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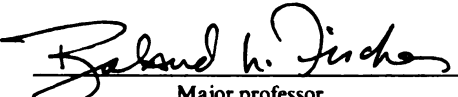
A Revision of the Genus Ravinia (Diptera:
Sarcophagidae)

presented by

Gregory Alan Dahlem

has been accepted towards fulfillment
of the requirements for

Doctoral degree in Entomology


Major professor

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A REVISION OF THE GENUS RAVINIA (DIPTERA: SARCOPHAGIDAE)

By

Gregory Alan Dahlem

A DISSERTATION

Submitted to

Michigan State University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

Department of Entomology

1989

6001798

ABSTRACT

A REVISION OF THE GENUS RAVINIA (DIPTERA: SARCOPHAGIDAE)

By

Gregory Alan Dahlem

The genus Ravinia Robineau-Desvoidy is revised. All available taxonomic, biological, and distributional data for the larvae, puparia, and adults are incorporated. A diagnostic key and illustrations of the male and female genitalia are presented for the identification of the thirty-seven species of Ravinia known from the world. The genera Chaetoravinia and Andinoravinia are placed as synonyms of Ravinia. Thirty-three species are redescribed and the following species are described as new: R. cisselli from Kentucky, R. downesi from Texas, R. lopesi from Argentina, and R. shewelli from Colorado. R. haematodes is placed as the senior name of the lone species from the Old World. R. lherminieri is redefined, removed from previous synonymy, and placed as the senior name of R. ochracea. R. anxia is raised to the senior name for the species which had been under the name R. lherminieri. Sarcophaga

addentata and S. obscuripes are placed as synonyms of R. pusiola. S. rediviva is removed from synonymy with R. lherminieri and is placed as a synonym of R. querula. R. columbiana is raised from subspecies to species status and R. rufipes intermedia is synonymized with R. rufipes. R. laakei is placed as a synonym of R. vagabunda. The species Chaetoravinia advena, C. barroii, and C. postnoda are included for the first time in the genus Ravinia.

This dissertation is dedicated to my mother, Shirley Marie Dahlem.

Thank you Mom, for always pushing me to do more,

and accepting me for the person I am.

ACKNOWLEDGMENTS

I would like to thank the following institutions for loans of specimens: British Museum (Natural History) (BMNH); Biosystematic Research Centre (BRC); California Academy of Sciences (CAS); Colorado State University (CSU); Dayton Museum of Natural History (DMNH); Field Museum of Natural History (FMNH); Museum of Comparative Zoology (MCZ); Michigan State University (MSU); Ohio State University (OSU); State University of New York (SUNY); U.S. National Museum of Natural History (USNM).

I would like to extend my personal gratitude to Dr. Guy Bush, who has opened my eyes to so many new possibilities about processes of evolution and speciation; Dr. Fred Stehr, for his help, advice, and ability to get things done; Dr. Monty Wood, for his enthusiasm and encouragement throughout this study; Dr. Guy Shewell, for all his help and advice; and Dr. Richard Merritt for all the help he has offered on short notice as a member of my committee.

Special thanks go to Dr. Roland L. Fischer for all of the time he has spent talking with me. I truly consider our lunchtime discussions on insect collecting experiences, systematic theory, various entomological

topics and current affairs as an integral part of my doctoral experience. Special thanks also go to Dr. William L. Downes, Jr. for his invaluable assistance throughout this project. The wealth of his personal knowledge and experience that he has shared with me and his great enthusiasm for this family of flies that has spread to me has been a source of inspiration.

I would also like to thank my father, Valentine, for his assistance with the inking of the figures and his patient help over the course of my life as well as my brother and best friend Andrew for always being there to listen. Finally, I would like to thank my wife, Theresa, for her understanding and assistance during the course of this study. I fully realize that she gave up many of her dreams to help me gain mine.

This revision was aided by a Grant-in-Aid of Research from Sigma Xi, the Scientific Research Society, a Grant-in-Aid of Research from the CanaColl Foundation for study at the Biosystematic Research Centre, a grant from the Department of Entomology and College of Natural Science at Michigan State University for study of European types of American species of Ravinia and attendance at the First International Congress of Dipterology in Budapest, Hungary and the Snodgrass Memorial Research Award from the Entomological Society of America.

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INTRODUCTION

The genus Ravinia represents a group of very common flies which is often found in association with man in North America. Those members whose life histories have been studied are primarily coprophagous in a wide variety of mammalian dung. The nature of the Neotropical members awaits further investigation, as very little is known of their biologies at present. The only species from the Old World, R. haematodes (Meigen), has been noted on numerous occasions as being a very common synanthropic species in the Palearctic and Oriental regions. This revision provides a key that will separate males and most females of this genus to species, new synonymy, and pulls together the widely scattered information on the genus, enabling association of much of the past research with current names.

In recent years there has been much interest in the insect faunas of dung, especially cow dung. This interest has been spawned by the spread of the introduced face fly, Musca autumnalis De Geer, across continental North America and by investigations concerning the introduced horn fly, Haematobia irritans (Linnaeus). Both of these introduced species are important pests of cattle and dairy operations and both breed in cow

manure. Much of the work currently being done in North America on the faunas of cow dung involves searching for native parasitoids and predators that may be useful in the biological control of these pest species. But these pests are recent invaders of the dung insect complex. Studies, such as those by Turner, et al. (1968) and Thomas & Wingo (1968), indicate that the predator/parasitoid complex of species found in cow dung is much more suited and prone to control the native flies found breeding in the dung, mainly members of the flesh fly genus Ravinia. In order to better understand the possible predator/parasitoid relationships which may have implications on the control of face fly and horn fly, more information needs to be accumulated on the natural associations of predator/parasitoid complexes with Ravinia, and precise identifications of the species involved are essential to allow repeatability of the findings from such studies. One recent study indicates that species within the Ravinia may be important biological control agents against the face and horn fly (Pickens, 1981).

Another important area of concern is fly production sources in urban communities. It has been noted in studies such as those by Schoof et al. (1954) and Silverly & Schoof (1955a, 1955b, 1955c) that dog dung is one of the most important production media of muscoid flies in metropolitan areas. Flesh flies are the most important decomposers of dog dung found in these environments and, although the previously mentioned authors were unable to identify or find experts to identify the sarcophagids they collected, species of the genus Ravinia are, most probably, the most

important species involved. Collecting of Ravinia by myself, and many years of collecting by Dr. William L. Downes, Jr., has shown that members of this genus do not normally occur in situations which would make them pests of humans (such as in houses, on porches, or at picnics). This cannot be said for other species, such as the house fly, which have been reared from dog dung. It is, therefore, important to know more about these decomposers of dog feces around our homes in order to promote those species of Ravinia which do the essential service of breaking down this material and which do not show up as pests around the house. Essential to such studies is the proper identification of the species involved.

Identifications of undetermined Sarcophagidae from various large, institutional collections indicate that one-fourth to one-fifth of all sarcophagids collected in North America belong to the genus Ravinia. The last comprehensive revision of this genus was provided by Hall (1928), but most of the names used in this revisionary study have subsequently been placed as synonyms. Seventy-nine species names have been applied to members of this genus, of which thirty-seven are currently recognized.

NOMENCLATURAL HISTORY

The genus Ravinia was established by Robineau-Desvoidy (1863) for his new species, R. aurea, R. hebes, R. sulcata, and Meigen's (1826) Sarcophaga haematodes with the latter designated as the type species. He

included Myophora limpidipennis Robineau-Desvoidy, M. haemispherica Robineau-Desvoidy, and M. horticola Robineau-Desvoidy, as synonyms of R. haematodes (Meigen), but did not include Myophora lherminieri Robineau-Desvoidy in this new genus. Bottcher (1913) included Ravinia as a subgenus of Sarcophaga and included the species S. haematodes Meigen as a member. No New World species were considered as members of the Ravinia group until Parker (1914) redescribed the genus and placed Helicobia quadrisetosa Coquillett and his new species R. communis, R. latisetosa, and R. peniculata in the genus. Aldrich (1916) suggested that Ravinia could be placed as a subgenus of Sarcophaga, included Parker's (1914) species, and described Sarcophaga floridensis, S. planifrons, S. ochracea (as a variant of R. communis Parker), and S. globulus as members of this subgenus.

While Parker and Aldrich were busy describing the North American fauna, C. H. T. Townsend was working on the fauna of South America. In 1912, Townsend described the genus Punasarcophaga and placed the new species P. auromaculata as the type of the genus. In 1917, Townsend named several genera and species that are currently considered within Ravinia. He described the genus Euravinia with R. communis Parker as the type species, Miltoravinia with S. planifrons Aldrich as the type species, Chaetoravinia with H. quadrisetosa Coquillett as the type species, Trixosarcophaga with S. aurigena Townsend as the type species, and Andinoravinia with his new species A. rufipes as the type species. In 1927, Townsend described the genus Catasarcophaga with his new species

Cat. trivittata as the type species.

Hall (1928) revised the New World species of Ravinia but considered Ravinia as a subgenus of Sarcophaga and synonymized Townsend's genera Punasarcofaga, Euravinia, Miltoravinia, Trixosarcophaga, Andinoravinia, and Chaetoravinia with this subgenus. He redescribed Townsend's species P. auromaculata, S. aurigena, and A. rufipes. He raised Aldrich's Sarcophaga communis var. ochracea to species level because Greene (1925) found the species to be distinct from R. communis Parker in the immature stages. He synonymized R. communis Parker with S. pallinervis Thomson because of correspondence with Timberlake. Timberlake found only one species of sarcophagid which agreed with Thomson's description from Hawaii. Hall did not examine Thomson's type. He also included his new species S. minuta, S. obscuripes, S. orbitalis, S. duplicata, S. aureopyga, S. ollantaytambensis, S. adamsii, and S. reinhardii in this subgenus. Hall (1929) changed the name of S. minuta to S. addentata, since the name S. minuta was preoccupied by an earlier Robineau-Desvoidy name.

Enderlein (1928) caused many nomenclatural problems throughout the Sarcophagidae, including the genera and species now considered in the Ravinia. He considered the genus Servaisia Robineau-Desvoidy as a synonym of Ravinia and included the species S. erythrura Meigen, S. haematodes Meigen, S. amata Wiedemann, Musca tessellata Fabricius, S. trivialis van der Wulp, S. debilis van der Wulp, and S. plinthopyga Wiedemann as members of the genus. Of these species, only the type

species, R. haematodes, is currently considered in the Ravinia. He also synonymized the genera Andinoravinia Townsend with Bercacea Robineau-Desvoidy and Chaetoravinia Townsend with Pierretia Robineau-Desvoidy, without any discussion. He established the genus Engelina for S. xanthopyga van der Wulp. Townsend (1938) later found that Enderlein's S. xanthopyga was actually a misidentification of Andinoravinia rufipes. Enderlein also established the genus Thyrocnema for Musca striata Fabricius which was shown by Lundbeck (1927) to be a senior name for S. haematodes Meigen. Hall (1937) notes that S. aureopyga Hall was placed in the genus Dienchaeta by Enderlein (1928) as an undescribed species.

Until 1930, the names applied to New World species of sarcophagids by the early authors such as Robineau-Desvoidy, Macquart, Walker, Thomson, and van der Wulp, were ignored for the most part, since their descriptions were not specific enough to separate one species from another and the types were generally inaccessible to American authors. However, in 1929, the United States National Museum sent J. M. Aldrich to visit several of the important European museums for the purpose of examining types of American Diptera. In the course of the work he was able to see most of the types of American Sarcophaga. He reported his findings on Sarcophaga in 1930 and established the following synonymy: Myophora lherminieri Robineau-Desvoidy = R. communis Parker; S. anxia Walker; S. querula Walker; S. avida Walker; S. rediviva Walker; S. aspersa Walker; S. rabida Walker; S. acerba Walker; S. comes Walker; and S. pallinervis Thomson. S. stimulans Walker = H. quadrisetosa

Coquillett; S. derelicta Walker; and S. vagabunda van der Wulp. S. effrenata Walker = S. adamsi Hall; S. xanthopyga van der Wulp; and S. conjugens van der Wulp. S. sueta van der Wulp, = S. ochracea Aldrich. S. errabunda van der Wulp = S. reinhardii Hall. S. pusiola van der Wulp = R. peniculata Parker. He also found that his 1916 description of S. assidua Walker corresponded to S. ventricosa van der Wulp. He redescribed S. assidua Walker and placed it in the Ravinia group along with S. quadrivittata Macquart.

From the 1930's to the 1950's and beyond, there appears to be a split between the generic nomenclature used by North American authors and South American authors. The North Americans were heavily influenced by Aldrich's (1916) major work and thus considered Ravinia as a subgenus of Sarcophaga. The South Americans were heavily influenced by Townsend, especially his works included in his Manuals of Myiology (1934-38), and utilized many of his smaller genera that are here considered synonymous with Ravinia.

Hall (1931) described two new species in the North American fauna in the subgenus Ravinia, S. coachellensis and S. laakei. Engel (1931) described S. townsendi from Bolivia. Prado & Fonseca (1932) described Euravinia belforti from Brazil. Blanchard (1939) described Andinoravinia meinckei from Argentina. In the Old World, Lundbeck (1927) examined Fabricius' (1794) types of Musca striata and placed S. haematodes Meigen as a synonym of this older name. Seguy (1935) described S. azoa from Libya and, in 1938, described Gesnerioides disjuncta from Maroc.

However, in 1939, Seguy placed these two species as synonyms of S. striata (Fabricius).

Lopes (1941a) placed E. belforti Prado & Fonseca in the genus Ravinia when he discussed the female genitalia. Lopes (1946a) considered Chaetoravinia a valid genus and placed S. effrenata Walker, S. errabunda Wulp, S. stimulans Walker, and R. latisetosa Parker as members of this genus, as well as his new species C. dampfi. He also redescribed S. vagabunda van der Wulp, removed it from synonymy with S. stimulans Walker, and placed it in the Chaetoravinia. In this same paper he considered M. lherminieri Robineau-Desvoidy, S. addentata Hall, S. sueta van der Wulp, and S. ochracea Aldrich as members of Ravinia, and redescribed S. sueta van der Wulp, removing it from synonymy with S. ochracea. Lopes (1946b) described C. almeidai as a new species in the genus Chaetoravinia.

Roback (1952) described the new species Ravinia tancituro and, in 1954, considered Ravinia as a valid genus with the following synonymy: Punarsarcophaga Townsend, Andinoravinia Townsend, Chaetoravinia Townsend, Euravinia Townsend, Miltoravinia Townsend, Trixosarcophaga Townsend, Catasarcophaga Townsend, and Engelina Enderlein. He redescribed the genus and included the following species as members: S. addentata Hall, C. almeidai Lopes, S. assidua Walker, S. aureopyga Hall, P. auromaculata Townsend, S. aurigena Townsend, E. belforti Prado & Fonseca, S. coachellensis Hall, C. dampfi Lopes, S. duplicata Hall, S. effrenata Walker, S. errabunda van der Wulp, S. floridensis Aldrich, S. globulus

Aldrich, S. laakei Hall, S. latisetosa Parker, M. lherminieri Robineau-Desvoidy, A. meinckei Blanchard, S. obscuripes Hall, S. ollantaytambensis Hall, S. pectinata Aldrich, S. planifrons Aldrich, S. pusiola van der Wulp, S. querula Walker, A. rufipes Townsend, S. stimulans Walker, S. sueta van der Wulp, R. tancituro Roback, Cat. trivittata Townsend, and S. vagabunda van der Wulp.

Dodge (1956a) considered Chaetoravinia as a valid genus and included the following U.S. species as members: Sarcophaga derelicta Walker, S. errabunda van der Wulp, S. effrenata Walker, S. assidua Walker, R. latisetosa Parker, S. coachellensis Hall, S. laakei Hall, and his new species C. anandra. From correspondence with Dr. van Emden at the British Museum of Natural History, Dodge found that the type of S. stimulans more closely resembled the species R. latisetosa Parker and S. vagabunda van der Wulp than H. quadrisetosa Coquillett, and, therefore, removed the name stimulans from use until such time that characters could be found in the females that would separate R. latisetosa and S. vagabunda from one another. He placed S. derelicta Walker as the senior name for H. quadrisetosa Coquillett. In the genus Ravinia, Dodge separated what had been known as M. lherminieri Robineau-Desvoidy into three species, R. querula (Walker), R. lherminieri (Robineau-Desvoidy) and R. acerba (Walker) with the following synonymy: R. querula = S. avida Walker; S. aspersa Walker; S. rabida Walker; and R. communis Parker. R. lherminieri = S. anxia Walker; S. rediviva Walker; S. comes Walker; and S. pallinervis Thomson. R. acerba = R. peniculata Parker.

In this separation he mentions that the species R. lherminieri appeared to be a complex of species. He also synonymized S. orbitalis Hall with S. pectinata Aldrich and placed S. pectinata as a member of the Ravinia. Dodge (1956b) described the new species C. barroi from Cuba and provided a description of the female of C. globulus.

Lopes (1962) reviewed the genus Andinoravinia and described A. rufipes intermedia and A. rufipes columbiana as two new subspecies of A. rufipes Townsend from Columbia.

Downes (1965) placed Chaetoravinia as a subgenus of Ravinia. He mentions that R. latisetosa Parker probably = R. assidua Walker and that R. floridensis (Aldrich) probably = R. ochracea (Aldrich). He also placed S. duplicata Hall as a synonym of R. planifrons (Aldrich).

Dodge (1968) described the new species C. postnoda from Central America.

Lopes (1969) separated the genus Ravinia into the following three genera, with indicated synonymy: Ravinia = Punasarcophaga Townsend, Euravinia Townsend, Miltoravinia Townsend, and Trixosarcophaga Townsend; Andinoravinia = Engelina Enderlein; Chaetoravinia = Catasarcophaga Townsend. He considered Boettia covai Dodge and S. quadrivittata Macquart as members of the genus Ravinia and mentions that the use of M. tessellata by Mattos (1919) was a misidentification of the species R. belforti (Prado & Fonseca). In the Chaetoravinia he placed S. townsendi Engel as a synonym of Cat. trivittata Townsend.

Lopes (1975a) described the species R. heithausi from Costa Rica.

Lopes (1976) redescribed S. advena Walker, placed it in the Chaetoravinia and placed S. contermina Walker and Cat. trivittata Townsend as synonyms. Lopes (1977) examined the holotype of S. derelicta Walker, redescribed the species and placed it in the Chaetoravinia. He also examined the holotypes of S. stimulans Walker, S. fulvipes Walker and S. assidua Walker. He raised S. stimulans to species status within the Chaetoravinia and placed S. assidua, S. fulvipes, and R. latisetosa Parker as synonyms. However, he did not discuss the relationship between C. vagabunda (van der Wulp) and C. stimulans. Lopes (1978b) removed Boettia covai from the Ravinia and synonymized it with B. fuscipennis Dodge. He notes that he originally placed this species in the Ravinia on the basis of Dodge's (1965a) figures of the female genitalia.

The placement of Musca pernix Harris as the senior name over the lone Palearctic species Ravinia striata (Fabricius), slowly worked its way into the literature. Dodge & Seago (1954) refer to pernix as the senior name as does Downes (1965). Lopes, *et al.* (1977), however, lists pernix as a questionable synonym of striata. The name Musca striata Fabricius is preoccupied by Gmelin, 1790. No Harris types have survived to the present, yet authors had interpreted the original description as that of lone Palearctic Ravinia. Pape (1986) examined the type material of Fallen and found that Musca haemorrhoidalis Fallen was a junior synonym of R. pernix. M. haemorrhoidalis Fallen is preoccupied by Villers (1789).

In this revision of the Ravinia, Chaetoravinia and Andinoravinia

are placed as synonyms of Ravinia. Thirty-three species are redescribed and the following species are described as new: R. cisselli from Kentucky, R. downesi from Texas, R. lopesi from Argentina, and R. shewelli from Colorado. R. haematodes is placed as the senior name of the lone species from the Old World. R. lherminieri is redefined, removed from previous synonymy, and placed as the senior name of R. ochracea after examination of the holotype in the Musee National D'Histoire Naturelle in Paris. R. anxia is raised to the senior name for the species which had been under the name R. lherminieri after study of the Walker and van der Wulp types at the British Museum of Natural History. Sarcophaga addentata and S. obscuripes are placed as synonyms of R. pusiola. S. rediviva is removed from synonymy with R. lherminieri and is placed as a synonym of R. querula. R. columbiana is raised from subspecies to species status and R. rufipes intermedia is synonymized with R. rufipes. R. laakei is placed as a synonym of R. vagabunda. The species Chaetoravinia advena, C. barroi, and C. postnoda are included for the first time in the genus Ravinia. The holotype of Sarcophaga quadrivittata Macquart was also studied and it was found to be not a member of Ravinia.

Appendix A provides a catalog-style listing of nomenclature and synonymy adopted for this revision.

BIOLOGICAL REVIEW

Much of the biological information recorded in the literature deals with rearing species of the Ravinia from various media. Rearing data described in the literature may be divided into two categories, rearings from natural media taken in from the field and rearings accomplished in the laboratory by placing the first-instars on a chosen media. Both types of investigations can provide valuable information on the life histories of these flies. The following biological review uses the nomenclature adopted in this study. To associate literature references with the names given below, consult the individual species descriptions.

Carnivore, omnivore, and herbivore dung is routinely utilized by members of the genus Ravinia. R. acerba, R. anandra, and R. stimulans have been reared from dog feces (Dodge, 1956a; Wilton, 1962; Coffey, 1966; personal observations). R. stimulans has been reared from wolf dung collected at a zoo in Lansing, Michigan (personal observations). R. acerba, R. almeidai, R. anandra, R. anxia, R. belforti, R. derelicta, and R. haematodes have been reared on human excrement (Howard, 1900; Aldrich, 1916; Kirchberg, 1954; Dodge, 1956a; Mihalyi, 1965; Coffey, 1966; Kano, Field and Shinonaga, 1967; Lopes and Kano, 1968; Sychevskaya, 1970; Lopes, 1974). Cow manure is the most commonly studied breeding media, and the species R. anxia, R. derelicta, R. lherminieri, R. pectinata, R. planifrons, R. pusiola, R. querula, and R. stimulans have been reared from it (Howard, 1901; Greene, 1925; Knipling, 1936; Mohr, 1943; Coffey, 1966; Sanders and Dobson, 1966; Turner, et al., 1968; Thomas and Wingo, 1968; Valiela, 1969; Blume, 1970; Thomas and Morgan, 1972; Valiela, 1974;

Merritt and Anderson, 1977; Davis and Turner, 1978; Wharton and Moon, 1979; Pickens, 1981). R. anxia and R. planifrons have been reared from sheep dung (Wilson, 1932; Coffey, 1966). R. anxia and R. querula have been reared from horse manure (Coffey, 1966). R. anxia has also been reared on pig feces (Coffey, 1966).

Some species of Ravinia have been reported as parasitoids of other insects and other invertebrates. While some of these records are probably based on misidentifications, others appear to have some validity. R. errabunda has been reared from the Mexican bean beetle, Epilachna varivestis Mulsant (Coleoptera: Coccinellidae) (van Emden, 1950). R. anxia has been reared from Iachnosterma horni Smith (Coleoptera: Scarabaeidae) (van Emden, 1950) and has been found to be a predator of eggs or larvae of the face fly, Musca autumnalis De Geer (Pickens, 1981). R. haematodes has been reared from Oryctes nasicornis L. (Coleoptera: Scarabaeidae) (Thompson, 1943; van Emden, 1950), as well as from grasshoppers and snails (Seguy, 1932, 1941; Rohdendorf and Verves, 1978).

Several species have been reared in the laboratory by various researchers. R. anandra has been reared from meat (Dodge, 1956a). R. anxia has been reared on decomposing hamburger (Knipling, 1936). R. anxia, R. pusiola, and R. stimulans have been reared on pork liver (Sanjean, 1957). R. haematodes has been implicated in human wound and intestinal myiasis (James, 1947; Trofimov et al., 1958; Zumpt, 1965; Rohdendorf and Verves, 1978).

Some of the data on collection of species of Ravinia also provides valuable information on the life histories of these species. R. coachellensis (Hall) was collected in traps which were baited with decaying liver, urea, and water (Hall, 1931). R. derelicta, R. stimulans, R. lherminieri, R. pusiola, and R. sueta (probably = R. querula) are recorded as scavenger species on pig carion by Payne & King (1972). R. vagabunda has been collected in traps baited with decaying beef (Hall, 1931). R. heithausi Lopes was collected on various flowers in Costa Rica (Lopes, 1975a). R. anxia is noted from onion fields (Merrill & Hutson, 1953), as being attracted to dog dung (Coffey, 1966), and collected from a trap baited with a hare carcass in Alaska (Gill, 1955). R. acerba is noted as being attracted to pig dung (Coffey, 1966). R. derelicta, R. stimulans, R. lherminieri, R. pusiola, and R. querula were collected in traps baited with chicken entrails and, sometimes, human feces (Dodge & Seago, 1954). R. stimulans is noted as being attracted to human dung (Coffey, 1966). Lundbeck (1927) notes that R. haematodes is common in sandy places and is often seen on human excrement. R. haematodes has been reported to be attracted to feces, meat and fruits (Eberhardt, 1955; Gregor and Povolny, 1961) and has been captured in food markets in Budapest, Hungary (Aradi and Mihalyi, 1971). R. querula is attracted to human, sheep, pig and dog dung (Coffey, 1966).

Some information on female fecundity is present in the literature. Knipling (1936) found that four females of R. derelicta yielded 20, 24, 28, and 30 larvae, respectively. He notes that 18, 32, and 40 larvae

were squeezed from three females of R. stimulans. For R. anxia he found 20, 27, 29, 32, and 40 larvae in five gravid females. He collected 15 larvae from a female of R. lherminieri. He also found that five females of R. pusiola produced 21, 24, 25, 40, and 44 larvae. Zakharova (1966) dissected 34 females of R. haematodes and notes the minimum fecundity to be 16 larvae and the maximum fecundity to be 52 larvae. Larval counts can be misleading if obtained from pinned specimens, as the females of Ravinia tend to expell many of their larvae as they die (personal observations).

Information on the length of the life-cycles of species of this genus is limited. Knipling (1936) notes that the life cycle, from first-instar to adult, may be less than 11 days for R. derelicta. He also notes the developmental period of R. stimulans as being 16 days and R. anxia as being 13 days. Thomas & Morgan (1972) found that the time of pupation of the horn fly, H. irritans, coincided with the time of pupation of R. querula and used R. querula as an indicator species to tell when the horn flies were pupating.

A number of insect parasitoids have been reared from the puparia of bovine dung-breeding Ravinia (Blickle, 1961; Turner, et al., 1968; Thomas and Wingo, 1968; Hayes and Turner, 1971; Moore and Legner, 1973; Watts and Combs, 1975; Wharton, 1979; Figg, et al., 1983a; Figg, et al., 1983b). These include: Aleochara bimaculata Gravenhorst; A. bipustulata (L.), and Aleochara sp. (Coleoptera: Staphylinidae); Alysia ridibunda Say, Aphaereta pallipes (Say), and Phaenocarpa sp. (Hymenoptera:

Braconidae); Xyalophora quinquelinata (Say) and Figites sp. (Hymenoptera: Cynipidae); Eucoila impatiens and Eucoila sp. (Hymenoptera: Eucolidae); Trichopria sp. (Hymenoptera: Diapriidae); Trichomalopsis dubia (Ashmead), Muscidifurax raptor Girault and Sanders, Muscidifurax sp., Spalangia haematobiae Ashmead, S. nigra Latreille, and S. nigroaenea Curtis (Hymenoptera: Pteromalidae). In addition to insect parasitoids, R. anxia is also known to be attacked by the nematode Heterotylenchus autumnalis Nickle (Stoffolano and Streams, 1971; Stoffolano, 1973).

Peckham, et al. (1973) found that Oxybelus uniglumis quadrinotatus (Hymenoptera: Sphecidae) provisioned its nests with R. acerba and R. anxia adults, along with a variety of other cyclorrhaphan flies. Only males were used as provisions. Wharton (1979) noted that Philonthus sp. (Coleoptera: Staphylinidae) adults captured early instars of R. querula. Ants are important natural enemies of dung-breeding Diptera, although published studies have not dealt with Ravinia specifically (Pimental, 1955; Wingo, et al., 1974; Wharton, 1979).

Cook and Gerhardt (1977) looked at selective mortality of insects in manure from cattle fed Rabon^R and Dimilin^R and found that population levels of members of the genus Ravinia were significantly reduced from Rabon, but not Dimilin.

Very little has been written on male station taking and mating behavior of the Ravinia. Dodge & Seago (1954) found unusually high ratios of males to females in R. lherminieri and R. querula in their collections of sarcophagids from mountain summits in Georgia. They were

unable to explain this phenomena as a mating behavior, since they only collected one mating pair of R. querula and none of R. lherminieri during their entire study. Chapman (1954) collected 41 males and only 1 female of R. querula in his study of summit-frequenting insects in Montana. Mating behavior of R. haematodes (as striata) is described by Hammer (1942) with the mere statement that the couples pursue each other into the air before tumbling to the ground. Lopes and Kano (1968) provide an examination of the relationships of the various parts of the male and female genitalia of R. belforti which were killed during copulation. A detailed account of the mating behavior of R. stimulans is presented later, under the biology section of this species' description. Observations of potential station-site locations are given in the species description, when available.

LARVAL MORPHOLOGY

The Sarcophagidae are normally ovoviviparous, that is, the eggs are retained within the bipouched uterus for development and first instars are deposited. The larvae are still enclosed in their chorionic membranes when deposited and release themselves by clawing vigorously with their mouth hooks (Sanjean, 1957). This important facet of the life history of sarcophagids allows the opportunity to study the first instars of these flies by dissecting a dead, pinned specimen of a female and obtaining the larvae held within the uterus. The larvae pass through

three instars before pupariation. First instars do not have developed anterior spiracles, second instars have only two slits in the posterior spiracles while third instars have three slits.

A detailed study of the larvae of Ravinia was outside the scope of this revision, but published accounts of the larvae have been incorporated. Knipling (1936) studied the first instar of R. pusiola, R. anxia, R. sueta (probably = R. querula or R. lherminieri), R. stimulans and R. derelicta. Sanjean (1957) studied the first, second, and third instars of R. pusiola, R. anxia and R. stimulans. The larvae of R. haematodes has been described by Kano & Sato (1951). Lopes (1982) described R. belfordi and R. almeidai first instars. Greene (1925) described the puparia of R. querula, R. lherminieri, and R. derelicta. Wharton and Moon (1979) described the puparia of R. stimulans, R. pusiola, R. planifrons, R. anxia, R. derelicta, and R. querula.

In the Ravinia and Oxysarcodexia the first instars exhibit an extreme state of the labrum in which it appears wholly membranous and have very well developed pseudotrachea, which are often darkly pigmented (Downes, 1955; personal observations). The well developed pseudotrachea also occurs in several coprophagous species of the genus Sarcophaga and may be related to the dung-feeding mode of life. Their function is unknown at the present time.

ADULT MORPHOLOGY

The genus Ravinia was described by Robineau-Desvoidy (1863) and was separated from other genera by the character of the frontal bristles diverging very little anteriorly. This character is generally true in the Ravinia, but it cannot be used to separate the genus from other sarcophagid genera recognized today. Adults of the genus Ravinia are separated from all others by the presence of the following characters: postalar wall setulate; tegulae orangish in ground color, sometimes partly infuscated; male without apical scutellar bristles and with reddish-orange genital capsule; female with frontal vitta at midpoint twice or more width of parafrontal plate at that level. R. shewelli n.sp. is the only species that does not conform to all of these external characters, having a black tegula and black genitalia. The form of the male and female genitalia, however, definitely associate this species with others in the genus Ravinia.

The terminology used in this revision is that of McAlpine, et al. (1981) except for characters of the aedeagus, where the terminology of Roback (1954) has been used. The male aedeagus has proven to be the single most important tool used to most separate species in this genus (and nearly all other genera of Sarcophaginae as well). I have aggressively searched for non-genitalic features of the adults that are useful in the separation of species and are mentioned where applicable.

METHODS AND MATERIALS

Nearly 12,000 specimens were examined from numerous localities in North, South, and Central America. The specimens were from various institutions, the collection of Dr. W. L. Downes, Jr. (WLD), and my personal collection (GAD). Examinations and dissections of specimens were normally undertaken at a magnification of 50 X with the use of a Leitz Wetzlar dissecting microscope. Illustrations of the genitalia were accomplished with the aid of a Bausch and Lomb Microprojector.

Dissections of the male and female genitalia were accomplished using the following technique:

Step 1: Heat up a solution of KOH (7 pellets KOH to 10 cc H_2O) in a water bath kept just below boiling. This usually takes about 2 hours.

Step 2: Carefully remove the entire abdomen of the specimen to be studied by grasping it gently with forceps and rocking the abdomen up and down until it breaks off from the thorax.

Step 3: Place the abdomen in the KOH solution for 5 minutes. While the abdomen is in the solution, place distilled H_2O in 3 depressions in a culture plate.

Step 4: Remove the abdomen from the KOH solution and place it in one of the depressions filled with distilled H_2O . Under the scope, make an incision between the 4th and 5th sternites (males) or 5th and 6th sternites (females). The cuticle should be very pliable at this point, if not, the KOH solution should be left to heat up for another hour or so (gravid females may need to soak a bit longer than other specimens).

Step 5: Dissect off the genitalia and place in adjacent fresh H_2O .

Step 6: Using an eyedropper or pipette, rinse the abdomen's interior and exterior until free of trachea and other unwanted remains. Discard old and resupply fresh H_2O at least 3 times. Be sure to check for larvae when dissecting females.

Step 7: Place abdomen in adjacent fresh water. Return to work on genitalia and dissect out parts that need detailed examination.

Step 8: Place abdomen in a vial of glacial acetic acid for ca. 1 minute. Remove abdomen and place on a paper towel, with the basal opening of the abdomen down, to dry. This will restore the abdomen's pruinosity and tessellation pattern. If it does not restore, it may be time to change the KOH and/or acetic acid solutions.

Step 9: Place a small amount of glue on the thorax where the abdomen is to be replaced, using a minuten mounted on a matchstick. Under the scope, replace the abdomen to its original position.

Step 10: Place genitalia in a depression filled with glycerine. Swirl around until most of the water is removed. Place genitalia in a microvial and attach to pin of specimen to which they belong.

Genus RAVINIA Robineau-Desvoidy

RAVINIA Robineau-Desvoidy, 1863: 434. Type species: Sarcophaga

haematodes Meigen (orig. des.).

Punasarcophaga Townsend, 1915: 408-409. Type species: Punasarcophaga

aurumaculata Townsend (orig. des.).

Andinoravinia Townsend, 1917: 190, 193, 195, 196. Type species:

Andinoravinia rufipes Townsend (orig. des.).

Chaetoravinia Townsend, 1917: 190, 193, 195. Type species: Helicobia

quadrissetosa Coquillett (orig. des.) = derelicta (Walker).

Euravinia Townsend, 1917: 191, 194, 195. Type species: Ravinia communis

Parker (orig. des.) = guerula (Walker).

Miltoravinia Townsend, 1917: 191, 194, 195. Type species: Sarcophaga

planifrons Aldrich (orig. des.).

Trixosarcophaga Townsend, 1917: 191, 194, 195. Type species: Sarcophaga

aurigena Townsend (orig. des.).

Catasarcophaga Townsend, 1927: 220, 295. Type species: Catasarcophaga

trivittata Townsend (orig. des.) = advena (Walker).

Engelina Enderlein, 1928: 16. Type species: Sarcophaga xanthopyga

Enderlein, nec. van der Wulp (orig. des.) = misidentification of

rufipes (Townsend).

Thyrsocnema Enderlein, 1928: 42-43. Type species: Musca striata

Fabricius (orig. des.).

ADULT: Frontal setae diverging very little. Male usually without proclinate orbital setae, female usually with two. Female with well developed outer vertical setae. Female with frontal vitta at midpoint twice or more width of fronto-orbital plates at that level. Postalar wall setulate. Tegulae orangish in ground color, sometimes partly infuscated (with the exception of R. shewelli n.sp. where the tegulae is blackish). Male without apical scutellar bristles. Mesofemur of male with postero-ventral, apical comb of short, stout, setae. Metatibia with apical posteroventral bristle not differentiated or but slightly so. Presutural acrostichal setae differentiated. R_{4+5} with dorsal setae, R_1 with or without dorsal setae. Genital capsule orangish (with the exception of R. shewelli where the genital capsule is blackish). Male aedeagus with basiphallus and distiphallus fused. Juxta absent (with the exception of R. effrenata (Walker)).

KEY TO SPECIES OF RAVINIA

- 1 R_1 with dorsal setae 2
- 1' R_1 without dorsal setae 25
- 2 (1) Costa with ventral setulae extending past Sc to R_1 3
- 2' Costa with ventral setulae ending at Sc 8
- 3 (2) R_1 with dorsal setae extending past bend of Sc, male with sinuous
cerci in lateral view 7
- 3' R_1 with dorsal setae ending at bend of Sc 4

- 4 (3) Male with bifid cerci (figures 2b-c), female with sternites 6, 7, and 8 with nearly parallel margins (figure 2e) R. advena
- 4' Cerci of male not bifid, female with sternites 6 and 7 much wider than sternite 8 (figures 13d, 25d, 32d) 5
- 5 (4) Palpus orange R. rufipes
- 5' Palpus black 6
- 6 (5) Cerci of male with long, thin, parallel apices (figure 25b);
hillae aedeagus with distinctly darkened base (figure 25c); sternite 8 of female with long, basal projections (figure 25d) ... R. meinkei
- 6' Cerci of male with stouter and more divergent apices (figure 13b);
hillae not distinctly darkened basally, not darker than adjacent distiphallus (figure 13c); sternite 8 of female without long, basal projections (figure 13d) R. columbiana
- 7 (3) Sternite 5 of male with large mesal window and multilobed appearance along mesal convexity (figure 3a); sternite 8 of female with a flat, apical lip (figure 3d) R. almeidai
- 7' Sternite 5 of male with mesal margins nearly parallel (figure 29a); sternite 8 of female uniformly convex, without apical lip (figure 29d) R. postnoda
- 8 (2) Males 9
- 8' Females 17
- 9 (8) Cerci with apices strongly convergent (figures 9b, 15b) 10
- 9' Cerci with apices slightly convergent or parallel 11
- 10 (9) Legs reddish-orange R. barroi

- 10' Legs grey R. derelicta
- 11 (9) Vesica long, extending much past hillae in lateral view, may be bent upwards against basiphallus 14
- 11' Vesica short, shorter or slightly longer than hillae in lateral view 12
- 12 (11) Proclinate upper orbital setae present R. downesii
- 12' Proclinate upper orbital setae absent 13
- 13 (12) Fifth sternite with a pair of large, ventrally produced lobes and several strong setae (figure 18a) R. errabunda
- 13' Fifth sternite produced medially, appearing as parallel brushes (figure 14a) R. dampfi
- 14 (11) Distiphallus rounded, vesica strongly bent upwards against basiphallus in lateral view (figure 20c) R. globulus
- 14' Vesica not strongly bent upwards against basiphallus in lateral view 15
- 15 (14) Cerci with long, thin apices (figure 17b) R. effrenata
- 15' Cerci with rather short, thick apices (figures 34b, 37b) 16
- 16 (15) Hillae rounded dorsally in lateral view (figure 37c) R. vagabunda
- 16' Hillae pointed dorsally in lateral view (figure 34c) .. R. stimulans
R. coachellensis
- 17 (8) Sternites 7 and 8 at least partially fused (figures 9d, 20d).. 18
- 17' Sternites 7 and 8 not fused 19
- 18 (17) Legs reddish orange R. barroi
- 18' Legs grey R. globulus

- 19 (17) Sternite 7 completely divided into two separate plates (figure 15d) R. derelicta
- 19' Sternite 7 entire 20
- 20 (19) Sternite 8 much smaller in width than sternite 7 and situated in apical indentation of sternite 7 (figures 17d, 34d, 37d) 21
- 20' Sternite 8 nearly as wide as sternite 7 (figures 4, 16d, 18d) ... 23
- 21 (20) Sternite 7 with a nearly straight anterior margin, not bi-lobed (figure 17d) R. effrenata
- 21' Sternite 7 incised anteriorly, appearing bi-lobed 22
- 22 (21) Sternite 7 with rounded anterior lobes (figure 34d) R. stimulans
- 22' Sternite 7 with pointed anterior lobes (figure 37d) ... R. vagabunda
- R. coachellensis
- 23 (20) Sternite 7 long, wide and conspicuous (figure 18d) R. errabunda
- 23' Sternite 7 not much different in size from sternites 6 and 8 24
- 24 (23) Sternite 8 with lateral, oval depressions (figure 16d) R. downesi
- 24' Sternite 8 without such depressions (figure 4) R. anandra
- 25 (1) With 3 postsutural dorsocentral setae 26
- 25' With 4 postsutural dorsocentral setae 31
- 26 (25) Tegulae and genitalia orange 27
- 26' Tegulae and genitalia black R. shewelli
- 27 (26) Male with hillae broad dorsally and much narrowed ventrally (figure 21c); female with sternite 7 long and rectangular (figure 21d) (Old World) R. haematodes
- 27' Hillae of male not drastically narrowed ventrally; sternite 7 of

- female often triangular, if rectangular then not longer than wide
(New World) 28
- 28 (27) Hillae broad dorsally with a distinct notch, giving the aedeagus
an ax-like appearance (figures 22c, 36c); sternite 7 of female more
rectangular than triangular in general appearance (figures 22d, 36d)
..... 29
- 28' Hillae without a distinct notch and not broad dorsally (figures 1c,
30c); sternite 7 of female triangular (figures 1d, 30d) 30
- 29 (28) Hillae with broad, conspicuous notch (figure 36c); sternite 7 of
female with nearly straight apical margin R. tancituro
- 29' Hillae with small notch (figure 22c); apical margin of sternite 7 of
female with triangular mesal projection (figure 22d) .. R. heithausi
- 30 (28) Hillae much thinner dorsally than ventrally (figure 1c);
sternite 7 of female broadly triangular (figure 1d) R. acerba
- 30' Hillae nearly equally thick dorsally and ventrally (figure 30c);
sternite 7 of female not as broad as above (figure 30d) . R. pusiola
- 31 (25) Palpus and legs orange R. floridensis
- 31' Palpus black 32
- 32 (31) Meso and metathoracic coxae and trochanters orange ... R. lopesi
- 32' Coxae and trochanters black 33
- 33 (32) Males 34
- 33' Females 45
- 34 (33) Gena golden pruinose 35
- 34' Gena grey pruinose, with at most yellow pruinosity restricted to

- edge of gena at genal groove 41
- 35 (34) Corpus abruptly expanded dorsally, posterior margin of aedeagus
in lateral view distinctly notched (figure 6c) R. aureopyga
- 35' Posterior margin of aedeagus in lateral view smoothly rounded ... 36
- 36 (35) Aedeagus with a distinct plate between hillae, extending
anteriorly R. sueta
- 36' Aedeagus without a distinct plate between hillae 37
- 37 (36) Fifth sternite with long lateral arms (figure 23a) R. lherminieri
- 37' Fifth sternite longer than wide (e.g., figure 8a) 38
- 38 (37) Frontal vitta distinctly narrowed posteriorly R. aurigena
- 38' Frontal vitta with parallel margins or slightly narrowed
posteriorly 39
- 39 (38) Hillae rounded and bulbous at tip (figure 10c) R. belforti
- 39' Hillae not bulbous, rather triangular in appearance 40
- 40 (39) Corpus smoothly rounded posteroventrally (figure 26c)
..... R. ollantaytambensis
- 40' Corpus with distinct medial expansion posteroventrally (figure 8c)
..... R. auronaculata
- 41 (34) Corpus much reduced and thinned at apex (figure 28c)
..... R. plannifrons
- 41' Corpus broadly rounded at apex 42
- 42 (41) Ground color of posteroventral area of tergum 5 orangish, hillae
appearing rather triangular (figure 11c) R. cissilli
- 42' Ground color of tergum 5 grey throughout, hillae not distinctly

- narrowing dorsally 43
- 43 (42) Hillae clear membranous dorsally, corpus not extending much past
ventral margin of hillae R. pectinata
- 43' Hillae at most with thin clear membranous strip dorsally, corpus
appearing rather bulbous below ventral margin of hillae 44
- 44 (43) Aedeagus with distinct anteriorly produced median plate between
the hillae R. querula
- 44' Aedeagus without such a plate between hillae R. anxia
- 45 (33) Sternite 7 without dense golden pruinosity 46
- 45' Sternite 7 with dense golden pruinosity 49
- 46 (45) Sternite 7 very broad, not distinctly narrowing posteriorly
(figure 31d) R. querula
- 46' Sternite 7 narrowing posteriorly 47
- 47 (46) Lateral margins of sternite 7 convergent, nearly from basal
margin (figure 5d) R. anxia
- 47' Lateral margins of sternite 7 nearly parallel over basal half ... 48
- 48 (47) Sternite 6 with medial invagination on anterior margin (figure
27d) R. pectinata
- 48' Sternite 6 with a straight anterior margin (figure 28d)
..... R. plannifrons
- 49 (45) Sternite 7 with basal lobes (figure 6d) R. aureopyga
- 49' Sternite 7 with lateral margins smoothly rounded 50
- 50 (49) Sternite 7 nearly equal in size to sternite 6, sternites 6 and 7
together appearing as a broad oval (figure 35d) R. sueta

- 50' Sternite 7 longer than sternite 6, sternites 6 and 7 not forming a
broad oval 51
- 51 (50) Gena grey pruinose, at most with tinge of yellow at margin with
genal groove R. cissilli
- 51' Gena golden pruinose R. aurigena
- R. auromaculata
- R. belforti
- R. lherminieri
- R. ollantaytambensis

Ravinia acerba (Walker)

(Figures. 1a - d)

Sarcophaga acerba Walker, 1849: 824-825. Type-locality: Nova Scotia
(female). Aldrich, 1930: 15 (synonymy).

