THE SYSTEMATICS, PHYLOGENY, AND ZOOGEOGRAPHY OF SYMMERUS WALKER AND AUSTRALOSYMMERUS FREEMAN (DIPTERA: MYCETOPHILIDAE: DITOMYIINAE)

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MEMOIRS OF

THE ENTOMOLOGICAL SOCIETY OF CANADA — No. 92

Editor: V. R. Vickery

Published by THE ENTOMOLOGICAL SOCIETY OF CANADA, OTTAWA

1974

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NOTE: Scale marks in figures represent 0.1 mm unless otherwise indicated.

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ABSTRACT

The holarctic genus *Symmerus* and the transantarctic genus *Australosymmerus* are revised, a reconstruction of their phylogeny is presented, and their zoogeography is discussed. Diagnoses or redescriptions of 31 of the 37 previously-known species and descriptions of 14 new species are presented. The new species are *S. nepalensis* from Nepal; *S. uncatus* and *S. vockerothi* from eastern North America; *A. acutus, A. magnificus,* and *A. truncatus* from Mexico; and *A. collessi, A. confusus, A. lobatus, A. maculatus, A. magellani, A. minutus, A. montorum,* and *A. peruensis* from South America. *Symmerus tristis* (Loew) and *S. dilutus* Fisher are considered synonyms of *S. lautus* (Loew), and a lectotype is designated for *Plesiastina bifasciata* Williston. A subgeneric classification is proposed, in which two subgenera of *Symmerus* and eight subgenera of *Australosymmerus* are described. *Crionisca* Colless is considered to be a subgenus of *Australosymmerus*. The subgenera of *Symmerus* are *Symmerus s. str.* and the new subgenus *Psilosymmerus* (type-species: *Symmerus coqulus* Garrett). The subgenera of *Australosymmerus* are *Australosymmerus s. str., Crionisca,* and the new subgenera *Ventrilobus* (type-species: *Centrocnemis fuscinervis* Edwards), *Araeostylus* (type-species: *Australomyia bivittata* Freeman), *Vellicocauda* (type-species: *Platyura insolita* Walker), *Tantrus* (type-species: *Australosymmerus montorum* Munroe), *Melosymmerus* (type-species: *Centrocnemis bisetosa* Edwards), and *Calosymmerus* (type-species: *Plesiastina bifasciata* Williston). New combinations include *A. aculeatus* (Edwards), *A. bisetosus* (Edwards), *A. mexicanus* (Giglio-Tos), *A. nitidus* (Tonnoir), *A. pediferus* (Edwards), *A. rieki* (Colless), *A. simplex* (Freeman), *A. tillyardi* (Tonnoir), *A. trivittatus* (Edwards), and *A. zonatus* (Giglio-Tos). In addition to the six previously-described species which were not included in the study, five species remain unplaced in the subgeneric classification. Significant biological data are presented for *S. coqulus* Garrett, and some observations on the biology of *S. vockerothi* Munroe are also presented.

The phylogeny of *Symmerus* and *Australosymmerus* was reconstructed by Hennig's system of "phylogenetic systematics" because there is no clearly-formulated alternative to the cladistic method for phylogenetic analysis. A number of logical and practical difficulties with the procedure are discussed. It was concluded that criteria of deviation from a basic plan and inferred adaptive significance were preferable to criteria of distribution of character states for the recognition and categorization of attributes as plesiomorphic or apomorphic, that the use of minute correspondence in structurally rich characters for the recognition of convergence and synapomorphy is not a reason for discarding phylogenetic methods for phenetic ones, as has been suggested, and that the necessity for tentative reference to a pre-existing phylogeny is neither a philosophical nor a practical problem.

For each attribute used in the cladistic analysis, the inferred plesiomorphic and apomorphic state is described and the reason for the inference is stated. The monophyletic group described by each synapomorphy is identified; description of the monophyletic groups at each level specify the phylogenetic reconstruction, which is summarized by means of cladograms.

Cladistic and zoogeographic evidence is presented which indicates that transantarctic relationships in *Australosymmerus* are found in a complex of closely-related sister-groups forming a monophyletic group confined to the South Temperate region. Two of the three transantarctic relationships occur at the intra-

[1]Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy at the University of California, Berkeley.

subgeneric level; the remaining one occurs at the inter-subgeneric level. The remaining species of *Australosymmerus* are shown to form a monophyletic morphological–chorological progression from south to north across the equator in the New World. The evidence indicates that the ancestor of *Symmerus* and *Australosymmerus* lived in the northern hemisphere. One phyletic line dispersed to the southern hemisphere and reached what is now South America at least by the early Tertiary, but probably much earlier, and gave rise to *Australosymmerus*. If *Australosymmerus* did not cross large water gaps, it must have been present in Gondwanaland before the break-off of New Zealand (Lower Cretaceous). *Australosymmerus* is not present in South Africa, indicating that it did not exist in Gondwanaland before the break-off of South Africa, or that it was present and has subsequently become extinct in South Africa. The sister–group of the trans-antarctic group migrated northwards, probably reaching northern South America before the end of the Oligocene.

INTRODUCTION

Scope of the Study

Prior to the present study, the subfamily Ditomyiinae consisted of seven genera of fungus-flies. The subfamily is based on the following characters: M_{1+2} and M_{3+4}[2] connected basally (m-cu of authors present); basal portion of M absent; R_4 present, long, generally more than half as long as R_5. The larvae of the few species whose immature stages are known live in bracket-fungi (Polyporaceae) or in rotting wood.

The systematics of the subfamily is in a confused state. Until now, the genera *Ditomyia* Winnertz, *Symmerus* Walker, *Nervijuncta* Marshall, *Calliceratomyia* Lane, *Australosymmerus* Freeman, *Neoditomyia* Lane and Sturm, *Rhipidita* Edwards, and *Crionisca* Colless have been placed in the Ditomyiinae. In addition, there is an undescribed genus from the Celebes (Saigusa, pers. comm.). Most of these genera, especially those occurring in the New World, contain many undescribed species. The subfamily is based on attributes which appear to be plesiomorphic, and may be polyphyletic or paraphyletic. A revision of *Symmerus,* with two subgenera, and of *Australosymmerus,* with eight subgenera, is presented. *Crionisca* Colless is treated as a subgenus of *Australosymmerus*.

The morphology of the subfamily is not well known. Edwards (1916) studied adults of *Ditomyia fasciata* (Meigen) and *Symmerus annulatus* (Meigen) and Keilin (1919) studied the larvae of these species. Madwar (1937) compared the larvae of *Ditomyia fasciata* and *Australosymmerus* sp. Shaw (1948) studied the pleural sclerites of *Symmerus* sp. and Shaw and Shaw (1951) compared the thoracic sclerites of *Nervijuncta, Australosymmerus,* and *Symmerus*. The morphology of the male genitalia is described in the present study.

References to the biology of the Ditomyiinae consist of little more than host records and descriptions of the immature stages of the commonest species. The wood- or hard fungus-boring habits of the larvae make it extremely difficult to study the life history in detail. The present study includes new information on the biology of two North American species of *Symmerus*.

There have been no comprehensive studies on the phylogeny of the Ditomyiinae. Freeman (1951), in a discussion of the affinities of Patagonian and Chilean Diptera, noted that *Australomyia* (= *Australosymmerus*) has affinities amongst northern and southern South America, Australia, and New Zealand. Hennig (1966*a*) included *Australosymmerus* in that distribution type in which the sister-

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[2]I have followed the system of wing vein nomenclature recommended and illustrated by Colless and McAlpine (1970).

group of New Zealand and Australian species is in South America, often restricted to Chile, but frequently occurring elsewhere in the Neotropical Region. Colless and McAlpine (1970) mentioned *Australosymmerus* as a representative of a distinct Antarctic element in the Australian fauna. A reconstructed phylogeny of *Symmerus* and *Australosymmerus,* based on cladistic inferences, is described in the present study.

Although there has been no detailed study of the zoogeography of the Ditomyiinae, the geographic distribution of the subfamily has long been known to be an interesting one. Tonnoir and Edwards (1927), in their discussion of the affinities of the New Zealand Mycetophilidae, noted that the large development of the Ditomyiinae in the fauna showed affinities with South America and Australia. Edwards (1925) considered *Australosymmerus* to be the southern hemisphere counterpart of the holarctic genus *Symmerus.* Freeman's (1951) discussion of the affinities of the southern South American fauna listed *Australosymmerus* as a genus with species in both tropical and southern (temperate) South America, as well as in Australia–Tasmania and New Zealand. Freeman (1951) also considered *Australosymmerus* to be the southern hemisphere counterpart of *Symmerus.* Hennig (1966*a*) listed *Australosymmerus* as having five New Zealand species, eight Australian species, and 13 South American species. This distribution fits a rather common variant of the "Antarctic" type of distribution. The same author (p. 50) noted, however, that the Brazilian and Mexican species should be examined for similarities to *Symmerus,* as such an affinity would be of significance in interpreting the history of the subfamily.

The final portion of the present study consists of a discussion of the zoogeography of *Symmerus* and *Australosymmerus.* Disjunct distributions of the kind shown by these two genera are of special interest to biologists for a number of reasons. Firstly, investigation of the nature of the phylogenetic relationships between the elements of a disjunct distribution pattern can provide information about the age of the group studied, and of its various subgroups. A second reason, related to the first, is that investigation of related organisms occurring in widely-separated parts of the world brings to light attributes, often previously unused, which indicate the affinities and the history of the organisms. These "zoological questions" (Hennig 1966*a*) cannot be answered until certain "geographical questions" have been dealt with. Aside from "Where do the organisms occur?" these include "From which parts of the world did the elements in the various regions come?" and "What was the route and the timing of the dispersal, and what role did intermediate regions play in it?"

Methods and Materials

The present study is based upon approximately 600 specimens representing 45 species of *Symmerus* and *Australosymmerus,* of which 14 are previously undescribed. Six previously-described species were not present in the material examined and have not been included in the present study. These species are *Australosymmerus bororo* (Lane 1947), *A. fumipennis* (Tonnoir in Tonnoir and Edwards 1927), *A. guarani* (Lane 1947), *A. guyanasi* (Lane 1947), *A. tupi* (Lane 1947), and *A. lenkoi* Lane 1959.

Approximately 400 of the specimens examined were dried specimens borrowed from institutions or collected in North America by the author. The remainder were specimens collected by the author into alcohol. The most effective collecting method proved to be Malaise traps. The large series collected in this way show that these flies are not as rare as their scarcity in museum collections would indicate. A few specimens were swept from the forest undergrowth.

Immature instars were discovered by searching the surface of pieces of rotten wood for eggs and for emergence holes with projecting cast pupal skins; once recognized, these were conspicuous. Later in the study, continuous cultures were maintained in rotting wood placed on wet sand in plastic shoe-boxes. Immature instars were killed by immersion in boiling water, and were stored in Kahle's fluid.

The genitalia of the adults were cleared in boiling KOH and preserved in glycerol. They were drawn with the aid of a Spencer dissecting microscope and an ocular grid. As far as possible the plates were prepared so that corresponding figures represent exactly the same view for each species illustrated. In the genitalic descriptions, particular views are indicated by the letters enclosed in parentheses. Scale marks on the figures indicate 0.1 mm unless otherwise indicated. Means of wing measurements are based on 10 specimens unless otherwise indicated.

ACKNOWLEDGMENTS

I am deeply indebted to the following persons for critical suggestions and comments during the course of this study, and for critically reviewing the manuscript: Dr. J. A. Powell, Dr. E. I. Schlinger and Dr. D. B. Wake of the University of California, Berkeley, and Dr. J. M. Campbell, Mr. J. A. Downes, Dr. E. E. Lindquist and Dr. J. R. Vockeroth of the Entomology Research Institute, Canada Department of Agriculture. I also wish to thank Mrs. A. E. Munroe and Mr. P. Childres for assistance with the figures. Mrs. J. Wilson and Mrs. J. Georgakopoulos typed earlier drafts of the manuscript. Parts of the field work were made possible by a grant from the Department of Entomology and Parasitology, University of California, Berkeley. I am grateful to the following persons and institutions for the loan of specimens. The letters in parentheses are used in the species records to cite the institution from which the material was borrowed.

Academy of Natural Sciences, Philadelphia (ANSP); W. W. Moss
Academy of Sciences, Leningrad (LEN); A. Stackleberg
American Museum of Natural History, New York (AMNH); P. Wygodzinski
Australian National Insect Collection, Canberra (ANIC); D. H. Colless
B. P. Bishop Museum, Honolulu (BPB); W. Steffan
British Museum (Natural History), London (BMNH); A. M. Hutson
California Academy of Sciences, San Francisco (CAS); P. H. Arnaud, Jr.
California Insect Survey, Berkeley (CIS); J. A. Powell
Canadian National Collection, Ottawa (CNC); J. R. Vockeroth
Department of Scientific and Industrial Research, Nelson (DSIR); J. S. Dugdale
Deutsches Entomologisches Institut, Berlin (DEI); G. Morge
Humboldt-Universität zu Berlin (HUMB); H. Schumann
Iowa State University of Science and Technology, Ames (ISU); J. L. Laffoon
Kyushu University, Fukuoka (KYUSHU); T. Saigusa
Michigan State University, East Lansing (MICH); R. L. Fischer
Muséum National d'Histoire Naturelle, Paris (MUS.PAR.); L. Matile
Museum of Comparative Zoology, Cambridge (MCZ); J. F. Lawrence
Naturhistorisches Museum, Vienna (WIEN); A. Kaltenbach
Naturhistoriska Riksmuseet, Stockholm (STOCK); L. Brundin
New York State College of Agriculture, Ithaca (CORN); L. L. Pechuman
Peabody Museum, Yale University, New Haven (PEAB); K. W. Brown
Research Institute for Food Industry, Prague (specimens in CNC); P. Lastovka
Staatliches Museum für Naturkunde, Ludwigsburg (STAAT); E. Lindner
United States National Museum, Washington (USNM); R. J. Gagne
Universidad Nacional de La Plata, Argentina (LA PLATA); L. de Santis

Universitets Zoologiske Museum, Copenhagen (COPEN); B. V. Pedersen
University of Canterbury, Christchurch (CANT); D. Horning, P. M. Johns
University of Kansas, Lawrence (KANS); G. W. Byers
University of Minnesota, St. Paul (MINN); P. J. Clausen
University of Wisconsin, Madison (WISC); L. J. Bayer
Werneth Park Study Centre, Oldham, England (WP); L. N. Kidd
Zoological Museum, Amsterdam (AMST); T. H. van Leeuwen
Zoological Museum, Helsinki (HELS); W. Hackman
Zoologische Sammlung des Bayerischen Staates, Munich (BAYER); F. Kühlhorn

SYSTEMATICS

Historical Review

The Ditomyiinae have attracted attention from dipterists since the first half of the nineteenth century, when Meigen (1818, 1830) described the two commonest European species (*Ditomyia fasciata* and *Symmerus annulatus*) under the generic name *Mycetobia*. Since then, prior to the present revision, 36 species have been described in the two genera under study.

Many of the publications referring to *Symmerus* and *Australosymmerus* consist of general papers containing passing references in the form of keys (Williston 1896, 1908; Landrock 1918); museum lists with diagnoses (Zetterstedt 1851, 1855) or without (Bradley 1897; Strobl 1898, 1910; Lane 1956, 1963); regional faunal lists (van der Wulp 1861; Osten-Sacken 1878; Smith 1890, 1910; Aldrich 1905; Sack 1907; Lundström 1909; Kröber 1910; Cole and Lovett 1921; Johnson 1925; Leonard 1928; Tonnoir 1929; Kloet and Hincks 1945; Nielsen 1946; Cole 1969); notes on behaviour (Edwards 1921*a*); biological records quoted from other sources (Osten-Sacken 1862; Brauer 1883); or book reviews (Mik 1888).

During the period 1830 to 1863 more comprehensive papers contained descriptions of new species (Walker 1837, 1856; Zetterstedt 1851), descriptions of new genera (Winnertz 1852; Walker 1848), or redescriptions of old species (Staeger 1840). In 1863 Winnertz divided the Mycetophilidae into groups based on wing venation, wing trichiation, and number and position of ocelli. He erected the subfamily Mycetobinae to include the genera *Mycetobia* Meigen, *Ditomyia* Winnertz, and *Plesiastina* Winnertz. Although this system was ignored by some workers (Schiner 1864; Loew 1869; van der Wulp 1877; Osten-Sacken 1878; Smith 1890; Aldrich 1905), most authors and cataloguers accepted it (Schiner 1868; Skuse 1888; Theobald 1892; Marshall 1896; Kertesz 1902, 1903; Johannsen 1909, 1910; Edwards 1913). In addition to these more comprehensive papers, there were several publications between 1863 and 1915 which dealt with new genera and species (Phillippi 1865; Bigot 1888; Giglio-Tos 1890; Williston 1901) and notes on synonymy (Kowartz 1868; Arribalzaga 1892; Mik 1894).

In 1916 Edwards made a detailed study of the morphology of adults and larvae of *Mycetobia, Ditomyia,* and *Symmerus*. He removed *Mycetobia* (but not *Ditomyia* or *Symmerus*) from the Mycetophilidae and placed it in the Anisopodidae, because of the large gular plate, the structure of the second palpal segment, the position of the fork of the radial vein, the course of the cubital vein, and the chitinous spermathecae of the female. Malloch (1917) then suggested that *Ditomyia* and *Symmerus* should form a separate family but did not elaborate on this. Keilin (1919) expanded upon Edwards' (1916) work by studying the larvae and pupae of *Ditomyia fasciata* and *Symmerus annulatus* and concluded, because of the structure of the antennae, mandibles, maxillae, labium, palpi, sensory organs, respiratory system, spiracles, and salivary glands that *Ditomyia* and *Symmerus* should be placed in a separate family, the Ditomyiidae.

Edwards (1921*b*), in an attempt to verify Keilin's (1919) results on the basis of adult morphology, found a number of characters (especially the long R_{2+3} ($= R_4$), the vestigial subcosta, the shape of the hypopleura, and the strong mesonotal bristles) which distinguished the Ditomyiinae from other Mycetophilidae, but concluded that the Ditomyiinae had many other characters in common with the Ceroplatinae. He considered that elevation of the Ditomyiinae to family rank would require similar elevation of the Bolitophilinae, Diadocidiinae, and Ceroplatinae. According to Edwards (1921*b*) he and Keilen were agreed that this was not justifiable. Since then, the classification given by Edwards (1925) has been accepted by most workers. Some European students, however, have considered the Ditomyiinae to be a family (notably Madwar, 1937) while others have considered each mycetophilid subfamily to be a family (notably Hennig, 1948).

Most of the papers since 1916 which refer to *Symmerus* and *Australosymmerus* deal with the systematics of these groups. They can be separated into those containing descriptions of new genera and species, or discussions of synonymy (Edwards 1926, 1940; Garrett 1925; Tarwid 1933; Okada 1936, 1939; Lackschewitz 1937; Fisher 1938; Landrock 1940; Tollet 1943; Lane 1947, 1948, 1956, 1959; Freeman 1954) and more general treatments of the fauna of large geographical areas (Edwards 1925; Landrock 1927; Tonnoir and Edwards 1927; Tonnoir 1929; Séguy 1940; Fisher 1941; Miller 1950; Freeman 1951; Sasakawa 1963; Colless 1970).

Key to Distinguish Ditomyiinae
(after Colless, 1970)

1. M_{1+2} and M_{3+4} connected basally (m-cu of authors present) 2

1′. M_{1+2} and M_{3+4} not connected basally .... Lygistorhininae
Manotinae
Sciophilinae
Mycetophilinae

2.(1) R_4 present and rather long, usually half or more as long as R_5; posterior divisions of pronotum with 1 or more long bristles .... Ditomyiinae

R_4 less than half as long as R_5, sometimes weak or absent; posterior divisions of pronotum without long bristles .... Bolitophilinae
Diadocidiinae
Macrocerinae
Ceroplatinae

Key to Distinguish *Symmerus* and *Australosymmerus*

1. Cross-vein r-m present (Fig. 63j) 2

1′. Cross-vein r-m obliterated by fusion .... *Calliceratomyia*
Neoditomyia
Nervijuncta
Rhipidita

2.(1) Basal section of R_s, r-m, and basal portion of M_{3+4} all in a nearly vertical line, so that distal end of basal cell is truncate (Fig. 63*l*) .... *Australosymmerus* Freeman

2′. Basal section of R_s and basal portion of M_{3+4} pointed obliquely in opposite directions, so that distal end of basal cell is pointed (Fig. 63a) 3

3.(2′) Eye produced above antenna; R_4 hardly longer than distal portion of R_5 (Fig. 63a); dorsal corner of anepisternite setose .... *Symmerus* Walker

3′. Eye not produced above antenna; R_4 much longer than distal portion of R_5; dorsal corner of anepisternite bare .... *Ditomyia* Winnertz

Symmerus Walker

Mycetobia Meigen, 1830: 294 (in part).
Symmerus Walker, 1848: 88.
Ceroplatus; Zetterstedt, 1851: 3447 (in part) (*nec* Bosc, 1792: 42).
Plesiastina Winnertz, 1852: 51.
Ditomyia; Walker, 1856: 64 (in part); Giglio-Tos, 1890: 142 (in part) (*nec* Winnertz, 1852: 53).
Type-species: *Mycetobia annulata* Meigen, 1830 (= *Symmerus ferrugineus* Walker) (by monotypy).

DESCRIPTION. Males usually yellow with conspicuous brown markings, occasionally predominantly brown. Females predominantly brown. Antenna 2+15 segmented; scape and pedicel with more or less complete ring of apical setae; flagellum usually laterally compressed and ventrally slightly serrate, rarely pectinate or fusiform; last segment usually minute, never more than ⅓ as long as preceding segment. Three ocelli present, forming a transverse row; median ocellus smaller than lateral ocellus. Dorsal margin of eye produced above antenna, reaching at least to level of mesal margin of lateral ocellus; eye haired, hairs 1 ommatidial diameter in length; distinct postorbital bristles absent. Clypeus setose; labellum and palpus clothed in minute bristles.

Mesonotum usually with 3 longitudinal dark vittae which are sometimes fused or absent; mesonotal bristles longer near lateral and posterior margins. Propleuron setose; prosternum and precoxal bridge sparsely setose, or with a fringe of strong stiff setae; anepisternite with a clump of setae in anterodorsal corner; remaining pleurites bare. Scutellum with a posterodorsal fringe of bristles.

Hind coxa with a posterolateral fringe of long bristles; tibial spurs 1-2-2; tibial spines weak, black, rarely longer than tibial diameter; tarsal spines similar in proportion to tibial spines.

Sc short, strong portion distal to humeral cross-vein never more than twice as long as cross-vein; R_4 about as long as distal portion of R_5, rather widely divergent from R_5; base of M_{3+4} and m-cu forming a straight line; r-m short; M_{1+2} and 1A faint, the latter vein reaching wing margin (Fig. 63a–i). Macro- and microtrichia present, uniformly dense except sparser in proximal portion of basal cell.

Abdomen with 7 visible segments; segment 8 small, retracted into 7, with sternite and tergite of equal size. Abdominal setae short to long, slender, sparser on sternites, especially anteriorly, and absent on sternite 1.

Male genitalia (Figs. 1–11) with sternite 9 distinct, large, fused to basistyli at base; basistyli not fused to one another. Sclerotized aedoeagal structures present, consisting of a pair of dorsolateral plates formed from mesal projections of the basistyli, and a ventral plate. Dististylus large, with an apicomesal fringe of stiff setae or spines. Tergite 9 large. Cerci extremely large, 1.5 to 2.5 times as long as tergite 9. Sternite 10 membranous or lightly sclerotized, sometimes with a few short setae. Female genitalia with sternite 8 bilobed; apical margin with strong setae (Fig. 44), but neither character as pronounced as in *Australosymmerus*. Cercus short, 2-segmented; segment 2 circular or ovoid; segment 1 expanded apically.

REMARKS. There are 11 known species of *Symmerus,* one of which is a Baltic Amber fossil, and three of which are newly described here. The genus is recorded from Europe, eastern and western North America, Japan, Taiwan, and Nepal.

KEY TO SUBGENERA OF *Symmerus*

1. Postnotum with setae on posterior half; dististylus subcylindrical, curved (Figs. 1 to 5) .... *Symmerus s. str.* Walker

1′. Postnotum bare; dististylus boot-shaped (Figs. 6 to 11) .... *Psilosymmerus* Munroe n. subgen.

Subgenus *Symmerus* Walker new status

Type-species: *Mycetobia annulata* Meigen, 1830 (by Article 44(a)).

DESCRIPTION. Antenna filiform, fusiform or laterally compressed, ventrally slightly serrate but never strongly serrate or pectinate; postnotum bearing setae on posterior half; basistylus cylindroconical; dististylus subcylindrical, curved mesally, without lobes or processes; apex of dististylus with a fringe or tuft of stiff setae, but without a distinct striate band inserted in membrane.

KEY TO LIVING SPECIES OF *Symmerus s. str.*[3]

1. Sternite 9 large, about 1.5 times as long as basistylus, with the apex produced into a pair of pointed lobes 2

1'. Sternite 9 small, about ⅔ as long as basistylus, with apical margin slightly notched or entire 3

2.(1) Sternite 9 constricted at midlength, emarginate laterally (Fig. 2b); cercus clothed in moderately long brown setae; postnotal setae yellow (EASTERN EUROPE) .... *nobilis* Lackschewitz

2'. Sternite 9 not constricted at midlength, the lateral margins straight (Fig. 1b); cercus clothed in short pale setae; postnotal setae brown (EUROPE) .... *annulatus* (Meigen)

3.(1') Flagellum of antenna compact, with the segments cylindrical; mesonotum dark brown, with flavous anterolateral margins (JAPAN) ..... *antennalis* Okada

3'. Flagellum of antenna laterally compressed; mesonotum with 2 or 3 longitudinal maculae which are never fused (EASTERN NORTH AMERICA) .... *lautus* (Loew)

Symmerus (Symmerus) annulatus (Meigen)

Figs. 1, 44, 63a, 69

Mycetophila (?) *zonata* Stephens, 1829: 252 (*nomen nudum*); Stephens, 1846: 24.

Mycetobia annulata Meigen, 1830: 294; Staeger, 1840: 281; Zetterstedt, 1851: 4072; 1855: 4904.

Symmerus ferrugineus Walker, 1848: 88; Bradley, 1897: 90 (synonymy by Kertesz, 1902: 38).

Ceroplatus flavus Zetterstedt, 1851: 3447; 1860: 6493 (synonymy by van der Wulp, 1877: 178).

Plesiastina annulata; Winnertz, 1852: 55; van der Wulp, 1861: 17; Winnertz, 1863: 670; Schiner, 1864: 429; Kowartz, 1868: 212; van der Wulp, 1877: 178; Theobald, 1892: 149; Mik, 1894: 26; Strobl, 1898: 282; Kertesz, 1902: 38; 1903: 39; Aldrich, 1905: 138; Sack, 1907: 9; Lundström, 1909: 3; Kröber, 1910: 8; Strobl, 1910: 238; Edwards, 1913: 338; Tarwid, 1933: 375.

Plesiastina apicalis Winnertz, 1852: 56; Osten-Sacken, 1862: 151; Winnertz, 1863: 671; Schiner, 1864: 429; van der Wulp, 1877: 179 (synonymy by Kowartz, 1868: 212).

Ditomyia ferruginea; Walker, 1856: 64.

Ditomyia vittata Walker, 1856: 64 (synonymy by Theobald, 1892: 149).

Ditomyia pallida Giglio-Tos, 1890: 2 (synonymy by Mik, 1894: 26).

Symmerus annulatus; Edwards, 1925: 511; Landrock, 1927: 6, Tarwid, 1933: 375; Lackschewitz, 1937: 1; Fisher, 1938: 196; Okada, 1939: 287; Landrock, 1940: 8; Fisher, 1941: 280; Tollet, 1943: 5; Kloet and Hincks, 1945: 343; Neilsen, 1946: 122; Laffoon, 1965: 199.

[3]Keys are to males only, unless specified; females are unknown for many species.

DIAGNOSIS. *Symmerus (Symmerus) annulatus* is similar to the only other European species of this genus, *S. (S.) nobilis*, but males can be readily distinguished from those of *S. (S.) nobilis* by the bristles on the cerci, which are short, fine, and pale in *S. (S.) annulatus* and longer, stronger and dark in *S. (S.) nobilis;* by the postnotal setae, which are dark in *S. (S.) annulatus* and pale in *S. (S.) nobilis;* by the shape of the dististylus and of sternite 9 (Figs. 1, 2); and by the mesonotal color: yellow, sometimes with brown lateral vittae in *S. (S.) annulatus,* dark brown with anterior corners yellow in *S. (S.) nobilis.*

DESCRIPTION. **Male.** *Head.* Vertex dark brown, fading to brown in postvertical and postocular regions. Gena and lateral occipital region flavotestaceous. Postvertical, postocular, and genal areas clothed in short brownish-black bristles. Postfrons testaceous, with a few short brownish-black bristles. Prefrons flavotestaceous, small, bare. Clypeus small, flavotestaceous, clothed in short yellowish-brown bristles. Labellum and palpus bearing minute black bristles; labellum and segments 1 and 2 of palpus ashy yellow; segments 3 and 4 of palpus greyish yellow. Scape flavotestaceous, with ventral surface brown apically; pedicel flavotestaceous; both with an incomplete ring of apical bristles, minute on ventral surface, longer than lateral ocellus dorsally; flagellum pubescent; flagellar segments 1 to 3 flavotestaceous; segments 4 and 5 testaceous; segments 6 to 14 dark ash-brown; segment 16 testaceous, minute, spherical, about 1/9 as long as preceding segment.

Thorax. Pronotum and humerus flavotestaceous, with many short to long bristles. Mesonotum flavotestaceous, with lateral macula represented by faint brown discolorations and median macula absent; mesonotal bristles short to moderately long on disc, moderately long to long near lateral and posterior margins. Scutellum flavotestaceous, with numerous bristles dorsally, longest near the apical margin. Postnotum flavotestaceous, with a faint brown basal discoloration extending to lateral and dorsal quarters; postnotum bearing moderately long brown bristles on basal one-half. Propleuron flavotestaceous, with about a dozen moderately long to long bristles. Katepisternum flavotestaceous, with ventral one-third testaceous. Anepisternum flavotestaceous, with a clump of moderately long to long bristles in dorsal angle. Remaining pleurites flavotestaceous, bare. Halter bearing short bristles on shaft and club; shaft flavotestaceous; club light brown.

Legs. Flavotestaceous. Fore coxa with short bristles on apical one-half of mesal surface; posterior surface and basal one-half of mesal surface bare; remainder densely clothed in long brown bristles. Mid coxa with a clump of moderately long to long bristles at lateral apex, otherwise bare. Hind coxa with a posterolateral band of mostly long bristles, otherwise bare. Femora with ventral surfaces bearing long bristles, remainder densely clothed in moderately long bristles. Tibiae and tarsi with a dense covering of bristles about as long as diameter of article bearing them; tibial and tarsal spines on fore legs as long as diameter of article bearing them, longer and stronger on mid and hind legs.

Wing. Length, 5.7 to 7.2 mm (mean, 6.3 mm). Venation as in Fig. 63a. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein slightly shorter than cross-vein. Basal curve of R_4 smooth. Basal portion of R_s forming an obtuse angle with R_1. Base of M_{1+2} about ⅓ as long as M_1.

Abdomen. Tergite 1 brown, with all margins flavotestaceous; tergite 2 dark brown with anterior one-third and margins flavotestaceous; tergites 3 and 4 dark brown, with anterior one-fifth and lateral margins testaceous; tergites 5 to 7 dark brown, with anterior one-quarter and lateral margins flavotestaceous. Sternites flavotestaceous, 6 and 7 with a small brown discolored area posteriorly. Abdominal setae moderately long to long, brown. Segment 8 small, flavotestaceous, ¼ as long as segment 7, bearing bristles on apical one-half.

Genitalia (Fig. 1). Sternite 9 (b) large, 1½ times as long as basistylus; attached at its base to basistylus; apical margin bifurcate, with lobes pointed; lateral margins straight, parallel. Basistylus (b, c, d) short, conical, open mesally, not fused ventrally, bearing short to moderately long brown bristles laterally and ventrally; dorsomesal margins produced mesoventrally, then apically, to form a large dorsal aedoeagal plate (d). A small, apically emarginate ventral aedoeagal plate present under apical margin of dorsal plate. Dististylus (b, c, d) cylindrical, curved, as long as basistylus, clothed basally in moderately long brown bristles; apex blunt, complex, heavily sclerotized, cap-like, bearing a fringe of indistinct teeth. Tergite 9 (a, c, e) transverse, apically emarginate, clothed in short to moderately long brown setae. Cercus (a, c, e) slender, twice as long as tergite 9, clothed in short fine pale setae. Sternite 10 (e) represented by a strip of strong membrane between cercal bases and basal and ventral to anal lobe.

Female. As described for male, except as follows: vertex and flagellar segments 4 to 14 dark brown; remainder of head testaceous. Pronotum and humeri testaceous. Mesonotum testaceous, with distinct median and lateral maculae; median macula extending from anterior mesonotal margin to posterior quarter; lateral macula extending from anterior quarter to posterior margin. Scutellum testaceous. Postnotum testaceous, with setose portion dark brown. Pleurites dark testaceous. Coxae dark brown. Femora brown, with ventral surfaces testaceous. Tibiae, tarsi, and abdominal segments 1 to 8 dark brown. Genitalia as in Fig. 44, brown, clothed in short bristles. Cercus flavotestaceous; segment 2 ovoid, slightly less than ½ as long as segment 1.

TYPE SPECIMENS. L. Matile has indicated (pers. comm.) that there are three syntypes in the Paris Museum; I have not been able to examine these, but one of them should be designated as lectotype.

MATERIAL EXAMINED. **Austria:** Winthem (WIEN), 1♂. **Belgium:** Namur Province (locality illegible) 25.vi.1897, Wourdiger (AMST), 1♀. **Czechoslovakia:** Slovensko Prov., Slov. or Snin., Kamen Vihorist, 25.vi.1966, P. Lastovka (CNC), 1♂, 1♀. **Denmark:** Falster Is., Staeger (COPEN), 1♂, 1♀. Langeland Is., Bukke Skad, R. W. Schlick (COPEN), 1♂. Same data except 6.vii.1879, 1♂. Langeland Is., Malemer, Karloff, 16.vi.1875, R. W. Schlick (COPEN); 1♂. Langeland Is., R. W. Schlick (COPEN), 2♂♂. Lolland Is. (locality illegible) 22.vi.1873, R. W. Schlick (COPEN), 1♂. Staeger (COPEN), 10♂♂. **England:** Edge of Barton, South Devon, 6.vi.1937, F. W. Edwards (BMNH), 1♂. Bolton Woods, 13.v.1936, J. Wood (WP), 2♂♂. Hardwick Woods, near Goring Heath, Oxfordshire, 8.vii.1963, E. Burtt (BMNH), 2♂♂. Lathkill Dale, Derbyshire, 22.vi.1953, L. N. Kidd (WP), 1♂. Same data, except 19.vi.1963, 2♂♂. Letchworth, Hertfordshire, rotten elm branch on ground, vi.1918, F. W. Edwards (BMNH), 1♂, 1♀. Monnour [?], 27.v.1912, J. Wood (BMNH), 1♀. New Forest, vi.1923, C. G. Lamb (WP), 1♂. New Forest, 29.vi.1911, F. C. Adams (MUS.PAR.), 1♂. Same data, except 23.vii.1910 (USNM), 1♂. Porthcawl, JWY 20.v.1903 (WP), 1♂. **Finland:** Karislojo, R. Frey (HELS), 1♂. **France:** Val d'Or, La Miniere (SO), ex larva, 9.v.1968, Couturier (MUS.PAR.), 1♂, 1♀. **Germany:** Berlin, Finkenkrug, 29.vi.1923, Oldenberg (DEI), 1♂. Berlin, O., 25.vi.1899 (DEI), 1♂. Berlin, Wannsee, 21.vi.1905, Lichtward (DEI), 1♂. Berlin, 6.vi.1922 (DEI), 1♂. Dachau, 7.vii.1930, E. Engel (BAYER), 1♂. Gernsbach, viii.1898, Oldenberg (DEI), 1♂. Reinerz, 19.vii.1916 (DEI), 1♂. Same data, except 4.viii.1916, 1♀. H. Loew (HUMB), 4♂♂. "Schwab. Grund." (DEI), 1♂. (Locality illegible) 2.ii.1905, Oldenberg (DEI), 1♂. (Locality illegible) 24.vi.1912 (DEI), 1♀. Ostholstein, vi.1906, Wustnei (COPEN), 3♂♂, 1♀. **Holland:** Amsterdam, 7.vii.1919, de Meijere (AMST), 1♂. Same data, except 5.vi.1921, 1♂. Linschoten, 3.vi.1920, de Meijere (AMST), 2♂♂. **Italy:** Pinzolo, vii.1899, Oldenberg (DEI), 1♂. **USSR:** Libau, Curland [now Liepaja, Lithuanian S.S.R.], C. Siebert (DEI), 2♂♂.

BIOLOGY. I have not seen the immature instars of this species. Keilin (1919) has given a detailed description of the larva and a brief one (based on a cast skin) of the pupa. He quotes Edwards as saying he reared them from rotting elm wood.

Symmerus (Symmerus) nobilis Lackschewitz

Figs. 2, 63b, 69

Plesiastina apicalis; Tarwid, 1933: 376 (*nec* Winnertz, 1852: 56).
Symmerus nobilis Lackschewitz, 1937: 1.
Symmerus apicalis (Winnertz); Séguy, 1940: 21.

DIAGNOSIS. Males of this species may be distinguished from those of *S.* (*S.*) *annulatus* by the setae of the cercus, by the structure of the genitalia, and by the mesonotal color, as noted in the diagnosis of *S. annulatus.*

DESCRIPTION. **Male.** *Head.* Vertex dark brown. Postvertical and postoccipital regions pale brown, clothed in short yellow setae. Frons flavous. Postfrons with short pale setae. Clypeus testaceous, with short yellow bristles. Labellum and palpus brown, clothed in minute yellow setae. Scape and pedicel testaceous, each with an apical ring of minute to short yellow bristles. Flagellar segments 1 to 14 dark greyish-brown; segment 15 minute, pale, spherical.

Thorax. Pronotum and humerus flavous, sparsely clothed in moderately long yellow bristles. Mesonotum flavous, with three fused longitudinal dark brown vittae; median vitta extending from anterior to posterior margin; lateral vitta reaching lateral margin and extending from anterior one-quarter to posterior margin; posterolateral corners flavous. Mesonotal setae yellow, short on disc to moderately long near lateral and posterior margins. Scutellum flavous, with short to moderately long setae. Postnotum flavous, bearing pale bristles on posterior one-half. Pleurites flavous. Halter with basal two-thirds of shaft flavous, otherwise dark brown.

Legs. Flavotestaceous, with mid and hind tarsus brown. Setae yellow. Fore coxa setose, the setae moderately long on anterior surface, short on posterior surface. Apical one-third of mid coxa with short to moderately long setae, otherwise bare. Hind coxa with a posterolateral fringe of moderately long to long bristles and with short to moderately long bristles near apex. Femora clothed in short bristles, and with moderately long ones ventrally. Tibial combs weak, the spines slightly shorter than tibial diameter. Tibiae with an apical ring of short to moderately long black spines.

Wing. Length, 6.3 to 6.8 mm (mean, 6.4 mm; *n*, 3). Venation as in Fig. 63b. Significant features of venation as follows: basal portion of R_s not interrupted, bent apically at midlength to form an obtuse angle. Basal portion of M_{1+2} almost ½ as long as M_1; M_1 almost obliterated at base.

Abdomen. Tergites with a narrow, white apical band. Except for this band, tergites 1 and 3 uniformly dark brown. Tergite 2 dark brown with flavous anterolateral corners. Remaining tergites dark brown, with a diffuse apical yellow band. Sternites 1 and 2 flavous; sternite 3 flavous, diffusely brown laterally; sternite 4 brown, median portion of basal one-half flavous; sternites 5 and 6 dark brown, median portion of basal margin flavous; sternite 7 dark flavous. Tergite 8 brown; sternite 8 flavous.

Genitalia (Fig. 2). Sternite 9 (b) large, clothed in minute setae, 1.5 times as long as basistylus; apical margin bifurcate, apices of lobes directed mesally, pointed; lateral margins divergent. Basistylus (b, c, d,) cylindroconical, open mesally, not fused ventrally; dorsomesal margins produced mesally into slender arms connected mesally by a weakly sclerotized plate (d). A small apically-rounded ventral aedoeagal plate present under apical margin of the dorsal plate. Dististylus (b, c, d) cylindrical, slightly longer than basistylus; apex pointed, with a nearly membranous cap-like structure bearing a sclerotized striate rim. Tergite 9 (a, c, e) broad, slightly emarginate apically. Cercus (a, c, e) slender, slightly more than twice as long as tergite 9, clothed in moderately long, stiff brown setae dorsally; apical one-half of ventral side bearing a dense tuft of slender, anteromesally-directed hairs. Sternite 10 (e) represented by a large, lightly sclerotized plate ventral to tergite 9 and basal to the cerci. Genitalia completely dark brown, except for the cerci, which are flavous.

Female. Probably identical with that of *S. annulatus.* There is a female specimen of *Symmerus* in poor condition in the Copenhagen Museum which has the same collection data as a male specimen of *S. nobilis.* Since these are the only *Symmerus* specimens from this locality, I am tentatively assuming that this is the female of *S. nobilis.* I cannot distinguish it from female *S. annulatus.*

The appearance of this specimen is as described for the male of *S. nobilis,* but (in addition to genitalic differences) differing as follows: Head brown, setae yellowish brown; thoracic setae brown; pleurites brown to dark brown; postnotum flavous laterally to dark brown medially; legs pale brown, with yellowish-brown setae; abdominal tergites dark brown; abdominal sternites brown; abdominal setae yellowish brown; genitalia pale brown, except for cerci which are flavous.[4]

DISTRIBUTION. Eastern Europe.

TYPE SPECIMEN. U.S.S.R.: Lettland, Embute; 25.vi.1925; P. Lackschewitz; (?RIGA); 1 ♂. I have not examined this specimen.

MATERIAL EXAMINED. **Germany:** Ostholstein, vi.1906, Wustnei (COPEN), 1 ♂, 1 ♀ (?). (Locality not given) H. Loew (HUMB), 2 ♂ ♂. (Locality indecipherable) No. 8605 (HUMB), 1 ♂.

Symmerus (Symmerus) balticus Edwards

Figs. 3, 69

Symmerus balticus Edwards, 1921*b*: 435.

DIAGNOSIS. The single male specimen known of this species differs from males of living European species of *Symmerus s. str.* in the color of the abdomen and the structure of the genitalia.

[4]The apical 11 segments of the antennae, the wings, and the femora, tibiae, and tarsi of the mid and hind legs are missing from this specimen.

DESCRIPTION. **Male.** *Head.* Testaceous, with ocelli enclosed in a distinct black triangle. Lateral ocellus 4 ommatidial diameters in length. Lateral ocellus very close to eye margin, separated from it by ⅛ its own diameter. Dorsal portion of head clothed in short to moderately long setae. Scape and pedicel testaceous, with minute to short setae on dorsal apex. Flagellum dark brown, ventrally slightly serrate, laterally compressed. Last segment dark, ovoid, ⅓ as long as preceding segment.

Thorax. Apparently unicolorous, but with traces of what may have been a pair of faint lateral mesonotal vittae. Pronotum and humerus with short sparse setae. Mesonotum clothed in short setae, with moderately long ones near lateral and posterior margins. Scutellum with a posterodorsal fringe of moderately long to long setae. Propleuron and prosternum with a fringe of short to moderately long setae.

Legs. Mid leg with apex of tibia, and tarsi, brown; remainder of legs testaceous. Anterior and lateral surfaces of fore coxa, and apical quarter of anterior surface of mid coxa clothed in short setae. Hind coxa with posterolateral setae. Femora densely clothed in minute setulae, with a sparse ventral fringe of long setae. Tibial spines less than 1 tibial diameter in length.

Wing. Sc with strong basal portion distal to humeral cross-vein 1.5 times as long as cross-vein. Basal portions of R_s, R_4, and M_1 smoothly curved. Macrotrichia dense, except in base of basal cell.

