# *Arquivos de Zoologia*

ARQ. ZOOL., S. PAULO, 29(1):1-109. 20.I.1977


## A SYSTEMATIC REVISION OF THE MESEMBRINELLIDAE, STAT. NOV. (DIPTERA, CYCLORRHAPHA)


J. H. GUIMARÃES


CONTENTS




Museu de Zoologia, Universidade de São Paulo

ABSTRACT

*A revised classification of the family Mesembrinellidae, stat. nov., is presented, and its affinities discussed. This group is withdrawn from the family Calliphoridae and raised to full family status in the Calyptratae. Three subfamilies, two tribes, and seven genera are recognized; keys to these taxa are provided.*

*The aedeagus, spermatheca, and the labial sclerite of the first instar larva are figured for nearly all species.*

*Two new genera*: Thompsoniella (*type-species,* anomala, *sp. n.*) *and* Souzalopesiella (*type-species,* Mesembrinella facialis *Aldrich*) *are described.*

*The zoogeography and phylogeny of this group indicate a long isolation. The distribution patterns and phylogenetic relationships of the Neotropical genera are also analyzed, suggesting a Gondwanian origin for the Mesembrinellidae.*

*The study of the internal anatomy of the female reproductive system showed that this group possesses a peculiar adenotrophic viviparity, presenting modification in the structure of the spermathecae, unknown in any other Calyptratae group. A comparison of the female genital tract of the Mesembrinellidae with that of* Glossina *and* Melophagus ovinus *discloses that it is fundamentally the same, and essentially that of the other higher Muscoidea.*

*The evolutionary trends within the Mesembrinellidae are discussed and critical morphological details discussed and illustrated.*

## 1. INTRODUCTION

The present revision is part of a Doctoral Thesis presented in June 1973 to the Instituto de Biociências da Universidade de São Paulo, in partial fulfillment for the obtention of the degree of Doctor in Biological Sciences.

Shannon (1923), Hall (1948) and James (1970) placed this group as a subfamily of Calliphoridae. Townsend (1935) treated the complex as a tribe of his family Rhiniidae. The Mesembrinellidae are certainly an anomalous group, and have been much neglected by specialists on higher Diptera. Apart from the scattered contributions of Townsend, only the revisions of Aldrich (1922), Hall (1948), and a recent review of the South American species by Mello (1969), have been available for identification purposes. Unfortunately, Mello did not study the types of the species he discussed, and therefore his work is much hampered by misidentifications. To unravel past confusion it has been necessary to go here into a full redescription of all species, of which several hitherto known only from a few brief lines in works of nineteenth-century authors.

As a result of the examination of types, only 26 of the nominal species previously described are accepted as valid, which added up to the 4 new ones described here make up a total of 30 species of Mesembrinellidae. The group is exclusively Neotropical; flies of this family are only found in the tropical rain forest areas.

A special study has been made of the internal anatomy of the female reproductive system, that showed that this group possesses a

peculiar adenotrophic viviparity not recorded in other Calyptratae flies. The cephalopharyngeal sclerites of the first instar larvae and the male genitalia proved to be of considerable taxonomic value.

## 2. MATERIALS AND METHODS

This revision is mainly based upon the extensive collections of Mesembrinellidae housed in the Museu de Zoologia da Universidade de São Paulo (MZUSP) and specimens assembled from the following museums (abbreviations given are those used throughout the text in the lists of material examined): American Museum of Natural History, New York (AMNH); British Museum (Natural History), London (BM); California Academy of Sciences, San Francisco (CAS); Hope Department of Entomology, Oxford University (OU); Muséum National d'Histoire Naturelle, Paris (MNHN); Naturhistorisches Museum, Vienna (NM); and United States National Museum, Washington, D.C. (USNM).

Primary types of 17 nominal species have been examined. For the remaining species type examination was not essential because either the species had been recently and very well described, or it was not possible to borrow the types (e.g., Fabricius' type of *Dexia aeneiventris*). Some of the types are apparently lost and a few other have not been located, but may still exist.

Flies were collected in baited traps; general collecting with hand nets is often rather unproductive. Two types of traps have been particularly effective: the Shannon trap (Shannon, 1939) and the blowfly trap described by Bishopp (Hall, 1948: 28). Flies spared for anatomical studies were preserved in 80% ethanol. The genitalia were cleared in hot 10% potassium hydroxide solution for about 3 minutes. After this procedure they were treated with glacial acetic acid, distilled water, and absolute ethanol and finally placed in a small drop of glycerol in a depression slide for microscopic study. The genitalia were stored in microvials attached to the insect pin as described by Gurney *et al.* (1964).

For studies of internal reproductive systems, flies were immobilized with ether and injected with picroformalin until their abdomens expanded slightly. Injected flies were stored in picroformalin for at least 48 hours before dissection. Eventually it was discovered that if injected flies were simmered in the fixative for 3 minutes they could be dissected without any further delay.

Dissections were performed in distilled water, after specimens were washed several times in 70% alcohol. Upon reaching a preliminary stage of dissection, specimens were washed in 70% alcohol for 1 minute. The excess alcohol was drained and a drop of aceto-carmine applied directly to the specimens. Staining time varied from 2-5 minutes for different specimens, depending upon the duration of storage in picroformalin.

For the preservation of dissected specimens, a mixture of one part glycerol and one part distilled water was found to be superior to different dilutions of ethanol.

## 3. ACKNOWLEDGMENTS

My sincere appreciation is first due to my graduate sponsor at the University of São Paulo, Prof. Claudio G. Froehlich.

I am also grateful to my colleagues Drs. Nelson Papavero and L. R. Guimarães, who gave freely of their time to discuss various taxonomic and evolutionary aspects of this problem with me. Their interest and stimulating ideas influenced the course of this work.

In addition, I am much indebted to Prof. Dr. Willi Hennig (Staatliches Museum für Naturkunde in Stuttgart) and Dr. C. W. Sabrosky (National Museum of Natural History, Washington, D.C.), for their criticism of several problems related with this revision.

I am very especially indebted to colleagues of several museums which kindly loaned materials: Drs. Paul H. Arnaud, Jr. (CAS), R. Gagné (USNM), E. Taylor (OU), C. Hogue (LACM), L. Matile (MNHN), A. C. Pont (BM), and P. Wygodzinsky (AMNH).

This reasearch was partially supported by a fellowship from the "Conselho Nacional de Desenvolvimento Científico e Tecnológico".

## 4. HISTORICAL REVIEW

Robineau-Desvoidy (1830: 452) proposed the group "Muscidae Testaceae" for the genera *Bengalia, Phumosia, Ormia,* and *Palpostoma.*

Macquart (1835) placed these genera as subgenera of *Ochromyia,* later on (1843: 276) he regarded *Bengalia* as a distinct genus.

Brauer & Bergenstamm (1893: 179) listed *Ochromyia* and *Bengalia* together, in their final synopsis of the subsection *Musca,* omitted *Ormia* and *Palpostoma,* and added two new genera, *Zonochroa* and *Auchmeromyia.*

Returning to the study of this group, Brauer (1895: 594) added two Neotropical genera to this complex: *Mesembrinella* Giglio-Tos and *Hemilucilia* Brauer.

Surcouf (1919), in his modernized version of Robineau-Desvoidy's "Muscidae Testaceae", lumped together 20 genera, 2 subgenera, and 29 species, belonging to at least three distinct Calyptratae families. Surcouf's work was criticized by Villeneuve (1920: 225), as the genera grouped were not sufficiently related to each other. This author proposed then a rearrangement of the Calliphoridae *s. l.,* and placed the "Testaceae" in his Xanthocalliphoridae, but did not include *Bengalia* and *Phumosia,* the foundation of Robineau-Desvoidy's group.

At this point of this review we will have to consider the American representatives of Surcouf's group, *Ochromyia* and *Mesembrinella*. The type-species of *Ochromyia* Macquart is *Musca jejuna* Fabricius, from Australia, by original designation; that of *Mesembrinella* Giglio-Tos, *Musca quadrilineata* Fabricius, a Neotropical species.

The first attempt to study American representatives of the *Mesembrinella*-complex was that of Aldrich (1922), who, still maintaining the "Muscidae Testaceae" as a taxonomic concept, was the first author to consider the American representatives of Surcouf's *Ochromyia* in the genus *Mesembrinella*.

The history of the suprageneric classification of the family Mesembrinellidae is in large part also the history of the classification of the muscoid flies.

Shannon (1923) was apparently the first author to give a suprageneric status to this group, recognizing the Mesembrinellinae as a subfamily of the Calliphoridae. Townsend (1935), in his "Manual of Myiology", proposed a rearrangement of the world fauna of muscoid flies, recognizing the family Rhiniidae for the combination of Mesembrinellini, Rhiniini, Bengaliini, and Poleniini. Townsend's arrangement was not accepted by subsequent authors.

Hall (1948) recognized two groups in the Calyptratae — Anthomyaria and Oestromuscaria; the latter were further divided into three superfamilies: Oestroidea, Muscoidea, and Sarcophagoidea. Two families were assigned to the Sarcophagoidea: Sarcophagidae and Calliphoridae. The Calliphoridae were further subdivided into five subfamilies, the Mesembrinellinae being included among the five.

Roback (1951) recognized three superfamilies in the Calyptratae: Muscoidea, Sarcophagoidea, and Oestroidea. The Faniinae were considered to be a distinct family of Muscoidea and the Scopeumatinae were lumped with the Anthomyinae in the Anthomyiidae. The Stomoxydinae were recognized as a distinct subfamily. In the Sarcophagoidea two families were included: Calliphoridae and Sarcophagidae. The Mesembrinellinae were maintained as a subfamily of Calliphoridae.

The Mesembrinellidae have been recently recognized as a subfamily of Calliphoridae by Mello (1967) and James (1970; in the arrangement of the Calliphoridae for the "Catalogue of the Diptera of the Americas South of the United States").

Crosskey (1965), in his study of the Ameniinae (Calliphoridae), discussing the affinities of this anomalous group, comments: "Family limits within the Tachinoidea (this superfamily here used includes the Tachinidae, Rhinophoridae, Sarcophagidae including Miltogrammatinae, and Calliphoridae) are in need of revision but an improved classification would probably result if the peculiar groups such as Mesembrinellinae were treated as families. This curious group (which, despite the presence of hypopleural setae may not be Tachinoidea at all) appears to be a

Neotropical analogue of the Australian Ameniinae, also having a non-telescoped female postabdomen and depositing a matura larva (Hall, 1948)".

## 5. STATUS AND RELATIONSHIPS OF THE MESEMBRINELLIDAE

Owing to the vastness of the numbers of closely resembling species, no entirely satisfactory set of characters appear to exist for defining suprageneric taxa among the Calyptratae. The classification of this group originated many disputes for several decades. Most of the systems proposed so far have been mainly founded upon characters of venation, antennae, chaetotaxy, etc., together with the genitalia. Larval characters have not been used to any great extent, exception being made to Townsend (1934-1942), Hall (1948) and Roback (1951). Recently, Hori (1967), as a result of the comparative anatomy of the internal organs of adult flies, presented data that clarify some relationships among the different groups of Calyptratae.

The Calliphoridae are the family to which the Mesembrinellidae have been most frequently associated; very often, as in the writings of Hall, Roback, and James, the Mesembrinellidae have been assigned to the Calliphoridae as a subfamily. Hall (1948) considered this group as an aberration among the calliphorids; the reproductive habit, the structure of the reproductive organs and certain details of the external anatomy are totally different from the typical Calliphoridae. Hall treated the Mesembrinellinae as a subfamily of Calliphoridae because of the male genitalia and because adults share some characters with this latter family.

The characters listed by Hall (*l. c.*) to separate the Mesembrinellinae from the rest of the Calliphoridae *s.l.* seem to be significant and suggest that this group belongs to a separate phylogenetic branch from that of the true Calliphoridae; this seems to be supported by zoogeographic evidences. In the Mesembrinellidae the metathoracic spiracle is very large and reniform, with a single lappet, while in other calliphorids, so far as known, the metathoracic spiracle is usually small and presents an anterior and posterior lappet. Again, the special type of adenotrophic viviparity, the long and coiled spermathecae, are unique among the Calyptratae.

In view of these contrasting characters, I agree with Crosskey (1965) that the Mesembrinellidae are better treated as a full family of Calyptratae. To summarize, Mesembrinellidae and Calliphoridae appear to be very closely related families; structurally there are some rather distinct differences, so that their separate family status seems assured, but a more thorough morphological and biological study of the whole complex is obviously desirable.

Consistent differences found between the two families are summarized in the following table:

| Mesembrinellidae | Calliphoridae |
|---|---|
| Metathoracic spiracles with a single, large, reniform lappet, with dorsal opening | Metathoracic spiracles with normal anterior and posterior lappets |
| Spermathecae in the shape of a long, sclerotized tube (except in *L. nigripes*) | Spermathecae ovoid to sausage-like |
| Female postabdomen not forming a telescopic ovipositor | Female postabdomen usually forming a telescopic ovipositor |
| Macrolarviparous species (adenotrophic viviparity of Hagan) | Oviparous species (some exceptions) |
| Vein M with an evenly curved bend | Vein M distinctly angulate (some exceptions) |

## 6. ADULT CHARACTERS AND THEIR TAXONOMIC VALUE

A detailed account of Mesembrinellidae morphology must be given, as some characters employed here have been little considered by other workers.

At present, morphological characters of the adult and first instar larvae are available for classification and species recognition. The following account details the characters that have been used in the taxonomy at the supraspecific and specific levels, and indicates briefly some of the features which (presently at least) have no taxonomic value.

### 6.1. Body color and pollinosity

The ground color of the head and its overlying pollinosity provide very often useful characters for distinguishing allied species. Leg color, and, to a lesser extent, palpus and antenna colors, provide useful characters at the specific level. The metallic color of the abdomen is especially important, but in some groups is variable intraspecifically.

Without going into any formal discussion, I may state that I regard structural characters as of primordial value, and differences or similarities in color or color patterns as of secondary importance. Only such forms are given specific rank as are separable by means of reliable

structural peculiarities in at least one sex. Groups of specimens differing from each other only in coloration, I have consistently treated as forms of a single species. I accept "stable color pattern" as supplementary evidence to define species or subspecies only if it can be correlated with geographical evidence.

### 6.2. Chaetotaxy

Chaetotaxy provides, in the Mesembrinellidae, some of the most important characters for the suprageneric classification and these are essential key characters by which genera and species may be readily distinguished. This character, however, should be used with caution, since some degree of intraspecific variability exists and it is virtually impossible to cover every conceivable variation in odd specimens in a practical key.

Keys in this work should be used for the recognition of species as populations, not as individuals. If the specimen or specimens show chaetotactic characteristics which conflict with the norm for their nominal taxon, they are probably variants of the species.

### 6.3. Head (Figs. 1-5, 41-52)

The most important character at the suprageneric level is the presence of *cruciate bristles* (Fig. 5c). These bristles are well developed in the frontalia of females of *Albuquerquea* and in a few species of *Huascaromusca*. *Proclinate frontoorbitals* in females (Fig. 5, PFO) also can provide a helpful generic character. Other bristles of value at the specific level are shown in Fig. 5.

The eyes are sexually dimorphic in the majority of the forms, but in *Albuquerquea* both sexes are nearly dichoptic (Figs. 42, 44). If thoroughly examined the eye height in relation to the width of the gena provides some specific differences (Figs. 1, 3).

The antennae are always elongate and extremely uniform, and provide few taxonomic characters; but the length of the third segment relative to the second sometimes offers useful specific characters (Fig. 1, A, B).

### 6.4. Thorax and wings

The works of the following authors provide some framework for a more thorough morphological study of chaetotaxy and sclerite nomenclature of the thorax of muscoid flies: Townsend (1935), Hall (1948; mainly chaetotaxy); Crampton (1942) and Downes (1955) made important contributions on sclerite nomenclature.

The postscutellum in the Mesembrinellidae is slightly swollen, as noted by Aldrich (1925: 11); however, it does not, in any way, resemble

the very strongly swollen and smoothly convex postscutellum characteristic of the Tachinidae.

The unique and most striking feature of the thorax in this group is the characteristic shape of the metathoracic spiracle, with a single large reniform lappet provided with dorsal opening (Fig. 8, MS); no such shape occurs within the true Calliphoridae.

In the wings, a remarkable characteristic of the family is the evenly curved bend of vein M (Figs. 7, 168-177), also very important at the specific level. The presence or absence of setulose subcostal sclerite (a small, elongate, triangular piece on the lower side of the wing, extending from the basicosta to the first vein) and the remigium (Fig. 37, Re) are also characteristics of great taxonomic importance. The degree of wing infuscation is very constant at the specific level and provides useful diagnostic characters.

As regards the thorax chaetotaxy, here are the most valuable characters; several groups of thoracic setae provide important suprageneric characters. The basic number of humeral setae is 3, but in *Eumesembrinella* Townsend, *Huascaromusca* Townsend, and *Thompsoniella,* gen. n., the inner pair is absent or virtually so. The posthumeral seta (ph) is typically developed in some species-group aggregates and undeveloped in others. The acrostichals (acr.) are extremely important in the definition of genus-group aggregates. The typical number is 2:3, but in *Thompsoniella, Huascaromusca,* and *Eumesembrinella* it is 0:1. With the exception of *Thompsoniella* (which has 2:3), the whole family has an uniform arrangement of 2:2 dorsocentrals. Other dependable taxonomic characters offered by thoracic setae are presented by the sternopleurals, which provide some useful hints in the definition of genus-group segregates, some having typically either 1:1 or 2:1 arrangements. No taxonomic value could be found in the propleural, mesopleural, hypopleural, prostigmatic and scutellar setae. No real taxonomic value either is ascribed to leg chaetotaxy.

### 6.5. Abdomen and genitalia

The abdomen is robust and convexly rounded, its shape moderately uniform in each genus segregate. In *Thompsoniella* the third tergite is twice the length of the second; the shape of sternites 2-4 is oblong to oval. In *Souzalopesiella* sternites 2-6 are quadrangular, with two rows of strong macrochetae along the margin.

The structure of the male genitalia is moderately uniform in the Mesembrinellidae, and of minor importance at the supraspecific level; the hypandrium, postgonite, pregonites and epiphallus (*spinus*) show little specific differences. The most important differences are found in the aedeagus, in which the relative lengths of the phallobase (p) and distiphallus provide characters of importance at the specific level; the paraphallus in frofile and in posterior view shows great diversity of shape.

The cercus and the surstylus show differences in profile or in posterior view, useful for species recognition.

Detailed examination has not revealed the existence of any valuable characters in the female genitalia.

## 7. ANATOMY OF THE REPRODUCTIVE SYSTEM OF MESEMBRINELLIDAE

### 7.1. Female reproductive system

The female reproductive system has received more attention from a comparative aspect than any other section of internal anatomy of muscoid flies. The comprehensive knowledge of modifications recorded for the different sections of reproductive system provides a framework for comparative physiological studies of the postembrionic development which may lend insight to the types of viviparity among various species. Furthermore, a comparative approach often discloses additional characters useful in assessing phyletic relationships. The diverse modifications recorded in the female reproductive system of Calyptratae muscoid flies are particularly striking and applicable to both systematic and functional problems.

The female genital organs of *Mesembrinella* consist of paired ovaries, each with two ovarioles, and a short paired oviduct. The common oviduct, the uterus with three spermathecae and a reduced pair of accessory glands opening dorsally into it. Since these various portions of the female reproductive system have been found to be curiously modified, it will be necessary to discuss them separately.

*Ovary.* The anatomy of the ovary was established by a series of dissections of *Mesembrinella peregrina* stained with acetocarmin. It was found that Mesembrinellidae exhibit adenotrophic viviparity and produce eggs in a cyclical fashion. The whole organ is enclosed in a common epithelial sheath consisting of epithelial cells, connective tissue and muscle fiber, and are well supplied with a system of tracheae and tracheoles. Each ovary consists of two meroistic polytrophic ovarioles. The ovarioles contain the germarium and vitellarium with a single developing follicle (Figs. 35-36).

*Paired oviducts.* In *Mesembrinella* they are very short and formed by a single layer of epithelial cells and an outer peritonial layer of muscles and connective tissue. (Fig. 39, P. O).

*Common oviduct.* The common and median oviducts are similar in structure to the paired oviduct but the epithelial layer is formed of slightly elongate cells. (Fig. 39, C. O).

*Uterus.* In the Mesembrinellidae the egg hatches within the uterus where the young larva is nourished till the end of the first instar. In nulliparous female the uterus is depressed while in gravid females

it varies of shape and size according to the degree of development attained by the larva. Dissections of recently emerged females of *Mesembrinella peregrina* (teneral specimens caught in traps) revealed that at emergence the right ovary is larger than the left one. The largest egg follicle (D) is in the right ovary and measures about 0.48 mm in length; the second ovariole in this ovary (C) shows the follicle descending from the germarium. The largest egg follicle in the left ovary (B) is about 0.22 mm in length at emergence. The second ovariole in the left ovary (A) consists of a germarium and follicular tube only (Fig. 35).

In *Mesembrinella* spp each young follicle contains an oocyte and seven nurse cells and the older follicles fourteen nurse cells, thus being similar to that of *Glossina* (Saunders, 1960).

*Accessory glands.* A pair of short accessory glands are found in the Mesembrinellidae. Their tube originate on the dorsal wall of the uterus and evidently discharge their contents into the latter through a common excretory duct (Figs. 39-40, AG).

*Spermathecae.* The spermathecae observed were invariably three in number but otherwise exhibited a range of forms which for convenience may be classified into three groups, namely A, B, and C. Group A found only in the genus *Laneella* presents a brown elongate, sausage-like capsule surrounded by a thick layer of large vacuolated cells (Fig. 39, Sper.). Group B is observed in the remaining genera of the family, the capsule being modified into a long, filiform tube, transversally corrugated and highly convulated. This tube is also lined with a single layer of vacuolated cells (Fig. 38).

## Discussion

There seems to be no doubt that viviparous species at present known arose from an oviparous ancestral stock. In some species the viviparous conditions is so highly specialized that their evolution in the production of living young must represent the accumulation of a long series of modifications, spread over a great time interval.

One is immediately impressed by the seemingly endless assortement of variations disclosed in viviparous species. To handle this task a variety of uses made of certain organs which sometimes depart far away from their original function.

The type of viviparity found in *Mesembrinella* fall in the class of adenotrophic viviparity, according to the terminology proposed by Hagan (1951: 59). In this group an egg contains sufficient yolk to nourish the embryo until hatching. Specialized maternal organs nourish the larva in the uterus. If the female reproductive system of the Mesembrinellidae is compared with the description of *Melophagus* and *Glossina* it will become strikingly evident that the general topography

of these organs is essentially alike. The principal point of divergence is the number, size, shape and function of spermathecae and accessory glands, as discussed below.

The pair of accessory glands in *Mellophagus* and *Glossina* are usually spoken of as the "milk glands"; they are very long, dichotomously branching glands, ramifying throughout the cavity. In the Mesembrinellidae these glands are degenerated and represented by a pair of thin, small, unbranched structures (Figs. 34-40 AG).

It has commonly been accepted by nearly all investigators that the secretion of the accessory glands of *Glossina* and *Melophagus* is the substrate supplied to the larva for its growth and further development. Berlese (1899), however, believed that the larva subsists on the spermatozoa and accompanying secretion from the male accessory glands, the product of the female accessory glands being perhaps of minor importance in this process. His preparations show clumps of spermatozoa in the mid-gut of the larva. Hardenberg (1927) has also observed spermatozoa very definitely in the esophagus and mid-gut of a young larga but he rejected Berlese's theory. In his view, the primary function of the milk-glands is to supply an adhesive substance that fixes the extruded larva to the sheep's fleece. This view is not supported by Zacharias (1928) who pointed out the fact that *Lipoptena* and *Ornithomyia* larvae are not provided with a cementing substance, although their milk glands function as do those of *Melophagus*. The spermathecae of female insects is a pouch of ectodermal origin, lined with cuticle, in which the spermatozoa received from the male are stored. Usually the spermathecae are surrounded by a cellular epithelium probably of secretory function. The function and nature of secretion of insect spermathecae has not been fully established but the most likely explanation is that it provides exogenous nutrient substrate for the stored sperm (Davey, 1965).

In *Glossina* there are two spermathecae, while three are almost constantly present in their closest relatives, the Muscidae. In function and in conformation they are typical muscoid organs. In the Hippoboscidae they often vary in shape, size and number. Examples of these changes may be found in the studies of Hardenberg (1927). They are three in number in *Sternopteryx* and *Craterina,* but only two in *Melophagus, Lipoptena* and *Hippobosca.* In the latter, they are strongly branched, but remain unbranched in other genera as in Muscidae in general.

In the Mesembrinellidae three spermathecae are regularly present showing considerable modification in size and shape.

In order to explain the anomalous development of the spermathecae in the Mesembrinellidae a hypothesis is proposed. The trends from the sausagelike (*Laneella*) toward the pyriform-filiform type (*M. bellardiana*) to the filiform (*Huascaromusca*) is a feature of great functional significance, in that this modification greatly increases the secretory activity of these structures.

The correlation of macrolarviparous development in these flies with the increase of secretory activity of spermathecae suggests a deviation of its original function of storage and provision of nutrients for the spermatozoa and to provide also nutrients for the developing larvae. For this purpose the spermathecae show structural modifications analogous to those observed in the Hippoboscidae and Glossinidae.

Several preparations of the female reproductive system of *Mesembrine bellardiana* show clumps of spermatozoa in the lumen of the chitinous capsule and ductus indicating that its original function of storing the spermatozoa is maintained.

### 7.2. Male reproductive system

The male reproductive system of Calyptratae muscoids consists of a pair of testes and their ducts or *vasa deferentia,* and a median ejaculatory duct (a pair of accessory glands or paragonia, and an ejaculatory sac).

The two testes lie ventro-laterally to the alimentary canal. In *Laneella* the testes are reddish-white, in the other genera of the family they are orange-yellow. Each testis is composed of a single sperm tube (Hori, 1960) and vary intraspecifically in size and in shape.

In the Mesembrinellidae they are oblong, cucumber-shaped, often with a transverse constriction at the basal third (Fig. 34 Tes.). The accessory glands (Fig. 34) in all species examined are opaque white, oval, both lying along the left side of the ejaculatory duct. Ejaculatory duct (Fig. 34 ED) long, coiled several times, slightly curved basally, and looping over the rectum from left to right. Ejaculatory apodeme sclerotized, with a rod-shaped stem.

#### Discussion

Bruel (1897) has observed the rotation of the ejaculatory duct around the rectum in *Calliphora erythrocephala* for the first time. Feuerborn (1922) in his study of male genitalia of Diptera, came to the conclusion that the genital segments in male *Calliphora* performed a 360 degree rotation. He introduced the terms "circumversum" for the rotation of the ejaculatory duct. Schröder (1927) also observed the hypopygium of *Calliphora erythrocephala* and considered that the torsion of the ejaculatory duct was the result of a complete clock-wise rotation, (as seen from the rear) of the terminal segments during pupal development.

Recently Hori (1960) in a study of 83 species of Calyptratae muscoid flies observed that the modes of the torsion of ejaculatory duct around the hind-gut, are of two types: clock-wise torsion and counterclockwise torsion. All but one species examined by Hori, show the first type of torsion. The occurrence of counterclockwise torsion seems to be very rare in the Calptratae muscoid flies. According to Hall

(1948) *Mesembrinella bicolor* presents this type of torsion (cf. his fig. 4). Milani & Rivosecchi (1955) demonstrated that in *Musca domestica* the direction of the torsion is determined by a single gene. The evaluation of the taxonomic value of these characters therefore must await further studies. All species I have examined in four genera of Mesembrinellidae present Hori's first type of torsion.

## 8. LARVA

The larva of Mesembrinellidae is a typical apodous cyclorrhaphous maggot. In living maggots the general color is grayish white in *Laneella,* and probably in *Souzalopesiella,* and orange yellow in the other genera.

The shape is conico-cylindrical in *Laneella* and *Souzalopesiella,* and ovoid in *Mesembriella, Huascaromusca, Eumesembrinella* and *Albuquerquea;* the body tapering off gradually to the anterior end from the middle region. The posterior end is obliquely truncate, not very concave as inthe blowfly larva. The cuticular integument is divided into twelve segments. In *Laneella* and *Souzalopesiella* the thoracic and abdominal segments bear anterior ventral patches of small sclerotized spines. In *Laneella* the first two thoracic segments are covered dorsally by a thickly sclerotized cuticular plate (fig. 14). In the genera *Mesembrinella, Huascaromusca, Albuquerquea* and *Eumesembrinella* the cuticular integument is covered by translucent microscopic scales, not visible with naked eye.

Labial sclerite. In Mesembrinellidae we observe three main types: in *Laneella* and *Souzalopesiella* the labial sclerite is long, narrow and pointed at apex, not fused to the hypostomal sclerite. In many species of *Mesembrinella* and also in *Albuquerquea* the labial sclerite is long, spathulate and round at apex, not fused to the hypostomal sclerite. In the genera *Huascaromusca, Eumesembrinella* and probably in *Thompsoniella,* gen. n. the labial sclerite is stout, almost as long as the hypostomal and pharyngeal sclerites together. In ventral view it is spathulate and round at apex. In this type all three main parts of cephalopahryngeal sclerite are fused.

Pharyngeal sclerite. This is a large trough-like structure protracted in lateral view into two paired structures called cornua; the dorsal cornua are generally free, while the ventral cornua are connected by the lower wall of the pharynx. In the genera *Mesembrinella, Souzalopesiella* and *Huascaromusca* the dorsal cornua are well sclerotized and separated from the ventral by a deep incision. In *Eumesembrinella* these structure are represented dorsally and posteriorly by sheets of unsclerotized cuticle. The first instar larva of *Mesembrinella* is metapneustic, the posterior spiracular plates (fig. 16 and 26) are two ovoid slits situated slightly above the center in a shallow posterior concavity surrounded by an open sclerotized peritreme.

## 9. FAMILY MESEMBRINELLIDAE, *STAT. NOV.*

Mesembrinellinae Shannon, 1926: 116, 117 (key to subfamilies, tribes and genera of American Calliphoridae); Hall, 1948: 60 (revision of North American species); Roback, 1951: 357; Hennig, 1952· 423; Crosskey, 1965: 44 (key to subfamilies of Calliphoridae); Mello, 1967 (revision of Brazilian species); Hori, 1967: 226; James, 1969: 251; 1970: 12 (catalogue).

Mesembrinellini; Townsend, 1934: 110; Hennig, 1952: 423.

Medium-sized to large species (8.5-15 mm) characterized as follow:

Eyes bare. Parafacialia bare. Arista long plumose. Propleura pilose. Prosternum bare to pilose. Hypopleura with row of well defined hypopleural bristles. Metathoracic spiracles very large, reniform with dorsal opening (fig. 8, MS). Prothoracic spiracles yellow, subelyptical with dorsal opening (fig. 8, MS). Cruciate bristles usually present in females. Remigium and subcostal sclerite usually ciliated. Wings with vein M with an evenly round bent (fig. 7). Postscutellum developed, but not as prominent as in Tachinidae. Female postabdomen (fig. 9) typical of larviparous Calyptratae (see Hertig, 1957: 441-443) not forming a telescoped ovipositor as in typical Calliphoridae. Abdominal tergites short and subellyptical (except for *Souzalopesiella* and *Laneella*). Abdomen usually metallic green to purplish.

Immature stages and biology. Not well known; the females present an adenotrophic viviparity (macrolarviparity) with retention in the uterus of a first instar larvae.

Distribution. Tropical rain forests of the Neotropical Region, except Antilles, Chile and Argentina.

A thorough examination of all species of this complex would be desirable to produce a satisfactory reclassification. The characters of spermathecae, body color, degree of development of sternite 2 to 4 and chaetotaxy appear to provide the most reliable characters. At present three subfamilies are reconized:

## 10. KEY TO SUBFAMILIES

1. Abdomen testaceous to brown, without metallic reflections; spermathecae of groups A and B ..... 2
   Abdomen brown to yellow with metallic green, blue to purplish reflections; spermathecae of group C (except for *M. bellardiana*). ..... Mesembrinellinae *s. str.*

2. Females. Sternite 2 to 4 subquadrangular with strong marginal macrochaetae (tab. IV, T3 A); spermathecae of group B; larva I with strong sclerotized plates on pseudocephalon; labial and hypostomal sclerites fused; acrostichals 3:2 ..... ..... Souzalopesiellinae, subfam. n.

Male. Female. Sternites 2 to 4 oval, without marginal macrochetae; spermathecae of group A. Larva I without sclerotized plates on pseudocephalon; labial and hypostomal sclerites free; acrostichals 2:3 ..... Laneelinae, subfam. n.

## 11. SUBFAMILY MESEMBRINELLINAE TOWNSEND

Diagnosis. Species with brown abdomen, with green to purplish metallic reflections. Acrostichals 2:1. Sternite 3 to 4 ellipsoidal without marginal machochaetae. Spermathecae of group C.

Key to tribes, subtribes and genera of Mesembrinellinae.

1. Humeral calli with three distinguishable humeral setae. Two or three sternopleurals; remigium bare to bristled ..... ..... (Mesembrinellini) *Mesembrinella* Townsend.
Humeral calli with two distinguishable setae; two sternopleurals; remigium always bare ..... (Eumesembrinellini, trib. n.) 2

2. Male with dichoptic head. Parafrontolia with a pair of cruciate frontals. Remigium bristled. Larva I with hypostomal and pharygeal sclerites free ..... ..... (Albuquerqueina, subtr. n.) *Albuquerquea* Mello
Male with holoptic head; cruciate frontals absent. Larva I with hypostomal and pharyngeal sclerites fused ..... ..... (subtribe Eumesembrinellina, new) 3

3. Male abdominal T 5 about twice as long as T 4. Dorsocentrals 2:2. Reclinate orbitals absent in females. Paraphallus and hypophallus fused ..... *Thompsoniella,* gen. n.
Male T 5 normal in size, about as long as T 4. Dorsocentrals 2:3. Reclinate orbitals usually absent in females. Paraphallus and hypophallus free ..... 4

4. Abdominal T 5 with a row of discal setae ..... ..... *Huascaromusca* Townsend
Abdominal T 5 without discals ..... *Eumesembrinella* Townsend

### TRIBE MESEMBRINELLINI TOWNSEND

Diagnosis. Mesembrinellinae with the following combination of characters. Humeral calli with three distinguishable setae. Sternopleurals 2 to 3. Remigium bare to bristled.

### Genus **Mesembrinella** Giglio-Tos, 1893

*Mesembrinella* Giglio-Tos, 1893: 4. Type-species, *Musca quadrilineata* Fabricius, orig. des.; misidentification = *bellardiana* Aldrich; Giglio-Tos, 1895: 11; Wulp, 1896: 300 (notes); Hough, 1899: 64; Aldrich, 1905: 518 (*partim*); 1922: 10; 1925: 22, 12; Surcouf,

1919: 72 (*partim*); Shannon, 1926: 120 (key to species); Townsend, 1935: 146; 1937: 66; Mello, 1967: 47 (South American species); James, 1970: 3 (catalogue).

*Ochromyia* Surcouf, 1919: 72 (*partim*).

*Mesembolia* Aldrich, 1925: 10 (Type species, *bellardiana* Aldrich; orig. des.).

*Huascaromusca* Hall, 1948: 68 (*partim*).

Diagnosis. Mesembrinellinae with the following combination of characters: Abdomen brown in ground color with bluish to greenish reflections. Acrostichals 2:2; dorsocentrals, 2:3; post humerals present. Humeral callus with three distinguishable humeral bristles. Discals in T 5 absent. Larva I with integument without spines or sclerotized plates; labial sclerite long and spathulate, round at apex; hypostomal sclerite not fused to the labial. Aedeagus with free paraphallus not fused to hypophallus.

## Discussion

Aldrich (1922) divided the genus *Mesembrinella* Giglio-Tos in two subgenera; *M.* (*Mesembrinella*) for the species with bare remigium and *M.* (*Mesembolia*) for those species with ciliated remigium. In this conception Aldrich included in the synonymy of *Mesembrinella* Giglio-Tos the genus *Huascaromusca* Townsend and species now belonging to the genus *Eumesembrinella* Townsend. Our studies have demonstrated that the character of ciliation of remigium is of secondary importance in supporting generic classification but useful at specific level. Townsend (1931) distinguished three genera in his Mesembrinellini (*Mesembrinella, Huascaromusca* and *Eumesembrinella*). The genus *Mesembrinella* was restricted to the species with ciliated remigium and *Mesembolia* regarded as a synonym of the latter. The species with bare remigium were placed in his genera *Huascaromusca* and *Eumesembrinella.*

Hall (1948) stated that species treated by Aldrich (1922) under the name *Mesembrinella* Giglio-Tos belong in the genus *Huascaromusca* Townsend and that *Mesembrinella* and *Mesembolia* do not occur in North America (North and Central America).

Mello (1967) in his studies of South American Mesembrinellinae defined the genus *Mesembrinella* Giglio-Tos mostly on internal structures of the female sex such as shape of spermathecae and labial sclerite of Larva I.

We are including the genus *Mesembrinella* Giglio-Tos in the subfamily Mesembrinellinae, differing from the other genera of this subfamily in possessing the humeral calli with three distinguishable humerals; two or three sternopleurals and remigium ciliate to bare. This genus is very common and occurs over the whole area of distribution of the family.

Key to species of *Mesembrinella* Giglio-Tos.

