair diverging, the second pair reclinate; arista short to long pubescent. Thorax with a weak anterior and a strong posterior presutural dorsocentral; 2 strong katepisternals (1:1), with occasionally a median hairlike seta. One or 2 very short prealars. Mid tibia bare ventrally; hind coxa with posterior hairlike setae; hind tibia with 1 posterodorsal, 1 anterodorsal and 1 submedian anteroventral seta. Wing with second anal vein weakly curved forward so as to intersect an extension of the first anal vein at or just before the margin of the wing; costal spine not developed. Abdomen broadest before posterior margin of second segment, that segment parallel-sided on apical 1/2 and not half as broad. Abdomen pollinose, weakly marked.

This is the second largest genus of the subfamily with one cosmopolitan, seven Neotropical, and one Nearctic species. There are probably several more species to be described from the Neotropical region.

The larvae are known for only two Panamanian species associated

with ant nests; they were described by Chilcott (1958). According to Chilcott (1960) they are similar to those of Platycoenosia and the Fannia canicularis group, but can be distinguished by the pebbled or spiculate, not reticulate, integument.

Euryomma sp. Only one specimen of this genus has been collected in P.R., at the Luquillo, Caribbean National Forest, El Verde Field Station; Mar. 26, 1969; Malaise trap. This could represent a new species, but more specimens are needed to reach a final conclusion.

Subfamily Phaoniinae

The members of this subfamily are characterized by having the hind tibia with one or more strong posterior setae, slightly displaced to the dorsal side, or, if without them, then either (Azelia) anal vein conspicuously short (not extending half-way from anal cell to wing margin) or (Hydrotaea armipes) front femora notched and toothed beneath at apex, or frontalia with strong, crossed setae and at the same time only one posterior katepisternal seta; abdomen generally with median stripe, often with shifting pruinose pattern, never with fixed paired spots (except very indistinctly in Phaonia cincta); when fourth vein (M_{1+2}) somewhat curved forward at wing tip (some Hydrotaea species), arista is pubescent.

Key to the genera of Phaoniinae

1. Third wing vein (R_{4+5}) bare, thoracic dorsum black and glossy

    . . . *Ophyra* Robineau-Desvoidy

    Third wing vein (R_{4+5}) setulose, thoracic dorsum never black and glossy . . . 2

2. Anepimeron setulose; 2 presutural and 4 postsutural dorsocentrals

    . . . *Cyrtoneurina* Giglio-Tos

    Anepimeron bare; 2 presutural and 3 postsutural dorsocentrals

    . . . *Scenetes* Malloch

Genus *Ophyra*

Ophyra Robineau-Desvoidy, 1830

Ophyra Robineau-Desvoidy, 1830: 516 Type-species: *nitida* Robineau-Desvoidy (Rondani, 1866: 70, 84, 1866: 3, 17) = *leucostoma* (Wiedemann)

Ophyra Aldrich, 1905: 536 (cat. NA spp.)

Ophyra Aldrich, 1928: 4 (descr. of SA spp.)

Ophyra Séguy, 1937: 307 (cat., key to world gen., summary of hosts and larval habits)

Ophyra Oliveira, 1941: 341 (biology, and key to spp. of Brazil)

Ophyra Sabrosky, 1949: 423 (rev. - key to Pacific Region spp.)

Ophyra Bohart & Gressitt, 1951: 113 (biology of spp. of Europe)

Ophyra Albuquerque, 1958b: 1 (rev. SA spp.)

Ophyra Snyder, 1965: 274 (rev., key to Micronesian spp.)

Ophyra Huckett, 1965: 901 (cat. of NA spp.)

Ophyra Pont, 1972: 13 (cat. of ASUS spp.)

Eyes bare, nearly contiguous in male, frons broad in female. Antenna short, arista pubescent in basal half. Subshiny, black, glossy with metallic blue or green reflections. Female ocellar triangle shiny, enlarged, and with a pair of cruciate interfrontal setae, one of median parafrontals proclinate and often stronger than adjacent posterior ones. Occipital part of head covered with setulae. Thorax with many short setulae; 2 presutural and 4 postsutural dorsocentrals; 1 or no prealar; 2 katepisternals, anepimeron and meron bare. Third (R_{4+5}) and fourth (M_{1+2}) wing veins slightly to distinctly convergent apically; all wing veins except costa, bare. Capitellum of halter brown to black, and usually darker than stalk. Hind tibia in both sexes with a distinct postero-dorsal seta at or beyond middle. Abdomen covered with dense clothing setulae. The genus Ophyra has about 21 described species, 6 of which occur in America.

Biology: The species of the genus Ophyra are widely distributed, a condition attributed to their breeding habits on vegetation, carrion and manure. Alysia manductor and Mormoniella brevicornis have been found parasitizing the puparia. Malloch (1932) states that members of this genus soar and hover like those of Fannia. According to Snyder (1965) adult females are often found on fresh feces and well-rotted, but not dried-out carrion, males are often on tree trunks, and frequently hover along paths or above areas where females are abundant.

The larvae are coprophagous, saprophagous and zoophagous, occasionally parasitic. The larva of Ophyra leucostoma has been described by Keilin & Tate (1930). Séguy (1937) has found the larvae of O. leucostoma in the birds' nests of Chelidon rustica, Delichon urbica and Passer domestica.

Bohart & Gressitt (1951) stated that Ophyra chalcogaster is reported as breeding in human and canine carcasses on European battlefields. According to Keilin & Tate (1930), maggots have been taken from nests of swallows, where they were apparently feeding on blood from nestlings, from dead rats, manure piles and manure in the field. Howard (1900) reared the species from isolated deposits of human feces.

Ophyra nigra was reared from carrion by Buxton & Hopkins (1927) and by Illingworth (1922) from hen manure.

The biology of Ophyra aenescens will be discussed under the species description.

Ophyra aenescens (Wiedemann) (Plate III, Fig. 10; Plate XVIII, Fig. 80)

Anthomyia aenescens Wiedemann, 1830: 435 (descr. - New Orleans and WI)

Ophyra aenescens Macquart, 1846a: 203 (coll. rec. USA)

Röder, 1885: 347 (coll. rec. - PR)

Gundlach, 1887: 194 (coll. rec. - PR)

Williston, 1896: 367 (coll. rec. - St. Vincent Is.)

Stein, 1898: 170 (coll. rec. - USA)

Grimshaw, 1901: 30 (coll. rec. - Hawaiian Is.)

Stein, 1904: 451 (coll. rec. - Brazil)

Aldrich, 1905: 536 (cat. - distr. - NA spp.)

Stein, 1911: 100 (coll., rec. - Chile)

Stein, 1918: 234 (coll. rec. - Mexico, Argentina, Perú)

Wolcott, 1923a: 226 (coll. rec. - PR)

Shannon & del Ponte, 1928b: 145 (coll. rec. - Argentina)

Aldrich, 1928: 4 (coll. rec. - S. A.: Brazil, Argentina, Chile, Perú)

Gaminara, 1929: 1257 (coll. rec. - Uruguay)

Engel, 1931: 136 (coll. rec. - Bolivia)

Wolcott, 1936: 368 (coll. rec. - PR)

Séguy, 1937: 308 (cat. rec. - Southern Europe)

Oliveira, 1941: 344 (coll. rec. - Brazil & distribution)

Wolcott, 1948: 495 (coll. rec. - PR)

Sabrosky, 1949: 423 (coll. rec. - Pacific Region)

Bohart & Gressitt, 1951: 113 (coll. rec. - Guam and Guatemala)

Albuquerque, 1958b: 2 (coll. rec. - Brazil)

Huckett, 1965: 901 (cat., distr. - USA, Bermuda, Galápagos Is., Hawaii, Nauru and Ocean Is. (W. of Gilbert Is.))

Pont, 1972: 13 (cat., distr. - Mexico, Nicaragua, Bermuda Is., St. Vincent, PR, Jamaica, Trinidad, Tobago, Guyana, Venezuela, Ecuador, Perú, Bolivia, Brazil, Uruguay, Argentina, Chile, Galápagos Is., USA, South Europe and Eastern Pacific)

Ophyra argentina Bigot, 1885: 302 (coll. rec. - Argentina)

Giglio-Tos, 1895: 26 (coll. rec. - Mexico)

Wulp, 1896: 323 (coll. rec. - Argentina, Mexico)

Ophyra carbonaria Shannon & del Ponte, 1928a: 20, 30 (coll. rec. - Argentina)

Ophyra trochantera Malloch, 1923a: 664 (coll. rec. - Uruguay & biology)

Ophyra virescens Macquart 1843: 321 (Type locality: Brazil, Panamá, Guaratuba)

Anthomyia setia Walker, 1849: 956 (descr. - Galápagos Is.)

Male length 5.4 to 6.0 mm. Color black with greenish tinge on dorsum. Frontal vitta and parafrontalia black; parafacialia silvery pollinose when viewed from the back; frontal lunule shown as a silvery spot; antenna brown with reddish-to-orange tinge, third segment blackish at apex covered with silvery tinge; palp deep red to reddish-yellow, with black microsetae at apex. Wing smoky, yellowish veins, calypter pale or white basally to brownish apically; halter black on apical half, basal half from dark-yellowish to yellowish-red; second and extreme base of third antennal segment light brown. Abdominal pleura yellow.

Eyes bare, contiguous; 8-9 pairs of frontal setae, except for 1 pair, all others short and thin; 1 interocellar pair, hairlike post-ocellar and outer vertical very short, inner not well-differentiated; second antennal segment with several very short, thick microsetae, 2 pairs well-developed and longer than the others. Arista with very short pubescence in basal half; occipital part of head setulose. Palp short, setulose at apex, larger basal setulae especially on the lower

side. Vibrissae stout, well-developed; peristomial setae well-developed.

Thorax covered with fine setulae; humerals; 1 stout seta and 1 very small one; 1 posthumeral; 1 sublateral; 2 presutural and 4 postsutural dorsocentrals; postsutural decreasing in size from transverse suture to base of scutellum; acrostichals (only prescutellar pair developed); 1 notopleural; 1 supra-alar; 1 postalar; 2 intra-alars; scutellars: 1 cruciate apical pair, 2 small lateral subapicals and 1 long subbasal (or discal); 7-8 mesanepisternals; 1 long, stout propleural and 1 stigmatal, with small setulae below the propleural and stigmatal area; 2 katepisternals; anterior seta very small, upper posterior seta very strong, well-developed; anepimeron with very short villosity; meron bare; katatergite covered with brownish-yellow villosity; calypter with many long hairlike setulae at edge.

Fore coxa covered with white villosity; long setae on anterior and posterior part; fore femur with 1 dorsal, 1 posterodorsal and 1 anterior row of setae; 1 ventral to posteroventral row of setae about twice in size and stronger than other setae of fore femur; 4-5 long setae basally in anterior row; fore tibia covered with many short setulae, with a long dorsal preapical seta. Mid coxa with about 8 well-developed setae; mid femur with 1 anterior row of setae well-developed in basal half; 3-4 stout, short, erect setae on basal posterior part; a row of long, curved apical posterodorsals; mid tibia with 1 apical dorsal; 1 posterior at 0.40 and 1 at 0.50; 1 apical posteroventral, 1 ventral and 1 long anterior seta. Hind coxae with some well-developed setae;

trochanters with long, fine, hairlike setulae bent apically, giving a hairbrush aspect; hind femur slightly setulose, with 1 anterodorsal to dorsal row of stout setae; a row of 7-8 stout apicals at middle; hind tibia covered with fine setulae; 1 long posterodorsal almost at middle; 1 dorsal preapical; 3 short anteroventrals (1 at center, 1 almost at center and 1 at apex).

Abdomen covered with many long and fine hairlike setulae, longer at sides and at apex of segments.

Female length 5.4 to 6.8 mm. Similar to male. The frontal triangle extending from vertex to frontal lunule; 1 pair of frontal cruciate interfrontals; 1 inner and 1 outer vertical pair, well-differentiated; 6 frontal pairs, last upper seta proclinate; lower and upper orbitals very small; 1 short prealar.

This is the only species reported from the West Indies.

Remarks: Malloch (1923a) recorded the larval stages feeding on human excrement and manure. According to Shannon & del Ponte (1928a), this species is abundant in kitchens in Guatemala, walking about on tables and food as does *Musca domestica*, and is not attracted to windows indoors. Oliveira (1941) recorded it living in humid sand of the sea shore and on flower spikes of corn. He also recorded it as a species of economic importance since it has been found with frequency in the slaughter houses around Río de Janeiro, from which the larvae could take food from salted meat and other products of animal origin. He recorded the life cycle: the larval period was from 12-14 days, a pupal period was 14-16 days, and the total time of the life cycle was

from 26-30 days. Johnson & Venard (1957) studied the biology and morphology of this species; they also described a laboratory method for culturing this fly and presented a key to differentiate the three species that occur in North America. Snyder (1965) reported that this species is commonly found on carrion and occasionally on fresh human faeces out-of-doors.

Specimens examined:	27 (21m, 3f, and 3 (sex undetermined) from 5 localities in Puerto Rico and 1 in Bermuda
Aguas Buenas	2m, 1f, 1,500 ft.; June 23, 1965, SMG & LFM
Guayama	6m, Guavate For., Rd. 179, K 9.6; on carcass of dog along roadside; Nov. 1, 1964, SMG & EM
Isabela	1f, AESb; on leaf of Gossypium spp. (cotton); many leaves on the plant were aphid-infested; Nov. 6, 1964, SMG
Lajas	13m, 1f, San Germán, Rd. 4, K 26.9; on grass along roadside; Sept. 3, 1968, SMG
Villalba	1 specimen, II-4-34; A. S. Mills; San Juan 5181
BERMUDA	1 specimen, Sandy's Parish; Nov. 1960, J. W. Hughes; and another on Dec. 26, 1908, E. A. Popenoe

Genus Scenetes

Scenetes Malloch, 1936

Scenetes Malloch, 1936: 9 Type-species: Scenetes cardini Malloch (by original designation)

Scenetes Snyder, 1949a: 127 (rev. gen. Neomuscina)

Scenetes Pont, 1972: 24 (cat. of ASUS spp.)

Head twice as high as its greatest length; facial ridges with close, short setulae. Arista plumose on basal half or more, bare apically; eye almost bare; frons in both sexes narrowly wide. Frons with 4-6 frontal incurved and 2 recurved setae; ocellar and inner vertical setae long; outer vertical very small, inconspicuous, parafrontalia with very small setulae. Prosternum, center of propleuron, anepimeron and meron bare. Mesonotum with 4 dark vittae. Lower calypter much larger than upper. Fourth wing vein (M_{1+2}) not curved forward at apex. First vein (R_1) with an apical row of setulae on upper side; third vein (R_{4+5}) setulose above and below from base to about midway to the (r-m) inner cross vein. Hind tibia without apical seta. This monotypic genus is known only from Cuba, Puerto Rico and St. Thomas, V.I.

Scenetes cardini Malloch (Plate I, Fig. 3; Plate XVI, Fig. 68)

Scenetes cardini Malloch, 1936: 10 (descr. - Cuba: Santiago de las Vegas and PR)

Wolcott, 1936: 364 (coll. rec. - PR)

Wolcott, 1948: 488 (coll. rec. - PR)

Snyder, 1949a: 127 (rev., comparison morphological characters with Neomuscina)

Pont, 1972: 24 (cat., distr. - Cuba and PR)

Miskimen & Bond, 1970: 70 (coll. rec. - St. Croix)

Male length 4.0 to 4.8 mm. Color black, shiny, with dense gray pruinescence, especially on head; antenna black, segments 1 and 2, sometimes base of 3 and palp brownish-yellow.

Thoracic tergum with 4 black vittae. Legs black to blackish-brown; apices of femora testaceous yellow, more so on ventral side. Wing grayish-hyaline; calypter white; halter yellow. Abdomen with a dark median vitta and a pair of large subtriangular black spots on each tergite.

Eyes with short pilosity especially on lower part. Frons longer than wide, as wide as long at middle. Vibrissae cruciate, very stout. Frontal vitta equally narrow in both sexes. Parafrontalia with 4 to 6 anterior incurved, and 2 reclinate setae; 1 pair of ocellars; inner vertical long; outer vertical underdeveloped; postvertical of medium size. Parafacialia closely short setulose; arista plumose on basal half; parafrontalia with short setulae. Second antennal segment with few setulae and 1 short, erect seta.

Mesonotum with 2 presutural and 3 postsutural dorsocentrals; 4 minute acrostichal rows (only prescutellar pair developed); 2 humerals; 1 posthumeral; 1 sublateral; 2 prealars, small, underdeveloped; 2 intra-alars; 2 post-alars; 3 katepisternals; 4-6 mesanepisternals, 1 on upper margin; scutellars: 1 apical pair, 2 discal (basal) pairs of which the last pair is the smaller; 2 stigmatals; 2 propleurals well-developed, other setulae at base. Wing rather short and broad; first cross vein over 1/3 from apex of discal cell; outer cross vein straight; R_1 vein with few very short, dorsal apical setulae; vein R_{4+5} setulose ventrally and apically, extending from base to about basal 1/3 midway to the inner r-m vein.

Legs rather stout; tarsi slender with very small claws and pulvilli;

fore femur with several long and stout posterodorsal and posteroventral rows of setae; fore tibia without a median seta, but apically with 1 stout dorsal; 1 posterodorsal and 1 posteroventral seta; mid femur with subapical posterodorsal and posterior setae; 2 or 3 stout, erect ventrals on basal 1/3; mid tibia with 3 or more short posteriors; 1 posteroventral, 1 ventral and 1 anteroventral seta, long and well-developed; hind femur with 3-4 stout anteroventrals on apical half, the one near apex the stoutest; 1 row of strong anterodorsals; 2 apical dorsal setae; hind tibia with 2 anterolaterals and 1 anteroventral; 1 long apical anterodorsal, 1 dorsal and 1 anteroventral seta.

Abdomen narrowly ovate, the setae at apex of apical tergite longer than apical setae on other tergites. Hypopygium always testaceous yellow, not very prominent and in the form of a pair of rounded lobes.

Female length 4.0 to 5.6 mm. Exactly as male in color and structure except the color of antenna and palp is brighter.

Specimens examined:	135 (61m, 65f and 9 (sex undetermined) from 18 localities in Puerto Rico, 1 in St. Thomas and 1 in Cuba:
Aguas Buenas	1m, Casa de Cursillos; Oct. 13, 1964, SMG & LFM; 1f, Aug. 2, 1965; 1f, Dec. 7-8, 1968; and 3f, Dec. 9-10, 1968, Malaise trap
Adjuntas	1f, Utuado; Rd. 10, K 7; reared in artificial medium from larvae taken on fruits of *Solanum torvum*; Sept. 4, 1968, SMG; and 1f, *ibid.*, at Km 63.4; near rotting, *Artocarpus communis*, Sept. 4, 1968, SMG
Bayamón	1 specimen, Spring 1932; San Juan No. 7691; Lesene & Anderson

Castañer	1m, 5f, Limaní, AESb; Feb. 7, 1969; 1f, Feb. 10, 1969; 2f, Feb. 11, 1969, Malaise trap
Cayey	1f, Henry Barracks; Nov. 15-17, 1968; 2f, Nov. 19, 1968; 3m, 2f, Mar. 15, 1969, Malaise trap; 2f, at Salinas, Rd. 1, K 80; Nov. 27, 1968, Malaise trap
Ciales	1m, Jayuya, Rd. 144, 2,700 ft.; on vegetation along roadside; July 16, 1965, SMG
Corozal	2m, 1f, AESb; Jan. 15, 1969; 6m, 4f, Jan. 16, 1969; 3m, 2f; Jan. 17, 1969; 8m, 9f; Jan. 18 1969; 9m, 7f; Jan. 19, 1969 and 1m, 5f, Jan. 20, 1969, Malaise trap
Gurabo	1m, AESb; on Digitaria decumbens; X-15, 1968; and 1m, 1f; Nov. 4-5, 1968; 1m, Nov. 8, 1968; and 1f, Nov. 9, 1968, Malaise trap
Isabela	1m, AESb; taken in a plantation of Carica papaya; Nov. 6, 1964, SMG, RB & GR
Las Marías	1f, at light; July 13-14, 1965, JAR
Luquillo	1f, Caribbean Nat. For., El Yunque Rd. 191, K 14.7, taken on Pangola grass near river; Sept. 8, 1964, SMG, PM & EM; 1f, on mixed vegetation by roadside; Aug. 26, 1968, SMG; 1m, at El Verde Field Station; Dec. 5, 1968; 1f, Dec. 6, 1968; and 1m, Dec. 7, 1968, Malaise trap
Maricao	1m, July 1960, JMC; 1 specimen on pomarrosa; VI-15-31, A. C. Harley, San Juan No. 2672
Mayagüez	5 paratypes: 1 from J. M. Aldrich collection; 3 from guava, Psidium guajava, 8-26-35; K. A. Bartlett; 1 from guava; S.J. #4070; IX-13-33; A. G. Harley; and 1 on X-15-32; A. G. Harley; San Juan No. 3071; 3m by house of G. Miskimen; Feb. 3, 1969, Malaise trap
Orocovis	1m, reared in lab. from Sechium edule; Nov. 26, 1968, M. E. Pérez

Río Piedras	2m, 3f, AES; reared from rotting fruit of Artocarpus communis (bread-fruit); Feb. 2, 1965, SMG; 1m, along riverbed of Río Piedras, Apr. 25, 1965, EM; 1 specimen, ACC. No. 4-26; Dec. 30, 1925, F. Stein; 2f, under Mangifera indica tree; July 7, 1965, SMG; 1f, AES-Biology building; Aug. 21, 1968, SMG; 1f, reared from Terminalia catappa fruits; Aug. 23, 1968, M. H. Muma; and 3m, Oct. 17, 1968; 2m, Oct. 20, 1968; 3m, Oct. 21, 1968; 1m, Oct. 22, 1968; and 1f, Nov. 4, 1968, Malaise trap
Trujillo Alto	1m, reared from Genipa americana; Aug. 20, 1968
Utuado	1m, Río Abajo For.; Rd. 21, K 5.2; 1,100 ft.; near Peace Corps camp; on vegetation by creek; Aug. 18, 1965, SMG
Yauco	1f, Lares Rd., K 22; collected at light; July 18, 1955, JAR & JM
CUBA, WI	Holotype: male, Stiago (sic) de las Vegas; Est. Cent. Agr. de Cuba; from oranges; II-28-19; P. Cardin; labelled with number 8420 (NMNH No. 22273). Allotype: female, same data as holotype, except labelled with 2 numbers: C-90 and 8420c.
ST. THOMAS, WI	1 specimen, St. Thomas-89; fruitfly trap; VII-19-52, 52-10585 (with a label as gen. sp. near Helina)

Genus Cyrtoneurina

Cyrtoneurina Giglio-Tos, 1895

Cyrtoneurina Giglio-Tos, 1895: 51 Type-species: Cyrtoneurina uber Giglio-Tos, 1893: 6; Coquillett, 1910: 530

Clinopera Wulp, 1896: 305 Type-species: Clinopera hieroglyphica Wulp (Coquillett, 1910: 535) = uber Giglio-Tos

Cyrtoneurina Aldrich, 1905: 533 (cat. of NA spp.)

Cyrtoneurina Coquillett, 1910: 530 Type-species of NA gen.

Clinopera Schnabl & Dziedzicki, 1911: 166 (rev. Anthomyiidae)

Cyrtoneurina Stein, 1918: 222 (rev. European spp.)

Cyrtoneurina Malloch, 1921a: 41 (notes on NA spp.)

Cyrtoneurina Malloch, 1925a: 89 (rev. of Cyrtoneurina)

Cyrtoneuropsis Malloch, 1925a: 91 Type-species: Spilogaster veniseta Stein (orig. des.)

Cyrtoneurina Curran, 1934: 342 (mon. of families and gen. of NA)

Mallocharia Curran, 1934: 462 Type-species: Mallocharia beebii Curran (orig. des.)

Cyrtoneuropsis Malloch, 1934: 342 (rev. Chilean spp.)

Cyrtoneurina Séguy, 1937: 350 (cat. - world spp.)

Cyrtoneurina Synder, 1954b: 429 (rev. of Neotropical spp.)

Cyrtoneurina Miskimen & Bond, 1970: 70 (coll. rec. - St. Croix, VI)

Cyrtoneurina Pont, 1972: 51 (cat. of ASUS spp.)

Eyes contiguous in male, well-separated in female. Antenna inserted at the level of middle of the eye; arista plumose. Parafacialia setulose on basal 1/3; vibrissae long, stout, cruciate with a long, slender seta below the vibrissae; frontal setae 5 pairs, 2 pairs cruciate; lower and upper orbital present; large interocellar; outer and inner verticals well-developed in female; 1 pair of interfrontals in female (PR species).

Humerals 2; 2 notopleurals; 2 presutural and 4 postsutural dorsocentrals; acrostichals (only the prescutellar pair developed); 1 prealar;

scutellum setulose at sides. Prosternum bare; propleuron bare at middle; 3 katepisternals well-developed; anepimeron with a group of anepimeral setulae at middle.

Wing in Puerto Rican species with a dorsal row of setae on R_1, interrupted for a very short distance near apex, ventral setae present on this vein only apically. Vein R_{4+5} with setae for about half the distance from base or node to r-m cross vein, ventrally only at node or slightly beyond it, fourth vein slightly curved at apex. Wing clear or spotted at r-m cross vein and at stigma.

Séguy (1937) separated Neomuscina from Cyrtoneurina and considered Cyrtoneuropsis Malloch and Clinopera van der Wulp to be synonyms of Cyrtoneurina. According to Snyder (1954b), Cyrtoneurina Giglio-Tos is one of the more abundant phaoniine groups in the Neotropics. He recorded 21 species of which 8 are found in Trinidad, 3 in Granada, 1 in Cuba, 1 in Puerto Rico and 1 on St. Vincent Is.

Cyrtoneurina rescita (Walker) (Plate VI, Fig. 19; Plate XVIII, Fig. 77)

Anthomyia rescita Walker, 1861: 315 (descr. - Mexico)

Anthomyia setinervis Thomson, 1868: 549 (descr. - Ecuador, Perú)

Cyrtoneurina gluta Giglio-Tos, 1894: 15 (descr. - Mexico)

Clinopera frontina Wulp, 1896: 306 (descr. - Mexico: Tabasco, Teapa)

Clinopera pterostigma Wulp, 1896: 309 (descr. - Mexico: Tabasco, Teapa and Frontera)

Cyrtoneurina maculipennis Williston, 1896: 368 (pl. 12, Figs. 121 and 121a (Cyrtoneura; preocc. Macquart, 1843); descr. - St. Vincent Is.)

Spilogaster rescita Stein, 1901: 207 (descr. - Bolivia)

Mydaea rescita Stein, 1911: 99 (coll. rec. - SA)

Cyrtoneurina rescita Stein 1918: 228 (coll. rec. - Bolivia, British Honduras, Colombia, Mexico and Paraguay)

Séguy, 1937: 351 (cat. - key world gen.)

Snyder, 1954b: 448 (coll. rec. - Cuba, St. Vincent, Trinidad, Costa Rica, Guatemala, Honduras, Panamá, Nicaragua, Brazil, British Guiana, Paraguay, Perú and Mexico)

Maldonado Capriles & Navarro, 1967: 57 (coll rec. - PR)

Pont, 1972: 53 (cat. distr. - Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panamá, Cuba, St. Vincent Is., Trinidad, Colombia, Venezuela, Guyana, Perú, Bolivia, Brazil, Paraguay and Ecuador)

Cyrtoneurina trita Malloch, 1925a: 91 (descr. - Bolivia, San Carlos)

Male length 3.6 to 5.8 mm. Black with densely grayish body, except frontal vitta black pruinose; parafrontalia, parafacialia and gena whitish to light-golden pruinose. Antennal segment 2 and base of 3 reddish-brown to yellow; aristal segment 1 and base of 3 yellow. Clypeus reddish-brown with whitish pollinosity. Yellow villosity on margin of anterior spiracle. Wing hyaline or faintly tinged yellow, dark spot on stigma much reduced and mostly enclosed by the first vein, anterior cross vein (r-m) surrounded by a dark brown cloud and the posterior cross vein (m-cu) may or may not have a faint darkened border; calypter white; halter yellow. Neither abdomen nor thorax with a distinct pattern.

Frons with a row of 9-10 frontal bristles, strong, upright, slightly cruciate; preapical pair the strongest, cruciate; 2 posterior reclinate setae (upper and lower orbitals); anterior interocellars as long as preapical frontal; 3-4 small postocellars, very small outer and inner verticals; antennal segment 2 with a long, well-developed seta about half the length of arista; longest aristal rays about half the size of the aristal length; parafacialia with a series of setulae above vibrissae. Palp cylindrical with short black setulae above, long below.