Abdomen. Abdominal setae short. Narrow posterior white marginal band present on each of segments 1 to 7. Segments 6 and 7 dark brown.

Genitalia (Fig. 3). Sternite 9 (b) large, 1.5 times basistylus in length, with a v-shaped notch at apex. Basistylus cylindroconical, not fused to its antimere or to sternite 9. Dististylus as long as basistylus, cylindrical, laterally compressed, with apex bearing a cap-like sclerite. Fringe of stiff setae apparently absent. Tergite 9 (a) not fused to basistylus, approximately ¾ as long as basistylus, with apical margin shallowly emarginate. Cercus (a) slender, tapering, 2.3 times the basistylus in length.

MATERIAL EXAMINED. *Holotype male.* Amber, East Prussia, [In 1879], 92-74, 405, Richard Klebs (BMNH).

Symmerus (Symmerus) lautus (Loew)

Figs. 4, 63c, 69

Plesiastina lauta Loew, 1869: 132; Osten-Sacken, 1878: 8; Smith, 1890: 361.

Plesiastina tristis Loew, 1869: 131; Osten-Sacken, 1878: 8; Kertesz, 1902: 40 (**new synonymy**).

Symmerus lauta; Johannsen, 1909: 12; 1910: 231.

Symmerus tristis; Johannsen, 1909: 12, 1910: 231; Johnson, 1925: 76; Shaw, 1941: 23; Fisher, 1941: 279; Laffoon, 1965: 199.

Symmerus annulata; Johnson, 1925: 76 (in part) (*nec* Meigen, 1830: 294) (synonymy by Fisher, 1941: 279).

Symmerus lautus; Leonard, 1928: 740; Fisher, 1941: 279; Laffoon, 1965: 199.

Symmerus diluta Fisher, 1938: 196 (**new synonymy**).

Symmerus dilutus; Fisher, 1941: 280; Laffoon, 1965: 199.

DIAGNOSIS. Males and females of *Symmerus (S.) lautus* may be distinguished from those of all the other North American species of *Symmerus s. lat.* by the presence of bristles on the postnotum and males by the shape of the dististylus which is subcylindrical, flattened, and curved dorsally. The short sternite 9 will distinguish males of *S. (S.) lautus* (Fig. 4b) from those of *S.* (*S.*) *annulatus* (Fig. 1b) and *S.* (*S.*) *nobilis* (Fig. 2b).

DESCRIPTION. **Male.** *Head.* Vertex brown, with each ocellus distinctly ringed with black, the rings fusing between ocelli. Postvertical region, postocular region, and gena flavotestaceous, clothed in short brownish-yellow setae. Dorsal arm of eye reaching to level of midway between lateral and median ocellus. Frons flavotestaceous; prefrons bare; postfrons with a few short black bristles between antennae. Clypeus testaceous, densely clothed in short to moderately long brownish-yellow bristles. Scape and pedicel flavotestaceous, each with an apical ring of short brownish-yellow bristles. Flagellar segment 1 flavotestaceous. Segments 2 to 6 grading from flavotestaceous to dark brown. Segments 9 to 14 dark brown. Segment 15 flavotestaceous, ⅓ as long as preceding segment.

Thorax. Pronotum and humerus flavous, clothed in short to long brown bristles. Mesonotum flavous, with a pair of lateral dark brown maculae extending from the anterior quarter almost to posterior margin. Median macula usually absent, but frequently present, ranging from light to dark brown, divided by a pale median line or entire. Mesonotal bristles brown, short to moderately long on disc, moderately long to long on lateral and posterior margins. Scutellum testaceous, with moderately long to long brown bristles. Postnotum flavotestaceous, posterior one-half bearing short brown setae. Propleuron flavotestaceous, clothed in moderately long to long brown bristles. Remaining pleurites flavotestaceous.

Legs. Flavotestaceous, bristles brown. Anterior surface of fore coxa densely clothed in short to long brown bristles; posterior surface bare. Mid coxa with apical two-thirds of anterior surface and apical one-third of lateral surface clothed in short to moderately long bristles. Hind coxa with posterolateral band of long bristles. Femora clothed in short bristles, with moderately long ones ventrally. Fore tibial spines shorter than the tibial diameter. Mid and hind tibial bristles slightly shorter to slightly longer than corresponding tibial diameters. Tibiae and tarsal segments each with an apical ring of black bristles.

Wing. Length, 4.2 to 5.4 mm (mean, 4.9 mm). Venation as in Fig. 63c. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein almost twice as long as cross-vein. Basal curve of R_4 smooth. Basal portion of R_5 forming a smooth curve, meeting R_1 at right angles. Ratio of length of M_1 to length of base of M_{1+2} 0.61 to 1.35 (mean, 0.822; *s*, 0.136).

Abdomen. Abdominal setae short to long, brown. Tergite 1 entirely flavous to pale brown with all margins and median line flavotestaceous; tergites 2 and 3 dark brown with all margins flavotestaceous; tergites 4 and 5 dark brown with anterior and posterior margins flavotestaceous; tergite 6 dark brown; tergite 7 dark brown with lateral and posterior margins flavotestaceous. Sternites 1 to 5 and 7 flavous; sternite 6 flavous, sometimes with diffuse brown markings. Segment 8 flavous.

Genitalia (Fig. 4). Sternite 9 (b, c) flavous, quadrate, shallowly emarginate apically, bearing short to moderately long brown setae on apical one-half. Basistylus (b, c, d) flavous, bearing short to long brown bristles on lateral surface. Middle one-third of dorsomesal margin produced mesoventrally and then apically to form a broad dorsolateral aedoegal plate (d), the latter bearing a flat dorsal lobe at its base. Ventral aedoeagal plate small, broad, with a long basal apodeme. Dististylus (a, b, c, d) flavous, ⅔ as long as basistylus, subcylindrical, laterally compressed, slightly curved towards dorsum, clothed in moderately long brownish-yellow setae. Apex of dististylus bearing a fringe of stiff black bristles. Tergite 9 (a, c, e) as wide as long, apical margin forming a shallow "v." Cercus (a, c, e) flavous, broad, less than 1.5 times as long as tergite 9; dorsal surface clothed in short brown setae; ventral surface clothed in moderately long slender pale brownish-yellow setae. Sternite 10 (e) membranous, bare.

Female. Chaetotaxy and venation as described for male. Size, color, and sexual characters differing from male as follows: wing length, 5.6 to 6.4 mm (mean, 6.0 mm). Postfrons and labellum brown. Remainder of head dark brown. Scape and pedicel brown. Flagellar segments 1 to 14 dark brown; segment 15 testaceous, slightly less than ⅓ as long as preceding segment. Prothorax dark brown; humerus flavous; remaining thoracic sclerites dark brown. Trochanters testaceous; remainder of legs dark brown. Abdomen dark brown. Cercus flavous, remainder of genitalia brown; second cercal segment wider than long.

REMARKS. The descriptions of *Plesiastina tristis* Loew and *P. lauta* Loew were published simultaneously. The similarity in chaetotaxy of these two species, the fact that *tristis* is known only from females and *lauta* only from males, and the occurrence of a specimen of each together *in copula* in the material before me lead me to consider these to be the same species. The darkness of the female, on which the name *tristis* is based, is not unique to this species, so as first reviser I have selected *Symmerus lautus* (Loew) as the species name, and placed *S. tristis* (Loew) in synonymy with it.

I have examined the holotype of *S. dilutus* Fisher. Unfortunately the slide of the genitalia prepared by Fisher has been lost (W. W. Moss, pers. comm.). On the basis of chaetotaxy, venation, and color of the holotype, I consider this to be merely a specimen of *S. lautus* (Loew). The length of the stem of the M fork (given as a diagnostic character by Fisher (1938)) is highly variable in this species.

Fisher's (1938, 1941) figures of the genitalia of the two species, in my opinion, do not show any significant differences.

DISTRIBUTION. Eastern North America, from southern Quebec to North Carolina, east of Iowa.

TYPE SPECIMENS. The holotypes of *S. lautus* and *S. tristis* are in the Museum of Comparative Zoology, Harvard University (Nos. 1237, 1238). The holotype of *Symmerus dilutus* is in the Academy of Natural Sciences, Philadelphia.

MATERIAL EXAMINED. *Holotype* (MCZ No. 1237). **Indiana:** Brown Co., 25.vi.1961, J. C. Schaffner (ISU), 2♂♂. Turkey Run, 20.viii.1918, J. M. Aldrich (USNM), 1♂. **Iowa:** Backbone St. Pk., 1.vii.1950, Hicks and Slater (ISU), 1♂. Clayton Co., Pike's Peak St. Pk., 4.vii.1949, J. L. Laffoon (ISU), 1♂. Linn Co., Palisades-Kepler St. Pk., 8.vii.1950, Laffoon, Slater, Hicks (ISU), 1♂. McGregor, 1.vii.1950, Hicks and Slater (ISU), 2♂♂. **Maryland:** Glen Echo, 3.vi.1898, R. P. Currie (USNM), 1♂. Plummer's Id., 23.vi.1907, W. L. McAtee (USNM), 1♂. Near Plummer's Id., 30.vi.1914, R. C. Shannon (USNM), 1♂. **New York:** East Aurora, 11.vi.1911, M. C. Van Duzee (CAS), 1♀. Grand Is., 18.viii.1917, M. C. Van Duzee (CAS), 1♂. Same data, except 7.vii.1918, 1♂. Ithaca, vii.1915, O. A. Johannsen (CORN), 1♀. Ithaca, 23.vi.1935 (CORN), 1♀. Irving, 30.vi.1918, M. C. Van Duzee (CAS), 1♂, 1♀. Little Valley, 30.vi.1912, M. C. Van Duzee (CAS), 1♂. Same data, except 24.vi.1929, 1♀. Niagara Falls, 22.vi (USNM), 1♂. N. Evan. 4.vii.1912, M. C. Van Duzee (CAS), 1♂. **North Carolina:** Macon Co., 1 mi S. Highlands, Clear Creek, 2000′; 35°1.5′ N., 83°11.5′ W., 2.vii.1958, J. L. Laffoon (ISU), 1♂. **Ohio:** Columbus, 17.vi.1947, H. E. Milliron (MINN), 1♂. **Ontario:** Kearney, 5.vii.1909, M. C. Van Duzee (CAS), 1♂. Same data, except 7.vii.1909, 1♂. Maynooth, 22.vi.1953, J. F. McAlpine (CNC), 1♂. Ottawa, 20.vi.1957, J. G. Chillcott (CNC), 1♂, 1♀. 6 mi West of Richmond, 22.vi.1971, Malaise trap, J. E. H. Martin (CNC), 3♂♂. Same data, except 27.vi.1971, 3♂♂, 3♀♀. Same data, except 4.vii.1971, 2♂♂, 1♀. Ridgeway, 22.vi.1919, M. C. Van Duzee (CAS), 1♂. 2 mi south of South March, 9.viii.1969, Malaise trap, D. D. Munroe (CNC), 1♂. Stittsville, 3.vii.1963, Malaise trap (CNC), 1♂. **Quebec:** Hull, 12.vii.1965, Malaise trap (CNC), 1♂. Same data, except 23.vii.1965, 3♂♂. Same data, except 29.vii.1965, 2♂♂. Joliette, 12.vii, C. W. Johnson (MCZ), 1♀. Knowlton Ldg., 17.vii.1968, J. R. Vockeroth (CNC), 1♂. Old Chelsea, 9.viii.1961, J. R. Vockeroth (CNC), 1♂. Same data, except 25.vi.1963, J. G. Chillcott, 2♂♂. Old Chelsea, Summit King Mtn., 1150′, various dates 14.vi–9.viii, 1961–65, Malaise trap, J. R. Vockeroth (CNC), 7♂♂. Old Chelsea, King Mtn., 1000′, various dates, 28.vi–13.viii.1969, Malaise trap, D. D. Munroe (CNC), 64♂♂. Owl Head Mtn., 21.viii.1936, G. E. Shewell (CNC), 1♀. Ste. Anne de Bellevue, Morgan Arboretum, 23.vi.1969, A. Earnshaw (CNC), 1♂, 1♀ (*in copula*). **Tennessee:** Great Smoky Mtn. Nat. Pk. (NE.), 4000′, Hemlock Forest, 13.vii.1947, R. H. Whittaker (ISU), 1♂. **West Virginia:** Fairmont, 22.vi.1908 (ANSP type No. 6544, *Symmerus diluta* Fisher), 1♂. No further data: holotype *S. tristis* (Loew) (MCZ No. 1238).

Symmerus (Symmerus) antennalis Okada

Figs. 5, 63d, 69

Symmerus antennalis Okada, 1936: 58; 1939: 288; Sasakawa, 1963: 18; Saigusa, 1966: 800.

DIAGNOSIS. Specimens of both sexes of *S. (S.) antennalis* are easily distinguished from those of the other described species of *Symmerus s. lat.* by the fusiform antennae. Males may be distinguished from those of other species by the lateral lobes on sternite 9 (Fig. 5b).

DESCRIPTION. **Male.** *Head.* Vertex dark brown, black around lateral ocellus. Median ocellus distinctly anterior to lateral ones, the posterior margin of the median ocellus in line with the anterior margins of the lateral ocelli. Postvertical and occipital regions dark brown, fading to flavous ventrally. Gena flavous. Vertex, postvertical and occipital regions clothed in short hairs. Prefrons flavous, bare. Postfrons testaceous, with short pale bristles. Clypeus flavous, densely clothed in moderately long to long bristles. Labellum and palpus flavous, with minute black bristles. Scape and pedicel testaceous, each with an apical ring of short to moderately long bristles. Flagellum compact, flagellar segments 2 to 14 testaceous, almost cylindrical, pilose; segment 15 flavous, ovoid, ⅓ as long as preceding segment.

Thorax. Pronotum and humerus flavous, with long strong dark bristles. Mesonotum dark brown, anterolateral margin flavous. Mesonotal bristles short medially, long near latero-anterior, lateral, and posterior margins. Scutellum testaceous, with an irregular transverse posterodorsal row of long slender bristles. Postnotum brown with a large flavous mediobasal macula; maculate portion bearing moderately long straight yellow bristles. Pleurotergite dark brown. Anepisternite and katepisternite with their adjoining margins diffusely brown, otherwise flavotestaceous. Remaining pleurites flavotestaceous. Halter flavous, with apical two-thirds of stalk testaceous.

Legs. Flavous. Fore coxa clothed in long slender brownish-yellow bristles, posterior surface bare. Mid coxa bare except near apex; apical bristles long on anterior surface, short on posterior surface. Hind coxa with an irregular posterolateral row of long bristles and with short to long bristles near apex. Femora clothed in short bristles, with moderately long ones ventrally. Tibal and tarsal spines very weak, shorter than diameter of article bearing them.

Wing. Length, 3.8 to 5.0 mm (mean, 4.5 mm; *n*, 8). Venation as in Fig. 63d. Sc with strong basal portion short, portion distal to humeral cross-vein shorter than cross-vein. R_4 forming a right angle with R_5, curving sharply towards apex of wing. Basal portion of R_5 forming right angles with R_1 and r-m.

Abdomen. Clothed in moderate to long brownish-yellow bristles. Tergites dark brown, tergites 3 and 4 with apical quarter flavous. Segment 8 flavous.

Genitalia (Fig. 5). Sternite 9 (b) ¾ as long as basistylus, with apicolateral margins produced to form a pair of slender lobes, which reach level of apex of basistylus. Basistylus (b, c, d) cylindroconical, slightly compressed laterally; dorsomesal margin of basistylus produced to form a simple truncate dorsal aedoeagal plate (d), not fused to its antimere. Ventral plate of aedoeagus transverse, scoop-like, with a slender basal rod. Dististylus (b, c, d) ¾ as long as basistylus, cylindrical, curved, with an apical tuft of stiff setae. Tergite 9 (a, c, e) wider than long, ¾ as long as basistylus. Cercus (a, c, e) twice as long as tergite 9, truncate, with mesal base (e) produced to form a narrow triangular basal lobe extending to midlength of tergite 9; mesal surface of cercus clothed in short, fine setae. Sternite 10 and anal lobe indistinct.

Female. As described for male, except for color, and for structure of genitalia. Body color as described for male, except as follows: Ventral portion of head, including mouthparts, brown; antenna brown, darker towards apex. Thorax dark brown, except humerus and membrane between sclerites. Fore and hind coxa, and all femora, brown. Abdomen, except intersegmental membrane and genitalia, dark brown. Segment 8 pale brown. Cerci flavous; segment 2 one-fifth as long as segment 1. Wing length 4.0 to 5.3 mm (mean, 4.7 mm; *n*, 2).

TYPE SPECIMENS. *Holotype male.* JAPAN: **Hokkaido:** Sapporo, 30.vi. 1935, I. Okada (in Hokkaido University, Sapporo).

Allotype female. Same data as holotype.

Paratypes. Same data as holotype, except vi.1934, 1 ♂; 25.vi.1935, 5 ♂ ♂; 30.vi.1935, 9 ♂ ♂, 1 ♀.

MATERIAL EXAMINED. JAPAN: **Hokkaido:** Same data as paratype, 25.vi.1935 (possible paratype) (BMNH), 1 ♂. Aizonkei, Daisetsuzan, 17.vii.1962, T. Saigusa (KYUSHU), 1 ♀. **Honshu:** Daisen, Tottori, 12.vi.1963, T. Saigusa (KYUSHU), 1 ♂. Mt. Daisen, 12.vi. 1963, T. Saigusa (KYUSHU), 2 ♂ ♂. Shosenkyo, Yamanaski, 6.vi.1962, T. Saigusa (KYUSHU), 1 ♂. **Kyushu:** Fukuoka, Inunakiyama, 25.v.1961, T. Saigusa (KYUSHU), 2 ♂ ♂. Kyusuikei, Mt. Kujusan, 28.v.1967, T. Saigusa (KYUSHU), 1 ♂. Oita, Kujusan, Kushuikei, 28.v.1961, T. Saigusa (KYUSHU), 2 ♂ ♂, 1 ♀. (?) Katazawatoge, Senjodake, 27.vii.1961, T. Saigusa (KYUSHU), 2 ♂ ♂.

Psilosymmerus[5] Munroe new subgenus

Type-species: *Symmerus coqulus* Garrett.

DESCRIPTION. Antenna laterally compressed, slightly serrate to pectinate ventrally; postnotum bare; basistylus cylindroconical or open mesally; dististylus heavily sclerotized, with a ventrobasal expansion creating a boot-shaped appearance; mesal margin of dististylus with a narrow striate or setose band inserted in membrane and continuous with the sclerotized portion only at ends.

[5] ψιλος (= bald) + συμ (= combined) + μερις (= part); masculine.

Key to Species of *Psilosymmerus*

1. Abdominal tergites with distinct yellow apical or lateral margins 2
1'. Abdominal tergites brown to brownish-black, without yellow apical or lateral margins 4
2.(1) Clypeus, labellum, and palpus brown; ventral plate of aedoeagus broad, ending in a short blunt hook (Fig. 8b) (EASTERN NORTH AMERICA) .... *uncatus* Munroe n. sp.
2'. Clypeus, labellum, and palpus flavous; ventral plate of aedoeagus not forming a hook 3
3.(2') Cercus 2.5 times as long as tergite 9; aedoeagus projecting beyond apical margin of basistylus; ventral aedoeagal plate tapering (Fig. 7b) (EASTERN NORTH AMERICA) .... *vockerothi* Munroe n. sp.
3'. Cercus 1.5 times as long as tergite 9; aedoeagus not projecting beyond apical margin of basistylus; ventral aedoeagal plate truncate (Fig. 6b) (WESTERN NORTH AMERICA) .... *coqulus* Garrett
4.(1') Antenna ventrally pectinate; ventral surface of antennal segments 3 to 12 greatly produced; basal portion of dististylus with a slender ventral lobe (Fig. 10c) (TAIWAN) .... *pectinatus* Saigusa
4'. Antennae slightly or distinctly serrate, but not pectinate; basal portion of dististylus without a lobe 5
5.(4') Sternite 9 tapering from base, divided at apex (Fig. 11b); cercus 2.0 times as long as tergite 9 (NEPAL) .... *nepalensis* Munroe n. sp.
5'. Sternite 9 tapering from midlength with apex entire; cercus 2.3 times as long as tergite 9 (JAPAN) .... *brevicornis* Okada

Symmerus (Psilosymmerus) coqulus Garrett

Figs. 6, 63e, 66, 67, 69

Symmerus coqula Garrett, 1925: 12.

Symmerus coqulus; Fisher, 1941: 280; Laffoon, 1965: 199.

Symmerus annulatus; Cole and Lovett, 1921: 217; Cole, 1969: 117 (*nec* Meigen, 1830: 294).

Diagnosis. This species is similar to *S. (P.) vockerothi* Munroe n. sp. The adults may be distinguished from those of *S. (P.) vockerothi* by the larger size of the dististylus in the male, and the generally darker color of the male. The pupa of *S. (P.) coqulus* has 4 mesonotal teeth per row, whereas the pupa of *S. (P.) vockerothi* usually has 3. The lateral pronotal spine is larger, and the mesal pronotal spine is smaller in the pupa of *S. (P.) coqulus.* The larva of *S. (P.) coqulus* is indistinguishable from that of *S. (P.) vockerothi*, and from that of *S. (S.) annulatus* as figured by Keilin (1919).

Description. ADULT. **Male.** *Head.* Vertex black, fading to testaceous behind eyes and ocelli. Ocelli almost forming a straight line, the median one slightly anterior to the others. Dorsal arm of eye reaching level of midway between lateral and median ocelli, or beyond. Postvertical and occipital regions bearing short black bristles. Postorbital bristles absent. Frons pale testaceous; postfrons with a few minute black bristles. Clypeus, labellum, and palpus light testaceous, clothed in short black bristles. Scape and pedicel testaceous; dorsolateral surface bearing short bristles. Flagellum slightly but distinctly serrate ventrally; basal segments testaceous, grading to black apically, usually by the seventh segment; last segment minute, spherical, testaceous.

Thorax. Prothorax and humerus testaceous, bearing dark slender bristles. Mesonotum testaceous, usually with 3 longitudinal, dark brown vittae, the median one often with a pale center line; mesonotum occasionally without a median vitta, rarely with no vittae. Mesonotal bristles short, fine, black, longer towards posterior and lateral margins. Postnotum bare; testaceous, usually with a large basal median brown macula, often without; rarely with anterolateral corners brown. Anepisternum irregularly brown and testaceous. Katepisternum and pleurotergite testaceous, usually with dark brown marks ventrally. Epimeron testaceous. Postepisternum usually greyish yellow or brown, sometimes flavotestaceous. Halter flavotestaceous.

Legs. Coxae testaceous, hind coxa usually with a grey or brown anterolateral macula. Anterior and posterior surfaces of fore coxa clothed in short fine black bristles, longer distally. Distal one-third of mid coxa with short, fine dark bristles, longer laterally, absent posteriorly. Hind coxa with a posterolateral row of fine, dark-colored bristles, widening to form a clump of bristles on distal one-third of lateral surface. Femora testaceous, clothed in short dark setae, with longer ventral bristles. Tibiae testaceous, densely covered with minute black setulae. Fore tibia without distinct spines. Mid and hind tibia with black spines, shorter than the tibial diameter, forming weak combs. Spurs black. Fore tibia with 3 apical spines dorsally. Mid tibia bearing 4 apical spines. Hind tibia with a ring of short stiff black bristles at apex, of which four are spine-like. Tarsi testaceous, densely clothed in black setulae.

Wing. Length, 5.3 to 6.8 mm (mean, 6.2 mm). Venation as in Fig. 63e. Significant features of venation as follows: Sc with the portion distal to the humeral cross-vein slightly longer than the cross-vein. Basal curve of R_4 smooth. Basal portion of R_s curved, nearly forming a right angle with R_1 and r-m.

Abdomen. Tergite 1 dark brown, with a pale apical band; tergites 2 to 4 dark brown, with basal one-quarter to one-half, and lateral and apical margins, flavotestaceous. Tergites 5 and 6 dark brown, with a narrow pale apical band; lateral portions of anterior margin usually flavotestaceous; tergite 7 flavotestaceous, usually with median portion of anterior margin dark brown; occasionally entirely flavotestaceous; rarely entirely dark brown. Sternites 1 to 3 flavotestaceous, sometimes with anterior one-third brown; sternite 4 flavotestaceous, usually with medial portion of anterior margin dark brown; sternites 5 and 6 dark brown, with posterior one-third flavotestaceous; rarely entirely flavotestaceous; sternite 7 flavotestaceous, medial portion of anterior margin occasionally dark brown. Anterior one-half of tergite 8 brown; remainder of segment 8 flavotestaceous. Abdominal setae brown to black.

Genitalia (Fig. 6). Sternite 9 (b) small, tapering, distinct, apically slightly emarginate, dark brown, about ⅔ as long as basistyli and fused to them at its base. Basistylus (b, c, d) dark brown, large, with dorsal margins produced into mesal arms curved ventrally, and produced into a pair of dorsal aedoeagal plates (d). Aedoeagus with a rectangular ventral plate (b, c). Dististylus (a–d) greatly expanded apically, roughly conical, with a sclerotized mesal toothed flange. Stylus dark brown to black. Tergite 9 transverse, ⅔ as long as basistylus, flavotestaceous; lateral one-third dark brown. Cercus (a, e) long, slender, flavous; dorsal surface clothed in short setae; ventral surface densely clothed in slender pale setae, directed anteriorly on apex, posteriorly on base. Sternite 10 membranous.

Female. Chaetotaxy and venation as described for male. Wing length, 5.6 to 7.1 mm (mean, 6.4 mm). Frons, clypeus, labellum, and palpus brown to dark brown. Vertex with a distinct black diamond-shaped macula enclosing ocelli. Remainder of head dark brown. Scape, pedicel, and flagellar segments 1 and 2 dark brown; flagellar segments 3 and 4 grading from dark brown to black; segments 5 to 14 black; segment 15 minute, spherical, testaceous. Humerus testaceous; remainder of thorax dark brown. Legs brown to dark brown. Abdomen dark brown; tergites 1 to 4, 7 and sternites 2 and 7 with narrow pale apical bands. Genitalia, except cercus, irregularly dark brown and flavotestaceous; cercus flavous. Sternite 8 with a row of spines on apical margin.

PUPA (Fig. 66b, c). Length, including prothoracic spines, 10.4 to 12.7 mm (mean, 11.5 mm). Head brownish orange, free but appressed to ventral surface. Antenna, palpus, and sclerites of head distinct. Antenna closely appressed to body along anterior margin of wing, reaching just beyond fore coxa. Prothorax small, occupying one-third of anterior surface. Prothoracic spine large, as long as head. Mesal base of prothoracic spine bearing another spine about ⅓ as long as larger one. Mesal spine bearing a small mesal peg with an apical bristle. Lateral portion of prothorax with a lateral spine as large as mesal spine. Mesothorax large, convex, forming anterodorsal surface of pupa; anterior portion densely covered in small but distinct punctures; anteroventral margin bearing a transverse row of 4 small teeth. Wing slender, apex covering metathoracic leg ventrally, reaching middle of second abdominal segment. Dorsum of head, prothorax, and anterior portion of mesothorax (forming anterior surface of the pupa) heavily sclerotized. Metathorax small, transverse, less than ⅓ as long as mesothorax; anterolateral corner with 3 minute anteriorly-directed teeth. Legs lying ventrally between wings. Fore leg mesal, reaching anterior one-third of abdominal segment 3. Mid leg reaching posterior one-third of abdominal segment 3. Hind leg reaching anterior margin of abdominal segment 4. Abdominal segment 1 rather short, ⅔ the length of the mesonotum. Abdominal segments 2 to 7 gradually tapering, the posterior segments less heavily sclerotized. Spiracles distinct, borne at ventral margin of tergites. Pleural membranes distinct. Tergites 2 to 6 and sternites 5 to 7 each bearing a transverse row of minute, anteriorly-directed teeth on posterior one-third. Abdominal segment 8 small, ½ as long as segment 7, complete; spiracle somewhat dorsal to the lateral mid-point. Segment 9 distinct, posterior margin with a pair of double teeth dorsally, and a pair of ventral lobes. Segment 10 distinct, with a dorsolateral posteriorly-directed tooth on lateroposterior margin. Cercus represented by an apical lobe.

MATURE LARVA (Figs. 66a; 67). Length (specimens preserved in Kahle's fluid), 17.6 to 20.1 mm (mean, 19.1 mm; *n*, 5). Width of head capsule, 1.1 to 1.7 mm (mean, 1.4 mm; *n*, 11). Head capsule (Fig. 67a) heavily sclerotized, pale brown. Mouthparts dark brown. Frontal plate triangular anteriorly, narrow posteriorly, slightly widened near posterior margin, bearing 2 anterior setae. Epicranial plates meeting at level of anterior one-third of head ventrally, their ventral margins narrowly separated otherwise; each bearing 5 setae, 1 dorsolateral, 1 lateral, 2 ventrolateral, and 1 ventral (Fig. 67a). Antenna (Fig. 67b) with a large basal segment bearing 5 papillae apically, a bell-shaped one, a bi-articulated cylindrical one, a seta-like one, a smaller cylindrical one, and a minute cylindrical one. Labrum (Fig. 67a) transverse, apically emarginate, with a minute fringe of sensory organs on anterior margin; lateral margin with a sclerotized ventral supporting rod. Mandible (Fig. 67d) with 5 distinct mesal teeth. Maxilla (Fig. 67c) with inner portion (mala of Madwar, 1937) sclerotized and bearing a large seta. Palpus consisting of one sclerotized segment with several clusters of apical papillae. Basal membranous portion bearing a transverse chitinous strip with a sensory papillus. Apical margin of labium (Fig. 67c) irregular. Labial palpus consisting of a membranous lobe with 3 apical cylindrical papillae. Thoracic and first eight abdominal segments conspicuous, white, with scattered setae, intersegmental areas constricted (to give the body the appearance of a string of beads). First thoracic segment and abdominal segments 1 to 8 each bearing a circular spiracle. Prothoracic spiracle 0.066 mm in diameter, with a small posteroventral scar, and with a single minute seta lying 1.5 diameters anteroventral to it. Imaginal buds (visible as distinct white tissue under the integument of each thoracic segment) each with a clump of 3 setae. Abdominal spiracles 1 to 7, 0.033 mm in diameter, without external scars or setae. Eighth abdominal spiracle similar to others, but .050 mm in diameter. Thoracic segments and abdominal segments 1 to 7 swollen dorsally and ventrally, the swellings clothed in minute brown anteriorly-directed setulae. Segment 8 similar, but ventral swelling absent. Anus enclosed by an indistinct lightly sclerotized toothed ring.

EGG. Length, 0.58 to 0.63 mm (mean, 0.60 mm); width, 0.43 to 0.50 mm (mean, 0.46 mm). Ovoid, slightly flattened, closely covered in minute tubercles (approximately 1450/sq. mm). Yellowish brown to reddish brown, but obscured by a coating of rust-colored adhesive substance.

DISTRIBUTION. West coast of North America, from San Francisco to Alaska, east to Alberta, Idaho, and Montana.

TYPE SPECIMEN. *Holotype female.* Cranbrook, B.C., June, C. B. D. Garrett (CNC).

MATERIAL EXAMINED. *Holotype female.* **Alaska:** Palmer, 1.viii.1948, R. I. Sailer (USNM), 1♂. Seward, 26.vii.1921, J. M. Aldrich (USNM), 1♂. ***British Columbia:*** Cowichan Lake, 18.ix.1964, Malaise trap (CNC), 1♂. Same data, except various dates, 30.vi–10.viii.1965, 12♂♂. Same data, except various dates 17.vii–24.viii.1966, 7♂♂. Hixon, various dates, 29.vi–24.viii.1966, Malaise trap (CNC), 74♂♂, 3♀♀ Inverness, vii.1910, J. H. Keene (CNC), 1♂. Kitimat, 19.vii.1960, B. Heming (CNC), 1♂. Lac La Hache, 27.viii.1965, B. Heming (CNC), 1♂. Lake Brock, nr. Deroche, 26.vii.1953, W. R. Mason (CNC), 1♂. Lemon Creek, 117°16′ W., 40°30′ N. [this latitude is incorrect], 15.viii.1967, J. Shepard (CNC), 1♂. Mount Thornhill, nr. Terrace, 30.vii.1960, B. Heming (CNC), 1♂. Oliver, 2.vii.1965, Malaise trap (CNC), 1♂. 54 mi NE. of Terrace, nr. Woodcock, 25.vii. 1960, B. S. Heming (CNC), 1♂. **California:** Arcata, 15.ix, "woods" (CIS), 1♂. Lily Pond, Alpine Lake, Marin Co., "glade in redwood grove," 31.v.1969, Malaise trap, D. D. Munroe (CNC), 8♂♂. Same data, except various dates, 11.iv–20.vi.1970, 57♂♂, 5♀♀. Same data, except various dates, 10.v–25.v.1971, 18♂♂. Same data, except *ex* rotten *Lithocarpus densiflora* log, 17.ii–31.v.1971, 244 specimens (eggs, larvae, pupae, adults) (ANIC, BMNH, CAS, CIS, CNC, KYUSHU, MUS.PAR.). **Idaho:** Priest Lake, 1.viii.1916, A. L. Melander (USNM), 1♂. **Montana:** Yellow Bay, Lake Co., 16.vii.1964, C. L. Remington (PEAB), 1♂. **Oregon:** Corvallis, 16.ix.1917 (CIS), 4♂♂. Eagle Creek, 16.vi.1925, A. L. Melander (USNM), 1♂. Indian Ford, 6 mi W. Sisters, Deschute National Forest, 10.vii.1965, Malaise trap, E. G. Munroe (CNC), 1♂. Mount Hood, 3000′, 29.vii.1921, A. L. Melander (USNM), 1♂. **Washington:** Mount Constitution, 28.vii.1919 (USNM), 1♂. 7.6 mi W. of Pe Ell, Washington Hwy. 5, Pacific Co., 8.ix.1968, D. D. Munroe (CIS), 2♂♂. Poulsbo, 17.viii.1910 (USNM), 1♀. 23.2 mi S. of South Bend, U.S. 101, 8–11.ix.1968, Malaise trap, D. D. Munroe (CIS), 16♂♂. 22.8 mi S. of South Bend, U.S. 101, 7.ix.1968, D. D. Munroe (CIS), 1♂. Same data, except 8.ix.1968, 2♂♂.

REMARKS. ***Color variation.*** The foregoing description of the adults indicates that the males of *S. coqulus* show considerable variation in color. This variation occurs mainly in (1) the presence or absence of a dark brown macula on the postnotum; (2) the presence or absence of dark brown marks on the pleurites; (3) the number of mesonotal stripes; (4) the color of the hypopleuron; (5) the color of the coxae; (6) the presence or absence of brown in the anterolateral corners of the postnotum; and (7) to (16) the color of tergites 5, 6, and 7, and of sternites 1 to 7 respectively.

To characterize this variation more fully, I examined 172 specimens of *S. coqulus* and noted their condition with respect to these characters. The specimens consisted of 65 males from Hixon, B.C.; 18 males from Cowichan Lake, B.C.; 17 males from the state of Washington; and 65 males from Alpine Lake, Calif. Each character, except for the mesonotal stripes and the color of tergite 7, was scored 1 for the presence of brown (or absence of yellow), and 0 for the absence of brown (or presence of yellow). The mesonotal character was scored as follows: 0 for mesonotal stripes absent; 1 for lateral stripes present, 2 for lateral and a divided median stripe present, and 3 for lateral and undivided median stripes present. The color of tergite 7 was scored 0 for flavotestaceous, 1 for some brown present, 2 for entirely brown.

Thus each specimen could be assigned a total score which reflected its color, ranging from 0 for the lightest possible to 19 for the darkest possible.

An analysis of variance was performed as described by Steel and Torrie (1960, p. 112) (Appendix I). F was calculated to be 1.39 (tabulated F, 3.06 for 3 and 168 degrees of freedom; p, 0.05) which was not significant. Therefore, a Student's t was calculated between each pair of populations with the results shown in Table I. Statistics for these samples are given in Appendix I.

These results indicate that the Hixon, B.C., specimens are significantly different from the others. The Hixon specimens are, in fact, strikingly darker than the others, the highest scores occurring in this group.

I have decided against proposing subspecific taxa for these "populations" as it is not known whether these samples represent a true range of variation, or whether more samples would indicate that they form part of a cline.

Biology. Adults of *S. coqulus* occur in Marin County, California, from the middle of April to the end of June. Oviposition occurs throughout this period.

Table I. Values of Student's T between populations of *S. coqulus*

Cowichan Lake, B.C.	8.003***	–	–
Washington St.	7.337***	0.542	–
Lily Pond, Calif.	8.510***	0.923	0.390
	Hixon, B.C.	Cowichan Lake, B.C.	Washington St.

Thirty to 60 eggs are laid singly or in small groups in crevices in the bare wood of fallen logs of Tan Oak (*Lithocarpus densiflora*). The logs must be sufficiently rotted for the bark to have fallen off, but are usually too hard to be broken easily with the hands. Marin County undergoes a dry season from May until late October or early November (White 1965). This period is passed in the egg stage. The eggs at this time are dark brown, and are apparently completely dry. With the first rain of the season (late October to early November) the egg absorbs water and takes on a rather lustrous orange-red color. This transformation in appearance takes place in less than 1 minute after water is applied to the egg. The aestivation of the eggs appears to be facultative: eggs kept moist from the time of oviposition in the laboratory hatch in 15 days.

The larva bores through the bottom of the egg and enters the wood directly. The moist wood at this time is usually soft, but occasionally is hard. As the larva leaves the egg, the empty shell becomes filled with frass and takes on the dull appearance of aestivating eggs. The larva continues to develop throughout the wet season, during which time it produces frass-filled tunnels in the 2 to 4 cm of wood near the surface. The larva remains much closer to the surface if the wood is hard. When the larva is mature, usually in late April or early May (roughly coinciding with the onset of the dry season) the larva burrows parallel to the surface about 1 to 2 cm below it, and then perpendicularly until the tunnel reaches the surface. The larva then retreats to the horizontal portion of the tunnel, where pupation occurs. This is the only period during which the immature insect is exposed to the exterior (via the open end of the tunnel); the heavy sclerotization and spines on the anterior end of the pupa serve to block the tunnel and protect the pupa. The pupa wriggles to the surface when mature. The adult then emerges, leaving the cast skin hanging from the hole, held in position by the spinules on the abdomen. Emergence occurs between midnight and 9:00 A.M., and the adults have usually hardened by 9:00 A.M.

Mating will not occur while the adults are teneral, but will occur as soon as they have hardened. Mating occurs in the laboratory when a male, apparently by chance, comes within 1 cm of a female. He turns quickly towards her, grapples with her from above and curves his abdomen ventrally and anteriorly until copulation takes place. As soon as the pair are joined the male twists until the two are facing in opposite directions, right side up on the substrate. The male proceeds to rapidly drum upon the female's wings with his raised hind-legs. This continues intermittently for 1 to 4 minutes, until the female struggles and copulation is broken. Both individuals remain motionless for several minutes after copulation. The males live for 5 to 7 days, the females for only 3 to 4 days if mated. Females will survive 6 to 8 days if unmated. The presence of honey or raisins or both does not appear to prolong the adult stage. Males will mate repeatedly, and apparently do not distinguish between mated and unmated females. Females will mate only once, and, having mated, will struggle to escape from subsequent males' attempting copulation.

Oviposition begins within 1 minute of the completion of mating, if a suitable substrate is present. The female runs rapidly over the surface of the wood, palpating it with her antennae, and with the abdomen curved so that the apex of the abdomen is in contact with the surface of the wood. The abdomen is inserted into cracks, crevices, and old emergence holes and one or several eggs are laid quickly in each. The eggs are obscured at first by a milky-white fluid, which soon dries and darkens to the usual orange-red color.

Symmerus (Psilosymmerus) vockerothi Munroe new species

Figs. 7, 63f, 69

Plesiastina annulata; Smith, 1910: 722 (*nec* Meigen, 1830: 294) (synonym of *Symmerus coqulus* Garrett, 1925 by Fisher, 1941: 281).

Symmerus annulata; Johannsen, 1910: 231 (*nec* Meigen, 1830: 294): Johnson, 1925: 76 (*nec* Meigen, 1830: 294) (synonym of *Symmerus coqulus* Garrett, 1925 by Fisher, 1941: 281).

Symmerus lauta; Johnson, 1925: 76 (*nec* Loew, 1869: 132) (synonym of *Symmerus coqulus* Garrett, 1925 by Fisher 1941: 281).

Symmerus coqulus; Fisher, 1941: 281 (in part) (*nec* Garrett, 1925: 12).

DIAGNOSIS. *Symmerus (P.) vockerothi* is most similar to *S. (P.) coqulus* and *S. (P.) uncatus* amongst North American *Symmerus.* Males may be distinguished from those of the western *S. (P.) coqulus* by the more slender diststylus (Fig. 7b, c, d) and by the yellow thoracic pleura. Males of *S. (P.) vockerothi* may be distinguished from those of *S. (P.) uncatus* by the shape of the aedoeagus (Fig. 7d), by the shape of sternite 9 (Fig. 7b), by the mesonotal color, and by the color of the pleurites.

DESCRIPTION. ADULT. **Male.** *Head.* Vertex black, fading to flavotestaceous posterior and lateral to ocelli. Ocelli forming a straight line. Dorsal arm of eye reaching to level of lateral margin of median ocellus. Postvertical and occipital regions flavotestaceous, clothed in short yellow bristles. Frons flavous. Postfrons with short brownish-yellow bristles medially. Clypeus, labellum and palpus flavous, clothed in short yellowish-brown bristles. Scape and pedicel flavous, each with a dorso- and lateroapical fringe of short yellowish-brown bristles. Flagellum distinctly serrate ventrally. Flagellar segments 1 and 2 testaceous, brownish grey, ventrally and dorsally; segments 3 and 4 brownish-grey, testaceous medially at base and apex; segments 5 to 14 brownish grey; segment 15 flavous, minute.

Thorax. Prothorax and humerus flavous, with yellow setae. Mesonotum flavotestaceous, with a pair of lateral brown vittae, which do not reach anterior and posterior margins; disc clothed in short brown bristles; lateral and posterior margins with moderately long to long bristles. Scutellum flavotestaceous, with short to long dorsal bristles. Pleuron flavous. Postnotum flavotestaceous, rarely with a brown posteromedial macula.

Legs. Coxae flavous. Fore coxa with anterior surface and apical one-half of posterior surface clothed in moderately long yellow bristles. Mid coxa with moderately long yellow bristles on apical one-third of mesal, anterior, and lateral surfaces. Hind coxa with a posterolateral row of yellow bristles, the row widening on apical one-half. Femora flavotestaceous, clothed in short to moderately long brownish-yellow bristles. Tibiae flavotestaceous. Fore tibia with a posteroventral comb present, spines shorter than tibial diameter. Mid tibial combs irregular, spines shorter than tibial diameter but stouter than those of fore tibia. Hind tibial spines stouter and more numerous than those of mid tibia. Tarsi flavotestaceous.

Wing. Length, 4.9 to 6.3 mm (mean, 5.6 mm). Venation as in Fig. 63f. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein slightly shorter than cross-vein. Basal curve of R_4 smooth. Basal portion of R_s forming an almost-smooth curve with distal portion; forming an obtuse angle with R_1.

Abdomen. Abdominal setae moderately long, brownish yellow. Tergite 1 dark brown, with lateral and posterior margins narrowly flavotestaceous; tergites 2 to 4 dark brown with all margins flavotestaceous, lateral and posterior ones narrowly so; tergite 5 dark brown; tergite 6 dark brown, with posterior margin narrowly flavotestaceous; tergite 7 flavotestaceous, with faint lateral mottled dark-brown markings, and with posterior one-third flavous. Sternites 1 to 4, and 7 flavous; sternites 5 and 6 flavous with diffuse brown markings to dark brown. Segment 8 flavous.

Genitalia (Fig. 7). Sternite 9 (b) dark brown, tapering, ⅔ as long as basistylus, slightly emarginate at apex. Basistylus (b, c, d) dark brown. Dorsomesal margin of basistylus near apex produced ventrally and apically to form a slender dorsolateral aedoeagal plate (d). Ventral plate of aedoeagus (b) large, scoop-like, rounded apically. Dististylus (a, b, c, d) black, boot-shaped, with a mesal band bearing minute teeth; dististylus as long as basistylus. Tergite 9 (a, c, e) dark brown laterally, flavous medially, ⅗ as long as basistylus, with apical margin shallowly emarginate. Cercus (a, b, c, e) 2.5 times as long as tergite 9, flavous. Sternite 10 membranous, with scattered setae. Tergite 9, basistylus, and dististylus clothed in moderately long to long strong yellowish-brown bristles. Dorsal surface of cercus clothed in moderately long yellowish-brown bristles. Ventral surface of cercus clothed in fine, pale setae, grading from very long and hair-like basally to moderately long apically.