1. Remigium bare ..... 3
   Remigium ciliate ..... 2

2. Subcostal sclerite ciliate ..... *bellardiana*
   Subcostal sclerite bare ..... *peregrina*

3. Abdomen densely pollinose, most of clothing setulae arising from a small shining spot ..... *batesi*
   Abdomen not densely pollinose and without clothing setulae arising from shining spots ..... 4

4. Males with a pair of reclinate orbitals in front of ocellus ..... 5
   Males without reclinate orbitals ..... 6

5. Wings subhyaline, without darker patterns ..... *abaca*
   Wings faintly infuscated on costa ..... *semihyalina*

6. Wings with section IV of costal vein equal to or longer than one half of section III ..... 7
   Section IV of costal vein less than one half of section III ..... 10

7. Sternopleurals 3; facialia with a group of brown to blackish cilia above vibrissae ..... 8
   Stenopleurals 2; facialia with a group of orange yellow bristles above vibrissae ..... *currani,* sp. n.

8. Wings strongly infuscated on apical half, pleura brownish red .. 9
   Wings faintly infuscated on apical half; pleura orange yellow .... ..... *umbrosa*

9. Face and epistoma dark brown; palpi black; wings base testaceous ..... *apollinaris*
   Face and epistoma yellow; palpi yellow; wing base orange yellow ..... *pictipennis*

10. Subcostal sclerite ciliate; wings with a black spot along costa ... ..... 11
    Subcostal sclerite bare; wings subhyaline, without darker pattern. ..... 12

11. Middle and hind femora brown, yellowish on apical one-third ..... ..... *brunnipes*
    Middle and hind femora orange yellow ..... *townsendi,* sp. n.

12. Mesonotum black ..... 13
    Mesonotum reddish brown to orange yellow ..... *bicolor*

13. Humeral calli yellow; femora orange yellow, tinged with brown dorsally on apical fourth ..... *flavicrura*
    Humeral calli and femora black ..... *xanthorrhina*

## **Mesembrinella bellardiana** Aldrich

From the examination of good series it appears likely that *bellardiana* falls into two distinct, largely geographically isolated populations, with sufficient constancy of structural differences to justify the recognition of two subspecies, at least for the time being: *M. bellardiana bellardiana* predominantly a southern subspecies, occurring most commonly along the Brazilian Atlantic coast; *M. bellardiana fuscicosta* a more northern subspecies occurring predominantly in the Amazon Valley (Amazonas, Pará and French Guiana) and replaced in northern South America by the typical subspecies. A summary of the differences between the two subspecies is given in the following key.

Key to the subspecies of *M. bellardiana*

1. Middle and hind femora black; head golden pollinose ..... ..... *M. bellardiana bellardiana*
   Middel and hind femora brownish red to orange; head whitish pollinose ..... *M. belladiana fuscicosta*

### **Mesembrinella bellardiana bellardiana** (Aldrich, 1922)
(Figs. 8, 12, 13, 20, 63, 82, 112, 130, 146, and 150)

*Mesembrinella* (*Mesembolia*) *bellardiana* Aldrich, 1922: 21 (holotype ♀, Espírito Santo, Brasil, USNM); 1928: 12.

*Mesembrinella* (*Mesembolia*) *fulvipes* Aldrich, 1922: 21 (holotype ♀, Espírito Santo, Brasil, USNM). *N. syn.*

*Mesembrinella bellardiana;* Townsend, 1931: 69 (type examination: 1937: 66; Melo, 1967: 48, figs. 7, 21, 157-176; James, 1970: 4.

*Mesembrinella quadrilineata;* Giglio-Tos, 1893: 4; Surcouf, 1919: 75 (*nec* Fabricius).

Male. Body length, 10 to 12 mm.

Head yellow, golden pollinose. Front at vertex about 0.06 to 0.08 of head width. Ocellar triangle brown. Ocellars proclinate, as long as post ocellars. Parafrontalia yellow, golden pollinose at the narrowest point. Occiput dark brown, orange yellow pilose, dusted with whitish pollen. Frontalia orange yellow. Antennae yellow, second segment about 0.43 the length of third. Facialia yellow with a cluster of short and robust bristles in basal one-fourth. Palpi yellow. Gena yellow, about 0.11 of eye height, covered with short sparse black hairs.

Thorax brownish red on dorsum, reddish on sides. Acrostichals 2: 2; dorsocentrals 2: 3; sternopleurals 3. Mesopleura and hypopleura covered with black hairs. Prosternum and lower half of humeral calli yellow pilose. Wings hyaline, strongly tinged with black along costa. Costal index, 0.44 to 0.56. Remigium and subcostal sclerite ciliate.

Upper calyter hyaline, darkened at border; lower calpter faintly infuscated, yellow on border. Legs yellow.

Abdomen brownish orange yellow at base, with bluish metallic reflection. Postabdomen dark brown. Cerci divergent toward apex, strongly curved backward in lateral view. Surstyli strong, curved; epiphallus enlarged at base, tapering toward apex, as long as basiphallus; paraphalli enlarged at middle, ending in slightly curved point (figs. 118 and 130).

Female. Body length 10-12 mm

Differs from male in the following characters: Front at vertex about 0.26 of head width; frontalia wide, with parallel sides. Proclinate orbitals, two pairs; reclinate orbitals, 1 pair. Ocellars long and strongly divergent, more developed than outer verticals. Spermathecae very similar to those of *M. batesi* (fig. 146).

Larva I. Length 7.5 to 2.0 mm; width 2.0 to 3.1 mm.

Musciform. Metapneustic with twelve apparent segments. Integument white, covered with small hyaline scales (fig. 13). Buccopharyngeal sclerite free, the labial sclerite slightly curved; pharyngeal sclerite with dorsal and ventral wings faintly pigmented (figs. 20 and 150). Anal area with dorsal and ventral tubercles weakly differentiated; posterior spiracles with bilobated slits fused at one and (fig. 12).

Distribution. Peru, Brazil (Bahia, Goiás, Espírito Santo, Rio de Janeiro, São Paulo, Mato Grosso and Santa Catarina), Paraguay, Argentina. (Map 3).

Material examined. Peru. Puccallpa. 17.IV.1965, J. Schunke (1 ♂ 1 ♀, Over Monzon River, 850 m, 18.VI.1964, J. Schunke (1 ♂, BM); Boqueron Abad, 10.V.1964, J. Schunke (1 ♀, BM). Brazil. *Bahia*: Prado, II. 1971, P. C. Elias (10 ♂ 16 ♀, MZSP); Mucuri, II.1971, P. C. Elias (2 ♂ 4 ♀, MZSP); *Goiás*: Tupirama, Belém-Brasília, IV.1966, L. Gomes (2 ♀, MZSP); Corumbá, XI.1964, M. P. Barreto (3 ♀, MZSP); Anápolis, 2.I.1937, R. C. Shannon (1 ♀, USNM); *Espírito Santo*: Parque Sooretama, Cupido, III.1948, Freitas & Travassos (2 ♂ 2 ♀, MZSP); Santa Tereza, III.1971, P. C. Elias (2 ♂ 5 ♀, MZSP); Conceição da Barra, IX.1971, P. C. Elias (9 ♂ 11 ♀, MZSP). *Rio de Janeiro*: Tinguá, VII.1940, R. C. Shannon (1 ♀, USNM); Petrópolis, III.1930, R. C. Shannon (1 ♀, USNM); Rio de Janeiro, X.1938, R. C. Shannon (20 ♂, 21 ♀, USNM). *São Paulo*: Santo Amaro (5 ♀, MZSP); Monte Alegre, 750 m, Fazenda Bom Jesus, 14-27.X.1924, L. Travassos F. & Almeida (3 ♀, MZSP); Peruíbe, XII.1946, M. Carrera (3 ♂ 1 ♀, MZSP); Bertioga, Praia de Guaratuba, VIII.1969, F. C. do Val (3 ♂, MZSP); Cantareira, I.1944, M. P. Barreto (3 ♂ 2 ♀, MZSP); Itu, Fazenda Pau

D'Alho, XI.1965, Exp. Dep. Zool. (3 ♂, 2 ♀, MZSP); Porto Cabral, Rio Paraná, 1-25.IV.1944, Travassos F.º, Carrera & Dente (2 ♀, MZSP); idem, L. Travassos F.º (3 ♀, MZSP); Estação Biológica de Boracéia, 26.IV.1968, R. Travassos F.º (2 ♀, MZSP); idem, VI.1968, J. Oliveira (2 ♂ 5 ♀, MZSP); idem, III.1972, J. H. Guimarães (15 ♂, 18 ♀, MZSP); Avanhandava, II.1946, M. P. Barreto (1 ♀, MZSP); Barueri, 29.XI. 1954, K. Lenko (10 ♂, 12 ♀, MZSP); Cajuru, Cássia dos Coqueiros, IX.1954, M. P. Barreto (3 ♂ 2 ♀, MZSP). *Mato Grosso*: Utiariti, Rio Papagaio, X.1955, K. Lenko & Pereira (2 ♀, MZSP); Macaraju, III. 1937, R. C. Shannon (3 ♂, USNM). *Santa Catarina*: Nova Teutônia, IX.1966, F. Plaumann (13 ♂, 18 ♀, MZSP); Corupá (Hansa Humboldt), XII.1944, A. Maller (1 ♀, AMNH). Paraguay, Pastoreo, 3-7.II.1972, L. Peña (5 ♀, MZSP). Argentina: Jujuy, Abra Pampa, 2.II.1970, L. Peña (5 ♀, MZSP).

**Mesembrinella bellardiana fuscicosta** Séguy, stat. n.

*Mesembrinella fuscicosta* Séguy, 1925: 105 (holotype ♂, St.-Jean-du--Maroni, French Guiana, MNHN); James, 1970: 4.

Very similar to the nominal subspecies, differing by the enlarged frontalia, at the narrowest point as vide as anterior ocellus. Front at vertex 0.03 of head width. Head yellow, dusted with whitish pollen. Gena about 0.06 of eye height. Occiput dusted with whitish pollen on upper half. Wings faintly infuscated along costa. Legs yellow, middle and hind tibiae black.

Distribution. French Guiana, Brazil (Amazonas, Pará). (Map. 3).

Material examined. French Guiana, St.-Jean-du-Maroni (holotype ♂, *Mesembrinella fuscicosta* Séguy, MNHN); Brazil: Pará, Santarém, Faz. Taperinha, 1-11.II.1968, Exp. Perm. Amaz. (2 ♀, MZSP); Maloquinha, near Itaituba, X.1970 (1 ♂ 1 ♀, MZSP); Cachimbo, X.1955, Pereira (1 ♂ 1 ♀, MZSP); Amazonas, Rio Aripuanã, Prainha, 6.X.1971, J. L. Silva (6 ♀, MZSP); Rio Preto da Eva, 13-15.IV.1967, Exp. Perm. Amaz. (3 ♀, MZSP).

**Mesembrinella peregrina** Aldrich, 1922
(Figs. 7, 21, 34-38, 40, 67, 96, 109, 138, 139, 170, 178 and 179)

*Mesembrinella peregrina* Aldrich, 1922: 22 (holotype ♂, Espírito Santo, Brazil, USNM); 1925: 12; Engel, 1931: 135 (Argentina); Mello, 1967: 59, figs. 8, 24, 196-218; James, 1970: 4.

Male. Body length, 8 to 9 mm.

Head yellow, golden pollinose; vertex dark brown, golden pollinose. Front about 0.01 of head width. Parafrontalia yellow, golden pollinose, at the narrowest point about 0.50 of anterior ocellus; inner verticals

long and decussate; accellars long parallel, about as long as post ocellar. Antennae orange-yellow; second segment about 0.33 length of third. Arista brown, orange yellow on the basal one-fourth. Vibrissae slightly above epistoma. Facialia with four to five bristles in the lower one-third well above the vibrissae. Palpi yellow and clavate. Occiput brown, orange yellow pilose. Gena about 0.06 to 0.08 of eye height.

Thorax orange-yellow; mesonotum light brown. Acrostichals, 2:3; dorsocentrals, 2:3; humerals 3; intraalars, 2; sternopleurals 3. Pleura black pilose, except on humeral calli, propleura, prosternum and lower half of sternopleura which are orange yellow pilose. Wings hyaline, faintly infuscated along costa and *r-m* (fig. 170). Remigium ciliate; subcostal sclerite bare. Costal index, 0.19-1.20. Calypteres hyaline, slightly infuscated on dorsum. Legs yellow, middle and hind tibiae faintly brownish.

Abdomen shining with bluish reflection. T 1 + 2 yellow, T 3 and T 4 with well differentiated latero-marginals; T 5 with a row of erect marginals. Cerci subtriangular, pointed at apex; surstyli strongly curved inward (Figs. 67 and 69). Aedeagus very similar to *E. quadrilineta;* paraphalli ending in three-pointed process at apex (figs. 109, 138).

Female. Body length 10 to 11 mm.

Differs from male in the following characters. Front about 0.24 of head width. Frontalia dark brown; cruciate frontals at the level of ocellar triangle; inner verticals strong and weakly decussate; outer verticals divergent; proclinate orbitals, two pairs. Ocellars, long, proclinate and divergent; post ocellars divergent. Gena, 0.09-0.10 of eye height. Spermathecae with the ducts widened on middle; capsule pyriform on base tapering in a long and coiled tube (fig. 139).

Larva I. Length 6.5-8.0 mm; width 1.6 to 2.0 mm.

Very similar to *M. bellardiana* differing in the shape of buccopharyngeal sclerite. Labial sclerite slightly curved toward apex; hypostomal and pharyngeal sclerites fused.

This species was described from Espírito Santo, Brazil. Through the kindness of Dr. Raymond Gagné, three paratypes were received from the USNM for study and their identity confirmed. This species is very common along the Brazilian Atlantic coast between Espírito Santo and São Paulo and differs from all the other of *Mesembrinella* Giglio-Tos by presenting the remigium bare and subcostal sclerite ciliate.

Distribution. Brazil (Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo). (Map. 5).

Material examined: Brazil: *Espírito Santo,* Santa Tereza, III.1971, P. C. Elias (2 ♀, MZSP); *Minas Gerais*: Barreiro de Cima, I.X.1960, J.

Evangelista (1 ♀, MZSP); *Rio de Janeiro*: VII.1938, R. C. Shannon (3 ♂, 1 ♀, USNM); Parque Nacional do Itatiaia, Lago Azul, 26.IX. 1954, Travassos, Barth, Albuquerque & Barros (1 ♂, MZSP): idem, 850 m, 27-29.XI.1970, J. H. Guimarães (2 ♂, MZSP). *São Paulo*: Salesópolis, Estação Biológica de Boracéia, VIII.1966, 27-29.XI.1970, J. H. Guimarães (15 ♂, 25 ♀, MZSP); idem, VIII.1969, N. Papavero (1 ♂, 3 ♀, MZSP); idem, VI.1968, J. Oliveira (13 ♂, 14 ♀, MZSP); Alto do Ipiranga, X.1923, Spitz (1 ♂, MZSP); Cássia dos Coqueiros, Cajuru, IX.1954, M. P. Barreto (4 ♂, 1 ♀, MZSP).

**Mesembrinella batesi** Aldrich, 1922
(Figs. 66, 74, 112, 135, 145, 153, 154 and 168, map 1)

*Mesembrinella batesi* Aldrich, 1922: 15 (holotype ♀, Amazonas, Brazil, BM); 1925: 11; Mello, 1967; 64, figs. 9, 24, 214-231; James, 1970: 4.

Male. Body length, 9-10 mm.

Head yellow, whitish pollinose. Front at vertex 0.08 of head width. Parafrontals at the narrowest point about 0.25 of the anterior ocellus. Ocellar triangle brown with a pair of fine and parallel ocellars, two pairs of post ocellars, the anterior pair less robust than occelars. Antennae orange yellow; second segment 0.50 length of third. Facialia with the lower one-third covered with a cluster of strong black bristles. Face and gena yellow dusted with whitish pollen. Gena about 0.05 to 0.07 of eye height. Palpi yellow. Occiput brown, covered with pale hairs.

Thorax light brown, dusted with yellow pollen on dorsum. Acrostichals, 2:3; dorsocentrals, 2:3; humerals, 3; post humerals 1; sternopleurals 3. Scutellum light brown, golden pollinose. Wings hyaline, tinged with brown along costa. Remigium bare, subcostal sclerite ciliate. Costal index 0.26 (fig. 169). Calypteres hyaline with long yellow hairs on borders. Legs orange, middle and hind legs reddish.

Abdomen brownish red, with bluish to greenish metallic reflections, dusted with dense whitish pollen. Most clothing setulae arising from small, shining spots. Cerci robust on ventral view, almost as long as surstyli (figs. 66 and 74). Aedeagus with the epiphallus as long as basiphallus; paraphalli strongly curved, ending in a slender point (figs. 112, 135).

Female. Body lenght 11 to 12 mm.

Very similar in color and general structure to the male, differing in the following characters: Front at vertex 0.54 of head width. Frontalia orange-yellow. Parafrontalia yellow, dusted with whitish pollen, with the characteristic pair of reclinate orbitals. Spermathecae very similar of *M. bicolor* except in having a less pigmented capsule (fig. 145).

Larva I. Length 11 mm; width 23 mm.

Externally very similar to *M. bellardiana,* differing in the shape of buccopharyngeal sclerite. Labial sclerite long, weakly curved and rounded at apex; hypostomal sclerite not fused to the labial; pharyngeal sclerite fused to the hypostomal, with the dorsal and ventral wings not pigmented (figs. 153 and 164).

The identity of this species was confirmed by Dr. A. Pont, British Museum Nat. Hist. who compared specimens identified in our collections with the *batesi* type.

Distribution. Brazil (Amazonas, Pará, Pernambuco, Mato Grosso, Bahia and Espírito Santo), Peru (Map 1).

Material examined. Brazil. *Amazonas*: Esperança, 19.III.1931, R. C. Shannon (2 ♀, MZSP); *Pará*: Coraci, 15 km NW Canindé, Rio Gurupi, IV.1963, B. Malkin (1 ♀, MZSP); Óbidos, Colônia Rio Branco, IX.1953, F. M. Oliveira (1 ♀, MZSP). *Pernambuco*: Vicência, 15.VI.1971, Exp. ABC-MZSP (6 ♂, 15 ♀, MZSP). *Bahia*: Prado, II.1971, P. C. Elias (5 ♂, 15 ♀, MZSP). *Mato Grosso*: Utiariti, Rio Papagaio, XI.1968, Lenko & Pereira (3 ♂, 5 ♀, MZSP). *Espírito Santo*: Parque Sooretama, Linhares, I.1953, P. A. Teles (1 ♀, MZSP). Peru. Cusco, Avispas IX. 1962, L. E. Leña (1 ♂, MZSP); Monson Valley, Tingo Maria, 11.X-XII. 1954, E. Schlinger & Ross (1 ♂, 1 ♀, CAS); Puno, Fundo Chela, 4.IV. 1964, 1.100 m, J. Schunke (1 ♀, CAS); Iquitos, III-IV.1931, R. C. Shannon (1 ♂, MZSP).

**Mesembrinella abaca** (Hall, 1948)
(Figs. 62-77, 115, 123, 156-157)

*Huascaromusca abaca* Hall, 1948: 68 (holotype ♂, Barro Colorado Island, Canal Zone, Panama, USNM).

*Mesembrinella abaca* James, 1970: 76.

Male. Body length 7 to 9 mm.

Head yellow, silvery pollinose; vertex dark brown, dusted with whitish pollen. Front at vertex 0.07 to 0.09 of head width. Parafrontalia silvery pollinose at the narrowest point, about as wide as third antennal segment. Parafrontalia with a pair of reclinate orbitals before anterior ocellus. Ocellars slender and parallel. Antennae yellow; second segment about 0.33 to 0.36 of third segment. Arista brownish-red; orange yellow on the basal one-fourth. Vibrissae well above the oral margin. Facialia with four to five short and robust black bristles on basal third. Palpi yellow, clavate. Occiput brown, with orange hairs. Subocular height orange with black hairs, about 0.07 of head height.

Thorax brown, whitish pollinose. Acrostichals 2:3; dorsocentrals 2:3; humeral calli with three distinguishable bristles; post humeral 1.

Thorax black haired, except sternopleura and hypopleura which are yellow pilose. Wings hyaline, faintly infuscated around *r-m*. Costal index about 0.23-0.24. Remigium bare; subcostal sclerite ciliate. Calypteres hyaline. Legs yellow: middle and hind tibiae faintly infuscate.

Abdomen T 1 + 2 and T 3 yellow; T 4 and T 5 brown with greenish metallic reflections. Cerci enlarged, curved at apex, ending in a slender and curved point: surstyli narrow at apex, strongly curved inward (Figs. 62 and 77). Epiphallus short, about as long as basiphallus; paraphalli ending in a strongly curved pont; hypophallus at middle as wide as apical half of paraphallus (Figs. 115 and 123).

Female. Body length 8 to 10 mm.

Differs from male in the following characters. Front about 0.26 to 0.33 of head width. Frontalia brownish red, with a pair of robust cruciates. Inner verticals strong and weakly decussate; outer verticals divergent. Parafrontalia with two pairs of strong proclinate obitals, the upper pair well developed. Abdomen brownish yellow with greenish metallic reflections.

Larva I. Very similar to those of *M. semihyalina,* differing in the shape of buccopharyngeal sclerite. Labial, hypostomal and pharyngeal sclerites weakly fused. Pharyngeal sclerites enlarged, with the dorsal and ventral wings undifferentiated at base (figs. 156 and 157).

Distribution. Panama, Costa Rica. (Map 2).

Material examined: Panama. Canal Zone, Barro Colorado Island, I.1929, XI.1939, C. H. Curran (2 ♂, 4 ♀, paratypes, USNM); idem, I.1955, I.1956, C. Rettenmeyer (2 ♂, 4 ♀, USNM); idem, IV.1967, R. D. Akre (5 ♀, USNM); idem, Cano Saddle, 5.V.1923, R. C. Shannon (1 ♀, USNM); idem, Porto Bello, 13.III.1911, A. Busck (1 ♀, USNM). Costa Rica. San Mateo, Higuito, no date, P. Schild (2 ♂, 2 ♀, USNM).

Through the kindness of Dr. R. Gané (USNM) 6 male paratypes of this species were received for study. *M. abaca* is close and extremely similar to *M. semihyalina;* in *abaca* the wings are clear, hyaline, whereas in *semihyalina* the wings have a faint though distinct blackish tinge on costa. Both species are unique in presenting a pair of orbitals in male. In both species such bristles are reclinate (not proclinate as mentioned in Hall, 1948 for *abaca*).

**Mesembrinella semihyalina** Mello, 1967
(Figs. 52, 56, 79, 117, 129, 160, 161 and 163)

*Mesembrinella semihyalina* Mello, 1967: 73, figs. 11, 27, 250-269 (holotype ♂, Espírito Santo, Parque Sooretama, Brazil); James, 1970: 4

Male. Body length 10 to 11 mm.

Head orange yellow, whitish pollinose. Front at vertex about 0.06 to 0.07 of head width. Parafrontalia yellow pollinose in the lower half with a pair of reclinate orbitals at anterior ocellus level. Inner verticals strongly decussate; outer verticals divergent. Ocellar triangle brownish. Ocellars about as long as inner verticals. Antennae orange yellow; second segment about 0.42 length of third. Arista light brown, yellowish on base. Vibrissae long and decussate, slightly above oral margin. Facialia with few black bristles in the lower one-forth. Gena about 0.09 of the eye height (fig. 52).

Thorax brownish, silvery pollinose; mesonotum and scutellum dark brown, dusted with yellowish pollen. Humeral calli, notopleura, postalar calli orange yellow in ground color. Acrostichals 1:1; dorsocentrals 2:3. Pleura yellow, orange yellow pilose. Hypopleura, sternopleura, lateral postscutellar plate, basiscutellum and postscutellum brown. Wings hyaline, infuscated in the apical half and darkened along costal vein. Remigium bare, subcostal sclerite ciliate. Costal index 0.17-0.24 (fig. 173). Calypteres hyaline. Legs yellow, middle and hind tibiae brownish-red.

Abdomen bluish to greenish, with purplish metallic reflections. T 1 + 2 and apical half of T 3 yellow; T 4 with a row of marginals; T 5 with a row of about five marginals. Cerci fused on middle, pointed at apex; surstyli strongly curved inward (figs. 56 and 79). Aedeagus with epiphallus slightly longer than basiphallus; paraphalli very similar to those of *M. abaca* but ending in a stronger spine on apex (figs. 117, 129).

Female. Body length 11 mm.

Differs from the male in the following. Front at vertex 0.33 of head width. Frontalia brownish red. Parafrontalia with only one distinguishable pair of orbitals.

Larva I. Length 0.85-0.90 mm; width 1.5 to 1.8 mm.

Very similar to *M. bellardiana bellardiana,* differing in the shape of buccopharyngeal sclerite. Labial and hypostomal sclerite fused, rounded at apex in ventral view; pharyngeal sclerite with the dorsal and ventral wings sclerotized on base (figs. 160 and 161).

This species is very close to *M. abaca* Hall, differing by the wing infuscation along the costa and by the differences in male genitalia.

Distribution. Brazil (Pernambuco, Espírito Santo and São Paulo). (map 2).

Material examined: Brazil. *Pernambuco*: Água Azul, Vicência, 5.VI.1971, Exp. ABC-MZSP (13 ♂, 12 ♀, MZSP); *Espírito Santo*: Cupido, Par-

quê Sooretama, III.1948, L. Travassos & Freitas (paratypes 1 ♂, 3 ♀, MZSP). *São Paulo*: Juquiá, X.1969, J. Lane (1 ♀, USNM); São Paulo, III.1923, L. G. Saunders (1 ♀, BM).

**Mesembrinella currani**, sp. n.
(Figs. 71 and 172) (Map 1)

Male. Body length, 12 mm.

Head yelow, golden pollinose. Front about 0.05 of head width. Parafrontalia yellow; at the narrowest point about 0.20 of anterior ocellus. Ocellar triangle brownish red. Ocellar weak; post ocellar longer than ocellars. Antennae orange-red; second segment 0.42 length of third. Vibrissae well above epistoma. Facialia covered with dense orange yellow bristles in the lower half. Gena 0.09 of eye height. Occiput blackish, covered with pale hairs.

Thorax brownish red, orange yellow on sides. Mesonotum brown, testaceous pollinose. Humeral calli yellow, covered with orange and black hairs. Acrostichals 2:1; dorsocentral 3:3. Pteropleura, hypopleura, postalar wall and postscutellum brown. Legs orange, tarsi brown. Wings hyaline, with a strong black spot along the costa (fig. 172). Costal index 0.76. Remigium bare. Subcostal sclerite ciliate.

Abdomen black with purplish metallic reflections. T 1 + 2 yellow on base; T 4 and T 5 with a weak row of marginals.

Material examined. Holotype ♂ Brazil, Maloquinha, near Itaituba, Pará, XI.1970. Exp. Perm. Amazônia, MZSP. (Map 1).

Discussion. This species is close to *M. pictipennis* in the wing pattern differing in having two sternopleurals and by the dense orange yellow bristles on facialia. This species is named in memory of Dr. C. H. Curran in recognition for his work on Neotropical muscoid flies.

**Mesembrinella umbrosa** Aldrich, 1922
(Figs. 58, 73 and 119) (Map 6)

*Mesembrinella umbrosa* Aldrich, 1922: 12 (holotype ♂, Tucurrique, Costa Rica, USNM); James, 1970: 4.

*Mesembrinella bicolor* Fabricius of Wulp, 1898: 305, pl. 7, fig. 18 (misident).

Male. Body length 10 to 11 mm.

Head yellow, whitish pollinose. Front at vertex 0.20 of head width. Frontalia yellow. Parafrontalia yellow, dusted with silvery pollen, at the narrowest point about 0.25 of the anterior ocellus. Antennae reddish-yellow; second segment about 0.57 length of third. Gena about 1.15 of eye height. Face yellow. Facialia with strong and short black cilia in the lower half. Palpi yellow, claviform. Occiput black, yellow pilose.

Thorax reddish-brown, dusted with testaceous pollen. Acrostichals 2:1; dorsocentrals 2:2; humerals 1; sternopleurals 3. Scutellum brownish red, dusted with testaceous pollen. Pleura orange yellow, dusted with whitish pollen. Wings hyaline, infuscated along the veins. Costal index, 0.70.

Abdomen brownish red with purplish metallic reflections. T 1 + 2 yellow, whitish pollinose. Cerci elongate, fused at base; surstyli strongly curved, slightly longer than cerci (figs. 55 and 73). Aedeagus slender, slightly curved toward apex; paraphalli widened at base, ending in a strongly curved point (fig. 112).

Female. Body length 12-13 mm.

Front at vertex 0.28 of head width. Frontalia brownish red. Parafrontalia yellow, whitish pollinose, with two pairs of strong reclinate orbitals.

This species, together with *M. pictipennis* and *M. apollinaris,* is among the largest species of this family. *M. umbrosa* is very close to *M. pictipennis* differing from this species mainly by the wing pattern.

Distribution. Costa Rica, Panama, Colombia, Ecuador and Bolivia (Map 6).

Material examined: *Costa Rica,* Caché, no locallity, H. Rogers (labelled "B. C. Americana", Dipt. II, *M. bicolor,* G. Tos ♀) (2 ♀, BM); La Palma, no data, M. Valeric (1 ♀, USNM); La Suiza de Turrialba, 9.X.1921 (1 ♂, 1 ♀, USNM). *Panama,* Chiriqui, VII.1968 (1 ♀, USNM). *Colombia,* Rio Aguacatal, w. cord. 1600 m, 20.VI.1968, Fassl (1 ♂, BM). *Ecuador,* Balzapamba, no date, R. Haensh (1 ♀, BM). *Bolivia,* no locality, O. J. Johnson "569" (labelled "*M. umbrosa* Ald".) (1 ♀, USNM).

**Mesembrinella apollinaris** Séguy, 1925
(Figs. 70, 116 and 137)

*Mesembrinella apollinaris* Séguy, 1925: 196 (lectotype ♂, Villavicencio, Colombia, MNHN).
*Mesembrinella apolinaris* Mello, 1967: 48, 54 (error); James, 1970: 4 (error).

Male. Body length 15 mm.

Head yellow, silvery pollinose. Front at vertex 0.05 of head width. Frontalia brownish red. Ocellar triangle blackish. Ocellars slender and elongate. Parafacialia yellow, silvery pollinose, at the narrowest point as wide as half anterior ocellus. Antennae brownish red; second segment about 0.57 length of third; third segment and arista dark brown. Facialia with a cluster of strong black bristles in the lower two-thirds. Face and epistoma brown. Gena light brown, about 0.08 of

eye height, silvery pollinose, covered with elongate pale hairs. Palpi clavate, dark brown. Occiput black, yellowish pollinose, covered with dense yellow hairs.

Thorax brownish red, dusted with fine whitish pollinosity. Acrostichals 2:1; dorsocentrals 3:3; humerals 3; sternopleurals 3. Scutellum brown, whitish pollinose. Legs brownish red. Middle and hind femora orange yellow on apical one-third. Wings elongate, strongly infuscated along R 1 and R 2 + 3. Costal index 0.70 and 0.80. Remigium bare; subcostal sclerite ciliate. Calypteres faintly infuscated and ciliated on margin.

Abdomen brown, with a purplish metallic reflection. Abdominal T 1 + 2 yellow on base, T 4 and T 5 with a weak row of marginals. Genitalia as in figs. 70, 116 and 137.

Female. Body length 16 to 18 mm.

Differs from male in the following characters. Front at vertex about 0.27 of head width. Frontalia brownish red. Parafrontalia blackish, dusted with whitish pollen. Proclinate orbitals absent. Antennae brownish red; second segment about 0.58 length of third.

Lectotype designation. No holotype of *Mesembrinella apollinaris* was designated by Séguy and the description was based on one male and two female syntypes (in MNHN). All the syntype series were examined and are conspecific, a male specimen has been labelled and is here designated as lectotype, the two female syntype have been labelled as paralectotype.

Material examined. *Mesembrinella apollinaris* Séguy, lectotype ♂, Villavicencio, Colombia, Fr. Apollinaire-Marie, 1924" and two paralectotypes, ♀, Susucumaco, Colombia, IX.1915, Fr. Apollinaire-Marie; Villavicencio, X.1915, Colombia, Fr. Apollinaire-Marie. (Map 5)

*M. appollinaris,* known only from the type series, shows some affinity with *M. pictipennis* but it is most easily distinguished from this species by the wing pattern and the blackish face.

**Mesembrinella pictipennis** Aldrich, 1922
(Fig. 48)

*Mesembrinella pictipennis* Aldrich, 1922: 11 (holotype ♂, Bolivia, Yungas de La Paz, BM): James, 1970: 4.

Female. Body length 15 to 17 mm.

Front at vertex about 0.26 of head width. Parafrontalia and parafacialia dusted with silvery pollen. Ocellars long and parallel. Parafrontalia with two pairs of long and slender reclinate orbitals. Antennae

orange-yellow; second segment about 0.57 length of third. Facialia with a cluster of dense short black cilia in the lower half. Gena about 0.27 of the eye height. Palpi orange. Occiput black, silvery pollinose.

Thorax brownish red, silvery pollinose. Acrostichals 2:1; dorsocentrals 2:3; intralars 1:2. Scutellum, with two pairs of laterals and one pair of apicals. Sternopleurals 3. Wings yellowish on base, strongly infuscated beyond *r-m*. Costal index 0.50. Legs reddish brown; middle and hind femora yellowish on the apical one-third.

Abdomen shining brown, with bluish-green metallic reflections. T 1 + 2 orange yellow; T 3 and T 4 with a weak row of marginals.

Distribution. Bolivia (Map 5).

Material examined. Bolivia: Rio Songo, 750 m, Fassl (2 ♀, BM); Ingavi, Coroico Road, 1400-1700 m, 2.VII.1964, B. Malkin (1 ♀, MZSP).

**Mesembrinella brunnipes** Surcouf, 1919

*Mesembrinella brunnipes* Surcouf, 1919: 78 (lectotype ♀, "Bolivia", MNHN); Aldrich, 1922: 11.

Female. Body length 10-11 mm (lectotype, 10 mm)

Head yellow, silvery pollinose. Front about 0.26 of head width. Frontalia orange to brownish red, darkened toward vertex. Ocellars one pair, fine and divergent. Reclinate orbitals well developed. Proclinate orbitals two pairs, well developed; cruciate frontals slender. Antennae orange yellow, second segment about 0.42 of third. Facialia with a cluster of short and robust bristles in the lower one-third. Gena about 0.12 of eye height, silvery pollinose, covered with sparse black cilia. Occiput yellow, yellow pollinose.

Thorax brownish red, dusted with whitish pollen. Mesonotum with pollinose stripes of white pollen in posterior view. Acrostichals 2:2; dorsocentrals 3:2; sternopleurals 3, the lowermost pair weak. Wings hyaline, strongly infuscated along costa. Costal index 0.35. Remigium bare. Subcostal sclerite ciliate. Legs brownish red, middle and hind tibiae yellow on apical half.

Abdomen yellow on base, brownish red with purplish reflection toward apex.

Lectotype designation. *Mesembrinella brunnipes* was described from three female syntypes from "Bolivia" in the MNHN. The type series received from Paris consisted of three conspecific ♀ syntypes in fair condition; one specimen is here designated as lectotype.

Lectotype ♀ "Bolivia" (no other data in MNHN). Paralectotype: two specimens, same data as lectotype (MNHN). Both lectotype and

paralectotypes bear a small square green label and an identification label in Surcouf's writing which reads *"Mesembrinella brunnipes* Surc."

Distribution. "Bolivia".

**Mesembrinella townsendi,** sp. n.
(Fig. 98)

Male. Body length 10 mm.

Head yellow, silvery pollinose. Front at vertex about 0.07 of head width. Parafrontalia at the narrowest point about 0.25 of the anterior ocellus. Ocellar triangle brown. Ocellar weak, about as long as inner verticals. Antennae yellow; second segment about 0.50 of third. Facialia yellow with several short cilia in the lower two-fifths. Gena about 0.07 of eye height. Palpi yellow and clavate. Occiput black, whitish pilose.

Thorax brown, darker on mesonotum. Acrostichals 2:3; dorsocentrals 3:3. Humeral calli orange yellow. Pleura orange. Scutellum brown, whitish pollinose. Sternopleura, hypopleura, pteropleura and postscutellum reddish. Wings hyaline with a black spot along the costa. Costal index 0.23. Remigium bare; subcostal sclerite ciliate. Legs black; tibiae and tarsi brownish red.

Abdomen with T 1 + 2 yellowish on base; T 3 and T 5 brownish red with bluish to purplish metallic reflection. Cerci and surstyli as in *M. bellardiana bellardiana;* aedeagus as in fig. 98.

Female. Body length 11 to 12 mm.

Differs from male in the following. Front at vertex 0.26 of head width. Frontalia brownish red. Ocellar triangle with a triangular black spot anteriorly. Parafrontalia yellow, with two pairs of reclinate orbitals. Parafacialia and face yellow, whitish pollinose.

Holotype ♂ Peru. *Puno*: Fundo Chela, 110 m, 4.VI.1964, J. Schunke (BM). Paratypes: Peru, *Loreto*: Boquerón, 500 m, 7-14.VII.1965, J. Schunke (1 ♀, LACM); idem, over Monzon River, 260 m, 10.VI.1964, J. Schunke (1 ♂, 1 ♀, BM); idem, Previsto, 900 m, 26.VI.1965, J. Schunke (2 ♀, BM).

This species is very close to *M. brunnipes,* differing from this species mainly by the yellow femora.