Ravinia peniculata Parker, 1914: 58-59, figure 45. Type-locality:
?Massachusetts (male). Metz, 1916: 218, 235, figures 98, 99
(description of chromosomes). Greene, 1925: 6, 21, figure 39
(description of puparium). Aldrich, 1930: 33 (synonymy).

Sarcophaga peniculata (Parker). Aldrich, 1916: 114, 121-123, figure 49
(key, redescription). Hall, 1928: 334, 336, figure 3 (key,
redescription). Winn and Beaulieu, 1932: 81 (locality records).
Brown, 1934: 250 (biology).

Sarcophaga pusiola authors, nec. van der Wulp. Sanjean, 1957: 55-56,
figures 114A-122 (description of larva).

Ravinia lherminieri authors, nec. Robineau-Desvoidy. Gill, 1955: 651
(biology).

Ravinia acerba (Walker). Dodge, 1956a: 188, 189 (synonymy,
redescription). Coffey, 1966: 214, 217 (biology). Peckham, et al.,
1973: 652 (biology).

ADULT: Length: 6 - 10 mm. Fronto-orbital plate gray pruinose,
often with copperish tinge ventrally. Gena gray pruinose with a bit of a
yellowish tinge at border with genal groove. Two to three well developed
presutural acrostichal setae; 3 postsutural dorsocentrals. Thoracic
pleurae gray pruinose.

MALE: Cerci of moderate size with apices parallel to slightly
convergent (figure 1b). Fifth sternite as in figure 1a. Hillae of the
aedeagus well developed, noticeably narrowing toward apex (figure 1c).

FEMALE: Sternite 7 much larger than sternites 6 and 8 and rather
triangular in shape (figure 1d). Sternite 6 with some basal, dark,
infuscation.

LARVAE: The larvae may have been described by Sanjean (1957).

PUPARIUM: A description of the puparium may be provided by Greene
(1925).

DIAGNOSIS: This species may be separated from R. anxia and R.
querula by the presence of 3 strong postsutural dorsocentral setae. It
is easily separated from R. shewelli by its orange tegulae and orange

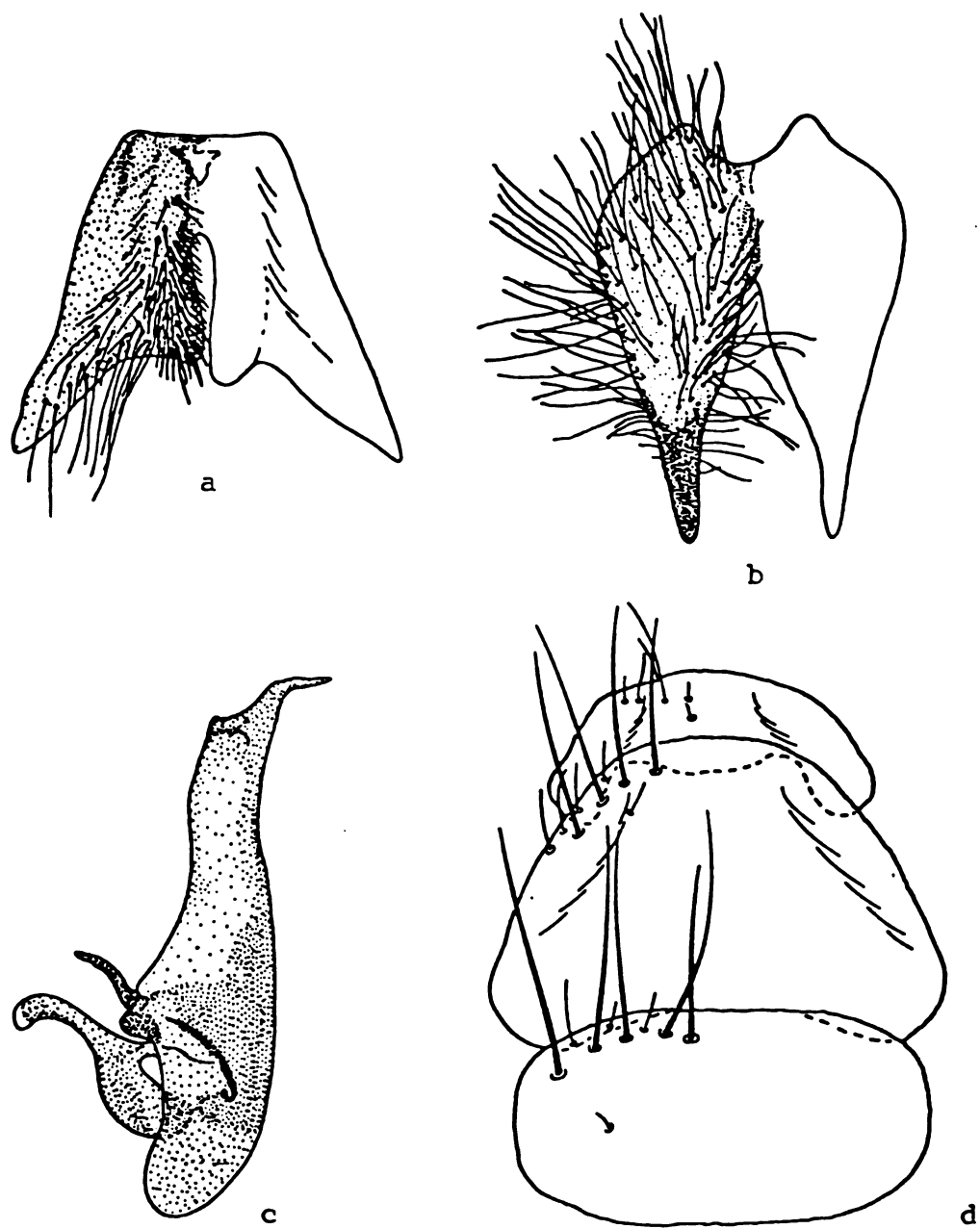


Figure 1: Genitalia of Ravinia acerba. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

genitalia. It can usually be separated from the species R. pusiola and R. tancituro by the presence of at least 2 strong presutural acrostichals and dark grey color. The genitalia are diagnostic (especially the male's aedeagus) and will separate this species from other species with 3 postsutural dorsocentrals.

TYPES: Female holotype, Nova Scotia (BMNH). Examined in 1986, in good condition.

MATERIAL EXAMINED: 88 males and 87 females (BRC, BMNH, CAS, CSU, FMNH, MCZ, MSU, OSU, SUNY, WLD), including 5 paratypes of peniculata (MCZ). MICH. Channing, Dickinson Co., 4 June 1983, M. Arduser (male-MSU; used for figures 1a-c). MICH. Channing, Dickinson Co., 12 Aug. 1987, R.L. Fischer (female-MSU, used for figure 1d).

DISTRIBUTION: Canada (Alberta, British Columbia, New Brunswick, Northwest Territory, Nova Scotia, Ontario, Quebec), northern United States (Alaska, California, Colorado, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Vermont, Washington). Distribution from material examined. The species appears to be relatively uncommonly collected but widely distributed.

BIOLOGY: Little is known of the biology. Coffey (1966) may have

reared acerba from human and dog feces and collected it on swine dung. It has been collected in an open white pine stand and on flowers in Timagami, Ontario (Brown, 1934). It may have been collected in a trap baited with a hare carcass in Circle, Alaska (Gill, 1955). A series of 4 males and 2 females was collected in New Brunswick on Chamcook Hill summit, 637' by G.E. Shewell (BRC). One female was collected in New Brunswick on flowers of Solidago sempervirens by G.E. Shewell (BRC). R. acerba has been collected in Malaise traps from the localities of Gatineau Co., Quebec (BMNH: 1 male); Dickenson Co., Michigan (MSU: 8 males, 1 female); and Kenora Co., Ontario (CAS: 3 females). A description and notes on the behavior of chromosomes may be given by Metz (1916). This species may have been found as prey/provision of larvae in the nest of the wasp Oxybelus uniglumis quadrinotatus Say (Hymenoptera: Sphecidae) by Peckham, Kurczewski, and Peckham (1973) in New York.

REMARKS: This species may be found in collections under the names acerba, lherminieri, peniculata and pusiola. In each of these cases, specimens may be mixed with those of pusiola, tancituro, as well as several other species. Determinations of acerba by Dodge after 1960 seem to be reliable, others should be regarded as questionable.

Aldrich (1930) erroneously placed acerba as synonym of lherminieri and placed peniculata as synonym of pusiola. This has caused some problems with information about this species in the literature. Although Boyes (1963) states the synonymy of peniculata with pusiola when

discussing the work of Metz (1916), I believe that the species in question may be acerba since the initial identifications were performed by Parker and I have seen a specimen of pusiola determined by Parker as peniculata, but the determination also included a statement that this may be a geographical race. Twelve specimens of acerba were studied that were identified as peniculata by Parker, including 5 paratypes. It can not be ruled out, however, that the species in question was actually pusiola. Six specimens of pusiola were studied that were identified as peniculata by Parker. Although Gill (1955) lists a record of lherminieri (this species is now placed under the name anxia), I believe this to be a record of acerba due to the more northern range of this species and because a specimen of acerba has been seen by myself, collected in Alaska, but no Alaskan specimens of anxia were included in material examined. The listing of acerba as a prey species by Peckham, et al. (1973) is considered to be questionable and may apply to acerba or pusiola, as both species are found in New York. Specimens borrowed from the State University of New York collection did not include Ravinia specimens attributable to this study. The figure of the male genitalia of pusiola by Hallock (1940a, 1940b) matches that of pusiola, rather than acerba, even though he notes synonymy with peniculata. The description of the larvae of pusiola by Sanjean (1957) and the puparium by Greene (1925) may apply to acerba or pusiola. The description he provided of the first instar is not sufficient to definitively separate these two species. I have not examined second or third-instars of these two

species and such examination may clear up the identity of Sanjean's species. The description of the first instar of pusiola by Knipling (1936) is believed to be that of pusiola (rather than acerba) due to the notation that the specimens were collected from Illinois and Iowa. The species pusiola is very commonly collected in Iowa and Illinois and no specimens of acerba have been seen from those states. The species reared and collected by Coffey (1966) may be acerba or pusiola.

Ravinia advena (Walker)

(Figures 2a - d)

Sarcophaga advena Walker, 1852: 324. Type-locality: Brazil (male).

Sarcophaga contermina Walker, 1852: 327. Type-locality: Brazil (female).

Lopes, 1976: 629-630 (notes on type).

Catasarcophaga trivittata Townsend, 1927: 220, 295. Type-locality:

Brazil, Sao Paulo, Itaquaquecetuba (male and female). Lopes, 1932: 46, pl. 3 (paratype examined).

Sarcophaga (Chaetoravinia) townsendi Engel, 1931: 149, figure 18. Type-locality: Bolivia, Northern Chiquitos (male).

Chaetoravinia advena (Walker). Lopes, 1976: 629-630, figures 1-3 (redescription of type).

ADULT: Length: 5 - 7 mm. Fronto-orbital plate yellow pruinose. Frontal vitta usually bicolored, reddish brown anteriorly and black posteriorly. Ventral setulae of costa extending past Sc to R_1 . Dorsal

setae present on R_1 , extending to bend of Sc.

MALE: Mesothoracic tibia with small anteroventral seta. Fifth sternite (figure 2a) with an oval median hole. Cerci bifid (figures 2b-c). Aedeagus somewhat curved (figure 2d), hillae mostly membranous.

FEMALE: Sternites 6, 7, and 8 nearly equal in width and well developed (figure 2e).

DIAGNOSIS: The ranges of advena and almeidai overlap in much of Brazil, but both males and females of advena can be easily separated from almeidai by the dorsal setae on R_1 extending only to the bend of Sc rather than continuing to near the wing margin. This character will also separate this species from the Central American/northwestern South American species postnoda (Dodge). The bifid cerci of the male is conspicuous and unique to the species advena among the Ravinia. Females can be separated from columbiana, meinkei and rufipes by the shape of the genital sternites.

TYPES: Male holotype, Brazil, Ex. coll. Saunders, 68-4. "advena" (BMNH). Redescription given by Lopes, 1976.

MATERIAL EXAMINED: 8 males, 8 females. Paraguay, Villarica, VIII, F. Shade collector (MCZ-male; used for figures 2a-c). Brazil, Nova Teutonia, 27° 11' B. 52° 23' L., 300-500 m, 11 1973, Fritz Plaumann (FMNH-male; used for figure 2d). Brazil, Nova Teutonia, 27° 11' B. 52°

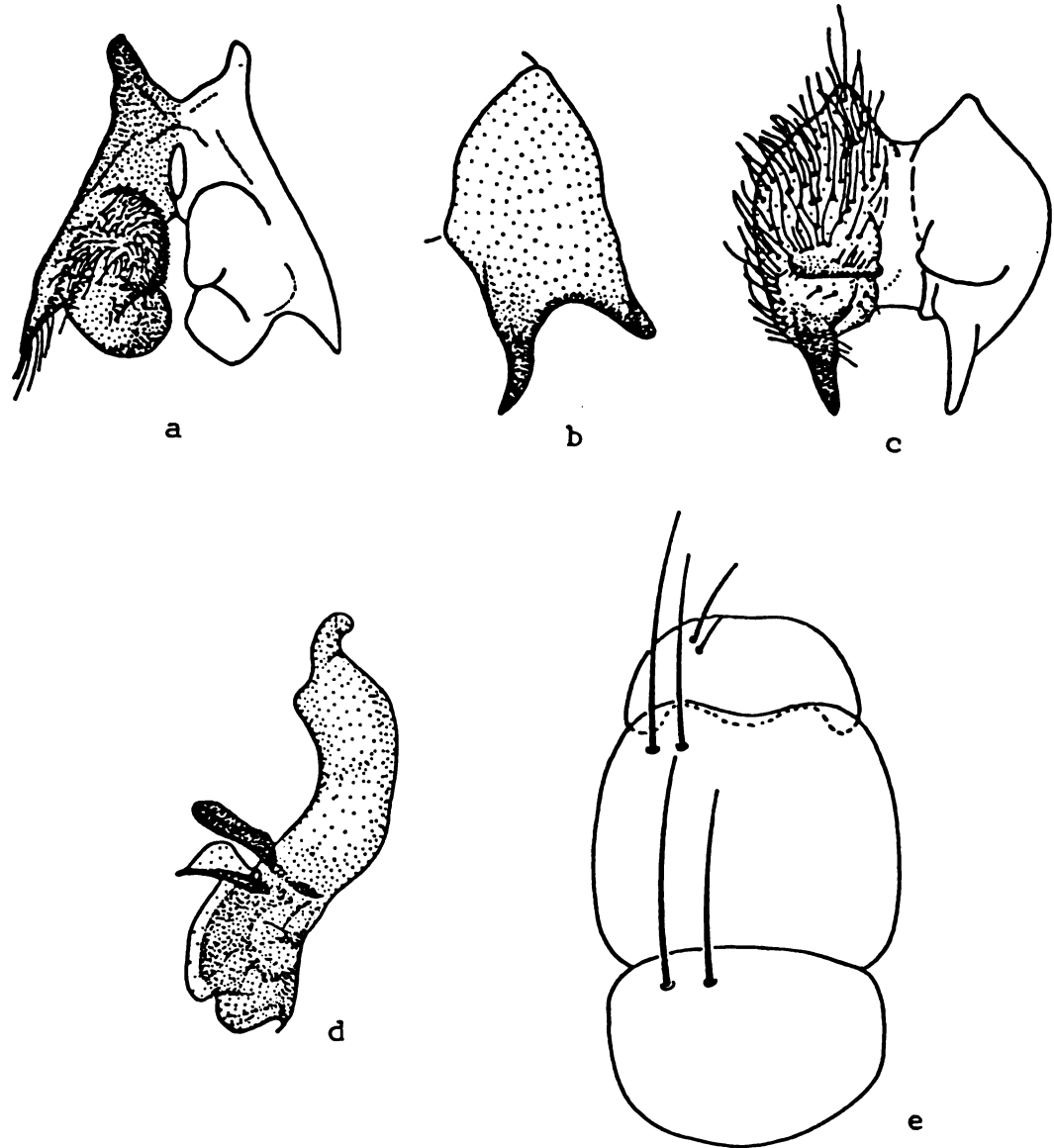


Figure 2: Genitalia of Ravinia advena. (a) Male fifth sternite; (b) Male cerci (lateral view); (c) Male cerci; (d) Aedeagus; (e) Female sternites 6, 7 and 8.

23' L., 300-500 m, VI 1950, Fritz Plaumann (FMNH-5 males, 6 females; one female used for figure 2e). Brazil, Nova Teutonia, 27° 11' B. 52° 23' L., 300-500 m, III 1957, Fritz Plaumann (FMNH-male, female). Paraguay, Cantera, Hapua, March 1954 (MSU-female).

DISTRIBUTION: Argentina, Bolivia, Brazil (Mato Grosso, Minas Gerais, Sao Paulo, Santa Catarina), Paraguay. Distribution from material examined and Lopes (1969).

BIOLOGY: Very little is known of the biology. Lopes (1976) indicates that females from an existing culture were used for comparative purposes. No further details on biology or larval substrate were given. Two dissected females yielded 15 and 17 larvae, respectively.

REMARKS: Determined specimens will usually be found under the name trivittata in collections.

Ravinia almeidai (Lopes)

(Figures 3a - d)

Chaetoravinia almeidai Lopes, 1946b: 227-230, figures 1-5. Type-

locality: Brazil, Mato Grosso, Salobra (male). Lopes, 1974: 272-273 (distribution and rearing). Lopes, 1982: 315, figures 72, 75, 82 (description of first instar).

ADULT: Length: 5 - 8 mm. Fronto-orbital plate pale yellow pruinose. Ventral setulae of costa extending past Sc to R_1 . Dorsal setae present on R_1 extending past bend of Sc.

MALE: Mesothoracic tibia with anteroventral seta. Fifth sternite (figure 3a) with a large median hole and several long conspicuous setae. Cerci sinuous in lateral view and with apices convergent in posterior view (figure 3b). Aedeagus somewhat curved (figure 3c), hillae mostly membranous.

FEMALE: Sternites 6, 7, and 8 nearly equal in width. Sternite 8 flattened along apical margin (figure 3d).

LARVAE: Lopes (1982) described the first instar.

DIAGNOSIS: Very similar to postnoda. The species appear to be geographically isolated by the Andes Mountains. Males are most easily separated by the shape of the fifth sternite and by the form of the aedeagus. The shape of the genital sternites will distinguish females of these two species from one another. Both males and females can be separated from advena (Walker) by the presence of dorsal setae extending past the bend in Sc. Males of almeidai are easily separated from advena by the sinuous cerci which are not bifid.

TYPES: Male holotype: Brazil, Mato Grosso, Salobra, Comissao do Instituto Oswaldo Cruz, I 1941 (IOC). Female allotype: Brazil, Mato Grosso, Salobra, Comissao do Instituto Oswaldo Cruz, I 1941 (IOC).

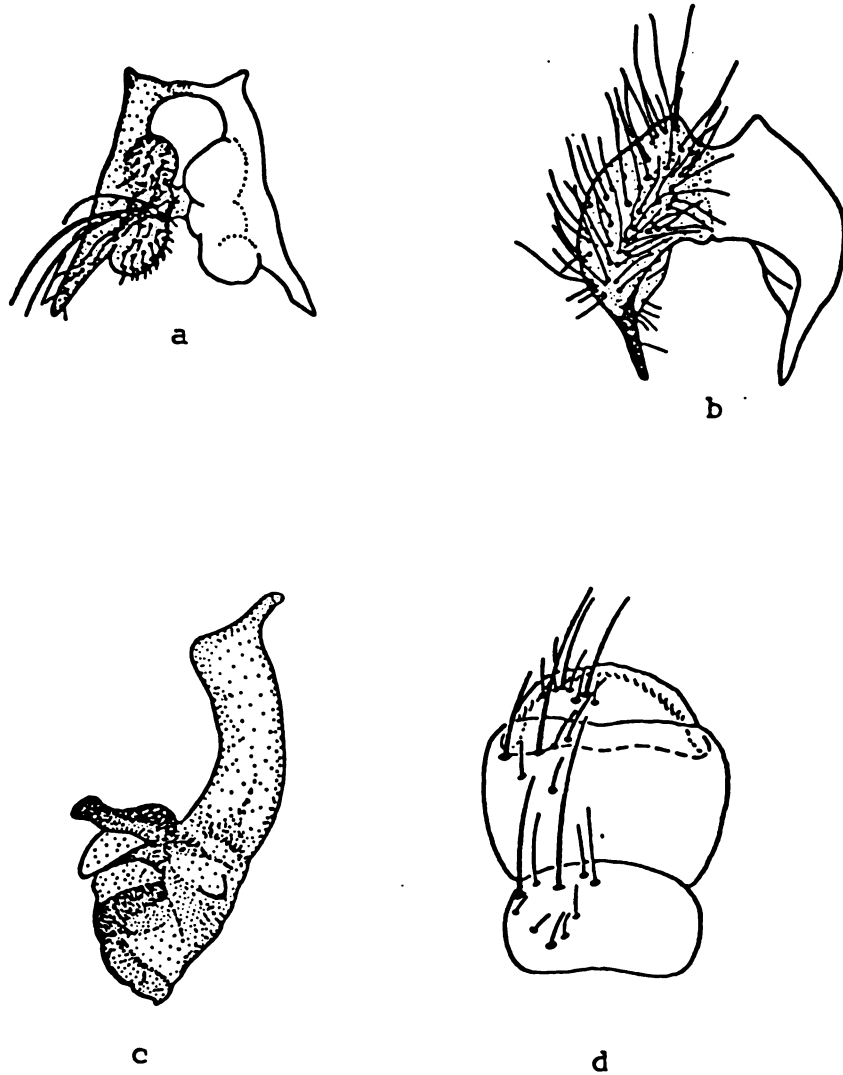


Figure 3: Genitalia of Ravinia almeidai. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

Twenty-four paratypes (Lopes, 1946b).

MATERIAL EXAMINED: 1 male and 2 females. Paratype, Brazil, Mato Grosso, Salobra, Com. I.O.C., Jan. 941 (MCZ-male; used for figures 3a-c). Paratype, same data (MCZ-female; used for figure 3d). Both specimens somewhat teneral. Argentina, Tecuman, Tecuman, January 1953, S.P. Colalao (MSU-female; in poor condition).

DISTRIBUTION: Argentina, Brazil (Ceara, Mato Grosso, Minas Gerais, Parana, Sao Paulo). Distribution from material examined and Lopes (1946b, 1969, 1974).

BIOLOGY: Larvae may be coprophagous. Lopes (1974) reports that one female collected from Brazil, Ceara, Pacatuba on 23 VII 1973 yielded 21 larvae which were reared on human feces. Twenty mature larvae were observed on 26 VII and the adults emerged on 5 VIII 1973 (14 days from first instar to adult). Reared adults were very small. First instars described by Lopes (1982) were apparently obtained from an existing culture of this species, but no details on rearing/ biology were given.

Ravinia anandra (Dodge)

(Figure 4)

Chaetoravinia anandra Dodge, 1956a: 187, figure 15. Type-locality:

United States, Georgia, Cobb County, Kennesaw Mt. (female). Lopes,

1961: 419, 422, figures 1a-d (key, locality records). Wilton, 1963: 313 (biology). Rohdendorf & Gregor, 1973: 8 (key). Hardy, 1981: 381, figure 164 (redescription).

ADULT FEMALE: Length: 4 - 7 mm. Fronto-orbital plate grey pruinose with pale yellowish tinge. Sternite 6 usually dark, 7 and 8 orange. Sternites 6-8 nearly equal in width (figure 4). R_1 with dorsal setae extending to bend of Sc.

DIAGNOSIS: Generally a small species with sternites 6-8 very similar to those of downesi. It may be separated from this species by the form of the lateral margins of sternite 8, which do not have the distinct oval depressions seen in downesi.

TYPES: Female holotype, United States, Georgia, Cobb County, Kennesaw Mt., June 18, 1952, CDC fly trap (type number 62337, USNM). Paratype females are widely distributed in many collections. Dodge (1956a) lists locality data for 198 paratype specimens and 1473 trapped specimens.

MATERIAL EXAMINED: 78 females (CAS, MCZ, MSU, OSU, WLD) including 5 paratypes (2-MCZ; 2-OSU; 1-CAS). FLA: Highlands Co., Archbold Biol. Sta., 11-X-1964, P.H. Arnaud, Jr. (CAS-female; used for figure 4).



Figure 4: Genitalia of Ravinia anandra. Female sternites 6, 7 and 8.

DISTRIBUTION: Canada (Ontario), United States (Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Michigan, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin). Distribution from material examined, Dodge (1956a) and Lopes (1961).

BIOLOGY: Larvae are coprophagous on carnivore and omnivore dung. Dodge (1956a) reports on rearing records of 165 specimens. Most were reared from dog and human feces and some larvae were reared on meat. Wilton (1963) reports small numbers of specimens reared from dog feces in Hawaii. This species is apparently parthenogenetic. Males are unknown although the females are fairly common. Rearings resulted in all females. The species has not, as yet, been reared through two generations to prove its parthenogenetic nature.

Ravinia anxia (Walker) complex

(Figures 5a - d)

Sarcophaga anxia Walker, 1849: 818. Type-locality: N. America (female).

Aldrich, 1930: 15 (synonymy).

Sarcophaga comes Walker, 1852: 323. Type-locality: U.S.A. (male).

Aldrich, 1930: 17 (synonymy).

Sarcophaga pallinervis Thomson, 1869: 535-536. Type-locality: Hawaii, Honolulu. Johnston and Tiegs, 1922: 184, figure 6 (biology,

redescription). Hardy, 1927: 458, figure 11 (redescription). Hall, 1928: 334, 339, figure 9 (key, redescription). Hall, 1929b: 87 (locality data).

Ravinia communis Parker, in part. Metz, 1916: 218, 234 (description of chromosomes).

Sarcophaga communis (Parker, in part). Aldrich, 1916: 253-255, figure 120 (redescription). Greene, 1925: 3, 7-8, figure 3 (description of puparia). Wilson, 1932: 84, 89 (biology). Wirm and Beaulieu, 1932: 81 (locality data).

Myophora lherminieri authors, nec. Robineau-Desvoidy. Aldrich, 1930: 13 (synonymy).

Sarcophaga lherminieri authors, nec. Robineau-Desvoidy. Knipling, 1936: 418, 420, 421, 425, 426, 429, 434-435, figures 6, 34, 51, 65, 81 (description of first instar, biology). Hallock, 1940a: figures 29-31 (male genitalia). Hallock 1940b: 207, 210, 215, 221-222, figures 116-118 (key, redescription). James, 1947: 48 (biology). Merrill and Hutson, 1953: 678 (biology). Sanjean, 1957: 17, 25-26, 39, 40, 41, 57-58, tables 1-7, 9-15, figures 123-131 (biology, description of larva). Blickle, 1961: 802 (parasitoid records).

Ravinia lherminieri authors, nec. Robineau-Desvoidy. Lopes, 1946a: 137 (locality data). Lopes, 1948: 567 (locality data). Van Emden, 1950: 195, 198 (host information). Roback, 1954: 27, 73, figures 242-244 (description of male genitalia). Gill, 1955: 651 (biology). Dodge, 1956a: 188-189 (synonymy). Lopes, 1961: 420, 422-424 (key,

locality data). Boyes, 1963: 1201-1202 (description of chromosomes). Coffey, 1966: 213, 217 (biology). Houser and Wingo, 1967: 731-732 (biology, parasitoid records). Poorbaugh, et al., 1968: 22, 35, figures 1-2 (biology). Valiela, 1969: 213 (biology). Rummel and Knapp, 1970: 167-169 (biology). Hayes and Turner, 1971: 444-447 (parasitoid records). Poorbaugh and Linsdale, 1971: 52, 55 (biology). Stoffolano and Streams, 1971: 195-196, 198, 200-201, 207 (parasitoid information). Peckham, et al., 1973: 652 (biology). Stoffolano, 1973: 263, 270 (parasitoid information). Valiela, 1974: 375, 378 (biology). Merritt and Anderson, 1977: 43 (biology). Davis and Turner, 1978: 113, 119-124, 127, tables 1-7, 12-13, figures 2, 3, 6 (biology). Wharton and Moon, 1979: 81, 87-88, figure 1 (description of puparium). Peterson, et al., 1981: 512, 514 (biology). Pickens, 1981: 523-526 (biology). Figg, et al., 1982: 476 (biology, parasitoid records). Figg, et al., 1983a: 962, 963 (biology, parasitoid records). Figg, et al., 1983b: 994-995 (biology, parasitoid record).

Ravinia iherminieri authors, nec. Robineau-Desvoidy (misspelling of iherminieri). Hardy, 1981: 383-385, figure 165.

ADULT: Length: 6 - 12 mm. Most specimens around 10 mm. HEAD: Fronto-orbital plate and gena light grey pruinose. Genal groove not pruinose, rather dark brown in color. THORAX: 4 postsutural dorsocentral setae, increasing in length posteriorly. Subapical scutellar setae

usually much stronger than adjacent lateral scutellar setae.

MALE: Tergite 4 with well developed, reclinate median marginal setae. Inner margin of apices of cerci smoothly rounded (figure 5b). Lateral arms of sternite 5 not strongly produced, giving a trapezoidal shape to the sternite as a whole (figure 5a). Aedeagus not strongly bulbous at tip and hillae not tapering dorsally but much thinner ventrally.

FEMALE: Sternite 7 broadly triangular in shape (figure 5d). Genital sternites without golden pruinosity.

LARVA: A description of the first-instar may be provided by Knippling (1936). Sanjean (1957) provides detailed descriptions of all three instars.

PUPARIUM: A description of the puparium is provided by Greene (1925) and Wharton and Moon (1979).

DIAGNOSIS: Can be separated from acerba over its northern range by the presence of 4 postsutural dorsocentral setae. Can be separated from lherminieri and sueta by the grey coloration of its head and abdomen. Males can be usually be separated from querula and cisselli by the lesser developed lateral scutellar setae, as compared to the subapical scutellar setae. The triangular appearance of sternite 7 of the female separates this species from the rectangular sternite 7 of querula. The lack of golden pruinosity on the genital sternites easily separates the females from cisselli, lherminieri and sueta. Usually noticeably larger in size

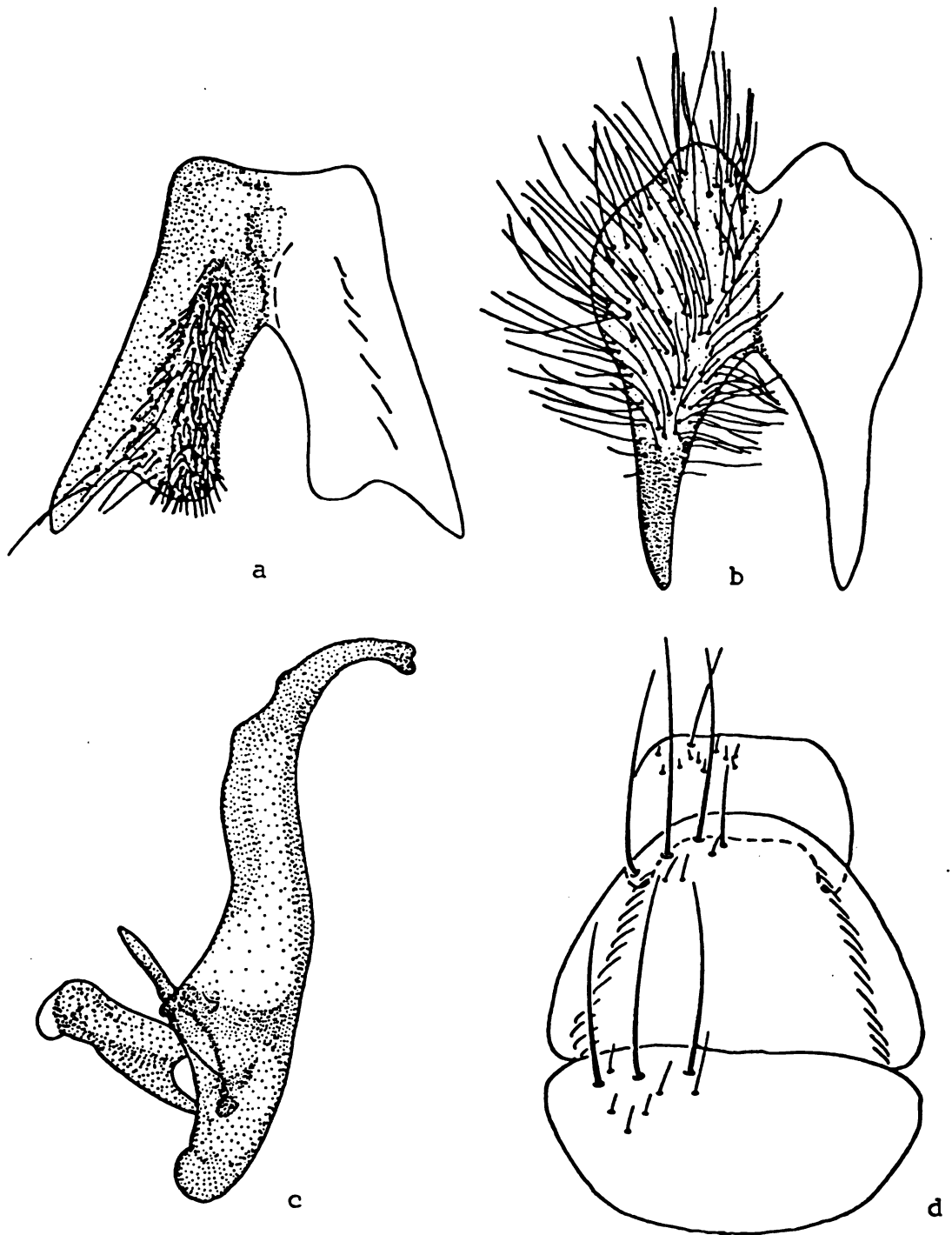


Figure 5: Genitalia of Ravinia anxia. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

than pectinata and planifrons. Shape of genitalia provides diagnostic characters to separate this species from others.

TYPES: Female holotype, ?N. America (BMNH). Examined in 1986, appears to be somewhat teneral.

MATERIAL EXAMINED: 1632 males and 1296 females (BRC, BMNH, CAS, CSU, FMNH, GAD, MCZ, MSU, OSU, WLD), including male holotype of comes, considered to be specimen from U.S.A. from series of 3 males. Specimens observed from Hawaii confirm placement of pallinervis as synonym. Mason Co., MICH., T20N, R17W, S 27, 23 July 1968, Norman T. Baker (male-MSU; used for figures 5a-c). Hickory Corners, Barry Co., MICH., 10 July 1964, R. Mathews collector (female-MSU; used for figure 5d).

DISTRIBUTION: Canada (Alberta, British Columbia, Ontario, Quebec, Saskatchewan), United States (Arizona, California, Colorado, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming), Mexico (Baja California Norte, Durango, Hidalgo, Jalisco, Mexico, Mexico D.F., Puebla, Sonora, Zacatecas). This is the most commonly collected member of Ravinia north of Mexico, with the exception of the Southeastern states of the U.S. It appears to become

scarcer proceeding south in Mexico.

BIOLOGY: A very common coprophagous species. This species is most commonly found breeding in cow dung (Johnston and Tiegs, 1922; Blickle, 1961; Coffey, 1966; Houser and Wingo, 1967; Poorbaugh, et al., 1968; Valiela, 1969; Hayes and Turner, 1971; Stoffolano and Streams, 1971; Stoffolano, 1973; Valiela, 1974; Merritt and Anderson, 1977; Davis and Turner, 1978; Pickens, 1981; Figg, et al., 1982; Figg, et al., 1983a; Figg, et al., 1983b). Merritt and Anderson (1977) found anxia inhabiting and colonizing cattle droppings in four different pasture and rangeland ecosystems at the Sierra Foothills Range Field Station in California. This species has been collected and reared from both sun exposed cowpats and shade exposed cowpats by Poorbaugh, et al. (1968). Davis and Turner (1978) mention that it was not unusual to count 100 or more larvae in a single cowpat. They found this species at all 9 research plots. One half of the sarcophagids they collected were represented by this species and R. planifrons. They note that the addition of cattle to the plots affected the abundance of Ravinia more than any other factor and they report rearings from cow manure. In addition to the literature citations of rearings, many of the specimens examined were reared from cow manure and I have reared this species from cow manure on several occasions. R. anxia has also been reared from sheep dung in New Jersey by Wilson (1932) and in Washington by Coffey (1966). Coffey (1966) also reports collecting and rearing this species from horse, swine, and human dung.

Coffey mentions that it is attracted to dog feces and two specimens were reared, on one occasion, from dog feces in El Cerrito, California by Poorbaugh and Linsdale (1971).

Sanjean (1957) found that the average time needed for this species to mature from first instar to adult on pork liver at 27°C was 12.6 days. The time duration increased to 13.4 days at 25°C. He also found a mean of 20.4 larvae per gravid female, with a sample size of 47 gravid females.

Richardson (1916) may have collected a few specimens of this species during his study of the attraction of Diptera to ammonia. Adults may have been captured in onion fields in Michigan by Merrill and Hutson (1953). Gill (1955) reports capturing this species with a trap baited with a hare carcass. It seems likely that this record actually applies to the capture of R. acerba, but it may apply to anxia. For further discussion, look under "Remarks" section of acerba. Sanjean (1957) collected this species at traps baited with: horse dung, cow dung, human feces, chicken entrails, bird feces, sheep liver, hog liver, bull brain, freshly killed American cockroaches, cow udder, hog viscera, deer heart, woodchuck, rabbit, and fish cadavers. He collected this species very commonly as it rested on a stone wall in the Ithaca, NY area. He also collected specimens on field stones, sticks on the ground, on pond lillies, at pitcher plants, and on vegetation in fields. Rummel and Knapp (1970) collected this species from June through September in Kentucky in traps baited either with liver, banana, or malt mixture.

Davis and Turner (1978) give general data on abundance and dates of adult activity. Specimens were collected in a Malaise trap, a baited Malaise trap, a baited Bishopp trap, and with a net. Peterson, et al. (1981) note that this species was commonly attracted to pellets of SWASS, a bait toxicant system for screwworms.

Three parasitoids of R. anxia were found to emerge from the puparia by Blickle (1961) from specimens collected in New Hampshire: Aphaereta pallipes (Say) (Hymenoptera: Braconidae); Xyalophora quinquelineata (Say) (Hymenoptera: Figitidae); and Eucoila sp. (Hymenoptera: Cynipidae). Houser and Wingo (1967) provide information on field parasitization of Aphaereta pallipes (Say) (Hymenoptera: Braconidae) from cow manure in central Missouri. This species was grouped together with Oxysarcodexia ventricosa, R. latisetosa, R. pectinata, and R. derelicta under the heading Ravinia sp. by Hayes and Turner (1971) in their study of parasitoids of coprophagous Diptera in Virginia. They note that this group of species was parasitized by Aphaereta pallipes (Say) (Hymenoptera: Braconidae); Eucoila impatiens (Hymenoptera: Cynipidae); Xyalophora quinquelineata (Hymenoptera: Figitidae); and Aleochara spp. (Coleoptera: Staphylinidae). Figg, et al. (1982) reared this species from bovine dung. Thirteen species of Diptera were reared from this dung and a list of 12 parasitoids is given without mention of host specificity. Figg, et al. (1983a) note a population peak during early spring and decline of abundance throughout the remainder of the season in central Missouri. They report that the parasitoid species Aphaereta

pallipes (Say) (Hymenoptera: Braconidae); Trichopria sp. (Hymenoptera: Diapriidae); and Eucoila sp. (Hymenoptera: Eucoilidae) accounted for at least 2.8% mortality. Figg, et al. (1983b) give further information on the host/parasitoid relationships between R. anxia and Aphaereta pallipes (Say) (Hymenoptera: Braconidae). Stoffolano and Streams (1971) discuss host reactions of anxia to the parasitic nematode Heterotylenchus autumnalis Nickle. Stoffolano (1973) mentions that the factors resulting in host specificity of the nematode Heterotylenchus autumnalis in R. anxia are encapsulation and melanization. Peckham, et al. (1973) report this species as part of the nest provisions of Oxybelus uniglumis quadrinotatus Say (Hymenoptera: Sphecidae).

A questionable record of anxia as a parasitoid of Ichnosterna horni Sm. (Coleoptera: Scarabaeidae) is given by Van Emden (1950). Pickens (1981) found that, in laboratory tests, R. anxia larvae were significant facultative predators of face fly larvae in cow manure. This species has also been recorded from three cases of supposed human intestinal myiasis in Texas (James, 1947).

REMARKS: The nomenclature involved with this species has been rather confused in the past and much of the confusion deals with the separation of this species from R. querula and the mistaken identity of R. lherminieri. The first name that was commonly applied to this species was Parker's R. communis. Specimens of anxia and querula were determined under this name generally between 1914 and 1928. The revision provided

by Hall (1928) placed communis as a synonym of pallinervis. For several years specimens of anxia and querula were placed under this name.

