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F. CHRISTIAN THOMPSON

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ABSTRACT

A revised generic classification of the Neotropical Milesinae is proposed. Twelve tribes, six subtribes and forty-two genera are recognized and keys to these taxa are provided. Detailed descriptions of the tribes and genera, along with a discussion of the new characters used, are included. The male genitalia and some of the other principal characters for almost all the genera are figured.

One new genus (Notiocheilosia, *type-species* Chilosia nitescens *Shannon and Aubertin) is described. The following new synonymies are made:* Copestylum *Macquart* (=Apophysophora *Williston,* =Megametopon *Giglio-Tos,* Viereckomyia *Curran,* =Lepidopsis *Curran,* =Volosyrpha *Shannon and* =Volucellosia *Curran);* Dolichogyna *Macquart* (=Nosodepus *Speiser*); Habromyia *Williston* (=Edwardsietta *Hull,* =Lycopale *Hull and* =Criorthrix *Hull*); Meromacrus *Rondani* (=Thalamopales *Hull*); *and* Sterphus *Philippi* (=Crepidomyia *Shannon,* =Tatuomyia *Shannon,* =Senoceria *Hull and*=Mutillimyia *Hull*). Copestylum *Macquart is recognized for the New World species of* Volucella *Geoffroy.* Chromocheilosia *Hull and Fluke is given full generic status and transferred from* Cheilosia *(Cheilosini) to the tribe Chrysogasterini.* Eristalis *Latreille is partitioned into* Eristalis, *s.s.,* Eoseristalis *Kanervo and* Palpada *Macquart.*

Zoogeography of the Neotropical milesine fauna is discussed. The gross statistics of the fauna are compared to those of other regions and these statistics indicate a long-isolated fauna. The distributional patterns and phylogenetic relationships of the Neotropical genera are also analyzed and these patterns and relationships support a Nearctic origin for almost all of the South American milesine flies. Continental Drift and its possible effect on the Neotropical fauna is also briefly reviewed. Finally the transition between the Nearctic and Neotropical milesine faunas is examined and this transition appears to consist of predominantly Neotropical groups that have moved northward, whereas only one Nearctic group has moved southward in the transitional zone.

INTRODUCTION

The family Syrphidae, commonly called "Flower or Hover flies", is a large group (over 5000 species) of rather conspicuous flies. Their sizes range from 4 mm to 25 mm and their colors from bright yellows and oranges to dull drab blacks and grays. Most syrphid adults are Batesian mimics of stinging Hymenoptera and are highly beneficial as pollinators. The economic importance of the larvae extends from the highly beneficial aphidophagous type of the subfamily Syrphinae to a few injurious pests of Narcissus bulbs (*Eumerus* spp. and *Merodon*

American Museum of Natural History, New York, NY 10024.

equestris Linné). The vast majority are neither useful nor detrimental to man in the larval stage. Their medical importance is almost nil; a few cases of accidental intestinal myiasis have been caused by the drinking of putrid water containing the saprophagous larvae of *Eristalis* (see James, 1957, and Zumpt, 1965, for a general review).

Syrphid flies are worldwide in distribution, with their greatest diversity of forms in the New World tropics. Despite this interesting diversity and the critical zoogeographic importance of the Neotropical area, the South American forms are probably the most neglected of all syrphids taxonomically. Most of the research on the South American syrphids has been restricted to the simple description of new taxa with the majority of this having been done by Curran and Hull in the 1930's and 40's. Very little has been done to organize and synthesize all such descriptive studies. In the last seventy years only two keys to the Neotropical genera of the Syrphidae have been published. Both of these were written by Shannon in the later 1920's and early 1930's and thus do not include the more recent works of Curran and Hull. Hull (1949) has published a revision of the world genera, but his keys are difficult to use and his descriptions are incomplete and misleading. Considering the outdated nature of Shannon's work and the inadequacy of Hull's, a synopsis of the South American genera of Syrphidae is needed. This paper is intended as a contribution toward the filling of this void.

The approach I have used in this revision is three-fold. First, I will discuss and review the characters used for the groups of syrphid flies. Then from this base, the taxonomic interrelationships indicated by these characters will be discussed. Finally, the history of the syrphid distributions in South American will be deduced from an integration of syrphid phylogeny with the geological history of South America.

The methods of preparation and study of the specimens were the traditional ones: Flies were obtained and prepared for study by the standard techniques as described in various textbooks (Oldroyd, 1958; Ferris, 1928; and others); genitalic structures were prepared in the usual manner as discussed by Metcalf (1921), and were stored in microvials attached to the insect pin as described by Gurney *et al.* (1964); drawings were made with the aid of an ocular grid and graph paper (see Oldroyd, 1958).

The scope of this revision is restricted to the tribes and genera of the subfamily Milesinae that are found in the Neotropical region. This region is here considered as all of South America and all of Middle America south of the isthmus of Tehuantepec. The isthmus of Tehuantepec is the traditional boundary used for the Neotropical region by the zoogeographers. However, for practical reasons, the two catalogues covering the Nearctic and Neotropical Diptera have used the boundary between Mexico and the United States for the division of their coverage. Thus to make this revision correspond to the catalogue coverage, I have included the genera found in Mexico north of the isthmus of Tehuantepec in my keys, but I have not described them.

Although this revision is restricted to the Neotropical region, I have studied all available milesine taxa (about 80% of the genera) of the world for the purpose of improving my taxonomic perspective on the Neotropical fauna. For this reason I have included in my character tables and discussions all of the non-neotropical milesine genera that were available to me. With this information it was possible to work out preliminary schemes of generic phylogeny within various milesine tribes and, to a lesser extent, of tribal phylogeny of the Milesinae. It should be clearly realized that these phylogeny representations are only tentative, being based in many places on incomplete information about some of the non-neotropical taxa.

With over 3000 species and some 150 genera of known milesine syrphids in the world, of which over 500 species and about 50 genera and undoubtedly many more unknown forms are Neotropical, it is obviously not possible to study all the taxa, all the stages and all structures in one lifetime. Thus a sampling-type of approach to each genus must usually be used. A knowledge of the nature of the sample used for the basis of the study is necessary for the reader's proper evaluation of my conclusions. The sample has been limited, of course, to the Milesinae and to the Neotropical region, as indicated by the title. The nature of the taxonomic sample[1] is precisely indicated for each genus in a list of the species studied along with the approximate numbers of known world and Neotropical species. Being confined to external structure of the adult I may have missed some sources of possible characters of phylogenetic importance in the syrphids, such as immature stages and internal anatomy. However, it is not possible to investigate these other sources at present because too little material suitable for study is available. In the immature stages, less than 10% of the Neotropical genera and less than 1% of Neotropical species have been described in the literature. Thus it has not been possible to include any meaningful data on the immature stages in this revision. Likewise, for the internal anatomy of these flies, there has been neither properly prepared material available for study nor any information available in the literature. Museum material has been available for the study of the male genitalia which I have used in this revision to help decipher the phylogeny of the milesine taxa and to assess the value of the external characters I have used. That is, I have checked to see that the male genitalia are consistent with interpretations based on external characters. I have figured the male genitalia of the type-species where possible and "typical" examples otherwise. The study of the full range of genitalic variation is beyond the scope of this revision as presently defined since it would involve many non-neotropical genera and species. Thus it is not possible now to indicate

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(1) The format for these sample statements is as follows: Material examined: number of world species (number of Neotropical species); list of species examined. The asterisk indicates a Neotropical species and the (HT) or (PT) indicates that either the holotype or paratypes were examined.

what characters of the male genitalia are of tribal, generic, *etc.* importance.

The reasons given above for restricting myself to external adult characters are really only symptoms of a taxonomically confusing situation. The basic reason why immature stages have not been described, why internal anatomy has not been studied and why the range of variation in male genitalia has not been evaluated is that at the present time it is almost impossible to identify even the adults of the Neotropical species of syrphids. The first step toward the solution of the Neotropical species problem was made by Fluke whose catalogue (1956-57, being revised by Sedman, *in litt.*) provides an index to all the literature on the known Neotropical species and genera. This present revision provides the second step: a preliminary framework in which to place all the presently described species (and hopefully, new ones too!). In short, it is hoped that this contribution will provide a useful higher classification of the Neotropical milesines which will aid the study of the Neotropical fauna and the search for the answers to many of the unsolved questions it has revealed. Prerequisite to establishing such a framework is a concise working definition of a genus.

The *definition* of a *genus* generally accepted by taxonomists is: "a taxonomic category containing a single species or a monophyletic group of species, which is separated from other genera by a decided gap" (Mayr, 1969:92). Much generic synonymy is due to the fact that taxonomists do not always agree on the same interpretation of the words, "decided gap". Although Mayr has qualified the interpretation of "decided gap" by recommending "for practical reasons that the size of the gap be in inverse ratio to the size of the taxon", there still can be much latitude in interpretations as to what is a sufficient gap for the separation of two genera. Because of the latitude of opinions on the proper extent of the gap, the working standard used for genera in this revision is defined here. For practical purposes, a genus is here defined as a group of similar species in which: 1) a group of species is distinctly separable from all other related groups in all life stages, if known; and 2) *all* and *only* the species descendent from a unique common ancestor are included in a genus, so that all member species will be more closely related to one another than to species outside the genus concerned. The first qualification discourages the construction of genera on the basis of characters found only in one sex and encourages generic revision when the immature stages become known. Also by requiring genera to be distinctive in all stages, the genus will correspond more precisely with the ecological niches involved. The second qualification eliminates the use of paraphyletic groups (Hennig, 1965 and 1966).

The above operational defination places the emphasis on finding similarities, not differences between taxa. When the emphasis is placed on differences, the usual attitude of taxonomists, the tendency is to split groups, not to combine them. The result is a trend towards a hodge podge of smaller and more numerous taxa with less and less distinctness. In some cases however, monotypic taxa are necessary since, for lack of sufficient evidence of similarities, certain species *can not* be placed in genera with other species.

TAXONOMY OF NEOTROPICAL GENERA OF THE MILESINAE

TAXONOMIC CHARACTERS OF GENERIC IMPORTANCE IN THE MILESINAE

Most of the characters used in this study are the well-known traditional ones (see Williston 1886:272-278; Lundbeck 1916:18-28; Shannon 1922:117-120; Curran 1924:14-16; Shannon 1926:6-7; and Hull 1949:259-268).

However, a few new characters and new interpretations of old characters have been used in this revision and an explanation of these with discussion of their distribution among the milesine syrphids has been included.

Facial Shape

Although the shape of the face is one of the traditional group characters in the syrphids, it is only recently (Hull 1945 and 1949) that the phylogenetic development of the various types of faces has been studied. In the conclusion of Hull's revision of fossil syrphids (1945) he discusses and diagrams the probable evolution of the facial region. He hypothesized that all the types of faces evolved from a straight type and diverged from this in four different lines — concave epistomal thrust type; convex type; tubercle type; and frontal thrust type (Hull 1945: Fig. 2). Later, Hull (1949) reversed himself on the starting point of the character phylogeny and stated that the convex type of face was the most primitive. This seems reasonable since the convex face is the type found in the primitive related Microdontidae (and also in the related primitive Pipunculidae). One alteration should be made of Hull's arrangement of facial types. My studies indicate that the tuberculate face is not a "dead-end" development but leads from the simple type of face to all the other facial types (Fig. 1).

In the Pipizini, the most primitive tribe of the Milesinae, as based on wing venation, pilosity, *etc.*, one can see a transition from the convex type of face to the tuberculate type. The pipizines have a convex face except for some species of *Trichopsomyia* which show traces of the development of a tubercle. *Trichopsomyia* is the most highly specialized member of the Pipizini (see text discussion, p. 93). In all the groups with frontal thrust types of faces there are still traces of the tubercle. The same is true of those groups with a downward thrust type of face and most of those groups with an epistomal thrust type. The concave type of face is a direct development from the tuberculate type. If the tubercle were removed from a face the result would be a slightly concave face. In some genera of Chrysogasterini and Milesini, where the males have tuberculate faces, the females have a slightly concave, non-tuberculate face.

METASTERNAL DEVELOPMENT

The extent of sclerotization and shape of the metasterna varies within the Syrphidae. The different forms of the metasterna have been arranged into a linear morphocline (Fig. 2). At one extreme of the cline the metasternal sclerites are just a thin sclerotic band stretching from one coxal articulation to the other; at the other end of the cline the metasternal sclerites are strongly produced ventrally and their medial areas are sclerotized. I have designated the former as underdeveloped, the other extreme as well developed. The pipizines display the typical underdeveloped metasterna, whereas *Milesia* shows a good example of the well developed condition. The underdeveloped condition of the metasterna is found in pipunculids and microdontids and is therefore considered primitive.

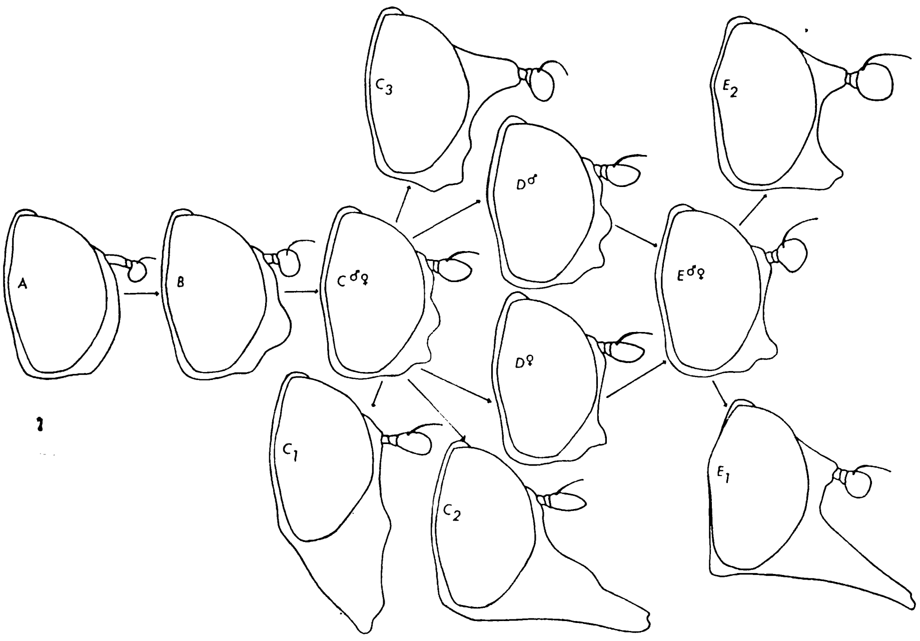


Fig. 1, interrelationships between various milesine facial types. A, convex type; B, tuberculate type without notched oral margin; C, tuberculate types — C, normal tuberculate type; C_1, downward thrust type; C_2, epistomal thrust type; C_3, frontal thrust type; D, sexually dimorphic type; E, concave types — E, normal concave type; E_1, epistomal thrust type; E_2, frontal-epistomal thrust type.

First Abdominal Spiracle

The first abdominal spiracle is usually embedded in the metathoracic epimeron (Fig. 3). However, in two groups, Pipizini and Eumerini, the spiracle lies free of the epimeral plate in the membrane between the abdominal tergites and sternites (Fig. 3, 4).

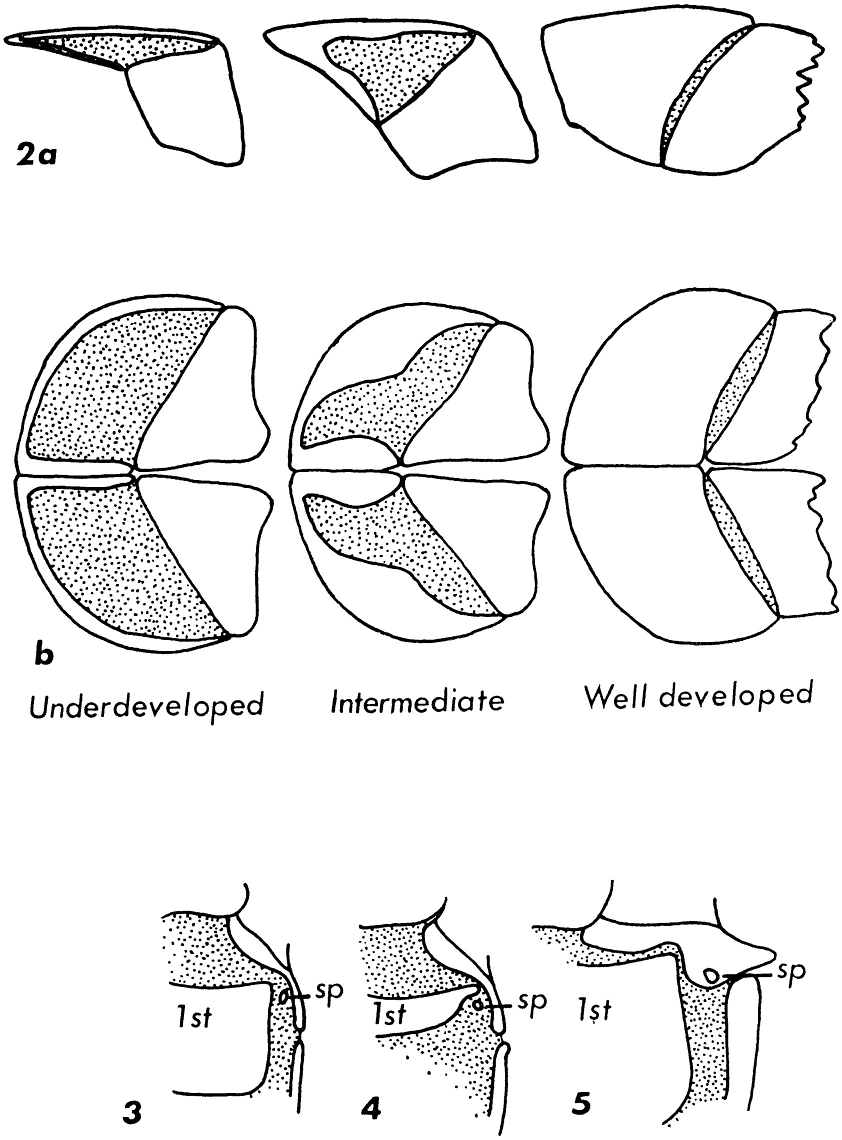


Fig. 2, Metasternal development: a, lateral view; b, ventral view. Figs. 3-5, first abdominal spiracle, ventral view: 3, Pipizine type; 4, Eumerine type; 5, normal type.

In the pipizines the "free" spiracle is probably a primitive condition since: 1) this is the condition of the spiracle in related primitive families (Microdontidae and Pipunculidae), and 2) many other characters show the pipizines to be primitive. This condition in the eumerines is probably a secondary specialization because 1) all the intermediate ancestral groups between the pipizines and the eumerines have the spiracle embedded in the epimeron; and 2) the first abdominal sternite has been reduced and modified to fit around the spiracle in eumerines whereas the pipizines have a normal first sternite as in other groups of the Milesinae.

THORACIC PILE PATTERNS

The taxonomic use of arrangement of pile on the thorax is a rather new development in syrphid classification and has not yet gained wide acceptance. Shannon was perhaps the first to recognize the great importance of pile patterns for generic characters. In a series of generic revisions (1921, 1922, 1926 and 1927) Shannon pointed out where the presence or absence of pile on particular parts of the thorax could be used to separate some groups. Although Shannon's work was accepted by most other syrphid workers, no other investigations for new thoracic pile characters were conducted until recently. Only Collin (1952a, b), Vockeroth (1969 and *in litt.*) and Thompson (1969) have extended this work. They found pleural thoracic pile patterns of great value for working out difficult groups like the Microdontidae (Thompson), the Pipizini (Collin) and the Syrphini (Vockeroth). Perhaps the use of thoracic pile patterns in combination with the more traditional characters will help to remove the enigma long associated with syrphid classification and characterized by Willinston's famous quote, "While, as a general rule, the *Syrphidae* present excellent specific characters, there is a remarkable dearth of generic or group characters." (1886: xiii).

The following discussion of thoracic pile patterns is restricted to the subfamily Milesinae. Vockeroth (1964 and 1969) has studied the pile patterns of the Syrphini and other syrphine groups.

Four conditions relating to hairs are usually recognized in the study of syrphids: 1) *Bare* — without pile but sometimes with either pubescence or pollinosity; 2) *Pollinosity* — opaque material which looks like fine powder or dust; 3) *Pubescence* — very short fine hairs, closely set together, much like velvet; 4) *Pilosity* — long scattered hairs, in some genera broadly flattened into *scales* (i.e., *Lepidomyia, etc.*), in other genera (i.e., *Meromacrus*, etc.) very thick and opaque and called *tomentum;* frequently in those genera and species which are wasp mimics there is a tendency for the thoracic pile to be composed of relatively small and appressed hairs. In the species of *Ceriana, Spheginobaccha, Neplas,* and other wasp mimics the normally long hairs of those sclerites which are pilose are very short and appressed to the exoskeleton.

Of the three types of modified hairs, the pilose condition is now considered to be primitive (Collin, 1952a; Chillcott, 1961:19). Hull (1949) considered the pilose condition to be derivative. He stated that there is a tendency toward the acquisition of pile on the metasterna, eyes and face. However, it is more logical to assume that primitive syrphids displayed the pilose condition since the pilose state is the usual condition found in Brachycerous and lower Cyclorrhaphous groups of Diptera (also in some higher Cyclorrhaphous groups).

Prothoracic Pile Patterns:

Pronotum, anepisternum, katespisternum, anepimeron and basisternum are the only distinct sclerotic areas of the prothorax, due to its reduction in size in the Diptera.

Pronotum or humerus: Shannon (1921-22) noted that the presence or absence of pile on the humerus could be used to distinguish most of the aphidophagous forms from other syrphids. This character correlates with the reduction of the pregenital segments in the males. All syrphids with five pregenital segments have the humerus bare and those with four pregenital segments have it pilose. Either one of these two characters will separate the subfamilies of Syrphidae. The subfamily placement of the Pipizini is somewhat in doubt. Even though they have a pilose humerus and four pregenital segments in the male, like the milesine flies, they are aphidophagous like the syrphines. Hopefully a study of the larvae will eventually elucidate their relationships. In *Alipumilio* the humeral hairs are greatly reduced in size and number, perhaps due to chafing against the close fitting head, but close examination will reveal a few hairs always to be present.

The *anepisternum* is usually strongly pilose. *Ceriogaster,* all the Pipizini except *Pipiza,* and some species of *Ceriana* have the anepisternum bare. In *Spheginobaccha* the anepisternum is enlarged and swollen and has a vertical row of long stiff hairs in contrast to the normal, short, soft, scattered hairs.

The *katepisternum* is always bare on the posterior portion and frequently is completely bare. Most eristaline genera, and some species of the genera *Cheilosia* and *Copestylum* have the anterior portion pilose (usually not visible with the head attached).

The *anepimeron* has the pilosity ranging from completely absent through short and scattered to densely pilose. The majority of the Milesinae have the anepimera strongly pilose. A few short and scattered hairs can be found on this sclerite in *Valdivia, Chamaespliegina, Portevinia, Lepidomyia, Ceriogaster, Neplas* and some species of *Sterphus.* It is bare in *Hammerschmidtia, Neoascia, Spheginobaccha* and *Alipumilio.* The whole spectrum of pilosity can be found in the genera *Ceriana* and *Brachyopa.*

The *basisternum* is usually pilose but the pile is generally represented by only a few hairs. In a few species the basisternum is bare but there appears to be no generic significance to this loss of pile.

The pilosity of this sclerite is either present or absent in each of the following genera: *Graptomyza, Trichopsomyia, Neocnemodon, Sphegina* and *Hemixylota*. In *Neoascia* it is always bare.

Mesothoracic Pile Patterns:

Of the three principal areas of the mesothorax, only the pleuron was found to display pile patterns of generic importance. The notum, except for the ventral portion of the scutellum, is always pilose and the sternal areas have been completely obliterated by the extension of the pleuron in Diptera. The sclerites of the pleuron that were examined for pile characters are: anepisternum; katepisternum; anepimeron; and meropleuron.

The *anepisternum,* frequently referred to as the mesopleuron, should, for the convenience of studying the pile, be considered as composed of two separate areas, a flat anterior portion and a convex raised posterior portion. Only in *Alipumilio* and *Nausigaster* is this distinction between the two portions lost and in these genera one finds a uniformly raised pilose anepisternum. The condition of the pile on the *anterior* part being variable amongst species, is of value for generic taxonomy. The *posterior* portion of the anepisternum is always pilose. The presence of some long hairs on the anterior anespisternal area was used by Collin (1952b) to separate his *Parapenium* from all other Brítish Pipizini. Collin (1952a) also noted this character for a number of species in the genus *Syrphus.* His work appears to have been the first recognition of the importance of the pile of this particular sclerite. Very few of the milesine syrphids have the anterior anepisternum pilose and those that do are mainly limited to two principle taxa, Eumerini and Volucellina. These have the anterior anepisterna strongly pilose. *Spilomyia, Hardimyia, Odyneromyia* and a few species of *Temnostoma* also have the anterior part of the sclerite pilose. *Ceriana* has the upper half of the anterior anepisternum pilose. There are also traces of anterior anepisternal pile in a few other groups. In *Lepidomyia, Orthonevra* and some species of *Myolepta* there are a few hairs on the upper posterior corner of the anterior anepisternal area and *Valdivia* has a patch of a few hairs in the middle of the posterior edge of this area.

Katepisternum: Malloch (in Shannon 1922) pointed out that *Sphegina* could be separated from *Neoascia* by its completely bare sternopleuron (katepisternum). Except for this particular case, the presence or absence of katepisternal pile was found to be of little use in the generic taxonomy of the Milesinae. In the majority of the species examined there are two patches of pile on the katepisternum: a dorsal patch on the upper portion of the sclerite and a ventral patch between the pro- and mesocoxae, usually separated by a broad bare area. In a few scattered species one or the other of these patches is absent and in some other species these patches are broadly connected. Although the katepisternal pile patches appear to have no value as generic characters, they may be useful as species or species group characters. It should be noted that, whereas in the milesines no generic value for the pilosity of the katepisternum is apparent, Vockeroth (1969) has found the character very helpful with syrphine genera.

The *anepimeron,* frequently referred to as the pteropleuron, should, for convenience of studying the pile, be divided by an imaginary line from the large cleft on its dorsal edge to the ventral edge into an anterior and posterior portion. The anterior portion is always pilose. The posterior portion is commonly bare but in a few groups this part of the anepimeron is pilose. In *Spilomyia, Korinchia, Ornidia, Pseudovolucella. Pyritis, Arctophila* and many eristaline genera there is some pile on the posterior portion.

The *meropleuron* is always bare except for two restricted areas, along the barrete and in front of the metathoracic spiracle.

The barrette, the upper edge (usually convex) of the meropleuron, is bare in most milesine syrphids. It is pilose in all Pipizini except *Pipiza. Chromocheilosia bicolor* and *Myolepta luteola* are the only chrysogasterines I have seen with pilose barrettes. In the volucellines all species of *Volucella* and *Ornidia* and a large group of *Copestylum* have the barrette pilose. In the milesines only *Merapioidus, Deineches,* and some species of *Criorhina* have the barrette pilose. *Criorhina* can be divided into two species groups based on the presence or absence of pile on the barrette (Vockeroth, *in litt.*). In the Eristalini, *Mesembrius. Megaspis, Eristalodes, Eristalis, Palpada, Lycastrirhyncha, Simioides,* and *Dolichomerus* have the barrette pilose.

The presence of a *metathoracic spiracular pile patch,* a patch of long hairs in front of the metathoracic spiracle, is a primitive trait found in only a few groups of syrphids. Among the non-syrphine groups I have found this character state in only the volucellines, some eristalines, *Psilota, Notiocheilosia, Lepidomyia,* most species of *Myolepta,* and some species of *Rhingia.* In *Rhingia* some species (*nasica* and *campestris*) have a distinct patch, others like *harrisi* have a few hairs only, and still others (*rostrata*) are completely bare in some individuals and have a few hairs in others. The patch is reduced to a narrow row of hairs in the eristaline genera which have the spiracular patch. Only *Megaspis, Simioides, Meromacrus, Eristalodes, Palpada,* and *Lycastrirhyncha* among the eristaline genera have the spiracular hair patch.

The *scutellar fringe* frequently is present on the ventral apical portion of the scutellum. This fringe was first noted by Lundbeck (1916) and its condition was described by him for all the Danish syrphid genera. Shannon (1922) discussed this character in relationship to the various cheilosine groups. He noted: 1) that all the Cheilosini had an "abundant fringe"; 2) *Chrysogaster* and *Apicomyia* (=*Cynorrhinella*) had a fringe reduced to a single row of hairs; and 3) all the rest of the groups of Cheilosinae lacked the fringe altogether. Goffe(1952), in his reclassification of the syrphids, used this character to define his third key dichotomy. I have noted a distinct subscutellar fringe in the following tribes and genera: Pipizini; Cheilosini; most Milesini except *Spilomyia, Chrysosomidia, Merapioidus,* some species of *Criorhina,* and *Temnostoma; Notiocheilosia; Chromocheilosia; Psilota; Azpeytia;* and some *Copestylum.*

Metathoracic Pile Patterns:

Like the prothorax, the metathorax in Diptera is greatly reduced and only three distinct areas are identifiable on the metathorax: episternum, epimeron and basisternum. The episternum is pilose only in *Spilomyia, Syritta, Senogaster* and *Mesembrius.* The epimeron is bare in all groups of milesine syrphids except *Nausigaster.* In *Nausigaster* this small sclerite is sparsely punctate and pilose.

The pair of sclerites between the meso- and metacoxae have been called by various terms such as, antecoxal piece, metasternum, and basisternum. Shannon in 1921-22 first used the presence or absence of pile on the antecoxal piece as a taxonomic character to separate some of the genera of his subfamily Xylotinae. Later Shannon (1922) discussed the value and distribution of the various states of this character in the Cheilosinae. He made the undefended statement that the character is only of "specific importance" in the Cheilosinae as is the case in the Xylotinae. Then in his revision of the xylotine flies (1926) he used the character for the main division of his key and also described two new genera based on metasternal pile. In his two keys to the South American genera (1927) and (1933) he continued to follow his 1926 use of the character in the xylotine groups. Hull (1949) in his revision of the world genera also placed strong emphasis on metasternal pile, describing it for all the genera.

I have found the metasterna bare in the following taxa: Pipizini, Cheilosini (Pelecocerina), all Chyrsogasterini except some species of *Myolepta,* Cerioidini, *Nausigaster* of Eumerini, and some Milesini (*Blera* group; *Xylota* group except *Xylotomina, Neplas* and *Chalcosyrphus; Temnostoma* group except *Takaomyia, Teuchnemis* and some species of *Temnostoma;* and *Korinchia, Pseudozettsetdia, Palumbia* and *Hemixylota of Milesia* group). The following taxa have the metasterna pilose: Cheilosini (Cheilosina), some species of *Myolepta* of Chrysogasterini, Eristalini, all Eumerini except *Nausigaster,* and some Milesini (*Criorhina* group; *Tropidia* group; *Milesia* group excep *Korinchia, Pseudozettsetdia, Palumbia* and *Hemixylota; Takaomyia, Teuchnemis* and some species of *Temnostoma* of *Temnostoma* group; and *Xylotomina, Neplas* and *Chalcosyrphus* of *Xylota* group). The metasternal pile character is intragenerically variable in only two genera, *Myolepta* and *Temnostoma.* However, it should be noted that this may be only an artifact of the present classification, and thus a more thorough investigation of these two genera from a worldwide basis might show the state of the character to be constant in each genus.

CLASSIFICATION OF NEOTROPICAL GENERA OF THE MILESINAE

CHARACTERIZATION OF THE FAMILY SYRPHIDAE

The syrphids can be easily separated from most dipterous groups by the following wing venational characters: 1) presence of long basal and anal cells; 2) apical and discal cells present and closed; 3) presence of a spurious vein between the radial and medial veins; and 4) radial sector only two-branched. The only family with which the Syrphidae may be confused is the Microdontidae, which was until recently included in the Syrphidae (Thompson, in preparation). However, the following key will separate the two families and summarize the main differences.

1. Hind femora, and usually tibiae, with pronounced scars or cicatricies; postmetacoxal bridge always complete; face always convex in profile, uniformly pilose, with oral margin not notched; antennae usually long, longer than face, with first segment usually much longer than broad. Male genitalia with: ejaculatory duct strongly sclerotized on posterior part, with a swollen and spherical portion partially enclosed by base of aedeagus, with apical portion elongate and completely ensheathed by aedeagus; aedeagus elongate, swollen basally, unsegmented, tubular, never with lateral or dorsal processes although frequently divided apically into two parallel tubes; aedeagal apodeme double or absent; posterior dorsal surface of ninth sternite infolded .... Microdontidae

   Hind femora and tibiae never with scars or cicatricies; postmetacoxal bridge usually incomplete, if complete, then face either distinctly concave or tuberculate; face usually either straight, concave, or tuberculate, rarely convex, either pilose or bare, almost always with a distinct notch in the oral margin; antennae usually short, shorter than face, with first segment rarely longer than broad. Male genitalia radically different from the Microdontidae: ejaculatory duct membraneous, never swollen or spherical, always a simple unmodified duct; aedeagus rarely elongate, frequently two-segmented, usually with lateral or dorsal processes; aedeagal apodeme always present and single; posterior dorsal surface of ninth sternite not infolded ...... Syrphidae

The subfamilies of the family Syrphidae can be separated by the following key:

1. Pronotum bare, with 5 pregenital segments in male .... Syrphinae

   Pronotum pilose, with 4 pregenital segments in male .... Milesinae

CHARACTERIZATION OF THE SUBFAMILY MILESINAE

Unlike the Syrphinae, the subfamily Milesinae is a very diverse group in both adult and larval forms, and at present is easily defined by two characters: 1) pronotum pilose; and 2) male with only four pregenital segments. The possession of only four pregenital segments in the males is the result of many complex peculiarities including such things as: reduction of fifth tergite and sternite, asymmetric modification of the fifth sternite, and 90° rotation of the sixth segment. This character complex is a derived condition found only in one other group of the Aschiza, the family Microdontidae. All other related families have five pregenital segments in the male (Platypezidae, Phoridae, Ironomyidae, Pipunculidae, Conopidae, and many groups of the Schizophora).

A major unsolved problem with the present subfamily groupings is the placement of the tribe Pipizini. The pipizines have a pilose pronotum and four pregenital segments in the male, like the rest of the Milesinae, but their larvae are aphidophagous, which is unique among the milesines. Various workers (such as Hartley, 1961, and Wirth *et al,* 1965) have used the carnívorous type of larvae as the evidence for placing pipizines with all the rest of the aphidophagous syrphids in the subfamily Syrphinae, but as pointed out by Thompson (1969), this placement in the Syrphinae creates more problems than it solves. Also, it should be noted that our knowledge of the aphidophagous habits of the pipizines rests mainly on field work, and thus, until someone does a detailed morphological study of the mouthparts of the larval pipizines to show whether the carnivorous habit is convergent with the Syrphinae or not, the pipizines are best left in the Milesinae on the basis of adult structures. Another unsolved question which could affect the placement of the Pipizini is whether the aphidophagous types of larvae are derived from the supposed primitive saprophagous types or vice versa. The present evidence (Hartley, 1961 and 1963) is not conclusive for either option. Pending new evidence to the contrary, the Pipizini are placed in the Milesinae where most workers have placed them (Shannon, 1921-22; Curran, 1924; Sack, 1928-30, 1930; Shiraki, 1949 and 1968; Seguy, 1965; Hull, 1949; Coe, 1954; and Fluke, 1957-58).

The history of the suprageneric classification of the family Syrphidae is in a large part also the history of the classification of the Milesinae since the Syrphinae have remained the same since it was first recognized and almost all the major changes in the classification of the Syrphidae have occurred in what is here considered the Milesinae. Since Rondani (1856-1857) first divided the Syrphidae into suprageneric groups, there have been two separate trends in classifying the higher groups of the family. The earliest of these trends was to elevate gradually each distinctive group of genera to subfamily status. Starting with Rondani's five subfamilies, various workers have increased the number of subfamilies to a high of 21. Goffe (1952) has reviewed, except for Shiraki's work (1949 and 1968), the historical development of the increase in syrphid subfamilies. Goffe (1952) was first to reverse the trend of increasing the number of subfamilies and suggested the use of two main groups only. Since Goffe's two subfamilies represent the two major phylogenetic lineages in the family, it is unfortunate that his oversimplified system of dividing the subfamilies results in obviously polyphyletic suprageneric groups and does not represent syrphid phylogeny. Whereas Goffe reduced the number of subfamilies to two, he increased the number of suprageneric groups to a new high of 32. Wirth *et al.* (1965) have slightly modified Goffe's two subfamily groups and have greatly improved the arrangement within each subfamily by reducing and incorporating Hull's 1949 classification into Goffe's two main groups. I have also followed Goffe's usage of two subfamilies except for considering one of his subtribes, the Microdontina, as a separate and distinct family (Thompson, in preparation) arrangement of tribes within the subfamily Milesinae (Sphixinae Goffe) is quite different from that of Goffe or Wirth.

In this revision 12 tribes are recognized in the Milesinae. Hull (1949) recognized 12 subfamilies and 25 tribes (Table I) among the

Table I. The arrangement of suprageneric taxa used by Hull (1949) for the World milesine Syrphids

- Subfamily Microdontinae
  - Tribe Ceratophyini
  - Microdontini
- Subfamily Eumerinae
- Subfamily Nausigasterinae
- Subfamily Cheilosinae
  - Tribe Rhingini
  - Pipizini
  - Chrysogasterini
  - Sphegini
  - Myioleptini
  - Cheilosini
- Subfamily Calliceratinae
- Subfamily Pelecoceratinae
- Subfamily Volucellinae
  - Tribe Graptomyzini
  - Volucellini
- Subfamily Sericomyinae
- Subfamily Xylotinae
  - Tribe Xylotini
  - Temnostomini
  - Milesinae
  - Criorhinini
  - Pocotini
  - Tropidini
- Subfamily Psarinae
- Subfamily Cerioidinae
- Subfamily Eristalinae
  - Tribe Helophilini
  - Eristalini

group of flies equivalent to my usage of Milesinae. More recently Wirth *et al.* (1965) have reduced the status of many of Hull's tribes and subfamilies to incorporate them into a two subfamily arrangement (Table II). My arrangement of tribes and genera in the subfamily Milesinae follows that of Wirth *et al.* except for four major changes along with a number of minor changes in the placement of genera into the tribes. The first change, the placement of the Pipizini into the subfamily Milesinae, has been discussed above. The second change is in recognition of the fact that the Microdontini are not true syrphids but represent a separate family as outlined above under the family discussion. This will also be covered in more detail in a separate paper. The third major change is the combination of three small aberrant tribes (two are monotypic) into one. I have "lumped" the Eumerini, Nausigasterini, Merodontini, along with *Psilota* and *Alipumilio* of Chrysogasterini into one tribe, Eumerini. The previous recognition of these tribes as separate taxa has been due to the fact that taxonomists have em-

Table II. The arrangement of suprageneric taxa used by Wirth & *al.* (1965) for the milesine syrphids found in America north of Mexico

- Subfamily Syrphinae
    - Tribe Pipizini
- Subfamily Milesinae
    - Tribe Cheilosini
        - Myoleptini
        - Chrysogasterini
        - Callicerini
        - Pelecocerini
        - Nausigasterini
        - Eumerini
        - Microdontini
        - Volucellini
        - Sericomyini
        - Milesini
        - Cerioidini
        - Merodontini
        - Eristalini

phasized the unique characters of each taxa and did not look for similarities. For example, Wirth *et al.* separated *Merodon* from the Eristalini to form a separate tribe because *Merodon* has a phytophagous larva whereas the rest of the eristalines have saprophagous larvae. It is surprising to me that they did not compare *Merodon* with the *only* other phytophagous milesine syrphid group, the eumerines. As a matter of fact, both *Merodon* and *Eumerus* have the same common English generic name, Narcissus Bulb Flies. The detailed reasons for combining these tribes and genera together has been discussed under the tribe Eumerini in the text.

Finally, I have reduced the Pelecocerini to a subtribe in Cheilosini. The traditional reason for considering the pelecocerines as a separate tribe or subfamily has been their unusual aristae. However, I do not feel that the unusual arista alone is sufficient ground for tribal recognition. Sedman (1955) has shown that the pelecocerines have the typical and unique two-segmented aedeagus of the cheilosines. The nature of the aedeagus, along with the presence of thoracic bristles and non-dimorphic tuberculate faces, indicates that the pelecocerines are nothing more than cheilosines with atypical aristae. Thus I have reduced the tribe to subtribal status (also see page 101).

Presently it is not possible to draw a detailed phylogenetic arrangement for the milesine tribes because too little is known about the primitive or derived nature of various character states. However, it is possible to present a general picture of the phylogenetic position of the tribes from the information provided by a few wellknown morphoclines.

The best known morphocline among the syrphids is the change in the shape and position of the anterior crossvein relative to the discal cell. The anterior crossvein ranges from being straight and located almost at the base of the discal cell to being strongly oblique and almost at the outer extreme of the discal cell, with almost every intermediate stage represented by some living species. Schiner (1862) was, I believe, the first to recognize the taxonomic importance of the anterior crossvein and since then it has been almost universally accepted by syrphid workers that the basal position represents the primitive end of the cline. The primitive nature of the basal position is supported by the fact that this is the condition found in the most closely related primitive families (Microdontidae and Pipunculidae) in addition to the reasons given by Hull for example (1949:274). The second morphocline of importance relates to the facial shape, evolving from a pilose convex condition to a bare concave condition. The facial morphocline has been illustrated and discussed in the character section. It should be noted that the extremes of the anterior crossvein cline and the facial cline correlate well with each other. The change in development of the metasterna from the very underdeveloped condition to the greatly enlarged condition (see character section) forms another morphocline which also corresponds in evolutionary direction with the facial and anterior crossvein clines.

Another major trend in the syrphids is the loss of pile on various parts of the body. This has not occurred in a uniform fashion, but generally the metathoracic sclerites, meropleurae, and anterior meso-anepisterna appear to have been the first areas to lose their pile. The loss of pile appears to be irreversible. The arrangement of thoracic pile has been discussed in the character section as well as the reasons for considering the bare condition as being derivative. Other tendencies of value in determining the phylogeny of the syrphids are: 1) bases of femora acquire basal setal patches; 2) hind femora acquire ventral spines; 3) third vein acquires a loop or kink. All of these trends have been discussed in detail by Hull (1949:262-268, 273-274).

With the above morphoclines the phylogenetic positions of the milesine tribes can be characterized as follows:

Pipizines are clearly the most primitive of the milesine syrphids because they have: 1) strongly basal and straight anterior crossvein; 2) pilose convex faces; 3) underdeveloped metasterna; 4) no hind femural spines; 5) no basal setal patches on any femora; 6) third vein always straight; and 7) subscutellar fringe. In short, the pipizines display the primitive extremes of all the morphoclines studied.