**Mesembrinella bicolor** (Fabricius, 1805)
(Figs. 5, 6, 68, 76, 108, 114, 136, and 171)

*Musca bicolor* Fabricius, 1805: 201 (holotype ♀, "America meridionalis", Copenhagen); Wiedemann, 1830: 392.

*Calliphora socors* Walker, 1861: 331 (holotype ♂, Mexico, BM).

*Leptoda bicolor;* Brauer & Bergenstamm, 1891: 406.

*Ochromyia bicolor;* Surcof, 1919: 10, pl. 3, fig. 6 (study of Fabricius type).

*Mesembrinella bicolor* Giglio-Tos, 1893: 4 (syntypes ♂, ♀, Mexico. In Torino); 1895: 11; Surcouf, 1919: 76, pl. 3, fig. 17 (study of Giglio-Tos type); Aldrich, 1922: 13; 1925: 11; Engel, 1931: 135; Townsend, 1931: 69 (study of Fabricius' type); Mello, 1967: 68, fig. 10, 26, 232-249; James, 1970: 4.

*Mesembrinella aeneiventris;* Wulp, 1896: 301, pl. 7, fig. 19.

*Mesembrinella transposita* Séguy, 1925: 196 (holotype ♂, Guyana, MNHN). *N. Syn.*

*Huascaromusca bicolor;* Hall, 1948: 69, pl. 8, fig. 3, pl. 11, figs. A-C, pl. 32, figs. A-C.

Male. Body length 8-9 mm.

Head yellow, silvery pollinose (fig. 6). Front at vertex 0.03 to 0.25 of head width. Frontalia orange-yellow. Ocellar triangle brown. Ocellars well developed, as long as inner verticals. Parafrontalia yellow, silvery pollinose, at the narrowest point as wide as anterior ocellus. Antennae orange; second segment about 0.43-0.50 length of third. Face yellow, whitish pollinose. Facialia with a cluster of short bristles in the lower one-third. Gena yellow, about 0.09-0.10 of eye height, covered with sparse black cilia. Palpi clavate, yellow to orange yellow.

Thorax testaceous and yellow on sides. Acrostichals 2:2; dorsocentrals 3:3; humerals 3; post humerals absent; sternopleurals 3. Scutellum testaceous, dusted with whitish pollen. Wings hyaline, faintly infuscated on costa (fig. 171). Costal index, 0.23-0.29. Remigium and subcostal sclerite bare. Legs yellow, middle and hind tibiae brownish red.

Abdomen bluish to green, purplish metallic, except T 1 + 2 which is yellow; T 1 + 2 and T 3 whitish pollinose. Cerci strong and fused in the middle area ending in lateral view in a slightly curved point; surstyli strongly curved, a little longer than cerci (Figs. 69 and 76). Epiphallus short and widened basally, about as long as phallobasis; paraphalli ending in a slightly curved point (Figs. 108, 114 and 136).

Female. Body length 10-12 mm.

Differs from male in the following characters. Front at vertex 0.26 of head width; ocellars proclinate and divergent, longer than inner verticals. Parafrontalia with two pairs of reclinate orbitals. Gena about 0.12 of eye height (fig. 5). Spermathecae with widened duct at base, tapering toward capsule; capsule enlarged at base, tapering to apex in a long and slender tubular structure.

*M. bicolor* is the most common species of genus *Mesembrinella*, being practically found in almost all area of distribution of the family. The type specimen, a female labelled "ex Amer. mer., Schmidt" in Copenhagen was studied by Townsend (1931: 69) who presented a detailed description. According to Papavero (1971), Schmidt (or Smidt) a collector mentioned by Fabricius, collected at various places in the Antilles and also in Demerara, Guyana. Almost certainly the type specimen was collected in this latter locality since this species does not occur in the Antilles.

*Mesembrinella bicolor* Giglio-Tos is a synonym, according to a syntype from Playa Vicente, Mexico, found in the material received from Paris to study. *Mesembrinella transposita* Séguy was also sunk in synonymy after the examination of Séguy's types received for study.

Distribution: Mexico to Panama. South America, except Chile and S. Argentina. (Map 4).

Material examined: Mexico, Tapachula, 17-19.VIII.1943, F. M. Snyder (1 ♂, USNM); North Yucatan, no date, Gaumer (1 ♂, USNM); Playa Vicente, no date, Sallé (MNHN), (syntype ♂, *Mesembrinella bicolor* Giglio-Tos); Tehuantepec, no date, Sumichrast (1 ♀, USNM); Cafetal, Concordia, 30.III.1933, E. V. Morton & Makinius (1 ♀, USNM). Guatemala, La Providencia, Opispo, no date, J. M. Aldrich (1 ♂, 2 ♀, USNM). Honduras, Danli, 1-3.I.1958, Banegas (1 ♀, USNM). El Salvador, Quezaltepeque, 500 m, 19.VI.1963, D. Q. Cavagnaro & M. W. Irwin (1 ♀, CAS); San Salvador, no date and collector (1 ♂, USNM); Santa Tecla, 3.II.1954, P. A. Berry (1 ♂, USNM). Costa Rica, Higuito, San Mateo, no date, Pablo Schild (1 ♂, 1 ♀, USNM); Golfito, 4.VII.1957, A. Manke (17 ♂, 8 ♀, LACM); La Suiza de Turrialba, 10.X.1921. Pablo Schild (1 ♀, USNM); "Costa Rica", Paul Serre (9 ♂, 1 ♀, MNHN). Panama, Canal Zone, Barro Colorado, I.X.1939, Zetek (9 ♂, 12 ♀, USNM); El Cernero, I.1940, Zetek (5 ♂, USNM); Fort Sherman, IX.1923, R. C. Shannon (3 ♂, 2 ♀, USNM); Canal Zone, Barro Colorado, 1-27.IV. 1956, C. W. & M. E. Rettenmayer (2 ♂, USNM); Canal Zone, Gatún, no date, J. H. Jenning (2 ♀, USNM); David, 6.VI.1943, F. M. Snyder (1 ♂, USNM); Darien, Santa Fé, 17.IV.1965, no collector (1 ♀, CAS). Colombia, Rio Aguacatal, W. cord. 2.800 m, 15.VII.1908, Fassl (1 ♀, BM); Buenaventura, no date, C. L. Fagan (1 ♀, USNM). Venezuela, no date and collector (Holotype ♂, *Mesembrinella transposita* Séguy, MNHN); no date and collector (1 ♀, BM); San Esteban, Falcon, 1-6.I. 1940, P. Anduze (1 ♂, 2 ♀, USNM). Trinidad, no date, W. Bathn. (2 ♂, BM); idem, no date, E. E. Connel (1 ♀, BM); Arima Valley, North Range, 1000-1500 ft., 10.III.1964, 14-19.XII.1970 (3 ♂, 13 ♀, CAS). Guyana, Bartica, 6-12.IV.1901, H. S. Parish (3 ♂, 5 ♀, USNM). French Guiana, Cayenne, no date, W. M. Schaus (1 ♀, MNHN); Kourou, no date and collector (Paratype ♂, *M. transposita* Séguy, MNHN). Ecuador, Los Rios, Vic. Quebrada, III-IV.1955, E. N. O. Rourke (1 ♀, USNM). Peru, Cusco, Avispas, no date, L. E. Peña (1 ♀, MZSP); Loreto, Boquerón, 500 m, VII.1965, J. Schunke (1 ♀, LACM). Bolivia, Huachi, Obis-

po, 15.IV.1926, J. M. Aldrich (1 ♀, USNM); idem, IX.1921, Mann (1 ♀, USNM). Brazil, *Amazonas*: Rio Preto da Eva, 13-15.IV.1967 (1 ♂, MZSP); Ilha Grande do Soriana, X.1969, Exp. Perm. Amaz. (1 ♀, MZSP); Urucurituba, Rio Tapajós, III.1920, C. H. T. Townsend (1 ♂, 1 ♀, USNM); Ilha Marajó, no date and collector (4 ♂, 1 ♀, USNM); Carvoeiro, 5.II.1972, Exp. Perm. Amaz. (8 ♂, 14 ♀, MZSP). *Pará*: Lago Jacaré, Rio Trombetas, X.1969, Exp. Perm. Amaz. (1 ♀, MZSP); Jabuti, IV.1924, E. X. Williams (1 ♀, USNM); Óbidos, Colônia Rio Branco, IX.1953, F. M. Oliveira (2 ♀, MZSP); Barreirinha, Rio Tapajós, X-XI.1970, Exp. Perm. Amaz. (4 ♂, 14 ♀, MZSP); Maloquinha, near Itaituba, XI.1970, Exp. Perm. Amaz. (4 ♂, 14♀, MZSP); Piratuba, 26.IX.1938, no collector (1 ♀, MZSP); As Pedras, Rio Cuminá-Mirim, IX-X.1969, Exp. Perm. Amaz. (2 ♂, 5 ♀, MZSP); Santarém, Faz. Taperinha, XI.1969, Exp. Perm. Amaz. (4 ♂, 2 ♀, MZSP); Belém, Utinga, VII.1963, Almeida (1 ♀, MZSP); Aurá, VIII.1940, Mangabeira (2 ♀, MZSP). *Maranhão*: São Luís, I.1935, Fiqueme (1 ♀, MZSP). *Pernambuco*: Vicência, Água Azul, 5.VI.1971, Exp. ABC-MZSP (65 ♀, 47 ♂, MZSP). *Mato Grosso*: Salobra, 21-27.I.1941, J. de Amico (1 ♀, MZSP); Utiariti, Rio Papagaio, X-XI.1966, Lenko & Pereira (19 ♂, 31 ♀, MZSP); Base Camp. 10-28.III.1968, B. E. Freeman (1 ♀, BM); Maracaju, III.1937, R. C. Shannon (16 ♀, 18 ♂, USNM). *Goiás*: Tupirama, IV.1965, L. Gomes (1 ♀, MZSP); Cabeceiras, 26-28.X.1964, Exp. Perm. Amaz. (3 ♀, MZSP). *Bahia*: Itamaraju, II.1971, P. C. Elias (5 ♂, 6 ♀, MZSP); Prado, II.1971, P. C. Elias (1 ♀, MZSP). *Minas Gerais*: Buritis, Ribeirão Confins, 29-31.X.1964. *Rio de Janeiro*: Tinguá, V.1940, R. C. Shannon (1 ♀, USNM). *São Paulo*: Cajuru, Cássia dos Coqueiros, IX.1954, M. P. Barretto (5 ♂, 1 ♀, MZSP); Porto Cabral, Rio Paraná, 20-31.III.1914, Travassos Filho, Carrera & Dente (2 ♂, 5 ♀, MZSP). Paraguay: San Bernardino, XII.1929, K. Fiebrig (1 ♀, USNM).

### **Mesembrinella flavicrura** Aldrich, 1925
(Fig. 97)

*Mesembrinella flavicrura* Aldrich, 1925: 16 (holotype ♂, La Suiza de Turrialba, Costa Rica, USNM).

*Huascaromusca flavicrura;* Hall, 1948: 75 (redescription); James, 1970: 4.

Male. Body length 7 to 8 mm.

Head orange yellow, whitish pollinose. Front at vertex about 0.20 of head width. Parafrontalia yellow, about 0.50 of anterior ocellus; inner verticals long and decussate; outer verticals weakly differentiated from postocular row. Antennae yellow; second segment about 0.33 length of third. Arista brown. Vibrissae well above the epistoma. Facialia with three to four small black bristles above vibrissae. Palpi yellow, clavate. Gena orange, about 0.06 to 0.08 of eye height, covered with black clothing hairs.

Thorax black with bluish metallic reflections. Mesonotum with fine whitish pollen. Acrostichals 2:1. Pleura brown, dusted with fine whitish pollen. Propleura, prosternum and humeral calli orange yellow. Wings hyaline, faintly infuscated; remigium and subcostal sclerite bare. Costal index 0.24. Calypteres hyaline, brownish on borders. Femora yellow, tinged with brown dorsally on the apical one-fourth.

Abdomen brown with bluish metallic reflection. T 4 with a row of erect marginals. T 5 with fine and elongated hairs. Aedegus about 0.50 of phallobasis length; paraphalli about twice as long as phallobasis (fig. 97); epiphallus short.

Female. Body length 7 to 8 mm.

Differs from male in the following characters. Front at vertex about 0.24 of head width, darkened toward apex; inner verticals strong and weakly decussate; outer verticals divergent, slightly stouter than ocellars. Proclinate orbitals, two pairs. Gena 0.09 to 0.10 of eye height.

This species is very close to *xanthorrhina* Bigot, differing by the humeral calli and orange yellow femora.

Distribution. Costa Rica, Panama.

Material examined: Costa Rica: La Suiza de Turrialba, 8.II.1923, P. Schild (1 ♂, paratype, *M. flavicrura,* USNM); idem, (1 ♀, paratype, *M. flavicrura,* USNM). Panama: El Valle, Coclé, 2500 ft, 20.V.1939 (1 ♀, USNM).

**Mesembrinella xanthorrhina** (Bigot, 1887)

*Calliphora xanthorrhina* Bigot, 1887a: clxxx. (lectotype ♀, "Mexico", Brauer, 1899: 32; Aldrich, 1922: 23.

*Somomyia xanthorrhina;* Bigot, 1887b: 602.

*Mesembrinella spicata* Aldrich, 1925: 13 (holotype ♂, La Suiza de Turrialba, Costa Rica, USNM); James, 1970: 4. *Syn. N.*

*Huascaromusca spicata;* Hall, 1948: 79.

Female. Body length 8.3 to 10.0 mm.

Front at vertex 0.13 of head width. Head orange yellow, dusted with orange yellow pollen. Frontalia reddish, darkened on upper half. Parafrontalia with two pairs of strong proclinate orbitals. Ocellars long, divergent, almost as long as inner verticals. Antennae orange; second segment about 0.40 length of third. Facialia with 3 to 4 black cilia above the vibrissae. Gena yellow, about 0.11 of eye height, dusted with pollen and covered with orange yellow hairs on posterior half. Face yellow, dusted with yellowish pollen. Palpi yellow. Occiput black, whitish pollinose, covered with yellow hairs.

Thorax black to dark brown with bluish metallic reflection. Mesonotum dusted with fine whitish pollen, without distinct vittae. Acrostichals, 2:1; dorsocentrals, 2:3; humeral cali yellow pilose anteriorly. Sternopleurals 2 to 3. Wings subhyaline faintly infuscated along costa and around *r-m*. Costal index 0.23. Legs black. Lower calypteres white, dark brown on margins.

Abdomen dark brown to black with purplish metallic reflections, dusted with fine whitish pollinosity. T 4 and T 5 with a row of marginals.

Distribution. Panama, Mexico.

Material examined. Panama, El Valle, Coclé, 2.500 ft. 20.V.1939 (1 ♀, USNM); Lectotype and paralectotype ♀, "Mexico". (In Oxford, Hope University Museum, Oxford).

The type of *Calliphora xanthorrhina* Bigot was recently located in the collection of Hope University Museum, Oxford, by Dr. Pont and has been loaned to study through the kindness of Dr. Taylor. Bigot (1887: 602) mentions five syntypes from "Mexico" but the material received from Oxford consisted of two conspecific females in fair condition, moderately molded and labelled *"C. xanthorrhina* ♀, *Somomyia*, Mexique, J. Bigot" in Bigot's label and "Brauer, Wien, CVIII, No. 230". One specimen was labelled and here designated as lectotype.

This species is certainly the female of *spicata* Aldrich from which the description agrees in detail.

### EUMESEMBRINELLINI TRIB. N.

Diagnosis. Mesembrinellinae with the following combination of characters. Humeral calli with three distinguishable setae; sternopleurals 2 to 3.

### ALBUQUERQUEINA, SUBTRIB. N.

Diagnosis. Male with dichoptic head; cruciate frontalia present; reclinate orbitals absent in females. Remigium and subcostal sclerite bristled.

### Genus **Albuquerquea** Mello

*Albuquerquea* Mello, 1967: 10. Type-species, *Albuquerquea latifrons*, orig. des.; James, 1970: 2.

Diagnosis. Small to medium sized species (7 to 11 mm). Front broad in both sexes. Cruciate at level of vertex of ocellar triangle. Reclinate orbitals absent in females. Remigium and subcostal sclerite bristled. Spermathecae of type C. Larva I with labial sclerite long not pointed at apex (group A).

**Albuquerquea latifrons** Mello, 1967
(Figs. 42, 89, 94, 120, 142, 163 and 181). (Map 8).

*Albuquerquea latifrons* Mello, 1967: 10, figs. 2, 13, 46-61. (Holotype ♂, Petrópolis, Rio de Janeiro, Brazil); James, 1970: 2.

Male. Body length, 7-11 mm.

Head yellow, golden pollinose, reddish brown on vertex. Front at vertex 0.19-0.22 of head width. Frontalia wide, yellow in ground color, brownish red toward apex. Frontalia with a pair of strong cruciate at level of ocellar triangle. Ocellar triangle brown. Occiput brown, covered with long yellow hairs (fig. 42); ocellars as long as outer verticals; inner verticals long, decussate and reclinate. Parafrontalia about half of frontalia width. Antennae yellowish; second segment about 0.25 length of third. Gena covered with long yellow hairs, about 0.72 of eye height. Palpi yellow, clavate.

Thorax yellow. Mesonotum reddish-brown. Acrostichals, 2:1 to 3:1; dorsocentrals, 2:3; intraalars, 2:2; humerals, 3; sternopleurals, 2. Hypopleura with a row of elongate cilia. Scutellum with two pairs of laterals, one pair of discals and apicals. Wings hyaline, with elongate black spot along the costal border. Remigium and subcostal sclerite ciliate. Calypteres weakly infuscated, bordered with pale hairs.

Abdomen with T 1 + 2 to T 4 yellow, T 5 brown with blue to purplish reflections. T 3 with erect marginals row, sternite 1 to 4 yellow, with elongated bristles on posterior end. Cerci robust, pointed at apex, fused in the upper half; surstyli strongly curved (fig. 89, 94); epiphallus curved and elongated, almost twice as long as basiphallus; paraphallus twice as long as basiphallus (fig. 126).

Female. Body lenght 7 to 11 mm.

Differs from male in the following characteres: Front about 0.27 of head width. Antennae with second segment about 0.23 length of third. Gena about 0.86 of eye height. Spermathecae as in fig. 142.

Larva I. Length 9 mm; width, 1,5 mm.

Similar to *M. bellardiana*, differing mainly by the shape of buccopharyngeal sclerite. Labial sclerite slightly curved in lateral view, rounded on apical end; hypostomal sclerite subtriangular in shape; dentate sclerite well differentiated and situated below the labial sclerite; pharyngeal sclerite with the dorsal and ventral wings hyaline, not well differentiated (fig. 163).

This species has been recorded so far along the rain forest of the Brazilian Atlantic coast between Rio de Janeiro and São Paulo. This is the smallest Mesembrinellidae species and differs from all other species of this family in presenting dichoptic head in males and cruciate frontals in both sexes.

Distribution. Brazil (Rio de Janeiro, São Paulo). (Map 8).

Material examined. Brazil. *Rio de Janeiro*: Muri, Nova Friburgo, 2.IV. 1972, VII.1965, J. H. Guimarães (2 ♂, 2 ♀, MZSP); Rio de Janeiro, IV.1938, R. C. Shannon (4 ♀, USNM). *São Paulo*: Salesópolis, Estação Biológica de Boracéia, 8.XI.1971, 25.III.1972, J. H. Guimarães (3 ♂, 1 ♀, MZSP); idem, 6.VII.1967, Travassos F.º & Kuhlmann (1 ♀, MZSP).

EUMESEMBRINELLINA, SUBTR. N.

Diagnosis. Males with holoptic heads; acrostichals 0:1; larva I with the labial and hypostomal sclerites fused; remigium bare.

## Genus **Eumesembrinella** Townsend, 1931

*Eumesembrinella* Towsend, 1931: 69. Type-species, *Musca quadrilineata* Fabricius, 1805, by monotypy; Townsend, 1935: 146; 1937: 65; Mello, 1967: 14 (key to species); James, 1970: 2.

Diagnosis. Medium sized species (8.5-12 mm). Acrostichals, 0:1. Post humerals absent to vestigial. Remigium and subcostal sclerites bare. Aedeagus with large and expanded ventralia; paraphallus strong, ending in three acute points at apex. Larva I with labial sclerite long and robust with round and divergent apex; hypostomal sclerite strongly fused with labial sclerite.

Discussion. In this genus only a small number of species is known, distributed mainly in northern South America (Amazon, Guyana and Venezuela) and not occurring in Central America.

Key to species of *Eumesembrinella* Townsend

1. Wings with a strong longitudinal dark spot along the costa .... 2
   Wings hyaline, without black patterns ..... *benoisti*
2. Abdominal T 1 + 2 to T 4 with distinct bluish purple stripe ..... *cyaneicincta*
   Abdominal T 1 + 2 to T 4 without distinct bluish purple stripe .. 3
3. Abdominal T 4 with a row of marginals; post humerals absent .... *quadrilineata*
   Abdominal T 4 without distinguishable marginals row; post humerals normal to vestigial ..... *randa*

### **Eumesembrinella quadrilineata** (Fabricius, 1805)

(Figs. 17, 18, 47, 48, 63, 72, 102, 120 and 141) (Map 6)

*Musca quadrilineata* Fabricius, 1805: 286 (holotype ♀, "America meridionalis").

*Mesembrina quadrilineata;* Wiedemann, 1830: 347.

*Mesembrinella quadrilineata;* Aldrich, 1922: 19.

*Ochromyia flavipennis* Macquart, 1843: 391 (1843: 143), (holotype ♀, Pará, Brazil, MNHN); Surcouf, 1919: 65, pl. 3, fig. 4 (Macquart's type redescription); Villeneuve, 1920: 224.

*Mesembrinella dorsimacula* Aldrich, 1922: 20 (holotype ♂, "Brazil", USNM). *Syn. N.*

*Eumesembrinella quadrilineata;* Townsend, 1931: 69, Mello, 1967: 16; James, 1970: 2.

Male. Body length 11 to 12 mm.

Head orange yellow, dusted with yellow pollen, darkened on vertex. Front at vertex about 0.14-0.16 of head width. Frontalia yellow, darkened toward vertex. Parafrontalia at the narrowest point about 1.5 wider than anterior ocellus. Parafrontalia with 8 to 12 frontals. Antennae orange yellow; second segment about 0.33 length of third; arista dark. Gena with an irregular row of black bristles and rare black hairs; gena about 0.16 of head height. Palpi yellow. Occiput black, covered with yellow hairs (fig. 48).

Thorax darkened on dorsum, yellowish on sides and dusted with whitish pollen. Mesonotum with four longitudinal stripes of white pollen on anterior half of prescutum, humeral calli and supraalar calli orange yellow. Wings hyaline with a longitudinal black spot on costal border at level of R 1 and R 2 + 3. Costal index 0.16 to 0.20. Legs yellow. Medium and hind tibiae darkened.

Abdomen predominantly yellow in ground color: T 4 and T 5 metallic greenish, bluish green to purplish, with a row of marginals. Cerci subtriangular in ventral view; surstyli strongly curved and about as long as cerci (Figs. 63 and 72). Epiphallus slightly curved, a little longer than phallosoma, ending in three short spines (fig. 102).

Female. Body length 11 to 12 mm.

Differs from male in the following characters. Front about 0.27 to 0.28 of head width. Frontalia brownish-red. Parafrontalia yellow, orange yellow pollinose, with a pair of reclinate orbitals. Gena about 0.7 to 0.18 of eye height (Fig. 47). Abdomen with T 1 + 2 to T 3 yellow; T 4 predominantly shining black, yellowish on sides; T 5 shining black, dorsally with metallic purplish to bluish green reflections. Spermathecae with hyaline ducts and with circular constrictions near base; capsule pigmented, in a shape of long, filiform and strongly ringed tube (fig. 141).

Larva I. Length 11-12 mm; width, 2.5-3.0 mm.

Musciform. Metapneustic. Integument whitish with twelve well differentiated segments and covered with small hyaline scales. Bucco-

pharyngeal sclerite strong and deeply sclerotized. Labial sclerite long and spathulated, strongly fused with the hypostomal sclerite; hypostomal sclerite fused with pharyngeal sclerite (figs. 17 and 18). Anal area with the dorsal and ventral tubercles not well differentiated. Spiracular plate with two partially fused slits.

The type species, *Musca quadrilineata* Fabricius (Holotype ♀, allotype ♂ in Copenhagen) labelled "ex Am. mer. Schmidt" was redescribed by Townsend (1931: 69) and designated as type-species of *Eumesembrinella* Townsend. In erecting the genus *Mesembrinella,* Giglio-Tos (1893) designated *Musca quadrilineata* Fabricius as type-species; however his *quadrilineata* was a misidentification; Aldrich (1922) redescribed *Musca quadrilineata* Giglio-Tos (*nec* Fabricius) as *Mesembolia bellardiana.*

*Mesembrinella dorsimaculata* Aldrich, according to a specimen compared by myself with *M. dorsimacula* type in Washington, is identical with *M. quadrilineata* and the new synonymy is here formally established.

*Eumesembrinella quadrilineata* occurs in almost all the Amazon valley; the procedence "ex Am. mer., Schmidt" probably refers to Guyana (see Papavero, 1971a: 21).

Distribution: Guyana, French Guyana, Brazil (Amazonas, Pará, Maranhão and Mato Grosso), Peru and Bolivia.

Material examined. Venezuela, Cauca Valley, without data and collector (1 ♂, MNHN). Bolivia, Huachi, XI.1921, Mann (1 ♀, USNM); Tumupasa, XII.1922, W. N. Mann (1 ♂, MNHN). Peru, over Monzon River, 860 m, 19.VI.1964, J. Schunke (1 ♂, BM); Iquitos, no date, H. Bassler (1 ♂, 1 ♀, AMNH); Satipo, no date, and collector (1 ♀, USNM); Loreto, Neshuya, 240 m, 25-28.XI.1964, J. Schunke (4 ♀, LACM); Pucallpa, 23.IV.1965, J. Schunke (1 ♀, LACM); Rio Tapiche, III.1928, H. Bassler (1 ♀, AMNH). Guyana, Bartica, Kartabo, III.1924, 13.III.1924, 4.IV.1924, 24.III.1924, 25.III.1924. Trop. Res. Stat. (3 ♂, 2 ♀, AMNH); idem, Kaieteur, 14.VIII.1911, 4.I.1924. Trop. Res. Stat. (2 ♀, AMNH). French Guiana, XI.1914, R. Benoist (4 ♂, 2 ♀, AMNH). Brazil. *Amazonas*: Tefé, 2.X., C. H. Townsend (1 ♀, USNM); Manacapuru, VIII.1963, Worontzov (1 ♀, USNM); Maués, XII.1936, no collector date (1 ♀, MZSP); Rio Aripuanã, Prainha, 6.X.1971, J. L. Silva (3 ♀, MZSP); Manaus, 3.XI.1962, K. Lenko (1 ♂, 2 ♀, MZSP); idem, 7.VIII.1964, A. Parko (1 ♀, MZSP); Óbidos, 27-31.XII.1952, P. A. Teles (1 ♀, MZSP); As Pedras, Rio Cuminá-Mirim, IX-X.1969, Exp. Perm. Amaz. (3 ♂, 4 ♀, MZSP); Santarém, Faz. Taperinha, 29.XII. 1967; 9.I.1968; X-XI.1970. Exp. Perm. Amaz. (9 ♂, 3 ♀, MZSP); Santana dos Macacos, IX.1969, Exp. Perm. Amaz. (2 ♂, 1 ♀, MZSP); Oriximiná, Rio Trombetas, X.1969, Exp. Perm. Amaz. (2 ♀, MZSP); Coraci, 15 km NW Canindé, Rio Gurupi, 27.IV.1963, B. Malkin (1 ♂, 6 ♀, MZSP); Jabuti, VI.1964, F. X. Williams (1 ♂, USNM); Boa Vista, Rio Tapajós, Fordlândia, James Camp, VIII.1931, C. H. T. Townsend (2 ♀, USNM). *Maranhão*: Igarapé Gurupi-Una, Aldeia Araçu, 50 km E of Canindé, V.1963, B. Malkin (1 ♂, 2 ♀, MZSP).

**Eumesembrinella benoisti** (Séguy, 1925), comb. n.
(Figs. 59-90, 113, 158 and 159)

*Ochromyia benoisti* Séguy, 1925: 196 (holotype ♂, French Guiana, MNHN).
*Mesembrinella incompleta* Curran, 1934: 470 (Holotype ♂, Kartabo, Guyana, AMNH); James, 1970: 2. *Syn. N.*
*Eumesembrinella lanei* Mello, 1967: 26 (Holotype ♂, Amapá, Serra do Navio, Brazil). *Syn. N.*

Male. Body length 11 to 12 mm.

Head yellow, silvery pollinose. Front about 0.16 to 0.18 of head width. Parafrontalia yellow, black near vertex, whitish pollinose. Parafrontalia at the narrowest point about as wide as anterior ocellus. Ocellar triangle blackish; ocellar bristles long and parallel. Occiput black, yellow pollinose, covered with long yellow hairs. Antennae orange yellow; second segment about 0.41 to 0.43 of third. Arista brown to black, yellowish on base. Facialia yellow, dusted with whitish pollen, with few black bristles above vibrissae. Cheeks covered with long black bristles and few black hairs, about 0.80 of head height. Palpi orange yellow.

Thorax orange to reddish-brown, yellow on sides, dusted with whitish pollen. Mesonotum with a dark brown median vitta and four orange yellow vittae. Acrostichals 0:1, dorsocentrals 2:3; post humeral absent; humerals 2. Scutellum reddish brown. Wings hyaline; remigium and subcostal sclerite bare. Costal index, 0.15. Legs yellow to orange. Front and hind tibiae brownish.

Abdomen brownish red with greenish to bluish-green reflections; T 1 + 2 to T 3 yellow. T 2 to T 4 with long lateromarginal bristles; T 5 with an irregular row of weak marginals. Cerci triangular in posterior view, ending in a pointed apex; surstyli weakly curved at apex (figs. 59 and 90). Aedeagus as in fig. 113.

Female. Total length 11 to 11.5 mm.

Differs from male in the following characters. Frontalia brown at vertex, yellowish toward bases of antennae. Front about 0.27 of head width. Ocellar triangle black. Parafrontalia reddish, silvery pollinose, with two well developed proclinate orbitals. Gena about 0.12 of head height. Abdomen brown in ground color with green to bluish reflections. Abdominal T 1 +2 to T 3 yellow.

Larva I. Length 10.5 mm; width 2.2 mm.

Very similar to those of *E. quadrilineata,* differing mostly in the shape of buccopharyngeal sclerite. Labial, hypostomal and pharyngeal sclerites fused; labial sclerite strongly spathulate, rounded at apex; pharyngeal sclerite with the dorsal and ventral wings hyaline (figs. 158 and 159).

The type-specimen of *Ochromyia benoisti* Surcouf received for study from Paris is a male labelled "*Ochromyia benoisti* Séguy, Type" in Séguy's handwriting and a green printed label "Muséum de Paris — Guiane Française — Oyac Conti, Cacao Brief-R. Benoist, 1914". *Eumesembrinella incompleta* Curran from Guyana and *Eumesembrinella lanei* from Amapá, Serra do Navio, Brazil are conspecific.

Distribution. Northern South America (Venezuela, French Guiana, Guyana) and Brazil (Amazonas, Pará and Amapá) (Map 7).

Material examined. Venezuela, Alto Orinoco, Salto de Las Acadencias, 1.X.1951, Exp. Fco. Ven. (1 ♀, USNM); Guyana, Bartica, Kartabo, 26.III.1924 (paratype ♀, of *Mesembrinella incompleta* Curran, AMNH); idem, 19.VI.1920 (1 ♀, CAS); Kalacoon, 1916 (1 ♀, CAS); New River, 750 ft., I-II/15.III.1938, C. A. Hudson (1 ♀, BM); Kaieteur, 6.VII. 1911, no collector data (2 ♀, USNM); Tukeit, 20.VII.1911, no collector data (1 ♀, USNM); Kutari, I/10.1936, C. A. Hudson (1 ♀, USNM); Charvein, II.1914, R. Benoist (2 ♀, MNHN); Oyac-Conti, Cacao Bief, IX.1914, R. Benoist (Holotype ♂, *Mesembrinella benoisti* Séguy, MNHN); Brazil. *Amazonas*: Manaus, 3.XI.1962, K. Lenko (1 ♀, MZSP); Serra da Neblina, Rio Tucano, 230 m, 4.XII.1965, E. Dente (1 ♀, MZSP); Pará: As Pedras, Rio Cuminá-Mirim, IX-X-1959, Exp. Perm. Amaz. (4 ♂, 6 ♀, MZSP). *Amapá*: Macapá, VI.1948, N. L. Cerqueira (paratype ♂, *Eumesembrinella lanei* Mello, MZSP); Serra do Navio, 15.IX. 1957; X.1967, J. Lane (4 ♀ paratypes, *E. lanei* Mello, MZSP).

**Eumesembrinella cyaneicincta** (Surcouf, 1919), comb. n.

*Ochromyia cyaneicincta* Surcouf, 1919: 69 (Holotype ♀, "Brazil, MNHN).

Description. See under subspecies below.

This species seems to be represented by two morphologically distinguishable but partly overlapping populations, one mainly centered in the Amazonas and Pará (Santarém) in which the post humeral is absent or vestigial, and the other occurring along the Brazilian Atlantic coast (from Bahia to Rio de Janeiro) in which the post humeral is always present and well developed. Such character and other enable almost all specimens of both sexes to be separated without difficulty, and since there appears to be associated geographically, two subspecies of *C. cyaneicincta* are here recognized. Surcouf's name *pauciseta* is available for the subspecies with post humerals absent. Both forms are not distinguished by the genitalia characters alone. The two subspecies are separated by the following key:

Key to subspecies of *Eumesembrinella cyaneicincta*

1. Post humeral bristle normal in size. Male middle femora and tibia measuring about 7.0 to 7.5 mm; tibia mainly orange to reddish in ground color ..... *cyaneicincta cyaneicincta*

Post humeral bristle absent or vestigial. Male middle femora and tibia about 4.5 to 5.5 mm, tibia mainly black in ground color ..... *cyaneicincta pauciseta*

**Eumesembrinella cyaneicincta cyaneicincta** (Surcouf, 1919)
(Figs. 86, 131, 166 and 167

*Ochromyia cyaneicincta* Surcouf, 1919: 69 (Holotype ♀, Brazil, MNHN).

Male. Body length, 10-12 mm.

Head yellow, silvery pollinose. Front about 0.10 to 0.12 of head width. Parafrontalia dark on upper part, slightly wider than anterior ocellus on the narrowest point. Frontals about 8 in number. Antennae orange yellow; second segment about 0.27 of third. Arista brown. Facialia yellow, dusted with whitish pollen and densely covered with bristles on basal 1/5. Gena about 0.08 to 0.09 of head width with a series of elongate bristles. Palpi yellow and clavate. Occiput black, dusted with whitish pollen and covered with sparse yellow hairs.

Thorax brownish-red on dorsum, dusted with white pollinosity; sides of thorax mainly dark brown. Wings hyaline, faintly infuscated along the costal border between R 1 to R 2 + 3; *r-m* encircled by a dark spot. Costal index about 0.27-0.28. Legs yellow; middle and hind tibiae elongated (about 7.0 to 7.5 mm), reddish brown in ground color.

Abdomen brown, dusted with whitish to bluish-green, with a distinct violet stripe on posterior margin. Cerci enlarged basally, tapering toward apex: surstyli strongly curved; epiphallus weakly curved, sligthly longer than phallobasis, paraphalli curved and ending in three pointed spines; hypophallus covered with strong spines (fig. 131).

Female. Body length 11 to 11.5 mm.

Differs from male in the following characters. Frontalia dark--reddish, orange yellow toward antennae. Front at vertex about 0.27 of head width. Parafrontalia yellow, dusted with orange-yellow pollen. Ocellar triangle black. Ocellars proclinate and divergent. Gena about 0.08 to 0.12 of eye height. Abdomen metallic green to bluish green. T 1 + 2 to T 3 yellowish. Spermathecae with short slender ducts, capsule strongly folded at base and tapering toward apex in a long, slender and folded tube.

Larva I. Length 11 mm; width 2.3 mm.

Externally very similar to *E. quadrilineata,* differing mainly in the shape of buccopharyngeal sclerite. All sclerites fused together; pharyngeal sclerite with dorsal and ventral hyaline wings (Figs. 166-167).

Distribution. Brazil (Bahia, Espírito Santo, Rio de Janeiro) (Map 6).

Material examined: "Brazil", no other data (holotype ♀, *Ochromyia cyaneiventris,* MNHN), Brazil. *Bahia*: Mucuri, II.1971, P. C. Elias (2 ♂,

14 ♀, MZSP); Alcobaça, II.1971, P. C. Elias (1 ♂, MZSP); Itamaraju, II.1971, P. C. Elias (1 ♀, MZSP); Rio Curiripe, 22.VIII.1920, R. C. Shannon (1 ♂, USNM). *Espírito Santo*: Cupido, Parque Sooretama, III.1948, L. Travassos & Freitas (1 ♂, 4 ♀, MZSP); Itaguaçu, IX.1971, P. C. Elias (2 ♂, MZSP); Conceição da Barra, IX.1950, E. Dente (1 ♀, MZSP). *Rio de Janeiro*: Tinguá, VI.1940 (7 ♂, 17 ♀, USNM); Magé, no collector and date (7 ♀, USNM); Deodoro, III.1939, W. Zikán (1 ♂, MZSP).