Two humerals; 1 posthumeral; 1 sublateral; 2 notopleurals; 2 presutural and 4 postsutural dorsocentrals; about 6 irregular rows of undifferentiated acrostichals, except for 1 pair of basal postsuturals; 1 prealar; 2 supra-alars; 1 intra-alar; 2 postalars; scutellars: 1 apical cruciate pair, 1 subbasal pair, 2 lateral pairs near the preapical, well-developed and differentiated from the other clothing setulae of scutellum; scutellum with lateral setulae on basal half; 1 to 3 propleurals well-developed, with 3-4 setulae at base; 1 long stout and 2 smaller stigmatal setae with many interspersed setulae; about 7 mesanepisternals with 2 thin, long setae above on frontal margin; 3 katepisternals; anepimeron setulose at the middle; meron bare; katatergite covered with short villosity.

Wing vein R_1 with a dorsal row of short setae, reaching the tip; interrupted for a short distance near apex; ventral apical setae present on vein R_1. Vein R_{4+5} with setae above for about half the distance from Rs; ventral setulae present only at node or slightly beyond it. Fourth vein (M_{1+2}) curved slightly upward at apex. Posterior cross vein (m-cu)

slightly clouded or shaded at sides.

Fore coxa with 2 rows of stout setae; fore femur with several rows of setae with the posterodorsals and posteroventrals well-developed; fore tibia with only 1 apical, 1 stout dorsal, 1 posterodorsal and 1 posteroventral seta. Mid femur with 2-3 preapicals posterior to posteroventral and anteroventral setae; mid tibia with 2 dorsal setae (1 at 0.50 and 1 at 0.40); 1 apical anterodorsal and 1 posteroventral which are subequal and longer than other apical setae. Hind femur with a row of anterodorsals; 5-6 long apical anteroventrals at middle; 1 preapical dorsal to slightly posterodorsal; hind tibia with 1 median anteroventral; 1 anterodorsal; 2 posterodorsals (1 at 0.50 and 1 at 0.25); hind tibia with 1 apical dorsal and 1 apical anteroventral. Tarsi not unusually modified in either sex.

Abdomen covered with numerous setulae, with a large apical row of setae. Segments 4 and 5 each with a discal and apical row of setae, well-spaced; discal row interrupted at middle.

Female length 3.1 to 5.2 mm. Identical to male in coloration and structure except eyes which are separated, frontal vitta with a pair of thin interfrontal setae. Outer and inner verticals well-developed, stouter than in male.

Specimens examined:	467 (202m, 260f and 5 (sex undetermined) from 22 Puerto Rican localities:
Aguas Buenas	1m, 2f, Casa de Cursillos; Dec. 7-8, 1968; 2m, 4f, Dec. 9-10, 1968; 4f, Dec. 14, 1968; and 4f, Dec. 16, 1968, Malaise trap
Aguirre	5m, 13f, sugarcane mill; Nov. 27-28, 1968, Malaise trap

Arecibo	2m, Bo. Cercadillo, R. 682; on mixed vegetation by roadside; Feb. 11, 1965, SMG; 1m, at Cambalache For.; Feb. 11, 1969; and 1f, Feb. 19, 1969, Malaise trap
Bayamón	3m, Urb. Sierra Bayamón; on mixed vegetation by sidewalk; June 27, 1965, EM
Camuy	2m, Lake Guajataca, Rd. 119, K 9; on grass along roadside; Sept. 3, 1968, SMG
Canóvanas	3f, Loiza Aldea, Rd. 187, Medianía Alta; Jan. 23, 1969, SMG
Castañer	1m, Limaní AESb, Feb. 7, 1969; 4m, Feb. 10, 1969; and 2m, 2f, Feb. 11, 1969, Malaise trap
Cayey	1m, 4f, Carite For.; Dec. 27-30, 1968, Malaise trap; 4f, at Salinas, Rd. 1, K 63.4; Nov. 22-25, 1968; 2f, at K 80; Nov. 22-25, 1968; 1f, Nov. 26, 1968; 10m, 4f; Nov. 27, 1968, Malaise trap; and 2m, 1f; Sept.-Nov. 1969, M. Beauchamp
Corozal	18m, 16f, AESb; Jan. 15, 1969; 16m, 17f, Jan. 16, 1969; 2m, 7f, Jan. 17, 1969; 2m, 2f, Jan. 19, 1969; and 1f, Jan. 20, 1969, Malaise trap
Fortuna	3m, 2f, AESb; Nov. 15-18, 1968; 1m, Nov. 19, 1968; and 1m, 1f, Nov. 21-22, 1968, Malaise trap
Gurabo	4m, 2f, AESb; on Pangola grass; Aug. 21, 1968, SMG; and 22m, 3f, X-15-1968; 7m, 30f, Nov. 4-5, 1969; 6m, 16f, Nov. 7, 1968; 10m, 27f, Nov. 8, 1968; 16m, 18f, Nov. 9, 1968; 4m, 10f, Nov. 10, 1968; and 5m, 23f, Nov. 11, 1968, Malaise trap
Humacao	1m, 12f, at Naguabo Rd. 3, K 81.6; on flowers of *Lagerstroemia speciosa*; July 16, 1965, GR & JGT
Isabela	4m, AESb; taken in a plantation of *Carica papaya*; Nov. 6, 1964, SMG, RB & GR; 7m, 1f, Jan. 22, 1969; 1m, 1f, Jan. 23, 1969; 1m, 1f, Jan. 24, 1969; 10m, 6f, Jan. 25-26, 1969; 2m, 2f, Jan. 27, 1969; and 2f, Jan. 28, 1969, Malaise trap

Juncos	1m, Sugarcane Mill; taken on Clitoria ternatea leaf; May 20, 1965 SMG
Lajas	4f, AESb; Feb. 3, 1969; and 7m, Feb. 4, 1969, Malaise trap
Luquillo	5f, Caribbean Nat. For., El Yunque, Rd. 191, K 1.4; on mixed vegetation by roadside; Aug. 26, 1968, SMG
Mayagüez	1m, Sept.-Nov., 1960, E. Murphy
Río Grande	2 specimens; 1 on VI-4-33, B. B. Sugermann; 1 at Girl Scout Camp; 6-27-53, B. B. Sugermann (identified as Cyrtoneurina pallipes)
Río Piedras	1f, along riverbed of Río Piedras; Apr. 25, 1965, EM; and 1m, at AES; 1m, Oct. 17, 1968; 1f, Oct. 20, 1968; 1m, Oct. 21, 1968; 1m, 1f, Oct. 22, 1968; 3m, 2f, Oct. 23, 1968; 1m, 1f, Oct. 24, 1968; and 2m, Oct. 25, 1968, Malaise trap
San Juan	1 specimen; 5-29-53, B. B. Sugermann
Utuado	1m, 1f, Río Abajo For., Rd. 621, K 5.2; 1,100 ft.; near Peace Corps Camp; on vegetation by creek; Aug. 18, 1965, SMG
Vega Baja	1m, Dorado, Rd. 693, K 11; on mixed vegetation by roadside; Aug. 5, 1965, JCT

Subfamily Muscinae

Body moderately robust; proboscis short, not rigid, labellum fleshy, well-developed. The characters that separate this group from other subfamilies in Muscidae consist of the wide lower calypter, which is subtransverse on its posterior margin and widened basally so that its inner margin usually touches the anterior lateral angle of the scutellum, or lying next to, or touching the basal lateral angle of scutellum. Wing vein R_{4+5} distinctly curved forward at or very close

to the middle of its apical section so that the posterior cell is not as wide or is very little wider at its apex than at the inner cross vein.

Key to the Genera of Muscinae

1. Pteropleura bare . . . 2

   Pteropleura setulose . . . 3

2. Eye with microsetulae; caudal margin notched at middle; prosternum bare; arista long, plumose . . . Graphomya Robineau-Desvoidy

   Eye bare; caudal margin not notched; prosternum setulose: arista almost bare . . . Synthesiomyia Brauer & Bergenstamm

3. Vein M_{1+2} sharply bent forward on ultimate section toward wing tip; prosternum and propleuron setulose; infrasquamal ridge (declivity above base of lower calypter) bare . . . Musca Linnaeus

   Vein M_{1+2} broadly curved, bent forward on ultimate section toward wing tip, or lacking such curvature; prosternum bare or setulose; infrasquamal ridge setulose . . . 4

4. Vein M_{1+2} ending at margin of wing before or anterior to apex of wing; stem vein (R) setulose just behind humeral cross vein on upper side; third vein (R_{4+5}) with setulae on dorsal and ventral side . . . Morellia Robineau-Desvoidy

   Vein M_{1+2} ending at margin of wing near or far from the apex of wing; all veins bare except costa . . . 5

5. Infrasquamal ridge (declivity above base of lower calypter) usually bare; apical portion of stem vein (R) always setulose on ventral surface, usually with 1 or 2 setulae on dorsal surface (Neomuscina sens. str.); ventral setulae on basal portion and 2 ventral setulae and 1 dorsal on apical portion of stem vein (R) (N. (Spilopteromyia)); third vein (R_{4+5}) with 1 or more setulae on ventral and dorsal surfaces beyond node . . . Neomuscina Townsend

Infrasquamal ridge usually setulose; basal and apical portion of stem vein (R) bare . . . Neomusca Malloch

Genus Graphomya

Graphomya Robineau-Desvoidy, 1830

Graphomya Robineau-Desvoidy, 1830: 403 Type-species: Musca maculata Scopoli (Rondani, 1856: 91)

Curtoneura Macquart, 1834: 146 Type-species: Curtoneura maculata Scopoli

Curtoneura Westwood, 1840: 141 (synopsis of British spp.)

Graphomya Aldrich, 1905: 528 (cat. of NA spp.)

Graphomya Schnabl & Dziedzicki, 1911: 171 (rev. of Palaearctic spp.)

Graphomyia Malloch, 1934: 344 (cat. of Chile and Patagonia spp.)

Protostomoxys Enderlein, 1935: 242 Type-species: Protostomoxys podexaureus Enderlein (orig. des.). Synonymized by Pont, 1972: 27

Graphomya Séguy, 1937: 384 (cat., distr., world spp.)

Graphomyia Albuquerque, 1954b: 79 (rev. of Brazil spp.)

Graphomya Hennig, 1958: 231 (cat. of Palaearctic spp.)

Graphomya Dodge, 1965: 394 (rev. of Neotropical spp.)

Graphomya Huckett, 1965: 910 (cat. of NA spp.)

Graphomya Pont, 1972: 27 (cat. of ASUS spp.)

Graphomya Arntfield, 1975: 261 (rev. of NA spp.)

Rather stout muscid. Color black to rufous with silvery to yellow markings. Eyes quite pilose, nearly contiguous in male; nearly bare and separated in female. Face with a distinct broad carina between antennae; parafacialia setulose. Proboscis soft, not adapted for sucking blood. Prosternum, propleura and anepimeron bare; meron with few setulae below spiracle; mesokatepimeron with long hairlike setulae; metepisternum with several setulae. Thoracic dorsum with dense silvery-gray pruinescence which is interrupted by five to seven sharply defined black to dark brown vittae of variable length and width. Two presutural and 4 postsutural dorsocentrals; 2 posterior katepisternals; 1 prealar. Mid tibia without posterior macrosetae. Third wing vein (R_{4+5}) with microsetae on dorsal and ventral surface beyond node; fourth wing vein (M_{1+2}) strongly curved forward, rounded, not angulate, and ending at wing tip. Lower calypter with apical margin truncate. Fore coxa with double row of setae; mid with single anterodorsal row of setae. Abdominal tergites without macrosetae. Male hypopygium protruding, external forceps with parts or branches swollen or rounded at apex; penis short.

Very few satisfactory structural characters have been found to distinguish the described species and varieties of Graphomya. Considerable emphasis has been given to such characters as the color of the thorax and abdomen as well as the hind tibia. Perhaps a study of the male genitalia will reveal good characters to separate these species which are so difficult to differentiate.

Séguy (1937) has incorrectly stated that the anepimeron and meron are both haired in Graphomya. This is certainly not true of all species.

The species of the genus Graphomya are numerous in the hot regions of the Old World, especially the Oriental and Ethiopian regions. At least 8 species occur in the New World. The genus is almost cosmopolitan in distribution. Séguy (1937) recorded 30 species in this genus.

Very little is known of the biology, according to Snyder (1965). Adult females of Graphomya are frequently found around feces or garbage, on which they generally oviposit, in shady, swampy environments and males, while often hovering near females, can usually be found more abundantly near the blossoms or leaves of legumes and umbelliferous plants. Both sexes feed almost exclusively on flowers. I have seen Puerto Rican specimens hovering below trees. The larva of G. maculata is saprophagous, according to Mackerras (1932).

Graphomya stipata (Walker) (Plate XVII, Fig. 73)

Musca stipata Walker, 1856: 348 (descr. - Guyana, Demerara)

Graphomyia stipata Wolcott, 1936: 364 (coll. rec. - PR)

Séguy, 1937: 386 (cat., distr. - SA)

Wolcott, 1948: 489 (coll. rec. - PR)

Cova García, 1964: 27 (coll. rec. - Venezuela)

Miskimen & Bond, 1970: 69 (coll. rec. - St. Croix, VI)

Pont, 1972: 28 (cat., distr. - PR, Venezuela, Guyana)

Graphomyia maculata Wolcott, 1936: 364 (misidentification, coll. rec. PR)

Wolcott, 1948: 489 (misidentification, coll. rec. - PR)

Male length 5.6 to 7.2 mm. Color black with gray-yellow and silvery-golden pollinosity on thorax and abdomen forming distinct patterns. Frontal vitta velvety black, with a gray to brown vitta running from ocellar triangle to lunule, sides of frontal vitta with golden-velvety pruinescence. Antenna dark gray to brown pollinose; arista light brown basally, darker at its tip; palp brown. Thorax black with golden and gray pollinosity; three black vittae, and two submedian extending from pronotum to mesonotum; the median vitta very narrow on anterior part of mesonotum, broadening again on base of scutellum, contiguous to apex of scutellum; sublateral vittae shortly behind the transverse suture, dividing into a fork which extends to above wing root and to scutellum. Scutellum basal lateral angles, black with grayish-golden pollinose vitta laterally fused with a median black vitta. Wings with a brown tinge. Calypter white, upper one with light-brownish edge; lower one with yellowish edge, both with many setulae; halter yellow. Legs dark brown to almost black; femur

with a tinge of pale yellow to gray pollinosity. Abdomen with dark abdominal maculate pattern. Villosity covering mesothoracic spiracle golden-yellow, metathoracic dark brown.

Frontal vitta with many fine, lateral hairlike setulae; a row of 9-12 pairs of convergent, slightly cruciate, frontal setae. Parafacialia setulose; ocellars more or less equal to postverticals; ocellar triangle with many microsetae. Inner vertical divergent; continuous row of postoculars present. Vibrissae short, with 3-4 stout bristles nearly the same size. Antennal segment 3 about 3 times as long as second; arista long plumose nearly to the tip, with longer rays on upper side. Oral margin protuberant, vibrissae well above oral margin; eyes thickly pilose in males, nearly bare in females. Palpi slightly clavate with scattered setulae.

Two humerals, 1 well-developed; 1 posthumeral; 2 presutural and 4 postsutural dorsocentrals; acrostichals (only the prescutellar pair well-developed); 1 prealar; 2 intra-alars; 1 supra-alar; 2 postalars; 2 notopleurals; scutellars: 2 discal (basal) pairs, lateral in position, 1 pair apically and 1 small pre-apical pair, a single median almost apical between the apicals. Only two posterior katepisternals; propleuron, prosternum, metasternum and anepimeron bare; meron and mesokatepimeron setulose; katatergite covered with short golden-brown villosity; mesanepisternum with a row of 14 strong posterior bristles, anteriorly with numerous hairlike setae; 1 very stout propleural; 1 stigmatal very close to the propleural.

Wing vein 3 (R_{4+5}) with dorsal and ventral setulae; vein 4 (M_{1+2})

strongly curved forward.

Fore femur with posterior, posterodorsal and posteroventral rows of setae, well-developed; fore tibia with 1 apical dorsal and 1 posteroventral bristle; mid femur with anterodorsal and ventral row of setae on basal 1/2, somewhat longer than the others; mid tibia with 1 posteroventral at middle; 1 apical, 1 anteroventral, 1 dorsal, 1 posteroventral and 1 ventral seta; hind femur with 1 anterodorsal to dorsal and 1 anteroventral row of setae; 2 stout dorsal and posterodorsal preapicals; 1 stout preapical anteroventral; hind tibia with 1 anterodorsal at middle and 1 short ventral seta; 1 dorsal apical anteroventral.

Female length 7.0 to 7.6 mm. Similar in color and structure to male except eyes almost bare and separated; frontal triangle almost reaching base of antenna and with rows of interfrontal and parafrontal setulae; inner and outer ventrals stouter and well-developed.

G. stipata is the only species present in Puerto Rico, even though Wolcott (1936 and 1948) also reported G. maculata. I have not been able to examine specimens of G. maculata from Puerto Rico. G. maculata apparently is a common species in temperate regions of Europe and North America, while G. stipata is a widely distributed Neotropical species. Probably the records of G. maculata for Puerto Rico were misidentifications.

Specimens examined:	33 (11m, 22f) from seven Puerto Rican localities, from Cuba and Haití:
Arecibo	1m, on leaf of bitter almond; VII-27-21, Kisliuk & Mills (#1482)

Cayey	1f, Carite For.; black-light trap; Aug. 15, 1969, R. Bonilla
Juncos	10f, at the sugarcane mill; hovering in shady place under Casuarina equisetifolia tree; May 20, 1956, SMG
Luquillo	4f, Caribbean Nat. For., El Verde Field Sta.; July 17-19, 1969; 1m, 1f, July 29, 1969; 1m, 2f, Aug. 12, 1969; and 2m, 1f, Aug. 23, 1969, Malaise trap
Mayagüez	1m, Sept. 18, 1953
Ponce	1m, (San Juan No. 2826); VII-22-32, R. G. Oakley
Río Piedras	3f, AES; hovering in shady place under Mangifera indica tree; July 7, 1965, SMG
CUBA, WI	3m, St. Tómas, P. de Zapata (EEA Cuba, Ento. No. 10690); May 5-9, 1927; S. C. Bruner & J. Acuña
HAITÍ, WI	1m, Kenkoff, VI-24-31, Kisliuk & Cooley

This species was previously recorded by Wolcott (1936, 1948) on mango blossoms at Mayagüez; Wolcott (1948) also placed it in the family Sarcophagidae.

Genus Synthesiomyia

Synthesiomyia Brauer & Bergenstamm, 1893

Synthesiomyia Brauer & Bergenstamm, 1893: 96 Type-species: brasiliana Brauer & Bergenstamm (orig. des.) = nudiseta (Wulp)

Synthesiomyia Hough, 1899: 26 (rev. of subfamily of NA)

Synthesiomyia Aldrich 1905: 529 (cat. of NA spp.)

Synthesiomyia Williston, 1908: 342 (rev. of St. Vinvent (W.I.) spp.)

Synthesiomyia Curran, 1934: 397 (rev. of families and gen. NA - Diptera)

Synthesiomyia Townsend, 1935: 143 (manual - classification and habits of Diptera)

Synthesiomyia Séguy, 1937: 381 (cat. of world spp.)

Synthesiomyia James, 1947: 123 (rev. of flies of medical importance)

Synthesiomyia Huckett, 1965: 911 (cat. of NA spp.)

Synthesiomyia Pont, 1972: 11 (cat. of ASUS spp.)

Eyes widely separated in female, nearly contiguous in male. Antenna thick; arista bare; proboscis short, thick; labella weak. Palp cylindrical, apex somewhat flattened. Prosternum setulose laterally. Propleuron and anepimeron bare; mesokatepisternum with 3 prominent katepisternals, the lower being situated very close to hind seta. Meron bare; metepisternum with several hairlike setulae; 1 prealar (2 in female) very short. The metathoracic spiracle much longer than broad. Two presutural and 4 postsutural dorsocentrals; sternopleurals 1:2. Third wing vein (R_{4+5}) bare above and below; vein 4 (M_{1+2}) bent strongly forward reaching the costa before the wing tip. Anal vein long, not reaching wing margin. Apical cell largely open. Squama well-developed with fine hairs on border.

Synthesiomyia nudiseta (Wulp) (Plate III, Fig. 11, Plate XIX, Fig. 81)

Cyrtoneurina nudiseta Wulp, 1883: 42 (descr. - Argentina)

Synthesiomyia brasiliana Brauer & Bergenstamm, 1893: 96 (descr. - Brazil)

Hyadesimyia grisea Giglio-Tos, 1893: 5 (descr. - Mexico)

Gymnostylina schmitzi Becker, 1908: 196 (coll. rec. - Madeira Is.)

Synthesiomyia nudiseta Stein, 1919: 111 (coll. rec. - European spp.)

Wolcott, 1923a: 226 (coll. rec. - PR)

Engel, 1931: 135 (coll. rec. - Chile)

Wolcott, 1936: 366 (coll. rec. - PR)

Séguy, 1937: 382 (coll. rec. - world distr.)

Siddons & Roy, 1942: 240 (life history study)

Beatty, 1944: 150 (coll. rec. - St. Croix, VI)

James, 1947: 123 (coll. rec. - WI (4 places), Central America (3 places), SA (8 places) and NA)

Wolcott, 1948: 493 (coll. rec. - PR)

Edlridge & James, 1957: 9 (coll. rec. - California, USA)

Cova García, 1964: 29 (coll. rec. - Venezuela)

Huckett, 1965: 911 (cat., distr. - Bermuda, PR and as Neotropical)

Miskimen & Bond, 1970: 70 (coll., rec. - St. Croix, VI)

Pont, 1972: 11 (cat., distr. - Bermuda Is., Mexico, Nicaragua, VI, Jamaica, Domingo, PR, Trinidad, Guyana, Venezuela, Ecuador, Bolivia, Brazil, Paraguay, Argentina, Chile and Galápagos Is.)

Male length 4.6 to 8.6 mm. Color dark brown to dark. Frontal vitta black with a bluish-gray pruinosity; parafrontalia and gena with golden pollinosity. Palp, antenna and apex of tesselated abdomen bright orange-yellow; arista brown. Thorax with 1 central vitta, 2 broad median dorsocentrals and 2 lateral whitish-gray vittae; 2 other vittae running through the humerus to wing base. Lower calypter light brown to smoky, upper lighter in color with dark brown border and hairs. Abdomen quite

variable in pattern of black and gray-white pollinosity. Halter yellowish with dark markings; wing smoky-brown.

Eyes separated by about half diameter across eyes; arista almost bare, microscopically pubescent; 7 to 8 frontal setae interspersed with setulae. Parafrontalia with a row of minute, fine setulae. Frontal vitta with many fine, minute setulae on upper half; facial ridge setulose. One pair of ocellars; 1 pair of diverging postverticals, 1 pair of converging inner vertical setae; 1 pair of diverging external vertical setae; 1 pair of lower and 1 of upper orbitals, a row of minute and thick postocular orbital setae.

Prosternum hairy laterally; propleuron and anepimeron bare; mesanepisternum setulose with rows of setae of different sizes of which 6-7 are very stout; mesokatepisternum setulose with 3 prominent katepisternals, lower most situated very close to the hind seta with many small to large setae in front of the other two. Meron setulose below spiracle; metepisternum setulose; katatergite prominent with many dark setulae. Humerals 3; 1 sublateral; 1 posthumeral; 2 presuturals and 4 postsutural dorsocentrals; acrostichals (only 1 prescutellar pair developed); 2 notopleurals; 1-2 prealars; 2 supra-alars; 2 intra-alars; scutellars: 2 basal bristles, 1 large strong apical pair, 1 pair near base of apicals; many other setulae.

Wing vein 3 (R_{4+5}) bare dorsally and ventrally; vein 4 (M_{1+2}) bare and bowing strongly forward, reaching costal vein before wing tip; squama well-developed, upper with dark border and dark rows of setulae and very long setae; lower squama with thin yellow setae.

Fore coxa with 2 rows of prominent curved setae; fore femur with posterodorsal, dorsal and ventral row of prominent setae; fore tibia with 2 apical and 2 short submedians; 1 apical dorsal and 1 apical posteroventral. Mid femur with anterior row in basal half; 2 prominent apical setae on dorsal and posterodorsal side; 1 row on ventral and one on posteroventral side; mid tibia only with a mid posterior short bristle; apically with 1 dorsal; 1 anterodorsal; 1 anterior; 1 ventral and 1 posteroventral seta well-developed. Hind femur with a row of stout anterodorsal and ventral setae; anteroventral row with last 3-5 apical setae stout; hind tibia with 1 anterodorsal; 2 posterodorsals and 2 almost posteroventrals; 1 dorsal preapical; 1 anterodorsal and 1 apical anterior; apical comblike setulae on posterior to ventral side.

Abdomen setulose, with prominent apical and lateral setae; segment 5 with apical and median row of prominent setae in addition to 3 lateral rows.

Female length 4.6 to 9.0 mm; almost identical in color and structure to male, frontal vitta width about twice that of male; calypters white with yellow tinge, upper with dark brown rim and hairs as in male. Some specimens have legs from reddish-brown to black in color.

Remarks: S. nudiseta breeds in a wide variety of decaying animal and vegetable materials. It has been implicated as a causal agent of secondary human myiasis (Siddons & Roy, 1942 and James, 1947). The fly breeds in decomposing animal and vegetable wastes and has been recorded as breeding in human cadavers by Townsend (1935) and Siddons & Roy (1942). The adults normally do not visit fresh foods but commonly feed

on fermenting substances and flowers according to Townsend (1935). Siddons & Roy (1942) studied the life cycle of this fly.

Only one species has been described in this genus: S. nudiseta of wide distribution. It can be recognized easily from other flies by the following characters. S. nudiseta is a grayish fly with a striped thorax, a somewhat tesselated abdomen which is yellow to orange in color at the apex, and bright orange-yellow antennae and palpi. In habitus it closely resembles a Sarcophaga, but the bare arista and the lack of katepisternal setae differentiate it immediately.

Specimens examined: 87 (27m, 60f) from 13 Puerto Rican localities, from Bermuda and Cuba:

Aguirre	1m, inside a car; Feb. 26, 1965, SMG
Aguas Buenas	1f, Casa de Cursillos; on glass door; Aug. 2, 1965; 3m, 1f, Aug. 9, 1965, SMG; 1f, Dec. 9-10, 1968, Malaise trap
Añasco	1f, Dec. 15, 1948, N. Vázquez
Castañer	1m, Limaní, AESb; Feb. 7, 1969; 2f, Feb. 10, 1969; and 1m, Feb. 11, 1969, Malaise trap
Cayey	1m, 6f, Carite For.; Dec. 27-30, 1968; 1m, Henry Barracks; Nov. 19, 1968; 2f, Nov. 21-22, 1968; and 2f, Mar. 15, 1969, Malaise trap
Corozal	1f, AESb; Jan. 16, 1969; 2m, 2f, Jan. 17, 1969; 1f, Jan. 18, 1969; 1f, Jan. 19, 1969; and 1m, 2f, Jan. 20, 1969, Malaise trap
Gurabo	1f, AESb; Digitaria decumbens; X-15-1968, SMG; 1f, on Nov. 4-5, 1968; 1m, Nov. 8, 1968; 1m, 1f, Nov. 10, 1968; and 1m, Nov. 11, 1968, Malaise trap
Isabela	1m, AESb; taken in a plantation of Carica papaya; Nov. 6, 1964, SMG, RB & GR; and 2f, Jan. 25-26, 1969, Malaise trap

Lajas	1f, Acc. No. 24-54; LFM
Loíza	1f, in black light trap at sugarcane field; Feb. 6, 1964, SMG
Mayagüez	1m, 5f; Aug. 1-31, 1953, JMC; 1m, Barrio Consumo; Sept. 25, 1953, SMG; and 2m, 5f, June, 1962, JMC
Río Piedras	1f, Acc. No. 430-12; May 18, 1912, D. L. Van Dine, AES; 1f, on inflorescence of Chrysalidocarpus lutescens; May 2, 1965; SMG & EM; 2f, at glass window, July 5, 1965; 1m, 1f, on fruit of Mangifera indica; July 7, 1965, 3m, 1f, on Dyctiosperma album; Aug. 9, 1965; 1m, as P. R. Acc. No. 347-17; Apr. 13, 1917, R. T. Cotton; and 1m, Oct. 18, 1968; 1m, Oct. 23, 1968; and 1m, 2f, Oct. 25, 1968, Malaise trap
San Juan	1f, VI-7, 1953, B. B. Sugermann
BERMUDA, WI	1f, St. George; Feb. 2, 1934, Melander, A. L. Melander Coll., 1961
CUBA, WI	3f, Sta. Barbara, Isle of Pines; VI-29-50, Berg & Link; and 6f, on Santa Fe, Isle of Pines; VI-29-50, Berg & Link; 1f, on Barguá taken wire screen (T.P.R.F., Ent. No. 3612); VII-II-29, L. C. Scaramuza

Genus Neomuscina

Neomuscina Townsend, 1919

Neomuscina Townsend, 1919: 541 Type-species: Neomuscina cavicola Townsend, 1919: 541

Spilopteromyia Malloch, 1921c: 422 Type-species: Spilogaster apicata Stein (orig. des.)