Callicerini, Volucellini, and *Cheilosini* represent a group of primitive flies characterized by possession of the following common features: 1) pilose and non-dimorphic (sexual) tuberculate faces; 2) pilose and underdeveloped metasterna; 3) anterior crossvein basal in position and straight; 4) thoracic bristles and subscutellar fringe usually present; and 5) absence of hind femoral spines. Cheilosini, with their highly specialized two-segmented aedeagi, are perhaps more recently derived than either Callicerini or Volucellini, which both have unsegmented aedeagi.

The *chrysogasterines* are intermediate between the more primitive milesine tribes mentioned above and the more advanced ones mentioned below. The intermediate conditions found in the chrysogasterines are: 1) anterior crossvein usually at the middle of the discal cell or slightly before it; 2) faces concave in both sexes or concave in females and tuberculate in males and usually bare; 3) metasterna bare but underdeveloped; 4) subscutellar fringe usually absent but scutellar or thoracic bristles frequently present.

The position of the *Sericomyini* is certainly phylogenetically intermediate and may be closely related to the Volucellini. The intermediate and specialized conditions found in the seriomyines are: 1) faces usually bare; 2) anterior crossvein at or beyond the middle of the discal cell; and 3) thoracic bristles absent. The primitive conditions of the sericomyines are: 1) faces non-dimorphic tuberculate; 2) femoral spines absent; and 3) metasterna pilose and underdeveloped. The tuberculate faces, position of anterior crossvein, lack of femoral spines, and particularly the plumose aristae suggest a close relationship to the volucellines.

The exact phylogenetic position of *Spheginobacchini* is rather problematic. The straight and basal position of the anterior crossvein along with the underdeveloped metasterna and tuberculate or convex faces are indicative of the primitive nature of the spheginobacchines but the presences of femoral spines strongly sugests that Spheginobacchini has an intermediate position in the phylogeny of Milesinae.

The *eumerines,* like the chrysogasterines, are intermediate. The possession of concave but pilose faces is a curious intermediate condition apparently restricted to the eumerines and *Milesia.* The ventral femoral spines and usually developed metasterna are derived conditions in the Eumerini, whereas the pilose anterior meso-anepisterna is a primitive trait. The anterior crossvein is in the middle area of the discal cell.

The *eristalines* are a recently derived milesine tribe because they are the only tribe with basal setal patches on all femora and always have a looped third vein. They also have hind femoral spines, an advanced feature. However, the pilose and tuberculate faces, pilose metasterna, and anterior crossvein at or only slightly beyond the middle of discal cell indicate that the eristalines are not as highly advanced as either the Milesini or Cerioidini.

The *cerioidines* and *milesines* are apparently the most highly advanced of the milesine tribes since they are generally essentially bare flies with the anterior crossvein located well beyond the middle of discal cell. Whether the cerioidines are more recently derived than the milesines is difficult to determine because both tribes are evolving along different lines. The cerioidines have retained the primitive tuberculate face and terminal style on the antennae, but they have greatly developed metasterna. On the other hand, while the Milesini includes, undoubtedly, the most recently derived genera (such as *Milesia,* which, has a strongly concave face, greatly reduced pile, well-developed metasterna, and highly specialized wing venation), some of the milesine genera are much more primitive (such as *Hemixylota,* which has a basal anterior crossvein). In short, Cerioidini are a small homogeneous taxon with many derived traits but a few very primitive ones, and the Milesini are a large heterogeneous tribe with many highly derived genera but with a few intermediate genera.

In general, the milesine tribes can be grouped as primitive, intermediate, or advanced on the basis of facial development, position of anterior crossvein, and presence or absence of hind femoral spines. The primitive tribes have basal anterior crossveins, convex or tuberculate faces in both sexes, and lack hind femoral spines, whereas advanced tribes have apical anterior crossveins, hind femoral spines, and usually have concave faces. The intermediate tribes have a mixture of primitive and derived character states, but usually have the recently derived hind femoral spines.

KEY TO THE TRIBES OF THE SUBFAMILY MILESINAE

1. Hind femur with well-developed anterior, basal patch of setulae; anterior meso-anepisterna bare .... Eristalini

Hind femora without basal patches of setulae; if with basal patch of setulae, then anterior meso-anepisterna pilose 2

2. Anterior crossvein (r-m) usually perpendicular, usually before the middle of the discal cell, never greatly slanted nor extending to the outer third or more of discal cell; if located at the middle area of the discal cell, then either with bristles on the thorax or with ventral spines on anterior four femora, or with basal patch of setulae on hind femora; and usually with underdeveloped metasterna 3

Anterior crossvein always slanted, usually beyond the middle of the discal cell, frequently greatly slanted and extending to the outer third or more of the discal cell; if located at the middle area of the discal cell, then with neither bristles on the thorax nor ventral spines on anterior four femora nor basal patches of setulae on hind femora and usually with developed metasterna 10

3. Oral margin evenly rounded, not notched apically; eyes and face pilose; subscutellar fringe present; facial grooves reduced to pits; hind femora unarmed .... Pipizini

Oral margin notched anteriorly; never with all the above characters together in combination 4

4. Pro-anepisternum greatly swollen and produced dorsoventrally, with a vertical row of long stiff hairs ... Spheginobacchini

Pro-anepisternum not greatly swollen nor produced, without a row of hair 5

5. Apical crossvein (upper turned portion of R4+5) either strongly recessive or straight; arista usually plumose; with a distinct patch of hairs in front of metathoracic spiracle .. Volucellini

Apical crossvein usually not recessive or straight; if recessive or straight, then without the metathoracic spiracular hair patch 6

6. Anterior meso-anepisternum pilose; frequently with a notal wing shield; scutellum with apical rim .... Eumerini

Anterior meso-anepisterna bare; never with notal wing shield; scutellum without apical rim 7

7. Antennae on short frontal pedicel; lst abdominal spiracle free. .... Psarini

Antennae not on a pedicel; lst abdominal spiracle in meta-epimeron 8

8. Subscutellar fringe usually absent; if present, then hind tarsi with ventral longitudinal combs; hind femora always armed with ventral spines .... Chrysogasterini

Subscutellar fringe usually present; hind femora rarely with ventral spines (only some *Cheilosia*) ; hind tarsi without ventral longitudinal combs 9

9. Without thoracic bristles; usually with a distinct patch of hairs in front of metathoracic spiracle; eyes and face strongly pilose; face with a tubercle .... Callicerini

With thoracic bristles; if without thoracic bristles, then eyes and/or face bare; usually without a metathoracic spiracular hair patch; if patch present, then face with a snout, not a tubercle .... Cheilosini

10. Antenna with a terminal style .... Cerioidini

Antenna with an arista 11

11. Arista distinctly pilose .... Sericomyini

Arista bare .... Milesini

TRIBE PIPIZINI

Head: face pilose, usually without a tubercle except for *Trichopsomyia* which has a small tubercle in some species; oral margin not notched, even; facial grooves reduced to large elongate pits at the bases of the eyes; facial stripes not differentiated; ocellar triangle small, distinctly before the posterior margins of the eyes; eyes pilose, holoptic in the male.

Thorax: without bristles; pro-anepimera pilose; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; metathoracic pleurae bare; metasterna bare; plumulae elongate; scutellum with ventral pile fringe. Legs without ventral femoral spines. Wings: anterior crossvein always clearly located before the middle of the discal cell, usually at about basal fourth of discal cell; without radial sector bristles.

Abdomen: elongate, never constricted.

Discussion: The tribe Pipizini is quite distinct from all other milesine tribes because of the predominance of primitive adult characters it displays. Of these primitive characters, the lack of an apical notch in the oral margin is found elsewhere only in the Nearctic species of *Chamaesyrphus* and the simple type faces are unique among milesine syrphids. Despite the primitive nature of adult pipizines, the larvae are predatory, a feature not possessed by other larval milesine syrphids. However, as discussed above, this habit of the pipizines suggests that the tribe may belong in the other subfamily, the Syrphinae.

The tribe Pipizini includes only two Neotropical genera, *Pipiza* Fallén and *Trichopsomyia* Williston. *Pipiza* is undoubtedly the most primitive member of the tribe since it is the only genus in the tribe in which the males lack a postanal hood, a specialization found only in the tribe Pipizini. *Trichopsomyia*, on the other hand, is one of the most highly derived genera of Pipizini in that it has: 1) the ninth sternite of the male usually elongate; 2) the antennal pits separated; and 3) traces of a facial tubercle. The last two specializations are unique among the pipizine genera. A tentative phylogeny for the World pipizines has been diagrammed (Diag. 1).

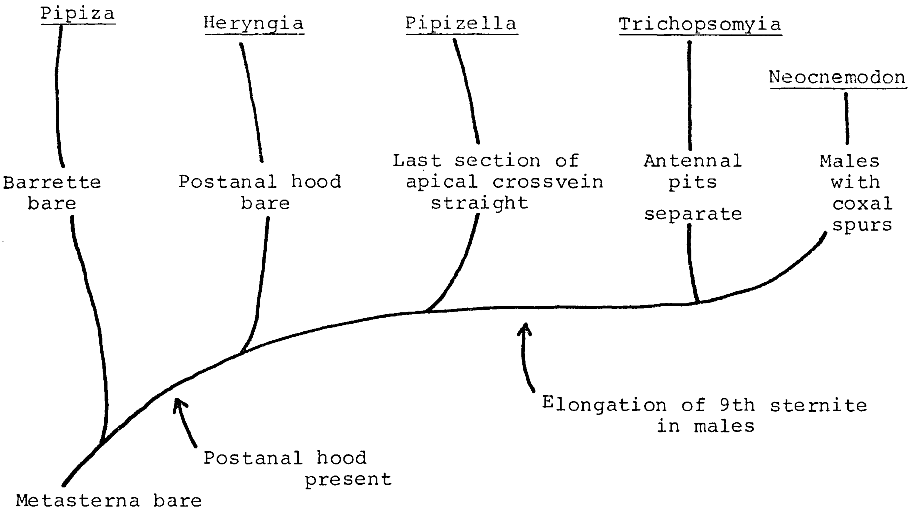


Diagram 1, Phylogeny of the Pipizini.

KEY TO THE NEOTROPICAL GENERA OF PIPIZINI

1. Barrette pilose; anterior meso-anepisternum with some long hairs; antennal pits separate .... *Trichopsomyia* Williston

Barrette bare; anterior meso-anepisternum without any long hairs; antennal pits confluent .... *Pipiza* Fallén

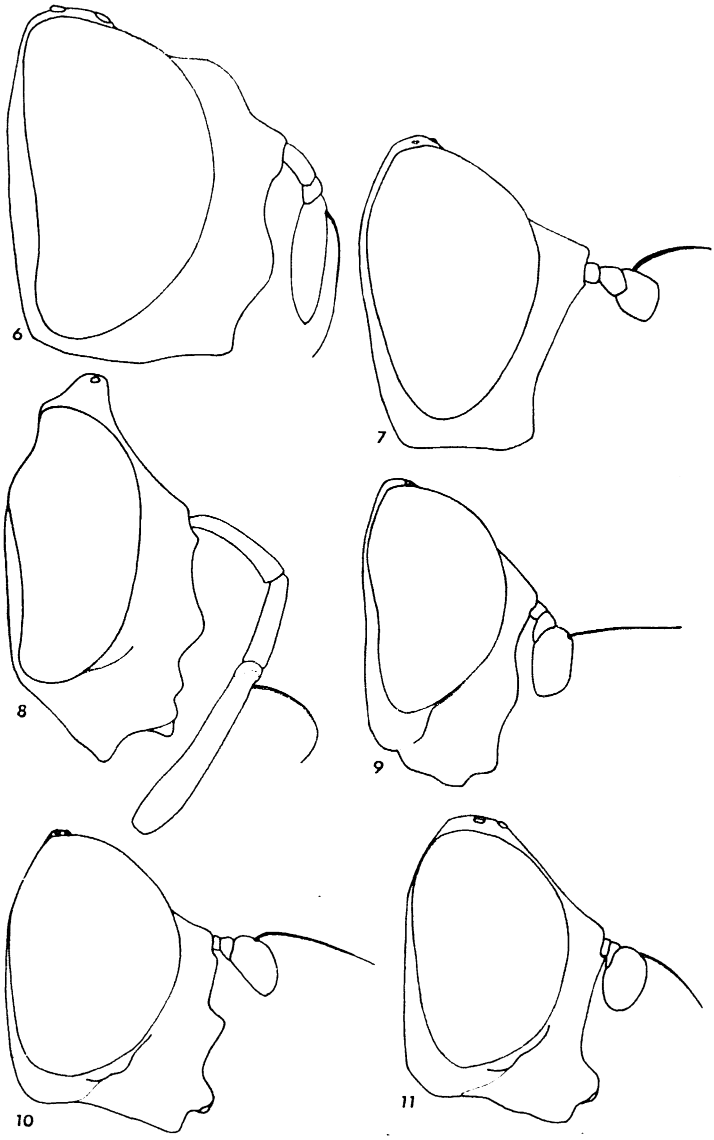
Genus **Pipiza** Fallén

(Fig. 7, 34)

Pipiza Fallén, 1810, Spec. ent. novam Dipt. disp. meth. exhibens., p. 11. Type-species, *Musca noctiluca* Linné, 1758 (subsequent designation; Curtis 1837, Brit. Ent. 13: pl. 669).

Head: two-thirds higher than long; face straight with a slightly projecting epistoma, with pubescences; frontal prominence distinct, conically produced forward, at middle of head; front of the male long, usually twice as long as eye contiguity, flattened, not puffed-out; front of the female broad, almost as broad at antennae as long, longer than face, with convergent sides above. Antennae short; third segment roughly quadratic, slightly deeper than long; arista shorter than antenna, thick.

Thorax: roughly about as long as broad; pro-anepisterna strongly pilose; meso-anepisterna with anterior portion without long pile, barrettes bare. Legs: hind femora slightly swollen. Wings: apical cell acute; subcosta ending usually beyond the level of the anterior crossvein, except before it in *aurantipes* Bigot.

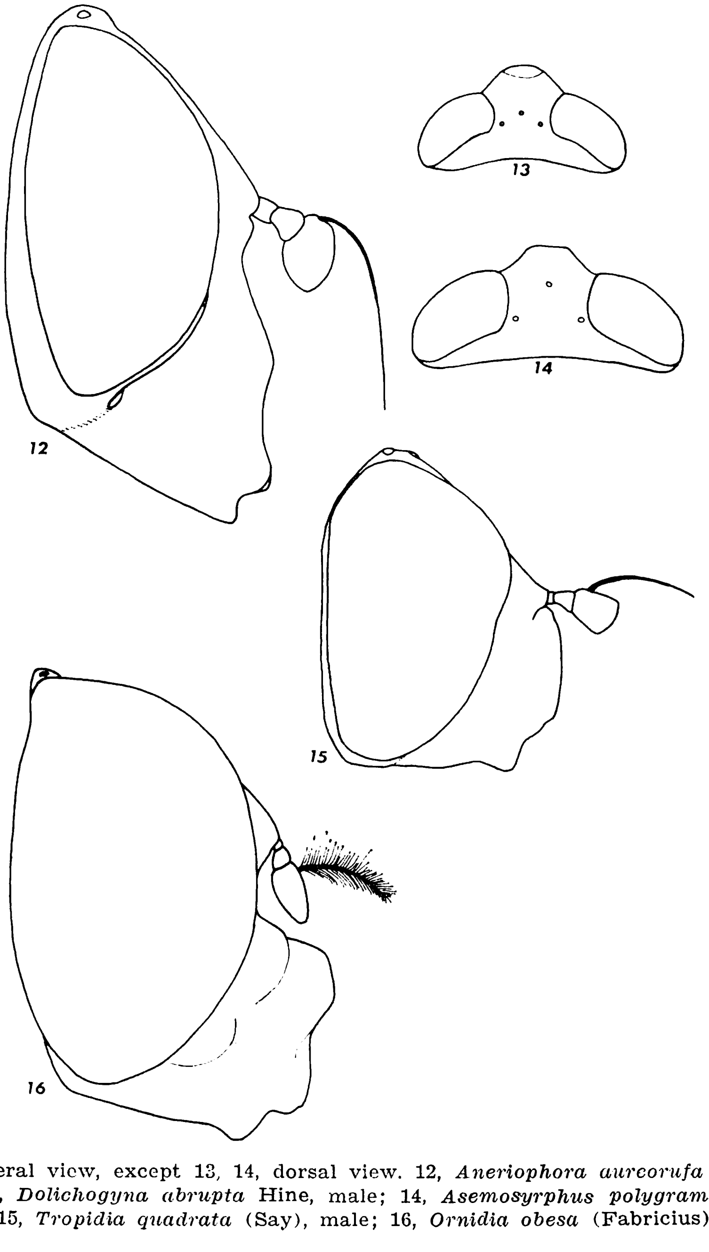


Heads, lateral view. 6, *Trichopsomyia lasiotibialis* Fluke, male; 7, *Pipiza claripennis* Shannon & Aubertin, male (PT); 8, *Lepidomyia* species nº 1 Thompson, female (HT); 9, *Macrometopia atra* Philippi, male; 10, *Chromocheilosia bicolor* (Shannon & Aubertin), male (PT); 11, *Chromocheilosia bicolor* (Shannon & Aubertin), female.

Abdomen: elongate and emarginate.

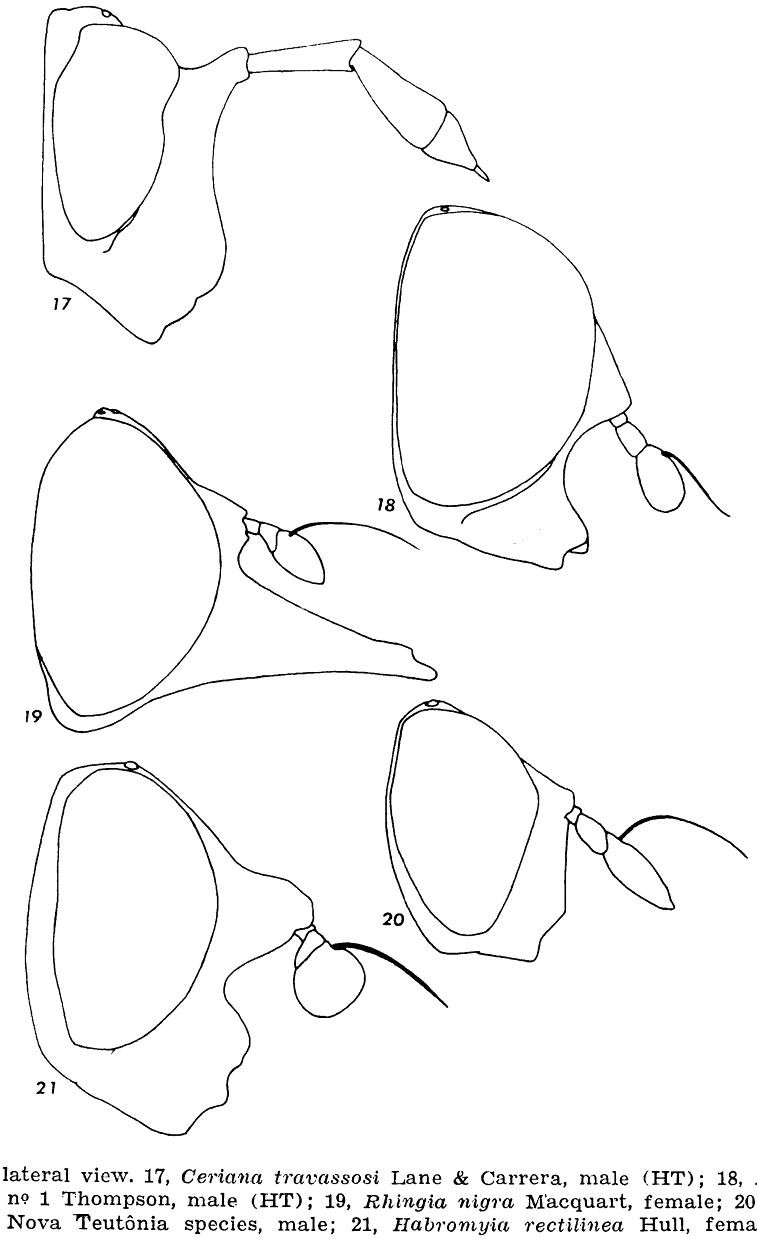
Material examined: 34(3) *albipilosa* Williston, *austriaca* Meigen, *aurantipes* (Bigot)*, *claripennis* Shannon and Aubertin (PTs) *, *femoralis* Loew and *triste* (Philippi)*.

Discussion: *Pipiza* can be separated easily from all other pipizines by: 1) the bare barrette and 2) the produced frons in the male. *Pipiza*



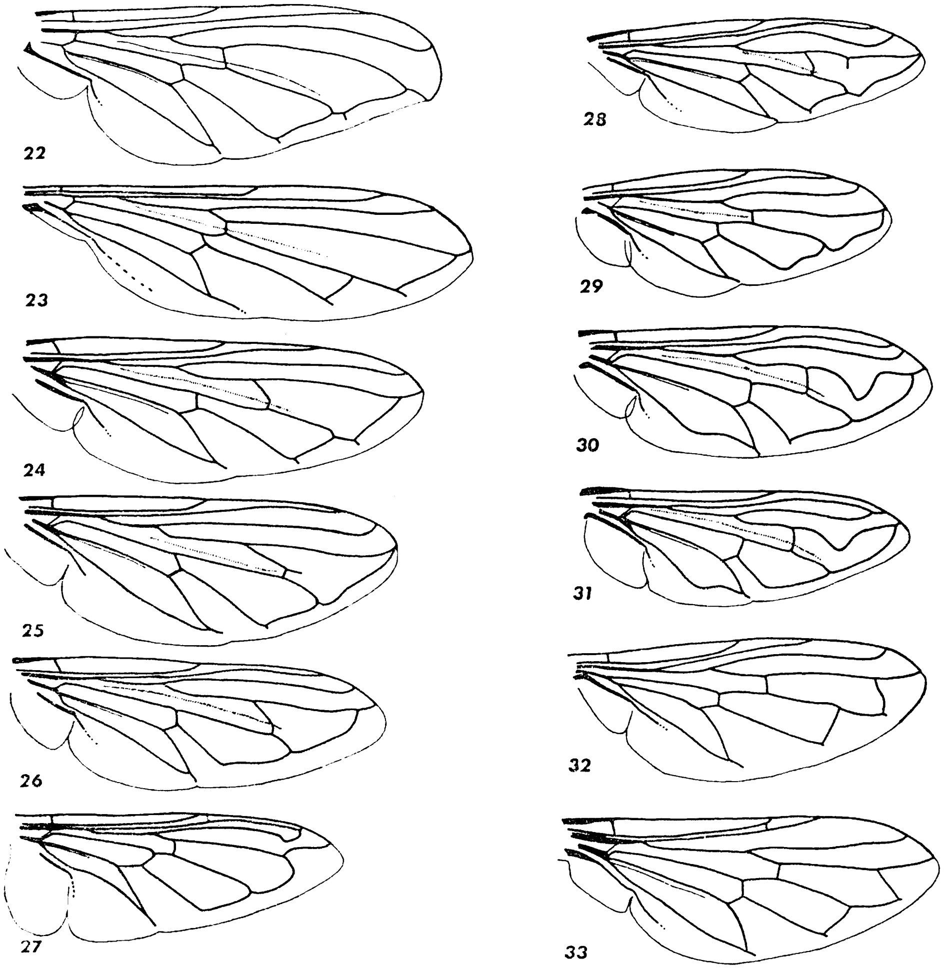
Heads, lateral view, except 13, 14, dorsal view. 12, *Aneriophora aureorufa* (Philippi), female; 13, *Dolichogyna abrupta* Hine, male; 14, *Asemosyrphus polygrammus* Loew, male; 15, *Tropidia quadrata* (Say), male; 16, *Ornidia obesa* (Fabricius), male.

is represented in the Neotropical Region by only three species which are restricted to the Andes of Chile and Argentina. The two species of *Pipiza* described by Enderlein from Brazil belong to the genus *Trichopsomyia.* The aedeagus of the Neotropical species of *Pipiza* examined is quite different from that of some of the Nearctic species and



Heads, lateral view. 17, *Ceriana travassosi* Lane & Carrera, male (HT); 18, *Alipumilio* species nº 1 Thompson, male (HT); 19, *Rhingia nigra* Macquart, female; 20, *Sterphus* Nova Teutônia species, male; 21, *Habromyia rectilinea* Hull, female.

indicates that the South American species should be considered as forming a species group separate from their northern relatives. The aedeagus of the Neotropical species is elongate and tubular in shape, not orbicular, and is without dorsal or ventral prolongations. Shannon and Aubertin (1933) provide a key to all the Neotropical species of *Pipiza*. Philippi's *flavipes* should be considered a *nomen nudum* since Philippi himself clearly states it was not described [*nicht beschrieben*].



Wings, dorsal view. 22, *Rhingia nascia* Say; 23, *Chamaesphegina argentifacies* Shannon & Aubertin; 24, *Aneriophora aureorufa* (Philippi); 25, *Stilbosoma rufisceps* Philippi; 26, *Criorhina caudata* Curran; 27, *Ornidia obesa* (Fabricius); 28, *Ceriana acra* Curran; 29, *Nausigaster flukei* Curran; 30, *Quichuana pogonosa* Fluke; 31, *Palpada precipuus* (Williston); 32, *Orthonevra pulchella* Williston; 33, *Alipumilio* species nº 1 Thompson (HT).

Genus **Trichopsomyia** Williston

(Fig. 6, 35)

Trichopsomyia Williston, 1888, Trans Amer. Ent. Soc. 15:259. Type-species, *Trichopsomyia polita* Williston, 1888 (subsequent designation; Hull 1949, Trans. Zool. Soc. London 26:330).

Head: higher than long; face with a distinct median tubercle, shiny, with pubescence restricted to a narrow band along eye margin; epistoma not produced; frontal prominence not differentiated, at middle of head; antennal pits separated; front of the male long, twice as long as or longer than eye continguity, flattened below and swollen above where it meets eye contiguity; front of female broad, about as broad at antennae as long, as long as face, with sides slightly convergent above; occiput produced slightly posteriorly on upper third. Antennae long; third segment elongate, longer than first two segments together, more than twice as long as broad; arista not thick, shorter than antenna.

Thorax: about as long as broad; pro-anepisterna bare; meso-anepisterna with anterior portion with some long pile, barrettes pilose. Legs: hind femora swollen apically. Wings: apical cell acute, with subcosta ending beyond level of anterior crossvein.

Abdomen: elongate, not distinctly emarginate.

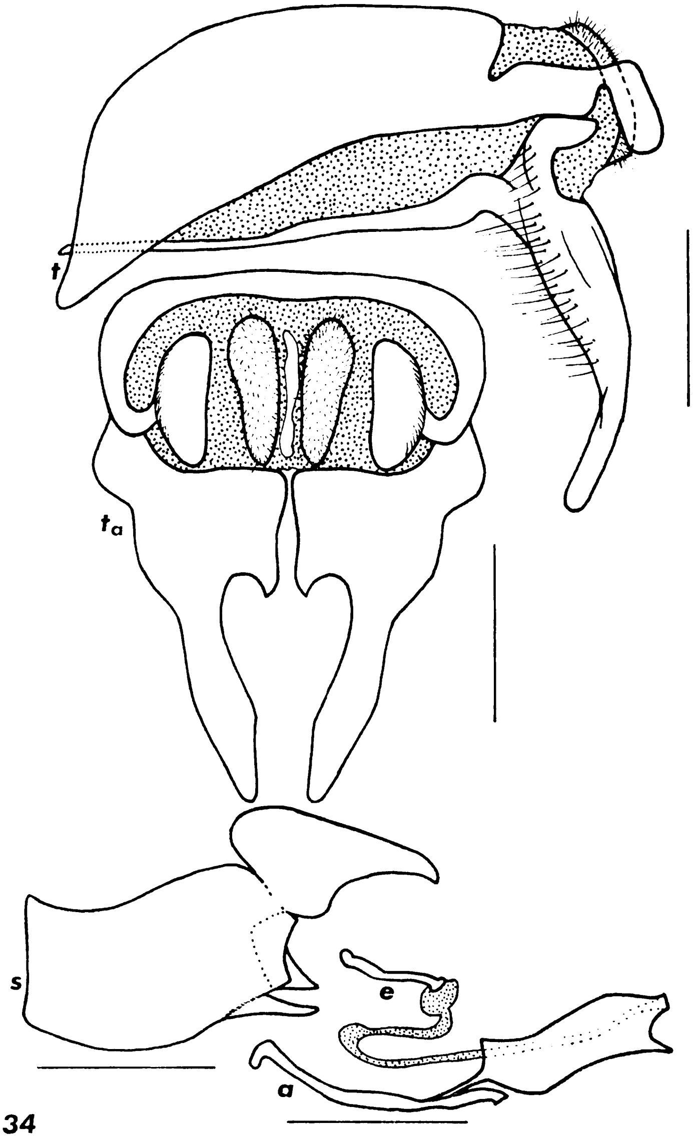
Material examined: 11(11); *catharinensis* (Enderlein)*, *currani* Fluke* and a number of undetermined species.

Discussion: The species of *Trichopsomyia* form a rather distinctive genus of pipizines with their: 1) separate antennal pits; 2) swollen hind femora; 3) patchy eye pile; and 4) facial tubercle. The genus includes 11 described species and is restricted to the Neotropical Region. Nine species of *Trichopsomyia* have been described from Brazil, one from Peru and one from Bolivia. Fluke (1937) provides the most recent key to the species of the genus. However, since Fluke only includes 7 of the 11 species and some of the characters he uses in his key appear to be variable, a revision based at least on genitalic characters is needed.

TRIBE CHEILOSINI

Head: face never strongly sexually dimorphic, usually with a tubercle except *Portevinia* and *Rhingia* with none; oral margin notched anteriorly; facial grooves elongate; males with holoptic eyes; antennae short, never elongate; arista long, usually longer than antennae.

Thorax: pro-anepimera pilose, pro-anepisterna pilose; meso-anepisterna with anterior portion bare; meso-anepimera with posterior portion bare; barrettes bare; metasterna underdeveloped, usually pilose except bare in *Chamaesyrphus;* scutellum without emarginate rim, with ventral pile fringe; legs simple except for some species of *Cheilosia* with ventral bristles or spines on hind femora; wings with apical cell acute, with long petiole, with anterior crossvein usually before middle of discal cell except at middle in *Ferdinandea.*

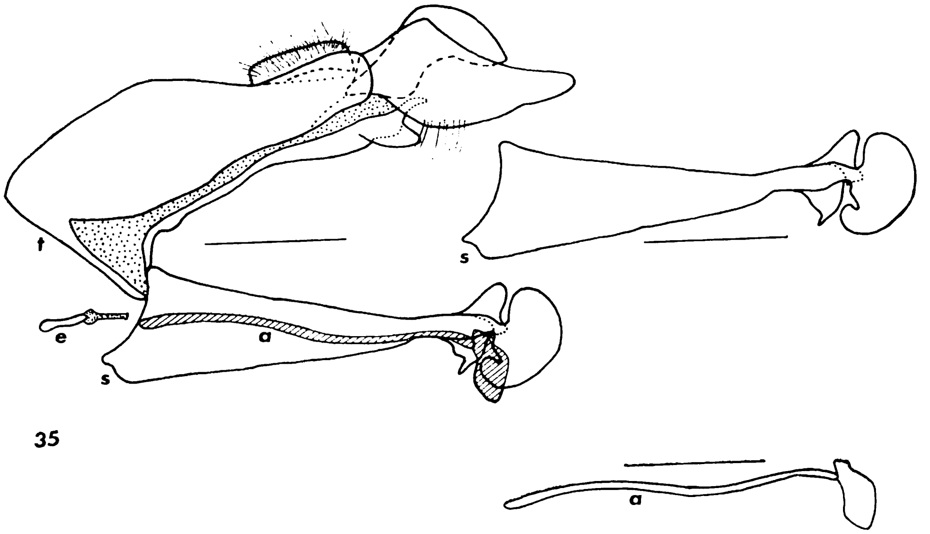


34

34, male genitalia of *Pipiza claripennis* Shannon & Aubertin (PT). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9, all lateral view except t_a anterior view.

Abdomen: oval to suboval, never constricted.

Discussion: The two-segmented aedeagus is a specialization that precisely defines the tribe Cheilosini. The only other milesine groups which have a two-segmented aedeagus are the *Criorhina* and *Tropidia* groups of Milesini. The two-segmented aedeagus of these groups is clearly of a different basic type. The presence of thoracic bristles and the lack of hind femoral spines in the Cheilosini will also distinctly separate the cheilosines from the Milesini. Characters 4-8 (see appendix I) indicate the primitive nature of cheilosines and when these chracters are used in combination they will distinguish the tribe from all other syrphids. The tribe Cheilosini can be divided into two subtribes based on the position of the arista, pilosity of metasterna, and size of the alula. The Pelecocerina has the arista inserted apically on the third antennal segment, metasterna bare and the alula reduced. The subtribe Cheilosina has the arista inserted basad, metasterna pilose and the alula not reduced.



35, Male genitalia of *Trichopsomyia lasiotibialis* Fluke. a, aedeagus and apodeme; s, sternum 9; t, tergum 9; all lateral view.

The tribe Cheilosini is predominantly northern in distribution. Only the genus *Rhingia* is found extensively outside of the Holarctic region. The phylogenetic position of *Rhingia,* the only Neotropical cheilosine genus, has been characterized by Hull (1949) as highly specialized (Phylogeront). However, I would consider *Rhingia* as the most primitive member of the subtribe Cheilosina. The presence of a metathoracic spiracular hair patch and the long costa support my contentions. I would suggest the following phylogenetic relationships between the world genera (Diag. 2).

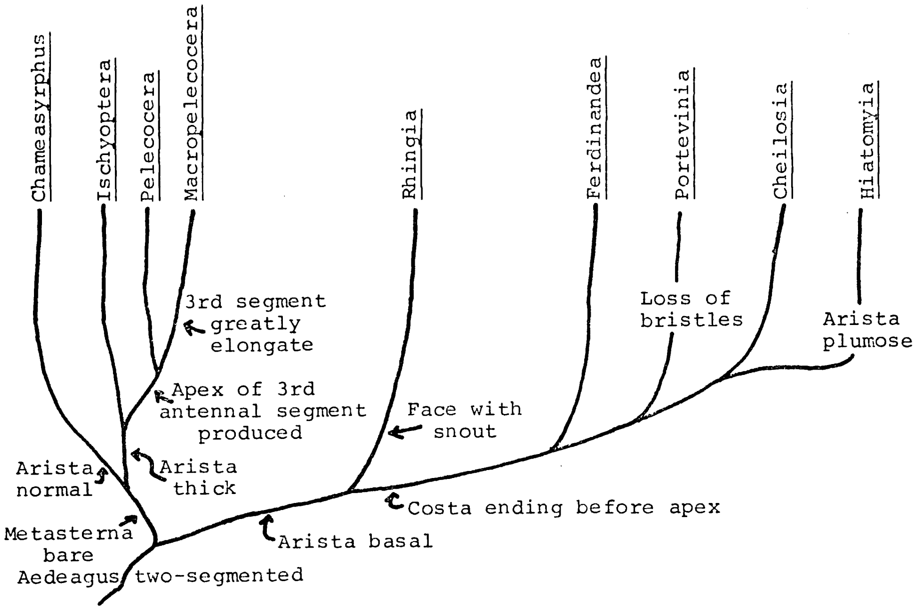


Diagram 2, Phylogeny of the Cheilosini.

KEY TO THE NEOTROPICAL GENERA OF CHEILOSINI

1. Face drawn out into a long, porrect snout (Fig. 19); costa and third vein (r4+5) ending well behind the apex of the wing (Fig. 22) .... *Rhingia* Scopoli

Face without a snout; costa and third vein ending at or before the apex .... *Cheilosia* Meigen

Genus **Rhingia** Scopoli

(Fig. 19, 22, 36)

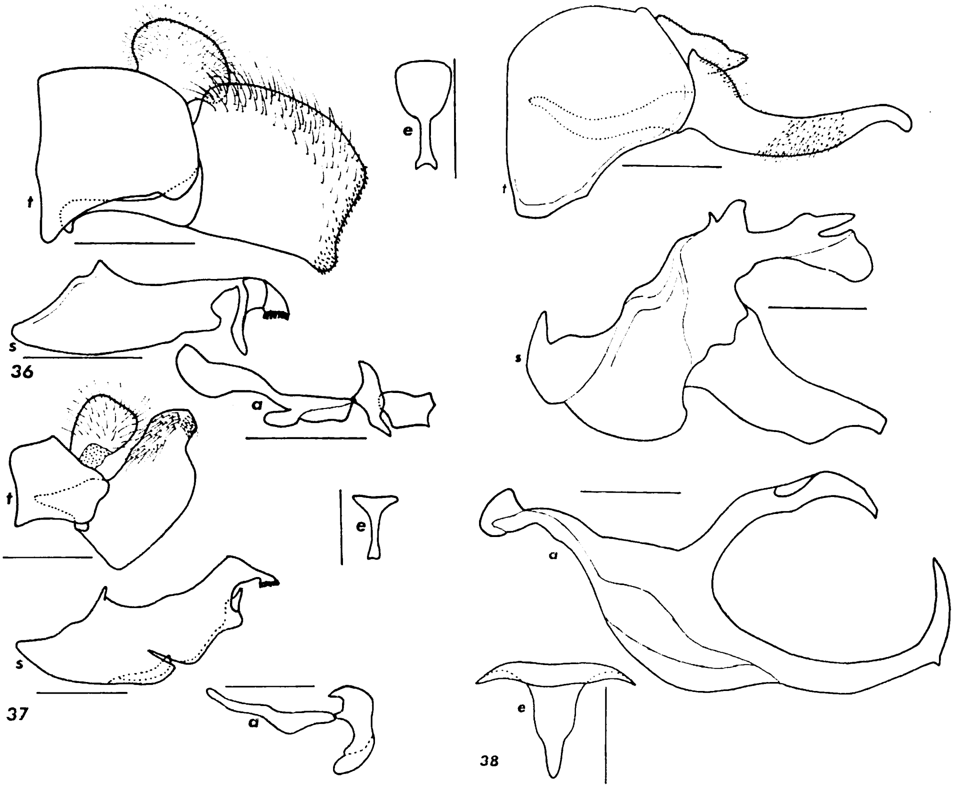
Rhingia Scopoli, 1763, Ent. Carniol, p. 358. Type species, *Conops rostrata* Linné, 1758 (monotypy).

Head: greatly longer than high; face with lower part greatly drawn out in a porrect snout, bare; facial grooves short, extending to level of epistoma; facial stripes distinct, narrow; antennal pits confluent; frontal prominence distinct, low, clearly above middle of head; front of male small, one-half or shorter than eye contiguity; front of female with parallel sides, ranging from one-half to three-fourths as broad at antennae as long (as measured perpendicularly from oral margin to frontal prominence); ocellar triangle small, distinctly before posterior margins of eyes. Eyes bare. Antennae short; third segment suboval, slightly pointed apically, as long as or longer than first two segments; arista bare or with very fine pubescences, longer than antennae.

Thorax: longer than broad, with bristles, with or without metathoracic spiracular hair patches, with separate dorsal and ventral sternopleural pile patches. Wings with costa extending beyond the apex.

Abdomen: oval and emarginate.

Material examined: 46(2); *campestris* Meigen, *nasica* Say, *nigra* Macquart*, and *rostrata* (Linné).



Male genitalia. 36, *Rhingia nigra* Macquart; 37, *Notiocheilosia nitescens* Shannon & Aubertin (HT); 38, *Orthonevra anniae* Sedman. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Discussion: *Rhingia* is the only syrphid genus which has the costa extended beyond the apex of the wing. *Rhingia* is also one of the few genera of the Milesinae with a snoutlike face. The only other genera of the Milesinae with snout-like faces are *Lycastris* Walker, *Lycastrirhynchus* Bigot and *Paratropidia* Hull. *Rhingia* can be separated from *Lycastris* by its lack of costal crossveins, from *Lycastrirhynchus* by its open marginal cell and straight R 4+5 vein, and from *Paratropidia* by its simple unswollen hind femora and non-rimmed scutellum.

Rhingia is obviously a relatively old genus: (1) known from both Miocene and Oligocene fossil remains, (2) almost worldwide in distribution, (3) morphologically primitive. *Rhingia* is absent only from the Australian fauna and has its greatest species abundance in the Oriental region. Only three Neotropical species of *Rhingia* have been described, two from Brazil and one from Ecuador. However, two of these species are probably synonyms. *Rhingia harrisi* Curran appears to be only a color variant of *nigra* Macquart. *R. nigra* is frequently cited as the type-species of *Lycastrirhynchus* Bigot. The type-species of *Lycastrirhynchus* is *nitens* Bigot by monotypy and Kertesz (1910) synonymy of *nitens* under *nigra* is wrong (see discussion under *Lycastrirhynchus*). There is no key to the Neotropical species of *Rhingia*. However, the comparative notes in Fluke's description of *longirostris* (1943) will serve to separate the two valid neotropical species.

TRIBE VOLUCELLINI

Head: Face pilose, with a tubercle; oral margin notched anteriorly; facial grooves elongate, long, almost extending to antennal bases; facial stripes differentiated; antennal pits confluent; ocellar triangle small, distinctly before the posterior margin of eyes; eyes pilose, usually holoptic in male except dichoptic in *Copestylum nasica* group. Antennae short, shorter than face; third segment longer than broad except in *Tachinosyrphus;* arista plumose except bare in *Tachinosyrphus.*

Thorax: usually with distinct bristles except in some *Copestylum.* pro-anepisterna pilose; pro-anepimera pilose; metasterna pilose and underdeveloped; meropleurae with a metathoracic spiracular pile patch. Legs: simple, without spines on hind femora. Wings: with anterior crossvein always clearly located before the middle of the discal cell, with radial sector bristles, with apical crossvein either straight or recessive never directed outward.

Abdomen: short, oval or suboval, never elongate, emarginate, nor constricted.