Female. Chaetotaxy and venation as described for male. Size, color, and sexual characters as follows: Wing length, 5.7 mm (two specimens, both the same). Vertex black as in male, but remainder of head dark brown. Thoracic sclerites and legs brown. Abdomen dark brown. Genitalia dark brown, irregularly testaceous basally, clothed in short to moderately-long yellowish-brown bristles. Cercus clothed in short brownish-yellow bristles, second cercal segment circular.

PUPA. As described for pupa of *S. (P.) coqulus* but differing as follows: Length (including prothoracic spines), 11.5 to 12.4 mm (mean, 11.9 mm; *n*, 2). Mesal base of prothoracic spine with 2 small spines, mesal one smallest. Lateral small spine 1/6 as long as the large prothoracic one. Anteroventral mesonotal margin with 3 teeth (4 on one side of one specimen). Hind leg not reaching abdominal segment 4.

MATURE LARVA.[6] As described for larva of *S. (P.) coqulus*, except as follows: Length, 16.4 to 18.9 mm (mean, 17.7; *n*, 3). Width of head capsule, 0.9 to 1.1 mm (mean, 1.0 mm; *n*, 3). Prothoracic spiracle 0.058 mm in diameter.

EGG.[6] As described for egg of *S. (P.) coqulus*, except as follows: length, 0.53 mm; width, 0.415 mm.

MATERIAL EXAMINED. *Holotype male.* **Quebec:** Old Chelsea, King Mountain, 1000′, 1.viii.1969, Malaise trap, D. D. Munroe (CNC No. 12967).

Allotype female. **New Hampshire:** Mt. Washington, Base Station, 22.vii, N. Banks (MCZ).

Paratypes. **Georgia:** Rabun Co., Rabun, 4600′, 9.viii.1957, J. G. Chillcott (CNC), 1 ♂. **Iowa:** Linn Co., Palisades-Kepler State Park, 8.vii.1950, Laffoon, Slater and Hicks (ISU), 1 ♂. **Manitoba:** Belanger, Osten-Sacken (MCZ), 1 ♀. **Maryland:** Plummers Id., 18.vi.1916 (USNM), 1 ♂. **Massachusetts:** Chester, 5.viii, C. W. Johnson (MCZ), 1 ♂. Same data except 9.viii.1912, 1 ♂. **Michigan:** Cheboygan Co., 17.vii.1942, C. W. Sabrosky (USNM), 1 ♂. **New Hampshire:** Franconia Notch, 8.vii.1931, A. L. Melander (USNM), 1 ♂. White Mountains, Dolly Copp., 13.vii.1931, A. L. Melander (USNM), 2 ♂ ♂. White Mountains, Morrison (USNM), 1 ♂. **New Jersey:** Riverton, vi.1919, C. W. Johnson (MCZ), 1 ♂. **New York:** Cattaraugus Co., Stoddard Hollow, 1800–1900′, 42°4′ N., 78°45.5′ W., 10.viii.1961, D. L. Deonier (ISU), 1 ♂. Hamilton Co., E. foot of West Notch Mtn., 1900′, 43°20.6′ N., 74°37.2′ W., 6.viii.1961, R. J. Gagne (ISU), 1 ♂. Ithaca, 24.viii.1894 (CORN), 1 ♂. Little Valley, 12.viii.1917, M. C. Van Duzee (CAS), 1 ♂. North River, 6–16.viii.1950, C. W. Sabrosky (USNM), 1 ♂. **North Carolina:** Macon Co., Highlands, 3850′, 35°3.2′ N., 83°11.3′ W., 15.vii.1958, J. L. Laffoon (ISU), 1 ♂. Nantahala Gorge, 2000′ (MCZ), 1 ♂. **Ontario:** 2 mi S. of South March, 1.viii.1969, Malaise trap, D. D. Munroe (CNC), 7 ♂ ♂. Stittsville, 6.viii. 1963, Malaise trap (CNC), 1 ♂. **Quebec:** Old Chelsea, King Mtn., 1000′, various dates 12.vii–12.viii.1969, Malaise trap, D. D. Munroe (ANIC, BMNH, CNC, KYUSHU, MUS.PAR.), 23 ♂ ♂. Same data, except 13.vi.1971, *ex* rotten maple log, D. D. and A. E. Munroe (CNC), 1 egg, 8 larvae, 2 pupae. Same data, except summit, 1150′, 9.viii.1961, J. R. Vockeroth (CNC), 1 ♂. Same data, except 28.viii.1965, 1 ♂. **Wisconsin:** Lilliwup, 3.vii.1917, A. L. Melander (ANSP), 1 ♂. (Total paratypes: 52 ♂ ♂, 1 ♀, 2 pupae, 8 larvae, 1 egg.)

BIOLOGY. The eggs are laid in cracks and crevices of the bare wood of rotten logs of maple. The activities of the larva and pupa are similar to those of *S. coqulus*. Probably the half-grown or mature larva overwinters, since large larvae, as well as pupae, may be found in the spring before adults appear.

Symmerus (Psilosymmerus) uncatus Munroe new species

Figs. 8, 63g, 69

Symmerus coqulus; Fisher, 1941: 281 (in part).

DIAGNOSIS. Males of *S. (P.) uncatus* may be distinguished from those of the other described North American species of *Psilosymmerus* by the large sclerotized

[6] Immature stages were associated with adults by their occurrence on or in logs from which adults emerged.

apically-hooked aedoeagus (Fig. 8b), by the slender boot-shaped dististylus (Fig. 8b, c, d), and by the brown thoracic markings.

DESCRIPTION. **Male.** *Head.* Vertex black. Postvertical and occipital regions testaceous, contrasting sharply with vertex; sparsely clothed in short brown bristles. Anterior margins of ocelli forming a straight line. Median ocellus ½ length of lateral ocellus. Frons dark brown, bare. Clypeus, labellum and palpus testaceous, clothed in short brown setae. Scape and pedicel testaceous, with short brown bristles on dorsal and lateral apical margins. Flagellar segments 1 and 2 testaceous, with dorsal one-third dark brown; segment 3 dark brown, with ventral one-third testaceous; remaining segments dark brown, with bases testaceous; last segment less than ¼ as long as preceding segment.

Thorax. Pronotum and humerus flavotestaceous. Pronotum bearing sparse short brown setae. Humerus bare. Mesonotum flavous, with 3 longitudinal dark brown maculae. Lateral macula extending from anterior one-fifth to posterior margin. Median macula extending from anterior one-tenth to posterior one-third, divided by a faint median stripe. Mesonotum sparsely clothed in brownish-yellow setae, short on disc, longer near lateral and posterior margins. Scutellum testaceous, with moderately long dorsal bristles. Postnotum testaceous anteriorly to brown posteriorly. Propleuron flavous, bearing long brown bristles. Pleurotergite flavous. Katepisternum and anepisternum light brown, ventral margins flavotestaceous. Remaining pleurites dark brown. Halter testaceous, lighter at base, clothed in minute brownish-yellow setae.

Legs. Flavotestaceous. Anterior surface of fore coxa clothed in long brown bristles, weaker basally; posterior surface with scattered long slender bristles. Mid coxa with weak moderately long bristles on apical one-fifth. Hind coxa with strong brown bristles on apical one-half and forming a posterolateral row. Femora clothed in moderately long bristles, sparser on ventral surfaces. Tibiae with weak combs. Comb of fore tibia represented by two or three stiff bristles, shorter than tibial diameter. Mid and hind tibial spines subequal to tibial diameter.

Wing. Length, 6.0 to 6.2 mm (mean, 6.1 mm; *n*, 2). Venation as in Fig. 63g. Significant features of venation as follows: strong portion of Sc distal to humeral cross-vein slightly longer than cross-vein. Basal portion of R_4 sharply bent towards apex of wing. Basal portion of R_5 forming a right angle with R_1 and r-m. M_1 indistinct.

Abdomen. Tergites 1 to 4 dark brown with lateral margin, and sometimes anterior and posterior margins, flavotestaceous; tergites 5 and 6 dark brown; anterior two-thirds of tergite 7 dark brown, posterior one-third flavotestaceous. Sternite 1 flavous, sternites 2 and 3 with anterior half light brown, posterior half flavotestaceous; sternites 4 and 7 with anterior two-thirds brown, posterior one-third flavotestaceous; sternites 5 and 6 dark brown, with posterior one-fifth flavotestaceous. Segment 8 flavotestaceous. Abdominal setae slender, moderately long to long, brownish yellow. Segment 8 with short bristles.

Genitalia (Fig. 8). Sternite 9 (b) dark brown, large, reaching beyond midlength of basistylus, triangular, with apex notched. Basistylus (b, c, d) dark brown, large, 1½ times as long as sternite 9. Dorsomesal margin of basistylus produced mesobasally to meet its antimere mesally. Ventral surface of this partial bridge produced apically to form a circular dorsal aedoeagal plate, this joining a broad tapering ventral plate to form a cone-like aedoeagus. Apex of ventral plate curved dorsally to form a hook. A short slender apodeme inserted into the open (basal) end of the cone. Dististylus (a, b, c, d) boot-shaped, slender, with a mesal fringe of tooth-like spines. Tergite 9 (a, c, e) quadrangular, with apical margin emarginate. Cercus (a, c, e) slender, flavous, 1½ times as long as tergite 9, bearing slender yellow setae. Sternite 10 (e) apparently membranous. Basistylus, dististylus, and tergite 9 clothed in moderately long yellowish-brown setae.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* U.S.A.: **New Hampshire:** Mt. Washington, 24.vii.1915, C. W. Johnson (MCZ).

Paratype male. U.S.A.: **New Hampshire:** Franconia Notch, 8.vii.1931, A. L. Melander (ANSP).

***Symmerus (Psilosymmerus) brevicornis* Okada**

Figs. 9, 63h, 69

Symmerus annulatus; Okada, 1936: 57 (*nec* Meigen, 1830) (synonymy by Okada, 1939: 287).

Symmerus brevicornis Okada, 1939: 287; Sasakawa, 1963: 16; Saigusa, 1966: 800.

DIAGNOSIS. Males of *S.* (*P.*) *brevicornis* Okada may be distinguished from those of other species of *Symmerus s. lat.* by the strongly serrate (but not pectinate) antenna and by the shape of sternite 9 (Fig. 9b).

DESCRIPTION. **Male.** *Head.* Vertex black, fading to testaceous behind eyes. Dorsal portion of head clothed in short black setae, longer near eyes and ocelli. Posterior margin of median ocellus aligned with anterior margins of lateral ocelli. Length of median ocellus ¾ that of lateral ocellus. Lateral ocellus 3.5 ommatidial diameters in length, separated from eye margin by half its own diameter. Dorsal margin of eye reaching level of lateral margin of median ocellus. Eye hairs 2 times ommatidial diameter in length. Frons brown; postfrons with a few minute bristles. Clypeus testaceous, clothed in short black bristles. Mouthparts brown. Scape and pedicel brown, each with a dorsolateral row of minute to short black bristles at apex. Flagellar segments 1 to 14 dark brown; segments 1 to 10 produced ventrally, the lobe 1 to 3 times the width of the basal portion; segment 15 minute, pale.

Thorax. Pronotum and humerus flavous, sparsely clothed in short to moderately long black setae. Mesonotum flavous, with or without a pair of lateral brown vittae. Mesonotal disc clothed in short black setae. Lateral and posterior margins, and posterior portion of mesal margins of vittae, clothed in short to moderately long black setae. Scutellum flavotestaceous, with dorsal side clothed in short to long black bristles. Postnotum flavotestaceous, bare. Propleuron and prosternum flavous, with a fringe of short to moderately long black bristles. Anepisternite with a clump of short to moderately long setae in dorsal corner. Pleurotergite with ventral half dark brown. Remainder of pleurites flavous.

Legs. Legs flavous, with tarsi dark brown. Leg bristles dark brown to black. Anterior surface of fore coxa clothed in short basal, to moderately long apical, setae. Mid coxa with short bristles on apical third of anterior surface. Hind coxa with posterolateral surface clothed in short to moderately long setae. Femora clothed in short setae, with a sparse ventral fringe of moderately long ones. Tibial spines shorter than the tibial diameter.

Wing. Venation as in Fig. 63h. Significant features of venation as follows: Strong portion of Sc distal to humeral cross-vein slightly shorter than cross-vein. Basal portion of R_s forming a distinct obtuse angle just beyond midlength. R-m small, nearly obliterated. Basal portions of R_4 and M_1 smoothly curved.

Abdomen. Abdominal setae short to moderately long, black. Posterior margins of sternites 1 and 2 with a few similar setae. Tergite 2 dark brown with anterior margin testaceous. Remaining tergites dark brown. Sternite 1 flavous; sternite 2 pale brown, with transverse suture flavous; sternites 3 to 7 grading from brown to dark brown. Segment 8 dark brown; tergite 8 three-quarters as long as sternite 8; sternite 8 one-third as long as sternite 7.

Genitalia (Fig. 9). Hypopygium, except cercus, dark brown. Cercus pale flavous, almost white. Sternite 9 (b) large, as long as basistylus, tapering and depressed over apical third. Apical third bifurcate, the lobes closely appressed. Basistylus (b, c, d) cylindroconical, not fused to its antimere or to sternite 9. Dorsomesal margin of basistylus produced mesally and fused with its antimere to form a large dorsal aedoeagal bridge (e). Ventral surface of bridge produced apically to form a pair of slender lateral aedoeagal plates. Ventral plate of aedoeagus narrow, with a long slender basal rod. Dististylus (b, c, d) boot-shaped, as long as basistylus. Apex of dististylus greatly expanded, largely membranous, but with ventral surface of basal portion continued to apex. Mesal tooth-plate short, free, bearing a fringe of minute setae. Lateral margin of basal portion produced into membranous area forming a fringed lobe similar to the tooth-plate. Tergite 9 (a, c, e) ⅘ as long as basistylus, not fused to basistylus, broad, with apical margin nearly straight. Cercus (a, c, e) 2.25 times as long as tergite 9, truncate, expanded posteriorly. Ventral surface clothed in short to moderately long fine pale setae, directed anteriorly. Sternite 10 (e) membranous. Anal lobe indistinct.

Female. I have not examined a female of this species.

TYPE SPECIMENS. Okada (1939) indicated that there were four paratypes in addition to the holotype and allotype (? HOKKAIDO).

MATERIAL EXAMINED.[7] JAPAN: **Hokkaido:** Aizonkei, Daisetsuzan, 19.vii.1963, A. Nakanishi (KYUSHU), 1♂. Apoidake, 18.vii.1967, T. Saigusa (KYUSHU), 1♂. Berabonai, Ashoro, 23.vii.1967, T. Saigusa (KYUSHU), 1♂. Same data except 24.vii.1967, 1♂. Hoheikyo, Sapporo, 18.vi.1961, A. Kato (KYUSHU), 1♂. Kanayama, 11.viii.1961 (KYUSHU), 1♂. Onpatsu, Shiranuka, 31.vii.1967, T. Saigusa (KYUSHU), 1♂.

[7]I have not examined the type material, but the specimens before me have been determined by Dr. Saigusa.

Symmerus (Psilosymmerus) pectinatus Saigusa

Figs. 10, 69

Symmerus pectinatus Saigusa, 1966: 800.

Saigusa's (1966) description and figures of *Symmerus (Psilosymmerus) pectinatus* are quite complete and this species is not redescribed in detail here. I have redescribed and redrawn the genitalia for comparative purposes (Fig. 10). The female is unknown. The diagnostic characters for the male are as follows:

Antenna ventrally pectinate, segments 3 to 12 strongly produced, segment 13 slightly produced, remaining segments not produced. Thorax testaceous, with a pair of lateral dark brown vittae. Pleurotergite testaceous with ventral one-half dark brown. Remaining pleurites testaceous. Postnotum testaceous, bare. Abdominal tergites 1 to 7 dark brown. Sternites 1 to 7 yellow. Segment 8 brown.

Sternite 9 (Fig. 10b) large, triangular, bifid at apex, as long as basistylus. Dorsomesal margins of basistylus produced to form a broad bridge; ventral surface of bridge produced posteriorly to form a pair of dorsolateral aedoeagal supports (d) which fuse at apex to one another and to a spindle-like ventral aedoeagal plate. Lateral margin of dististylus (b, d) with a narrow strip which supports a fringe of stiff black spines. Basal portion of dististylus produced into a narrow ventral lobe. Cercus (a, b, c, e) large, 1.5 times as long as tergite 9, truncate, with a mesal lobe at midlength. Ventral surface of cercus with a clump of very strong black spines at basal one-third, a clump of weaker, but still strong, brown setae at midlength. Remainder of cercus clothed in slender pale setae.

MATERIAL EXAMINED. *Holotype male.* TAIWAN: Alishan, Chiayi Hsien, 12-16.vi.1965, T. Maa and K. S. Lin (BPB No. 6942).

Symmerus (Psilosymmerus) nepalensis Munroe new species

Figs. 11, 63i, 69

DIAGNOSIS. The combination of the short dark brown lateral mesonotal maculae, the pale brown median mesonotal macula, the brown club of the halter, the brown abdomen with segment 1 pale, and the large sternite 10 will distinguish males of *S. nepalensis* from those of all other known species in the genus.

DESCRIPTION. **Male.** *Head.* Vertex black. Postocular area dark brown. Postvertical area and gena flavotestaceous. Anterior margins of ocelli forming a straight line. Median ocellus ⅓ as long as lateral ocellus. Vertex, postocular, and postvertical areas sparsely clothed in minute bristles. Frons bare; portion of postfrons between antennae dark brown; remainder of frons flavotestaceous. Clypeus flavotestaceous. Palpus and labellum dark brown. Clypeus, palpus, and labellum clothed in short black bristles. Scape and pedicel brown, each with short black bristles at dorsal apex, minute black bristles at lateral apex. Flagellar segments 1 to 4 flavotestaceous; segment 5 flavotestaceous, with ventral margin dark brown; segments 6 to 8 dark brown, with dorsal one-half flavotestaceous; segments 9 to 15 dark brown; segment 15 small, ⅓ as long as preceding segment.

Thorax. Pronotum and humerus flavotestaceous, bearing short black bristles. Mesonotum flavotestaceous, with 3 longitudinal brown maculae. Lateral macula extending from first to last quarter, tapering posteriorly. Median macula paler than lateral, almost reaching anterior margin, fading posteriorly. Mesonotal bristles short on disc to long near lateral and posterior margins. Scutellum flavotestaceous, bearing short to long posterodorsal bristles. Postnotum flavous, bare. Propleuron flavotestaceous with moderately long bristles. Pleurotergite bare, flavous, with ventral margin brown. Metepisternum bare, flavous, with dorsal margin brown. Remaining pleurites flavous. Halter with shaft testaceous, club brown.

Legs. Coxae and femora flavotestaceous. Fore coxa clothed in short black bristles, which are longer ventrally; lateral surface bare. Mid coxa with basal two-thirds and posterior surface bare; remainder clothed in moderately long bristles. Hind coxa with a posterolateral row and distal clump of moderately long to long bristles. Tibiae flavotestaceous, darkening to brown at extreme apex, bearing a dense covering of minute black setulae. Fore tibial spines sparse, shorter than tibial diameter. Spines of mid and hind tibia less than twice tibial diameter in length. Basal segment of each tarsus flavotestaceous basally, brown apically. Remainder of tarsi brown.

Wing. Length, 4.8 to 5.3 mm (mean, 5.05 mm; *n*, 2). Venation as in Fig. 63i. Significant features of venation as follows: Sc with the strong portion distal to the humeral cross-vein slightly longer than the cross-vein. Basal curve of R_4 smooth. Basal portion of R_s angled slightly at midlength. R-m short, as long as width of R_1, forming a smooth curve with the distal portion of R_s and an obtuse angle with the basal portion of R_s. M_1 indistinct. Stem of M_{1+2} fork shorter than M_1.

Abdomen. Tergite 1 flavotestaceous; tergites 2 to 7 dark brown. Sternites 1 and 2 light brown; sternites 3 to 7 dark brown. Abdominal setae moderately long to long, brownish yellow. Segment 8 flavotestaceous.

Genitalia (Fig. 11). Sternite 9 (b) triangular, as long as basistylus, apical one-half laterally compressed, apex divided. Dorsomesal margins of basistylus produced mesally to form a bridge (d). Ventral surface of bridge produced apically into a pair of dorsolateral aedoeagal plates. Dorsolateral aedoeagal plates fused at apex to ventral plate. Dististylus (a, b, c, d) boot-shaped, sclerotized, divided apically into a ventral plate and a dorsal lobe, closely appressed to one another. Tergite 9 (a, e) broad, simple. Cercus (a, c, e) twice as long as tergite 9, simple. Sternite 10 (e) distinct, large, triangular, setose, ventral to cercal bases. Cercus yellow, remainder of genitalia brown.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* Nepal, Kathmandu Valley, Godavari, 6000′, 3.viii.1967, Malaise trap, Canadian Nepal Expedition, Mason and Munroe (CNC No. 12966).
Paratype male. Same data as holotype except 7300′, 6.viii.1967, Malaise trap No. 19.

Australosymmerus Freeman

Centrocnemis Phillippi, 1865: 619 (preocc. Signoret, 1852: 545).
Ditomyia; Giglio-Tos, 1890: 2 (in part) (*nec* Winnertz, 1852: 53).
Plesiastina; Kertesz, 1902: 40 (in part) (*nec* Winnertz, 1852: 55).
Symmerus; Johannsen, 1909:12 (in part) (*nec* Walker, 1848: 88).
Australomyia Freeman, 1951: 7 (preocc. Schmid, 1949: 600).
Australosymmerus Freeman, 1954: 39.
Crionisca Colless, 1970: 95.

Type-species: *Centrocnemis stigmatica* Phillippi, 1865: 619 (by monotypy).

DESCRIPTION. Antenna 2+15 segmented, with flagellum laterally compressed; segment 15 usually very small, occasionally longer than preceding segment. Eye haired, with dorsal margin slightly to strongly emarginate. Three ocelli present, the median one slightly to much smaller than lateral ones; lateral ocellus separated from dorsal margin of eye by 0.2 to 2.0 times its own diameter; directed laterally. One to six strong postorbital bristles present, forming a row.

Prosternum and precoxal bridge with a row or fringe of setae. Scutellum with 1 or 2 pairs of extremely long bristles. Pleurotergite bare or haired. Postnotum bare.

Strong tibial combs present on all tibiae, except rarely absent on fore tibia; anterior apex of fore tibia, and posterior apex of hind tibia, with a row of flattened scale-like setulae; apex of tibiae with 1 or more strong spines in addition to the spurs; spurs 1-2-2.

Sc ending in costa, or apically obsolescent; r-m present; R_4 and M_1 usually sharply curved or angled near base; 1A reaching wing margin, but faint or absent at base; macrotrichia dense except near base of wing; microtrichia present or absent.

Abdomen with 7 visible segments; segment 8 small, retracted into segment 7; sternite 2 with a transverse suture. Abdominal setae short to long; setae sparse or absent on sternites 1 and 2.

Male genitalia with sternite 9 distinct or indistinct; basistylus open mesally, or mesally and dorsally; basistylus and tergite 9 fused at base, fused entirely, or free. Cerci usually large, widely separated, often with a variety of lobes and processes. Sternite 10 sclerotized or membranous.

KEY TO SUBGENERA AND UNPLACED SPECIES OF *Australosymmerus*[8]

1. Scutellum with 2 pairs of bristles much longer than the rest 2
1'. Scutellum with 1 pair of bristles much longer than the rest 10
2.(1) Lateral pair of long scutellar bristles subequal to medial pair in length; microtrichia absent 3
2'. Lateral pair of long scutellar bristles half as long as medial pair; microtrichia present or absent 9
3.(2) Tergite 9 longer than basistylus; cercus without distinct lobes or processes (Figs. 12–18) 4
3'. Tergite 9 shorter than basistylus; cercus with distinct lobes or processes (Figs. 19–43) 6
4.(3) Clypeus wider than long; subcosta ending free 5
4'. Clypeus longer than wide; subcosta ending in the costa ...... *Crionisca* Colless
5.(4) Mesonotum with 3 distinct longitudinal black maculae, fused together only posteriorly (NEW ZEALAND) .... *A. trivittatus* (Edwards)
5'. Mesonotum with maculae fused, or absent on anterior half, or altogether absent .... *Australosymmerus* Freeman
6.(3') Dististylus finger-like but not slender, with conspicuous weakly sclerotized or membranous portions 7
6'. Dististylus slender, tapering except at apex, heavily sclerotized, without weak or membranous portions (Figs. 26–29) .... *Araeostylus* Munroe n. subgen.
7.(6) Ventral margin of cercus with a sclerotized tubular process (Figs. 19–23) .... *Ventrilobus* Munroe n. subgen.
7'. Ventral margin of cercus with a heavily sclerotized lobe, but without a tubular process 8
8.(7') Dorsum of head with a conspicuous, sharply defined dark area over ocelli, not reaching postvertical region; genitalia as in Fig. 24 .... *A. naevius* Colless
8'. Dorsum of head with dark ocellar region diffuse, pruinose, extending into postvertical region; genitalia as in Fig. 25 .... *A. tonnoiri* Colless
9.(2') Mesal surface of cercus with a compressed flange-like lobe or lobes, raised from mesal surface (Figs. 30–32) .... *Vellicocauda* Munroe n. subgen.
9'. Mesal surface of cercus not produced; dorsal plates of aedoeagus each produced to form a filament (Fig. 33) .... *Tantrus* Munroe n. subgen.
10.(1') Sternite 9 inconspicuous, with 2 or 3 large, free lobes; colors bold, yellow and black or brownish-black; setae and macrotrichia golden-yellow or black .... *Calosymmerus* Munroe n. subgen.
10'. Sternite 9 without free lobes; colors not as above 11
11.(10') Sternite 9 fused to basistylus only at base (Fig. 34) .... *A. peruensis* Munroe n. sp.
11'. Sternite 9 fused to basistylus along lateral margins (Figs. 35–39) .... *Melosymmerus* Munroe n. subgen.

Subgenus *Australosymmerus* Freeman new status

Type-species: *Centrocnemis stigmatica* Phillippi, 1865: 619 (by Article 44(a)).

DESCRIPTION. Scutellum with 2 pairs of long bristles differentiated from fringe. Microtrichia absent; Sc short, apically obsolescent. Sternite 9 entire, with apical portions of lateral margins free from basistylus. Basistylus with a tapering apical lobe. Dististylus with conspicuous membranous region near apex. Tergite 9 longer than basistylus, with posterolateral

[8]*A. zonatus* is not included in the key, for reasons discussed on p. 99. This species closely resembles those included in *Calosymmerus*. Males of *A. zonatus* may be distinguished from those of species of *Calosymmerus* by the characters given in the description.

corners simple. Cercus simple, without ventral, dorsal or mesal lobes or processes, although ventral margin may be notched (Fig. 12c); attached at apical margin of tergite 9; 0.3 to 0.6 tergite 9 in length. Colors not bold, flavotestaceous to dark brown.

Key to Species of *Australosymmerus s. str.*

1. Abdominal tergites 1 to 5 with conspicuous *basal* pale bands 2
1'. Abdominal tergites 1 to 5 dark brown, with pale *apical* bands 3
2.(1) Pleurites flavotestaceous with brown markings (CHILE) .... *stigmaticus* (Phillippi)
2'. Pleurites entirely flavotestaceous (NEW ZEALAND) .... *basalis* (Tonnoir)
3.(1') Pleurites brown to dark brown; hind coxa dark brown (NEW ZEALAND) .... *tillyardi* (Tonnoir)
3'. Pleurites testaceous; hind coxa flavotestaceous (NEW ZEALAND) .... *nitidus* (Tonnoir)

Australosymmerus (Australosymmerus) stigmaticus (Phillippi)

Figs. 12, 45, 63j, 70

Centrocnemis stigmatica Phillippi, 1865: 619.
Plesiastina stigmatica; Kertesz, 1902: 40.
Symmerus stigmatica; Johannsen, 1909: 12.
Australomyia stigmatica; Freeman, 1951: 8.
Australosymmerus stigmaticus; Lane, 1956: 143.

Diagnosis. Males and females of *A. (A.) stigmaticus* (Phillippi) may be distinguished from those of other Chilean species of *Australosymmerus s. lat.* by the combination of brown pleurites and yellow coxae, and by the very distinctive genitalia (Figs. 12, 45).

Description. **Male.** *Head.* Ocelli enclosed in a fairly distinct black triangle, somewhat diffuse posteriorly. Labellum and palpus flavous. Remainder of head orange-yellow. Three postorbital bristles present, the dorsal one twice as long as third antennal segment, ventral ones weaker. Vertex clothed in minute pale setae. Postorbital region and clypeus with short pale setae. Eye distinctly emarginate, with dorsal margin reaching almost to mesal margin of lateral ocellar prominence. Scape and pedicel flavous, with diffuse dusky markings. Scape with a clump of short coarse pale setae on ventral surface. Pedicel with a clump of minute pale setae on ventral surface. Flagellum brownish orange at base, grading to brown at penultimate segment. Last segment brownish orange, ovoid, ⅓ as long as preceding segment.

Thorax. Pronotum and humerus flavous, with diffuse brown markings; pronotum bare; humerus with 2 long brown bristles. Mesonotum flavous, with 3 longitudinal dark brown vittae; posterior half of pale lines separating vittae, and lateral and posterior margin, bearing extremely long strong brown bristles; remainder of mesonotum clothed in short to moderately long pale setae. Scutellum flavous. Postnotum pale brown, pruinose. Propleuron, prosternum and precoxal bridge flavous, with a fringe of moderately long pale setae. Remaining pleurites brown, pruinose. Halter flavous.

Legs. Coxae and femora flavous. Fore coxa clothed in short pale setae which are smaller and more sparse on posterior surface. Mid coxa with short to moderately long pale bristles on distal half. Hind coxa with an irregular posterolateral row and lateral apical clump of moderately long to long pale bristles. Femora clothed in minute brown setulae, each with a ventral fringe of moderately long pale bristles. Tibiae flavous, slightly darkened apically. Fore tibial combs represented by 2 or 3 spines, 1 to 1.5 times the tibial diameter in length. Apex of fore tibia with a posterior spine shorter than the tibial diameter in length, a shorter anterodorsal spine, and a still shorter dorsal spine. Mid tibial combs consisting of 4 or 5 spines 1.5 to 2.5 times tibial diameter in length. Apex of mid tibia with 1 posterior and 1 anterodorsal spine, these about 1.5 times tibial diameter in length. A minute spine lies anterior to the anterodorsal spine. Hind tibial combs represented by 3 to 6 spines, 0.5 to 4 times tibial diameter in length. Apex of hind tibia with 1 dorsal and 1 anterior spine, twice tibial diameter in length. Fore tarsus with 2 basal segments, and basal three-quarters of third, pale brown; remainder of fore tarsus flavous. Mid tarsus with segment 1 flavous, brown apically; segments 2 to 4 brown; segment 5 flavous. Hind tarsus with segments 1 and 2 flavous, with apex brown; segments 2 and 3 flavous, faintly brown at apex; segment 5 flavous.

Wing. Length, 7.0 to 7.9 mm (mean, 7.5 mm; *n*, 5). Venation as in Fig. 63j. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein as long as cross-vein. Basal portion of R_s sharply curved, almost forming a right angle. Basal portions of R_4 and M_1 smoothly curved. Wing markings brown; strength and position as follows: faintly clouded around apices of M_2, M_{3+4} and CuA, and between R_4 and R_5 in apical third of cell R_4. Base of R_s with a faint spot. Apical third of subcostal cell distinctly marked.

Abdomen. Abdominal setae short to moderately long, pale. Tergites 1 to 5 testaceous basally to dark brown at apical margin; tergites 6 and 7 dark brown. Sternite 1 flavous, sometimes with pruinose markings. Sternites 2 to 7 flavous with brown markings to entirely brown. Sternites 1 to 6 with pale apical bands.

Genitalia (Fig. 12). Sternite 9 (b) triangular, about ⅓ as long as basistylus. Basistylus (b, c, d) with apical margin produced into a long slender tapering pointed lobe. Dorsomesal margin of basistylus produced mesally to form a bridge between basistyli. Aedoeagus consisting of a dorsal plate produced from bridge, a large black heavily-sclerotized mass at ventral apex, a ventral articulatory process, and a rather simple basal apodeme (e). Dististylus (b, c, d) constricted at distal one-third. Apical margin of dististylus expanded, but not reflexed, bearing 7 or 8 blunt teeth. Tergite 9 (a, c, e) very large, with apical margin produced into a tapering lobe which is reflexed and completely hidden by the basal portion. Cercus (a, b, c, e) ⅔ as long as tergite 9, truncate, with a small lobe on ventral margin. Sternite 10 (e) transverse, lightly but distinctly sclerotized. Basistylus and tergite 9 brown. Cercus flavous. Genitalia clothed in short to moderately long brownish-yellow bristles.

Female. As described for male, except as follows: Black triangle on vertex distinct. Abdominal segments 2 to 5 flavous to pale brown basally to dark brown apically. Basal portion of R_s rather more smoothly curved. Basal portion of M_1 more sharply curved. Wing length, 8.0 to 8.6 mm (mean, 8.2 mm; *n*, 5). Segment 8 pale brown. Apical margin of sternite 8 bilobed (Fig. 45), lobes long, twisted mesally and directed dorsally. Apex of lobe with a clump of long stiff spines. Cercus flavous; segment 2 less than ½ as long as segment 1.

TYPE SPECIMEN. I have not been able to locate the type of *A. stigmaticus.* It is presumably in the collection of the Museo Nacional de Historia Natural de Chile, Santiago, Chile.

MATERIAL EXAMINED. **Argentina:** Terr. Rio Negro, Puerto Blest, L. Nahuel Huapi, 2–3.xii.1926, F. and M. Edwards (BMNH), 3♂♂. **Chile:** Aysen, Puerto Aysen, 24–26.i.1961, L. E. Pena (CNC), 2♀♀. Aysen, Rio Maniguales, 72°30′ W., 45°25′ S., 26–28.i.1961, L. E. Pena (CNC), 1♀. Cautin, Los Coigues, L. Villarica, 16–31.xii.1964, L. E. Pena (CNC), 1♀. Same data, except 1–15.i.1965, 1♂, 1♀. Chiloe, Chiloe Is., Ancud, 19.xii.1926, F. and M. Edwards (BMNH), 1♂. Same data, except Bahia Toigoi, *ca.* 19 mi SW. of Ancud, 1–3.ii.1952, L. E. Pena (ISU), 1♀. Curico, Las Trancas, 21–30.xi.1964, L. E. Pena (CNC), 1♀. Curico, Nuble, 2.7 km N. of Las Trancas, 1320 m, 15.i.1967, M. E. Irwin and L. A. Stange (CIS), 1♀.

Australosymmerus (Australosymmerus) basalis (Tonnoir)

Figs. 13, 46, 70

Centrocnemis basalis Tonnoir (in Tonnoir and Edwards, 1927: 759).
Symmerus basalis; Miller, 1950: 57.
Australosymmerus basalis; Colless, 1970: 86.

DIAGNOSIS. Males and females of *A. (A.) basalis* may be distinguished from those of the other described species of New Zealand *Australosymmerus s. lat.* by the presence of pale basal bands on the abdominal segments and males by the structure of the genitalia (Fig. 13).

DESCRIPTION. **Male.** *Head.* Vertex flavotestaceous, clothed in minute to short black setae, with ocelli enclosed in a distinct black triangle. Postorbital bristles short to moderately long, brownish yellow, 6 in number. Median ocellus 0.7 lateral ocellus in length, with posterior margin in line with middle of lateral ocellus. Lateral ocellus slightly more than 4 ommatidial diameters in length, separated from eye margin by ⅓ its length. Dorsal margin of eye extending to level of middle of lateral ocellus. Eye hairs less than 1 ommatidial diameter in length. Mouthparts and remainder of head capsule flavotestaceous. Frons bare. Clypeus clothed in short to moderately long yellowish-brown setae. Scape and pedicel flavotestaceous, with minute setae on dorsal apex; ventral surface of scape with a clump of short coarse setae. Flagellum grading from flavotestaceous at base to brown at segment 8; penultimate segment 1.25 times preceding segment in length; segment 15 brown, ⅓ as long as preceding segment.

Thorax. Uniformly flavotestaceous, with shorter setae yellow, longer ones dark brown. Pronotum sparsely clothed in short to moderately long setae. Humerus with one short and one moderately long bristle. Mesonotal setae minute to short on disc, moderately long to extremely long on anterolateral, lateral and posterior margins and on posterior half of intervittal lines. Propleuron, prosternum, precoxal bridge, and dorsal half of anterior margin of anepisternite with short to moderately long setae.

Legs. Flavotestaceous. Setae of coxae and femora yellow. Anterior surface of fore coxa, distal half of anterior surface of mid coxa, and posterolateral line of hind coxa with short to moderately long setae. Femora densely clothed in minute setulae, with moderately long setae at ventral apex. Fore tibial combs each represented by 2 or 3 spines, 1 to 1.5 times tibial diameter in length. Apex of fore tibia with 1 minute anterior spine, and 1 moderately long posterodorsal one. Mid tibial combs each represented by 3 to 5 spines, 1 to 2 tibial diameters in length. Apex of mid tibia with a short anterodorsal and a short dorsal spine, with a minute one between them, and with a large posterior spine. Hind tibial combs each represented by four to six spines, 1 to 3 times tibial diameter in length. Apex of hind tibia with 1 long anterior spine.

Wing. Length, 7.1 mm. Venation and markings as in Tonnoir and Edwards (1927, fig. 1). Significant features of venation and markings as follows: Strong portion of Sc distal to humeral cross-vein slightly longer than cross-vein. Basal portions of R_s and R_4 smoothly curved. Basal portion of M_1 rather sharply curved. Distinct brown marks present over base of R_4; base of M_1; and base R_s, r-m, basal portion of M_{3+4} and m-cu. Fainter marks present in costal cell except at base, along apical and posteroapical margin, and along all veins reaching the margin except 1A.

Abdomen. Abdominal setae short to long, fine, yellow. White posterior marginal bands absent; segments 1 to 5 with anterior half flavotestaceous, posterior half brown; segments 6 and 7 brown, with sternites slightly paler than tergites; segment 8 flavotestaceous. Tergite 8 two-thirds as long as sternite 8; sternite 8 less than ½ as long as sternite 7.

Genitalia (Fig. 13). Sternite 9 (b) rounded apically, less than ⅓ as long as basistylus. Basistylus (b, c, d) open mesally, fused to sternite 9 at base, with ventroapical margin produced to form a slender, dorsally-directed lobe. Dorsomesal margin of basistylus produced mesally to form a dorsolateral aedoeagal plate, with complex base and apex fused to its antimere (d). Bases of dorsolateral plates produced ventrally to form an arch, under which is suspended the aedoeagus, and basally to form a small, apically rounded apodeme. Lateral apex of aedoeagus produced to form a pair of large membranous lobes (d). Ventral plate of aedoeagus small, narrow, with a basal pair of short ventrally-projecting apodemes. Basal apodeme short, expanded, with a deep notch. Dististylus (b, d) ¾ the length of the basistylus. Basal portion greatly expanded apically, with a strong ventral bristle. Distal portion consisting of a short cylinder, greatly expanded at apex to form a large, wedge-shaped lobe, bordered with teeth except basally. Teeth approximately 60 in number; mesoventral teeth pointed, dorsolateral teeth blunt. Tergite 9 (a, c, e) 1.5 times basistylus in length, shallow, roughly ovoid, with a sclerotized triangular apical lobe. Cercus (a, c, e) rounded, with ventral base produced basally to midlength of tergite 9; ventral margin near apex produced to form a small pointed lobe; mesal surface clothed in minute erect setulae on basal half, short to moderately long reflexed setae on apex. Cercus, excluding basal projection, less than ½ as long as tergite 9. Sternite 10 (e) consisting of a transverse, apically emarginate sclerite, and a pair of lateroapical triangular sclerites. Anal lobe indistinct. Hypopygium flavotestaceous.

Female. As described for male, except as follows: Penultimate segment of antenna no longer than preceding segment; segment 15 two-thirds as long as preceding segment. Apex of fore tibia with 1 minute anterior, 1 minute posterior, and 1 moderately long posterodorsal spine. Apex of mid tibia with 1 short anterior spine, a short anterodorsal one, and a long posterodorsal one. Wing length, 8.1 to 8.9 mm (mean, 8.5 mm; *n*, 2). Faint wing markings almost invisible. Abdominal segments with basal flavotestaceous portion narrow or absent. Genitalia as in Fig. 46. Significant features of structure of genitalia as follows: Apical margin of sternite 8 cleft, with apical lobes simple, slightly more than ¼ as long as remainder of sternite. Apical margin of lobe with a clump of stiff setae, of which 10 to 12 are long and strong, and dark brown. Cercus ⅚ as long as tergite 8; segment 2 one-third as long as segment 1.

TYPE SPECIMENS. *Holotype male.* NEW ZEALAND: Waiho, 20.i.1922, A. L. Tonnoir (DSIR).

Paratypes. NEW ZEALAND: Raetihi Hill, 3000′, xi.1923, T. R. Harris (BMNH), 1 ♂. West Coast, South Island, ii.1923, T. R. Harris (BMNH), 1 ♀.

MATERIAL EXAMINED. Both paratypes, and a female without collection data, in DSIR.

Australosymmerus (Australosymmerus) nitidus (Tonnoir) new combination

Figs. 14, 47, 70

Centrocnemis nitida Tonnoir (in Tonnoir and Edwards, 1927: 759).
Symmerus nitidus; Miller, 1950: 57.

DIAGNOSIS. *A. (A.) nitidus* is very similar to *A (A.) tillyardi.* In addition to the key characters, the structure of the male genitalia, the brown postorbital bristles, and the absence of brown on the legs except for the tarsi will distinguish members of this species from those of *A. tillyardi.*

DESCRIPTION. **Male.** *Head.* Flavotestaceous, with ocelli enclosed in a distinct black posteriorly rounded macula. Vertex, postocular, and occipital regions clothed in minute yellow setae. Postorbital bristles short to moderately long, brown, 4 in number. Anterior margins of ocelli forming a straight line. Median ocellus ⅗ the lateral ocellus in length. Lateral ocellus 5 ommatidial diameters in length, separated from eye margin by ⅖ its diameter. Dorsal margin of eye extending beyond level of midlength of lateral ocellus. Eye hairs 1 ommatidial diameter in length. Frons bare. Clypeus clothed in short sparse setae. Scape and pedicel flavotestaceous, each with minute to short coarse brown setae on ventral surface, and with minute to short yellow setae on dorsal and lateral apex. Flagellum grading from ochreous at base to dark brown at segment 8; penultimate segment 1.25 times preceding segment in length. Segment 15 dark brown, spherical, ⅓ as long as preceding segment.

Thorax. Short setae yellow; longer ones dark brown. Pronotum ochreous, with short sparse setae. Humerus flavotestaceous, with 2 long setae. Mesonotum flavotestaceous, with 3 longitudinal brown vittae, fused posteriorly. Mesonotal setae short on disc, long to very long on anterolateral, lateral and posterior margins, and on posterior portion of intervittal lines. Scutellum flavotestaceous, with dorsal surface brown. Postnotum ochreous. Propleuron, prosternum, and precoxal bridge ochreous, with a fringe of short to long setae. Dorsal corner of anepisternite with a clump of short to long setae. Mesopleurites irregularly ochreous and pale brown.