Neomuscina Séguy, 1937: 349 (cat. & key to world gen.)

Scutellomusca Townsend, 1931: 313 Type-species: Musca scutellaris Fabricius (orig. des.). Synonymized by Pont 1972: 50

Neomuscina Snyder, 1949b: 1 (rev. of gen.)

Neomuscina Snyder, 1954b: 424 (notes on gen.)

Neomuscina Huckett, 1965: 911 (cat. of NA spp.)

Neomuscina Pont, 1972: 50 (cat. of ASUS spp.)

Eyes contiguous in male, well-separated in female; antenna large; arista plumose, about 0.66 length of antenna. Frontal setae 9-10 pairs; interocellars well-developed; 1 postvertical pair; 1 inner and 1 outer vertical; second antennal segment with 2 well-developed dorsal setae in male; female with well-developed lower and upper orbitals; 2 presutural and 4 postsutural dorsocentrals; prosternum bare; anepimeron and metepisternum setulose; meron bare; 3 katepisternals. Apical portion of stem vein (R) always setulose (2 microtrichia) on ventral surface, usually with 1 or 2 microtrichia on dorsal surface; vein R_{4+5} bare; fourth longitudinal vein (M_{1+2}) roundly bent at apex, terminating at or close to wing tip.

This genus is subdivided into two subgenera Neomuscina (Neomuscina) and Neomuscina (Spilopteromyia). The latter can be distinguished from Neomuscina sens. str. by the 2 setulae on basal portion of stem vein (R) on ventral surface, and 1 dorsal setula on the apical portion. Third wing vein (R_{4+5}) with one or more setulae on dorsal and ventral surfaces beyond node while in N. (Neomuscina) it is entirely bare.

Neomuscina farri Dodge (new status) (Plate XVIII, Fig. 79)

Muscina tripunctata Coquillett, 1900: 256 (misidentification, coll. rec.- PR)

Neomuscina tripunctata Wolcott, 1923a: 226 (misidentification, coll. rec. - PR)

Wolcott, 1936: 368 (misidentification, coll. rec. - PR)

Wolcott, 1948: 495 (misidentification, coll. rec. - PR)

Neomuscina (Spilopteromyia) rufoscutella farri Dodge, 1955: 151 (descr.- Jamaica, Clarendon, 1 mile W. of Jacob's Hut)

Neomuscina rufoscutella farri Pont, 1972: 51 (cat., distr. - Jamaica)

Male length 4.0 to 6.5 mm. Dark brown to black; palp light basally on lower side; antenna, apices of femora and extreme base of tibia from yellow to deep orange; front of coxa with yellowish reflections. Frontal vitta and parafrontalia reddish-brown, covered with golden pollinosity; parafacialia and gena yellow to reddish-yellow with brownish tinge mainly at facial ridge. Wing infuscated, white to pale yellow at extreme base; squamae light gray-brown, upper squama whitish basally toward outer part, lower squama whitish toward base and margin much more darkened than in upper squama. Scutellum deep yellow to orange on about its apical half or little more, ventrally almost completely yellow; halter pale yellow with base of capitellum black; thorax gray pollinose, with 4 black vittae, outer pair narrowly interrupted at the transverse suture, inner pair extending half way from the suture to the scutellum; a short median stripe present with reddish reflections extending from apex of mesonotum to basal half of scutellum; a short lateral stripe above notopleuron.

Abdomen with yellowish reflections laterally; segment 1 with lateral extensive area with silvery pollinosity, somewhat marmorate as seen in posterior view; tergites 3, 4 and 5 with dark spots on basal 1/2 of segments.

Frontal setae 11-12 pairs; 1 stout anterior interocellar, longer than frontals; antennal segment 2 with 2 stout dorsal setae; 3 postocellar pairs; 1 postvertical pair; 1 inner and 1 outer vertical; parafacialia setulose; vibrissae very short, a well-developed seta beneath.

Humerals 3, the innermost small, 1 posthumeral; 1 lateral; 2 presutural and 4 postsutural dorsocentrals, first postsutural very small; acrostichals not differentiated (only prescutellar pair developed); 1 small prealar; 2 supra-alars; 1 intra-alar; 2 postalars; scutellars: 1 discal (basal) short, 1 subbasal long, 1 preapical at middle of scutellum; apical anterodorsals well-developed, 1 stout dorsal seta near apex of scutellum. Hind tibia with very short median anterior and anteroventral setae; apically with a very long and stout anteroventral and anterodorsal seta; dorsal, posterodorsal, anterior and anteroventral setae, short setae on posterodorsal to ventral apical 1/3 of tibia, slightly erect, prominent, forming a mat.

Abdominal segments with prominent lateral and apical setae; fourth segment with complete row of setae; fifth with 3 stout rows from basal 1/2 to apex.

Female length 4.0 to 6.0 mm. Color and structure similar to male except for brighter yellow to orange antenna and palpus; clypeus and part of facial cavity yellow; frontal vitta black pollinose, shiny,

frons widely separated. Humeri bright yellow; apical 1/2 of scutellum orange; calypters white to pale yellow, upper one with grayish-brown border. Thoracic vitta more sharply defined and setae on head stouter. Third humeral seta smaller than in male.

Neomuscina (S.) farri, which I have raised to full species, was described by Dodge (1955) as a variety of Neomuscina (Spilopteromyia) rufoscutella from a single female specimen collected at Clarendon, 1 mile West of Jacob's Hut, Jamaica, Sept, 28, 1954, by T. H. Farr. Since then, additional female and male specimens have been collected by me and compared with the description of Dodge and with the holotype at the NMNH. I have reached the conclusion that the variety farri must be considered a full species.

This species can be distinguished from N. rufoscutella by having most of the legs black and only the apical half of the scutellum bright-yellow to orange.

Specimens examined:	211 (89m, 122f) from 14 Puerto Rican localities and from St. Thomas, VI. Type material: Holotype male described by Dodge:
PUERTO RICO	1m, on human manure; Aug. Busck, with a wrong identification label as Muscina tripunctata
Aguas Buenas	1m, 1f, Casa de Cursillos; 1,200 ft.; on glass door; Oct. 20, 1964, SMG & LFM; 3m, Dec. 9-10, 1968; and 2f, Dec. 16, 1968, Malaise trap
Aguirre	1m, 5f, Sugarcane Mill; Nov. 27-28, 1968, Malaise trap
Arecibo	2m, Cambalache For.; on mixed vegetation near ground; June 16, 1965, SMG; and 3m, 1f; Feb. 19, 1969, Malaise trap

Castañer	2m, 3f; Limaní AESb; Feb. 11, 1969, Malaise trap
Cayey	12m, 16f; Carite For., Dec. 27-30, 1968, Malaise trap; and 1m, Aug. 15, 1969, black-light trap, R. Bonilla. Also 2m, 5f, at Henry Barracks; Nov. 15-17, 1968; 1m, 2f, Nov. 19, 1968 and Nov. 21-22, 1968, Malaise trap, and 2m, 20f, at Cayey-Salinas, Rd. 1, K 80; Nov. 22-25, 1968; 1m, 8f, Nov. 26, 1968 and 12m, 15f, Nov. 27, 1968, Malaise trap
Corozal	2m, 2f; AESb; Jan. 16, 1969; 3m, 3f, June 17, 1969; 2m, 1f; June 18, 1969; 2m, 4f, June 19, 1969; and 2f, June 20, 1969, Malaise trap
Fortuna	1m, 3f, AESb; Nov. 15-18, 1968; 2f, Nov. 19, 1968; and 3f, Nov. 21-22, 1968, Malaise trap
Gurabo	1f, AESb; Nov. 8, 1968; and 1m, Nov. 10, 1968, Malaise trap
Isabela	4f, AESb; Jan. 25-26, 1969, Malaise trap
Lajas	1f, AESb; Feb. 4, 1969, Malaise trap
Luquillo	1m, 1f, Caribbean Nat. For., El Verde Field Sta., Dec. 25-26, 1968, Malaise trap, July 17-19, 1969, in a black light trap, R. Bonilla
Mayagüez	2f, June, 1962, JMC; and 1m, 1f, by Dr. G. Miskimen house Feb. 3, 1969, Malaise trap
Río Piedras	1f, AES; Nov. 2, 1968, Malaise trap
Utuado	27m, 5f, on Arecibo, Rd. 10, K 63.4; on Artocarpus communis (breadfruit) near rotting; Sept. 4, 1968, SMG
ST. THOMAS, VI	2m, 2f, St. Thomas 90; fruitfly trap; 52-20586; VII-19-52

Genus Neomusca

Neomusca Malloch, 1921a

Philornis Meinert, 1890: 304 (preocc. Selys., 1839) Type-species: molesta Meinert (mon.). Synonymized by Pont, 1972: 55

Philornis Brauer & Bergenstamm, 1895: 568 (monog. of family)

Philornis Bezzi & Stein, 1907: 545 (cat. of Palaearctic spp.)

Philornis Nielsen, 1911: 195 (biology of a parasitic spp.)

Neomusca Malloch, 1921a: 41 Type-species: Mydaea obscura Wulp (orig. des.)

Philornis Aldrich, 1923: 304 (descr. of gen. & spp. from Dominican Republic, Costa Rica & Trinidad)

Mesembrinellopsis Townsend, 1927: 207 and 328 Type-species: mima Townsend (orig. des.). Synonymized by Pont, 1972: 55

Philornis Séguy, 1937: 375 (cat. of world gen. and spp.)

Philornis García, 1952: 277 (rev. of Argentina spp.)

Philornis Albuquerque, 1954a: 141 (rev. of gen. and descr. of spp.)

Philornis Dodge, 1955: 147 (descr. of Florida & WI spp.)

Philornis Dodge, 1963: 239 (biology of spp.)

Philornis Huckett, 1965: 911 (cat. of NA spp.)

Philornis Dodge & Aitken, 1968: 134 (rev. of gen. & descr. of Trinidad spp.)

Philornis Dodge, 1968: 155 (descr. of Trinidad spp.)

Neomusca Pont, 1972: 55 (cat. of ASUS spp.)

Eyes bare, almost contiguous in male, slightly separated in female;

arista long plumose; proboscis short, labella enlarged; palpi spatulate. Two presutural and 4 postsutural dorsocentrals; 1 prealar; prosternum and propleuron bare at middle; 3 well-developed katepisternals; anepimeron setulose; mesokatepimeron setulose; meron bare; katatergite villous; metepisternum with hairlike setae (beret hairs). Postalar declivity with a tuft of setulae.

Wing veins in Puerto Rico species bare except costa; fourth vein (M_1+_2) slightly bent upward near apex, diverging from the third (R_4+_5). Calypter triangular and prolonged toward scutellum, touching its base; posterior spiracle with accessory setulae.

Fore legs without any extraordinary setae, mid femur with 2 strong apicals on posterodorsal and posterior side; mid tibia with 3 prominent posteriors; hind femur with a row of dorsal setae; 1 anterodorsal row and 3-4 stout anteroventral rows of stout setae on apical half; hind tibia with 3 stout anteriors, a row of 5-6 anteroventrals; all tibiae with a short, stout pair of setae on anterior, anteroventral posterior and posteroventral sides; 2 rows of short, stout ventral setae.

Abdomen setose with prominent apical and lateral setae, segment 5 with prominent apical row of setae, others irregularly placed on dorsum.

Flies of the genus are yellow-brown to nearly black in color, more robust and usually larger than the house fly with abdomen rarely metallic blue and often yellow basally and ventrally, especially in the males.

Neomusca is readily distinguished from other muscid genera by a combination of the following adult characters, listed more or less in order of their importance. Postalar declivity with a tuft of setulae above tympanic ridge; calypter broadly joined to thorax, the union extending to base of scutellum, hind margin of lower lobe broadly rounded; anepimeron setulose; prosternum, meron and pre-episternum bare; wing with anal vein long but not reaching wing margin; vein 4 (M_{1+2}) essentially straight, somewhat bowed backward and forward again just before reaching wing margin; apical cell broadening to apex; antenna yellowish with arista long-plumose; palp yellow, somewhat flattened, bare or nearly so on inner ventral surface, armed with short, stubby, spinelike setae on outer surface, inner margin and sometimes apically, outer margin with a few longer setae; haustellum shorter than palpus.

Biology: The genus Neomusca is Neotropical in distribution except for 3 species occurring in the southern United States; most of its members are associated with birds. The larvae of most species have been found in subcutaneous cysts, especially in nestling birds, forming lumps under the skin of the head, neck, wings or back. Dodge (1963) recorded Neomusca aitkeni (as Philornis aitkeni) from Trinidad where the larvae were in a jacamar nest feeding on the faeces. The puparia of Neomusca (as Philornis) have been found in bird nests; in some species the puparium is in a frothy (chalky white) cocoon (Dodge, 1963) or enclosed in a dense mass or cocoon of downy feathers (Aldrich, 1923). Adults have been collected in various ways, apparently none around birds. Little else is known about the biology of the genus.

About 34 species, listed under the genus Philornis, have been described by Dodge (1968) and Dodge & Aitken (1968) from Trinidad. Most of the described species have been associated in one way or another with birds. The genus is in need of revisional work, a task which was started by the late Dr. Dodge. The status of his work at the time of his death is not known to me. The genus Philornis was synonymized with Neomusca by Pont (1972).

Neomusca pici (Macquart) (Plate IV, Figs. 12 and 13)

Aricia pici Macquart, 1854: 659 (descr. - S. Domingo)

Hylemyia pici Aldrich, 1905: 553 (cat. of NA spp.)

Lutz & Neiva, 1912: 130 (biological notes)

Rodhain & Bequaert, 1916: 259 (monogr. of spp.)

Philornis pici Bezzi, 1922: 38 (coll. rec. - Cuba, Dominican Republic, Central America and Argentina)

Aldrich, 1923: 308 (coll. rec. - Dominican Republic, Costa Rica and Trinidad)

Shannon & del Ponte, 1928a: 37 (coll. rec. - Argentina)

Séguy, 1937: 377 (coll. rec. - Central America, Dominican Republic, Cuba & Jamaica)

Philornis obscura Wolcott, 1936: 369 (misidentification, coll. rec. - PR)

Wolcott, 1948: 496 (coll. rec. - PR)

Neomusca pici Wolcott, 1948: 496 (coll. rec. - PR)

Neomusca pici Pont, 1972: 56 (cat., distr. - Costa Rica, Panamá, Cuba, S. Domingo, PR, Trinidad, Brazil, Argentina)

Male length 7.8 to 10.8 mm. Color yellow; frontal vitta and parafrontalia brown; thoracic and abdominal terga 3, 4 and 5 dark reddish-brown with a bluish tinge; thoracic pleuron light reddish-brown, covered with a white-bluish tinge. Aristal segment 3 brown. Wing pale brown, veins brown. All main setae black, vestiture yellow; calypters yellow, upper with dark brown edge.

Frontal vitta very narrow above antenna; eyes almost contiguous, separated only by the parafrontalia which, at their narrowest point, are about the diameter of the median ocellus; 12-13 frontal setae; 1 stout interocellar pair; 4-5 minute postocellar pairs; 1 postvertical pair; 1 outer and 1 inner vertical and 1 row of occipitals well-developed; arista long-plumose, especially on dorsal part; antennal segment 2 with stout black, dorsal setae. Subgena and vertex with yellow setulae; yellow microsetulae at base of facial ridge; lateral clypeal ridge with a row of stout black setae; vibrissae prominent, stout, black; palp with short, thick, black microsetulae, yellowish hairlike setae on lower side.

Three stout humerals, humerus covered with black setulae on posterior part, yellow setulae on anterior; 1 posthumeral; 1 sublateral; 2 notopleurals; 2 presutural and 4 postsutural dorsocentrals; acrostichals (1 well-developed basal pair); scutellars: 1 apical pair; 1 preapical pair smaller than apical, 1 well-developed discal (subbasal), 1 very small pair of yellow setulae on basal 1/3 to 2/3 ventrally; 1 prealar; 2 supra-alars; 1 intra-alar; 2 postalars; postalar

declivity with a tuft of coarse black setae. Prosternum bare, 1-2 well-developed black propleural setae on lower edge; 2 well-developed and 2 smaller black stigmatal setae; many other yellow setulae around these setae; mesanepisternum with a single seta on anterior upper margin, a row of 6-7 mesanepisternals, covered with black and yellow setulae; 3 black katepisternals; other clothing setulae yellow except for a row of strong black setae on lower part; anepimeron with yellow setulae, a tuft of black setulae on upper margin; meron bare; mesokatepimeron and metepisternum with yellow setulae; katatergite with yellow villosity; anterior and posterior spiracles about same size, covered with yellow hairs and with 3-4 black accessory setae. Wing veins except costa completely bare.

Fore coxa with well-developed, somewhat curved setae; fore femur setulose, with posterodorsal, posterior and ventral rows of setae; fore tibia setulose with a row of short anterodorsals; apically 1 dorsal and 1 posterodorsal seta, a mat of short yellow setae on basal 1/2 on anterior to ventral part. Mid femur with 3-4 well-developed anteriors at middle; posterior row with setae longer on apical half; 2 apical posteriors and 2 posterodorsals; ventral row with prominent stout basal and apical setae; mid tibia with 3 stout posterior setae; 1 long, stout, apical anteroventral, ventral and posteroventral setae; short setae on dorsal, anterior, anteroventral and ventral sides. Hind femur with anterodorsal, anterior and anteroventral rows of well-developed setae; anterior row with about 4 stout setae at middle; 1 apical anteroventral row; hind tibia with 3 stout anterior setae in male, 1 in female;

5-6 anteroventrals but thinner than one on anterior side; 1 dorsal and 1 anteroventral apical stout seta; smaller setae on anterodorsal, anterior and ventral side; yellow mat of setae as on fore tibia and tarsal segment 1. All tibiae with a pair of short setae on each of the anterior, anterodorsal, posterior and posteroventral surfaces; 2 rows of short, stout ventral setae.

Abdominal sternite 1 + 2 with many yellow setulae; all other sternites with yellow setulae in addition to the black setae; terga with prominent setae at sides and at apex of segments; segment 5 with a row of prominent apical setae.

Female length 6.4 mm. Almost identical to male in color and structure except in having the frontal vitta reddish-brown and a little wider than male; about 3-4 times diameter of anterior ocellus. Leg setae not as stout and well-developed as in male; hind femur without the anterior row of setae; hind tibia with only 1 anterodorsal seta at middle.

Specimens examined:	19 (3m, 1f, and 15 (sex undetermined) from three Puerto Rican localities:
Mayagüez	1m, 1f, May 20, 1938, JAR; 8 specimens, Sept. 14, 1935, H. L. Dozier, Bishop No. 23507; 2 specimens, Sept. 18, 1935; 4 specimens; reared from the Boattailed Grackle, H. L. Van Volkenberg
Ponce	(No. 5578), 1 specimen flying at Torres finca (sic); Sept. 17, 33, R. G. Oakley
Río Piedras	2m, P.R. Acc. No. 34-61; young bird of *Mimocichla plumbea ardosiacea* (Veillot); Aug. 31, 1961, E. Betancourt

Remarks: Described by Macquart (1854) from the Dominican Republic as Aricia pici, recording the larva as subcutaneous on the woodpecker bird (Picus striatus). Wolcott (1948) recorded it as P. obscura and P. pica collected by H. L. Van Volkenberg (2939-4) who reports "the warble-like larvae are common in the grackle or mozambique, Holoquiscalus niger brachypterus; at Mayagüez". The specimens recorded by Wolcott as Philornis obscura are identified in the NMNH as P. pici. The records of P. obscura are considered by me as a misidentification; apparently only one species of Neomusca is present in Puerto Rico. More collecting and rearing will be needed to reach a conclusion.

Genus Morellia

Morellia Robineau-Desvoidy, 1830

Morellia Robineau-Desvoidy, 1830: 405 Type-species: agilis Robineau-Desvoidy (Townsend, 1916: 8) = Musca hortorum (Fallen)

Morellia Wulp, 1896: 301 (rev. of Central America spp.)

Morellia Aldrich, 1905: 526 (cat. of NA spp.)

Morellia Williston, 1896: 434 (rev. Diptera of St. Vincent Is.)

Morellia Coquillett, 1910: 571 (designation of type spp. of NA gen. of Diptera)

Morellia Schnabl & Dziedzicki, 1911: 173 (rev. of family)

Parapyrellia Townsend, 1915b: 97 Type-species: Musca violacea Fabricus (orig. des.) = maculipennis (Macquart)

Morellia Malloch, 1923b: 520 (rev. of gen.)

Sarcopromusca Townsend, 1927: 209 Type-species: arcuata Townsend (mon.) = pruna (Shannon and Del Ponte)

Biopyrellia Townsend, 1932: 105 Type-species: Musca bipuncta Wiedemann (orig. des.)

Chaetopyrellia Townsend, 1932: 106 Type-species: Pyrellia ochrifacies Rondani (orig. des.) = flavicornis (Macquart)

Neopyrellia Enderlein, 1935: 236 Type-species: Pyrellia violacea Robineau-Desvoidy (orig. des.) = flavicornis (Macquart)

Morellia Séguy, 1935b: 103 (rev. of gen.)

Morellia Townsend, 1937: 44 (gen. diagnosis)

Morellia Séguy, 1937: 390 (cat. of world gen.)

Morellia Albuquerque, 1956a: 1 (rev. of gen.)

Morellia Peris, 1961: 349 (synopsis of Ethiopian spp.)

Morellia Hennig, 1964: 962 (cat. of Palaearctic spp.)

Morellia Huckett, 1965: 912 (cat. of NA spp.)

Morellia Pont, 1972: 8 (cat. of ASUS spp.)

Eye bare; interocular space narrow in male, wide in female. Frontal row of hairlike setulae; parafrontalia setulose; inner vertical setae stout, as long or longer than vibrissae. Antenna pectinate; lower and upper orbitals present. Proboscis short, stout; labella large. Presuturals inconspicuous or with 2 well-developed; 3-4 postsutural dorsocentrals, only apical 2 well-developed; 3-4 humerals, sometimes 6; 1-2 prealars; 3 katepisternals; meron bare; metepisternum and anepimeron setulose, katatergite villose; prosternum setulose in Puerto

Rican species; propleuron bare in the middle.

Wing stem vein (R) setulose just after humeral cross vein on upper side; fourth vein (M_{1+2}) longitudinally curved or sharply bent upward on ultimate section toward tip but ending distinctly behind wing tip. Third vein (R_{4+5}) with microsetae most of its length; just beyond the intersection of the transverse vein dorsally, ventrally with basal setulae.

Mid tibia without midventral setae; 3 setae in a row at posterior to posterodorsal side. Hind femur with large setae spread over all anteroventral, anterodorsal and posterodorsal sides; posterior tibia distinctly curved with quite distinct lateral villosity.

Body blue, green or iridescent, distinctly covered with clothing setulae; gena whitish-pruinose; wing base and calypters not densely yellow.

There are about 73 described species in the genus. Albuquerque (1956a) treated 8 Neotropical species in his revision, providing keys for both males and females as well as their synonymies.

Morellia is closely associated with the South American genus Xenomoriella described by Malloch (1923b). In this genus the radial stem vein has a very long and fine seta and some short strong setae at the level of the humeral vein. This vein is completely bare in Morellia.

Biology: Very little is known of the biology of this genus. Species living in the Holarctic region, according to Séguy (1937), are occasionally coprophagous, but sometimes they are autophilous or phytophilous, commonly found on foliage, bushes, flowers, especially of

umbelliferous plants. In hot regions, as is the case in Puerto Rico, species are mainly coprophagous, living and feeding on the excrement of vertebrates. The larvae are saprophilous, coprophilous and zoophagous.

The two species present in Puerto Rico can be distinguished by the following key.

Key to the species of *Morellia*

1. Humerus yellow; wing without spots . . . *M. basalis* (Walker)

   Humerus metallic; wing with spots . . . *M. maculipennis* (Macquart)

Morellia basalis (Walker) (Plate XIX, Fig. 83)

Musca basalis Walker, 1852: 347 (descr. - Brazil)

Lucilia surrepens Walker, 1861: 312 (descr. - Mexico; synonymized by Pont, 1972: 8)

Pyrellia scapulata Bigot, 1878: 35 (descr. - Mexico, synonymized by Pont, 1972: 8)

Aldrich, 1905: 526 (cat., distr. - Mexico)

Stein, 1919: 107, 178 (distr. - SA)

Malloch, 1923b: 523 (rev. of spp. & distr.)

Wolcott, 1923a: 225 (coll. rec. - PR)

Wolcott, 1923b: 20, 23, 26, 31 (coll. rec. - PR)

Curran, 1928: 92 (coll. rec. - V.I.: St. Croix, St. John and St. Thomas)

Séguy, 1935b: 113 (rev. of genus spp.)

Wolcott, 1936: 365 (coll. rec. - PR)

Séguy, 1937: 395 (cat. of world gen.)

Wolcott, 1941: 117 (coll. rec. - PR)

Beatty, 1944: 150 (coll. rec. - St. Croix, VI)

Wolcott, 1948: 492 (coll. rec. - PR)

Albuquerque, 1956a: 20 (coll. rec. - Cuba, Ecuador and Mexico)

Huckett, 1965: 912 (cat., distr. - PR, Mexico and USA: S. Texas and S. Florida)

Miskimen & Bond, 1970: 69 (coll. rec. - St. Croix, VI)

Pyrellia flora Bigot, 1878: 35 (descr. - Mexico, synonymized by Pont, 1972: 8)

Morellia basalis Pont, 1972: 8 (cat., distr. - El Salvador, Costa Rica, Jamaica, Cuba, Haití, PR, VI)

Male length 5.4 to 6.4 mm. Head dark brown with golden pruinescence. Frontal vitta dark brown; antenna and palp yellow to yellowish-brown. Thorax metallic blue to green; humerus distinctly yellow; legs mostly brown to dark brown, femoro-tibial joints brownish-yellow. Wing with a brownish tinge, especially on costal area; calypter densely brown tinged, upper with basal white area at outer lateral part; halter yellow. Abdomen metallic blue to green.

Eye bare; frontal vitta narrow; 16-19 hairlike frontal setae, first pair fairly well-developed. Inner vertical cruciate setae well-developed, as long as vibrissae; outer pair small; lower and upper orbitals small; small diverging ocellar pair. Second antennal joint with 2 dorsal setae; apical seta about 1/3 length of arista and with apical row and scattered microsetae; arista plumose.

Humerus with 4, sometimes 6, humerals; 1 posthumeral; 1 lateral; 2 notopleurals; acrostichals (only prescutellar pair developed); 2 presutural (sometimes not well-differentiated) and 2-4 postsutural dorsocentrals, apical 2 pairs well-developed; 2 prealars; 2 supra-alars; 1 intra-alar; 2 postalars; scutellars: 2 long cruciate apicals, 2 lateral pairs and 1 basal pair. Mesanepisternum setulose with one well-developed seta on upper front corner and 9-11 setae on posterior part, diminishing in size from top to bottom, anepimeron with tuft of short erect setae; meron bare; katatergite villous; metepisternum setulose; 2:1 katepisternals, the lower posterior one often very weak. Posterior spiracle with accessory setae; 4 propleural setae diminishing in size from very stout above to smaller below; 3-4 stigmatals with many setulae at their base.

Fore femur somewhat curved, with a row of long anteroventral, anterodorsal and dorsal setae; fore tibia with 1 apical anterodorsal seta. Mid femur with anterior row of setae, 4-5 posteroventrals, apically with a tuft of short to somewhat developed setae on anterior to posteroventral side; mid tibia with 3 submedians. Hind femur with row of well-developed anterodorsal setae; 1 apical seta on dorsal, posterodorsal and posterior sides. Hind tibia with 5-6 anteroventrals; 1 anterodorsal; 2 posterodorsals; apically with 1 apical, thin dorsal seta.