Aldrich (1930) examined types of American Sarcophagidae in European museums and he provided the mistaken synonymy of anxia and querula with lherminieri. Both anxia and querula were identified as lherminieri until Dodge (1956a) was able to provide characters to separate querula from anxia. Therefore, references before 1956 concerning one of the earlier names are considered as potentially referring to this species, unless otherwise indicated by the author's figures or comments.

Unfortunately, Dodge (1956a) continued the improper usage of lherminieri as the senior name of anxia. Discussions with Dr. W. L. Downes, Jr. have provided some insight into how this mistake occurred. Apparently, both Downes and Dodge independantly discovered characters to separate what was considered lherminieri into two species. The type of lherminieri was not actually seen by either of these specialists, but specimens representing the two species were independently sent to E. Seguy at the National Museum of Natural History in Paris for comparison with the type. The comparison indicated that lherminieri = anxia. Unfortunately, neither thought to include a third species (actually a complex of species), ochracea, which was originally considered just a variation of communis by Aldrich. In 1986, the author was able to examine the type of lherminieri and establish that the holotype did not match the species that had been placed under its name. During this same year the author was able to examine the types of Walker at the British

Museum (Natural History). Direct examination of the types resulted in the indicated synonymy. Thus, anxia becomes the next available name for this common species.

Actually, anxia represents a complex of closely related sibling species. Close study of this species over the wide geographical range that it occupies indicates that the variation observed applies to more than one species. Two larval forms are easily recognized from puparia pinned with reared flies and is mentioned by Dodge (1956a). The first form, which is very common in eastern North America, has very darkly pigmented dorsal tubercles. The second form lacks these conspicuous tubercles. Many dissections of specimens from pivotal areas, such as Arizona, Oregon, and Mexico, lead the author to believe that more than two species are involved in this complex, but no definite characters have been found that will allow consistent separation of this species into smaller units. It is believed that rearing studies are needed, especially from western localities, to determine the range of infraspecific versus intraspecific variation in this complex.

The listing of lherminieri from Bolivia by Engel (1931) and from Argentina by Blanchard (1939) are errors, as this name applied to anxia/querula during this time and Bolivia and Argentina are well beyond the range of either of these species. Engel's description and figures are not sufficient to definitively place his species under any currently recognized name. The listing of Sarcophaga anxia by Johnson (1895) from Florida is considered an error as this species name had not been accepted

into useage in North America at this time and the author has seen no specimens of anxia from Florida.

Specimens of anxia may be found in collections under the names communis, pallinervis, or lherminieri. All determined specimens should be rechecked for separation of querula from mixed series.

Ravinia aureopyga (Hall)

(Figures 6a - d)

Sarcophaga aureopyga Hall, 1928: 339-340, figure 10. Type-locality:

Chile, Angol. Hall, 1937: 351, 373-374 (key, locality records).

Ravinia aureopyga (Hall). Ortiz, 1946: 170 (locality record). Roback, 1954: 74 (synonymy). Lopes, 1969: 21 (locality records).

ADULT: Length: 8 - 11 mm. Gena and parafacials golden pruinose. Gena abruptly changes to grey pruinose at line extending from hind margin of eye. Presutural acrostichals reduced, only slightly differentiated. Usually with only 2 katepisternal bristles.

MALE: Sternite 5 almost forming an equilateral triangle (figure 6a). Apices of cerci very slightly sinuous along inner margins (figure 6b). Corpus abruptly expanded dorsally, hillae broadly rounded (figure 6c).

FEMALE: Sternites 6, 7, and 8 golden pruinose. Sternite 6 much wider than long. Sternite 7 with anterolateral projections (figure 6d). Sternite 8 with broad, apical invagination.

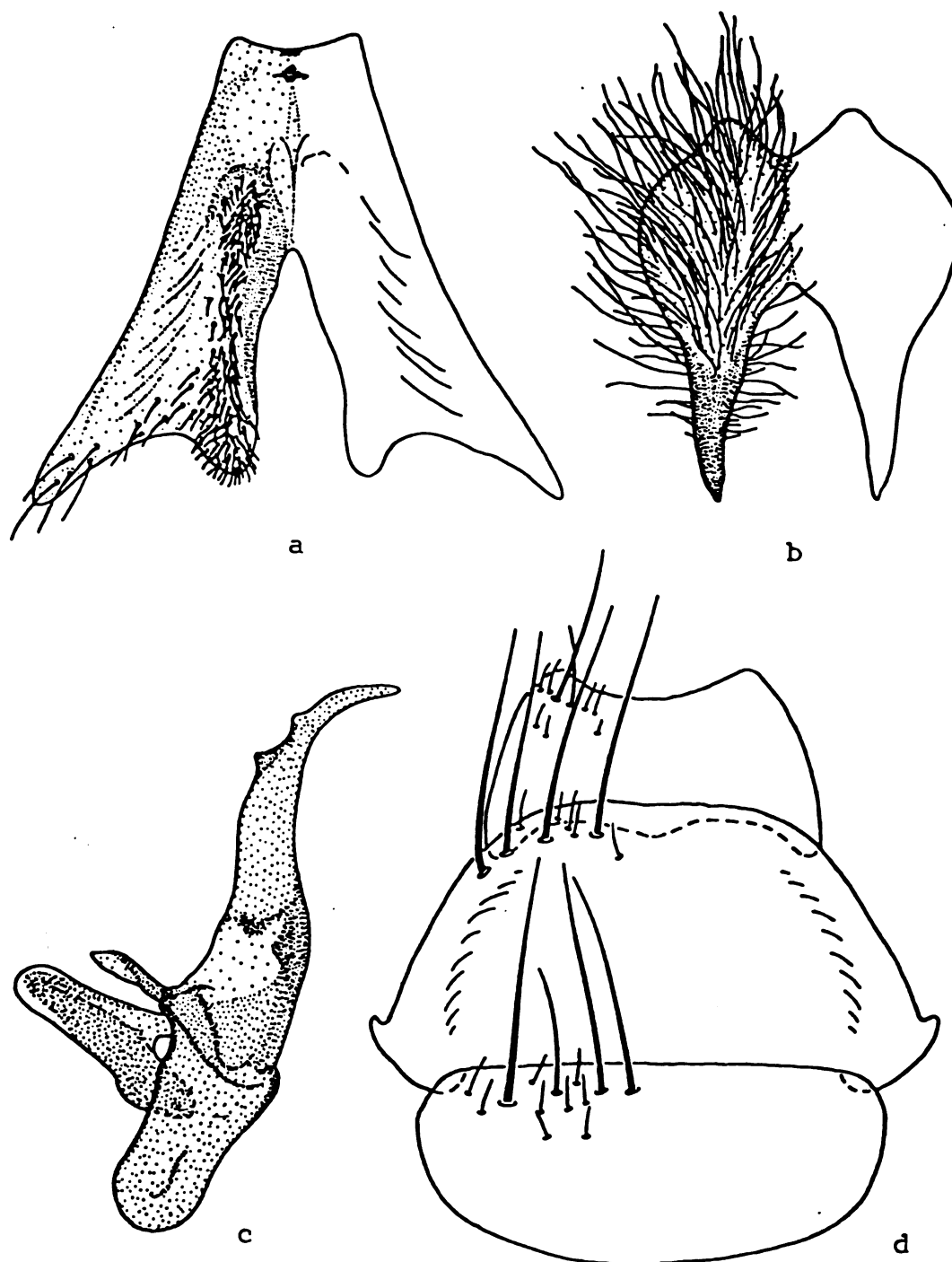


Figure 6: Genitalia of Ravinia aureopyga. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

DIAGNOSIS: The grey coxae and trochanters easily separate this species from lopesi. The abruptly expanded corpus separates males of this species from all others. The anterolateral projections of sternite 7 serves to separate the females of this species from all others.

TYPES: Male holotype, Chile, Angol (USNM).

MATERIAL EXAMINED: 29 males and 25 females (BRC, FMNH, MSU, WLD) including 24 specimens from Angol, Chile. ARG., Santa Fe, Laguna Paiva, S. Bolle, Jan. 1974 (male-BRC; used for figures 6a-c). Angol-Chile, 15 Oct. 1962, E. Bostidas (female-MSU; used for figure 6d).

DISTRIBUTION: Argentina (Cordoba, Entre Rios, Santa Fe), Brazil (Rio Grande do Sul), Chile (La Araucania, Maule, Santiago). Distribution from material examined and Lopes (1969).

BIOLOGY: Unknown.

REMARKS: Hall (1937) mistakenly synonymized this species with R. belforti. He notes that the synonymy was questionable and that he had not studied the type of belforti. Ortiz (1946) lists this species in his catalog of the Diptera of Chile without comment.

Ravinia aurigena (Townsend)

(Figures 7a - c)

Sarcophaga aurigena Townsend, 1912: 357-358. Type-locality: Peru, Piura.

Hall, 1928: 334, 341, figure 12 (redescription).

Trixosarcophaga aurigena (Townsend). Townsend, 1917: 191, 194, 195

(genotype placement, key).

Ravinia aurigena (Townsend). Roback, 1954: 73, figures 233-234 (new combination, male genitalia). Lopes, 1969: 21 (locality records).

Lopes and Tibana, 1982a: 136 (locality records).

ADULT MALE: Length: 10 - 13 mm. Gena and parafacials golden pruinose. Gena with abrupt change to grey pruinose at line extending from hind margin of eye. Frontal vitta narrowing posteriorly. Presutural acrostichals only slightly differentiated. Sternite 5 very long and rather rounded basally, giving the appearance of an isocles triangle (figure 7a). Apices of cerci sinuous along inner margins (figure 7b). Parameres broader than those of other Neotropical species. Hillae broadly rounded dorsally (figure 7c).

FEMALE: Not separable from several other South American species.

DIAGNOSIS: This species can be differentiated from other sympatric species by its relatively large size, convergent margins of the frontal vitta, broad parameres, and shape of the genitalia.

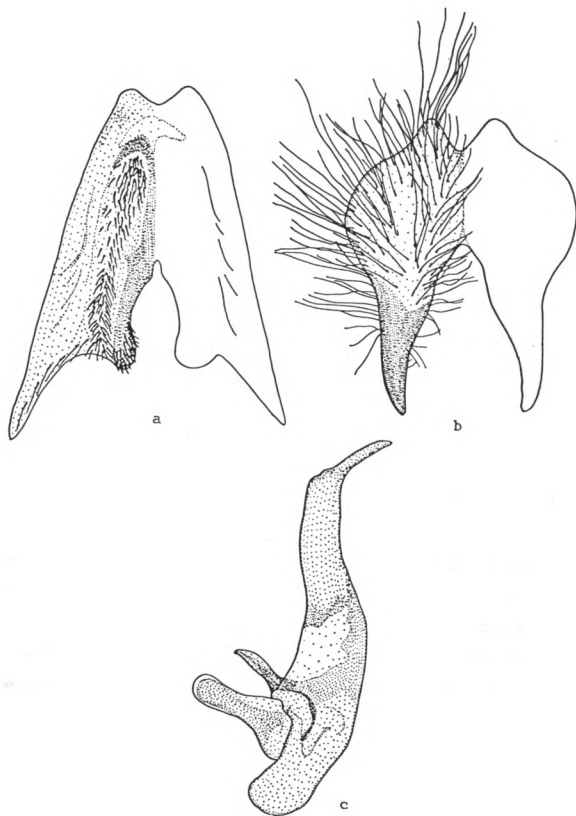


Figure 7: Genitalia of *Ravinia aurigena*. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus

TYPES: Female holotype, Piura, Peru, March 29, 1911 (USNM).

MATERIAL EXAMINED: 6 males (BRC). Rio Palenque, ECUAD., 0°35'S, 79°22'W, 22-26.II.1976, G.& M. Wood, 150m (2 males; one specimen used for figures 7a-c). ECUAD., Rio Palenque, 0°35'S, 70°22'W, 22-26 Feb. 1976, 150 m., G.E. Shewell (4 males).

DISTRIBUTION: Chile, Costa Rica, Ecuador, Panama, Peru.
Distribution from material examined, Hall (1928), and Lopes and Tibana (1982a).

BIOLOGY: Unknown.

REMARKS: Townsend (1911) notes that this species has been dissected and drawn, but did not publish the figures in this paper and no figures accompanied his description of this species in 1912. Although females cannot be separated from several other South American species at this time and the holotype is female, this species is described from males which match Townsend's (1917) concept of the genus Trixosarcophaga and the description of males determined to be this species by Townsend.

Ravinia auronaculata (Townsend)

(Figures 8a - c)

Punasarcohaga auromaculata Townsend, 1915: 409-410. Type-locality:

Peru, Oroya.

Sarcophaga auromaculata (Townsend). Hall, 1928: 334, 342-343, figure 14 (redescription).

ADULT MALE: Length: 10 mm. Gena and parafacials light golden pruinose. Gena with abrupt change to grey pruinose at line extending from hind margin of eye. Presutural acrostichal setae only slightly differentiated. Sternite 5 with nearly a straight anterior margin, not deeply cleft (figure 8a). Cerci deeply cleft, apices sinuous along inner margin (figure 8b). Hillae almost triangular in appearance, corpus broadly rounded with posteromesal hump extending from apex a short distance upward (figure 8c).

FEMALE: Not separable from several other Neotropical species.

DIAGNOSIS: The nearly straight anterior margin of sternite 5 and shape of the aedeagus separate this species from all other similar species.

TYPES: Male holotype. Oroya, Peru, over 12,000 feet, Rio Mantaro valley bottom, March 7, 1913 (USNM).

MATERIAL EXAMINED: 2 males (MSU). ECUADOR, Quito, Pichincha, 15 January 1958, R.W. Hodges (used for figures 8a-c). Calderon, ECUADOR,

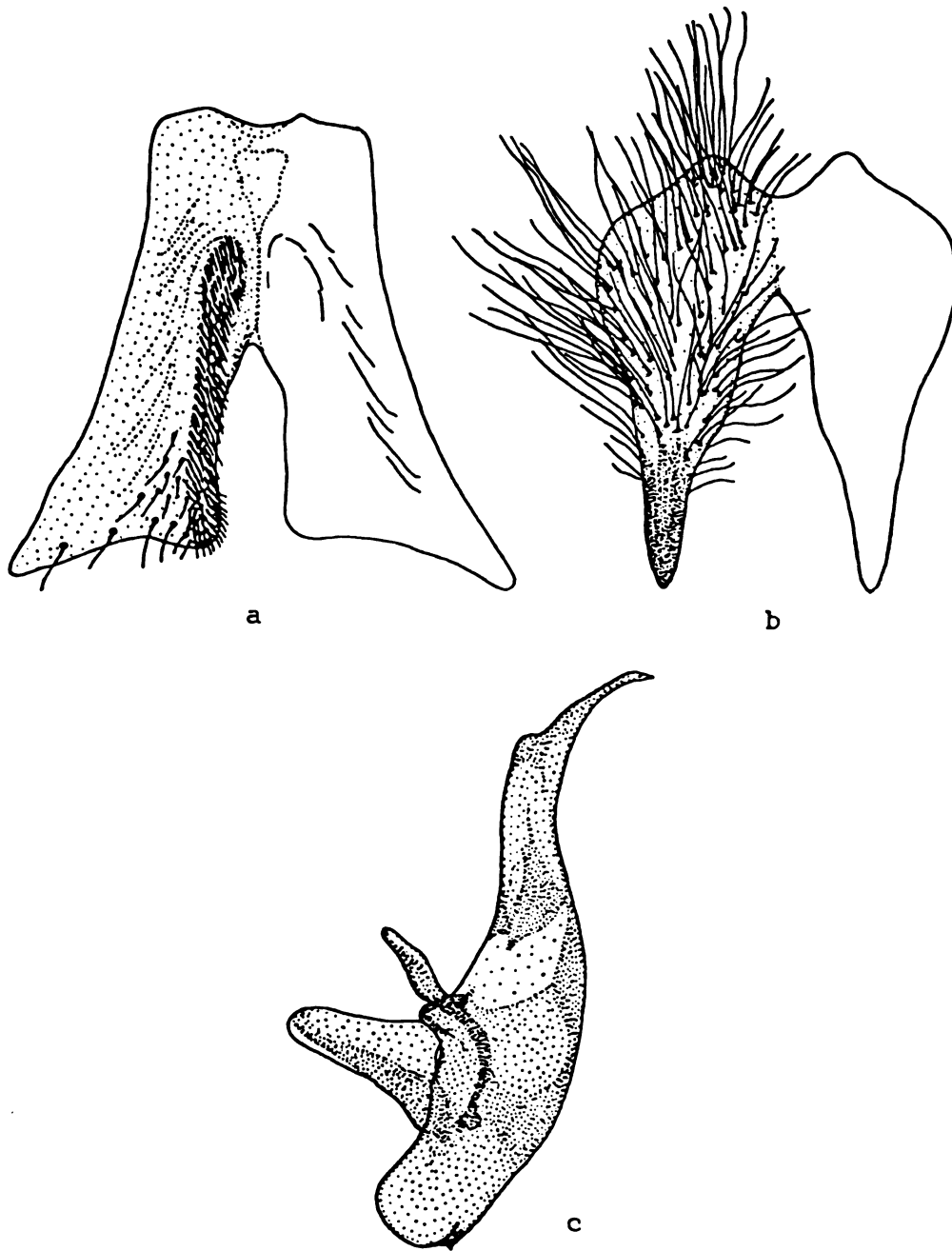


Figure 8: Genitalia of *Ravinia auromaculata*. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus

Pichincha Prov., 1 May 1958, R.W. Hodges, 8500 feet.

DISTRIBUTION: Ecuador, Peru.

BIOLOGY: Unknown.

Ravinia barroi (Dodge)

(Figures 9a - d)

Chaetoravinia barroi Dodge, 1956b: 97-99, figures 1-5. Type-locality:

Cuba, Habana, Lomas de Camoa. Lopes, 1969: 22 (locality records).

Rohdendorf and Gregor, 1973: 8, figures 15a-c (key, male and female genitalia).

ADULT: Length 6.5 - 8 mm. Fronto-orbital plate grey pruinose with yellow tinge. Legs with tibia and femora reddish-orange in ground color. R_1 with dorsal setae extending to bend of Sc.

MALE: Fifth sternite Y-shaped, the sides divergent and straight (figure 9a). Cerci with apices convergent (figure 9b). Aedeagus with well developed vesica and large, bowed, rather membranous hillae (figure 9c).

FEMALE: Sternite 6 much wider than 5. Sternites 7 and 8 fused. Sternite 8 narrow with a prominent pair of lateral pits (figure 9d).
Note: description of female and figure 9d from Dodge (1956b) as no females of this species were examined by the author.

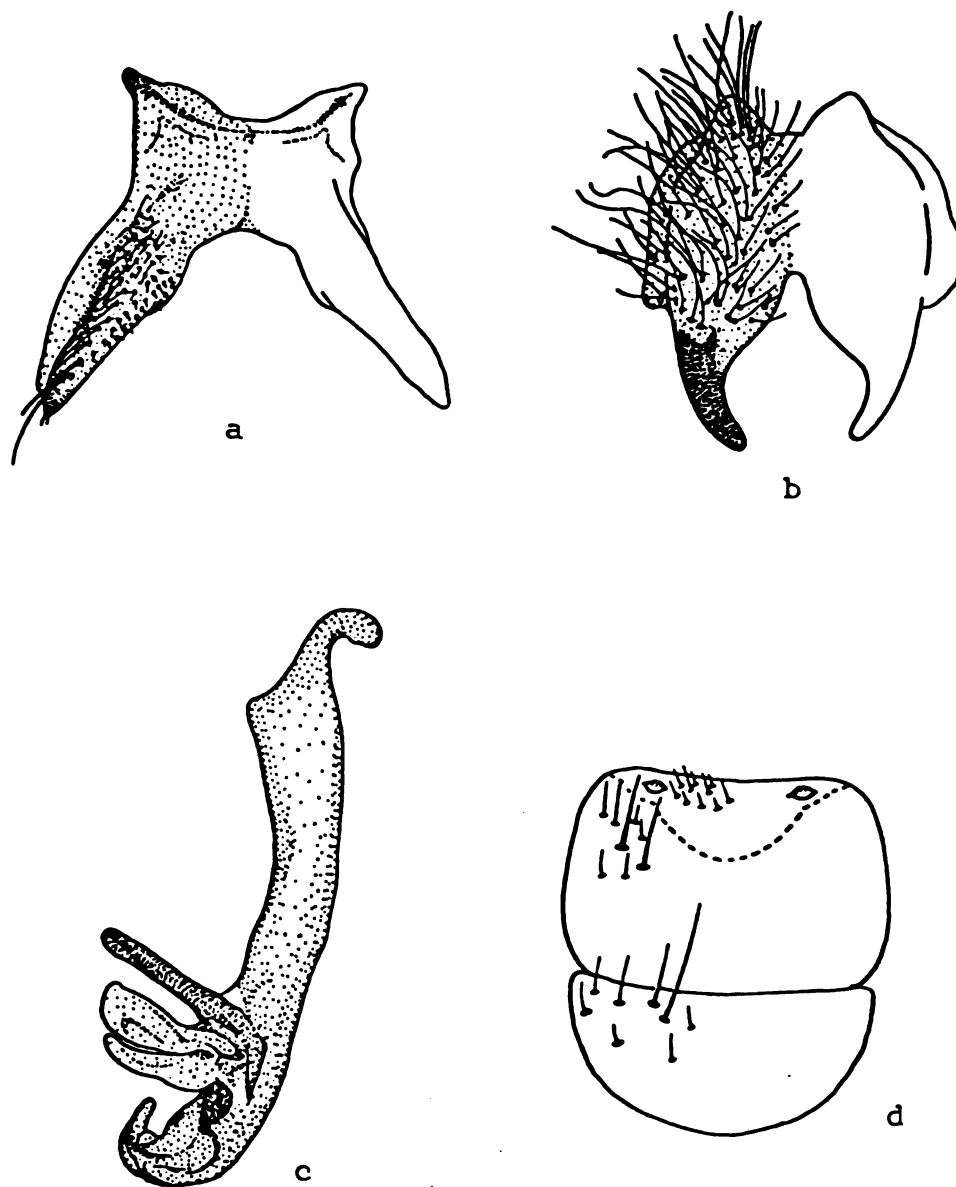


Figure 9: Genitalia of Ravinia barroi. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6+7 and 8 (Female redrawn from Rohdendorf and Gregor, 1973).

DIAGNOSIS: This species appears to be confined to the island of Cuba. The red legs will easily separate barroi from the other two species that have been collected on Cuba, effrenata and globulus. The male and female genitalia are unique and diagnostic.

TYPES: Male holotype, Cuba, Habana, Lomas de Camoa, March 14, 1952, Dodge and Seago; net (type number 62778, USNM). Female allotype, Cuba, Oriente, Sierra Maestra mountains, Loma del Gato, June, 1952, Fernando de Zayas (USNM). Three male paratypes, same data as holotype, but some taken by trap. One male paratype from Cuba, Boniato.

MATERIAL EXAMINED: 1 male. Paratype, Cuba, Boniato, 11-25-04, H.S. Parish (OSU; used for figures 9a-c).

DISTRIBUTION: Cuba.

BIOLOGY: Unknown. Identified as a synanthropic species by Rohdendorf and Gregor (1973).

Ravinia belforti (Prado and Fonseca)

(Figures 10a - d)

Euravinia belforti Prado and Fonseca, 1932: 39, figure 7. Type-locality:

Brazil, Sao Paulo. Hall, 1937: 373 (synonymy).

Ravinia belfordi (Prado and Fonseca) (misspelling of belforti). Lopes, 1941a: 221, figures 17-18 (description of spermathecae and accessory glands). Lopes, 1974: 272 (locality records). Lopes, 1982b: 313-315, figures 69-71 (description of larva).

Ravinia belforti (Prado and Fonseca). Roback, 1954: 74 (synonymy). Lopes and Kano, 1968: 295-296, 299-301, figures 8-12 (male and female genitalia, biology). Lopes, 1969: 21 (locality records). Lopes and Tibana, 1982b: 288 (locality records).

ADULT: Length: 11 - 14 mm. Gena and parafacials golden pruinose. Gena with abrupt change to grey pruinose at line extending from hind margin of eye. Presutural acrostichal setae only slightly differentiated.

MALE: Sternite 5 with shallow anterior invagination and with posterior arms extending enough to give lateral margins a curved appearance rather than straight (figure 10a). Apices of cerci stout and sinuous along interior margin (figure 10b). Hillae somewhat bulbous at tip (figure 10c).

FEMALE: Sternites 6, 7, and 8 golden pruinose. Sternite 6 much wider than long. Sternite 7 with lateral margins broadly convergent, apex with shallow invagination (figure 10d). Sternite 8 large, approximately 1/2 length of sternite 7 and with anterolateral lobes. Lopes (1941a) describes the spermathecae and accessory glands. Not separable from several other Neotropical species.

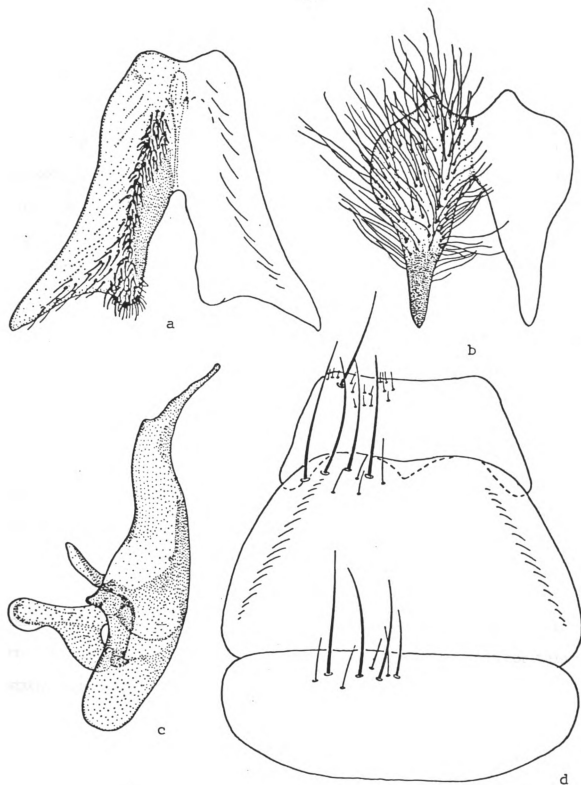


Figure 10: Genitalia of Ravinia belforti. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

LARVA: The first instar is described by Lopes (1982b).

DIAGNOSIS: The nearly parallel margins of the frontal vitta and the bulbous appearance of the tip of the hillae serve to separate males of this species from other Neotropical Ravinia.

TYPES: Male holotype, Sao Paulo, Brazil (IOC?).

MATERIAL EXAMINED: 1 male, 2 females (MCZ-used for figures 10a-d)). All specimens from S.Paulo, Brazil, Brune Pohl collector, and determined by H.S. Lopes.

DISTRIBUTION: Argentina, Brazil (Ceara, Mato Grosso, Goias, Minas Gerais, Rio de Janeiro, Guanabara, Sao Paulo, Parana), Columbia, Paraguay, Trinidad. Distribution from Lopes (1969, 1974).

BIOLOGY: Lopes and Kano (1968) provide a discussion of the relationship of the various parts of the male and female genitalia of this species during copulation. The specimens that they used for this study were reared on human feces.

Ravinia cisselli n.sp.

(Figures 11a - d)

Ravinia cisselli n.sp. Type-locality: Kentucky, Marion Co., Rowan's

Knob.

ADULT: Length: 8 - 12 mm. Gena and parafacials grey pruinose. Gena may have a tinge of yellow pruinosity near margin at genal groove. Anterior acrostichal setae differentiated, usually with 4 pairs. Tergite 5 grey pruinose, at most with orange ground color restricted to posteroventral margin.

MALE: Sternite 5 with long, thin posterior arms (figure 11a). Apices of cerci with nearly straight interior margins, not sinuous (figure 11b). Hillae similar in appearance to a right triangle (figure 11c).

FEMALE: Sternites 6, 7, and 8 golden pruinose. Sternite 6 much wider than long. Sternite 7 with lateral margins broadly convergent (figure 11d). Sternite 8 with anterolateral projections.

DIAGNOSIS: The large size, grey pruinose gena, and reddish ground color of tergite 5 restricted to posteroventral margin separate this species from other Nearctic species.

TYPES: Male holotype and allotype, KY: Marion Co., Rowan's Knob, 19 May 1985, G.A. Dahlem (BRC-used for figures 11a-d). 11 male and 15 female paratypes: KY: Marion Co., Rowan's Knob, 19 May 1985, G.A. Dahlem (1 male-BRC, 1 male-GAD); KY: Holy Cross, Marion Co., 20 May 1985 (1 male-GAD); KY: Nelson Co., nr. Holy Cross, 25 July 1985, G.A. Dahlem (1

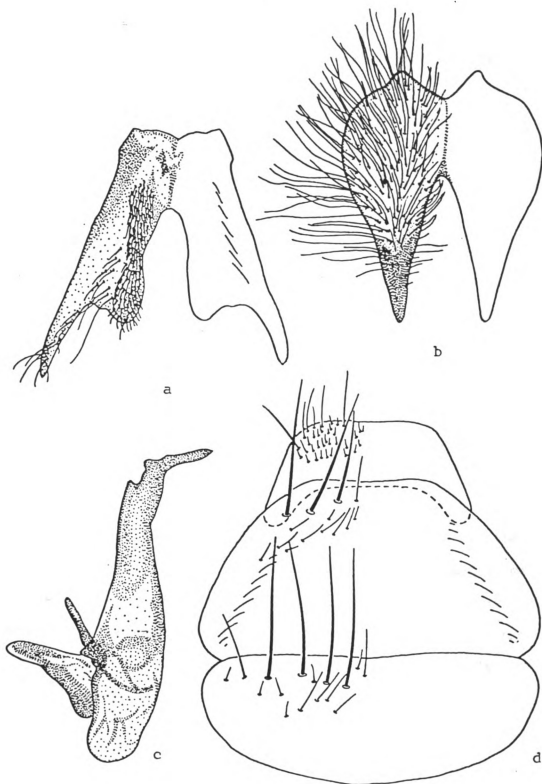


Figure 11: Genitalia of Ravinia cisselli. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

female-BRC, 1 female-MSU, 6 females-GAD); Inwood Hill Park, New York, N.Y., 8-IX-1962, P.H. Arnaud, Jr. (1 male-CAS); New York, NY, IHP 24-IX-1961, P.H. Arnaud, Jr. (1 male-CAS); Central Park, New York, NY, 1-VII-1962, P.H. Arnaud, Jr. (2 males-CAS); Central Park, New York, NY, 30-VI-1962, P.H. Arnaud, Jr. (1 male-CAS); Central Park, New York, NY, 5-VIII-1961, P.H. Arnaud, Jr. (3 males, 2 females-CAS); Central Park, New York, NY, 2-VII-1962, P.H. Arnaud, Jr. (1 female-CAS); Central Park, New York, NY, 6-VIII-1961, P.H. Arnaud, Jr. (1 female-CAS); NEW YORK, Riverhead, L.I., 9.IX.1961, P.H. Arnaud, Jr. (1 female-CAS); Maspeth, L.I., Sep. 4, 1927, Schott (1 female-FMNH); Tar Hollow St. For., Vinton Co., Ohio, 4-IX-74, Collector G.A. Coovert (1 female-DMNH).

BIOLOGY: Unknown. Several females collected on fresh cow manure in Kentucky by the author.

REMARKS: Females of this species will usually be found under the name ochracea or sueta. Males may be found under ochracea, guerula, or sueta. This species is named in honor of my mother and her brothers and sisters, most of whom are currently living in Kentucky. Special thanks are given to my aunt, M. Sue Cissell, who collected and froze daily Malaise trap samples for me from Nelson Co., Kentucky.

Ravinia coachellensis (Hall)

(Figure 12)

Sarcophaga coachellensis Hall, 1931: 182, figure 1c. Type-locality:

United States, California, Coachella (male). Dodge, 1956a: 186, 188 (key). Poorbaugh and Linsdale, 1971: 55 (biology).

ADULT: Length: 6 - 8 mm. R_1 with dorsal setae extending to bend of Sc. Tergite 5 orangish along posterior margin.

MALE: Apices of cerci nearly parallel, not distinctly convergent. Paramere distinctly broadened apically (figure 12).

FEMALE: Sternite 6, 7, and 8 very similar in appearance to that of vagabunda (figure 37d).

DIAGNOSIS: This species is very similar to R. stimulans.

TYPES: Male holotype, United States, California, Coachella, summer of 1929 (type number 43265, USNM). Nine paratypes, same locality.

MATERIAL EXAMINED: The author has not examined specimens of this species.

DISTRIBUTION: Appears to be very restricted. All known specimens have been collected in California's Coachella and Imperial Valleys. Distribution from material examined and Dodge (1956a).

BIOLOGY: Type series collected in traps which were baited with



Figure 12: Genitalia of Ravinia coachellensis. Male gonopod and paramere (redrawn from Hall, 1931).

decaying liver, urea, and water. Poorbaugh and Linsdale (1971) report rearings of this species from dog dung in Riverside, California.

REMARKS: The record of this species reared from dog dung given by Poorbaugh and Linsdale (1971) is considered highly questionable. Examination of large numbers of Ravinia from Riverside and other localities in this general area of California leads the author to believe that this citation is based on a misidentification of R. stimulans.

Although the author did not have specimens of this species to dissect and figure, paratypes were examined during a trip to the Biosystematic Research Centre and their genitalia were noted as distinct. The description provided comes from information provided in Hall (1931) and Dodge (1956a). The figure of the paramere is from Hall (1931).

Ravinia columbiana (Lopes)

(Figures 13a - d)

Andinoravinia rufipes columbiana Lopes, 1962: 170, figures 19-22. Type-locality: Columbia. Lopes, 1969: 22 (locality records).

ADULT: Length: 6 - 9 mm. Palpi black. Gena, genal groove, parafacials and fronto-orbital plate gold pruinose. Gena abruptly changing to grey pruinose along line extending from posterior margin of eye. Legs dark grey in ground color. Ventral setulae of costa extending past Sc to R_1 . R_1 with dorsal setae extending to bend of Sc.

MALE: Posterior arms of sternite 5 long and laterally produced (figure 13a). Apices of cerci long and with sinuous inner margins (figure 13b). Corpus well developed and rounded. Hillae large and bulbous at tip (figure 13c).

FEMALE: Sternite 6 smoothly curved anteriorly and with a straight posterior margin, almost semicircular in appearance. Lateral margins of sternite 7 divergent in basal third then convergent to apical margin (figure 13d). Sternite 8 with convex, ovoid, lateral margins.

DIAGNOSIS: The combination of the wing setation mentioned above, dark palpi and legs, and distinctive genitalia separates this species from all others.

TYPES: Male holotype. Pasto, Departamento de Cundinamarca, Colombia, 3500 m, A. Unigarro, 29.X.1958 (IOC?). Allotype, Bogota, Departamento de Cundinamarca, Columbia, 14.III.1937. 7 male and 10 female paratypes designated by Lopes (1962).

MATERIAL EXAMINED: 3 males and 8 females (BRC). Paramo de Purace, Cauca, COLUMBIA, 26.II.1970, ca. 3400 m., D.M. Wood (1 male; used for figures 13a-c); 16 km. e. Silvia, Cauca, COLUMBIA, 22.II.1970, ca. 2800 m., D.M. Wood (1 male, 2 females); ECUADOR, Pich., 20 km. W. Aloag, 2500m. 4.III.76, G.E. Shewell (1 male, 1 female); ECUADOR, Pich., 10 km. W. Aloag, 3000 m., 17.III.76, G.E. Shewell (1 female); ECUADOR, Napo,

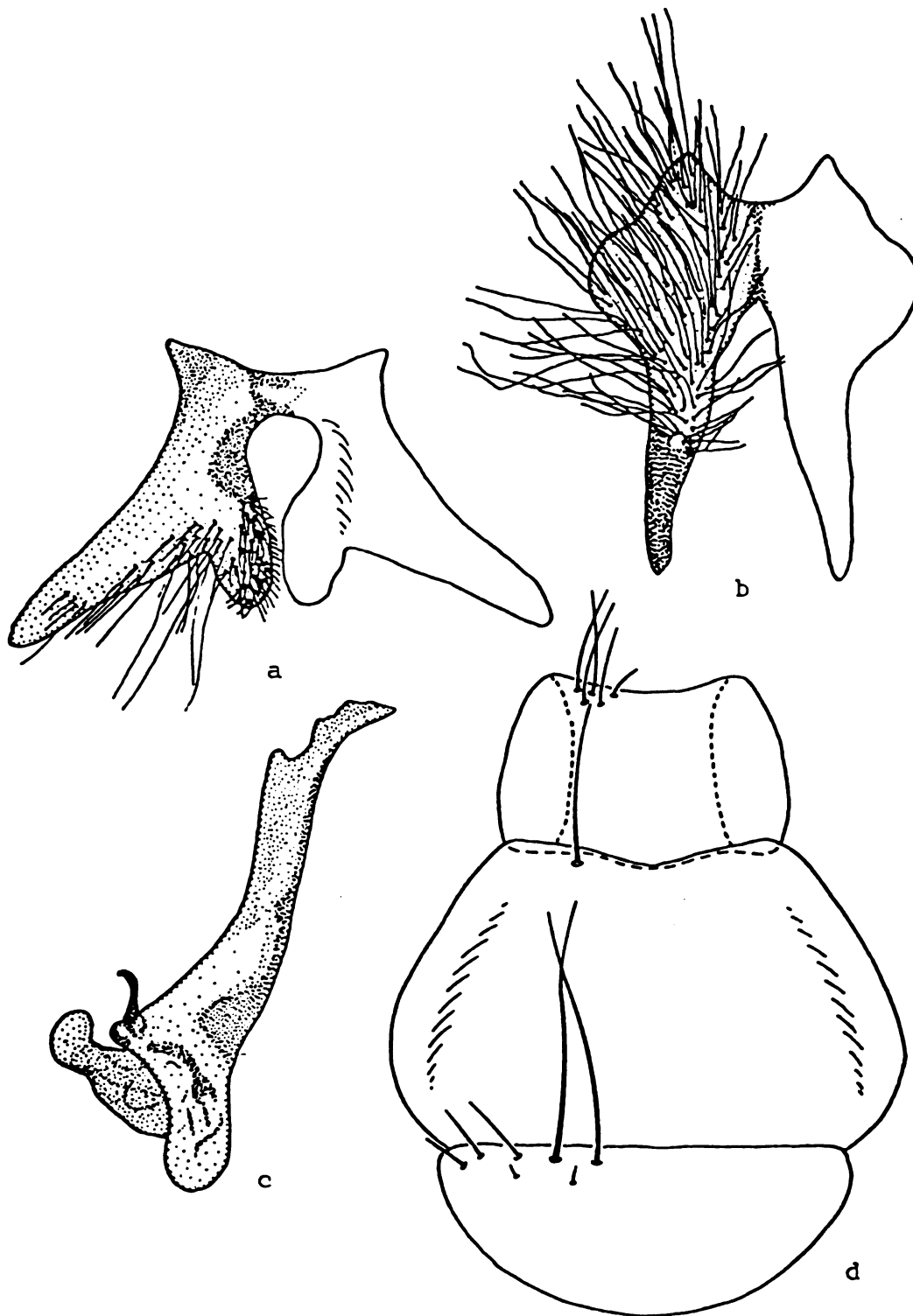


Figure 13: Genitalia of Ravinia columbiana. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

30km. W. Baeza, 2500m., 5.III.76, G.E. Shewell (1 female; used for figure 13d); ECUADOR, Napo, 43 km. W. Baeza, 3500m., 4-7.III.76, G.E. Shewell (1 female); VENEZ., Merida, Mucui, 10km. E. Tobay, 2000m., 28.IV.81, H. Townes (2 females).

DISTRIBUTION: Columbia, Ecuador, Venezuela. Distribution from material examined.

BIOLOGY: Unknown.

Ravinia dampfi (Lopes)

(Figures 14a - c)

Chaetoravinia dampfi Lopes, 1946a: 135-137, figures 36-40. Type-

locality: Mexico, Chapultepec. Lopes, 1948: 567 (locality record).

ADULT: Length: 7 - 9 mm. Fronto-orbital plate golden pruinose. R_1 with dorsal setae extending to bend of Sc.

MALE: Mesotibia with anteroventral seta. Fifth sternite with a basal median hole and mesal areas of posterior arms with many setae, giving the appearance of two parallel brushes in pinned, non-dissected specimens (figure 14a). Cerci with apices straight and parallel apically (figure 14b). Aedeagus with large hillae and rounded corpus (figure 14c).

FEMALE: Not figured by previous authors and not seen by the author.

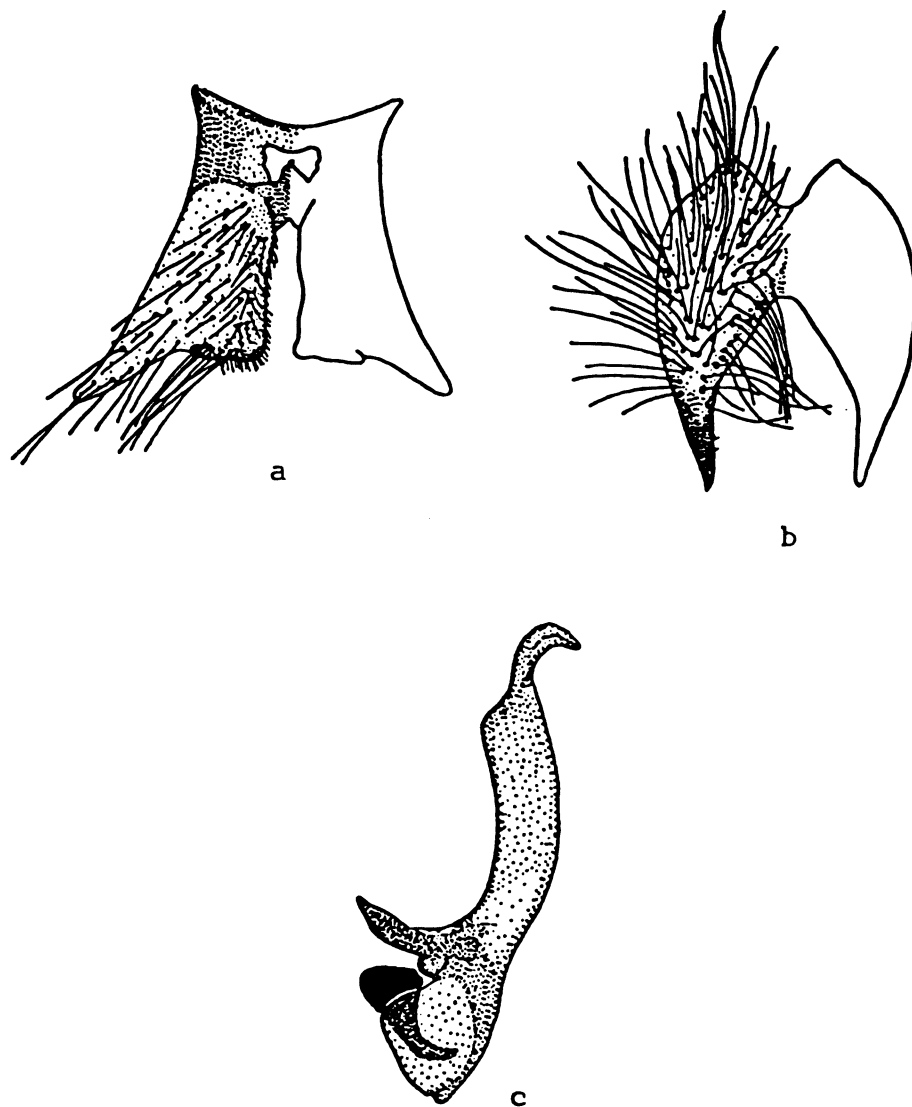


Figure 14: Genitalia of *Ravinia dampfi*. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus

Description of allotype does not discuss any characters that are sufficient to separate dampfi females from those of other species.