Discussion: The volucellines are a rather homogeneous group of flies, easily recognized by their straight or recessive apical crossvein and plumose arista. Only *Tachinosyrphus* does not have a plumose arista but *Tachinosyrphus* is unique among the Syrphidae in that it has bristle-like hairs on the abdomen. The presence of bristles, the underdeveloped metasterna, basal anterior crossvein and the lack of hind femoral spines indicates that the volucellines are one of the more primitive milesine tribes. All the New World volucellines except the Holarctic species *bomblyans*, have the anterior part of the mesoanepisterna bare whereas the rest of the world volucellines have this area pilose. Thus the Neotropical volucellines and the Nearctic species derived from the Neotropical region (see discussion on transition between Neotropical and Nearctic milesine faunas) are clearly distinct from the other volucellines and are placed in a separate subtribe, Ornidina. Two

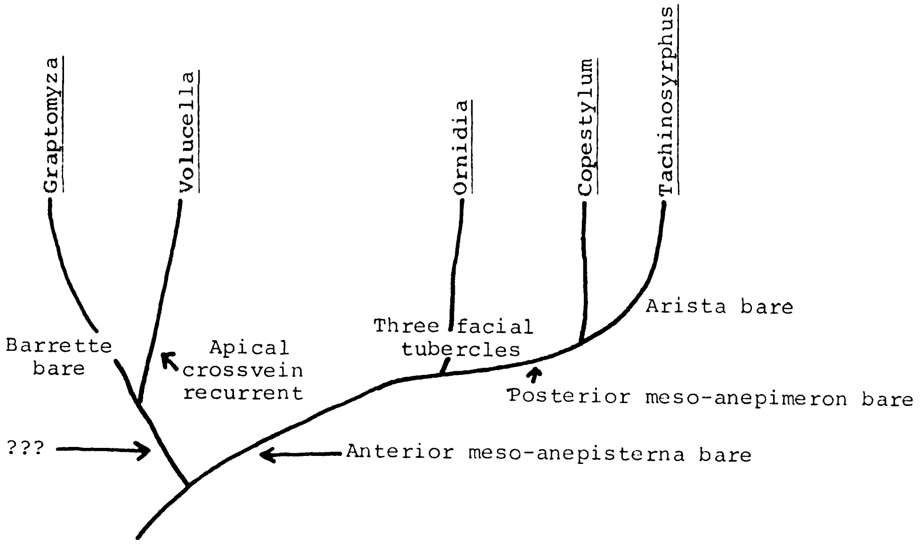


Diagram 3a, Phylogeny of the Volucellini, incorporating a monophyletic origin for the Old World forms.

possible phylogenetic arrangements are suggested for the tribe. It is not possible to say which of these two plans represents the actual phylogeny to the tribe without knowing more about the Old World genus *Graptomyza*. The answers to such questions as the larval feeding habits of *Graptomyza*, whether saprophytic or scavenging in nests of Hymenoptera, are needed to indicate whether the Old World forms are monophyletic (Diag. 3a) or diphyletic (Diag. 3b).

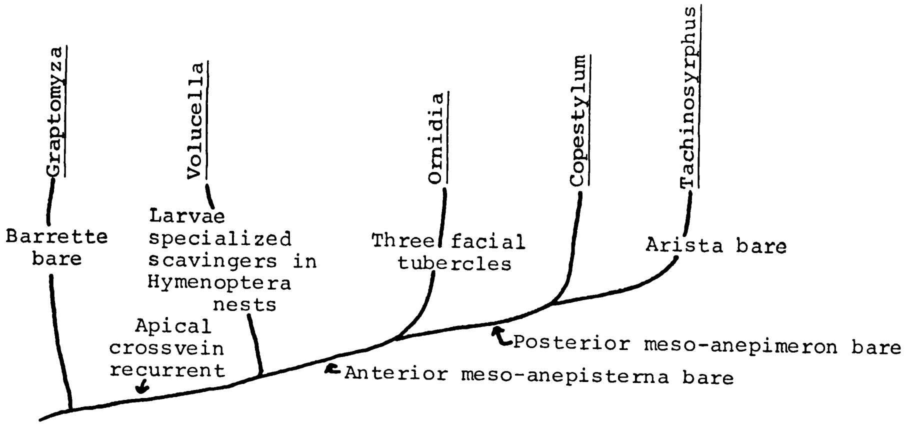


Diagram 3b, Phylogeny of the Volucellini, incorporating a diphyletic origin for the Old World forms.

KEY TO THE NEOTROPICAL GENERA OF THE VOLUCELLINI

1. Arista bare .... *Tachinosyrphus* Hull
   Arista pilose 2

2. Posterior portion of meso-anepimeron pilose ....
   .... *Ornidia* Lepeletier and Serville
   Posterior portion of meso-anepimeron bare ....
   .... *Copestylum* Macquart

Genus **Ornidia** Lepeletier and Serville

(Figs. 16, 27, 44)

Ornidia Lepeletier and Serville, 1828, Encyclopedie methodique 10:786. Type-species, *Syrphus obesus* Fabricius, 1775 (original designation).

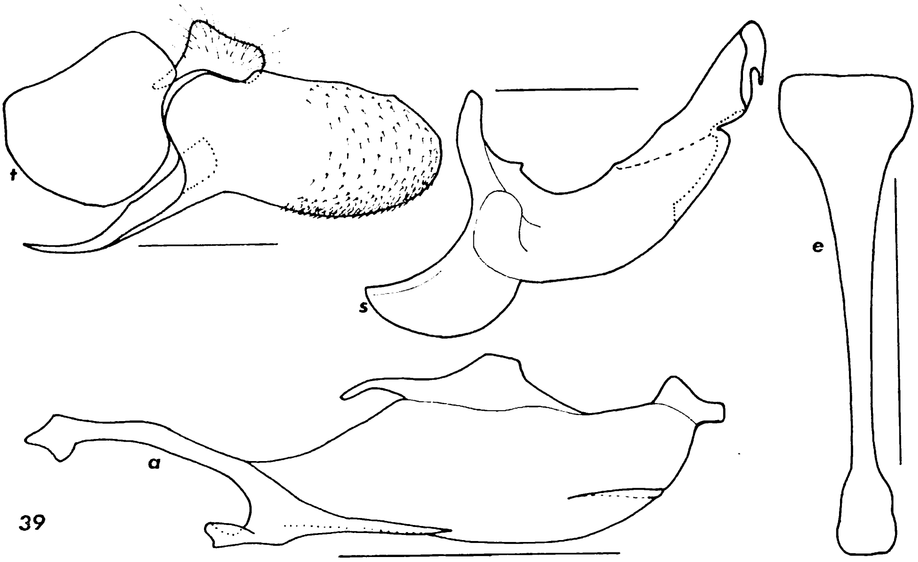
Head: face concave beneath antennae, straight below median tubercle, with distinct median tubercle and two small lateral tubercles on either side of median tubercle, frontal prominence distinct, low above middle of head; front of male short, one-half as long as eye contiguity, slightly puffed out; front of female narrow, about twice as long as wide at antennal bases, as long as face, with convergent sides above, puffed out, with a transverse depression about one-third of frontal length above antennae, with two short longitudinal depressions extending about one-third the length of front above transverse depression. Eyes pilose, holoptic in male. Antennae short, shorter than face; third segment elongate, twice as long as broad at base; arista plumose, as long as antenna.

Thorax: about as long as broad; notopleurae enlarged, swollen and elongate posteriorly on lateral one-half; meso-anepisterna with anterior portion bare; meso-katepisterna with posterior half completely pilose; meso-anepimera with posterior portion pilose; meropleurae with barrettes pilose; scutellum with a pre-apical depression and without ventral pile fringe. Wings: without microtrichia; marginal cell closed, petiolate, with apical portion angulate on posterior part; apical crossvein recessive.

Abdomen: suboval, convex, without bristles.

Material examined: 4(4); *obesa* (Fabricius)*, and *major* Curran*.

Discussion: *Ornidia* can be readily recognized by its three facial tubercles and pilose posterior meso-anepimera. Both of these characters are unique iln the Volucellini. *Ornidia* is endemic to the Neotropical Region but *O. obesa* has been widely distributed throughout the Old World tropics by man (Hull, 1929:196). Curran (1930) provides a key to the four known species.



39, male genitalia of *Myolepta luteola* (Gmelin). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Genus **Tachinosyrphus** Hull

Tachinosyrphus Hull, 1936, Proc. Ent. Soc. Wash. 38:167. Type-species. *Tachinosyrphus pseudotachina* Hull, 1936 (original designation).

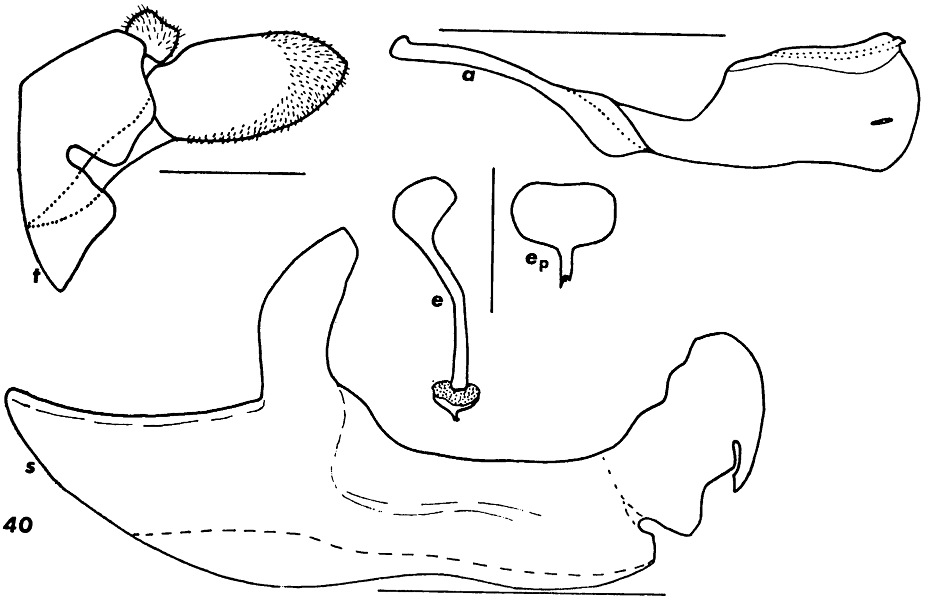
Head: Face bloated, in profile evenly convex from antennae to slightly above oral margin where it forms an acute cone; cheeks large, about one-half as wide as eye height; frontal prominence low, at upper third of head; front of male swollen, slightly longer than eye contiguity. Eyes strongly pilose, holoptic in male. Antennae short; third segment subglobose; arista bare, about twice as long as antennae.

Thorax: about as long as broad; meso-katepisterna continuous pilose from dorsal to ventral margin; posterior meso-anepimera bare; barrettes pilose; scutellum without pre-apical depression and subscutellar fringe. Wings: without microtrichia; marginal cell closed; apical crossvein recessive; spurious vein absent.

Abdomen: oval, flattened slightly, with very dense long bristle-like hairs on the fourth segment.

Material examined: 1 (1); *pseudotachina* Hull* (HT, AT).

Discussion: *Tachinosyrphus* is the only known syrphid with bristle-like hairs on the abdomen. Its swollen and puffed-out face and bare aristae are found nowhere else in the Volucellini. The genus contains only one known species, which was described from Peru.



40, male genitalia of *Lepidomyia similis* Williston. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Genus **Copestylum** Macquart

(Fig. 43)

Copestylum Macquart, 1846, Mem. Soc. Roy. Sci. Agr. Arts Lille (1845) 1844:252. Type-species, *Copestylum flaviventris* Macquart, 1846 (monotypy) = *Volucella marginata* Say, 1829.

Apophysophora Williston, 1888, Trans. Amer. Ent. Soc. 15:276. Type-species, *Apophysophora scutellata* Williston, 1888 (subsequent designation; Curran 1930, Amer. Mus. Novit. 413:5). *New synonymy.*

Megametopon Giglio-Tos, 1891, Boll. Mus. Zool. Anat. Comp., Torino 6(108):5. Type-species, *Ophromyia nasica* Williston 1891 (subsequent designation; Williston, 1892, Biol. Centr. Amer., Dipt. 3:79; also Giglio-Tos, 1892, Ditteri del Messico, Pt. 1:44). *New synonymy.*

Viereckomyia Curran, 1925, Ann. Mag. Nat. Hist. (9) 16:243. Type-species, *Volucella gibbera* Schiner, 1868 (original designation). *New synonymy.*

Lepidopsis Curran, 1925, Ann. Mag Nat. Hist. (9) 16:247. Type-species, *Lepidopsis compactus* Curran, 1925 (monotypy). *New synonymy.*

Volosyrpha Shannon, 1929, An. Mus. Nac. Hist. Nat. Buenos Aires 34:575, (as a subgenus of *Volucella*). Type-species, *Volucella* (*Volosyrpha*) *tibialis* Shannon, 1929 (original designation). *New synonymy.*

Volucellosia Curran, 1930, Amer. Mus. Novit. 413:5. Type-species, *Volucella fornax* Townsend, 1895 (original designation). *New synonymy.*

Head: face usually concave beneath antennae, usually straight below medial tubercle, in some species straight from antennae to oral margin, in a few other with a snout, always with a median tubercle, without lateral tubercles; frontal prominence distinct, low, usually above middle of head except below the middle in *Nasica* group; front of male short except long in *Nasica* group, ranging from one half as long as to as to as long as eye contiguity, in *Nasica* group as long as face, and slightly puffed-out; front of female variable in size, ranging from four times as long as to shorther than wide at antennal bases, usually as long as face, with sides convergent above, usually with two lateral crescent shaped depressions. Eyes pilose, holoptic in male except dichoptic in *Nasica* group. Antennae short, shorter than face; third segment elongate, ranging from twice to about five times as long as broad at base; arista very variable but always with some sort of long hairs present.

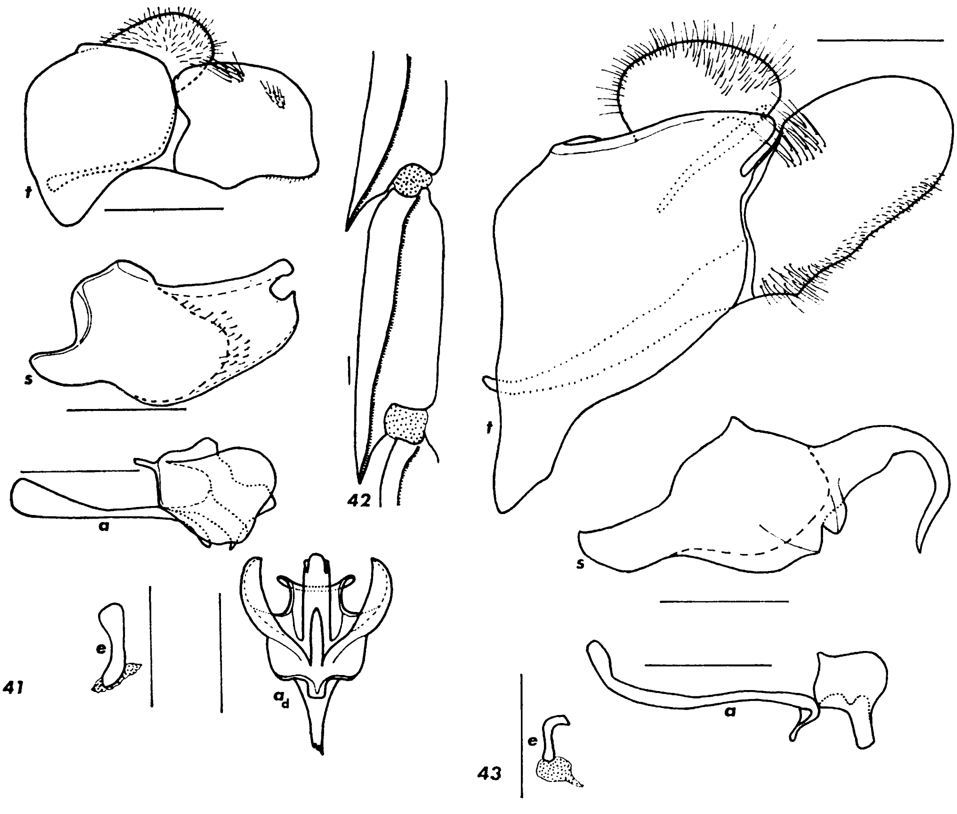
Thorax: as long as or longer than broad and with or without bristles; meso-anepisterna with anterior portion bare; meso-katepisterna with either separate dorsal and ventral pile patches or continuously pilose; meso-anepimera always bare; meropleurae with barrettes either pilose or bare; scutellum with or without a pre-apical depression or ventral pile fringe. Legs: usually simple although hind tibiae greatly swollen in *Hirtipes* group. Wings: with or without microtrichia; marginal cell open or closed and petiolate; apical crossvein always recessive.

Abdcmen: suboval to oval, convex and without bristles.

Material examined: 300+(275); *azurea* (Philippi)*, *belinda* (Hull)*, *circe* (Curran)*, *compactus* (Curran)*, *dracaena* (Curran)*, *eugenia* (Williston), *fasciata* (Macquart), *fornax* (Townsend), *fuscipennis* (Macquart)*, *haagi* (Jaennicke), *hirtipes* (Macquart)*, *horvathi* (Szilady), *impressa* (Hull)*, *isabellina* (Williston), *marginata* (Say), *meretricias* (Williston)*, *nigra* (Greene), *obscurior* (Curran)*, *pallens* (Wiedemann)*, *picta* (Wiedemann)*, *pusilla* (Macquart), *sapphirina* (Bigot)*, *scutellata* (Macquart)*, *scutellata* (Williston)*, *selecta* (Curran)*, *smithae* (Thompson)*, (HT), *spinigera* (Wiedeman)*, *spinithorax* (Arribalzaga)*, *tripunctata* (Hull)*, *tympanitis*

(Fabricius)*, *unipunctata* (Curran), *vesicularia* (Curran), *violacea* (Curran)*, *vulta* (Fluke)*, *zephyra* (Curran)* and about two dozen new species.

Discussion: *Copestylum* is a very large (over 300 species) and diverse genus it is clearly separated from all other volucellines by its: 1) bare anterior meso-anepisternum; 2) bare posterior meso-anepimeron; and 3) pilose arista. Many generic names have been proposed for the species of this genus but since these names are based either on: 1) single or small groups of species with a few unique specializations (*Volosyrpha* Shannon, *Viereckomyia* Curran, *Apophysophora* Williston, *Volucellosia* Curran and *Copestylum s. s.*), or 2) larger groups with characters which since have been shown to be variable (*Phalacromyia* Rondani), they have not here been recognized as representing valid genera. Clearly the names based on variable characters cannot be accepted representing good genera but the names for the small



41, male genitalia of *Chromocheilosia bicolor* (Shannon & Aubertin). 42, hind tarsus, ventral view, of same species. 43, male genitalia of *Copestylum spinithorax* (Arribalzaga). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

specialized species groups may be said to represent valid genera. However, splitting these specialized species groups off as separate genera will leave the remaining genus a poly- and paraphyletic mess, since all the species groups are clearly derived from one common ancestral species with the three above mentioned characters. Thus I have synonymized all these genera. Since many of these generic names have been used in the syrphid literature, I have included a key to them. Curran provides a series of keys to the Neotropical species of *Copestylum* (1930 *Volucella** and *Copestylum s. s.;* 1939 *Volucella**; 1947 *Vesicularia* group; and 1953 *Abdominalis* and *Esuriens* groups). Also Fluke (1953) has revised the *Scutellata* Macquart group.

KEY TO THE FORMERLY SEPARATE NEOTROPICAL GENERA OF COPESTYLUM, s. l. (BASED ON CURRAN 1930)

1. Arista bushy plumose, appearing more or less straplike 2

Arista loosely plumose 3

2. Hairs of arista all of about the same length and extending to the tip .... *Copestylum s. s.* Macquart

Arista with dorsal and ventral row of longer, isolated hairs and with the apex broadly bare .... *Volosyrpha* Shannon

3. Arista pectinate, with long hairs above and extremely short hairs below .... *Volucellosia* Curran

Arista plumose, the ventral hairs never imperceptible 4

4. Scutellum basally either with a very strong acute tubercle or with three weak tubercular swellings 5

Scutellum without tubercles basally 6

5. Scutellum with three rather weak tubercular swellings which bear dense black pile; vertex of female strongly produced upward .... *Apophysophora* Williston

Scutellum with a median, strongly produced, acute tubercle .... *Viereckomyia* Curran

6. Eyes of male widely separated; front much longer than the face .... *Megametopon* Giglio-Tos

Eyes of male contiguous; front shorter than the face or at most slightly longer 7

7. Pile of eyes dense and with scale-like hairs intermixed .... *Lepidopsis* Curran

No scale-like hairs on the eyes .... *Volucella* Geoffroy[1]

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(1) New World species, except Holarctic *bombylans* a true *Volucella*, are now included in *Copestylum*.

TRIBE CALLICERINI?

Notiocheilosia,[1] gen. n.

(Fig. 37)

Head: about one-third higher than long: face very broad, occupying more than one-half of head width, strongly pilose, broadly pollinose on sides, straight with a small low median tubercle slightly nearer to oral margin than to antennae; oral margin with an anterior notch and epistoma distinctly produced at tip of notch; cheeks broad, about two-thirds as broad as long, pilose, pollinose; facial grooves elongate, short, extending only to level of tubercle; facial stripes very narrow, pilose, pollinose; frontal prominence not differentiated from surrounding area, at upper third of head; frontal triangle of male puffed-out slightly, pilose, as long as eye contiguity, about twice as broad as long, with a medial impressed groove; vertical triangle of male small, equilateral and less than one-half as long as eye contiguity, about twice as broad as long, with a medial impressed groove; vertical triangle of male small, equilateral and less than one-half as long as eye contiguity; front of female broad, about one-fourth longer than broad at antennae, with a medial impressed groove on lower part of front like male, about one-third shorter than face, shiny, pilose; ocellar triangle small, equilateral, at posterior margin of eyes. Eyes strongly pilose and holoptic in male, thinly pilose and dichoptic in female, facets of uniform size. Antennae: short, about one-fourth as long as face; first two segments about as long as broad; third segment roughly orbicular; arista basal, slightly less than twice as long as antenna, bare.

Thorax: with mesonotum about as long as broad excluding scutellum, with pile long in male and short in female, without bristles; pro-anepisterna pilose; pro-anepimera pilose; meso-anepisterna with anterior portion with only very short pubescences; meso-katepisterna broadly and continuous pilose from ventral margin to dorsal margin; meso-anepimera with posterior portion with only very short pubescences; meropleurae bare except for a large patch of long pile in front of metathoracic spiracle; metathoracic pleurae bare; metasterna pilose, underdeveloped; plumulae elongate, almost as long as lower squamal lobe; squamae without long pile on disk; scutellum without an apical emarginate rim, with a sparse ventral pile fringe. Legs: simple, hind femora without ventral spines. Wings: marginal cell open; apical cell closed, acute, petiolate, with petiole about as long as anterior crossvein; anterior crossvein straight, basal, before the basal fourth of discal cell; radial sector bristles present but weak in female; alulae normal not narrowed.

Abdomen: short, oval, non-emarginate, with 1st abdominal spiracle embedded in metathoracic epimeron.

Type-species: *Chilosia nitescens* Shannon and Aubertin.

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(1) From the Greek, *Notios*, southern and *Cheilosia* referring to the syrphid genus.

Material examind: Holotype and allotype of type-species plus addition specimens of type-species.

Discussion: The position of *Notiocheilosia* in the phylogeny and classification of the Milesinae is problematic. It clearly does not belong to any tribe as presently characterized but I do not feel this exclusion from the other tribes is a sufficient reason for erecting a new tribe for its inclusion presently. The strongly basal anterior crossvein, underdeveloped and pilose metasterna, lack of femoral spines and the strongly pilose nature of *Notiocheilosia* places the genus among the more primitive tribes of the Milesinae. *Notiocheilosia* definitely does not belong with the Cheilosini because of its lack of a segmented aedeagus as Sedman (1955) has pointed out. The lack of thoracic bristles also excludes *Notiocheilosia* from the cheilosines. The presence of 1) tuberculate faces in both sexes, 2) subscutellar fringe, 3) pilose metasterna, 4) pilose eyes, and 5) lack of femoral spines, all exclude *Notiocheilosia* from the Chrysogasterini. The acute apical cell, lack of thoracic bristles, bare arista; all eliminate *Notiocheilosia* from the Volucellini. The tuberculate faces in both sexes, notched oral margin and pilose metasterna exclude the genus from the Pipizini. Only the presence of a basal arista separates *Notiocheilosia* from the Callicerini. However, the terminal styles may be of only minor importance in the recognition of *Callicera* as a separate tribe, thus *Notiocheilosia* may belong to the Callicerini.

I consider antennal differences of only minor significance in deciding whether a taxon should have tribal status or not, unless they are correlated with other characters. Since the peculiar arista of the pelecocerines is not correlated with any other major difference and the pelecocerines do have the characteristic two segmented aedeagus of Cheilosini, I have considered the pelecocerines as only a subtribe under Cheilosini. I have considered the terminal style of *Callicera* of tribal value in the adult fly because it correlates with the very unusual larval form. Since the larvae of *Notiocheilosia* are not known, it is not possible to securely assign *Notiocheilosia* to the Callicerini. However, because *Notiocheilosia* shares more characteristics with *Callicera* than any other milesine genera I am placing *Notiocheilosia* in the Callicerini. The characteristics *Notiocheilosia* shares with *Callicera* are: 1) pilose face; 2) pilose eyes; 3) pilose metasterna; 4) scutellum with ventral pile fringe; 5) low facial tubercle in both sexes; 6) mesokatepisterna almost completely pilose; 7) scutellum without apical emarginate rim; 8) meropleurae with a patch of pile in front of metathoracic spiracle (only in some species of *Callicera*); 9) short facial grooves; 10) undifferentiated or very narrow facial stripes; and 11) similar wing venation. In short, although *Notiocheilosia* has been tentatively placed in Callicerini, the genus is phylogenetically isolated from all other syrphid genera and likewise abundantly distinct.

Only one species of *Notiocheilosia* is known, *nitescens*. *Nitescens* is restricted to the Chilean Subregion of South America and is clearly described by Shannon and Aubertin (1933).

TRIBE CHRYSOGASTERINI

Head: oral margin notched anteriorly; face bare except for a few scattered scales in *Lepidomyia* Loew; antennal pits confluent except narrowly separated in *Chamaesphegina*. Eyes usually bare, pilose in *Chromocheilosia*, holoptic in male except dichoptic in *Neoascia*, *Sphegina* and *Lejogaster*. Antennae usually short, shorter than face, longer than face in *Lepidomyia;* arista bare, except for short pile in *Brachyopa*, usually longer than antenna, thin.

Thorax: pro-anepisterna pilose; pro-anepimera pilose except bare in some species of *Brachyopa;* meso-anepisterna with anterior portion usually bare except for upper posterior corner pilose in *Orthoneura*, *Myolepta* and *Lepidomyia;* meso-anepimera with posterior portion bare; metathoracic pleurae bare; metathoracic spiracle small; metasterna usually bare, underdeveloped; plumulae elongate except absent in *Sphegina* and *Neoascia;* scutellum without ventral pile fringe except with in *Chromocheilosia*. Legs: hind femora with ventral spines. Wings: anterior crossvein usually before middle of discal cell.

Abdomen: variable, either oval, elongate or constricted.

Discussion: The chrysogasterines form a rather homogeneous tribe characterized by: 1) anterior crossvein before the middle of discal cell; 2) bare eyes; 3) bare metasterna; 4) absence of subscutellar fringe; and 5) absence of facial tubercle in female. However, there is at least one genus which is an exception to each of the above characters: a species of *Myolepta* from Chile has the anterior crossvein beyond the middle of discal cell; some *Myolepta* species have pilose metasterna; *Chromocheilosia* has a distinct subscutellar fringe; and *Lepidomyia* has a facial tubercle in the female. Despite all these exceptions, a consensus of the five above characters will clearly delimit the tribe.

The tribe Chrysogasterini can be divided into two subtribes, Chrysogasterina and Spheginina. The Spheginina includes those genera with: 1) concave faces in both sexes; 2) narrow alulae; 3) pair of scutellar bristles; and 4) parallel-sided or constricted abdomens. Spheginina includes three genera, *Sphegina*, *Neoascia* and *Chamaesphegina*. The Chrysogasterina have: 1) usually tuberculate faces in the male; 2) normal broad alulae; 3) usually no scutellar bristles; and 4) usually oval abdomen. The Spheginina is a very distinctive group, first recognized by Williston (1886) as a tribe. Since that time the spheginines have been almost universally recognized as either a tribe or subfamily. However, the lack of subscutellar fringe, bare metasterna and femoral spines clearly places the Spheginina in with the chrysogasterines. The spheginines form a natural group when restricted to *Sphegina* and *Neoascia* (and now *Chamaesphegina*) as almost every worker has done except Hull (1949). Hull enlarged the spheginines to include *Takaomyia*, *Odyneromyia* and *Valdivia*. These three genera belong to the tribe Milesini with the *Temnostoma* group because of the presence of a subscutellar fringe, bright pollinose markings, and tuberculate faces in males, and the absence of thoracic bristles. *Chamaesphegina* was first placed in with the spheginines when Enderlein described his *Desmetrum* (a synonym) and this action was repeated independently by Hull (1949), who did not know that *Desmetrum* was a synonym of *Chamaesphegina.*

The Spheginina is a predominantly Holarctic group with only the monotypic genus *Chamaesphegina* found greatly beyond the bounds of the northern temperate zone. *Chamaesphegina* is restricted to the Chilean Subregion of South America. The Chrysogasterina are worldwide in distribution, although the Ethiopian chrysogasterines appear to be limited to the genus *Orthonevra.* Four genera of the Chrysogasterina are found in the Neotropical Region: one genus and another subgenus, *Lepidomyia* and *Myolepta* (*Protolepidostola*), are wide-spread in the tropical areas; whereas the rest of the chrysogasterine genera are restricted to the temperate Andes. The phylogenetic relationships of these Neotropical genera are tentatively suggested (Diag. 4).

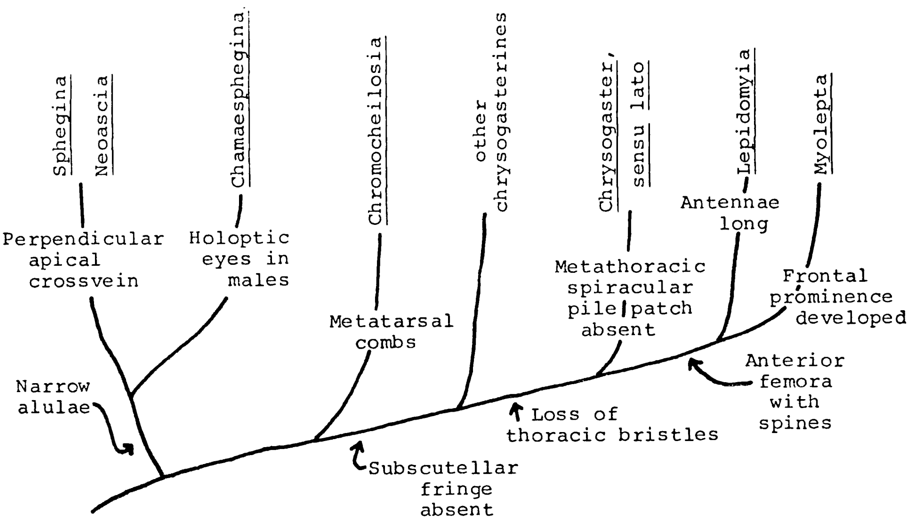


Diagram 4, Phylogeny of the Neotropical Chrysogasterini.

KEY TO THE NEOTROPICAL GENERA OF CHRYSOGASTERINI

1. Apical crossvein recessive or vertical, forming either a right or an obtuse angle with third vein (r4+5) (Fig. 32) .... *Orthonevra* Macquart
   Apical crossvein directed outward, forming an acute angle with third vein (Fig. 23) 2
2. Anterior four femora armed with ventral spines 3
   Anterior four femora unarmed, without ventral spines 4

3. Antennae elongate, longer than or as long as face; third antennal segment elongate, more than twice as long as wide .... *Lepidomyia* Loew

Antennae short, never as long as face; third antennal segment short and oval .... *Myolepta* Newman

4. Hind basal three tarsal segments with ventral longitudinal combs (Fig. 42); eyes usually pilose .... *Chromocheilosia* Hull and Fluke

Hind tarsi without ventral longitudinal combs; eyes bare .... *Chamaesphegina* Shannon and Aubertin

Genus **Lepidomyia** Loew

(Fig. 8, 40)

Lepidomyia Loew, 1864, Berlin. Ent. Zeitschr. 8:69. Type-species, *Lepidomyia calopus* Loew, 1864 (monotypy).

Head: short, higher than long; face tuberculate in both sexes, frequently with two median tubercles, produced slightly downward, with scattered scales or hairs; facial grooves short, extending to level of tubercle; facial stripes wide; frontal prominence not differentiated, slightly above middle of head; front of male long, longer than eye contiguity; front of female broad, about a third broader at antennae than long, about as long as face, with convergent sides above; ocellar triangle small, before posterior margin of the eyes, usually protuberant; occiput reduced laterally, just a mere line along upper third of head, flattened. Eyes flattened with metallic patterns in life, holoptic in male. Antennae long, longer than face; third segment more than twice as long as broad.

Thorax: as long as broad, with very short pile and scales; meso-anepisterna with anterior portion with upper posterior corner pilose; meso-katepisterna with separate dorsal and ventral pile patches; meropleurae bare except for a patch of pile in front of metathoracic spiracle; scutellum frequently triangular and produced into dorsal thorn-like protuberance. Legs: all femora swollen and with two ventral lateral rows of short spines; hind tibiae with a basal ventral short spine. Wings: apical cell acute; anterior crossvein at basal third of discal cell; sometimes with spurs on apical crossvein.

Abdomen: oval to elongate, indistinctly emarginate.

Material examined: 16(15); *calopus* Loew*, *dionysiana* D'Andretta and Carrera* (HT), *ortalina* van der Wulp*, *perpolita* Johnson* (HT), *pulchra* Williston* and *similis* Williston*.

Discussion: *Myolepta* and *Lepidomyia* are distinguishable from all other syrphids by the presence of strong ventral spines on all femora. *Lepidomyia* can be separated from *Myolepta* by its: long antennae which are longer than the face, and presence of facial tubercle in the female. *Lepidomyia* is wide-spread throughout the Neotropical Region and extends into the southern Nearctic Region.

Genus **Myolepta** Newman

(Fig. 39)

Myolepta Newman, 1838, Ent. Mag. 5:373. Type-species, *Musca luteola* Gmelin, 1790 (monotypy).

Head: Face usually dark, with distinct tubercle in male, straight to slightly concave and with strongly projecting epistoma in female, bare; facial grooves short, extending along lower third of eyes; facial stripes distinct, pilose; frontal prominence distinct, slightly above middle of head; front of male short, one-half as long to as long as eye continguity; front of female broad to narrow as long to one and a half times as long as face, with sides convergent above; ocellar triangle slightly before posterior margin of eyes, vertical triangle ranging from as long as to twice as long as eye continguity; occiput usually normal except reduced in *Protolepidostola.* Eyes holoptic or narrowly dichoptic in male. Antennae short, shorter than face; third segment large, not elongate.

Thorax: usually longer than broad; with short pile; meso-anepisterna with anterior portion with upper posterior corner pilose; meso-katepisterna with separate dorsal and ventral pile patches; meropleurae usually bare except in *luteola* with a patch of pile in front of metathoracic spiracle and barrettes pilose; metasterna usually pilose, bare in *strigilata;* scutellum usually with distinct apical emarginate rim. Legs: all femora swollen and with two ventral lateral rows of short spines. Wings: apical cell closed at wing margin; anterior crossvein at middle of cell.

Abdomen: oval to elongate, not emarginate.

Discussion: *Myolepta* with its ventral spines on all femora can hardly be confused with any other syrphid genus except its sister-group *Lepidomyia. Myolepta* is distinguished from *Lepidomyia* by its: short antennae which are shorter than the face, and concave face in the female. Thompson (1968) has provided a key for the separation of *Myolepta* and its related genera and has discussed the subgeneric division of the genus. Fluke and Weems (1956) have provided a key to all the New World species of *Myolepta.* Thompson has described two more species (both of subgenus *Protolepidostola*) since that revision and provided a new key to the species of the subgenus *Protolepidostola.* The species of *Myolepta* are found throughout most of the world but are completely absent from Ethiopian and Australian Regions. The

Neotropical myoleptas of the typic subgenus are restricted to the temperate Andes of South America. However, the type species of *Protolepidostola* and one other species of this subgenus were described from Brazil, which suggests that *Protolepidostola* not only differs structurally from *Myolepta, s. s.,* but differs in its adaptation to the tropical climate.

KEY TO THE SUBGENERA OF MYOLEPTA NEWMAN

1. Head short, occiput reduced laterally; small compact flies .... *Protolepidostola* Hull

   Head normal, not short; occiput not reduced laterally; not compact flies .... *Myolepta* Newman

Subgenus **Myolepta** Newman

Head: not short, about as high as long; face broad, straight with a strongly projecting epistoma in the female, tuberculate in male; frontal prominence at upper two-thirds of the head; front of female broad, usually as broad at antennae as long; front of male short; occiput normal not reduced as in *Protolepidostola* or *Lepidomyia*. Eyes holoptic or narrowly dichoptic in male.

Thorax: as long as or longer than broad; with pile ranging from normal hair type to flattened scales.

Abdomen: oval to elongate.

Material examined: 21(9); *haemorrhoidalis* (Philippi)*, *luteola* (Gmelin), *nascia* (Hull)*, *nigra* Loew and *strigilata* Loew.

Discussion: Shannon in 1922 described the genus *Eumyiolepta* for those members of *Myolepta* with scales on the thorax and abdomen. He designated *M. strigilata* Loew as the type of the group. In 1941 Hull erected *Sarolepta* for a new species, *dolorosa,* which had an intermediate form of pile on the thorax. However, a few years (1949) later he synonymized his genus under *Myolepta.* Thus, it is clear that the type of pile on the thorax and abdomen of myoleptine flies ranges all the way from normal hairs to short and flattened opaque scales. For this reason I feel myoleptine groups should not be recognized solely on the basis of pile types. *Sarolepta* and *Eumyiolepta* do not differ structurely from *Myolepta.* Therefore I do not consider these valid groups.

Subgenus **Protolepidostola** Hull

Protolepidostola Hull, 1949, Trans. Zool. Soc. London 26:333 (as a subgenus of *Lepidostola*). Type-species, *Lepisdostola scintillans* Hull, 1946 (original designation).

Small compact flies with scale-like pile on some parts of the body.

Head: very short, compressed longitudinally, twice as high as long; face narrow, about as long as wide, deeply concave in female, tuberculate in male; frontal prominence at middle of head; front of female narrow, occupying less than one-third of head width, about one and one-third as long as face, with an impressed medial groove on upper three-fourths, distinctly punctate on either side of this groove, with sides only slightly convergent above; front of male about twice as long as eye contiguity; ocellar triangle of male long; occiput reduced laterally, just a mere line along the upper one-half of eyes, flattened. Eyes very large, occupying two-thirds or more of head width. Antennae: third segment short, oval, about twice as long as second segment.

Thorax: short and compact, with scales, with ventral meso-katepisternal pile patch reduced to only a few hairs in between medial suture, with scutellum without an apical emarginate rim. Wings: with the spurious vein absent.

Abdomen: short and compact.

Material examined: 3(3); *evansi* Thompson* (HT), *problematica* Thompson* (HT) and *scintillans* (Hull)* (HT).

Genus **Orthonevra** Macquart

(Fig. 32, 38)

Orthonevra Macquart, 1829, Mem. Soc. Roy. Sci. Agr. Arts Lille 1827/1828:188. Type-species, *Chrysogaster elegans* Meigen, 1822 (monotypy).

Head: higher than long; face without a distinct tubercle in either sex, with scattered scales or hairs, frequently with strigae extending from eyes to middle of face; facial grooves extending to level of the produced epistoma, ending in a distinct pit; facial stripes indistinct; lower face and epistoma distinctly produced forward; frontal prominence not differentiated, above middle of head; front of male slightly swollen, usually with a distinct indentation above the antennal bases, usually about as long as eye contiguity; front of the female broad, as broad at antennae as long, about as long as face, with convergent sides above, strongly rugose, with a median longitudinal groove or carina; ocellar triangle small, at posterior margin of eyes, not protuberant; occiput reduced on upper third of head. Eyes with metallic patterns in life, holoptic in male. Antennae vary from short to long, third segment variable, usually much longer than broad.

Thorax: longer than broad, with short pile; meso-anepisterna with anterior portion having upper posterior corner pilose; meso-katepisterna with separate dorsal and ventral pile patches; meropleurae bare; scutellum with distinct apical emarginate rim. Legs: all femora swollen; hind femora with two ventral lateral rows of short spines; hind tibiae without ventral lateral rows of short spines; hind tibiae without ventral spines or knife-edge. Wings: frequently with brown patterns; apical cells obtuse; apical crossvein recessive on its upper portion; anterior crossvein always distinctly before middle of discal cell.

Abdomen: oval, flattened dorsoventrally, not emarginate, with the disc opaque and the sides shiny.

Material examined: ?(6) *anniae* Sedman, *bellula* Williston, *chalybeata* (Meigen), *gewgew* Hull (HT), *nigrovittata* Loew (CTs), *nitida* (Wiedemann), *parva* (Shannon), *pictipennis* (Loew) (CTs), *pulchella* (Williston), *robusta* '(Shannon), *sonorensis* (Sedman) and *stigmata* (Williston).

Discussion: *Orthonevra* is usually considered as a subgenus of *Chrysogaster*. Wirth *et al.* (1965) have raised another subgenus of *Chrysogaster*, *Chrysosyrphus*, to full generic status and this action leaves the typic genus, *Chrysogaster*, a polyphyletic group. Sedman (1959), who has studied the male genitalia of *Chrysogaster*, s. l., states that 1) *Orthonevra* is derived from a *Chrysogaster* like ancestor and 2) *Chrysosyrphus* is apparently intermediate between *Chrysogaster* and *Orthonevra*. Thus, if one is to consider the phylogenetic intermediates as a distinct genus, the extremes must also be considered separate genera. I feel on the basis of external characters and the male genitalia, all three of these subgenera are sufficiently distinct to be recognized as separate genera. The interrelationships and distinctions of these three genera are indicated by the following characterization:

Chrysogaster, s. s.: 1) aedeagus simple, without distinct ejaculatory process but weakly developed ejaculatory hood; 2) 3rd antennal segment oval, 2nd with long bristle-like hairs; 3) male frons only slightly puffed out; and 4) apical crossvein forming an acute angle with third vein.

Chrysosyrphus: 1) aedeagus intermediate, with distinct ejaculatory process but weakly developed ejaculatory hood; 2) 3rd antennal segment oval 2nd with long bristle-like hairs; 3) males frons only slightly puffed out; and 4) apical crossvein forming an acute angle with third vein.

Orthonevra: 1) aedaegus complex, with distinct ejaculatory hood and process; 2) 3rd antennal segment elongate, 2nd without bristle-like hairs; 3) male frons not puffed out but rugose; and 4) apical crossvein forming a right or obtuse angle with third vein.

As for the other subgenera of *Chrysogaster*, s. l., it is probable that the two Palearctic subgenera, *Lejogaster* and *Liochrysogaster*, are also distinct and should be raised to generic status. I have seen two new species from New Caledonia which agree with the description of *Plesia* and *Hemilampra* (two Australian subgenera), respectively and these species definitely deserve full generic status; and Bezzi's Ethiopian *Orthonevra* with pilose eyes clearly do not belong to any of the described genera or subgenera related to *Orthonevra.* In short, I strongly suspect most subgenera and a few odd species now listed under *Chrysogaster,* s. l., probably represent distinct genera.