Wing with setulae on dorsal and ventral part of third vein (R_{4+5}),

extending from the node almost to r-m cross vein. Some dorsal setulae on stem vein (R) beyond humeral cross vein. Fourth wing vein (M_{1+2}) deflected upward on ultimate section toward tip but ending distinctly behind wing tip.

Abdominal tergum completely covered with microsetae; lateral and apical setae of tergites longer and stouter.

Female length 4.8 to 7.2 mm. Almost identical to male in coloration and structure, frons contiguous as in male; frontal vitta reddish-brown; surrounded by golden pollinose parafrontalia and a stripe below ocellar triangle; black behind this line; parafrontalia with several setulae; inner and outer verticals stouter than vibrissae; mid femur as in male but mid tibia without dorsal tuft of short spinelike setae as in male.

Specimens examined:	506 (214m, 255f, & 37 (sex unidentified) from 23 Puerto Rican localities, 3 in Cuba, 5 in the Dominican Republic, 1 in Dominica and 1 in Guadaloupe
Aguas Buenas	2m, 3f, Casa de Cursillos; 1,200 ft.; on glass door barrier; Oct. 13, 1964, SMG & LFM; 2m, 5f, Oct. 20, 1964; 3f, Oct. 26, 1964; 2f, Nov. 17, 1964; 2f, Jan. 11, 1965; 1m, 4f, Aug. 2, 1965, SMG; and 3m, 6f, Dec. 7-8, 1968; 7m, 7f, Dec. 9-10, 1968; 3m, 1f, Dec. 14, 1968; and 1m, of, Dec. 16, 1968, Malaise trap
Aguirre	1f, Sugarcane Mill; Nov. 27-28, 1968, Malaise trap
Barceloneta	1 specimen, I-23-34; in field; San Juan No. 6791
Bayamón	2 specimens, Spring 1932; Lesesna & Anderson, San Juan No. 2686

Castañer	1m, 5f, Limaní, AESb; Feb. 7, 1969; 4m, 1f, Feb. 10, 1969; 13m, 22f, Feb. 11, 1969, Malaise trap
Cayey	1f, Carite For.; Dec. 27-30, 1968, Malaise trap; 2m, 13f, Henry Barracks; Nov. 15-17, 1968; 1m, 4f, Nov. 19, 1968; 2m, 1f, Nov. 21-22, 1968, Malaise trap; 20m, 9f, Salinas; Rd. 1, K 80; Nov. 22-25, 1968; 38m, 4f, Nov. 26, 1968; and 11m, 7f, Nov. 27, 1968, Malaise trap
Corozal	5m, 8f, AESb; Jan. 15, 1969; 4m, 9f, Jan. 16, 1969; 5m, 12f, Jan. 17, 1969; 3m, 5f, Jan. 18, 1969; 6m, 4f, Jan. 19, 1969; and 16m, 17f, Jan. 20, 1969, Malaise trap
Ensenada	1m, Sept.-Nov., 1960, A. Avilés
Fajardo	2m, Cabezas de San Juan; (Acc. 395-1921); on corn; flies feeding on plant juices and/or excrement on Peregrinus maidis and Aphis maidis; Nov. 2, 1921, Federico Vizcarrondo
Fortuna	1f, AESb; Nov. 11, 1968, Malaise trap
Gurabo	1f, AESb; Oct. 15, 1968; 1m, 2f, Nov. 4-5, 1968; 2f, Nov. 9, 1968; and 1m, 4f, Nov. 10, 1968, Malaise trap
Guaynabo	1 specimen, Pueblo Viejo; on orange; II-19-1932, Anderson, Faxon, Mills, San Juan 2433
Humacao	1f, Naguabo, Rd. 3, K 81.6; on flowers of Lagerstroemia speciosa; July 16, 1965, GR & JGT
Isabela	2m, 1f, AESb; Jan. 22, 1969; 3m, 3f, Jan. 23, 1969; 8m, 14f, Jan. 25-26, 1969; 4m, 5f, Jan. 27, 1969; and 1m, Jan. 28, 1969, Malaise trap
Juncos	1f, at sugarcane mill; Clitoria ternatea leaf; May 20, 1965, SMG
Lajas	1m, Sept.-Nov. 1956, R. Cotte; and 1f, at AESb; Feb. 3, 1969; 1f, Jan. 29, 1969, Malaise trap

Luquillo	1f, P.R. Caribbean Nat. For., El Yunque, at spot called Vista Las Cabezas; on grasses mainly Panicum barbinode; Nov. 8, 1964, SMG, PM & EM; and 1m, 1f, at El Verde Field Sta.; Oct. 28-29, 1968; and 1m, Dec. 4, 1968, Malaise trap
Mayagüez	1 specimen, on mango bloom; March 14-33, A. G. Harley, San Juan No. 3817; 1f, Feb. 2, 1953; 3m, Nov. 3, 5, 25, 1953, respectively; and 1m, 2f, by Dr. G. Miskimen house; Feb. 3, 1969, Malaise trap; 17m, 19f, (Bishop No. 23687); bred from cow dung at Expt. Sta.; H. L. Dozier
Naguabo	3 specimens, on grapefruit leaves; Apr. 11, 1953, Faxon & Mills, San Juan, No. 3936
Río Piedras	1f, Acc. No. 254-21; Aug. 11, 1920, F. Sein; 1m, 2f; P. R. Acc. No. 254-21; on corn; Aug. 26, 1921, F. Sein; 3f, P.R. Acc. No. 267-21; at Vanina sugarcane mill; in coffee grove, resting on underside of coffee leaves; Aug. 31, 1921, G. N. Wolcott; 2 specimens, Acc. No. 21-17 (1 labelled as Pyrellia ochricornis; 1-18-17, R. T. Cotton; 1m, 7f, along riverbed of Río Piedras; Apr. 25, 1965, EM; 2f, at AES; on fruit of Mangifera indica; July 7, 1965, SMG; 4f, Oct. 18, 21, 22, 24, 1968, respectively; and 1m, Nov. 2, 1968, Malaise trap
Salinas	4m, 1f, Cayey Rd.; P.R. Acc. No. 9-58; 500 ft.; resting on leaf on Ficus laevigata; July 24, 1956, LFM
Vega Alta	5f, (2 with Acc. No. 21-17); 1-18-17; 3 with (Acc. No. 117-17); 1-22-17, R. T. Cotton
CUBA, WI	1m, Havana; W. F. Buren 3411; 48-1293; X-21-47; 1f, Santa Fe, Isle of Pines; VI-29-50, Berg & Link; 3m, 1f, Columbia, Isle of Pines; VI-29-50, Berg & Link; 1m, 2f, Santa Barbara, Isle of Pines; VI-29-50, Berg & Link

DOMINICAN REPUBLIC, WI	1f, San Pedro de Macoris; Acc. No. 96-49; Sept. 19, 1949; 2f, S. Domingo; I-XI-66; 1m, 2f, S. Domingo; 2-XI-66; 1m, Espaillat Prov.; 22-VIII-1967, L. H. Rolston; 1m, Puerto Plata Prov.; 24-VIII-1967, L. H. Rolston; 1m, San Cristóbal Prov.; 8-VIII-1967, L. H. Rolston; 1f, ibid., but 25-VIII-1967, 1m, 3 miles west of Haina, San Cristóbal Prov.; Aug. 9, 1967; J. C. Schaffner; 1f, La Altagracia Prov.; 8-XI-67, L. H. Rolston; 1f, La Vega Prov.; 9-VIII-1967, MHS & L. H. Rolston; and 1 specimen, on La Romana; 4-11-1913, W. V. Tower, originally identified as Pyrellia ochrichornis
DOMINICA, WI	25 specimens, Clarke Hall Est.; on human feces; May 12, 1966, G. Steyskal, Bredin-Archbold-Smithsonian Biol. Surv. of Dominica
GUADALOUPE, WI	1 specimen, Grand Terre; July 1963, JMC

Remarks: Wolcott (1923a, 1923b, 1924, 1936, 1941, 1948) recorded this species from Puerto Rico on corn leaves, on underside of coffee leaves, as food of the lizards: Anolis pulchellus, A. kruggii, A. stratulus & A. cristatellus, and killed by the fungus Entomophthora sp. (near E. calliphora), on mango blossoms, on egg plant, resting on "Almendra" (Terminalia catapa) leaf, on Citrus maximum, adults on "Jobos" (Spondias mombin) tree with ripe fruits.

Morellia maculipennis (Macquart) (Plate XVIII, Fig. 75)

Pyrellia maculipennis Macquart, 1846a: 327; 1846b: 199 (descr. - Colombia and Brazil).

Musca violacea Fabricius, 1805: 228 (descr. - SA, Nec. Scopoli, 1763; synonymized by Pont, 1972: 9)

Pyrellia maculipennata Macquart, 1851a: 225; 1851b: 252 (descr. - Brazil, Minas Gerais; synonymized by Pont, 1972: 9)

Pyrellia specialis Walker, 1861: 313 (descr. - Mexico; synonymized by Pont, 1972: 9)

Pyrellia centralis Loew, 1869: 37 (descr. - Cuba, synonymized by Pont, 1972: 9)

Röder, 1885: 347 (coll. rec. - PR)

Gundlach, 1887: 193 (coll. rec. - PR)

Morellia violacea Aldrich, 1905: 527 (cat., distr. - PR)

Curran, 1928: 92 (coll. rec. - PR & VI)

Séguy, 1935b: 115 (rev. of gen.)

Wolcott, 1936: 366 (col. rec. - PR)

Séguy, 1973: 395 (cat. of world gen.)

Wolcott, 1948: 492 (coll. rec. - PR)

Albuquerque, 1956a: 12 (coll. rec. - Brazil and Mexico)

Pyrellia violacea Wetmore, 1916: 84 (coll. rec. - PR, as food of birds)

Parapyrellia (Morellia) violacea Wolcott, 1923a: 226 (coll. rec. - PR)

Parapyrellia violacea Townsend, 1931: 68 (notes of American types)

Morellia maculipennis Pont, 1972: 9 (cat., distr. - Mexico, Cuba, PR, Jamaica, Dominica, Trinidad Is., Colombia, Venezuela, Guyana, Perú, Bolivia, Brazil and Paraguay)

Male length 4.5 to 6.0 mm. Frontal vitta dark brown to black with yellow or golden pruinosity. Parafrontalia, parafacialia, antenna and palpus yellowish-brown; gena reflecting brown; proboscis glossy. Antennal segment 3 more infuscated than first and second; segment 1 and

2 more yellowish than third; basal half of arista yellow, black apically. Thorax and abdomen bluish to violaceous. Wing faintly tinged with brown, distinct dark spots at cross veins, r-s and r-m, basally and distally extending across wing from end of subcostal vein to end of first vein and down to r-m cross vein. Dark spot before humeral cross vein in base of cell; cross vein (r-m) with light infuscation. Lower calypter dark brown, darker at apex; upper with basal part at union with the lower calypter white; other areas light brown; halter yellow. Legs brown; pulvilli yellowish.

Eyes almost contiguous in male; about 12 pairs of hairlike frontal setae; very stout, cruciate inner vertical seta; 1 hairlike, slender, diverging ocellar pair; outer vertical seta not differentiated. Arista plumose on its basal 2/3; second antennal segment with a dorsal seta. Three humerals, outer one stout, inner one short; 1 posthumeral; acrostichals undeveloped; 1-2 or no presuturals and 3-4 postsutural dorsocentrals; 2 notopleurals; 1 prealar; 1 well-developed and 1 small supra-alar; 1 intra-alar; 2 postalars; scutellars: 1 long apical pair, 1 anterior pair, 1 discal (subbasal) pair; 2:1 katepisternals, lower posterior very weak, almost undeveloped.

Fore femur somewhat curved; 1 row of bristles on dorsal, posterodorsal and posteroventral sides; the last one the stoutest. Fore tibia with 1 apical anterodorsal and 1 anteroventral seta. Mid femur with 3 apical dorsal to posterior recurved setae and anterior row of short setae on basal 2/3; mid tibia with two short, stout, dark, posterior setae; apically with 1 long anteroventral, 1 ventral and 1 postero-

ventral seta. Hind femur with 1 row of anterodorsals and 1 row of anteroventral setae, stoutest on apical half; hind tibia with 4 long, thin posteroventrals and 2-3 basal anteroventrals; 1 posterior subbasal; about 4-5 anterodorsals in a row more or less equally spaced; apically, 1 short dorsal, 1 anterodorsal and 1 anteroventral.

Wing vein 3 with ventral and dorsal setae extending to about midway from r-m cross vein; base of stem vein (R) with several microsetae on its dorsal surface after humeral cross vein.

Abdomen as well as other body parts with many yellowish-white setulae. Some large and slender yellowish-white setae at side of abdominal tergites and across the second abdominal tergum. Long setae at sides and apex of segments.

Female length 4.5 to 6.5 mm. Similar to male in color and structure, except that frontal vitta is wide; head setae somewhat stouter than in male; hind tibia with only the mid-anteroventral seta; 1 dorsal apical, 1 anterior and 1 anteroventral seta.

Specimens examined:	186 (19m, 50f) and 17 (sex undetermined) from 9 Puerto Rican localities, 3 in the Dominican Republic, 3 in Dominica, one in Grenada, 1 in Haití and 1 in Trinidad:
Adjuntas	1m, June 26, 1915; 2f, June 8-13, 1915; 1m, on leaf of sour orange; (San Juan No. 4001C); 4-21-33, Faxon, Mills & Anderson
Aibonito	2f, June 1-3, 1915, C. H. Curran Coll., Acc. 31144
Arecibo	3m, 2f, June 24-26, 1915, C. H. Curran Coll., Acc. 31144
Barranquitas	1f, Orocovis; Rd. 143, K 2.7; on mixed vegetation by roadside; Aug. 17, 1965, SMG

Castañer	1m, 6f, Limaní; AESb; Feb. 11, 1969; and 1f, Feb. 12, 1969, Malaise trap
Ciales	1f, March 24, 1921, GNW
Yauco	1m, 2f, Lares Rd., K 29; Jan. 20, 1954, JM & SMG
Luquillo	1f, Caribbean Nat. For., El Verde Field Station; Dec. 22, 1968; and 1f, Dec. 25-26, 1968, Malaise trap
Mayagüez	7m, July 24-29, 14; and 1f, San Juan No. 2971; VIII-10-32, A. G. Harley
DOMINICAN REPUBLIC, WI	2m, 12f, S. Frnsco Mts.; Sept. 1905, Aug. Busck; 1f, Romana; 4-11-1913, W. V. Tower; 1m, 8 miles West Jayaco, La Vega Prov.; Aug. 3, 1967, J. S. Schaffner
DOMINICA, WI	3f, Greenhill Estate; 1000 ft.; on shrubs at light; VI-3-12, 1941; 1m, Belfast East; 9-19-31, Kisliuk & Cooley; and 15 specimens, at Clarke Hall Est.; May 12, 1966, on human feces; G. Steyskal, Bredin-Archbold-Smithsonian Biological Survey Dominica
GRENADA, WI	1m, 1f, 9.6 (sic), Aug. Busck
HAITÍ, WI	2 specimens, Al Melander collection
TRINIDAD, WI	13f, Monserrat; June 30, 1905, Aug. Busck

Genus Musca

Musca Linnaeus, 1758

Musca Linnaeus, 1758: 589 Type-species: Musca domestica L. (by International Commission of Zoological Nomenclature, 1925: 1)

Byomya Robineau-Desvoidy, 1830: 392 Type-species: violacea Robineau-Desvoidy. Designated by Townsend 1915a: 434

Musca Williston, 1896: 366 (rev. of St. Vincent Is. spp.)

Musca Aldrich, 1905: 527 (cat. of NA spp.)

Musca Schnabl & Dziedzicki, 1911: 180 (rev. of Anthomyiidae)

Eumusca Townsend, 1911: 170 (as subg.) Type-species: Musca corvina Fabricius (orig. des.) = autumnalis De Geer

Promusca Townsend, 1915a: 434 Type-species: domestica Linnaeus (orig. des.)

Emusca Malloch, 1925b: 372 Type-species: Musca autumnalis De Geer (orig. des.)

Musca Malloch 1934: 343 (rev. of Chile spp.)

Musca Séguy, 1937: 409 (cat. of world gen.)

Musca Emden, 1939: 73 (rev. of Ethiopian spp.)

Musca James, 1947: 138 (rev. of myiasis causing flies)

Musca West, 1951: 130 (rev. of biology)

Musca Hennig, 1964: 976 (cat. of Palaearctic spp.)

Musca Huckett, 1965: 913 (cat. of NA spp.)

Musca Pont, 1972: 7 (cat. of ASUS spp.)

Musca West & Peters, 1973: 1-743 (annotated bibliography)

Eyes somewhat contiguous in male, the distance between the eyes in the male is 1/2 the distance between the eyes in the female. Frontal setae short, first pair the longest; parafrontalia very narrow with few microsetulae in male, wider and with more setulae in female. Anterior interocellar well-developed in female, short in male. Inner vertical setae well-developed, stoutest of head. Pedicel with a long

dorsal seta and numerous microsetae; arista short, thick basally, with very long dorsal and central rays, some as long as arista.

Two presutural and 4 postsutural dorsocentrals; 2 notopleurals; prosternum setulose or bare at middle; 3 katepisternals, well-developed, last 2 very close together; anepimeron setulose below and with 3-4 long anepimerals above; meron bare or few setulate near the spiracle; metepisternum setulose.

Wing with many setulae on C, 1-2 on upper side of R, proximad of h; fourth vein (M_{1+2}) strongly bent forward, angular at its bend, reaching the costa before the wing apex; lower squama wide, truncate posteriorly, widened basally, its inner margin contacting anterior angle of scutellum.

Abdominal terga often extensively yellow or orange to almost black, more or less covered with grayish pollinosity.

Musca domestica Linnaeus (Plate II, Fig. 6; Plate VI, Fig. 18; Plate XVI, Fig. 64)

Musca domestica Linnaeus, 1758: 596. (descr. - Europe and America)

Stahl, 1882: 175 (coll. rec. - PR)

Röder, 1885: 347 (coll. rec. - PR)

Gundlach, 1887: 402 (coll. rec. - PR)

Williston, 1896: 336 (coll. rec. - St. Vincent Is.)

Coquillett, 1900: 256 (coll. rec. - PR)

Schnabl & Dziedzicki, 1911: 180 (coll. rec. - Palaearctic)

Wolcott, 1923a: 226 (coll. rec. - PR)

Wolcott, 1924: 150 (coll. rec. - PR - economic importance)

Curran, 1928: 91 (coll. rec. - PR)

Malloch, 1934: 343 (coll. rec. - Chile)

Wolcott, 1936: 366 (coll. rec. - PR)

Séguy, 1937: 414 (cat., key world gen., summary of hosts and larval habits)

Wolcott, 1941: 117 (coll. rec. - PR & Mona Is.)

Beatty, 1944: 150 (coll. rec. - St. Croix, VI)

Ramos, 1946: 61 (coll. rec. - Mona Is.)

James, 1947: 140 (coll. rec. - man myiasis)

Wolcott, 1948: 492 (coll. rec. - PR)

Pérez, 1951: 139 (coll. rec. - PR, as food of Rana catesbeiana)

West, 1951: 130 (monog. of spp.)

Tucker, 1952: 351 (coll. rec. - Barbados Is.)

Wolcott, 1955: 173 (economic importance in PR)

Hennig, 1964: 997 (cat. - Palaearctic spp.)

Legner, 1965: 109 (coll. rec., parasites and predators)

Legner, Bay & McCoy, 1965: 368 (coll. rec., parasites)

Huckett, 1965: 913 (coll. rec. - cosmopolitan, NA, including Greenland)

Miskimen & Bond, 1970: 70 (coll. rec. - St. Croix, VI)

Pont, 1972: 7 (coll. rec. - NA, SA, Central America and WI, cosmopolitan)

West & Peters, 1973: 1-743 (annotated bibliography)

Musca domestica major De Geer, 1776: 71 (descr. - Sweden and Surinam)

Musca stomoxidea Robineau-Desvoidy, 1830: 396 (descr. - Brazil)

Musca basilaris Macquart, 1843: 310 (descr. - Brazil)

Musca analis Macquart, 1843: 311 (descr. - Chile)

Musca chilensis Macquart, 1843: 311 (descr. - Chile, nec chilensis Walker, 1837)

Musca consanguinea Rondani, 1848: 78 (descr. - Brazil)

Musca vicina Macquart, 1851a: 226; 1851b: 253 (descr. - America)

Musca contigua Walker, 1852: 334 (descr. - US)

Musca flavinervis Thomson, 1868: 547 (descr. - Ross Is.)

Musca harpyia Harris, 1869: 335 (descr. - NA)

Musca flavipennis Bigot, 1887b: 605 (descr. - NA)

Musca atrifons Bigot, 1887b: 607 (descr. - Cuba and Mexico)

Musca pampasiana Bigot, 1887b: 607 (descr. - Argentina, Buenos Aires)

Male length 4.0 to 6.5 mm; black; tergum and pleuron of thorax and abdomen more or less covered with grayish pollinosity. Abdominal segments 1 + 2 and 3 extensively yellow to orange with a median black stripe; segments 4 and 5 almost black; squamae yellow; wing grayish, yellowish at base; halter yellow. Frontal vitta brown to black pollinosity; lower part of parafrontalia, parafacialia and gena whitish-gray pollinose in male, antenna and palp dark. Mesoscutum with 4 dark vittae, the median vittae united as one medially on scutellum, the lateral vitta coursing laterad of dorsocentrals to scutellar angles.

Frontal vitta very narrow; parafrontalia nearly touching at middle; 12-13 frontal setae, first pair the largest; anterior interocellar short; 2 very short postocellar pairs; 1 postvertical pair; 1 stout vertical pair; 1 small, outer vertical pair; upper and lower orbitals very small.

Antenna short; arista short, longest dorsal rays of arista in upper part, as long as arista length; pedicel with a long dorsal seta and 2 rows of setulae; palp with long fine setae below, a short one above.

Three stout humerals, 1 posthumeral; 1 sublateral; 2 notopleurals; acrostichals (prescutellar pair only); 2 presutural and 4 postsutural dorsocentrals; 1 prealar; 1 long supra-alar; 2 intra-alars. Scutellars: 1 pair of apicals, 1 dorsal preapical pair, 1 pair of short basals, 1 large subbasal somewhat laterally placed, several dorsal scutellars. Prosternum setulose laterally; propleuron hairy at middle, a specific character unique to Musca; a very long, stout seta and many hairlike setae on lower margin of propleuron, 1 long stigmatal seta, many other setulae at base of the stigmatal. Mesanepisternum with 1 seta on upper anterior margin, a row of 6 setae on hind margin interspersed with other thin, long setulae; 3 katepisternals in an arcuate row, hind two very close. Anepimeron setulose at middle, with a tuft of 4-5 strong setae; meron setulose; metepisternum with several hairlike setulae; posterior spiracle fringed with several black accessory setae, katatergite with short villosity.

Wing veins without setae except on C, 1-2 setulae on R before h; fourth vein (M_{1+2}) strongly bent angularly forward, reaching costa before wing apex.

Fore coxa with many thin anterior setae; fore femur with prominent rows of posterodorsal and posteroventral setae; fore tibia shortly setulose with a conspicuous mat of posterodorsal and posteroventral setae; fore tarsus shortly setulose with a conspicuous mat of short

appressed setae on anteroventral to ventral side; mid femur with 3-5 erect ventral setae; 2 stout posteriors at apex; mid tibia with 2-3 posterior setae; apically 1 long anteroventral; 1 ventral; 1 anterodorsal and 1 posteroventral seta; hind femur with anterodorsal row of setae, apically 4-5 long anteroventrals; 1 erect ventral on basal 1/3; hind tibia with 2 setae near middle, a row of short anterodorsals distinct from clothing setulae; 1 posterodorsal at middle; 1 long dorsal preapical seta.

Abdomen with longest tergal setae apically and laterally, longest and stoutest setae at apex of tergum 5.

Female length 4.0 to 6.0 mm; almost identical to male in color and structure, except for widely separated eyes, about 3-4 times that of males; frontal vitta reddish-brown; parafrontalia golden pollinose with 2 rows of setulae; inner and outer verticals very stout; parafacialia golden pollinose; gena reddish-brown, golden pollinose from posterior aspect. Anterior spiracle with yellow villosity.

Remarks: *Musca domestica*, the house fly, is well-known because it is generally near human and animal habitations. While most important as a disease carrier, the house fly also disturbs some domestic animals. It is most active on hot, sunny days and is nearly cosmopolitan in distribution.

For detailed information on the biology of the housefly, West (1951) and the annotated bibliography by West & Peters (1973) should be consulted. For specific areas related to this fly several articles should be consulted, especially those of Zingrove, Bruce & Decker (1959)

on mating in the female; Rogoff, Beltz, Johnsen & Plapp (1964) on pheromones; Murvosch, La Brecque & Smith (1964) on the effect of chemosterilants, longevity and sterility; and Chang (1965) on the chemosterilization and mating behavior of the male.

This species was recorded by Wolcott (1923a) from reared specimens from a rotten palm tree at Añasco. Wolcott (1936) also recorded it from rotten pumpkins intercepted at Arroyo, collections from Bayamón, Guayama, and found it to be very abundant at Hormigueros and Santa Rita in a house near a pile of fresh filter press cakes. Bartlett (1939) reported the use of house fly puparia as a rearing medium for fruitfly parasites such as Spalangia philippinensis (now S. endius), Dirhimus giffardii and Muscidifurax raptor.

The recorded natural enemies of the house fly in Puerto Rico are very numerous. The anonymous (1938) Puerto Rico Report lists Muscidifurax raptor (Pteromalidae: Hymenoptera) as having been reared from M. domestica puparia collected at Hormigueros on June 21, 1937; this was the first record of this species from the island.

West (1951) noted the parasite Ashmeadropia sp., now Trichopria sp. (Hymenoptera: Diapriidae), parasitizing 10% of the house flies in Puerto Rico in the 1930's. He also reported Pachycrepodeus dubius, now P. vindemiae (Hymenoptera: Pteromalidae), as very active in Puerto Rico. He reported Spalangia endius (Hymenoptera: Pteromalidae), as a true active, house fly parasite in Puerto Rico. West (1951) and Pinkus (1913) cited cases where it parasitizes other hosts such as Stomoxys calcitrans and Haematobia irritans in other areas. Spalangia nigroaenea

(also the variety stomoxysiae) was reported by West (1951) as occurring in Puerto Rico and Spalangia philippinensis (Hymenoptera: Pteromalidae) now S. endius as an introduced species.

Legner (1965) and Legner, Bay & McCoy (1965) in their search in Puerto Rico during 1963 for natural enemies of Musca domestica found that 6 hymenopterous parasites attack the puparium and found 50 other arthropods, that, by their direct attacks on the larvae and puparia, or by other diverse environmental alterations, determined the natural suppression of the same. They found that 23% of natural parasitism is achieved principally by 4 species. They concluded that the parasitism and predation are enough to significantly reduce the Musca domestica populations in Puerto Rico, as well as populations of other muscids in the Western hemisphere.

The 6 hymenopteran parasites found in natural rearing areas of Puerto Rico are: 1 species Trichopria sp. (Hymenoptera: Diapriidae), and Spalangia endius, Muscidifurax raptor, Pachycrepoideus vindemiae, S. nigroaenea and S. stomoxysiae (Hymenoptera: Pteromalidae).

Three species of predaceous mites were found by Legner (1965): Enemothrombium sp., Fuscuropoda marginata and Fuscuropoda sp. He listed 47 insect species, 4 of which were: Carcinops troglodytes, Epierus nov. sp., Hister punctifer, Peranus confinis (Coleoptera: Histeridae). Another 5 were Dicchus sanus, Hyponygrus humeralis, Oxytelus incisus, Philonthus discoideus and Platystethus spiculus (Coleoptera: Staphylinidae) and a further 3 were predatory species of ants: Ponera sp., Solenopsis geminata and Tetramorium guineense (Hymenoptera: Formicidae).

He also listed 3 muscids, Fannia pusio, Gymnodia arcuata and

Stomoxys calcitrans, among the other insects that have some influence on Musca domestica populations in Puerto Rico. Legner, Bay & White (1967) published on the same subject including the Western hemisphere.

Pimentel (1955) found that 91% control of the Musca domestica population in Puerto Rican breeding sites was achieved mainly by the ant Solenopsis geminata.