DIAGNOSIS: The appearance of the fifth sternite can be used to separate this species from the sympatric errabunda, effrenata and vagabunda. The lack of proclinate upper orbital setae in the male will separate dampfi from downesii. The structure of the aedeagus suggests affinities with errabunda, which may mean that the female genitalia would most resemble that species.

TYPES: Male holotype and female allotype, Mexico, Mexico D.F., Chapultepec, May 30, 1941-June 28, 1942 (IOC). Three male and one female paratypes, Mexico, Morelos, Cuernavaca, November 1-December 5, 1941.

MATERIAL EXAMINED: 3 males. Mexico, Durango, 5 mi. W. Durango, 6500', Aug. 11, 1964, J.F. McAlpine (BRC) (used for figures 14a-c). Mexico, Chiapas, 25 mi. so. Tuxtla, elev. 8-9,000 ft, km 1133 s. Mex. City, Rte. 190, 10-VIII-62, H.E. Milliron (BRC). Mexico, Morelos, Tepoztlan, 8-20-56, R. & K. Dreisback (MSU).

DISTRIBUTION: Mexico (Chiapas, Durango, Hidalgo, Mexico D.F., Morelos). Distribution from material examined and Lopes (1946a, 1948).

BIOLOGY: Unknown.

Ravinia derelicta (Walker)

(Figures 15a - d)

Sarcophaga derelicta Walker, 1852: 322. Type-locality: United States

(male). Benson and Wingo, 1963: 254. Sanders and Dobson, 1966: 957
(biology).

Helicobia quadrisetosa Coquillett, 1901: 17-18. Type-locality: United

States, Washington, D.C. (male). Howard, 1900: 568-569 (biology).

Howard, 1901: 44 (biology). Baker, 1904 (nec Coquillett): 3

(locality records based on misidentification?). Johnson, 1913: 75
(locality record).

Sarcophaga (Helicobia) quadrisetosa (Coquillett). Greene, 1911: 384

(locality record). Pratt, 1912: 181 (locality record and biology).

Ravinia quadrisetosa (Coquillett). Parker, 1914: 60-62, figures 27, 46

(description of adult, distribution).

Sarcophaga quadrisetosa (Coquillett). Aldrich, 1916: 249, 296-298,

figure 143 (key, description of adult, distribution). Hall, 1928:

334, 346, figure 18 (key, distribution, male genitalia). Hall,

1929: 88 (locality record).

Chaetoravinia quadrisetosa (Coquillett). Townsend, 1917: 195

(Genotype designation). Greene, 1925: 5, 14, figure 20 (biology,
description of puparium).

Sarcophaga stimulans Aldrich (nec. Walker). Aldrich, 1930: 15, 17

(synonymy). Hall, 1931: 182, figure 1A (comparison of gonopod and paramere). Knipling, 1936: 420, 421, 432-433, figures 4, 31, 63 (biology, description of larva). Hallock, 1940a: figures 35-37 (male genitalia). Hallock, 1940b: 208, 210, 222-223, figures 122-124 (key, distribution, male genitalia). Mohr, 1943: 285-286 (biology).

Chaetoravinia stimulans Aldrich (nec. Walker). Lopes, 1946a: figure 32 (male genitalia). Lopes, 1948: 566 (locality record).

Ravinia stimulans Aldrich (nec. Walker). Roback, 1954: 14, 15, 27, 42, 73, 74, figures 215-219 (description of adult, male genitalia).

Chaetoravinia derelicta (Walker). Dodge and Seago, 1954: 53, 55 (biology). Dodge, 1956a: 185-186, 188, figure 16 (key, description of female). Reed, 1958: 241 (biology). Lopes, 1977: 43, 44, figures 1-6 (redescription).

Ravinia derelicta (Walker). Houser and Wingo, 1967: 731-732. Blume, 1970: 1023 (biology). Rummel and Knapp, 1970: 167-168 (biology). Hayes and Turner, 1971: 444-445 (parasitoid record). Payne and King, 1972: 160 (biology). Moore and Legner, 1973: 250 (parasitoid record). Watts and Combs, 1975: 564 (parasitoid record). Wharton and Moon, 1979: 81, 87 (key and description of puparium, biology). Peterson, et al., 1981 (biology). Figg, et al., 1982: 476 (parasitoid records). Figg, et al., 1983a: 962-965 (parasitoid records). Figg, et al., 1983b (parasitoid record).

ADULT: Length 6 - 8.5 mm. Fronto-orbital plate grey pruinose with yellowish tinge. R_1 with dorsal setae extending to bend of Sc.

MALE: Occasional specimens will well developed outer vertical seta. Fifth sternite U-shaped, with a small, densely setulate, ventrally projecting plate near apex of the inner margin of the posterior arms (figure 15a). Cerci with dark, convergent apices, resembling a crab's claw (figure 15b). Aedeagus long, with darkly sclerotized and angular hillae (figure 15c).

FEMALE: Sternite 6 very large and conspicuous. Sternite 7 completely divided with the lobes situated laterally. Sternite 8 much smaller than the preceeding genital sternites (figure 15d).

LARVAE: Knipling (1936) provides a description of the first instar.

PUPARIUM: A description of the puparium is provided by Greene (1925) and Wharton and Moon (1979).

DIAGNOSIS: The claw-like cerci is the easiest character to use to separate the males of this species from all others over its range. The aedeagus is also very distinctive. The large sixth sternite of the female is distinctive in pinned specimens and will allow identification without dissection. In dissected specimens, the completely divided seventh sternite is unique to derelicta.

TYPES: Male lectotype. U.S.A., ex coll. Saunders, 68.4; = quadrisetosa Coq., det D.J. Clark, 1953 (without head).

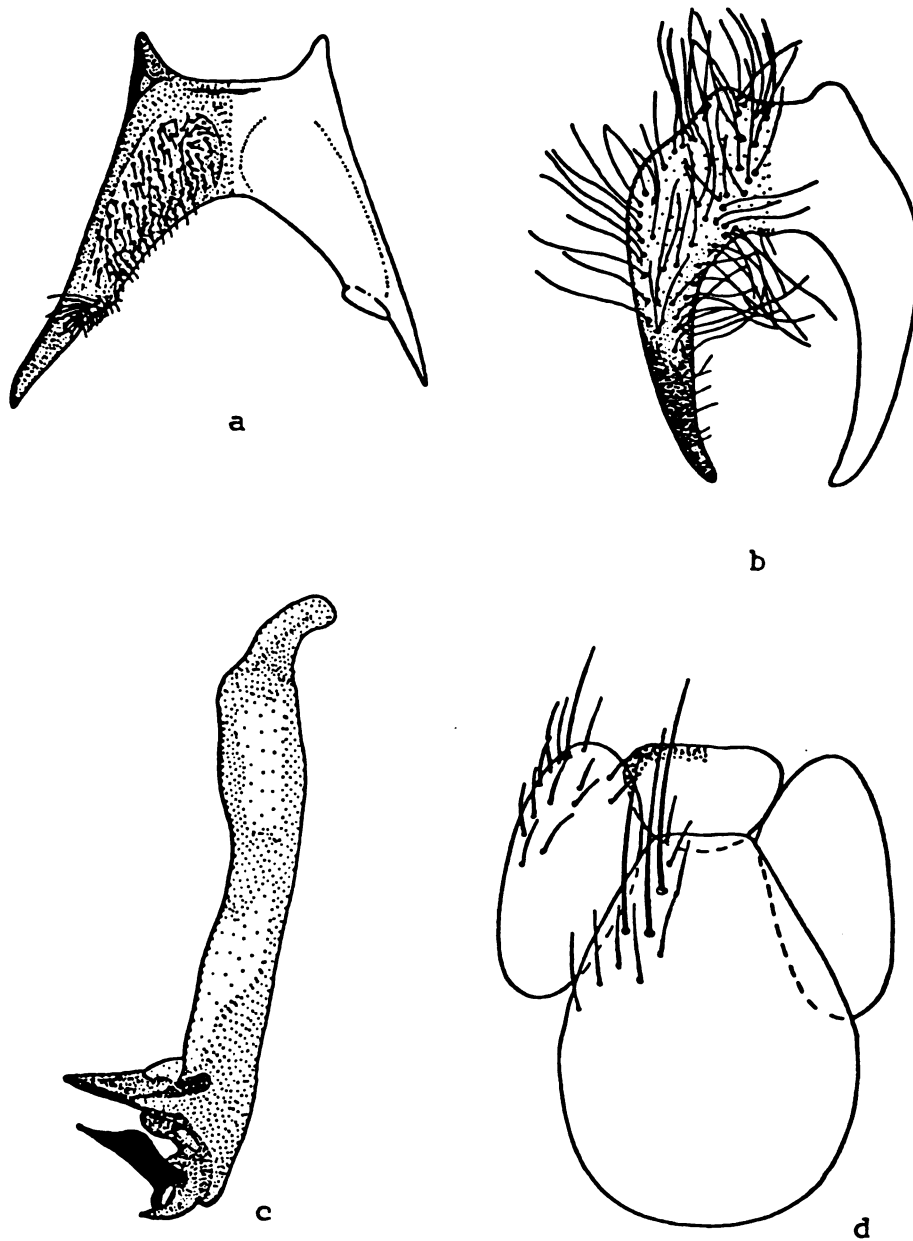


Figure 15: Genitalia of Ravinia derelicta. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

MATERIAL EXAMINED: 533 males and 642 females (BRC, CAS, CSU, DMNH, GAD, MCZ, MSU, NYSM, OSU). FLA: Highlands Co., Archbold Biol. Sta. 9-X-1964, P.H. Arnaud, Jr. (CAS-male; used for figures 15a-c). Laguna Atascosa Ntl. Wildlf. Ref., Cameron Co., TEX., 18 March 1972, R.K. Zaidel (MSU-female; used for figure 15d).

DISTRIBUTION: Canada (Ontario), United States (Alabama, Arkansas, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, Wisconsin), Mexico (Michoacan, Nayarit, Tabasco, Veracruz).

BIOLOGY: A common coprophagous species. R. derelicta has been reared on numerous occasions from cow manure (Howard, 1901; Pratt, 1912; Greene, 1925; Knipling, 1936; Mohr, 1943; Benson and Wingo, 1963; Sanders and Dobson, 1966; Houser and Wingo, 1967; Blume, 1970; Wharton and Moon, 1979). It is also reported by Howard (1900) as one of the most abundant flies bred and captured from human excrement. Knipling (1936) was unsuccessful in his attempts to rear this species on decomposing meats. It has not been reared from dog dung.

The life cycle, from freshly deposited, first instar to adult was

recorded by Knipling (1936) to take less than 11 days on cow manure. He found that the larvae were beginning to transform to the third instar after 21 hours. Pupariation began less than 4 days after larviposition and adults began emerging 6 days after pupariation. Howard (1900) reports that this species developed from first instar to adult in 6 days on human excrement. He notes that the weather was very warm, the average temperature being estimated at 90° F.

The maximum number of first instars that was dissected from a single female is 30 (Knipling, 1936), with most gravid females having much fewer. Estimations of fecundity based on numbers of larvae contained in pinned specimens of this species is difficult, due to the expulsion of larvae from gravid females as they die in a killing vial (personal observation).

Trapping records of adults include Dodge and Seago (1954), who collected 100 males and 316 females at several sites in Georgia in traps baited with chicken entrails and, sometimes, human feces. Rummel and Knapp (1970) collected large numbers of specimens throughout the months of June, July, August and September at several sites in Kentucky in modified USDA traps which were baited with liver, banana, beer, or malt mixture. Reed (1958) collected this species from dog carcasses. Payne and King (1972) lists R. derelicta as a scavenger species on baby pig carrion which was placed on the soil surface, in trees, and in water. The study sites were not described but are assumed to be located in South Carolina. Adults have also been collected in a Malaise trap in a

grassy/shrubby field (OH, Montgomery Co., Huber Heights, June-July, 1975, G.A. Dahlem). One specimen from one study area baited with SWASS pellets, a bait toxicant for screwworms, was collected by Peterson, et al. (1981).

Males have been noticed exhibiting station-taking behavior at two general sites, at small animal carcasses and at omnivore dung. Station-taking takes place in the afternoon in the sun. Information on male station-taking behavior comes from biological notes taken by Dr. William L. Downes, Jr. during the summer of 1964, mainly at IL, Mason Co., Mason State Forest (MSF). Male station-taking behavior is highly dependant on exact site and time of day. Therefore, the following information is provided for future, comparative studies. Times given are Central Daylight Time, # refers to W.L.D. Bio. Note number, and locality is MSF, unless otherwise noted. On June 8: nine males, 2 females were collected at a fresh pheasant carcass (6:45-7:00 P.M., #86). On June 9: one male on racoon dung (11:45-12:30 P.M., #99); one male at pheasant carcass (1:25-1:40 P.M., #102); one male at pheasant carcass (2:40-2:55 P.M., #109); two males, one female at pheasant carcass (5:45-6:00 P.M., #111). On June 23: one male at ground squirrel carcass (1:30-1:45 P.M., #176); two males, 1 female at fresh human feces (1:45-2:00 P.M., #177); five males at human feces (4:45-5:00 P.M., #183). On June 24: three males, 1 female at day-old human feces (2:37-2:52 P.M., #205); one male at turtle carcass (Spring Lake State Park, IL 6:40-6:55 P.M., #213). On June 25: three males at 2-day old human feces (8:45-9:00 A.M., #218); one male at 2-day

old human feces (3:45-4:00 P.M., #231). These specimens are located in Dr. Downes' personal collection.

R. derelicta appears to be quite secretive during mating. Of the 1175 specimens examined, no correctly associated mating pairs were indicated. Dodge and Seago (1954) mentions the unusual capture of a mated pair in a light trap and proposes that the diurnal copulation was not completed by nightfall and that upon being disturbed the couple flew to the light. A male of derelicta, apparently attempting copulation with a female of R. stimulans, was collected in tall grass adjacent to fresh human feces on a flat rock in a grassy field (KY, Marion Co., Holy Cross, 19 May 1985, 2:00-3:00 P.M., G.A. Dahlem). The specimens separated in the killing jar.

Potential parasitoid records (records for derelicta or complexes of Ravinia species which include R. derelicta) include: Alysia ridibunda Say (Figg, et al., 1982, 1983a) and Aphaereta pallipes (Say) (Benson and Wingo, 1963; Houser and Wingo, 1967; Hayes and Turner, 1971; Figg, et al., 1982, 1983a, 1983b) (Hymenoptera: Braconidae); Eucoila sp. (Figg, et al., 1982) and Eucoila impatiens (Say) (Hayes and Turner, 1971) (Hymenoptera: Cynipidae); Figites sp. (Figg, et al., 1982) and Xyalophora quinquelineata (Say) (Hayes and Turner, 1971) (Hymenoptera: Figitidae); Trichopria sp. (Figg, et al., 1982, 1983a) (Hymenoptera: Diapriidae); Trichomalopsis dubia (Ashmead) (Figg, et al., 1983a), Eupteromalus sp. (Figg, et al., 1982), Muscidifurax sp. (Figg, et al., 1983a), M. raptor Girault and Sanders (Figg, et al., 1982), Spalangia haematobiae Ashmead

(Figg, et al., 1982, 1983a), S. nigra Latr. (Figg, et al., 1982, 1983a) and S. nigroaenea Curtis (Figg, et al., 1982, 1983a) (Hymenoptera: Pteromalidae); and Aleochara sp. (Hayes and Turner, 1971; Figg, et al., 1982, 1983a) and Aleochara bipustulata L. (Moore and Legner, 1973) (Coleoptera: Staphylinidae).

REMARKS: This species may be found in collections under the names derelicta, quadrisetosa, or stimulans, depending on when the determination was made and which systematist made the identification. There are records in the literature that indicate that this species occurs in western states such as Idaho, Oregon, Utah, Nevada, and California as well as several Caribbean islands, but the author has seen no evidence for such claims and it is believed that such records are based on misidentifications.

Ravinia downesi n.sp.

(Figures 16a - d)

Ravinia downesi n.sp. Type-locality: United States, Texas, 23 mi. W. Ft. Davis, 5000' (male).

ADULT: Length: 5.5 - 6.5 mm. Fronto-orbital plate yellow pruinose. R_1 with dorsal setae extending to bend in Sc.

MALE: Two proclinate upper orbital setae present and well developed outer vertical setae. Mesotibia with anteroventral seta. Fifth sternite

without basal mesal hole but with mesal lobes setulate, appearing as a pair of parallel brushes in non-dissected specimens (figure 16a). Cerci small with apices parallel in posterior view (figure 16b) and apices slightly curved anteriorly in lateral view. Aedeagus very distinctive for a species having dorsal setae on R_1 (figure 16c).

FEMALE: Sternites 6, 7, and 8 nearly equal in width and sternite 8 with lateral, oval depressions which give the raised mesal area an hourglass appearance (figure 16d).

DIAGNOSIS: The proclinate upper orbital setae will easily separate the males of this species from all others. Female very similar to anandra but with lateral oval depressions on the eighth sternite giving the mesal area an hourglass appearance. This character is very noticeable even in pinned, non-dissected specimens.

TYPES: Holotype male - 23mi.W. Ft.Davis, 1.VI.1959 TEXAS, 5000' F.McAlpine (ERC; used for figures 16a-c). Allotype female - Santa Cruz Co., ARIZ., 13 mi SE Continental Madera Canyon, elev. 5500 feet, 20 June 1965, R. & J. Matthews (MSU; used for figure 16d). Four male and four female paratypes: S'ta. Rita Mts., Range Res. Ariz., Aug. 18, 1930, Ar.L.P. Wehrle (male-ERC); Big Bend N.P. TEX, Dugout Wells, 3000', May 13, 1959, J.F. McAlpine (male-ERC); USA Texas Big Bend N.P., Panther Junction, 103°12'W 29°19'N, 3.VIII.1982 1130m., J.E. O'Hara (male-ERC); ARIZONA, Graham Co., 0.9 mi. along road to Marijilda canyon from Hwy.

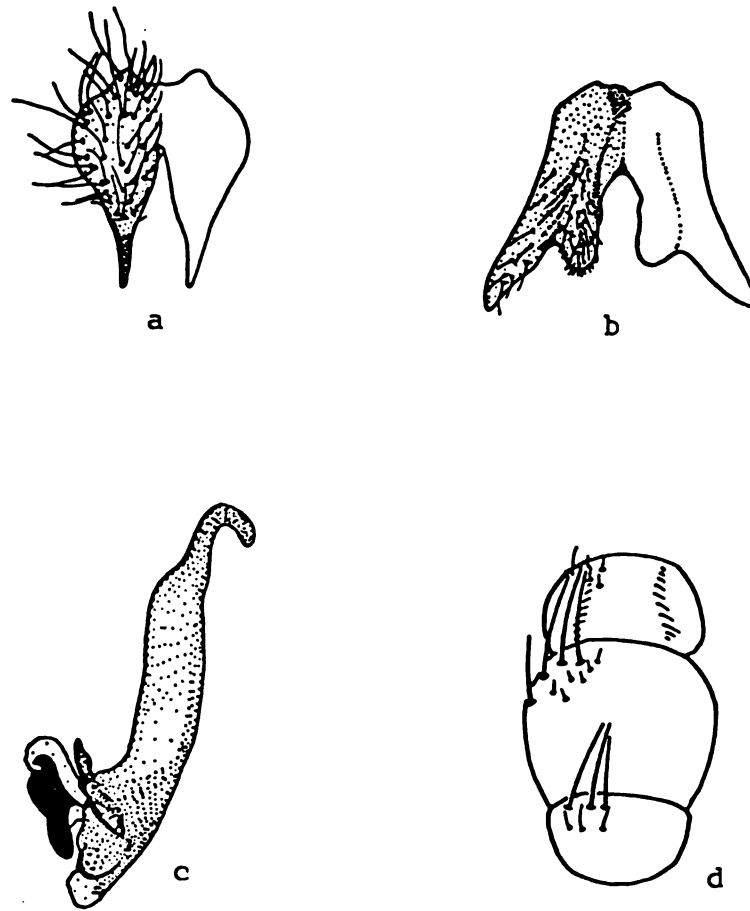


Figure 16: Genitalia of Ravinia downesi. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

666, Alt. 3860', 3.VIII.1965, collector H.B. Leech (male-CAS). Same locality as allotype (2 females-MSU). ARIZ.: Portal, Cochise Co., 3-10 July 1978, Duane Flynn (2 females-MSU).

BIOLOGY: Unknown. Allotype female contained 16 first instars which were very similar in appearance to anadra larvae.

REMARKS: The female of this species has not, as yet, been directly associated with the male. This species is named in honor of Dr. William L. Downes, Jr. who repeatedly has reminded me of exceptions to the rules in the Sarcophagidae. This species certainly exhibits characteristics that were not expected to be found in species with dorsal setae on R_1 .

Ravinia effrenata (Walker)

(Figures 17a - d)

Sarcophaga effrenata Walker, 1861: 309-310. Type-locality: Mexico (male). Aldrich, 1930: 20 (synonymy). Hall, 1931: 181 (key).

Sarcophaga xanthopyga Wulp, 1895: 272. Type-locality: Mexico (male and female).

Sarcophaga conjugens Wulp, 1895: 272. Type-locality: Mexico (male).

Sarcophaga adamsii Hall, 1928: 345-346, pl. 22, figure 17. Type-locality: Jamaica (male/female, mating pair).

Chaetoravinia effrenata (Walker). Lopes, 1946a: 131 (locality record). Lopes, 1948: 566 (locality records). Dodge, 1956a: 188, figure 18

(female genitalia). Dodge, 1965b: 475, 484 (key, locality record).

Dodge, 1965c: 498, 503 (key, locality records). Rohdendorf &

Gregor, 1973: 8 (key). Lopes, 1975a: 485 (locality record).

Ravinia effrenata (Walker). Roback, 1954: 11, 13, 26, 73-74, figures 227-229 (male genitalia).

ADULT: Length: 6 - 9 mm. Fronto-orbital plate grey pruinose with yellowish tinge. R_1 with dorsal setae extending to bend of Sc.

MALE: Fifth sternite U-shaped, with ventrally produced, setulate, medial lobes on posterior arms (figure 17a). Cerci with long, thin, parallel apices (figure 17b). Aedeagus with juxta well developed and very long vessica (figure 17c).

FEMALE: Sternites 6, 7, and 8 very different in shape from one another. Sternite 7 with apical indentation and sternite 8 smaller in width than preceeding sternites and situated in indentation of sternite 7 (figure 17d).

DIAGNOSIS: The long apices of the cerci and the structure of the male genitalia (especially noticeable is the long vesica) serve to separate males of this species from all others. The angle of the fronto-orbital plate as seen in lateral view is usefull for separating this species from vagabunda (see figure 15a) collected in Mexican localities. The shape of the genital sternites is unique to this species, but dissection is often necessary for determinations.

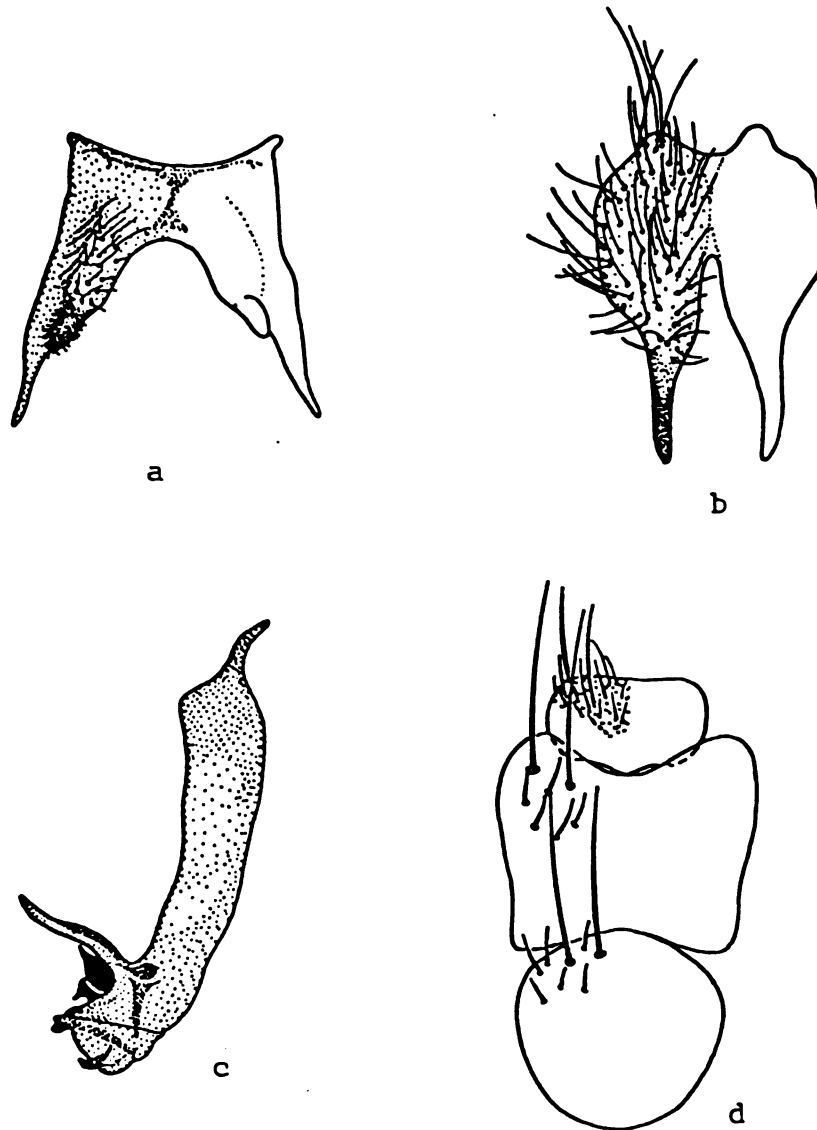


Figure 17: Genitalia of Ravinia effrenata. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

TYPES: Male holotype, Mexico (BMNH).

MATERIAL EXAMINED: 122 males and 76 females (BRC, CAS, MCZ, MSU, OSU, WLD). FLA: Highlands Co., Archibold Biol. Sta., 8-X-1964, P.H. Arnaud, Jr. (male-CAS; used for figures 17a-c). MEX.: Sonora, Alamos, 25-II-1963, P.H. Arnaud, Jr. (female-CAS; used for figure 17d).

DISTRIBUTION: United States (Arizona, California, Florida, Texas), Mexico (Baja California Norte, Baja California Sur, Chihuahua, Durango, Guanajuato, Guerrero, Jalisco, Mexico D.F., Morelos, Nayarit, Oaxaca, San Luis Potosi, Sinaloa, Sonora, Veracruz, Yucatan), Guatemala, Honduras, Costa Rica, Panama, Columbia, Cuba, Jamaica, Puerto Rico, Barbados, Trinidad, Bahamas.

BIOLOGY: One male swept from flowers Encelia farinosa (USA: ARIZ.: Pima Co., Organ Pipe Cactus Nat. Mon., Williams Spring, 15-II-1970, A. Gray, CAS). One male collected at flower Lopezia trichota (MEXICO: Durango, 17 road miles W. Durango, 10-IX-1966, 6600', D.E. Breedlove, CAS). One female collected at fir Mangifera indica (MEX.: Sonora, Alamos, 21-II-1963, P.H. Arnaud, Jr., CAS). Maximum number of first instars dissected from one female was 13. First instar with darkly pigmented pseudotrachea.

REMARKS: Although there are several synonymous names, virtually all determined specimens should be found under the name effrenata.

Ravinia errabunda (Wulp)

(Figures 18a - d)

Sarcophaga errabunda Wulp, 1896: 278. Type-locality: Mexico, Tabasco (4 males). Aldrich, 1930: 33 (synonymy).

Sarcophaga reinhardii Hall, 1928: 346-347, pl. 22, figure 20. Type-locality: United States, Texas, College Station (male). Van Emden, 1950: 199 (parasitoid record).

Chaetoravinia errabunda (Wulp). Lopes, 1946a: 131 (locality record).

Lopes, 1948: 566 (locality records). Dodge, 1956a: 186, 187, 188, figure 19 (key, female genitalia).

Ravinia errabunda (Wulp). Roback, 1954: 74, figures 230-232 (male genitalia).

ADULT: Length: 5 - 11 mm., usually 9 - 10 mm. Fronto-orbital plate grey pruinose with yellowish tinge. R_1 with dorsal setae extending to bend of Sc.

MALE: Mesotibia usually with anteroventral seta. Fifth sternite with conspicuous mesal lobes with several long setae (figure 18a). Cerci large with apices slightly convergent (figure 18b). Aedeagus large, with well developed corpus, short vessica, and partially hidden hillae (figure 18c).

FEMALE: Sternites 6 and 7 nearly equal in width, sternite 8 slightly narrower (figure 18d). Sternite 7 much larger than surrounding sternites and conspicuous, even in pinned, non-dissected specimens.

DIAGNOSIS: The male genitalia are very distinctive and determinations can usually be made even in non-spread specimens by examination of the large setulate lobes of the fifth sternite. The genital sternites of the female are usually very apparent and distinctive, thus allowing determinations of non-dissected specimens. The aedeagus appears to have many affinities with that of dampfi, particularly in the structure and appearance of the hillae.

TYPES: Four male syntypes, Mexico, Tobasco (BMNH).

MATERIAL EXAMINED: 148 males and 68 females (BRC, CAS, FMNH, MCZ, MSU, OSU, WLD). Fairbanks Sprs., Ash Meadows, Nye Co., Nev., 20(vi)51, LaR. and Ted Frantz (male-CAS; used for figures 18a-c). Aguanga, Cal., 4/28 '33, A.J. Basinger Collector (female-CAS; used for figure 18d).

DISTRIBUTION: United States (Arizona, California, Kansas, Louisiana, Nevada, New Mexico, Texas), Mexico (Baja California Norte, Chiapas, Durango, Hidalgo, Jalisco, Mexico, Mexico D.F., Morelos, Oaxaca, Puebla, San Luis Potosi, Sonora).

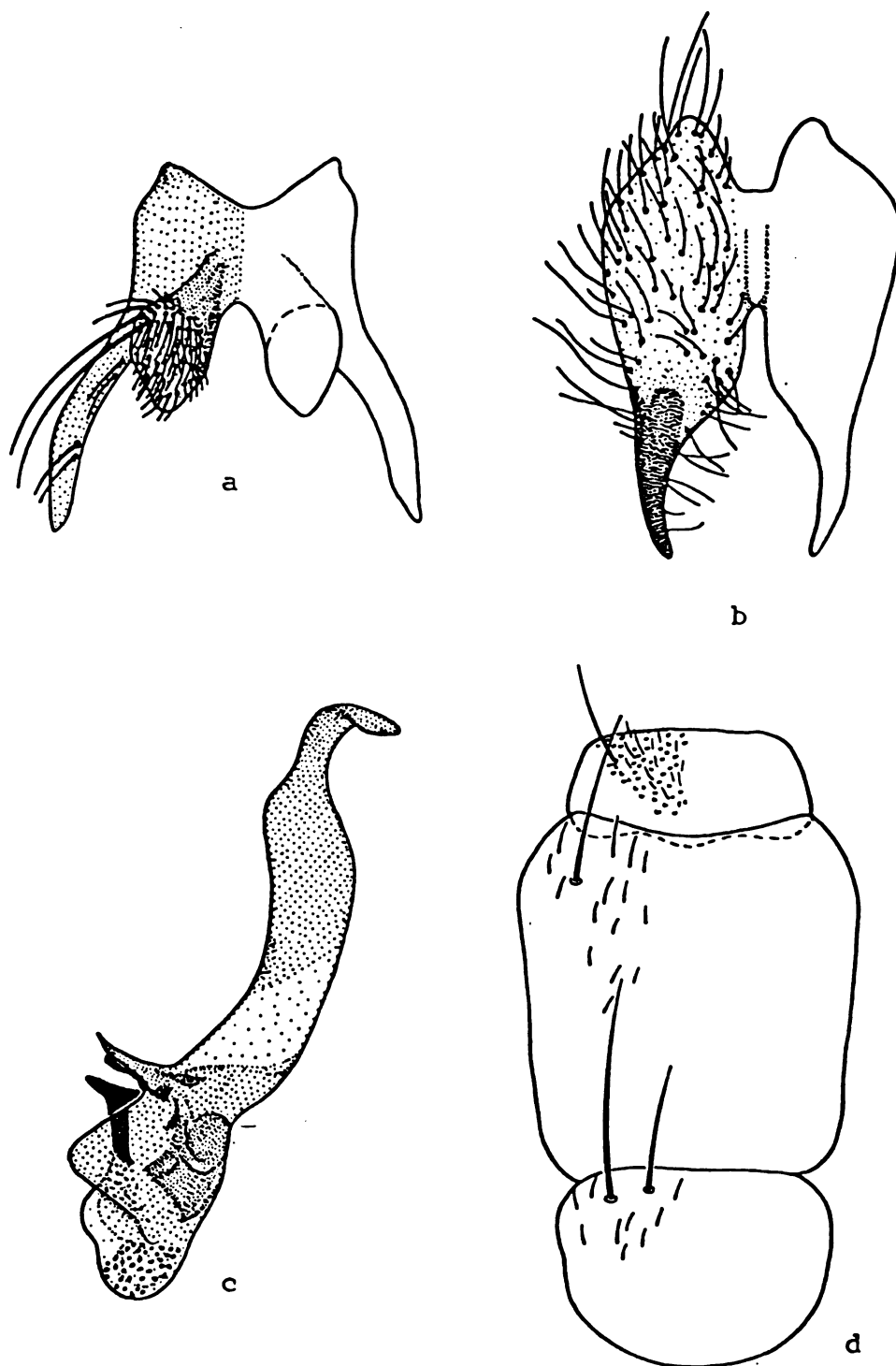


Figure 18: Genitalia of Ravinia errabunda. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

BIOLOGY: Van Emden (1950) lists R. errabunda as a parasitoid of Epilachna varivestis Muls. (Coleoptera: Coccinellidae). Sixteen males and seven females were collected by A.J. Basinger at human excrement ((3/2) San Jacinto, Cal., 5/18 '33; (0/1) Aguanga, Cal., 4/28 '33; (2/0) Riverside, Cal. 6/20 '33; (0/1) Riverside, Cal., 11/23 '33; (1/2) Riverside, Cal. III-8-34, Cottonwood Can.; (7/0) San Andreas Can., Riv. Co., Cal., 12/20 '33; (0/1) San Andreas Can., XI-21-33, Riv. Co., Cal.; (2/0) Indio, Cal., 11/24 '33; (1/0) Chino, Cal., IV-20-34). Two males and five females were collected by A.J. Basinger at an orange dump (Riverside, Cal. 3/27 '33). One male and four females were collected by A.J. Basinger at fresh chicken guts (Casa Grande, Ariz. III-25-34). One male and one female was collected by A.J. Basinger at aphids (Downey, Cal. 11/27 '33). Five males and one female was collected by A.J. Basinger at fish bait ((1/1) Riverside, Cal. 5/19 '33; (2/0) Riverside, Cal., 12/20 '33; (1/0) Riverside, Cal. 5/4 '33; (1/0) San Andreas Can., Riv. Co., Cal., 12/21 '33). One male was collected by A.J. Basinger at fish (Riverside, Cal., 11/26 '33). One male was swept from flowers of Encelia farinosa A. Gray (USA: ARIZ: Pima Co., Organ Pipe Cactus Nat. Mon., Williams Spring, 17-II-1970, P.H. Arnaud, Jr.). One male was collected at flowers of Lopezia trichota (MEXICO: Durango, 17 road miles W. Durango, 10-IX-1966, 6600', D.E. Breedlove). One male was collected in a light trap (CAL. Mono Co., The Hot Spgs., 2.5 mi. S. of Bridgeport, 15-VIII-1963, H.B. Leech). All of the above mentioned specimens can be found in the collection of the California Academy of Sciences.

REMARKS: Virtually all determined specimens in collections will be found under the name errabunda.

Ravinia floridensis (Aldrich)

(Figures 19a - d)

Sarcophaga floridensis Aldrich, 1916: 249, figure 117. Type-locality: Miami, Florida. Hall, 1928: 334, 336-337, figure 4 (key, redescription).

Ravinia floridensis (Aldrich). Roback, 1954: 74, figures 235-236 (synonymy, male genitalia). Downes, 1965: 954 (locality records). Dodge, 1965b: 491 (locality data). Lopes, 1969: 21 (locality records). Rohdendorf and Gregor, 1973: 7 (key, locality records).

ADULT: Length 7 - 11 mm. Gena grey pruinose. Pedicel and palpus bright orange. Presutural acrostichal setae well differentiated. Legs orange in ground color.

MALE: Lateral margins of sternite 5 divergent and slightly concave. Sternite 5 length approximately equal to width at apex (figure 19a). Apices of cerci stout, with nearly straight interior margins (figure 19b). Hillae rounded apically, extending from corpus at nearly a right angle anteriorly (figure 19c).

FEMALE: Sternite 6, 7, and 8 with scattered golden pruinosity. Sternite 6 much wider than long. Sternite 7 with small anterolateral

processes (figure 19d).

DIAGNOSIS: The orange palpi and legs combined with the lack of dorsal setae on R_1 , allows easy separation of this species from all others.

TYPES: Male holotype. Miami, Florida, C.H.T. Townsend collector (USNM). Allotype from same locality (USNM). Six paratypes from various localities (Aldrich, 1916).

MATERIAL EXAMINED: 6 males and 5 females. Tifton, Ga., Oct. 16 '96 (FMNH-male paratype; used for figures 19a-c). St. Petersburg, Fla., Snell Isle, Nov. 8 1967, Peter J. Martinat (MSU-1 female; used for figure 19d). Mayport, Fla., June 16, 1954, R.L. Fischer (MSU-1 female). Tifton, Ga., June 13 '96 (FMNH-male paratype and 1 female). St. Augustine, Fla. (FMNH-male paratype). Tifton, Ga., Oct. '96 (FMNH-1 female). Orlando, FLA., 22 June 1981, Wm. Downes, Jr. (WLD-2 males). Sarasota Co., Fla., 6-30-1952, col. L.R. Penner (WLD-1 female). Gainesville, Fla., 17.VII.55, R.A. Morse coll., at dung of man (WLD-1 female).

DISTRIBUTION: Bahama Islands, United States (Florida, Georgia). Distribution from material examined and Dodge (1965b).

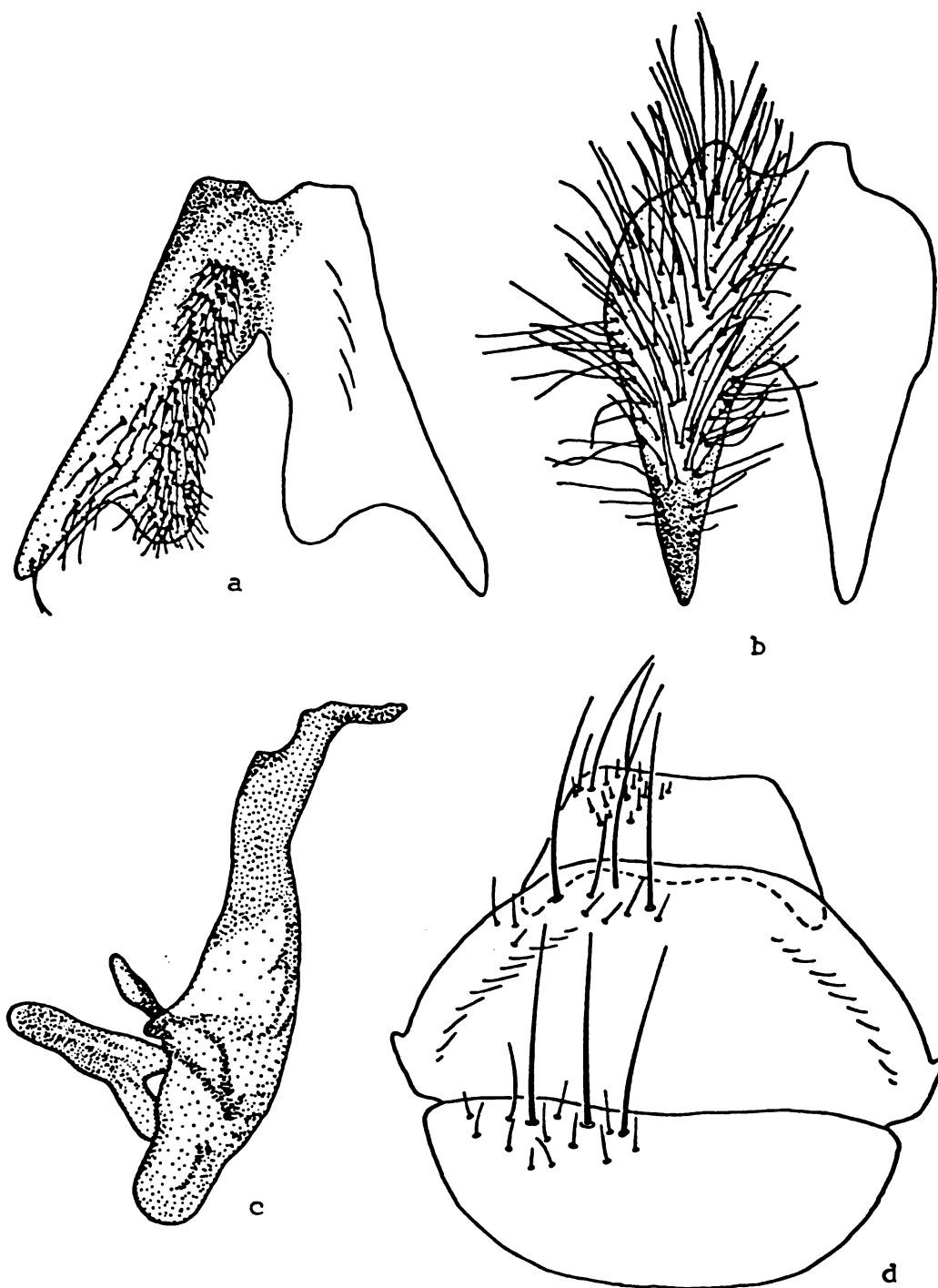


Figure 19: Genitalia of Ravinia floridensis. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

BIOLOGY: Unknown. One female examined was collected at human dung (see above for locality data).

REMARKS: Virtually all determined specimens in collections will be found under the name floridensis.

Ravinia globulus (Aldrich)

(Figures 20a - d)

Sarcophaga globulus Aldrich, 1916: 249, 299-301, figure 145. Type-

locality: Cuba, Havana (male). Hall, 1928: 334, 346, figure 19 (key, male genitalia).

Ravinia globulus (Aldrich). Roback, 1954: 74 (synonymy).

Chaetoravinia globulus (Aldrich). Dodge, 1956b: 99, figure 13

(description of female). Lopes, 1969: 23 (locality records).