Eight species of *Chrysogaster,* s. l., have been described from the Neotropical Region. Of these eight species, five were described from the temperate Andes (*labyrinthops* Hull, *neotropica* Shannon, *nitida* Wiedemann, *shannoni* Curran and *quadristriata* Shannon and Aubertin) and are *Orthonevra,* two of them (*lugubris* Jaennicke and *annulifera* Bigot) do not belong with the genera related to *Chrysogaster,* and one species (*argentina* Brèthes) has not been available for study. There is no available keys to the Neotropical species of *Orthonevra.* However, Sedman (*in litt.*) is currently working on a revision of the Neotropical species.

Genus **Chromocheilosia** Hull and Fluke

(Fig. 10, 11, 41, 42)

Chromocheilosia Hull and Fluke, 1950, Bul. Amer. Mus. Nat. Hist. 94:306 (as a subgenus of *Cheilosia*). Type-species, *Chilosia bicolor* Shannon and Aubertin, 1933 (original designation).

Head: about one-third higher than long; face yellowish orange, with distinct tubercle in male, straight and with strongly projecting epistoma in female, bare, as long as broad; facial grooves short, extending along lower third of eyes; facial stripes distinct, pilose; frontal prominence low, slightly above middle of head; antennal pits confluent; front of male one-half as long as eye contiguity; vertical triangle about one-half as long eye contiguity, longer than broad at occiput; front of female about as long as face, one-third longer than broad, with sides convergent above, one-third broader at antennae than at ocellar triangle; ocellar triangle before posterior margin of eyes. Eyes usually pilose (sparsely pilose in female of *incerta*), holoptic in male. Antennae short, almost two-thirds as long as face; third segment large, orbicular; arista bare, about twice as long as antenna.

Thorax: about as long as broad; with mesonotal bristles; mesokatepisterna with separate dorsal and ventral pile patches; meropleurae bare except for barrettes being pilose in *bicolor;* metasterna bare; scutellum with strong ventral pile fringe, without apical emarginate rim. Legs: hind femora swollen, with two lateral ventral rows of strong spines; hind tibiae with sharp ventral knife-edge on basal one-half; hind tarsi with ventral longitudinal combs on basal three segments. Wings: apical cell petiolate, with petiole about one-half as long as anterior crossvein; anterior crossvein at basal third of discal cell.

Abdomen: oval to elongate, not emarginate.

Material examined: 3(3); *bicolor* Shannon and Aubertin* (HT); *incerta* Shannon and Aubertin* (PTs); *pubescens* Shannon and Aubertin* (PTs).

Discussion: The species of *Chromocheilosia* were first described as cheilosine flies not chrysogasterines. Shannon and Aubertin (1933) in their study of the Syrphidae of Southern Chile and Patagonia described four species in the genus *Chilosia* Meigen. At that time they noted the close interrelationship among three of the species (*Chromocheilosia*) and the distinctiveness of the fourth (*Notiocheilosia*). They also indicated that they were uncertain as to the limits of *Cheilosia* and thereby the placement of their species. Since then no one has re-examined the species involved until now. Hull and Fluke merely made the distinctiveness of these flies official by naming a special subgenus for them. In their (Hull and Fluke, 1950) review of the North American species of *Cheilosia* they erected the subgenus *Chromocheilosia* "for those truly aberrant antipodal *Cheilosiae,* of which there are several species, that are in large part bright, pale orange in color", and designated *Chilosia bicolor* as the genotype. It is surprising that the significance of the unusual characteristics of *Chromocheilosia* which are the complete antithesis of those of *Cheilosia* were not recognized. The peculiar coloration and geographic distribution of *Chromocheilosia,* Hull and Fluke's characters, clearly indicate that *Chromocheilosia* is not a subgenus of *Cheilosia* but a valid genus. The characteristics of *Chromocheilosia* are not peculiar and the species of *Chromocheilosia* are not aberrant when one considers the genus as belonging to the tribe Chrysogasterini. In 1968 I (Thompson, 1968) raised the group to generic level and placed it in the Myoleptini.

The presence of a scutellar fringe and thoracic bristles indicates that *Chromocheilosia* is the most primitive genus in the Chrysogasterina. The strongly sexually dimorphic face and the short petiolate apical cell suggests that *Myolepta* is the closest related group. The fact that *Myolepta luteola* (Gmelin) (European) and *Chromocheilosia bicolor* are the only two chrysogasterine flies that have pile on the barrette may be another indication of this relationship. The ventral longitudinal combs on the hind tarsal segments appears to be unique among the syrphids.

Genus **Chamaesphegina** Shannon and Aubertin

(Fig. 23)

Chamaesphegina Shannon and Aubertin, 1933, Dipt. Patagonia S. Chile 6:145. Type-species, *Chamaesphegina argentifacies* Shannon and Aubertin, 1933 (original designation).

Head: about one-fourth higher than long; face yellowish pollinose, bare, concave, with slightly projecting epistoma; facial grooves very short, not extending above level of oral margin; frontal prominence low, slightly above middle of head; antennal pits narrowly separated above; front of female about twice as long as broad, with slightly convergent sides above, as long as face; ocellar triangle slightly before posterior margin of eyes. Eyes bare, holoptic in males. Antennae short, about one-half as long as face; third antennal segment orbicular; arista bare, about one and one-half times as long as antenna.

Thorax: about twice as long as broad, with short pile; meso-katepisterna with separate dorsal and ventral pile patches; meropleurae bare; metasterna bare; scutellum with a pair of apical bristles, with distinct apical emarginate rim. Legs: simple except for minute ventral spines on hind femora. Wings: elongate, as long as whole fly; apical cell peticlate; anterior crossvein strongly basal, at basal one-eighth of discal cell; alula narrow, narrower than second basal cell.

Abdomen: elongate, not emarginate, about twice as long as wide, parallel-sided.

Material examined: 2(2); *argentifacies* Shannon and Aubertin* (PTs).

Discussion: The non-constricted abdomen and the acute apical cell place *Chamaesphegina* as the primitive sister group to the rest of the Spheginina. Shannon and Aubertin in the original description stated that the group was probably allied to *Hemixylota*..Their statement confuses me since the group is clearly allied to *Sphegina* and this is what their name reflects also (*chamae* - from the Greek meaning dwarf and *Sphegina*). *Hemixylota*, with its scutellar fringe, lack of strong femoral spines and the developed metasterna, is far removed from *Chamaesphegina*.

Desmetrum Enderlein has not been seen but it appears to be a synonym of *Chamaesphegina*. The original description agrees perfectly with *Chamaesphegina*. Fluke (1956) also considers this group a synonym, and Hull (1949) suggested the possibility of such a synonymy. The original description of *Desmetrum* Enderlein is based on the male with I have not studied. The only important differences between the sexes is in the nature of the frontal region of the head, due to the fact that the male is holoptic and the female dichoptic.

TRIBE EUMERINI

Head: face pilose, usually concave except tuberculate in *Nausigaster;* oral margin notched; antennal pits usually confluent except separate in *Nausigaster;* ocellar triangle before posterior margin of eyes; eyes pilose, usually narrowly holoptic in male except in *Nausigaster* broadly holoptic. Antennae short, shorter than face; arista usually bare except with very short pubescences in *Alipumilio*.

Thorax: pro-epimera usually pilose except with pubescence in *Alipumilio;* pro-anepisternum pilose; meso-anepisterna with anterior portion pilose; meso-anepimera with posterior portion bare; meropleurae bare; metasterna pilose except bare in *Nausigaster;* metathoracic pleurae bare except epimera pilose in *Nausigaster;* scutellum with distinct flattened emarginate crenate rim, usually without ventral pile fringe except in *Merodon, Azpeytia,* and *Psilota.* Legs: hind femora with ventral spines except in some *Nausigaster.* Wings: apical cell usually obtuse except in *Nausigaster* and *Psilota;* apical crossvein usually recessive except in *Nausigaster* and *Psilota.*

Abdomen: oval to suboval, not constricted, with first abdominal spiracle free, not embedded in metaepimeron.

Discussion: The tribe Eumerini is easily distinguished from most milesine taxa by its pilose anterior meso-anepisterna. The only other milesine taxa with the anterior meso-anepisterna pilose are Volucellina, *Trichopsomyia, Spilomyia, Milesia,* and *Temnostoma.* The eumerines can be separated from both the volucellines and *Trichopsomyia* by their scutellum with its apical emarginate rim and hind femoral spines and from the three genera of Milesini by their recessive apical crossvein. The reduced and modified first abdominal sternite along with its free spiracle is a unique specialization found only in the eumerines.

The tribe Eumerini as considered here is a greatly enlarged concept from that previously recognized (Hull, 1949; Wirth *et al.*, 1965). *Merodon* from the old Eristalinae, *Psilota* and *Alipumilio* from the old Cheilosinae, along with *Nausigaster,* formerly Nausigasterinae, have been combined with the old Eumerinae. All these taxa which are now combined were formerly considered to be aberrant taxa not closely related to any other groups. By grouping all these taxa together with some previously overlooked characters one forms a rather homogeneous tribe. Not only are the adults very similar as indicated by the below character table (Appendix I) but the larvae also appear to be very similar in habits and structure. The larvae of Eumerini are short-tailed maggots which breed in rotten bulbs or plant exudates. Hartley (1961 and 1965) has shown that the larvae of *Eumerus* and *Merodon* are very similar. Carrera *et al.* (1947) described the larvae of *Nausigaster.* Miller (1921) has described a New Zealand species of *Psilota* in great detail. Hill (1921) has mentioned the presence of *Psilota* larvae in the putrid exudate of a *Mastotermines darwinensis* nest. I have received a series of a new species of *Alipumilio* from Brazil which is labelled as reared from the pitch of *Araucaria australis.*

The phylogenetic position of the Neotropical members of the tribe Eumerini is rather difficult to determine at the present time because so little is known about the character of some of the Oriental and Ethiopian taxa. However, the Neotropical members of the tribe share a couple of unique specializations which may suggest that they form a separate group within the tribe. *Alipumilio* and *Nausigaster* are the only two syrphid taxa which do not have the meso-anepisterna differentiated into a flat anterior portion and convex posterior portion. Also *Alipumilio* and *Nausigaster* are the only milesine taxa that are strongly and distinctly punctate. However, both these Neotropical genera share another unique specialization with *Eumerus,* the notal wing shield. These unique characters may be combined to suggest the following phylogenetic arrangement for the tribe as a whole (Diag. 5).

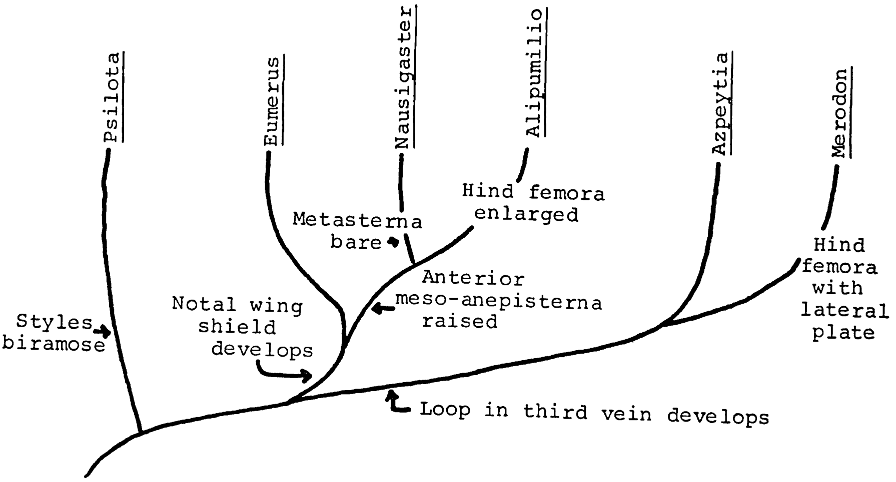


Diagram 5, Phylogeny of the Eumerini.

KEY TO THE NEOTROPICAL GENERA OF EUMERINI

1. Apical crossvein recurrent (Fig. 33); face concave (Fig. 18); antennal pits confluent .... *Alipumilio* Shannon

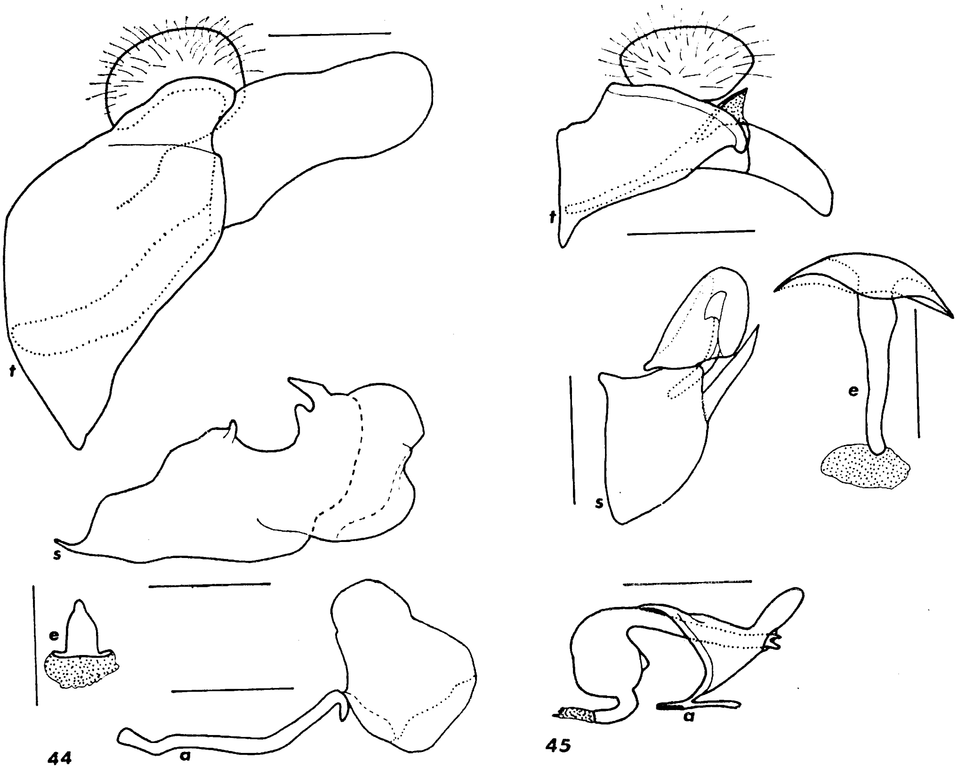
Apical crossvein directed outwards (Fig. 29); face tuberculate; antennal pits separated .... *Nausigaster* Williston

Genus **Alipumilio** Shannon

(Fig. 18, 33, 46, 47)

Alipumilio Shannon, 1927, Proc. U.S. Nat. Mus. 70(9):12. Type-species, *Alipumilio femoratus* Shannon, 1927 (original designation).

Head: much higher than long, short; face short, concave, with a projecting epistoma; facial grooves short extending to slightly above level of epistoma; facial stripes not differentiated; frontal prominence distinct, at middle of the head; antennal pits connected; front of male large, about one-third broader at antennae than long, as long as the face, about four times as long as the eye contiguity; vertical triangle of male long, about five times as long as eye contiguity; front of female narrow, more than twice as long as broad at antennae, long, about twice as long as face, with slightly convergent sides above, punctate, with a distinct medial line running from ocellar triangle to just above antennae; ocellar triangle small, not protuberant; occiput greatly reduced, not visible laterally. Eye pile very short, thick, dense. Antennae short; third segment suboval to oval, as long as or longer than first two segments; arista with very short fine pubescences.



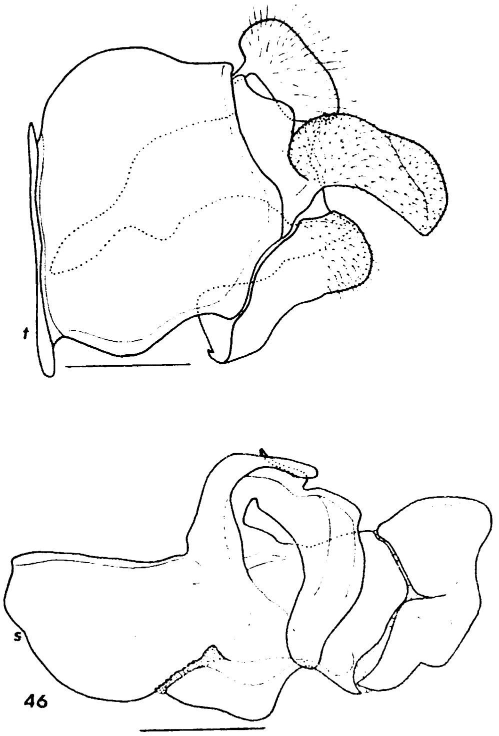
Male genitalia. 44, *Ornidia obesa;* 45, *Nausigaster tuberculata* Carrera, Lopes & Lane. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

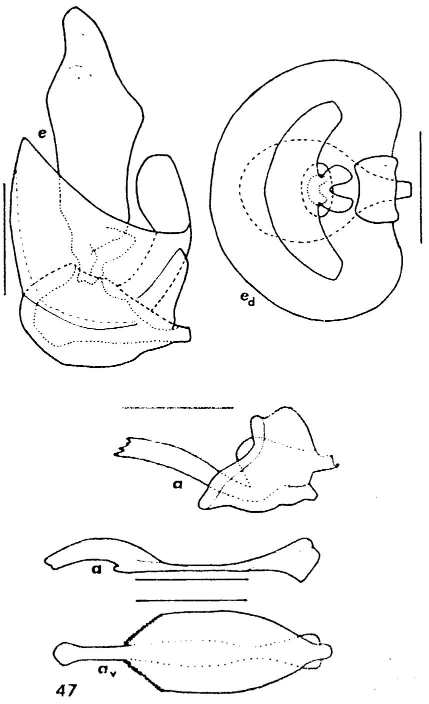
Thorax: very short and broad, almost twice as broad as long; meso-katepisterna with small dorsal pile patches; scutellum without ventral pile fringe; plumulae long elongate. Legs: hind femora greatly swollen and armed ventrally with two lateral rows of short spines; hind tibiae arcuate. Wings: apical cell obtuse; apical crossvein strongly recurrent; spurious vein absent; anterior crossvein always distinctly before middle of discal cell.

Abdomen: very short, broad, not emarginate, strongly curved down and forward at the third segment, sternites greatly reduced.

Material examined: 4(4); *avispas* Vockeroth* (HT), *pullatus* Vockeroth* (HT) and four new species.

Discussion: *Alipumilio* is readily separated from *Nausigaster,* the only other Neotropical eumerine, by its 1) concave face; 2) confluent antennal pits; 3) enlarged hind femora; and 4) recessive apical crossvein. *Alipumilio* can be separated from all other syrphid taxa by the unique characters it shares with *Nausigaster* (see above discussion under the tribe) and its unusually enlarged swollen hind femora and concave face. Also, *Alipumilio, Nausigaster,* and *Eumerus* have a unique lateral project of the mesonotum which partly covers the base of the wing (called the notal wing shield).





Male genitalia of *Alipumilio* species 1 Thompson (HT). 46, s, sternum 9; t, tergum 9; all lateral view; 47, aedeagus and apodeme; e, ejaculatory apodeme; all lateral view except a_v ventral view and e_d dorsal view.

Alipumilio appears destined to be a large genus although it is quite rare in collections. Shannon described the genus from a single female collected by Darwin on the Amazon. For some forty years, this was the only known specimen of the genus, but recently Vockeroth (1964) uncovered three more specimens representing three new species. One of Vockeroth's species was from Mexico and the other two were from Peru. During the course of this revision, seven more specimens of the genus were discovered in various collections. These seven specimens, including one series of four specimens reared from pine pitch, represented four more new species. Thus, in all, only a dozen specimens of *Alipumilio* are presently known and these represent nine species, which range from Argentina in the south to Mexico in the north. Vockeroth (1964) has provided a key to the described species.

Genus **Nausigaster** Williston

(Fig. 29, 45)

Nausigaster Williston, 1883, Trans. Amer. Ent. Soc. 11:33. Type-species, *Nausigaster punctulata* Williston, 1883 (monotypy).

Head: slightly higher than long; face with a distinct tubercle, deeply concave under antennae and above tubercle, not produced greatly below tubercle, without a projecting epistoma; facial grooves short, extending to the level of epistoma; facial stripes not differentiated; frontal prominence distinct, at middle of head; antennal pits widely separated; front of male small, about as long as eye contiguity; vertical triangle long, varying from as long as eye contiguity to twice as long; front of female as long as face, about one-fourth longer than broad at antennae, with a median tubercle, with strongly convergent sides above; ocellar triangle small, usually protuberant; occiput slightly swollen laterally, punctate. Eye pile fine, short and widely scattered. Antennae short, about one-half as long as face; third segment round, swollen, longer than first two segments; arista thin, inserted dorsally at middle of third segment.

Thorax: about as broad as long with short thick pubescences, with only dorsal meso-katepisternal pile patches, without subscutellar fringe, with very short, broadly rounded plumulae. Legs: simple. Wings: usually with brown patterns; apical cells acute; apical crossvein strongly directed outward on apical portion; anterior crossvein at basal third of discal cell.

Abdomen: elongate, drooping, flexed at end of second segment where there is a strongly transverse crease; sides and apical end greatly produced downward and somewhat inward, producing a large ventral cavity; lateral margins distinct, end in the form of small lobes on either side of apex; sternites not reduced.

Material examined: 14(7) ; *bonariensis* Arribalzaga*, *clara* Curran, *curinervis* Curran, *geminata* Townsend, *punctulata* Williston, *scutellaris* Adams, *texana* Curran, *tuberculata* Carrera, Lopes and Lane*, and *unimaculata* Townsend.

Discussion: The strongly punctate exoskeleton of *Nausigaster* will clearly separate the genus from all other syrphid taxa. Although *Alipumilio* is also punctate, the punctures of *Alipumilio* are not as large or as numerous as those in *Nausigaster. Nausigaster* has the head punctate all over whereas in *Alipumilio* the head punctures are restricted to the front of the female only. The other characters of value in distinguishing *Nausigaster* from *Alipumilio* and other milesine taxa have been discussed under *Alipumilio.* About 14 species of *Nausigaster* have been described and Curran (1941) has provided a key to all but three of the more recently described species of the genus. The genus is distributed from Argentina in the south to the southern border of the United States in the north. The numbers of species are about equally divided between the Nearctic and Neotropical regions but the Nearctic species are restricted to the tropical portion of the region. The restricted range of the Nearctic species along with the *Nausigaster*'s extensive range in the Neotropical region strongly suggests that the genus had a Neotropical origin.

TRIBE CERIOIDINI

Wasp-mimics with very short appressed hairs, each hair arising from a distinct but very small puncture.

Head: face with sparse short pile, broad, usually as broad as high, straight, with a low median tubercle near oral margin; cheeks broad, usually as broad as long or broader; oral margin notched anteriorly; facial grooves elongate, extending about half the length to frontal prominence; facial stripes indistinct; antennal pits confluent; frontal prominence at upper third or higher of head, ranging from undifferentiated condition to many times longer than broad; front of male excluding frontal prominence short, usually about as long as eye contiguity; front of female excluding frontal prominence short, usually less than one-half as long as face, broad, always broader at antennae than long, with convergent sides above; vertical triangle short, equilateral; ocellar triangle usually before posterior margins of eyes; occiput thickened posteriorly behind ocellar triangle. Eyes bare, holoptic in male. Antennae long, at least as long as face; third segment tapering to a point, always with terminal style instead of arista.

Thorax: longer than broad, with very short appressed pile; meso-anepisterna with anterior portion with upper half pilose; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna developed, always with a few short distinct hairs; postmetacoxal bridge complete or incomplete; plumulae usually absent, present in a few Australian species; scutellum without a ventral pile fringe and without distinct apical emarginate rim. Legs: simple except with hind femora slightly swollen and with ventral spines. Wings: long, pointed, with anterior margin always broadly darkened; marginal cell broadly open; apical cell closed at wing margin; third vein usually looped into apical cell, frequently with an appendix; anterior crossvein always beyond middle of discal cell, usually at outer third of discal cell; stigmatic crossvein well-developed.

Abdomen: elongate or constricted, never oval.

Discussion: As presently construed, the tribe Cerioidini consists of only the genus *Ceriana*.

Ceriana, sensu lato contains a large number of highly varied wasp mimics which some workers, notably Shannon (1925 and 1927) and Hull (1949), have placed in a number of different genera. However, the characters used by Shannon and Hull, such as length of antennae and frontal prominence, abdominal shape and postmetacoxal bridge, are the type of attributes involved in forming the mimetic appearance of these flies. Thus convergence rather than common ancestry is a distinct possibility for *Ceriana*. Riek (1954), the only person who has done a detailed study of the genus using genitalic characters, has shown that the traditional characters of Shannon *do not* divide the Australian *Ceriana* into genera along phylogenetic lines. Riek has suggested that until the world species of *Ceriana* can be studied for genitalic characters, it is best to consider all the species as belonging to one genus, *Ceriana*. Since many of the world species of *Ceriana* are very rare in collections and unavailable for study, and the restricted Neotropical *Ceriana* fauna is an inappropriate basis for a revision, I have followed Riek's advice and leave all species of Cerioidini in one genus for the present.

Genus **Ceriana** Rafinesque

(Figs. 17, 28, 48)

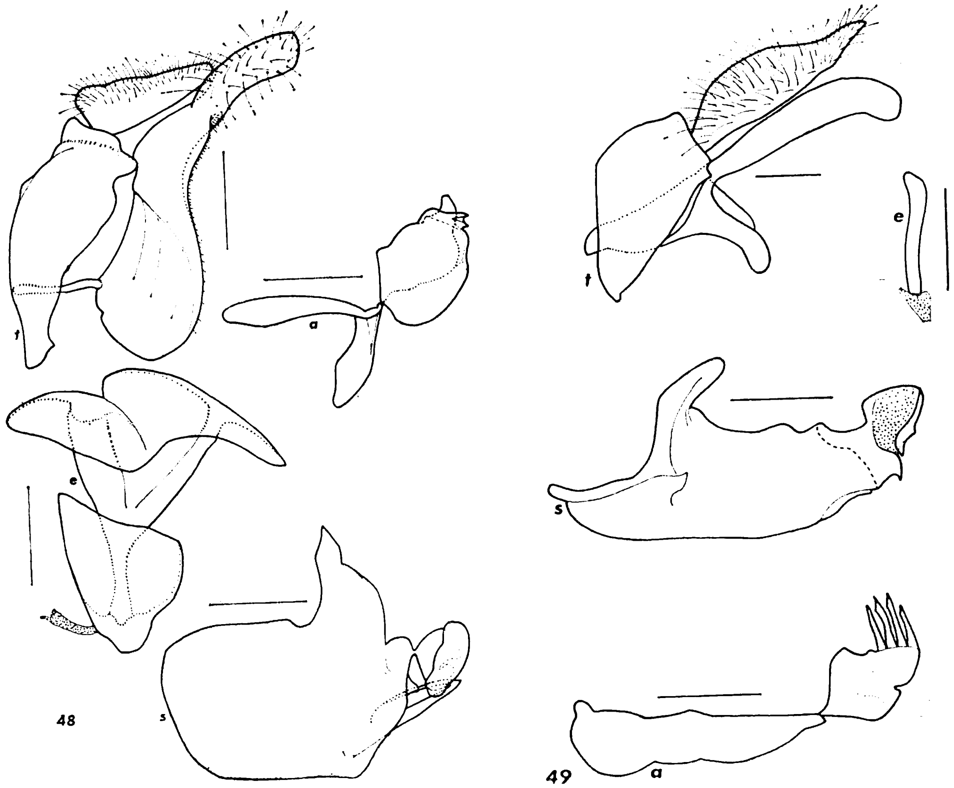
Ceriana Rafinesque, 1815, Analyse Nat. tab. Univers corps organises :131 (new name for *Ceria* Fabricius, not Scopoli). Type-species, *Ceria clavicornis* Fabricius, 1794 (automatic) = *Musca conopsoides* Linné, 1758.

Generic description — same as tribe.

Material examined: 176 (46) *abbreviata* Loew, *acra* Curran*, *ancoralis* Coquillett, *barbipes* Loew*, *bassleri* Curran*, *bigotii* Williston*, *brauerii* Williston*, *capitis* Curran*, *conopsoides* Linné, *daphnaeus* Walker*, *facialis* Kertesz*, *nigripennis* Williston* (HT), *shannoni* Lane & Carrera* (PTs), *signifera* Loew, *superba* Williston* (HT), *tridens* Loew, *travassosi* Lane & *Carrera** (HT), *wulpii* Williston* and *tricolor* Loew*.

Discussion: *Ceriana* is separated readily from all other syrphids by having: 1) a terminal style on the antenna and 2) the anterior crossvein beyond the middle of the discal cell. *Callicera* and *Macropelecocera* are the only other syrphid genera with terminal styles on the antennae but both of these genera have the anterior crossvein before the middle of the discal cell. Besides the above characters, *Ceriana* can be distinguished by its general habitus. Cerioidines are wasp mimics except for a few Australian species that mimic sawflies. The wasp appearance of having: 1) no body hairs, 2) constricted abdomens, 3) two pairs of wings, and 4) long antennae, is achieved in *Ceriana* by having: 1) body hairs greatly shortened and appressed, 2) abdomen constricted and/or with a pair of yellow lateral spots near the base of abdomen, 3) anterior margin of wing dark, and 4) either long antennae or frontal prominence greatly produced. Some of the cerioidines have also evolved a mechanism for folding their single pair of wings in such a way as to appear similar to the wasp's four folded wings (see Riek, 1954, for details).

Curran (1941) has provided a key to the Neotropical *Ceriana* but it includes less than one-half of the described species. However, *Ceriana*



Male genitalia. 48, *Ceriana travassosi* Lane & Carrera (HT). 49, *Dolichogyna abrupta* Hine. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

because of their distinctive mimetic appearances are easily recognized from their original descriptions. Shannon (1927) states that for more than 120 described species there have been less than 10 synonyms!

TRIBE ERISTALINI

Head: face usually with a tubercle except in *Dissoptera* and *Keda,* never strongly sexually dimorphic, densely pilose on sides; oral margin notched anteriorly; facial grooves elongate; antennal pits confluent; ocellar triangle distinctly before posterior margin of eyes. Antennae short, rarely elongate, usually shorter than face; third segment usually small, orbicular, rarely elongate; arista basal, usually bare, rarely sparsely pilose on basal half, usually longer than antenna.

Thorax: pro-anepimera pilose; pro-katepisterna pilose frequently with a few short spines; meso-anepisterna with anterior portion bare; metasterna pilose; postmetacoxal bridge incomplete; plumulae usually present and elongate except absent in *Xenzoon;* scutellum usually without apical emarginate rim except in *Orthoprosopa, Solenaspis* and *Dolichomerus.* Legs: hind femora with basal setal patches and usually ventral spines. Wings: anterior crossvein at or beyond middle of discal cell except before in *Xenzoon;* third vein usually forming a strong loop or kink in apical cell except in *Xenzoon;* apical and discal cells usually without external appendices on outer posterior corners; stigmatic crossvein usually present.

Abdomen: oval, rarely elongate and never constricted.

Discussion: The basal setal patch on the hind femur will readily distinguish the eristalines from all other syrphid taxa except *Merodon. Merodon* can be easily distinguished by its pilose anterior meso-anepisterna. The strongly looped third vein also serves as a good characteristic for the eristalines. However, care must be used with this looped third vein character since a few milesine genera, such as *Korinchia,* also have a distinctly looped third vein. Eristalini is traditionally broken down into two subtribes based on whether the marginal cell is open or closed, Helophilina and Eristalina, respectively. Both of these subtribes are world-wide in distribution and are well distributed in the Neotropical Region.

KEY TO THE NEOTROPICAL GENERA OF THE ERISTALINI

1. Marginal cell (R1) open (Fig. 30) .... Helophilina 6
Marginal cell closed (Fig. 31) .... Eristalina 2

2. Face drawn out into a long slender porrect snout ....
.... *Lycastrirhyncha* Bigot
Face without a long snout 3

3. Thorax with marking of opaque tomentum; eyes bare .... *Meromacrus* Rondani

Thorax without marking or tomentum; eyes pilose or bare. 4

4. Barrettes bare .... *Eoseristalis* Kanervo

Barrettes pilose 5

5. With pile in front of and/or beneath metathoracic spiracle; eyes without contrasting stripes of pile; wings frequently microtrichose .... *Palpada* Macquart

Without any pile around metathoracic spiracle; eyes with contrasting stripes of pile; without microtrichia .... *Eristalis* Latreille

6. Eyes pilose 7

Eyes bare 8

7. Third antennal segment deeper than long; anterior part of wing usually not dark .... *Mallota* Meigen

Third antennal segment longer than deep, usually twice as long or longer than deep (except *cestus* Hull only 1.5 as long as deep); anterior part of wing usually dark .. *Quichuana* Knab

8. Ocellar triangle extremely large; front very broad (Figs. 13, 14) 9

Ocellar triangle normal size, small; front not very broad 10

9. Front greatly swollen below; ocellar triangle obtuse, anterior ocellus close to the base of the triangle (Fig. 13) .... *Dolichogyna* Macquart

Front not greatly swollen; ocellar triangle equilateral (Fig. 14) .... *Asemosyrphus* Bigot

10. Thorax densely pilose, without distinct pollinose ground patterns .... *Mallota* Meigen

Thorax with scattered pile, not dense pile, usually with distinct pollinose stripes and bands 11

11. Fronto-antennal region usually greatly produced forward, subconical to conical (Fig. 21); anterior edge of wing dark; males holoptic or narrowly dichoptic ...... *Habromyia* Williston

Fronto-antennal region not greatly differentiated, not subconical; wings hyaline, anterior edge not dark; males broadly dichoptic .... *Helophilus* Meigen

Genus **Dolichogyna** Macquart

(Figs. 13, 49)

Dolichogyna Macquart, 1842, Mem. Soc. Roy. Sci. Agr. Arts Lille 1841 (1):125. Type-species, *Dolichogyna fasciata* Macquart, 1842 (monotypy).

Nosodepus Speiser, 1913, Jb. Nassau. Ver. Naturk. Wiesbaden 66:131. Type-species, *Nosodepus minotaurus* Speiser, 1913 (monotypy). *New Synonymy.*

Head: face yellow, broad, slightly broader than long, occupying more than one-half head width, shallowly concave beneath antennae, with a large very low medial tubercle, pollinose and pilose on sides, shiny and bare medially; cheeks narrow in profile, longer than broad; facial grooves short, extending along lower fourth of eyes; facial stripes indistinct; frontal prominence low, at upper third of head; front yellow, pollinose, puffed-out, with frontal lunule very large, in males more strongly narrowed posteriorly; vertex black, pollinose, rectangular, more than twice as wide as long; ocellar triangle very broad at base, more than three times as broad at base as long. Eyes bare, broadly dichoptic in male. Antennae very short, less than one-fourth as long as face; third segment quadrate; arista bare, more than twice as long as antenna.

Thorax: broader than long, long pilose, with longitudinal light pollinose stripes on mesonotum; meso-katepisterna continuously pilose from ventral margin to dorsal margin; meso-anepimera with posterior portion bare; mero-pleurae bare; metathoracic spiracle large, two to three times as large as third antennal segment; plumulae elongate and unbranched. Legs: Hind femora swollen; hind tibiae slightly arcuate, without apical spur. Wings: marginal cell open; apical cell with a short petiole, with petiole shorter than stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval to suboval with paired lateral light colored spots on dorsum.

Material examined: 7(7); *abrupta* Hine * and *chilensis* (Guérin)*.

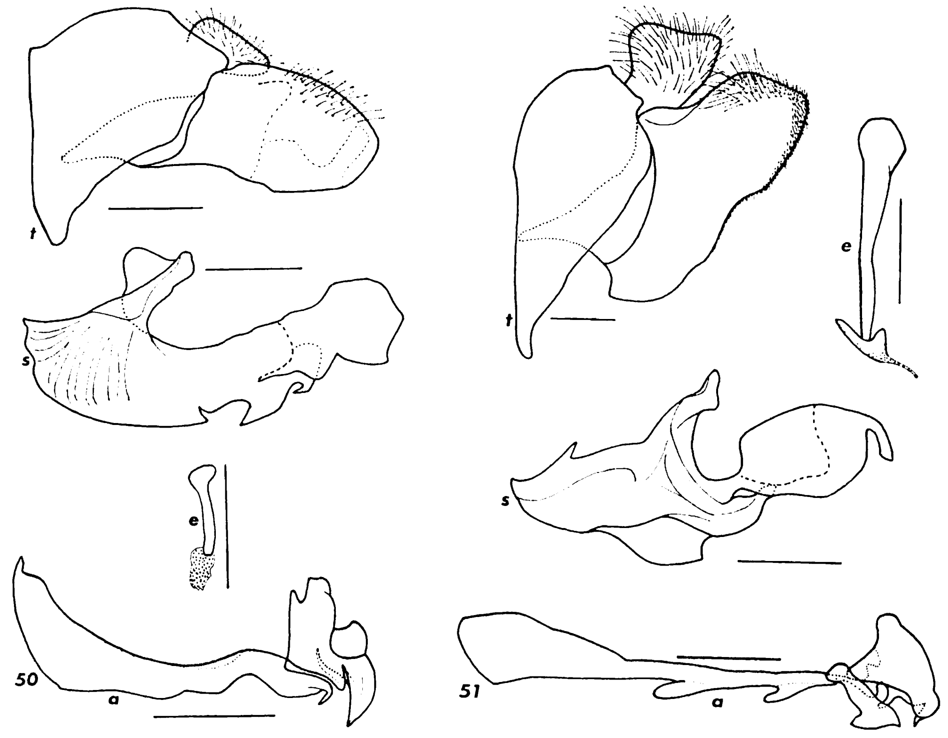
Discussion: The habitus of *Dolichogyna* with its 1) very broad face and front in both sexes, 2) vittate mesonotum and 3) spotted abdomen readily distinguishes the genus from all other syrphid taxa. *Asemosyrphus* and *Arctosyrphus* are similar in that they both have very broad ocellar triangles and fronts in both sexes but they have quite different color markings. Also these two genera have small facial tubercles, longer antennae and dark faces, whereas *Dolichogyna* has a large facial tubercle, short antennae and a yellow face. *Dolichogyna* is confined to the Andes of South America. Seven species have been described. Fluke (1951) has revised the genus and provided a key with numerous figures illustrating the heads, abdominal patterns, and male genitalia.

Genus **Quichuana** Knab

(Figs. 30, 50)

Quichuana Knab, 1913, Ins. Insci. Mens. 1:13. Type-species, *Quichuana sylvicola* Knab, 1913 (original designation).

Head: higher than broad; face pollinose and pilose broadly on sides, shiny and bare medially, concave beneath antennae, with medial tubercle, straight beneath tubercle; cheeks narrow, usually longer than broad; facial grooves short, extending to the level of tubercle; facial stripe indistinct; frontal prominence medium height, about one-half to three-fourths as high as broad at base as measured in profile, above the middle of head; front of male long, more than twice as long as vertical triangle; vertical triangle short, as broad as long; front of female long, slightly shorther than face, about one-half as broad at



Male genitalia. 50, *Quichuana pogonosa* Fluke. 51, *Habromyia chrysotaenia* Fluke. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

antennae as long, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes thinly pilose, narrowly holoptic in male. Antennae variable in length, from as long as to one-half as long as face; third segment elongate, usually more than twice as long as broad except only slightly longer than broad in *cestus;* arista bare, long, about as long as antenna.

Thorax: longer than broad, with short pile, without tomentum or pollinose markings; meso-katepisterna either with a narrowly connected or separated ventral and dorsal pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae usually bare; metasterna frequently greatly developed; metathoracic spiracle small, with diameter about equal to width of third antennal segment; plumulae short, unbranched. Legs: hind femora swollen; hind tibiae arcuate, without apical spur. Wings: marginal cell open, apical cell petiolate, with petiole longer than stigmatic crossvein; stigmatic crossvein present.

Abdomen: elongate.

Material examined: 25(25); *auratus* (Walker)*, *bezzii* Ceresa*, *borgmeieri* Carrera & Lane* (HT), *calathea* Shannon* and *pogonosa* Fluke*.

Discussion: *Quichuana* is readily recognized among the eristalines by its pilose eyes and long antennae. It is related to *Mallota* but *Mallota* has short antennae and is thickly pilose on thorax. Twenty-five species of *Quichuana* are known. 21 from the Neotropical Region and 4 from the southern part of the Nearctic Region (Mexico). Hull (1945) has revised *Quichuana* and provided keys and illustrations.

Genus **Habromyia** Williston

(Figs. 21, 51)

Habromyia Williston, 1888, Trans. Amer. Ent. Soc. 15:284. Type-species, *Habromyia coeruleithorax* Williston, 1888 (monotypy).

Edwardsietta Hull, 1941, J. Wash. Acad. Sci. 31:437. Type-species, *Edwardsietta ochracea* Hull, 1941 (original designation). *New Synonymy.*

Lycopale Hull, 1944, J. Wash. Acad. Sci. 34:129. Type-species, *Meromacrus vittata* Hull, 1937 (original designation). *New Synonymy.*

Criorthrix Hull, 1949, Trans. Zool. Soc. London 26:391. *Type-species, Habromyia rectilinea* Hull, 1942 (original designation). *New Synonymy.*

Head: higher than broad; face pollinose and pilose broadly on sides, shiny and bare medially, ranging from straight to deeply concave beneath antennae, with a median tubercle, straight beneath tubercle;

cheeks broad or narrow, ranging from as broad as long to longer than broad; facial grooves short, extending to level of facial tubercle; facial stripes indistinct; frontal prominence ranging from very low to greatly produced, above middle of head; front of male long, always as long as vertical triangle, frequently longer than vertical triangle; vertical triangle long, more than twice as long as broad at occiput; front of female long, as long as or longer than face, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes bare, narrowly dichoptic in male. Antennae short, ranging from one-half as long as to about as long as face; third segment either orbicular or elongate, never more than twice as long as broad; arista bare, long, slightly longer than antenna, thick.

Thorax: longer than broad, with short pile and usually tomentum, usually with longitudinal vittae and/or transverse bands; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare, meropleurae bare; metathoracic pleurae bare; metasterna greatly developed; metathoracic spiracle large, usually as large as third antennal segment; plumulae elongate, single or multibranched. Legs: hind femora swollen; hind tibiae slightly arcuate, with or without apical spur. Wings: marginal cell open; apical cell petiolate, with petiole as long as or longer than stigmatic crossvein; stigmatic crossvein present.

Abdomen: variable, ranging from short subtriangular and flattened to long and subcylindrical.

Material examined: 10(10); *barbiellini* Ceresa*, *chrysotaenia* Fluke* (PTs), *coeruleithorax* Williston*, *ochracea* (Hull)* (HT) and *rectilinea* Hull*.

Discussion: *Habromyia* is easily recognized among the helophilines by its bare and holoptic or narrowly dichoptic eyes, short body pile, dark anterior wing margin and patterns of tomentum on mesonotum. The genus is rather homogeneous except there is considerable variation in the shape of both the frontal prominence and abdomen. A couple of genera, *Edwardsietta*, *Lycopale*, and *Criorthrix*, have been described on the basis of slight differences in the shape of both the frontal prominence and abdomen. However, the differences integrate into each other and I can not find any other significant differences that correlate with either abdomen or frontal prominence shape.