The only other species of the genus in the New World is Musca autumnalis De Geer, commonly known as the face fly. The male of this species can be separated from M. domestica by having eyes separated above by less than the width of the ocellar triangle; the propleuron bare; abdominal terga of second and third segments, except for median line, yellow to orange-brown, remainder blackish. The female has the gray pollinose orbital stripes at least half as wide as the black median frontal stripe; and the abdomen dark above. It has spread into many areas of the US, becoming another species of economic significance.

Specimens examined:	475 (223m, 209f, and 43 specimens (sex undetermined) from 27 Puerto Rican localities and from Antigua, Bermuda, Cuba (5 localities) Dominican Republic, Grenada, Haití, and Trinidad:
Aguadilla	2f, Oct. 1936; and 1f, Nov. 1936, J. Labadie
Aguirre	2f, reared from cow manure; Oct. 7, 1969; JMC & SMG
Adjuntas	1f, June 8-13, 1915
Añasco	3m, Acc. 116-1922; in rotten palm trunk; Jan. 25, 1922, J. Oliver Lugo
Barranquitas	1m, Feb. 15, 1935, J. R. Martin
Cayey	1f, Salinas, Rd. 1, K 80; Nov. 22-25, 1968, Malaise trap
Coamo	1f, July 10, 1932, R. Rivera

Corozal	1f, AESb; Jan. 17, 1969, Malaise trap
Desecheo Is.	1f, at seashore; July 13, 1968, SMG
Fajardo	2f, Las Croabas Rd., K 4.8; on trunk of *Ceiba pentandra*; Apr. 19, 1965; SMG
Guayama	3m, 7f, on cow barn; Oct. 7, 1969; JMC & SMG; 1m, 2f, on Guavate, Rd. 179, K 9.6; Nov. 1, 1964, taken along roadside over a dog carcass; SMG
Gurabo	1f, AESb; Nov. 8, 1968, Malaise trap
Hatillo	1m, Mar. 2, 1935, V. Bryent
Humacao	1m, 2f, Santos Rivera Farm; cow barn; Oct. 27, 1969, SMG
Lajas	28m, 25f, AESb; on cow pen; Feb. 18, 1965, SMG; 3 specimens on Nov. 22, 1935, H. L. Dozier, Bishop 23625; and 5 specimens reared on 12-4-1935, H. L. Dozier
Manatí	1f, March 5, 1914
Mayagüez	1f, June 21-23, 1915; 3f, June 19, 1936, JAR; 1f, Apr. 28, 1939; JGR; 4m, 1f, Dec. 1949, N. Meléndez; 1m, 5f, Mar. 1960, JMC; 1f, Aug. 1-31, 1953, JMC; 1m, 3f, Sept.-Nov. 1960, M. M. Beauchamp; 2m, Dec. 9, 1949, P. J. Matos; and 2 specimens on VII-1915, R. H. Van Zwaluwenburg; and 6 specimens reared from cow manure: IV-22-36, H. L. Dozier, Bishop 24460.
Mona Island	2f, Apr. 1935, A.M.C. Expedition; and 1m, Ref. 203-39, Aug. 1939, LFM
Muertos Island	1m, Acc. No. 175-59; at light; May 27-30, 1959, LFM & SMG
Peñulelas	1m, Sept. 1960, M. Santiago
Ponce	1f, Mercedita sugarcane mill; on mud bank of rum distillery waste ditch; May 2, 1965, SMG & JCT

Río Piedras	141m, 112f, AES; on cow pen; May 2, 1965, SMG & EM; 4f, Feb. 17, 1965; 1f, May 18, 1965, on glass window at Biology Building, SMG; 2m, Sept. 11, 1911, D. L. Van Dine (Acc. 751-1917); 3m, along river bed of Río Piedras; Apr. 25, 1965; 5m, at Urb. San Gerardo; Jan. 24, 1965, at glass window, EM & PM; and 15m, 18f, at AES, Oct. 25, 1968, Malaise trap
Salinas	1m, June 5, 1961, JMC; and 1m, July 11, 1970, JMC
San Juan	1m, Feb. 11-14, 1914
Santurce	(as San Turce) 1m, Jan. 1, 1918
Yabucoa	5m, 3f, at sugarcane mill; taken in flight over human feces; May 14, 1965, SMG
Vieques Is.	1 specimen, Feb. 1899, Aug. Busck
ANTIGUA, WI	1 specimen, July, Stoner (sic)
BERMUDA, WI	1m, 3f, St. Georges; Jan. 23, 1934, Al Melander (Al Melander Collection 1961)
CUBA, WI	3 specimens, as Musca corvina from Guantanamo; 7-26-01, S. M. Spain; 2 specimens at Havana (sic); III-14-50, Finlay I; 1 specimen, Nueva Gerona; Isle of Pines; VI-29-54, Berg & Link; 2 specimens, Baracoa; 1901, Aug. Busck, 1 specimen, Havana; Baker, J. M. Aldrich Collection
DOMINICAN REPUBLIC, WI	8 specimens, S. Francisco Mts.; Sept. 5, Aug. Busck
GRENADA, WI	2 specimens, 9.6 (sic), Aug. Busck
HAITÍ, WI	3 specimen, P. au Prince; V-1949, A. Curtiss
TRINIDAD, WI	1 specimen, E. A. Popenoe; 1 specimen, on June 5; Aug. Busck; and 1 specimen, on Montserrat; June 29-05, Aug. Busck

Subfamily Stomoxyiinae

The flies which belong to this subfamily can be separated from all other Muscidae by their long, slender, projecting and strongly chitinous proboscis, gradually slender from the base to apex, ordinarily without the apical thickened and setulose soft labella but fitted for piercing. The palps are usually shorter than the proboscis; if they are as long as the proboscis, the arista is bare in the superior part, and rarely with some hairs on the lower side. Wing veins R_{2+3} or R_{4+5} setulose at base; R_{4+5} gently curving upward, never angularly curved near the transverse posterior vein; vein six (Cu_2+A_1) elongated; the lower calypter more developed than the upper calypter, somewhat rounded at the apex and well-separated from the scutellum at its internal part. All the genera of this subfamily have the anepimeron and the prosternum partially covered with hairlike setulae. Meron bare or setulose; usually at the most, one katepisternal seta.

Biology: All members of this subfamily suck blood; they frequent and can be seen on flowers in humid surroundings, but their normal food is mammalian blood.

Some species are distributed over the entire world, others are localized in some parts of the Old World. *Stomoxys calcitrans* is almost cosmopolitan and *Haematobia irritans* is very common in the Holarctic region.

Key to the Genera and Species
of Stomoxyiinae

1. Palp short, not as long as sclerotized portion of proboscis; 1 stout, black katepisternal seta; meron with short hairlike setulae . . . Stomoxys calcitrans (L.)

   Palp long, prominent, as long as sclerotized portion of proboscis; katepisternals weak and pale, 1:0 or 1:1; meron bare . . . Haematobia irritans (L.)

Genus Haematobia

Haematobia Lepeletier and Serville, 1828

Haematobia Lepeletier & Serville in Latreille et al., 1828: 499 Type-species: Conops irritans Linnaeus (Westwood, 1840: 140)

Lyperosia Rondani, 1856: 93 Type-species: Stomoxis irritans Mg. (orig. des.)

Haematobia Schnabl & Dziedzicki, 1911: 178 (rev. of Palaearctic spp.)

Siphona Meigen, 1803: 281, of authors, not of Meigen (True Siphona belongs to the family Tachinidae)

Haematobia Séguy, 1935a: 46 (rev. of gen.)

Haematobia Séguy, 1937: 434 (cat., key world gen.)

Haematobia Townsend, 1937:23 (gen. diagnosis)

Haematobia Huckett, 1965: 914 (cat. of NA spp.)

Haematobia Pont, 1972: 58 (cat. of ASUS spp.)

Eyes nearly contiguous in male, separated in female. Palp long, shiny, about 1/2 to 3/4 as long as haustellum, distinctly broader on basal half than at apex; grooved along its internal face, generally with short microsetae, resting along the beak. Proboscis elongate, horny,

adapted for blood-sucking. No stout vibrissae, not really differentiated from other setae on bucal ridge. Arista bare on ventral surface.

Two presutural and 4-5 postsutural dorsocentrals. Prosternum laterally and dorsally with some pale hairs; no prealar; propleuron, meron and metepisternum bare. Mesokatepisternum with only the anterior seta distinguishable. Pleuron with hairlike setulae gray to golden, very slender, long. Mesanepisternum with row of weak setae posteriorly. Third (R_{4+5}) and fourth (M_{1+2}) veins strongly convergent; fourth ending in or slightly behind wing tip. Sixth vein (Cu_2+A_1) gradually thinner apically, continued more than 0.25 distance from its point of origin to its margin. All veins except costa bare. Lower calypter rounded apically, somewhat rounded at apex and well-separated from the scutellum at its internal part.

Male hind tibia dilated, provided with long hairlike setulae on external part. The adults of all the species of this genus are known to feed primarily on the blood of ungulates, but they have been recorded biting man also.

Haematobia irritans (Linnaeus) (Plate III, Fig. 8; Plate VI, Fig. 67)

Conops irritans Linnaeus, 1758: 604 (descr. - Sweden)

Haematobia serrata Robineau-Desvoidy, 1830: 389 (descr. - South France)

Merrill, 1915: 53 (coll. rec., life history and bionomics in PR)

Colón, 1919: 39 (control, life history and bionomics)

Smyth, 1919a: 10; 1919b: 17 (control, life history and bionomics)

Smyth, 1921: 1 (control, life history and bionomics)

Wolcott, 1922: 18 (coll. rec., parasites of larvae in PR)

Catoni, 1923: 35 (coll. rec., attacking domestic animals in PR)

Wolcott, 1923a: 226 (coll. rec., habitat and biology in PR)

Haematobia cornicola Williston, 1899: 180 (descr. - e. NA)

Haematobia irritans Schnabl & Dziedzicki, 1911: 178 (coll. rec. - Palaearctic)

Wolcott, 1924: 163 (coll. rec. - economic account in PR)

Dickmans, 1927: 22 (coll. rec., abundance in PR)

Curran, 1928: 91 (coll. rec. - PR)

Root, 1929: 405 (coll. rec. - PR)

Volkenberg, 1932: 25 (coll. rec. - report damage to cattle in PR)

Leonard, 1933: 130 (coll. rec. - Vieques Is.)

Volkenberg, 1934: 22 (parasite of cattle in PR)

Volkenberg, 1935: 17 (parasite of cattle in PR)

Séguy, 1935a: 56 (rev. of gen. spp.)

Volkenberg, 1939: 4 (rec., notes in PR)

Wolcott, 1936: 367 (coll. rec. - PR)

Séguy, 1937: 437 (cat., key world gen., summary of hosts and larval habitats)

Bartlett, 1939: 1 (control by introduction of beneficial insects)

Wolcott, 1941: 117 (coll. rec. - PR)

Beatty, 1944: 150 (coll. rec. - St. Croix, VI)

Huckett, 1965: 914 (cat., distr. - Sweden, Canada, USA: S. to California and Florida; WI, Europe)

Miskimen & Bond, 1970: 69 (coll. rec. - St. Croix, VI)

Pont, 1972: 58 (cat., distr. - Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica, Panamá, PR, Jamaica, VI, Haití, S. Domingo, Colombia, Venezuela, Guyana, Brazil, Chile, NA,

Europe, Asia, North Africa and Hawaii)

Lyperosia irritans Séguy, 1937: 440 (cat., key world gen., summary of hosts and larval habitats)

Siphonia irritans Wolcott, 1948: 493 (coll. rec., biology - PR)

Wolcott, 1955: 188 (coll. rec., economic account in PR)

Eldridge & James, 1957: 6 (coll. rec. - California)

Hennig, 1964: 1054 (cat., distr. - Palaearctic)

Male length 2.8 to 4.0 mm. Frontal vitta of head dark brown; parafrontalia silvery gray pollinose; parafacialia and gena silvery gray; antennal segment 3 light brown to grayish; tip of palp dark-brownish to light brown; proboscis glossy; vibrissae and buccal setae yellowish. Thorax and abdomen with dark ground color, covered with a gray to rusty pollinosity; pronotum and mesonotum with only faint traces of vittae. Abdomen with a dark brown median vitta, faintly extended along posterior margin of terga. Legs dark brown except tibia and apical part of femur; front and middle leg yellowish-brown. Calypter yellowish-white, translucent, with brownish border, its hairlike setulae yellowish.

Frontal vitta very narrow; eyes almost contiguous; about 12 pairs of slender frontal setae; 3 interocular pairs; postocellar pair; 1 short outer vertical; 1 stout, long inner vertical; 1 single row of post-orbitals. Arista bare ventrally. Palp concave on inner surface, setulose on outer surface, long, almost 0.50 to 0.75 the length of proboscis. No stout vibrissae, not differentiated from other buccal setae. Eye large, occupying almost all the head as seen in profile.

Three to 4 humerals; 1 posthumeral; 1 lateral; acrostichals not differentiated from rest of thoracic setae; 3 prescutellar setae only

somewhat longer than the others; 2 notopleurals; 3 presuturals and 4-5 postsutural dorsocentrals; no prealar; 1 supra-alar; 1-2 postalars; 1 intra-alar; scutellars, 1 apical and 1 subbasal pair. A patch of pale golden, upward-inclined, hairlike setulae beneath anterior spiracle; 1 stout brown mesanepisternal seta, others hairlike, pale brown. Many hairlike setulae on mesokatepisternum; anterior katepisternal setae well-developed. Meron bare; anepimeron with short anepimeral setae; katatergite with very short setae; metepisternum bare.

Fore femur somewhat arcuate; anterodorsal and ventral row of setae stouter as they approach apex. Fore tibia covered with straight rows of short microsetae; only 1 apical dorsal seta conspicuous. Mid femur with 1 anteroventral row on basal 1/2; 5-6 ventral erect setae on basal 1/2; 1 apical dorsal; 1 anterodorsal; mid tibia without any conspicuous setae except for short, median, posterior one; 1 apical ventral. Hind femur with a row of anterodorsals, stouter on apical 1/2; many long apical dorsal and posterodorsal setae; a long ventral subbasal seta; hind tibia with a very stout well-developed subapical seta; hind tarsi with dorsal angular dilation, provided with long hairlike setae; pulvilli large, padlike; claw strong; empodium bristlelike.

Wings somewhat infuscated; no special marks or vein setulae except for costal ones. Third (R_{4+5}) and fourth (M_{1+2}) veins strongly convergent, fourth ending at or slightly behind wing tip.

Abdomen subcylindrical; tergum covered with strong to medium sized setae, longer at sides; sternites covered with long, golden setae, fifth with dark lateral clawlike projections.

Female length 2.8 to 4.6 mm. Similar to male except frons wider

than in male. Legs as in male, except for the hind tibia which is not laterally dilated.

Remarks: The horn fly was introduced into the United States from Europe, where it has been an important cattle pest for many years. It is thought that it was introduced in Puerto Rico with the importation of cattle.

When the horn fly is at rest, its wings lie flat on its back and fold rather closely, but when it bites, the wings are spread and the insect stands almost perpendicular, hidden between the hairs of the host. In Puerto Rico this fly is found most of the time on the flanks of cattle. Unlike the stable fly, the horn fly remains with the animal almost constantly.

Numerous articles on the control and biology of this fly appear every year. Those interested in knowing more about the species should consult the annotated bibliography of Morgan & Thomas (1974). Articles by McLintock & Depner (1954), Bruce (1964) and Sanders & Dobson (1969) consider the history, biology and habits of the horn fly.

Man is rarely attacked but Séguy (1923) reported one case, and Knapp et al. (1955) reported a surprising case of human myiasis, apparently caused by the horn fly.

The horn fly can be readily distinguished from the stable fly by its small size and the greater length of its palpi.

Wolcott (1922) reported on the parasites of the horn fly larvae in Puerto Rico: two minute hymenopterous parasites, *Spalangia* sp. and *Xyalosema bifoveolata* now *Neralsia bifoveolata* and a small staphylinid

beetle, Aleochara sp. (antomyae or nitida) (sic). He, Strong (1938), and Lee (1938 and 1941) also reported the introduction of several species of "tumble bugs" or scarab beetles, Aphodius lividus and Ataenius stercorator, for the purpose of reducing the amount of manure subitable for the development of the fly maggots. Wolcott (1941) listed an introduced parasite Spalangia philippinensis now S. endius from Hawaii as informed by Bartlett (1939) in his mimeographed agricultural notes.

Specimens examined: 202 (60m, 85f, and 57 specimens (sex undetermined) from twelve Puerto Rican localities and the Virgin Islands:

Aguirre	6m, 8f, over Bos taurus; Oct. 7, 1969, JMC & SMG
Aibonito	1m, La Plata; V-2, 1929, S. T. Danforth
Ensenada	3 specimens, IV-20-36; on cow manure; H. L. Dozier, Bishop 24447; and 3m, 7f, at Josefa; 7-9-1913, W. V. Tower
Guánica	1f, P.R. S.G.A., Acc. No. 343-13; Apr. 8, 1913, D. L. Van Dine; 2m, 2f, P.R. Acc. No. 710-17; Oct. 1, 1917, L. Dávila; and 2m, 13f, 3-20, 1913, W. V. Tower
Guayama	6m, 6f, over Bos taurus; Oct. 7, 1969, JMC & SMG
Humacao	1m, 3f, Santos Rivera farm; over Bos taurus; Oct. 27, 1969, SMG
Lajas	18m, 21f, AESb; over Bos taurus; Feb. 18, 1965, SMG
Manatí	6m, 8f, José Avalo farm; over Bos taurus; June 11, 1970, JMC & SMG; and 1m, 13f, Nov. 20, 1969

Mayagüez	3m, Mar. 1940, JMC; 2m, Mar. 1960, F. Cedó; and 1f, Mar. 1960, P. Perea
Salinas	1f, over Bos taurus; July 11, 1970, JMC
San Germán	8m, 1f, Acc. No. 594-22; Dec. 4, 1922
San Juan	1m, 3-20, 1913, W. V. Tower
VIRGIN ISLANDS	54 specimens, biting cattle; 4-4-41, No. 1223, H. A. Beatty, Lot No. 41-9453

Genus Stomoxys

Stomoxys Geoffroy, 1762

Stomoxys Geoffroy, 1762: 449 Type-species: Conops calcitrans (International Commission Zoological Nomenclature, 1957: 85). Conserved by I.C.Z.N., 1957: 85)

Stomoxys Aldrich, 1905: 529 (cat. of NA spp.)

Stomoxys Schnabl & Dziedzicki, 1911: 177 (rev. Palaearctic spp.)

Stomoxys Séguy, 1935a: 20 (rev. of gen.)

Stomoxys Séguy, 1937: 423 (cat., key to world gen., summary of hosts and larval habits)

Stomoxys Townsend, 1937: 29 (diagnosis of gen.)

Stomoxys Zimin, 1951: 250 (rev. of tribes Muscini and Stomoxydini)

Stomoxys Hennig, 1964: 1037 (cat. of Palaearctic spp.)

Stomoxys Huckett, 1965: 914 (cat. of NA spp.)

Stomoxys Pont, 1972: 58 (cat. of ASUS spp.)

Eye large, oval, strongly emarginated posteriorly. Interocular space wide in females, narrower in males by about half the distance of separation in females. Proboscis very long, subshiny, horny, base

swollen; labella very small, adapted for blood-sucking; palpus slender, small, not longer than antenna. Arista pectinate only along upper part. Katepisternal 1, well-developed; many microsetae all over mesokatepisternum; propleuron with short microsetulae; meron with setulae below spiracle; mesokatepimeron with many setulae; anepimeral setulae very numerous. Prealar bristle absent. Third vein (R_{4+5}) setulose on node and beyond on both sides; setulae present also on base of stem vein (R). Fourth wing vein (M_{1+2}) distinctly curved forward, ending slightly behind wing tip. Lower calypter rounded apically, inner margin reaching almost to the end of bare supra-squamal ridge.

This genus is distinguished from other muscoids principally by the long proboscis, small palpi, and the arista, which is pectinate on the upper part only.

Stomoxys calcitrans (Linnaeus) (Plate II, Fig. 7; Plate III, Fig. 9; Plate V, Fig. 14; Plate XVI, Fig. 63)

Conops calcitrans Linnaeus, 1758: 604 (descr. - Sweden)

Stomoxys parasita Fabricius, 1781: 467 (descr. NA) (Fabricius 1805: 280). Fabricius 1794: 394 (stated that it was from "America" but specified "America boreali" in 1805)

Stomoxys nebulosa Fabricius, 1805: 282 (descr. - in Americae meridionalis insulis)

Stomoxys sugillatrix Robineau-Desvoidy, 1830: 386 (descr. - Brazil)

Stomoxys dira Robineau-Desvoidy, 1830: 387 (descr. - NA)

Stomoxys inimica Robineau-Desvoidy, 1830: 387 (descr. - NA)

Stomoxys geniculata Macquart, 1846a: 320 (descr. - Brazil)

Stomoxys cybira Walker, 1849: 1159 (descr.- NA)

Musca occidentis Walker, 1852: 332 (descr. - US)

Stomoxys calcitrans Röder, 1885: 347 (coll. rec. - PR)

Gundlach, 1887: 403 (coll. rec. - PR)

Williston, 1896: 336 (coll. rec. - St. Vincent Is.)

Coquillett, 1900: 256 (coll. rec. - Vieques Is., PR)

Aldrich, 1905: 529 (cat. of NA spp.)

Bruce, 1913: 468 (geographical distribution of the spp.)

Wolcott, 1923a: 226 (coll. rec. - PR)

Wolcott, 1923c: 41 (coll. rec. - PR)

Curran, 1928: 91 (coll. rec. - PR)

Root, 1929: 405 (notes of this fly in PR)

Volkenberg, 1932: 25 (notes and economic account in PR)

Volkenberg, 1934: 24 (notes and economic account in PR)

Malloch, 1934: 342 (coll. rec. - Chile)

Volkenberg, 1935: 17 (notes and economic account in PR)

Séguy, 1935a: 40 (taxonomy and biology of spp.)

Wolcott, 1936: 336 (coll. rec. - PR)

Séguy, 1937: 428 (cat., distr. - world, summary of hosts and larval habitats)

Volkenberg, 1939: 4 (rec. - notes in PR)

James, 1947: 133 (coll. rec. - WI, Central America, SA, NA, Europe, Africa, Australia, New Zealand and Asia)

Wolcott, 1948: 493 (coll. rec. - PR)

Tucker, 1952: 351 (coll. rec. - Barbados)

Hennig, 1964: 1039 (cat., distr. - in Palaearctic region)

Huckett, 1965: 914 (cat., distr. - Sweden, Alaska, B.C. to N.S., throughout US, south to Argentina and Chile, cosmopolitan)

Miskimen & Bond, 1970: 70 (coll. rec. - St. Croix, VI)

Pont, 1972: 58 (cat., distr. - Mexico, Guatemala, Nicaragua, Costa Rica, Panamá, Bermuda, Jamaica, Bahamas, Grenada, Barbados, PR, St. Vincent, Haití, Dominica, Trinidad, Venezuela, Guyana, Colombia, Ecuador, Bolivia, Brazil, Uruguay, Chile, Argentina and Galápagos Is., cosmopolitan)

Male length 4.4 to 6.4 mm. Frontal vitta black pollinose, yellow around ocellar triangle; parafrontalia golden pollinose; parafacialia gray pollinose when seen from side or back. Gray to yellowish pollinose abdomen and thorax; dorsum with four brownish pollinose vittae. Legs black, base of tibia yellowish-brown. Wing tinged smoky-brown, calypter light yellowish, border brownish; halter yellow. Abdomen with brownish pollinose spots, at least 3 abdominal segments with a single median spot basally and pair of spots at apex of each segment. Pleura yellow; sternites dark brown to black.

Eye bare, very large, occupying most of head, strongly emarginate; arista bare below, pectinate along its dorsal part. Eight to 10 frontal setae; parafrontalia and interfrontalia with several microsetae; ocellar bristles well-developed; 4 minute interocellar pairs; 1 post-vertical pair; 1 inner and 1 outer vertical pair.

Two to 3 humerals (1 well-developed); 2 notopleurals; 1 post-

humeral; 1 lateral; 3 very small or undistinguishable presuturals; 3-5 postsutural dorsocentrals, only the last pair distinguishable from other dorsal setulae; acrostichals (only prescutellar pair distinguishable). Prealar absent; 1 supra-alar; 2 postalars; 1 intra-alar. Scutellars: 2 discal (basal to subbasal) pairs and 2 apicals.

Prosternum setulose laterally; propleuron setulose at middle, 1 strong seta and numerous hairlike setae at lower edge; 1 stigmatal well-developed, many other setulae present; mesanepisternum setulose with a well-developed row of setae posteriorly and 1 on upper fore margin; anepimeron, mesokatepisternum and mesokatepimeron setulose; 1 well-developed katepisternal; meron setulose below spiracle; katatergite with minute yellowish pilosity.

First wing vein (R_1) bare, only few minute setulae on upper surface, beyond humeral cross vein. Third wing vein (R_{4+5}) setulose on node and beyond on both surfaces; fourth vein (M_{1+2}) distinctly curved forward but not strong, ending slightly behind wing tip. Lower calypter rounded apically, but inner margin reaches almost to end of bare supra-squamal ridge.

Fore femur with rows of posterodorsal, posterior and postero-ventral setae; fore tibia with almost straight rows of very short setae, preapically with short, conspicuous anterodorsal, anterior and anteroventral setae. Fore tarsi in both sexes without outstanding, long, anterior hairlike setae. Mid femur with short, thick anterior and anteroventral setae; 1 long, thin basal ventral seta; several stout and thin apical posteroventral setae; mid tibia with 1 short apical

anterior; 1 anteroventral, 1 long ventral, 1 short posterior and 1 dorsal seta.

Hind femur with row of stout setae running from anterodorsal to dorsal side, row of short setae on ventral side, 1 long seta near apex; hind tibia with a mat of short, thin setae; several short rows of anterior setae thicker and somewhat longer than the ventral, apically with a conspicuous dorsal seta.

Abdominal setae long and thin, especially at apex of segments, sides, and all of segment 5. Abdominal sternites with a lateral row of long, thin setae.

Female length 3.6 to 6.5 mm. Identical to male in color and structure except for wider frontal vitta; frontal triangle with golden pollinosity extending almost to frontal ridge; setae on head somewhat stouter than in male.

Remarks: *Stomoxys calcitrans*, commonly known as the stable fly, the biting house fly and the dog fly, is distinguished from all other common domestic flies by its piercing proboscis which protrudes bayonet-like in front of the head. It is widely distributed throughout the world and may be found wherever man and domestic animals occur.

Bruce & Decker (1958) considered the effects of biting flies to be far-reaching in causing losses in milk production not limited to the period of attack, but sustained and even cumulative in effect upon the vitality of cattle. Bishop (1939) attributed a substantial loss in milk and beef production to this fly.

Todd (1964) made an ecological study of the species in New Zealand,

and found that 15 flies per cow produced enough irritation to cause restlessness and interfere with normal grazing habits, undoubtedly resulting in a serious decline in milk yields.

Parr (1962), in Uganda, studied the life history of the species with emphasis on the number of larval instars and their duration, describing the morphological development of the cephalopharyngeal sclerites.

The anonymous report (1969) of the USDA-ARS indicated that production of milk may be reduced by 10% and a loss of 10 pounds of beef per head in the presence of an infestation of only 10 flies per animal.

From 1969 to 1970, I was able to observe some of the habits of S. calcitrans in a sanitary-entomological survey conducted on 63 dairy farms in Puerto Rico. This fly sucks blood mainly from the legs and underside of the abdomen of cattle. The blood-sucking habit distinguishes the stable fly and the horn fly from house flies which may be found in association. The stable fly abandons its hosts soon after a blood meal, unlike the very common horn fly which remains attached head down, feeding on the upper parts of the animal. For this reason it can be easily overlooked if animals only are examined. In addition, grazing animals in extensive fields or in the hilly central part of Puerto Rico are difficult to examine.

Among the 33 dairy farms surveyed by Maldonado Capriles & Medina Gaud (1971) only two farms were found to be positive for the stable fly when animals only were examined. On the other hand, of 30 other farms

surveyed by examining barbed-wire fences, 23 were found to be positive, a highly significant difference. Fences around the sheds or where animals were resting or grazing were examined. A reinspection of barbed-wire fences of 6 randomly selected farms revealed 6 out of 6 infested with stable flies. From these findings it is evident that examination of barbed-wire fences is a useful means of surveying for the presence of stable flies.