Rohdendorf and Gregor, 1973: 8, figure 18 (key, male and female genitalia).

ADULT: Length: 6 - 9 mm. Fronto-orbital plate grey pruinose with yellowish tinge. R_1 with dorsal setae extending to bend of Sc.

MALE: Mesotibia with small anteroventral seta. Fifth sternite without anterior mesal hole, generally Y-shaped, and with blunt mesal lobes on posterior arms (figure 20a). Cerci with nearly parallel apices, may be slightly convergent at tip (figure 20b). Tip of aedeagus very compact, vesica strongly bent upwards (figure 20c).

FEMALE: Fifth tergite orange, barely visible from above, and folded roof-like medianly around genitalia. Sternites 7 and 8 apparently fused, some indication of line of fusion visible. Sternite 6 nearly equal in size to sternite 7+8. Sternite 8 slightly smaller in width than preceeding genital sternites (figure 20d). Posterior margins of abdominal terga usually with a thin band of brown pruinosity.

DIAGNOSIS: The dark legs of this species easily separate it from barroi on Cuba. The cerci and structure of the aedeagus will separate this species from the sympatric effrenata. The folded fifth tergite, similar to that seen in many members of the genus Oxysarcodexia, easily separates the female from all other species. While females of barroi also show a fusion of sternites 7 and 8, other characters of the adults do not indicate a close relationship.

TYPES: Male holotype, Havana, Cuba (type no. 20575, USNM). Female allotype, Havana, Cuba (USNM). Twenty-one paratypes from same locality.

MATERIAL EXAMINED: 5 males and 3 females. Calabazar, Cuba, IV-14-23, J.S. Hine collector (OSU-male; used for figures 20a-c). Calabazar, Cuba, IV-30-23, J.S. Hine collector (OSU-2 females; one specimen used for figure 20d). Rep. Dominicana, La Cumbre, 300m, 22-23.III.1978, L. Masner (BRC-2 males). Havana, Cuba, Baker (MCZ-paratype male; damaged specimen, only thorax remains on pin). Havana, Cuba, Baker, H.E. Smith Coll. (MCZ-

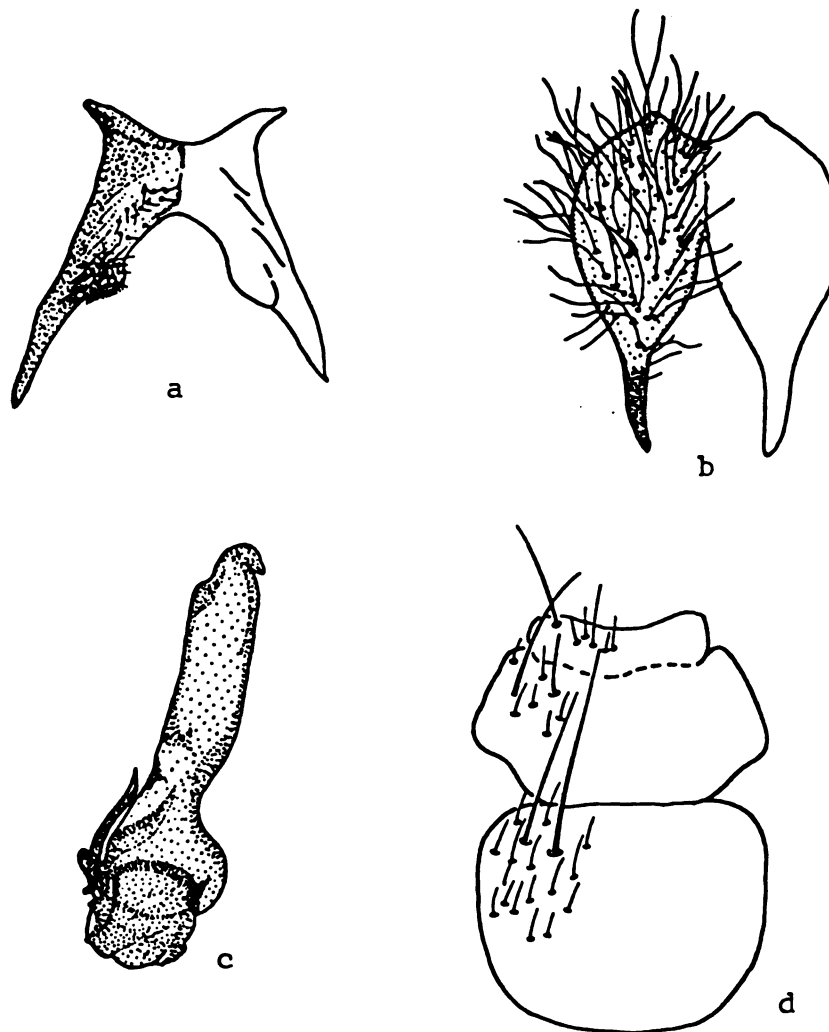


Figure 20: Genitalia of Ravinia globulus. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

male). Marianao, Cuba, V-13-23, J.S. Hine collector (OSU-female).

DISTRIBUTION: Cuba, Hispaniola, Puerto Rico.

BIOLOGY: Unknown.

Ravinia haematodes (Meigen)

(Figures 21a - d)

Sarcophaga haematodes Meigen, 1826: 29. Type-locality: ?Germany, Aachen.

Macquart, 1834: 225. Zetterstedt, 1838: 650. Walker, 1849: 820
(synonymy). Schiner, 1862: 572. Pandelle, 1896: 176. Villeneuve,
1900: 364 (type information). Bezzi, 1907: 481. Bottcher, 1912:
707 (redescription). Enderlein, 1928: 24 (systematics). Hardy,
1936: 90 (locality records).

Musca pernix authors, nec. Harris, 1780: 84.

Musca striata Fabricius, 1794: 315 (preoc. by Gmelin, 1790). Type-
locality: Denmark.

Musca haemorrhoidalis Fallen, 1817: 237 (preoc. by Villers, 1789). Type-
locality: Sweden.

Myophora haemisphaerica Robineau-Desvoidy, 1830: 346. Type-locality:
France.

Myophora limpidipennis Robineau-Desvoidy, 1830: 346. Type-locality:
France.

- Myophora horticola Robineau-Desvoidy, 1830: 346. Type-locality: France.
- Myophora campestris Robineau-Desvoidy, 1830: 346. Type-locality: France.
- Pierretia parva Robineau-Desvoidy, 1863: 427. Type-locality: France.
- Ravinia haematodes (Meigen). Robineau-Desvoidy, 1863: 435-436
(redescription, genotype placement).
- Ravinia hebes Robineau-Desvoidy, 1863: 436. Type-locality: France.
- Ravinia sulcata Robineau-Desvoidy, 1863: 437. Type-locality: France.
- Sarcophaga nova Siebke, 1877: 94. Type-locality: Norway.
- Sarcophaga striata (Fabricius). Lundbeck, 1927: 169, 171-173
(redescription, locality records, key). Patton & Wainwright, 1935: 346. Salem, 1935: 225. Seguy, 1939: 58 (synonymy). Seguy, 1941: 153 (biology). Hammer, 1942: (biology). Kano, 1950: 825, figures 8-10. Zumpt, 1965: 108 (biology).
- Thyrsocnema striata Enderlein, nec. Fabricius. Enderlein, 1928: 42
(genotype placement).
- Sarcophaga aozia Seguy, 1935: 5. Type-locality: Chad.
- Ravinia striata (Fabricius). Rohdendorf, 1937: 391. Roback, 1954: 74
(synonymy). Rohdendorf, 1960: 790. Lehrer, 1961: 534-535
(redescription, locality records). Zakharova, 1966: 161, 162
(biology). Kano, et al., 1967: 5, 130-132, figure 74
(redescription, locality records, biology). Slameckova, 1969: 225
(locality records). Lopes, et al., 1977: 563 (locality records).
Rohdendorf and Verves, 1978 (biology). Verves, 1980: 355-356
(locality data, biology). Sugiyama and Kano, 1984: 347, 348,

figures 8-11 (sytematics, male genitalia). Verves, 1986: 133-134 (synonymy, locality records).

Gesneriodes disjuncta Seguy, 1938: 43. Type-locality: Morocco.

Ravinia pernix authors, nec. Harris. Rognes, 1986: 16 (locality records, biology). Pape, 1986: 303, 304-305 (reexamination of types). Pape, 1987a: 45 (locality records). Pape, 1987b: 99-100, figures 206-209 (redescription, locality records).

ADULT: Length: 5 - 8 mm. Gena grey pruinose. Three well developed postsutural dorsocentral seta.

MALE: Sternite 5 much wider than long (figure 21a). Apices of cerci convergent, inner margins noticeably bent (figure 21b). Hillae very broadly rounded anteriorly (figure 21c).

FEMALE: Sternite 6 very rounded in appearance, mostly covered with grey pruinosity. Sternite 7 very distinctly elongated, appearing as a long rectangle (figure 21d).

DIAGNOSIS: This is the only species of Ravinia known to occur in the Old World and it has not been recorded from any locality in North or South America. The genitalia are distinctive and would allow easy separation from other species if it should be collected in the New World.

TYPES: Male holotype and allotype represented by mating pair on single pin. No locality data accompanies specimens, but they are

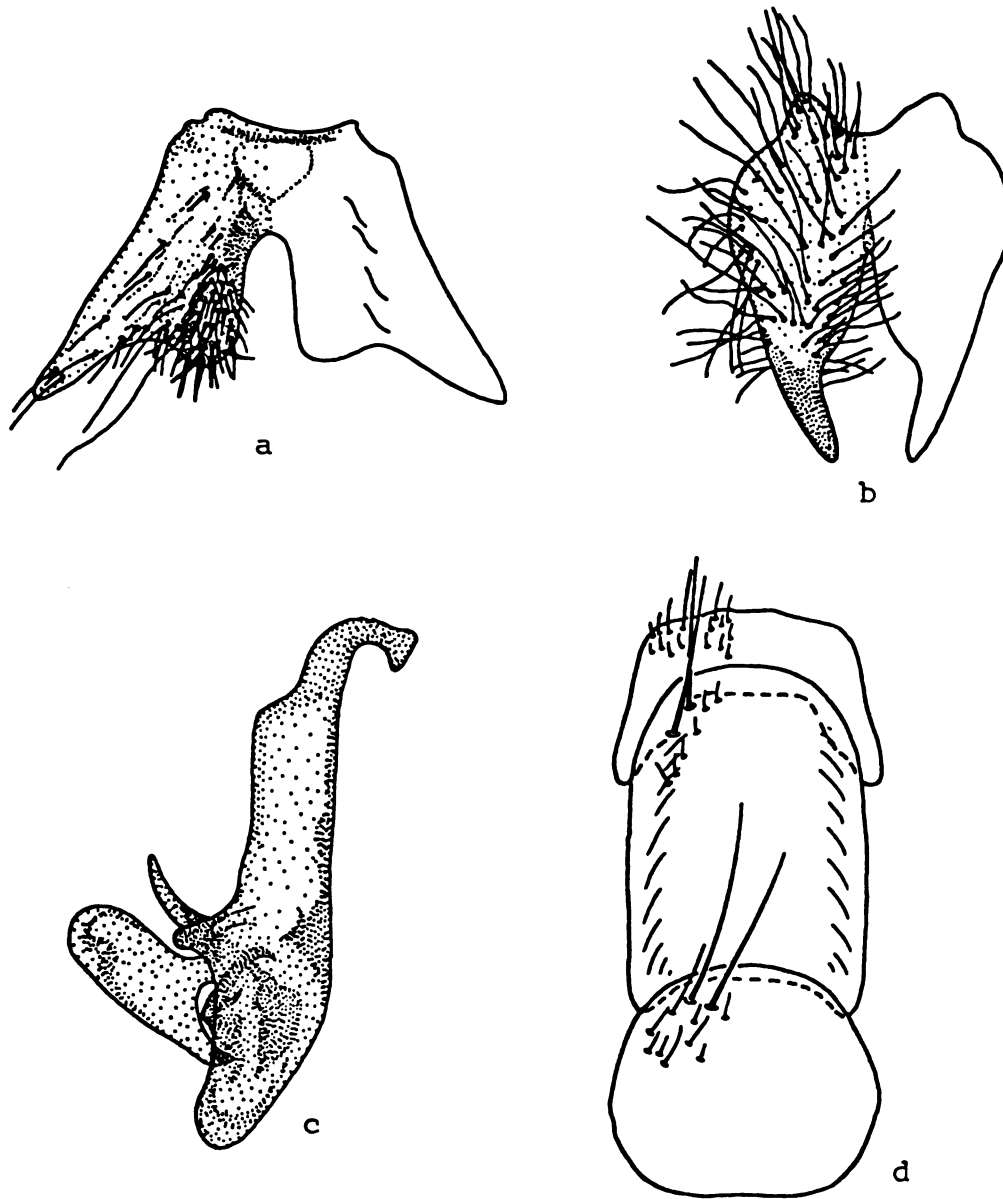


Figure 21: Genitalia of Ravinia haematodes. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

suspected of being from Germany, Aachen. Both specimens are missing their abdomens, male missing 1 wing. On separate pin beside the specimen is a wing and abdomen. Both specimens are definitely Ravinia. Types were examined in 1986 at Museum National D'Histoire Naturelle in Paris.

MATERIAL EXAMINED: 5 males, 4 females. INDIA: Mussoorie, U.P., 15 May 1962, J.P. Donahue, elev. 5400 feet (MSU-male; used for figures 21a-c). Same locality, 16 May 1962 (MSU-1 male). Cypem, Ayia Napa, 10 km W. Capo Greco, 13-23.vi.1983, B. Petersen leg. (WLD-1 male, 2 females; a female used for figure 21d). Morocco, Werner coll., 13.V.30 (MCZ-male). ENGLAND DT: Wareham-Corfe Rd., 26.vii.54, J.A. & D.J. Clark (WLD-1 male). Lynton, 16.VIII.41 (WLD-1 female). Moccas, 9.VIII.56 (WLD-1 female).

DISTRIBUTION: Afghanistan, Albania, Algeria, Austria, Azores, Belgium, Bulgaria, Canary Islands, Chad, China, Cyprus, Czechoslovakia, Denmark, Egypt, Finland, France, German Federal Republic, German Democratic Republic, Greece, Hungary, India, Iran, Iraq, Ireland, Israel, Italy, Japan, Korea, Lebanon, Libya, Madeira, Malta, Mongolia, Morocco, Nepal, Norway, Pakistan, Poland, Portugal, Romania, Saudi Arabia, Soviet Union, Spain, Sweden, Switzerland, Syria, Tunisia, United Kingdom, Yemen, Yugoslavia. Distribution from Kano, et al. (1967), Lopes, et al. (1977), and Verves (1986).

BIOLOGY: Despite the large volume of literature that has discussed

this species, little is known of its life history. Kano, et al. (1967) reports that this species breeds in human feces and dead animals in nature. A possible case of intestinal myiasis caused by this species is mentioned by Zumpt (1965). Verves (1980) mentions that the larvae develop in feces, occasionally developing in dead animals and that it is recorded as a parasitoid of Gastropoda. Seguy (1941) and Rohdendorf and Verves (1978) report this species being reared from snails, grasshoppers and a beetle. Zakharova (1966) observed that females lay larvae in ovarian membranes when a suitable substrate is available. The larvae immediately distard these membranes, which remain on the surface of the substrate and burrow into the substrate. He found a potential fertility of up to 52 larvae and that females laid a maximum of three batches of larvae. Hammer (1942) describes the mating behavior of this species with the observation that couples pursue each other into the air before tumbling to the ground.

REMARKS: This species has been cited under the name of striata since the publication of Lundbeck's (1927) synonymy of the Fabricius name with Meigen's haematodes. It was discovered fairly recently that striata was preoccupied by Gmelin's (1790) Musca striata. Pape (1986) reexamined the types of Fallen and found that haemorrhoidalis applied to this species. This name has been used extensively for the species now known as Sarcophaga cruentata. Fortunately, the name is unavailable as it is preoccupied by Villers' (1789) Musca haemorrhoidalis. Several authors

began to use Harris' (1780) name pernix for this species. No Harris types remain and study of the description he provides gives no indication that pernix is a member of Ravinia. Furthermore, most Palearctic species of Sarcophaginae have black genital capsules and Harris specifically mentions the red genitalia of another species of Sarcophagidae that he described, but did not mention red genitalia in his description of pernix. For these reasons I believe that the name pernix should not be applied to this species and the next available name, haematodes (Meigen) should be used. Examination of the types definitely associate this name with this species.

Most determined specimens in collections will be found under the name striata.

Ravinia heithausi Lopes

(Figures 22a - d)

Ravinia heithausi Lopes, 1975a: 485-486, figures 1-4. Type locality:

Costa Rica, Cerro de la Muerte, 6 km W. Villa Mils, Inter-Am. H'wy,
San Jose Pvnce, el.: 3340 m.

ADULT: Length: 6 - 9 mm. Anterior margin of gena, parafacials and fronto-orbital plate yellow pruinose. Gena changing to gray pruinose anterior to line from posterior margin of eyes. Three postsutural dorsocentral setae. Presutural acrostichal setae with one pair differentiated more than others.

MALE: Sternite 5 much wider than long (figure 22a). Apices of cerci slightly convergent, with sinuous inner margins (figure 22b). Hillae giving aedeagus a rather ax-like appearance and with small ventral notch (figure 22c).

FEMALE: Sternite 7 with, at most, a scattering of golden pruinosity and with a curved mesal projection at apex (figure 22d).

DIAGNOSIS: This species may be separated from all others by the 3 postsutural dorsocentral setae and distinctive genitalia. I have seen no other species with only 3 postsutural dorsocentrals from Costa Rica.

TYPES: Holotype male, allotype, and 17 male and 43 female paratypes all from: Cerro de la Muerte, 6 km W Villa Mils, Inter-Am. H'wy, San Jose Provce, Cost Rica, El. 3340 m, Coll. E.R. Heihaus, on various flowers, from 22.X.1971 to 24.II.1972. The location of the types are not given (IOC?).

MATERIAL EXAMINED: 27 males and 51 females (WLD). COSTA RICA, Cerro de la Muerte, 23 XII 1987, Wm. L. Downes, Jr., 3000 m. (WLD-8 males, 15 females; 1 male and 1 female used for figures 22a-d). 43 of these specimens were collected on Volcan Irazu in Costa Rica at 2000m on 13.II.1988 by W.L. Downes Jr. Other specimens from various localities in Costa Rica.

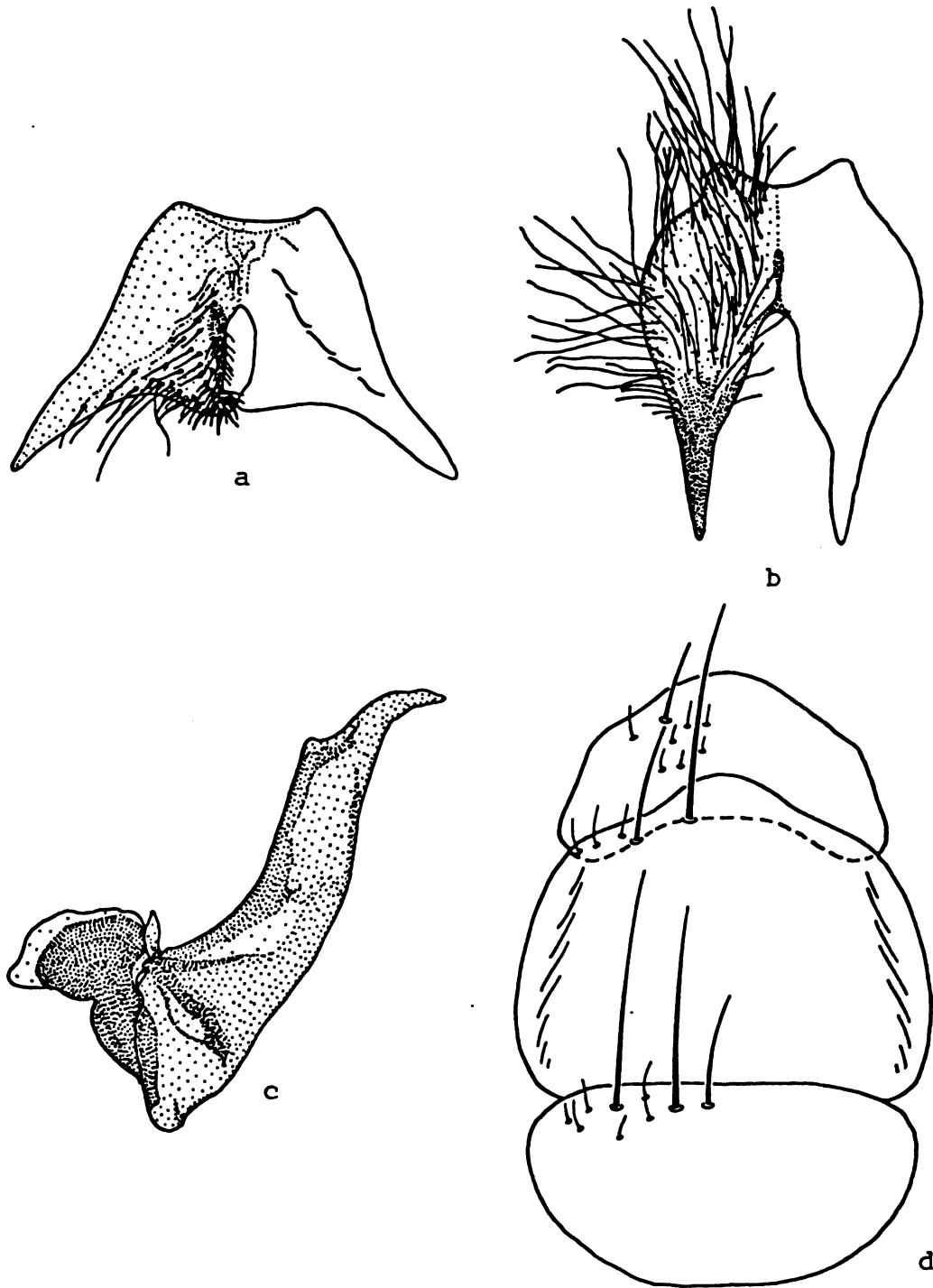


Figure 22: Genitalia of Ravinia heithausi. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

DISTRIBUTION: Costa Rica.

BIOLOGY: Unknown. Adults have been collected at flowers. Most specimens have been collected at elevations at or above 2000 m.

Ravinia lherminieri (Robineau-Desvoidy) complex

(Figures 23a - d)

Myophora lherminieri Robineau-Desvoidy, 1830: 339. Type-locality:

U.S.A., Carolina.

Sarcophaga ochracea Aldrich, 1916: 255-256, figure 121 (as communis variant). Type-locality: Hamburg, Mississippi. Greene, 1925: 7, figure 2 (description of puparium, biology). Hall, 1928: 340, fig. 11 (redescription, key). Aldrich, 1930: 34 (synonymy).

Sarcophaga sueta authors, nec. van der Wulp. Knipling, 1936: 418, 426, 429, 435-436, figures 7, 33, 52, 66 (description of larva). Mohr, 1943: 283, 284 (biology).

Ravinia ochracea (Aldrich). Lopes, 1946a: 137-139, figures 44-46 (redescription). Dodge and Seago, 1954: 52, 53, 55 (biology). Reed, 1958: 241 (biology). Downes, 1965: 954 (locality records). Lopes, 1969: 22 (locality records). Rohdendorf and Gregor, 1973: 7 (key, locality records).

Ravinia sueta authors, nec. van der Wulp. Roback, 1954: 74, figures 237-239 (synonymy, description of male genitalia). Poorbaugh, et al., 1968: 22 (biology) Poorbaugh and Linsdale, 1971: 52, 53, 55

(biology).

ADULT: Length: 10 - 14 mm. Gena golden to greyish-yellow pruinose. Four postsutural acrostichal setae, anterior 2 much reduced in size. Lateral scutellar setae well developed, pair adjacent to subapical scutellar setae extending well over half its length.

MALE: Tergite 5 usually quite orange in ground color. Sternite 5 shallowly concave along anterior margin. Not distinctly longer than wide (figure 23a). Apices of cerci stout with inner margins nearly straight (figure 23b). Hillae resembling a right triangle (figure 23c).

FEMALE: Sternite 7 golden pruinose. Sternite 6 much wider than long. Sternite 7 with broadly rounded, convergent lateral margins (figure 23d).

LARVA: The first instar is described by Knipling (1936).

PUPARIUM: Greene (1925) provides a description of the puparium.

DIAGNOSIS: The golden pruinose gena and large size easily separate this species from all other Nearctic species, except sueta. It can be separated from this species on the basis of the genitalia.

TYPES: Female holotype, Caroline (FMNH). In good condition when examined in 1986.

MATERIAL EXAMINED: 122 males and 186 females (BMNH, BRC, CAS, CSU,

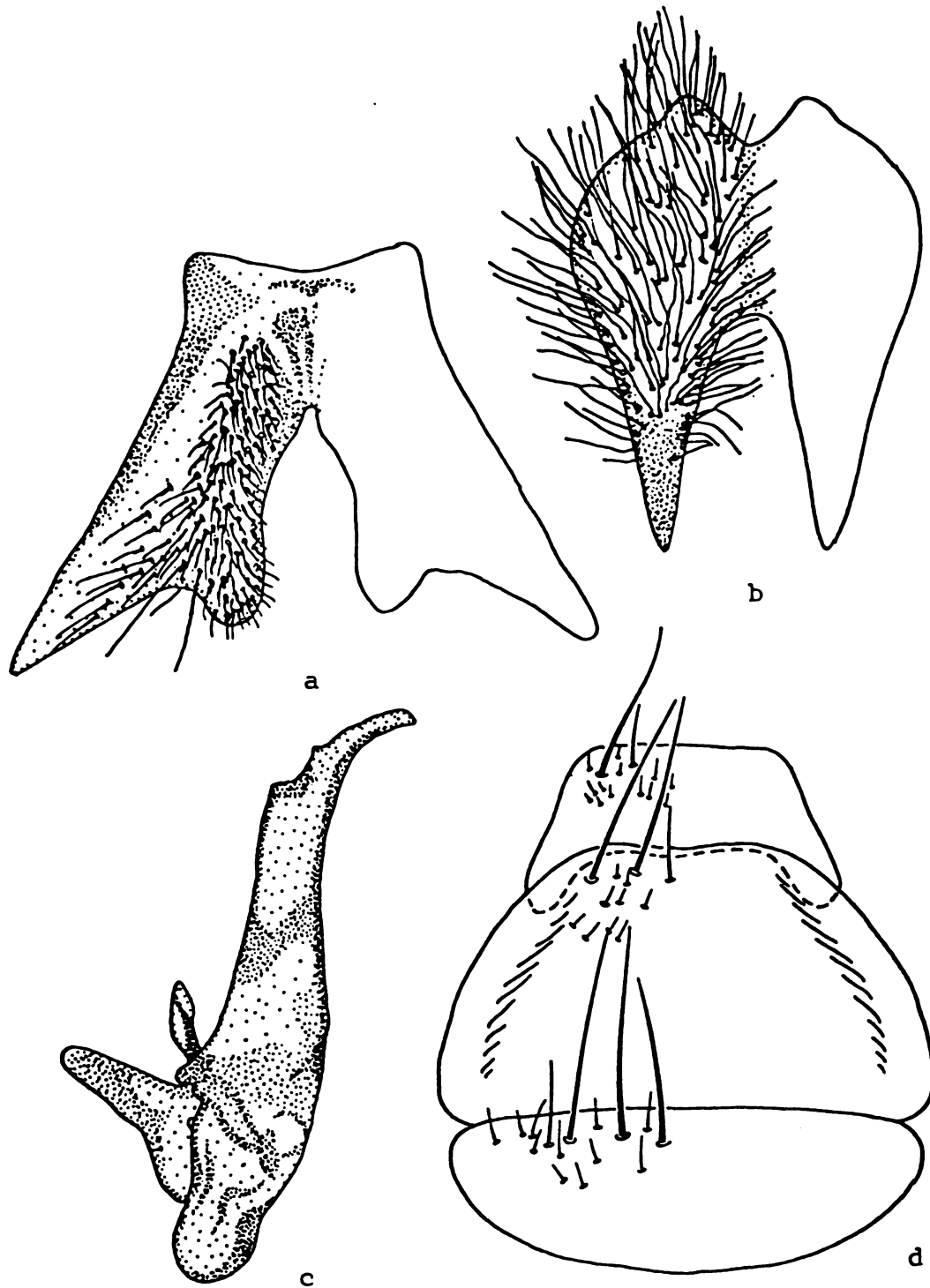


Figure 23: Genitalia of Ravinia lherminieri. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

FMNH, GAD, MCZ, MSU, OSU, SUNY, WLD). U.S.A., N. Carolina, 1918, A.H. Manee (BMNH-1 male; used for figures 23a-c). Highlands, N.C., 13.VIII.1957, W.R. Richards (BRC-1 female; used for figure 23d).

DISTRIBUTION: United States (Arkansas, California, Florida, Georgia, Illinois, Louisiana, North Carolina, Ohio, Oregon, Tennessee, Texas, Virginia), Mexico (Baja California Norte, Baja California Sur, Durango, Morelos), Guatemala, Costa Rica.

BIOLOGY: A common coprophagous species over its range. This species has been reared from cow manure (Aldrich, 1916; Greene, 1925; Knipling, 1936; Mohr, 1943). It was found to be attracted to cow manure in California by Poorbaugh, et al. (1968) but was not reared from the manure. This species has also been commonly reared from dog dung in California by Poorbaugh and Linsdale (1971). Mohr (1943) provides detailed information on the habits of this species in association with cow manure and the habits of a parasitoid, Xyalophora quinquelineata Say (Hymenoptera: Figitidae). Four females (CAS) were collected in Riverside Co., California at human feces.

R. lherminieri has also been noted to be attracted to carion. Reed (1958) collected this species coming to dog carcasses. Payne and King (1972) report this species in association with decomposing baby pigs.

Little is known of the mating habits of this species, but Dodge and Seago (1954) found high concentrations of males on Georgia mountain

summits, especially after 11:00 A.M., perhaps indicating that summits may play a role as a station site for this species.

REMARKS: This species is labeled as a complex because of the extreme diversity of the male and female genitalia. The species is either very polytypic in the structure of its genitalia or it is composed of many sympatric sibling species. After many dissections it was difficult to find three male specimens which exactly matched one another in the fine structure of the aedeagus, even when the specimens were collected as part of a series from the same location on the same date. For further explanation of the application of this name to this species, see the remarks section of anxia.

Most determined specimens in collections will be found under the names ochracea and sueta. Literature citations concerning ochracea or sueta are considered under this species, as I found sueta to be almost entirely restricted to Mexico.

Ravinia lopesi n.sp.

(Figures 24a - d)

Ravinia lopesi n.sp. Type-locality: Argentina, Catamarca, El Arenal.

2600 m., W. cord Aconquija.

ADULT: Length: 6 - 9 mm. Gena, genal groove, and parafacials golden pruinose. Fronto-orbital plate also golden pruinose, but with a

brownish tinge. Presutural acrostichal setae well differentiated. Coxa and trochanter bright orange in ground color. Femur and tibia grey pruinose.

MALE: Posterior arms of sternite 5 much longer than inner mesal lobes (figure 24a). Apices of cerci stout, inner margins smoothly rounded (figure 24b). Hillae broadly rounded apically (figure 24c).

FEMALE: Sternite 6 with a convex anterior margin. Sternite 7 triangular in appearance (figure 24d).

DIAGNOSIS: The orange coxae and trochanters, in conjunction with the dark grey femurs and tibia, serve to easily separate this species from all others.

TYPES: Male holotype, allotype, and 4 male and 2 female paratypes all from: ARG. Catamarca, El Arenal. 2600 m., W. cord Aconquija., 3-4.X.68, Pena (ERC). One paratype female from ARGENT. Jujuy, La Quiaca, 23.X.68, 3500 m., L.E. Pena (ERC).

BIOLOGY: Unknown.

Ravinia meinckei (Blanchard)

(Figures 25a - d)

Andinoravinia meinckei Blanchard, 1939: 835, figure 12. Type-locality:

Argentina, La Falda, Cordoba. Lopes, 1962: 166, 167, 172-173 (key,

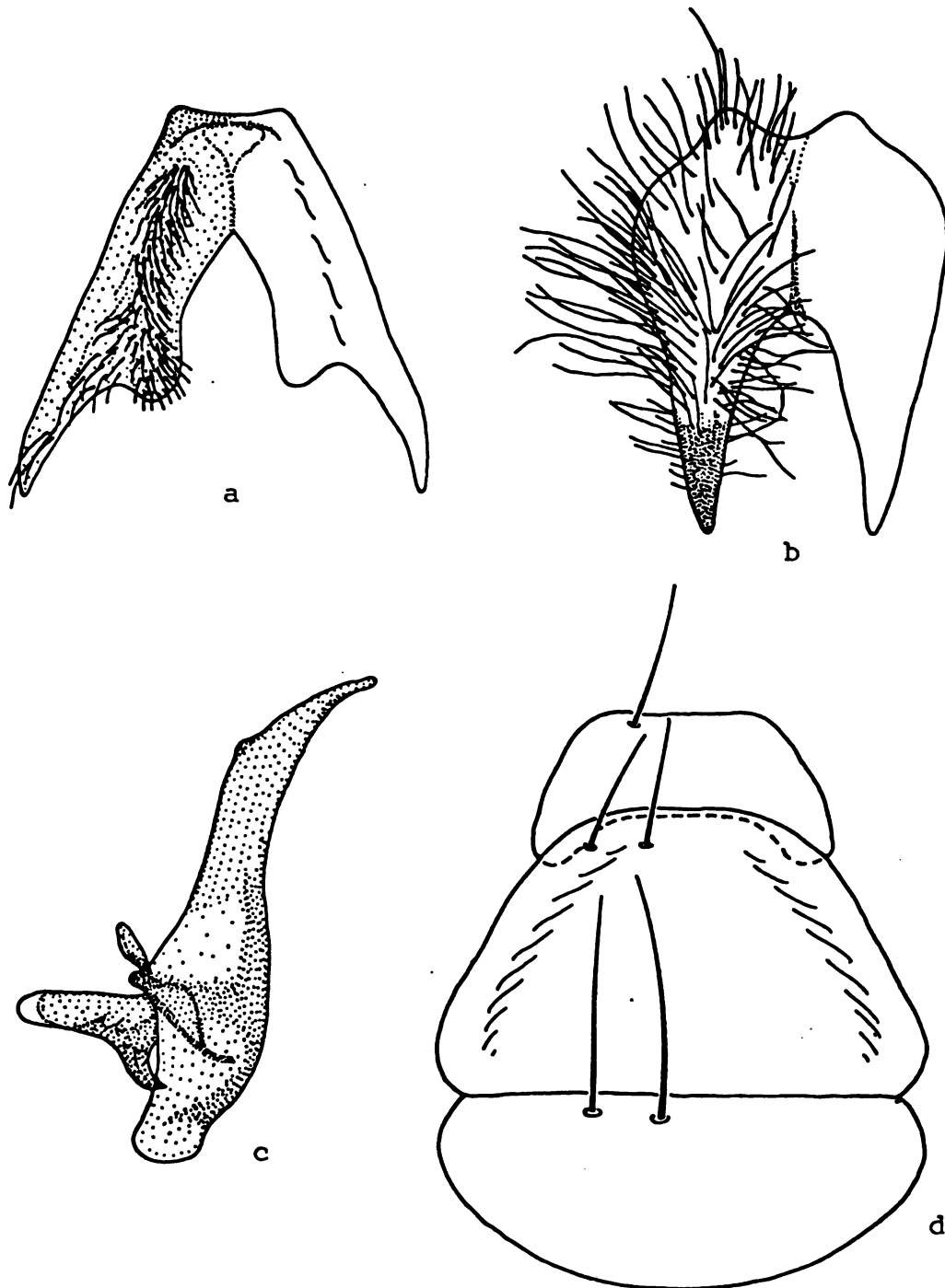


Figure 24: Genitalia of Ravinia lopesi. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

description of female). Lopes, 1969: 22 (locality records).

Ravinia meinckei (Blanchard). Roback, 1954: 74 (synonymy).

ADULT: Length: 9 - 10 mm. Gena, genal groove, parafacials, and fronto-orbital plate golden pruinose. Gena abruptly changing to gray pruinose at line extending from posterior margin of eyes. Palpus dark. R_1 with dorsal setae extending to bend of Sc. Ventral setulae of costa extending past Sc to R_1 .

MALE: Posterior arms of sternite 5 produced laterally, much wider than long (figure 25a). Apices of cerci very long and thin (figure 25b). Hillae with apical membranous tip, darkly pigmented and potato-like in appearance basally. Vesica strongly bent near apex (figure 25c).

FEMALE: Sternite 6 with convex anterior margin. Sternite 7 with apical mesal invagination. Sternite 8 with long posterolateral processes (figure 25d).

DIAGNOSIS: The wing setation, dark palpi and golden genae separate this species from all others, except columbiana. The distinctive form of the genitalia easily separates meinckei from this species.

TYPES: Three male and one female cotypes. La Falda, Cordoba, Argentina, III-1933, M. Meincke. Deposited in the Blanchard's personal collection. Current location unknown.

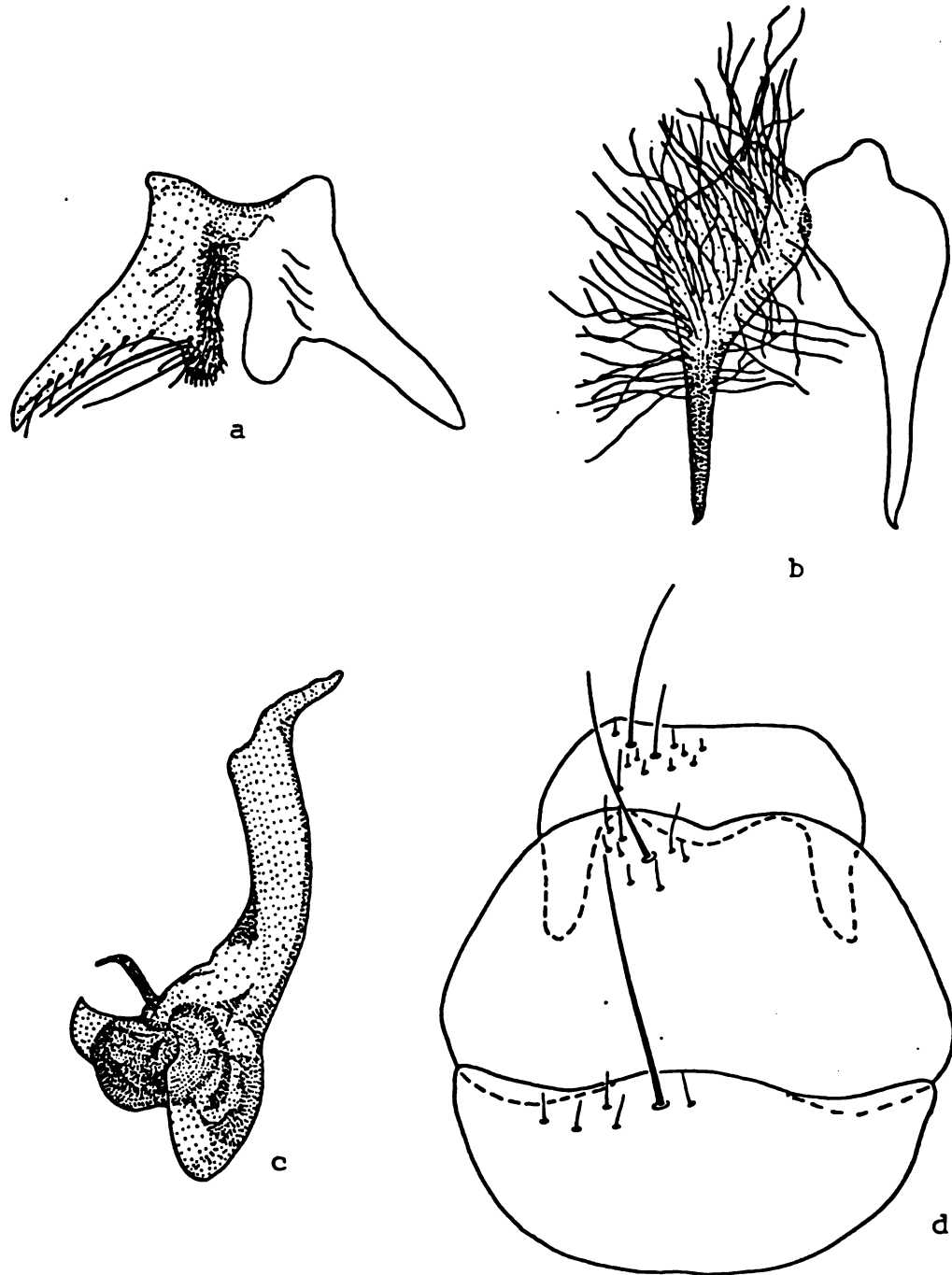


Figure 25: Genitalia of Ravinia meinckei. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

MATERIAL EXAMINED: BOLIVIA, Carrasco, Dept. Cochabamba, Siberia, 1650 M., October 1963, F.H. Walz (MSU-1 male and 1 female; used for figures 25a-d).

DISTRIBUTION: Argentina, Bolivia.

BIOLOGY: Unknown.

REMARKS: Blanchard's figure of the male genitalia of this species clearly differentiates it from all others. I believe that Lopes correctly associated the female of this species and his figures match those provided here.

Ravinia ollantaytambensis (Hall)

(Figures 26a - d)

Sarcophaga ollantaytambensis Hall, 1928: 341, figure 13. Type-locality: Peru, Ollantaytambo.

Ravinia ollantaytambensis (Hall). Roback, 1954: 74 (synonymy). Lopes, 1969: 22 (locality records). Lopes and Tibana, 1982a: 135 (locality records).

ADULT: Gena golden pollinose. Parafacials grey pollinose, tinged with yellow. Presutural acrostichal setae well differentiated.

MALE: Sternite 5 longer than wide, medial lobes nearly parallel

(figure 26a). Apices of cerci slightly convergent, inner margins sinuous (figure 26b). Corpus not conspicuously widening at attachment point with hillae and bulbous apically (figure 26c)

FEMALE: Appearance of the genital sternites not distinct enough to allow separation from several other Neotropical species.

DIAGNOSIS: The structure of the aedeagus allows separation of this species from all others.

TYPES: Male holotype, Ollantaytambo, Peru, 9000 feet, 20 vii, 1911, Yale Peruvian Expedition (USNM). Allotype from same locality (USNM).

MATERIAL EXAMINED: No specimens of this species were examined.

DISTRIBUTION: Chile, Peru. Distribution from Lopes and Tibana (1982a).

BIOLOGY: Unknown.

REMARKS: I have not seen representatives of this species, but Hall's (1928) figures of the genitalia and discussions with Guy Shewell at the Biosystematic Research Centre indicate that this is a valid species. The figures presented here are modified from Hall (1928).