**Eumesembrinella cyaneicincta pauciseta** (Aldrich, 1922), stat. n.

*Mesembrinella pauciseta* Aldrich, 1922: 12. (Holotype ♀, Pará, Brazil, USNM).
*Eumesembrinella pauciseta;* Mello, 1967: 20; James, 1970: 2.

Very similar to the nominal subspecies, differing in the following characters.

Male. Body length 8.5 to 9 mm; females, 10 to 11 mm.

Both sexes with thorax black on dorsum, except on humeral calli and notopleura which are yellowish. Mesonotum dusted with yellow pollinosity, with three distinct black vittae; post humerals absent, if present vestigial. Male middle femora and tibiae distinctly shorter than in *cyaneicincta cyaneicincta* (length, 4.5 to 5.5 mm); tibiae mainly black in ground color.

Distribution. Brazil (Pará, Amazonas) (Map 6).

Material examined: Brazil. *Pará*: Santarém, Faz. Taperinha, XI.1969, X-XI.1970. Exp. Perm. Amaz. (2 ♂, 7 ♀, MZSP). *Amazonas*: Manaus, 3.XI.1962, K. Lenko (2 ♀, MZSP).

**Eumesembrinella randa** (Walker, 1849), comb. n.
(Figs. 58, 95, 101 and 155)

*Dexia randa* Walker, 1849: 252 (Holotype ♀, "Brasil", BM).
*Mesembrinella randa;* Aldrich, 1922: 20; 1925: 12; Mello, 1967: 32; James, 1970: 2.

Male. Body length, 10-12 mm.

Head as in *quadrilineata*. Front at vertex about 0.07 of head width. Thorax as in *quadrilineata,* except for presenting a pair of rudimentary post humerals. Abdomen without differentiated marginals on T 4. Cerci subtriangular in posterior view; surstyli slender and elongate (Figs. 58 and 95). Epiphallus slightly curved, shorter than basiphallus; paraphalli twice as long as basiphallus; hypophallus enlarged at base (fig. 101).

Female. Very similar to *quadrilineata,* except in presenting the rudimentary post humeral bristles.

Larva I. Buccopharyngeal sclerite as in fig. 155.

With the very helpful assistance of Dr. R. H. Crosskey, it was possible to determine both the generic and specific identities of *Dexia randa* Walker. I have not seen the type specimen but received for study material directly compared with the holotype by Dr. Crosskey. This species is very close to *quadrilineata,* differing mainly by lacking a row of marginals in T 3 and by having a pair of rudimentary post-humerals.

Distribution. Guyana, Brazil (Amazonas, Pará, Maranhão), Bolivia and Peru. (Map 7).

Material examined. Brazil. *Amazonas*: Manacapuru, X.1936, no collector data (1 ♀, MZSP); *Pará*: Coraci, 15 km NW Canindé, Rio Gurupi, IV.1963, B. Malkin (1 ♀, MZSP); *Maranhão*: Iguapé Gurupi-Una, Aldeia Araçu, 50 km E of Canindé, 1.V.1963, B. Malkin (1 ♀, MZSP). Bolivia, Tumupaza, XII.1922, W. W. Mann (1 ♂, USNM). Peru. Loreto: Boquerón Abad, 500 m, 28 II.1964, 22.III.1964, J. Schunke (3 ♀, BM; 3 ♀, LACM); idem, Pucallpa, 17.IV.1965, J. Schunke; idem, Over Monson River, 860 m, 19.VI.1964, J. Schunke; idem, Previsto, 650 m, 30.VI.1965.

## Genus **Huascaromusca** Townsend, 1918

*Huascaromusca* Townsend, 1918: 155. Type species, *cruciata* Townsend (orig. des.) = *aeneiventris* (Wiedemann); 1935: 146; 1937: 66; Hall, 1948: 68 (*partim*); Mello 1967: 32 (key to species); James, 1970: 3 (catalogue).

*Promesembrinella* Hall, 1948: 65. Type-species, *Mesembrinella semiflava* Aldrich (orig. des.).

Diagnosis. Acrostichals 0:1. Abdominal T 5 with discals; remigium bare; subcostal sclerite bare. Larva I with labial sclerite strongly fused to hypostomal.

Discussion. Townsend (1918) erected *Huascaromusca* for *H. cruciata* Townsend (holotype ♀, from Peru). Dr. Raymond Gagné kindly sen me notes on the type in the USNM which allowed me to establish its proper identity.

Hall (1948) sunk *cruciata* Townsend, *chrysorhea* Brauer, *bequaerti* Séguy and *decrepita* Séguy in the synonymy of *xanthorrhina* Bigot, probably based on Aldrich's notes on types. After examination of types of Séguy and Bigot I have concluded that most of the proposed synonymy was not correct; *M. bequaerti* and *M. decrepita* being distinct species; *M. chrysorhea* is a *nomen nudum* and *xanthorrhina* belongs to the genus *Mesembrinella* Giglio-Tos. Townsend (1935) restricted the genus *Huas-*

*caromusca* to the species of Mesembrinellidae with ciliated subcostal sclerite. Hall (1948) expanded this generic concept to include all species with pre-acrostichals. I consider the characters used both by Townsend and Hall as being of specific value, preferring to follow Mello (1967: 3) in considering the presence of discals in abdominal T 5 as the most important character at generic level.

Key to species of the genus *Huascaromusca* Townsend

1. Post humeral bristles present ..... 2
   Post humeral bristles absent ..... 5
2. Subcostal sclerite ciliated ..... *vogelsangi*
   Subcostal sclerite bare ..... 3
3. Thorax black; humeral calli with three differentiated setae .... 4
   Thorax brownish red to orange; humeral calli with two differentiated setae ..... *purpurata*
4. Legs brown ..... *uniseta*
   Legs yellow ..... *decrepita*
5. Sides of thorax, middle and hind femora yellow ..... 6
   Sides of thorax, middle and hind femora black ..... *bequaerti*
6. Wings with a strong transversal black spot along the costal border; abdominal T 3 predominantly brown ..... *aeneiventris*
   Wings hyaline; T3 predominantly yellow ..... *semiflava*

**Huascaromusca aeneiventris** (Wiedemann, 1830)
(Figs. 50, 51, 81, 85, 99, 128, 144, 148, 151 and 177)

*Dexia aeneiventris* Wiedemann, 1830: 376 (holotype ♂, Brazil, NM).

*Ochromyia nigrifrons* Bigot, 1878: 39 (Lectotype ♀, "Brazil", Oxford); Brauer, 1899: 518.

*Huascaromusca cruciata* Townsend, 1918: 158 (Holotype ♀, Jaen, Peru, USNM). *Syn. n.*

*Ochromyia aeneiventris;* Surcouf, 1919: 68, pl. 3, fig. 5.

*Mesembrinella aeneiventris;* Villeneuve, 1920: 224; Aldrich, 1905: 518; 1922: 17; 1925: 12.

*Mesembrinella tibialis* Aldrich, 1922: 16 (holotype ♂, Panama, Porto Bello, USNM).

*Huascaromusca grajahuensis* Mello, 1967: 43 (holotype ♂, Grajaú, Rio de Janeiro, Brazil). *Syn. n.*

*Huascaromusca aeneiventris;* Mello, 1967: 40; James, 1970: 3.

Male. Body length 9 to 10 mm.

Head yellow, silvery pollinose. Front about 0.16 to 0.19 of head width. Frontalia brownish red, darker toward vertex. Ocellar triangle black. Parafrontalia yellow, silvery pollinose. Antennae yellow; second segment about 0.42 to 0.43 length of third. Arista brown. Gena about 0.18-0.19 of head height. Facial plate yellow, whitish pollinose. Facialia covered with long bristles in the inferior one-third. Occiput black, covered with yellow hairs (fig. 50).

Thorax brown. Mesonotum dark-brown, with three longitudinal vittae of whitish pollen. Acrostichals 0:2; dorsocentrals 2:3; post humerals present. Humeral calli yellow, with orange hairs anteriorly. Scutellum brown, with bluish reflections. Propleura yellow. Wings hyaline (fig. 177); costal index 0.10 to 0.14. Anterior legs yellow; middle and hind femora yellow, brownish at apex; middle and hind tibiae and tarsi brownish.

Abdomen brown, yellow at base. Abdominal T 1 + 2 to T 5 bluish green pollinose, purplish to bluish green on the apical one third. Cerci and surstyli as in figs. 81 and 85; epiphallus as long as phallosoma; paraphalli elongate and curved toward apex; hypophallus strongly curved in the apex (figs. 99 and 128).

Female. Length 10 to 11 mm.

Differs from the male in the following characters. Front at vertex 0.23 of head width. Frontalia black. Parafacialia black, whitish pollinose. Cruciate frontals weakly developed or absent; reclinate orbitals well developed (fig. 51). Spermathecae with long and hyaline ducts, enlarged at median section; capsule with circular constrictions tapering toward apex in a long and coiled tube (fig. 144).

Larva I. Length 10-11 mm; width 2.0-2.5 mm.

Very similar to *E. quadrilineata,* differing mostly in the shape of buccopharyngeal sclerite. Labial, hypostomal and pharyngeal sclerites fused and sclerotized; labial sclerite spathulated and divergent, rounded apically (figs. 148 and 151).

The type specimen of *"Dexia aeneiventris* Wied." labelled "Brasillien, col. Winthem" is deposited in Vienna and apparently was not examined by any specialist working in this group. I am very grateful to Dr. Kaltenbach by the notes on *aeneiventris'* type which enabled me to establish its identity.

*Ochromyia nigrifrons* Bigot was considered in the synonymy of *aeneiventris* Wied. by Surcouf (1919: 68) and this was confirmed by the study of types of *nigrifrons* received from Oxford University. The type series consisted of two female syntypes, all conspecific, labelled *"O. nigrifrons.* Brésil, J. Bigot" in Bigot's label and Brauer, "Wien CVIII.

No. 130" in Verrall's hand. One female was selected and labelled lectotype and the other paralectotype. Mello (1967: 34) misidentified this species, his *nigrifrons* is *purpurata* Aldrich of the present paper.

*Huascaromusca grajahuensis* Mello, described from a male from Rio de Janeiro, was regarded as a variation of *aeneiventris* and is here placed in the synonymy. *Huascaromusca cruciata* Townsend is also a synonym according to the notes on types kindly sent by Dr. Gagné from the U. S. National Museum.

This species is usually collected along the Atlantic rain forest of Brazil from Rio de Janeiro to São Paulo coast and probably the type-specimen was collected in that area by Bescke (see Papavero, 1971a: 88).

Distribution: Panama, Costa Rica, Colombia, Ecuador, Peru, Brazil (Rio de Janeiro, São Paulo). (Map 9).

Material examined: Costa Rica, La Suiza de Turrialba, 13.X.1921. Pablo Schild (1 ♀, without head, named by Aldrich as *Mesembrinella tibialis*, USNM). Peru, no date and collector (labelled, "Perou", 1 ♂, 3 ♀, MNHN). Ecuador, El Napo, VIII.1930, R. Benoist (1 ♂, MNHN). Brazil. *Rio de Janeiro*, 8.VIII.1923, L. G. Saunders (labelled "Rio", 5 ♂, BM). Rio de Janeiro, IV.1938, VIII.1938, IX.1938, X.1938, II.1939. R. C. Shannon (4 ♂, 6 ♀, USNM). *São Paulo*: Salesópolis, Estação Biológica de Boracéia, 16.III.1972, J. H. Guimarães (3 ♂, 4 ♀, MZSP); idem, VIII.1966, Exp. Dep. Zool. (2 ♀, MZSP); Praia de Guaratuba, Bertioga, VII.1969, F. C. do Val (2 ♂, MZSP); "Brazil"; Lectotype ♀, paratype ♀, labelled *"O. nigrifrons* J. Bigot" and Brauer, Wien, CVIII no. 130, Hope Department of Entomology, University of Oxford.

**Huascaromusca purpurata** (Aldrich, 1922), comb. n.
(Figs. 60, 84, 106, 164, 185, 176 and 180)

*Mesembrinella purpurata* Aldrich, 1922: 16 (holotype ♂, Brazil, Espírito Santo, USNM).

*Mesembrinella purpurata* Séguy, 1925: 195 (holotype ♂, "Brazil", MNHN). Syn. n.

*Mesembrinella confusa* Séguy, 1925: 196 (holotype ♀, "Peru", MNHN). *Syn. n.*

*Huascaromusca nigrifrons;* Mello, 1967: 34 (misident.).

Male. Body length 9-10 mm.

Head yellow, yellow pollinose. Front at vertex about 1.5 to 1.8 of head width. Parafrontalia at the narrowest point about 1/4 of the anterior ocellus. Frontalia yellow. Antennae yellow, second segment about 0.35 of third. Face yellow, whitish pollinose. Facialia with few

sparse bristles above vibrissae. Gena yellow, yellow pollinose, about 0.17 of eye height. Palpi orange yellow. Occiput black, orange yellow pilose on upper half.

Thorax brownish red, yellowish on sides. Mesonotum brown, with four longitudinal stripes of whitish pollen. Acrostichals, 0:1; dorsocentrals 2:3; sternopleurals 2 or 3. Post humerals absent. Humeral calli and propleura orange-yellow. Mesopleura, sternopleura and pteropleura faintly infuscated. Postscutellum brown, testaceous pollinose. Wings hyaline, with a strong transversal black spot along the costal border between Sc and R 2 + 3; *r-m* faintly infuscated. Costal index about 0.16 to 0.17 (fig. 176). Legs yellow, femora and tarsi brown; middel and hind tibiae darkened at apex.

Abdomen brown, with greenish reflection. T 1 + 2 yellow; T 3 and T 4 with a purplish stripe on apical half. Cerci elongate and subtriangular in posterior view; surstyli elongate and clavate, strongly curved inward, about twice as long as phallobasis; paraphalli short, enlarged at medium region, ending in a slender point (fig. 106).

Female. Body length 10 to 11 mm.

Differs from male in the following characters. Front at vertex about 0.23-0.26 of head width. Parafrontalia black, dusted with whitish pollen. Proclinate orbitals absent or rudimentary. Frontalia brownish red; cruciate frontals weakly developed. Ocellar triangle black; ocellars slender.

Larva I. Length 11 mm; width 2.2 mm.

Externally very similar to *Huascaromusca aeneiventris,* differing in the shape of buccopharyngeal sclerite. Labial sclerite strong, ending in a curved point. Labial, hypostomal and pharyngeal sclerites fused. Pharyngeal sclerite with the dorsal and ventral wings well developed (Figs. 164 and 165).

This species and *aeneiventris* are fairly common in tropical South America. *M. purpurata* Séguy and *M. confusa* Séguy are considered synonymous according to Séguy's types received from Paris. Most recent authors misidentified this species under *nigrifrons* Bigot.

Distribution: Ecuador, Peru, Brazil (Espírito Santo, Rio de Janeiro, São Paulo and Santa Catarina). (Map 4).

Material examined: Ecuador. Tena, 16.III.1972, F. X. Williams (1 ♀, MNHN) (labelled *Mesembrinella nigrifrons* comp. type Bigot, det. Aldrich); Rio Margajitas, Rio Pastaza, 19.III.1939, F. M. Brown (1 ♀, AMNH); Rio Mapoto, 24.III.1939, F. M. Brown (1 ♀, AMNH). Peru. Puno. Fundo Chela, 4.VI.1964, 1.100 m, J. Schunke (1 ♀, BM); idem, no date and collector (1 ♀, MNHN), (type of *Mesembrinella confusa* Séguy). Brazil, *São Paulo*: Salesópolis, Estação Biológica de Boracéia,

16.III.1972, J. H. Guimarães (14 ♂, 8 ♀, MZSP); idem, VII.1966, Exp. Dep. Zool. (1 ♂, 1 ♀, MZSP); idem, IV.1969, N. Papavero (1 ♂, MZSP); idem, VI.1968, J. Oliveira (2 ♂, MZSP). *Santa Catarina*: Brusque, VII. 1957, J. Lane (1 ♀, MZSP); no date and collector (1 ♂, MNHN) (Holotype of *Mesembrinella purpurata* Séguy).

**Huascaromusca bequaerti** (Séguy, 1925)

*Mesembrinella bequaerti* Séguy, 1925: 195 (holotype ♀, "Peru", MNHN). *Huascaromusca bequaerti;* Hall, 1948: 86; James, 1970: 3.

Female. Body length 9 mm.

Front about 0.16 of head width. Frontalia brownish red, darkened toward vertex; cruciate frontals weakly developed; parafrontalia black, dusted with whitish pollen; proclinate orbitals absent. Antennae yellow, second segment about 0.14 length of third. Arista yellow, darkened in the apical half. Parafrontalia and gena yellow, dusted with whitish pollen. Facialia yellow with few black cilia above the vibrissae; gena with few testaceous hairs, about 0.08 of eye height. Palpi orange yellow. Occiput black, covered with orange yellow pilosity.

Thorax shining black, covered with slender black and yellow hairs. Mesonotum with four conspicuous stripes of whitish pollen. Acrostichals 2:1; dorsocentrals 2:3; humerals 2; sternopleurals 2. Scutellum shining black, dusted with whitish pollen, with a pair of laterals and apicals, discals absent. Humeral calli predominantly orange yellow pilose. Wings hyaline, faintly infuscated on costal border beyond R 1. Costal index 0.5. Propleura and prosternum yellow. Anterior legs brownish red; middle and hind legs dark brown; coxae yellow.

Abdomen dark brown, yellowish on base. Abdominal T 3 to T 5 brown with cupreous pollinosity.

Distribution. Peru.

Material examined. 1 ♀ "Peru" (holotype, labelled *Mesembrinella bequaerti*, "type", in MNHN).

**Huascaromusca vogelsangi** Mello, 1967
(Fig. 175)

*Huascaromusca vogelsangi* Mello, 1967: 46 (holotype ♂, Venezuela, Aragua); James, 1970: 3.

Female. Body length, 12 mm.

Head yellow in ground color, whitish pollinose. Front at vertex about 0.25 of head length. Frontalia brownish red; cruciate frontals well developed. Parafrontalia light brown, orange toward bases of antennae; proclinate orbitals well developed. Occiput black, dusted with

whitish pollen and yellow hairs. Antennae orange yellow, second segment about 0.32 length of third; arista brownish red. Facialia with robust setae for about one-third the distance from the vibrissae to the antennal base. Gena about 0.18 of eye height. Palpi yellow.

Thorax brownish red, orange yellow on sides. Mesonotum dusted with testaceous pollinosity. Acrostichals 1:1; dorsocentrals 2:3; humerals 3; post humerals 1. Scutellum with two pairs of laterals, one of apicals and discals. Sternopleurals 2. Wings hyaline; remigium bare; subcostal sclerite ciliate. Costal index, 0.20. Legs yellow.

Abdomen brownish red. Abdominal T 1 + 2 and T 3 yellow; T 4 and T 5 with greenish metallic reflections on anterior half, purplish on posterior half. T 4 with a row of erect marginals; T 5 with two irregular rows of discals and a row of marginals.

Distribution. Venezuela (Aragua). (Map 9).

Material examined. Venezuela, Rancho Grande, Aragua, 900 m, P. C. Garcia (1 ♀, MZSP).

**Huascaromusca semiflava** (Aldrich, 1925), comb. n.
(Figs. 88, 91 and 104)

*Mesembrinella semiflava* Aldrich, 1925: 14 (holotype ♂, La Suiza de Turrialba, Costa Rica, USNM); James, 1970: 2.

*Promesembrinella semiflava;* Hall, 1948: 66.

Male. Body length 10 mm.

Head yellow, darker at vertex. Front at vertex about 0.18 of head width. Parafrontalia yellow, dusted with orange yellow pollinosity, at the narrowest point as wide as anterior ocellus. Ocellar triangle black; ocellars long and parallel. Antennae orange-yellow; second segment about 0.40 of third. Arista brownish red. Facialia with few black hairs above the vibrissae. Gena with few sparse black hairs, about 0.18 of eye height. Palpi yellow. Occiput black, covered with yellowish hairs.

Thorax orange yellow, dusted with thin whitish pollen. Mesonotum black with bluish metallic reflections. Humeral calli yellow. Acrostichals 0.1; dorsocentrals 2:3; humerals 3; sternopleurals 2. Sides of thorax predominantly yellow with orange yellow pilosity. Postscutellum and postalar wall infuscate. Costal index, 0.15. Legs yellow; middle and hind tibiae and apex of middle and hind tibiae brown; tarsi brown.

Abdomen light brown, yellowish on base. Abdominal T 3 to T 5 with purplish metallic reflections. Cerci elongate, pointed at apex. Surstyli very elongated and curved inward (figs. 88 and 91); epiphallus slender, curved at apex, about twice as long as phallosoma; paraphalli short, enlarged at middle, ending in a sclerotized stripe with strong teeth (fig. 104).

Female. Body length 10 mm.

Differs from male in the following characters. Front at vertex 0.26 of head width. Parafrontalia yellowish; reddish brown toward apex; reclinate orbitals absent. Frontalia reddish brown; cruciate frontals well developed.

Distribution. Costa Rica (Map 9).

Material examined: Costa Rica, La Suiza de Turrialba. 23.II.1923 and 28.II.1923, Pablo Schild (1 ♂, 1 ♀, paratypes, USNM).

**Huascaromusca uniseta** (Aldrich, 1925)
(Figs. 54, 83 and 133)

*Mesembrinella uniseta* Aldrich, 1925: 13 (holotype ♂, La Suiza de Turrialba, Costa Rica, USNM).

*Huascaromusca uniseta;* Hall, 1948: 84; James, 1970: 3.

Male. Body length 9 mm.

Head yellow, dusted with whitish pollen. Front at vertex about 0.15 of head width. Parafrontalia yellow, brownish toward vertex. Frontalia reddish brown; orange-yellow toward basis of antennae. Ocellar triangle black. Ocellars long and parallel; post ocellars rather far behind the posterior ocellus, longer than outer verticals. Antennae yellow; second segment about 0.42 of third. Arista brownish red. Facialia and gena yellow. Facialia with few black cilia above the vibrissae. Gena about 0.16 of eye height. Face yellow, dusted with whitish pollen. Palpi yellow. Occiput black, dusted with whitish pollen, with few black hairs on upper half.

Thorax black to dark brown, dusted with fine whitish pollen, with purplish metallic reflections. Acrostichals 2:1; dorsocentrals 2:3; humerals, 3; post humerals, 1; sternopleurals, 3. Wings hyaline. Costal index 0.13 to 0.14. Legs brown to black, faintly orange in the apex of femora and tibiae.

Abdomen brown, with bluish green to purplish, faintly dusted with whitish pollen. Abdominal T 3 with a pair of lateromarginals; T 4 with two pairs of lateromarginals and a pair of erect median marginals, sometimes absent. T 4 and T 5 with a row of marginals; T 5 with a row of discals. Cerci wide, subtriangular at apex; surstyli short and curved, constricted near base, widened toward apex (fig. 54); aedeagus as in fig. 133.

Distribution. Costa Rica. (Map 9).

Material examined. Costa Rica. La Suiza de Turrialba, 22.II.1922, 2.IV. 1921, Pablo Schild (paratypes, 2 ♂, 2 ♀, USNM; BM).

**Huascaromusca decrepita** (Séguy, 1925)
(Figs. 64 and 76)

*Mesembrinella decrepita* Séguy, 1925: 195 (holotype ♂, "Colombia", MNHN).

*Huascaromusca decrepita;* Hall, 1948: 86; James, 1970: 3 (cat., as synonym of *xanthorrhina*).

Male. Body length 8 mm.

Head yellow, silvery pollinose. Front at vertex about 0.12 of head width. Parafrontalia at the narrowest point as wide as the anterior occellus. Parafacialia, vertex and ocellar triangle blackish. Ocellars as long as inner verticals. Frontalia reddish in the lower half, blackish toward ocellar triangle. Antennae yellow; second segment about 0.40 of third. Parafacialia and gena yellow, dusted with yellowish pollinosity. Facialia covered with short bristles above the vibrissae. Gena about 0.17 of eye height. Palpi yellow.

Thorax black. Acrostichals 2:1; dorsocentrals 2:3. Humeral calli with three distinguishable bristles. Sternopleurals 2; post-humerals present. Scutellum black, with a pair of laterals, discals and apicals. Wings hyaline. Costal index, 0.14. Legs yellow, hind femora and tarsi brownish red.

Abdomen black, with purplish metallic reflection. Abdominal T 1 + 2 and T 3 with a pair of lateromarginal bristles; T 4 with a row of marginals, T 5 with two rows of discals and one marginal. Cerci and surstyli as in figs. 64 and 74; surstyli slightly shorter than cerci.

Distribution. Colombia (Bogotá). (Map 9).

Material examined. Colombia, Bogotá, no date and collector, MNHN (holotype ♂ of *Mesembrinella decrepita* Séguy, MNHN).

**Thompsoniella,** gen. n.

Diagnosis. Very close to *Huascaromusca* Townsend differing in the following characters. Scutellum with discals absent; T 5 very elongate, about twice as long as T 4. Hypophallus fused at base on the anterior portion of paraphalli. Proclinate orbitals absent in females. Cruciate frontals rudimentary; T 5 without discals.

This genus is dedicated to the memory of Dr. W. R. Thompson, Entomology Research Institute, Ottawa.

Type-species, *Thompsoniella anomala,* sp. n.

**Thompsoniella anomala,** sp. n.
(Figs. 41, 43, 53, 57 and 103)

Male. Body length 9 mm.

Head yellow, silvery pollinose. Front at vertex about 0.22 of head width. Frontalia black, yellowish near antennal base. Ocellar triangle black. Ocellars slender, longer than inner verticals. Antennae orange--yellow, third segment brownish red; second segment about 0.30 length of third; vibrissae elongate and decussate. Facialia with a group of short and strong bristles in the basal one-fourth.

Gena about 0.11 of eye height. Occiput black, dusted with whitish pollinosity, covered with long whitish hairs. Palpi yellow (fig. 43).

Thorax orange yellow, whitish pollinose. Mesonotum blackish with metallic bluish to green reflections, dusted with whitish pollen. Acrostichals 0:1; dorsocentrals, 2:2; sternopleurals, 2; post humeral absent; humerals 2; notopleurals 2. Scutellum bluish red, whitish pollinose, with one pair of laterals and apicals present. Coxa, propleura, lower half of humeral callus and sternopleura orange yellow with yellow pilosity. Metapleura and hypopleura brownish red. Metanotum and postscutellum dark brown. Wings hyaline, faintly infuscated along the veins: remigium and subcostal sclerite bare. Costal index about 0.18. Anterior legs brown, whitish pollinose; middle and hind femora yellow, darkened at apex, covered with long yellow hairs; tibiae, middle and hind tarsi brown.

Abdomen brownish red. Abdominal T 5 enlarged, about twice as long as T 4. T6 + T 7 well developed. Sternite 5 shining black, strongly emarginated. Cerci U-shaped (fig. 57); cerci strong, longer than surstyli (fig. 53). Epiphallus more or less uniform in width, slightly curved at apex; paraphallus enlarged at middle, tapering toward apex; hypophallus in a shape of a wide strongly curved stripe (fig. 103).

Female. Body length 10 mm.

Differs from the male in the following characters. Front at vertex 0.18 head width. Frontalia brownish red in the lower one-third. Cruciate frontals weakly developed. Inner verticals strongly developed and decussate; outer verticals weakly differentiated from postocular row. Proclinate and reclinate orbitals absent. Antennae reddish, second segment black, about 0.30 length of third; third segment brownish red. Abdomen brownish red with tergites normally developed (fig. 41).

Holotype ♂. Venezuela, San Diego, April 1937 (MZSP). Paratype: 1 ♀ Venezuela, Aragua, 1.000 m (MZSP). (Map 5).

This species differs from all other known Mesembrinellidae mainly in the shape of male abdomen, especially in the peculiar development of abdominal T 5. The male genitalia is very distinct and similar to those of *M. xanthorrhina.*

## 12. SOUZALOPESIELLINAE, SUBFAM. N.

Diagnosis. Mesembrinellinae with the following combination of characters. Abdomen testaceous in ground color without metallic reflection. Spermathecae of B group. Larva I with labial and hypostomal sclerites strongly fused; pseudocephalon with sclerotized plates dorsally. Remigium and subcostal sclerite bare.

### **Souzalopesiella,** gen. n.

Diagnosis. Medium to large species. Acrostichals 3:2; dorsocentrals 3:3; humerals 3; sternopleurals 3; post humerals 1; reclinate orbitals present in females.

Type species — *Mesembrinella facialis* Aldrich, 1922

### **Souzalopesiella facialis** (Aldrich, 1922), comb. n.

(Figs. 14-16, 69, 80, 110, 125, 140, 147, 152 and 169)

*Mesembrinella facialis* Aldrich, 1922: 17 (Holotype ♀, Higuito, Costa Rica, USNM); Mello, 1967: 56, figs. 23, 190-195; James: 1970: 4.
*Huascaromusca facialis;* Hall: 1948: 72, pl. 32, figs. D-H (female, larva).

Male. Body length 12-13 mm.

Head brown. Front at vertex about 0.02 of head width. Parafacialia and parafrontalia yellow, silvery pollinose. Antennae orange yellow; second segment about 0.30-0.32 length of third. Facialia with strong black cilia in the lower one-third. Palpi yellow. Occiput black, covered with pale hairs.

Thorax light brown, darkened on dorsum and dusted with testaceous pollen. Acrostichals 3:2; dorsocentrals 3:3; sternopleurals 3. Thorax with darker clothing hairs except on humeral calli, prosternum, pteropleura and lateral postscutellar plate where the hairs are orange. Postscutellum brown. Wings hyaline, faintly infuscated along R 1 and R 2 + 3. Costal index 0.54 to 0.55 (fig. 169). Remigium and subcostal sclerite bare.

Abdomen shining brown, without metallic reflection. Abdominal T 3 and T 4 with a strong row of marginals. Sternite large, subquadrangular, with two rows of strong macrochaetae in posterior margin; cerci strongly curved, elongate and slender in lateral view, surstyli slender, distinctly shorter than cerci (figs. 69 and 80). Aedeagus with short and elongate epiphallus; paraphalli not fused on middle, ending in a moderately curved point (figs. 110 and 125).

Female. Body length 12 to 13 mm.

Differs from male in the following. Frontalia brownish red, with a short pair of cruciate before anterior ocellus. Front at vertex 0.22-0.24

of head width. Ocellar triangle brown, with a strong pair of proclinate and divergent ocellars and two pairs of post ocellars. Inner verticals short and robust; outer verticals about as long as cruciate. Parafrontalia with two pairs of well developed reclinate orbitals. Spermathecae with long ducts; capsule pyriform in shape, abruptly tapering into a long and coiled tube (fig. 140).

Larva I. Length 8.5 to 9 mm; width 2.9 mm (fig. 14)

Integument translucent, with twelve well distinguishable segments. Metapneustic. Musciform. Abdominal segments with well pigmented spinose bands. Pseudocephalon projecting anteriorly into two whitish lobes with a black shining sclerotized plate dorsolaterally. Pseudocephalon ventrally with strong patches of short black spines below labial sclerite. Oral hooks strongly pigmented. Labial sclerite strongly curved and pointed at apex; labial and hypostomal sclerites strongly fused; pharyngeal sclerite with the dorsal and ventral wings strongly pigmented. Thorax with segment II with a shining black band occupying almost all the dorsal and lateral areas (figs. 147 and 152); segments III to XI very similar, showing an area of small spines ventrally (fig. 19); segment XI ventrally with a black tubercle, strongly sclerotized (fig. 15). Anal area placed in a shallow concavity; dorsal tubercles well differentiated; posterior spiracles with two fused slits, each slit showing three branched interspiracular processes close to peritrema (fig. 16).

Distribution. Honduras, Guatemala, Panama, Venezuela (Caracas) and Trinidad. (Map 1).

Material examined: Panama, Canal Zone (Barro Colorado I., 1.VII.1956, C. W. & M. E. Rettenmeyer (3 ♀, USNM); idem, VIII-IX.1936, Zetek, Fruit fly trap (14 ♂, 7 ♀, USNM). Trinidad, Arima Valley, Northern range, 1.000-1.500 ft., 14-19.XII.1970, D. E. Breedlove (6 ♂, 9 ♀, CAS). Venezuela, Caracas, 1938, Anthonius (1 ♂, USNM).

### 13. LANEELLINAE, SUBFAM. N.

Diagnosis. Abdomen brown to testaceous. Acrostichals 2:3. Sternites 2 to 4 oval in shape, without marginal macrochetae. Spermathecae of group A; larva I with labial sclerite pointed at apex, not fused with hypostomal sclerite; larval integument with a ring of short spines; remigium and subcostal sclerites not bristled.

This subfamily includes the genus *Laneela* Mello.

### Genus **Laneella** Mello, 1967

*Laneella Mello,* 1967: 3. Type-species, *Mesembrinella brunnipes* Surcouf, by original designation (misidentification = *nigripes,* sp. n.); Mello, 1969: 244; James, 1970: 3.

Diagnosis. Medium sized species (8-11 mm) with the following combination of characters. Acrostichals 2:3; dorsocentrals 2:3. Wings with a large black longitudinal spot on costa border extending from R 1 to R 4 + 5.

Mello (1967) in erecting the genus *Laneella,* misidentified the type--species as being *Mesembrinella brunnipes* Surcouf. Through the kindness of Dr. L. Matile, Muséum National d'Histoire Naturelle, Paris I had a chance to study Surcouf's type series and establish the identity of this species; *Mesembrinella brunnipes* Surcouf (Lectotype ♀, from "Bolivia"), is a typical *Mesembrinella* close to *M. bellardiana* while *Mesembrinella brunnipes, sensu* Mello, belongs to a new species.

**Laneella nigripes,** sp. n.
(Figs. 22-30, 39)

*Mesembrinella brunnipes* Surcouf of Mello, 1967: 4; 1969: 244 (misident.).

Male. Body length 8-11 mm.

Head yellow, silvery pollinose. Occiput black, covered with pale yellow black pilosity. Parafrontalia yellow, silvery pollinose; front at vertex 0.13 the anterior ocellus width. Ocellar triangle black. Ocellar bristles long and parallel; inner verticals absent. Frontals, 8 to 10. Antennae yellow, second segment 0.35 length of third; arista yellow. Facial plate dark brown to black. Facialia orange yellow with a group of strong short bristles near vibrissae. Gena about 0.70 of eye height covered with long and sparse black hairs anteriorly. Palpi black with long cilia in the inferior margin.

Thorax brownish red on dorsum, yellowish laterally. Mesonotum with four white pollinose vittae. Humeral callus yellow in ground color, dusted with orange yellow pollen. Scutellum reddish-brown, darker on sides. Sternopleura, pteropleura, pleurotergite and postscutellum, brown. Wings hyaline, with a strong longitudinal black spot along costal vein between R 1 and R 4 + 5 (fig. 174). Costal index 0.24-0.29. Legs black; coxae yellowish; anterior femora black, yellow on distal end; front and middle tibiae black, dark brown on apical half; front and middle tarsi black; hind femora yellow; hind tibiae yellowish on base; hind tarsi black with the first three segments orange-yellow; claws yellowish, black on the apical third.

Abdomen brownish. Abdominal T 1 + T 2 and T 3 yellow. T 4 and T 5 black to dark brown, with a ring of silvery pollen on the apical third of T 4 and T 5; surstyli shorter than cerci (figs. 61 and 63). Epiphallus slightly curved at apex, about as wide as basiphallus; paraphallus enlarged near middle, ending in a long duct at apex; ventralia with strong, small teeth (figs. 124, 132).

Female. Body length 7 to 9 mm.

Differs from male in the following characters. Front 0.25 to 0.29 of head width. Frontalia brownish red. Parafrontalia with two strong pairs of proclinate orbitals; cruciate frontals well developed. Spermathecae with long ducts; capsule elongate, dark brown, sausage-like (fig. 143).

Larva I. Total length 5.5 to 6.0 mm; width 1.2 to 1.5

Integument grayish white, with twelve apparent segments. Each segment with a ring of short spinules. Musciform. Metapneustic. Anterior end bilobated, each lobus dorsally with a unisegmented antenna, other papillae not evident. Buccopharyngeal sclerite long; labial sclerite deeply sclerotized, strongly curved at apex; hypostomal sclerite not fused to the labial but fused to the pharyngeal sclerite; pharyngeal sclerite with the dorsal and ventral wings strongly pigmented; dorsopharyngeal sclerite weakly sclerotized. Posterior spiracle bilobated (fig. 26); anal tubercles weakly developed.

Larva II. Length 7.5 to 8.0 mm, width 1.5 to 1.8 mm

Integument translucid white, with a well defined segmentation, each segment with a ring of short spines (fig. 31). Musciform. Amphipneustic. Anterior end bilobated. Buccopharyngeal sclerite (fig. 30) similar to those of larva I; parastomal and dorsopharyngeal sclerites well developed; posterior spiracles with two slits; peritrema closed (fig. 27).

Larva III. Length 12 to 13.5 mm; width 2.0 to 2.5 mm (fig. 22)

Integument translucid white, with twelve well defined segments. Each segment with a ring of short spines. Musciform. Amphipneustic. Anterior spiracle with 7 to 8 small digitiform projections (fig. 29). Buccopharyngeal sclerite (figs. 32 and 33) with the labial sclerite more strongly curved than in larva II; sclerite dentate, distinctly separate from the labial sclerite; pharyngeal sclerite with the dorsal and ventral wings weakly pigmented. Posterior spiracles placed in a shallow concavity with three distinct slits (fig. 28). Peritrema open, bottom not clearly visible. Anal area with eight dorsal and six ventral tubercles (fig. 11). Anal organ well developed and bilobated (Figs. 24 to 30); anal protuberance with two short anal tubercles.