Legs. Coxae, femora, and tibiae flavous, with yellow setae. Anterior surface of fore coxa with moderately long setae; posterior surface with minute ones. Distal half of anterior surface of mid coxa clothed in short setae, with moderately long ones at apex. Posterolateral surface of hind coxa with minute sparse setae and with a distinct row of long ones. Femora clothed in minute setulae, with moderately long bristles on ventral apex. Fore tibial combs each represented by zero to 3 spines, 0.5 to 2 tibial diameters in length. Apex of fore tibia with 1 short anterior, 1 minute anterodorsal, 1 moderately long posterior spine. Mid tibial combs each represented by 3 to 5 spines, from 0.5 to 4 times the tibial diameter in length. Apex of mid tibia with 1 moderately long anterior, 1 short anterodorsal, and 1 long posterodorsal spine. Hind tibial combs each represented by 4 or 5 spines, 2 to 4 tibial diameters in length. Apex of hind tibia with 1 long anterior spine. Tibial spurs orange. Tarsi with first segment grading from flavous at base to brown at apex; remainder brown.

Wing. Venation and markings as in Tonnoir and Edwards (1927, fig. 3). Significant features of venation and markings as follows: Sc with strong basal portion short, the portion distal to humeral cross-vein as long as cross-vein. Basal portions of R_s, R_4, and M_1 smoothly curved. Extremely faint brown markings present over basal portion of R_s, base of M_1 and between R_4 and costa.

Abdomen. Abdominal setae short to long, pale. Segments 1 to 7 black, each with a narrow pale (unpigmented), apical marginal band; segment 8 dark brown; tergite 8 two-thirds as long as sternite 8; sternite 8 two-thirds as long as sternite 7.

Genitalia (Fig. 14). Sternite 9 (b) broad, ½ as long as basistylus (excluding apical lobe); fused to basistylus at base; rounded apically. Basistylus (b, c, d) open mesally, with apex produced to form a slender apical lobe. Dorsomesal margin of each basistylus produced to form a lateral aedoeagal plate, heavily sclerotized at apex (d). Ventral plate of aedoeagus indistinct. Ventral articulatory process consisting of two short ventrobasally directed sclerotized arms, not fused to one another. Basal apodeme simple, blade-like. Dististylus slightly shorter than basistylus (excluding apical lobe); apical one-third reflexed ventrally; apex heavily sclerotized, cap-like, reflexed dorsally, with a fringe of teeth along free margin of cap-like portion. Teeth minute laterally and mesally, longer and peg-like apically. Base of dististylus produced to form a large lobe, slightly expanded and bluntly pointed apically; lobe slightly shorter than dististylus proper. Tergite 9 (a, c, e) 1.5 times as long as basistylus (excluding apical lobe), rectangular, fused to basistylus at extreme base. Cercus (a, c, e) ⅔ as long as tergite 9, flattened, tapering, with mesal surface sparsely clothed in fine erect setae. Sternite 10 (e) consisting of a transverse sclerotized strip, fused to tergite 9 at midlength of tergite 9, with a narrow apical lobe. Anal lobe (e) small, triangular, clothed in minute setulae.

Female. As described for male, except as follows: Mesonotal vittae brown, not fused; median vitta divided by pale median line; mesonotal vittae sometimes absent. Mid and hind tarsus flavotestaceous, with apex of segments 1 to 3 and segments 4 and 5 brown. Apical tibial spines short to long. Dark markings of abdominal tergites brown; sternites flavous. Genitalia as in Fig. 47. Significant features of structure of genitalia as follows: Sternite 8 completely divided by a narrow unsclerotized median line. Apical lobe rounded, simple, with a clump of stiff spines on mesal apex. Cercus ¾ as long as tergite 8; segment 2 one-quarter as long as segment 1.

TYPE SPECIMENS. *Holotype male.* NEW ZEALAND: Dun Mountain, Nelson, 5.i.1922, A. L. Tonnoir (DSIR).

Allotype female. NEW ZEALAND: Aniseed Valley, Nelson, 1.xii.1923, A. L. Tonnoir (DSIR).

Paratypes. NEW ZEALAND: Nelson, ix-xii [Tonnoir did not indicate number or sex]; Otira, 10.i.1910, J. W. Campbell (DSIR), 1 ♂, 1 ♀. Ohakune, 20.xi. 1919, T. R. Harris (DSIR), 1 ♀.

MATERIAL EXAMINED. Paratype male from Aniseed Valley; paratype female from Nelson. Additional specimens: NEW ZEALAND: Nelson, 3.i.1921, A. Philpott (BMNH), 1 ♀. Otira, 10.i.1920, T. R. Harris (BMNH), 1 ♀. Same data, except J. W. Campbell, 1 ♂.

***Australosymmerus (Australosymmerus) tillyardi* (Tonnoir) new combination**

Figs. 15, 48, 70

Centrocnemis tillyardi Tonnoir (in Tonnoir and Edwards, 1927: 758).
Symmerus tillyardi; Miller, 1950: 57.

DIAGNOSIS. *A. (A.) tillyardi* is very similar to *A. (A.) nitidus.* In addition to the key characters, the structure of the male genitalia, the yellow postorbital bristles and the presence of brown markings on the femora and coxae will distinguish members of this species from those of *A. nitidus.*

DESCRIPTION. **Male.** *Head.* Vertex dark grey, pruinose, fading to testaceous posteriorly, except behind eyes. Dorsum of head clothed in short yellow setae, with sparse, coarse moderately long yellow setae between ocelli. Postorbital bristles long, strong, yellow, 4 in number. Posterior margins of ocelli forming a straight line. Median ocellus 0.7 lateral ocellus in length. Lateral ocellus 4 ommatidial diameters in length, separated from eye margin by half its own diameter. Dorsal margin of eye reaching level of middle of lateral ocellus. Eye hairs 1 ommatidial diameter in length. Frons bare; prefrons testaceous, postfrons grey. Clypeus greyish brown, clothed in short to moderately long yellow setae. Labellum brown, palpus testaceous. Scape and pedicel brown, each with a clump of short but coarse setae on ventral surface, and minute, fine setae around apex. Flagellum laterally compressed, grading from ochreous at base to dark brown by segment 8; penultimate segment 1.5 times as long as preceding segment; last segment dark brown, half as long as preceding segment.

Thorax. Shorter setae yellow, longer ones dark brown. Pronotum dark brown, with sparse short to moderately long setae. Humerus testaceous, brown dorsally, with 2 long strong setae. Mesonotum testaceous, with 3 longitudinal dark brown maculae, only faintly separated from one another. Mesonotal disc clothed in short setae, with very long, strong brown ones on anterolateral, lateral and posterior margins, and on intervittal lines. Scutellum testaceous. Postnotum dark brown, pruinose. Propleuron dark brown, with 3 long, and sparse short, setae. Prosternum and precoxal bridge brown, pruinose, with a row of long yellow setae. Pleurites dark brown; anepisternite with a large clump of short to long setae in dorsal corner. Halter testaceous.

Legs. Fore coxa flavotestaceous, clothed in yellow setae which are moderately long posterolaterally and apically, otherwise minute. Mid coxa brown and pruinose at base, to flavotestaceous at apex; apical half clothed in short, yellow setae. Hind coxa brown, pruinose; clothed in short, yellow setae with a posterolateral fringe of long ones. Trochanters and extreme base of femora brown; remainder of femora flavous. Femora clothed in minute setulae, with moderately long setae ventrally at apex. Tibiae flavotestaceous, slightly darker at apex. Fore tibial combs each represented by 1 or 2 spines, shorter than the tibial diameter in length. Apex of fore tibia with 1 short anterior and 1 long posterodorsal spine. Mid tibial combs each represented by 4 or 5 spines, 1 to 4 times the tibial diameter in length. Apex of mid tibia with 1 long anterior and 1 long posterodorsal spine. Hind tibial combs each represented by 4 to 6 spines, 1 to 4 times the tibial diameter in length. Apex of hind tibia with 1 long anterior spine. Tarsi flavotestaceous.

Wing. Length, 6.4 mm. Venation and markings as in Tonnoir and Edwards (1927, fig. 2). Significant features of venation and markings as follows: Strong portion of Sc distal to the humeral cross-vein slightly shorter than the cross-vein. Basal portions of R_s and R_4 smoothly curved. Basal portion of M_1 sharply bent. Wing hyaline, with faint brown marks over bases of R_s and R_4.

Abdomen. Abdominal setae short to long, fine, yellow. Segments 1 to 7 dark brown, with extremely narrow unpigmented posterior marginal bands, and increasingly wide flavous subapical bands. Segment 8 dark brown, ⅓ as long as preceding segment, with sternite and tergite of equal size.

Genitalia (Fig. 15). Sternite 9 (b) broad, rounded apically. Basistylus (b, c, d) open mesally, deep and rather narrow. Lateral apex of basistylus produced to form an attenuated lobe, one-half as long as the rest of the basistylus. Dorsomesal margin of basistylus produced mesally and apically to form a broad lateral aedoeagal plate. The two approximate dorsally without fusing, and are produced ventrally almost to the inner surface of the basistylus. Dorsal plates heavily sclerotized at apex and produced dorsally to form a beak-like apex. Ventral plate long and narrow, with apex expanded and completely reflexed. Base of ventral plate bearing a pair of short ventrally-directed apodemes. Basal apodeme ½ as long as aedoeagus, blade-like, simple. Diststylus (b, c, d) with basal portion greatly produced to form a large heavily sclerotized trifurcate lobe. Beyond this lobe, basal portion of diststylus slender, cylindrical. Apical portion a slender cylinder, continuous with basal portion, but forming a right angle with it. Mesal surface of apical portion membranous. Toothplate indistinct, continuous with ventral surface; teeth large, 33 in number, forming an incomplete rosette. Tergite 9 (a, c, e) 1.3 times as long as basistylus, longer than wide, shallow, rectangular, with apical margin slightly emarginate. Cercus (a, c, e) ovoid, slightly more than ½ as long as tergite 9, inserted just under apical margin of tergite 9. Ventral surface sparsely clothed in fine setae, curved posteriorly but directed slightly anteriorly. Sternite 10 (e) transverse, heavily sclerotized, fused to tergite 9 at midlength of tergite 9. Anal lobe (e) triangular, reaching almost to midlength of cerci.

Female. As described for male, except as follows: Integument behind eyes, frons, scape, and pedicel flavotestaceous. Mesonotal vittae distinctly separated. Postnotum brown with anterior and anterolateral margins flavotestaceous. Katepisternite and pleurotergite with dorsal half flavotestaceous, ventral half brown. Pteropleurite flavotestaceous. Hypopleurite flavotestaceous with dorsal margin brown. Wing length 7.2 mm. Genitalia as in Fig. 48. Significant features of genitalia as follows: Segment 8 dark brown, with apical margin flavotestaceous. Sternite 8 completely divided ventrally, the two halves connected by membrane for basal two-thirds of length. Apical portion of mesal surface of apical lobe bearing a clump of strong, short to very long, dark brown setae. Cercus slender, as long as tergite 8, with segment 2 less than ¼ as long as segment 1.

TYPE SPECIMENS. *Holotype male.* **New Zealand:** Mt. Arthur, 24.xii.1921, Nelson (DSIR).

Paratypes. **New Zealand:** Kinloch, L. Wakatipu, i.1921, Hudson (DSIR), 1 ?. Otira, 10.i.1920, Campbell (DSIR), 1 ♂, 1 ♀.

MATERIAL EXAMINED. **New Zealand:** Otira, 10.i.1920, T. R. Harris (BMNH), 1♂, 1 (no abdomen). Kinloch, L. Wakatipu, i.1921, G. V. Hudson (BMNH), 1♀ (may be paratype).

UNASSIGNED SPECIES[9]

Australosymmerus trivittatus (Edwards) new combination

Figs. 49, 70

Centrocnemis trivittata Edwards (in Tonnoir and Edwards, 1927: 759).
Symmerus trivittatus: Miller, 1950: 57.

DIAGNOSIS. In addition to the key characters, the structure of the male genitalia[10] will separate males of *A. trivittatus* from other species of *Australosymmerus s. lat.*

DESCRIPTION. Male and female as described for male of *A.* (*A.*) *nitidus* Tonnoir, except as follows: Median ocellus of male ⅔ length of lateral ocellus[11]; lateral ocellus 4 ommatidial diameters in length. Flagellum grading from testaceous at base, to pale brown at segment 3, to dark brown apically; segment 15 ovoid, ⅖ as long as preceding segment. Mesonotal vittae of male fused at extreme posterior only. Postnotum and pleurites pale brown. Base of M_1 sharply angled. Wing markings absent. Dark markings of abdominal tergites brown. Sternites testaceous. Female genitalia as in Fig. 49. Apical spines slightly swollen at base.

TYPE SPECIMENS. *Holotype male.* **New Zealand:** Governor's Bay, 28–29. ix.1922, J. F. Tapley (BMNH).

Paratypes. **New Zealand:** White Rock, 26–28.xi.1922, J. W. Campbell, 1♂, 1♀. Dean's Bush, Riccarton, 17.iii.1925 and 8.i.1925, A. Tonnoir. Christchurch, 18.ii.1925, A. Tonnoir. Cass, 27.xi.1924, A Tonnoir (number, sex, and museum of specimens of last three localities not indicated).

MATERIAL EXAMINED. Holotype, in BMNH and 1♂, 1♀ in DSIR with data of White Rock paratypes, which may *be* paratypes.

Subgenus *Crionisca* Colless[12] new status

Crionisca Colless, 1970: 95.

Type-species: *Crionisca rieki* Colless, 1970: 95 (by original designation).

DESCRIPTION. Scutellum with 2 pairs of long bristles, differentiated from fringe. Microtrichia absent; subcosta with an anterior branch ending in the costa, a weak, apically obsolescent middle branch, and a short posterior branch ending in R_s, the latter two branches scarcely visible. Sternite 9 entire, fused to basistylus at extreme base, without long, tapering apical lobes. Dististylus large, greatly expanded apically, with a large basal lobe present or absent. Tergite 9 large, 1.5 times basistylus in length, with posteroapical corners produced mesoventrally to form thumb-like processes; not fused to basistylus at base. Cercus simple, without lobes or processes, 0.2 to 0.25 tergite 9 in length, inserted under ventral side of apical margin of tergite 9. Colors rather bold, flavous to black, occasionally with white markings.

KEY TO MALES AND FEMALES OF *Crionisca*

1. Pleurotergites bare (TIERRA DEL FUEGO) .... *magellani* Munroe n. sp.
1′. Pleurotergites with long setae (SE. AUSTRALIA, TASMANIA) 2
2.(1′) Integument almost entirely dark brown or black; abdominal segment 5 with a narrow white apical band .... *aculeatus* (Edwards), ♀
2′. Head, thorax, and abdomen with conspicuous pale markings 3

[9]For a discussion of the relationships of this species to other members of the genus, see page 99.
[10]It was not possible to examine the male genitalia of this species. For figures, see Tonnoir and Edwards, 1927, figs. 127, 128.
[11]Tonnoir and Edwards (1927: 759) stated that the median ocellus is much smaller than the lateral ocellus in *A. trivittatus*, whereas in *A. (A.) nitidus* they are subequal. This does not appear to be the case in the male examined.
[12]I consider *Crionisca* to constitute a subgenus rather than a genus because cladistic information discussed under PHYLOGENY indicates that there are several other groups of *Australosymmerus* of equal or greater rank (age). Therefore if *Crionisca* were to be considered as a genus, so must these other groups. In my opinion this involves excessive splitting.

3.(2′) Large mesonotal and scutellar bristles yellow; scutellum and postnotum dark brown .... *aculeatus* (Edwards), ♂

3′. Large mesonotal and scutellar bristles brown; scutellum and postnotum pale brown .... *rieki* (Colless)

Australosymmerus (Crionisca) rieki (Colless)[13] new combination

Figs. 16, 50, 70

Crionisca rieki Colless, 1970: 98.

DIAGNOSIS. In addition to the key characters, the following combination of characters may be used to distinguish specimens of *A. (C.) rieki* from those of other species of *Crionisca*. Labellum pale brown. Large bristles of lateral margin and submedian line of mesonotum, and large scutellar bristles, dark brown. Median vitta of mesonotum faint, indistinctly divided by a pale median line. Scutellum and postnotum pale brown. Abdomen with segment 1 dark brown; tergites 2 to 7 testaceous, each with a broad dark brown posterior margin, expanded medially in posterior segments to reach the anterior margins; sternites 2 to 7 testaceous.

DESCRIPTION. *Male genitalia* (Fig. 16). Sternite 9 (b) transverse, arched, reaching to basal third of basistylus. Basistylus (b, c, d) 3/5 as long as tergite 9, with lateral apical margin produced to form a short tapering lobe. Dorsomesal margin of basistylus produced mesally and fused with its antimere to form a large sclerotized triangular tapering dorsal aedoeagal plate. Aedoeagus consisting of this dorsal plate, a pair of elongate but weak ventral plates, a ventral articulatory process, and a basal apodeme extending basally to sternite 9. Dististylus (b, c, d) essentially as described for that of *A. aculeatus* but larger, with the ventral expansion of the basal portion more pronounced, and with most of the lateral surface of the apical portion membranous. Lateral fringe of teeth consisting dorsally of 6 large separated teeth and ventrally of approximately 10 wafer-like teeth, closely contiguous, so that the fringe appears to be a striate band. Teeth of mesal row similarly appressed, small, thin. Tergite 9 (a, c, e) narrow, convex, with thumb-like processes of apical corners curved, extending to level of apical third of cercus. Cercus (a, c, e) small, short, but rather deep, 1/5 as long as tergite 9, twice as deep as long. Sternite 10 (e) small, triangular, supporting anal lobe, which is small. Hypopygium brown. Tergite 9 clothed in short to moderately long stiff setae. Sternite 9, basistylus, basal portion of dististylus, and cercus clothed in short to moderately long fine setae.

Female genitalia (Fig. 50). Significant features of the structure of the female genitalia as follows: Segment 10 elongate, 1/2 as long as tergite 8. Basal segment of cercus almost 2/3 as long as tergite 8, apical segment of cercus 1/6 as long as basal segment. Sternite 8 convex, narrow; apical margin deeply incised, the incision extending to basal sixth of sternite 8; margins of incision divergent for apical two-fifths; mesal surface of apical lobe with 12 short to long stiff bristles.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **Victoria:** Mt. Dom Dom, 22.x.1961, D. H. Colless (ANIC No. 5918).

Paratypes. 14 ♂♂ and 5 ♀♀ in ANIC, BMNH, BPB, and USNM from Australian Capital Territory, Victoria and Tasmania.

MATERIAL EXAMINED. *Paratype male.* AUSTRALIA: **Victoria,** Robley's Spur, 24.xi.1964, N. Dobrotworsky (ANIC).

Paratype female. Same data as male, except Mt. Baw Baw, 3600′, 30.xi.1964 (ANIC).

Australosymmerus (Crionisca) aculeatus (Edwards) new combination

Figs. 17, 51, 63k, 70

Centrocnemis aculeata Edwards, 1921*b*: 434; Tonnoir, 1929: 594.

Crionisca aculeata; Colless, 1970: 96.

DIAGNOSIS. **Male.** In addition to the key characters, the following characters will distinguish the males of this species from those of the other species of *Crionisca*: Labellum

[13]Colless' (1970) descriptions of *A. (C.) rieki* (Colless) and *A. (C.) aculeatus* (Edwards) are adequate for the purposes of the present study, except with respect to the genitalia. The genitalia are described in greater detail here. The diagnosis given here should be sufficient for identification of the species. Reference should be made to Colless (1970) during later discussion of the phylogenetic relationships of these species.

dark brown. Large bristles of lateral margin and submedian line of mesonotum, and large scutellar bristles, yellow. Scutellum and postnotum dark brown. Abdomen with segment 1 brown; tergites 2 to 6 testaceous or pale brown, each with a narrow dark brown apical band, which is sometimes absent on posterior segments; tergite 2 also with anterolateral portion dark brown; sternites 2 to 6 testaceous; segments 7 and 8 brown. Wing as in Fig. 63k.

Genitalia (Fig. 17).[14] Sternite 9 small, crescentic, ⅕ as long as basistylus; basal margin at middle with a very short broad ventral projection. Basistylus (c) (see Colless, 1970: figs. 19, 20) ¾ as long as tergite 10, with lateroapical margin produced to form a short, tapering lobe. Dorsomesal margin of basistylus produced mesally to fuse with its antimere, forming a large triangular dorsal aedoeagal plate. Aedoeagal apparatus rather heavily sclerotized, consisting of the tapering slender triangular dorsal plate, closed ventrally to form a beak-like cone, ventral articulatory processes, and a short truncate basally expanded, ventrally directed basal apodeme (see Colless, 1970: fig. 22). Dististylus complex, distinctly divided into basal and apical portions. Basal portion of dististylus consisting of a short cylinder, with ventral surface expanded to form a bulging lobe, tapering to a rounded apical point. Apical portion of dististylus consisting of a laterally compressed, irregularly tapered lobe projecting dorsally from the basal portion, and continuous with it. Apical portion of dististylus heavily sclerotized, except for a longitudinal membranous or lightly sclerotized strip of integument on each of mesal and lateral surfaces. Mesal and lateral surfaces each with a longitudinal suberect row of sclerotized teeth. Teeth of mesal row fine, progressively smaller dorsally, approximately 30 in number. Teeth of lateral row large, blunt, 20 in number. Tergite 9 (a) large, narrow, convex. Cercus (a) small, roughly circular, less than ¼ as long as tergite 9. Sternite 10 indistinct. Genitalia brown. Tergite 9 clothed in short to moderately long, rather stiff setae. Apical margin of sternite 9, basistylus, basal portion of dististylus, and cercus clothed in short to moderately long, rather slender setae.

Female. Differing from that of *A. rieki* in the following characters in addition to those given in the key: Halter white; apical half of tergite 8 white.

Genitalia (Fig. 51). Significant features of structure of genitalia as follows: Segment 10 not particularly elongate. Basal segment of cercus extremely elongate, more than ¾ as long as tergite 8. Second segment of cercus ovoid, slightly less than ⅕ as long as segment 1. Sternite 8 slender, with apical margin incised to the basal quarter of the sternite; medial portion depressed along incision; margins of incision divergent for apical quarter. Mesal surface of apical lobe with 11 moderately long to long, stiff setae.

TYPE SPECIMEN. *Holotype male.* AUSTRALIA: **Tasmania,** Mt. Wellington, 7.x.1912, A. White (BMNH).

MATERIAL EXAMINED. AUSTRALIA: **Tasmania:** Mt. Wellington, 20.xi.1922, A. L. Tonnoir (ANIC), 1♂. Renisor Bell, 6.xi.1961, N. Dobrotworsky (ANIC), 1♀.

Australosymmerus (Crionisca) magellani Munroe new species

Figs. 18, 63*l*, 70

DIAGNOSIS. In addition to the key character, the following combination of characters may be used to distinguish males of *A. (C.) magellani* from those of the Australian species of *Crionisca*: Wing markings, distinct, dark brown, consisting of spots (1) between R_1 and the basal half of R_4 and (2) distal to the basal portion of R_5; mid and hind coxa with extensive brown markings; mid tibial combs well developed; tergites 2 to 6 dark brown, each with a testaceous apical band.

DESCRIPTION. **Male.** *Head.* Head capsule black, pruinose. Median ocellus minute, ⅓ the diameter of lateral ocellus. Lateral ocellus separated from eye margin by its own diameter. Dorsal and posterior portions of head clothed in short to moderately long yellow setae. Mouthparts, scape, and pedicel testaceous; apical half of scape and pedicel each sparsely clothed in short fine pale setae; flagellum black, pruinose, except for extreme base of segment 1 which is testaceous; apical flagellar segment ovoid, ⅖ as long as preceding segment.

[14]The genitalia of the specimen examined had already been dissected into the following parts when received: tergite 9 with cerci, each basistylus with dististylus, aedoeagus, and sternite 9. My figure of the ventral half of segment 9 is a composite. Reference should be made to Colless' (1970) fig. 19 and fig. 20 for lateral and ventral views of the genitalia of this species.

Thorax. Pronotum irregularly testaceous and brown, with sparse, short to moderately long, yellow setae. Humerus testaceous, with short sparse yellow setae. Mesonotum pruinose, dark brown, with 3 indistinctly separated longitudinal black vittae. Mesonotum sparsely clothed in yellow setae, short on disc, long to very long on lateral margin and posterior half of pale lines between vittae. Scutellum brown, pruinose. Remainder of thorax dark brown, pruinose. Propleuron and prosternum with a fringe of moderately long yellow setae. Halter flavous.

Legs. Fore coxa clothed in short to moderately long yellow setae, with anterior surface brown, remainder flavous. Mid coxa with distal half of lateral surface clothed in short to moderately long setae. Mid coxa flavous, with lateral surface brown, pruinose. Hind coxa dark brown, pruinose, flavous at base. Posterolateral surface clothed in short to long pale setae. Femora clothed in minute brown setulae, with moderately long pale setae on ventral surface near apex. Fore femur flavous. Mid and hind femur flavous, with apex dark brown. Fore tibia testaceous. Foretibial combs each represented by 1 or 2 spines, slightly greater than the tibial diameter in length. Apex of fore tibia with 1 large anterodorsal, and 1 large posterodorsal spine, and with a minute spine immediately dorsad to the anterodorsal one. Mid and hind tibia brown. Mid tibial combs each represented by 4 or 5 spines, 1 to 2.5 times the tibial diameter in length. Apex of mid tibia with 1 moderately long anterior, 1 minute anterodorsal, and 1 large posterodorsal spine. Hind tibial combs each represented by 4 or 5 spines, 1 to 3 times the tibial diameter in length. Apex of hind tibia with 1 long anterior spine, 1 minute dorsal spine, and 1 minute spine dorsad to the large anterior one. Tarsi brown.

Wing. Length, 6.8 mm. Venation and markings as in Fig. 63*l*. Significant features of venation and markings as follows: Basal portions of R_4 and R_5 smoothly curved. Basal portion of M_1 sharply angled towards apex of wing. Wing membrane hyaline, with distinct brown spots (1) between basal half of R_4 and R_5, extending just anterior to R_1 and (2) over and distal to basal portion of R_5 and r-m. Faint brown markings present along apical portion of M_2, M_{3+4}, CuA, and 1A.

Abdomen. Abdominal setae short to long brownish yellow. Segment 1 black, with a very narrow, pale, almost white posterior marginal band. Tergites 2 to 6 dark brown, each with a narrow testaceous apical band, the band narrower on posterior segments. Sternites dark brown with a wider posterior testaceous band (up to ⅓ length of sternite). Segments 7 and 8 dark brown.

Genitalia (Fig. 18). Sternite 9 (b) broad, shallowly triangular, ⅓ as long as basistylus with a short dorsal apodeme arising from center. Basistylus (b, c, d) with mesal portion of apical ventral margin bearing a v-shaped notch, forming a small mesal lobe. Lateral apical margin simple. Dorsomesal margin produced mesally to form a complex broad tapering dorsal plate and a large vertical lateral plate. Remainder of aedoeagus consisting of a complex ventral articulatory process and a short basal apodeme. Dististylus (b, c, d) large, with greatest dimension almost as long as basistylus. Basal portion of dististylus forming a short broad cylinder, expanded apically to form a large flat lobe. Dorsal and mesal margin of apical lobe bearing a continuous fringe consisting of 53 blunt teeth. Mesodorsal fringe enclosing the base of a slender apical lobe bearing 5 slender teeth. Tergite 9 (a, c, e) narrow, convex, with apical corners produced to form ventral points. Cercus (a, c, e) short, ¼ as long as tergite 9, as deep as tergite 9, tapering to a point ventrally. Sternite 10 rectangular, situated ventral to midlength of tergite 9 and connected to it by long anterolateral arms. Anal lobe triangular, pointed, projecting between cerci. Hypopygium clothed in short to moderately long setae. Cercus testaceous; remainder of hypopygium brown.

Female. Unknown.

TYPE SPECIMEN. *Holotype male.* CHILE: **Tierra Del Fuego:** Isla Navarino, Puerto Williams, 22–29.xi.1960, L. E. Pena (CNC No. 12975).

Ventrilobus[15] Munroe new subgenus

Type-species: *Centrocnemis fuscinervis* Edwards.

DESCRIPTION. Scutellum with 2 pairs of long bristles differentiated from the fringe. Microtrichia absent. Subcosta short, apically obsolescent, ending free. Sternite 9 entire, fused to basistyli at base. Basistylus with apical margin entire, or produced to form one or two short lobes, and in one case (*A. cornutus*) an attenuated lobe. Dististylus sclerotized, with

[15]*Venter* (= stomach) + *lobus* (= rounded projection); masculine.

distinct subapical membranous region and cap-like apex; free margin of apex with a fringe of teeth. Tergite 9 subequal to, or slightly shorter than, basistylus in length; posterolateral corners not produced; fused to basistylus at extreme base or free. Cercus with a heavily sclerotized cylindrical process on ventral margin, separated from cercus by deep invagination, or apparently entirely separated; dorsal and mesal processes of cercus absent; cercus slightly shorter to slightly longer than tergite 9; attached to apical margin of tergite 9. Colors not bold.

Key to Species of *Ventrilobus*[16]

1. Dorsum of head with a conspicuous, sharply-defined dark area over the ocelli, not extending laterally along the eye-margin or posteriorly to the nape; abdomen not conspicuously banded .... *cornutus* Colless

1′. Dark ocellar region, if present, diffuse and pruinose, and/or extending laterally along the eye-margin or posteriorly to the nape 2

2.(1′) Pedicel with coarse setae on ventral surface; palpus flavous .... *nebulosus* Colless

2′. Pedicel with at most inconspicuous fine setae on ventral surface; palpus at least partly brown 3

3.(2′) Abdominal tergites with conspicuous flavotestaceous apical bands extending into setose portion .... *fuscinervis* (Edwards)

3′. Abdominal tergites without conspicuous flavotestaceous apical bands, or bands extending only to apical setae 4

4.(3′) Tergite 9 of male deeply emarginate apically (Fig. 22a); ventral lobe of cercus simple, incurved, pointed (Fig. 22e) .... *anthostylus* Colless

4′. Tergite 9 of male produced apically (Fig. 23a); ventral lobe of cercus bifid, with ventral apex pointed and dorsal apex truncate (Fig. 23e) .... *propinquus* Colless

Australosymmerus (Ventrilobus) fuscinervis (Edwards)[17]

Figs. 19, 53, 64a, 71

Centrocnemis fuscinervis Edwards, 1921*b*: 434; Tonnoir, 1929: 594.
Australosymmerus fuscinervis; Colless, 1970: 88.

Diagnosis. In addition to the key characters, the following combination of characters will distinguish specimens of *A. (V.) fuscinervis* from those of other Australian species of the genus *Australosymmerus*: Flagellar segments 3 to 8 progressing from flavotestaceous to dark brown; segments 9 to 15 dark brown; segment 15 minute, spherical. Mesonotum with 3 longitudinal dark brown vittae, the median one sometimes divided. Pleurites flavotestaceous, with brown near ventral margin of each. Coxae flavous; mid and hind coxae sometimes with faint markings. Femora testaceous. Fore tibia and tarsus dark brown. Apex of fore tibia with 1 posterodorsal spine. Apex of mid tibia with 1 larger anterodorsal and 1 large posterodorsal spine and with 1 short spine just dorsad to the large anterodorsal one. Apex of hind tibia with 1 large anterior spine and several small ventral ones. Basal portion of R_4 rather sharply curved towards apex of wing, often with a protruding stub (Fig. 64a) Genitalia as follows.

[16]Modified from Colless (1970). Colless' key includes all of the Australian species of *Australosymmerus*, two of which (*A. naevius* and *A. tonnoiri*) were not assigned to subgenera in the present study. The position of these two species in the key to the species of *Ventrilobus* is discussed under their respective descriptions.

[17]Colless' (1970) revision of the Australian species of Ditomyiinae is entirely adequate for their identification. The purpose of the present study is not entirely taxonomic, however, and I am compelled to enlarge upon some of his descriptions for the purpose of comparing the Australian species with those from other regions. The male and female genitalia of all the Australian species, where known, have been redescribed and refigured from material determined by Colless. Except for the genitalia, Colless' (1970) description of *A.* (*V.*) *fuscinervis* (Edwards) is adequate for the purposes of the present study. The descriptions of *A.* (*V.*) *anthostylus* Colless, *A.* (*V.*) *propinquus* Colless, and *A. tonnoiri* Colless, which take the form of comparisons with *A.* (*V.*) *fuscinervis*, are also adequate for these purposes. I have only given diagnoses (except for the redescription of the genitalia) for these species. The reader should refer to Colless (1970) when the zoogeographic and phylogenetic status of these species is being discussed in a later section. I have redescribed *A.* (*V.*) *nebulosus* Colless in greater detail. I have added to Colless' (1970) descriptions of *A. naevius* and *A.* (*V.*) *cornutus*, which take the form of comparisons to *A.* (*V.*) *nebulosus*, so that they are consistent with my redescription of *A.* (*V.*) *nebulosus*.

Male genitalia (Fig. 19). Sternite 9 (b) distinct, triangular, ½ as long as basistylus, fused between basistyli at base. A dorsal strip present, fused to the base of sternite 9, which may represent tergite 9. Basistylus (b, c, d) with apex produced into two lobes. Latero-apical lobe short, triangular. Mesoapical lobe longer, sclerotized, rounded apically, directed dorsally. Dorsomesal margin of basistylus produced mesally and apically to form (with its antimere) a dorsal aedoeagal plate. Ventral portion of aedoeagus with a broad, basally expanded apodeme. Dististylus (d) with apical two-fifths bent dorsally, to form a right angle, the angle bearing a single strong seta. Lateral, apical, and mesal margins bearing a fringe of 17 teeth, basally short and pointed, apically large and rounded. Tergite 9 (a, c, e) large, shallowly emarginate apically. Cercus (a, c, e) large with dorsal portion only slightly shorter than tergite 9. Cercus rounded, tapering, with a large heavily sclerotized tapering pointed ventral lobe, as long as the dorsal portion. Sternite 10 (e) transverse, strip-like. Anal lobe indistinct. Cercus flavous. Remainder of hypopygium brown. Basistylus, tergite 9, and cercus clothed in short brownish-yellow setae.

Female genitalia (Fig. 53). Significant features of structure of female genitalia as follows: Sternite 8 more than twice as long as tergite, consisting of a large expanded bare lightly sclerotized basal portion, and a tapering setose distal portion. Apical margin bilobed, the lobes rounded and simple, with moderately long to long, strong bristles. Cercus rather elongate, with segment 2 approximately ⅗ the length of segment 1. Segment 8 brown. Cercus flavous. Tergite 8 and cercus clothed in short brownish-yellow setae. Apical portion of sternite 8 clothed in short to moderately long brownish-yellow setae.

TYPE SPECIMENS. Colless (1970: 88) designated two males from Mangalore, Tasmania, as lectotype and paralectotype.

MATERIAL EXAMINED. AUSTRALIA: **New South Wales:** Katoomba, 16.x.1950, G. H. Hardy (ISU), 1♂. Same data, except x.1949 (ISU), 1♂. Same data, except 7.x.1950 (ISU), 1♀. **Tasmania:** National Park, 6.xii.1922, A. L. Tonnoir (ANIC), 1♂.

Australosymmerus (Ventrilobus) cornutus Colless

Figs. 20, 71

Australosymmerus cornutus Colless, 1970: 95.

DIAGNOSIS. *A. (V.) cornutus* is similar to *A. naevius* and *A. (V.) nebulosus*. Of the characters given below, the structure of the genitalia is the most useful in separating males of these species. The general body color, as well as markings of the head, wing and abdomen, and the configuration of the apical tibial spines, will also distinguish males of *A. (V.) cornutus*.

DESCRIPTION. **Male.** As described for male of *A. nebulosus*, except as follows: Ocelli included in a rather distinct transverse black macula. Remainder of head capsule flavotestaceous. Lateral ocellus without a mesal bristle at base. Four distinct postorbital setae present. Palpus pale brown. Anterior surface of pedicel bare (flagelli missing in specimen examined). Thorax flavotestaceous. Legs uniformly flavotestaceous. Apex of mid tibia with 1 large anterior spine, 1 short but distinct anterodorsal spine, and 1 anterodorsal spine. Apex of hind tibia with 1 large anterior spine, and an anterior and ventral fringe of enlarged spine-like setulae. Wing length, 5.7 to 6.7 mm (Colless 1970). Markings and venation of wing as in Colless (1970: pl. I, fig. F). Wing with faint brown marks over apex of costal cell, basal portion of R_4, base of M_1, r-m, and basal portion of M_{3+4}. Tergites with rather distinct but very narrow pale posterior marginal bands. Tergites uniformly pale brown. Sternites pale brown, tending towards flavotestaceous at posterior margin. Genitalia as follows (Fig. 20): Sternite 9 (b) triangular, fused to basistyli at base. Basistylus (b, c, d) with apical margin emarginate, forming two lobes. Mesal lobe large, slender, tapering, ½ as long as basal portion of basistylus. Lateral lobe short, triangular. Dorsomesal margin of basistylus produced mesally and apically, fusing with its antimere to form a large, tapering dorsal aedoeagal plate, which is constricted beyond midlength (d). Basal apodeme of aedoeagus broad, emarginate. Dististylus (d) resembling an irregular cylinder with a striate apical hood. Tergite 9 (a, c, e) large, rounded, simple. Cercus (a, c, e) slightly longer than tergite 9, rectangular, with rounded corners. Base of ventral margin produced to form a large tapering sclerotized ventral lobe almost as long as the cercus. Sternite 10 (e) small, simple, transverse. Anal lobe indistinct. Hypopygium clothed in short to long brownish-yellow setae. Heavily sclerotized portions of genitalia dark brown; remainder flavotestaceous.

Female. Uknown

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **New South Wales:** Clyde Mtn., Landslip, 17.ii.1961, D. H. Colless (ANIC No. 5916).

Paratypes. AUSTRALIA: **New South Wales:** Mt. Wilson, 30.xii.1960, 1 ♂. Brown Mt., 18.i.1961, 1 ♂. Rutherford Ck., Brown Mt., 19.i.1961, 5 ♂ ♂. (All D. H. Colless.) **Victoria:** 17 mi. SW. Lake Mt., Swamp, 3000′, 1.ii.1967, N. Dobrotworsky, 1 ♂ (all in ANIC, except 1 ♂ in BMNH).

MATERIAL EXAMINED. One paratype from Rutherford Ck., Brown Mtn.

Australosymmerus (Ventrilobus) nebulosus Colless

Figs. 21, 52, 71

Australosymmerus nebulosus Colless, 1970: 92.

DIAGNOSIS. The strong bristles, especially on the tibia, the configuration of the apical bristles of the tibia, the dull, rather uniform color, and the structure of the male and female genitalia will distinguish specimens of *A. (V.) nebulosus* from those of other species of the genus *Australosymmerus.*

DESCRIPTION.[18] **Male.** *Head.* Vertex and postorbital region between posterior margin of eye and postorbital setae dark greyish-black, pruinose. Postvertical and occipital regions dark testaceous. Eye distinctly emarginate, the dorsal margin reaching the level of the mesal margin of the lateral ocellus. Anterior margin of median ocellus anterior to that of lateral ocellus. Lateral ocellar prominence with a distinct seta at its mesal base. Postorbital bristles moderately long, distinct, yellowish brown, 5 in number. Apical three segments of palpus flavous. Remainder of mouthparts and head capsule brown. Scape and pedicel brown, each with a clump of coarse setae on ventral surface. Flagellum pale brown.

Thorax. Uniformly brownish testaceous. Humerus bearing 1 or 2 long, yellowish-brown setae. Mesonotum clothed in minute dark setulae, slightly longer laterally. Lateral and posterior margins of mesonotum, and a pair of submedial lines on posterior half of mesonotum bearing extremely long strong brown setae. Propleuron sparsely clothed in short pale to long bristles. Prosternum and precoxal bridge with a distinct row of long brownish-yellow bristles.

Legs. Fore tarsus and distal two segments of mid tarsus brown. Remainder of legs flavotestaceous. Anterior surface of fore coxa and distal half of anterior surface of mid coxa clothed in short brownish-yellow setae, which are longer near apex. Posterolateral margin of hind coxa with a row of very long brown bristles interspersed with short to moderately long pale ones. Femora clothed in minute setulae. Apical third of ventral margin of mid and hind femora with a fringe of moderately long yellowish-brown setae. Fore tibial combs each represented by 2 or 3 spines, 1 to 2 times the tibial diameter in length. Apex of fore tibia with 1 long anterodorsal, 1 long posterodorsal and 1 long posterior spine, and with a short spine dorsad of the anterodorsal one. Mid tibial combs each represented by 3 spines, 1 to 4 times the tibial diameter in length. Apex of mid tibia with 1 large anterodorsal, 1 large posterodorsal, and a ventral and posterior fringe of small spines. Hind tibial combs each represented by three to five spines, 1.5 to 4 times the tibial diameter in length. Apex of hind tibia with 1 large anterodorsal spine and an incomplete fringe of small ones.

Wing. Length, 5.6 to 6.4 mm (Colless 1970). Venation and markings as in Colless (1970: pl. I, fig. D). Significant features of venation as follows: Strong portion of Sc distal to humeral cross-vein as long as cross-vein. Basal portion of R_4 smoothly curved. Basal portion of R_s sharply bent towards apex of wing, forming a right angle. Basal portion of M_1 rather sharply bent towards apex of wing but not forming a right angle. Apex of wing distal to level of base of R_4 clouded. Brown marks present between costa and basal third of R_4 and over basal portion of R_s and r-m.

Abdomen. Setae brownish yellow, short to moderately long. Conspicuous pale apical marginal bands absent. Tergites 1 to 7 pale brown, with posterior margin narrowly flavotestaceous. Sternites 1 to 7 testaceous, pale brown laterally, with posterior margins narrowly flavotestaceous. Segment 8 brown. Sternite 8 less than ½ as long as sternite 7. Tergite 8 strap-like, ½ as long as sternite 8.

Genitalia (Fig. 21). Sternite 9 (b) indistinct, transverse, fused between basistyli at base. Lateral margins of sternite produced dorsally to form a basal lip fused to tergite 9. Basistylus (b, c, d) with apical margin deeply emarginate, thus forming a small mesal and

[18]See footnote 17.

large lateral lobe. Dorsomesal margin of basistylus produced mesally and apically to form a dorsolateral aedoeagal plate which tapers to a point and is fused to its antimere along basal two-thirds. Apex of dorsolateral plate truncate in lateral view. Ventral portion of aedoeagus complex, with a pair of ventrally-directed arms at midlength, and a tapering basal apodeme. Dististylus (d) bent ventrally at midlength. Basal portion cylindrical; distal portion cylindrical, with an apical cap, which bears 19 teeth on mesal and dorsal margins; teeth minute mesally to long dorsally. A mesal sclerotized cylindrical apically bifurcate process arises from base of dorsal surface of lateral apical lobe of basistylus. Tergite 9 (a, c, e) broad, simple. Cercus (a, c, e) as long as tergite 9. Base of ventral margin of cercus produced to form a long sclerotized tapering cylindrical lobe. Sternite 10 (e) transverse, small, supported between mesal arms projecting from the ventroapical margin of tergite 9. Hypopygium brown, clothed in short to moderately long brownish-yellow setae.

Female. As described for male, except as follows: Generally somewhat paler. Wing length, 6.6 to 6.9 mm (Colless 1970). Apex of mid tibia with 1 long posterodorsal spine, 1 moderately long anterior spine, 1 moderately long posterior spine, 1 short anterodorsal spine, and 1 short dorsal spine in addition to a ventral fringe of enlarged setulae. Genitalia as in Fig. 52. Significant features of structure of genitalia as follows: Sternite 8 approximately 1.5 times as long as tergite 8, broad, with apical margin bilobed. Apical lobe ¼ as long as basal portion of sternite 8, with a clump of moderately long to long setae on dorsomesal surface, of which four are distinctly stronger than the rest. Segment 2 of cercus slightly less than one-half as long as segment 1. Cercus, and base of segment 8, flavous; remainder of segment 8 brown.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **Tasmania:** Heyler Gorge, 4.ii.1967, E. F. Riek (ANIC No. 5917).

Paratypes. 7 ♂ ♂ and 2 ♀ ♀ from Victoria, and 1 ♂ from Tasmania.

MATERIAL EXAMINED. AUSTRALIA: **Tasmania:** Paratype ♂, 9 mi S. of Treasure H'st., N. of Dargo, 4000', 14.ii.1965, N. Dobrotworsky (ANIC). Paratype ♀, 10 mi E. of Beech Forest, 1.i.1967, Z. Liepa.

***Australosymmerus (Ventrilobus) anthostylus* Colless**

Figs. 22, 71

Australosymmerus anthostylus Colless, 1970: 90.