Stable flies were occasionally resting on concrete walls and wooden structures and, as expected, breeding in a mixture of manure and straw. Other flies found resting with stable flies were a banded-winged undetermined species of Euxesta (Otitidae), Cochliomyia macellaria (Calliphoridae), and Musca domestica.

The life cycle of the stable fly is similar to that of the house fly.

Specimens examined:	97 (56m, 41f) from 15 Puerto Rican localities, 1 from Bermuda, 1 from Cuba, 3 from the Dominican Republic, 1 from Grenada and 1 from British Guiana:
Aguadilla	2f, Oct. 1936 and Nov. 1936, J. Labadie
Aguas Buenas	1m, Casa de Cursillos; 1,200 ft., on glass door barrier; Oct. 13, 1964, SMG & LFM; and 1m, 1f, Dec. 16, 1968, Malaise trap
Bayamón	1f, Urb. Sierra Bayamón; on mixed vegetation by sidewalk; June 27, 1965, EM
Castañer	1f, Limaní, AESb; Feb. 7, 1969; and 1m, Feb. 10, 1969, Malaise trap
Cayey	2m, 1f, Carite For.; Dec. 27-30, 1968, Malaise trap; 1m, Henry Barracks; Nov. 19, 1968, Malaise trap; 1m, 2f, Salinas; Rd. 1, K 80; Nov. 27, 1968, Malaise trap

Corozal	1m, AESb; Jan. 19, 1969; and 1f, Jan. 20, 1969, Malaise trap
Guayama	1f, Guavate For., Rd. 179; Nov. 1, 1964, SMG & EM
Gurabo	1f, AESb; Pangola grass; Aug. 21, 1968, SMG; 3m, on Digitaria decumbens; X-15-1968, SMG; and 2f, Nov. 8 & 10, 1968, Malaise trap
Hatillo	1m, Bo. Pueblo; resting on wire fence of cowpens; Nov. 26, 1969; JMC & SMG
Humacao	1f, Santos Rivera Farm cowbarn; Oct. 27, 1969, SMG
Isabela	1m, AESb; Jan. 22, 1969, Malaise trap
Lajas	2m, AESb; on cowpen; Feb. 18, 1965, SMG
Luquillo	1f, Caribbean Nat. For.; El Yunque, Rd. 191, K 59; on vegetation by roadside; Aug. 26, 1968, SMG; and 1m, at El Verde Field Sta.; Dec. 8, 1968, Malaise trap
Ponce	1f, Adjuntas, Rd. 10, K 28.6; on rotten leaves and bananas; Sept. 4, 1968, SMG
Río Piedras	2m, 1f, Acc. No. 18-17; Jan. 17 and 18, 1917; 2m, P.R. Acc. No. 23-17; on weeds; R. T. Cotton; 1m, May 1931, M.D.L.: 1f, at Urb. San Gerardo; on patio of a home near human food; Feb. 1, 1965, EM; 1m, on window; Feb. 20, 1965, EM; 1m, along riverbed of Río Piedras, Apr. 25, 1965, EM; 19m, 15f, at AES; over Bos taurus; May 2, 1965, SMG & EM; 1f, June 27, 1965, EM; and 1m, 1f, Oct. 15, 1968
Yabucoa	3m, 1f; at sugarcane mill; among mixed vegetation of Panicum barbinode, Digitaria sanguinalis, Paspalum millegrana and Axonopus compressus; May 14, 1965, SMG
BERMUDA, WI	5m, 2f; St. Georges; Jan. 28, 1934
CUBA, WI	1m, 1f; Havana, Baker, J. M. Aldrich Collection

DOMINICAN REPUBLIC, WI	1m, La Vega, La Vega Prov.; Aug. 10, 1967; J. C. Schaffner; 1m, in Monte Cristi Prov.; May 9, 1967; and 1f, San Cristóbal Prov.; XII-14, 1967
GRENADA, WI	1f, Gran Etang, July 1962, JMC; and 1m, from Fontenoy; July 1962, JMC
BRITISH GUIANA, SA	1m, Ogle; on vegetation by ditch in sugar-cane field; May 31, 1965, SMG & LFM

ILLUSTRATIONS

Plates

PLATE I

Figure 1. Calythea minuta New Species (Paratype) female: head, frontal view showing main chaetotaxy

(AFR = Anterior Frontal Orbital Setae; IfSe = Interfrontal Setae; ISe = Interocular Setae; IV = Inner Vertical Setae; OC = Ocellar Setae; OV = Outer Vertical Setae; OVi = Oral Vibrissae; PFR = Posterior Orbital Setae; PO = Postocellar Setae)

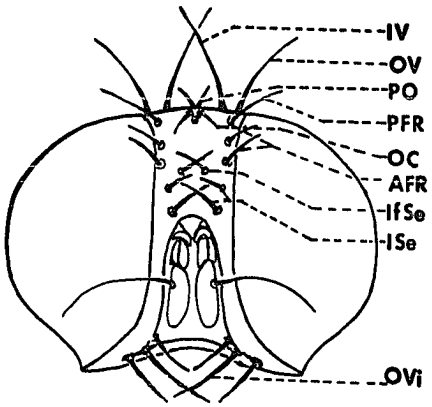
Figure 2. Calythea minuta New Species (Paratype) male: head, frontal view

Figure 3. Scenetes cardini Malloch, male: head, posterior view showing main sutures and parts

(Cs = Coronal Suture; Oc = Occiput; OF = Occipital Foramen; OS = Occipital Suture; PEO = Posterior Eye Orbit; PG = Postgena; PO = Paraocciput; POS = Postoccipital Suture; PTP = Posterior Tentorial Pit)

Figure 4. Limnophora laffooni New Species (Holotype) male: head, frontal view

Figure 5. Limnophora laffooni New Species (Allotype) female: head, frontal view



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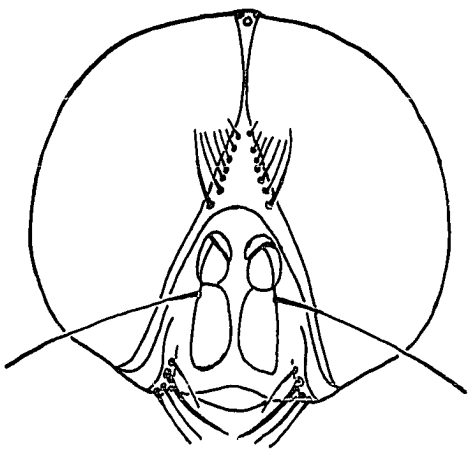

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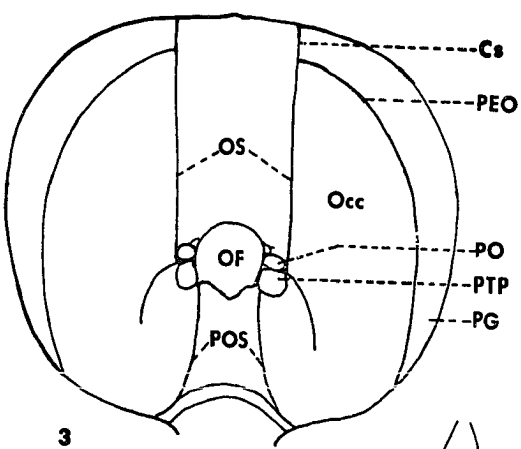

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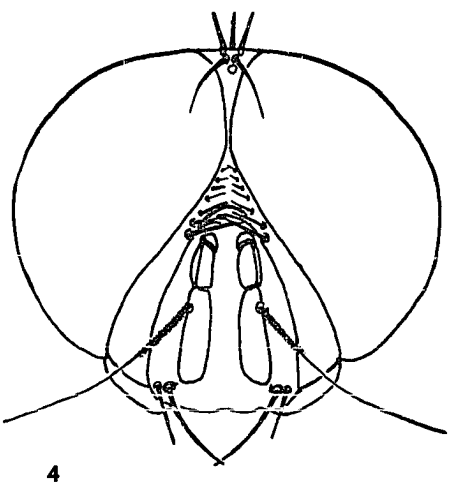

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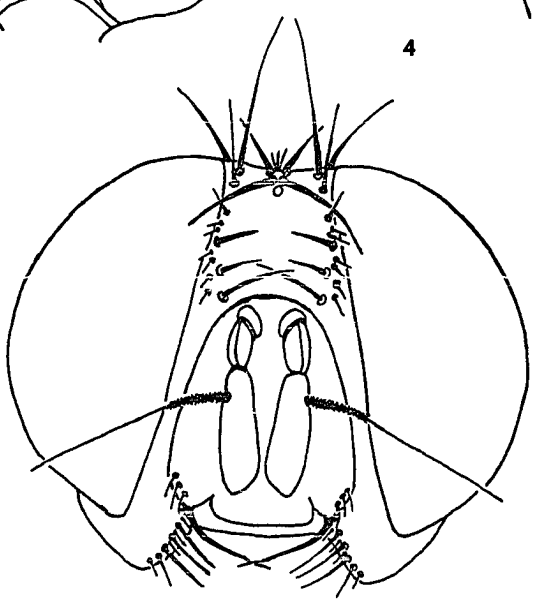

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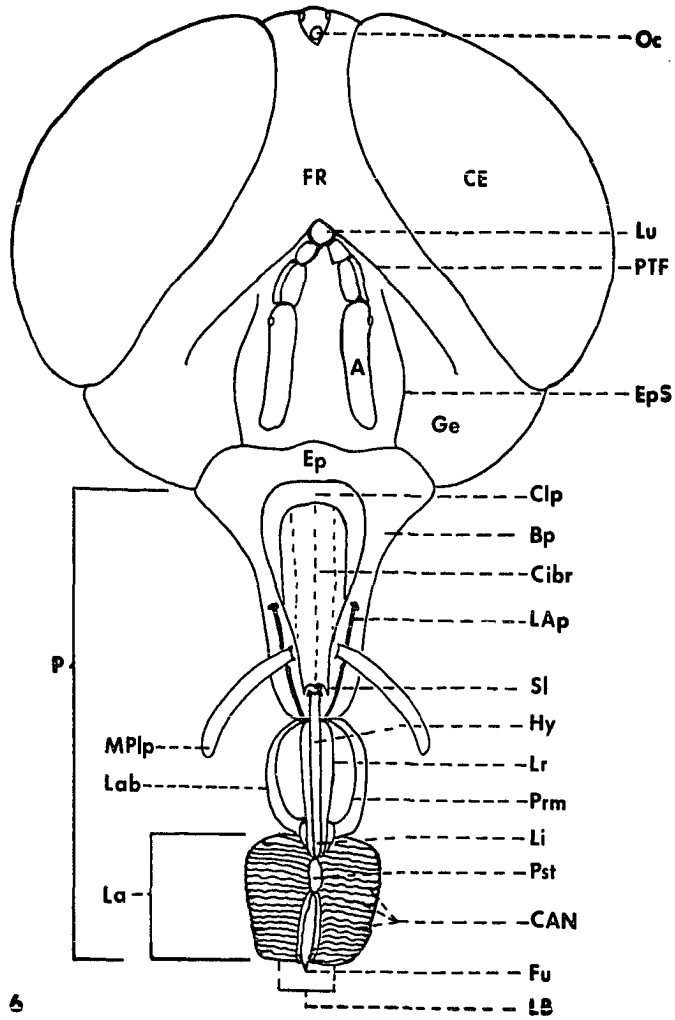
PLATE II

Figure 6. Musca domestica Linneaus, male: head, frontal view showing main pertinent parts (setae and other details omitted). Example of a sucking mouth type

(A = Antenna; Bp = Basiproboscis; CAN = Canaliculi; CE = Compound Eye; Cibr = Cibarium; Clp = Clypeus; Ep = Epistoma; EpS = Epistomal Suture; FR = Frons; Fu = Furca; Ge = Gena; Hy = Hypopharynx; La = Labellum; LB = Labella; Lab = Labium; LAp = Labial Apodeme; Li = Ligula; Lr = Labrum; Lu = Frontal Lunule; MPlp = Maxillary Palpus; Oc = Ocellus; P = Proboscis; Prm = Prementum; Pst = Prestomum; PTF = Ptilinal Suture; SI = Food Meatus Siphon)

Figure 7. Stomoxys calcitrans (Linnaeus), male: head, frontal view. Example of a piercing mouth type (Note: the prementum drawn out into a long, rigid shaft)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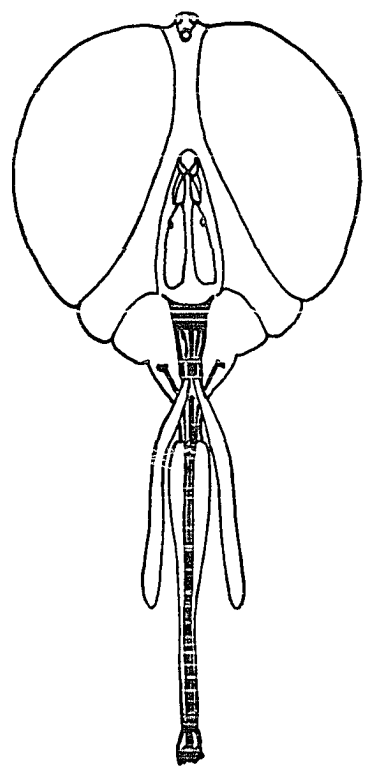

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PLATE III

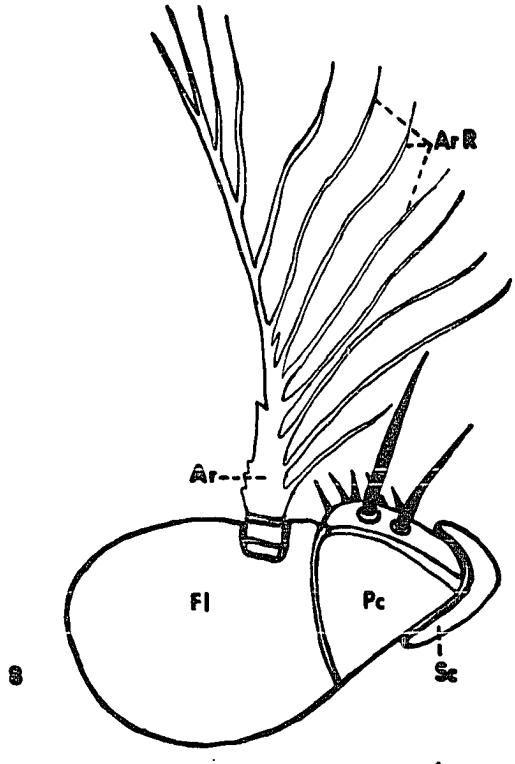
Figure 8. Haematobia irritans (Linnaeus), antenna showing pertinent parts

(Ar = Arista; ArR = Aristal Rays; Fl = Flagellum; Pc = Pedicel and Sc = Scape)

Figure 9. Stomoxys calcitrans (Linnaeus), antenna

Figure 10. Ophyra aenescens (Wiedemann), antenna

Figure 11. Synthesiomyia nudiseta Brauer & Bergenstamm, antenna



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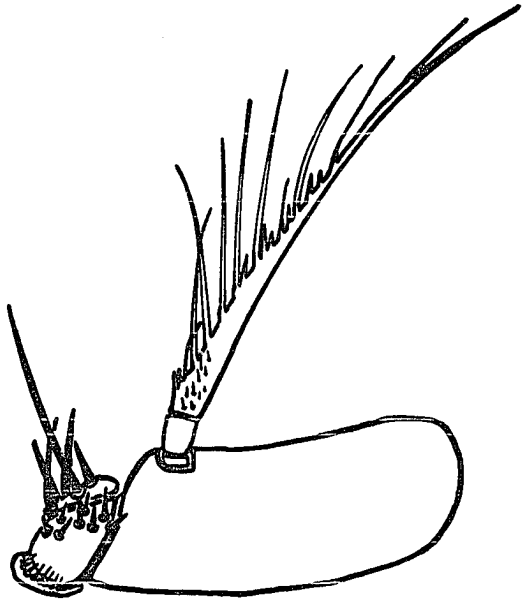

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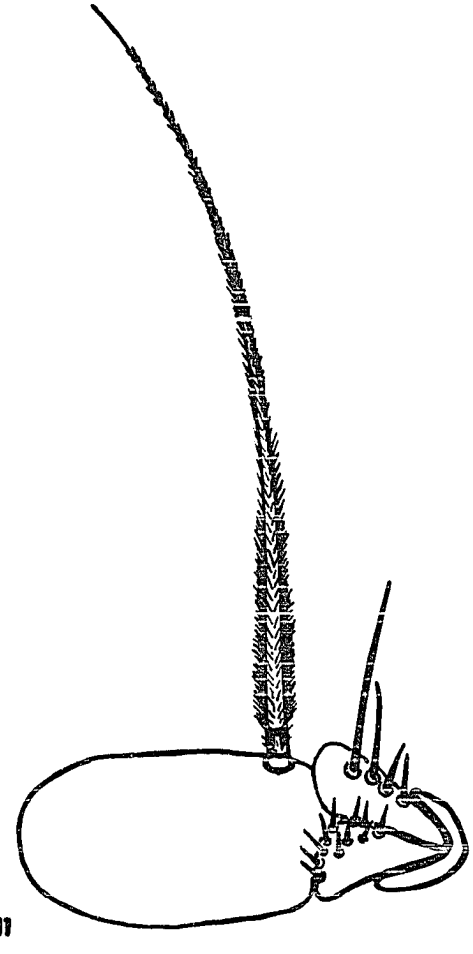

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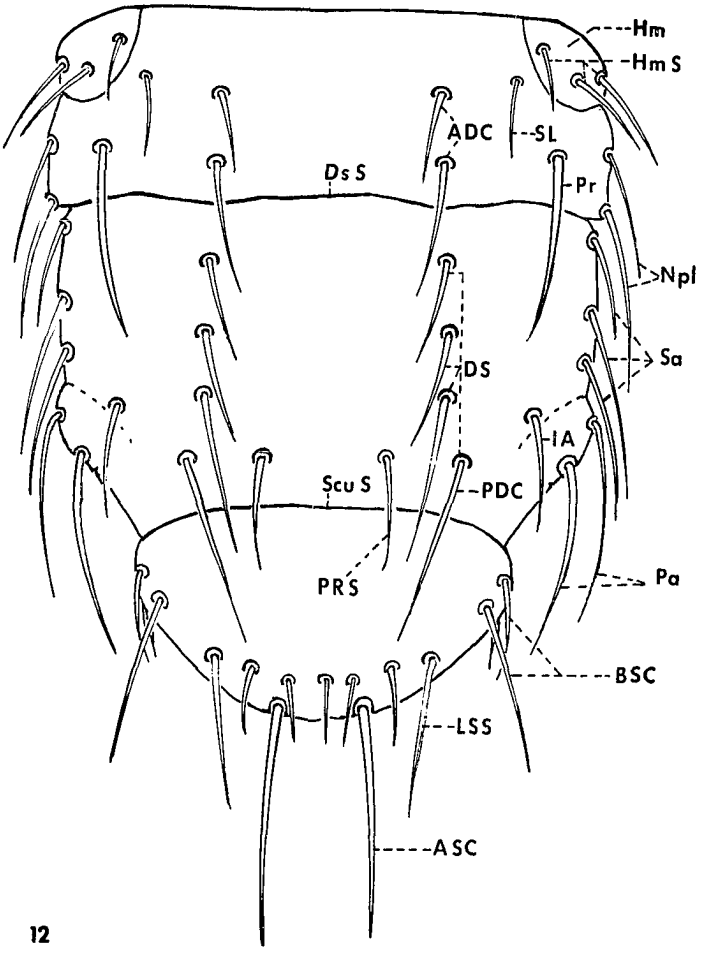
PLATE IV

Figure 12. Neomusca pici (Macquart), thorax: dorsal view showing chaetotaxy (minor setae omitted)

(ADC = Predorsocentral Setae; ASC = Apical Scutellars; BSC = Basal Scutellar Setae; DS = Dorsocentral Setae; DsS = Dorsocentral Suture; Hm = Humerus; HmS = Humeral Setae; IA = Interalar Setae; LSS = Lateral Scutellar Setae; Npl = Notopleural Setae; Pa = Postalar Setae; PDC = Postdorsocentral Setae; Pr = Presutural Setae; PRS = Prescutellar Setae; Sa = Supraalar Setae; ScuS = Scutoscutellar Suture; SL = Sublateral Seta)

Figure 13. Neomusca pici (Macquart), thorax: side view showing pertinent parts

(A = Basalarite; AES = Mesanepisternum; AEM = Mesanepimeron; AEMS = Anepimerals; B = Basalarite B; C = Basalarite C; C-I = Forecoxa; C-II = Midcoxa; C-III = Hindcoxa; D = Mesopleural Wing Process; Hl = Halter; HlCa = Halter Capitellum; HlPe = Halter Pedicel; HlSl = Halter Scabellum; Hm = Humerals; HmC = Humeral Callus; KES = Mesokatepisternum; M = Meron; MdT = Mediotergite; Mem = Metameron; MenS = Mesepisternal Suture; Mep = Metepimeron; Met = Metepisternum; MS = Mesopleural Suture; MSp = Mesothoracic Spiracle; MStL = Lower Mesokatepisternals; MStU = Katepisternals; MtSp = Metathoracic Spiracle; MtSt = Metapleural Suture; NP = Notopleuron; NPs = Notopleurals; PlS = Propleural Setae, Pp = Propleuron; PWP = Pleural Wing Process; SsRS = Suprasquamal Ridge Setae; Stm = Scutellum; T = Tegula)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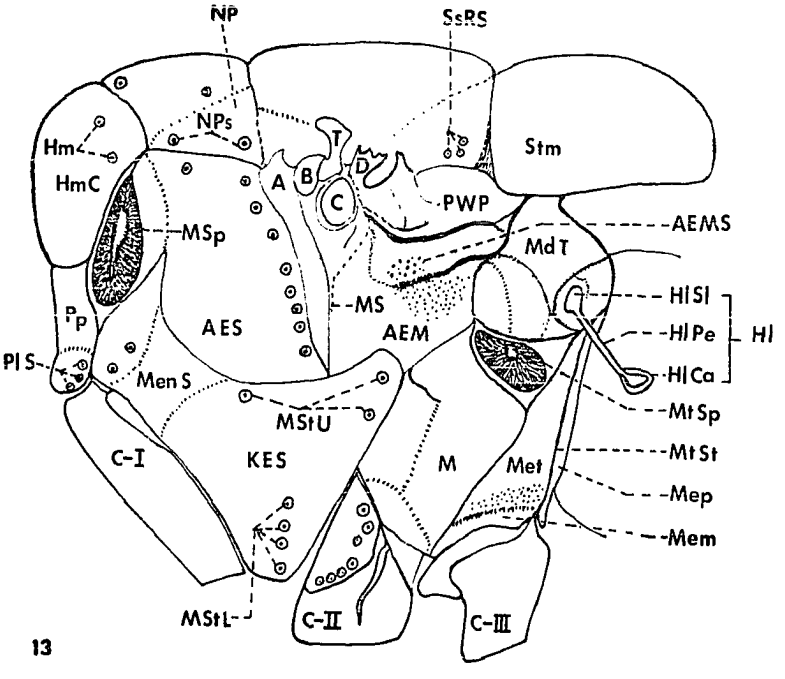
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PLATE V

Figure 14. Stomoxys calcitrans (Linnaeus), wing: showing venation (C = Costal Vein; Sc = Subcostal Vein; R_1 = Radial Vein (Vein 1); R_{2+3} = Radial $Vein_2$ + Radial $Vein_3$ (Vein 2); R_{4+5} = Radial $Vein_4$ + Radial $Vein_5$ (Vein 3); M_{1+2} = Median $Vein_1$ + Median $Vein_2$ (Vein 4); M_3+Cu_1 = Median $Vein_3$ + Cubital $Vein_1$ (Vein 5); Cu_2+A_1 = Cubital $Vein_2$ + Anal $Vein_1$ (Vein 6); A_2 = Anal $Vein_2$ (Vein 7); h = humeral cross vein; r-m = radiomedial cross vein; m-cu = mediocubital cross vein; LC = Lower Calypter; UC = Upper Calypter)

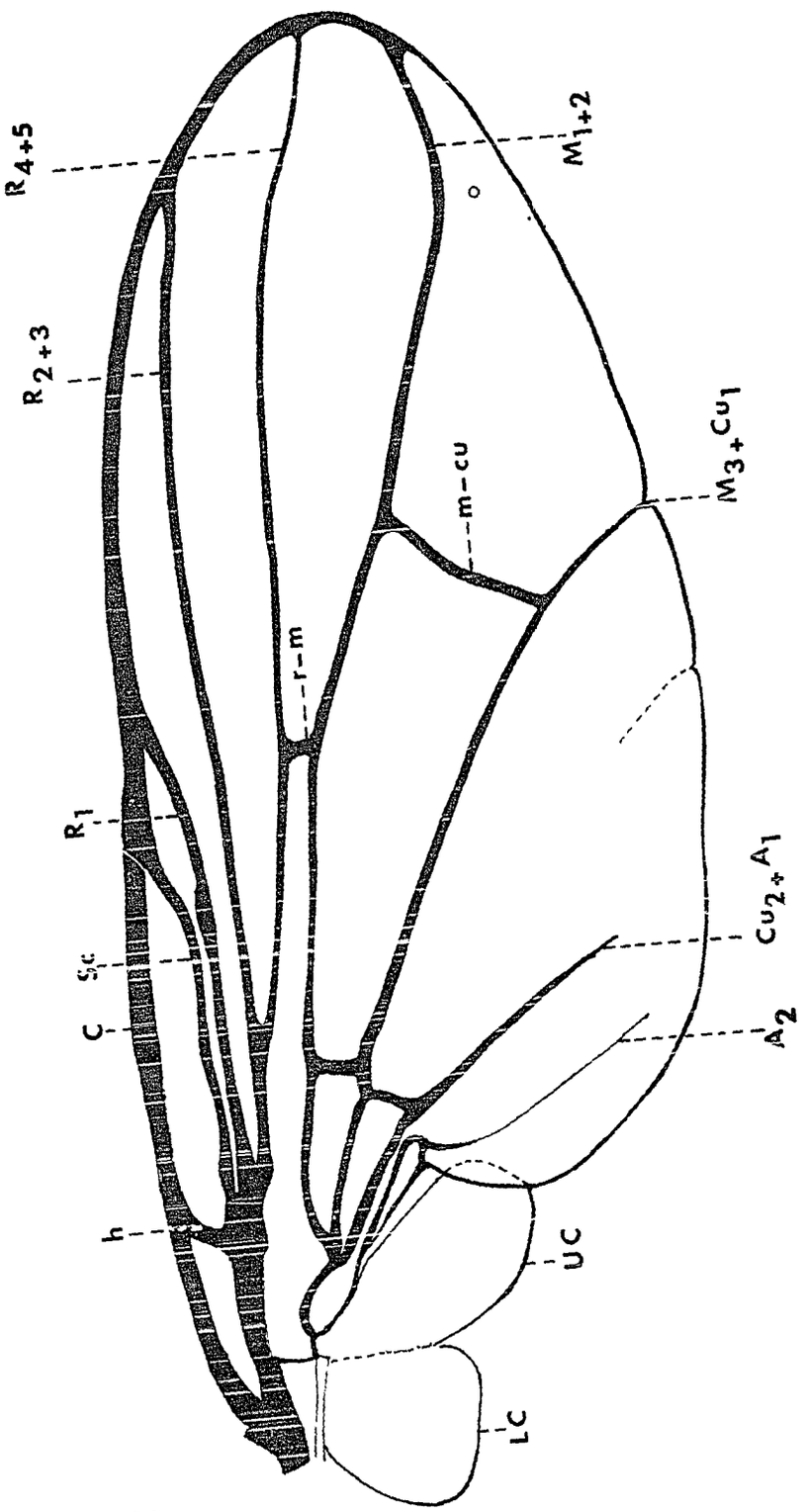

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PLATE VI

Figure 15. Diagram of a cross section through the leg to show application of terminology used in description of the sides and setae of the legs

(Ant = Anterior; Ant D = Anterodorsal; Ant V = Anteroventral; D = Dorsal; Post D = Posterodorsal; Post = Posterior; Post V = Posteroventral; V = Ventral)