Puparium (Fig. 10). Length 9 mm; width 3 mm.

Distribution. Brazil (Bahia, Espírito Santo, Rio de Janeiro, São Paulo and Santa Catarina). (Map 7).

Holotype ♂ Salesópolis, *São Paulo;* Estação Biológica de Boracéia, 15.II.1972, J. H. Guimarães (MZSP). Paratypes. *Bahia*: Alcobaça, II.1971, P. C. Elias (10 ♂ 1 ♀, MZSP); Mucuri, II.1971, P. C. Elias

(1 ♀, MZSP); Prado, II.1971, P. C. Elias (1 ♀, MZSP). *Espírito Santo*: Cupido, Parque Sooretama, II-III.1948, L. Travassos, Freitas & H. Travassos (1 ♀, MZSP); *Rio de Janeiro*: Rio de Janeiro, IX-XII.1938, I.1939, R. C. Shannon (17 ♂, 12 ♀, MZSP); *São Paulo*: Salesópolis, Estação Biológica de Boracéia, 12-19.I.1972; III.1972, J. H. Guimarães (3 ♂, 24 ♀♀, MZSP); idem, VI.1968, J. Oliveira (1 ♂, MZSP); idem, XII.1949, L. Travassos F.º & E. Rabello (1 ♀, MZSP); *Santa Catarina*: Joinville, Bequaert (1 ♂, USNM).

## 14. *NOMINA NUDA* AND SPECIES *INCERTAE SEDIS*.

*Mesembrinella chrysorrhoea* Moritz *in* Brauer, 1895.

*Mesembrinella chysorrhoea,* mentioned by Aldrich, 1922: 23 and James, 1970: 3 as a synonym of *Calliphora xanthorrhina,* is a *nomen nudum* based on a specimen in Vienna collection mentioned by Brauer. This species was never formally described and this name is not nomenclaturally available.

*Mesembrinella formosa* Aldrich, 1932.

It was not possible to establish the identity of this species, described from 1 ♂ (holotype) and 3 ♀ (paratypes) from Santa Emília, Pochuta, Guatemala. The holotype was not found in the collection of the Museum of Comparative Zoology, Harvard, according Dr. Evans (personal communication). A paratype received from USNM for study proved to be identical with *M. abaca* Aldrich. No other specimens were found agreeing with the original diagnosis.

## 15. BIOLOGY AND HABITS

### MESEMBRINELLIDAE

The type of vegetation seems to be of primary importance in effecting the distribution of these flies. The adults were regularly collected inside humid forest areas, not being observed in open formations except under exceptional conditions. In early mornings and late afternoons, or in cloudy days, they could be observed in open areas near the edge of forest, attracted to decaying fallen fruits for feeding purposes. Inside the forest the adults were occasionally seen feeding on exuding sap of trees or birds faeces or on decaying vegetable or animal substances. The adults rarely fly more than a few feet above the forest floor and in spite of their large size these flies display a fast, noiseless flight.

Mesembrinellidae flies appeared in large numbers in the traps in mornings and late afternoons, disappearing at dust. The effect of clouds and rains greatly affect the abundance of these flies in the traps.

LARVA

During the period January 12 through 19, 1972, several pilot experiments were carried out at Salesópolis (Estação Biológica de Boracéia) São Paulo (see Travassos F.º & Camargo, 1958) to test the ability of several species of Mesembrinellidae larvae to breed on several artificial diets and to study their trophic adaptations. All of the species ocurring in that area were tested. Larvae were obtained by dissection of gravid females recently captured in traps, the larvae immediately being transferred to Petri dishes with a sample of the food material to be tested. All Petri dishes were maintained at room temperatures and were inspected at four hours intervals, for the observation of larval development. Only full grown first instar larvae were utilized in these experiments. The following substrates were tested:

1. *Vegetable material*: a — banana; b — pinapple + yeast + sugar; c — orange juice; d — banana + yeast + sugar.

2. *Animal material*: a — fish; b — liver; c — ground beef; d — dead molluscs; e — human faeces; f — boiled eggs; g — agar + bovine serum.

Being hard to come by, only two larvae were tested in each of the substrata.

RESULTS

Attempts to rearing larvae in vegetable substances were unsuccessful, the larvae dying after a 5 or 6 hours exposure. In animal substrate only one species, *Laneella nigripes*, was able to develop through pupal stage in four of the media tested (a, c, d and e).

DISCUSSION

In non sterile, heterogeneous substrate continuously changing during the larval development, is is very difficult to analyse in detail the process of larval nutrition. However, some idea of the physiological and ecological adaptations can be obtained by comparing the course of the larval development and the ethological response of the larvae. Information on the larval habitat of the Mesembrinellidae is still in the phase of conjectures. So far, nothing is definitely known on the type of food substrates on which the larvae of this group develop in nature.

Townsend (1935: 145) surmised that the maggots of Mesembrinellidae were external parasites of nestling birds, where blood was intermitently sucked, in which case the fly larviposits in the nests of various birds. Hicks (1959) reviewing the literature of insects associated to birds nests did not record any other information supporting Townsend's idea.

Mello (1967) concludes from the relative abundance of adults of these flies on animal faeces that the third instar larvae is spent in this medium.

Poorbaugh, *et al.* (1968) studying the insect communities occurring in fresh, undisturbed cattle droppings in northern California, have shown that from 109 species of Diptera attracted to fresh cow dung only 50 were reared in this medium. Webber (1958) has shown that many calliphorids feed in cow dung and that this medium provides a sufficient source of protein from which they can develop their eggs, but they do not oviposit on this medium.

Kano & Lopes (*in* Mello, 1969) conducted intensive faunal survey of muscoids in the forested areas of Rio de Janeiro, RJ, by using baited traps. The basic sampling methods used in this study consisted in exposing several types of decaying animal matter in predermined sites in the forest for colonization. After 48 hours exposure the traps were taken to the laboratory and maintained in especially designed rearing boxes for the collection of emergent flies. The baits used in these experiments were ground beef, faeces and fish. During the survey on one occasion a female of *Laneella nigripes* emerged from a rearing box containing fish bait.

One must keep in mind that the substrates are not merely nutritive media, but represent in many cases a biologically and independent microhabitat. So far, only one species of Mesembrinellidae (*Laneela nigripes*) was found to develop through the adult stage in laboratory, utilizing as food source nearly any animal substance. Attempts to rear other species using the same substrate were unsuccessful.

## 16. EVOLUTION

### 16.1. Brief consideration on the evolution of food habits of muscoid fly larvae.

One interesting and important point in the evolution of Calyptratae muscoid flies is the evolution of larval food habits. In this group the larvae feed chiefly on fluid food although in a short section of the peritrophic membrane there occurs the intake and digestion of minute particles of solid food. The group underwent an adaptive radiation occupying a series of "nutritive zones" (Roback, 1951).

In relation to the Diptera in general, there occurs a series of steps in larval food habits, ranging gradually from one food habit to another, probably in the following sequence: beginning with feeders on dead vegetable matter and leading, on the one hand, to (1) feeders on excrement of herbivores, (2) excrement of omnivores (e.g.man), (3) excrement of carnivores, (4) carrion, (5) parasites of vertebrates; (6) parasites of invertebrates (insects, molluscs, earthworms, etc.). It is probable that a primitive branch of the Calyptratae muscoids, the Anthomyidae, has derived from a primitive ancestor close to the Acalyptratae of the

families Heleomyzidae and Otitidae (Roback, 1951). Both families are essentially saprophagous in the larval stage, and this condition is also found in the most primitive members. In this family forms are also found occupying the phytophagous and coprophagous zones.

The Muscidae are phylogenetically close to the Anthomyiidae, this relation also extending to the feeding habits. Species with a free labial sclerite, capable of independent movements, are usually predatory; species with asymmetrical and spathulated labial sclerite, invaded the coprophagous and saprophagous zones.

The Calliphoridae are predominantly sarcophagous and present an enormous trophic adaptability to qualitatively different substrates; few species breed in living mammalian tissue, causing myiasis, most certainly a recent invasion. Some species have been recorded as parasitoids of living molluscs.

Certain species usually found breeding in dead animals or faeces may develop also in exposed wounds. Such forms are a transitional stage between sarcophagous and obligatory parasites of mammals.

The Sarcophagidae present a wide trophic adaptation going from saprophagous, coprophagous to obligatory parasitism of mammals and insects. Frequently such variation of food habits occurs in the same species. Most species did not specialize in a given food habitat and if compared with the Tachinidae and Anthomyiidae they could be termed a transitional group. Baumberger (1919) has observed that a great many dipterous larvae usually known as saprophagous are really mycetophagous. Greenberg (1954, 1968) and Levinson (1960) have recently demonstrated that dead bacteria constitute a main food source of vitamins during the development of house fly larvae. The cibarial filter, observed in the Calyptratae larvae and used for concentration of food substrate seems to be a characteristic not of saprophagous larvae as surmised by Keilin (1915) but of larvae which feed on microorganisms such as fungi spores or bacteria.

The Mesembrinellidae, as demonstrated in chapter 15, are evolving from the saprophagous to an unknown but apparently restricted nutritive zone. The most primitive member of this family (*Laneella*) was able to develop experimentally in several animal decomposing materials, whereas other species of this family did not succeed. The type of labial sclerite spathulated and rounded at the apex, found in this group, is unique among the higher muscoid flies and probably an adaptation to the collection of soft or semiliquid food materials.

The Oestroidea and Tachinidae are among the Diptera which occupy the most specialized nutritive zone; the former being obligatory parasite of mammals and the latter having invaded the zone of insect parasitism, a zone already filled with success by the Conopidae, Pyrgotidae and some Acalyptratae. The Tachinidae had however the greatest success in the exploration of this zone.

One of the highest points for consideration in the evolution of trophic relation of muscoid flies is that connected with the physiological adaptation of these flies for invading certain nutritive zones not previously occupied. Structurally there are few morphological differences in the larvae of Anthomyiidae or Sarcophagidae that could explain their ability to digest cellulose or protein. The main differences are certainly found in the digestive enzymes. It would be logical to suppose that larvae in some way pre-adapted for feeding in a certain nutritive zone would survive and develop through maturity when accidentaly placed in situations where the selective pressure would favor the possibility to digest a new food substrate. Several examples of such transient adaptation are known from amongst the muscoid flies. The house fly (*Musca domestica*), although an essentially saprophagous species, has been reported to cause several types of human myiasis; *Lucilia sericata* is a typical necrophagous species but under certain conditions can easily be adapted to causing several types of myiasis in man and animals (Povolny & Rozsypal, 1968). A number of other examples could be listed.

The trophic adaptations of the larvae of most muscoid flies are not yet fully studied any more than the complex of nutritive enzymes involved in the process. Hobson (1931) has demonstrated the presence of collagenase (a specific enzyme attacking the connective component of the muscle tissue) in browfly larvae (*Lucilia sericata*) causing myiasis in sheep and absent from populations breeding in animal carcasses.

These trophic adaptations show two evolutionary trends in *L. sericata*: the first one very likely took place through scent attraction of females, conditioned by the presence of ergosterol in the sheep fleece and the subsequent ability to digest by means of specific larval collagenase, the muscular fasciae, toward progressive parasitism of the species on sheep. The other tendency is a process conditioned by the ability of the larvae of *L. sericata* to utilize purely secondary substrate, poor in biologically valuable proteins, through a symbiosis with the microflora on the one hand, rendering the necessary nutrients in the substrates available by hydrolytical activity and, on the other hand, enriching the substrates with scarse or missing substances including ergosterol which are of biogenetic and scent importance.

Comparative studies of the digestive enzymes of the Calyptratae flies would be of extreme importance in helping to clarify the evolution of this group. Some studies on this line have been conducted such as those of Kamal (1959) on digestive enzymes of several Sarcophagidae and Calliphoridae in relation to their parasitary habits, and those of Povolny & Rozsypal (1968) related to the adaptation of *Phaenicia sericata* to the synanthropic habit. In the light of our present knowledge, nobody could object the hypothesis that the viviparity resulted in a acquisition of modifications which gradually supplanted the oviparous method of reproduction. The strategy for high egg production as seen in the Muscidae, Anthomyiidae, etc., is regarded as only successful when food is abundant.

Theoretically, the first step towards this process would be the necessity of the female to delay oviposition. This would ensure to the female longer time in searching suitable places for oviposition. If this time could be prolonged an internal eclosion could happen. The selection of forms with a wide oviduct could be another step favoring both the mother and progeny by reducing the emergency for deposition. These could be some of the steps leading to the evolution toward the viviparity. Independent of this modification, other structural changes could occur in the female genital system which could have a marked influence towards evolution to viviparity. The acessory glands or even the spermathecae, could be transformed in an organ responsible for the nutrition of the developing larvae, the reduction of ovarioles, and the transformation of the genital chamber into a uterus, able of considerable distention for lodging a developing larva, would be another important modification.

According to Bock (1959) the evolution of new structures involves the utilization of older ones, preadapted to a new function. A structure is said to be preadapted for a new function if its present form enables it to discharge its original function and also enables it to assume a new function whenever the need for this function arises. The selective pressure involved in molding a new structure into a preadapted function are always those associated with the original function of the structure and the original selective pressure may continue to operate even after the preadapted structure assumes its new function, by the fact that a structure may have a simultaneous number of functions. As example, the spermathecae of Mesembrinellidae continue to serve its original function (of store and feed for the spermatozoa) after its transformation into a feeding organ. We could say that in the higher Muscoidea some oviparous forms are evolving toward ovoviviparity while other already ovoviviparous are evolving toward the macrolarviparity. The ovoviviparity would be one of the initial steps of the evolutive process towards viviparity.

16.2. Evolution of viviparity in the Calyptratae with special reference to the Mesembrinellidae.

Viviparity among the higher Diptera is only observed in a small group of Calyptratae.

Keilin (1916) in a detailed study of this phenomenon classified the viviparous Diptera into two basic groups based mostly upon physical and physiological peculiarities during postembrionic development.

Table I

Classification of viviparity in Diptera according to Keilin (1916)

A. Those insects that incubate the offspring only during the embryonic phase; that is, whose larvae are never nourished in the uterus. They are those ovoviviparous or ovolarviparous forms laying mature eggs or recently hatched larvae. This group is subdivided in 3 subgroups as follows:

1. Modification of the maternal uterus into a storage reservoir: Tachinidae.
2. Eggs large but generally few in number: Sarcophagidae, Oestridae and Gasterophilidae.
3. Eggs greatly limited in number or of extraordinary size: *Mesembrina meridiana* L., *M. mystacea, Hylemyia strigosa* F., *H. variata* Fall., *Musca larvipara* Port., *Dasyphora pratorum* Meigen and *Theria muscaria* Meigen.

B. Those insects that continue to incubate the larvae beyond the embryonic stage: that is, those forms which nourish the hatched offspring in the maternal uterus by means of certain special adaptations:

1. Larviparous species of *Glossina.*
2. Pupiparous species of *Hippobosca, Melophagus* and *Ornithomyia.*

In his arrangement of viviparity Keilin (1916) eliminated the species which are only occasionally viviparous and he segregated individual species into their appropriate classes of viviparity without regard to taxonomic affinities. In type *A,* Keilin shows a series of gradations in complexity, recognising the need of thorough consideration of the physiological function involved in the evolution of each case.

Only group *B* shall be considered in our discussion. In this group a single egg is produced which is retained and incubated in a wide, short uterus; the accessory glands being transformed into nutritive organs (adenotrophic viviparity of Hagan, 1951). Examples of this type are found in families Glossinidae, Hippoboscidae, Nycteribiidae and Streblidae. The Mesembrinellidae also fall in this category, however the spermathecae rather than the accessory glands are the organs involved in larval nutrition.

Among the oviviparous forms of group *A* of Keilin several examples are known of evolution towards adenotrophic viviparity (*e. g. Hylemyia strigosa, M. meridiana, Theria muscaria, Dasyphora pratorum, Musca larvipara,* etc.).

All the above species possess common characteristics indicating an evolutive convergence towards macrolarviparity, ovolarviparity being an intermediate step. In all these species the ovarioles are reduced to numbers similar to those of *Glossina* and *Melophagus* where only a single egg is produced in an alternative way. The viviparity of the Mesembrinellidae was first demonstrated by Souza Lopes (cf. Townsend, 1935: 145).

In this group the eggs are retained in the uterus and develop through the end of first instar, while in *Mesembrina meridiana, M. australis, M. humilis* and *Hylemyia strigosa* the larvae develop through the end of a second instar. In *Dasyphora pratorum,* the larva passes through all three stages in the uterus, feeding externally for a short period of

time. The evidences suggest in the case cited above that the limitation of food supply, or food site quality seem to be the selective pressure involved in the evolution tending towards viviparity.

The major adaptive values in the evolution of viviparous forms would be: (1) reduction of energy to provide large amount of vitellum for the future eggs; (2) elimination of potential egg predators and parasites; (3) ensurance of more time for the female in discovering a suitable place for deposition of its progeny and (4) increase of the survival of the individual while exploiting as food substrate certain short lived food sources, of low abundance or acessibility in mature (e. g., carrion, faeces).

In the Mesembrinellidae the evolution towards viviparity would probably ensure the exploration of a specialized habitat (still unknown). In a pilot laboratory experiment I have demonstrated that at least one species of Mesembrinellidae was able to develop through the pupal stage in several animal substrates. Dead snails were the favourable substrate for at least one species in laboratory experiments (*Laneella nigripes*). This substrate forms a protected nutritially rich and easily accessible source of food in which rapid development is possible, and it is surmised here that *Laneella nigripes* exploits this substrate in nature. Due to the small size of most snails found in the tropical rain forest probably one single generation develops before the snail is exhausted as food source. The evolution towards viviparity in the Mesembrinellidae suggests an exploitation of a restricted, short lived food substrate; the possibility of its being a predator or parasite being less probable, evidenced by the general anatomy of buccopharyngeal apparatus (not adapted for grasping or holding a victim; cf Roberts, 1971).

## Discussion

Townsend (1937), Hall (1948) and Mello (1967) wrongly believed that the larva develops in the uterus up to the second instar. Our breeding tests, however, have demonstrated that the larvae of this group are not retained in the uterus beyond the end of the first instar, the second and third instars taking place externally.

Although the Calyptratae muscoid flies make use basically of the same structures in their different modes of feeding, there is a considerable modification in the morphology of cephalopharyngeal apparatus and cibarial musculatures as shown by Roberts (1970). These modifications are largely influenced by the nature of food substrates. A number of cyclorrhaphous larvae found in association in dead material have a broad labial sclerite used to push the food material towards the mouth. The larvae of these flies are always found in association with large number of microorganisms, as blowfly larvae, for instance, that feed almost entirely on bacteria found in rotting material (Greenberg, 1954, 1968).

In carnivorous forms like *Limnophora* the labial sclerite is used to catch and kill the prey and its shape is interestingly modified for this function. Keilin (1915) has demonstrated that among larvae of Diptera Cyclorrhapha those feeding on dead material are distinguished from the parasitic and predatory species by the possession of a cibarial filter. This cibarial filter consists of a number of longitudinal ridges projecting upwards from the floor of the pharynx. These structures are found in many families of the Cyclorrhapha and were probably present in the common ancestral. Parasitic and predatory larvae occur in many families, they lack the cibarial filter which has probably been lost with decreasing dependence on microorganisms as food substrate, along with an increasing utilization of living food material. According to Roberts (*loc. cit.*) the presence of cibarial filter in Diptera larvae would seem to be a characteristic, not of saprophagous larvae as suggested by Keilin (1915) but of larvae which feed on microorganisms, wheter fungal or spores of bacteria. In the Mesembrinellidae the presence of pharyngeal ridges was observed only in larvae of *Laneella nigripes,* they being absent in other genera. The interesting range of shape and structures of the labial sclerite in most species of this group, from pointed and slender (*Laneella, Souzalopesiella*) to the spathulate type (*Mesembrinella, Huascaromusca,* etc.) indicate a progressive adaptation for making use of a particular substrate. The nature of this substrate is still unknown.

### 16.3. Origin and evolution of Mesembrinellidae.

As the foregoing discussion has indicated, the Messembrinellidae were found to be a monophyletic group. An intuitive estimate of the overall resemblances indicates the Calliphoridae as the most probable sister-group. Before an analysis of distributional pattern is included and the history of Mesembrinellidae is discussed, it is deemed useful to consider the results obtained by other workers dealing with selected groups of the Diptera.

Hennig (1960) compiled a list of all supraspecific groups of Diptera which occur in New Zealand, in Southern Australia or in both places, and whose apparent sister-groups in each case occurred in Southern South America. Those pairs of sister-groups that present a disjunct austral distributional pattern he refers to as an AS-group. He concluded that, although many of these groups are used as evidence for an Antarctic center of evolution or a migration route, no group has yet been sufficiently well analyzed to provide such evidence.

Vockeroth (1969), commenting Hennig's AS Diptera shows one striking peculiarity. Only two groups, the family Sciadoceridae and the genus *Teratomyza* (Teratomyzidae), belong to the Brachycera Cyclorrhapha. Based on the virtual absence of higher Diptera (Cyclorrhapha) among the AS-groups, Vockeroth postulated a hypothesis to explain this fact. He reasoned that the absence of AS groups among the Cyclorrhapha was not because they might not have beein in existence during the time of families interchange between South

America and Australia and New Zealand, but although abundant and highly diversified in North America and most of the Old World, they where prevented from entering South America and Australia by the isolation of these continents until the disappearance of the condition that made the transantarctic dispersion possible. The hypothesis is based on the assumption that certain groups of South American Diptera have a characteristic and peculiar generic composition because those groups were unrepresented in South America before a particular time, probably very early in the Tertiary, when a small number of northern forms, the ancestors of those groups, entered South America.

In spite of several groups of Cyclorrhapha having entered South America through the north, after the Pliocene, several other groups already existed in South America, since the lower Cretaceous. Such groups would be of Gondwanian origin, and had evolved along with the tropical rain forest. It is difficult to accept the fact that a fauna well adapted to live in forest conditions could present an aggressivity and adaptation which would make it possible to disperse through diverse open formations (presenting AS group or having its origin in the northern continents). In such case the most probable place to look for the sister group would be in Africa. With the fragmentation of West Gondwana into South America and Africa the ancestral stock of Mesembrinellidae probably remained isolated on both sides of South Atlantic, giving origin to the Mesembrinellidae in South America. This primitive stock radiated in the Guyano-Brazilian subregion giving rise to three distinct branches.

I. *Laneellinae,* with the following combination of characters: abdomen testaceous in ground color, without metallic reflections; spermathecae of group A; post humerals present; remigium and subcostal sclerite bare, without strong marginal macrochetae; acrostichals, 2:1.

II. *Souzalopesiellinae,* with the following combination of characters: Abdomen testaceous in ground color, without metallic reflection; spermathecae of group B; post humerals present; remigium and subcostal sclerite bare; sternite 2 to 6 quadrangular, with a long row of marginal macrochetae; acrostichals, 3:2.

III. *Mesembrinellinae,* the most recent group, with the following combination of characters: Body testaceous to green, bluish to purplish metallic reflections; spermathecae of C group; sternite 2 to 6 oval in shape without strong marginal macrochetae; acrostichals 2:1.

Laneellinae and Souzalopesiellinae probably occupied the rain forests of the Guyano-Brazilian subregion and probably by competition with the Mesembrinellinae became restricted to the forests of the Brazilian Atlantic coast and the Souzallopesillinae in the forests of Panama and Venezuela entering into Trinidad. The Mesembrinellinae evolved into two branches; Mesembrinellini and Eumesembrinellini. These two branches occupied all the forested areas of the Guyano-Brazilian subregion. Later, with the

appearance of Central America in the Pliocene-Pleistocene transition (Haffer, 1970), they had the opportunity to spread their distribution through Southern Mexico. The Eumesembrinellini subdivided into other branches, probably of contemporaneous origin; Albuquerqueina and Eumesembrinellina. Albuquerqueina with a monotypic genus *Albuquerquea,* known to occur in the rain forest of eastern Brazilian Atlantic coast (map 8), and probably formed or restricted to the area by competition with the Eumesembrinellini.

The Eumesembrinellini gave origin to three genera; *Eumesembrinella* Townsend, *Huascaromusca* Townsend and *Thompsoniella* gen. n.

*Eumesembrinella,* a recent and agressive genus, is found all over the Amazon valley; one species, *E. cyaneicincta,* with one subspecies in the Atlantic coastal area of southern Brazil. *Huascaromusca* probably had its origin in the Guyano-Brazilian subregion in an initial radiation; probably occupied the whole of the forest of the Guyano-Brazilian subregion, and by competition with *Mesembrinella* and *Eumesembrinella* became more restricted to Central America and northeastern South America. Two species, *H. cruciata* and *H. aeneiventris,* present a disjunct distribution in Northeastern South America and Central America, and in the Brazilian Atlantic coast.

## 17. GEOGRAPHICAL DISTRIBUTION

Examination of maps 1 to 9 readily discloses that the species of this family are restricted to the forest habitat of the rain forest of the Neotropical Region (see vegetation maps in Hueck, 1966). The area of distribution ranges from Yucatan, Mexico, to the southernmost limit in the province of Buenos Aires (approximately 37° S). The family does not occur in the West Indies (except Trinidad), Chile and Southern Argentina.

Five out of the seven genera recognized in this family are endemic to the Guyano-Brazilian subregion and two are limited to the rain forests of the Guyano-Brazilian and Central America regions.

The genus *Mesembrinella* (maps 1 to 8) could be divided into five groups: group I, composed of *abaca, flavicrura, xanthorrhina,* occurs in Southern Central America; group II, with *apollinaris, confusa, pictipennis, transposita* and *umbrosa,* occurs in Northern South America, having also been recorded in Central America; group III, with *peregrina* and *semihyalina,* is restricted to the Southern Brazilian states of Espírito Santo through São Paulo; group IV, *bicolor,* has a wide distribution, ranging from Yucatan (Mexico) to Paraguay and northern Argentina; group V, *batesi* and *bellardiana,* presentes a disjunct distribution, as it occurs in Eastern Amazonia, Rio Grande do Norte south to Santa Catarina along the coast (map 3) and also to westernmost Brazilian Amazonia, Peru, through southern Argentina.

The genus *Huascaromusca* Townsend (map 9) presents three main patterns: group I, with *semiflava, uniseta* and *spicata,* restricted to southern Central America; group II, *aeneiventris* and *purpurata,* with

the following disjunct distribution: *aeneiventris,* from Costa Rica south to Peru, then along Brazilian Atlantic coast from Rio de Janeiro to São Paulo; *purpurata,* Northern Ecuador, Peru and Espírito Santo to Santa Catarina (map 9); group III, *vogelsangi, decrepita,* restricted to northern South America.

Genus *Eumesembrinella* Townsend (maps 6 and 7) presents three main patterns; group I, *benoisti,* occurring in northern South America [Venezuela, Guyana, and Northern Brazil (Amazonas and Amapá]; group II, *quadrilineata* and *randa,* occurring over almost all of the Amazon valley; group IV, *cyaneicincta,* with a disjunct distribution: in eastern Brazil from Bahia to Rio de Janeiro (*cyaneicincta cyaneicincta*), and Amazon valley (*cyaneicincta pauciseta*).

*Souzalopesiella* gen. nov. (map 1) — monotypic, occurs in Central America (Mexico south to Panama), south to South America (Venezuela and Trinidad).

*Albuquerquea* Mello (map 8) — monotypic, occurs along the Brazilian Atlantic coast, between the states of Rio de Janeiro and São Paulo.

*Laneella* Mello (map 7) — monotypic, also occurs along the Brazilian east coast between Bahia and Santa Catarina.

*Thompsoniella* gen. nov., (map 5) — monotype, known only from Venezuela.

## 18. SUMMARY

1. It is concluded that the Mesembrinellidae are probably of Gondwan-origin. This group presents a strong ecolcgical fidelity to the tropical rain forest of Guyano-Brazilian subregion and probably evolved in this area.

2. The family is exclusively Neotropical, only occurring in the tropical rain forest condition, with three dominant genera (viz. *Mesembrinella, Huascaromusca* and *Eumesembrinella*).

3. Five out of seven genera recognized in this family are endemic of the Guyano-Brazilian subregion and five occur in all tropical rain forests of the Neotropical Region (forests of Guyano-Brazilian and Central America region).

4. The area of higher endemism is the Brazilian Atlantic coast (between the states of Bahia and Santa Catarina). The most primitive genus of this complex (viz. *Laneella*) occurs in that area.

5. The most phylogenetically recent species are found in Central America and southern Mexico and are derived from species of the Guyano-Brazilian subregion.

6. The systematic structure of the family has shown the existence of several waves of speciation, the recent and aggressive groups entering into competition and the older ones being displaced to the peri-amazon rain forest or restricted to the eastern Brazilian Atlantic coast as geo-

graphic and phylogenetic relicts. The present speciation (subspeciation) shows that the same process has occurred in the past and explains the presence of geographic and phylogenetic relicts in the peri-amazon areas with the derivative and aggressive groups occupying the Amazon.

The colonization of the forest of southeastern and southern Brazil probably must have occurred in the periods of coalescence between the two areas; the Amazon and Atlantic forests, or along gallery forests of Central Brazil.

Patterns of evolution of several Diptera families associated to the Neotropical rain forest show several waves of speciation, with the most recent groups centered in the Amazon valley and the primitive forms in circum Amazon or Atlantic coast forest or also with disjunct distribution in the two areas (Papavero, 1971b).

## 19. REFERENCES

Aldrich, J.M., 1905. A catalogue of North American Diptera. *Smithson. Misc. Coll. 46*: 1-680.

Aldrich, J.M., 1922. The Neotropical muscoid genus *Mesembrinella* Giglio-Tos and other testaceous muscoid flies. *Proc. U.S. Nat. Mus. 62* (18): 1-36.

Aldrich, J.M., 1925. New Diptera or two-winged flies in the United States National Museum. *Ibidem 68* (18): 1-36.

Aldrich, J.M., 1932. A new genus and two new species of muscoid flies from Guatemala. *Proc. Ent. Soc. Wash. 34* (2): 23-35.

Baumberger, J.P., 1919. A nutritional study of insects with special reference to microorganisms and their substrata. *Jour. Exp. Zool. 28* : 1-81.

Berlese, J., 1899. Fenomeni che accompagnano la fecondazione in taluni insetti. *Riv. di Patol. Veg.*, Firenze 7 : 1-18 (1898). (Summary in *Zool. Centralbl.* 1899: 292-296).

Bigot, J.M., 1878. Diptères nouveaux ou peu connus. 9e. partie, XII: Genus *Phumosia, Pyrellia, Cosmina, Ochromyia* et *Curtonevra*. *Ann. Soc. Ent. France* (5)*8*: 31-40.

Bigot, J.M., 1881a. (Diagnoses abrégées de quelques Diptères nouveaux, provenant de l'Amérique du Nord). *Ibidem* (6)7 *(Bull.)* : clxxx-clxxxii.

Bigot, J.M., 1881b. Diptères nouveaux ou peu connus. Muscidi. *Bull. Soc. Zool. France XII*: 581-617.

Bock, W.J., 1959. Preadaptation and multiple evolutionary pathways. *Evolution 13*: 194-211.

Brauer, F., 1895. Bemerkungen zu einigen neuen Gattungen der Muscarien und Deutung einiger Original -Exemplare. *Sitz. K. Akad. Wiss. Wien, Math.-Naturw. Cl. 104*: 582-604, illus.

Brauer, F., 1899. Beiträge zur Kenntnis der Muscaria schizometopa. Bemerkungen zu den Original exemplaren der von Bigot, Macquart und Robineau-Desvoidy beschriebenen Muscaria schizometopa aus der Sammlung des Hern G.H. Verrall. III. *Ibidem 108*: 495-529.

Brauer, F. & J.E. von Bergenstamm, 1891. Die Zweiflügler des Kaiserlichen Museums zu Wien. V. Vorarbeiten zu einer Monographie der Muscaria schizometopa (exclusive Anthomyidae) Pars II. *Denksch. K. Akad. der Wiss., Wien* (Math.-Nat. Cl.) *60*: 89-240.

Brauer, F. & J.E. von Bergenstamm, 1893. Die Zweiflügler des Kaiserlichen Museums zu Wien. VI. Vorarbeiten zu einer Monographie des Muscaria schizometopa (exclusive Anthomyiidae). Pars III. *Ibidem 60*: 89-240.

Crampton, G.C., 1942. The external morphology of the Diptera. *Bull. Conn. State Geol. Nat. Hist. Surv. 64*: 10-165.

Crosskey, R.W., 1965. A systematic revision of the Ameniinae (Diptera: Calliphoridae). *Bull. Brit. Mus., (Nat. Hist.), Entom. 16*(2): 35-140.

Davey, K.G., 1965. *Reproduction in the insects,* x + 96 pp., 21 figs. Olivier & Boyd, Edinburgh.

Downes, W.L., 1955. Notes on the morphology and classification of Sarcophagidae and other calyptrates (Diptera). *Proc. Iowa Acad. Sci. 62*: 514-538

Engel, E.O., 1931. Die Ausbeute der deutschen Chaco-Expedition 1925/26. Diptera. *Konovia 10*: 133-154, 6 pls.

Fabricius, J.C., 1805. *Systema antliatorum secundum ordines, genera, species,* 373 pp., 30 pp., Brunsvigae [= Brunswick].

Giglio-Tos, E., 1893. Diagnosi di nuovi generi e di nuove specie di ditteri. *Boll. Mus. Zool. Anat. Comp.*, Torino *147*: 1-11.

Giglio-Tos, E., 1895. *Ditteri del Messico 4*, 74 pp., 1 pl., Torino (also published in *Mem. R. Accad. delle Sci. Torino, Cl. di Sci. Fis. Mat. e Nat.*) *45*: 1-74, 1 pl., 1896).

Greenberg, B., 1954. A method for sterile culture of house fly larvae, *Musca domestica* L. *Can. Ent. 86*: 527.

Greenberg, B., 1968. Model for destruction of bacteria in the midgut of blowfly maggots. *Jour. Med. Ent. 5*: 31-38.

Gurney, A.B., J.P. Kramer & G.C. Steyskal, 1964. Some techniques for preparation study, and storage in microvials of insect genitalia. *Ann. Ent. Soc. Amer.* 57(2): 240-242.

Hagan, H.R., 1951. *Embryology of the viviparous insects*, 472 pp., Ronald Press Comp., New York.

Hall, D.G., 1948. *The blowflies of North America.* (vol. 4), 477 pp., 51 pls., *In* Entomological Society of America, Thomas Say Foundation. Washington, D.C.

Hardenberger, J.D.F., 1927. *Bijdrage tot de Kennis der Pupipara.* J. van Boekhoven, Utrecht, 1929 (also as Beiträge zur Kenntnis der Pupiparen. *Zool Jahrb. Abt. f. Anat. 50*(4): 497-570).

Hennig, W., 1952. *Die Larvenformen der Dipteren 3*. 628 pp., illus., Berlin.

Hennig, W., 1960. Die Dipteren-Fauna von Neuseeland als systematisches und tiergeographischer Problem. *Beitr. Ent. 20*: 221-239.

Herting, B., 1957. Die weibliche Postabdomen des calyptrate Fliegen (Diptera) und sein Merkmalswert für die Systematik der Gruppe. *Ztschr. f. Morphol. u. Oekol. d. Tiere 45*: 429-461.

Hicks, E.A., 1959. *Checklist and bibliography on the occurrence of insects on birds' nests.*, 681 pp., Iowa State College Press, Ames, Iowa.

Hobson, R.P., 1931. On an enzyme from blow-fly larvae (*Lucilia sericata*) which digests collagen in alkaline solution. *Biochem. Jour. 25*: 1458-1463.

Hori, K., 1960. Comparative anatomy of the internal organs of the calyptrate muscoid flies. I. Male internal sexual organs of the adult flies. *Sci. Rep. Kanazawa Univ.* 7(11): 23-83.

Hori, K., 1967. Comparative anatomy of the internal organs of the calyptrate muscoid flies. V. Considerations on the phylogeny of Calyptratae. *Ibidem 12* (2): 215-254.

Hough, G.N., 1899. Synopsis of the Calliphorinae of the United States. *Zool. Bull. 2*: 283-290, 11 figs.

Hueck, K., 1966. *Die Wälder Südamerikas. Oekologie, Zusammensetzung und wirtschaftliche Bedeutung*. xvii+422 pp., Gustav Fischer Verlag, Stuttgart.

James, M.T., 1969. A study on the origin of parasitism. *Bull. Ent. Soc. Amer. 15*(3): 251-253.

James, M.T., 1970. Family Calliphoridae, *in* Museu de Zoologia, Universidade de São Paulo, *A Catalogue of the Diptera of the Americas south of the United States 102*: 1-28, São Paulo.

Kamal, A.S., 1959. Comparative studies of thirteen species of sarcophagous Calliphoridae and Sarcophagidae. *Ann. Ent. Soc. Amer. 52*: 167-173.

Keilin, D., 1915. Recherches sur les larves de diptères cyclorrhaphes. *Bull. Scient. Franc. Belg. 49*: 15-198.

Keilin, D., 1916. Sur la viviparité chez les diptères et sur les larves de diptères vivipares. *Arch. Zool. Exp. Gén. 55*: 393-415, 8 figs.

Levinson, Z.H., 1960. Food of housefly larvae. *Nature 188*: 427-428.

Macquart, J., 1835. *Histoire naturelle des insectes. Diptères 2* : 703 pp., 12 pls. *In* (N.E. Roret, ed.), Collection des suites à Buffon. Paris.