DIAGNOSIS. In addition to the characters given in the key, the following combination of characters will distinguish males of *A. (V.) anthostylus* from those of other Australian species of the genus *Australosymmerus*: Dorsum of head rather uniformly greyish black. Six moderately long black postorbital bristles present. Pedicel with a clump of coarse setae on ventral surface. Flagellum pale brown at base to dark brown at segment 11 and beyond; last segment minute, spherical, paler than preceding segment. Mesonotal vittae, pleurites, and postnotum dark brown, remainder of thorax testaceous. Mesonotal vittae only faintly separated. Coxae, femora, and mid and hind tibiae flavous. Fore tibia flavous at base to brown at apex. Apex of fore tibia with 1 large anterodorsal and 1 large posterodorsal spine. Apex of mid tibia with 1 large anterodorsal and 1 large posterodorsal spine, and with a fringe of small spines. Apex of hind tibia with 1 large anterior spine. Fore tarsus dark brown. Mid and hind tarsi irregularly flavous to dark brown. Abdominal tergites dark brown, each with a narrow pale apical band and a narrow anterior flavous band. Sternites 1 to 5 flavous; sternites 6 and 7 dark brown with flavous posterior margin.

Male genitalia (Fig. 22). Sternite 9 (b) distinct, less than ½ as long as basistylus, fused at base to basistyli. Basistylus (b, c, d) with apex of lateral margin produced to form a short pointed lobe. Apical margin produced to form a rather triangular, but apically rounded, lobe. Dorsomesal margin of basistylus produced mesally and apically to fuse with its antimere, forming a large dorsal aedoeagal plate. Each half of the dorsal plate tapering to a separate point (obscured in figure). Basal portion of dististylus cylindrical, connected narrowly to distal portion. Distal portion of basistylus consisting of a complex central process with a rosette of 20 blunt teeth which are small ventrally to large dorsally. Tergite 9 (a, c, e) broad, apically emarginate. Cercus (a, c, e) slightly longer than tergite 9, tapering to a point at ventral apex. Base of ventral margin produced to form a large, heavily sclerotized, basally swollen, apically tapering lobe. Sternite 10 (e) indistinct, lightly sclerotized medially, membranous laterally. Sternite 9, basistylus, and tergite 9 clothed in short to moderately long brownish-yellow setae. Cercus clothed in short pale setae. Cercus and most of tergite 9 flavous. Margins of tergite 9 and sternite 9 and basistylus brown.

Colless (1970) has doubtfully associated a female from the type locality with this species. I have not seen this specimen and, as far as I know, no others have been collected.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **Tasmania:** L. Margaret, 3.ii.1923, A. L. Tonnoir (ANIC No. 5912).

Paratypes. AUSTRALIA: **Tasmania:** 10 mi E. of Strahan, 20.ii.1963, I. F. B. Common and M. S. Upton, 1 ♂. Same data, except 7.ii.1967, E. F. Riek, 1 ♂.

MATERIAL EXAMINED. The second paratype.

Australosymmerus (Ventrilobus) propinquus Colless

Figs. 23, 64b, 71

Australosymmerus propinquus Colless, 1970: 90.

DIAGNOSIS. In addition to the key characters, the following combination of characters will distinguish males of *A. (V.) propinquus* from those of other Australian species of the genus *Australosymmerus*: Dorsum of head with an indistinct greyish-black triangle which includes the ocelli; remainder of head greyish testaceous. Postorbital setae 3 or 4 in number. Ventral surface of pedicel bare. Flagellum flavotestaceous at base to dark greyish brown at segment 11 and beyond; last segment minute, spherical, testaceous. Mesonotal vittae coalesced, brown, mesonotum appearing brown with testaceous lateral and anterolateral margins. Pleurites testaceous, with ventral portion of each brown. Wing as in Fig. 64b. Coxae, femora, and tibiae flavous. Basal portion of basal segment of each tarsus flavous; remainder of tarsi dark brown. Apex of fore tibia with 1 large anterodorsal and 1 large posterodorsal spine, and 1 small dorsal and 1 small posterior spine. Apex of mid tibia with 1 large anterodorsal and 1 large posterodorsal spine, and an anterior and ventral fringe of small ones. Apex of hind tibia with 1 anterior spine. Abdominal tergites dark brown with narrow pale apical bands. Tergites 1 to 3 also with anterior margins diffusely flavotestaceous. Sternites 1 to 5 flavotestaceous; sternite 2 with anterior margin brown; sternites 6 and 7 brown with posterior margins flavotestaceous. Segment 8 dark brown; sternite 8 one-half as long as sternite 7; tergite 8 one-half as long as tergite 7, two-thirds as long as sternite 8. Genitalia as described below.

Male genitalia (Fig. 23). Sternite 9 (b) triangular, slightly less than ½ as long as basistylus, fused to basistyli at base. Basistylus (b, c, d) with dorsolateral portion of apical margin emarginate, forming shallow mesal and lateral apical lobes. Dorsomesal margin of basistylus produced mesally and apically to form a lateroapical aedoeagal plate, approximating its antimere for only a short distance near midlength (e). Aedoeagus with a bilateral ventral plate, and an almost transparent rounded basal apodeme. Dististylus (e) with basal portion cylindrical. Apical portion with a rosette of 25 blunt teeth of approximately equal size. Tergite 9 (a, c, e) roughly quadrate, with apical margin produced to form a short tapering apicomedial lobe with a minute apical notch. Cercus (a, c, e) approximately ⅔ length of tergite 9, tapering. Ventral margin at base produced to form a large flattened tubular lobe, tapering dorsally to a point. Apical portion of mesal face of ventral lobe transparent (giving the lobe the appearance of a hollow tube). Sternite 10 (e) transverse, with posterior margin twisted dorsally except medially. Anal lobe indistinct. Hypopygium brown, clothed in short, pale setae.

Female. Unknown, but the female doubtfully placed under *A. anthostylus* may belong here.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **Tasmania:** Mt. Wellington, 12.ii.1963, D. H. Colless (ANIC No. 5913).

Paratype. Same data as holotype (ANIC), 1 ♂

MATERIAL EXAMINED. Paratype male.

UNASSIGNED SPECIES[19]

Australosymmerus naevius Colless

Figs. 24, 54, 64c, 71

Australosymmerus naevius Colless, 1970: 94.

DIAGNOSIS. Males and females of *A. naevius* are similar to those *A. (V.) nebulosus,* from which they may be distinguished by the description given below. Members of *A. naevius* may be distinguished from those of other Australian species of *Australosymmerus* by the combination of the markings of head, abdomen and wings, by the bare pedicel, by the configuration of tibial spines, and by the structure of the male and female genitalia.

DESCRIPTION. Male and female as described for male of *A. (V.) nebulosus,* except as follows: Ocelli enclosed in a fairly distinct transverse black macula. Remainder of head capsule pale testaceous. Anterior surface of pedicel bare. Thorax pale testaceous. Hind coxa pale brown or testaceous. Tarsi testaceous. Wing length of male, 5.5 to 6.0 mm (Colless 1970). Wing length of female, 6.4 to 6.5 mm (Colless 1970). Venation and markings as in Fig. 64c. Basal portion of R_s smoothly curved. Dark brown spots present over base of R_s, r-m, basal portion of CuA, M fork, and between R_5 and the costa over the basal portion of R_4. Fore tibia with 1 long anterodorsal and 1 long posterodorsal spine. Hind tibia with ventral fringe of small spines. Tergites 1 to 4 with distinct narrow pale posterior marginal bands. Sternites pale brown. Genitalia as described below.

Male genitalia (Fig. 24). Sternite 9 (b) triangular, rounded apically, ½ as long as basistylus, fused between basistyli at base. Basistylus (b, c, d) with apical margin shallowly emarginate to form a short narrow mesal lobe, and a rounded lateral lobe. Dorsomesal margin of basistylus produced to form a transverse dorsal aedoeagal bridge, from which a tapering triangular aedoeagal plate extends apically. Basal aedoeagal apodeme broad, deeply emarginate. Dististylus (e) rather simple, with a fringe of 10 teeth on dorsomesal margin. Tergite 9 (a, c, e) roughly quadrate, rather rounded, simple. Cercus (a, c, e) truncate, slightly shorter than tergite 9, with apical portion of ventral margin compressed to form a flange-like lobe. Sternite 10 (e) small, transverse. Anal lobe indistinct. Cercus dark brown. Remainder of hypopygium testaceous. Hypopygium clothed in short to moderately long brownish-yellow setae.

Female genitalia (Fig. 54). Significant features of structure as follows: Sternite 8 with apical margin deeply emarginate to form a pair of apical lobes, the lobes ½ as long as the basal portion. Apical half of basal portion, and apical lobes, extremely dark brown; basal half of basal portion pale. Mesal surface of apical lobe bearing moderately long setae, of which five are strong. Tergite 8 as long as basal portion of sternite 8, testaceous. Segment 2 of cercus ⅓ as long as segment 1. Setae short to long on segment 9, short on remainder of genitalia.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **New South Wales:** Kangaroo Valley, 23.xi.1960, D. H. Colless (ANIC No. 5915).

Paratypes. AUSTRALIA: **New South Wales:** Rutherford Ck., Brown Mountain, 19.i.1961, D. H. Colless, 1 ♂. **Victoria:** Nowa Nowa, 28.x.1961, D. H. Colless, 2 ♂ ♂, 1 ♀ (all in ANIC except 1 ♂ in BMNH).

MATERIAL EXAMINED. 1 ♂ and 1 ♀ paratype from Nowa Nowa.

Australosymmerus tonnoiri Colless

Figs. 25, 64d, 71

Australosymmerus tonnoiri Colless, 1970: 92.

DIAGNOSIS. In addition to the key characters, the following combination of characters may be used to distinguish males of *A. tonnoiri* from those of other Australian species of *Australosymmerus*: Dorsum of head dark brown, pruinose. Remainder of head, including antenna, brown to dark brown. Four distinct brown postorbital setae present. Anterior surface of pedicel bare. Thorax dark brown, pruinose. Legs flavous,[20] with dark brown tarsi. Apex of fore tibia with 1 large anterior spine (Colless 1970). Apex of mid tibia with 1 large

[19]See page 99 for a discussion of the relationships of the following two species to other members of the genus.
[20]One fore leg beyond the coxa, and the other fore leg beyond the femur, are missing in the paratype specimen I have examined.

anterodorsal and 1 large posterodorsal spine. Apex of hind tibia with 1 large anterior spine, and with a ventral fringe of small spines. Wing as in Fig. 64d. Abdominal segments dark brown, each with a narrow pale posterior marginal band. Sternites 1 to 5 with an additional posterior flavotestaceous submarginal band. Genitalia as described below.

Male genitalia (Fig. 25).[21] Sternite 9 (b) distinct, ⅓ as long as basistylus, fused to basistyli at base. Basistylus (b) with dorsolateral portion of apical margin emarginate, forming short rounded dorsal and lateral lobes. Dorsomesal margin of basistylus (visible through tergite 9 in cleared specimen on slide) produced mesally to form a long dorsolateral aedoeagal plate, fused with its antimere for most of length, to form a dorsal plate which is produced to midlength of cercus. Basal apodeme deeply emarginate basally. Diststylus (b) with basal portion simple. Apical portion heavily sclerotized, attached to basal portion by transparent cuticle, bearing a vëntral fringe of 12 blunt teeth. Tergite 9 (a) broad, approximately ¾ as long as basistylus, with apical margin rather straight. Cercus (a) as long as tergite 9, rounded, with a broad pointed flange-like lobe at base of ventral margin. (Sternite 10 is not visible.) Genitalia brown, clothed in short to moderately long setae.

Female. Unknown.

TYPE SPECIMENS. *Holotype male.* AUSTRALIA: **Tasmania:** Mt. Wellington, 30.xi.1922, A. Tonnoir (ANIC No. 5914).

Paratype. Same data as holotype, except 28.xi.1922 (ANIC), 1 ♂.

MATERIAL EXAMINED. The male paratype.

Araeostylus[22] Munroe new subgenus

Type-species: *Australomyia bivittata* Freeman.

DESCRIPTION. Scutellum with 2 pairs of extremely long bristles differentiated from fringe. Microtrichia absent. Subcosta short, apically obsolescent, ending free. Sternite 9 entire, transverse, with lateral margins fused to basistyli. Basistylus open mesally, with a tubular tapering or bifurcate lobe, or with a convolute, flange-like lobe on apex. Diststylus narrow, heavily sclerotized, without a membranous subapical region; mesal margin of apex bearing 1 to 10 blunt, peg-like teeth, or teeth absent. Tergite 9 from 0.7 to 1.3 times basistylus in length; posterolateral corners simple; tergite 9 not fused to basistyli at base. Cercus with mesal, ventral or basal tubular lobes, sclerotized or not; cercus attached to apical margin of tergite 9; length of cercus 0.5 to 3.0 times that of tergite 9. Coloration flavous to dark brown, the colors and markings not bold.

KEY TO SPECIES OF *Araeostylus*

1. Mesothoracic pleuron with conspicuous brown markings .... *simplex* (Freeman)
1′. Mesothoracic pleuron entirely flavotestaceous 2
2.(1′) Mesonotum with 2 longitudinal dark brown maculae; wings hyaline .... *bivittatus* (Freeman)
2′. Mesonotum entirely flavotestaceous; wings with diffuse brown markings 3
3.(2′) Abdominal tergites with yellow apical bands, extending into setose region; cercus of male about as long as tergite 9, with slender, heavily sclerotized ventral lobe (Fig. 27e) .... *collessi* Munroe n. sp.
3′. Yellow apical bands on abdominal tergites absent; cercus of male 3 times as long as tergite 9; long, slender, heavily sclerotized ventral lobe absent (Fig. 26) .... *lobatus* Munroe n. sp.

[21] The genital capsule of the paratype is mounted on a slide. Therefore, ony the dorsal and ventral views of the genitalia are illustrated (see Colless, 1970: 91, fig. 10, for lateral views).

[22] αραιος (= slender) + στυλος (= stylus); masculine.

Australosymmerus (Araeostylus) bivittatus (Freeman)

Figs. 26, 55, 64e, 71

Australomyia bivittata Freeman, 1951: 9.
Australosymmerus bivittatus; Lane, 1956: 143.

DIAGNOSIS. Males and females of *A. (Ar.) bivittatus* may be distinguished from those of other Chilean species of the genus by the presence of only two mesonotal vittae, the absence of microtrichia and wing markings, and the structure of the genitalia (Figs. 26, 55).

DESCRIPTION. **Male.** *Head.* Vertex black, fading to brown posteriorly, clothed in minute or short brownish-yellow bristles. Postorbital bristles strong brown, 5 in number; long dorsally to short laterally. Anterior margins of ocelli forming a straight line. Median ocellus ⅔ as large as lateral ocellus. Eye distinctly emarginate. Dorsal margin of eye reaching level of mesal margin of lateral ocellus. Posterior surface of head ventral to cervix flavous, with moderately long yellow hairs. Frons flavous, bare. Clypeus flavous, clothed in short to moderately long brownish-yellow setae. Mouthparts flavous. Scape and pedicel flavous, each with a distinct clump of short yellowish-brown setae on ventral surface and apical margin. Flagellum flavous at base, darkening to dark brown by segments 7 to 9; penultimate segment 1.3 times as long as preceding segment; last segment spherical, testaceous, minute.

Thorax. Flavous, except for 1 postnotal and 2 mesonotal vittae. Mesonotal vittae dark brown, extending from anterior third to posterior margin. Pronotum and humerus with sparse, short to moderately long, yellowish-brown setae. Mesonotal bristles yellow on anterior third, yellowish brown on posterior two-thirds; short on disc, long to very long on mesal margins of vittae and on lateral and posterior mesonotal margins. Propleuron with 3 to 5 long strong brown dorsally-directed setae, and with 3 to 4 long strong yellow ventrally-directed setae. Prosternum and precoxal bridge with a distinct fringe of long yellow setae. Postnotum with a faint brown posterior median vitta. Halter flavous with club testaceous.

Legs. Coxae, femora, and tibiae flavous. Fore coxa with short yellow setae on anterior surface, and moderately long brownish-yellow setae on lateral surface and apex. Mid coxa with short yellow setae on apical third of anterior surface and with moderately long brownish-yellow setae on apical third of lateral surface. Hind coxa with a posterolateral fringe of moderately long to very long, yellow to brown bristles. Femora clothed in minute pale setae, with a ventral fringe of moderately long bristles. Fore tibial combs represented by 1 to 3 spines, 1 to 2 times the tibial diameter in length. Apex of fore tibia with 1 anterodorsal, 1 dorsal and 1 posterodorsal spine, the dorsal spine ½ as long as the others. Mid tibial combs represented by 4 or 5 spines, 2 to 3 times the tibial diameter in length. Hind tibial combs represented by 4 or 5 spines, 3 to 4 times the tibial diameter in length. Mid and hind tibial apical spines as described for fore tibia, with additional very small spines. Fore and mid tarsi flavous at extreme base, the remainder brown. Hind tarsus flavous, pale brown at apex of each segment.

Wing. Length, 5.0 to 6.3 mm (mean, 5.5 mm). Venation as in Fig. 64e. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein slightly shorter than cross-vein. Basal portions of R_s, R_4, and M_1 smoothly curved. R-m longer than basal portion of R_s. Wing markings absent.

Abdomen. Abdominal setae short to long, slender, yellow. Tergites 1 to 7 with an extremely narrow pale apical band; tergite 1 brown to dark brown, with lateral third flavous; tergite 2 brown to dark brown, with lateral and anterior margins flavous; tergites 3 and 4 brown to dark brown with anterolateral corners flavous; tergites 5 to 7 brown to dark brown. Sternites 1 to 5 flavous; sternites 6 and 7 brown. Segment 8 brown, with moderately long yellow bristles on apical margin. Tergite 8 transverse, ½ as long as sternite 8.

Genitalia (Fig. 26). Sternite 9 reduced, apparently represented by a small triangular area between fused bases of basistyli demarcated by a V-shaped sclerotized internal ridge (b). Basistylus (b, c, d) brown, flavous ventrally. Basistyli fused along basal third ventrally. Dorsomesal margin of basistylus produced posteromesally to form a dorsolateral aedoeagal rod (d). Apex of basistylus produced into a bifurcate immobile lobe (b, c, d). Aedoeagus supported ventrally by complex articulatory processes with a basal apodeme (d). Dististylus (d) slender, sclerotized, ¾ as long as basistylus. Apex of dististylus with 6 ventral teeth, largest mesally (d). Tergite 9 (a, c) quadrate with apical margin deeply emarginate. Cerci (a, b, c, e) as long as tergite 9, truncate, expanded posteriorly. Mesal base of cercus produced into a sclerotized, cylindrical lobe (a, b, e), pointed at apex. Ventral margin of cercus produced into a slender setose lobe (b). Mesal surface of cercus produced into a similar lobe (b). Sternite 10 (e) distinctly sclerotized, diamond shaped, with a slender lateral arm. Tergite 9 and cercus brown.

Female. As described for male, except for size and for the structure of the genitalia, as follows: Wing length, 5.8 to 7.1 mm (mean, 6.6 mm). Tergite 8 (Fig. 55a) brown, with apical margin flavous; clothed in short to moderately long brownish-yellow setae. Sternite 8 (Fig. 55a, b) flavous, clothed in short setae. Apical margin of sternite 8 bilobed, the lobes twisted mesally and dorsally. Apical margin of lobe with 4 long stout black spines. Apical portion of mesal surface of lobe with additional moderately long, black spines. Cercus flavous, clothed in short setae. Second segment of cercus 0.4 as long as first.

TYPE SPECIMENS. *Holotype male.* CHILE. Llanquihue Prov., Casa Pangue, 4–10.xii.1926, F. and M. Edwards (BMNH).

Paratypes. CHILE. Same data as holotype, 5 ♂ ♂, 4 ♀ ♀. Ancud, Chiloe Is., 17–19.xii.1926, F. and M. Edwards (BMNH), 1 ♂. Bariloche (BMNH), 1 ♂. Chiloe Is., "Train to Castro," 10.xii.1926, F. and M. Edwards (BMNH), 2 ♂ ♂, 3 ♀ ♀. Llanquihue Prov., Peulla, 12–13.xii.1926, F. and M. Edwards (BMNH), 4 ♂ ♂, 2 ♀ ♀. Mechuque Is. (BMNH), 1 ♂. Puerto Blest (BMNH), 1 ♂. Puntra (BMNH), 1 ♂, 1 ♀.

MATERIAL EXAMINED. I have examined the following specimens of the paratype series: Ancud, 1 ♂; Casa Pangue, 1 ♀; Castro, 1 ♂, Peulla, 1 ♂, 1 ♀, as well as the following specimens: CHILE: **Arauco:** Caramevida, 5–10.ii.1953, L. E. Pena (CNC), 1 ♀. Pinchinahuel, 6.iii.1959, L. Pena (CNC), 1 ♀. **Aysen:** Lago Frio, Coihaique Valley of Rio Simpson, 20–23.i.1961, L. Pena (CNC), 1 ♂. Puerto Aysen, 24–26.i.1961, L. Pena (CNC), 1 ♂. Puerto Cisnes, 72°40′ W., 44°45′ S., 1–15.ii.1961, L. Pena, 1 ♂. Same data, except 16–28.ii 1961, (CNC, MUS.PAR.), 3 ♂ ♂. Rio Maniguales, 72°30′ W., 45°25′ S., 26–28.i.1961, L. Pena (CNC), 7 ♂ ♂, 2 ♀ ♀. **Cautin:** Los Coigues, L. Villar, 16–31.xii.1964, L. Pena (CNC), 1 ♂, 3 ♀ ♀. Same data, except 1–15.i.1965 (CNC), 4 ♂ ♂ (CNC, ANIC), 3 ♀ ♀. Same data, except 16–25.i.1965, 4 ♂ ♂, 3 ♀ ♀. **Chiloe:** Bahia Toigoi, ca. 19 mi SW. of Ancud, 1–3.ii. 1952, L. Pena (ISU), 1 ♂. Dalcahue, ii.1961, L. Pena (CNC, KYUSHU) 6 ♂ ♂. Same data, except 1–8.ii.1962, 1 ♀. Same data, except 17–22.i.1962, 6 ♂ ♂, 5 ♀ ♀, Same data, except 17–31.i.1962, 1 ♂, 3 ♀ ♀. Same data, except 20.i.1962, R. L. Usinger (CIS), 2 ♀ ♀. **Curico:** El Coigual, 20–26.i.1964, L. Pena (CNC), 1 ♂. Estero La Jaula, *"Nothofagus,"* i.1964, L. Pena (CNC), 5 ♂ ♂, 3 ♀ ♀. **Linares:** Fundo Malcho, 11–21.xi.1965, L. Pena (CNC), 1 ♂, 1 ♀. **Llanquihue:** Ensenada, 13–15.i.1962, L. Pena (CNC), 3 ♂ ♂. **Malleco:** Rio Blanco, Curacautin, 1100 m, ii.1964, L. Pena (CNC), 1 ♂, 1 ♀. Same data, except 1100–2000 ft, 2 ♂ ♂. **Osorno:** 8 km W. of La Picada, El Refugio Volcan Osorno, 41°04′ S., 72°26′ W., 6.ii. 1967, E. I. Schlinger (CIS), 1 ♀. 20 km E. of Puyehue, 25.i.1951, Ross and Michelbacher (CAS), 2 ♂ ♂, 1 ♀.

Australosymmerus (Araeostylus) simplex **(Freeman) new combination**

Figs. 27, 56, 64f, 71

Australosymmerus simplex Freeman, 1951: 8.

DIAGNOSIS. In addition to the key characters, the following combination of characters may be used to distinguish specimens of *A. (Ar.) simplex* from those of the other Chilean species of the genus *Australosymmerus*: Pteropleurite flavous, remaining pleurites, and postnotum, mainly dark brown; males with dististylus slender, tapering, heavily sclerotized, with a knob but no peg-like teeth on apex; tergite 9 with a small apical median notch.

DESCRIPTION. **Male.** *Head.* Vertex black, fading to flavotestaceous in postvertical and occipital regions. Vertex, postvertical and occipital regions clothed in minute pale setae. Eye distinctly emarginate, the dorsal margin reaching the level of middle of lateral ocellus. Postorbital bristles 4 in number, 1 to 2 times the length of flagellar segment 1, second from vertex longest. Postfrons dark greyish brown. Remainder of head including mouthparts flavous.

Clypeus densely clothed in short yellow to brownish-yellow setae. Ventral portion of head clothed in pale setae. Scape flavous. Pedicel flavous, with a brown patch on apical half of lateral surface. Scape and pedicel each with a clump of coarse brown setae on ventral surface and apical margin. Flagellum testaceous basally to dark greyish brown apically; apical segment slightly paler than, and half the length of, the preceding segment.

Thorax. Pronotum flavous with short brown setae. Humerus flavous, bare. Mesonotum flavous, with 3 longitudinal dark brown vittae, the median one paler and divided by a faint yellow median line. Mesonotum with short pale setae on disc, and extremely long dark bristles on lines between vittae, and on lateral and posterior margins. Scutellum flavotestaceous. Postnotum dark brown, with anterolateral corners flavotestaceous. Propleuron and prosternum flavous, with long brown bristles, forming a fringe. Pteropleurite flavous. Remaining pleurites brown to dark brown.

Legs. Coxae and femora yellow. Fore coxa with anterior surface clothed in short, almost transparent setae. Lateral surface and apex of anterior surface with long brown setae. Mid coxa with apical half of anterior and lateral surfaces clothed in short pale setae interspersed with long dark ones. Hind coxa with a posterolateral row of moderately long to long brown setae. Femora clothed in minute dark setulae. Ventral margin of mid femur with a fringe of moderately long, yellowish-brown bristles. Similar bristles present on apex of ventral margins of fore and hind femur. Tibiae flavous, testaceous at apex. Fore tibial combs represented by 1 or 2 spines, 1.5 to 2.0 times the tibial diameter in length. Apex of fore tibia with 1 long anterior, 1 short posterodorsal, and 1 long posterior spine. Mid tibial combs represented by 3 to 5 spines, 0.75 to 3.0 times the tibial diameter in length. Apex of mid tibia with 1 long posterodorsal, 1 short dorsal, and 1 moderately long anterior spine. Hind tibial combs represented by 3 to 5 spines, 2 to 3 times the tibial diameter in length. Apex of hind tibia with 1 long posterodorsal, 1 short dorsal, and 1 intermediate anterior spine. Fore tarsus with basal half of first segment flavous, otherwise brown. Mid and hind tarsus with basal segment and base of second segment flavous, otherwise brown.

Wing. Length, 5.3 to 6.2 mm (mean, 5.8 mm; *n*, 7). Venation as in Fig. 64f. Markings absent. Significant features of the venation as follows: Sc short, with strong portion distal to humeral cross-vein slightly longer than cross-vein. Basal portions of R_4 and R_5 smoothly curved.

Abdomen. Abdominal setae short to moderately long, pale. Tergites each with a narrow white apical band. Tergite 1 dark brown with anterior quarter flavous to entirely dark brown. Tergites 2 to 7 dark brown with yellow posterior bands adjoining the white posterior margins. Sternites each with a narrow white apical band. Sternite 1 flavous; sternites 2 to 7 progressively darker, with sternite 7 entirely brown. Segment 8 brown, with moderately long setae on posterior margin.

Genitalia (Fig. 27). Sternite 9 (b) indistinct, fused to bases of basistyli. Basistylus (b, c, d) with apical margin produced, and the mesal surface of the lobe sclerotized. Basistyli fused along basal third of mesal margin. Dorsomesal margin of basistylus produced mesally and apically, to form a large dorsal aedoeagal plate (d), fused to its antimere. Ventral plate of aedoeagus complex, with a short broad flat lightly sclerotized basal apodeme. Dististylus (a, b, c, d) slender, sclerotized, ⅔ as long as basistylus, with apex blunt and rounded. Apical teeth and bristles absent. Tergite 9 (a, e) almost square, with an apical median notch. Cercus (a, c, e) short, ½ as long as tergite 9, truncate, expanded posteriorly, with a short blunt heavily sclerotized ventral mesal lobe. Sternite 10 (e) large, heavily sclerotized, transverse, with a large median apical lobe and a pair of lateral arms. Tergite 9, basistylus, sternite 9 and cercus flavous, clothed in short to moderately long setae.

Female. As described for male, except as follows: Apical segment of antenna almost as long as preceding segment. Genitalia as in Fig. 56. Significant features of structure of genitalia as follows: Sternite 8 abruptly tapered apically. Apical lobes short, rounded, broad. Apical margin of lobes with 4 strong setae. Mesal surface and posterior margin of lobes with short to long brownish-yellow setae. Second segment of cercus less than ½ as long as first. Segment 8 and cercus flavous, clothed in short to moderately long brownish-yellow setae.

TYPE SPECIMENS. ARGENTINA: L. Correntoso (BMNH), holotype and 3 paratype ♂♂. Terr. Rio Negro, L. Nahuel Huapi, Puerto Blest, 2–3.xii.1926, F. and M. Edwards (BMNH), 7 paratype ♂♂.

MATERIAL EXAMINED. ARGENTINA: All paratypes. CHILE: Curico, Las Trancas, 21–30.xi.1964, L. E. Pena (CNC), 3♂♂, 1♀.

Australosymmerus (Araeostylus) lobatus Munroe new species
Figs. 28, 57, 64g, 71

DIAGNOSIS. In addition to the characters given in the key, the following combination of characters may be used to separate males of *A. (Ar.) lobatus* from those of other species of the genus *Australosymmerus*: Cercus tapering, with the ventral margin produced to form a narrow basal lobe and a broad, subapical lobe; apex of cercus with a large curved spine-like seta; a smaller but otherwise similar seta present on dorsal margin beyond midlength.

DESCRIPTION. **Male.** *Head.* Vertex brown, black between and around ocelli. Gena brown between posterior margin of eye and postocular bristles, flavous posterior to postorbital bristles. Postorbital bristles brown, 6 in number, long dorsally to short ventrally. Vertex, postvertical region, and dorsal half of occipital region and of gena sparsely clothed in minute black setae. Ventral half of gena and occipital region clothed in long yellow setae. Anterior margin of median ocellus slightly anterior to that of lateral ocellus. Eye distinctly emarginate, with dorsal margin reaching level of mesal margin of lateral ocellus. Frons flavotestaceous, bare. Clypeus flavotestaceous, clothed in short to moderately long brown bristles. Labellum and palpus flavous, clothed in short dark bristles. Scape and pedicel flavous, each with an apical fringe of short brown bristles. Flagellum with segment 1 dark greyish-brown, flavous at base; segments 2 to 14 dark greyish-brown; segment 15 dark brown, ⅓ as long as the preceding segment.

Thorax. Pronotum flavous, bare. Humerus flavous, with 1 long bristle and a few short ones. Mesonotum testaceous, slightly paler on median portion of anterior half. Mesonotal bristles short to moderately long on disc, extremely long laterad of median line and on lateral margin. Scutellum and postnotum flavotestaceous. Propleuron flavous, with 2 very long brown bristles, and several smaller ones. Pleurotergite flavous, brown near ventral margin. Remaining pleurites flavous.

Legs. Coxae and femora flavous. Anterior surface of fore coxa densely clothed in short to moderately long bristles, with several long dark ones distally; mesal surface of fore coxa with short brownish-yellow bristles; remainder of fore coxa bare. Mid coxa with distal half of lateral surface clothed in brown bristles, short proximally to long distally. Hind coxa with a posterolateral row of short to long brownish-yellow bristles. Femora clothed in minute black setulae, with a sparse ventral fringe of moderately long bristles on apical half. Fore tibia flavous at base to light brown near apex; extreme apex dark brown. Fore tibial combs represented by 1 spine, slightly more than twice the tibial diameter in length. Apex with 1 anterior and 1 posterodorsal spine. Mid and hind tibia flavous, darker near apex, dark brown at extreme apex. Mid and hind tibial combs each represented by 4 or 5 spines, 3 times tibial diameter in length. Apex of mid tibia with 1 anterodorsal and 1 posterodorsal spine. Apex of hind tibia with 1 dorsal and 1 anterodorsal spine. Fore tarsus dark brown. Mid tarsus with basal segment flavous at base to dark brown at apex; remaining segments dark brown. Hind tarsus with basal 2 segments flavous, each with brown apex; remaining segments brown.

Wing. Length, 5.9 to 6.9 mm (mean, 6.4 mm; *n*, 2). Venation and markings as in Fig. 64g. Significant features of markings and venation as follows: Sc with strong portion distal to humeral cross-vein slightly longer than cross-vein. Basal portions of R_4 and R_5 smoothly curved. R-m twice as long as basal portion of M_{3+4}, the basal half weak and forming an angle with the apical half. Markings brown, situated as follows: between R_1 and R_s at base of R_s; between anterior wing margin and basal two-thirds of R_4; along CuA at its midlength.

Abdomen. Abdominal setae short to moderately long, pale. Tergites 1 to 5 with an extremely narrow pale band on apical margin; tergite 1 dark brown; tergites 2 to 5 dark brown, with flavotestaceous anterolateral margins; tergites 6 and 7 dark brown. Sternites 1 to 5 flavous; sternites 6 and 7 dark brown. Segment 8 flavous, with short setae on apical margin.

Genitalia (Fig. 28). Sternite 9 (b) short, transverse. Apical margin of basistylus (b, c, d) produced into a slender sclerotized lobe, about ⅔ as long as basistylus. Dorsomesal margin of basistylus (d) produced, the lobe from each basistylus fusing to form an apically bilobed aedoeagal plate. Remainder of aedoeagus (d) largely membranous, but with sclerotized ventral articulatory processes and a slender basal apodeme. Dististylus (d) slender, as long as basistylus, curved dorsally, with a lateroapical fringe of 8 blunt teeth. Tergite 9 (a, c, e) small, ⅔ as long as basistylus, slightly emarginate apically. Cercus (a, c, e) extremely large, almost 3 times as long as tergite 9, slender and tapering, with the ventral margin produced to form a narrow basal lobe and a large broad subapical lobe. Apex of cercus with a large curved spine. Mesal surface beyond midlength, near the dorsal margin, bearing a smaller but otherwise similar spine. Ventral margin between lobes with a slender sclerotized dorsomesally directed spine-like process. Sternite 10 (e) large, broad, distinctly sclerotized, with an apical dorsally directed slender lobe supporting the anal lobe. Hypopygium flavotestaceous. Tergite 9, cercus, and basistylus clothed in short to moderately long setae.

Female. As described for male, except as follows: Wing length, 6.6 to 7.1 mm (mean, 6.8 mm; *n*, 2). Ventral surface of scape with a clump of short to long dark bristles. Flagellum light brown at base, grading to dark brown at fifth segment; last segment testaceous, ¾ as long as preceding segment. Sternites 6 and 7 flavotestaceous. Fore tibia with 1 long and 1 short apical spine. Hind tibia with 1 dorsal and 1 anterior spine. Genitalia as in Fig. 57. Significant features of structure of genitalia as follows: Sternite 8 constricted at apical third. Apical margin of sternite 8 bilobed, the lobes short, rounded, twisted mesally and directed posterodorsally. Apical margin of lobe with 4 long strong spines, the anterior one shortest. Mesal surface of lobe with short to moderately long setae. Second segment of cercus ½ as long as first. Genitalia flavotestaceous, clothed in short setae.

MATERIAL EXAMINED. *Holotype male.* CHILE: Aysen, Puerto Cisnes, 72°40′ W., 44°45′ S., 1–15.ii.1961, L. E. Pena (CNC No. 12973).

Allotype female. Same data as holotype, except 16–28.ii.1961.

Paratypes. Same data as holotype: 1 ♂, 1 ♀.

Australosymmerus (Araeostylus) collessi Munroe new species

Figs. 29, 58, 64h, 71

DIAGNOSIS. In addition to the key characters, the following combination of characters will separate males of *A. (Ar.) collessi* from those of other species of the genus *Australosymmerus*: Apex of basistylus produced into a short bluntly-pointed sclerotized lobe; dististylus with 10 peg-like teeth; dorsal margin of cercus with 2 large spine-like setae.

DESCRIPTION. **Male.** *Head.* Flavotestaceous, with ocelli enclosed in a transverse rectangular black macula. This macula sharply defined, touching eye margin posterior to apex of dorsal arm. Vertex, and postvertical and occipital regions, clothed in minute brownish-yellow setae, longer behind ocelli. Gena clothed in moderately long yellow setae. Eye distinctly emarginate, the dorsal margin reaching beyond level of median margin of lateral ocellus. Postorbital bristles moderately long, 4 in number, strongest towards vertex. Frons clothed in short pale setae. Scape and pedicel flavotestaceous, each with an apical ring of minute brown setae. Anterior surface of scape with a clump of minute to moderately long brown setae. Flagellum pale brown at base, darkening to brownish grey towards apex; last segment pale brown, slightly shorter than preceding segment.

Thorax. Mesonotum flavotestaceous, flavous at lateral margin. Remainder of thorax flavous. Pronotum and humerus with short to moderately long brownish-yellow setae. Mesonotal bristles brown, short to moderately long on disc, very long near lateral and posterior margins and in a row laterad of mesal margin. Propleuron and prosternum with a fringe of long brown bristles.

Legs. Coxae, femora, and tibiae flavous. Anterior half of fore coxa clothed in short pale setae, with moderately long brown ones near apex. Posterior half of fore coxa clothed in moderately long brown setae. Mid coxa with short weak pale to long strong brown setae on apical half of lateral surface. Hind coxa with an irregular posterolateral row of long bristles, and with short pale setae on lateral surface. Femora densely clothed in minute brown setulae, with a ventral fringe of moderately long brownish-yellow bristles. Fore tibial combs each represented by 1 or 2 spines, twice as long as the tibial diameter. Apex of fore tibia with 1 anterodorsal and 1 posterior spine, and several minute spine-like setae. Mid and hind tibial combs each represented by 4 or 5 spines, up to 3 times the tibial diameter in length. Apex of mid and hind tibia with 1 dorsal and 1 anterior spine. Basal two-thirds of first segment of tarsi flavous, remainder pale brown.

Wing. Length, 6.3 mm. Venation and markings as in Fig. 64h. Significant features of venation and markings as follows: Sc with strong portion distal to humeral cross-vein about as long as cross-vein. Basal portions of R_1 and R_s smoothly curved. Markings faint, brown, consisting of a spot distad of junction of R_1 and R_s and a stigmatic spot between the costa and R_1.

Abdomen. Abdominal setae short to long, yellowish brown. Tergite 1 flavous, with a large diffuse brown patch; tergites 2 to 7 brown with a flavous band on apical one-fifth. Sternites 1 to 5 flavous; sternites 6 and 7 pale brown. Segment 8 flavous, with moderately long, yellowish-brown setae near apical margin.

Genitalia (Fig. 29). Sternite 9 (b) small, transverse, crescentic, fused between bases of basistyli. Apical margin of basistylus (b, c, d) produced into a short sclerotized bluntly-pointed lobe. Dorsomesal margin of basistylus produced, the two lobes thus produced fused to form a large triangular dorsal aedoeagal plate with an apical notch (d). Ventral aedoeagal process complex with a truncate basal apodeme. Dististylus (b, c, d) short, sclerotized, ½ as long as basistylus, with a lateroapical fringe of 10 blunt teeth. Tergite 9 (a, c, e) broad, with apical margin produced into a triangular lobe with apex rounded. Cercus (a, c, e) irregularly tapering, broad, with a very long slender sclerotized ventral lobe. Dorsal margin of cercus with 2 strong, laterally-curved spine-like setae. Sternite 10 (e) large, produced dorsally to support a long slender anal lobe, almost reaching level of apex of cercus. Basistylus, cercus, and tergite 9 flavous, clothed in short to long yellowish-brown setae.

Female. As described for male, except as follows: Ocelli ringed with black, the black only faintly continuous between ocelli. Six postorbital bristles present. Apex of mid tibia with 1 large anterodorsal and 1 large posterodorsal spine. Fore tarsus with first segment flavous except at apex; remainder of fore tarsus brown. Mid and hind tarsus flavous. Wing length, 7.2 mm. Genitalia as in Fig. 58. Significant features of structure of genitalia as follows: Sternite 8 broad, with apical margin bilobed, the lobes short, rounded, twisted mesally and dorsally. Apex of lobe with 6 stiff spines. Lateral surface of sternite 8 slightly excavated. Cercus rather short; segment 2 two-thirds as long as segment 1. Tergite 8 brown with posterior margin flavous. Sternite 8 and cercus flavous. Segment 8 and cercus clothed in short brownish-yellow bristles.

MATERIAL EXAMINED. *Holotype male.* CHILE: Arauco, Palo Botado, Contulmo, 2.ii.1953, L. Pena (CNC No. 12971).

Allotype female. CHILE: Aysen, Rio Maniguales, 82°30′ W., 45°25′ S., 26–28.i.1961, L. Pena (CNC).

Vellicocauda[23] Munroe new subgenus

Type-species: *Platyura insolita* Walker, 1837.

DESCRIPTION. Scutellum with 1 pair of extremely long and 1 pair of long bristles differentiated from the fringe. Microtrichia present or absent. Subcosta short, apically obsolescent, ending free. Sternite 9 entire, fused to basistyli at extreme base. Apex of basistylus with a convolute sinuate vertical sclerotized lobe or bluntly-pointed short lobe, but lobe never attenuate; basistylus open dorsally. Tergite 9, 1.0 to 1.2 times basistylus in length (excluding apical lobe of basistylus), with posterolateral corners simple; tergite 9 not fused to basistylus. Cercus 0.5 to slightly more than 1.0 times tergite 9 in length, without dorsal or ventral processes; mesal surface with a flange-like lobe or lobes, raised from mesal surface; cerci borne on apical margin of tergite 9. Colors dull, flavous to dark brown.

KEY TO SPECIES OF *Vellicocauda*

1. Combs of anterior tibia represented by 1 or 2 spines; microtrichia absent .... *maculatus* Munroe n. sp.
1′. Combs of anterior tibia absent; microtrichia present 2
2.(1′) Mesal lobe of cercus of male distinctly divided into basal and apical portions (Fig. 28e) .... *insolitus* (Walker)
2′. Mesal lobe of cercus of male continuous to apex (Fig. 29e) .... *confusus* Munroe n. sp.

[23]Vellico (= to compress) + cauda (= tail); feminine.

Australosymmerus (Vellicocauda) insolitus (Walker)

Figs. 30, 59, 64i, 72

Platyura? insolita Walker, 1837: 335; Kertesz, 1902: 52; Johannsen, 1909: 23.
Ditomyia incerta Bigot, 1888: 16; Arribalzaga, 1892: 435; Kertesz, 1902: 38; Johannsen, 1909: 11 (synonymy by Freeman, 1951: 9).
Centrocnemis insolita; Edwards, 1921: 435.
Australomyia insolita; Freeman, 1951: 9.
Australosymmerus insolitus; Lane, 1956: 143; Lane, 1963: 3.

DIAGNOSIS. *Australosymmerus (Vellicocauda) insolitus* (Walker) is very similar to *A. (Vl.) confusus* Munroe. The brown mid coxa, the configuration and number of the apical spines of the tibiae, the distinctive wing markings, and the structure of the genitalia will distinguish males of *A. (Vl.) insolitus* from those of *A. (Vl.) confusus.*

DESCRIPTION. **Male.** *Head.* Vertex and postocular region greyish brown. Frons, clypeus, and labellum testaceous. Palpus brown. Clypeus and postocular region clothed in short yellowish-brown bristles. Median ocellus ½ as long as lateral ocellus. Eye distinctly emarginate; dorsal margin projecting just beyond level of mesal margin of lateral ocellus. Scape and pedicel flavotestaceous, with short yellowish-brown apical bristles; scape with additional short bristles on ventral surface. Flagellum brown basally, grading to dark brown at apex; last segment paler than and slightly more than one-third as long as preceding segment.

Thorax. Pronotum and humerus testaceous, clothed in short to moderately long, brownish-yellow bristles. Mesonotum testaceous, with 3 longitudinal dark brown vittae. Lateral vitta extending from the anterior quarter to the posterior margin. Median vitta extending from the anterior margin to the posterior quarter. Mesonotum clothed in brownish-yellow bristles, these short on disc, moderately long between vittae, long on lateral and posterior margins. Propleuron and prosternum flavous, clothed in short to moderately long brownish-yellow bristles which form a weak fringe. Pteropleurite testaceous. Remaining pleurites brown to dark brown. Postnotum brown. Halter flavotestaceous.