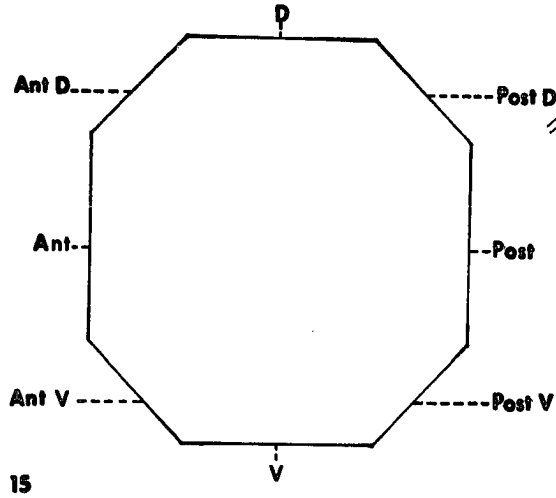
Figure 16. Calythea minuta New Speices (Paratype) male: hind leg (minor setae omitted)

Figure 17. Limnophora laffooni New Species (Holotype) male: hind leg showing pertinent parts and some important setae (minor setae omitted)

(ADS = Apical Dorsal; A Ant DS = Apical Anterodorsal Setae; C-III = Hind Coxa; Em = Empodium; Fe-III = Hind Femur; M Ant Ds = Mid-anterodorsal Setae; M Ant Vs = Mid-anteroventral Setae; Pv = Pulvillus; Ta-III = Hind Tarsus; Ti-III = Hind Tibia; Tr-III = Hind Trochanter; U = Unguis

Figure 18. Musca domestica Linnaeus, antenna

Figure 19. Cyrtoneurina rescita (Walker), antenna



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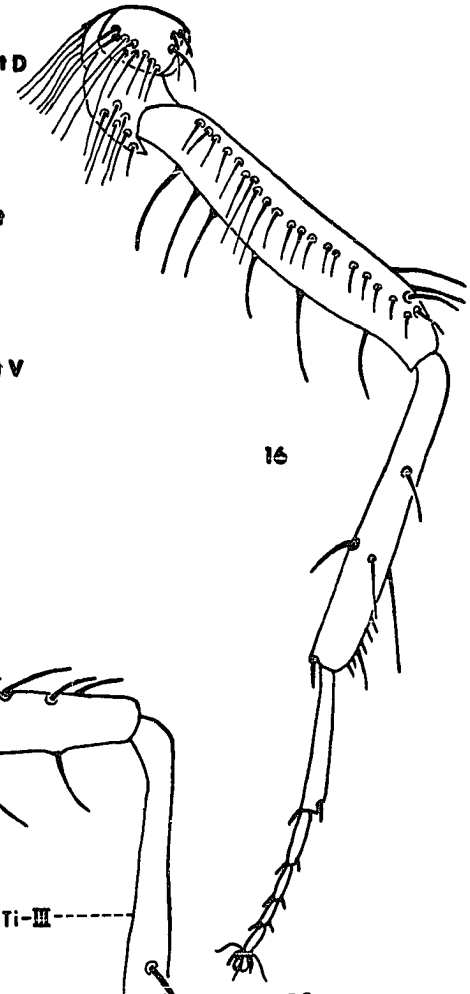

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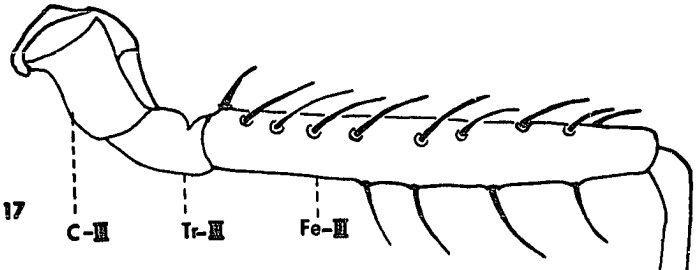

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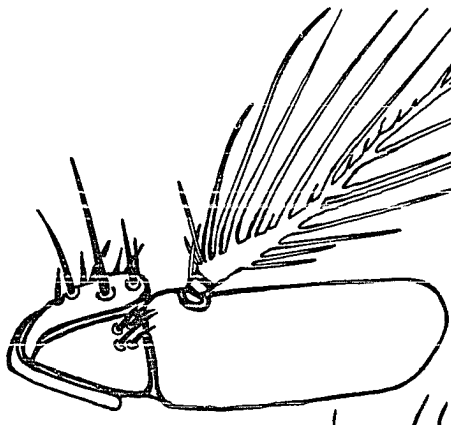

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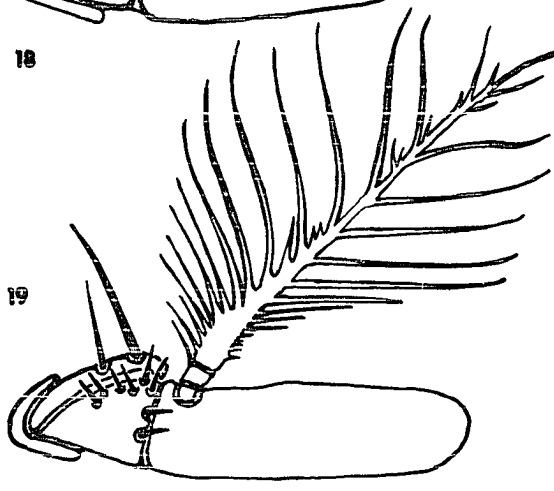

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Ti-III
M Ant DS
M Ant VS
ADS
A Ant VS
Ta-III$_1$
Ta-III$_2$
Ta-III$_3$
Ta-III$_4$
Ta-III$_5$
U
Pv
Em

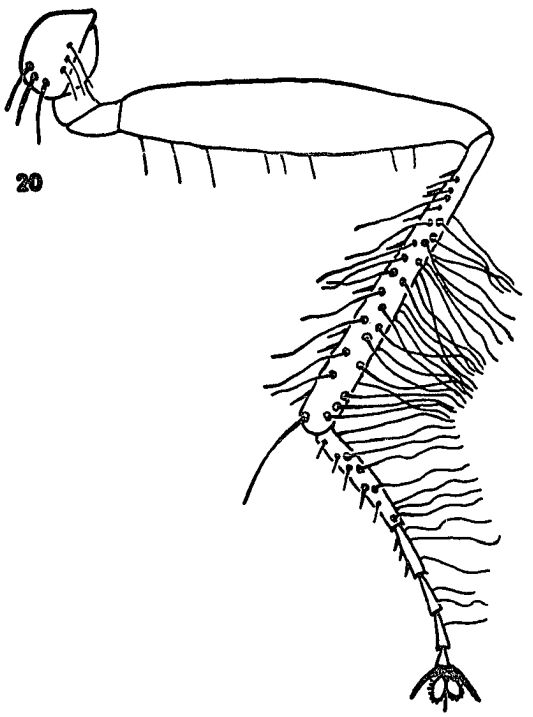
PLATE VII

Figure 20. Neodexiopsis wolcotti New Species (Holotype) male: hind leg (minor setae omitted)

Figure 21. Neodexiopsis wolcotti New Species (Allotype) female: hind leg (minor setae omitted)

Figure 22. Neodexiopsis drewryi New Species (Holotype) female: hind leg (minor setae omitted)

Figure 23. Neodexiopsis puertoricensis New Species (Holotype) male: hind leg (minor setae omitted)



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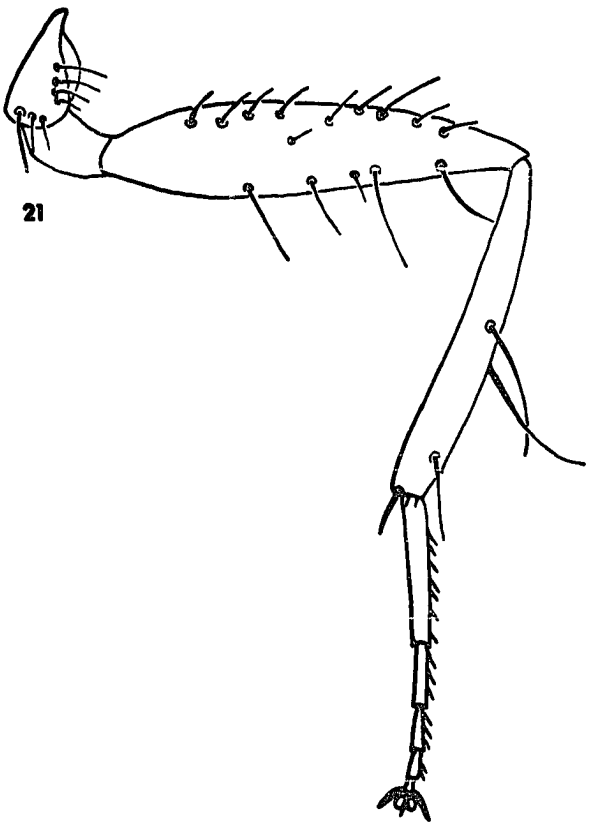

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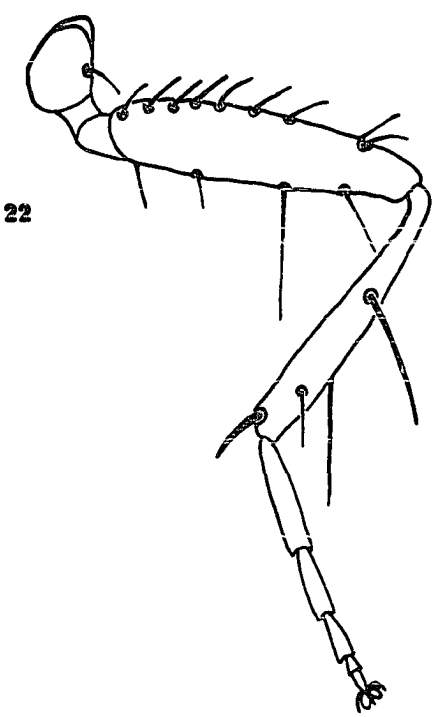

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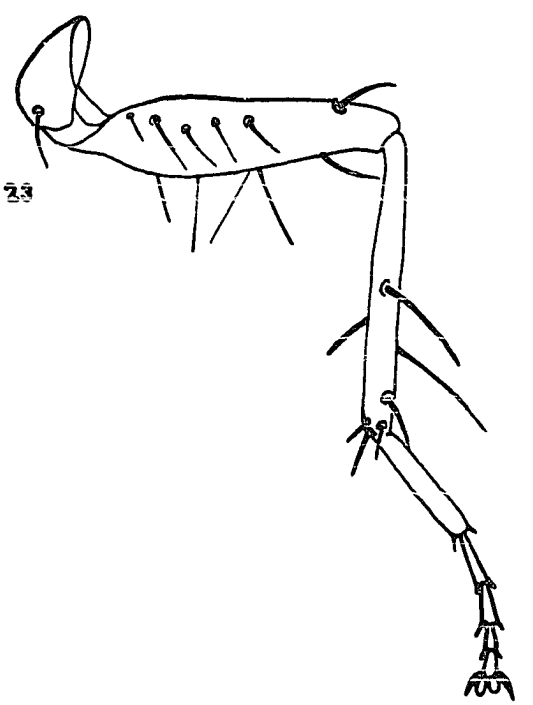

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PLATE VIII

Figure 24. Helina yunquensis New Species (Paratype) male: head, frontal view (minor setae and arista omitted)

Figure 25. Helina borinquensis New Species (Holotype) male: hind leg (minor setae omitted)

Figure 26. Helina yunquensis New Species (Holotype) male: hind leg (minor setae omitted)

Figure 27. Neodexiopsis drewryi New Species (Holotype) female: head, frontal view (minor setae and arista omitted)

Figure 28. Helina borinquensis New Species (Paratype) female: head, frontal view (minor setae and arista omitted)

Figure 29. Helina borinquensis New Species (Paratype) male: head, frontal view (minor setae and arista omitted)

Figure 30. Helina yunquensis New Species (Paratype) female: head, frontal view (minor setae and arista omitted)

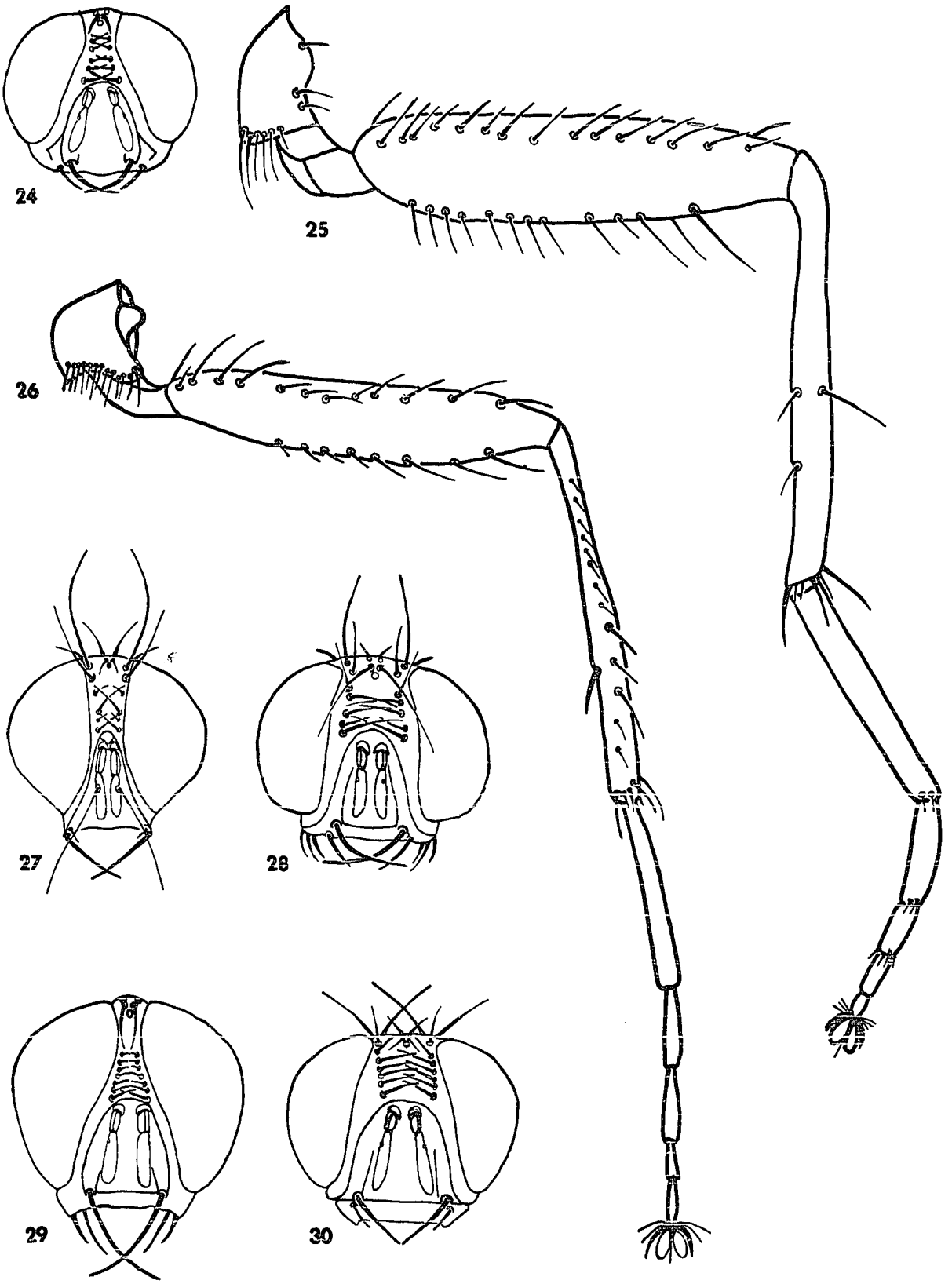
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PLATE IX

Figure 31. Calythea minuta New Species (Paratype) female: genitalia, dorsal view

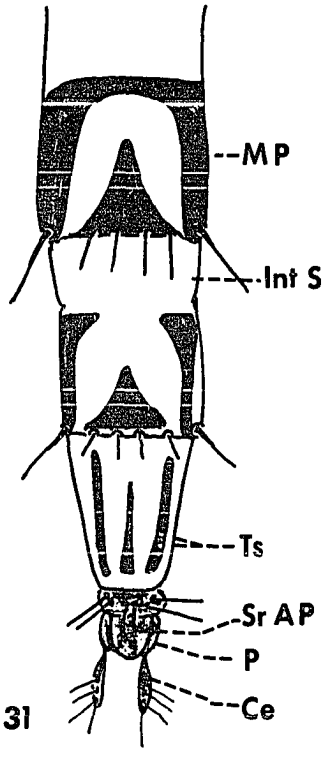
(Ce = Cercus; Int S = Intersegment; MP = Marginal Plate; P = Petiole; SrAP = Supra-anal Plate; Ts =Tergites)

Figure 32. Calythea minuta New Species (Paratype) female: genitalia, ventral view

(Ce = Cerci; SbAP = Subanal Plate; St = Sternites)

Figure 33. Limnophora laffooni New Species (Paratype) female: genitalia, dorsal view

Figure 34. Limnophora laffooni New Species (Paratype) female: genitalia, ventral view



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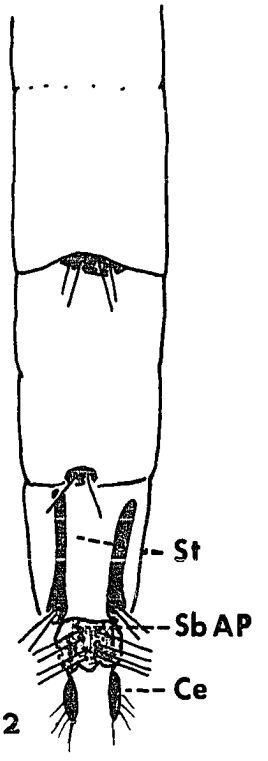

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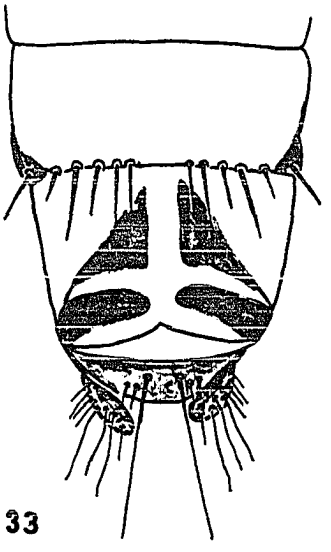

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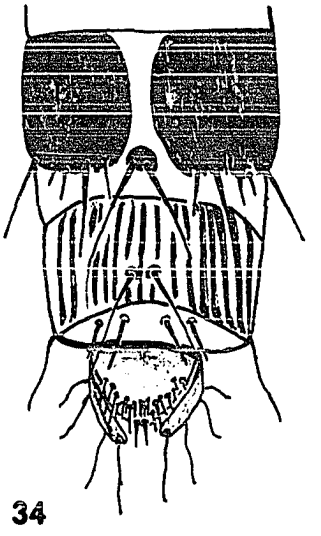

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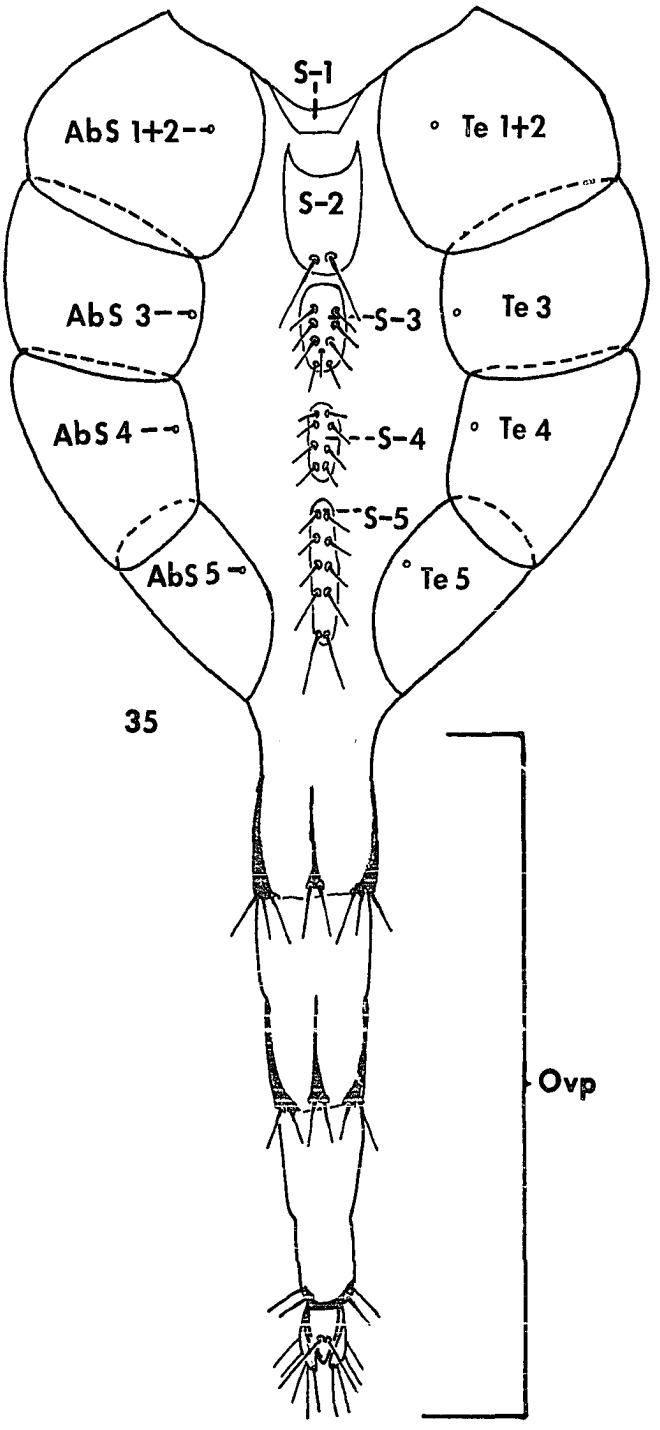
PLATE X

Figure 35. Neodexiopsis drewryi New Species (Paratype) female: abdomen, ventral view

(AbS 1-5 = Abdominal Spiracles 1-5; Ovp = Ovipositor; S-1-5 = Sterna 1-5; Te 1-5 = Terga 1-5)

Figure 36. Neodexiopsis drewryi New Species (Paratype) female: genitalia, dorsal view


S-1
AbS 1+2
Te 1+2
S-2
AbS 3
S-3
Te 3
AbS 4
S-4
Te 4
S-5
AbS 5
Te 5
35
Ovp

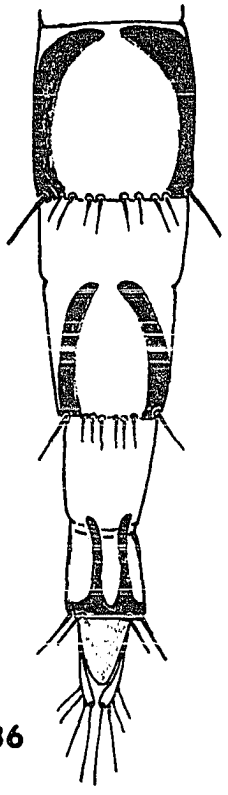

36

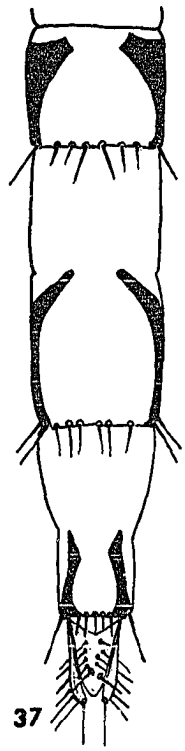
PLATE XI

Figure 37. Neodexiopsis wolcotti New Species (Paratype) female: genitalia, dorsal view

Figure 38. Neodexiopsis wolcotti New Species (Paratype) female: genitalia, ventral view

Figure 39. Neodexiopsis puertoricensis New Species (Paratype) female: genitalia, dorsal view

Figure 40. Neodexiopsis puertoricensis New Species (Paratype) female: genitalia, ventral view



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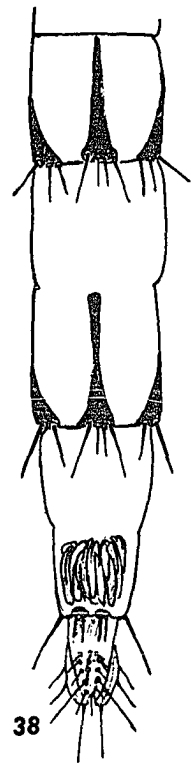

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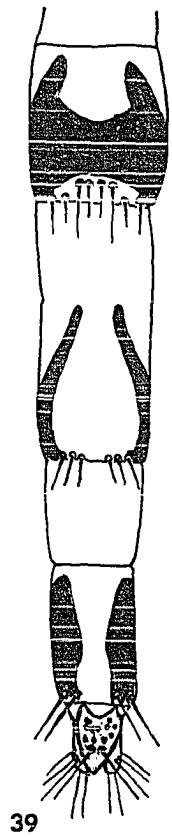

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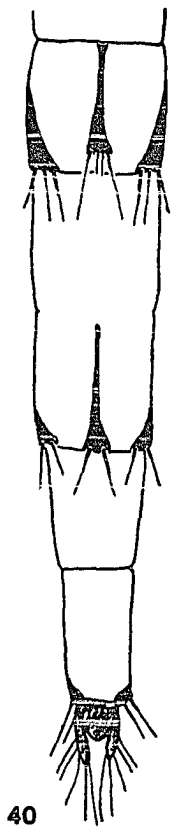

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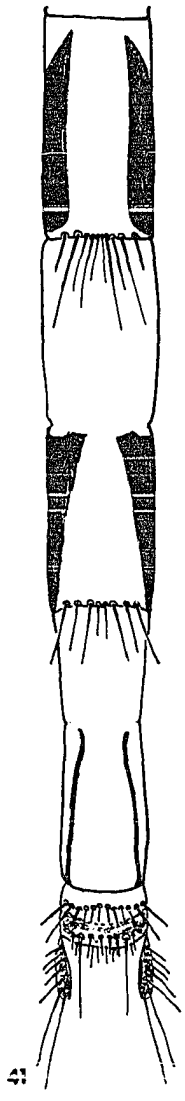
PLATE XII

Figure 41. Helina borinquensis New Species (Paratype) female: genitalia, dorsal view

Figure 42. Helina borinquensis New Species (Paratype) female: genitalia, ventral view

Figure 43. Helina yunquensis New Species (Paratype) female: genitalia, dorsal view

Figure 44. Helina yunquensis New Species (Paratype) female: genitalia, ventral view



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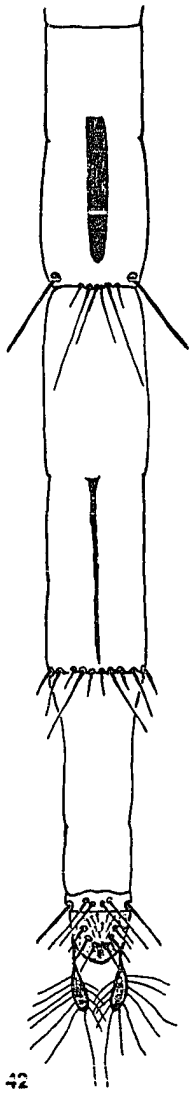

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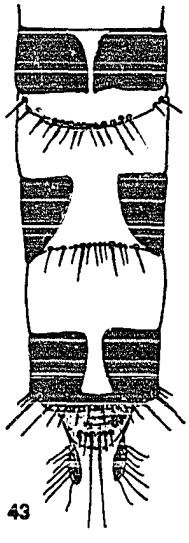

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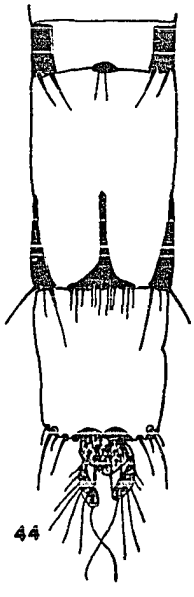

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PLATE XIII

Figure 45. Calythea minuta New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

Figure 46. Calythea minuta New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (Epandrium)

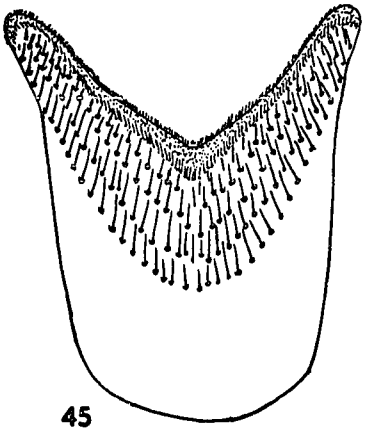
(Ce = Cercus; GS = Telomeres; Te-IX = Ninth Tergum (Epandrium)