Macquart, J., 1843. Diptères exotiques nouveaux on peu connus. *Mém. Soc. Roy. des Sci., de l'Agr. et des Arts, Lille, 1842*: 162-460, 36 pls.

Mello, R.P. de, 1967. Contribuição ao estudo dos Mesembrinellinae sulamericanos (Dipt., Calliphoridae). *Studia Entom. 10*: 1-80, illus.

Mello, R.P. de, 1969. Notes on *"Laneella brunnipes"* (Surcouf, 1919). (Diptera, Calliphoridae). *Rev. Brasil. Biol. 29*(2): 243-247.

Milani, R. & L. Rivosecchi, 1955. Malformazioni e mutazioni di *Musca domestica* L. di interesse per la conoscenza dei segmenti terminali maschili dei ditteri. *Boll. Zool. 22*: 341-372.

Papavero, N., 1971a. *Essays on the history of neotropical dipterology, with special reference to collectors* (1750-1905), *1* : viii+216 pp., 12 maps, São Paulo.

Papavero, N., 1971b. *Sistemática e evolução dos Megapodini (Diptera, Asilidae) do mundo.* (Tese de doutoramento). São Paulo.

Poorbaugh, J.H., J.R. Anderson & J.F. Burger, 1968. The insect inhabitants of undisturbed cattle droppings in northern California. *Calif. Vector Views 15*: 17-36.

Povolny, D. & J. Rozsypal, 1968. Towards the autoecology of *Lucilia sericata* (Meigen, 1826) (Dipt., Call.) and the origin of its synanthropy. *Acta Sci. Nat. Brno 2*(2): 1-32.

Roback, S.S., 1951. A classification of the muscoid Calyptrate Diptera. *Ann. Ent. Soc. Amer. 44*(3): 327-361.

Roberts, M.J., 1970. The structure of the mouthparts of syrphid larvae (Diptera) in relation to feeding habits. *Acta Zoologica 51*: 43-65.

Roberts, M.J., 1971. The structure of the mouthparts of some calyptrate dipteran larvae in relation to their feeding habits. *Ibidem 52*: 171-188.

Robineau-Desvoidy, J.B., 1830. Essai sur les Myodaires. Inst. de France (Cl. des Sci. Math. et Phys.), Acad. Roy. des Sci., *Mém. présentées par divers savants* (2)*2* : 1-813, Paris.

Saunders, D.S., 1960. Ovaries of *Glossina morsitans*. *Nature, 185*: 121-122.

Séguy, E., 1925. Espèces nouvelles du genre *Mesembrinella* G.T. *Encycl. Entom.*, Ser. (B) [Div.] II: Diptera *2*: 195-196.

Shannon, R.C., 1923. Genera of nearctic Calliphoridae (blowflies) with revision of the Calliphorini (Diptera). *Insect. Insc. Menstr. 11*: 101-118.

Shannon, R.C., 1926. Synopsis of the American Calliphoridae. *Proc. Ent. Soc. Wash. 28*: 115-129.

Shannon, R.C., 1939. Methods for collecting and feeding mosquitoes in jungle yellow fever studies. *Amer. Jour. Trop. Med. 19*: 131-140.

Schröder, T., 1927. Das Hypopygium "circumversum" von *Calliphora erythrocenhala*. *Ztschr. f. Morphol. u. Oekol. d. Tiere* 8(1): 1-44.

Surcouf, J.M.R., 1919. Revision des Muscidae Testaceae. *Nouv. Arch. Mus. Hist. Nat.*, Paris *5*: 27-124.

Townsend, C.H.T., 1918. New muscoid genera, species and synonymy. *Insect. Insc. Menstr. 6*: 151-156.

Townsend, C.H.T., 1931. Notes on American oestromuscoid types. *Rev. Ent. 1*: 65-104, 157-183.

Towsend, C.H.T., 1934. Muscoid notes and descriptions. *Ibidem 4*: 110-112.

Townsend, C.H.T., 1935. *Manual of Myiology 2*: 143-146, São Paulo.

Townsend, C.H.T., 1937. *Manual of Myiology 5*: 1-232, São Paulo.

Townsend, C.H.T., 1937-1942. *Manual of Myiology*, Vols. 1-12, C.H. Townsend & Filhos, São Paulo.

Travassos F.°, L. & H. F. Camargo, 1958. A Estação Biológica de Boracéia. *Arq. Zool. Est. São Paulo 11*: 1-21.

Vockeroth, J.R., 1969. A revision of the genera of the Syrphini (Diptera: Syrphidae). *Mem. Ent. Soc. Canada 62*: 1-176.

Villeneuve, J., 1920. A propos de Revision des Muscidae Testaceae de J. Surcouf. *Bull. Soc. Ent. France 14*: 223-226.

Walker, F., 1849. *List of the specimens of the dipterous insects in the collection of the British Museum 4*: 689-1172, London.

Walker, F., 1891. Characters of undescribed Diptera in the collection of W. Saunders. *Trans. Entom. Soc. London* 2(5): 268-334.

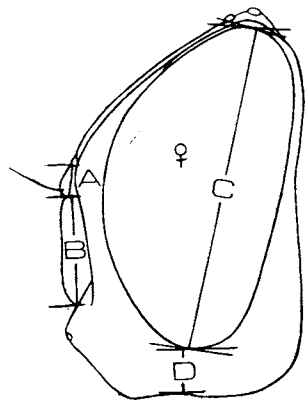
Webber, L.R., 1958. Nutrition and reproduction in the Australian sheep blow fly, *Lucilia cuprina*. *Austr. Jour. Zool. 6*: 139-144.

Wiedemann, C.R.W., 1830. *Aussereuropäische zweiflügelige Insekten*. Vol. 2, xii + 684 pp., 5 pls., Hamm.

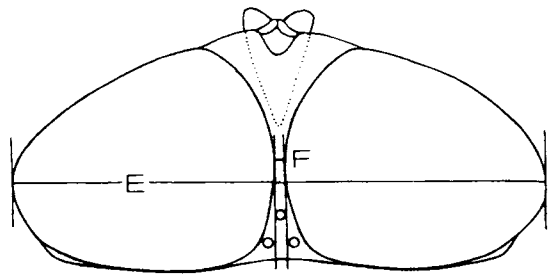
Wulp, F.M. van der, 1896. Fam. Muscidae, pp. 273-280, 281-288, 289-304, 305-312, 313-320, 321-344, pls., 7-8, *in* F.D. Godman & O. Salvin, eds., *Biologia Centrali Americana. Zoologia-Insecta Diptera 2*: 489 pp., 11 figs., 13 pls. London.

Zacharias, A., 1928. Untersuchungen ueber die intracellulare Symbiose bei dem Pupiparen. *Ztsch. f. Morphol. u. Oekol. d. Tiere 10*: 676-737.

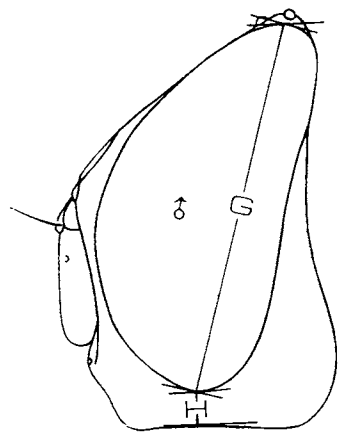
# INDEX



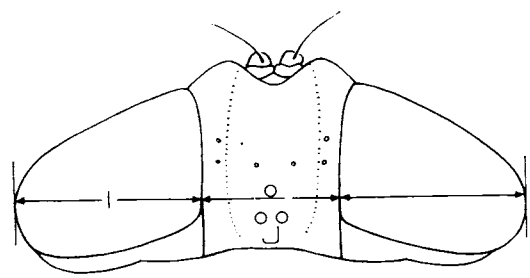

1




2

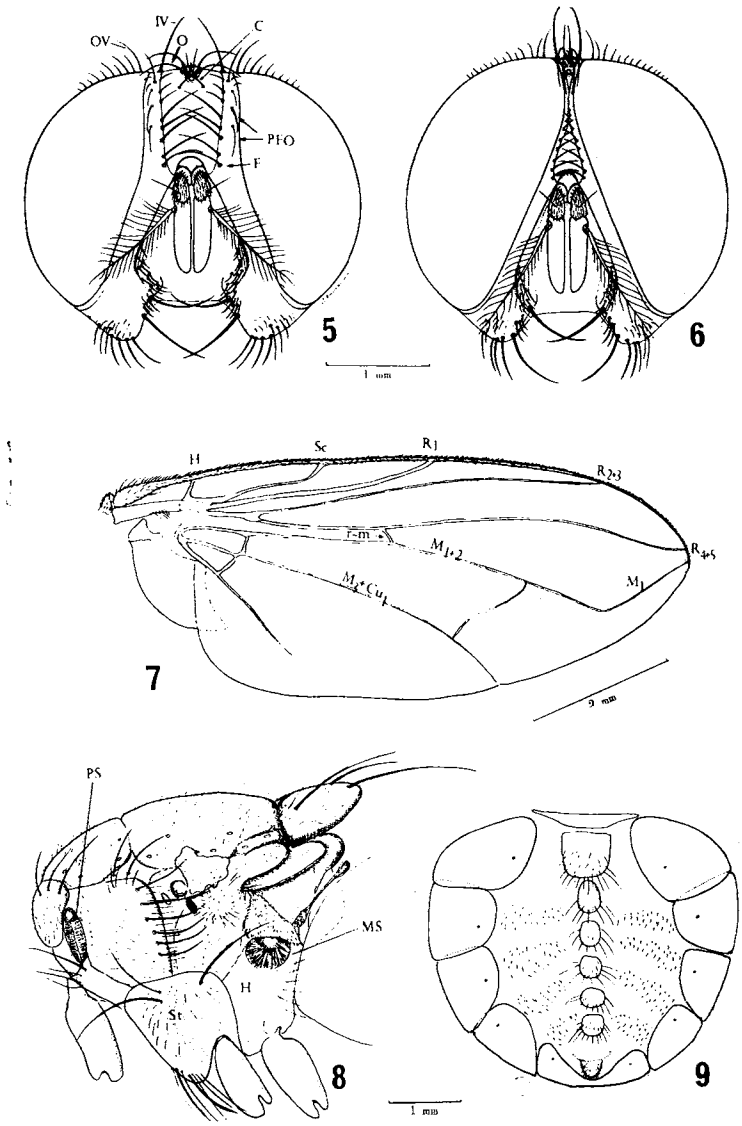



3

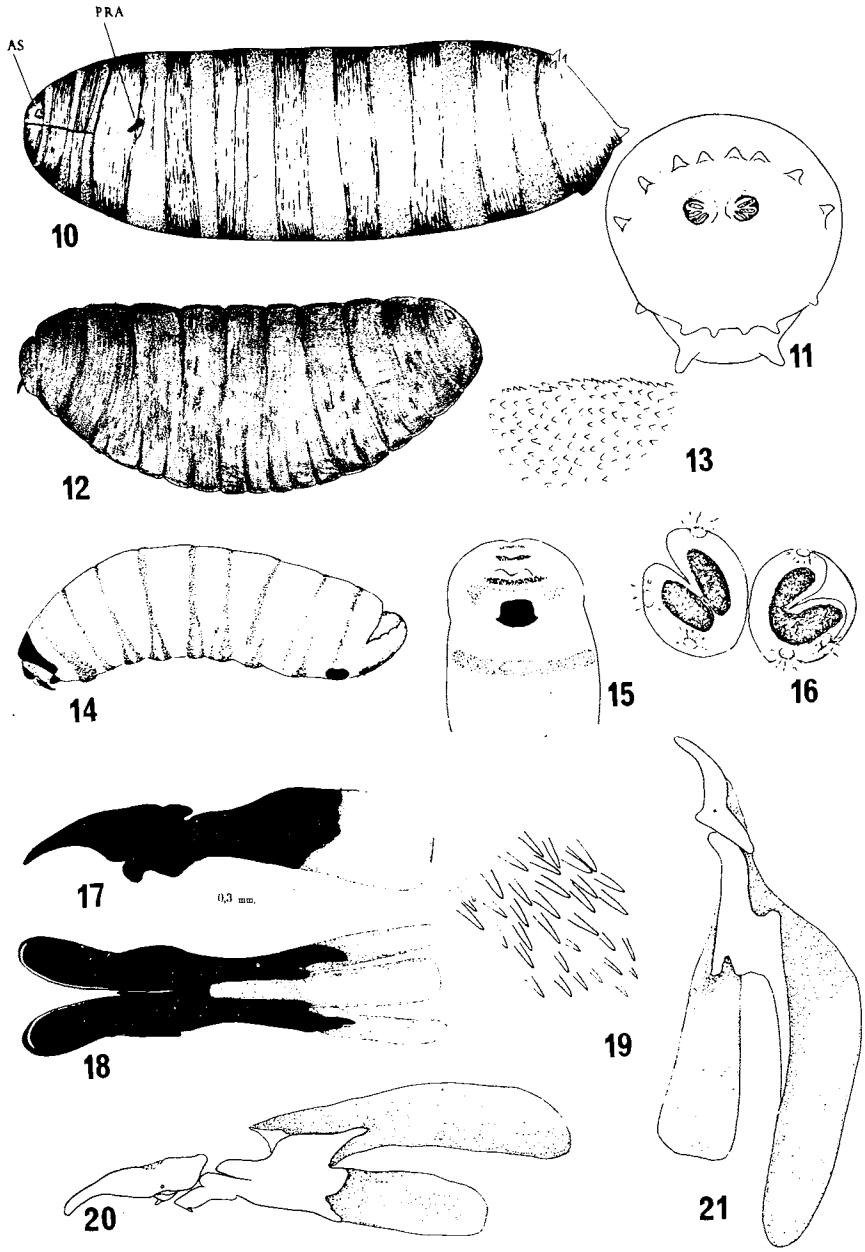



4

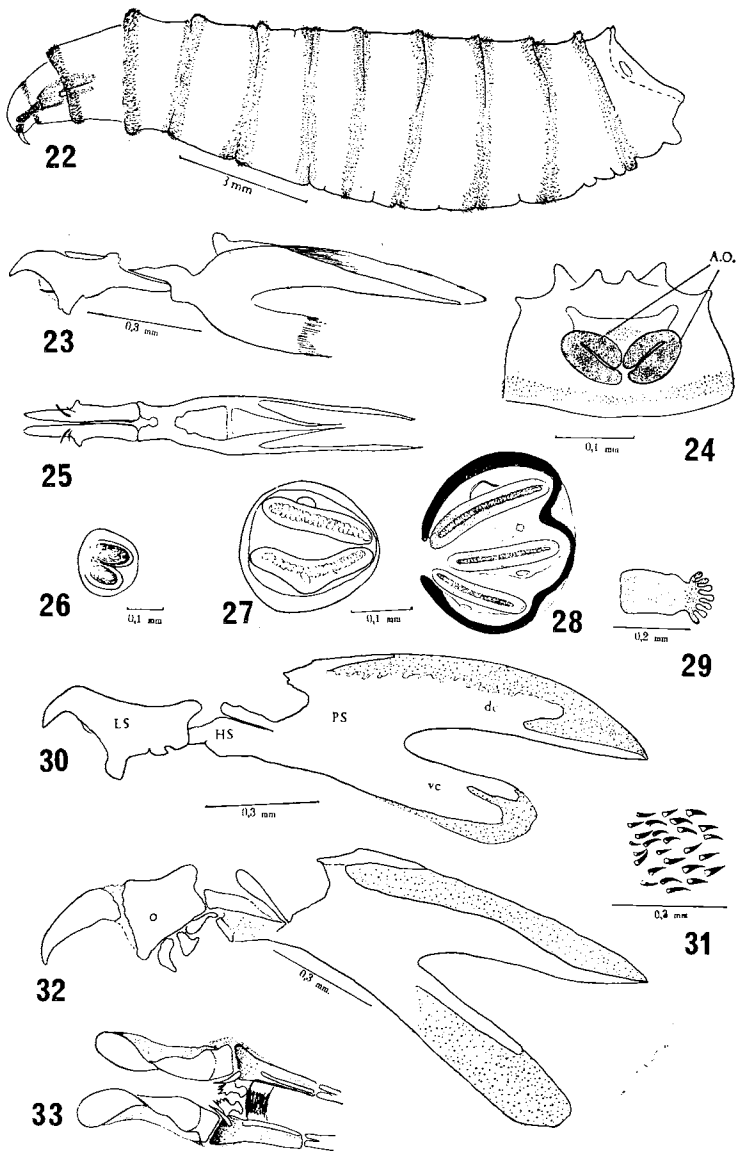
Mesembrinellidae head, schematic, showing reference points for measurement of head structures. Fig. 1: Female, lateral view; A: length of 2nd antennal segment; B: length of 3rd antennal segment; C: eye height. Fig. 2: Male, dorsal view; E: width of head; F: width of vertex. Fig. 3: Male, lateral view; G: eye height; H: height of gena. Fig. 4: Female, dorsal view; I: width of an eye; J: width of vertex.



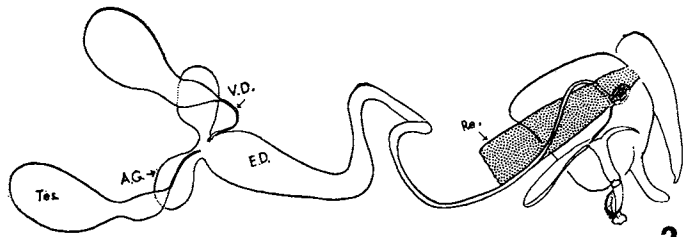

*Mesembrinella*. Figs. 5-6: *bicolor*, head, anterior view, of ♀ (5) and ♂ (6). Fig. 7: *peregrina*, right wing. Fig. 8: *bellardiana bellardiana*, thorax, lateral view; *H*: hypopleura; *MS*: metathoracic spiracle; *PS*: prothoracic spiracle; *St*: sternopleura. Fig. 9: *peregrina*, abdomen (♀), ventral view.



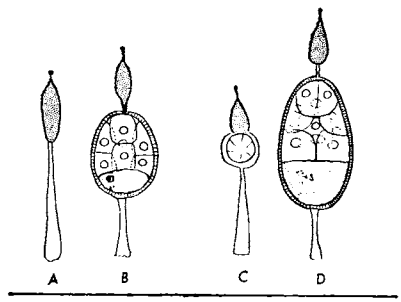

Figs. 10-11: *Laneella nigripes;* 10: puparium, lateral view; *AS*: anterior spiracle; *PRA*: pupal respiratory aperture; 11: caudal view of larva III. Figs. 12-13 *Mesembrinella bellardiana bellardiana*, larva I; 12: lateral view; 13: detail of cuticle, dorsal view. Figs. 14-16: *Souzalopesiella facialis*, larva I; 14: lateral view; 15: detail of posterior end, ventral view; 16: detail of posterior spiracles. Figs. 17-18: *Eumesembrinella quadrilineata*, cephalopharyngeal sclerite, larva I; 17: lateral view; 18: ventral view. Fig. 19: *Souzalopesiella facialis*, larva I, detail of spines of tegument of ventral area. Fig. 20: *Mesembrinella b. bellardiana*, cephalopharyngeal sclerite, larva I, lateral view. Fig. 21: *Mesembrinella peregrina*, same.



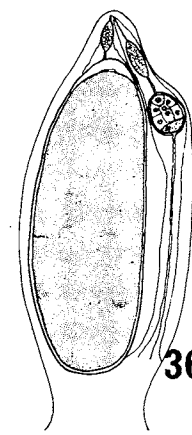

Larvae I (23, 25-26), II (27, 30) and III (22, 24, 28-29, 31-33) of *Laneella nigripes*. Fig. 22: lateral view. Fig. 23: cephalopharyngeal sclerite. Fig. 24: posterior end, ventral view; *AO*: anal organ. Fig. 25: cephalopharyngeal sclerite. Figs. 26-28: posterior spiracle. Fig. 29: anterior spiracle. Fig. 30: cephalopharyngeal sclerite; lateral view; *dc*: dorsal cornua; *HS*: hypostomal sclerite; *LS*: labial sclerite; *PS*: pharyngeal sclerite; *vc*: ventral cornua. Fig. 31: detail of spines on cuticle, dorsal view. Fig. 32: cephalopharyngeal sclerite. Fig. 33: detail of labial and hypostomal sclerite, ventral view.



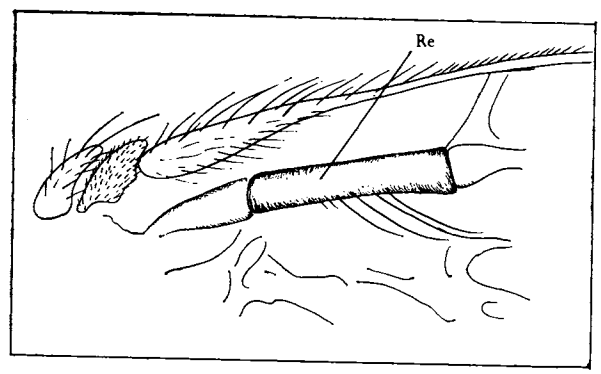

34




35



36




37

*Mesembrinella peregrina.* Fig. 34: male reproductive system; *AG*: accessory glands; *ED*: ejaculatory duct; *Re*: rectum; *Tes*: testicles; *VD*: vasa defferentia. Fig. 35: diagram of developmental stages of ovarioles — see text for explanation. Fig. 36: ovariole with egg in advanced stage of development. Fig. 37: wing base with ciliated remigium (*Re*).

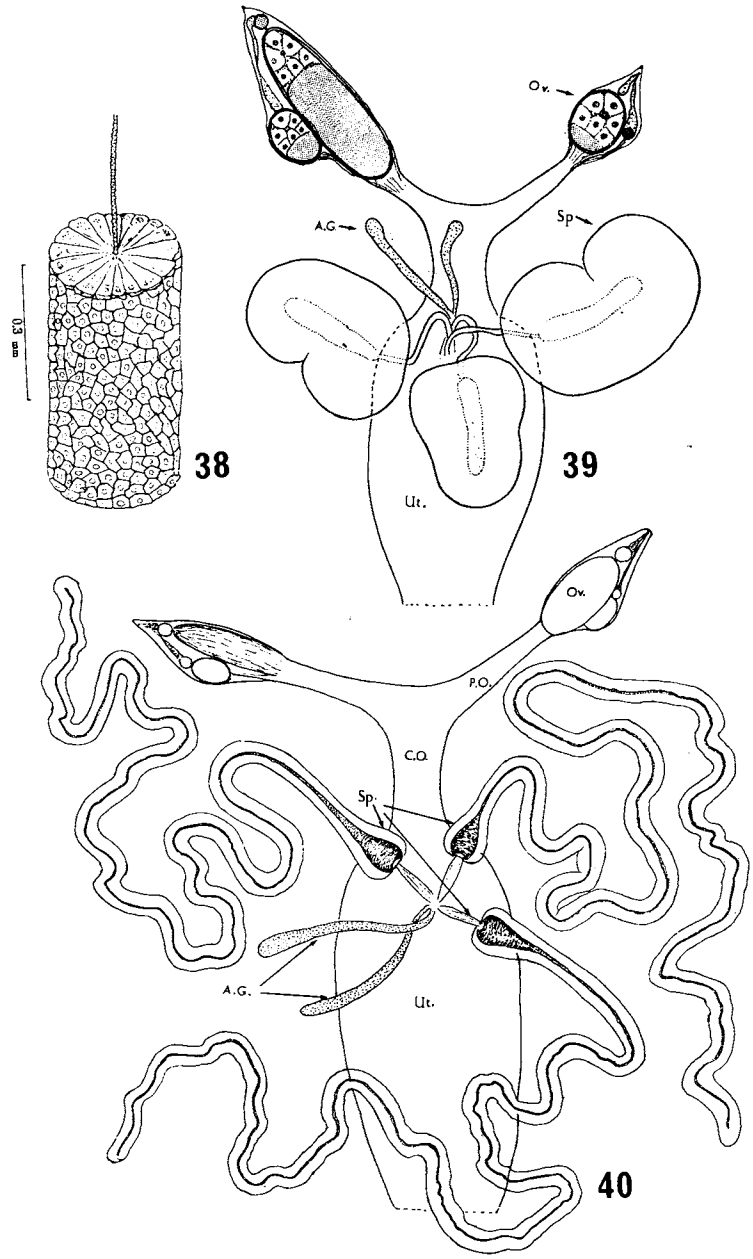
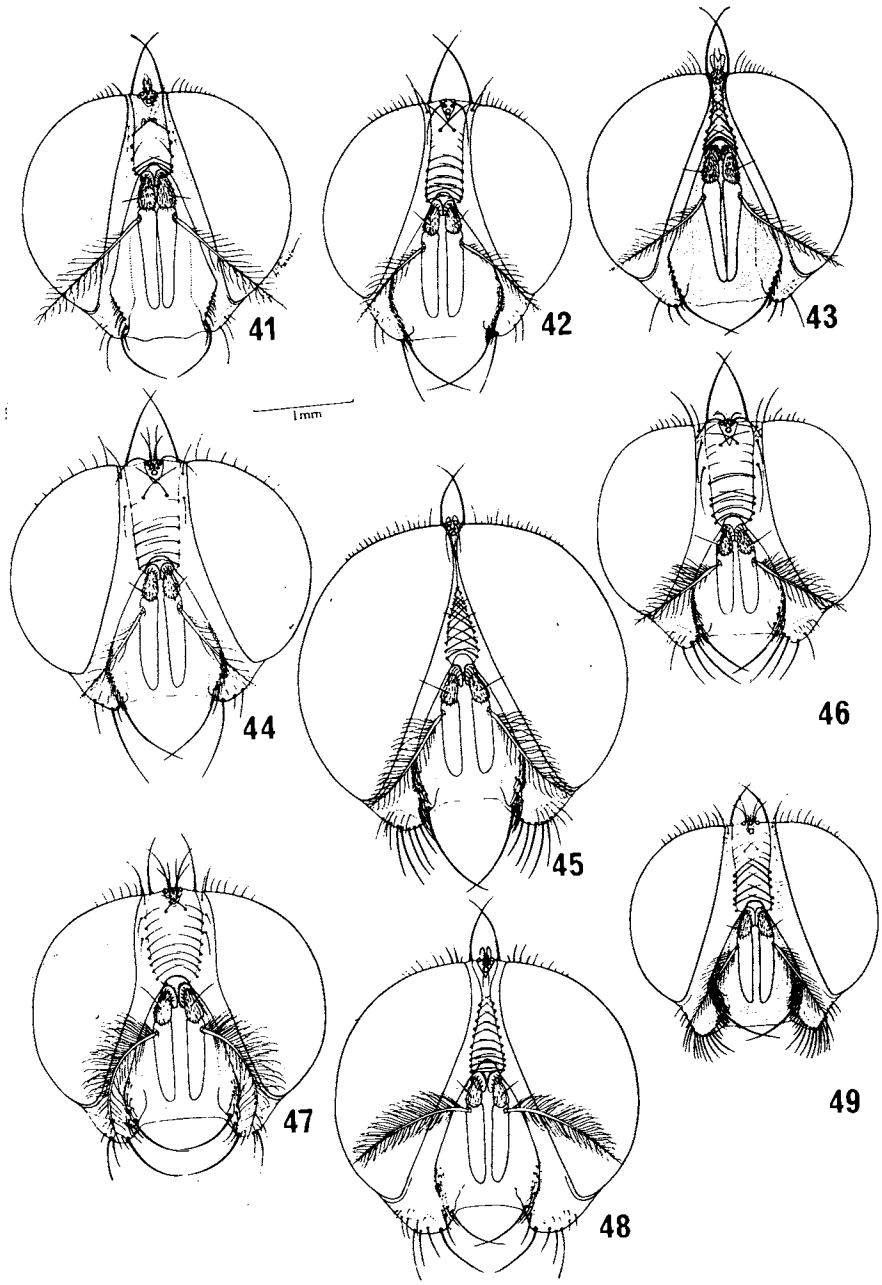
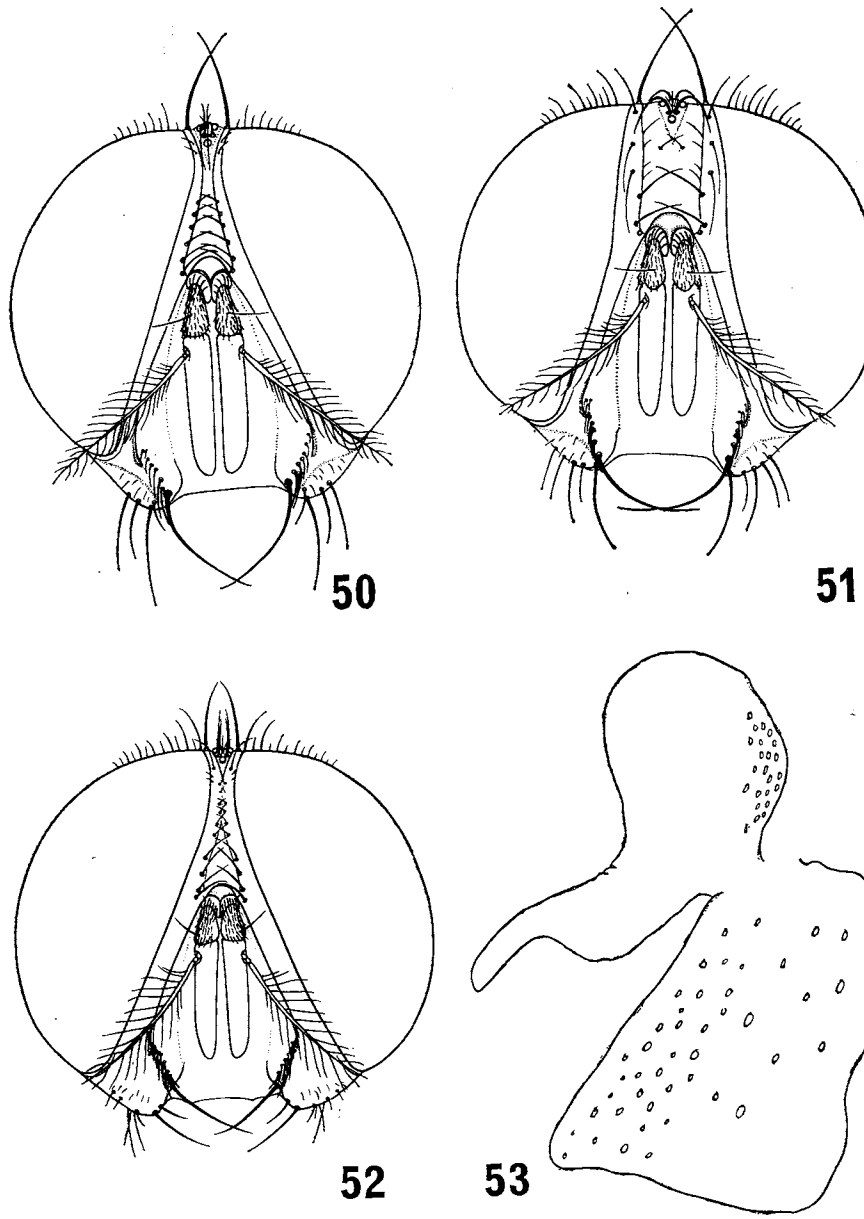


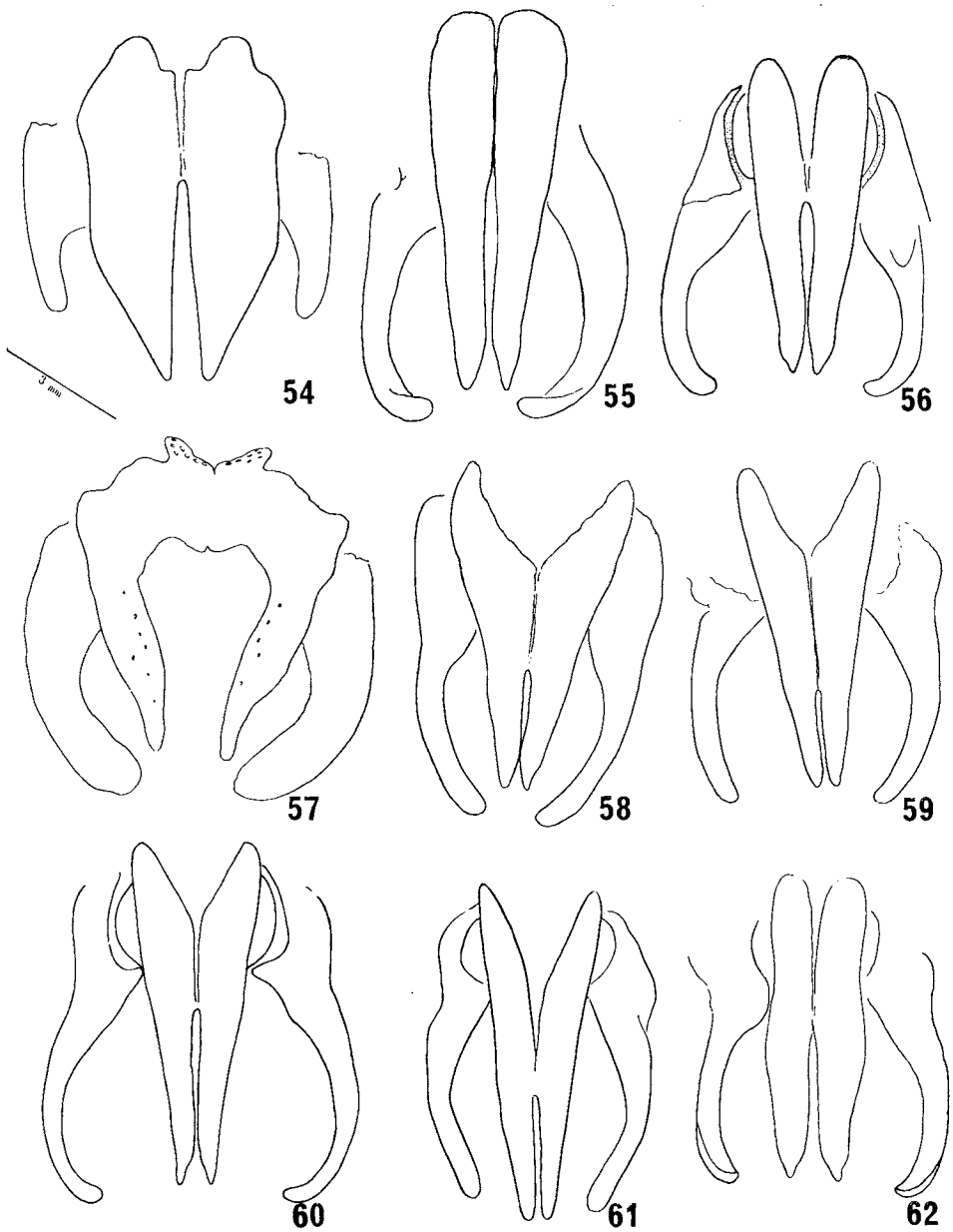

Fig. 38: Detail of mid-section of spermatheca of *Mesembrinella peregrina*. Fig. 39: Female reproductive system, *Laneella nigripes*. Fig. 40: Same, *Mesembrinella peregrina*. *AG*: accessory glands; *CO*: common oviduct; *PO*: paired oviduct; *Ov*: ovary; *Sp*: spermatheca; *Ut*: uterus.



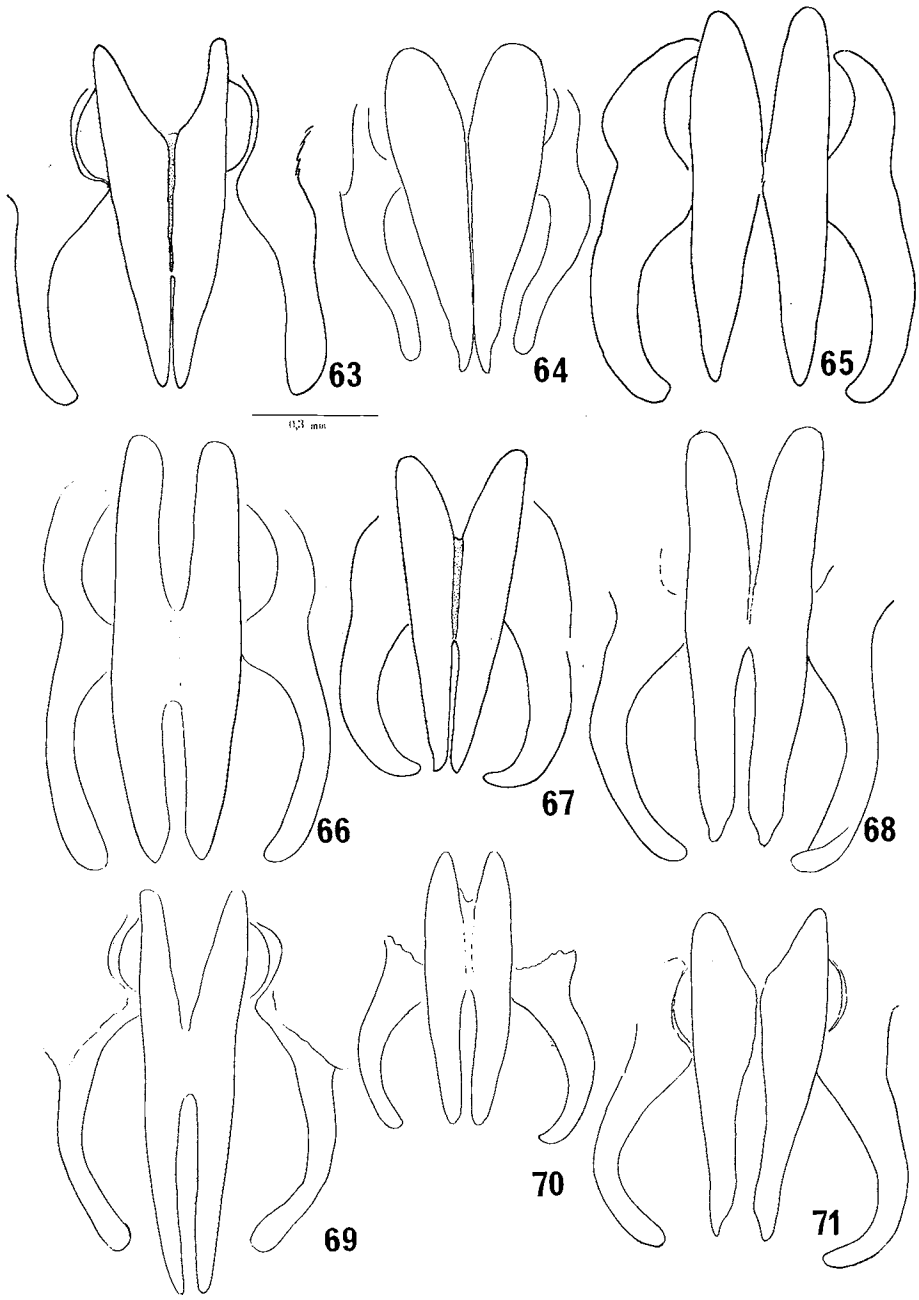

Head, anterior view. Fig. 41: *Thompsoniella anomala*, ♀. Fig. 42: *Albuquerquea latifrons*, ♂. Fig. 43: *T. anomala*, ♂. Fig. 44: *A. latifrons*, ♀. Fig. 45: *Laneella nigripes*, ♂. Fig. 46: same, ♂. Fig. 47: *Eumesembrinella quadrilineata*, ♀. Fig. 48: same, ♂. Fig. 49: *Mesembrinella pictipennis*, ♀.