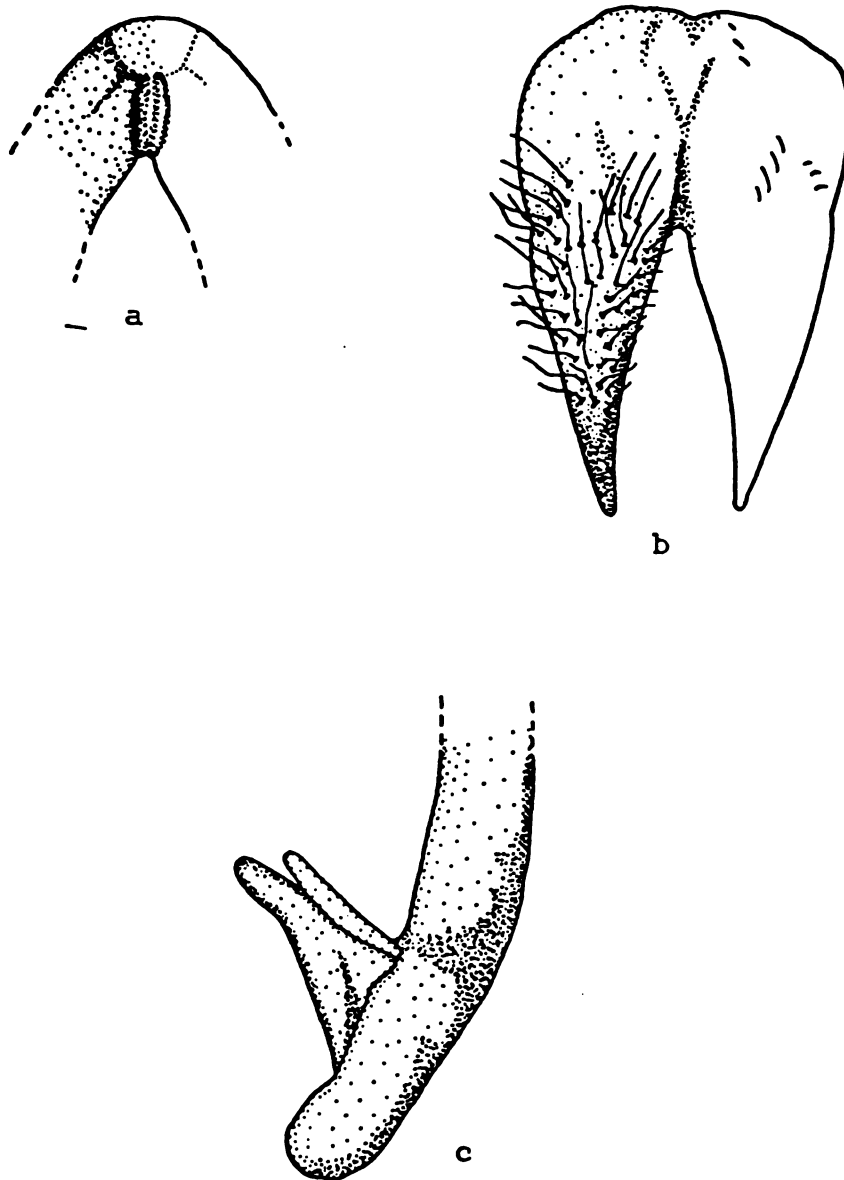


Figure 26: Genitalia of Ravinia ollantaytambensis. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus (redrawn from Hall, 1928).

Ravinia pectinata (Aldrich)

(Figures 27a - d)

Sarcophaga pectinata Aldrich, 1916: 251-253, figure 119. Type-locality:

Indiana, La Fayette. Hall, 1928: 339, figure 8 (redescription).

Knipling, 1936: 421 (biology).

Sarcophaga orbitalis Hall, 1928: 337-338, figure 6. Type-locality:

Colorado, Paonia (as Columbia, error). Hall, 1929: 71 (locality record).

Ravinia pectinata (Aldrich). Roback, 1954: 74, figures 247-250

(synonymy, description of male genitalia). Dodge, 1956a: 189

(redescription, synonymy). Downes, 1965: 954 (locality records).

Turner, et al., 1968: 1013 (biology, parasitoid records). Hayes and

Turner, 1971: 444 (biology, parasitoid records).

ADULT: Length: 5 - 7 mm. Gena gray pruinose. Subapical scutellar setae well developed, without adjacent lateral scutellar setae. Pleura gray pruinose in ground color. Four postsutural dorsocentrals.

MALE: Frontal vitta very wide, some specimens with proclinate orbital setae. General appearance of head resembling female head. Anterior margin of sternite 5 straight, lateral margins divergent and nearly straight (figure 27a). Apices of cerci slightly convergent, with medial bend along inner margins (figure 27b). Hillae clear membranous dorsally, corpus not extending much past ventral margin of hillae (figure 27c).

FEMALE: Sternite six with anteromesal concavity. Sternite 7 with lateral margins slightly convergent, anterior margin convex (figure 27d).

DIAGNOSIS: A rather small species which may be confused with planifrons on the basis of external features. Males are easily separated from this species on the basis of the structure of the aedeagus. Females can be separated, with some difficulty, by the shape of the genital sternites.

TYPES: Holotype male, La Fayette, Ind., Aldrich (USNM). Allotype, Arizona (USNM). 5 male paratypes.

MATERIAL EXAMINED: 6 males and 21 females (BRC, CAS, FMNH, GAD, MSU, OSU, WLD) including 4 paratypes: Tifton, Ga., Oct. '96 (FMNH-3 males) and Alab. (FMNH-1 male). MEXICO: Hidalgo, 13 mi. SE Pachuca, thorn *Opuntia* scrub, VI-22-82, 8000', Greg A. Dahlem, col. (GAD-1 male; used for figures 27a-c). Ames, Iowa, 22 VI 1952, W.L. Downes (WLD-1 female; used for figure 27d).

DISTRIBUTION: Canada (British Columbia), United States (Alabama, Arizona, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Ohio, Utah), Mexico (Hidalgo). Distribution from material examined. Wideranging species but very uncommonly collected.

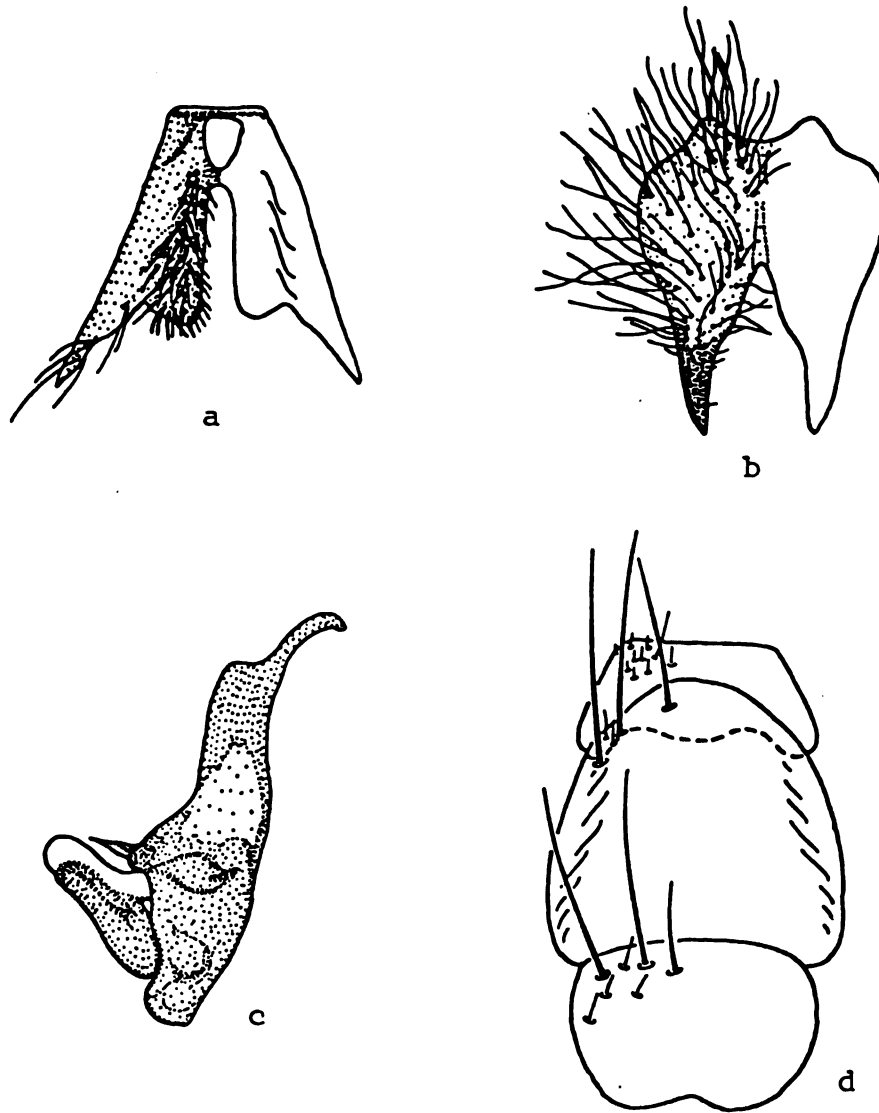


Figure 27: Genitalia of Ravinia pectinata. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

BIOLOGY: Knipling (1936) notes that this species overwinters as puparia in Iowa (diapause). Turner, et al. (1968) reports rearing this species from cow manure and lists the following parasitoids: Aphaereta pallipes (Say) (Hymenoptera: Braconidae), Eucoila impatiens (Say) (Hymenoptera: Cynipidae), and Xyalophora quinquelineata (Say) (Hymenoptera: Figitidae). Hayes and Turner (1971) report rearing pectinata from cow dung in Virginia but note that they could not separate its puparia from 4 other coprophagous sarcophagids. They included this species under the heading Ravinia sp. in their discussion of parasitoids, which include the species mentioned above and a staphylinid beetle, Aleochara spp.

REMARKS: Examination of thousands of specimens of Ravinia indicates that this species is very uncommon. Therefore, literature citations of this species as a coprophage in cow manure are considered questionable, as the other bovine dung-breeding Ravinia are usually very commonly collected.

Ravinia planifrons (Aldrich)

(Figures 28a - d)

Sarcophaga planifrons Aldrich, 1916: 249-251, figure 118. Type-locality: New Mexico, Alamogordo. Hall, 1928: 334, 337, figure 5 (redescription). Hall, 1929b: 87-88 (locality data).

Miltoravinia planifrons (Aldrich). Townsend, 1917: 195 (genotype designation).

Sarcophaga duplicata Hall, 1928: 338, figure 7. Type-locality: New Mexico, State College. Downes, 1965: 954 (synonymy).

Ravinia duplicata (Hall). Roback, 1954: 74 (synonymy).

Ravinia planifrons (Aldrich). Roback, 1954: 74, figures 245-246 (synonymy, male genitalia). Downes, 1965: 954 (synonymy, locality records). Coffey, 1966: 213, 214, 217 (biology). Poorbaugh, et al., 1968: 22, 35, figures 1-2 (biology). Merritt and Anderson, 1977: 44, table 4 (biology). Davis and Turner, 1978: 120, 122, table 1, 3, 5, 6, 7, 12 (biology). Wharton and Moon, 1979: 81, 88, figure 3 (description of puparium). Wharton, 1979: 183 (parasitoid record). Peterson, et al., 1981: 512 (biology).

ADULT: Length: 4 - 7 mm. Gena grey pruinose. Light grey to greyish-yellow pruinose in ground color. 4 postsutural dorsocentral setae. Preapical scutellar setae well developed with no adjacent lateral scutellar setae.

MALE: Frontal vitta very wide, head female-like in appearance. Sternite 5 short, posterior arms not extending much past median lobes (figure 28a). Apices of cerci slightly convergent, inner margin sinuous in appearance (figure 28b). Corpus highly reduced ventrally to a thin posterior lobe. Vesica membranous and very small (figure 28c).

FEMALE: Sternite 6 with nearly straight anterior margin. Sternite

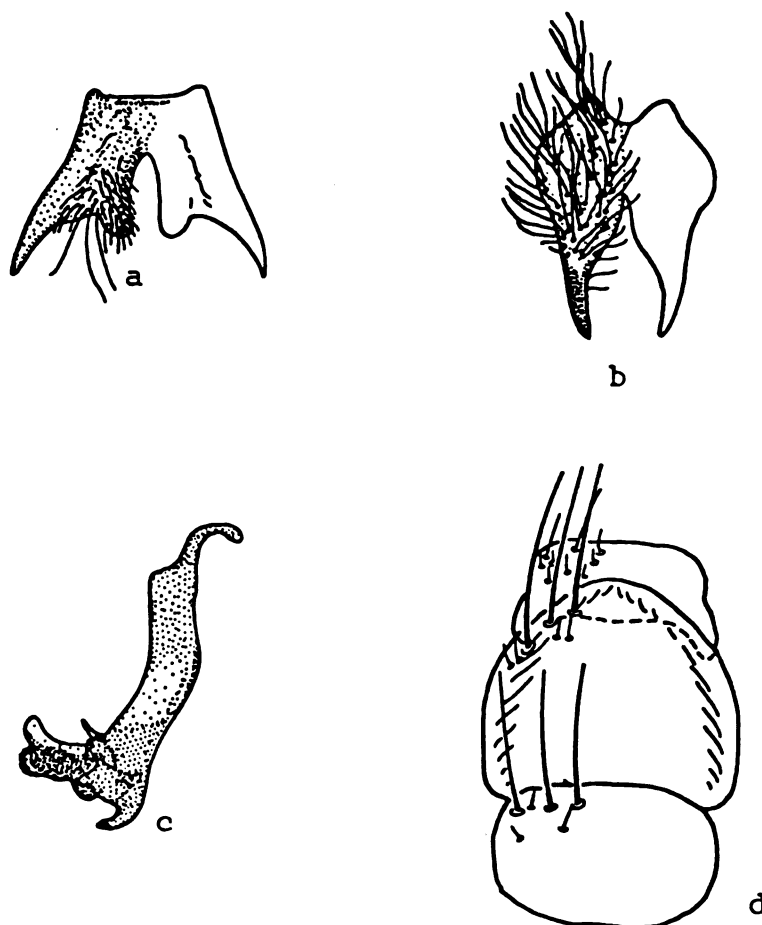


Figure 28: Genitalia of Ravinia planifrons. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

7 nearly triangular in appearance over apical third (figure 28d).

PUPARIUM: The puparium is described by Wharton and Moon (1979).

DIAGNOSIS: The small size of this species and 4 postsutural dorsocentral setae separates it from all others, except pectinata, over its range. It can easily be separated from pectinata on the basis of the genitalia.

TYPES: Male holotype, Alamogordo, N.M., May 5, 1902 (USNM). Allotype, Morton County, Kansas, 3200 feet altitude, F.H. Snow collector (USNM). 8 male and 6 female paratypes.

MATERIAL EXAMINED: 636 males and 482 females (BMNH, BRC, CAS, CSU, FMNH, MCZ, MSU, OSU, WLD). CALIF.: Sierra Co., Yuba Pass, V-27-80, Malaise trap, Stanley C. Kuba (CAS-male; used for figures 28a-c). Rillito, Pima Co., Ariz., III-26-34, A.J. Basinger coll. (CAS-female; used for figure 28d).

DISTRIBUTION: Canada (British Columbia), United States (Arizona, California, Colorado, Idaho, Illinois, Iowa, Kansas, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming), Mexico (Baja California Norte, Baja California Sur, Chihuahua, Durango, Zacatecas). Distribution from material examined.

BIOLOGY: This species has been collected and reared from cow dung (Coffey, 1966; Poorbaugh, et al., 1968; Merritt and Anderson, 1977) and sheep dung (Coffey, 1966). Coffey (1966) also found that it was attracted to horse, swine, and dog dung in southeastern Washington. Davis and Turner (1978) found that it was attracted to cow, deer, coyote, and rodent dung but were unable to rear this species from any of these media. Merritt and Anderson (1977) reared plannifrons from cow dung at all of their study sites at the Sierra Foothills Range Field Station in California except their irrigated pasture site. Davis and Turner (1978) collected this species at all 9 of their study sites in Wallowa-Whitman National Forest in northeastern Oregon and they list this species as one of the two most commonly collected sarcophagids at these sites. This species was collected using Malaise traps, baited Malaise traps, baited Bishopp traps (Davis and Turner, 1978). Peterson, et al. (1981) found that this species was attracted to SWASS pellets, a bait toxicant system for screwworm control.

The only parasitoid record for this species is Aleochara bimaculata (Coleoptera: Staphylinidae), provided by Wharton (1979).

REMARKS: Determined specimens in collections may be found under the names plannifrons and duplicata. Females can be separated into two morphotypes on the basis of the shape of the genital sterna, but no characters could be found in the male genitalia to support those seen in the females.

Ravinia postnoda (Dodge)

(Figures 29a - d)

Chaetoravinia postnoda Dodge, 1968: 423, 426-428, figures 4-5. Type-locality: Mexico, S.L.P., 12 mi. NW Nuevo Morelos, Tamps., 1225 ft. (male).

ADULT: Length 6 - 9 mm. Fronto-orbital plate golden pruinose. Costa with ventral setulae extending past Sc to R_1 . R_1 with dorsal setae extending past bend of Sc.

MALE: Mesotibia usually with anteroventral seta. Fifth sternite with deep median cleft which is not connected apically, and medial pads with long setae (figure 29a). Cerci with convergent apices when viewed posteriorly (figure 29b) and strongly sinuous in lateral aspect. Aedeagus curved with hillaes mostly membranous (figure 29c).

FEMALE: Sternites 6, 7, and 8 nearly equal in width. Sternite 7 slightly larger than surrounding sternites. Sternite 8 without apical "lip" (figure 29d).

DIAGNOSIS: Very closely related to almeidai, both species having the ventral setulae of the Costa extending past Sc to R_1 and dorsal setae of R_1 extending past the bend of Sc. These two species appear to be allopatric, but may be separated in border regions on the basis on the structure of the male aedeagus and female sternite 8.

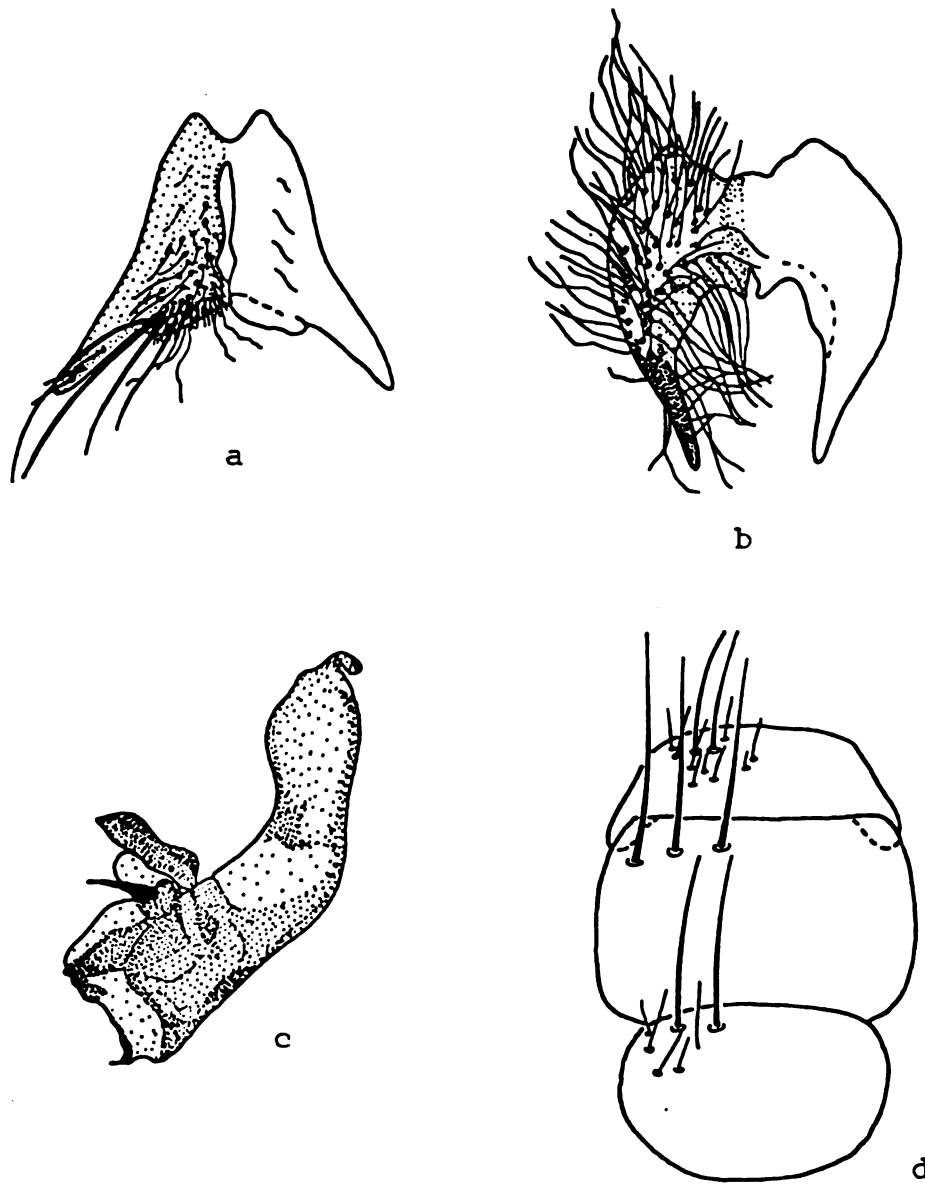


Figure 29: Genitalia of Ravinia postnoda. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

TYPES: Male holotype, Mexico: S.L.P., 12 mi NW Nuevo Morelos, Tamps., Sept 4, 1962, 1225 ft, Malaise trap (USNM). Female allotype, Panama: Barro Colorado Island, 27.VI.1956, Rettermeyers (KU). Paratypes: one female, same data as allotype; two males, Turrialba, Costa Rica, Aug. 6, 1952, W.W. Neel, trap; one female, Corrizal, Guerrero, Mex., Aug. 10, 1950, W.G. Downs; one female, Moca, Gualaton, Guatemala, J. Bequaert; one male, Actenango, Chimaltenango, Guat., 15.VI.1950, PHS.

MATERIAL EXAMINED: 4 males and 21 females (BRC, CAS, FMNH, MCZ, OSU, WLD), including a female, labeled as a paratype by Dodge but not listed in Dodge's publication, from Bartica, Br. Guiana, June 6, 1901, H.S. Parish collector (OSU). COSTA RICA: San Pedro, Monte de la Oca, 6 XII 1987, Wm.L. Downes, Jr. (male-WLD; used for figures 13a-c). ECUAD. Rio Palenque, 0°35'S, 70° 22'W, 22-26 Feb. 1976, 150 m., G.E. Shewell (female-BRC; used for figure 13d).

DISTRIBUTION: Mexico (Guerrero, San Luis Potosi, Sonora, Veracruz), Guatemala, Honduras, Costa Rica, Panama, Columbia, Ecuador, British Guiana, Trinidad. Distribution from material examined and Dodge (1968).

BIOLOGY: Unknown.

Ravinia pusiola (van der Wulp)

(Figures 30a - d)

Sarcophaga pusiola van der Wulp, 1896: 278. Type-locality: Mexico, Mexico city. Aldrich, 1930: 33 (synonymy). Knipling, 1936: 425, 432, figures 3, 30, 49, 62, 79 (description of larva, biology). Hallock, 1940a: figures 32-34 (male genitalia). Hallock, 1940b: 205, 222, figures 119-121 (key, redescription). Mohr, 1943: 285 (biology). Sanjean, 1957: 16, 17, 39, 40, 41, 55-56, table 1-7, 9-15, figures 114a-122 (description of larva, biology).

Ravinia peniculata authors, nec. Parker. Metz, 1916: 218, 235, figures 98-99 (description of chromosomes). Aldrich, 1930: 33 (synonymy).

Sarcophaga minuta Hall, 1928: 333, 335, figure 1 (preoc. by Robineau-Desvoidy, 1863). Type-locality: Puebla, Mexico.

Sarcophaga obscuripes Hall, 1928: 334, 335-336, figure 2. Type-locality: Sierra Madre, Chihi, Mexico.

Sarcophaga addentata Hall, 1929a: 71. Type-locality: Puebla, Mexico (new name for minuta).

Ravinia addentata (Hall). Lopes, 1946a: 137 (locality records). Lopes, 1948: 567 (locality records). Roback, 1954: 74 (synonymy). Peterson, et al., 1981: 512, 515 (biology).

Ravinia obscuripes (Hall). Roback, 1954: 74 (synonymy).

Ravinia pusiola (van der Wulp). Roback, 1954: 74, figures 251-253 (synonymy, male genitalia). Dodge and Seago, 1954: 53 (locality data). Reed, 1958: 241 (biology). Boyes, 1963: 1201 (chromosomes). Downes, 1965: 955 (locality records). Poorbaugh and Linsdale, 1971:

55 (biology). Payne and King, 1972: 160 (biology). Wharton and Moon, 1979: 81, 88 (description of puparium).

ADULT: Length: 6 - 9 mm. Gena gray pruinose. Presutural acrostichal setae differentiated, one pair more than others. Three postsutural dorsocentral setae.

MALE: Sternite 5 with concave anterior margin, just a bit wider than long (figure 30a). Apices of cerci parallel to slightly convergent, with sinuous inner margins (figure 30b). Hillae bulbous dorsally and remaining quite wide ventrally (figure 30c).

FEMALE: Sternite 6 rather rectangular in shape. Sternite 7 with lateral margins convergent almost from base (figure 30d).

LARVA: The first instar is described by Knipling (1936). Sanjean (1957) provides detailed descriptions of all three larval instars.

PUPARIUM: A description of the puparium is provided by Wharton and Moon (1979).

DIAGNOSIS: The normal, thin frontal vitta of this species serves to separate males from pectinata and planifrons. Males are very similar in external appearance to tancituro and some acerba but are easily separated on the basis of the male genitalia. Females can be separated from the species acerba, pectinata, planifrons, and tancituro on the basis of the genital sternites.

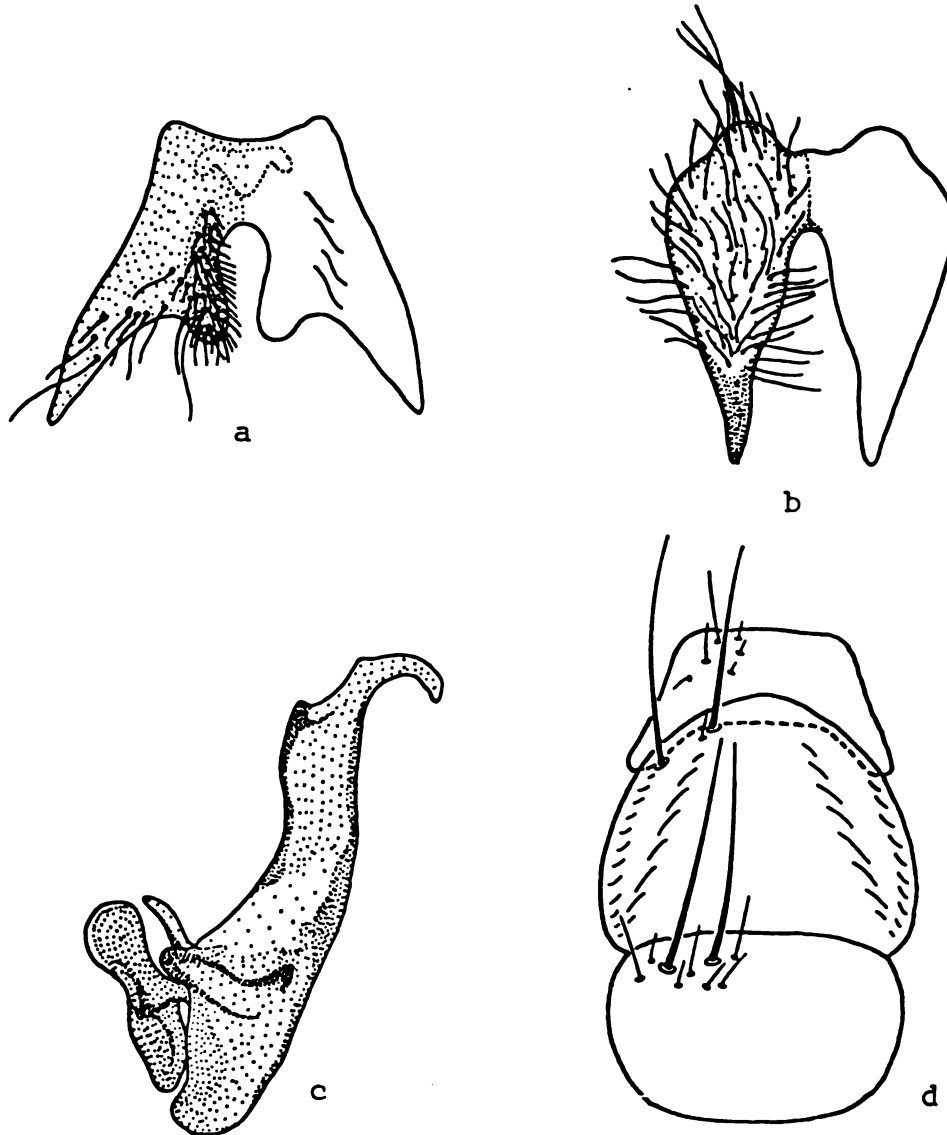


Figure 30: Genitalia of Ravinia pusiola. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

TYPES: Male holotype, female allotype, Mexico, Mexico City (BMNH).

MATERIAL EXAMINED: 696 males and 708 females (BRC, CAS, CSU, FMNH, GAD, MCZ, MSU, SUNY, WLD). Amanalco, MEX., 5-V-50, Coll. W.G. Downs (MSU-male; used for figures 30a-c). Ames, Iowa, 22.VI.1952, W.L. Downes (WLD-female; used for figure 30d).

DISTRIBUTION: Canada (Alberta, British Columbia, Ontario, Quebec), United States (Arizona, California, Colorado, Illinois, Iowa, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Mexico, New York, North Dakota, Oregon, South Dakota, Utah, Wisconsin), Mexico (Chiapas, Chihuahua, Durango, Mexico, Mexico D.F., Morelos, Puebla, Tlaxcala).

BIOLOGY: Despite the many literature references to this species, very little is known of the preferred larval media. Knipling (1936) reared this species on both decomposing hamburger meat and cow manure in the laboratory. Sanjean (1957) reared this species on decomposing pork liver in the laboratory. Mohr (1943) reared this species from cow dung but indicates that this is probably not the preferred breeding medium. Mohr (1943) notes that this was the only sarcophagid reared from cattle droppings located in dense shade. Poorbaugh and Linsdale (1971) list several rearing records of this species from dog dung. I have examined over 400 specimens of this species from Lansing, Michigan which were

collected by M. McReynolds in 1955. Although no rearing data appears in conjunction with these specimens it is believed that these represent specimens reared from dog dung that McReynolds was investigating as part of a study on fly production sources in Lansing, Michigan. However, many rearings of dog dung from Lansing over the summers of 1985-1988 by the author have yielded no specimens of this species. I commonly collected adults of R. pusiola in the Lansing area during this time.

Many collections of this species by myself and W.L. Downes, Jr. indicate a close association of the males of this species with carrion. Males can be easily collected during the summer by searching a bit downwind from a small to medium-sized mammal or bird carcass (e.g. a road-kill). The males appear very alert and it is believed that this represents the station site for this species. It has been collected in association with dog carcasses by Reed (1958) and baby pig carcasses by Payne and King (1972). Sanjean collected numbers of this species at the following baits: horse dung, human feces, sheep liver, freshly killed American cockroaches, cow udder, dog viscera, dog muscle, deer heart, woodchuck, chicken, and rabbit carcasses. It was also commonly collected sunning on a stone wall. Peterson, et al. (1981) report this species being attracted to SWASS pellets, a bait toxicant system for screwworm control.

Metz (1916) may have described the chromosomes of this species and Boyes (1963) lists Metz's peniculata specimens under this name.

REMARKS: The identity of the species used by Metz (1916) under the name peniculata may apply to this species or acerba. Specimens determined by Parker have been found to represent both of these species. Aldrich (1930) mistakenly synonymized this species with peniculata.

Most determined specimens of this species will be found under the name pusiola, although specimens can commonly be found under the names pectinata, addentata, and peniculata.

Ravinia querula (Walker)

(Figures 31a - d)

Sarcophaga querula Walker, 1849: 821-822. Type-locality: ?N. America.

Aldrich, 1930: 13, 15 (synonymy). Blickle, 1961: 802 (parasitoid records).

Sarcophaga avida Walker, 1849: 822-823. Type-locality: Nova Scotia.

Aldrich, 1930: 13, 15 (synonymy).

Sarcophaga rediviva Walker, 1849: 823. Type-locality: Canada, Ontario.

Aldrich, 1930: 13, 15 (synonymy).

Sarcophaga rabida Walker, 1849: 823-824. Type-locality: Nova Scotia.

Aldrich, 1930: 13, 15 (synonymy).

Sarcophaga aspersa Walker, 1849: 825. Type-locality: ?N. America.

Aldrich, 1930: 13, 15 (synonymy).

Ravinia communis Parker, 1914: 55-57, pls. 1-5. Type-locality:

Massachusetts (?). Richardson, 1916: 411 (biology). Metz, 1916: 218 (chromosomes). Aldrich, 1930: 13, 15 (synonymy).

- Sarcophaga communis (Parker). Aldrich, 1916: 253-255, figure 120
(redescription, biology). Wilson, 1932: 84, 89 (biology). Winn and Beaulieu, 1932: 81 (locality records).
- Euravinia communis (Parker). Townsend, 1917: 191, 194, 195 (genotype designation).
- Sarcophaga pallinervis authors, nec. Thompson. Hall, 1928: 334, 339, figure 9 (redescription, key). Hall, 1929b: 87 (locality record).
- Sarcophaga lherminieri authors, nec. Robineau-Desvoidy. Knipling, 1936: 418, 420, 421, 425, 426, 429, 434-435, figures 6, 34, 51, 65, 81 (description of larva, biology). Hallock, 1940a: figures 29-31 (male genitalia). Hallock, 1940b: 207, 210, 215, 221-222, figures 116-118 (key, locality record, male genitalia). Merrill and Hutson, 1953: 678 (biology).
- Ravinia querula (Walker). Roback, 1954: 74, figures 240-241 (synonymy, male genitalia). Chapman, 1954: 44 (biology). Dodge and Seago, 1954: 52-53, 56 (biology). Downes, 1955: 524, figures 13, 22 (morphology). Dodge, 1956a: 188, 189 (synonymy). Downes, 1965: 954 (locality records). Coffey, 1966: 213, 214, 217 (biology). Sanders and Dobson, 1966: 957 (biology). Houser and Wingo, 1967: 731, 732 (parasitoid records). Turner, et al., 1968: 1013, 1014 (parasitoid data). Poorbaugh, et al., 1968: 22, 35, figures 1-2 (biology). Thomas and Wingo, 1968: 148, 151-152 (parasitoid records). Blume, 1970: 1023 (biology). Rummel and Knap, 1970 (biology). Hayes and Turner, 1971: 444-447 (parasitoid records). Thomas and Morgan,

1972: 169 (biology). Merritt and Anderson, 1977: 43, 57 (biology). Davis and Turner, 1978: 122, table 4-7 (biology). Wharton and Moon, 1979: 81, 88, figure 2 (description of puparium). Wharton, 1979: 182-184 (parasitoid and predator records). Peterson, et al., 1981: 512 (biology). Figg, et al., 1982: 476 (biology). Figg, et al., 1983a: 961-965 (parasitoid records). Figg, et al., 1983b: 994-995 (parasitoid records).

ADULT: Length: 7 - 12 mm. Gena gray pruinose. Presutural acrostichal setae well differentiated. Four postsutural dorsocentral setae, the setae becoming longer and thicker posteriorly. Usually with 2 pairs of well developed lateral scutellar setae adjacent to the long preapical pair. Tergite 5 of abdomen grey pruinose in ground color.

MALE: Posterior arms of sternite 5 not extending much past medial lobes and sternite not conspicuously longer than wide (figure 31a). Apices of cerci large with inner margins sinuous in appearance (figure 31b). Corpus not conspicuously widening at juncture with hillae (figure 31c). Anteromesal plate present between the hillae.

FEMALE: Sternite 7 almost bare of pruinosity and deep orangish-red in ground color; very wide, rectangular in appearance and quite distinct, even in pinned specimens (figure 31d).

PUPARIUM: A description of the puparium is given by Wharton and Moon (1979).

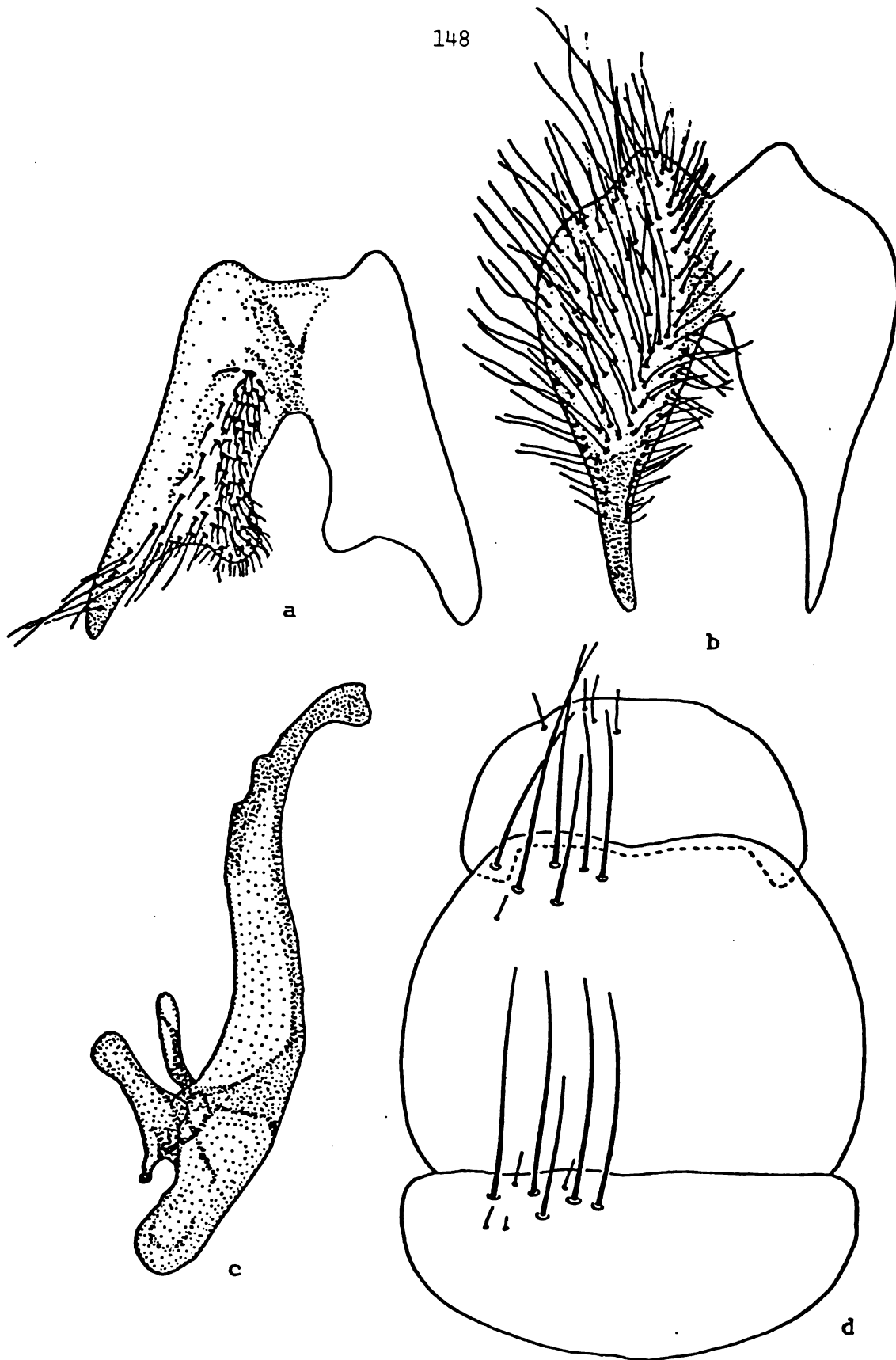


Figure 31: Genitalia of Ravinia querula. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

DIAGNOSIS: The large size, 4 postsutural dorsocentral setae, and gray pollinose gena and tergite 5 separate this species from all but anxia. It can be separated from anxia in eastern North America by the presence of 2 pairs of well developed lateral scutellar setae adjacent to the preapical scutellar setae. In western North America the diagnostic shape of the male and female genitalia will separate it from members of the anxia complex.

TYPES: Male holotype, ?N. America (BMNH). Found to be in good condition when examined in 1986.

MATERIAL EXAMINED: 864 males and 972 females (BMNH, BRC, CAS, CSU, DMNH, FMNH, GAD, MCZ, MSU, OSU, SUNY, WLD). KY.: Nelson Co., nr Holy Cross, 19 May 1985, G.A. Dahlem, EX: Malaise trap (GAD-male; used for figures 31a-c). KY.: Holy Cross, Marion Co., 8 June 1985, G.A. Dahlem (GAD-female; used for figure 31d).

DISTRIBUTION: Canada (Alberta, British Columbia, Manitoba, Ontario, Quebec), United States (Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming).

BIOLOGY: Parker (1914) mentions that this species is often found feeding or larvipositing on human excrement. Aldrich (1916) mentions a single specimen reared from cow dung. Wilson (1932) reports commonly rearing this species from sheep dung. Knipling (1936) reared this species on hamburger meat, cow manure, and horse dung in the laboratory. Sanders and Dobson (1966) report commonly rearing this species from cow manure throughout the summer in Indiana. Coffey (1966) reared querula from cow and horse dung. He also reports that it was collected on human, sheep, swine and dog dung in southeastern Washington. Poorbaugh, et al. (1968) reports rearing this species from cow manure in California. Thomas and Morgan (1972) used this species as an indicator organism in cow manure when studying parasitoids of the horn fly, as the developmental time to the pupal stage was found to correspond with that of the horn fly. Merritt and Anderson (1977) reared this species from cow manure at all four of their study sites in California. R. querula is noted for colonizing cow manure dropped during the night and was considered to have a definite nocturnal activity period. Figg, et al. (1982) reared this species from cow feces in central Missouri. Blume (1970) collected querula in association with bovine droppings in Texas. Davis and Turner collected a few specimens of this species in association with cow dung in northeastern Oregon.

Richardson (1916) collected one specimen in traps baited with ammonium carbonate but collected two specimens in his control traps.

Knipling (1936) commonly collected this species in flytraps baited with liver. Dodge and Seago (1954) collected many specimens in traps baited with chicken entrails or human feces. Rummel and Knap (1970) commonly collected querula in traps baited with liver, banana, or malt mixture in Kentucky. Peterson, et al. (1981) report that this species was attracted to SWASS pellets, a bait toxicant system for screwworms.

Merrill and Hutson (1953) report trapping and netting this species in Michigan onion fields. Chapman (1954) reports that this species was observed to prefer summit areas in Montana over adjacent lower areas. Dodge and Seago (1954) also noted this species frequenting summits of mountains in Georgia. Collections by myself and W.L. Downes, Jr. confirm this association of the species with the highest point in a given area. At such sites many more males are collected than females, indicating that this may be a station site location for this species.

The average number of larvae collected from 5 gravid females by Knipling (1936) was 29.6. Knipling notes that the developmental period, from first instar to adult, of this species when reared on hamburger meat is 13 days. This species is noted as overwintering (diapausing) in the puparia by Knipling (1936).