Figure 47. Calythea minuta New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages

Figure 48. Limnophora laffooni New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

Figure 49. Limnophora laffooni New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (Epandrium)

Figure 50. Limnophora laffooni New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages



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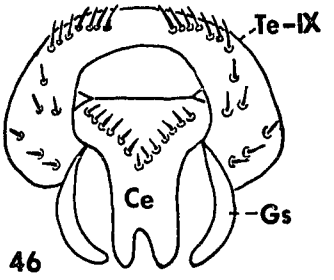

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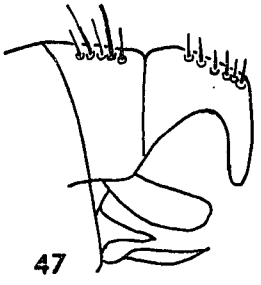

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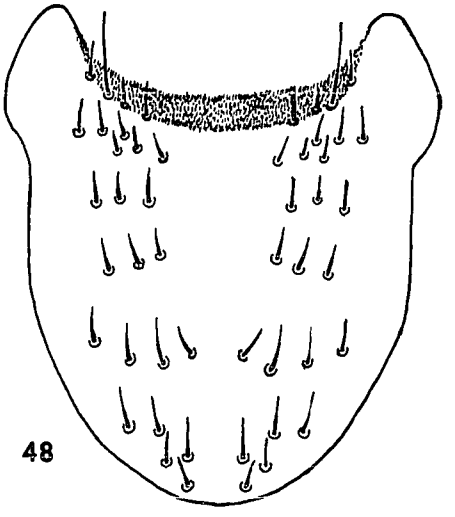

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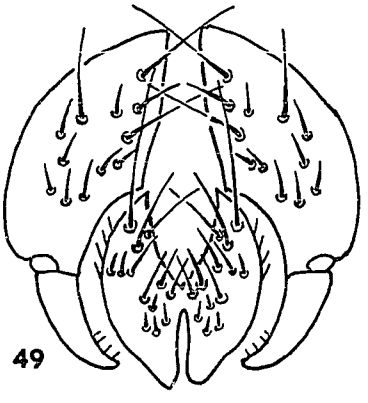

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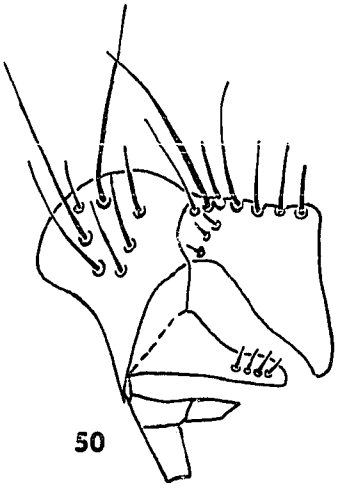

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PLATE XIV

Figure 51. Neodexiopsis puertoricensis New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

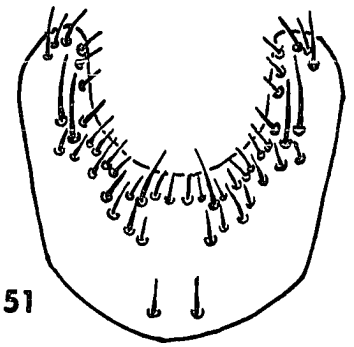
Figure 52. Neodexiopsis puertoricensis New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (epandrium)

Figure 53. Neodexiopsis puertoricensis New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages

Figure 54. Neodexiopsis wolcotti New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

Figure 55. Neodexiopsis wolcotti New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (epandrium)

Figure 56. Neodexiopsis wolcotti New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages



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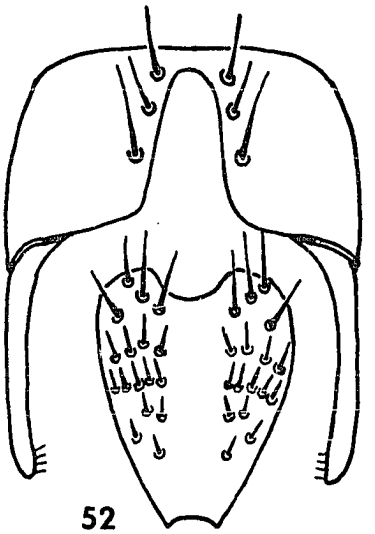

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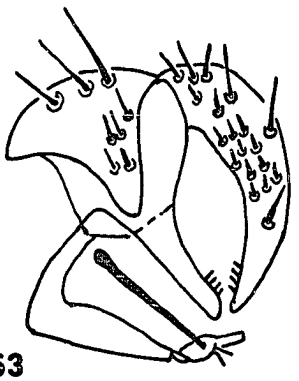

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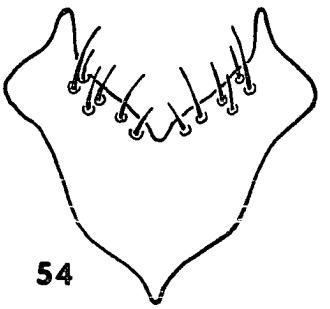

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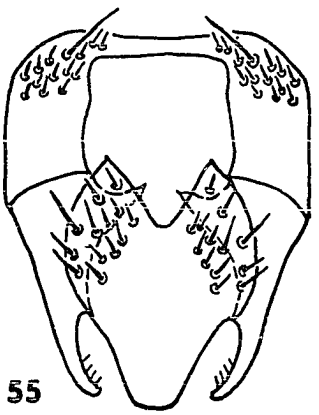

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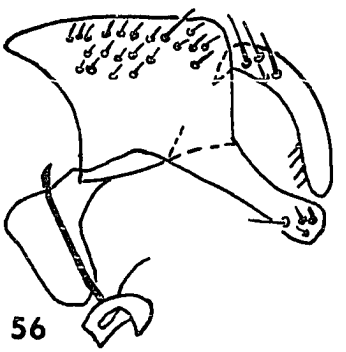

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PLATE XV

Figure 57. Helina borinquensis New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

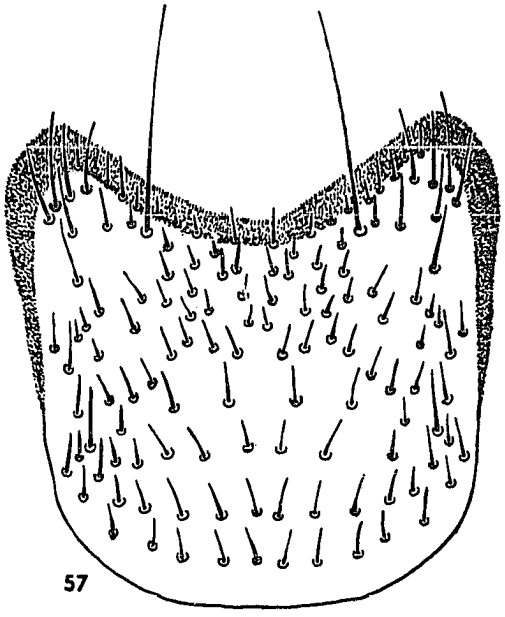
Figure 58. Helina borinquensis New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (epandrium)

Figure 59. Helina borinquensis New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages

Figure 60. Helina yunquensis New Species (Paratype) male: genitalia; ventral aspect of fifth sternum

Figure 61. Helina yunquensis New Species (Paratype) male: genitalia; caudal aspect of cercus, telomeres and ninth tergum (epandrium)

Figure 62. Helina yunquensis New Species (Paratype) male: genitalia; lateral aspect of male copulatory appendages



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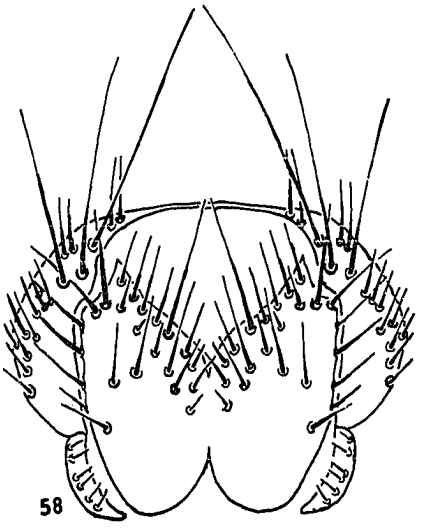

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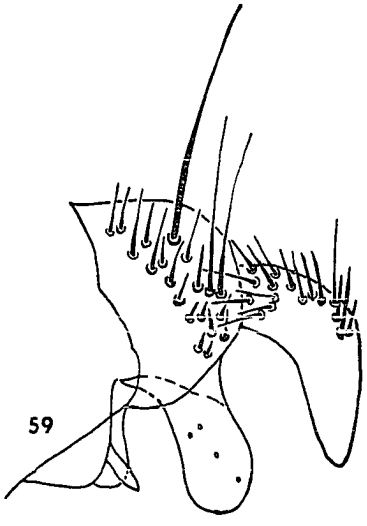

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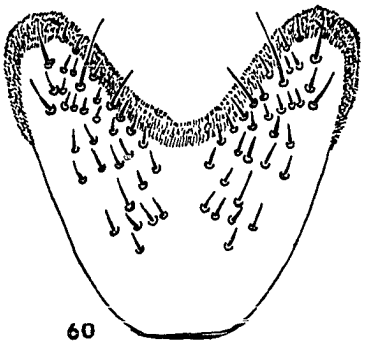

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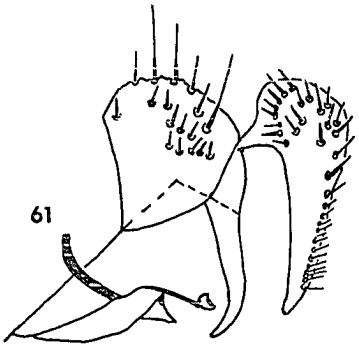

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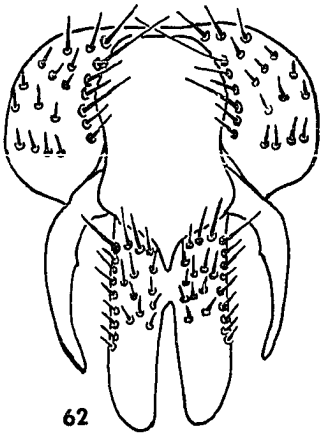

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PLATE XVI

Muscidae Wings

Figure 63. *Stomoxys calcitrans* (Linnaeus)

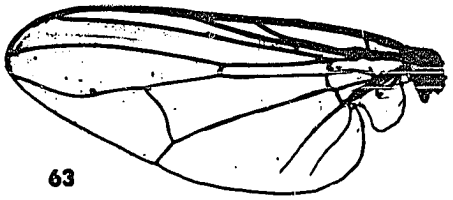
Figure 64. *Musca domestica* Linnaeus

Figure 65. *Lispe* sp.

Figure 66. *Bithoracochaeta varicornis* (Coquillett)

Figure 67. *Haematobia irritans* (Linnaeus)

Figure 68. *Scenetes cardini* Malloch



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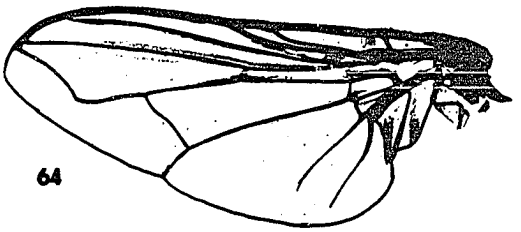

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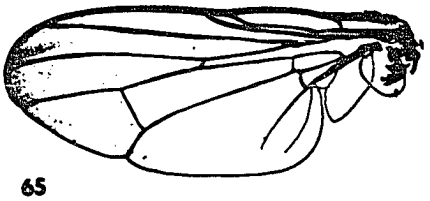

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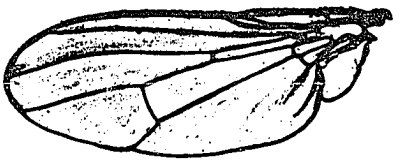

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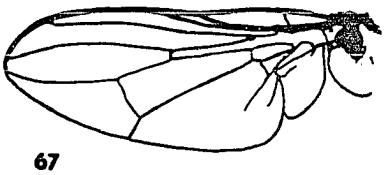

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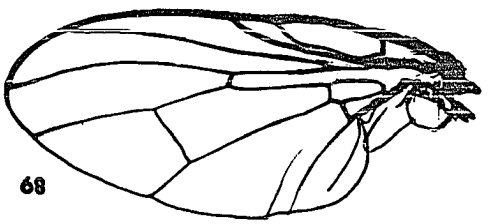

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PLATE XVII

Muscidae Wings

Figure 69. *Myospila obsoleta* (Brauer & Bergenstamm)

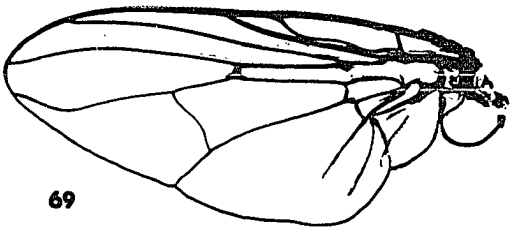
Figure 70. *Gymnodia debilis* (Williston)

Figure 71. *Fannia pusio* (Wiedemann)

Figure 72. *Calythea minuta* New Species (Paratype)

Figure 73. *Graphomya stipata* (Walker)

Figure 74. *Limnophora* sp.



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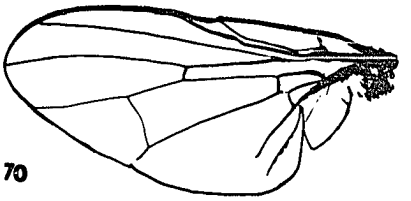

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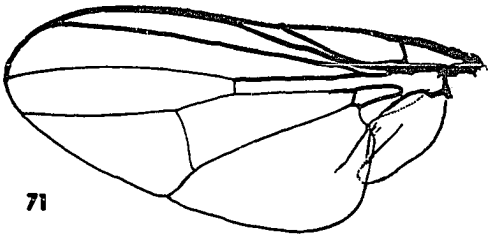

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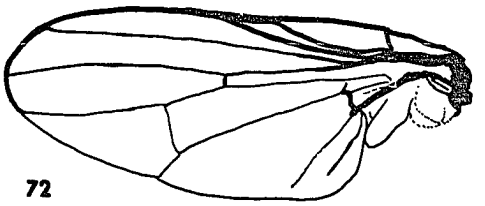

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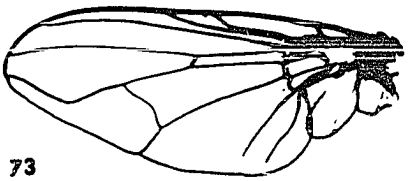

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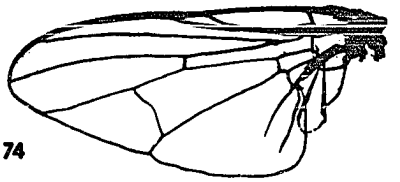

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PLATE XVIII

Muscidae Wings

Figure 75. Morellia maculipennis (Macquart)

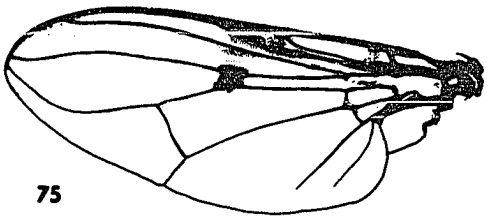
Figure 76. Hylemya (Craspedochaeta) confusa Albuquerque

Figure 77. Cyrtoneurina rescita (Walker)

Figure 78. Scatophaga stercoraria (Linnaeus)

Figure 79. Neomuscina farri Dodge

Figure 80. Ophyra aenescens (Wiedemann)



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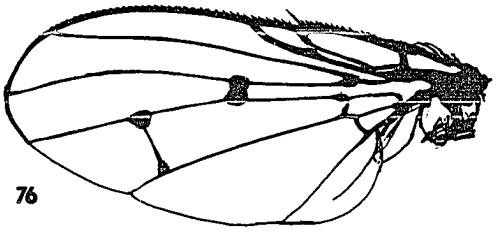

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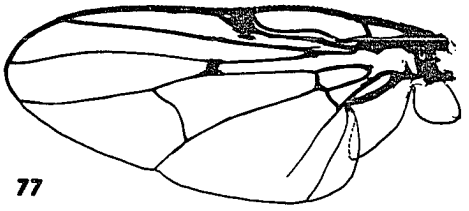

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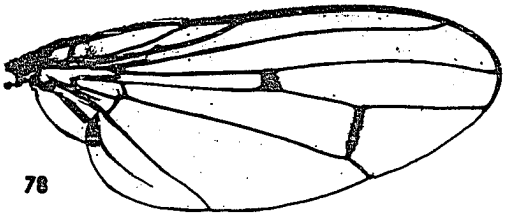

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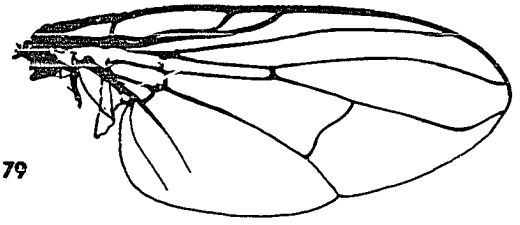

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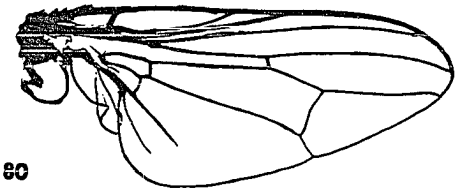

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PLATE XIX

Muscidae Wings

Figure 81. Synthesiomyia nudiseta Brauer & Bergenstamm

Figure 82. Helina borinquensis New Species (Paratype)

Figure 83. Morellia basalis (Walker)

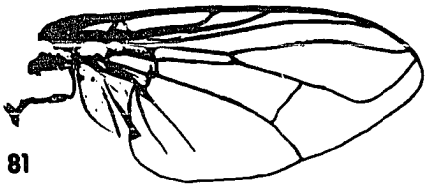
Figure 84. Neodexiopsis cavalata Snyder

Figure 85. Helina yunquensis New Species (Paratype)

Figure 86. Spilogona sp.

Figure 87. Atherigona (Acritochaeta) orientalis Schiner

Figure 88. Neodexiopsis rex Curran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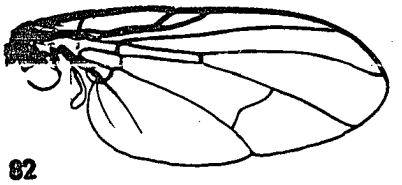
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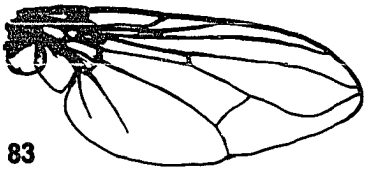
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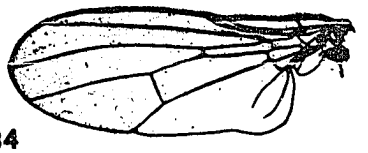
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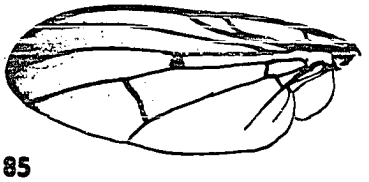
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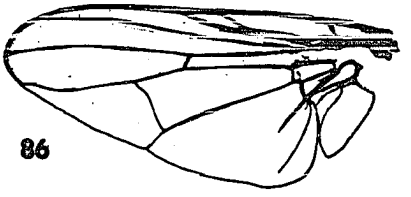
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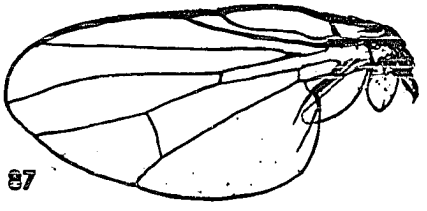
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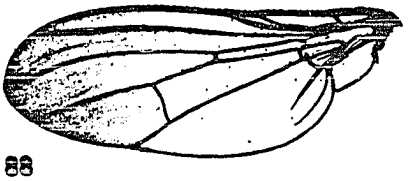
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Tables

Table 1. Distributional list of West Indian Islands Muscidae

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahama Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
SCATOPHAGINAE:																		
Scatophaga stercoraria							x			x		x						
FUCELLINAE:																		
Fucellia tergina				x								x						
ANTHOMYIINAE:																		
Calythea crenata												x			x			
Calythea micropteryx																		x
Calythea minuta												x	x					
Calythea nigricans											x							
Hylemya (*Craspedochaeta*) *confusa*												x						
Delia platura				x														

[a]Based mainly on Pont (1972, 1974) publications, literature and author records locus cited.

[b]Some of the original records of the Bahamas are under Nassau (capital of Bahamas).

[c]No specific mention to any island in particular, could be in any of the US or British, VI.

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahamas Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
COENOSIINAE																		
Atherigona orientalis			x	x	x		x					x	x		x			x
Bithoracochaeta leucoprocta					x						x	x						
Bithoracochaeta varicornis												x						
Cordiluroides insularis																x		
Neodexiopsis cavalata												x						
Neodexiopsis crassicrurus												x						
Neodexiopsis crispiseta												x						
Neodexiopsis discolorisexus												x						
Neodexiopsis ditiportus												x						
Neodexiopsis drewryi												x						
Neodexiopsis ebenifemur												x						
Neodexiopsis flavipes											x	x			x	x		
Neodexiopsis maldonadoi												x						
Neodexiopsis medinai												x						
Neodexiopsis micans												x						

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahamas Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Neodexiopsis neoflavipes												x						
Neodexiopsis ovata		x																
Neodexiopsis peninsula		x																
Neodexiopsis priscipagus												x						
Neodexiopsis puertoricensis												x						
Neodexiopsis rex												x						
Neodexiopsis rufitibia											x							
Neodexiopsis tenuicornis											x							
Neodexiopsis wolcotti												x						
Tetramerinx cordyluroides		x		x														
Tetramerinx rufitibia		x																
LISPINAE:																		
Lispe albitarsis		x		x														
Lispe bahama		x																
Lispe nasoni		x										x			x			x
Lispe rufitibialis												x						
Lispe serotina												x						

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahama Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Lispe tentaculata											x							
Lispe uliginosa																x		
LIMNOPHORINAE:																		
Gymnodia arcuata												x						
Gymnodia debilis						x	x				x	x				x		
Gymnodia scatophaga										x								
Limnophora corvina												x						
Limnophora cubana					x													
Limnophora exul					x						x					x		
Limnophora laffooni												x						
Limnophora narona		x		x								x						
Limnophora pica											x							
Spilogona sp.												x						
MYDAEINAE:																		
Helina borinquensis												x						
Helina discreta											x							
Helina yunquensis												x						

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahama Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Myospila obsoleta					x		x			x	x	x						
FANNIINAE:																		
Euryomma sp.												x						
Fannia benjamini					x													
Fannia dodgei					x													
Fannia exilis																x		
Fannia femoralis					x		x			x		x						x
Fannia intensica											x							
Fannia polychaeta				x														
Fannia pusio		x			x				x			x				x	x	
Fannia trimaculata							x			x	x	x	x		x			
PHAONIINAE:																		
Cyrtoneurina armipes																	x	
Cyrtoneurina beebei																	x	
Cyrtoneurina gemina								x									x	
Cyrtoneurina praenubila								x									x	
Cyrtoneurina rescita					x							x				x	x	

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahamas Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Cyrtoneurina scutellata											x							
Cyrtoneurina uber								x										
Cyrtoneurina veniseta																	x	
Cyrtoneurina wulpi																	x	
Ophyra aenescens				x							x	x				x	x	
Ophyra chalcogaster				x														
Scenetes cardini					x							x	x		x			
MUSCINAE:																		
Graphomya cubana					x													
Graphomya maculata												x						
Graphomya stipata					x					x		x	x					
Morellia basalis					x	x	x		x	x	x	x	x		x			x
Morellia bipuncta																	x	
Morellia flavicornis											x							
Morellia maculipennis					x	x	x	x	x	x	x	x					x	
Morellia ochricornis					x							x						
Musca domestica	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahamas Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Neomusca aitkeni																	x	
Neomusca angustifrons																	x	
Neomusca deceptiva																	x	
Neomusca downsi																	x	
Neomusca falsifica																	x	
Neomusca glaucinis																	x	
Neomusca niger																	x	
Neomusca obscura												x						
Neomusca pici					x		x				x	x					x	
Neomusca querula																	x	
Neomusca sanguinis																	x	
Neomusca spermophila											x							
Neomusca trinitensis																	x	
Neomusca capalta																	x	
Neomuscina (*Spilopteromyia*) *farri*											x	x			x			

Table 1 (Continued)

Muscidae (sensu lato) Subfamilies, Genera, and Species[a]	Antigua	Bahamas Is.[b]	Barbados	Bermuda	Cuba	Dominica	Dominican Republic (St. Domingo)	Grenada	Guadeloupe	Haiti	Jamaica	Puerto Rico	St. Croix	St. Lucia	St. Thomas	St. Vincent	Trinidad	Virgin Islands[c]
Neomuscina instabilis																	x	
Neomuscina nigricosta																	x	
Neomuscina rufoscutella					x													
Neomuscina similata																	x	
Neomuscina tripunctata												x						
Synthesiomyia nudiseta				x	x		x				x	x	x				x	x
STOMOXYIINAE:																		
Haematobia irritans							x			x	x	x	x					x
Neivamyia flavicornis																	x	
Stomoxys calcitrans	x	x	x	x	x	x	x	x	x	x	x	x				x	x	

Table 2. Malaise trap Muscidae collection

Muscidae (sensu lato) Subfamilies, Genera and Species	Aguas Buenas	Aguirre	Arecibo	Cambalache For.	Carite For.	Castañer	Cayey	Corozal	Fortuna	Gurabo	Isabela	Lajas	Luquillo	Carib. Nat. For.	Mayagüez	Río Piedras	Salinas	TOTAL
ANTHOMYIINAE:																		
Hylemya (*Craspedochaeta*) *confusa*							4											4
COENOSIINAE:																		
Atherigona orientalis		2			2			14	13	4	18						4	57
Bithoracochaeta varicornis						15		2	1	2								20
Neodexiopsis cavalata													18					18
Neodexiopsis discolorisexus													43					43
Neodexiopsis ditiportus													12					12
Neodexiopsis drewryi													5					5
Neodexiopsis maldonadoi													4					4
Neodexiopsis micans													30					30
Neodexiopsis neoflavipes													36					36
Neodexiopsis puertoricensis													5					5
Neodexiopsis rex													30					30
Neodexiopsis wolcotti													10					10

Table 2 (Continued)

Muscidae (sensu lato) Subfamilies, Genera and Species	Aguas Buenas	Aguirre	Arecibo Cambalache For.	Carite For.	Castañer	Cayey	Corozal	Fortuna	Gurabo	Isabela	Lajas	Luquillo Carib. Nat. For.	Mayagüez	Río Piedras	Salinas	TOTAL
LISPINAE:																
Lispe nasoni					11			2		1					1	15
Lispe serotina					1			5		1						7
LIMNOPHORINAE:																
Limnophora laffooni												15				15
MYDAEINAE:																
Helina borinquensis	1			4	11	9	5		3	1		1		1	8	44
Helina yunquensis				2	5	1						24	1	2		35
Myospila obsoleta					1	2						6			1	10
FANNIINAE:																
Euryomma sp.												1				1
Fannia pusio				1		1	2			2				4		10
PHAONIINAE:																
Cyrtoneurina rescita	17	18	2	5	9		81	8	197	34	11			14	21	417
Scenetes cardini	6			2	18	8	67		4			3	3	10	2	123

Table 2 (Continued)

Muscidae (sensu lato) Subfamilies, Genera and Species	Aguas Buenas	Aguirre	Arecibo	Cambalache For.	Carite For.	Castañer	Cayey	Corozal	Fortuna	Gurabo	Isabela	Lajas	Luquillo Carib. Nat. For.	Mayagüez	Río Piedras	Salinas	TOTAL
MUSCINAE:																	
Graphomya stipata													12				12
Morellia basalis	29	1			1	46	23	94	1	11	41	2	3	3	5	89	349
Morellia maculipennis						8							2				10
Musca domestica								1		1					33	1	36
Neomuscina (*S.*) *farri*	5	6		4	28	5	17	21	9	2	4	1	2	2	1	58	165
Synthesiomyia nudiseta	1				7	4	5	10		5	2				5		39
STOMOXYIINAE:																	
Stomoxys calcitrans	2				3	2	1	2		2	1		1		2	3	19
TOTAL																	1581

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