Legs. Fore coxa flavous. Mid and hind coxae brown. Femora and tibiae flavous. Tarsi flavous at base to dark brown at apex. Fore coxa with short to moderately long pale bristles on anterior surface. Mid coxa bearing short to moderately long bristles on distal half of anterolateral surface and at apex. Hind coxa with a posterolateral row of short to moderately long bristles. Femora, tibiae, and tarsi clothed in minute dark setulae. Femora with a ventral fringe of moderately long pale hairs. Fore tibia without spines, except at apex. Apex of fore tibia with 1 anterior and 1 posterodorsal spine, 1 to 1.5 times the tibial diameter in length. Mid tibial combs each represented by 2 spines, 1 to 2 times the tibial diameter in length. Apex of mid and hind tibia each with one anterior spine shorter than the tibial diameter in length, and one posterodorsal spine, 1.5 times the tibial diameter in length. Hind tibial combs each represented by 2 or 3 spines, 1 to 2 times the tibial diameter in length.

Wing. Length, 5.7 to 6.8 mm (mean, 6.3 mm; n, 5). Venation and color as in Fig. 64i. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein 1.5 times as long as cross-vein. Basal portions of R_s and R_4 smoothly curved. Apex of wing beyond R_1, area around base of R_s and r-m, and portions of posterior margin between M_{3+4} and CuA and between CuA and 1A distinctly brown. Remainder of wing clear. Microtrichia present, dense. Macrotrichia sparse in basal one-third of subcostal cell, and in area of wing basal to r-m and posterior to R_1; otherwise dense.

Abdomen. Abdominal setae short to moderately long, brownish yellow. Tergites 1 to 7 brown, each with an extremely narrow pale apical band; tergite 2 with anterolateral margin testaceous. Sternites 1 to 7 brown, each with a narrow pale apical band. Segment 8 brown, with an apical fringe of moderately long bristles.

Genitalia (Fig. 30). Sternite 9 (b) transverse, with posterior margin emarginate. Basistylus (b, c, d) with a vertical apically bi-emarginate apical lobe; apical lobe flange-like, sinuate. Dorsomesal margin of basistylus (d) produced mesally and apically into a broad dorsal aedoeagal plate. Dorsal plates connected by narrow bridges basally and at extreme apex. Ventral aedoeagal plate long, slender, with a basal apodeme. Dististylus (b, d) slender, swollen at base; distal portion forming a right angle with basal portion, flattened. Apex of distal portion forming a hood, fringed with coarse teeth dorsally, fine teeth ventrally. Tergite 9 (a, c, e) roughly quadrate, apically notched. Cercus (a, c, e) quadrate, truncate; mesal surface produced to form a sharp ridge. Apex produced into a truncate short sclerotized lobe, distinctly separated from mesal ridge. Tergite 9 (e) transverse, lightly but distinctly sclerotized. Anal lobe (e) with 5 setae at apex. Mesal portion of tergite 9, and cercus, brown; remainder testaceous. Setae brownish yellow; short and dense on cercus, short to moderately long on tergite 9 and basistylus.

Female. *Head.* Vertex greyish brown, fading to testaceous behind eyes. Anterior margins of ocelli forming a straight line. Median ocellus slightly smaller than lateral ocellus. Eye distinctly emarginate, the dorsal margin reaching to level of mesal margin of lateral ocellus. Postorbital bristles moderately long, brown. Vertex clothed in minute brown setae. Postocular and occipital regions clothed in moderately long yellow hairs. Frons, clypeus, and labellum flavotestaceous. Palpus pale brown to brown. Scape and pedicel flavous, with a row of short brown setae on dorsal apex and a few yellow setae on ventral surface. Flagellum pale brown at base to brown at segment 14; segment 15 pale brown, ⅔ as long as preceding segment.

Thorax. Pronotum and humerus flavous to flavotestaceous, with moderately long to long yellow or yellowish-brown bristles. Mesonotum flavotestaceous with 3 distinct longitudinal vittae. Median vitta extending from anterior margin to posterior one-quarter, divided anteriorly by a pale median line. Lateral vitta extending from anterior quarter to posterior margin. Mesonotum sparsely clothed in short pale setae. Pale areas between vittae, and lateral and posterior margins, bearing long to very long, brown or yellowish-brown setae. Scutellum flavotestaceous. Propleuron, prosternum, and precoxal bridge flavotestaceous, with an indistinct fringe of moderately long yellow or brownish-yellow setae. Pteropleurite flavotestaceous, remaining pleurites and postnotum brown to dark brown. Halter flavotestaceous.

Legs. Leg bristles yellow. Fore coxa flavous or flavotestaceous; anterior surface densely clothed in moderately long bristles. Mid and hind coxa brown to dark brown. Distal one-half of anterior surface of mid coxa and extreme apex with moderately long bristles. Hind coxa with an irregular posterolateral fringe of moderately long bristles. Femora and tibiae flavous. Femora clothed in short bristles, with a ventral fringe of moderately long hairs. Fore tibia without distinct spines along length. Apex of fore tibia with 2 posterior spines and 1 anterior spine. Mid tibial combs each represented by 1 or 2 spines, from 1 to 2 times the tibial diameter in length. Apex of mid tibia with 1 anterior and 1 posterior spine. Hind tibial combs each represented by 2 to 4 spines, from 1½ to 2 times the tibial diameter in length. Apex of hind tibia with 1 anterior and 1 dorsal spine. Tarsi flavous, except distal one-half of last segment brown.

Wing. As described for male.

Abdomen. Tergites and sternites 1 to 7 with an extremely narrow, pale apical margin. Abdominal setae short to moderately long, yellow or brownish yellow. Tergite 1 dark brown; tergites 2 to 7 dark brown with anterior one-third to one-half flavotestaceous (giving a distinctly banded appearance to the abdomen). Sternite 1 flavous. Sternites 2 to 7 marked in the same way as the corresponding tergites, but with the brown markings paler.

Genitalia (Fig. 59). Tergite 8 flavotestaceous laterally, brown medially. Apical margin of sternite 8 bilobed, the lobes twisted mesally and dorsally. Apical margin of lobe bearing 4 stiff spines. Apical half of mesal surface of lobe bearing shorter stiff spines. Segment 2 of cercus slightly less than ½ as long as segment 1.

TYPE SPECIMEN. The holotype is a male in the BMNH.

MATERIAL EXAMINED. CHILE: Cape Horn Region, Caleta Lennox, 7.ii.1970, E. L. Bousefield (CNC), 1♂. Malleco, Curacautin, Rio Blanco, ii.1964, 1100 m, L. F. Pena (CNC), 1♀. TIERRA DEL FUEGO: Estancia Viamonte (Argentina), xii.1929, P. W. Reynolds (BMNH), 1♂, 1♀. Lago Fagnano (Argentina), i.1962, Lane, Coscaron and Capri (LA PLATA), 5♂♂. Lake Yuvin, 18.i.1931, P. W. Reynolds (BMNH), 1♂.

Australosymmerus (Vellicocauda) confusus Munroe new species

Figs. 31, 64j, 72

DIAGNOSIS. *Australosymmerus confusus* is very similar to *A. (Vl.) insolitus* (Walker). Males may be distinguished by the color of the mid coxa (flavous in *A. (Vl.) confusus,* brown in *A. (Vl.) insolitus*); the configuration of the apical spines of the tibia; the wing markings; and the slight but distinct differences in the genitalia.

DESCRIPTION. **Male.** As described for male of *A. (Vl.) insolitus,* except as follows: Ocelli indistinctly ringed with greyish black. Vertex greyish brown, fading to testaceous posteriorly and behind eye. Dorsal arm of eye projecting to level of mesal margin of lateral ocellus. First flagellar segment testaceous or brown; segments 2 to 14 brown; last segment testaceous, slightly less than ½ as long as preceding segment. Fore and mid coxa flavous, hind coxa brown. Fore tibia with 1 anterior and 2 posterior apical spines. Mid and hind tibia each with 1 anterior and 1 dorsal apical spine. Wing length, 5.9 mm (*n*, 2). Basal portion of R_4 (Fig. 64j) smoothly or abruptly curved towards apex of wing. R-m interrupted. Wing markings faint, consisting of a small brown mark at basal portion of R_s and a stigmatic spot. Wing apex distad of base of R_4 very faintly clouded. Genitalia as in Fig. 31. Apical lobe of basistylus (b, c, d) flange-like, the dorsal portion of the lobe turned laterally. Basal apodeme of aedoeagus (d) short. Mesal ridge of cercus (e) continuing to ventral apex. Ventral apex of cercus rounded.

TYPE SPECIMENS. *Holotype male.* CHILE: Cord. Nahuelbuta, Pichinahuel, 1400–1600 m, 37°50′ S., 73°07′ W., 12–20.ii.1953, L. E. Pena (CNC No. 12972).

Paratype. CHILE: Cautin, Los Paraguas, 1400 m, 21–24.(?).1955, L. E. Pena (CNC), 1 ♂.

Undetermined Female

I have examined a female specimen of *Australosymmerus s. lat.* which was collected with the paratype of *A. (Vl.) confusus* Munroe n. sp. I can detect only the slightest differences in the internal structure of the genitalia between this specimen and *A. (Vl.) insolitus* (Walker) females. The specimen is as described for the females of *A. (Vl.) insolitus,* except as follows: Ocelli indistinctly ringed with black. Mid tibia with 1 posterior, 1 dorsal, and 2 anterior apical spines. Hind tiba flavous, brown at apex. Fore and mid tarsus flavous, with extreme apex brown. Hind tarsus brown. Brown wing markings present at base of R_s and base of R_4. Apex of wing beyond R_4 faintly clouded.

This specimen is probably a female of *A. confusus,* but this identification is doubtful as it is based on a single specimen, and the differences from *A. (Vl.) insolitus* are very small.

MATERIAL EXAMINED. CHILE: Cautin, Los Paraguas, 1400 m, 21–24.(?).1955, L. E. Pena (CNC), 1 ♀.

Australosymmerus (Vellicocauda) maculatus Munroe new species

Figs. 32, 64k, 72

DIAGNOSIS. Males of *A. (Vl.) maculatus* may be distinguished from those of the other species of *Vellicocauda* by the following characters in addition to the key characters: Mid coxa with a brown macula on anterolateral surface; hind coxa with a brown macula occupying middle half of lateral surface.

DESCRIPTION. **Male.** As described for male of *Australosymmerus* (*Araeostylus*) *simplex,* except as follows: Dorsal margin of eye reaching level of mesal margin of lateral ocellus. Postfrons flavous. Palpus pale brown. Scape flavotestaceous, with a clump of short coarse brownish-yellow setae on anterior surface. Pedicel with constricted basal portion testaceous or brown, apical portion flavous. Apical margin of pedicel with minute brownish-yellow setae. Flagellum uniformly brown. Pronotum testaceous, bare. Humerus flavous, with 1 long brown seta. Median vitta of mesonotum as dark as lateral vitta. Propleural and prosternal bristles brownish yellow. Mid coxa flavous, with a brown macula on anterolateral surface. Posterolateral surface of mid coxa bare. Hind coxa flavous with a brown macula occupying middle half of lateral surface. Coxal setae moderately long and pale to long and brownish yellow. Fore tibial combs represented by 1 or 2 spines, 1 tibial diameter in length. Anterior and posterior apical spines of fore tibia short; posterodorsal spine moderately long. Apex of mid tibia with 1 long posterodorsal, 1 short dorsal, and 1 moderately long anterodorsal spine. Hind tibial combs each represented by 3 or 4 spines. Apex of hind tibia with 1 anterior and 1 dorsal spine. Basal half of basal segment of fore tarsus flavous. Remainder of tarsi brown. Wing length, 5.5 to 6.0 mm (mean, 5.7 mm; *n*, 5). Wing surface faintly brown between R_4 and R_1 (Fig. 64k). Tergite 1 of abdomen dark brown; tergite 2 dark brown with anterolateral corner flavous; tergites 3 to 7 dark brown. Sternites with posterior pale bands; sternite 2 brown, with anterior margin flavous; sternites 3 to 7 dark brown; segment 8 brown. Tergite 8, at middle, ½ as long as sternite 8. Genitalia as in Fig. 32. Significant features of structure of genitalia as follows: Sternite 9 (b) short, rounded apically, fused to bases of basistyli only at its base. Basistylus (b, c, d) with apical margin produced into a short pointed lobe, which is not particularly heavily sclerotized. Dorsomesal margin of basistylus produced mesally to form a posteriorly-directed dorsolateral aedoeagal plate (d), the apex of which is produced into a short filamentous lobe. Dorsolateral aedoeagal plates fused to form a bridge. Ventral portion of aedoeagus (b, d) with an apical yoke-like structure with a pair of apical filamentous lobes, and with a rather slender basal apodeme. Tergite 9 (a, c, e) large, rather quadrate, apically emarginate. Cercus (a, b, c, e) quadrate, slightly more than ½ as long as tergite 9. Apical portion of mesal surface produced to form a transverse flange-like lobe (e). Sternite 10 (e) very large, consisting of a transverse basal portion, with a very large bifurcate apical lobe. The two portions of the apical lobe curve dorsally and support the lateral ventral region of the large pointed anal lobe. Sternite 9 testaceous. Remainder of hypopygium brown.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* CHILE: Aysen, Rio Maniguales, 72°30′ W., 45°25′ S., 26–28.i.1961, L. E. Pena (CNC No. 12974).

Paratypes. CHILE: Same data as holotype, 2♂♂. Aysen, Puerto Cisnes, 72°40′ W., 44°45′ S., 1–15.ii.1961, L. E. Pena (CNC), 1♂. Cautin, Los Coigues, L. Villar, 1–15.i.1965, L. E. Pena (CNC), 1♂. Rio Chaquiqua, 460 m, 18.iii.1965, L. E. Pena (BMNH), 1♂.

Tantrus[24] Munroe new subgenus

Type-species: *Australosymmerus montorum* Munroe.

DESCRIPTION. Scutellum with 2 extremely long and 2 long bristles differentiated from fringe. Microtrichia present, dense between costa and CuA proximal to junction of R_4 and R_5, sparse on remainder of surface. Subcosta short, apically obsolescent, ending free. Sternite 9 entire, fused to basistylus along basal half of lateral margins. Basistylus open mesally, with apex produced into an attenuated lobe. Tergite 9 approximately as long as basistylus, with basal half of ventral margin fused to basistylus; posterolateral corner of tergite 9 simple. Cercus half as long as tergite 9, borne on apical margin of tergite 9; ventral margin of cercus produced to form cylindrical tapering heavily sclerotized process.

NOTE: This subgenus at present contains only one species.

Australosymmerus (Tantrus) montorum Munroe new species

Figs. 33, 64*l*, 72

DIAGNOSIS. In addition to the characters given in the key, the sparse microtrichia beyond the junction of R_4 and R_5, and the structure of the genitalia (Fig. 33) will distinguish males of this species from those of other *Australosymmerus s. lat.*

DESCRIPTION. **Male.** *Head.* Vertex black, fading abruptly to testaceous in postvertical and occipital regions. Postvertical and dorsal occipital regions clothed in minute to short black bristles. Gena flavous. Gena and ventral occipital region clothed in moderately long yellow bristles. Posterior margins of ocelli forming a straight line. Dorsal margin of eye only slightly emarginate, reaching level of lateral ocellus. Postorbital bristles 4 in number, brown, short dorsally to long laterally. Frons flavous, bare. Clypeus densely clothed in setae, short and pale dorsally to moderately long and brown ventrally. Labellum and segment 1 and basal half of segment 2 of palpus flavous; distal half of segment 2 and segments 3 and 4 of palpus brown. Scape and pedicel flavous, each with ventral surface, and apex, bearing minute brown setae. Flagellum grading from light brown at base to dark brown at segment 12 and beyond; segment 15 three-quarters as long as preceding segment.

[24]An arbitrary combination of letters; masculine.

Thorax. Pronotum flavous, diffusely and faintly marked with brown; bearing scattered short brown setae. Humerus flavous, with 1 long strong black bristle. Mesonotum dark brown, with anterolateral corners and posteromedian margin flavous. Two pairs of pale longitudinal lines usually present, the mesonotum appearing to have five longitudinal vittae. Mesonotal setae black, short on disc, moderately long in position of pale lines, long to extremely long laterally and posteriorly. Scutellum testaceous. Postnotum brown medially, flavo-testaceous laterally. Propleuron and prosternum flavous, with a fringe of short to long brown setae. Anepisternum, katepisternum and pleurotergite dark brown. Remainder of thorax flavous.

Legs. Fore coxa flavous, sometimes with basal one-third of anterior surface diffusely brown. Anterior surface of fore coxa densely clothed in setae, moderately long and yellow, except at apex; apical setae long and brown. Base of lateral surface of mid coxa diffusely brown; remainder of mid coxa flavous. Apex of anterior surface of mid coxa with a dense clump of short pale to long dark setae. Hind coxa flavous, with basal one-half of lateral surface diffusely brown; bearing a posterolateral band of minute to short black setae. Trochanters brown with minute to moderately long black bristles. Femora densely clothed with minute black setulae and with a few ventral hairs. Femora flavous with basal and apical extremities brown. Hind femur also diffusely marked with brown on ventral surface. Tibiae flavous, with apical swelling dark brown. Fore tibial combs represented by 1 or 2 spines, 3 to 4 times the tibial diameter in length. Apex of fore tibia with 1 long anterior, 1 long anterodorsal, and 1 long posterodorsal spine, and a short spine between the anterior ones. Mid and hind tibial combs each represented by 3 to 5 spines, 3 to 4 times the tibial diameter in length. Apex of mid tibia with 1 long anterodorsal and 1 long posterior spine, and with several enlarged setulae. Apex of hind tibia with 1 long anterior spine. Fore and mid tarsi brown. Basal two-thirds of first segment of hind tarsus flavous; remainder of hind tarsus brown.

Wing. Length, 7.2 to 7.6 mm (mean, 7.4 mm; *n*, 5). Venation and markings as in Fig. 64*l*. Significant features of venation and markings as follows: Strong portion of Sc distal to humeral cross-vein slightly longer than cross-vein. Basal portions of R_4 and R_s smoothly curved. Basal portion of M_1 sharply angled towards anterior portion of apex of wing, forming a basally-tapering cell. M_1 curved posteriorly. Apex of wing beyond junction of R_4 and R_5 pale brown. Region including basal portion of R_s, r-m, basal portion of M_{3+4} and m-cu distinctly brown.

Abdomen. Abdominal setae short to long, brownish yellow. Tergite 1 brown with margins near all corners flavous. Tergites 2 to 5 with narrow, pale marginal band; tergite 2 dark brown with flavous anterolateral corners; tergites 3 to 7 dark brown. Sternites 1 to 5 flavous; sternites 6 and 7 dark brown, with posterior margins flavous. Segment 8 brown. Tergite 8 transverse, ⅕ as long as tergite 7. Sternite 8 one-third as long as sternite 7.

Genitalia (Fig. 33). Sternite 9 (b) small, triangular, with basal half fused to bases of basistyli. Basistylus (b, c, d) with apex produced to form 3 lobes. Two mesal lobes short, pointed. Lateral lobe ½ as long as basal portion of basistylus, tapering, with irregular rounded apex. Base of the mesal lobe bearing a long, slender rod-like sclerotized lobe, ½ as long as the basistylus. Dorsomesal margin of basistylus produced mesally to form a slender lobe. Mesal lobes of basistyli apparently not fused, but connected by a complex dorsal aedoeagal plate. Aedoeagus largely membranous, but with a small ventral apical plate, a complex ventral articulatory process and a broad basal apodeme. Dististylus (d) ½ as long as basistylus, bent dorsally at apical one-third. Basal portion cylindrical. Distal portion connected to basal portion by transparent integument, bearing 10 finger-like teeth, distinctly hand-like. Tergite 9 (a, c, e) broad, with apical margin shallowly emarginate. Cercus (a, c, e) short, ½ as long as tergite 9, triangular. Ventral margin of cercus produced to form a thick, sclerotized, pointed lobe. Sternite 10 (e) large, transverse, with a pair of dorsal impressions which support the anal lobe laterally. Anal lobe triangular, distinct. Basistylus, cercus and anterolateral margin of tergite 9 flavotestaceous. Remainder of hypopygium dark brown. Basistylus and tergite 9 clothed in short to long yellowish-brown setae. Cercus clothed in short to moderately long yellowish-brown setae.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* ECUADOR: Azuay Cerro Tinajillas, 3100 m, 18–21.iii.1965, L. E. Pena (CNC No. 12977).

Paratypes. Same data as holotype (CNC), 2♂♂.

UNASSIGNED SPECIES[25]

Australosymmerus peruensis Munroe new species

Figs. 34, 65a

DIAGNOSIS. Males of *A. peruensis* may be distinguished from those of all other species of *Australosymmerus s. lat.* by the following characters: Basal segments of antenna ochreous; distal segments black; apical segment white, longer than preceding segment; apical portion of dististylus without teeth, consisting of an irregular sclerotized globule.

DESCRIPTION. **Male.** *Head.* Vertex flavotestaceous. Anterior margin of median ocellus aligned with midlength of lateral ocellus. Ocelli ringed with black, except at lateral margin of lateral ocellus and anterior margin of median ocellus. Postvertical and occipital regions flavous, clothed in short pale setae. Dorsal margin of eye only slightly emarginate, the emargination about ½ the length of the lateral ocellus in depth. Four weak postorbital bristles present. Genal region flavous, clothed in moderately long yellow setae. Frons flavotestaceous, bare. Clypeus flavotestaceous, clothed in brownish-yellow to brown bristles. Clypeal bristles moderately long on anterior margin, otherwise short. Labellum flavotestaceous. Palpus with segment 1 brown, segments 2 to 4 greyish testaceous. Scape and pedicel flavous, each with a ventral clump and apical ring of short black setae. Flagellum with segments 1 to 8 ochreous; segments 9 and 10 ochreous ventrally, black dorsally; segments 11 to 14 black; segment 15 flavous, almost white, slightly longer than the preceding segment.

Thorax. Entirely flavous. Pronotum with scattered moderately long yellowish-brown bristles. Humerus with 1 long strong brown bristle and 1 moderately long brownish-yellow bristle. Mesonotal setae black, short to moderately long on disc. Lateral and posterior margins and a line laterad of median line with long strong bristles. Propleuron and precoxal bridge with a fringe of long brownish-yellow setae. Halter flavous, with knob testaceous.

Legs. Uniformly flavotestaceous. Moderately long to long brownish-yellow bristles present on anterior surface of fore coxa, distal one half of anterior surface of mid coxa, and posterolateral line of hind coxa; remaining coxal surfaces bare. Femora densely clothed with minute brown setulae and with a ventral fringe of moderately long brownish-yellow bristles. Fore tibial combs consisting of 1 or 2 spines, equal to the tibial diameter in length. Apex of fore tibia with 1 anterior, 1 posterodorsal, and 1 posterior spine. Mid and hind tibial combs each represented by 4 or 5 spines, slightly more than 3 times the tibial diameter in length. Apex of mid tibia with 1 long anterior and 1 long posterodorsal spine, and with a ventral fringe of 6 short spines. Apex of hind tibia with 1 long anterior and 3 short ventral spines.

Wing. Length, 4.4 to 4.7 mm (mean, 4.5 mm; *n*, 7). Venation and markings as in Fig. 65a. Significant features of venation as follows: Sc with strong portion distal to humeral cross-vein approximately twice as long as cross-vein. Basal portion of R_4 and R_5 smoothly curved. Basal portion of M_1 angled sharply towards wing margin. Apex of wing beyond base of R_4 faintly brown, darker at junction of R_4 and R_5. Surface also dark brown along base of R_5, r-m, basal portion of M_{3+4}, and m-cu. Microtrichia present, dense.

Abdomen. Abdominal setae moderately long to long, yellowish brown. Tergite 1 flavous; tergite 2 dark brown with lateral and posterior margins flavous; tergites 3 to 5 dark brown with posterior margin pale flavous; tergites 6 and 7 dark brown. Sternites 1 to 7 flavous. Tergite 8 dark brown, transverse, 1/15 as long as tergite 7. Sternite 8 flavous, with posterior margin brown, ½ as long as sternite 7.

Genitalia (Fig. 34). Sternite 9 (b) triangular, tapering, apically rounded, fused to basistylus only at base. Basistylus (b, c, d) large, with dorsal apex produced to form a short rounded sclerotized lobe. Dorsomesal margin of basistylus produced mesally and apically to produce a wish-bone-shaped dorsal aedoeagal plate. Aedoeagus mostly membranous, with a pair of slender lateral plates, and a broad trough-like ventral process, the anterior end of which forms a short broad truncate basal apodeme (d). Dististylus (d) short, less than ½ as long as basistylus, with a black irregular sclerotized mass at apex. Apical teeth absent. Tergite 9 (a, c, e) roughly quadrate, ¾ as long as basistylus, with a shallow apical emargination. Cercus (a, c, e) broadly triangular. Ventral margin heavily sclerotized, produced to form a slender pointed mesal lobe at midlength and a point at apex. Sternite 10 (e) divided, the basal portion consisting of an elongate triangular plate on the ventral side of the anal lobe.

Female. Unknown.

[25]See page 99 for discussion of relationships of this species to other members of the genus.

MATERIAL EXAMINED. *Holotype male.* PERU: Cuzco, Quincemil, 1–15.xi.1962, 700 m, L. E. Pena (CNC No. 12978).

Paratypes. Same data as holotype, 3 ♂ ♂ Same data as holotype, except 15–30.x.1962, 1 ♂ (CNC, except 1 in BMNH).

Melosymmerus[26] Munroe new subgenus

Type-species: *Centrocnemis bisetosa* Edwards.

DESCRIPTION. Scutellum with two extremely long setae differentiated from fringe. Microtrichia present or absent. Subcosta short, apically obsolescent, ending free. Sternite 9 entire, fused to basistylus along its lateral margins. Basistylus open mesally, with or without apical processes or lobes. Dististylus expanded apically, with membranous portion large; teeth approximately 30 in number, largest apically. Tergite 9 slightly smaller to slightly larger than basistylus; fused to basistylus at extreme base only, or for up to half its length; postero-lateral corners simple. Cercus borne on apical margin of tergite 9; cercus 0.5 to 1.5 times length of tergite 9, with ventral margin produced to form sclerotized lobes or processes. Colors not bold, but markings rather distinct.

KEY TO SPECIES OF *Melosymmerus*

1. Ventral process of cercus of male not separated from ventral margin, consisting of 4 sclerotized lobes (Fig. 35e) (ECUADOR) .... *minutus* Munroe n. sp.

1′. Ventral process of cercus of male separated from ventral margin by a deep invagination 2

2.(1′) Microtrichia present (MEXICO) 3

2′. Microtrichia absent (BRAZIL) 4

3.(2) Ventral process of cercus with apical margin corrugate and sinuate, with dorsal and ventral apices drawn to a point (Fig. 37e) ...... *acutus* Munroe n. sp.

3′. Ventral process of cercus with dorsal apex pointed, ventral apex rectangular, abruptly narrowed and truncate (Fig. 36e) ...... *truncatus* Munroe n. sp.

4.(2′) Ventral process of cercus with irregular ventral margin, with apical corners each drawn to a point (Fig. 33e) .... *bisetosus* (Edwards)

4′. Ventral process of cercus with smooth ventral margin; process arm-like, smooth, bifurcate at apex (Fig. 34e) .... *pediferus* (Edwards)

Australosymmerus (Melosymmerus) bisetosus (Edwards) new combination

Figs. 35, 61, 65b, 73

Centrocnemis bisetosa Edwards, 1940: 442; Lane, 1947: 339.

DIAGNOSIS. The male of *A. (M.) bisetosus* may be distinguished from that of other species of *Australosymmerus s. lat.* by the presence of a distinctive ventral lobe on the cercus (Fig. 35e) which, from the lateral view, appears to be short, broad, originating at the middle of the cercus, with dorsal and ventral apices produced. The female may be distinguished by a combination of the following characters: tergite 8 flavous; apical margin of sternite 8 deeply bilobed; each apical lobe with 1 very large thick spine (Fig. 61), 1 smaller but similar one, and several moderately long bristles.

DESCRIPTION. **Male.** *Head.* Vertex flavotestaceous, sparsely clothed in short black setae. Ocelli ringed with black, except at lateral margin of lateral ocellus and anterior margin of median ocellus, the black area weakly continuous between ocelli. Postvertical, occipital, and genal regions flavotestaceous, sparsely clothed in short to moderately long, brownish-black setae dorsally, and in moderately long yellow setae ventrally. Frons flavous, bare. Clypeus flavous, clothed in yellow to brown setae, these short dorsally to moderately long ventrally. Mouthparts testaceous. Dorsal margin of eye shallowly emarginate, the depth of the emargination not exceeding the length of the lateral ocellus. Scape and pedicel flavotestaceous, each with a clump of short to moderately long black setae on ventral surfaces. Apex of scape and pedicel with a fringe of short dark setae. Flagellum grading from testaceous at

[26] $\mu\epsilon\lambda\zeta$ (= honey) + $\sigma\upsilon\mu$ (= combined) + $\mu\epsilon\rho\iota s$ (= part); masculine.

segment 1 to dark greyish brown at segments 6 to 11; segments 12 to 14 dark greyish brown; segment 15 testaceous, slightly less than ⅔ as long as preceding segment.

Thorax. Pronotum flavotestaceous, with scattered moderately long brownish-yellow setae laterally. Humerus flavotestaceous, with 1 long strong black seta. Mesonotum flavous, with 3 longitudinal testaceous vittae; median vitta extending from near the anterior margin to the posterior margin; lateral vitta extending from the anterior one-fifth to the posterior margin. Mesonotal setae black. Mesonotal disc clothed in short to moderately long setae. Pale line between median and lateral vitta with fine stiff setae, moderately long anteriorly to extremely long posteriorly. Lateral and lateroposterior margin of mesonotum with long strong setae. Scutellum brown. Postnotum flavous. Propleuron flavotestaceous, with short to moderately long yellow setae. Prosternum and precoxal bridge flavous, with a fringe of moderately long brownish-yellow setae. Halter testaceous with knob brown. Remainder of thorax flavous.

Legs. Coxae and femora flavous. Lateral surface of fore coxa bare. Remainder of fore coxa clothed in short to moderately long yellow setae. Mid coxa with distal half of anterior surface densely clothed in moderately long yellow setae and with a few longer dark bristles on anterolateral apex. Remainder of mid coxa bare. Hind coxa with distal half of lateral surface clothed in short to moderately long brownish-yellow setae and with a posterolateral row of long brown bristles. Femoral setae brownish yellow. Femora clothed in minute to short setae, with a ventral fringe of moderately long setae. Fore tibia flavous, pale brown at apex. Fore tibial combs each represented by 1 or 2 spines, 2 to 3 times as long as tibial diameter. Apex of fore tibia with 1 anterodorsal, 1 posterodorsal, and 1 posterior spine. Mid and hind tibia flavous, dark brown at apex. Mid and hind tibial combs each represented by 3 or 4 spines, 2 to 4 times tibial diameter in length. Apex of mid tibia with 1 anterodorsal and 1 posterodorsal spine. Apex of hind tibia with 1 anterodorsal spine. Tarsi with basal segment flavous except at apex, otherwise dark brown.

Wing. Length, 5.2 to 5.9 mm (mean, 5.4 mm; *n*, 10). Venation as in Fig. 65b. Significant features of venation and trichiation as follows: Sc with strong portion distal to humeral cross-vein slightly longer than cross-vein. Basal portion of R_4 and R_5 smoothly curved. Basal portion of M_1 sharply curved. Wing hyaline, without microtrichia,

Abdomen. Abdominal setae short to long, yellow. Tergite 1 flavous, with median portion testaceous to brown; tergite 2 dark brown, with all margins flavous; tergites 3 to 5 dark brown, with posterior margins flavous; tergites 6 and 7 dark brown; tergites without white posterior marginal bands. Sternites 1 to 5 flavous; sternites 6 and 7 brown, with posterior margins testaceous. Segment 8 pale brown; tergite 8 one-sixth as long as tergite 7; sternite 8 one-half as long as sternite 7.

Genitalia (Fig. 35). Sternite 9 (b) reduced, almost absent, represented by a basal lip demarcated from the bases of the basistyli. Basistyli (b, c, d) fused for almost two-thirds of their length. Apicomesal margin of basistylus produced to form a short tapering lobe. Dorsomesal margin of basistylus produced mesally to form an aedoeagal bridge. This bridge extends apically to form a lateral aedoeagal plate. Aedoeagus with a central sclerotized rod, a complex ventral articulatory process, and a broad rectangular basal apodeme. Dististylus (d) bent dorsally to form a right angle at midlength. Basal portion of dististylus roughly cylindrical. Distal portion consists of a flat dorsal (ventral *in situ*) plate, with a sclerotized ventral (dorsal *in situ*) process with 31 blunt teeth on mesal and apical margin. Tergite 9 (a, c, e) large, as long as basistylus, with apical margin produced to form a broad, short lobe. Cercus (a, c, e) ⅔ as long as basistylus. Ventral margin at midlength produced to form a complex heavily sclerotized lobe with an irregular ventral margin (c, e), this lobe appearing truncate in lateral view, with apical corners produced and each tapering to a point. Sternite 10 (e) large, transverse, expanded laterally, produced to form a narrow tapering lobe medially. Anal lobe produced, triangular, supported by apical lobe of sternite 10. Genitalia flavous, except for heavily sclerotized portions, which are dark brown. Basistylus, tergite 9, and cercus clothed in short to moderately long, brownish-yellow setae.

Female. As described for male, except as follows: Wing length, 5.4 to 5.9 mm (mean, 5.6 mm; *n*, 6). Genitalia as in Fig. 61. Significant features of structure of genitalia as follows: Entirely flavous, clothed in short to moderately long yellow setae. Apical margin of tergite 8 smoothly curved. Sternite 8 narrow, with apical margin deeply emarginate, the lobes half as long as the portion anterior to the lobes. Apex of apical lobe with 1 large swollen spine, with 1 similar but smaller one, and with several long setae of normal proportions. Cercus broad; segment 2 two-thirds as long as segment 1.

TYPE SPECIMENS. There is a male specimen in the BMNH which bears a "type" label. Edwards (1940) did not designate a holotype; therefore this specimen should be designated as a lectotype. I have not examined this specimen. Additional specimens in the BMNH are possible paralectotypes.

MATERIAL EXAMINED. BRAZIL: Nova Teutonia, 27°11′ S., 52°23′ W., 300–500 m, various dates vi–ii.1937–1966, F. Plaumann, 27♂♂, 7♀♀ (CNC); 2♂♂, 1♀ (BMNH); 1♂ (CAS).

Australosymmerus (Melosymmerus) pediferus (Edwards) new combination

Figs. 36, 62, 65c, 73

Centrocnemis pedifera Edwards, 1940: 443.

DIAGNOSIS. *A. (M.) pediferus* is most like *A. (M.) bisetosus* (Edwards). The male of *A. (M.) pediferus* may be distinguished from that of *A. (M.) bisetosus* by the presence of a ventral cercal lobe which is as long as the cercus, boot-shaped, apically bifurcate (Fig. 36e). The female may be distinguished by a combination of the following characters: Base of tergite 8 brown; apical margin of tergite 8 sinuous; sternite 8 broad; apical lobes of sternite 8 each with 4 strong setae and many weaker ones (Fig. 62).

DESCRIPTION. As described for male of *A. (M.) bisetosus,* except as follows: Black integument surrounding ocelli not continuous, indistinctly interrupted with testaceous between ocelli in male, distinctly interrupted in female. Palpus pale brown (testaceous in older specimens). Last segment of antenna testaceous, ovoid, less than ½ as long as preceding segment. Wing length of male, 5.3 to 7.0 mm (mean, 6.0 mm; *n,* 8). Wing length of female, 5.6 to 7.3 mm (mean, 6.4 mm; *n,* 5). Venation as in Fig. 65c. Sternites 6 and 7 pale brown or testaceous. Segment 8 of male brown. Tergite 8 of male extremely short, forming a transverse strip. Sternite 8 of male ½ as long as sternite 7. Male genitalia as in Fig. 36. Significant features of structure of male genitalia as follows: Sternite 9 (b) indistinct, represented by depressed area between basistyli, and basal region of fused basistyli. Basistylus (b, c, d) with apical margin produced to form a short tapering lobe. Dorsomesal margin of basistylus produced mesally to form a dorsal aedoeagal bridge, from which a pair of lateral aedoeagal plates extend apically (d). Aedoeagus largely membranous, with a complex ventral articulatory structure and a short ventral apodeme. Basistylus (d) bent dorsally to form a right angle at midlength. Basal portion of basistylus roughly cylindrical. Distal portion of basistylus as long as basal portion, forming a lamina. Mesal and apical margin of distal portion bearing a fringe of 40 slender, sclerotized teeth. Tergite 9 (a, c, e) broad, with a small notch in apical margin. Cercus (a, c, e) as long as tergite 9, triangular, tapering. Ventral margin of cercus produced at base to form a slender boot-like lobe, as long as cercus. Ventral lobe sclerotized, bifurcate apically, smooth, and with a small apically setose mesal lobe. Sternite 10 (e) broad, simple, transverse, with apical margin sinuate. Anal lobe indistinct. Mesal portion of tergite 9, and heavily sclerotized portions of genitalia, dark brown. Remainder of genitalia flavous. Basistylus, tergite 9, and cercus clothed in short to long brownish-yellow setae. Ventral surface of cercal lobe with scattered moderately long brownish-yellow setae.

Female genitalia as in Fig. 62. Significant features of structure as follows: Tergite 8 brown with posterior margin flavotestaceous. Posterior margin of tergite 8 slightly emarginate on each side, appearing sinuate. Sternite 8 flavous, broad. Apical margin of sternite 8 deeply bilobed. Apical lobe ⅓ as long as the basal portion, with 4 long strong setae and many moderately long ones at apex. Cercus flavous, short, broad, segment 2 two-thirds as long as segment 1. Segment 8 and cercus clothed in short pale setae.

TYPE SPECIMENS. Edwards (1940) did not designate type specimens for this species. There is a male specimen in the BMNH (A. M. Hutson, pers. comm.) which should be designated as a lectotype. I have not seen this specimen. Additional specimens in the BMNH are possible paralectotypes.

MATERIAL EXAMINED. BRAZIL: Mato Grosso, Pto. Primavero, Rio Parana, x.1954, J. Lane (CAS), 1♂. Nova Teutonia, 25°11.5′ S., 53°23′ W., 300–500 m, F. Plaumann (CNC), various dates vi–xii.1944–1964, 11♂♂, 2♀♀. Same data except 16 and 30.viii.1937 (BMNH), 2♀♀.

Australosymmerus (Melosymmerus) minutus Munroe new species

Figs. 37, 65d, 73

DIAGNOSIS. Specimens of *A.* (*M.*) *minutus* may be distinguished from those of other species of *Australosymmerus s. lat.* by a combination of the following characters: 2 postorbital bristles present; antenna grading from testaceous to greyish brown, with last segment testaceous, minute; microtrichia present on wing membrane. The configuration of the apical spines of the tibiae, and the structure of the male genitalia, are also characteristic.

DESCRIPTION. **Male.** As described for male of *A. peruensis*, except as follows: *Head.* Anterior margins of ocelli forming a straight line. Setae on dorsal portion of head yellowish brown. Two distinct postorbital bristles present. Clypeus with short yellowish-brown setae dorsally to moderately long brown ones ventrally. Palpus greyish brown. Scape and pedicel flavotestaceous. Flagellum grading smoothly from testaceous at base to greyish brown at penultimate segment, with segments 6 to 10 intermediate. Last segment minute, ovoid, testaceous, ⅖ as long as preceding segment.

Thorax. Entirely ochreous flavotestaceous. Humerus with 4 moderately long yellowish-brown setae. Prosternal bristles yellowish brown. Halter brown, with basal one-third of shaft testaceous.

Legs. Tarsi flavotestaceous at base to brown at apex. Apex of fore tibia with 1 anterior, 1 anterodorsal, and 1 posterodorsal spine. Apex of mid tibia with 1 anterodorsal and 1 posterodorsal spine, and with a ventral fringe of 5 short spines.

Wing. Length, 4.1 to 4.6 mm (mean, 4.2 mm; *n*, 2). Venation and markings as in Fig. 65d. Apical half of wing and membrane near veins in basal half of wing faintly clouded. Strong portion of Sc distal to humeral cross-vein slightly less than twice as long as cross-vein.

Abdomen. Tergites 2 and 3 with a narrow posterior pale band in addition to the flavous band. Tergite 6 dark brown with posterior margin flavous. Sternites 6 and 7 greyish brown. Tergite 8 transverse, ⅕ as long as tergite 7. Sternite 8 two-thirds as long as sternite 7.

Genitalia (Fig. 37). Sternite 9 (b) indistinct, represented by basal region between the fused basistyli. Basistyli (b, c, d) fused mesobasally for ½ their length. Apex of basistylus with 3 shallow lobes. Dorsomesal margin of basistylus produced mesally to form a dorsal aedoeagal bridge (d). Dorsal bridge produced apically to form a broad dorsal plate, from each side of which extends a lateral aedoeagal plate. Ventral portion of aedoeagus consisting of a complex articulatory process with a short slender basal apodeme. Dististylus (d) shorter than basistylus, bent dorsally at midlength to form an acute angle. Basal portion of dististylus roughly cylindrical. Distal portion anvil shaped, with anterior, mesal and posterior margins bearing a fringe of 28 teeth. Mesal margin with 13 short teeth; posterior margin with 9 moderately long teeth; anterior margin with 6 long teeth. Tergite 9 (a, c, e) broad, apically emarginate, with basal half of ventral margin fused to basistylus. Cercus (a, c, e) short, as deep as basistylus and tergite 9 together (c), pointed and sclerotized ventrally. Ventral margin produced into 4 sclerotized lobes (e). Sternite 10 (e) broad, deeply emarginate apically. Anal lobe indistinct. Tergite 9 flavous with a brown median patch. Basistylus and dorsal half of cercus flavous. Ventral half of cercus brown. Tergite 9, basistylus, and cercus clothed in short to moderately long, yellowish-brown setae.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* ECUADOR: Pastaza, Napo R., Pompeya, 14–22.v.1965, L. E. Pena (CNC No. 12976).

Paratype. Same data as holotype (CNC), 1 ♂.

Australosymmerus (Melosymmerus) acutus Munroe new species

Figs. 38, 60, 65e, 73

DIAGNOSIS. Males and females of *A.* (*M.*) *acutus* may be distinguished from those of other species of *Australosymmerus s. lat.* by the color of the head, antenna, mesonotum and abdomen, as well as by the configuration of the apical tibial spines and by the structure of the male and female genitalia.

DESCRIPTION. Male and female as described for *A. peruensis* except as follows: Pale regions of body flavotestaceous, almost ochreous. Three distinct brown postorbital bristles present. Clypeus clothed in yellow to brownish-yellow setae. Palpus with segment 1 flavotestaceous, segments 2 to 4 greyish testaceous. Flagellum with segments 1 to 4 ochreous with diffuse dark brownish-grey markings; flagellar segments 5 to 14 dark greyish brown; segment 15 flavous, slender, 1½ times as long as preceding segment. Pronotal bristles brownish yellow. Humerus with 1 long slender black bristle. Tarsi with last three segments brown. Femoral setulae brownish yellow. Apex of fore tibia with 1 anterodorsal, 1 posterodorsal, and 1 posterior spine. Mid tibial combs each represented by 3 or 4 spines, twice the tibial diameter in length. Apex of mid tibia with a ventral fringe of enlarged setulae. Hind tibia with a similar ventral fringe. Wing as in Fig. 65e; wing length of male, 4.9 mm; wing length of female, 5.5 mm. Strong portion of Sc distal to humeral cross-vein slightly less than twice as long as cross-vein. Basal portion of M_1 curved rather sharply towards apex of wing. Brown markings near cross-veins faint. Tergite 1 and segments 2 to 7 of abdomen clothed in short to long brownish-yellow setae; tergites 1 to 6 with a distinct white narrow posterior marginal band, in addition to other markings; tergite 2 dark brown with all margins flavotestaceous; tergite 8 of male ⅕ as long as tergite 7.