In the typic genus, *Habromyia*, the frontal prominence ranges from not differentiated (*barbiellini*) to as high as broad at base as measured in profile (*coeruleithorax*). The abdominal shape ranges from short, subtriangular and flattened in *barbiellini* to long, parallel-sided and apically pointed in *coeruleithorax*. The other three genera were described by Hull for differences in the abdominal shape and frontal prominence which are within the range of variation mentioned above. Since I am unable to find any other significant differences between these genera and *Habromyia*, I have synonymized them. The type of *Meromacrus vittata* Hull, the only known specimen of *Lycopale* Hull, could not be found at the United States National Museum and is presumed lost. Thus the synonymy of *Lycopale* is made on the basis of Hull's descriptions only.

Genus **Mallota** Meigen

(Fig. 52)

Mallota Meigen, 1822, Syst. Beschr. 3:377. Type-species, *Syrphus fuciformis* Fabricius, 1794 (subsequent designation; Rondani, 1844, Nuov. Ann. Sci. Nat. Bologna (2) 2:452).

Head: higher than broad; face pollinose and pilose broadly on sides, shiny and bare medially, deeply concave beneath antennae, with a median tubercle, straight beneath tubercle; cheeks broad, broader than long; facial grooves short, extending above the level of the tubercle; facial stripes indistinct; frontal prominence low, slightly more than one-half as high as broad at base when measured in profile, above middle of head; front of male long, slightly longer than ocellar triangle; vertical triangle long, about a third longer than broad at occiput; front of female broad, about as broad at antennae as long, slightly shorter than face, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes thinly pilose or bare, dichoptic or holoptic in male. Antennae short, about one-half as long as face; third segment quadrate, usually slightly broader than long; arista bare, long, about twice as long as antenna.

Thorax: about as broad as long, with mesonotal pile long and dense, without tomentum nor pollinose markings; meso-katepisterna and ventral continuously pilose from ventral margin to dorsal; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metathoracic spiracle large, as large or larger than third antennal segment; plumulae long unbranched. Legs: hind femora greatly swollen, arcuate; hind tibiae flattened laterally, arcuate, without distinct apical spur. Wings: marginal cell open; apical cell petiolate, with petiole as long as or longer than stigmatic crossvein; stigmatic crossvein present.

Abdomen: suboval with long pile.

Material examined: 49(10); *aberrans* Shannon* (HT), *analis* (Macquart)*, *bautias* (Walker), *inversa* Shannon* (HT), *posticata* (Fabricius) and *sackeni* Williston.

Discussion: *Mallota* species are typical bee mimics with dense long mesonotal pile. This bee-like appearance along with their massive hind femora will readily separate *Mallota* from the other Helophilina. *Mallota* is predominantly a northern temperate genus with about ten species found along the Andes in South America. Curran (1953) has indicated that the Ethiopian and perhaps Oriental mallotas do not belong in *Mallota* proper, but probably in other genera. Curran (1940) has provided a key to all the New World species.

Genus **Eristalis** Latreille

(Fig. 53)

Eristalis Latreille, 1804, Nouv. Dict. Hist. Nat. 24:194. Type-species, *Musca tenax* Linné, 1758 (subsequent designation; Curtis 1832, Brit. Ent. 9: pl. 432).

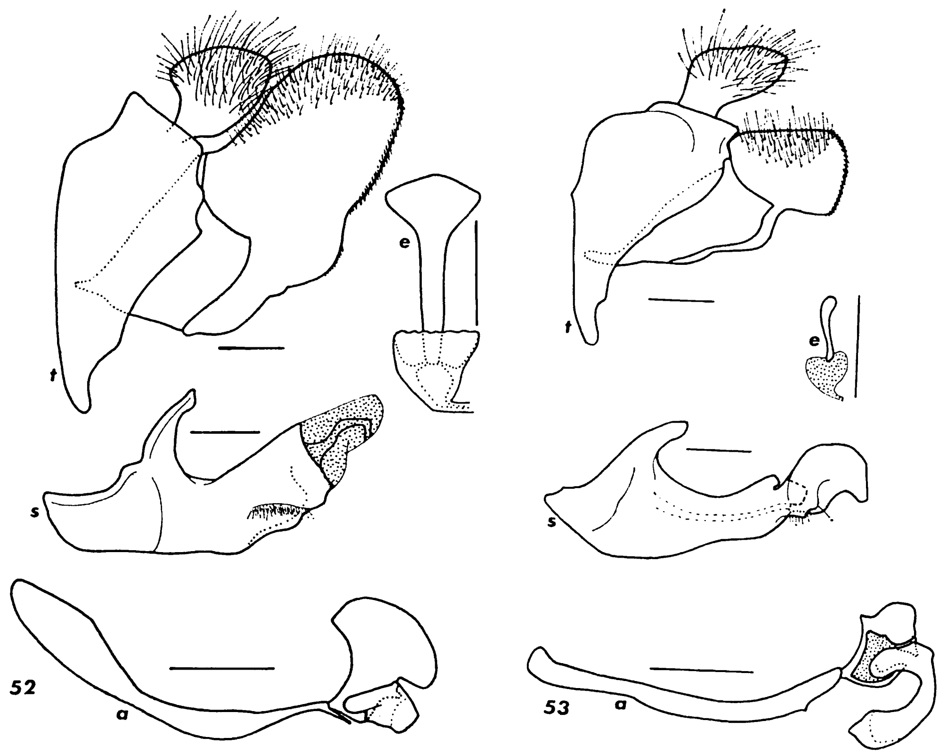
Head: about twice as high as broad; face broadly pilose and pollinose on sides, shiny and bare medially, straight except for medial tubercle and slight outward production at antennal pits, with tubercle on lower third of its length, strongly produced downward, with about one-third of facial length below eyes; cheeks broad, broader than long; facial grooves short, extending along lower third of eyes; facial stripes indistinct; frontal prominence low, on the upper third of head; front of male long, about twice as long as eye contiguity, slightly longer than vertical triangle; vertical triangle small, as broad as long; front of female broad, broader than long, about two-thirds as long as face, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes pilose, with two denser longitudinal pile bands, holoptic in male. Antennae short, about one-fourth as long as face; third segment quadrate, slightly longer than broad; arista bare, long about twice as long as antenna.

Thorax: slightly longer than broad, with long pile; meso-katepisterna continnuously pilose from ventral to dorsal margin; meso-anepimera with posterior portion bare; mero-pleurae bare except for barrettes pilose; metathoracic pleurae bare; metathoracic spiracle large, larger than antenna; plumulae long and multibranched. Legs: simple. Wings: without microtrichia; marginal cell petiolate; apical cell petiolate, with petiole as long as stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval in males and suboval in females.

Material examined: 1? (1); *tenax* (Linné).

Discussion: Vockeroth (in litt.) is currently working on a generic revision of the genus *Eristalis, sensu lato,* and his preliminary findings indicate that *Eristalis* should be restricted to *tenax* and related species only. The rest of the species formally placed in *Eristalis* belong to a number of other genera but all the Neotropical species belong to either *Eoseristalis* or *Palpada.* These three genera can be easily distinguished by pile characters: *Eoseristalis* has all of the posterior parts of thoracic pleurae bare, including the posterior meso-anepimera, mero-



Male genitalia. 52, *Mallota sackeni* Williston. 53, *Eristalis tenax* (Linné), a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

pleurae and barrette and metapleurae; *Palpada* and *Eristalis* both have the barrettes pilose; but *Palpada* also has a distinct patch of long hairs in front of and at base of the metathoracic spiracle. *Eoseristalis* is apparently restricted to the temperate Andes, whereas *Palpada* is found throughout the Neotropical region. *Eristalis* is represented in the Neotropical Region by only its cosmopolitan type-species, *tenax*.

Genus **Eoseristalis** Kanervo

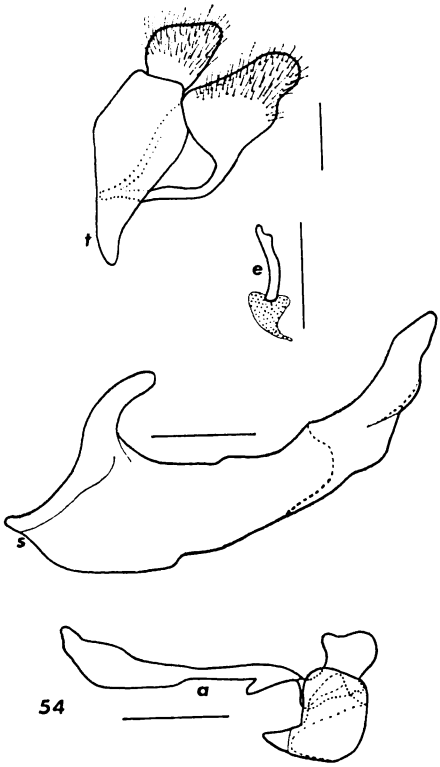
(Fig. 54)

Eoseristalis Kanervo, 1938, Annal. Univ. abo. (turku.), ser. A, 6:12. Type-species, *Eristalis cerealis* Fabricius, 1805 (by original designation).

Head: only about one-third higher than broad; face almost completely pilose and pollinose except for a narrow medial area bare and shiny, with a large broad low median tubercle, with tubercle on lower third of face, slightly concave beneath antennae, straight below tubercle, not produced greatly below eyes; cheeks narrow, as long as broad; facial grooves short, extending to level of tubercle; facial stripes indistinct; frontal prominence low, slightly above middle of head; front of male long, about twice as long as eye continguity; vertical triangle short, about one-half as long as front of male, equilateral; front of female broad, slightly broader at antennae than long about three-fourths as long as face, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes pilose, holoptic in male. Antennae short, about one-fourth as long as face; third segment quadrate, as long as broad; arista usually sparsely pilose on basal one-half, long, about one and one-half times as long as antenna.

Thorax: about as broad as long, with long pile; meso-katepisterna continuously pilose from ventral to dorsal margin; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metathoracic spiracle large, larger as third antennal segment; plumulae long, multibranched. Legs: simple. Wings: without microtrichia; marginal cell petiolate; apical cell petiolate, with petiole as long as stigmatic crossvein; stigmatic crossvein weak.

Abdcmen: oval.



54, male genitalia of *Eoseristalis arbustorum* (Linné). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Material examined: 22? (?): *arbustorum* Linné, *assimilis* Macquart*, *bogotensis* Macquart*, *brousii* Williston, *intricarius* Linné, *latifrons* Loew, *nemorum* Linné, *obscurus* Loew, *pertinax* Scopoli, *rupium* Fabricius, *saxorum* Wiedemann and *transversus* Wiedemann.

Discussion: *Eoseristalis* is readily distinguished from *Eristalis*, *Palpada* and related genera by its almost completely bare posterior thoracic pleurae (posterior meso-anepimera, meropleurae, and metathoracic pleurae, all bare). *Eoseristalis* includes most of the North American and European species formerly placed in *Eristalis* and is restricted to the temperate Andes in South America. The genus was apparently unrecognized because of the confusion about the type-species of *Eristalis*. Most authors have accepted *arbustorum* Linné as the type-species of *Eristalis* and have used Rondani's *Eristalomyia* for the species related to *tenax*. Wirth *et al.* (1965) indicate that *tenax* Linné is the correct type for *Eristalis*, designated by Curtis (1832). Thus *Eristalomyia* with its type-species *tenax* becomes an objective synonym of *Eristalis* and the *arbustorum* group was without a name. However, *Eoseristalis*, previously considered a synonym of *Eristalis*, is an available name for the *arbustorum* group. Curran (1930) has included the New World species of *Eoseristalis* his *Eristalis* key and Bean (1949) has figured the peripheral system of the male genitalia for most Neartic species (includes a few Neotropical ones).

Genus **Palpada** Macquart

(Fig. 31, 55)

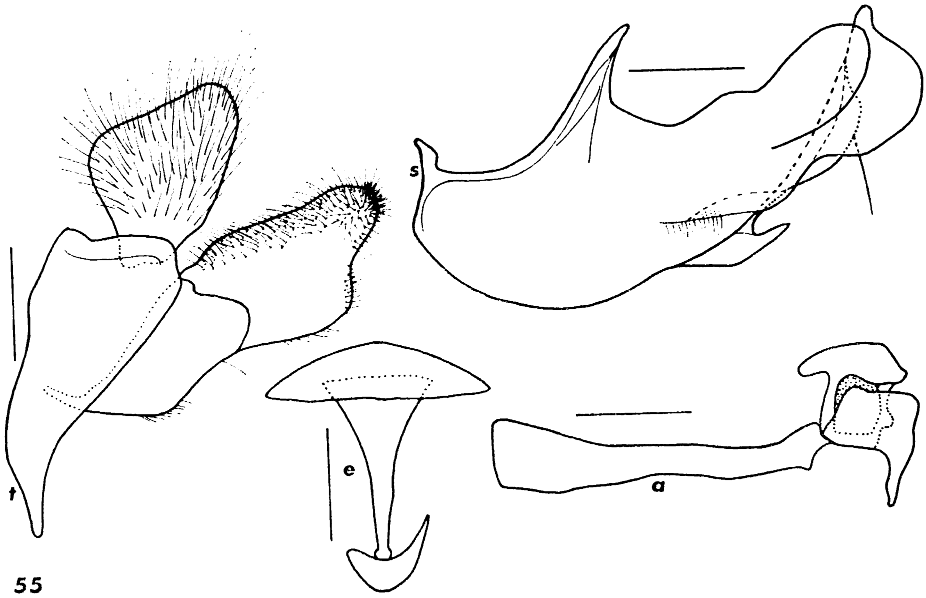
Palpada Macquart, 1834, Hist. Nat. Ins. Dipt. 1:512. Type-species, *Palpada scutellata* Macquart, 1834 (monotypy) = *Milesia conica* Fabricius, 1805.

Head: higher than broad; face broadly pilose and pollinose on sides, shiny and bare medially, concave beneath antennae, with a large median tubercle on lower third, straight beneath tubercle, may be produced greatly below eyes; cheeks usually broad, ranging from slightly longer than broad to much broader than long; facial grooves short, extending to the level of the tubercle; facial stripes indistinct; frontal prominence usually low, above middle of head; front of male usually slightly puffed-out, long, usually twice as long as vertical triangle, always longer than eye contiguity; vertical triangle short, about two-thirds as broad at occiput as long; front of female long, usually as long as face and twice as long as broad at antennae, with slightly convergent sides above; ocellar triangle small, equilateral. Eyes bare or short pilose, holoptic in males. Antennae short, about one-fourth as long as face; third segment usually quadrate, as long as broad; arista bare, longer than antenna, at least one and one-half times as long as antenna.

Thorax: longer than broad, with either long or short pile, without tomentum; meso-katepisterna usually continuous pilose from ventral to dorsal margin, sometimes with narrowly divided dorsal and ventral pile patches; meso-epimera with posterior portion bare; meropleurae bare except for barrettes pilose and a few hairs in front of metathoracic spiracle; metathoracic pleurae bare except for a distinct patch of pile below spiracle; metathoracic spiracle large, larger than third antennal segment; plumulae long, multibranched. Legs: hind femora swollen, frequently strongly swollen; hind tibiae flatten laterally, arcuate, frequently ciliate. Wings: usually with extensive areas of microtrichia; marginal cell petiolate; with petiole as long as stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval to elongate.

Material examined: about 100± (100±); *agrorum* (Fabricius)*, *albifrons* (Wiedemann)*, *aemulus* (Williston)*, *atrimanus* (Loew)* (HT), *cosmius* (Schiner)*, *dorothea* (Hull)* (HT), *doris* (Curran)*, *erraticus* (Curran)*, (PTs), *glabella* (Hull)* (HT), *gundlachi* (Loew)* (LTs), *fasciatus* (Wiedemann)*, *furcatus* (Wiedemann)*, *precipuus* (Williston)*, *pygolampus* (Wiedemann)*, *testacecornis* (Macquart)*, *thalia* (Hull)* (HT), *vinetorum* (Fabricius)* and two dozen new or unidentified species.



55

55, male genitalia of *Palpada ochraceous* (Williston). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Discussion: *Palpada* contains most of the Neotropical species formerly included under the name *Eristalis*. However, *Eristalis* is quite different from these Neotropical species (See discussion under *Eristalis*). *Palpada* appears to be the oldest available name for the Neotropical species. Curran (1930) has provided a key to the New World species of *Eristalis* including both *Eoseristalis* and *Palpada* but the key is outdated and now includes less than half of the described species.

Genus **Meromacrus** Rondani

(Fig. 56)

Meromacrus Rondani, 1848, Studi Ent. (Turin) 1:70. Type-species, *Meromacrus ghilianii* Rondani, 1848 (monotypy).

Thalamopales Hull, 1949, Trans. Zool Soc. London 26: 401. Type-species, *Helophilus scitus* Walker, 1857 (original designation). *New Synonymy.*

Head: higher than broad; face broadly pilose and pollinose on sides, bare and shiny medially, concave beneath antennae, with or without a low median tubercle on lower third, straight below tubercle, not greatly produced below eyes; cheeks narrow, longer than broad; facial grooves short, extending to level of tubercle; facial stripes indistinct; frontal prominence low, on upper third of head; front of male long, more than twice as long as eye contiguity, as long as or longer than vertical triangle; vertical triangle long, about twice as long as broad at occiput; front of female short to long, from one-third shorter than to slightly longer than face, slightly longer than broad at antennae; oceliar triangle small, equilateral. Eyes bare, holoptic in male. Antennae short, about one-half as long as face; third segment pointed, slightly longer than broad; arista bare, about one-third longer antenna.

Thorax: about as broad as long, with very short pile, with distinct patterns of tomentum; meso-katepisterna with narrowly separated dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare except frequently for a few hairs above coxal articulation; plumulae long, multibranched. Legs: hind femora swollen; hind tibiae slightly arcuate. Wings: with anterior margin dark, with microtrichia; marginal cell petiolate; apical cell petiolate, with petiole as long as stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval to suboval, rarely elongate.

Material examined: 38(36); *acutus* (Fabricius)*, *anna* Curran*, *brunneus* Hull*, *cingulatus* Sack*, *decorus* (Loew)*, *draco* Hull* (HT, PTs), *ghilianii* Rondani*, *gloriosus* Hull*, *milesia* Hull*, *niger* Sack, *obscurus* Hine*, *panamensis* Curran*, *pratorum* (Fabricius)*, *ruficrus* (Wiedemann)*, *scitus* (Walker)* (HT) and *zonatus* Loew*.

Discussion: The petiolate marginal cell and presence of tomentum will distinguish *Meromacrus* from all the other syrphids. *Thalamopales* Hull was erected for a species with a "greatly produced" frontal prominence and elongate abdomen. Hull thought his new genus was "nearest" *Meromacrus.* I have studied the type-species of *Thalamopales, scitus* Walker, and I can find no differences between the two genera other than the elongate abdomen. The frontal prominence of *scitus* is no more produced than in some of the typical *Meromacrus* species which lack a tubercle. Since I don't consider the elongate abdomen of *scitus* to be anymore than a trivial difference I have synonymized *Thalamopales.* Hull's subgeneric name, *Metameromacrus,* is not available, since no type-species was designated.

Genus **Lycastrirhynchus** Bigot

(Fig. 57)

Lycastrirhynchus Bigot, 1859. Rev. Mag. Zool. (2) 9: 307. Type-species, *Lycastrirhynchus nitens* Bigot, 1859 (monotypy).

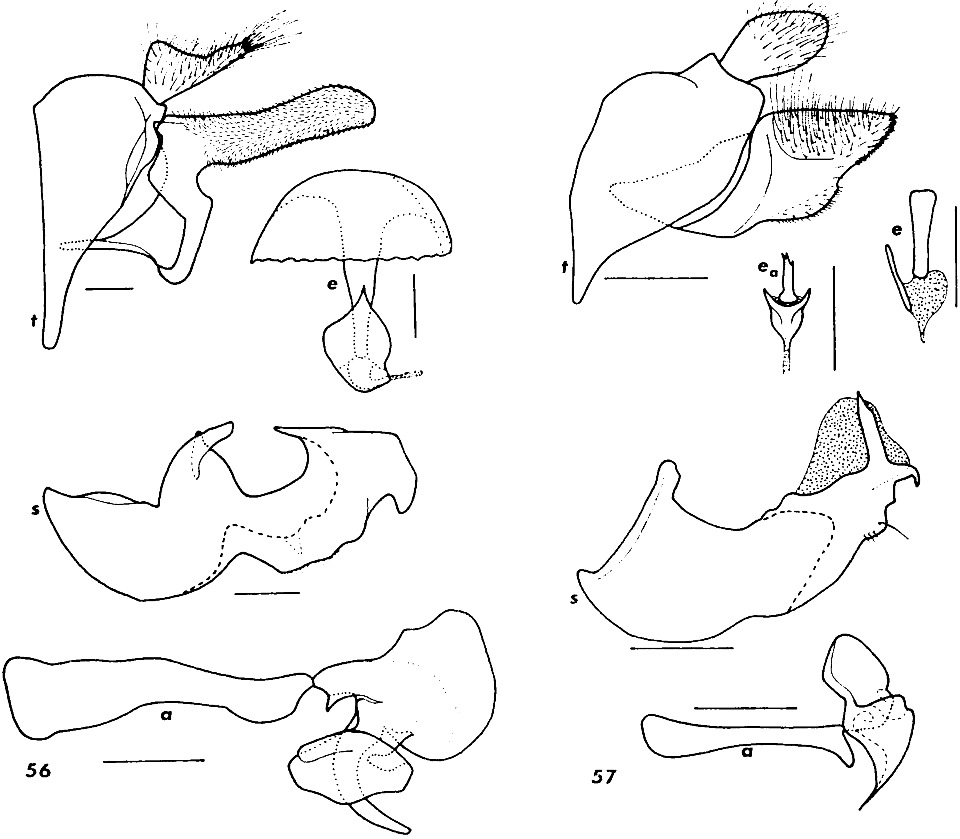
Head: about one-third broader than high; face pilose and pollinose on sides, bare and shiny medially, snoutlike, strongly concave beneath antennae, with snout produced straight forward, with snout above level of bottom of eyes; cheeks linear, much longer than broad; facial grooves short, extending along lower half of eyes; facial stripes indistinct; frontal prominence low, above middle of head; front of male short, as broad as long, one-half as long as vertical triangle; vertical triangle rectangular, slightly longer than broad; front of female short, about two-thirds as long as face when face measured vertically from oral margin, about as broad as long, with sides only slightly convergent above; ocellar triangle small and equilateral. Eyes bare, broadly dichoptic in male. Antennae short, about one-third as long as face when face measured vertically from oral margin; third segment slightly elongate, little longer than broad, pointed; arista bare, long, about twice as long as antennae.

Thorax: longer than broad, with short pile and usually dark pollinose longitudinal vittae; meso-katepisterna with broadly separated dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare except for barrette pilose and a few hairs in front of metathoracic spiracle; metapleurae bare except for a distinct patch of pile below the spiracle; metathoracic spiracle large, about as large as third antennal segment; plumulae short and unbranched. Legs: simple except hind femora slightly swollen. Wing: without microtrichia; marginal cell petiolate; apical cell petiolate, with petiole longer than stigmatic crossvein; stigmatic crossvein present.

Abdomen: oval.

Material examined: 5(3) ; *mexicana* Curran*?

Discussion: *Lycastrirhynchus* is one of the few syrphids with a snout-like face and it can be easily separated form all of the other snout-faced syrphids by its looped third vein and petiolate marginal cell (see *Rhingia* for notes on other snout-faced syrphids). Van Doesburg (1963) has presented a key to all the species of *Lycastrirhynchus*.



Male genitalia. 56, *Meromacrus cingulatus* Sack. 57, *Lycastrirhynchus mexicana* Curran. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except e_a anterior view.

There is considerable confusion in the literature as to the type-species of *Lycastrirhynchus*. Most authors (Hull, 1949, Fluke, 1956) have cited *Rhingia nigra* Macquart as the type-species without explanation. *Lycastrirhynchus* was described by Bigot for a single new species, *nitens*. Thus *nitens* is the only possible type-species. The confusion in the literature probably stems from Kertesz (1910) synonymy of *nitens* Bigot under *Rhingia nigra* Macquart. Why Kertesz made the synonymy is not explained in his catalogue citation. Macquart in his description clearly stated that *nigra* had normal venation which would immediately eliminate it from being the same as *nitens* (the looped third vein and petiolate marginal cell of *nitens* are not usual among most syrphids). Further, Macquart does not mention any body marking, only stated that the fly is black. This is in contrast to *nitens* which has distinct mesonotal vittae and a pair of light colored spots on the abdomen. I think there can be no doubt that Macquart described a true *Rhingia* and Bigot's *nitens* is distinct from it since there exists both, a common South American *Rhingia* which agrees perfectly with Macquart's description and a fly which agrees with Bigot's *nitens* and belongs to *Lycastrirhynchus*. Thus *nitens* Bigot is a valid species (*NEW STATUS*), not a synonym of *nigra* Macquart.

TRIBE MILESINI

Head: face usually bare except *Macrometopia, Milesia* and some *Criorhina*, either concave or tuberculate or straight; oral margin notched anteriorly; facial grooves elongate; antennal pits usually confluent except in *Cacoceria;* ocellar triangle usually before posterior margin of eyes. Eyes bare except in *Macrometopia*, either holoptic or dichoptic in male. Antennae usually short, shorter than face except in *Sphecomyia* and *Cacoceria;* third segment orbicular or elongate; arista always bare.

Thorax: usually short pile; anterior meso-anepisterna usually bare, completely pilose in *Spilomyia*, some *Temnostoma* and *Milesia*, and with a small patch of pile in *Odyneromyia* and *Valdivia;* meso-katepisterna usually with separate dorsal and ventral pile patches except patches united in *Temnostoma* and *Takaomyia;* metasterna usually developed, either pilose or bare; scutellum with or without ventral pile fringe; plumulae present. Legs: hind femora frequently greatly swollen and/or armed with apical ventral spurs or plates, always with ventral spines. Wings: anterior crossvein usually at or beyond middle of discal cell except before middle in *Valdivia* and *Hemixylota;* marginal cell usually open except closed in *Milesia:* third vein frequently with a shallow loop, rarely with a deep loop into apical cell.

Abdomen: variable in shape, from oval to elongate to constricted.

Discussion: The tribe Milesini is a rather heterogenuous group as compared to the other tribes recognized here. The Milesini is best defined by exclusion: milesines are those flies 1) with anterior crossvein usually at or beyond middle of discal cell, 2) without a terminal style on antenna, 3) without thoracic bristles, 4) without basal setal patch on hind femur, 5) without ventral spines on anterior four femora, and 6) without plumose aristae. Milesine flies, in general, tend to be rather bare flies with bare faces and aristae, whereas most other syrphids tend to be pilose flies.

Hull (1949) has recognized six tribes within the Xylotinae, the equivalent of my tribe Milesini, which he characterized as follows:

> "First, the *Xylotini;* these are short pilose, setaceous species with the face concave, the femora either slender or greatly swollen and the abdomen sometimes petiolate. Second, the *Temnostomini;* large, wasp-like, usually bright yellow pollinose, the femora simple, the anterior crossvein at or near the middle of the discal cell. Third, the *Milesini;* large flies with front more or less produced, the face concave, or plano-concave, the marginal cell closed, or open, the femora slender and often toothed. Fourth, the *Criorrhinini;* large, shaggy, woolly, usually long pilose flies, the face generally tuberculate, the metasternum pilose; *Lycastris* possibly belongs here, or by itself. Fifth, the *Pocotini,* in which the metasternum is pubescent and the face concave, and which are also rather long pilose as a rule. Lastly the *Tropidini,* in which the face is distinctly tricarinate". Hull 1949:356.

Hull's subfamily groupings roughly correspond to the tribes recognized here. The limited work done on male genitalia in the course of this study tends to support Hull's groupings of genera, and perhaps, when the tribal groups are revised on a world-wide basis using genitalic characters, they will be found to be sufficiently distinctive to warrant formal recognization as subtribes. However, for the present I have not assigned a definite category rank to Hull's tribes but I have indicated the genera I place in these respective grouping in the tribal table (see Appendix I).

KEY TO THE NEOTROPICAL GENERA OF MILESINI

1\. Eyes pilose .... *Macrometopia* Philippi
Eyes bare 2

2\. Hind femur with apical ventral spur, tooth or plate 3
Hind femur without any ventral projections 8

3\. Marginal cell (R1) closed and petiolate .... *Milesia* Latreille
Marginal cell open 4

4\. Anterior meso-anepisternum pilose; hind femur with a single small ventral spur .... *Spilomyia* Meigen
Anterior meso-anepisternum bare; hind femur with a bifid spur or ventral plate 5

5\. Anterior crossvein (r-m) with a long spur (Fig. 25) .... *Stilbosoma* Philippi
Anterior crossvein without a spur 6

6\. Metasternum bare .... *Crioprora* Osten-Sacken
Metasternum pilose 7

7\. Hind femur greatly swollen, with a large ventral bifid spur near the apex; metasternum not divided by membraneous band .... *Senogaster* Macquart

Hind femur without a bifid spur, not greatly swollen, with a prominent subapical lateral plate; metasternum divided into two parts by a basal membraneous band .... *Tropidia* Meigen

8. Anterior edge of mesonotum and posterior dorsal edge of occiput with a transverse row of short spines; post-metacoxal bridge complete .... *Ceriogaster* Williston

Mesonotum and occiput without a transverse row of spines; post-metacoxal bridge usually not complete 9

9. Antennae elongate, longer than the face; first antennal segment more than three times as long as broad .... *Cacoceria* Hull

Antennae short, shorter than the face; first antennal segment never more than twice as long as broad 10

10. Metasternum bare 15

Metasternum pilose 11

11. Scutellum with a ventral pile; meta-episternum bare 12

Scutellum without a ventral pile fringe; meta-episternum with a few long hairs .... *Syritta* Saint Fargeau and Serville

12. Face concave, subcarinate; antennae elongate, about as long as face; third antennal segment elongate, usually twice as long as wide; hind femur short and greatly swollen; hind tibia strongly arched; with very short body pile ... *Neplas* Porter

Face usually tuberculate (Fig. 12); antennae short, much shorter than the face; third antennal segment orbicular or kidney-shaped, never longer than wide; hind femur elongate and usually not greatly swollen; hind tibia usually not arched; with at least long, thick mesonotal pile 13

13. Anterior crossvein (r-m) at or before middle of the discal cell (1st M2) 14

Anterior crossvein at the distal fourth of discal cell .... *Criorhina* Meigen

14. Apical cell petiolate, with petiole longer than humeral crossvein (Fig. 24) .... *Aneriophora* Stuardo and Cortes

Apical cell not petiolate, closed at wing margin .... *Flukea* Etcheverry

15. Face straight, with distinct keels (Fig. 20) .... *Sterphus* Philippi

Face either concave or tuberculate, never straight 16

16. Third antennal segment deeper than long 17

Third antennal segment orbicular or elongate, never deeper than long 18

17. Scutellum with apical emarginate rim .. *Philippimyia* Shannon

Scutellum without apical emarginate rim .. *Crioprora* Osten-Sacken

18. Face bright yellow in ground color; metathoracic spiracle distinctly larger than third antennal segment ...... *Sterphus* Philippi

Face dark in ground color; metathoracic spiracle usually much smaller than third antennal segment 19

19. Face usually with a tubercle; if without facial tubercle, then either with strongly constricted abdomen or wings bicolored, anterior edge dark and posterior part light 20

Face concave; abdomen not strongly constricted and wings never bicolored 21

20. Apical cell petiolate, with petiole as long as or longer than humeral crossvein .... *Valdivia* Shannon

Apical cell not petiolate, closed at wing margin .... *Odyneromyia* Shannon and Aubertin

21. Anterior crossvein distinctly before middle of discal cell; males with dichoptic eyes .... *Hemixylota* Shannon & Aubertin

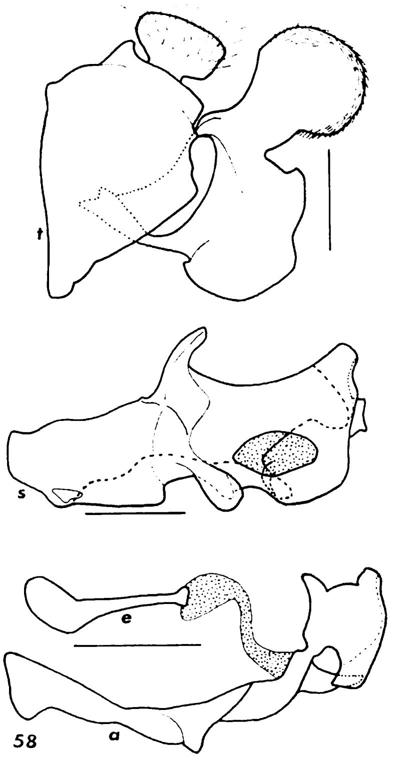
Anterior crossvein at or beyond middle of discal cell; males with holoptic eyes .... *Xylota* Meigen

Genus **Ceriogaster** Williston

(Fig. 59)

Ceriogaster Williston, 1888, Trans. Amer. Ent. Soc. 15:285. Type-species, *Ceriogaster fascithorax* Williston, 1888 (monotypy).

Head: higher than long; face bare, pollinose except keels shiny, carinate, with strong medial and lateral keels, with medial keel slightly concave below antennal pits and slightly rounded below the concavity into a low indistinct tubercle; cheeks narrow; facial grooves long, extending about two-thirds the distance to antennal pits; facial stripes indistinct; frontal prominence low, slightly above middle of head; front of male short, about two-thirds as long as vertical triangle; vertical triangle long, more than twice as long as broad at occiput; front of female broad, as broad at antennae as long; ocellar triangle always distinctly before posterior margin of eyes; occiput with a transverse row of short strong spines on upper half. Eyes bare, narrowly dichoptic in male, with an oblique transverse impressed groove at level of antennal pits. Antennae elongate, slightly shorter than face; third segment always elongate, two or more times as long as broad; arista long, longer than either antenna or face.

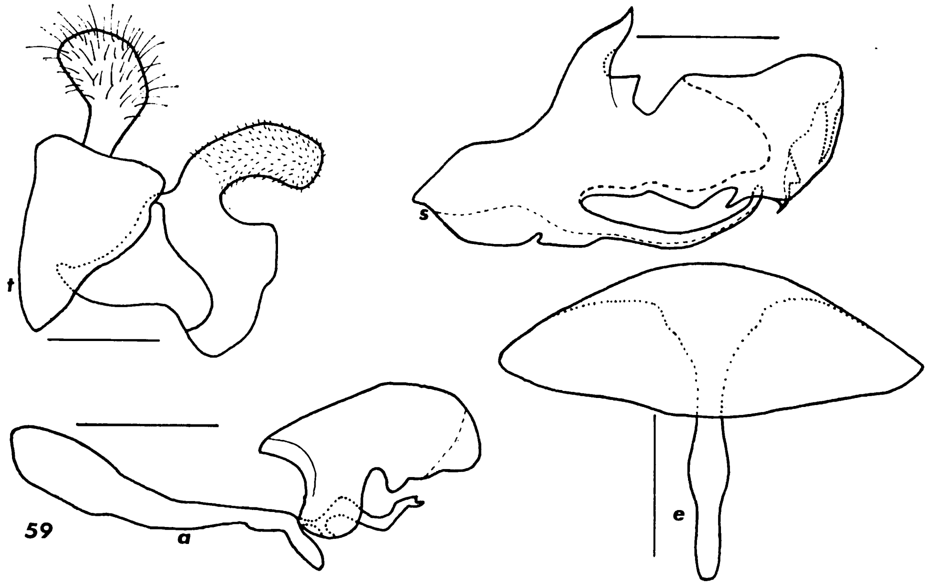


58, male genitalia of *Neplas armatipes* Curran. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Thorax: longer than broad, with transverse row of short strong spines on anterior edge of mesonotum, with a pair of median interrupted transverse golden pollinose bands on anterior half, with one band on anterior edge and the other in front of transverse suture, with very short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna bare, developed; postmetacoxal bridge always complete; metathoracic spiracle small; plumulae very short but distinct; scutellum without ventral pile fringe and without distinct apical, emarginate rim. Legs: anterior tarsi flattened, always dark; hind femora swollen; hind tibiae with ventral basal knife edge. Wings: marginal cell open; apical cell petiolate; anterior crossvein at or slightly before middle of discal cell, straight.

Abdomen: slightly petiolate, with constriction on second segment, with third and fourth segments forming a short club.

Material examined: 9(9); *aureopila* Hull*, *fascithorax* Williston*, *scutellata* Curran*, *spinosa* (Shannon)* and about half dozen undetermined species.



59, male genitalia of *Ceriogaster* species. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Discussion: *Ceriogaster* is unique among the syrphids because of its collar of short spines on both the occiput and anterior edge of mesonotum. Also, the complete postmetacoxal bridge is another rather uncommon character in the syrphids: only *Sphegina* (all); some *Neoascia, Lepidomyia Valdivia, Ceriana* and *Baccha* have a complete postmetacoxal bridge. Hull (1943) has written a key to the nine species of the genus but it is impossible to use since its couplets conflict with each other and the description of various species.

Genus **Macrometopia** Philippi

(Figs. 9, 61)

Macrometopia Philippi, 1865, Verh. Zool.-Bot. Ges. Wien 15:740. Type-species, *Macrometopia atra* Philippi, 1865 (monotypy).

Head: higher than long; face strongly pilose, broadly pollinose on sides, shiny medially, with a weak medial keel, almost straight, with a low medial tubercle, produced slightly downward below eyes; cheeks broad, broader than long; facial grooves short, extending along lower one-third of eyes margins; facial stripes indistinct; frontal prominence low, on upper third of head; front of male long, about one-fourth longer than vertical triangle; vertical triangle long, twice as long as broad at occiput; front of female broad, only slightly longer than broad at antennae, slightly longer than face, with strongly convergent sides above, only one-half as broad at ocellar triangle as at antennae; ocellar triangle clearly before posterior margin of eyes. Eyes strongly pilose, narrowly dichoptic in male. Antennae short, much shorter than face; third segment elongate ventrally, about twice as broad as long; arista long, longer than antenna.

Thorax: about as long as broad, with long pile, with mesonotum shiny and pleurae pollinose; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna bare and under developed; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae elongate; scutellum with ventral pile fringe, without apical emarginate rim. Legs: simple with hind femora not swollen and with very few small ventral spines. Wings: marginal cell open; apical cell closed at costa, without petiole; anterior crossvein slightly beyond middle of discal cell and slightly oblique.

Abdomen: oval in female, suboval in male.

Material examined:1 (1) ; *atra* Philippi *.

Discussion: *Macrometopia* is the only genus in the tribe Milesini that has pilose eyes. Only one species of *Macrometopia* is known - *Macrometopia atra* Philippi, which is rather common in the Andes of Chile and Argentina.

Genus **Sterphus** Philippi

(Figs. 20, 60)

Sterphus Philippi, 1865, Verh. Zool.-Bot. Ges. Wien 15:737. Type-species, *Sterphus antennalis* Philippi, 1865 (original indication) = *Xylota coerulea* Rondani, 1863.

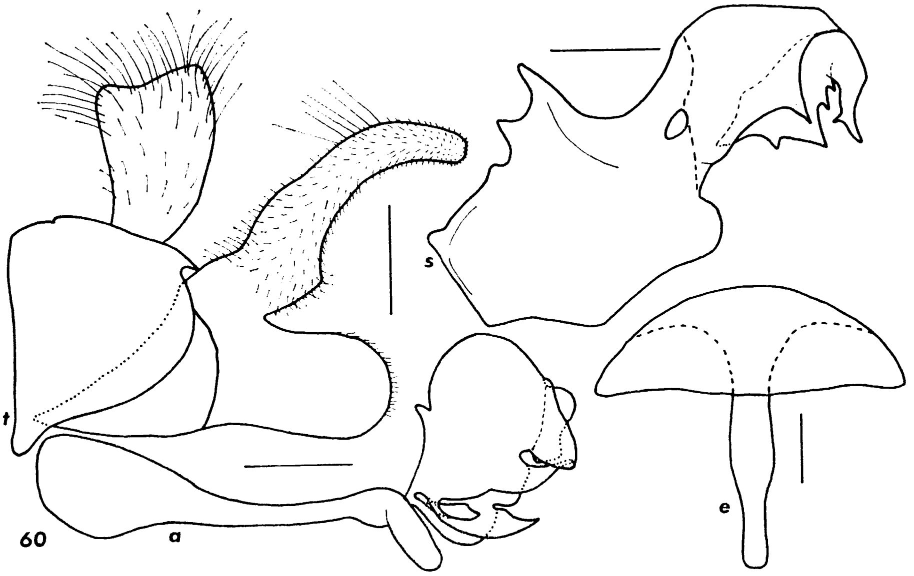
Crepidomyia Shannon, 1926, Proc. U.S. Nat. Mus. 69 (9) :47. Type-species, *Crepidomyia tricrepis* Shannon, 1926 (original designation). *New Synonymy.*

Tatuomyia Shannon, 1926, Proc. U.S. Nat. Mus. 69 (9) :48. Type-species, *Tatuomyia batesi* Shannon, 1926 (original designation). *New Synonymy.*

Senoceria Hull, 1930, Trans, Amer. Ent. Soc. 56:144, Type-species *Senoceria spinifemorata* Hull, 1930 (original designation) = *Xylota coarctata* Wiedemann, 1830. *New Synonymy.*

Mutillimyia Hull, 1943, Rev. Soc. Ent. Argentina 12:139. Type-species, *Ceriogaster auricaudata* Williston, 1892 (original designation). *New Synonymy.*

Head: higher than long; face bare, either completely pollinose or pollinose only on sides, carinate, with medial and lateral keels, frequently with keel very strong and straight, rarely with medial keel slightly concave beneath antennal bases and swollen laterally near the oral margin; cheeks broad, as broad as or broader than long; facial grooves long, extending about two-thirds the way to the antennal bases; facial stripes indistinct; frontal prominence low, above the middle of the head; front of male short, slightly longer than vertical triangle; front of female broad, as broad as or broader at antennal bases than long; vertical triangle of male long, about twice as long as broad; ocellar triangle always distinctly before posterior margin of eyes. Eyes bare, narrowly holoptic in male. Antennae usually elongate, slightly shorter than face, sometimes only half as long as face; third segment usually elongate, rarely slightly orbicular, usually two or more times as long as broad; arista long, longer than antenna.

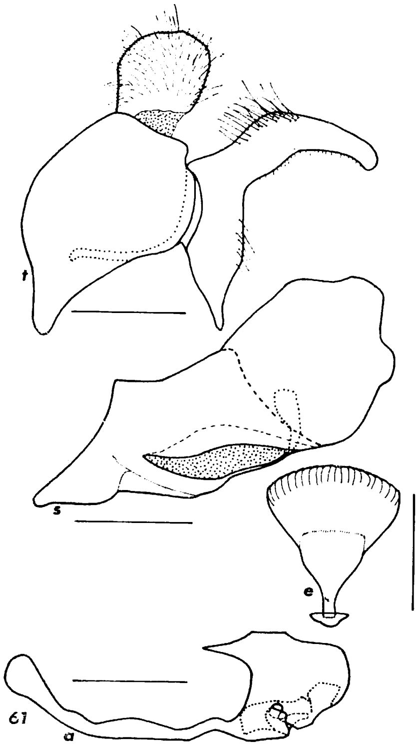


60, male genitalia of *Sterphus coerulea* (Rondani). a, aedeagus and apodeme; s, sternum 9; t, tergum 9; all lateral view.