Blickle (1961) reports rearing the parasitoids Aphaereta pallipes (Say) (Hymenoptera: Braconidae), Xyalophora quinquelineata (Say) (Hymenoptera: Figitidae), and Eucoila sp. (Hymenoptera: Cynipidae) from this species in New Hampshire. In Missouri, Houser and Wingo (1967) found that querula was the preferred host of A. pallipes, as compared to

other Diptera species breeding in cow manure. Turner, et al. (1968) reared the parasitoids A. pallipes, X. quinquelineata as well as Phaenocarpa spp. (Hymenoptera: Braconidae), Eucolla impatiens (Say) (Hymenoptera: Cynipidae), Spalangia nigra Laterille (Hymenoptera: Pteromalidae), and Aleochara spp. (Coleoptera: Staphylinidae). This study was undertaken in pastures in Virginia and charts are given of percent parasitization over time for 1965 and 1966. Thomas and Wingo (1968) found A. pallipes to be the most common parasitoid of querula, with Aleochara bimaculata (Gravenhorst) (Coleoptera: Staphylinidae) and E. impatiens as lesser, although significant, parasitoids. In Virginia, Hayes and Turner (1971) colonized the parasitoids A. pallipes, E. impatiens and but was unable to successfully colonize X. quinquelineata on this species, although parasitism was noted. Wharton (1979) reported A. bimaculata, X. quinquelineata, and Eucolla sp. as parasitoids of querula in California and also notes that the larvae are subject to predation by Philonthus sp. (Coleoptera: Staphylinidae) adults. In central Missouri, Figg, et al. (1983a) collected the parasitoids A. pallipes, Trichopria sp. (Hymenoptera: Diapriidae), Trichomalopsis dubia (Ashmead) and Muscidifurax sp. (Hymenoptera: Pteromalidae) from the puparia of querula found in bovine dung. Figg, et al. (1983b) report that the highest incidence of parasitism of bovine dung breeding Diptera by A. pallipes occurs in this species but that the emergence success of the parasitoid from the puparium was low.

Metz (1916) mentions this species as an experimental organism in his

study, but does not mention it by name in his discussion of the chromosomes of several species of Sarcophagidae.

REMARKS: From 1916 to 1928 this species and the species anxia were known under the name communis. Hall (1928) synonymized communis under the name pallinervis. Aldrich (1930) synonymized pallinervis with lherminieri. It was not until Dodge (1956a) published new characters that separated querula from anxia that this species was reported separately. Therefore, references before 1956 concerning one of the earlier names are considered as potentially referring to this species, unless otherwise indicated by the author's figures or comments. The current synonymy is based on the my examination of the holotypes of all synonymous species. The only difference in synonymy from that given by Dodge (1956a) is the placement of Sarcophaga rediviva Walker as a synonym of this species.

Determined specimens of this species can be found in collections mixed with specimens of anxia under the name lherminieri as well as under querula.

Ravinia rufipes (Townsend)

(Figures 32a - d)

Andinoravinia rufipes Townsend, 1917: 195, 196. Type-locality: Huariaca, canyon of the Rio Huallaga, Peru. Townsend, 1935: 11 (redescription). Lopes, 1962: 165-169, figures 1-11 (key,

redescription). Lopes and Tibana, 1982a: 136 (locality records).

Sarcophaga rufipes (Townsend). Hall, 1928: 334, 344-345, figure 16
(redescription, key).

Ravinia rufipes (Townsend). Roback, 1954: 74 (synonymy).

Andinoravinia rufipes rufipes Townsend. Lopes, 1962: 165-169, figures 1-
11 (key, redescription). Lopes, 1969: 22 (locality records).

Andinoravinia rufipes intermedia Lopes, 1962: 169-170, figures 12-18.

Type-locality: Pasto, Departamento Narino, Columbia. Lopes, 1969:
22 (locality records).

ADULT: Length: 6 - 10 mm. Gena and parafacials golden pruinose.
Palpus orange. Dorsal setae on R_1 extending to bend of Sc. Ventral
setulae of costa extending past Sc to R_1 . Often with bright orange legs.

MALE: Sternite 5 much wider than long, posterior arms extending
almost laterally (figure 32a). Apices of cerci with nearly straight
inner margins (figure 32b). Hillae bulbous distally (figure 32c).

FEMALE: Sternite 6 much wider than long. Sternite 7 with lateral
margins convergent in apical half. Sternite 8 with thickened anterior
margin, appearing trilobed (figure 32d).

DIAGNOSIS: The wing setation and red palpi easily separate this
species from all others.

TYPES: Female holotype. Huariaca, canyon of the Rio Huallaga,

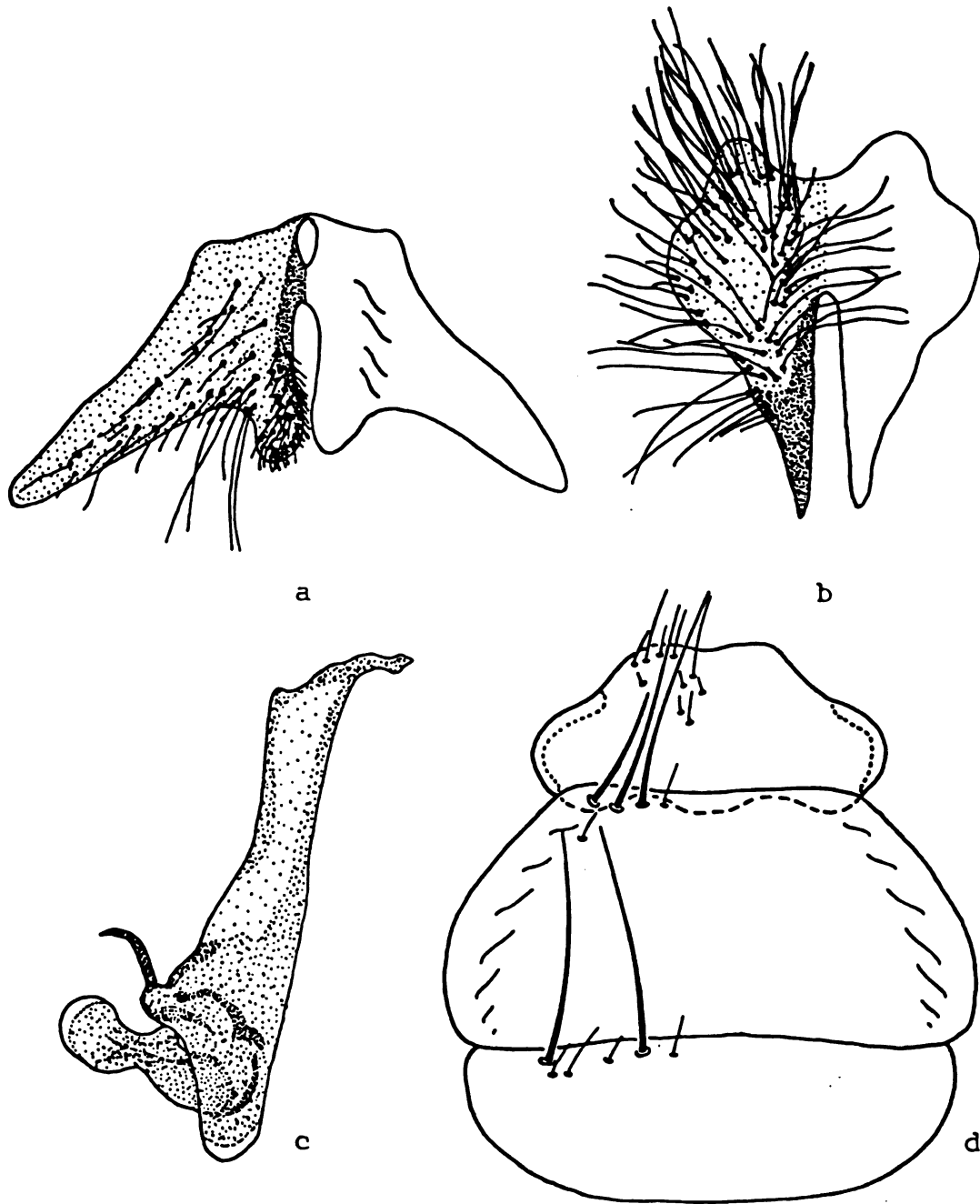


Figure 32: Genitalia of Ravinia rufipes. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

Peru, 10,750 feet, December 20, 1913, C.H.T. Townsend (USNM).

MATERIAL EXAMINED: 34 males and 69 females (BRC, FMNH, MSU, WLD).
 ECUADOR, Napo, 43 km. W. Baeza, 3500m, 4-7.III.76, G.E. Shewell (BRC-male; used for figures 32a-c). Napo, ECUADOR, 0°20'S, 78° 3'W, 6.III.76, 2500 m, G. & M. Wood (BRC-female; used for figure 32d).

DISTRIBUTION: Chile, Columbia, Ecuador, Peru, Venezuela.
 Distribution from material examined and Lopes (1962).

BIOLOGY: Unknown.

REMARKS: Numerous dissections of classic, red-legged rufipes specimens and the dark-legged form, described as the subspecies intermedia, yielded no consistent morphological characters to separate these two morphs except for color variation. Both color morphs were examined from specimens collected in Columbia. As such, I do not believe that the dark-legged form deserves subspecies status and it is here synonymized. Lopes' (1962) subspecies rufipes columbiana was found to be distinct and was raised to species status.

Ravinia shewelli n.sp.

(Figures 33a - c)

Ravinia shewelli n.sp. Type-locality: Loveland Pass, Colorado.

ADULT MALE: Length: 10 mm. Gena, genal groove, parafacials, and fronto-orbital plate bright silver pruinose. Outer vertical setae well differentiated. Presutural and postsutural acrostichal setae not differentiated. Three postsutural dorsocentral setae. Tegula black. Genital capsule dark grey, with many long setae and without stout bristle-like setae along posterior margins. Sternite 5 with sides approximately equal to distance between lateral arms, resembling an equilateral triangle in outline (figure 33a). Cerci nearly as wide as long with short stout apices which are blunt at the tips (figure 33b). Corpus thin apically and bent anteriorly (figure 33b).

DIAGNOSIS: The dark tegula and genital capsule easily separate this species from all others.

TYPES: Male holotype. Loveland Pass, Colo., August 12, 1958, F.C. Harmston collector. Deposited at USNM.

DISTRIBUTION: United States (Colorado).

BIOLOGY: Unknown.

REMARKS: This remarkable species is named in honor of Guy Shewell

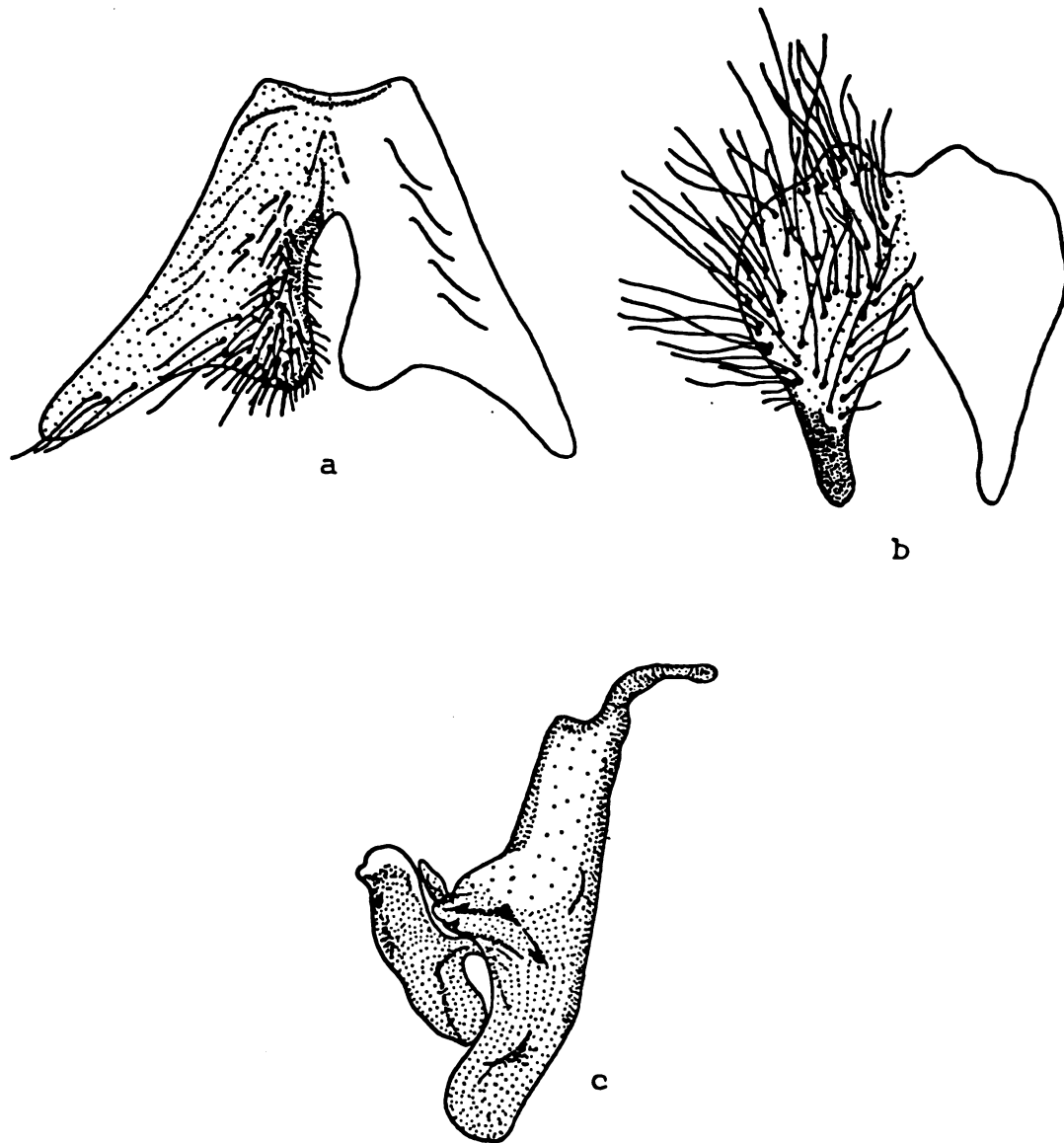


Figure 33: Genitalia of Ravinia shewelli. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus

of the Biosystematic Research Centre.

Ravinia stimulans (Walker)

(Figures 34a - d)

Sarcophaga stimulans Walker, 1849: 817-818. Type-locality: ?N. America (female).

Sarcophaga assidua Walker, 1852: 328. Type-locality: United States (male and female). Aldrich, 1930: 18-19, figure 5 (redescription). Dodge, 1956a: 186, 188 (key, female genitalia). Rohdendorf and Gregor, 1973: 8 (key).

Sarcophaga fulvipes Walker, 1852: 328 (preoc. Macquart, 1843). Type-locality: United States (female).

Ravinia latisetosa Parker, 1914: 63-65, figures 26, 45. Type-locality: ? (male). Roback, 1954: 15, 27, 42, 73, figures 225-226 (male genitalia). Downes, 1965: 954 (locality records). Payne and King, 1972: 160 (biology). Rummel and Knapp, 1970: 167, 168 (biology). Hayes and Turner (1971): 444-447 (parasitoid records). Wharton and Moon, 1979: 81, 87. Figg, et al., 1982: 476. Figg, et al., 1983a: 962-965 (parasitoid records). Figg, et al., 1983b: 994-995 (parasitoid records).

Sarcophaga latisetosa (Parker). Aldrich, 1916: 248, 299, figure 144 (key, description of male). Hall, 1928: 334, 343, figure 15 (key, male genitalia). Hall, 1929: 87 (locality record). Hall, 1931: 181 (key). Knipling, 1936: 425 (biology). Hallock, 1940a: figures 26-28

(male genitalia). Hallock, 1940b: 208, 210, 221, figures 113-115 (key, locality records, male genitalia). Sanjean, 1957: 15, 16, 17, 18, 19, 20, 33, 34, 35, 37, 39, 40, 41, 54-55, figures 106-114 (key, biology, description of larva). Reed, 1958: 241 (biology). Blickle, 1961: 802 (parasitoid records). Sanders and Dobson, 1966: 957 (biology).

Chaetoravinia latisetosa (Parker). Lopes, 1946a: figures 27-31, 34 (male genitalia). Dodge and Seago, 1954: 53 (biology). Dodge, 1956a: 186-187, 188, figure 17 (key, female genitalia). Lopes, 1975b: 163 (description).

Sarcophaga laakei (Knippling, nec. Hall). Knippling, 1936: 425, 433-434, figures 5, 32, 50, 64, 80 (biology, description of larva).

Sarcophaga laakei (Hallock, nec. Hall). Hallock, 1940b: 208, 210, 221, figure 112 (key, locality records, male genitalia).

Ravinia laakei (Roback, nec. Hall). Roback, 1954: 15, 27, 42, 73, figures 220-224 (male genitalia). Downes, 1965: 954 (locality records).

Chaetoravinia laakei (Dodge, nec. Hall). Dodge, 1956a: 186, 188, figure 20 (key, female genitalia).

Chaetoravinia stimulans (Walker). Lopes, 1977: 44-46, figures 7-20 (redescription, synonymy).

Ravinia stimulans (Walker). Peterson, et al., 1981: 512.

ADULT: Length: 5 - 10 mm. Fronto-orbital plate grey pruinose with

yellowish tinge. The geographical race, originally described as assidua, with reddish orange legs.

MALE: Usually with well developed outer vertical seta. Fifth sternite generally U-shaped, with ventrally produced, setulose medial projections near apex of posterior lobes (figure 34a). Cerci with short parallel apices (figure 34b). Aedeagus with well developed vesica and hillae with pointed tips in lateral view (figure 34c).

FEMALE: Sternites 6, 7, and 8 progressively smaller in size. Sternite 7 bilobed, with rounded anterior margins. Sternite 8 reduced, situated in mesal indentation of sternite 7 (figure 34d).

LARVAE: The first instar is described by Knipling (1936) under the name laakei. Sanjean (1957) provides descriptions of all instars.

DIAGNOSIS: Genitalia very similar to vagabunda, but males with pointed tips of the hillae and females usually with rounded anterior margins of lobes of sternite 7. The two species appear to be allopatric or slightly parapatric along a southern line extending from San Diego, California to Houston, Texas. The structure of the male and female genitalia easily separate this species from all other members of the Chaetoravinia.

TYPES: Female holotype, ?N. America (BMNH). Redescribed by Lopes (1977).

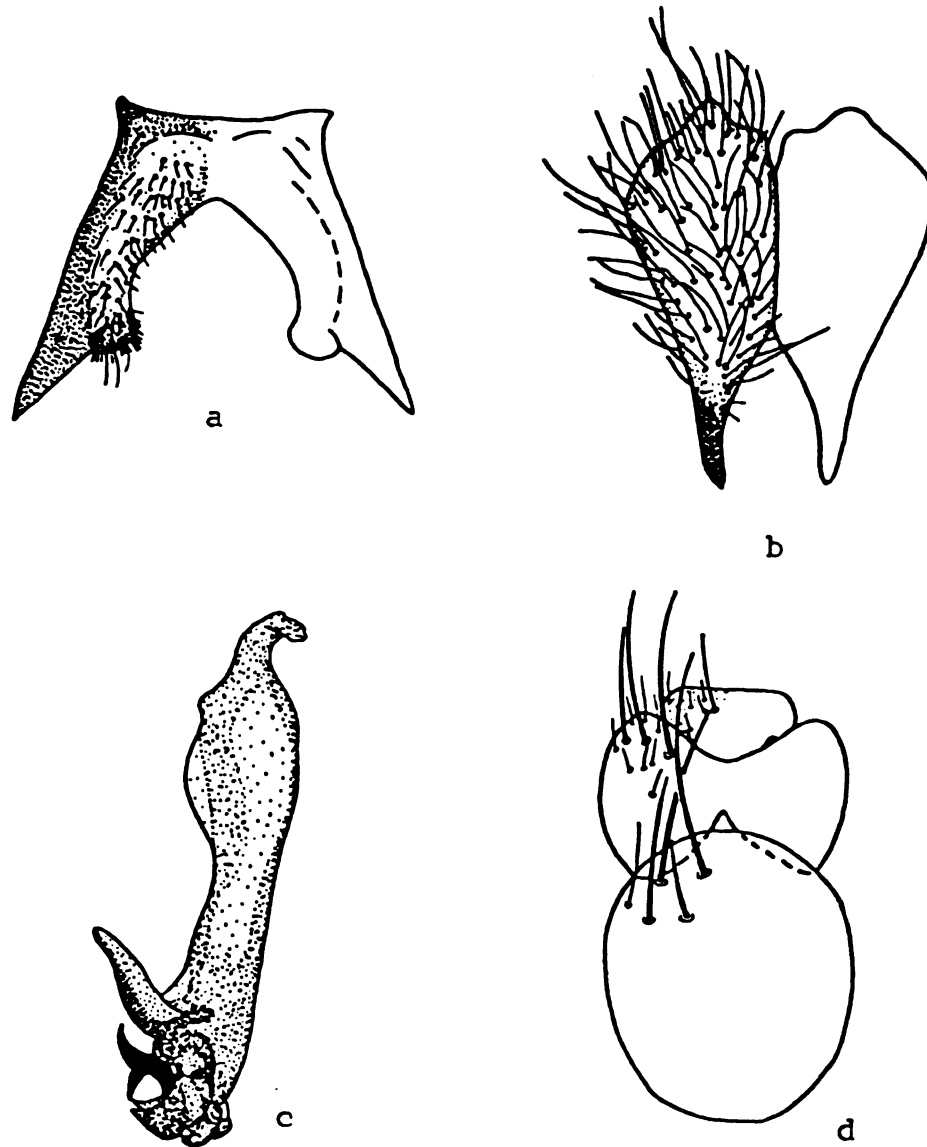


Figure 34: Genitalia of Ravinia stimulans. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

MATERIAL EXAMINED: 920 males and 1008 females (BRC, CAS, DMNH, GAD, MCZ, MSU, NYSM, OSU, WLD). Moorhead, Clay Co., Minn., VII-11-79, J.R. Powers, Collr., collected at malaise trap (male-CAS; used for figures 34a-c). Moorhead, Clay Co., Minn., VI-20-1971, J.R. Powers, Collr., collected in malaise trap (female-CAS; used for figure 34d).

DISTRIBUTION: Canada (Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, Saskatchewan). Continental United States except Alaska, not extending to Mexico. Distribution from material examined.

BIOLOGY: A very common coprophagous species. It is believed that the usual food source for the larvae of this species is carnivore dung, especially dog dung. I reared large numbers of this species from dog dung collected at several sites in Michigan, Ohio, Kentucky, and from one site in Alabama. Nearly every pile of dog dung collected during the summer at each of these sites was infested with larvae of stimulans. Even very dry dog feces was found to contain larvae. The Sarcophaga sp. reared from dog excrement by Schoof, et al. (1954) is presumed to be, in large part, this species. I also reared this species from wolf dung, collected at Potter Park Zoo in Lansing, Michigan. It was not reared, however, from cougar dung or black bear dung collected at the same locality and date. The bear dung that was collected was very runny (as compared to bear scat that was seen, but not collected, in Michigan's

Upper Peninsula) and this may offer an explanation of why stimulans was not reared from it. The cougar dung seemed perfectly acceptable, yet yielded no sarcophagids. Out of hundreds of reared specimens from dog dung, only a couple of individuals of other Sarcophagidae species have been seen. This species has also been reared on cow manure (Sanders and Dobson, 1966; Wharton and Moon, 1979; Figg, et al., 1983a). Knipling (1936) reared this species on decomposing hamburger meat and Sanjean (1957) reared it on beef or pork liver.

The life cycle, from freshly deposited, first instar to adult, was recorded by Knipling (1936) to take a period of 16 days. Sanjean (1957) found that the length of the life cycle was partially temperature dependant and ranged from 12-13 days for larvae reared at 27° C to 13-18 days for larvae reared at 23° C. Sanjean (1957, Table 1-3) also provides information on the length of time spent in each immature stage at 23°, 25°, and 27° C. The life cycle averages between 15-17 days on dog dung, with pupariation occuring 6-8 days after deposition. The larvae migrate away from the pile of dung and into the soil before pupariation takes place. The underside of dog dung has a characteristic appearance after the larvae leave, looking much like someone had exploded a firecracker under it (personal observations). Most adults emerge during the night or early morning hours.

The maximum number of first instars that have been dissected from the abdomen of a single female is 40 (Knipling, 1936), with most gravid females having much fewer. I dissected many females over the

distributional range of this species and has routinely found over 30 larvae in some females where multiple specimens were collected, except in the state of California. The maximum number of first instars dissected from California specimens was twelve. Estimations of fecundity based on numbers of larvae contained in pinned specimens of this species may be difficult, due to the expulsion of larvae from gravid females as they die in a killing vial. This species does not, however, do this as commonly or completely as females of R. derelicta (personal observations).

Trapping records for adults include Knipling (1936) who collected R. stimulans in flytraps baited with liver in the vicinity of Ames, Iowa. Dodge and Seago (1954) collected numerous specimens at several sites in Georgia in flytraps baited with chicken entrails or human feces. They collected almost eight times as many females as males in these traps. Sanjean (1957) collected this species at the following baits: horse dung, human feces, sheep liver, hog liver, shoat intestines, deer heart, woodchuck carcass, chicken carcass, and rabbit carcass. Most specimens were collected at human feces. He also notes collecting stimulans specimens on a stone wall, on tree trunks, and several other resting sites. Reed (1958) collected this species from dog carcasses. Rummel and Knapp (1970) collected this species in Kentucky from traps baited with liver. Payne and King (1972) list this species as a scavenger on baby pig carcasses placed on open ground, in trees, and in water. Females of this species can be easily collected as they come to dog feces in the sun during the first 10-20 minutes after deposition (personal

observations). Peterson, et al. (1981) report one specimen collected from 1 study area baited with SWASS pellets, a bait toxicant for screwworms.

Male station-taking behavior is not well understood for this species, although I have spent much time trying to find sites and observe this behavior. Males have been observed exhibiting this behavior in the afternoon on the trunks of isolated trees in fields and on low hanging branches of isolated trees (personal observations and observations by Dr. W.L. Downes, Jr.). Such observations, however, are not common and a low number of males have been involved at such sites. They do not serve to explain where and when mating is taking place in this very common species. Extensive searching in and around (even on top of) my personal residence has provided no clues to this mystery, even though rearing studies based on dung deposited by my dog indicates continual fly production from late spring to late fall. By the process of elimination, it is hypothesized that mating takes place somewhere in the canopy of larger trees in the suburban and urban environments.

Mating behavior of R. stimulans was observed in a 12"X 12"X 12" collapsible field cage during the summer of 1986 in the suburban community of Okemos, Ingham Co., Michigan. The following example provides the procedures used and typical observations of this species' courtship and copulation. My dog, Pippin, is a male mixed-breed of collie and German shepard origin. He supplied all the feces used as larval media for this study. Pippin was fed a diet consisting of Purina

Dog Chow and occasional table scraps. Small flags were placed by piles of dog feces deposited in the early morning and late afternoon on 6-7 June. On 9 June, the four piles of feces were collected and placed on one inch of slightly damp sand in a large plastic shoebox. The shoebox was covered, in order to protect the developing larvae from parasitoids or predators and rain, and was left outside in a shaded area. Puparia were sifted out of the sand on 14 June and were placed on a 1/4 inch layer of sand in individual 6 oz. paper cups. The paper cups were covered with plastic wrap, held in place by a rubber band. Each cup was outfitted with a plastic centrifuge vial, held in place with modeling clay, containing sugar water and capped with half of a cotton ball. A total of seventy-three puparia were collected.

Emergence began on 20 June with three specimens, and all 73 adults had emerged by 22 June. Emergence was not observed but usually occurred at night or in the early morning hours. Emergence must occur fairly rapidly, as several freshly emerged specimens were observed during wing expansion on the sides of the cups when observations 15 minutes earlier indicated non-emergence. Significant mortality was observed over the first 48 hours after eclosion, with 18 males and 5 females dying during this time. Surviving members consisted of 20 males and 30 females. On 25 June the males were placed in one collapsible field cage and the females were combined into another. Water, dry sugar, and dog feces (as a protein source) were provided.

On 29 June the males were placed into the cage with females. One

male was killed in the transfer process. The transference was performed from 12:00-12:15 P.M., E.D.T. The cage was placed in direct sunlight outside. The temperature remained between 80°-85° F. throughout the time spent observing the flies. During the first half-hour, approximately 7 unsuccessful mating attempts were observed. Pairs of flies fell to the bottom of the cage but the females were not receptive to the males. The females would not stay on their feet and pairs struggled upside-down until the male was pushed off. Some weeds were added to the bottom of the cage at this time, in case a rougher foothold was needed than the metal bottom of the cage. Two pairs successfully joined between 1:00 and 1:15 P.M. One pair stayed in copuli until 4:35 P.M., the other pair until 4:50 P.M. A few other unsuccessful attempts were noted during the first couple of hours, but the frequency of attempts dropped off over time. Between 6:00-9:00 P.M. the cage was observed for short periods at half-hour intervals and no mating attempts were observed. The cage was not observed again until 11:30 P.M. and two pairs were noted in copuli at this time.

The landing of the male on the dorsum of the female is the first body contact in this species courtship and virtually all strikes by the male occurred as a female flew, rather than as she sat or crawled on the inside of the cage. The pair would immediately fall to the bottom of the cage where the female would struggle to dislodge the male for several seconds by flipping over and kicking the male with her legs (this occurred even in successful copulations). In successful mating attempts, the

female would end rejection behavior and the following mating position was noted: male on back of female; female's wings spread slightly; male's fore tarsi at female's wing base, occasionally moving up to humeral area; male's midlegs hanging over female's costa of wing, with tarsi suspended a bit above the ground; male's hindlegs resting on the ground behind the female. During copulation, the female would often clean her front legs and rubbed her hind legs together occasionally. The female would crawl around the cage during the first hour, then settled down in one place for the remainder of the copulation. An odd movement consisting of the pair rocking from side to side was noticed sporadically throughout the copulation. This may be comparable to the rocking motion noted for Sarcophaga melanura Meigen by Sanjean (1957: 18).

Although a few apparently successful copulations were noticed in nearly all rearing attempts during the summer of 1986, most mating attempts were rejected by the females. I was not able to colonize this species and none of the females were ever found to contain developed larvae.

Potential parasitoid records (records for stimulans or complexes of Ravinia species which include R. stimulans) include: Alysia ridibunda Say (Figg, et al., 1982, 1983a) and Aphaereta pallipes (Say) (Hymenoptera: Braconidae) (Blickle, 1961; Hayes and Turner, 1971; Figg, et al., 1982, 1983a, 1983b); Eucoila sp. (Blickle, 1961; Figg, et al., 1982) and Eucoila impatiens (Say) (Hymenoptera: Cynipidae) (Hayes and Turner, 1971); Figites sp. (Figg, et al., 1982) and Xyalophora quinquelineata

(Say) (Hymenoptera: Figitidae) (Blickle, 1961; Hayes and Turner, 1971); Trichopria sp. (Hymenoptera: Diapriidae) (Figg, et al., 1982, 1983a); Trichomalopsis dubia (Ashmead) (Figg, et al., 1983a), Eupteromalus sp. (Figg, et al., 1982), Muscidifurax sp. (Figg, et al., 1983a), M. raptor Girault and Sanders (Figg, et al., 1982), Spalangia haematobiae Ashmead (Figg, et al., 1982, 1983a), S. nigra Latr. (Figg, et al., 1982, 1983a) and S. nigroaenea Curtis (Figg, et al., 1982, 1983a) (Hymenoptera: Pteromalidae); and Aleochara sp. (Coleoptera: Staphylinidae) (Hayes and Turner, 1971; Figg, et al., 1982, 1983a).

REMARKS: Most determined specimens of this species will be found under the name latisetosa. Aldrich (1930) incorrectly synonymized the name stimulans with quadrisetosa. This led to much confusion and specimens determined as stimulans almost always represent the species R. derelicta. Dodge (1956a) removed the name stimulans from usage as it was not possible to separate several species of closely related females. Lopes (1977) reexamined Walker's types and provided the synonymy adopted here. The female genital sternites and the hillae of the males, as well as other parts of the male genitalia, are more variable than seen in other species of Chaetoravinia. This, combined with an insufficient original description of the species laakei, has led many authors to use the name laakei as a dumping ground for various genital morphs of the species stimulans in addition to vagabunda specimens. R. stimulans may very well be a complex of closely related

sympatric species, but I have been unable to find consistent morphological characters to separate these species, if they exist. In all cases, reared specimens from one locality were remarkably similar in genital structure when compared to specimens collected from other, even nearby, areas.

Another common name that may show up in collections is assidua. This name was applied to a red-legged geographical race which replaces the normal dark-legged morph in areas of the southeastern range of this species (Florida, adjacent states). Unfortunately, the name was incorrectly applied to Oxysarcodexia ventricosa (Wulp) by Aldrich (1916). Although Aldrich (1930) corrected this mistake and provided a redescription of assidua, many determinations in collections were based on his original work. As such, any specimens that have been determined as assidua should be rechecked to see if the name was incorrectly applied to ventricosa specimens. Oxysarcodexia ventricosa has black tegulae and lacks dorsal setae on R_1 . Although specimens have not been seen, it is believed that the R. assidua of Hayes and Turner (1971) and Wharton and Moon (1979) are actually O. ventricosa.

Ravinia sueta (van der Wulp)

(Figures. 35a - d)

Sarcophaga sueta van der Wulp, 1896: 281. Type-locality: Mexico, Amula in Guerrero. Aldrich, 1930: 34 (synonymy).

Ravinia sueta (van der Wulp). Lopes, 1946a: 137-139, figures 41-43

(redescription, locality records). Lopes, 1948: 567 (locality records). Lopes, 1969: 22 (locality records).

ADULT: Length: 10 - 14 mm. Gena, parafacials, and fronto-orbital plate golden pruinose. Gena abruptly changing to grey pruinose posterior to line extending from posterior margin of eye. Genal groove less densely golden pruinose. Presutural acrostichals differentiated, especially near anterior margin.

MALE: Sternite 5 much longer than wide and with concave anterior margin (figure 35a). Apices of cerci begin to diverge very high, with inner margins sinuous (figure 35b). Aedeagus with anteriorly projecting mesal plate between hillae (figure 35c).

FEMALE: Sternite 6 and 7 golden pollinose, very wide and rounded, resembling a broad oval when viewed together (figure 35d).

DIAGNOSIS: The genitalia of this species will separate it from all others.

TYPES: Male lectotype. Mexico, Amula in Guerrero, 6000 feet, H.H. Smith (BMNH). Two male paratypes from same locality.

MATERIAL EXAMINED: 14 males and 28 females (ERC, CAS, GAD, MSU). Tepic, Mexico, 7-5-56, R. & K. Dreisbach (MSU-male; used for figures 35a-c). Tepoztlan, Morelos, Mexico, 8-20-56, R. & K. Dreisbach (MSU-female;

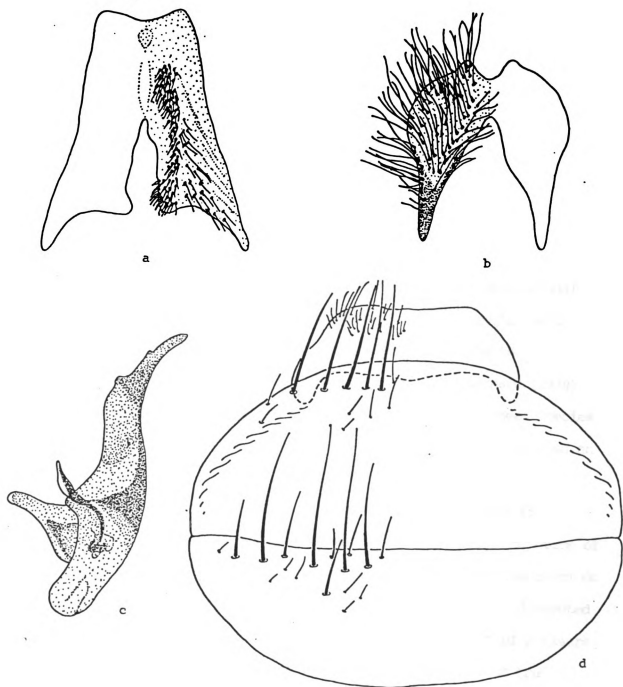


Figure 35: Genitalia of Ravinia sueta. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

used for figure 35d).

DISTRIBUTION: United States (Texas), Mexico (Chiapas, Chihuahua, Durango, Mexico, Mexico D.F., Morelos, San Luis Potosi, Tabasco).
Distribution from material examined and Lopes (1948).

BIOLOGY: Unknown.

REMARKS: Aldrich (1930) mistakenly synonymized this species with his ochracea. Most information published under the name sueta, until Lopes (1946a) separated these two species, actually applies to lherminieri. The Argentine locality data provided by Blanchard (1939) under the name Duravinia sueta does not apply to either of these species as Argentina is well south of their ranges and the name is considered an error.

Lopes (1946a) noted that the apices of the cerci of sueta are divergent and gives this as a distinctive character for the separation of sueta from ochracea (= lherminieri). It should be noted that the cerci do not appear to be divergent in pinned specimens or in carefully dissected specimens, but the cerci are rather loosely joined and a bit of pressure on dissected cerci causes the apices to diverge. The shape of the female's genital sterna appear to be very distinctive, but it should be noted that much of the lateral area of sternites 6 and 7 are hidden in pinned specimens under the abdominal terga.

Determined specimens of this species may be found mixed with lhermineri under the names sueta and ochracea.

Ravinia tancituro Roback

(Figures 36a - d)

Ravinia tancituro Roback, 1952: 48, figures 6a-c. Type-locality: Mexico, Michoacan, Mount Tancituro. Roback, 1954: 74, figures 254-255 (synonymy, male genitalia). Lopes, 1969: 22 (locality data).

ADULT: Length: 6 - 9 mm. Gena and parafacials grey pruinose, often with a coppery tinge. One pair of presutural acrostichal setae more differentiated than others, erect. Three postsutural dorsocentral setae.

MALE: Sternite 5 not much wider posteriorly than long (figure 36a). Apices of cerci with nearly parallel inner margins and convergent outer margins (figure 36b). Hillae very broad and with distinct ventral notch near apex, giving the aedeagus an ax-like appearance (figure 36c).

FEMALE: Sternite 7 square to short rectangular in appearance, with apical margin slightly convex (figure 36d). Sternite 8 nearly semicircular.

DIAGNOSIS: The three postsutural dorsocentrals and relatively small size serve to separate this species from all others except pusiola over its range. It is easily separated from this species on the basis of genital characters.

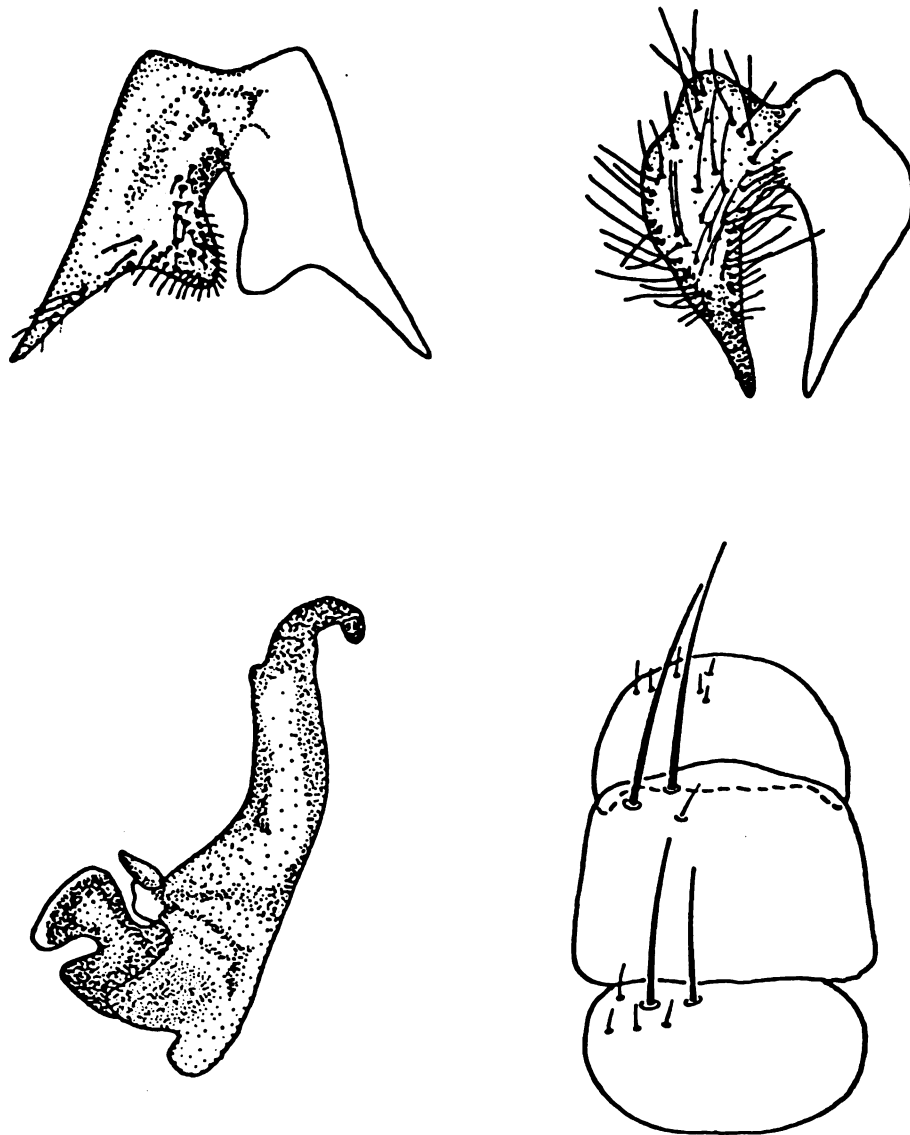


Figure 36: Genitalia of Ravinia tancituro. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

TYPES: Holotype male. Mount Tancituro, sweeping in meadow, 780 feet, Michoacan, Mexico, Fourth Hoogstraal Mexican Biological Expedition, 1941, H. Hoogstraal (Chicago Natural History Museum).

MATERIAL EXAMINED: 43 males and 21 females (BRC, CAS, GAD, WLD). Barfoot Lookout, Chiricahua Mts., 8800', ARIZ., 8 Sept. 1966, Wm.L. Downes, Jr. (WLD-male; used for figures 36a-c). MONT., Gallatin Co., Fairy Lake, 9500', 18 Aug. 1983, Wm.L. Downes, Jr. (WLD-female; used for figure 36d).

DISTRIBUTION: United States (Arizona, Colorado, Montana), Mexico (Durango, Mexico, Michoacan, Morellos). Distribution from material examined.

BIOLOGY: Unknown.

REMARKS: This species commonly occurs with pusiola in mixed series. Only by spreading the genitalia or dissection can these two species be differentiated.

Ravinia vagabunda (van der Wulp)

(Figures 37a - d)

Sarcophaga vagabunda Wulp, 1895: 270, pl.7, figure 4. Type-locality: Mexico (male and female).

Sarcophaga laakei Hall, 1931: 181-182, figure 1b. Syn. nov. Type-locality: United States, Texas, Menard (male).

Chaetoravinia vagabunda (Wulp). Lopes, 1946a: 132-135, figures 23-26, 33 (description, male genitalia, locality record). Lopes, 1948: 566 (locality records). Lopes, 1978a: 221-222, figures 13-15 (redescription, lectotype designation).