Male genitalia (Fig. 38). Sternite 9 (b) indistinct, fused between the bases of the basistyli. Basistylus (b, c, d) with posterior margin produced to form a short broad pointed lateral lobe and a short broad rounded mesal lobe. Dorsomesal margin of basistylus produced mesally to form a dorsal aedoeagal bridge. Dorsal bridge produced apically to form a triangular dorsal aedoeagal plate which fuses apically with the ventral plate. Ventral plate heavily sclerotized, dark brown (d). Dorsal bridge also produced to form a pair of lateral aedoeagal plates. Basal apodeme short, expanded basally. Dististylus (d) bent dorsally at midlength to form a right angle. Basal portion cylindrical. Distal portion consisting of dorsal and ventral sclerotized strips, joined along their length by membrane. Apex of the tube thus formed heavily sclerotized. Apical and mesal margin of distal portion with a fringe of approximately 30 sclerotized teeth, minute near base of distal portion, long at apex. Tergite 9 (a, c, e) quadrate, with a flange-like lobe extending apically from the ventral side of the posterior margin. Median portion of posterior margin shallowly emarginate. Cercus (a, c, e) ⅔ as long as tergite 9, rounded apically. Ventral margin of cercus produced to form a large, sclerotized lobe almost as long as cercus. Ventral lobe complex, with apical margin corrugate and sinuate, and with dorsal and ventral apices drawn to a point. Dorsal margin of cercus with a small heavily sclerotized mesally-directed pointed lobe. Sternite 10 (e) transverse; strip-like, with posterior margin sinuate. Anal lobe indistinct.

Female Genitalia (Fig. 60). Significant features of structure of female genitalia as follows: Color flavous. Sternite 8 swollen basally, tapering apically. Apical margin bilobed, the lobes ½ as long as the basal portion. Apical half of mesal margin of lobe with 3 large sclerotized spines. Cercus short, with segment 1 broad, segment 2 two-thirds as long as segment 1. Genitalia clothed in short brownish-yellow setae.

MATERIAL EXAMINED. *Holotype male.* MEXICO: Chiapas, Huixtla, 4.vi.1969, H. J. Teskey (CNC No. 12968).

Allotype female. Same data as holotype (CNC).

Australosymmerus (Melosymmerus) truncatus Munroe new species

Figs. 39, 65f, 73

DIAGNOSIS. Males of *A. (M.) truncatus* may be distinguished from males of *A. (M.) acutus* by the shape of the ventral apex of the cercal lobe, by the number of humeral bristles (several in a clump in *A. (M.) truncatus,* 1 in *A. (M.) acutus*), and by the relative positions of the ocelli.

DESCRIPTION. **Male.** As described for male of *A. peruensis,* except as follows: Anterior margins of ocelli forming a straight line. Ocelli completely but narrowly ringed with black. Three distinct brown postorbital bristles present. Palpus with segment 1 flavous, segments 2 to 4 testaceous. Flagellar segments 1 to 8 flavotestaceous, with increasing amounts of dark greyish-brown; flagellar segments 9 to 14 dark greyish-brown. Humerus with a sparse clump of short to long setae. Last three segments of fore tarsus brown. Femoral setulae, and leg bristles, yellow. Apex of mid and hind tibia with a ventral fringe of strong black setulae. Wing length, 5.6 to 6.3 mm (mean, 5.9 mm). Venation and trichiation as in Fig. 65f. Strong portion of Sc distal to humeral cross-vein slightly longer than cross-vein. Surface faintly brown between R_1 and R_4, otherwise hyaline. Tergites 1 to 6 with a posterior narrow pale marginal band; tergite 2 flavous with an irregular transverse dark brown macula; tergites 3 to 6 dark brown, with anterior and posterior margins flavous, more narrowly so posteriorly; tergite 7 dark brown, with anterior margin flavous; tergite 8 brown, transverse, ⅕ as long as tergite 7. Sternite 8 flavous, ½ as long as sternite 7. Genitalia (Fig. 39) as follows: Sternite 9 (b) indistinct, fused to and connecting bases of basistyli. Basistylus (b, c, d) with mesal portion of apical margin produced to form a rounded lobe. Dorsomesal margin of basistylus produced mesally to form a dorsal aedoeagal bridge (d). Dorsal bridge produced apically to form a narrow dorsal aedoeagal plate and a pair of slender twisted lateral filaments. Diststylus (d) bent dorsally at midlength to form a right angle. Basal portion cylindrical. Distal portion cylindrical, with dorsal and ventral surfaces, and apex, heavily sclerotized. Apical and mesal margin of distal portion bearing a fringe of approximately 30 teeth which are minute mesally, large apically. Apical teeth forming a palmate hood over a sclerotized black mass. Tergite 9 (a, c, e) quadrate, with a sclerotized flange-like lobe protruding from the ventral side of the apical margin. Cercus (a, c, e) apically rounded, ½ as long as tergite 9. Ventral margin of cercus produced to form a large sclerotized lobe, as long as the cercus. Dorsal apex of lobe pointed. Ventral apical portion rectangular, narrowed abruptly and truncate at extreme apex. Dorsal margin of cercus at base with a small, pointed, mesally directed lobe. Sternite 10 (e) transverse, twisted dorsally. Anal lobe indistinct. Hypopygium flavous except for heavily sclerotized portions, clothed in short to long brownish-yellow setae.

Female. Unknown.

MATERIAL EXAMINED. *Holotype male.* MEXICO: Sinaloa, 15 mi SW. El Palmito, 5000′, 30.vii.1964, Malaise trap, W. R. Mason (CNC No. 12970).

Paratypes. Same data as holotype, 3 ♂ ♂. Same data as holotype except 3–4.viii.1964 (CNC, 6 specimens; BMNH, 1 specimen), 7 ♂ ♂. Same data as holotype, except 12.viii.1964 (CNC), 1 ♂.

Calosymmerus[27] Munroe new subgenus

Type-species: *Plesiastina bifasciata* Williston, 1901.

DESCRIPTION. Scutellum with 2 extremely long bristles differentiated from fringe. Microtrichia absent. Subcosta short, apically obsolescent, ending free. Sternite 9 reduced, with 2 or 3 large setose lobes. Basistylus completely or partially fused to its antimere ventrally, with ventral apex twisted ventrally to form a free lobe; basistylus open mesally and dorsally. Tergite 9 as long as basistylus, fused to basistylus ventrally for basal half or completely, forming a complete ring with basistyli. Cercus 0.5 to 1.0 times as long as tergite 9, attached to its lateroapical margin; cercus with a sclerotized arm-like ventral process, separated from the ventral margin of a deep invagination or apparently completely separated. Colors bold, black or deep brown and vivid yellow; integument, wing membrane, setae, microtrichia, and wing veins all differentiated in color.

KEY TO SPECIES OF *Calosymmerus*

1\. Mesonotum with 3 dark brown or black longitudinal vittae .... *bifasciatus* (Williston)

1′. Mesonotum bright yellow, unicolorous 2

2.(1′) Scutellum brown; pleurites yellow with dark brown markings .... *magnificus* Munroe n. sp.

2′. Thorax entirely yellow .... *mexicanus* (Giglio-Tos)

Australosymmerus (Calosymmerus) bifasciatus (Williston)

Figs. 40, 73

Plesiastina bifasciata Williston, 1901: 217; Aldrich, 1905: 138.
Symmerus bifasciata; Johannsen, 1909: 12; 1910: 229.
Australosymmerus bifasciata; Lane, 1959: 106.
Australosymmerus bifasciatus; Lane, 1959: 106.

DIAGNOSIS. In addition to the key characters, a combination of the following characters will distinguish males of *A. (Cl.) bifasciatus* from those of other species of *Calosymmerus*: abdominal tergites 2 to 7 dark brown with pale posterior margins; mid coxa entirely brown.

[27] καλος (= beauty) + συμ (= combined) + μερις (= part); masculine.

DESCRIPTION. **Male.** *Head.* Golden-yellow, with ocelli ringed in black. Anterior margins of ocelli forming a straight line. Eye haired, the hairs 2 ommatidial diameters in length. Dorsal margin of eye scarcely emarginate, not reaching level of lateral margin of lateral ocellus. Postorbital bristles weak, brown, 4 in number. Clypeus clothed in setae which are moderately long and brown on anterior portion, otherwise short and yellow. Scape and pedicel yellow, each with coarse yellow and brown setae on anterior surface and posterior apex. Flagellum yellow at base to black on apical segments.

Thorax. Pronotum and humerus bright yellow, with moderately long yellow setae. Mesonotum yellow, with 3 longitudinal brown vittae, distinctly separated. Median vitta indistinctly divided by a pale median line. Mesonotal disc sparsely setose. Lateroanterior, lateral, and posterior margins, and posterior half of pale lines between vittae, with short yellow anterior to moderately long brownish-yellow posterior setae. Scutellum yellow. Dorsal third of postnotum yellow; ventral two-thirds dark brown. Propleuron and prosternum flavous, with a fringe of moderately long yellow setae. Remaining pleurites yellow with brown markings, to almost entirely dark brown.

Legs. Fore coxa yellow, clothed in short to moderately long yellow setae. Mid coxa brown, with yellow setae on distal two-thirds of anterior surface. Hind coxa dark brown, with an irregular posterodorsal row of yellowish-brown setae, the row widening to form a band distally. Femora clothed in short pale setae, with longer ones ventrally and apically. Fore and mid femur yellow. Hind femur brown. Fore and mid tibia yellow. Fore tibial combs each represented by 1 to 4 spines, 1.5 to 2 times the tibial diameter in length. Apex of fore tibia with 1 large anterior spine. Mid tibial combs each represented by 5 or 6 spines, 1 to 2 times the tibial diameter in length. Apex of mid tibia with 1 moderately long anterior, 1 long dorsal, and 1 short posterodorsal spine. Hind tibia yellow, with apical swelling brown. Setae of hind tibia vivid yellow on yellow portions of integument, brown on brown portions. Hind tibial combs each represented by 5 or 6 spines, 1 to 2 times the tibial diameter in length. Apex of hind tibia with 1 short posterior spine. Fore and mid tarsus yellow. Hind tarsus dark brown.[28]

Wing. Color yellow, with bold, dark brown markings as follows: apex of wing from apical third of costal cell, distad of junction of R_4 and R_5, across apical half of M_1 and M_2, to wing margin anterior to M_{3+4}; on wing margin between M_{3+4} and CuA; on posterior margin proximal to 1A; in basal two-thirds of costal cell, but separated from apical marking; and in a narrow band distal to basal portion of R_s, r-m, and basal portion of M_{3+4} from R_1 to posterior margin. Macrotrichia yellow on yellow portions of wing, brown on brown portions.

Abdomen. Abdominal setae moderately long, slender, golden on yellow portions of integument, brownish yellow on brown portions of integument. Segment 1 yellow. Tergites 2 to 6 dark brown, with narrow yellow posterior marginal bands; anterior half of tergite 7 dark brown; posterior half yellow. Sternites 1 to 3 grading from yellow to pale brown; sternite 4 dark brown, with a narrow posterior yellow marginal band; sternites 5 to 7 yellow. Segment 8 testaceous; tergite 8 one-half as long as sternite 8.

Genitalia (Fig. 40). Sternite 9 (b) consisting of a transverse, nearly membranous strip bteween basistyli, produced laterally and ventrally to form a pair of free lobes, ⅓ as long as basistylus, densely clothed in fine setae. Basistyli (b, c, d) fused ventrally, with median apical margin narrowly invaginated and twisted to form a pair of short ventral lobes. Dorsomesal margin of basistylus produced mesally and fused with its antimere to form a large, heavily sclerotized dorsal aedoeagal plate. Dorsal aedoeagal plate produced apically to form a slender, sclerotized, aedoeagus ⅔ as long as basistylus (d). Dorsal aedoeagal plate produced ventrally to fuse with a slender process inserted into the cone-like aedoeagus, with a basal bulb. Basal apodeme large, with a dorsally concave median groove. Dististylus (d) slender, as long as basistylus, with an apical cap bearing a fringe of irregular teeth. Tergite 9 (a, c, e) quadrate, slightly narrower at base. Cercus (a, c, e) deeply divided apically. Dorsal portion short, ½ as long as tergite 9, truncate. Ventral portion slender, as long as tergite 9, heavily sclerotized, with apex palmate and produced to form 3 small, mesal, marginal lobes. Sternite 10 (e) large, sclerotized, transverse, with apical margin emarginate medially and reflexed. Anal lobe membranous, indistinct.

TYPE SPECIMENS. Williston (1901) did not designate type specimens of *Plesiastina bifasciata.* He indicated (1901: 217) that he examined three specimens from "Mexico, Sierra de la Aguas Escondidas in Guerrero, 7000′ (H. H.

[28]Of the tarsi of the specimens I have examined, only the basal segment of one hind tarsus remains. This segment is dark brown. Williston's figure (1901: pl. 4, fig. 1) disagrees with his description and apparently is in error. It shows a black mid tarsus and yellow hind tarsus.

Smith)." These male specimens are in the BMNH. The specimen bearing a "type" label is hereby designated as lectotype. The other two specimens are hereby designated as paralectotypes.

MATERIAL EXAMINED. Lectotype and paralectotypes.

Australosymmerus (Calosymmerus) magnificus Munroe new species

Figs. 41, 65g, 73

DIAGNOSIS. In addition to the key characters, the combination of the following characters will distinguish males of *A. (Cl.) magnificus* from those of other species of *Calosymmerus*: ocelli enclosed in a transverse black macula; abdomen yellow with basal portion of tergites 5, 6, and 7 brown; basal fifth of mid coxa yellow, remainder brown.

DESCRIPTION. **Male.** As described for *A.* (*Cl.*) *bifasciatus* (Williston) except as follows: Black rings around ocelli fused to form an irregular transverse black macula enclosing ocelli. Eye haired, the hairs 2 to 3 times the ommatidial diameter in length. Clypeus clothed in moderately long, golden-yellow setae. Setae on anterior surface of scape golden-yellow, of pedicel yellowish brown. Flagellar segments 1 to 6 golden-yellow, segment 8 brown, segments 9 to 15 dark brown.

Mesonotum uniformly golden-yellow. Scutellum brown. Dorsal half of postnotum yellow, ventral half brown. Pteropleurite brown. Remaining mesopleurites yellow, each with ventral half brown.

Mid coxa with basal fifth yellow, apical four-fifths brown. Hind femur yellow with distal half of dorsal margin brown. Spines of fore tibial combs[29] 1.5 to 3.0 times the tibial diameter in length. Mid tibia yellow, with apex dark brown. Mid tibial combs each represented by 4 spines, 2 to 3 times the tibial diameter in length. Apex of mid tibia with 1 long anterodorsal and 1 long posterodorsal spine. Hind tibial combs each represented by 3 to 4 spines, 1.5 to 3.0 times the tibial diameter in length. Apex of hind tibia with 1 long anterior spine and an irregular ring of small ones. Mid tarsus flavous, with last two segments pale brown. Hind tarsus dark brown.

Wing length, 7.4 mm. Dark brown wing markings (Fig. 65g) present as follows: (1) from base of costal cell to midlength, extending from costa to anterior margin of basal cell basally and to posterior margin of wing apically; (2) in apical half of costal cell, narrowly joined to (1) along costa and extending from costa to anterior margin of R_1 cell. Faint brown markings present on wing margin at apex, at M_2, at CuA, and in anal cell. Strong portion of Sc distal to humeral cross-vein shorter than cross-vein.

Abdominal sternites, and tergites 1 to 4, yellow. Basal half of tergites 5 and 7 dark brown, apical half yellow. Tergite 6 dark brown, with posterior margin yellow. Segment 8 yellow, with extreme apical margin brown.

Genitalia (Fig. 41).[30] Sternite 9 (b) consisting of a weak transverse strip with a pair of lateral lobes, rather longer than those of *A. (Cl.) bifasciatus*. Basistylus (b, c) fused ventromesally distad of sternite 9, with apical margin narrowly emarginate. Margin of incised medial portion turned ventrally to form a flap-like lobe. Basistyli fused completely with ventral margins of tergite 10, forming a complete ring. Aedoeagus as described for that of *A. (Cl.) bifasciatus*, but larger and more heavily sclerotized. Diststylus slender, sinuate, with apical half of ventral surface transparent except at apex. Apex cap-like with a fringe of irregular teeth. Tergite 9 (a, c) transverse, slightly tapering. Cercus (a, c) deeply cleft apically, the emargination reaching the base of the externally-visible portion of the cercus. Dorsal lobe of cercus simple, rounded, slightly more than ½ as long as tergite 9. Ventral portion of cercus heavily sclerotized, mesally concave, abruptly narrowed near apex and terminating in a tapering claw-like hook. Sternite 10 transverse, emarginate apically, sclerotized. Hypopygium yellow, clothed in short to long yellow setae.

Female. Unknown.

TYPE SPECIMEN. *Holotype male.* MEXICO: Chiapas, San Cristobal, 7200′, 25.vi.1969, Malaise trap (CNC No. 12969).

[29] One fore leg beyond the coxa, one beyond the middle of the tibia, as well as one hind tarsus and distal three segments of the other, are missing in the specimen described.

[30] The internal structures have not been figured for this species and the following two (*A.* (*Cl.*) *mexicanus* and *A. zonatus*) because the fusion of basistyli with tergite 9 makes it impossible to remove tergite 9 and segment 10 without damaging the specimen.

Australosymmerus (Calosymmerus) mexicanus (Giglio-Tos) new combination

Figs. 42, 65h, 73

Ditomyia mexicana Giglio-Tos, 1890: 3.
Plesiastina mexicana; Mik, 1894: 26; Kertesz, 1902: 40.
Symmerus mexicana; Johannsen, 1909: 12.

DIAGNOSIS. In addition to the key characters, the combination of abdominal tergites 5 and 6 black with *basal* margins yellow, tergite 7 entirely black, tarsi entirely black, and the structure of the genitalia will distinguish males of *A. (Cl.) mexicanus* from those of other species of *Calosymmerus.*

DESCRIPTION. **Male.** As described for male of *A. (Cl.) bifasciatus,* except as follows: Postorbital bristles black, 3 in number. Clypeal bristles brownish yellow dorsally to dark brown, almost black, ventrally. Pedicel yellow with a ventral brown macula at base. Scape and pedicel each with a ring of setae on apical third, these moderately long and golden-yellow on ventral surface, short and brownish yellow on dorsal surface. Flagellar segments 1 to 3 yellow; segments 4 to 6 grading from yellow to black; segments 7 to 15 black; segment 15 minute, spherical, 1/7 as long as preceding segment. Thorax uniformly golden-yellow, with golden-yellow setae.

Coxae uniformly golden-yellow. Apical half of anterior surface of mid coxa clothed in short to moderately long golden-yellow to black setae. Remainder of coxal setae golden-yellow. Hind femur with basal third brownish black; apical two-thirds yellow. Mid tibia yellow, with extreme apex brown. Hind tibia yellow, with apical swelling black. Fore tibial combs each represented by 2 spines, from 1 to 2 times the tibial diameter in length. Apex of fore tibia with 1 long anterior, 1 long anterodorsal, and 1 long posterodorsal spine. Mid and hind tibial combs represented by 4 or 5 spines, 1 to 2 times the tibial diameter in length. Apex of mid tibia with 1 moderately long posterior spine, and with an irregular ventral fringe of small spines. Apex of hind tibia with 1 large anterior and 1 large posterior spine. Fore and mid tibia densely clothed in brown setulae. Hind tibial setulae golden-yellow on yellow integument, black on black integument. Tarsi black.

Wing length, 7.3 mm. Black markings present as follows (Fig. 65h): (1) over apical third of wing, distal to level of junction of M_{3+4} and wing margin; (2) basal half of wing, except for a band extending from basal cell to posterior margin; (3) on posterior margin in anal angle. Yellow markings present as follows: (1) over basal pale area, from basal cell to posterior wing margin proximad anal angle; (2) between basal and apical black markings from costa to M_2. Remainder of wing hyaline. Macrotrichia and veins black in black and hyaline portions of wing; yellow in yellow portions.

Abdominal segments 1 to 4 and sternites 5 and 6 golden-yellow. Tergites 5 and 6 black with basal margins yellow; tergite 7 black. Segment 8 black.

Genitalia (Fig. 42). Sternite 9 (b) consisting of three weakly sclerotized portions of integument connected by membrane. Lateral portions directed ventrally; mesal portion roughly diamond-shaped. Basistylus (b, c) fused to tergite 9 dorsally, and to its antimere ventrally, thus forming a complete ring. Apical margin notched at point of fusion with tergite 9. Apicoventral margin of fused basistyli narrowly invaginated, and produced ventrally to form a pair of flat lobes. Aedoeagus as described for *A. (Cl.) bifasciatus,* but larger and more heavily sclerotized. Diststylus club-shaped, with a ventral transparent region near apex and an irregular dorsoapical fringe of blunt teeth. Tergite 9 (a, c) broad, tapering slightly. Cercus (a, c) short, deeply emarginate apically, the invagination extending nearly to the base, in lateral view. Dorsal portion consisting of a small flat lobe, slightly more than ½ as long as tergite 9. Ventral lobe slender, heavily sclerotized, truncate, with apex produced dorsally to form two bluntly-pointed lobes. Sternite 10 transverse, with basal margin emarginate. Dorsal lobe of cercus flavous; remainder of hypopygium dark brown. Hypopygium clothed in short to moderately long setae.

TYPE SPECIMEN. I have not been able to examine the type specimen of this species. J. R. Vockeroth has informed me (pers. comm.) that Giglio-Tos' type material is in the Bellardi collection in the Institute e Museo di Zoologia, Universita di Torino, Torino, Italy. Giglio-Tos based this description (1890: 3) on a single male specimen from Orizaba, Veracruz, Mexico.

MATERIAL EXAMINED. MEXICO; Chiapas, 23 to 27 mi NE. of Huixtla, 2.vi.1969, B. V. Peterson (CNC), 1 ♂.

UNASSIGNED SPECIES

Australosymmerus zonatus (Giglio-Tos) new combination

Figs. 43, 65i

Ditomyia zonata Giglio-Tos, 1890: 2.
Plesiastina zonata; Mik, 1894: 26; Kertesz, 1902: 40.
Symmerus zonata; Johannsen, 1909: 12.
Symmerus lenis Johannsen, 1910: 229 (replacement name for *Symmerus zonata* (Giglio-Tos, 1890: 2) *nec Symmerus zonata* Stephens, 1829: 252).

DIAGNOSIS. Males of *A. zonatus* may be distinguished from those of other species of *Australosymmerus s. lat.* by the following combination of characters (in addition to those given in the key): setae on dorsum of head black; base of hind femur pale brown, remainder yellow; legs with black setae present over some *yellow* integument; macrotrichia black.

DESCRIPTION. **Male.** *Head.* Ocelli ringed with black; remainder of head capsule bright yellow. Median ocellus minute, ⅓ as large as lateral ocellus. Eye scarcely emarginate, clothed in hairs 4 times the ommatidial diameter in length. Vertex and posterior surface of head clothed in short black bristles. Postorbital bristles moderately long, black, 4 in number. Palpus with distal half of third segment, and segment 4, brown; remainder of mouthparts yellow. Scape and pedicel yellow, each with a clump of interspersed yellow, brown and black, coarse setae on ventral surface, and dense black setae on apical third of dorsal surface. Flagellar segments 1 to 8 bright yellow; segment 9 yellow, with diffuse black near apex; segments 10 to 14 black; segment 15 dark brown, ⅓ as long as preceding segment.

Thorax. Thoracic setae golden-yellow. Pronotum and humerus yellow. Mesonotum yellow, with 3 longitudinal black maculae, fused at posterior margin. Median vitta reaching anterior margin; lateral vittae reaching anterior third of mesonotum. Mesonotum with moderately long to very long setae on lateroanterior, lateral and posterior margins, and on pale lines between vittae; otherwise bare. Scutellum bright yellow, with 4 extremely long setae, and a fringe of slightly shorter ones.[31] Postnotum dark brown, with lateral margin, and dorsal half of median line, yellow. Propleuron and prosternum bright yellow, with a fringe of moderately long setae. Mesopleuron bright yellow, with brown to black markings as follows: (1) along ventral margin of katepisternum; (2) over anepisternum (except posteroventral corner), extending ventrally into anterodorsal region of katepisternum, and (3) over pleurotergite except dorsal margin.

Legs. Fore coxa bright yellow. Posterolateral surface bare. Remainder of fore coxa densely clothed in short to moderately long golden-yellow setae interspersed with black ones. Mid coxa yellow, with basal half of anterior surface brown. Apical half of anterior and lateral surfaces clothed in moderately long setae, these golden-yellow at extreme apex, otherwise black. Hind coxa yellow, with basal four-fifths of anterior surface dark brown. Posterolateral surface of hind coxa clothed in short to long black setae. Fore and mid femur yellow, clothed in short golden-yellow setae, with longer ones ventrally and apically. Hind femur yellow with base pale brown. Fore and mid tibia bright yellow; apical portion clothed in black setae; remainder clothed in golden-yellow setae. Fore tibial combs each represented by 2 spines, 1.5 to 2 times the tibial diameter in length. Apex of fore tibia with 1 large anterodorsal spine. Mid tibial combs each represented by 4 to 6 spines, 1.5 to 2 times the tibial diameter in length. Apex of mid tibia with 1 large anterodorsal, 1 large posterodorsal, and 1 large posterior spine, and with a ventral and posterior fringe of small ones. Hind tibia bright yellow, with apical portion dark brown. Setae golden-yellow on pale portion, black on dark portion. Apex of hind tibia with 1 large anterior spine, and with a fringe of small ones. Basal segment of each tarsus yellow, with apical portion black. Setae black on black portion and at base, otherwise yellow. Apical segments of tarsi black, clothed in black setae.

Wing. Length, 8.5 mm. Venation and markings as in Fig. 65i. Significant features of venation and markings as follows: Strong portion of Sc distal to humeral cross-vein slightly longer than cross-vein. Basal portion of R_s sharply curved at midlength, forming an obtuse angle. Basal portion of R_4 smoothly curved. Basal half of M_1 divergent from M_2; apical half parallel. Membrane of subcostal cell yellow, fainter towards apex. Brown membrane forming a narrow, tapering oblique band extending from the base of R_s and following basal

[31]The large scutellar bristles are not arranged in pairs. Giglio-Tos does not mention these setae in his description, but the condition may be an aberrant one.

portion of R_s, r-m, basal portion of M_{3+4} and m-cu to wing margin. Proximal portion of anal angle brown at margin. Remainder of wing hyaline. Macrotrichia black.

Abdomen.[32]

Genitalia (Fig. 43).[32] Sternite 9 (b, c) extremely large, apparently ¾ as long as basistylus, but with an apical portion reflexed dorsally and directed basally. Reflexed apical portion about ⅓ as long as external basal portion. Basistylus (b, c) very large, fused completely to tergite 9 dorsally. Apical margin of basistylus produced to form a tapering lateral lobe. Aedoeagal apparatus extremely large, heavily sclerotized, supported by a pair of dorsal and a pair of ventral apodemes, and a large basal apodeme. Dorsal apodemes fused, extending to internal surface of dorsal portion of capsule. Basal apodeme broad, thin, with a narrow median groove. Aedoeagus pointed apically, with a basal bulb-like process, from which a pair of short broad apodemes extend ventrally. Dististylus small, ⅓ as long as basistylus, very slender. Apex of dististylus expanded, with a mesal fringe of 7 long, blunt teeth. Dististylus inserted on mesal surface of lateral lobe of basistylus. Tergite 9 not distinctly demarcated. Cercus (a, b, c) very small, completely divided into a dorsal flap-like simple flat lobe, and a ventral sclerotized pointed blade-like lobe. Sternite 10 small, enclosed basally by dorsal aedoeagal apodemes, heavily sclerotized, transverse. Medial portion of sternite 10 produced to form a narrow lobe supporting membranous anal lobe.

TYPE SPECIMENS. Giglio-Tos (1890) did not designate type specimens for *Ditomyia zonata.* He indicated (1890: 3) that he had examined 3 males and 1 female from Orizaba, Mexico. These syntypes should be in the Bellardi Collection, Institute e Museo di Zoologia, Universita di Torino, Torino, Italy (J. R. Vockeroth, pers. comm.).

MATERIAL EXAMINED. MEXICO: Veracruz, Catemaco, 1100 ft, 17.vi.1969, W. R. Mason (CNC), 1♂.

PHYLOGENY

METHOD OF PHYLOGENETIC ANALYSIS

Introduction

This study of the phylogeny of *Symmerus* and *Australosymmerus* is based on Hennig's (1966*b*) method of "phylogenetic systematics." There is no clearly formulated alternative to the cladistic method for phylogenetic analysis; in addition, the logical structure of cladistic procedures seems to be particularly compatible with the study of disjunct distributions. Colless (1967*b*, 1969*a*), however, has pointed out a number of theoretical and practical difficulties which I will discuss along with some recently-developed numerical methods. The source and meanings of terms used are given in the glossary in the present paper.

Hennig's method is as follows (Hennig 1966*b*; and discussions by Colless, 1967*b*, 1969*a*; Schlee 1969): Taxa, to be monophyletic in Hennig's sense, must be based upon synapomorphic attributes. If attributes can be identified as apomorphic or plesiomorphic, a system of monophyletic taxa can be established. Within this system, two monophyletic taxa form a sister-pair if each of them has a different apomorphic attribute which is plesiomorphic in the other, and if they share a third apomorphic attribute. The two taxa are then each sister-groups of the other. The method is to search for the sister-group (Brundin 1965).

The primary practical difficulties are (1) the recognition and categorization of plesiomorphy and apomorphy; and (2) the recognition of convergence. The major objections of Colless (1967*b*, 1969*a*) concern (1) the necessity of reference to a higher "phenetic" classification; (2) the "hypothetico-deductive" system; and (3) the congruence of phenetic and phyletic classifications.

[32]The abdomen and genitalia of the specimen examined have been overcleared and are transparent.

The Recognition and Categorization of Plesiomorphy and Apomorphy

Ways in which attributes have been recognized and categorized as apomorphic or plesiomorphic have been summarized by a number of workers in recent papers. Liem (1970) gave the following criteria:

1. Character states which are widely distributed in the presumed ancestral stock are plesiomorphic, the rationale being that the more widely distributed a particular state is, the less chance there is that its various occurrences are due to independent evolution.
2. If two character states are equally distributed, the state occurring in the most generalized group is considered to be primitive.
3. If a state occurs in a restricted small group, it is considered to be primitive if this leads to the most parsimonious tree. The sequence of characters is to be determined by inferring the adaptive significance of the character (by following the development of the specialization) and, where the adaptive significance is obscure, by selecting the most parsimonious cladogram.

Schlee (1969) commented that an extensive knowledge of the variation of the characters (in other taxa) was necessary, and that apomorphies were most readily inferred by looking for deviations from the "basic plan" of structurally rich characters. As shown below, there is good reason to use this approach.

Kluge and Farris (1969) listed their criteria for primitiveness of a character, in order of reliability, as follows (p. 5):

1. The primitive state of a character for a particular group is likely to be present in many of the representatives of closely related groups.
2. A primitive state is more likely to be widespread within a group than is any one advanced state.
3. The primitive state is likely to be associated with states of characters known from other evidence to be primitive.

Criteria based on the distribution of a particular state in the taxon concerned, and in related taxa, have been criticized by Colless (1967*b*). As he pointed out, the distribution of a state *per se* tells us nothing about its apomorphy or plesiomorphy. Another element in the criteria given above is that of "inferred adaptive significance." I think that inferred adaptive significance is usually present, but hidden, in discussions of the distribution of character states in taxa. This is because underlying most considerations of changes of characters is the assumption that they have changed as a result of natural selection on the populations which bear them.

There are some kinds of characters, for instance those involving mimicry and warning coloration, where a high level of probability concerning apomorphy or plesiomorphy is easy to establish. In this case, apomorphies and plesiomorphies are inferred by implicit analogy with similar characters in other groups, the adaptive significance of which is known. The inference becomes almost certainly true if the adaptive significance is demonstrated, but a high level of credibility can often be attained without such demonstration, in the same way that most "biological species" are credible in spite of the fact that genetic isolation has not been demonstrated.

Another method of inferring apomorphies and plesiomorphies is by reference to a "basic plan" (Schlee 1969). This, as Colless has repeatedly pointed out, entails reference to a higher-level phylogeny. I have deferred discussion of this for the moment (see below), but I do not think this is a problem, either philosophically or in practice. As a simple example of the way in which the method works, one might credibly infer that a fly exhibiting the wing attribute "apterous" shows an apomorphic state of the character "wing development," on the grounds that the "basic plan" of the Diptera for this character is "two-winged." There are some theories of the adaptive significance of the dipterous condition (e.g., McAlpine and Munroe 1968) which allow the inference that the absence of wings in this case is a specialization. If, in addition, it is known that the fly in question is a parasite, say, the inference of apomorphy becomes even more probably correct. But I think the probability is often sufficiently high without the last piece of information.

Other workers have used criteria for inferences of apomorphy and plesiomorphy which are very similar to the foregoing ones. Kluge and Farris (1969) relied entirely on the distribution of character states in taxa for decisions about apomorphy and plesiomorphy. They rejected those criteria "which depend upon weighting characters according to the individual taxonomist's opinions." The latter include criteria based upon functional importance, significance of biological roles, implications of functional relationships, and "most logical" direction of evolution of characters, which they thought too conjectural for use in taxonomy. In my opinion, however, criteria based on the distribution of states in taxa are ultimately based on some concept of a basic plan.

The foregoing interpretation may be summarized as follows: The distribution *per se* of character states in taxa tells us nothing about the plesiomorphy or apomorphy of the states. On the other hand, deviation of states from a basic plan, and inferred adaptive significance, do provide a basis for inferring apomorphy and plesiomorphy. The concept of a relationship between the distribution of a character state in taxa and its apomorphy or plesiomorphy appears to be derived from a concept of deviation from a basic plan, and perhaps one of inferred adaptive significance.

If this interpretation is correct, then the use of criteria based on the distribution of character states in taxa is merely a means of ignoring the conjectural aspects of inferences concerning apomorphy and plesiomorphy. The alternative to criteria based on the distribution of character states in taxa, as suggested by Kluge and Farris, is to find ways in which biological evidence can be more rigorously interpreted. The only solution to this is to accumulate more knowledge about biological events. This would allow one to make more rigorous interpretations of the evidence, and more probably correct inferences should result. I have concluded that it is preferable to deal with the equivocal nature of inferences concerning apomorphy and plesiomorphy directly, by discussion of each inference on an individual basis, rather than indirectly by means of criteria based on the distribution of character states.

Recognition of Convergence

It is necessary to discuss what I believe to be a misunderstanding on Colless' part, of the similarities and differences between, and hence the relative merits of, cladistic versus phenetic techniques. Schlee (1969) stated that apomorphies could be established as synapomorphies rather than as convergences by establishing the minute correspondence of structures rich in characters. Colless (1969*b*) agreed with this, and went on to point out the parallel between this procedure and the procedures of phenetic taxonomy. Determining synapomorphy in this way is, in fact, the use of an intuitive estimate of overall resemblance between organs (rather than between organisms). Colless then asked (p. 137) why this should not be extended to organ systems, or ultimately to organisms. But the *aim* of this "estimate of overall resemblance of organs" is to determine homologies of organs and characters, a procedure which is a prerequisite to phenetic taxonomy as well as to cladistic taxonomy, and has nothing to do with how the organisms are classified. As an illustration Colless (1967*a*: 17) said "the first step in the taxonomic process is the detection and tabulation of OTU-attributes, and the second step is the estimate of degrees of resemblance between OTUs." The essence of Colless' criticism here is that if phenetics is adequate for establishing homology of apomorphy, i.e. synapomorphy, why not use it for taxonomy. The reason is that phenetic taxonomy (according to its advocates) does not allow inferences to be made concerning phylogeny, although it may be very useful in forming classifications. This is discussed below under the "Hypothetico-deductive System."

Pre-existing Classifications and High-level Phylogenies

Colless (1967*a, b;* 1969*b*) has repeatedly pointed out that cladistic methods must eventually entail acceptance of a high-level phylogeny. His major complaint is that one enters a regress which he described as follows (1967*b*: 292): ". . . unless 'phenetic' classification is admitted somewhere along the line, we proceed in a regress to a primordial organism with *no* phylogenetic background whatever." This regress arises because the cladistic process originates from an apomorphy recognized with respect to a basal group of which we know nothing by the cladistic method, but only that it is homogeneous in some striking aspect. I do not see any logical difficulty in this. Presumably there once existed a primordial organism with no phylogenetic background. There is a practical difficulty in studying the phylogeny of all taxa at once, however. To overcome this practical difficulty, tentative reference to a higher phenetic classification is necessary, but this does not detract from the logic of the method. To my mind, when the regress is complete, phylogeny will be completely specified, which presumably is the aim of phylogeneticists.

The Hypothetico-deductive System

Colless (1969*a*) described what he called the "Hypothetico-deductive System" of scientific logic as formulated by Popper (1959). He concluded that phenetic taxonomy could be considered to be "scientific" because "it only derives its conclusions via what seem to be impeccable statistical procedures" (p. 118). He then criticized "phylogeneticists" for rejecting phenetic taxonomy for unscientific reasons. In my opinion, the reason phylogeneticists reject phenetic taxonomy is because it provides no opportunity to infer phylogeny. Phenetic taxonomy, as advocated by Colless himself (1967*a*), cannot be used as a means of inferring phylogeny. Colless has specifically stated (pp. 6–7): ". . . [Phenetic taxonomy] can, and to be strictly phenetic, *must* [his italics] provide nothing more than a summary of observed facts" and (pp. 17–18) "'a phenetic classification is not a hypothesis, but a datum, a convenient summary of observed facts . . . ." For those very reasons it is difficult to see how "phylogeneticists" can be criticized for rejecting it as a means of inferring phylogeny.

Statistics and the Number of Characters Used

Schlee (1969: 133) pointed out that ". . . a single, distinctively synapomorphic feature proves taxa as being most closely related, while 10 symplesiomorphic characters do not." Although taxa cannot be "proved" to be most closely related, because synapomorphies cannot be proved, Schlee's main point is correct. Colless

(1969*b*) considered this to exemplify a common and important misunderstanding, which is that symplesiomorphy is included in the results of cladistic reconstruction as an essential (but undifferentiated) component of "primitive patristic similarity" (p. 142). But the point is that symplesiomorphy is not used to determine taxa, even though it is an essential part of the classification (because every apomorphy must be related to a plesiomorphy). Colless' remark that "if a majority vote is taken amongst 100 randomly selected unit attributes (as in phenetic method), the decision as to relationships is likely to be more reliable than one based on the unanimous vote of, say, 50 unit attributes linked in a single complex structure" is perfectly true as far as it goes. I think, however, that the "relationships" are different in the two cases. In the case of phenetic method, the relationships are based on the criterion of similarity between organisms, so that in general the larger the sample considered, the better founded are the decisions concerning relationships. In the case of phyletic relationships, on the other hand, those relationships which are based on similarity are relationships between structures, studied in order to establish the homology of two apomorphic character states, so that decisions as to whether or not they are synapomorphic can be made. The results of a number of decisions about this kind of relationship can then be used to make a decision about relationships between organisms.

Congruence of Cladistic and Phenetic Classifications

Colless (1969b) found that with Schlee's (1969) model, classifications based on cladistic reconstructions (with attributes categorized as apomorphic and plesiomorphic) were identical with those based on phenetic taxonomic methods (without attributes categorized), possibly because recognition of a case of symplesiomorphy entails recognition of a corresponding synapomorphy. This is an interesting speculation, which may, as he says, have a mathematical proof. But, for reasons discussed above, it is beside the point, since phenetic taxonomy as advocated by Colless (1967*a*) seeks only to describe a state of affairs, whereas the object of interest in cladistic reconstruction is not only the classification it provides, but the cladistic information itself. This cannot, and (according to Colless) must not, be inferred from a classification provided by phenetic taxonomy.

Quantitative Phyletics

In recent years there have been several attempts to make phylogenetic methods more objective by the use of numerical techniques. The use of numerical techniques in phylogenetic analysis has been called "quantitative phyletics" by Kluge and Farris (1969). These methods are mostly based on the principle of "evolutionary parsimony" as outlined by Camin and Sokal (1965), or on related considerations. I have included the following brief discussion of these methods as there are some implications in them which I feel have not been adequately discussed. Hennig's method is to form monophyletic taxa based on synapomorphic attributes and to search for the sister-group of each taxon by finding plesiomorphic–apomorphic character-state pairs. The cladistic methods of Camin and Sokal (1965), Kluge and Farris (1969), and Farris *et al.* (1970) are outlined and discussed below.

Camin and Sokal (1965) attempted to devise operational methods for "deducing" the cladistic relationships between taxa so that, given the same data, different investigators would reach the same conclusions. A model had shown that the most parsimonious cladistic reconstructions were closest to the "true" phylogeny of a group. Their method consisted of searching for the most parsimonious cladogram incorporating all of the character data. Their assumptions about characters were as follows: (1) character states are discrete; (2) character states can be logically ordered; (3) the direction of evolution is known; (4) the *ancestral* states are unique (in the sense of Wilson, 1965), but derived states may arise more than once; and (5) evolution is irreversible. They used three methods of approximating the most parsimonious phylogenetic tree: (1) by fitting the cladogram of each character to an optimally compatible one and making adjustments for incompatibilities as necessary; (2) by single-linkage cluster analysis based on the number of common evolutionary steps; and (3) by a monothetic method which consisted of successively incorporating decreasingly primitive OTUs into a preliminary cladogram (procladogram) which is then adjusted for parsimony.

Kluge and Farris (1969) tried to incorporate the precision of numerical techniques with the power of evolutionary inference. They rejected evidence which depends on taxonomists' opinions, as being too conjectural; these kinds of evidence include conclusions, speculation or inferences concerning functional importance of characters, biological role of characters, functional relationships between characters, and the "most logical" direction of evolution of characters. For the same reason they rejected two of Inger's (1967) four criteria for determining the "uniqueness" and "unreversedness" of characters, *viz.* there is no obvious selective difference between states; and the unique state has an unusual development pattern. The remaining criteria (the states occur in many taxa of the group being studied; and the character has low variability within taxa) they accepted as objectively measurable. They reasoned that if uniqueness is correlated with low variability within OTUs, then it becomes operationally equivalent to conservatism. The rationale is that a highly conservative character would be more likely to have a state characteristic of a monophyletic group than would a more variable character. In addition, the states of conservative characters are less likely to have been reversed, because (by definition) conservative characters evolve slowly. They concluded that a large difference between OTUs on the basis of a variable character does not indicate distant relationship because the character could have evolved rapidly, but a large difference based on a conservative character does indicate distant relationship.

Accordingly, they weighted characters inversely in relation to their variation within OTUs. They constructed a cladogram by means of the Wagner (1961) method, whereby a parsimonious tree is constructed based on attributes whose order, but not direction, of evolution is specified.

Farris *et al.* (1970) considered the ways in which Hennig's principles restrict the procedures of quantitative phyletics, evaluated existing quantitative phyletic procedures on the basis of their consistency with phylogenetic premises, and attempted to formulate a method which was consistent with Hennig's premises. They restated Hennig's principles in the form of four axioms. The first two are formal statements of the distribution of primitive and derived states in hierarchies of monophyletic taxa, as defined by Hennig (1966*b*). The remaining two "axioms" are statements of procedure, rather than logical axioms. They are (Farris *et al.*, 1970: 174): "AIII. In the absence of evidence to the contrary, any state corresponding to a step shared by a group, G, of OTUs is taken to have arisen just once in G" (that is, is taken to be unique in the sense of Wilson, 1965). A step is defined (p. 174) as "the transition from state y to state x, where y is the most derived state which is ancestral relative to state x." To share a step is to possess state *x* or one derived from it. The remaining "axiom" (AIV) is "the more characters certainly interpretable as apomorphous that there are present in a number of species the better founded is the assumption that these species form a monophyletic group."

They developed three theorems from these axioms which demonstrated the close relationship between Hennig's phylogenetic method and evolutionary parsimony as outlined by Camin and Sokal (1965), and formalized by Estabrook (1968). The Estabrook procedure generates all the trees possible under AI to AIII; the most nearly correct tree should be the one most acceptable under AIV. One way to select the most nearly correct tree is by the principle of parsimony. They reasoned that this is consistent with AIV, since on a most parsimonious tree OTUs sharing the greatest number of steps (and the corresponding apomorphous states) are generally placed together. As an alternative to parsimony, Farris *et al.* (1970) developed the Weighted Invariant Step Strategy (WISS), which consists of finding clusters of OTUs which share the greatest number of steps (and whose inclusion in monophyletic groups is most justified under AIV). These clusters are then treated as OTUs, and the procedure repeated until the tree is complete.