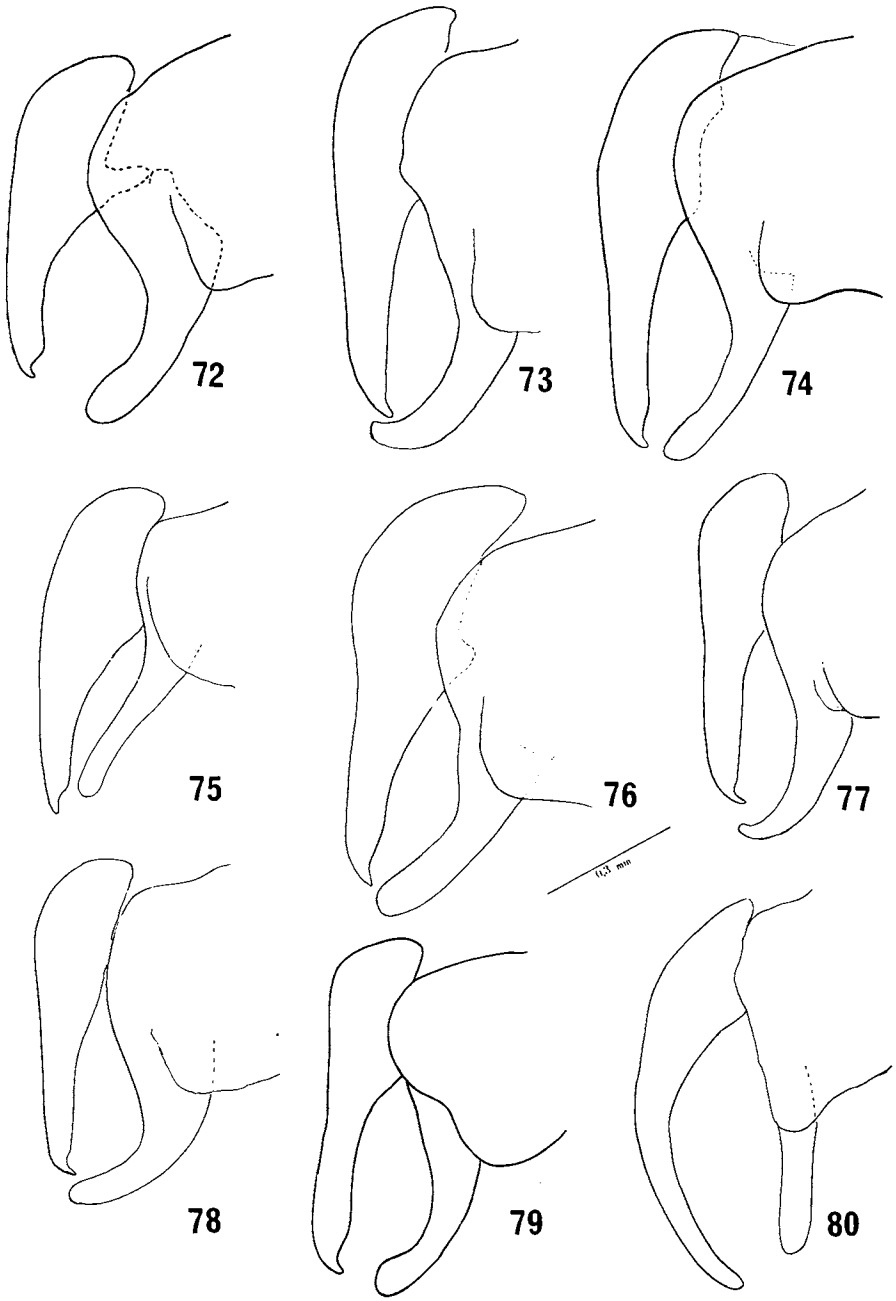

Figs. 50-52: head, anterior view, of *Huascaromusca aeniventris* (50, ♂; 51, ♀) and *Mesembrinella semihyalina*, ♂ (52). Fig. 53: *Thompsoniella anomala*, cercus and surstylus, lateral view.



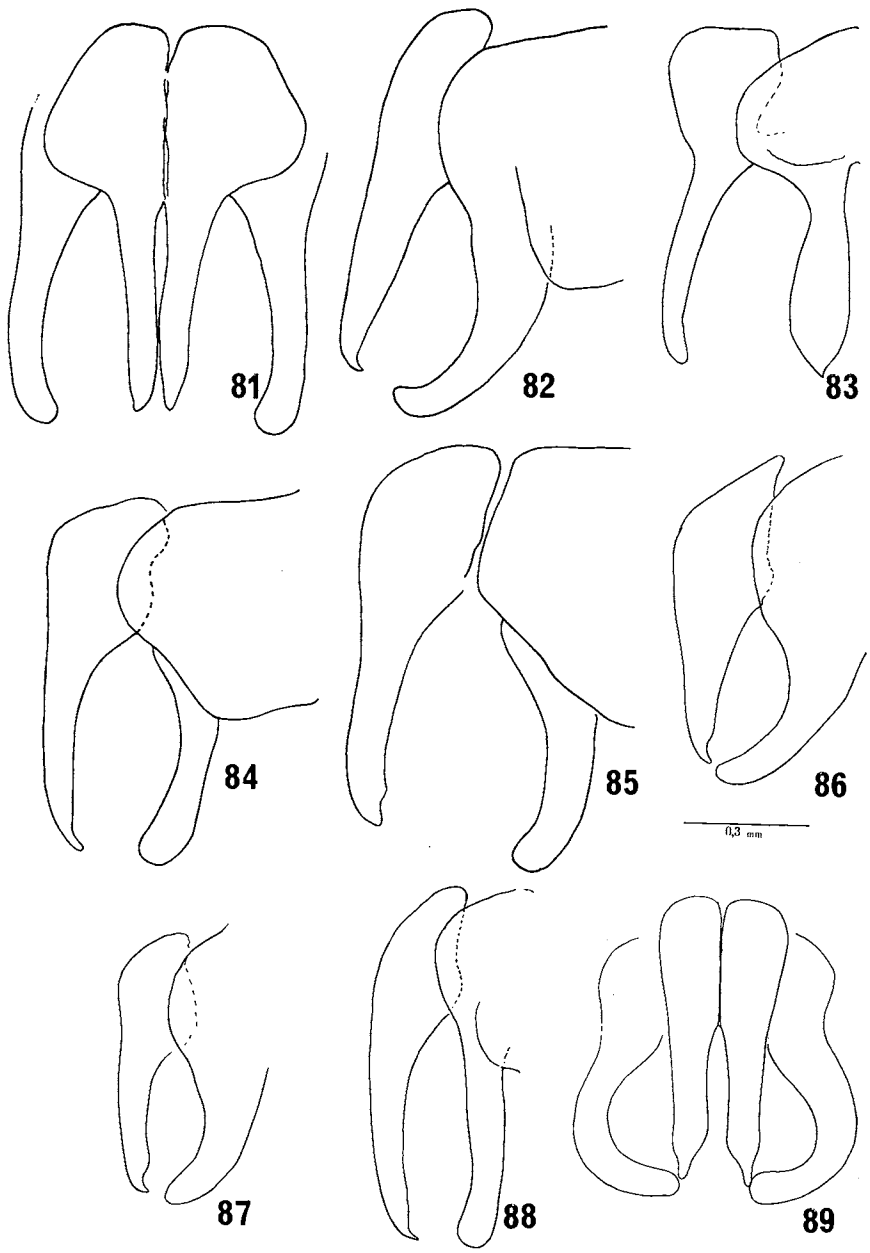

Male genitalia, cercus and surstylus, posterior view. Fig. 54: *Huascaromusca uniseta.* Fig. 55: *Mesembrinella umbrosa.* Fig. 56: *M. semihyalina.* Fig. 57: *Thompsoniella anomala.* Fig. 58: *Eumesembrinella randa.* Fig. 59: *E. benoisti.* Fig 60: *Huascaromusca purpurata.* Fig. 61: *Laneella nigripes.* Fig. 62:*Mesembrinella abaca.*



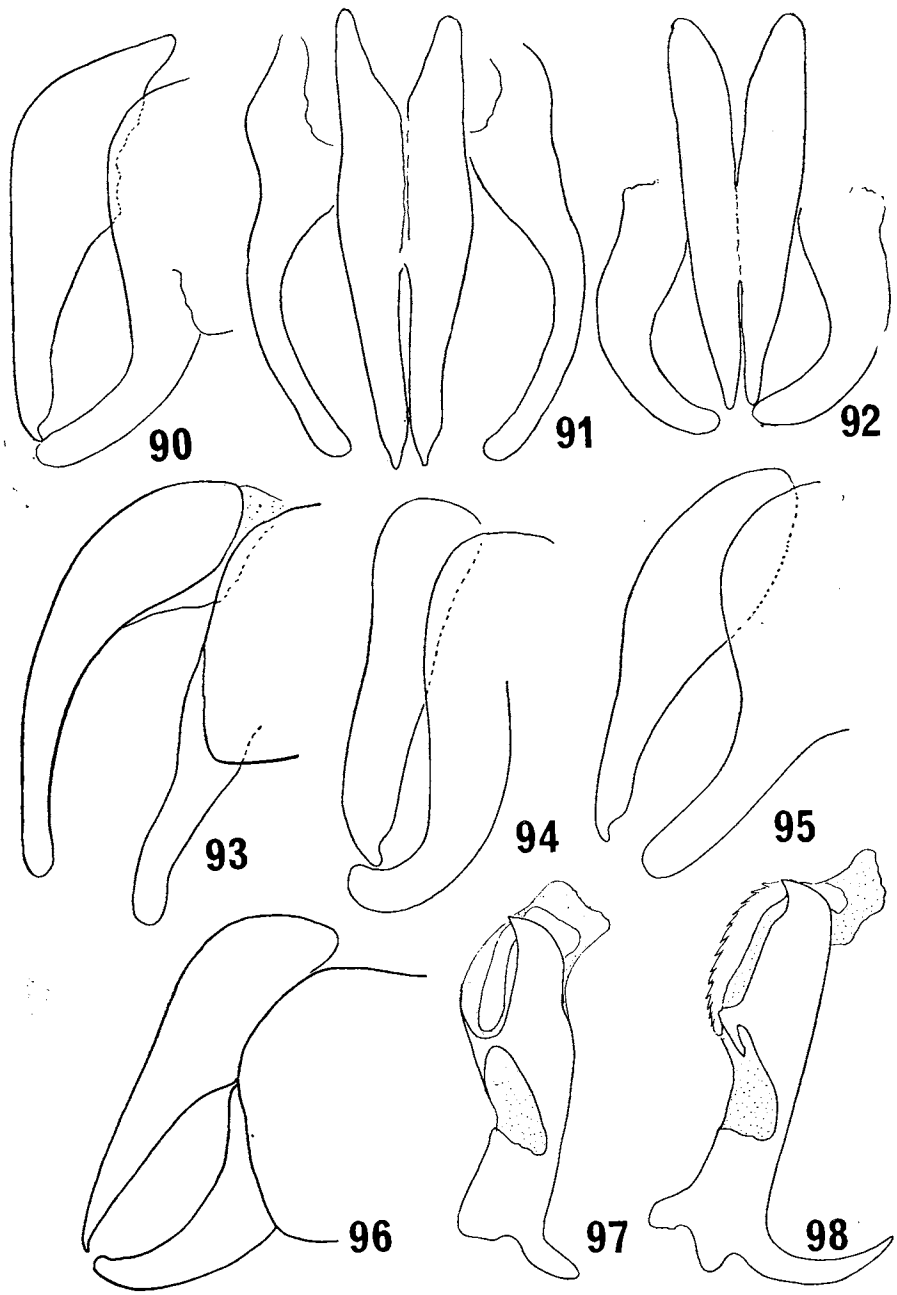

Male genitalia, cercus and surstylus, posterior view. Fig. 63: *Eumesembrinella quadrilineata*. Fig. 64: *Mesembrinella decrepita*. Fig. 65: *M. b. bellardiana*. Fig. 69: *Souzalopesiella facialis*. Fig. 70: *Mesembrinella apollinaris*. Fig. 71: *M. currani*.



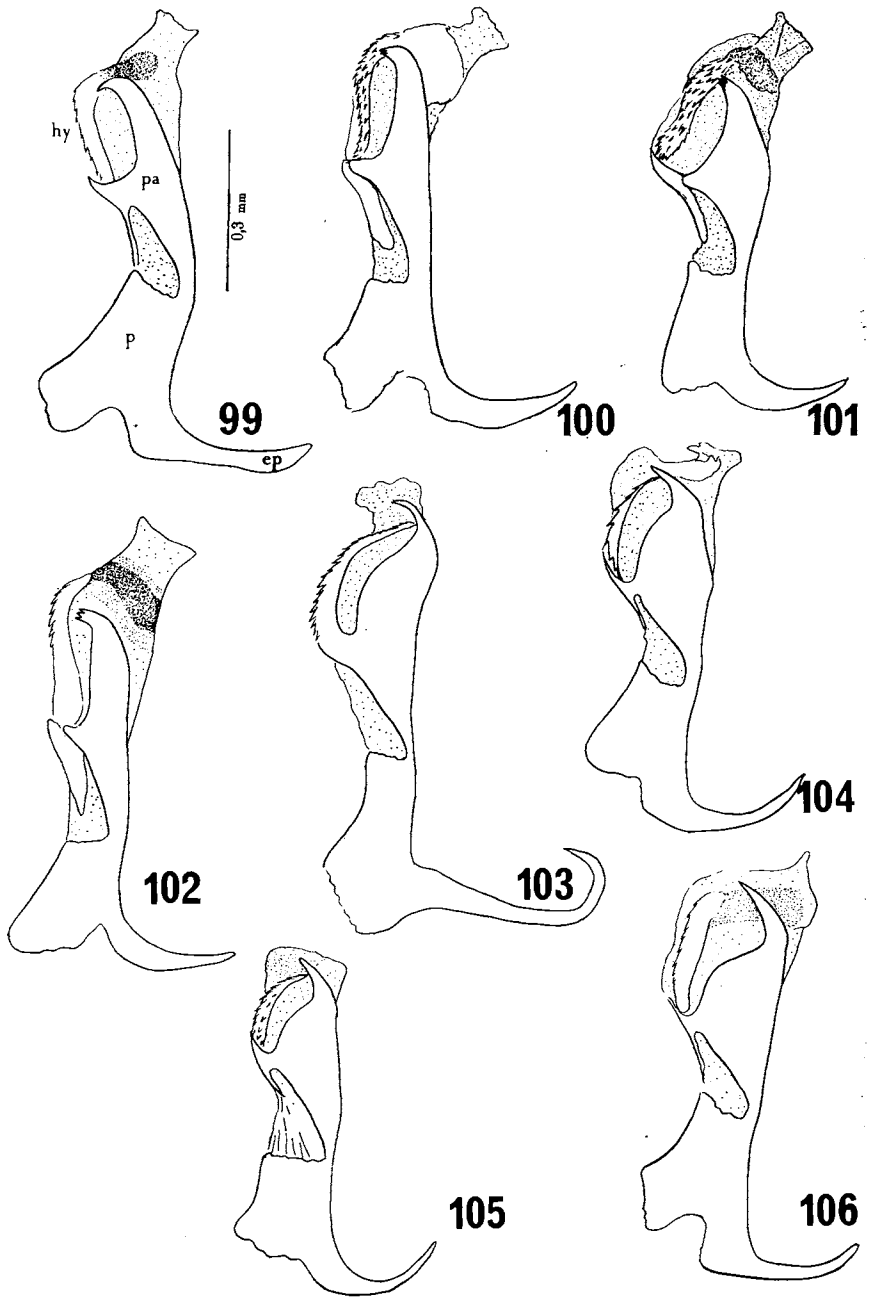

Male genitalia, cercus and surstylus, lateral view. Fig. 72: *Eumesembrinella quadrilineata*. Fig. 73: *Mesembrinella umbrosa*. Fig. 74: *M. batesi*. Fig. 75: *M. decrepita*. Fig. 76: *M. bicolor*. Fig. 77: *M. abaca*. Fig. 78: *M. fulviceps*. Fig. 79: *M. semihyalina*. Fig. 80: *Souzalopesiella facialis*.



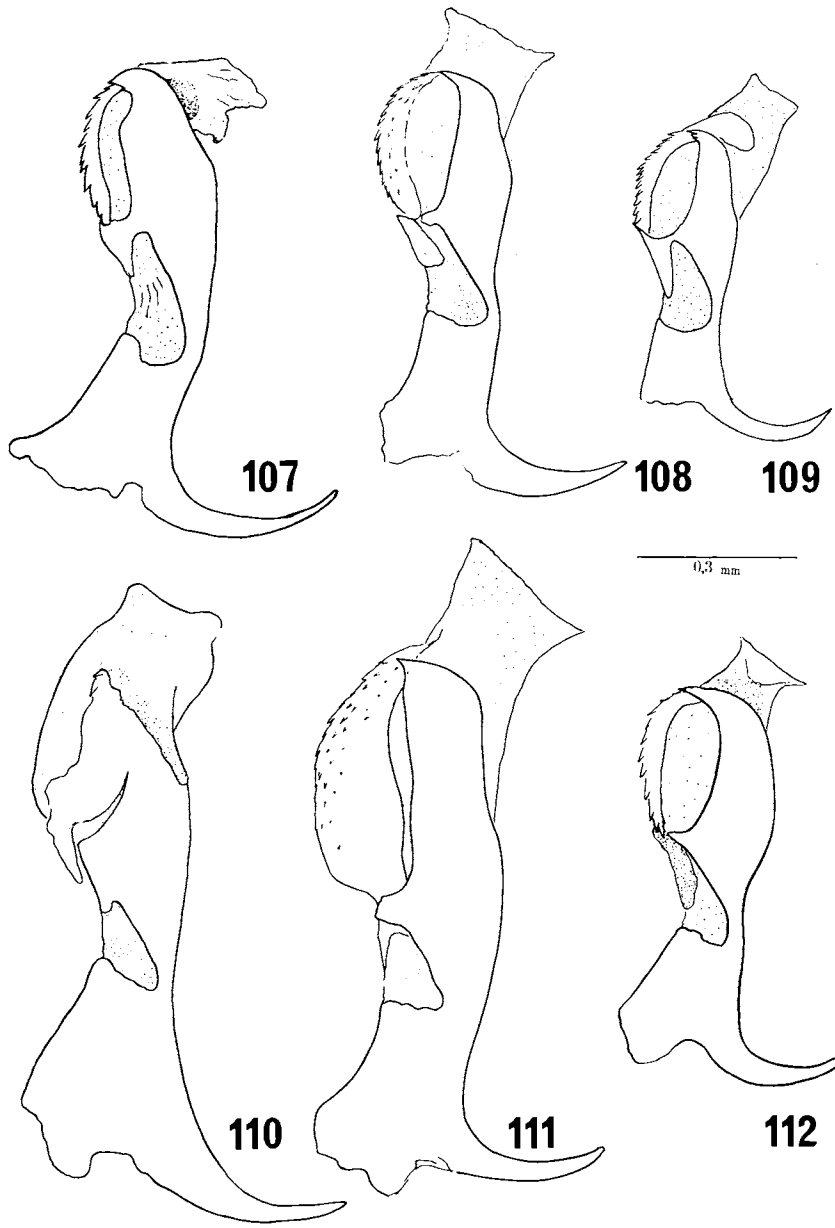

Male genitalia, cercus and surstyli, posterior (81, 89) and lateral views (82-88). Fig. 81: *Huascaromusca aeneiventris*. Fig. 82: *Mesembrinella b. bellardiana*. Fig. 83: *Huascaromusca uniseta*. Fig. 84: *H. purpurata*. Fig. 85: *H. aeneiventris*. Fig. 86: *Eumesembrinella c. cyaneicincta*. Fig. 87: *Mesembrinella apollinaris*. Fig. 88: *Huascaromusca semiflava*. Fig. 89: *Albuquerquea latifrons*.



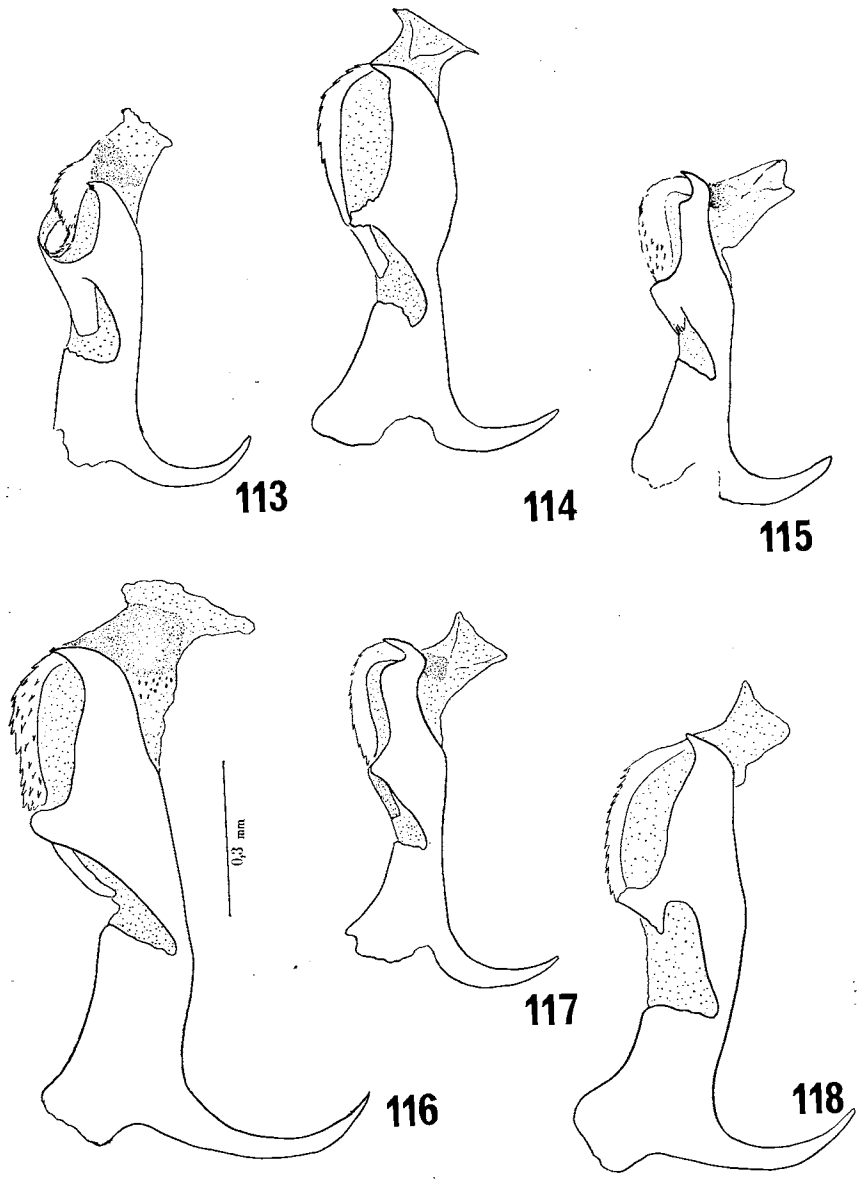

Male genitalia, cercus and surstylus, posterior (91-92) and lateral views (90, 93-96). Fig. 90: *Eumesembrinella benoisti*. Fig. 91: *Huascaromusca semiflava*. Fig. 92: *H. pauciseta*. Fig. 93: *Laneella nigripes*. Fig. 94: *Albuquerquea latifrons*. Fig. 95: *Eumesembrinella randa*. Fig. 96: *Mesembrinella peregrina*. Figs. 97-98: Aedeagus, lateral view, of *Huascaromusca flavicrura* (97) and *Mesembrinella peregrina* (98).



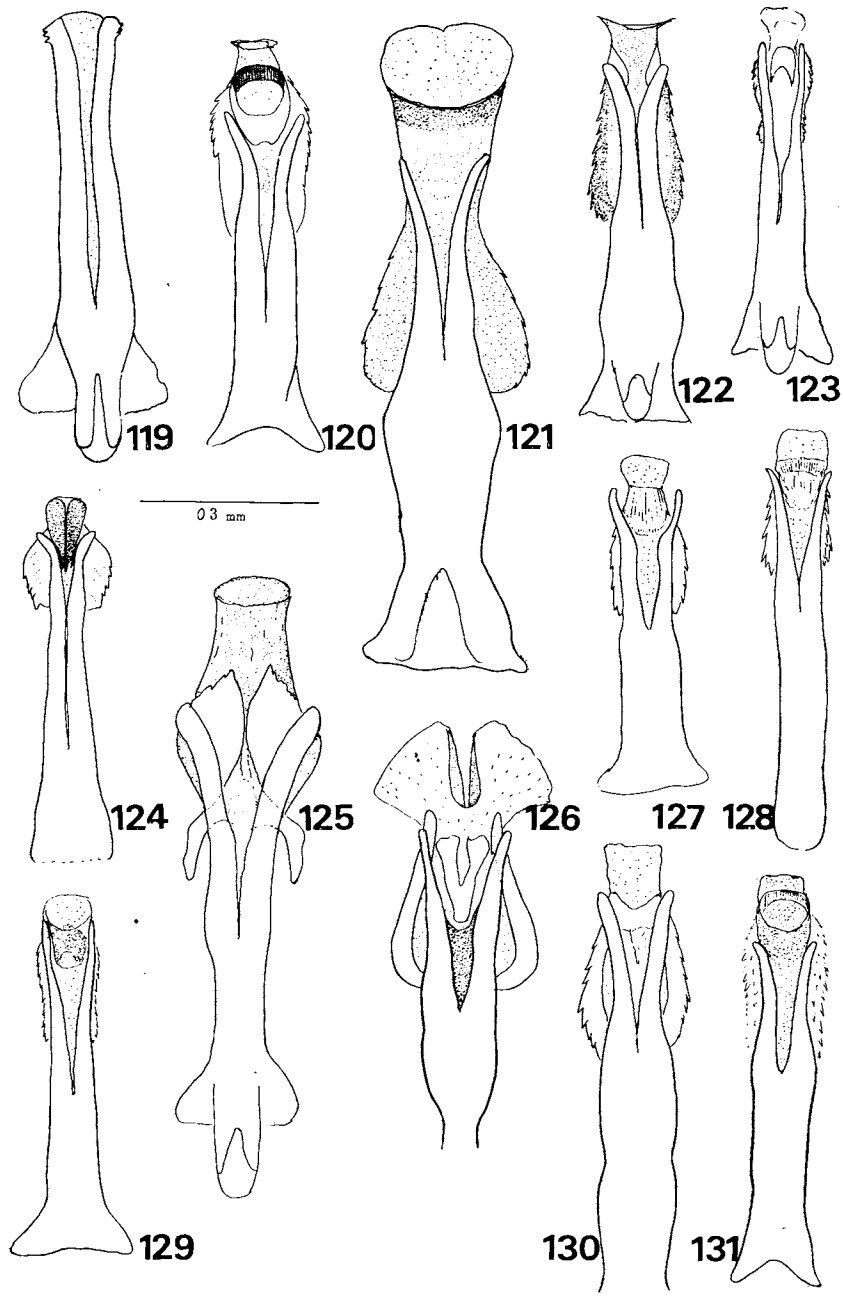

Aedeagus, lateral view. Fig. 99: *Huascaromusca aeneiventris*. Fig. 100: *Eumesembrinella pauciseta*. Fig. 101: *E. randa*. Fig. 102: *E. quadrilineata*. Fig. 103: *Thompsoniella anomala*. Fig. 104: *Huascaromusca semiflava*. Fig. 105: *H. confusa*. Fig. 106: *H. purpurata*. *Ep*: epiphallus; *hy*: hypophallus; *P*: phallobasis; *pa*: paraphallus.



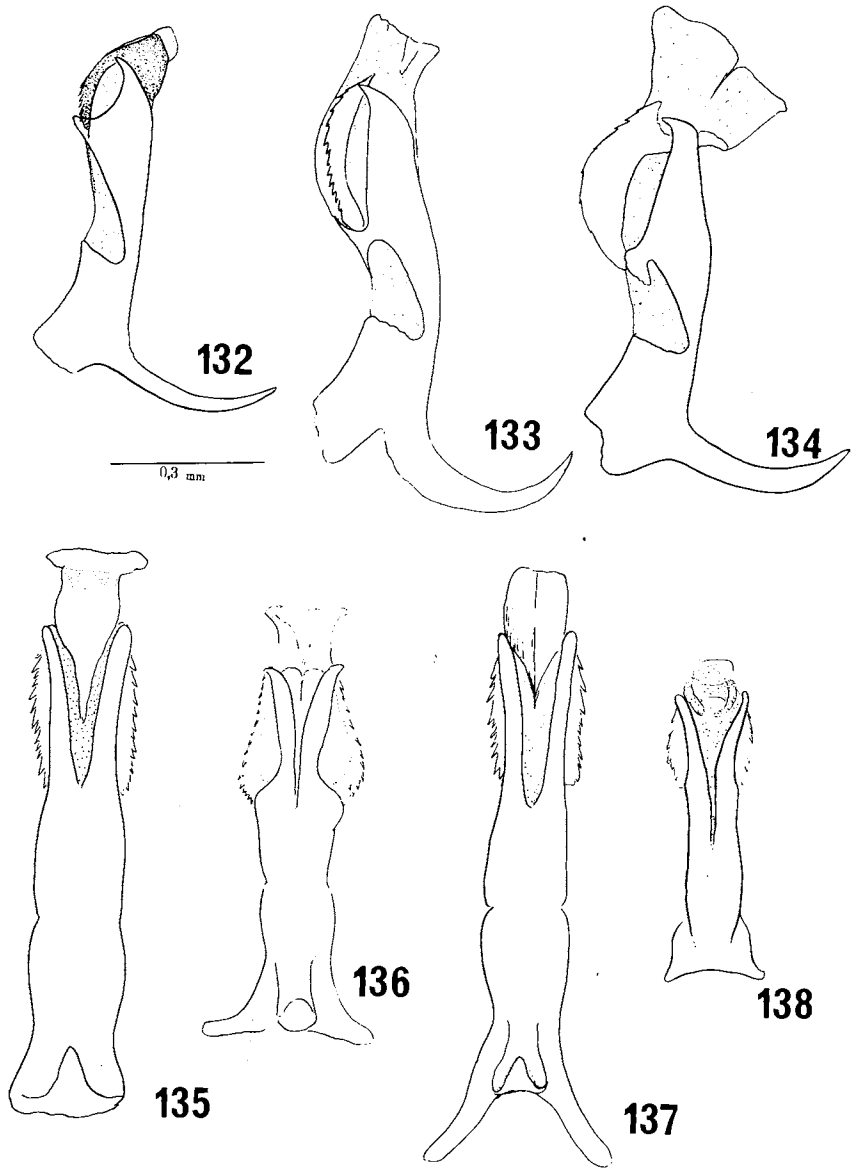

Aedeagus, lateral view. Fig. 107: *Mesembrinella umbrosa*. Fig. 108: *M. bicolor*. Fig. 109: *M. peregrina*. Fig. 110: *Souzalopesiella faciatis*. Fig. 111: *Mesembrinella fulvipes*. Fig. 112: *M. batesi*.



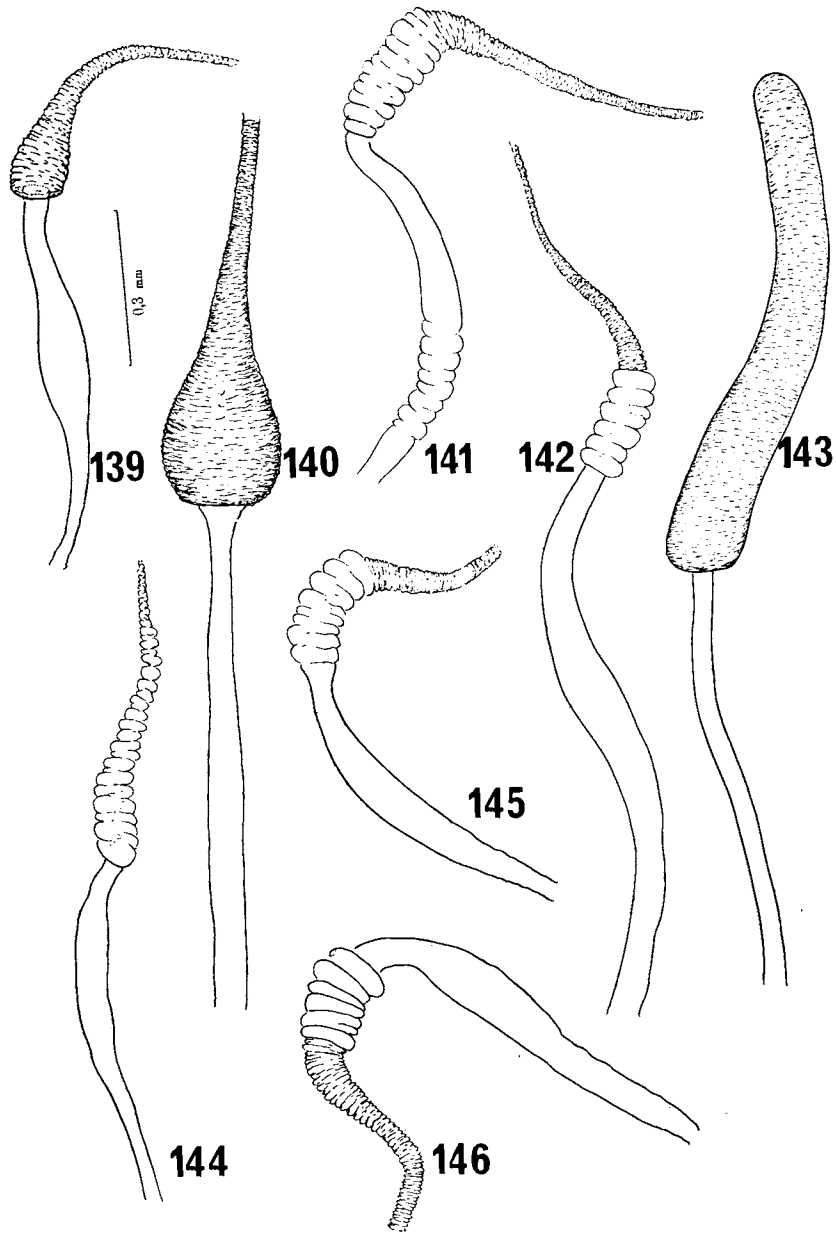

Aedeagus, lateral view. Fig. 113: *Eumesembrinella benoisti*. Fig. 114: *Mesembrinella bicolor*. Fig. 115: *M. abaca*. Fig. 116: *M. apollinaris*. Fig. 117: *M. semihyalina*. Fig. 118: *M. b. bellardiana*.