Thorax: longer than broad, usually with short pile, rarely with long pile, may have a pair of medially interrupted transverse golden pollinose bands on the anterior part of notum; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metasterna bare and developed; post-metacoxal bridge always incomplete; metathoracic pleurae bare; metathoracic spiracle usually enlarged, in some species larger than third antennal segment; plumula ranging from absent to elongate; scutellum with a ventral pile fringe, with or without a distinct emarginate apical rim. Legs: hind trochanters frequently with spurs; hind femora usually slightly swollen, straight ventrally, with two rows of ventral spines, frequently with ventral spines very strong; hind tibiae frequently with apical spurs. Wings: marginal cell open; apical cell closed and petiolate; anterior crossvein at or beyond the middle of the discal cell, always greatly oblique; anterior margin of wings may be dark.

Abdomen: usually elongate, rarely petiolate; *batesi* with a long petiole; *coarctata* with a short petiole; constriction always on second segment.

Material examined: 10(10); *auricaudata* (Williston)* (LTs), *batesi* (Shannon)*, *coarctata* (Wiedemann)*, *coeruleus* Rondani*, *darlingtoni* (Hull)* (HT), *genuina* (Williston)*, *plagiata* (Wiedemann)* and *tincta* (Fluke)* (also about half dozen new species as mentioned below).



61, male genitalia of *Macrometopia atra* Philippi. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Discussion: *Sterphus* can be separated easily from most milesine syrphids by its carinate face. Only *Tropidia, Nepenthosyrphus,* and *Ceriogaster,* have distinctly carinate faces and *Senogaster, Syritta Neplas,* and *Macrometopia* have weakly subcarinate faces, but all of these genera except for *Ceriogaster* and *Macrometopia* have pilose metasterna. *Sterphus* can be distinguished from *Ceriogaster* and *Macrometopia* to which it is clearly closely related by its: 1) bare face, 2) bare eyes, 3) lack of spines on occiput and anterior edge of mesonotum and 4) incomplete post-metacoxal bridge. *Sterphus, Ceriogaster,* and *Macrometopia* all have the metasterna bare and are the only genera except *Neplas* (pilose metasterna) of the *Xylota* group with carinate faces or subcarinate faces. These similarities suggest that *Sterphus, Ceriogaster* and *Macrometopia* had a single common ancestral species and these genera represent just one emigration into South America from the north.

Crepidomyia, Senoceria and *Tatuomyia* have all been synonymized because the characters on which they are based have been found to intergrade.

Crepidomyia was erected for the species with 1) strong straight facial keels, 2) black faces, 3) elongate third antennal segments, and 4) hind trochanters spurred in the males. *Tatuomyia* differs from *Crepidomyia* only in that it has 1) constricted abdomen, and 2) lacks suprs on the hind trochanter of the males. *Tatuomyia coarctata* was later split off from *Tatuomyia* as *Senoceria* because it has a short abdominal petiole instead of a long petiole. *Sterphus* was originally described for a Chilean species with: 1) elongate abdomen; 2) orange face with weak medial keel; 3) oval third antennal segment; and 4) hind trochanter of male spurred. During the course of this revision I have found a number of new species which are intermediate between all these groups. One new species (in American Museum of Natural History) is like a typical *Crepidomyia* but has no spurs on the trochanters. *Crepidomyia tincta* Fluke has its antennae and face like a typical *Crepidomyia* but has a slightly constricted abdomen and no spurs on the trochanters. Thus there are species that display the complete transition of the characters of *Crepidomyia, Senoceria* and *Tatuomyia*: from elongate abdomen and spurred males (*Crepidomyia*) to elongate abdomen and non spurred males (new species), to slightly constricted abdomen and non-spurred males (*C. tincta*), to constricted abdomen but short petiole (*Senoceria*), to constricted abdomen and long petiole (*Tatuomyia*). Two other new species (Museu de Zoologia, Universidade de São Paulo, Brazil) bridge the gap between *Crepidomyia* and *Sterphus*. One is a typical *Crepidomyia* except that it has an oval third antennal segment and a slightly weaker medial facial keel and the other new species is very similar to the first but has a medial keel like *Sterphus* and black and orange face. The genitalic differences between the species are not of generic significance (Thompson, in preparation).

Genus **Neplas** Porter

(Fig. 58)

Planes Rondani, 1863, Arch. Zool. 3:9 (preoccupied, Bowdich 1825; Saussure 1862). Type-species, *Xylota vagans* Wiedemann, 1830 (original designation).

Neplas Porter, 1927, Rev. Chil. Hist. Nat. 31:96 (new name for *Planes* Rondani).

Head: slightly higher than broad; face bare, narrow, subcarinate, with a weak medial keel and two short lateral keels, slightly concave in profile, completely pollinose; cheeks linear; facial grooves short, extending along lower third of eyes; facial stripes indistinct; frontal prominence low, slightly above middle of head; front of male short, as long as or slightly longer than eye contiguity; vertical triangle long, more than three times as long as broad, more than twice as long as eye contiguity; front of female narrow, slightly less than twice as long as broad at antenna, with convergent sides above; ocellar triangle always distinctly before posterior margin of eyes. Eyes bare, narrowly holoptic in male. Antennae elongate, as long as face or slightly longer; third segment ellliptical or elongate, always twice as long as broad or longer; arista bare, longer than antenna or face.

Thorax: longer than broad, with very short pile; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna pilose and strongly developed; postmetacoxal bridge incomplete; pleurotergite with one or more distinct carinate ridges; plumula absent; metathoracic spiracle small; scutellum with ventral pile fringe and apical emarginate rim. Legs: hind femora short, greatly and evenly swollen, with some long ventral bristles as well as two rows of numerous short ventral spines; hind tibiae strongly arcuate, with ventral side forming a long kinfe edge, ending with short spur. Wings: marginal cell open; apical cell petiolate; anterior crossvein at middle of discal cell and oblique.

Abdomen: elongate and frequently constricted near base; sternites extremely long and narrow.

Material examined: 28(26); *armatipes* Curran *, *frontalis* Curran *, and more than a dozen undetermined species.

Discussion: *Neplas* is distinguished from the other milesine syrphid genera by the following combination of characters: 1) pilose metasterna; 2) greatly swollen hind femora; 3) strongly arcuate hind tibiae; 4) carinate pleurotergites and 5) scutellum with ventral fringe. *Neplas* is frequently considered a synonym of the Holarctic genus *Xylota, s. l.*, but *Neplas* is readily separated from *Xylota* by the following characters, in addition to characters 2, 3 and 4 above: 1) subcarinate faces; 2) very narrow and long sternites; 3) long and narrow vertical triangle in male. I have not seen any *Neplas* species from outside the Neotropical Region although two Nearctic species have been described from Sierra Madre just north of the Isthmus of Tehuantepec (*willistoni* Shannon and *pauxilla* Williston). Curran (1941) provides a key to 12 of the 28 species of *Neplas*.

Genus **Odyneromyia** Shannon and Aubertin

(Fig. 62)

Odyneromyia Shannon and Aubertin, 1933, Dipt. Patagonia S. Chile 6:156. Type-species, ?*Doros odyneroides* Philippi, 1865 (original designation).

Head: higher than long; face bare, completely pollinose; face in male with a low medial tubercle about half way between oral margin and antennae, slightly concave above tubercle, straight below tubercle; face in female concave; cheeks linear, longer than broad; facial grooves short, extending along lower one-fourth of eye margins; facial stripes indistinct; frontal prominence low, slightly above middle of head; front of male short, slightly longer than vertical triangle, about three times as long as eye contiguity; vertical triangle short, slightly longer than broad at occiput; front of female broad, slightly longer than broad at antennae, with sides convergent above, slightly longer than face; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, narrowly dichoptic in male. Antennae short, about one-half as long as face; third segment orbicular; arista about one and one-half times as long as antenna.

Thorax: about as long as broad, without distinct light colored pollinose markings on mesonotum, with short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna underdeveloped and bare; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae very short but distinctly present; scutellum with ventral pile fringe, without apical emarginate rim. Legs: simple except hind femora slightly swollen apically. Wings: with anterior half orange and brown; marginal cell open; apical cell closed at costa, without a petiole; anterior crossvein at or slightly before middle of discal cell, oblique.

Abdomen: petiolate, constricted on base of second segment, narrowest at base of second segment, with petiole short and about one-half length of second segment.

Material examined: 2(2); *odyneroides* (Philippi)* and *valdiviformis* Shannon and Aubertin*.

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62, male genitalia of *Odyneromyia odyneroides* (Philippi). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except a_d dorsal view.

Discvssion: *Odyneromyia* can be separated from *Valdivia* by the following characters: 1) apical cell nonpetiolate; 2) anterior crossvein at or beyond middle of discal cell; 3) eyes holoptic in males; 4) frontal prominence near the middle of head, not on upper fourth of head; 5) abdomen narrowest at base of second segment, not at middle of second segment; and 6) abdominal petiole short, only about half as long as segments three and four together, not as long as these segments together. *Odyneromyia* and *Valdivia* with their: 1) tuberculate faces, 2) simple legs, 3) bare and underdeveloped metasterna, 4) subscutellar fringes and lack of apical emarginate scutellar rims, and 5) constricted abdomens are definitely sister-groups and form a group distinctly different from all other milesine syrphids. The first four characters are shared by only the Holarctic genus *Temnostoma* which never has a constricted abdomen. *Takaomyia,* a Far East genus beloging to the *Temnostoma* group, has a strongly constricted abdomen but it has a concave face, pilose and developed metasterna.

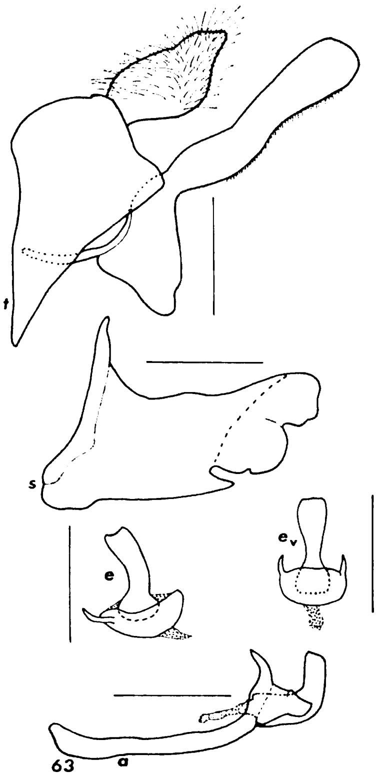
Odyneromyia includes only two species, both known only from the Andes of Chile and Argentina. The descriptive notes provided by Shannon and Aubertin (1933) with their description of *valdiviformis* will aid in distinguishing the two species.

Genus **Valdivia** Shannon

(Fig. 50)

Valdivia Shannon, 1927, Proc. U. S. Nat. Mus. 70(9) : 31. Type-species, *Valdivia darwini* Shannon, 1927 (original designation).

Head: higher than long; face bare, pollinose broadly on sides; face in male with a low medial tubercle on lower third of face, with shallow concavity above tubercle, straight below tubercle; face in female either concave or tuberculate as in male; cheeks linear, much longer than broad; facial grooves short, extending along lower third of eyes; facial stripes not differentiated; frontal prominence low, on upper fourth of head; front of male short, shorter than vertical triangle; vertical triangle long, about twice as long as broad; front of female narrow, about twice as long as broad at antennae, less than two-thirds as long as face, with sides convergent above ocellar triangle distinctly before posterior margin of eyes. Eyes bare, narrowly dichoptic in male.



63, male genitalia of *Valdivia darwini* Shannon. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except e_v ventral view.

Antennae short, less than one-half as long as face; third segment orbicular; arista long, about one and one-half times as long as face. Thorax: about twice as long as broad, with short pile, frequently with lateral borders of mesonotum broadly pollinose; meso-anepisterna with anterior part with a distinct patch of pile in the middle of posterior margin; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna bare and underdeveloped; metathoracic spiracle small; postmetacoxal bridge complete in *darwini*, incomplete in all other species; plumulae elongate; scutellum with ventral pile fringe, without apical emarginate rim. Legs: simple. Wings: marginal cell open; apical cell petiolate, with a distinct petiole about one-half as long as anterior crossvein; anterior crossvein distinctly before middle of discal cell, usually at basal third of discal cell, straight.

Abdomen: strongly constricted in males, in females of almost uniform width; petiole of male almost as long as third and fourth segments combined, as long as second segment, narrowest at middle of second segment.

Material examined: 6(6) ; *camrasi* Sedman* (HT), *darwini* Shannon*, *edwardsi* Shannon & Aubertin*, *nigra* Shannon* (HT) and *ruficauda* Shannon* (HT).

Discussion: See discussion under *Odyneromyia* for distinctive characters of *Valdivia*. Only six species of *Valdivia* have been described, all from Chile. Sedman (1965) has provided an up-to-date key to all known species along with figures of the male genitalia of *darwini* and *camrasi*. Sedman has pointed out that the aedeagi of *darwini* (type-species) and *camrasi* are quite different and these differences "may necessitate a sub-generic splitting of this interesting genus.". Too little is still known about some of the species in the genus to do this but I should point out some other structural characters that may correlate with genitalic differences: 1) most species (*edwardsi, ruficauda, nigra* and *camrasi*) have incomplete postmetacoxal bridge, whereas *darwini* has a complete postemetacoxal bridge; and 2) *darwini* has a facial tubercle in both sexes, whereas *edwardsi* and *ruficauda*, the only other species of which the female is known, lack the tubercle in the female.

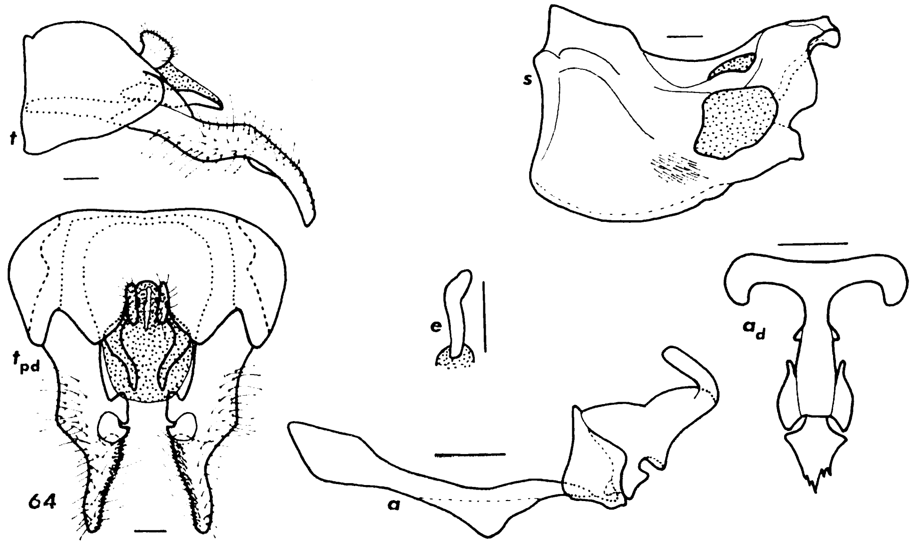
Genus **Aneriophora** Stuardo and Cortés

(Figs. 12, 24, 64)

Eriophora Philippi, 1865, Verh. Zool.-Bot. Ges. Wien 15:736 (preoccupied, Simon 1864). Type-species, *Eriophora aureorufa* Philippi, 1865 (monotypy).

Aneriophora Stuardo and Cortés, 1952, Rev. Chil. Ent. 2:311 (new name for *Eriophora* Philippi).

Head: twice as high as long; face bare, lightly orange pollinose, long, produced downwards, one-half of face below bottom of eyes, slightly concave under antennae, with traces of small medial tubercle, straight below tubercle; cheeks shiny, elongate anteriorly, as long as broad; facial grooves short, extending along basal one-third of eyes; facial stripes indistinct; frontal prominence low, on upper third of head; front of male very short, as long as eye contiguity, only one-half as long as vertical triangle; vertical triangle long, more than twice as long as broad at occiput; front of female broad, about two-thirds as broad at antennae as long, slightly more than two-thirds as long as face; ocellar triangle always distinctly before posterior margin of eyes. Eyes bare, holoptic in male. Antennae very short, about one-third as long as face; third segment almost quadrate; arista long, about two and one-half times as long as antenna.



64, male genitalia of *Aneriophora aureorufa* (Philippi). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except a_d dorsal view and t_{pd} posterodorsal.

Thorax: as long as broad, mostly orange pollinose except pectus black, with long mesonotal pile; meso-katepisterna with broadly separated dorsal and ventral pile patches; meso-anepimera with posterior portion bare; mero-pleurae bare; metathoracic pleurae bare; metasterna pilose and intermediate in development; postmetacoxal bridge incomplete; metathoracic spiracle medium in size, as large as third antennal segment; plumulae elongate; scutellum with ventral pile fringe and distinct apical emarginate rim. Legs: simple except for hind femora very slightly swollen before apex in males and with only a few ventral spines, hind tibiae with a short broad rounded projection at apex. Wings: with apical third orange brown; marginal cell open;

apical cell petiolate, with petiole longer than humeral crossvein; anterior crossvein at middle of discal cell strongly oblique.

Abdomen: oval; tergites orange with long orange pile; sternite shiny black with black pile.

Material examined: 1(1); *aureorufa* Philippi *.

Discussion: *Aneriophora* has frequently been considered a synonym or a subgenus of the large almost worldwide genus *Criorhina*. The usual reasons for this synonymy is that the only differences between *Criorhina* and *Aneriophora* are insignificant. *Aneriophora* differs from *Criorhina, s. l.,* by the following characters: 1) apical cell with a long petiole; 2) apical and posterior crossvein disjunct, not jointing in a line; and 3) coloration, orange instead of usually black and yellow. Further, an examination of the male genitalia indicates that *Aneriophora* is quite distinctive and not very closely related to *Criorhina* but to *Temnostoma* instead. The aedeagus of *Aneriophora* is one segmented and has fairly well developed lateral and dorsal lobes, whereas the typical *Criorhina* has a two-segmented aedeagus with very reduced lateral lobes. The very distinctive male genitalia of *Aneriophora* suggests that: 1) *Criorhina* on a world-wide basis is probably paraphyletic or polyphyletic; and 2) *Criorhina* and related genera were probably derived from a *Temnostoma-Aneriophora* type of ancestor. In support of the first suggestion, *Deineches,* the only non-Holarctic "supposed" synonym of *Criorhina* I have seen besides *Aneriophora,* has also been found to have radically different genitalia from the typical *Criorhina* and is distinct (see discussion under *Flukea*). *Aneriophora* contains only one species, which is restricted to Chile.

Genus **Flukea** Etcheverry

Flukea Etcheverry, 1966, Publ. Centr. Estud. Ent. 8:1. Type-species, *Flukea vockerothi* Etcheverry, 1966 (monotypy).

Head: higher than long ; face bare; pollinose in male, shiny in female, concave in female, in male concave beneath antennae with a distinct medial tubercle and straight beneath tubercle, produced slightly downwards, with about one-third of face below bottoms of eyes. Cheeks narrow, longer than broad; facial grooves short, extending around basal third of eyes; facial stripes distinct, pilose; frontal prominence high, about as high as face is deep, on upper third of head; front of male long, as long as vertical triangle, about twice as long as broad at occiput; front of female broad, as broad as face, almost as broad at antennae as long, with only slightly convergent sides above, three-fourths as broad at ocellar triangle as at antennae; ocellar triangle small, always before posterior margin of eyes. Eyes bare, dichoptic in male, separated in males by one and one-half times width of ocellar triangle. Antennae short, one-half as long as face; third segment kidney-shaped, twice as broad as long; arista long, twice as long as antenna.

Thorax: longer than broad, with long mesonotal pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; mero-pleurae bare; metathoracic pleurae bare; metasterna pilose and developed; postmetacoxal bridge incomplete; metathoracic spiracle small; plumula elongate; scutellum with ventral pile fringe and without apical emarginate rim. Legs: hind femora swollen and slightly arcuate, without ventral spines; hind tibiae flattened laterally and arcuate.

Male genitalia of *Flukea vockerothi* Etcheverry (PT). 65, s, sternum 9; t, tergum 9; all lateral view. 66, a, aedeagus and apodeme, lateral view; e, ejaculatory apodeme, lateral view; e_d, same, dorsal view; s_d, posterior half of sternum 9, dorsal view; 7s, 8s, sternum 7 and sternum 8, dorsal view.

Wings: with apical third dark and the rest orange; marginal cell open; apical cell closed at costa and without petiole; anterior crossvein slightly before middle of discal cell.

Abdomen: suboval, distinctly emarginate on segments two through four in males, with emargination indistinct in female.

Material examined: 1(1) ; *vockerothi* Etcheverry (PTs)*.

Discussion: The two-segmented aedeagus, pilose metasterna, kidney-shaped third antennal segment, tuberculate face in male, *etc.* all indicate a close relationship between *Flukea* and *Criorhina* and its related genera. *Flukea* and *Aneriophora* are different from all the genera related to *Criorhina* in that the apical and posterior crossveins are not continuous with each other but are disjunctive (Fig. 24) (posterior crossvein ends in fourth vein (m1+2) well before base of apical crossvein and at the base of the apical crossvein there is a distinct m2 spur) whereas in *Criorhina, Sphecomyia, Merapioidus, Deineches* and *Lycastris* (the other genera of the *Criorhina* group) the posterior crossvein ends at the base of the apical crossvein and there is no spur at the base of apical crossvein (Fig. 26).

Flukea is easily separated from *Aneriophora* by its dark coloration as well as by the following characters: 1) dichoptic eyes in male; 2) strongly tuberculate face in male; 3) strongly concave face in female: 4) high frontal prominence; 5) kidney-shaped third antennal segment; 6) absence of emarginate scutellar rim; 7) swollen hind femora; and 8) arcuate hind tibiae.

The genitalia of *Flukea* are very similar to those of the Australian genus *Deineches*. The aedeagi of the two genera are virtually identical, but there are a few minor differences in the superior lobes and surstyli of the two genera. However, none of these genitalic differences appear of any more than species importance. *Flukea* does differ from *Deineches* in a number of characters besides the wing venation as mentioned above, *Flukea* has: 1) bare barrette; 2) no apical emarginate scutellar rim; 3) small metathoracic spiracle; 4) broadly dichoptic eyes in male; 5) bare front in male; and 6) anterior crossvein located before middle of discal cell. *Deineches* was considered by Ferguson (1926) in the most recent revision of the Australian milesine syrphids to be only a synonym of *Criorhina*. Ferguson considered the Australian species of *Criorhina* "to form a fairly homogeneous group," but Hardy (1921) earlier pointed out that *Deineches* had the apical and posterior crossveins continuous, whereas in "*Criorhina*" they are disjunctive. Hardy goes on to say, "It is doubtful if this character is sufficient to justify generic separation." As I mentioned above, only the two Chilean genera, *Flukea* and *Aneriophora,* have the disjunctive crossvein. Hardy's "*Criorhina*" are apparently not the same as the Holarctic *Criorhina* species and may belong to either *Aneriophora* or *Flukea.* Also, one Australian species, *hackeni,* is described as lacking the tubercle in the female, a character found among the criorrhine genera in only *Flukea.* Unfortunately, with the exception of the type-species of *Deineches,* I have been unable to study any of the other Australian "*Criorhina.*" For this reason I am forced to leave the questions of interrelationships between the Australian genera related to *Criorhina* and the Chilean ones unsolved.

In summary, *Flukea* and *Deineches* are definitely sister-groups and represent the first known case of trans-antartic relationships among the syrphids and higher Diptera in general. However, until more is known about the Australian components of this relationship, it is not possible tc make any further evaluation.

Genus **Philippimyia** Shannon

(Figs. 65, 66)

Philippimyia Shannon, 1926, Proc. U. S. Nat. Mus. 69 (9) :47. Type species, ?*Sterphus cyanocephala* Philippi, 1865 (original designation).

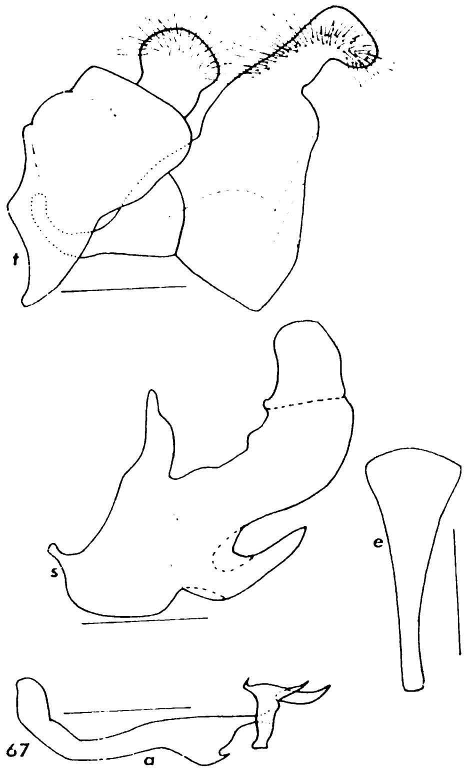
Head: metallic bluish, one-third higher than long; face bare, shiny, not pollinose, obliquely retreating below antennae to just above oral margin, straight just above oral margin; cheeks linear, longer than broad; facial grooves short, extending along lower third of eyes; facial stripes very narrow, pilose and pollinose; frontal prominence high, extending distinctly beyond oral margin, at middle of head; front of male long, about four times as long as eye contiguity, as long as vertical triangle; vertical triangle long, about twice as long as broad at occiput; front of female narrow, about twice as long as broad at antennae, about one-third longer than face, with slightly convergent sides above; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, narrowly holoptic in male. Antennae short, about two-third as long as face; third segment trapezoidal, ventral margin longer than dorsal, apical end oblique; arista long, about one third longer than antenna.

Thorax: as broad as long, metallic bluish, with short pile, without pollinose markings; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna bare and intermediate in development; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae short; scutellum with ventral pile fringe and distinct broad emarginate apical rim. Legs: simple except hind femora slightly swollen. Wings: marginal cell open; apical cell closed just before costa, with a distinct but very short petiole; anterior crossvein slightly beyond middle of discal cell, oblique.

Abdomen: elongate, metallic bluish with short pile.

Material examined: 1(1) ; *cyanocephala* (Philippi) *.

Discussion: *Philippimyia* is readily separated from most milesine genera by its distinctive face with a strongly protruding frontal prominence. Only the faces of *Stilbosoma* and some species of *Lejota, Xylota, Blera* and *Somula* may be confused with *Philippimyia*'s face. *Philippimyia* is easily distinguished from all the above genera by the following characters: 1) bare metasterna; 2) simple legs; 3) broadly emarginate scutellar rim; and 4) very short petiole of apical cell. The general habitus of *Philippimyia* is also very distinctive: completely



67, male genitalia of *Philippimyia cyanocephala* (Philippi). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

metallic bluish flies with elongate abdomen and smoky wings. *Stilbosoma cyanea* is the only other South American syrphid with this appearance that I know of, and it may be separated by the characters given above. *Philippimyia* contains only one species, which is restricted to Chile.

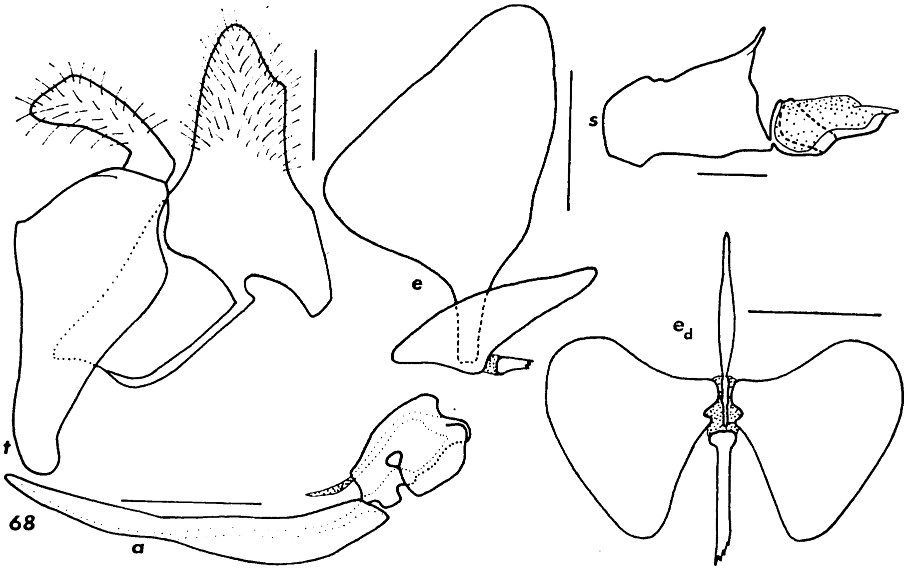
Genus **Senogaster** Macquart

(Fig. 67)

Senogaster Macquart, 1834, Hist. Nat. Ins. Dipt. 1:519. Type-species, *Senogaster coerulescens* Macquart, 1834 (monotypy).

Head: higher than long; face bare, pollinose, concave; cheeks linear, much longer than broad; facial grooves short, extending along lower third of eyes; facial stripes indistinct; frontal prominence low, slightly below middle of head; front of male short, about one-half as long as eye contiguity, less than one-fourth as long as vertical triangle very long, over four times as long as broad at occiput; front of female very narrow, more than four times as long as broad at antennae, one-third longer than face, with slightly convergent sides above; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, narrowly holoptic in male. Antennae short, about three-fourths as long as face: third segment oval, with apex bluntly rounded, with a basal row of short black spines on inside near aristal base; arista long, longer than face.

Thorax: one-fourth longer than broad, with very short pile and two pairs of pale pollinose longitudinal vittae on mesonotum; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepisterna with apical posterior edge raised into a small ridge; meso-anepimera with posterior portion pilose on ventral half; meropleurae bare except with anterior part of barrette pilose; metasterna greatly developed and pilose; metathoracic spiracle small; postmetacoxal bridge incomplete; meta-episterna with a distinct patch of pile behind and below spiracle; plumulae very short but distinct; pleurotergite with one large short transverse keel; scutellum without ventral pile fringe and emarginate apical rim. Legs: anterior four legs simple except for strongly developed basal setal patches on both coxae and base of femora; hind coxae with distinct small tubercle on inner sides; hind trochanter in male with tubercle on inner side larger than coxal tubercle, in female without tubercle but with slight swelling instead; hind femora short, greatly swollen, with ventral apical bifid spur on outer side; hind tibiae slightly arcuate, ending with short blunt spur on outside. Wings: marginal cell narrowly open at costa; apical cell distinctly



68, male genitalia of *Senogaster dentipes* (Fabricius). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except e_d dorsal view.

closed before meeting costa, with petiole very short and shorter than humeral crossvein; apical and posterior crossveins continuous, without spurs at their bases; anterior crossvein beyond middle of discal cell oblique.

Abdomen: Female abdomen elongate, strongly emarginate on segments three and four, with a pair of strong lateral tubercles and a single low medial swelling on segments three and four, with sternite four swollen medially; male abdomen constricted, with second segment narrowed posteriorly, with third segment cylindrical and forming the petiole, with rest of abdomen club-shaped.

Material examined: 1(1) ; *dentipes* (Fabricius) *.

Discussion: *Senogaster* is unique among syrphids for a number of reasons: 1) the male abdomen with the petiole formed by the third segment not the second; 2) the female abdomen with two pairs of large dorsal tubercles (The only other syrphid with abdominal tubercles is "*Sphaerophoria*" *quadrituberculata* Bezzi but in this species the tubercles are quite different and are restricted to the male) 3) hind femora with a bifid spur, (*Stilbosoma*, has a bifid hind femoral process but *Stilbosoma*'s process is a large flattened plate-like structure, not a spur). Also, *Senogaster* is one of the few syrphid genera with true hind coxal processes. The only other genera with true hind coxal processes, to my knowledge, are *Neocnemodon* (males only) and *Stilbosoma*.

The similar head shape, lack of subscutellar fringe, presence of pile on meta-episterna, pilose and developed metasterna, swollen hind femora, carinate pleurotergite, *etc.* are some of the common characters shared by *Syritta* and *Senogaster* and strongly suggest a sister-group relationship despite all of *Senogaster*'s unique characters. *Senogaster* is represented by a single wide-spread Neotropical species, whereas *Syritta* is a large Old World genus absent from the New World until introduced by Man.

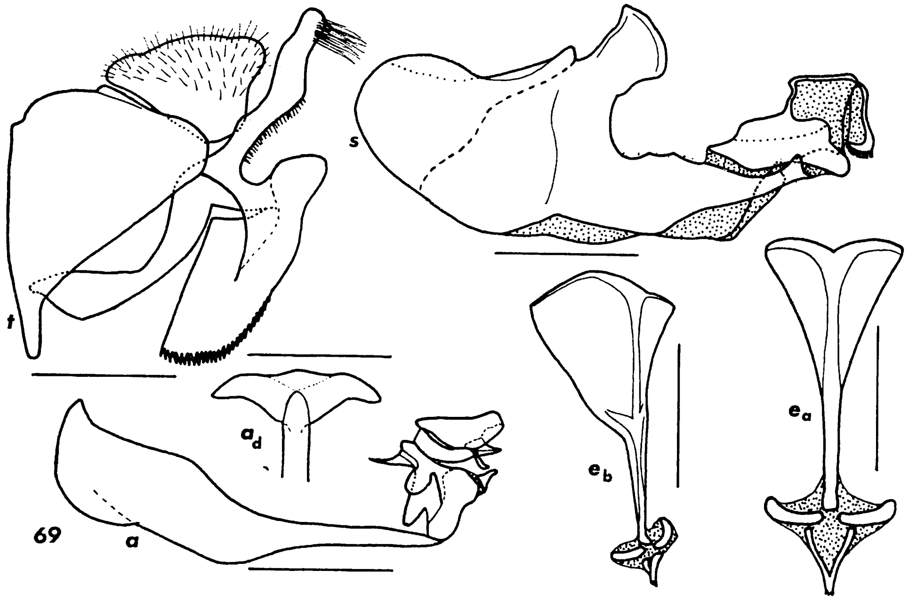
Some authors have used Bigot's name *Acrochordonodes* because *Senogaster* is supposedly preoccupied. However, it is Williston's injustified emendation, *Stenogaster*, that is preoccupied, not Macquart's original spelling, *Senogaster*. Thus *Senogaster* is the valid name of the genus.

Genus Syritta Lepeletier and Serville

(Fig. 69)

Syritta Lepeletier and Serville, 1828, Encyclopedie methodique 10:808 (as subgenus of *Xylota*). Type-species, *Musca pipiens* Linné, 1758 (as *Xylota pipiens* Meigen) (monotypy).

Head: about one-third higher than long; face bare except for some long hairs narrowly along sides, completely pollinose, subcarinate, with medial keel fairly distinct and slightly concave in profile, lateral keels indistinct; facial grooves very short, extending only half the length to level of tip of oral notch, extending along lower sixth of eyes; facial stripes distinct, pilose, restricted to cheeks only; cheeks very elongate, about eight times as long as broad; frontal prominence low, not clearly differentiated from surrounding area, at middle of head; front of male short, slightly shorter than eye contiguity, about one-third as long as vertical triangle; vertical triangle long, more than twice as long as broad at occiput; front of female fairly broad, slightly less than twice as long as broad at antennae, with sides only slightly convergent above, about two-thirds as broad at occiput as at antennae; ocellar triangle slightly in front of posterior margin of eyes. Eyes bare, narrowly holoptic in male. Antennae of medium length, ranging from two-thirds as long as to as long as face; third segment rectangular, ranging from as long as broad to twice as long as broad; arista short, about as long as antenna.



69, male genitalia of *Syritta flaviventris* Macquart (*Austrosyritta cortesi* Marnef (PT). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except a_d dorsal view, e_a anterior view and e_b bias lateral view.

Thorax: about one-third longer than broad, with lateral mesonotal margin pollinose in front of suture, with pleurae pollinose, with very short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepisterna with apical posterior edge swollen and ridge-like; meso-anepimera with posterior portion bare; meropleurae bare; metasterna pilose and greatly developed; metathoracic spiracle small: postmetacoxal bridge incomplete; meta-episterna with distinct patch of pile behind and below spiracle; plumulae short; scutellum without ventral pile fringe, with distinct apical emarginate rim. Legs: hind femora short, greatly swollen and with a low spinose ridge on outer apical ventral third; hind tibiae arcuate; various species with additional armature on hind legs. Wings: marginal cell broadly open; apical cell petiolate, with petiole long and about as long as anterior crossvein; anterior crossvein slightly before middle of discal cell, straight; spurious vein frequently absent.

Abdomen; elongate, narrowed slightly beyond base of second segment, with apical segment in male club-shaped, with a row of strong curved long hairs at base of second segment.

Material examined: 28(1); *flaviventris* (Macquart) * and *pipiens* (Linné).

Discussion: The presence of pile on the meta-episterna is found only in three genera of the tribe Milesini, *Syritta, Senogaster* and *Spilomyia*. The differences and interrelationships between *Syritta* and *Senogaster* have been discussed under the latter. *Spilomyia* can be distinguished from both *Senogaster* and *Syritta* by its slender elongate hind femora with a small apical ventral tooth. The spinose ridge on the hind femora of *Syritta* is found elsewhere in the syrphids only in the Oriental genus *Nepenthosyrphus*. *Nepenthosyrphus,* although closely related to *Syritta,* is easily separated from *Syritta* by its strongly carinate face with the median keel convex or straight in profile, not concave.

Syritta is not indigenous to the New World but has been introduced by Man. The larvae of *Syritta* breed in almost any kind of waste and *pipiens* has been frequently reported to breed in human feces. *Syritta* is found throughout the Old World and has its greatest species abundance in Africa. *S. pipiens* is almost world-wide in distribution being absent in South America. It is possible that *S. flaviventris,* which is found only in Africa and South America, has occupied the *pipiens* niche in South America.

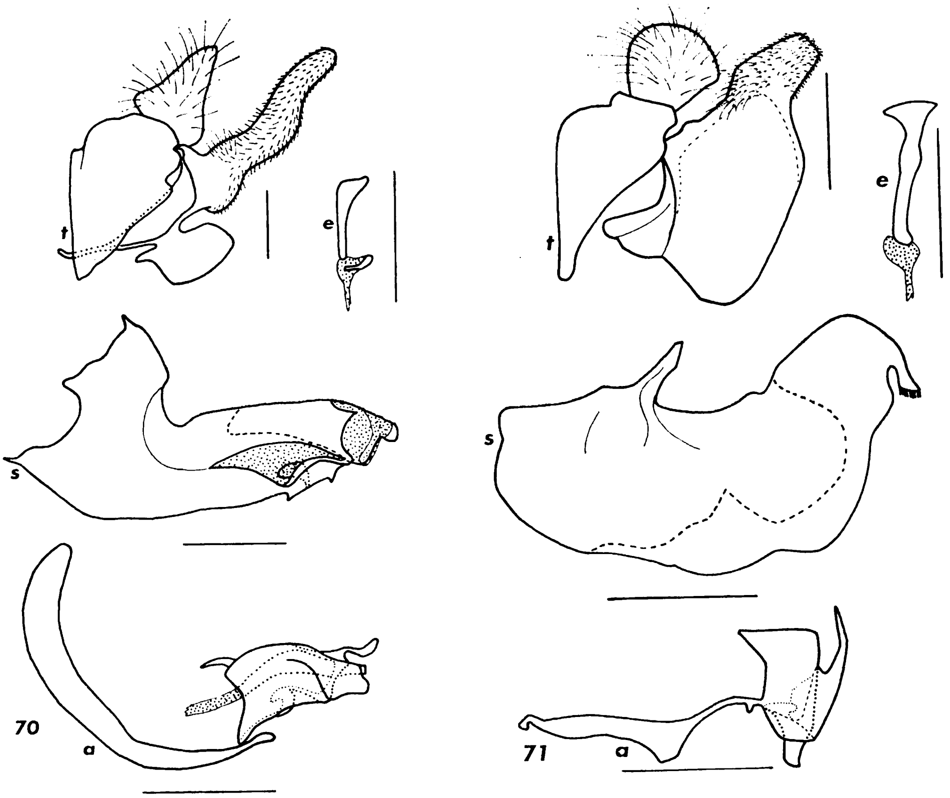
Genus **Tropidia** Meigen

(Fig. 70)

Tropidia Meigen, 1822, Syst. Beschr. 3:346. Type-species, *Eristalis milesiformis* Fallen, 1817 (subsequent designation; Curtis, 1832, Brit. Ent. 9: pl. 401) = *Musca scita* Harris, 1782.

Head: higher than long; face bare, mostly pollinose, carinate, males with strong median keel convex in profile, females with medial keel weaker and frequently concave; cheeks linear, about twice as long as broad; facial grooves short, extending along lower third of eyes; facial stripes distinct, pilose; frontal prominence low, above middle of head; front of male short, slightly shorter than eye contiguity, about one-half as long as vertical triangle; vertical triangle long, twice as long as broad at occiput; front of female broad, about two-thirds as broad at antennae as long, about as long as face, with convergent sides above; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, holoptic in males. Antennae intermediate in length, ranging from about one-half as long as face to as long as face; third segment quadrate, about as long as broad; arista long, about one-fourth longer than antenna.

Thorax: slightly longer than broad, with pleurae and frequently sides of mesonotum pollinose, with short pile; meso-anepisterna with posterior apical edge frequently swollen and ridge-like; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna pilose, greatly developed, with a membranous stripe dividing base from developed ventral portion; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae elongate; scutellum with a broad emarginate apical rim, with or without ventral pile fringe. Legs: hind femora strongly swollen, with ventral triangular plate on apical third on outside; hind tibiae ending in a broad rounded spur.



Male genitalia. 70, *Tropidia quadrata* (Say); 71, *Hemixylota varipes* Shannon & Aubertin (PT). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Wings: marginal cell open; apical cell closed distinctly before reaching costa, with petiole very short and shorter than humeral crossvein; anterior crossvein at or beyond middle of discal cell, frequently on outer third of discal cell; apical and posterior crossveins continuous, without spurs at their bases.

Abdomen: elongate, with sides converging slightly towards the apex.

Material examined: 20(6); *calcarata* Williston, *quadrata* (Say), *scita* (Harris) and a couple of undetermined neotropical species.

Discussion: *Tropidia* is readily recognized by its triangular ventral plate on the hind femora and strongly carinate faces. The divided metasternum of *Tropidia* is a unique character among the syrphids. *Tropidia* is a Holarctic genus with six species extending south along the temperate Andes into Chile. A single species, *dicentra* Speiser, has been described from outside the Holarctic and Neotropical Regions. However, the description of this African species suggests that it does not belong to *Tropidia*, the face and plate on hind femora being unlike those of a typical *Tropidia*. Shannon and Aubertin (1933) provided a key to four of the Neotropical species.