ADULT: Length: 7 - 9 mm. Fronto-orbital plate grey pruinose with yellowish tinge.

MALE: Head as in figures 15a-b. Usually with well developed outer vertical seta. Fifth sternite generally U-shaped, with ventrally produced, setulose medial projections near apex of posterior lobes (figure 15c). Cerci with short parallel apices (figure 15d). Aedeagus with well developed vesica and hillae with rounded tips in lateral view (figure 15e).

FEMALE: Sternites 6, 7, and 8 progressively smaller in size. Sternite 7 bilobed, with pointed anterior margins. Sternite 8 reduced, situated in mesal indentation of sternite 7 (figure 15f).

DIAGNOSIS: Genitalia very similar to stimulans, but males with rounded tips of the hillae and females usually with pointed anterior margins of lobes of sternite 7. The two species appear to be allopatric

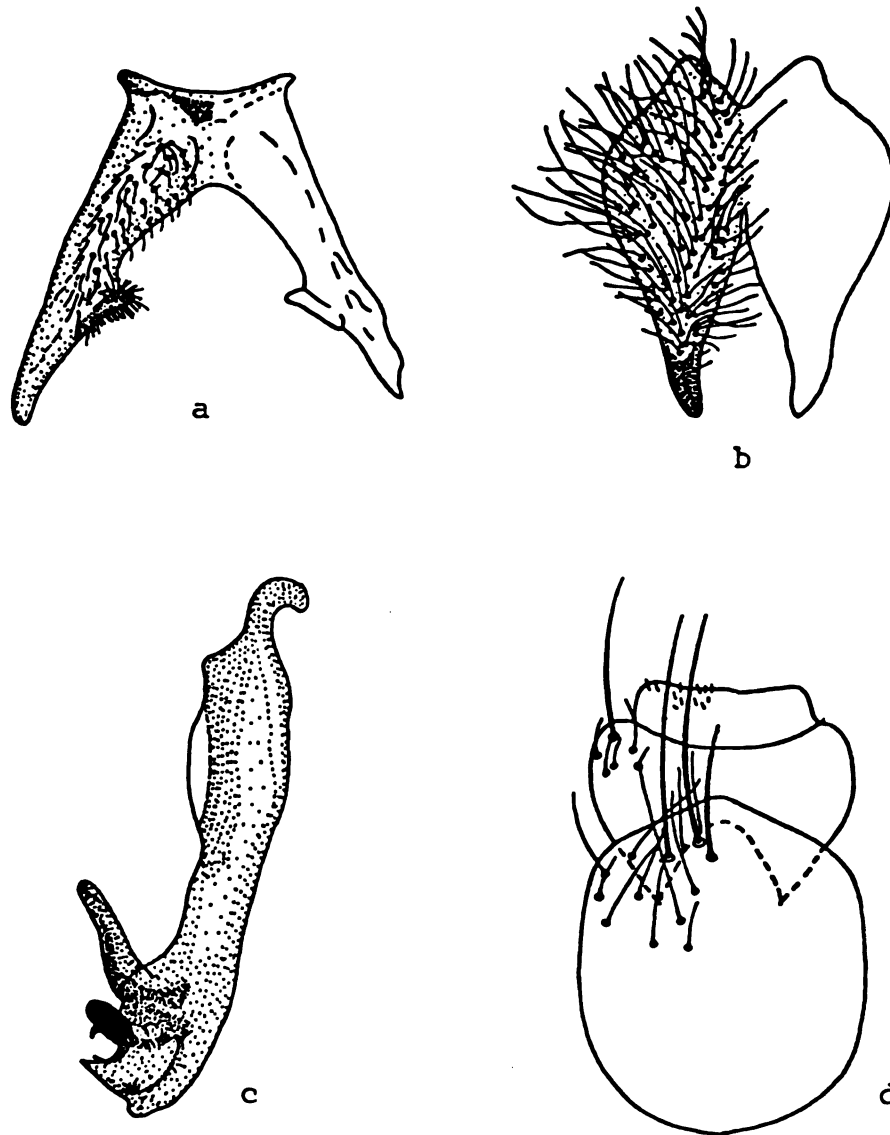


Figure 37: Genitalia of Ravinia vagabunda. (a) Male fifth sternite; (b) Male cerci; (c) Aedeagus; (d) Female sternites 6, 7 and 8.

or slightly parapatric along a southern line extending from San Diego, California to Houston, Texas. The structure of the male and female genitalia easily separate this species from all other members of the Chaetoravinia.

TYPES: Male lectotype, Mexico City, May 88, H.H.S. (BMNH). 8 male paralectotypes. Amula, Guerrero, 6000 ft., Aug. H.H. Smith (5 males-BMNH). Mexico City, May 88, H.H.S. (2 males-BMNH). Xucumanatlan, 7000 ft., July H.H. Smith (male-BMNH). Redescription of type by Lopes (1978).

MATERIAL EXAMINED: 73 males and 39 females (BRC, CAS, CSU, GAD, MCZ, MSU, WLD). 11 mi. W. Durango, Dgo. MEX., 7000', June 20, 1964, J.F. McAlpine (male-BRC; used for figures 15a-e). Almolongo, 6000', Gro., MEX., VII-29-62, Guy L. Bush Collector (female-MSU; used for figure 15f).

DISTRIBUTION: Southeastern U.S. (Arizona, California, New Mexico, Texas), Mexico (Baja California Norte, Baja California Sur, Durango, Guerrero, Jalisco, Mexico, Mexico D.F., Michoacan, Morelos, Puebla, Sonora, Veracruz, Zacatecas). Distribution from material examined and Lopes (1946a, 1948).

BIOLOGY: Unknown. Two males collected at flowers of Lopezia trichota (MEXICO: Durango, 17 road miles W. Durango, 10-IX-1966, 6600', D.E. Breedlove, CAS). One male collected at human excrement (Casa

Grande, Ariz., III-25-34, A.J. Basinger coll. CAS). Routinely collected at elevations above 6000'. Maximum number of first instars dissected from one female was 43.

REMARKS: Wulp's name vagabunda was not applied to this species until Lopes (1946a) redescribed this species and illustrated its genitalia. Prior to this time, Hall's name laakei was commonly used, both for this species and for aberrant forms of the species stimulans. Aldrich (1930) erroneously placed vagabunda as a synonym of stimulans and quadrisetosa. Unfortunately, Sarcophagidae specialists in the U.S. seem to have ignored Lopes' information, even after his 1978 redescription. Therefore, specimens of vagabunda in North American collections will usually be found under the name laakei, especially those determined by H.R. Dodge.

APPENDICES

APPENDIX A: A CATALOG OF THE RAVINIA

A CATALOG OF THE RAVINIA

Ravinia Robineau-Desvoidy, 1863: 434. Type species: Sarcophaga

haematodes Meigen (orig. des.).

Punasarcophaga Townsend, 1915: 408-409. Type species: Punasarcophaga

auromaculata Townsend (orig. des.).

Euravinia Townsend, 1917: 191, 194, 195. Type species: Ravinia communis

Parker (orig. des.) = querula (Walker).

Miltoravinia Townsend, 1917: 191, 194, 195. Type species: Sarcophaga

planifrons Aldrich (orig. des.).

Trixosarcophaga Townsend, 1917: 191, 194, 195. Type species: Sarcophaga

aurigena Townsend (orig. des.).

Andinoravinia Townsend, 1917: 190, 193, 195, 196. Type species:

Andinoravinia rufipes Townsend (orig. des.).

Chaetoravinia Townsend, 1917: 190, 193, 195. Type species: Helicobia

quadrisetosa Coquillett (orig. des.) = derelicta (Walker).

Catasarcophaga Townsend, 1927: 220, 295. Type species: Catasarcophaga

trivittata Townsend (orig. des.) = advena (Walker).

Engelina Enderlein, 1928: 16. Type species: Sarcophaga xanthopyga

Enderlein, nec. van der Wulp (orig. des.) = misidentification of

rufipes (Townsend).

Thyrsoctena Enderlein, 1928: 42-43. Type species: Musca striata

Enderlein, nec. Fabricius (orig. des.) = misidentification of

Sarcophaga melanura (?).

acerba (Walker) 1849: 824-825 (Sarcophaga) - Nova Scotia; Canada

(Alberta, British Columbia, New Brunswick, Northwest Territory, Nova Scotia, Ontario, Quebec), United States (Alaska, California, Colorado, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Vermont, Washington).

peniculata Parker, 1914: 58-59, fig. 45 - ?Massachusetts.

advena (Walker) 1852: 324 (Sarcophaga) - Brazil; Argentina, Bolivia, Brazil (Mato Grosso, Minas Gerais, Sao Paulo, Santa Catarina), Paraguay. N. COMB.

contermina Walker, 1852: 327 (Sarcophaga) - Brazil.

trivittata Townsend, 1927: 220, 295 (Catasarcophaga) - Brazil, Sao Paulo.

townsendi Engel, 1931: 149, fig. 18 (Sarcophaga) - Bolivia.

almeidai (Lopes) 1946b: 227-230, figs. 1-5 (Chaetoravinia) - Brazil, Mato Grosso; Argentina, Brazil (Ceara, Minas Gerais, Parana, Sao Paulo).

anandra (Dodge) 1956a: 187, fig. 15 (Chaetoravinia) - Georgia; Canada (Ontario), United States (Arkansas, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland,

Michigan, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin).

anxia (Walker) 1849: 818 (Sarcophaga) - ?N. America; Canada (Alberta, British Columbia, Ontario, Quebec, Saskatchewan), United States (Arizona, California, Colorado, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming), Mexico (Baja California Norte, Durango, Hidalgo, Jalisco, Mexico, Mexico D.F., Puebla, Sonora, Zacatecas).

comes Walker, 1852: 323 (Sarcophaga) - U.S.A.

pallinervis Thomson, 1869: 535 (Sarcophaga) - Hawaii, Honolulu

aureopyga (Hall) 1928: 339-340, fig. 10 (Sarcophaga) - Chile, Angol; Argentina, Brazil, Chile.

aurigena (Townsend) 1912: 357-358 (Sarcophaga) - Peru, Piura; Chile, Costa Rica, Ecuador, Panama, Peru.

auromaculata (Townsend) 1915: 409-410 (Punasarcophaga) - Peru, Oroya; Ecuador, Peru.

barroi (Dodge) 1956b: 97-99, figs. 1-5. (Chaetoravinia) - Cuba, Habana;
Cuba.

belforti (Prado and Foneseca) 1932: 39, fig. 7 (Euravinia) - Brazil, Sao
Paulo; Argentina, Brazil, Columbia, Paraguay, Trinidad.

cisselli - Kentucky, Marion Co., Rowan's Knob; Kentucky, New York, Ohio.
N. SP.

coachellensis (Hall) 1931: 182, fig. 1c (Sarcophaga) - California,
Coachella.

columbiana (Lopes) 1962: 170, fig. 19-22 (Andinoravinia) - Columbia;
Venezuela. N. COMB.

dampfi (Lopes) 1946a: 135-137, figs. 36-40 (Chaetoravinia) - Mexico,
Chapultepec; Mexico (Chiapas, Durango, Hidalgo, Mexico D.F.,
Morelos).

derelicta (Walker) 1852: 322 (Sarcophaga) - U.S.; eastern North America,
Massachusetts south to Veracruz, west to Manitoba and Texas.

quadrisetosa Coquillett, 1901: 17-18 (Helicobia) - U.S., District of
Columbia.

stimulans Aldrich, nec. Walker, 1930: 15, 17 (Sarcophaga).

downesi - Texas; Arizona. N. SP.

effrenata (Walker) 1861: 309-310 (Sarcophaga) - Mexico; Florida to California, south to Columbia, including West Indies.

xanthopyga van der Wulp, 1895: 272 (Sarcophaga) - Mexico.

conjugens van der Wulp, 1895: 272 (Sarcophaga) - Mexico.

adamsii Hall, 1928: 345-346, fig. 17 (Sarcophaga) - Jamaica.

errabunda (van der Wulp) 1896: 278 (Sarcophaga) - Mexico, Tabasco; southeastern U.S. (Arizona, California, Kansas, Louisiana, Nevada, New Mexico, Texas), Mexico (Baja California Norte, Chiapas, Durango, Hidalgo, Jalisco, Mexico, Mexico D.F., Morelos, Oaxaca, Puebla, San Luis Potosi, Sonora).

reinhardii Hall, 1928: 346-347, fig. 20 (Sarcophaga) - Texas.

floridensis (Aldrich) 1916: 249, fig. 117 (Sarcophaga) - Florida.

globulus (Aldrich) 1916: 249, 299-301, fig. 145 (Sarcophaga) - Cuba; Hispaniola, Puerto Rico.

haematodes (Meigen) 1826: 29 (Sarcophaga) - ?Germany, Aachen.

pernix authors, nec. Harris 1780: 84 (Musca)

striata Fabricius, 1794: 315 (Musca) (Preocc. by Gmelin, 1790) - Denmark.

haemorrhoidalis Fallen, 1817: 237 (Musca) (Preocc. by Villers, 1789) - Sweden.

haemisphaerica Robineau-Desvoidy, 1830: 346 (Myophora) - France.

limpidipennis Robineau-Desvoidy, 1830: 346 (Myophora) - France.

horticola Robineau-Desvoidy, 1830: 346 (Myophora) - France.

campestris Robineau-Desvoidy, 1830: 346 (Myophora) - France.

parva Robineau-Desvoidy, 1863: 427 (Pierretia) - France.

hebes Robineau-Desvoidy, 1863: 436 (Ravinia) - France.

sulcata Robineau-Desvoidy, 1863: 437 (Ravinia) - France.

nova Siebke, 1877: 94 (Sarcophaga) - Norway.

aozia Seguy, 1935: 5 (Sarcophaga) - Chad.

disjuncta Seguy, 1938: 43 (Gesneriodes) - Morocco.

heithausi Lopes, 1975a: 485-486, figs. 1-4 - Costa Rica.

lherminieri (Robineau-Desvoidy) 1830: 339 (Myophora) - U.S.A., Carolina.

ochracea Aldrich, 1916: 255-256, fig. 121 as communis variant (Sarcophaga) - Mississippi.

lopesi Dahlem, 1989: - Chile.

meinckei (Blanchard) 1939: 835, fig. 12 (Andinoravinia) - Argentina.

ollantaytambensis (Hall) 1928: 341, fig. 13 (Sarcophaga) - Peru,

Ollantaytambo.

pectinata (Aldrich) 1916: 251-253, fig. 119 (Sarcophaga) - Indiana.

orbitalis Hall, 1928: 337-338, fig. 6 (Sarcophaga) - Colorado (as
Columbia, error).

planifrons (Aldrich) 1916: 249-251, fig. 118 (Sarcophaga) - New Mexico.

duplicata Hall, 1928: 338, fig. 7 (Sarcophaga) - New Mexico.

postnoda (Dodge) 1968: 423, 426-428, figs. 4-5 (Chaetoravinia) - Mexico,

San Louis Potosi; Mexico (Guerro, Sonora, Veracruz), Guatemala,
Honduras, Costa Rica, Panama, Columbia, Ecuador, British Guiana,
Trinidad. N. COMB.

pusiola (van der Wulp) 1895: 268, 1896: 278 (Sarcophaga) - Mexico, Mexico
City.

minuta Hall, 1928: 335, fig. 1 (Sarcophaga) (preoc. Robineau-
Desvoidy, 1830) - Mexico, Puebla.

obscuripes (Hall) 1928: 335-336, fig. 2 (Sarcophaga) - Mexico,
Sierra Madre.

addentata (Hall) 1929: 71 (Sarcophaga) - Mexico, Puebla.

querula (Walker) 1849: 821-822 (Sarcophaga) - ?N. America.

avida Walker, 1849: 822-823 (Sarcophaga) - Nova Scotia.

rediviva Walker, 1849: 823 (Sarcophaga) - Canada, Ontario.

rabida Walker, 1849: 823-824 (Sarcophaga) - Nova Scotia.

aspersa Walker, 1849: 825 (Sarcophaga) - ?N. America.

communis Parker, 1914: 55-57, pls. 1-5 (Ravinia) - ?Massachusetts.

rufipes (Townsend) 1917: 196 (Andinoravinia) - Peru; Columbia, Ecuador, Chile.

rufipes intermedia Lopes, 1962: 169, fig. 12-18 (Andinoravinia) - Columbia. N. SYN.

shewelli Dahlem, 1989: - Canada, Yukon.

stimulans (Walker) 1849: 817-818 (Sarcophaga) - ?N. America; Canada

(Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, Saskatchewan), continental United States, except Alaska, and not extending to Mexico.

assidua Walker, 1852: 328 (Sarcophaga) - U.S.

fulvipes Walker, 1852: 328 (Sarcophaga) (preoc. Macquart, 1843) - U.S.

latisetosa Parker, 1914: 63-65, figs. 26, 45. - ?Massachusetts.

sueta (van der Wulp) 1895: 268, 1896: 281 (Sarcophaga) - Mexico,

Guerrero.

tancituro Roback, 1952: 48, fig. 6a-c. - Mexico, Michoacan.

vagabunda (van der Wulp) 1895: 270, pl. 7, fig. 4 (Sarcophaga) - Mexico; southwestern U.S. (Arizona, California, New Mexico, Texas), Mexico (Baja California Norte, Baja California Sur, Durango, Guerrero, Jalisco, Mexico, Mexico D.F., Michoacan, Morelos, Puebla, Sonora, Veracruz, Zacatecas).

laakei Hall, 1931: 181-182, fig. 1b (Sarcophaga) - Texas. N. SYN.

APPENDIX B: FIGURES OF THE HEADS OF MALES OF SEVERAL RAVINIA SPECIES

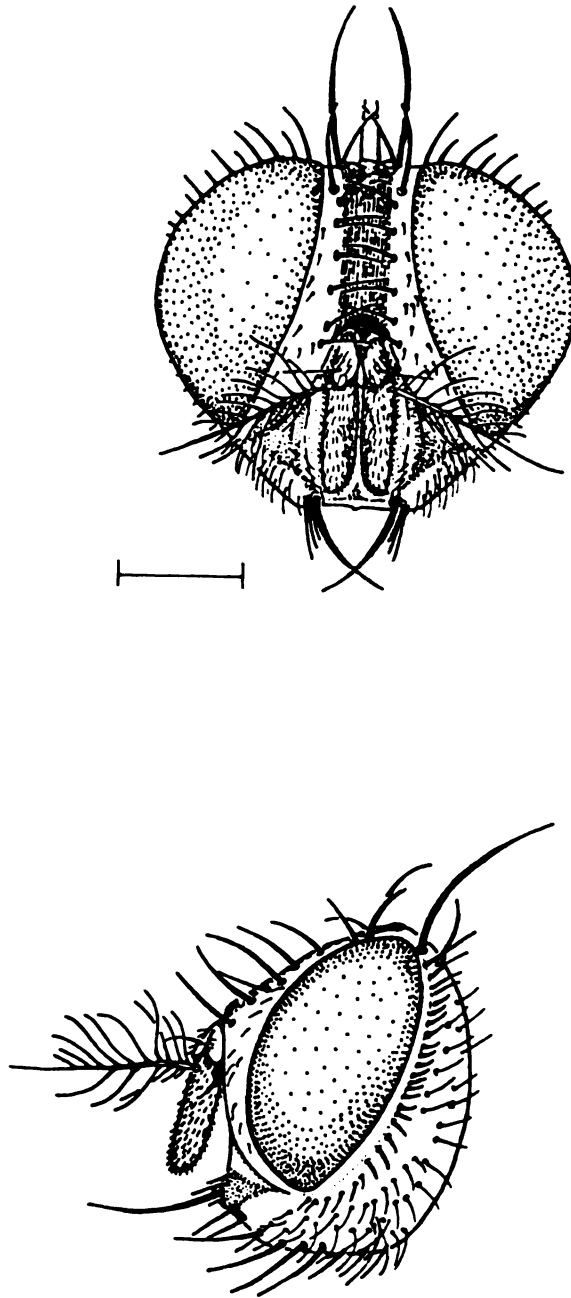


Figure 38: Head of Ravinia advena male. Front and lateral view.

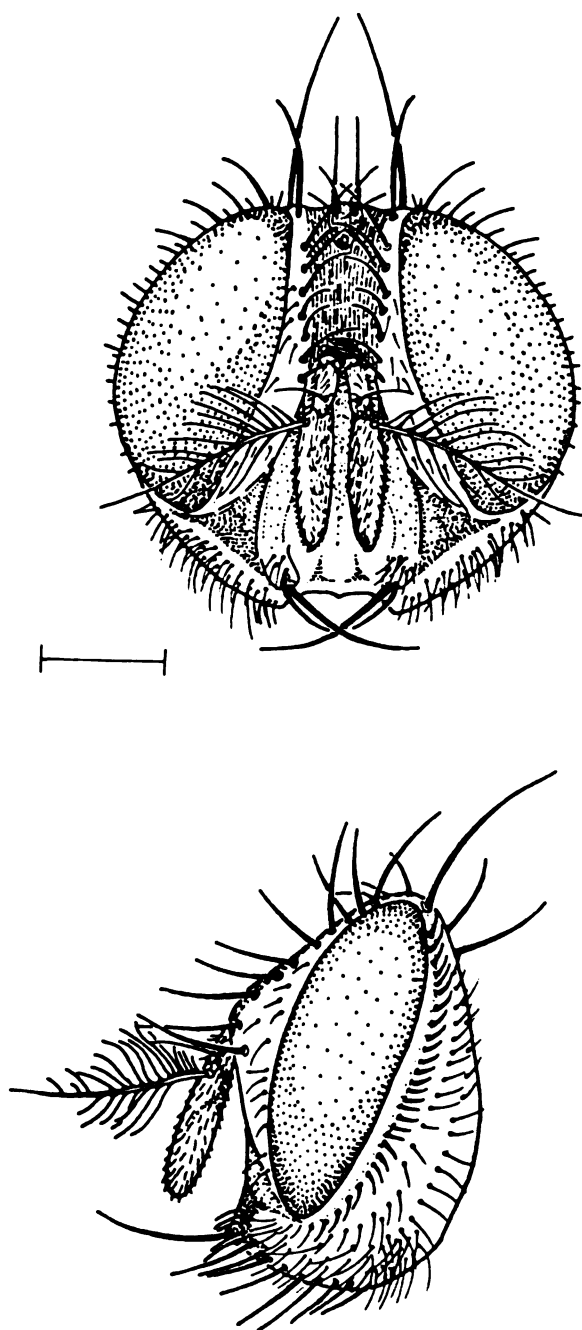


Figure 39: Head of *Ravinia almeidai* male. Front and lateral view.

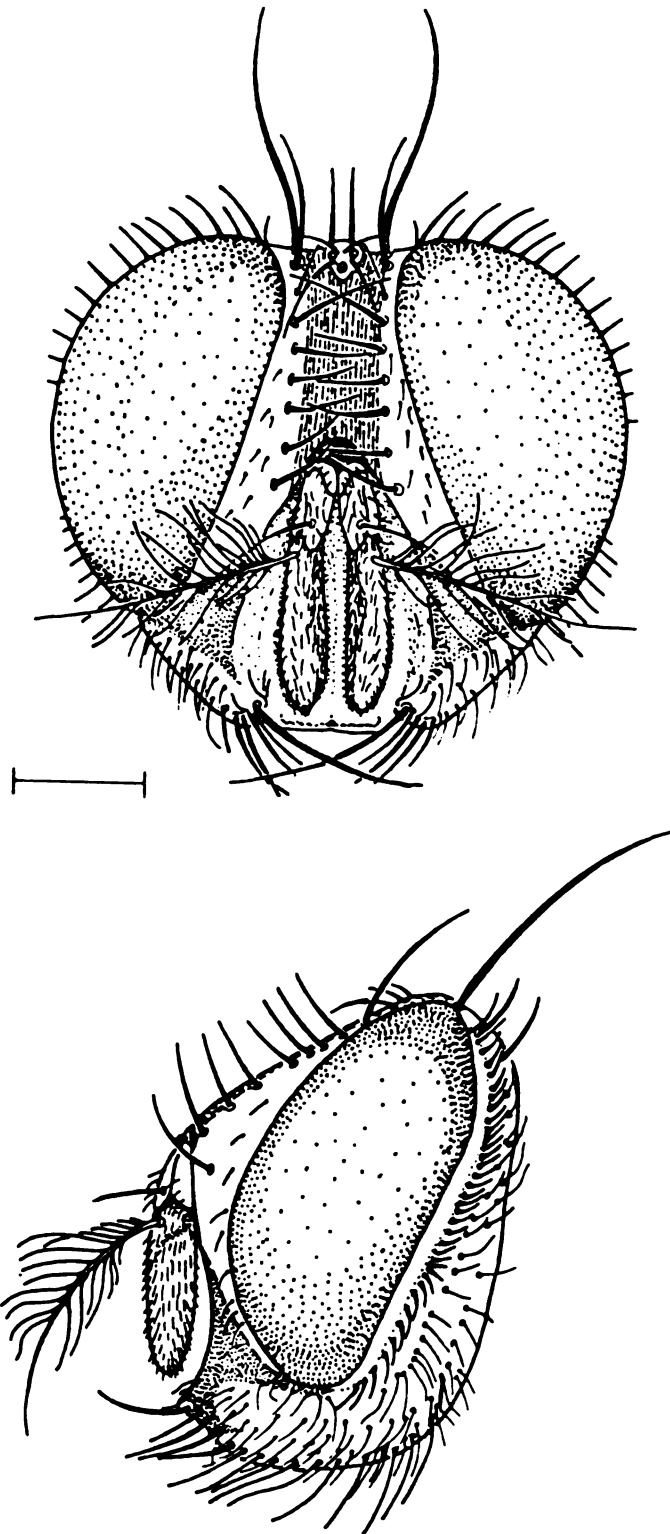


Figure 40: Head of Ravinia barroi male. Front and lateral view.

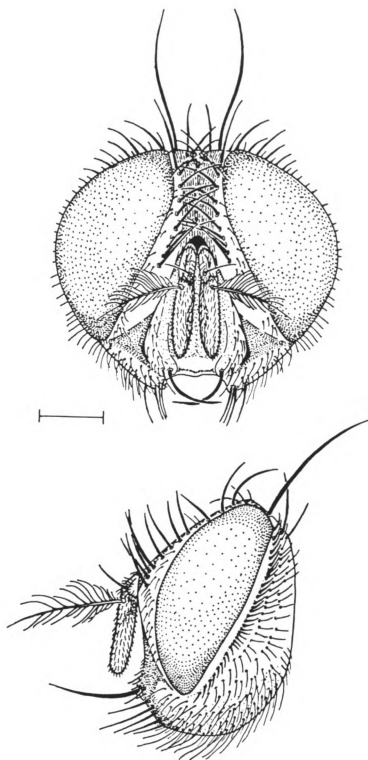


Figure 41: Head of *Ravinia dampfi* male. Front and lateral view.

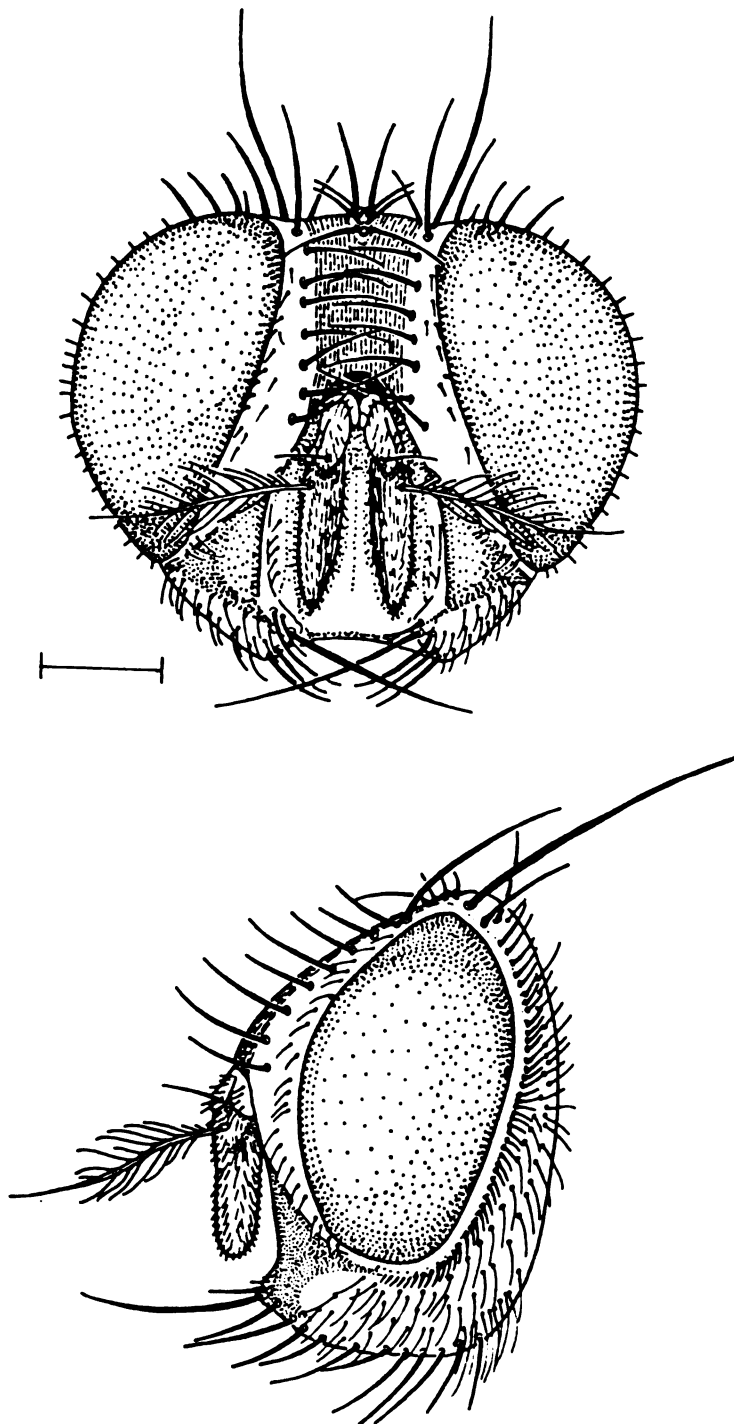


Figure 42: Head of Ravinia derelicta male. Front and lateral view.

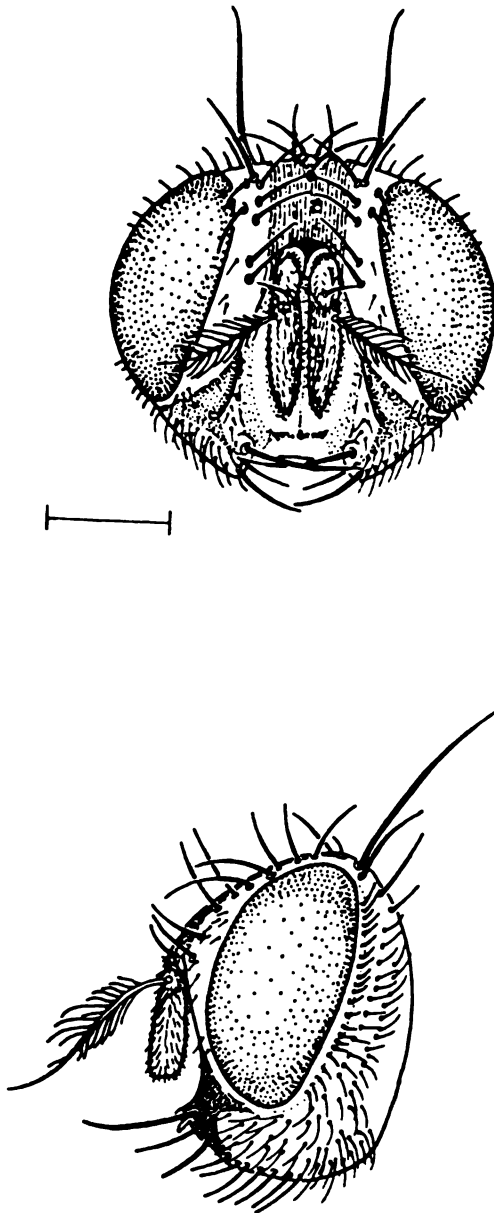


Figure 43: Head of Ravinia downesi male. Front and lateral view.

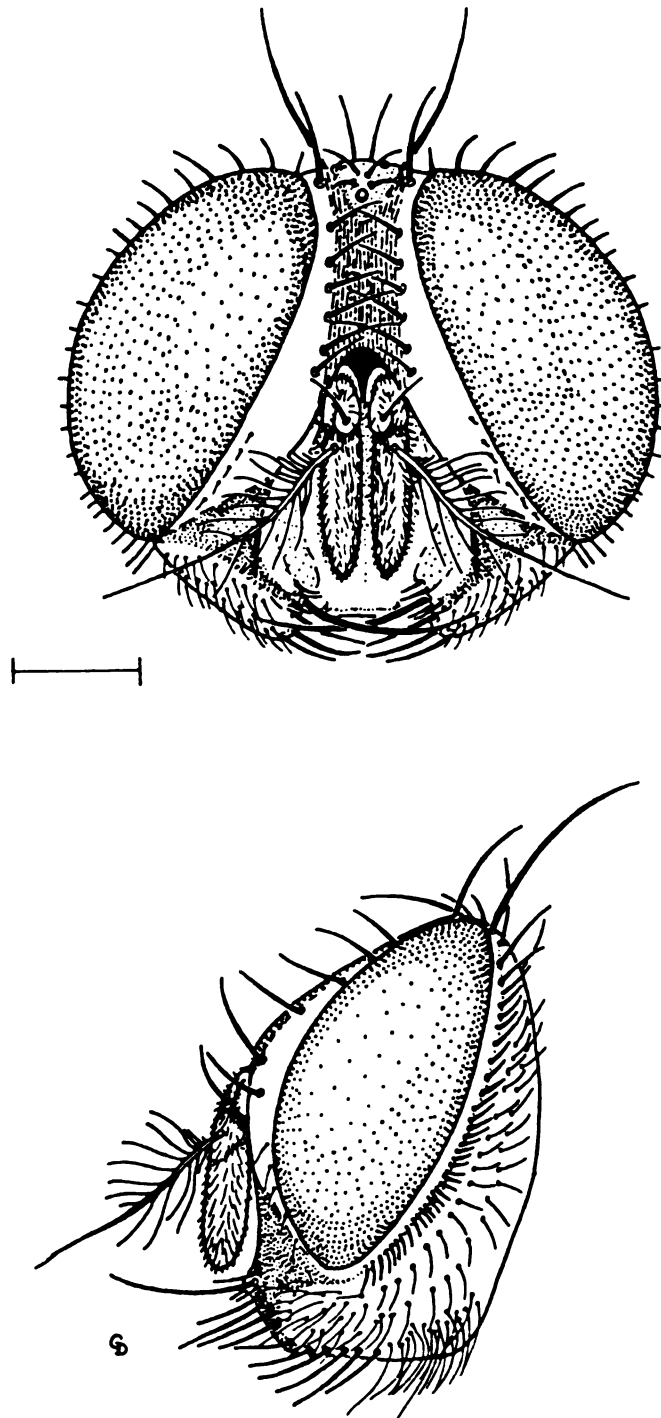


Figure 44: Head of *Ravinia effrenata* male. Front and lateral view.

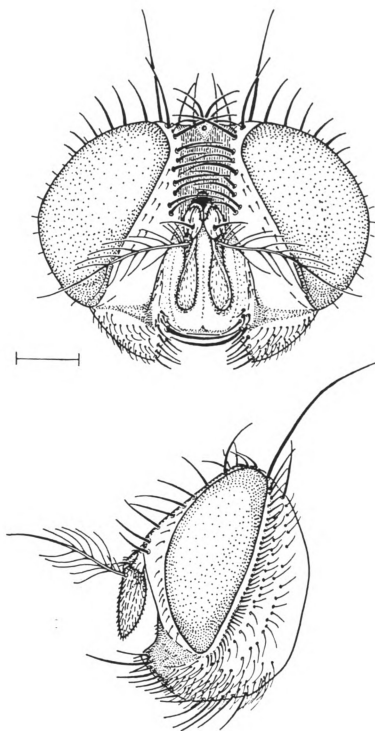


Figure 45: Head of *Ravinia errabunda* male. Front and lateral view.

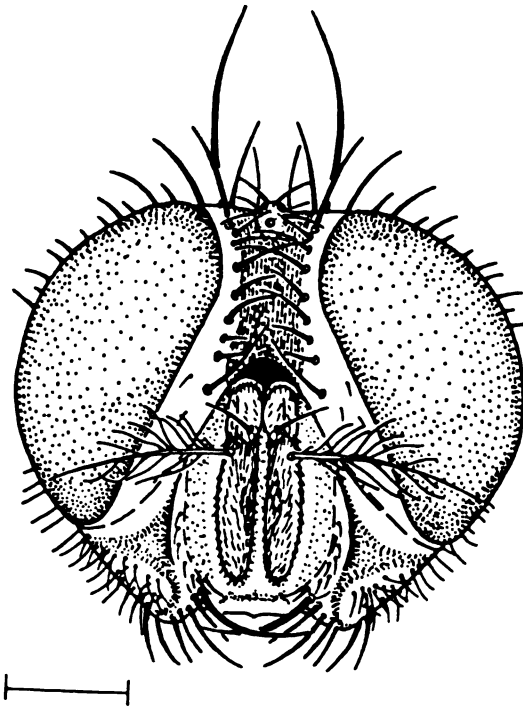


Figure 46: Head of Ravinia globulus male. Front view.

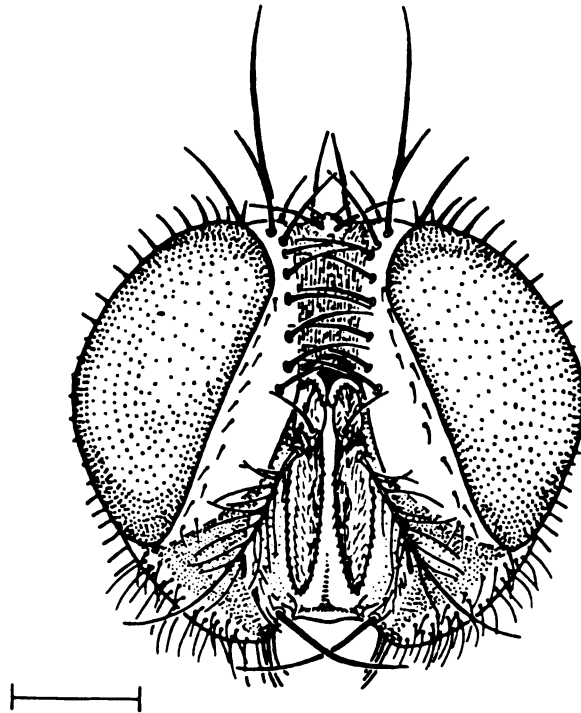


Figure 47: Head of *Ravinia postnoda* male. Front view.

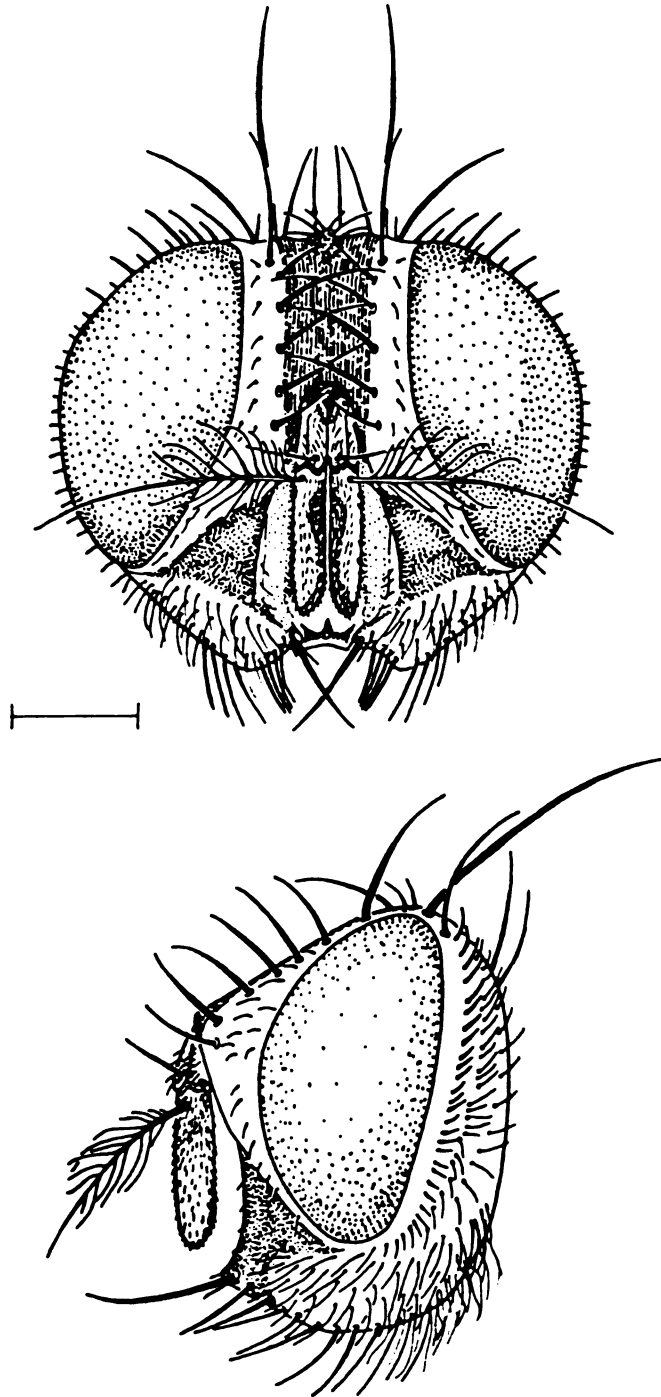


Figure 48: Head of Ravinia stimulans male. Front and lateral view.

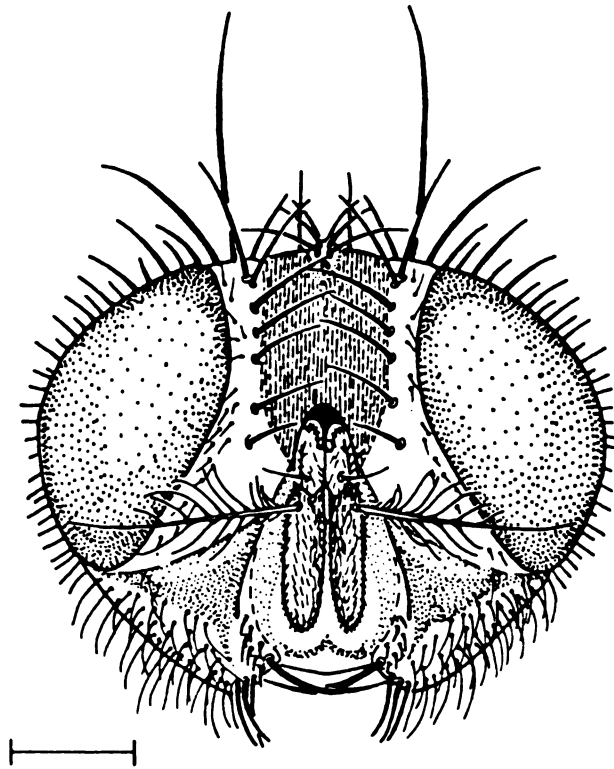


Figure 49: Head of Ravinia vagabunda male. Front view.

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