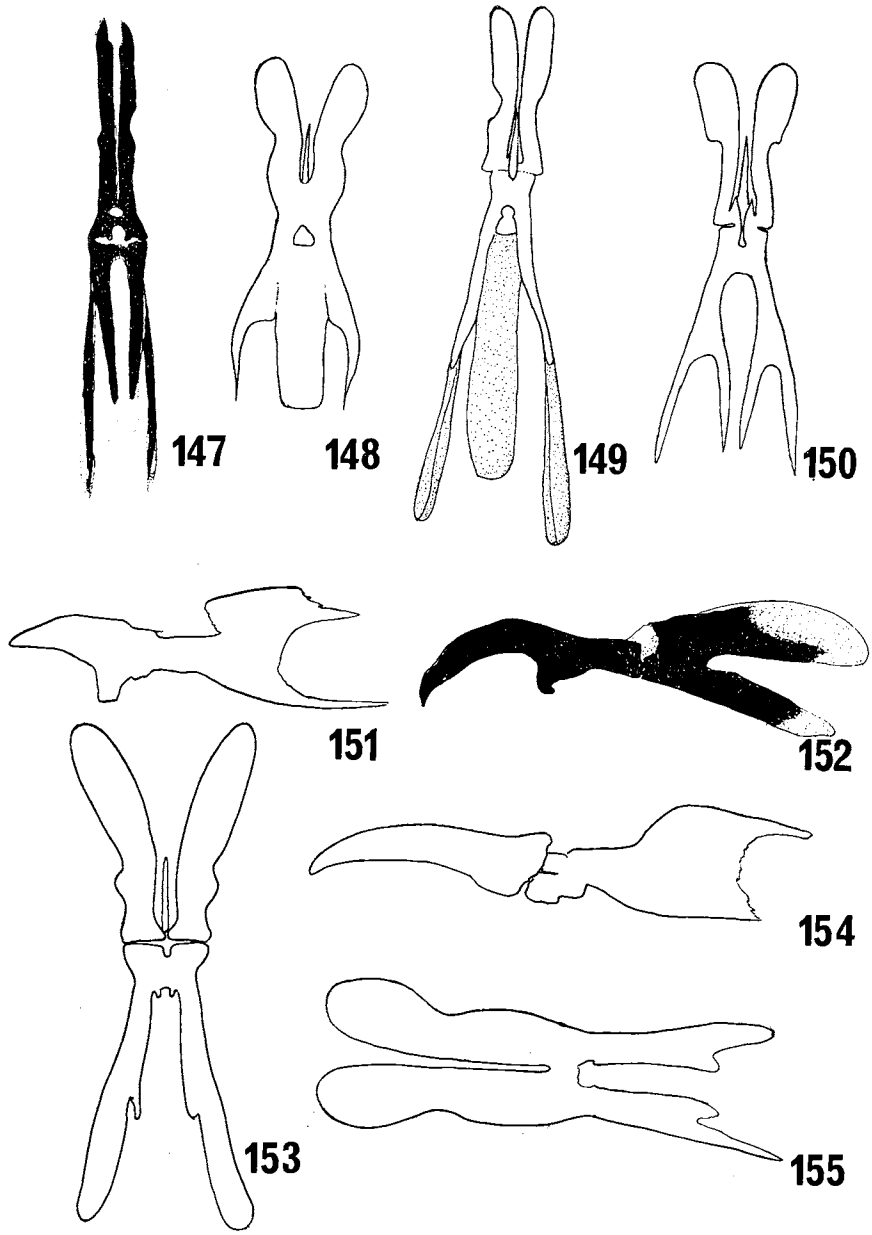

Aedeagus, dorsal view. Fig. 119: *Mesembrinella umbrosa*. Fig. 120: *Eumesembrinella quadrilineata*. Fig. 121: *Mesembrinella fulviceps*. Fig. 122: *M. batesi*. Fig. 123: *M. abaca*. Fig. 124: *Laneella nigripes*. Fig. 125: *Souzalopesiella facialis*. Fig. 126: *Albuquerquea latifrons*. Fig. 127: *Huascaromusca purpurata*. Fig. 128: *H. aeneiventris*. Fig. 129: *H. semihyalina*. Fig. 130: *Mesembrinella b. bellardiana*. Fig. 131: *Eumesembrinella c. cyaneicincta*.



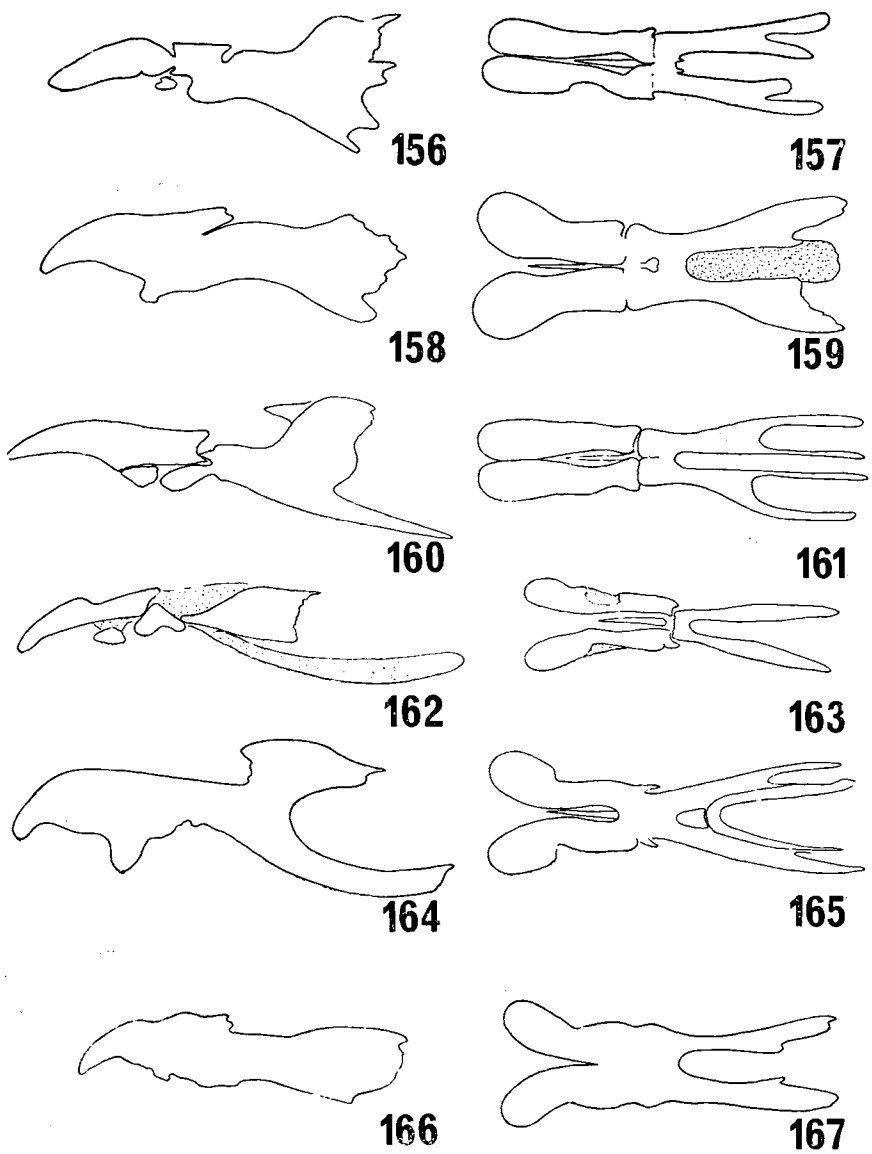

Aedeagus, lateral (132-134) and dorsal (135-138) views. Fig. 132: *Laneella nigripes*. Fig. 133: *Huascaromusca uniseta*. Fig. 134: *Albuquerquea latrifrons*. Fig. 135: *Mesembrinella batesi*. Fig. 136: *M. bicolor*. Fig. 137: *M. apollinaris*. Fig. 138: *M. peregrina*.



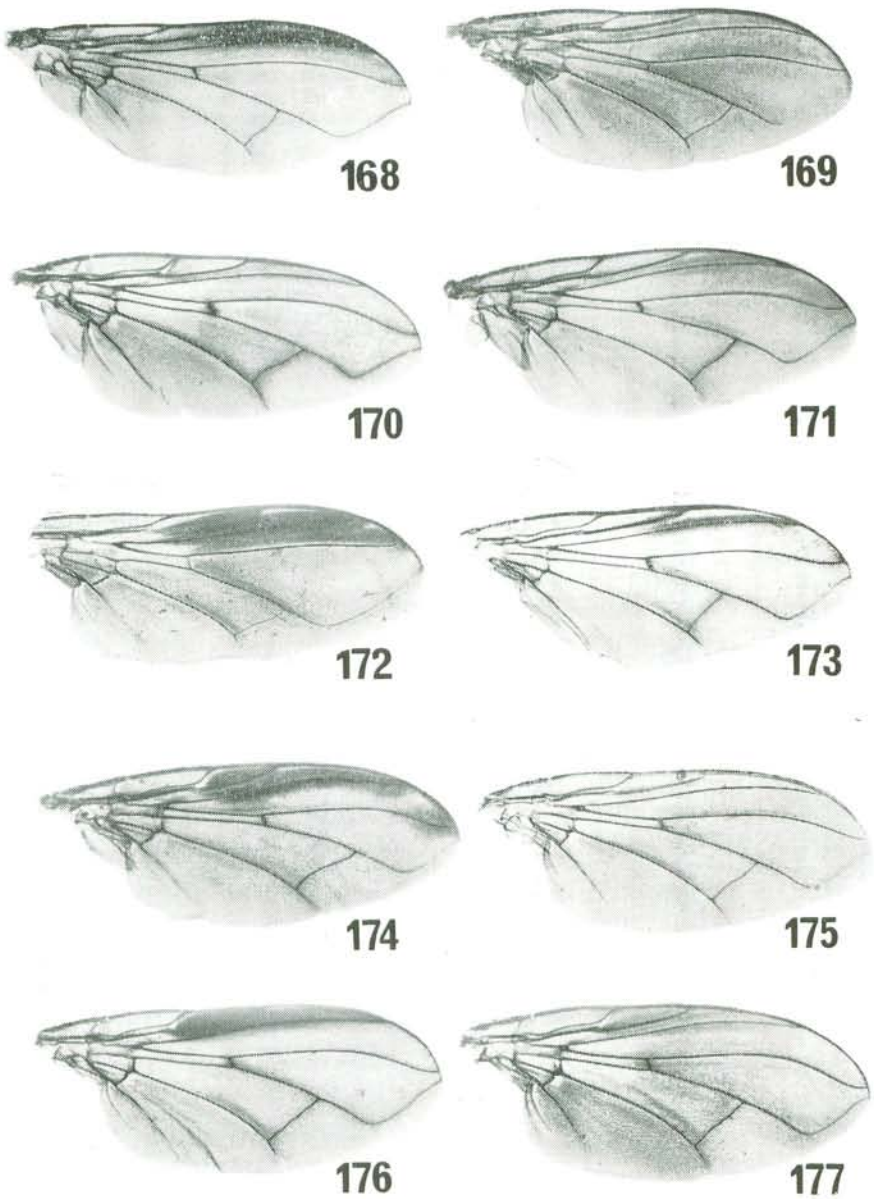

Spermathecae. Fig. 139: *Mesembrinella peregrina.* Fig. 140: *Souzalopesiella facialis.* Fig. 141: *Eumesembrinella quadrilineata.* Fig. 142: *Albuquerquea latifrons.* Fig. 143: *Laneella nigripes.* Fig. 144: *Huascaromusca aeneiventris.* Fig. 145: *Mesembrinella batesi.* Fig. 146: *M. b. bellardiana.*



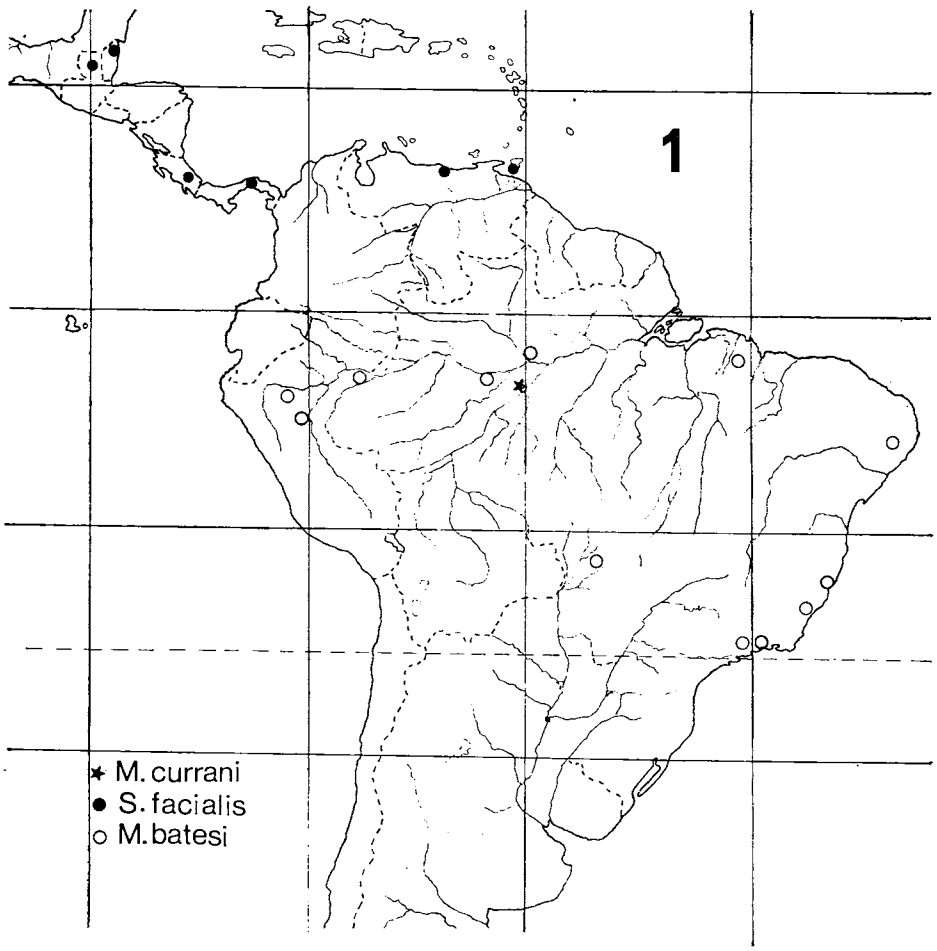

Cephalopharyngeal sclerite, Larva I, ventral (147-150, 153, 155) and lateral (151-152, 154) views. Fig. 147: *Souzalopesiella facialis*. Fig. 148: *Huascaromusca aeneiventris*. Fig. 149: *Mesembrinella peregrina*. Fig. 150: *M. b. bellardiana*. Fig. 151: *Huascaromusca aeneiventris*. Fig. 152: *Souzalopesiella facialis*. Fig. 153: *Mesembrinella batesi*. Fig. 154: same. Fig. 155: *Eumesembrinella randa*.



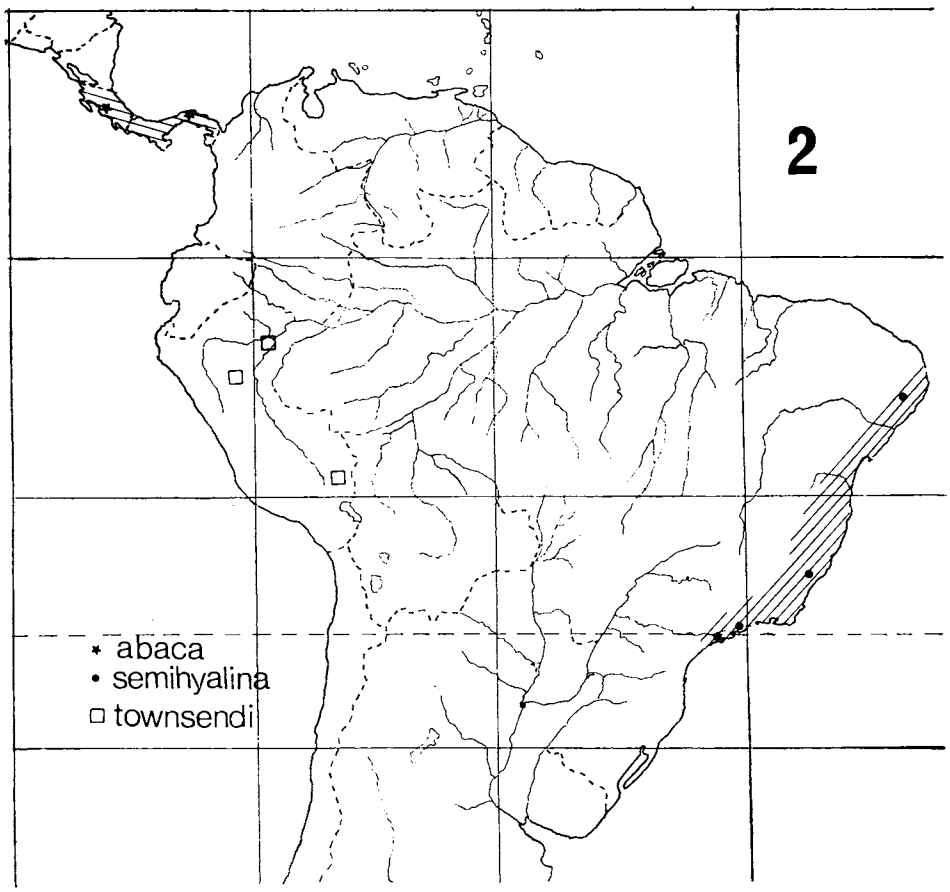

Cephalopharyngeal sclerite, Larva I. Left: lateral view. Right: ventral view. Figs. 156-157: *Mesembrinella abaca*. Figs. 158-159: *Eumesembrinella benoisti*. Figs. 160-161: *Mesembrinella semihyalina*. Figs. 162-163: *Albuquerquea latifrons*. Figs. 164-165: *Huascaromusca nigrifrons*. Figs. 166-167: *Eumesembrinella c. cyaneicincta*.



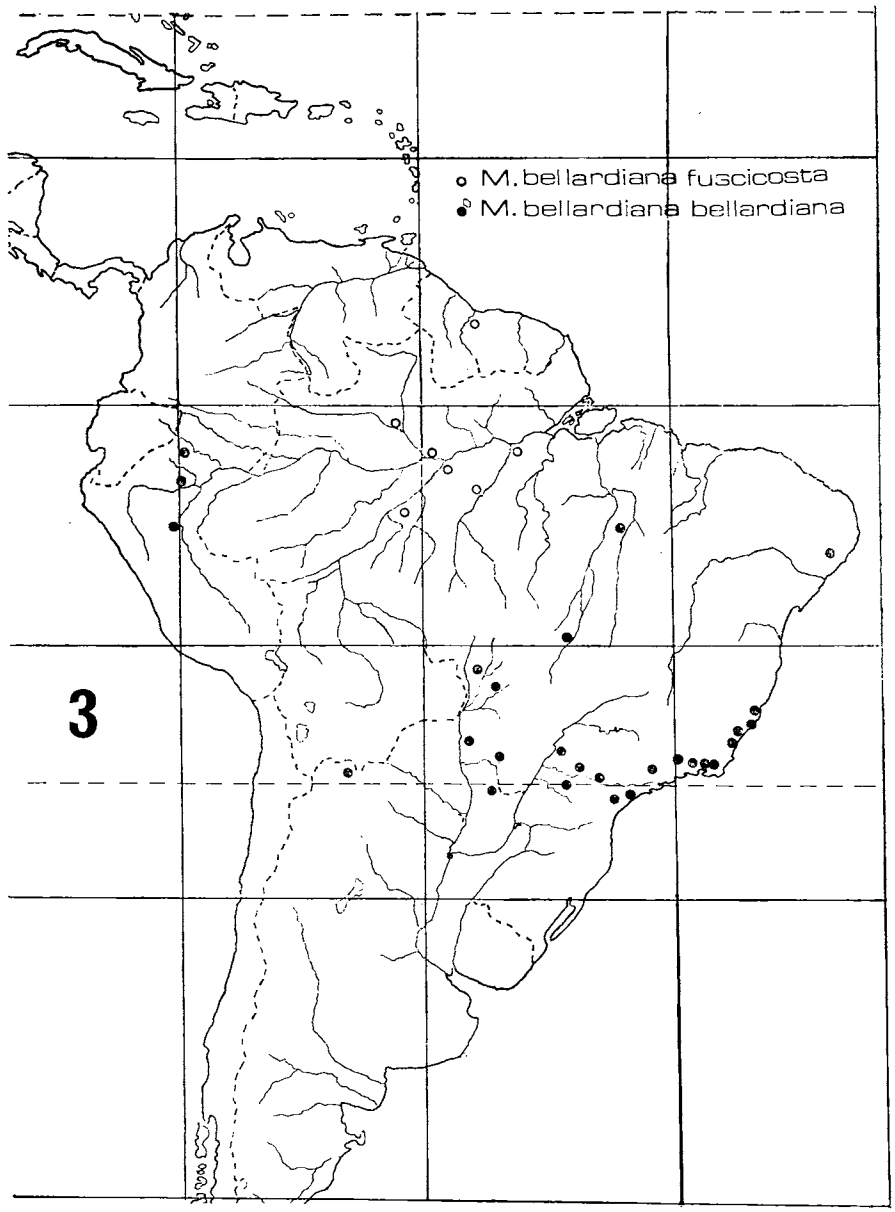

Wing. Fig. 168: *Mesembrinella batesi*. Fig. 169: *Souzalopesiella facialis*. Fig. 170: *Mesembrinella peregrina*. Fig. 171: *M. bicolor*. Fig. 172: *M. currani*. Fig. 173: *M. semihyalina*. Fig. 174: *Laneella nigripes*. Fig. 175: *Huascaromusca vogelsangi*. Fig. 176: *H. purpurata*. Fig. 177: *H. aeneiventris*.



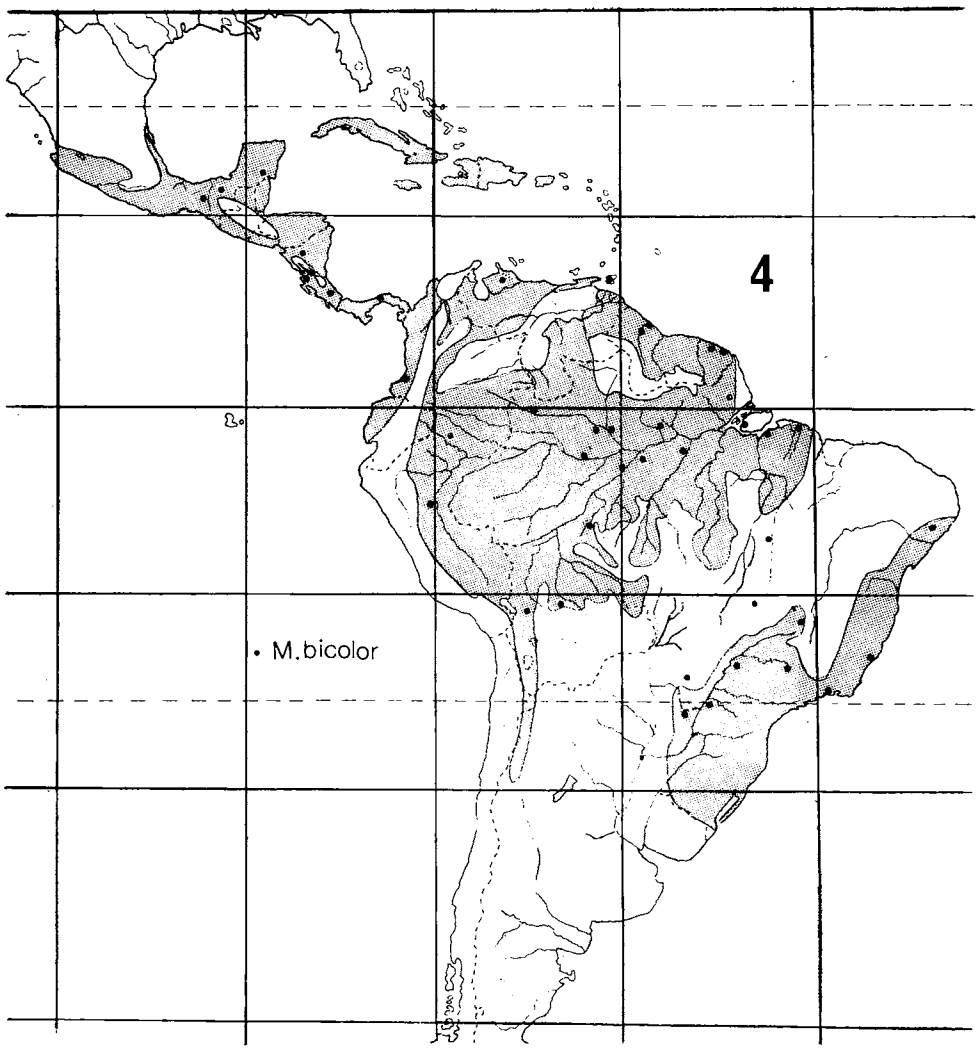

Map 1: Geographical distribution of *Mesembrinella batesi*, *M. currani*, and *Souzalopesiella facialis*.



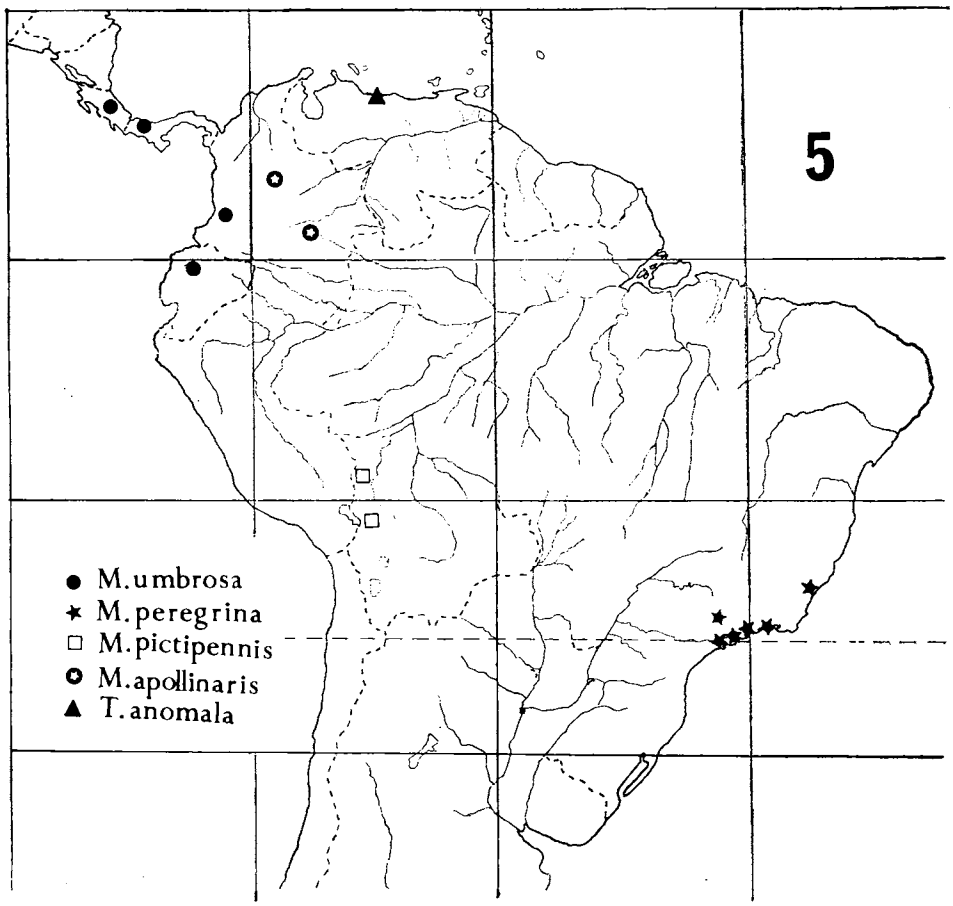

Map. 2: Geographical distribution of *Mesembrinella abaca, semihyalina* and *townsendi.*



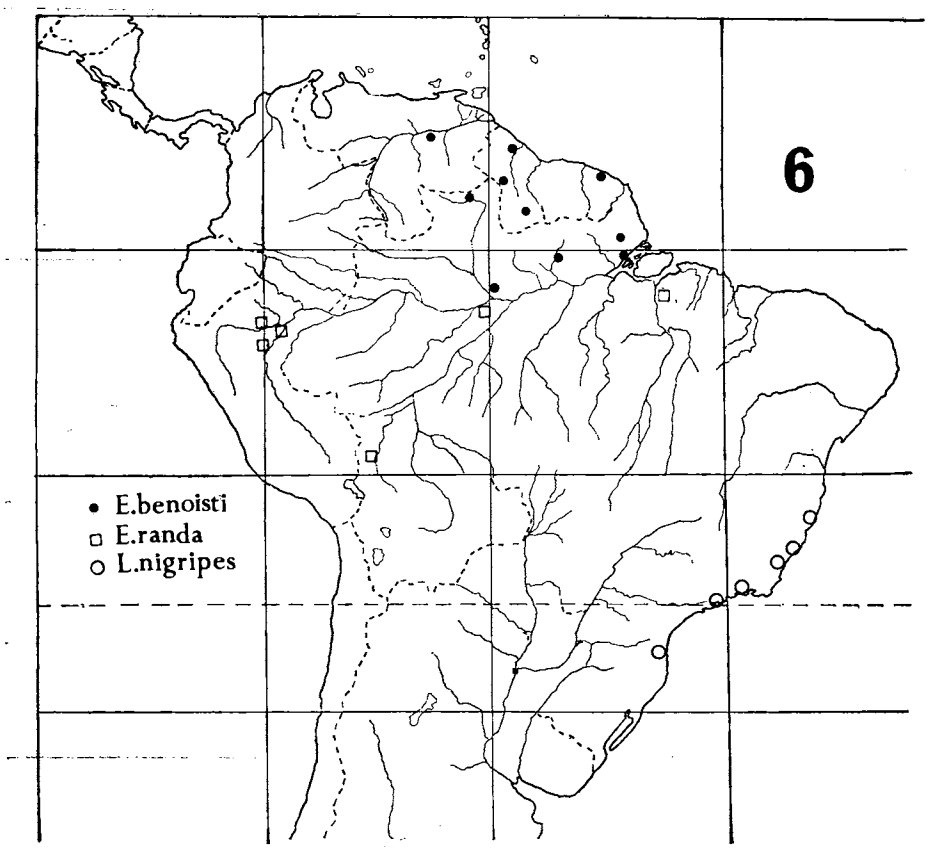

Map 3: Geographical distribution of the subspecies of *Mesembrinella bellardiana*.



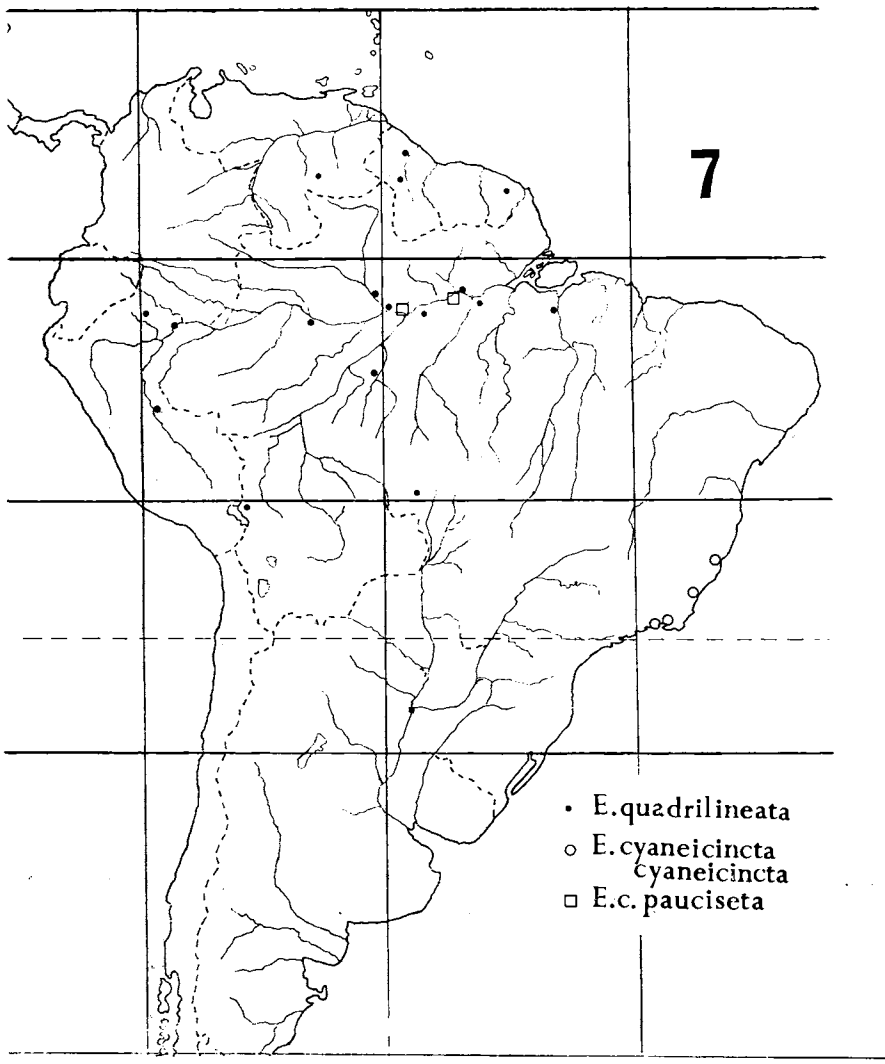

Map 4: Geographical distribution of *Mesembrinella bicolor*, compared with distribution of forests (shaded areas).



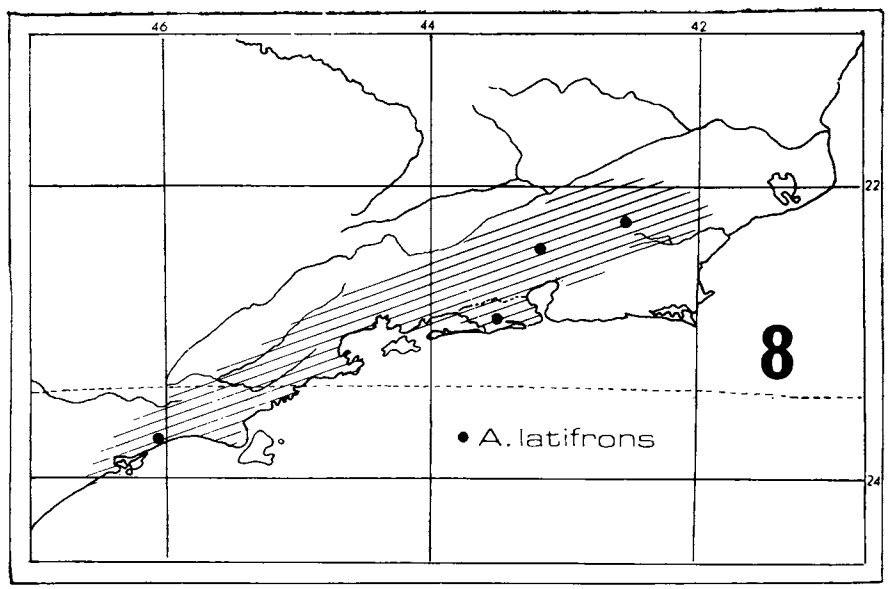

Map 5: Geographical distribution of *Mesembrinella umbrosa, peregrina, pictipennis* and *apollinaris*, and of *Thompsoniella anomala*.



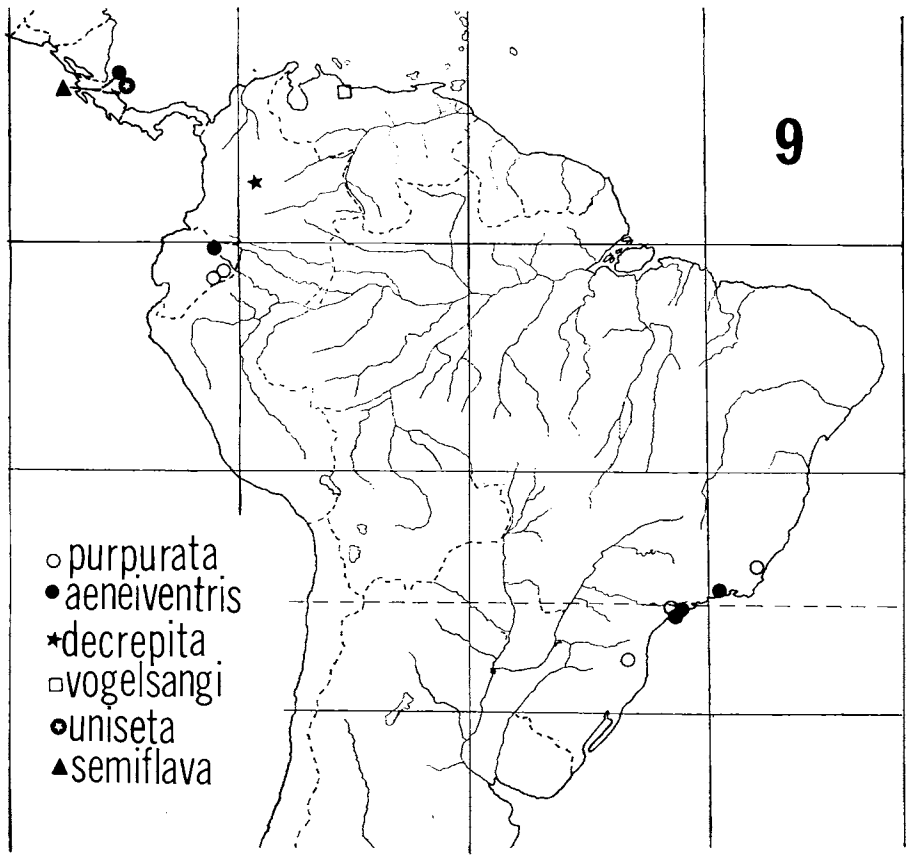

Map 6: Geographical distribution of *Eumesembrinella benoisti* and *randa*, and of *Laneella nigripes*.




Map 7: Geographical distribution of *Eumesembrinella quadrilineata* and subspecies of *cyaneicincta*.




Map 8: Geographical distribution of *Albuquerquea latifrons* in the States of Rio de Janeiro and São Paulo (Brazil).




Map 9: Geographical distribution of *Huascaromusca*.