Genus **Hemixylota** Shannon and Aubertin

(Fig. 71)

Hemixylota Shannon and Aubertin, 1933, Dipt. Patagonia S. Chile 6:146. Type-species, *Hemixylota varipes* Shannon and Aubertin, 1933 (original designation).

Head: slightly higher than long; face bare, pollinose, concave; cheeks linear, about twice as long as broad; facial grooves very short, extending along lower sixth of eyes; facial stripes distinct and pilose; frontal prominence low, slightly above middle of head; front of male long, slightly longer than vertical triangle; vertical triangle rectangular, only slightly broader at occiput than at front, about one-fourth longer than broad; front of female broad, slightly broader than long, as long as face, with sides slightly convergent above, about three-fourths as broad at ocellar triangle as at antennae; ocellar triangle distinct before posterior margin of eyes. Eyes bare, dichoptic in male, separated in male by about width of ocellar triangle. Antennae short, about three-fourths as long as face; third segment orbicular; arista long, about one-third longer than antenna.

Thorax: slightly longer than broad, with short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; mero-pleurae bare; metathoracic pleurae bare; metasterna pilose and developed; postmetacoxal bridge incomplete; metathoracic spiracle small; pleurotergite not carinate; plumulae elongate; scutellum with a ventral pile fringe and distinct apical emarginate rim. Legs: simple; hind femora with only a few ventral spines. Wings: marginal cell open; apical cell petiolate, with long petiole; anterior crossvein distinctly before middle of discal cell.

Abdomen: elongate, with parallel sides.

Material examined: 3(3); *varipes* Shannon and Aubertin (PTs) *.

Discussion: In appearance, *Hemixylota* looks like a typical *Xylota* but with dichoptic eyes in the male and anterior crossvein distinctly before middle of the discal cell. *Xylota* is the only genus with which *Hemixylota* is likely to be confused, but besides the obvious differences mentioned above, *Hemixylota* differs from *Xylota* by its: 1) much smaller metathoracic spiracle, only about one-half as large as third antennal segment; 2) lack of trochanteral spurs in the male; and 3) lack of ventral spines on probasitarsi of male. *Chamaesphegina* might be confused with *Hemixylota* because of its concave face, orbicular third antennal segment and elongate abdomen but its lack of subscutellar fringe, scutellar bristles, and reduced alulae will clearly separate *Chamaesphegina* from *Hemixylota*.

Only three species of *Hemixylota* have been described. All species were described from the Chilean Subregion of South America by Shannon and Aubertin (1933) who have provided comparative notes for the identification of the various species.

Genus **Stilbosoma** Philippi

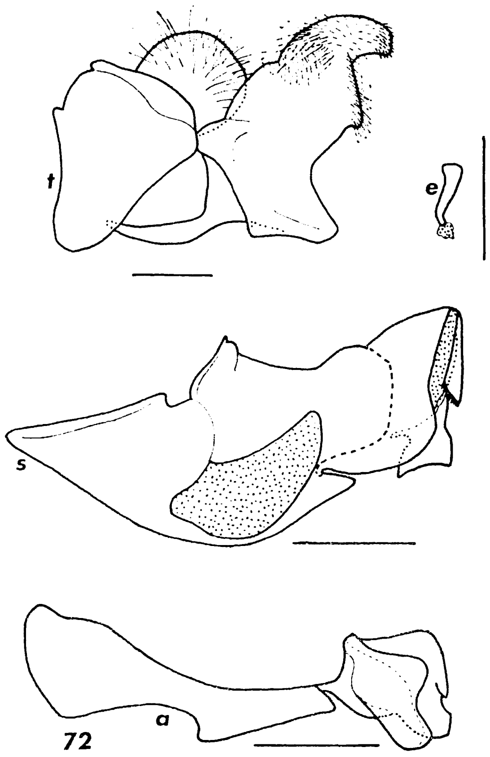
(Fig. 25, 72)

Stilbosoma Philippi, 1865, Verh. Zool.-Bot. Ges. Wien 15:736. Type species, *Stilbosoma rubiceps* Philippi, 1865 (subsequent designation; Shannon 1926, Proc. U.S. Nat. Mus. 69(9):45).

Head: higher than long; face bare, thinly pollinose, concave; cheeks linear, more than twice as long as broad; facial grooves short, extending along lower fourth of eyes; facial stripes distinct, pilose; frontal prominence greatly produced forward, extending far beyond oral margin, above middle of head; front of male long, slightly longer than broad, as long as vertical triangle; vertical triangle slightly swollen, rectangular, broader than long, with sides straight; front of female broad, as broad as face, about as long as broad, about one-fourth longer than face, with parallel sides; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, broadly dichoptic in male. Antennae short, about two-thirds as long as face; third segment large, orbicular; arista short, only about a third longer than antenna.

Thorax: as broad as long, with short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna greatly developed, pilose; postmetacoxal bridge incomplete; metathoracic spiracle large, but not as large as third antennal segment; plumulae elongate; scutellum with ventral pile fringe and distinct apical emarginate rim. Legs: hind coxae with a blunt tubercle on inside; hind femora swollen, with apical ventral large notched plate on outside. Wings: marginal cell open; apical cell distinctly closed before reaching costa, but with very short petiole; anterior crossvein at outer fourth of discal cell, with anterior three-fourths strongly oblique and continuous with appendix, at junction of oblique and straight sections.

Abdomen: short and oval.



72, male genitalia of *Stilbosoma ruficeps* Philippi. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Material examined: 2(2); *cyanea* Philippi *, *rubiceps* Philippi *.

Discussion: *Stilbosoma* is unique among syrphids for its long spur on the anterior crossvein and large notched ventral plate on hind femora. The spur, which Curran (1923) has called r5, to my knowledge is not only unique among syrphids but all cyclorrhaphous Diptera. Only two species of *Stilbosoma* are known. Both are restricted to the Chilean Subregion of South America and can be easily separated by the color of their heads: *cyanea* has a shiny black face and front; whereas *rubiceps* has an orange face and front.

Genus **Milesia** Latreille

(Fig. 73)

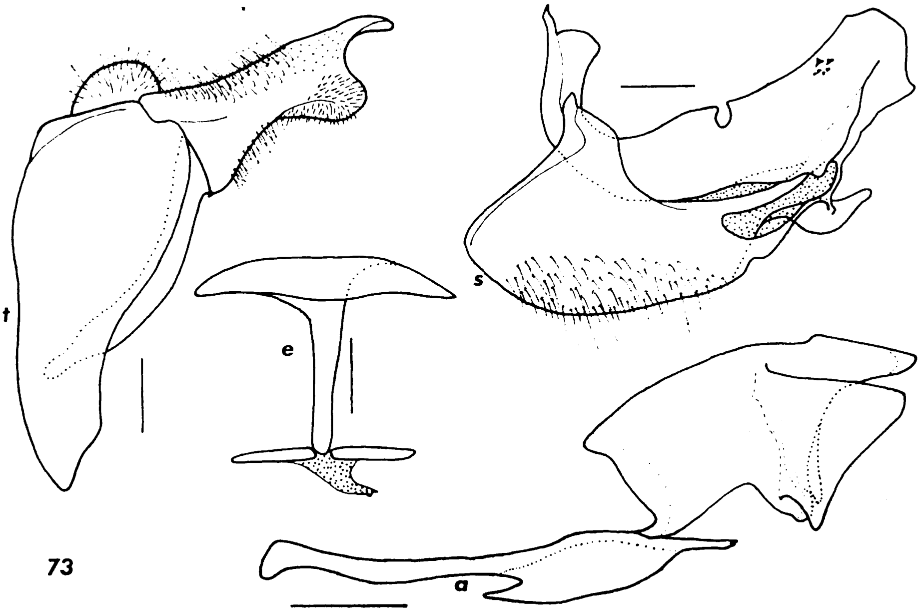
Milesia Latreille, 1804, Nouv. Dict. H. N. 24 (*Tab.*) :194. Type-species, *Syrphus crabroniformis* Fabricius, 1775, by designation of Williston, 1887, Bull. U. S. nat. Mus. 31:254. To preserve the long and almost universal usage of *Milesia* in the sense of *Syrphus crabroniformis* Fabricius, as type-species, the International Comission on Zoological Nomenclature should be asked to suspend the rules and suppress Rondani's (1844. Nuovi Ann. Sci. nat. Bologna (2)2:455) designation of *Musca diophthalma* Linnaeus (Type-species of *Spilomyia* Meigen) and to place *Milesia* Latreille on the Official list of Generic Names with *Syrphus crabroniformis* Fabricius as type-species (see Williston, 1887:254-255).

Head: higher than long; face bare in middle, distinctly pilose on sides, extensively pollinose, concave; cheeks linear, more than twice as long as broad; facial grooves short, extending along lower third of eyes; facial stripes indistinct, pilose; frontal prominence low, slightly above middle of head; front of male short, more than three times as long as eye contiguity, two-thirds as long as vertical triangle; vertical triangle long, about as long as face, more than twice as long as broad at occiput; front of female narrow, about three-fifths as broad at antennae as long, about one-fourth longer than face; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, narrowly holoptic in males. Antennae short, about half as long as face; third segment quadrate with apical end slightly rounded; arista long, more than one-half longer than antenna.

Thorax: usually longer than broad, with short pile, usually with bright color and pollinose markings; meso-katepisterna continuously pilose from ventral to dorsal margins; meso-anepisterna with anterior portion frequently with pile on upper half, with posterior apical edge swollen ridge-like; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna pilose, greatly developed; postmetacoxal bridge incomplete; metathoracic spiracle large, as large as third antennal segment; plumulae short, frequently very short; scutellum with ventral pile fringe and distinct apical emarginate rim. Legs: hind femora slightly swollen, with a small ventral spur near apex. Wings: marginal cell petiolate, with a long petiole; apical cell petiolate, with a long petiole; anterior crossvein at outer fourth of discal cell, greatly oblique; apical and posterior crossvein continuous, without spurs at their bases; anal cell with petiole meeting wing margin perpendicularly.

Abdomen: elongate and parallel-sided.

Material examined: 50(2); *brunetti* Hervé-Bazin, *scutellata* Hull and *virginiensis* (Drury).



73, male genitalia of ***Milesia virginiensis*** (Drury). a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view.

Discussion: *Milesia* is readily recognized by its strongly concave face and petiolate marginal cell. The only other groups with petiolate marginal cells, the Eristalina and some volucellines, all have tuberculate faces. *Milesia* appears to be one of the most highly specialized syrphid genera as the following characteristics would seem to indicate: 1) petiolate marginal cell; 2) apical anterior crossvein, at outer fourth or more of discal cell; 3) greatly developed metasterna; and 4) concave face.

Milesia, which is a predominantly Oriental genus, is represented by only five New World species, of which two are found in the Neotropical Region. Both species are restricted to Central America. The comparative notes provided by Fluke (1939) in his description of *nigra* will separate this species from the rest of the New World species, to which Hull (1924) has provided a key.

Genus **Spilomyia** Meigen

(Fig. 74)

Spilomyia Meigen, 1803, Mag. Insektenkunde 2:273. Type-species, *Musca diophthalma* Linné, 1758 (subsequent designation; as *Syrphus diophthalmus* Fabricius, Coquillett, 1910, Proc. U.S. Nat. Mus. 37:607).

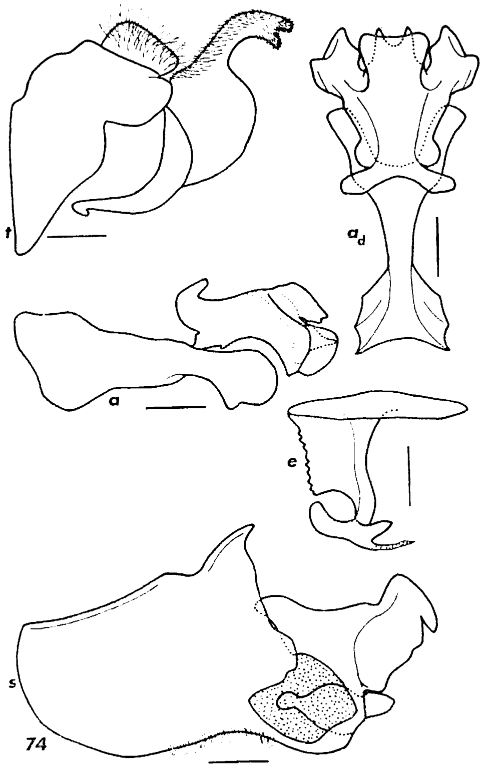
Head: higher than long; face bare in middle, pilose on sides above, straight with a slightly produced epistoma, in some species with a low medial tubercle; cheeks linear, more than twice as long as broad; facial grooves short, extending along lower third or eyes; facial stripes indisctint, pilose; frontal prominence low, on upper third of head; front of male short, about twice as long as eye contiguity, about three-fourths as long as vertical triangle; vertical triangle long, half as long as face, more than twice as long as broad at occiput; front of female broad, ranging from two-thirds to three-fourths as broad at antennae as long, about one-third to one-fourth shorter than face, with slightly convergent sides above; ocellar triangle distinctly before posterior margin of eyes. Eyes bare, holoptic in males. Antennae short, ranging from three-fourths to one-third as long as face; third segment suboval, slightly longer than broad; arista short, shorter than or equal to antenna.

Thorax: about as broad as long, with short pile; meso-katepisterna with separate dorsal and ventral pile patches; meso-anepisterna with anterior portion pilose; meso-anepimera with posterior portion pilose on anterior basal half; meropleurae bare; metasterna pilose, greatly developed; meta-episterna with a distinct pile patch below and behind spiracles; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae elongate; scutellum without a ventral pile fringe, usually with a distinct apical emarginate rim, without a rim in *gratiosa*. Legs: hind femora elongate, slightly swollen, with a ventral spur on outside near apex. Wings: marginal cell broadly open; apical cell distinctly closed before wing margin but with a very short petiole; anterior crossvein at outer fifth of discal cell, greatly oblique; anal cell with petiole greatly elongate and parallel to wing margin.

Abdomen: suboval, with apical half of second segment and all of third and fourth segments emarginate.

Material examined: 22(1); *ephippium* (Osten Sacken) (HT), *fusca* Loew, *gratiosa* Wulp*, *haemifera* Loew, *interrupta* Williston, *longicornis* Loew, *pleuralis* Williston (HT) *quadrifasciata* (Say) and *texana* Johnson (HT).

Discussion: The presence of pile on both the anterior portion of the meso-anepisterna and meta-episterna as found in *Spilomyia* is a unique combination among the milesine syrphids. Other distinctive characteristics of *Spilomyia* are; 1) anterior crossvein strongly oblique and extending to outer fifth of discal cell; 2) hind femora with a small ventral spur near the apex; 3) scutellum with apical emarginate rim; and 4) eyes with metallic patterns. The very similar wing venation of *Spilomyia* and *Milesia* along with the common possession of character 2 and 3 above indicate a close relationship between the two genera. Only one species of *Spilomyia* has been described from the Neotropical Region. *Spilomyia gratiosa* Wulp was described from Argentina and I



74, male genitalia of *Spilomyia gratiosa* Wulp. a, aedeagus and apodeme; e, ejaculatory apodeme; s, sternum 9; t, tergum 9; all lateral view, except a_d dorsal view.

have figured the male genitalia of a specimen from the coastal mountains of Brazil. This species does not appear to have been recorded since it was originally described. *Gratiosa* has an extensively yellow pleuron and will key to *pallipes* Bigot in Curran's key to Neartic species (1951). However, it should be readily recognized by its distinctive color pattern which was beautifully illustrated by Wulp (1888) in his original description.

Genus **Cacoceria** Hull

Cacomyia Hull, 1930, Trans. Amer. Ent. Soc. 56:147 (preoccupied, Coquillett 1906). Type-species, *Cacomyia cressoni* Hull, 1930 (original designation).

Cacoceria Hull, 1936, Ent. News 47:277 (new name for *Cacomyia* Hull).

Head: twice as high as long; face bare, pollinose, straight with a low medial tubercle, produced downward; cheeks broad, as broad as long; facial grooves short, extending along lower third of eyes; facial stripes indistinct; frontal prominence low, as high as facial tubercle, at upper third of head; front of male long, about one-third longer than eye contiguity; vertical triangle small, one-half as long as eye contiguity, about twice as long as broad; front of female short, only three-fourths as long as face, narrow, longer than broad at antennae; ocellar triangle slightly protuberant and distinctly before posterior margin of eyes. Eyes bare, holoptic in male. Antennae very long, more than one and one-half times as as long as face; first segment elongate, about four times as long as broad; second segment elongate, more than twice as long as broad; third segment elongate, in female more than twice as long as broad, in male with two long slender adjacent prongs of equal length; arista short, shorter than antenna.

Thorax: as long as broad, with short pile; meso-katepisterna with two widely separated dorsal and ventral pile patches; meso-anepimera with posterior portion bare; meropleurae bare; metathoracic pleurae bare; metasterna pilose, greatly developed; postmetacoxal bridge incomplete; metathoracic spiracle small; plumulae short; scutellum with a ventral pile fringe, without a distinct apical emarginate rim. Legs: hind femora greatly swollen medially, tapered at both ends, spindle shaped, with a row of distinct long ventral spines on apical third; hind tibiae strongly arcuate, ending in long ventral spur. Wings: marginal cell open; apical cell petiolate; anterior crossvein at or beyond middle of discal cell, straight.

Abdomen: constricted, with second segment forming petiole, with constriction only one-half of width of second segment.

Material examined; 2(2); one undetermined species.

Discussion: *Cacoceria* is a rather aberrant genus not closely related to any other milesine genus. The very long antennae, with deeply bifurcate third segment in the male, is unique among the syrphids. The pilose and well-developed metasterna, enlarged hind femora, tuberculate face in both sexes and subscutellar fringe places the genus in the Milesini but neither the male genitalia nor any other characteristic reveals any indication of the probable ancestral group. Thompson (1968) called *Cacoceria* a genus of Myoleptini but at that time I was not clear about the limits of either the Myoleptini or Milesini. Only two known species of *Cacoceria* are from Mexico and Peru, respectively.

ZOOGEOGRAPHY OF THE NEOTROPICAL MILESINAE

A REVIEW OF CONTINENTAL DRIFT AND ITS EFFECT ON THE NEOTROPICAL FAUNA

Ever since evolution replaced the biblical notion of special creation as an explanation of organic diversity, biologists have been left with the questions of when, from where, and how animals became distributed. In fact, it was the observation of present and past distributions of animals, particularly those of South America, that led Darwin to doubt the idea of special creation and to suggest evolution instead. Thus, modern zoogeography began with Darwin's *On the Origin of Species,* 1859. Since then, there have developed two main schools of thought on animal and plant distribution.

One school, Wegenerians, has stressed the positions of and connections between the land masses as being of major importance in the dispersal of living things. The other school, Matthewites, feels that the movement of the continents and the presence of land bridges other than those present now are not necessary to explain the distribution patterns of life. They maintain that the forces of competition and climate working directly and through evolution are sufficient to account for the distribution patterns of animals and plants.

As with all disputes, neither side is all right or all wrong and both have valid points. As Darlington, a Matthewite, has clearly stressed, favorable climate and large areas are related to the evolutions of dominance among animals and there *is* a trend for the more competitive organism to evolve and disperse from the tropics and to replace the less efficient elsewhere. But it is also true that the continents have not long been where they are and their migration *has* influenced the distribution of past and present organisms. To deny either one is to see only half of the true picture. Since Darlington (1957:chap.9; 1965:chaps.5&6) has done an excellent job in summarizing the interrelationships and effects of area, climate, and evolution on dispersal and distribution patterns, I will not delve into these here. However, the past history of land connections has been greatly neglected in the biological literature due to the dominance of the Matthewite school of thought. Therefore, I will briefly review these connections and their biological implications for South America.

The following review of the geologic history of South America and the southern continents is mainly based on King's *Morphology of the Earth* (2nd Ed., revised 1967) but other sources such as Carey (1958) and Runcorn (1962) have been reviewed. It is restricted to describing the relative positions of the continents and the major geologic events that might have biological significance.

Fortunately, the history of the geographical relationhips of South America to other land masses is fairly well known since South America has been one of the key points of emphasis in proof of the Continental Displacement. When animals first came out on land, sometime in the Devonian Period or earlier, South America probably was part of a large supercontinent called Gondwanaland. Gondwanaland consisted of all the southern continents: South America, Africa, Antarctic, India, Australia, and associated islands. It is not clear when this supercontinent was first formed since as one goes further back into time the geological record becomes more fragmentary. There are some indications, such as strike direction in the basement rock of the southern continents (King, 1967:84), that Gondwanaland has existed since

Pre-Cambrian times. By the time of the arrival of the first insects in the Carboniferous the evidence is overwhelmingly in favor of the existence of Gondwanaland.

Although the southern continents were united in a single unit throughout the Paleozoic Era, they were not stationary. They moved considerably as a unit before breaking up as the accompanying text maps illustrate. This displacement has been a critical determinant of climate since it has determined position relative to the poles and thus has affected the angle of incidence of sun's rays. Gondwanaland was tropical for most of its existence[1]. As Darlington (1957, 1965) has maintained, the tropics are the workshop of evolution and the main trend in animal distribution is for dominant groups to arise in the tropics and to move outward. Thus, the paleoclimate of South America, as determined by the relative continental position, is a major factor in the determination of the size and diversity of the Neotropical fauna.

Besides the paleoclimate of South America, the history of accessibility of South America to the influx of animals from other continents is also a major factor affecting faunal composition. During the Paleozoic Era there were a number of cordilleras stretching across the various areas of Gondwanaland that later brooke up into the present southern continents. These formerly continuous cordilleras provide an explanation for the present disjunctive distribution of various ancient cold-adapted groups of animals in the southern hemisphere, as has been shown by Brundin (1966) for the primitive austral chironomid midges. The question of whether there was a connection between the southern land mass, Gondwanaland, and its northern counterpart, Laurasia, during the late Paleozoic is still a moot point. Present geological evidence strongly suggests that if there was a connection between Laurasia and Gondwanaland, it *was not* through the South American area of Gondwanaland.

Gondwanaland was extensively glaciated towards the end of the Carboniferous Period and during the early part of the Permian Period. It was then much farther south than now and the land mass was moving through the South Pole area (Irving and Robertson, 1968). As Gondwanaland swung in an arc across the South Pole, the land mass was progressively glaciated slowly from west to east. The glaciation was followed by a cold-temperate climate period. Thus, for example, Australia was glaciated later than the other continents and remained cold throughout the Permian while the Congo and India were semi-tropical (King, 1967:55). The Permo-carboniferous glaciation was restricted to the southern continents, as one would expect if the phenomenon was due to the displacement of the continents and not a world-wide climate change.

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(1) The tropics are by definition the areas of the earth where the sun's rays fall perpendicularly (Darlington, 1957:4). Thus, the tropics are bounded by the tropic of Cancer and Capricorn (23°27' north and south of Equator).

The disruption of Gondwanaland in the Mesozoic Era into its various component continents was the result of two major breaks (see text maps). The first divided Gondwanaland into a western and an eastern component. The eastern component consisted of Australia, India, and possibly Antarctica, whereas the western part contained South America and Africa. The questionable position of Antarctica in either the western or eastern component is due mainly to the lack of paleomagnetic data from this continent.The time of this first break is also somewhat uncertain at present. Opinions on the time of breakup of eastern Gondwanaland range from the beginning of the Mesozoic to the beginning of the Tertiary. Irving and Robertson (1968) have suggested that the fragmentation began between the Permian and Triassic Periods whereas King (1967) thinks it started in the middle of the Jurassic Period. These discrepancies need not worry the reader since the connections between South America and the continents of eastern Gondwanaland were always indirect, either though Africa or Antarctica. Thus, the important break is the second one, between South America and Africa (or the rest of Gondwanaland, if you please), and the time of occurrence of this break is well documented. In the mid-Cretaceous period the Atlantic basin began to open up in the south and gradually the two continents, Africa and South America, moved apart. The separation was complete by Upper Cretaceous times and South America drifted slowly westward to its present position, arriving there at the beginning of Tertiary times.

The rest of the geological story of South America is the same whether one be a Wegenerian or conventional geologist. As Darlington has defended and clearly stated, *"the Tertiary isolation of South America is a fact"* (Darlington, 1957:594). However, during the Tertiary the water gap between North America and South America fluctuated in size with changes in the geomorphism of Central America and the Antilles. There were two island arcs. Lesser Antilles and present Panama area, over which some animals could have "leap-frogged" their way into or out of South America. The Lesser Antilles form such a connection from South America through Trinidad and Tobago to Greater Antilles, the latter being simply an extension of the North American cordilleran structures. The Panama island arc connected Colombia with the south borders of Nicaragua. Both island arcs appear to have been present and above water since the late Cretaceous Period. During the late Pliocene and early Pleistocene the Panama island arc became a continuous land bridge.

In summary, there are three key geological time points in respect to the biogeography of south America. *First,* up to the mid-Cretaceous times South America was directly connected to Africa, and earlier still in the Paleozoic Era both of these continents were also attached to Antarctica, Australia, and India, forming a single land mass called Gondwanaland. *Second,* South America was an island from the time it separated from Africa until the time the present isthmus of Panama was formed, that is, from Upper Cretaceous to the end of Tertiary.

Third, throughout the Tertiary there was a fluctuating water gap between them. Therefore, there should be three corresponding faunal and floral strata in South America, reflecting the geologic history: old residents from Gondwanaland, island-hoppers crossing narrow water gaps from North America during the Tertiary, and recent arrivals coming by way of the isthmus of Panama during the Pleistocene.

GENERAL ANALYSIS OF THE ZOOGEOGRAPHY OF THE NEOTROPICAL MILESINE FAUNA

GROSS STATISTICAL ANALYSIS OF THE NEOTROPICAL MILESINE FAUNA IN COMPARISON TO THE OTHER REGIONAL FAUNAS.

The zoogeography of the Neotropical milesine syrphids will be examined from a general viewpoint; first, by comparison of the gross statistics (such as number of species and genera) of the Neotropical milesine fauna with the fauna of various other regions; and second, by plotting the distribution of the Neotropical genera on maps and studying the resulting patterns. The treatment of the individual genera has been included under the generic discussions.

Table III lists the number of milesine genera and their species endemic to each particular region, along with the total number of milesine genera and species for that region. The species counts are approximate for the number of species described as of 1965 exclusive of fossil species, and were compiled from the following sources: Wirth *et al.* (1965) for the Nearctic region, exclusive of Mexico; Fluke (1956) for the Neotropical region and Mexico; Hull and Fluke (1950) for the genus *Cheilosia, sensu lato;* Hull (1949) for the rest of the world; and the Zoological Record (1945-65). During the course of this study

Table III. Number of genera and species, total and endemic, for each faunal region

Region	nº endemic genera-species	nº genera	nº species
Palearctic	16 -- 32	70	805
Nearctic	15 -- 35	66	738
Holarctic	17 -- 513	91	1523
North-Temperate	48 -- 579		
Ethiopian	5 -- 19	22	267
Neotropical	26 -- 137	42	570
Oriental	9 -- 20	47	652
Australian (includes Oceania)	13 -- 19	26	150

on Neotropical milesine genera I have critically reviewed about 80% of the world milesine genera. The total number of genera and the number of endemic genera listed for each particular region considerably reflect my opinions of what are good genera (see Appendix II).

The amount and nature of the taxonomic work on a particular region can greatly affect the number of taxa being recorded for the area. In the analysis of any quantitative zoogeographic data the taxonomic bias should be nearly the same from region to region. The only area of the world on which there has been significantly more systematic work done relative to the rest of the world is Europe. Thus the greater amount of taxonomic work on the Palearctic region may bias the figures. Whether taxonomists split or lump taxa in their work can also affect the number of taxa. Thus it is essential that degree of clustering of taxa be nearly the same for the faunal regions being compared. On the species level, the problem of the "splitters and lumpers" is not significant in syrphids since there has been very little use of the infraspecific categories, such as variety, form, subspecies, *etc.*, and most workers have used the same operational definition of a species. On the generic level, when I critically reviewed the world milesine genera I tried to apply criteria (see Introduction, definition of genus) uniformly so that figures for the numbers of genera for each region would have a uniform base. Only in some of the eristaline groups do I feel that I may have had a tendency to lump more than I did elsewhere. I have not recognized a number of subgroups in the Eristalini, such as the subgenera of *Mallota, Mesembrius,* and *Eristalis.* There undoubtedly has been a large eristaline radiation in the Old World tropics and some of the groups that I have not recognized are possibly valid; a thorough study is needed. When the cristaline radiation is worked out, it is doubtful that more than a dozen genera will be added to the syrphid faunas of the Old World tropics (Ethiopian and Oriental). Such an eventuality would not upset my conclusions on zoogeographic relationships between the Neotropical fauna and the rest of the world. Thus the numbers in Table III should allow for reliable zoogeographical interpretations.

The regional milesine faunas are either quite large or small; none are intermediate in size. Interestingly, the range of variation in the number of species amongst the small faunas is the same as for the large faunas, about 150 (except for the intensively worked Palearctic fauna). Even the minimum gap between the numbers of species in the large and small faunas is more than twice the above figure, over 300. The Neotropical region, along with the Palearctic, Nearctic, and Oriental regions, has as relatively large, rich milesine fauna, whereas Australian and Ethiopian regions have rather depauperate faunas.

The various faunal regions are not of uniform land size (Table IV) and because large areas tend to have larger numbers of taxa than smaller areas, dividing the number of taxa by a unit of area produces more meaningful comparative figures. The effects of area on number of taxa are not arithmetic but geometric. However, within

Table IV. Land area for each faunal region, from Lane (1949)

Region	Area of region in square miles	Rank
Palearctic	17,421,000	1
Nearctic	7,335,000	4
Holarctic	24,756,000	-
Ethiopian	10,762,000	2
Oriental	4,120,000	5
Neotropical	7,721,000	3
Australian	3,610,000	6

the range of values for the areas used in the present analysis, an arithmetic interpretation is sufficient to compensate for the area factor and thus to help evaluate the other influences affecting faunal size (see Williams, 1964, for details on the mathematical interpretation of species and area problems).

The numerical relationships between land area and number of taxa is nct the same for all categories: as area becomes smaller, there is a greater effect on the lower categories like species than on higher categories like genus. Thus, a very small area may have many genera but only one species per genus, whereas a large area may have a few more genera but many more species per genus. For example, the milesine fauna of the Juan Fernandez Islands consists of two tribes representing two broad ecological niches, the terrestrial short-tailed maggots and the aquatic long-tailed maggots, but only one genus and species for each of the two broad niches as opposed to Chile with five tribes, twenty-three genera, and about fifty species representing the same two broad niches

The relationships indicated for the different milesine faunas based on the diverty per unit area (Table V) are quite different from those based on the unadjusted numbers of taxa (Table III) per faunal area. Although Africa, even based on diversity per unit area, has a depauperate milesine fauna, the small Australian fauna is as rich in species per unit area as is the Palearctic fauna and about twice as rich in genera. The Neotropical and Nearctic milesine faunas are intermediate in terms of diversity per unit area and the Oriental region has significantly more milesines than all others.

The differences between the figures of diversity per unit area for the various milesine faunas reflect mainly variation in climate and to some extent the history of accessibility of each faunal region to animals from other regions. Tropical climates produce much larger faunas than temperate climates when the land areas and other factors

Table V. Milesine diversity per unit area (100,000 sq.miles) for each faunal region

Region	Generic	Specific
Palearctic	.42	4.6
Nearctic	.90	10.0
Holarctic	.37	6.1
Ethiopian	.20	2.5
Neotropical	.55	7.4
Oriental	1.14	15.8
Australian	.72	4.2

are equal. Islands and isolated continents generally have smaller faunas than connected areas when climate, area, *etc.* are equal[1] (see Darlington 1957&1965, and also MacArthur and Wilson 1966, for detailed discussion of the area, accessibility, and climate factors). Unfortunately, there is no numerical method or index for working with the climate or accessibility factors of a faunal region for the study of the taxonomic diversity of that region as there is for the area factor. Thus the best way to study the effects of the climate and accessibility variables is to designate a "standard" faunal region and compare the others with it. The Oriental region has the optimal conditions of both climate and accessibility and therefore provides a good reference point or "standard" for comparsion.

As Darlington (1957) has pointed out, the tropics are the workshop of evolution and for the workshop to be most efficient in producing species variety, it must be readily accessible for the inflow of new types.The Oriental region is almost completely within the tropical belt of the world with mostly tropical rain forest type of habitat, and has been readily accessible to the Palearctic and other faunal regions throughout the Cenozoic Era. As would be expected of a region with such ideal conditions, the Oriental region has a significantly greater milesine generic and species diversity per unit area than all other faunal regions. The Neotropical region and Australian region to a lesser extent also have extensive tropical areas, but both of these regions have been isolated from the rest of the world for long periods

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(1) The above are general statements applying to taxonomic units occupying a wide variety of habitats and niches (**sensu** Elton). The milesine syrphids are such a large, diverse group that these general statements do have applicability to them. However, it would be absurd to apply, for example, the statement about tropical climate to a group like the Capniidae, a strictly cold adapted group of stoneflies.

of time and this isolation probably accounts for their smaller unit-area faunas of milesines relative to the Oriental region.

If isolation has indeed been a major factor in determining the diversity of a fauna, then one would expect a high percentage of endemic genera and a high endemic quotient (EQ). Endemic quotient is defined as the percentage of the *total number of species* represented by the *species in the endemic genera.* The endemic quotient and percentage of endemic genera are about the same for all faunal regions except for the Australian and Neotropical[1] regions (see Table VI).

Table VI. Endemic levels for each milesine syrphid fauna

Region	Per cent of Endemic Genera	Endemic Quotient
Palearctic	23	04
Nearctic	23	05
Holarctic	53	38
Ethiopian	23	07
Neotropical	62	24
Oriental	19	03
Australian	50	13

$$\text{Endemic Quotient} = \frac{\text{nº species belonging to endemic genera}}{\text{nº species belonging to all genera}} \times 100$$

The high endemic levels (EQ and percentage of endemic genera) for the Neotropical and Australian milesine syrphid faunas confirm the geological evidence that these faunas have long been isolated. The difference in endemic levels between Neotropical and Australian milesine syrphid faunas are probably due mainly to differences in accessibility and secondarily to differences in sizes of the regions. Table VI can be modified to show, by dividing by units of area (million square miles, 8 and 4, for example), that the endemic diversity per unit area is slightly higher for the Australian fauna than the Neotropical. Thus it can be safely stated that the slightly higher endemic levels per unit

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(1) The endemic quotient of the Neotropical region is rather conservative because of the arbitrary boundary of the Neotropical region which excludes the consideration of *Copestylum* and *Palpada* as endemic Neotropical genera. These two large genera account for about 70% of the total South American milesine fauna but about 10% of species of *Copestylum* and *Palpada* have extended their ranges across the Neotropical Nearctic boundary into Mexico and southern United States (see below under Transition between Neotropical and Nearctic fauna). If these two Neotropical radiations were scored as endemic, since they certainly had a recent origin in South America, the endemic quotient would be about 98% instead of 62%.

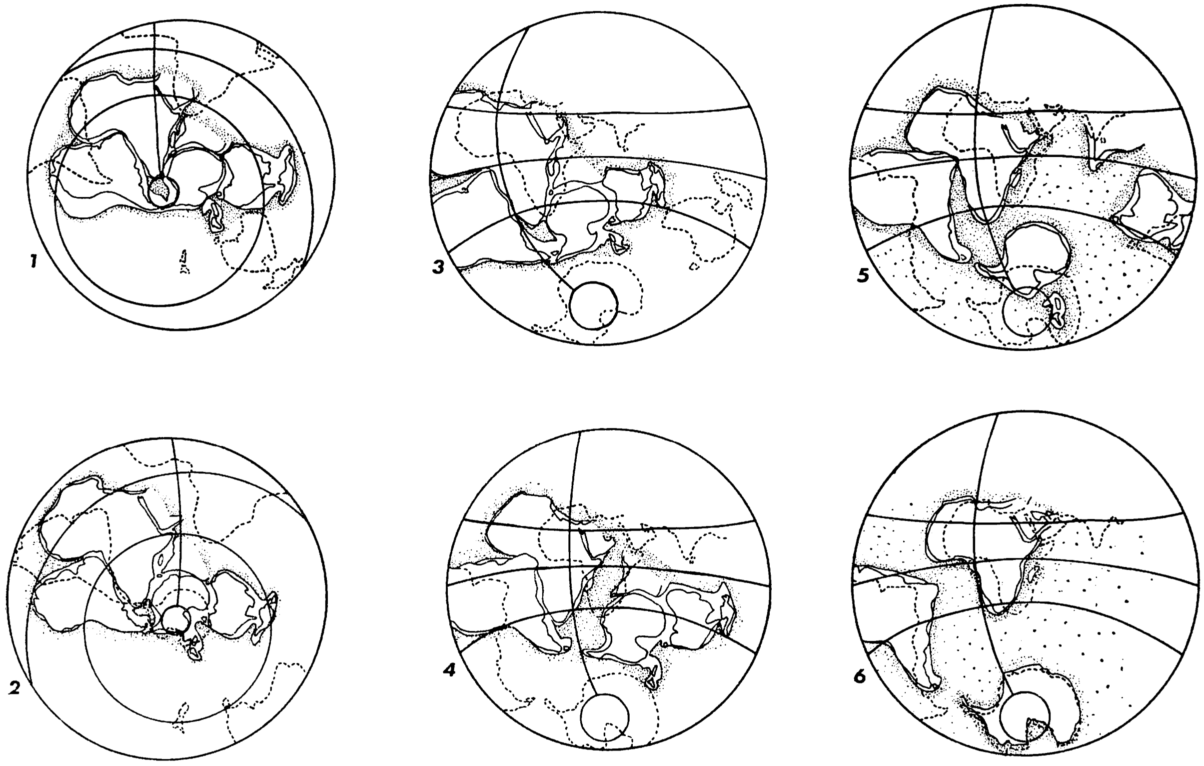
area for the Australian region are due to its slightly longer period of isolation than that of South America.

The Holarctic or North Temperate region has been physically joined to the Ethiopian and Oriental regions throughout the Cenozoic Era (also intermittently connected to South America). Therefore, the only plausible isolating mechanism to explain the high endemicity of the Holarctic milesine fauna is climate. The southern limits of the Holarctic region are, by definition, the tropics. Thus any northern group of animals that is strictly cold adapted will be limited to the Holarctic region.

The Nearctic milesine syrphid fauna is numerically significantly larger than the Neotropical one. Since the areas of both regions are roughly the same, the difference is probably due to the greater accessibility of the Nearctic region. This greater accessibility in comparison to the Neotropical region is due to North America's intermediate position between the Old World and South America. Thus the Nearctic region can receive taxa from both the Old World and the Neotropical region, whereas the Neotropical region can receive taxa from the Nearctic region only. The Neotropical milesine contribution (8 genera and 157 species) to the Nearctic fauna alone is sufficient to compensate for the difference between the two regions. And considering that the Nearctic fauna also receives a large number of taxa from the Old World too, it is clear how the Nearctic region with less extensive tropical area can have a larger milesine fauna than South America with its extensive tropical areas.

The reasons for the apparently depauperate milesine fauna of the Ethiopian region are not clear. The relatively small African tropical rain forest area, in conjunction with the Sahara Desert acting as a barrier, could help account for the reduced faunal variety of Africa. However, the low percentage of endemic genera and low endemic quotient for the Ethiopian region tend to suggest that geographic isolation has not been a significant factor. Similarly the reasons for the significant differences between the Nearctic and Palearctic milesine faunas when adjusted for area factor are not apparent unless one assumes an upper limit for the area factor beyond which it does not affect faunal size. Both regions have a similar climate and history of accessibility.

In summary, from a gross analysis of numbers of endemic genera and their species, along with total numbers of genera and species of the milesine syrphids of the major world faunal regions, several conclusions have been reached about the Neotropical milesine fauna: 1) Neotropical milesine fauna is relatively large in terms of absolute numbers of species and genera; 2) Neotropical fauna in diversity per unit area is only intermediate; 3) South America's relatively low milesine diversity for such a large area with extensive tropical climate is probably related to long isolation from the rest of the world; and 4) South America's unusually large number of endemic genera and



Maps 1-3, Gondwanaland. 1, late Carboniferous Period; 2, early Permian Period; 3, late Triassic Period. 4, separation of Eastern Gondwanaland during late Jurassic - early Cretaceous Period. 5, Beginning of separation of South America and Africa during mid to upper Cretaceous Period. 6, South America and Africa during the beginning of the Tertiary Period.

high endemic quotient strongly supports the idea of a long isolated South American milesine fauna.

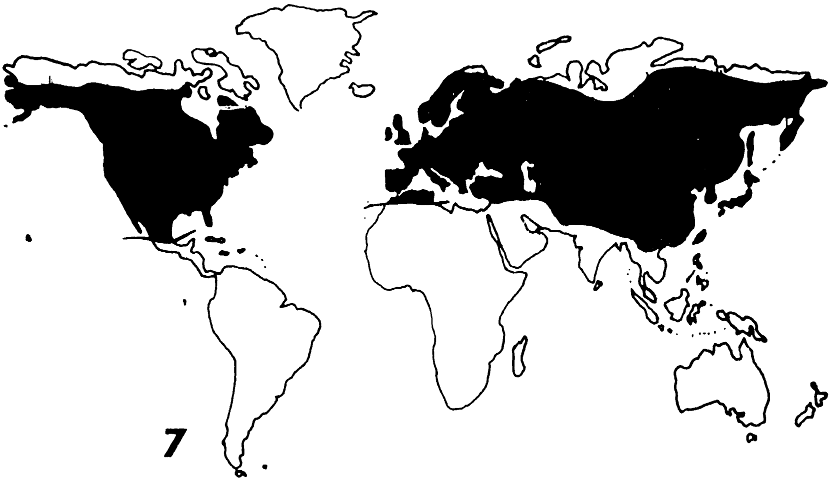
PATTERNS OF DISTRIBUTION OF THE NEOTROPICAL MILESINE GENERA

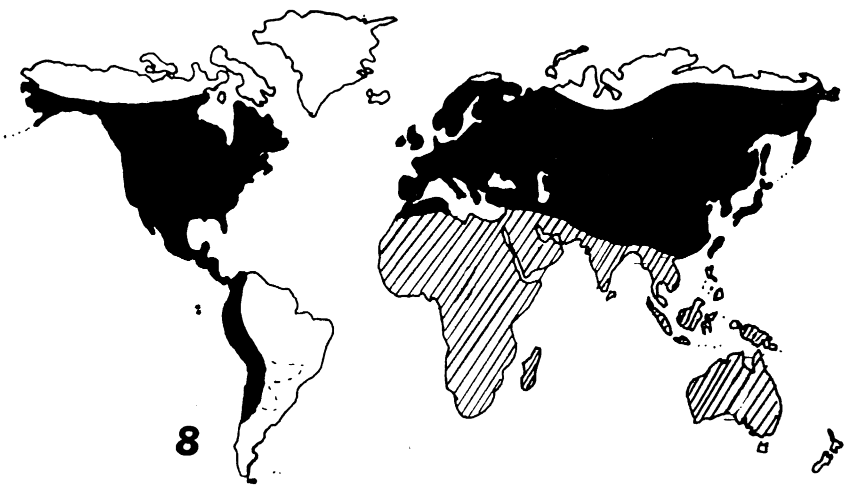
When the geographic distributions of the Neotropical milesine syrphid genera are plotted on maps of the world the results can be grouped into four distinct patterns (see text maps 7 - 10). The first pattern represents the Holarctic endemic genera extending into the transitional zone between the Neotropical and Nearctic regions and marking the southern limits of the Nearctic fauna (see section below on transition between Nearctic and Neotropical faunas).

The second pattern also represents predominantly northern groups, but these extend into the Neotropical region along the Andean cordillera. The genera of the second pattern, like the above ones, are restricted to the temperate climate except for two genera, *Rhingia* and *Spilomyia,* extending across South America from the Andes to the semitropical coastal mountains of Brazil. I have called the genera of the second pattern, "recent invaders", due to the fact that these genera have not yet: 1) evolved new generic distinctions, nor 2) adapted to the true tropical climate. The older resident groups, Pattern III, have envolved generic distinctiveness in South America and can be divided into two groups depending on whether or not some of their species have had time to adapt to tropical climates. The two groups of endemic milesine genera are reflected by their different distributional patterns; Pattern IIIa representing endemic genera which have become adapted to the tropics, whereas Pattern IIIb represents endemic genera restricted to the temperate Chilean subregion.

It is quite apparent where the non-endemic Neotropical milesine genera (Pattern II) came from since their restricted distribution in South America along the Andean cordillera, but widespread distribution in the northern hemisphere strongly suggests that these genera have recently moved into South America by way of the Panama isthmus from the north. However, the question of where the endemic Neotropical genera came from is not quite as obvious. Some Neotropical endemic genera could possibly have come also from more distant places, like Australia or Africa. To decide which was or were the source or sources of the endemic Neotropical genera, two types of approaches will be used: one, by working out the phylogenetic relationships of the endemic genera and relating this to geographic origins; and two, by comparision with the history of the land connection of South America to see which routes of introduction were most plausible.

The history of the land connections between the Neotropical region and the rest of the world has already been discussed, so it will be sufficient just to point out where the milesine syrphids fit into the time table of that history. The first fossil syrphids known are from the Eocene period and they are representative of both present day





Map 7, Pattern I, Northern Groups; map 8, Pattern II, Recent Invaders.

subfamilies. Thus, the origin of the family and divergence into two subfamilies must have been before Eocene times. The two subfamilies probably arose in the Paleocene and the family itself probably in the late Cretaceous Period (Hull, 1945; also see Hennig, 1954). The relatively young age of the family Syrphidae and the subfamily Milesinae places their origin at a period in time when South America was an island. Thus either 1) the family arose in the Neotropical region and spread out to the rest of the world, or 2) the first syrphids must

Map 9, Pattern IIIa, Endemic Groups, Radiations; map 10, Pattern IIIb, Endemic Groups, Chilean.

have crossed a water gap to South America. The presence of a large number of fossil syrphids (35 genera, 75 species) in Eocene, Oligocene, and Miocene deposits from the northern continents strongly suggests that the family did not arise in the Neotropical region, since this would have required rather rapid and frequent dispersal from South America across a large water gap in the very early part of the Tertiary. Also, as will be shown below by phylogenetic evidence, *all* endemic Neotropical milesine genera are obviously recently derived from more primitive genera in other parts of the world.

In studying zoogeographical relationships of the endemic Neotropical genera, two questions are of major interest: first, what is the location of the non-endemic group most closely related to the taxon in question (its sister-group) ; and second, if there is a non-endemic sister-group, in which direction did the past dispersal take place. If no non-endemic sister-group is found, then the group in question probably arose in the area where it is found. However, if a non-endemic sister-group is found, then there must have been some past dispersal. This dispersal could have been of two types: 1) the ancestor of one of the sister-groups dispersed to a new area, or 2) the ancestors of both sister-groups dispersed to new areas. In the first case, only two different areas are involved and in the second case, three. Almost all endemic Neotropical milesine genera have a strictly northern group as their nearest relative (see Table VII, VIII), strongly indicating that only two areas are involved as possible sources of the Neotropical endemic genera, South America itself and North America. The few remaining endemic Neotropical milesine genera, except for *Senogaster* and *Flukea,* are closely related to genera found throughout most of the world including the Nearctic region. Thus these few endemic genera could possibly have had their origins

Table VII. Sister-group relationships of the Chilean endemic milesine genera

Chilean Genus	Sister-group	Location of Sister-group	Status of Sister-group in	
			Ethiopian	Australian
			Regions	
Chamesphegina	*Neoascia* *Sphegina*	Holarctic	absent	absent
Chromocheilosia	*Myolepta*	mainly Holarctic	absent	absent
Notiocehilosia	*Callicera*	mainly Holarctic	absent	absent
Valdivia and *Odyneromyia**	*Temnostoma*	Holarctic	absent	absent
Eriophora	*Criorhina*	Holarctic Oriental	absent	???
Macrometopia	*Xylota* group	Holarctic Oriental	absent	?absent
Philippimyia	*Blera*	Holarctic	absent	absent
Hemixylota and *Stilbosoma**	*Milesia*	Holarctic Oriental	absent	absent
Flukea	*Deinches*	Australian	absent	present

*The two genera listed have the same extralimital sister-group

Table VIII. Sister-group relationships of the Neotropical milesine radiations

Radiation	Sister-group	Location of Sister-group	Status of Sister-group in	
			Ethiopian	Australian
			Regions	
Trichopsomyia	*Neocnemodon*	Holarctic	absent	absent
Ornidina	*Volucella*	mainly Holarctic	absent	a few spp.
Nausigaster and *Alipumilio*	*Eumerus*	Megagea	present	present
Lepidomyia	*Myolepta*	mainly Holarctic	absent	absent
Quichuana	*Mallota*?	mainly Holarctic	absent	absent
Habromyia	*Mallota*	mainly Holarctic	absent	absent
Palpada and *Lycastrirhynchus**	*Eoseristalis* *Eristalis*	mainly Holarctic	1 sp. (*tenax*)**	1 sp. (*tenax*)**
Meromacrus	*Eoseristalis* *Eristalis*	mainly Holarctic	1 sp. (*tenax*)**	1 sp. (*tenax*)**
Ceriana	???	???	???	???
Sterphus and *Ceriogaster**	*Chrysosomidia* *Hadromyia*	Nearctic	absent	absent
Neplas	*Chalcosyrphus*	Nearctic	absent	absent

*As in Table VII. **Eristalis tenax is now cosmopolitan and was probably introduced into the Australian and Ethiopian regions by man.

on almost any continent, but the probabilities, based on the majority of the cases being of New World origin, strongly favor that these are also of Nearctic or Neotropical origin.

Only two particular cases suggest a non-New World origin of an endemic Neotropical milesine group. The monotypic genus *Senogaster* is most closely related to *Syritta,* which is *absent* from the Nearctic region but is abundant in the Ethiopian region. *Flukea* is the sister-group of *Deinches,* an Australian endemic genus. Since *Senogaster* and *Flukea* are monotypic, I would suggest, in these special cases, either wind dispersal or rafting across the oceans to explain these two exceptions to the general pattern of endemic Neotropical milesine genera (as well as all higher Diptera - see Vockeroth 1969) - having a northern sister group.

Although most endemic Neotropical milesine genera have a northern sister-group, the location of the sister-group does not indicate the direction of past dispersal unless we know which sister-group is primitive or have other information about the geographical location of the ancestral group to both sister-groups, i.e. fossils. The fact that the sister-groups of the Neotropical endemic milesine genera are almost always found in the Nearctic region mutually supports the geological evidence that there are only two probable sources for these genera, the Nearctic or Neotropical region. The dispersal of the ancestor of either sister-group probably took place during the Tertiary Period, as indicated previously, thus allowing both sufficient time and isolation for the evolution of generic distinctiveness. The Tertiary isolation of South America, which greatly restricted faunal interchanges, would tend to cause the retention of primitive forms in the area where they arose and insure the dispersal of the derived forms across the barrier. The hypothesized nature of the selective or filtering mechanism affecting the fauna of South America, the isolating Tertiary water gap, is based on the following evolutionary observation. The fossil record indicates that higher taxa also have a definite life cycle, as species have: a new taxon comes into existence, quickly grows abundant and diverse, spreading over many niches and much land area, and then leveling off at a peak point. From this peak point in the life cycle of the taxon, one of three different things may happen: 1) the taxon may give rise to new taxa, 2) it may be replaced by another taxon and quickly go to extinction, or 3) it may persist in low numbers and in specialized niches or isolated areas. Thus it would appear that the derived groups of animals, being more numerous and widespread, have a greater probability of crossing a barrier than primitive groups which tend to be rare and restricted in range. The Tertiary ocean between South and North America was a constant barrier to syrphids: no syrphid has ever become adapted to survive in salt water. In summary, if syrphids arose in South America, then the oldest syrphids should still be there. However, if syrphids arose elsewhere, these primitive groups probably would not have been able to cross the barrier into South America and therefore they should be absent from the Neotropical region.

Table IX. Sister-group relationships of miscellaneous endemic Neotropical

Genus	Sister-group	Location of Sister-group	Status of Sister-group in Regions	
			Ethiopian	Australian
Cacoceria	*?Temnostoma*	Holarctic	absent	absent
Senogaster	*Syritta*	Megagea	present	absent

Knowing whether the endemic South American genera are either derived or primitive is essential for indicating the direction of past dispersal. In the determination of the phylogenetic relationship between the northern and Neotropical genera, the sister-groups *must* be dealt with individually. For our general purpose it is only necessary to study a few of the sister-group relationships since we are mainly concerned with the place of origin of the milesines. The answer to the question of whether the milesines arose in South America or not depends only on whether the oldest extant milesine genera are restricted to the Neotropical region or not. The oldest genera will naturally be found only in the most primitive milesine tribes — Pipizini, Cheilosini, Volucellini, and Callicerini.

Of these tribes only two[1], Pipizini and Volucellini, have endemic Neotropical milesine genera and in both of these tribes the endemic Neotropical milesine genera are the most recently derived genera in their respective tribes as indicated in the main text. Thus absence of primitive endemic genera of the primitive milesine tribes indicates that the family did not arise in South America and that almost all endemic milesine syrphids must have crossed the Tertiary water gap from the north.

TRANSITION BETWEEN THE NEARCTIC AND NEOTROPICAL MILESINE FAUNAS

Faunal regions provide a means for categorizing the main features of distribution of existing animals. Since Sclater (1857) first proposed faunal regions to explain the distribution of birds, there has been considerable controversy about the reality and practicality of these faunal regions. The controversy stems from the lack of appreciation of two fundamental facts about faunal regions: 1) the limits of faunas do not correspond exactly to certain geographical boundaries, but they tend to merge into each other in complex zones of transition; and 2) faunal regions are only pragmatical devices, representing the *average* patterns of animal distribution and thus serving as a "standard" for comparison purposes only.

An appreciation of the above two fundamental facts concerning faunal regions leads to questions as to the nature of the transition between the Neotropical and Nearctic milesine syrphid faunas — 1) what taxa are involved in the overlap; 2) how large or small a part of the main fauna are involved in the overlap; 3) what is the relative contribution of each faunal region to the overlap; and 4) how well are the distribution patterns of the milesine syrphids categorized by the faunal regions. Faunas and the transitions between them include three types of taxa: shared taxa, transitional taxa and exclusive taxa. The *shared taxa* are those equally distributed in both regions. The *transitional taxa*, which are those taxa that are predominantly distributed in one region but with a few representatives in the other region, are the only type of taxa actually involved in the overlap between faunal regions. The *exclusive taxa* (including the endemic taxa), which are those taxa distributed in one of the regions but not the other, are not involved in the overlap but the limits of their distributions define the faunal boundaries. The boundary between two faunal regions can be defined operationally as

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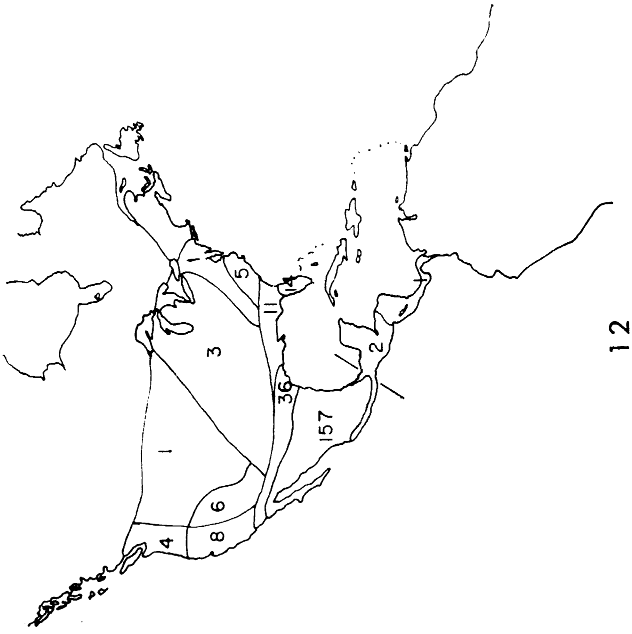
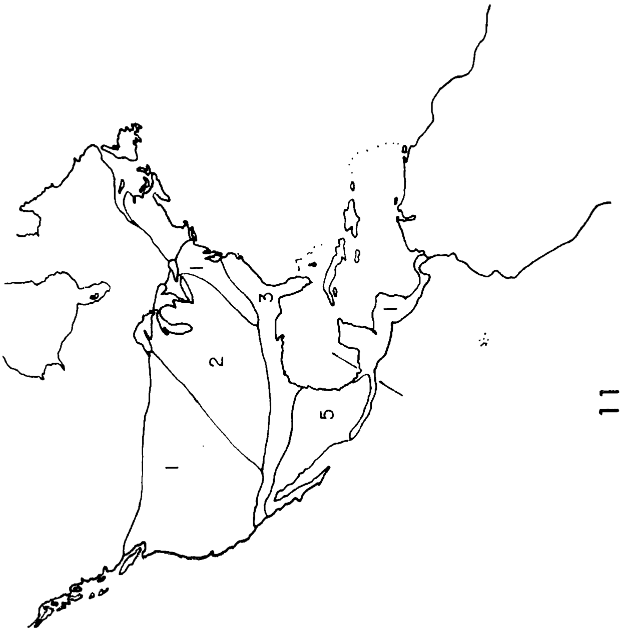
(1) If *Notiocheilosia* is a Callicerini, which is likely, then it is the derived sister-group of *Callicera* (see above).



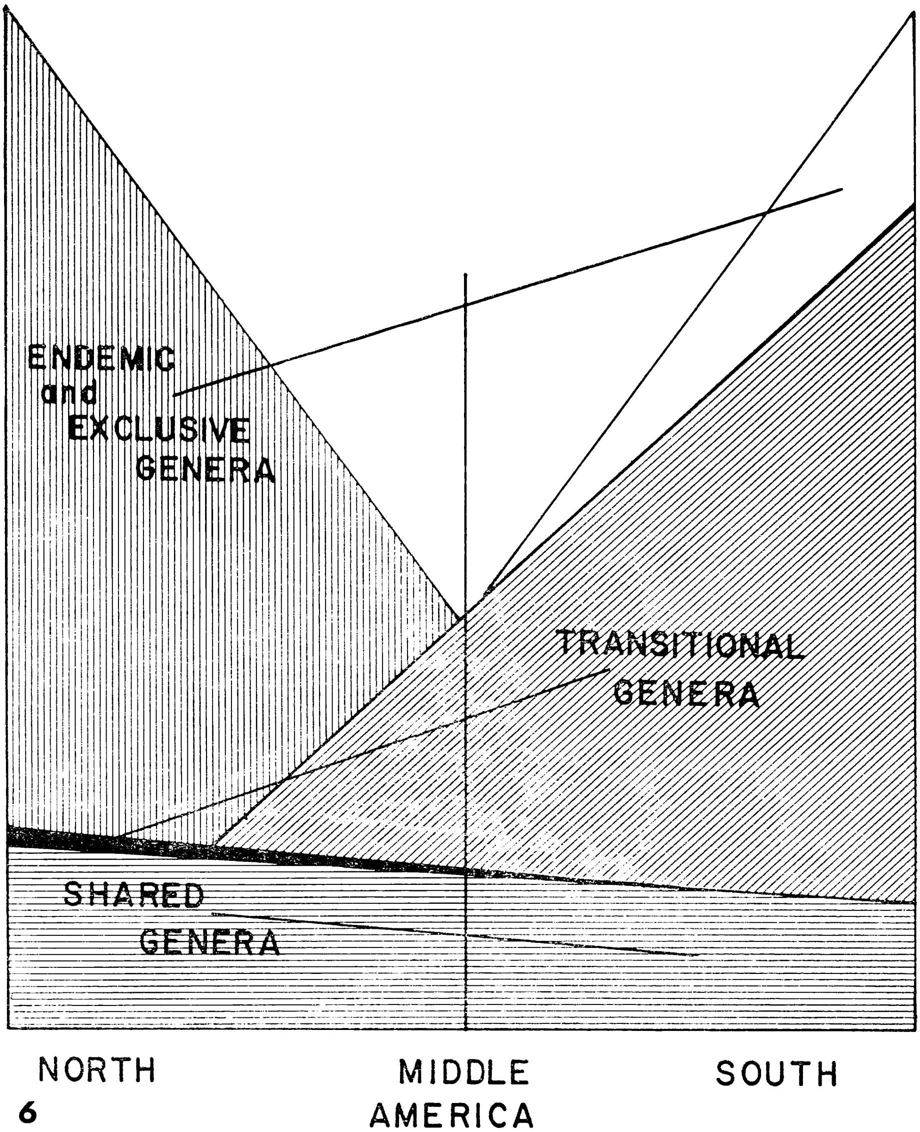
12



11

Map 11, Geographic distribution of the Neotropical-Nearctic transitional genera plotted with approximate isometric lines. Map 12, Geographic distribution of the transitional species of the Neotropical-Nearctic transitional genera plotted with aproximate isometric lines.

the geographical boundary that divides two faunas in such a way as to maximize the number of exclusive taxa and minimize the number of transitional taxa. The transitional taxa and the shared



6

Diagram 6, Transition between the Nearctic and Neotropical milesine faunas. The area with the horizontal lines represents the shared genera; with the diagonal lines, Neotropical transitional genera; with solid black, Nearctic transitional genera; with the vertical lines, Nearctic exclusive and endemic genera; without lines, Neotropical endemic genera.

taxa have all been marked in the list of genera in Appendix II. Diagram 6 is a modification of Darlington's diagram of faunal transition (1957:453, fig. 53), illustrating the transition between the Nearctic and Neotropical milesine faunas. The vertical axis represents the percentage, based on number of species, of each type of genera present in the respective fauna excluding the transitional genera from the other fauna and the longitudinal axis represents the geographical relationship of the various types of taxa. From the above mentioned diagram, it can be clearly seen that the transition between the Nearctic and Neotropical milesine fauna appears to be made up of predominantly southern groups which have moved northward in direction. Only the genus *Milesia* extends slightly south of the isthmus of Tehuantepec, whereas a number of genera of Neotropical origin have extended northward across the isthmus of Tehuantepec and into Mexico and the southern United States. The transition between the Nearctic and Neotropical milesine faunas can be also illustrated by plotting the distribution of the involved genera and their species with isometric lines (see maps 11,12). In short, the isthmus of Tehuantepec is the southern limit for almost all northern taxa and thus the isthmus precisely defines the southern boundary of the Nearctic fauna. On the other hand, the isthmus is not as useful as a boundary for categorizing the Neotropical milesine syrphid fauna as for Nearctic milesines, since many predominantly South American taxa extend their range beyond the isthmus.

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GLOSSARY

Williston (1886) and Shannon (1922 and 1926) have provided brief glossaries to some of the special terms and characters used for syrphids. However, most of the terms used in syrphid systematics can be found also in Torre-Bueno (1937). Where my usage of a term differs from that in those papers, or where it may not be clear in which sense I have used a term, or where I have used a term not included in these papers, I have then listed the term below with its definition. Also, the section on characters in the first part of this revision should be consulted.

Apical cell: Apical cell is the same as cell R4+5, also called the first posterior cell (Williston).

Apical crossvein: Apical crossvein is the up-turned portion of vein m1+2, which seals off the apical cell (R4+5).

Barrette: The barrette is the upper, usually convex, portion of the meropleuron.

Character: A character is anything that *differs* among a collection of objects. Each difference is a state of the character. Thus character is a collective term, denoting a set of differences of a homologous nature. For example: color is a character; red, white and blue are states of the character color.

Derived: Derived refers to the character state that has changed the most in a dichotomy. It is the new difference that has evolved to separate one taxon from another. Hennig's term apomorphic (apo-) is synonymous.

Dichotomy: A dichotomy is the graphic representation of the divergence between any two taxa. Over a period of time, two taxa, sister-groups, diverge from a single ancestral taxon. This phenomenon can be drawn on paper as a dichotomy with one axis, ordinate, as time and the other, abscissa, as divergence.

Endemic Quotient: Endemic quotient is defined as the percentage of the total number of species of a fauna represented by the species in the endemic genera.

Facial stripes: The facial stripes is the area between the facial grooves and the eye margin.

Faunal Boundary: A faunal boundary can be defined operationally as the geographical boundary that divides two faunas in such a way as to maximize the number of exclusive taxa and minimize the number of transitional taxa (see page 197).

Primitive: Primitive refers to the character state that has remained the same or changed the least in a dichotomy. It is the condition or state closest to that of the ancestral taxon. Hennig's term plesiomorphic (plesio-) is synonymous.

Sister-group: Sister-groups are taxa, which share the same immediate ancestral group (also see dichotomy).

APPENDIX I. Character survey of the milesine tribes

Genera	1	2	3	4	5	6a	6b	6c	7	8	9	10	11	12	13	14	15a	15b	16	17	18	19	20
	Character states																						
Tribe Pipizini																							
Pipiza	-	-	-	+	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	+	+
Trichopsomyia	-	-	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-	-	-	-	-	-	+
Neocnemodon	-	-	-	+	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	+	+
Pipizella	-	-	-	+	-	-	-	-	+	-	-	+	-	-	-	+	-	-	-	-	-	+	+
Heryngia	-	-	-	+	-	-	-	-	+	-	-	+	-	+	-	+	-	-	-	-	-	+	+
Tribe Cheilosini																							
Subtribe Cheilosina																							
Cheilosia	+	v	v	-	-	-	-	+	-	-	-	+	-	-	-	+	-	+	-	-	-	+	+
Hiatomyia	+	+	+	-	-	-	-	+	-	-	-	+	-	-	-	+	-	+	-	-	-	+	+
Portevinia	+	+	+	-	-	-	-	+	+	-	-	+	-	-	-	+	-	+	-	-	-	+	+
Ferdinandea	+	-	+	-	-	-	-	+	-	-	-	+	-	-	-	+	-	+	-	-	-	+	+
Rhingia	+	+	+	-	-	+	+	+	-	-	-	v	-	-	-	+	-	+	-	-	-	+	+
Subtribe Pelecoceratina																							
Chamaesyphus	v	+	v	+	v	-	-	+	-	-	-	+	-	-	-	+	-	v	-	-	-	+	+
Pelecocera	+	+	+	+	+	-	-	+	-	-	-	+	-	-	-	+	-	+	-	-	-	+	+
Tribe Volucellini																							
Subtribe Volucellina																							
Volucella	+	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+	-	+	-	+	-	-	+
Graptomyza	+	-	-	-	+	v	v	+	-	-	+	-	-	+	-	+	-	+	-	-	-	-	+
Subtribe Ornidina																							
Tachinosyrphus	+	-	-	-	+	-	-	+	-	-	-	-	-	+	-	+	-	+	-	+	-	+	+
Ornidia	+	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+	-	+	-	+	-	+	+
Copestylum	+	-	-	-	v	-	-	+	v	-	+	-	-	+	-	+	-	+	-	v	-	+	+
Tribe Calliceratini																							
Callicera	+	-	-	-	-	-	-	+	+	v	-	v	-	-	-	+	-	+	-	-	-	+	+
Notiocheilosia	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	-	+	-	-	-	+	+
Tribe Sericomyini																							
Arctophilia	+	+	+	-	-	-	-	+	+	-	+	+	+	-	v	+	-	+	-	-	-	+	+
Sericomyia	+	+	+	-	-	-	-	+	+	-	+	+	+	-	-	+	-	+	-	-	-	+	+
Pyritis	+	-	-	-	-	-	-	+	+	-	+	+	+	-	-	+	-	+	-	-	-	+	+
Pseudovolucella	+	+	+	-	-	-	-	+	+	-	+	+	+	-	-	+	-	+	-	-	-	+	+
Tapetomyia	+	+	+	-	-	-	-	+	+	-	+	+	+	-	-	+	-	+	-	-	-	+	+
Tribe Spheginobacchini																							
Spheginobaccha	+	+	+	-	+	-	-	+	+	+	-	+	-	-	-	+	-	-	-	-	-	+	+
Tribe Psarini																							
Psarus	+	+	+	+	-	-	-	+	+	+	-	+	+	+	-	+	-	-	-	-	-	+	+
Tribe Chrysogasterini																							
Subtribe Spheginina																							
Sphegina	+	+	+	+	+	+	+	+	-	+	-	+	-	+	-	+	-	+	-	-	-	+	+
Neoascia	+	+	+	+	+	+	+	+	-	+	-	+	-	+	-	+	-	+	-	-	-	+	+
Chamaesphegina	+	+	+	+	+	+	+	+	-	+	-	+	-	-	-	+	-	+	+	-	-	+	+
Subtribe Chrysogasterina																							
Brachyopa	+	+	+	+	+	+	+	+	+	+	v	+	-	-	-	+	-	+	-	-	-	+	+
Chrysogaster	+	+	+	+	+	-	+	+	+	+	-	+	-	-	-	+	-	+	v	-	-	+	+
Orthonevra	+	+	-	+	+	-	+	+	+	+	-	+	-	+	-	+	-	+	v	-	-	+	+
Chromocheilosia	+	-	+	+	-	-	+	+	-	+	-	+	-	-	-	+	-	+	-	-	-	+	+
Lepidomyia	+	+	-	+	+	-	-	+	+	+	-	-	-	-	-	+	-	+	-	-	-	+	+
Myolepta	+	+	+	v	+	-	+	+	+	+	-	v	v	-	-	+	-	+	+	-	-	+	+
Tribe Eumerini																							
Nausigaster	+	-	-	+	+	-	-	+	+	+	-	+	-	-	-	+	+	+	+	-	-	-	+
Alipumilio	+	-	-	-	+	+	+	+	+	+	-	+	-	+	-	+	+	+	+	-	-	-	+
Eumerus	+	-	-	-	+	+	+	+	+	+	-	+	v	+	-	+	+	+	+	-	-	-	+
Merodon	+	-	-	-	v	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+
Azpeytia	+	-	-	-	-	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	-	+
Psilota	+	-	-	-	-	+	+	+	+	+	-	+	-	-	-	+	+	+	+	-	-	-	+
Tribe Cerioidini																							
Ceriana	+	+	-	-	+	-	-	+	+	+	-	+	+	-	v	-	-	+	-	-	-	-	+

Genera	Character states																						
	1	2	3	4	5	6a	6b	6c	7	8	9	10	11	12	13	14	15a	15b	16	17	18	19	20
Tribe Eristalini																							
Subtribe Helophilina																							
Quichuana	+	-	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Polydontomyia	+	+	-	-	v	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Asemosyrphus	+	+	-	-	v	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Arctosyrphus	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Mallota	+	v	-	-	v	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Helophilus	+	+	-	-	-	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Lunomyia	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Parohelophilus	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Anasimyia	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Eurmyia	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Dolichogyna	+	+	-	-	v	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Habromyia	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Orthoprosopa	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	+	-	+	+	+
Myiatropa	+	-	-	-	v	-	-	+	+	+	-	+	+	-	+	+	-	+	-	-	+	+	+
Mesembrius	+	+	-	-	+	-	-	+	+	+	-	v	+	-	+	+	-	+	-	-	+	+	+
Subtribe Eristalina																							
Megaspis	+	+	-	-	v	-	-	+	+	+	v	-	+	-	+	+	-	+	v	+	+	+	+
Solenaspis	+	+	-	-	-	-	-	+	+	+	-	+	+	-	+	+	-	+	+	+	+	+	+
Simioides	+	+	-	-	v	-	-	+	+	+	+	-	+	-	+	+	-	+	-	+	+	+	+
Keda	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	+	+	+	+
Xenzoon	+	+	-	-	+	-	-	+	+	+	-	+	-	-	+	+	-	+	-	+	+	+	+
Meromacrus	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	+	+	+	+
Eristalis	+	-	-	-	v	-	-	+	+	+	+	+	+	-	+	+	-	+	-	+	+	+	+
Eoseristalis	+	-	-	-	v	-	-	+	+	+	v	+	+	-	+	+	-	+	-	+	+	+	+
Eristalinus	+	-	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	+	+	+	+
Eristalodes	+	-	-	-	v	-	-	+	+	+	-	-	+	-	+	+	-	+	-	+	+	+	+
Lathyrophthalmus	+	+	-	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	+	+	+	+
Palpada	+	+	-	-	v	-	-	+	+	+	-	-	+	-	+	+	-	+	-	+	+	+	+
Lycastrirhychus	+	+	-	-	v	-	-	+	+	+	-	-	+	-	+	+	-	+	-	+	+	+	+
Axona	+	+	+	-	+	-	-	+	+	+	-	+	+	-	+	+	-	+	-	+	+	+	+
Dissoptera	+	+	-	-	+	+	+	+	+	+	-	+	-	-	+	+	-	+	-	+	+	+	+
Tribe Milesini																							
***Criorhina* Group**																							
Criorhina	+	+	v	-	v	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Flukea	+	+	+	-	-	-	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Aneriophora	+	+	+	-	-	-	-	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Merapioidus	+	+	+	-	+	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Deineches	+	+	+	-	-	-	-	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Sphecomyia	+	+	+	-	-	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Caliprobola	+	+	+	+	+	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Paratropidia	+	+	+	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Blera Group																							
Blera	+	+	+	+	v	v	v	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Somula	+	+	+	+	-	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Lejota	+	+	+	+	v	v	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	+	+
Philippimyia	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Temnostoma Group																							
Temnostoma	+	+	+	v	-	-	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	v	+
Takaomyia	+	+	+	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Valdivia	+	+	+	+	-	-	+	+	+	+	-	+	-	-	-	+	-	+	-	-	-	+	+
Odyneromyia	+	+	+	+	-	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Tuechnemis	+	+	+	-	+	-	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Pterallastes	+	+	+	+	-	-	+	+	+	+	-	+	+	-	v	+	-	+	-	-	-	+	+
***Tropidia* Group**																							
Tropidia	+	+	+	-	v	-	v	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Senogaster	+	+	+	-	+	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Syritta	+	+	+	-	+	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Nepenthosyrphus	+	+	v	-	+	-	-	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
***Xylota* Group**																							
Xylota	+	+	+	+	+	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Xylotomimia	+	+	+	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Chalcosyrphus	+	+	+	-	-	+	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	+	+
Crioprora	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Brachypalpus	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Chrysosomidia	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Neplas	+	+	+	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Sterphus	+	+	+	+	-	-	-	+	+	+	-	+	+	-	-	+	-	+	v	-	-	+	+
Ceriogaster	+	+	+	+	+	-	-	+	+	+	-	+	+	-	-	+	-	+	v	-	-	+	+
Macrometopia	+	-	v	+	-	-	-	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Hadromyia	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
Pocota	+	+	+	+	-	+	+	+	+	+	-	+	+	-	-	+	-	+	-	-	-	+	+
***Milesia* Group**																							
Milesia	+	+	v	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	+	-	v	+
Hemixylota	+	+	+	+	-	+	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	+	+
Korchinia	+	+	+	+	-	-	+	+	+	+	-	+	+	-	+	+	-	+	+	-	-	+	+
Spilomyia	+	+	+	-	+	v	+	+	+	+	-	+	+	-	-	+	-	+	v	-	-	-	+
Stilbosoma	+	+	+	-	-	+	+	+	+	+	-	+	+	-	-	+	-	+	+	-	-	+	+
Syrittosyrphus	+	+	+	-	-	+	+	+	+	+	-	+	+	-	+	+	-	+	+	-	-	+	+
Hardimyia	+	+	-	-	-	+	+	+	+	+	-	+	-	-	-	+	-	+	+	-	-	-	+
Pseudozettsetdia	+	+	+	+	-	+	+	+	+	+	-	+	+	-	+	+	-	+	-	-	-	+	+
Palumbia	+	+	+	+	-	+	+	+	+	+	-	+	+	-	+	+	-	+	+	+	-	+	+

CHARACTERS USED IN APPENDIX I

1. Oral margin medially notched (+), not notched, evenly rounded (—).
2. Eyes bare (+), pilose (—).
3. Face bare (+), pilose at least on sides (—).
4. Metasterna bare (+), pilose (—).
5. Subscutellar fringe absent (+), present (—).
6a. Face concave (+), otherwise (—).
b. Face concave in female at least (+), otherwise (—).
c. Face tuberculate in both sexes or concave (+), otherwise (—).
7. Thoracic bristles absent (+), present (—).
8. Hind femur with ventral spines (+), without (—).
9. Arista plumose (+), bare (—).
10. Metathoracic spiracular pile patch absent (+), present (—).
11. Anterior crossvein distinctly at or beyond middle of discal cell (+), before middle of discal cell (—).
12. Apical crossvein perpendicular or recessive (+), directed outward (—).
13. Third vein strongly looped into apical cell (+), straight (—).
14. Antenna with arista (+), with terminal style (—).
15a. 1st abdominal spiracle free and 1st abdominal sternite reduced (+), otherwise (—).
b. 1st abdominal spiracle embedded in meta-epimeron or 1st abdominal sternite reduced (+), 1st abdominal spiracle free and 1st abdominal sternite unmodifield (—).
16. Scutellum with distinct apical emarginate rim (+), without such a rim (—).
17. Marginal cell petiolate (+), open at wing margin (—).
18. Hind femur with a basal setal patch (+), without such a patch (—).
19. Anterior portion of meso-anepisternum bare (+), pilose (—).
20. Male with four pregenital segments (+), with five pregenital segments (—).

Note: v means variable or intermediate.

APPENDIX II

Neotropical milesine genera

- Pipizini
  - _Pipiza_ (s)
  - *_Trichopsomyia_
- Cheilosini
  - Cheilosina
    - _Rhingia_ (s)
- Callicerini
  - *_Notiocheilosia_
- Volucellini
  - Ornidina
    - _Copestylum_ (t)
    - *_Ornidia_
    - *_Tachinosyrphus_
- Chrysogasterini
  - Spheginina
    - *_Chamaesphegina_
  - Chrysogasterina
    - _Orthonevra_ (s)
    - _Myolepta_ (s)
    - _Lepidomyia_ (t)
    - *_Chromocheilosia_
- Eumerini
  - _Nausigaster_ (t)
  - *_Alipumilio_
- Cerioidini
  - _Ceriana_ (s)
- Eristalini
  - Helophilina
    - *_Dolichogyna_
    - *_Quichuana_
    - *_Habromyia_
    - _Mallota_
  - Eristalina
    - _Eristalis_ (introduced)
    - _Eoseristalis_ (s)
    - _Palpada_ (t)
    - _Meromacrus_ (t)
    - *_Lycastrirhynchus_
- Milesini
  - *_Neplas_
  - *_Ceriogaster_
  - *_Sterphus_
  - *_Macrometopia_
  - *_Cacoceria_
  - *_Valdivia_
  - *_Odyneromyia_
  - *_Aneriophora_
  - *_Flukea_
  - *_Philippimyia_
  - *_Senogaster_
  - _Syritta_ (introduced)
  - _Tropidia_
  - *_Hemixylota_
  - *_Stilbosoma_
  - _Milesia_ (t)
  - _Spilomyia_ (s)

Nearctic milesine genera

- Pipizini
  - _Pipiza_ (s)
  - _Heryngia_
  - _Parapenium_
  - _Neocnemodon_
- Cheilosini
  - Cheilosina
    - _Cheilosia_
    - _Cartosyrphus_
    - _Hiatomyia_
    - _Rhingia_ (s)
    - _Ferdinandea_
  - Pelecocerina
    - _Pelecocera_
    - _Chamaesyrphus_
- Callicerini
  - _Callicera_
- Volucellini
  - Volucellina
    - _Volucella_
  - Ornidina
    - _Copestylum_ (t)
- Chrysogasterini
  - Spheginina
    - _Sphegina_
    - _Neoascia_
  - Chrysogasterina
    - _Chrsysogaster_
    - *_Chrysosyrphus_
    - _Orthonevra_ (s)
    - _Myolepta_ (s)
    - _Lepidomyia_ (t)
    - _Brachyopa_
- Sericomyini
  - _Sericomyia_
  - _Arctophila_
  - *_Pyritis_
  - *_Tapetomyia_
- Eumerini
  - _Nausigaster_ (t)
  - _Eumerus_ (introduced)
  - _Merodon_ (introduced)
  - _Psilota_
- Cerioidini
  - _Ceriana_ (s)
- Eristalini
  - Helophilina
    - _Helophilus_
    - _Anasimyia_
    - _Parohelophilus_
    - _Eurimyia_
    - *_Lunomyia_
    - *_Asemosyrphus_
    - *_Polydontomyia_
    - _Mallota_ (s)
  - Eristalina
    - _Meromacrus_ (t)
    - _Eoseristalis_ (s)
    - _Eristalis_
    - _Palpada_ (t)
- Milesini
  - _Xylota_
  - _Xylotominia_
  - _Brachypalpus_
  - *_Chrysosomidia_
  - *_Teuchocnemis_
  - _Syritta_ (introduced)
  - _Tropidia_
  - *_Pterallastes_
  - *_Hadromyia_
  - *_Crioprora_
  - _Pocota_
  - _Blera_
  - *_Somula_
  - _Criorhina_
  - *_Merapioidus_
  - _Sphecomyia_
  - _Spilomyia_ (s)
  - _Temnostoma_
  - _Lejota_
  - _Milesia_ (t)
  - *_Cynorhinella_
  - *_Chalcosyrphus_

Palearctic milesine genera

- Pipizini
    - Pipiza
    - Heryngia
    - Parapenium
    - Triglyphus
    - Neocnemodon
    - Pipizella

- Cheilosini
  - Cheilosina
    - Cheilosia
    - Cartosyrphus
    - Hiatomyia
    - Rhingia
  - Cheilosina
    - Ferdinandea
    - *Psarocheilosia
    - *Portevinia
  - Pelecocerina
    - Pelecocera
    - Chamaesyrphus
    - *Ischyroptera
    - *Macropelecocera

- Callicerini
    - Callicera

- Volucellini
  - Volucellina
    - Volucella
    - Graptomyza

- Chrysogasterini
  - Spheginina
    - Sphegina
    - Neoascia
  - Chrysogasterina
    - *Helleniola
    - Myolepta
    - Orthonevra
    - Chrysogaster
    - *Lejogaster
    - Brachyopa

- Sericomyini
    - Sericomyia
    - Arctophila
    - Pararctophila
    - Pseudovolucella

- Eumerini
    - *Platynochaetus
    - Merodon
    - Eumerus
    - Psilota

- ?????
    - *Psarus

- Cerioidini
    - Ceriana

- Eristalini
  - Helophilina
    - Helophilus
    - Anasimyia
    - Parohelophilus
    - *Lejops
    - Eurimyia
    - Mesembrius
    - *Myiatropa
    - Arctosyrphus
    - Mallota
  - Eristalina
    - Eristalis
    - Eoseristalis
    - Simioides
    - *Pleaskeola

- Milesini
    - Xylota
    - Xylotomina
    - Brachypalpus
    - *Macrozelima
    - Syritta
    - Tropidia
    - *Rhinotropidia
    - Pocota
    - Blera
    - *Matsumyia
    - *Calliprobola
    - Criorhina
    - Sphecomyia
    - Spilomyia
    - Korinchia
    - Milesia
    - Temnostoma
    - Takaomyia
    - Lejota
    - *Palumbia

Oriental milesine genera

- Pipizini
    - Pipiza
    - Pipizella

- Cheilosini
  - Cheilosina
    - Cheilosia
    - Ferdinandea
    - Rhingia
  - Pelecocerina
    - Chamaesyrphus

- Callicerini
    - Callicera

- Volucellini
  - Volucellina
    - Volucella
    - Graptomyza

- Chrysogasterini
  - Spheginina
    - Sphegina
  - Chrysogasterina
    - Myolepta
    - Chrysogaster

- Spheginobacchini
    - Spheginobaccha

- Sericomyini
    - Sericomyia
    - Pararctophila
    - Pseudovolucella

- Eumerini
    - Eumerus
    - Merodon
    - Psilota
    - *Azpeytia

- Cerioidini
    - Ceriana

- Eristalini
  - Helophilina
    - Helophilus
    - Eurimyia
    - Mesembrius
    - Mallota
    - *Klossia
    - *Catacores
  - Eristalina
    - *Solenaspis
    - *Digulia
    - *Keda
    - Eristalis
    - Phytomia
    - Dissoptera
    - Axona

- Milesini
    - Xylota
    - Brachypalpus
    - Syritta
    - Blera
    - Milesia
    - Temnostoma
    - Takaomyia
    - Korinchia
    - *Nepenthosyrphus
    - *Lycastris
    - *Cheiroxylota
    - Criorhina
    - Spilomyia

Ethiopian milesine genera

Cheilosini
Cheilosina
Rhingia

Volucellini
Volucellina
Graptomyza

Chrysogasterini
Chrysogasterina
Orthonevra
Chrysogaster

Spheginobacchini
Spheginobaccha

Eumerini
Eumerus
Merodon

Cerioidini
Ceriana

Eristalini
Helophilina
Eurmyia
Mallota
Mesembrius
*_Chasmomma_

Eristalini
Eristalina
Eristalis
Phytomia
Simioides
*_Senaspis_
*_Meromacroides_

Milesini
Xylota?
Syritta
Tropidia?
*_Syrittosyrphus_
*_Pogonosyrphus_

Australian milesine genera

Pipizini
*_Emmyia_
Triglyphus?

Volucellini
Volucellina
Graptomyza

Chrysogasterini
Chrysogasterina
*_Cyphipelta_
*_Eocheilosia_
*_Coeloprosopa_
*_Plesia_
*_Hemilampra_

Eumerini
Psilota
Eumerus

Cerioidini
Ceriana

Eristalini
Helophilina
Helophilus?
*_Pilinascia_
Mesembrius
*_Orthoprosopa_
Eristalina
Eristalis

Dissoptera
Axona
*_Xenzoon_

Milesini
Syritta
Xylota?
Criorhina?
*_Deinches_
*_Paratropidia_
*_Malometaternum_
*_Hardimyia_

Symbols used in Appendix II

(s) = shared genera
(t) = transitional genera
* = endemic genera

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