Farris *et al.* (1970) found that the chief difficulty with the Camin–Sokal and WISS clustering methods was that it was not always possible to satisfy the requirement that every OTU in a monophyletic group share at least one step not shared by any OTU outside the group. They thought that this problem could be solved by recoding some characters or by looking for more characters, until this requirement was met.

Discussion

The quantitative phyletic methods discussed above have one defect in common: synapomorphies (as opposed to apomorphies) are not determined until after the classification has been produced. In these methods, an apomorphic character state is taken to have arisen only once unless a conflict with the cladogram of another character argues against this assumption. When a conflict arises between two or more apomorphic characters, one or more of these must have arisen more than once. Procedures based on parsimony rearrange the cladogram of each character until a cladogram is produced which incorporates them all, with the fewest independent appearances of inferred apomorphic states. Then each of the "final" occurrences of an apomorphy describes (in the sense of Farris *et al.*, 1970) its own monophyletic group. These "final apomorphies" are each synapomorphies in the sense of Hennig, and each is unique in the sense of Wilson.

The crucial point is, that Hennig's method is to find groups each of which is shown to be monophyletic by the possession of not just an apomorphic state, but of a synapomorphic state. Then the classification is constructed. The argument of these parsimonious methods is, I think, circular: there is a prior assumption of certain apomorphies, but once the classification is constructed, the monophyletic groups in it are each based on synapomorphies, which must be synapomorphies because the classification has been constructed in a way "consistent" with phylogenetic principles.

It is clear that the original apomorphies are not synapomorphies. Synapomorphy, as defined by Hennig (1966*b*: 89) is ". . . the presence of apomorphous characters in different species . . . always with the assumption that the compared characters belong to the same transformation series." Thus, synapomorphies must be unique in the sense of Wilson (1965: 214): ". . . a given character state . . . appeared in the past once and in only one species." Camin and Sokal (1965: 312) assumed that "The ancestral state arose only once in the taxa at hand" but "derived states may . . . have arisen repeatedly." Farris *et al.* (1970) made a similar assumption under axiom AIII, quoted above. "Evidence to the contrary" in AIII, of course, is the requirements of parsimony.

The fact that parallelisms, convergences, and synapomorphies are not "detected" until after the classification is formed is an inevitable result of methods based on the principle of parsimony. In my opinion, the increased objectivity of such techniques, gained at the expense of the credibility of the underlying assumptions about each character, does not increase the probability of the correctness of the classification or the reconstructed phylogeny. This opinion is based on the following considerations: (1) Phylogenetic reconstructions can never be more certain than "probably" correct; (2) the correctness of the hierarchy depends directly on the correctness of the inferred synapomorphies; and (3) although establishing apomorphies ". . . opens the possibility of endless arguments between different taxonomists with different understandings of the same situation" (Kluge and Farris 1969: 2), it seems preferable (to me) to have possibly equivocal, but basic, inferences clearly visible, rather than disguised as a byproduct of the classification they purport to produce.

There can be little doubt that some characters have arisen more than once. Purely parsimonious methods make no consideration of the relative probability of correctness of the inferences concerning apomorphy. I think a consideration of the relative probability of two conflicting inferred apomorphies is extremely important in constructing a system whose value lies in its credibility.

On the other hand, there are groups which defy any attempt to infer synapomorphies amongst their members. Farris *et al.* (1970) concluded that Hennig's method is well suited to situations in which character state trees and the identity of ancestral states can be safely (credibly) established without "prior taxonomic analysis," but that in other cases initial methods must be consistent with phylogenetic principles but must not make strong assumptions concerning character state trees. If groups can be established directly on the basis of inferred synapomorphies, I think it is preferable to do so because this method is more directly inferential. The best kinds of inferences about synapomorphy appear to be those concerning deviations from a "basic plan," or concerning inferred adaptive significance. Credible cladistic reconstruction is especially important for zoogeographic studies, where further inferences are to be made.

CLADISTIC ANALYSIS

Characters Examined

The taxonomic descriptions of the genera and species under study were based on 96 characters selected by prior experience with taxonomic characters in Diptera. A list of these characters and a summary of the states they exhibit in the taxa under study is given in Appendix II. For many of these it was not possible to reach any conclusions concerning apomorphy. The latter group of characters, which were omitted from the cladistic analysis (not marked with an asterisk (*) in Appendix II), were generally "simple" characters, for which probable transformation series could not be established and which had no obvious adaptive significance. On the other hand, a ground plan could be inferred for some characters, especially more complex ones such as those of the male genitalia. Deviation from this '"basic plan" provided a basis for inferring apomorphy. In addition, some of the simple characters were sufficiently striking that some adaptive significance could be inferred. The latter two kinds of characters (marked with an asterisk (*) in Appendix II) were included in the cladistic analysis.

Basic Plans of the Male Genitalia of Nematocera and Mycetophilidae

A preliminary examination of species of *Symmerus* and *Australosymmerus* indicated that the greatest diversity of structure amongst the species was to be found in the male genitalia. Since it is easier to make inferences concerning apomorphy where differences between attributes are large, it was expected that the genitalia would provide many, if not most, of the attributes from which inferences of apomorphy in these two genera could be made.

An attempt was made to determine the "basic plan" of the male genitalia in the Mycetophilidae, so that deviation from this plan would provide a basis for inferences of apomorphy. In order to determine the "basic plan" a survey was made of the genitalia of 255 species of Mycetophilidae in 79 genera, and of representatives of most subfamilies of Nematocera. The male genitalia of these species were examined for structures which recurred in the major groups, and which could therefore be inferred to be primitive.

Nematocera

The elements of the structural scheme outlined below occur in a wide variety of nematocerous groups, although I know of no group which shows all the elements at once. The scheme is a synthesis of attributes, which appear to be primitive for three reasons. Firstly, in every group in which they occur these elements appear to form one end of a transformation series, but in every group it appears to be a different transformation series. Secondly, if they were apomorphic, their occurrence at one end of a variety of transformation series in a wide spectrum of groups would require an independent origin of a large number of apparently identical conditions. Thirdly, whenever they form one end of a transformation series, the other end cannot credibly be inferred to be primitive.

The basic plan is as follows:

Sternite 9. A ventral sclerite approximately half as long to as long as sternite 8; proximal to the stylus (which is primitively borne on segment 9); proximal to the genital opening (primitively borne between segments 9 and 10).

Stylus. Two-segmented, the segments cylindrical or cylindroconical; basistylus borne primitively between segments 9 and 10, so the stylus projects posteriorly; dististylus a simple cylindrical tube, closed apically and about as long as the basistylus.

Aedoeagus. It was not possible to determine the homologies of all of the aedoeagal structures observed; determination of the transformation series involved will require a much more intensive study than was possible during the course of the present study.

Tergite 9.[33] The dorsal sclerite of the hypopygium, of the same order of size as sternite 9; distal to tergite 8.

Cerci. A pair of free simple ear-like lobes situated between tergite 9 and sternite 10, with the anus opening between them.

[33]The sclerite described here is conventionally referred to as tergite 9, but the position of the genital pore and anus (primitively borne posterior to segments 9 and 10, respectively) indicate that it might just as well be regarded as tergite 10 (with tergite 9 lost) or as a sclerite resulting from the fusion of tergites 9 and 10.

Sternite 10. A sclerite lying dorsal to the aedoeagus, ventral to tergite 9, and proximal and ventral to the cerci.

Mycetophilidae

The "basic plan" of the male genitalia of the Mycetophilidae is identical with that outlined above, except that the cerci and sternite 10 are small, free lobes which form a short, broad tube with the anus at its apex, the tube borne at the apical margin of tergite 9.

The foregoing discussion is admittedly a cursory treatment of a very complex subject. But I think the main points of the "basic plan" are correct, and that deviations from it provide a credible basis for inferring apomorphy.

Cladistic Procedure

The following procedure was used to reconstruct the cladistic relationships of *Symmerus* and *Australosymmerus*. The distribution of the characters for which probable transformation series and apomorphic states were inferred (discussed below, and marked with an asterisk (*) in Appendix II) was examined, and the monophyletic groups described by the inferred synapomorphous states were successively added to a preliminary cladogram. Each time two monophyletic groups were inferred to form a third monophyletic group containing them both, one node of the cladogram was established. In this way the sister-group relationships were determined as the cladogram was constructed. The operation could loosely be termed "a search for monophyletic groups" rather than "a search for the sister-group" (term preferred by Hennig), but these are really the same. In some cases two inferred synapomorphies described overlapping (conflicting) monophyletic groups. There are two logical possibilities which explain this: (1) one or the other or both inferred apomorphies are not apomorphic; (2) the occurrences of one or the other or both inferred synapomorphies are not synapomorphic. Simply stated, these are that either the inferences of apomorphy are incorrect, or the inferences of synapomorphy are incorrect. When this situation arose, both levels of inference were re-examined, and the most probable alternative selected. In some cases a simple reversal of the direction of transformation of one character resulted in a relatively large reduction of the number of conflicts. In other cases (discussed under "Non-unique Apomorphies"), some states initially inferred to be synapomorphic in their occurrences were finally considered to be parallel or convergent in their occurrences.

Transformation Series and Monophyletic Groups

Intra-subfamily Level

1. *Emargination of dorsal margin of eyes.* The plesiomorphic state of the dorsal eye margin in Nematocera appears to be "eye margin entire" because of the wide distribution of this state in a wide variety of taxa throughout the Nematocera. All the species of the genera *Symmerus* and *Australosymmerus* possess dorsally emarginate eyes. The transformation series ranges almost continuously from "dorsal margin slightly emarginate" to "dorsal margin reaching level of lateral margin of median ocellus." No reason was found to believe that the occurrence of this inferred apomorphy in the two genera is due to convergence, so it was inferred to

be due to synapomorphy. This inferred synapomorphy unites the genera *Symmerus* and *Australosymmerus* in a monophyletic group.[34]

2. *Enlargement of cercus.* According to the "basic plan" of the male genitalia, in the plesiomorphic state the cercus in the Mycetophilidae is much smaller than tergite 9 and has the shape of a simple ear-like lobe. The two genera under study show greatly enlarged and modified cerci (except for some apparently secondary reductions, discussed at the subgeneric level). This condition was inferred to be apomorphic because of its deviation from the "basic plan." This inferred synapomorphy unites the genera *Symmerus* and *Australosymmerus* in a monophyletic group.

Generic Level

GENUS *Australosymmerus*

3. *Postorbital setae.* The differentiation in size and color of a row of 1 to 6 setae can be inferred to be an adaptive specialization, in my opinion, for reasons given on page 76. Even if the actual sensory function is unknown, it seems more probable that these large, strong setae are apomorphic with respect to the scattered and varied vestmental setae which occur in *Symmerus* than that the reverse is true.

4. *Scutellar setae.* The occurrence in species of *Australosymmerus* of one or two pairs of extremely long scutellar bristles, differentiated from a fringe of short to moderately long setae, was inferred to be synapomorphic for the reasons given for the postorbital bristles.

5. *Spines of tibial combs.* The occurrence of one to six strong spines in at least some of the combs of at least some of the legs in each species of *Australosymmerus* as opposed to the small (not more than one tibial diameter in length) more numerous spines of *Symmerus* were inferred to be synapomorphic for the same reasons given for the postorbital bristles.

6. *Apical spines of tibiae.* The occurrence of up to four large, stiff apical spines on the tibiae of species of *Australosymmerus* as opposed to the smaller, less differentiated ones of *Symmerus* were inferred to be synapomorphic for the reasons given for the postorbital bristles.

7. *Shape of the basistylus.* In the "basic plan" of the Mycetophilidae, the basistylus is cylindrical or cylindroconical. *Symmerus* retains this condition to some extent, although the basal opening is rather wide (Figs. 1d, 2d, 4d–11d) and the basal portion of the mesal surface has become modified to form part of the aedoeagal apparatus. In *Australosymmerus* the mesal surface has become reduced to the point that, except at its extreme apex, the mesal surface is incorporated completely into the aedoeagal apparatus, and the original basal opening of the cone has become enlarged so that the basistylus is open mesally as well as basally. The transformation series within the genus will be discussed at the subgeneric level; the modification discussed above deviates from the "basic plan" and was inferred to be apomorphic for this reason.

8. *Basal apodeme of aedoeagus.* Although the "basic plan" of the aedoeagal apparatus was not determined, in the case of some aedoeagal structures it was possible to infer apomorphic states. Members of *Australosymmerus* possess a horizontal apodeme projecting basally from the aedoeagus. Since the aedoeagus in this genus appears to be formed from the mesal wall of the basistylus, and since

[34]The ditomyiine genus *Nervijuncta*, which is endemic to New Zealand, also possesses dorsally emarginate eyes. This raises the possibility that the genera *Symmerus* and *Australosymmerus* form a paraphyletic group rather than a holophyletic one. Because of inadequate material, and other limitations, I was not able to include *Nervijuncta* in the present study.

the apodeme does not occur in *Symmerus,* which has more primitive basistyli, it was inferred that the presence of the apodeme is an apomorphy. Further details of the transformation series within the genus are discussed at the subgeneric level.

9. *Shape of diststylus.* The dististylus in the "basic plan" of the Mycetophilidae is a cylindrical tube, closed apically. In *Australosymmerus* the dististylus is reduced in size and heavily sclerotized, with an expanded apex. The apex is partly membranous, and shows a sclerotized "tooth-plate" bearing a row of strong, tooth-like pegs. This structure deviates from the "basic plan," and was therefore inferred to be apomorphic.

10. *Size of tergite 9.* In the "basic plan" of the genitalia of the Mycetophilidae, tergite 9 is transverse and of the same order of size as tergites 1 to 7. In *Australosymmerus* it is quadrate or elongate, and about as long as the basistylus or longer. The enlargement of tergite 9 was inferred to be apomorphic in *Australosymmerus* because it deviates from the "basic plan."

11. *Position of the cerci.* In the "basic plan" of the male genitalia of the Mycetophilidae the cerci lie at the distal margin of tergite 9, each forming an oblique, dorsolateral wall to the "anal tube," which is triangular in cross-section (sternite 10 forms the ventral wall). In *Australosymmerus,* in which tergite 9 is enlarged, the cerci lie at the posterolateral corners of tergite 9 and are widely separated. In addition, they are orientated vertically rather than obliquely. This condition, in which the cerci are widely separated and vertically orientated, is inferred to be apomorphic, since it deviates from the "basic plan" of the male genitalia of the Mycetophilidae.

It was concluded that the members of *Australosymmerus* form a monophyletic group based on inferred synapomorphic attributes 3 to 11 discussed above.

GENUS *Symmerus*

There are two attributes which were inferred to be synapomorphic in *Symmerus* and which therefore indicate that its members form a monophyletic group.

12. *Basal opening of cercus.* All the species of *Symmerus* examined show a large basomesal opening in the cercus, from which protrudes the anal lobe (Figs. 1e, 2e, 4e–11e). This constitutes a deviation from the "basic plan" of the cercus, in which the basal opening is narrow.

13. *Elongation of cercus.* As discussed under (2) above, the large cerci of *Symmerus* and *Australosymmerus* were inferred to be synapomorphic with respect to the "basic plan." The examined species of *Symmerus* possess cerci which are elongate and tapering (with the mesal surface forming a very shallow groove in most cases). This condition was inferred to be apomorphic with respect to the condition in which the cerci are enlarged but basically ear-shaped (shown by *Australosymmerus*).

It was concluded that *Symmerus* constitutes a monophyletic group based on inferred synapomorphic attributes 12 and 13 above.

Subgeneric Level

SUBGENUS *Symmerus s. str.*

Symmerus is the most primitive of the subgenera examined: Its members show the fewest apomorphic states of the characters considered in this study. No character state was found which (in my opinion) can be inferred to be synapomorphic in the species of this subgenus alone. As will be shown below, there are character states from which *Psilosymmerus* may be inferred to be monophyletic.

The remaining species of *Symmerus* (*lautus, antennalis, annulatus,* and *nobilis*) show a close overall resemblance, but close examination of these species did not reveal any evidence for their holophyly. There is a distinct possibility that one or more of these species is more closely related to *Psilosymmerus* than to the other species of *Symmerus s. str.* and therefore that the latter is a paraphyletic group. It is possible that the setose postnotum of *Symmerus s. str.* is an apomorphic attribute, but I was not able to reach a satisfactory conclusion.

SUBGENUS *Psilosymmerus*

14. *Shape of dististylus.* The species included in *Psilosymmerus* possess dististyli which are expanded ventrobasally and which taper to a point, thus appearing boot-shaped (Figs. 6c, d – 11c, d). This condition deviates from that shown in the "basic plan" of the male genitalia of the Mycetophilidae, and is therefore concluded to be apomorphic.

15. *Mesal margin of dististylus.* The mesal surface of the dististylus in the species included in *Psilosymmerus* is at least partly membranous. A narrow heavily-sclerotized strip of integument lies in this membrane, connected to the strong portions of the dististylus at its ends. The strip is largely composed of a fringe of fine spines, which are close-set, so that the strip appears striate (Figs. 6d–11d). It was inferred that this condition is apomorphic with respect to that of *Symmerus s. str.* in which the mesal surface bears a fringe of setae on the mesal apex of the dististylus. The latter condition appears to be more similar to the "basic plan" of the dististylus.

It was concluded that *Psilosymmerus* is a monophyletic group, based on inferred apomorphies 14 and 15. The species of *Psilosymmerus* possess bare postnota, as opposed to the setose postnotum in *Symmerus s. str.* It is possible that this condition represents an apomorphy, but, as noted under *Symmerus s. str.* no conclusion was reached about the character.

SUBGENUS *Australosymmerus s. str.*

16. *Apical lobe of basistylus.* The species included in *Australosymmerus s. str.* possess a slender tubular lobe on the ventral apex of the basistylus (Figs. 12b–15b). This attribute differs from that shown in the "basic plan" of the male genitalia of the Mycetophilidae, in which the apex of the basistylus is simple. These processes are quite varied, but there is no conflict or other reason to infer that their occurrences are due to convergence; therefore it was inferred that they are due to synapomorphy.

SUBGENUS *Crionisca*

The species of *Crionisca* share a number of attributes which were inferred to be synapomorphic.

17. *Size of cercus.* The species included in *Crionisca* possess small, simple cerci. Although this is a primitive condition in the Mycetophilidae, I have inferred that this is a secondary occurrence in these species for three reasons. Firstly, species of *Crionisca* (apomorphies 1–11, 34–36) possess all the other apomorphies required to place it in the *Australosymmerus–Symmerus* group, in the genus *Australosymmerus,* and in the groups intermediate between the generic and subgeneric levels. If *Crionisca* were to have cerci which were, in fact, plesiomorphic, all of these other apomorphies would have to have arisen in *Crionisca* independently

from their origins within *Australosymmerus–Symmerus.* Secondly, the cerci in *Crionisca* are situated near the lateral margins of tergite 9, rather than close together. The former condition has been inferred, under (11) above, to be an apomorphy. Thirdly, the structure of tergite 9 in *Crionisca* (see below), which is correlated with these occurrences of small cerci, has been inferred to be apomorphic with respect to that of tergite 9 in other subgenera of this section of *Australosymmerus* (*Australosymmerus s. str.*, *Ventrilobus*, and *Araeostylus*). For these reasons, it was inferred that cerci of *Crionisca* are apomorphic with respect to the larger cerci of other members of *Australosymmerus–Symmerus.*

18. *Position of the cercus.* In addition to being well separated, the cerci of the species of *Crionisca* lie under the apical margin of tergite 9 (Figs. 16e–18e). This condition deviates from that shown in the "basic plan" of the male genitalia of the Mycetophilidae, and was inferred to be apomorphic for that reason.

19. *Structure of tergite 9.* The posterolateral angle of tergite 9 in the species of *Crionisca* is produced ventrally into a heavily sclerotized arm (Figs. 16e–18e). This deviates from the condition of tergite 9 in the "basic plan" of the male genitalia of the Mycetophilidae, and was thus inferred to be apomorphic.

20. *Course of the subcosta.* The subcosta in species of *Crionisca* (Fig. 63k, l) possesses a strong short anterior branch which reaches the costa, an apically obsolescent straight branch, and a short, very faint, posterior branch running into R_1. The primitive condition of the subcosta of Diptera appears to be Sc_1 long, and running into the costa, and Sc_2 running into R_1 (Colless and McAlpine 1970). All Ditomyiinae except *Crionisca* possess the "middle" straight branch, which is apically obsolescent. All members of the *Australosymmerus–Symmerus* group also possess the short posterior branch. It was concluded that the "middle" branch in *Australosymmerus–Symmerus* represents the vestige of Sc_1, and the posterior branch represents Sc_2, based on their respective courses and positions. If this is the case, then the anterior branch possessed by members of *Crionisca* must represent a secondary vein which has arisen in these species.

Attributes 17 to 20 discussed above give a rather strong basis (in my opinion) for concluding that *Crionisca* is monophyletic.

Subgenus *Ventrilobus*

One attribute was found which could be inferred to be synapomorphic in the species of *Ventrilobus.*

21. *Ventral lobe of cercus.* The species included in *Ventrilobus* possess a heavily sclerotized, curved, ventral process extending from the base of the cercus. The processes in the five species are very similar, and were inferred to be homologous. They represent a deviation from the "basic plan" of the male genitalia of the Mycetophilidae, and were inferred to be apomorphic. This apomorphy has apparently arisen more than once in *Australosymmerus s. lat.*; this is discussed under "Non-unique Apomorphies." Within the species included in *Ventrilobus,* however, there is no conflict or other reason to suppose that its occurrences are due to convergence rather than to synapomorphy.

Subgenus *Araeostylus*

22. *Shape of dististylus.* In the inferred primitive condition the dististylus of *Australosymmerus s. lat.* has many small teeth, a conspicuous membranous region subapically and the apex expanded. This condition was inferred to be primitive

because of its occurrence in each of the phyletic lines within *Australosymmerus s. lat.* (although not in all members of each line), and because it appears at one end of several transformation series. If it were to be apomorphic, its appearance in these several transformation series would require the independent origin on several occasions of a complex structure. The species included in *Araeostylus* possess dististyli which are heavily sclerotized, tapering, slender, slightly expanded at the apex, and with a row of up to 10 blunt peg-like mesal teeth (the apex of the dististylus in *A. (Ar.) simplex* (Freeman) does not have teeth, but tapers to a round sclerotized point: this was inferred to be apomorphic with respect to the other species of *Araeostylus*). The reduction in size, reduction in number of teeth, and uniform, strong sclerotization constitutes a deviation from the "basic plan" of the male genitalia of the Mycetophilidae and is inferred to be apomorphic. *Araeostylus* was concluded to form a monophyletic group based on the reduction of the dististylus.

SUBGENUS *Vellicocauda*

23. *Mesal lobe of cercus.* The species included in *Vellicocauda* possess cerci which bear a flange-like mesal lobe, orientated dorsobasally to ventroapically, which has the appearance of having been "pinched" from the mesal surface. This condition deviates from the "basic plan" of the male genitalia in which the primitive condition of the mesal surface of the cercus is simple, and was inferred to be apomorphic for this reason. A close examination of this process did not give any indication that it is homologous with other cercal processes in *Australosymmerus s. lat.*

SUBGENUS *Melosymmerus*

There is one character which was inferred to be synapomorphic in the species of *Melosymmerus.*

24. *Fusion of sternite 9.* In the species included in *Melosymmerus,* sternite 9 is completely fused between the basistyli, except for its distal margin. In the "basic plan" of the male genitalia of the Mycetophilidae, sternite 9 is free. Most species of *Australosymmerus s. lat.* have sternite 9 fused at the base, but it remains clearly demarcated from the basistylus. The condition shown in *Melosymmerus* was inferred to be apomorphic because of its deviation from the "basic plan." *Melosymmerus* constitutes a monophyletic group based on this inferred synapomorphy.

SUBGENUS *Calosymmerus*

There were several characters which indicated rather strongly that *Calosymmerus* is a monophyletic group.

25. *Ventral process of cercus.* The species of *Calosymmerus* possess a heavily sclerotized tubular ventral process on the base of the cercus. This process is similar to those of *Ventrilobus* and was inferred to be apomorphic for the same reason. This condition appears to have arisen several times in *Australosymmerus s. lat.*; this is discussed under "Non-unique Apomorphies."

26. *Color differentiation of integument.*[35] The species included in *Calosymmerus* possess integument colored either vivid yellow or deep velvety black or

[35]Attributes 26 to 30 could perhaps be considered as one character, as they are very similar. They have been considered separately because (1) they are of two kinds: one in which some differentiation in color is usual (i.e., integument and setae) and the other in which it occurs nowhere else in the group under study (i.e., wing veins and macrotrichia); (2) although the occurrence of these attributes is correlated completely, the distribution of the attributes is not always correlated (for instance, vivid black setae do not always occur on black integument) so they are, to some extent, independent of one another.

brown, the areas of different color being distinctly demarcated. This condition differs from that found in other species of the *Australosymmerus–Symmerus* group, which have rather dull, diffuse, brown and yellow markings, with the exception of some *Crionisca* females. The latter, however, are colored black with white markings, and there is little doubt that these are not synapomorphic with the markings of *Calosymmerus*. The adaptive significance of the markings in *Calosymmerus* is not known, but I think a mimetic or warning function can safely be inferred.

27. *Color differentiation of wing membrane.* The color differentiation of the wing membrane is the same as that of the integument; this is considered a separate character because yellow markings on the wing do not occur elsewhere in the *Australosymmerus–Symmerus* group. The argument for apomorphy and synapomorphy is the same as for character 26.

28. *Color differentiation of macrotrichia.* The macrotrichia on the wing membrane are differentiated into dark brown or black, or vivid yellow, the color corresponding to the color of the wing membrane. The macrotrichia of *Calosymmerus* are the only ones in the *Australosymmerus–Symmerus* group showing a distinct color differentiation. The argument for apomorphy and synapomorphy is the same as for character 26.

29. *Color differentiation of setae.* The setae of members of *Calosymmerus* are differentiated in color in the same way as the integument. The setae of other members of the *Australosymmerus–Symmerus* group are duller and less differentiated in color. The argument for apomorphy and synapomorphy is the same as for character 26.

30. *Color differentiation of wing veins.* The species of *Calosymmerus* possess wing veins colored dark brown in the dark areas of the wing, and yellow in yellow areas. The wing veins of other species of *Australosymmerus–Symmerus* group are not differentiated with respect to color. The argument for apomorphy and synapomorphy is the same as for character 26.

31. *Division of sternite 9.* The species included in *Calosymmerus* possess a reduced sternite 9 consisting of two or three free lobes separated at their bases by membrane. This condition deviates from that shown in the "basic plan" of the male genitalia of the Mycetophilidae, in which sternite 9 is entire and free, and from the primitive condition in *Australosymmerus s. lat.* (see character 24).

32. *Fusion of tergite 9.* Tergite 9 in *Calosymmerus* is fused to the dorsal margin of the basistyli for its basal half or for its entire length. This constitutes a deviation from the "basic plan" of the male genitalia of the Mycetophilidae in which it is free. There is evidence that the fusion of tergite 9 at its extreme base has occurred more than once in the *Australosymmerus–Symmerus* group. There was no reason to suspect, however, that the more extensive fusion shown in *Calosymmerus* species is due to convergence amongst these species; therefore it was concluded that its occurrence in these species is due to synapomorphy.

33. *Structure of the aedoeagus.* Although it was not possible to determine the "basic plan" of the aedoeagus of the Mycetophilidae or the *Australosymmerus–Symmerus* group in the present study, the species of *Calosymmerus* show some striking modifications which I believe can be inferred to be apomorphic. In *Calosymmerus*, the aedoeagal elements are fused to form a huge, heavily sclerotized structure consisting of a long penis projecting between the cerci, an enormous basal apodeme projecting into the abdomen, in one case as far as abdominal segment 6, and dorsal and ventral supporting structures. It seems probable to me that this structure can be inferred to be apomorphic with respect to the aedoeagal apparatus

of other species of the *Australosymmerus–Symmerus* group. From their position and appearance, various parts of the complex fused aedoeagus can be homologized with individual, unfused elements of the aedoeagal apparatus of other *Australosymmerus s. lat.* species: the basal apodeme of *Calosymmerus* with that of other *Australosymmerus s. lat.*, the large ventral strut of *Calosymmerus* with the short ventral process of other *Australosymmerus s. lat.*, and the penis and dorsal strut of *Calosymmerus* with the dorsal plates of other *Australosymmerus s. lat.* It seems more credible to me that the structure shown by *Calosymmerus* is the result of fusion of the various elements of the aedoeagus shown in *Australosymmerus s. lat.* than that the latter have arisen by a breaking-up of the former. In addition, the aedoeagus of other *Australosymmerus s. lat.* seems to be derived from the mesal wall of the basistylus; in *Symmerus s. lat.* the dorsal plates are little more than lobes of the basistylus. It does not seem probable to me that the latter condition represents the derived end of the transformation series.

The aedoeagus of *Calosymmerus* was inferred to be apomorphic with respect to that of other *Australosymmerus s. lat.* because it appears to represent one end of a transformation series, the other end of which cannot be inferred to be apomorphic.

It was concluded that *Calosymmerus* constitutes a monophyletic group based on inferred synapomorphies 25 to 33.

SUBGENUS *Tantrus*

This monotypic subgenus is represented by *Australosymmerus (Tantrus) montorum* which is described as a monophyletic group by the autapomorphic attributes given in the species description.

The foregoing inferences provided a basis for concluding that the *Australosymmerus–Symmerus* group consists of the following monophyletic subgeneric groups: *Symmerus* consists of two subgenera which (with qualifications in the case of *Symmerus s. str.*) can reasonably be regarded as monophyletic. *Australosymmerus* consists of eight subgenera, each of which has also been inferred to be monophyletic. The following discussion deals with the relationships between these subgenera.

Intrageneric Relationships

This section deals with monophyletic groups at levels intermediate between the generic and subgeneric levels. There are no such groups in *Symmerus.*

34. *Length of tergite 9.* Members of *Australosymmerus s. str.* and *Crionisca* possess an enlarged tergite 9, that is one and one-third or more times as long as the basistylus. This constitutes a deviation from the "basic plan" of the male genitalia of the Mycetophilidae, and of *Australosymmerus–Symmerus* in which tergite 9 is of the same order of size as the basistylus and sternite 9. It was concluded that the occurrences of this inferred apomorphy are due to synapomorphy in the two subgenera, and that they form a monophyletic group.

35. *Ventral process of cercus.* Members of *Ventrilobus* and *Araeostylus* possess cerci which bear lobes or process on the ventral margin. This deviates from the "basic plan" of the male genitalia of the Mycetophilidae and from the primitive condition of the *Australosymmerus–Symmerus* group, in which the cercus is simple (albeit enlarged). The ventral processes in some cases are similar in appearance to those in *Melosymmerus* and *Calosymmerus,* but the next three characters to be discussed provide evidence that this similarity is due to convergence. Within *Araeostylus* and *Ventrilobus,* there is no evidence that the occurrences of the ventral

processes are due to convergence, although heavy sclerotization of the process, and separation of the process from the cercus, have apparently occurred more than once. This character is discussed further under "Non-unique Apomorphies." On the basis of these considerations, it was concluded that the occurrences of ventral processes on the cercus in *Ventrilobus* and *Araeostylus* are due to synapomorphy rather than to convergence, and that this inferred synapomorphy unites them in a monophyletic group.

36. *Loss of microtrichia.* The two groups of subgenera discussed above possess wings which lack microtrichia. The presence of microtrichia appears to be a primitive attribute in the Mycetophilidae. This is inferred from the presence of the attribute in a wide variety of groups throughout the Mycetophilidae. The requirements of parsimony, as outlined under "Non-unique Apomorphies" indicate that the microtrichia have been lost four times in *Australosymmerus s. lat.* If those species which lack microtrichia were inferred to form a monophyletic group, the inferred apomorphies defining the major clades in which the *Australosymmerus–Crionisca–Ventrilobus–Araeostylus* group, the *bisetosus–pediferus* group of *Melosymmerus* and *Calosymmerus* occur would have to have arisen more than once. This would require the inference of a larger number of independent origins of apomorphic states. Within the *Australosymmerus–Crionisca–Ventrilobus–Araeostylus* group, however, there is no conflict or other reason to suppose that the microtrichia have arisen more than once. Loss of microtrichia in this group was therefore inferred to be synapomorphic.

37. *Scutellar bristles.* As discussed under (4) above, the differentiation of one or two pairs of strong scutellar bristles was inferred to be synapomorphic in *Australosymmerus s. lat.* It is now necessary to discuss further details of the transformation series of this character. It was inferred that the transformation series is "scutellar bristles undifferentiated" to "two pairs of scutellar bristles differentiated" to "lateral pair shorter than mesal pair" to "one pair differentiated." The reason for this inference was that the alternatives did not give rise to probable monophyletic groups, because within the monophyletic groups implied by the alternatives, inferred apomorphies at the subordinate levels would have had to arise more than once in many cases. The transformation series actually inferred, on the other hand, implies two groups: *Calosymmerus–Melosymmerus* and *Calosymmerus–Melosymmerus–Vellicocauda–Tantrus.* *Calosymmerus* and *Melosymmerus* possess one strong pair of scutellar bristles. It was concluded that *Calosymmerus* and *Melosymmerus* form a monophyletic group. Members of *Vellicocauda* and *Tantrus* possess two large and two smaller scutellar bristles, both pairs being distinctly larger than the undifferentiated fringe. This intermediate state is still apomorphic with respect to "two large pairs," and thus unites *Tantrus* and *Vellicocauda* with *Calosymmerus* and *Melosymmerus.*

38. *Fusion of tergite 9.* According to the "basic plan" of the male genitalia of the Mycetophilidae, tergite 9 in the primitive condition is not fused to the basistyli. In species of *Tantrus, Melosymmerus,* and *Calosymmerus* it is fused at its extreme base, at least, and often (in *Calosymmerus*) completely fused. This condition was inferred to be apomorphic, but appears to have arisen more than once in *Australosymmerus s. lat.* This is discussed under "Non-unique Apomorphies." Within the three subgenera, however, there is no conflict or other reason to suppose that this apomorphy has arisen more than once. The three subgenera are therefore inferred to form a monophyletic group.

The foregoing discussion treats all the monophyletic groups inferred in the *Australosymmerus–Symmerus* group to the level of subgenus. The relationships of these are summarized in a cladogram (Fig. 68). *Symmerus* consists of two subgenera, each the sister–group of the other. *Australosymmerus* consists of two major phyletic lines, each the sister-group of the other. The first of these contains four subgenera: *Australosymmerus s. str., Crionisca, Ventrilobus,* and *Araeostylus. Australosymmerus s. str.* and *Crionisca* form a monophyletic group, as do *Ventrilobus* and *Araeostylus.* In each of these pairs, each subgenus is the sister-group of the other. Each pair is the sister-group of the other. The second major clade within *Australosymmerus s. lat.* contains four subgenera: *Vellicocauda, Tantrus, Melosymmerus,* and *Calosymmerus. Melosymmerus* and *Calosymmerus* are sister-groups, forming a monophyletic group. *Tantrus* is the sister-group of the *Melosymmerus–Calosymmerus* group. *Vellicocauda* is the sister-group of the *Tantrus–Melosymmerus–Calosymmerus* group. Finally, *Australosymmerus s. lat.* is the sister-group of *Symmerus s. lat.*

Intra-subgeneric Level

Monophyletic groups within subgenera were more difficult to infer. This was because the subgenera are rather homogeneous phenetically, so that transformation series and corresponding apomorphies and plesiomorphies are more difficult to recognize. It was not possible to establish the relationship of every species within its particular subgenus, but a number of monophyletic groups were inferred.

SUBGENUS *Symmerus s. str.*

39. *Size of sternite 9.* Within *Symmerus s. str., S. annulatus, S. nobilis* and *S. balticus* possess a large sternite 9, approximately 1.5 times the basistylus in length. This condition deviates from that of sternite 9 in the "basic plan" of the male genitalia of the Mycetophilidae, in which sternite 9 is of the same order of size as the basistylus. It was therefore inferred that these three species form a monophyletic group within *Symmerus s. str.*

40. *Apical lobes of sternite 9. Symmerus* (*Symmerus*) *annulatus* and *S.* (*S.*) *nobilis* bear a pair of large pointed lobes on the apical margin of sternite 9 (Figs. 1b, 2b). These lobes are approximately one-half as long as the basal portion of the sternite. This condition deviates from that shown in the "basic plan" of the male genitalia of the Mycetophilidae, in which the apical margin of sternite 9 is entire. The large lobes were inferred to be apomorphic with respect to the slight emargination shown in the other species of the subgenus, because this transformation series was considered to be more credible than the alternative. It was concluded, therefore, that this inferred apomorphy is a synapomorphy uniting *S. annulatus* and *S. nobilis* in a monophyletic group within *Symmerus s. str.*

It was not possible to determine the precise relationships of *S. lautus* and *S. antennalis* within *Symmerus s. str.* The relationships within the subgenus, as far as they were determined, are summarized by means of a cladogram (Fig. 69). *S. annulatus* and *S. nobilis* are sister-species, and together share a sister-group relationship with *S. balticus.* The *annulatus–nobilis–balticus* group must share a sister-group relationship with either or both of *S. lautus* and *S. antennalis,* but no evidence was found which indicated the precise nature of the relationship.

SUBGENUS *Psilosymmerus*

41. *Ventral processes of antenna.* *S.* (*P.*) *brevicornis* and *S.* (*P.*) *pectinatus* possess ventrally serrate antennae and ventrally pectinate antennae, respectively. The strongly serrate antennae of *S.* (*P.*) *brevicornis* is intermediate between that of *S.* (*P.*) *pectinatus* and the remaining species of *Psilosymmerus,* in which the antennae are only very slightly serrate. A three-step transformation series was inferred in which *S.* (*P.*) *pectinatus* and *S.* (*P.*) *brevicornis* share the step from "antennae slightly serrate" to "antennae strongly serrate." The direction of the transformation series was inferred to be towards increased production of the antennal segments, because transformation in the alternative direction is less probable (in my opinion). Therefore it was concluded that *S.* (*P.*) *pectinatus* and *S.* (*P.*) *brevicornis* form a monophyletic group within *Psilosymmerus.*

42. *Dorsal plates of aedoeagus.* As stated above, it was not possible in the present study to determine the homologies of all of the elements of the aedoeagus in all of the species studied. It has been noted elsewhere (character 8, above), however, that the aedoeagus appears to have been derived from the mesal surface of the basistylus in *Australosymmerus–Symmerus.* In *Symmerus s. lat.* the dorsal plates of the aedoeagus consist of a mesal lobe of the mesal surface of the basistylus, with little or no fusion between the corresponding elements from each basistylus. This condition was inferred to be plesiomorphic with respect to the condition shown in *Australosymmerus s. lat.* (where the dorsal plates are more or less completely fused to one another) because it deviates less from the "basic plan" of the male genitalia of the Mycetophilidae, in which the basistyli are cylindroconical and unfused. Within *Symmerus s. lat.,* however, there has been in some species a reduction in width of the dorsal plates, which have become narrow lateral strips, expanded at the apex and fused to form a sclerotized aedoeagal apex. This was inferred to be apomorphic with respect to the larger, less completely fused or unfused plates shown by other species of *Symmerus s. lat.* This inferred apomorphy does not appear to be synapomorphic with the apomorphies shown by *Australosymmerus s. lat.,* and was consequently inferred to form one end of a separate transformation series within *Symmerus s. lat.* This unites *S.* (*P.*) *nepalensis,* and the group formed by *S.* (*P.*) *pectinatus* and *S.* (*P.*) *brevicornis* as a monophyletic group.

43. *Sensory regions of the dististylus.* Three species of *Psilosymmerus* (*uncatus, coqulus,* and *vockerothi*) possess conspicuous, greyish, sponge-like regions on the ventral surface of the dististylus. These regions consist of closely-set, pit-like sense-receptors, the function of which is unknown. The structure of this sensory area is similar in the three species. However, the remaining three species of *Psilosymmerus* also have sensory regions with minute receptors, although these are not as striking. I was not able to reach a conclusion concerning these sensory areas. If it were demonstrated that the occurrence of the sensory region in *uncatus, coqulus* and *vockerothi* is synapomorphic, these three species would be united in a monophyletic group forming the sister-group of the three species discussed under (42).

Characters 40 to 43 above describe the phyletic relationships, as far as they were inferred, within the subgenus *Psilosymmerus.* These relationships are summarized by means of a cladogram (Fig. 69). *S.* (*P.*) *brevicornis* and *S.* (*P.*) *pectinatus* are sister-species which form a monophyletic group, which in turn shares a sister-group relationship with *S.* (*P.*) *nepalensis.* The monophyletic group formed by the latter three species may share a sister-group relationship with a monophyletic group containing *S.* (*P.*) *vockerothi, S.* (*P.*) *uncatus,* and *S.* (*P.*) *coqulus.*

SUBGENUS *Australosymmerus s. str.*

44. *Apex of aedoeagus. A. (A.) nitidus* and *A. (A.) tillyardi* possess dorsal aedoeagal plates which are expanded and heavily sclerotized at the apex, forming a large dorsally-curved beak. This condition deviates from the inferred primitive one in *Australosymmerus–Symmerus,* in which the dorsal plates are truncate, and consist of uniformly sclerotized lobes of the mesal surface of the basistylus. This inferred synapomorphy unites *A. tillyardi* and *A. nitidus* in a monophyletic group within *Australosymmerus s. str.*

The relationships of the species of *Australosymmerus s. str.* are summarized by means of a cladogram (Fig. 70). *A. tillyardi* and *A. nitidus* are sister-species, forming a monophyletic group which shares a sister-group relationship with one or the other or both of *A. stigmaticus* and *A. basalis.*

SUBGENUS *Crionisca*

The relationship amongst the three species of *Crionisca* can be ascertained with a high degree of probability, in my opinion.

45. *Pleurotergal bristles. A. (C.) aculeatus* and *A. (C.) rieki* possess long setae on the pleurotergite. This was inferred to be an apomorphy since the alternative, that the absence of setae is apomorphic, would require the independent loss of setae in *A. (C.) magellani, Australosymmerus s. str.,* the *Ventrilobus–Araeostylus* group, the *Vellicocauda–Tantrus–Melosymmerus–Calosymmerus* group and in *Symmerus s. lat.* This alternative was not considered probable. *A. (C.) aculeatus* and *A. (C.) rieki* therefore form a monophyletic group which is the sister-group of *A. (C.) magellani.*

The relationships of the species of *Crionisca* are summarized by means of a cladogram (Fig. 70).

SUBGENUS *Ventrilobus*

It was not possible to determine the exact relationships of two of the five species of *Ventrilobus*: *A. cornutus* and *A. fuscinervis.* Conclusions were reached concerning the relationships of *A. (V.) anthostylus, A. (V.) propinquus,* and *A. (V.) nebulosus* (Fig. 71).

46. *Arrangement of teeth of diststylus. A. (V.) anthostylus* and *A. (V.) propinquus* share a condition in which the apical teeth of the diststylus form a rosette, which is incomplete only basally (Figs. 22, 23d). Except for the rosette the apex is membranous, with the teeth apparently joined to one another at the base, and inserted in the membrane. Although the details of the transformation series involved are not fully understood, the reduction of the sclerotized strip supporting the teeth ("tooth-plate"), and the rosette arrangement of the teeth can be inferred to be apomorphic, because of their deviation from the "basic plan" of the male genitalia of the Mycetophilidae (9). Thus *A. (V.) anthostylus* and *A. (V.) propinquus* are united in a monophyletic group.

47. *Ventral lobe of cercus.* The transformation series on which *Ventrilobus* is based (21) was inferred from the deviation of the ventral lobe of the cercus from the condition of the cercus in the "basic plan" of the male genitalia of the Mycetophilidae. Within *Ventrilobus,* the transformation series is inferred (for the same reason) to be from "lobe separated from cercus by deep emargination" to "lobe apparently separate from cercus." The latter state was inferred to be synapomorphic in *A. (V.) anthostylus, A. (V.) propinquus,* and *A. (V.) nebulosus.* The *anthostylus–propinquus* group therefore shares a sister-group relationship with

A. (*V.*) *nebulosus.* In turn, the *anthostylus–propinquus–nebulosus* group shares a sister-group relationship with one or the other or both of *A.* (*V.*) *cornutus* and *A.* (*V.*) *fuscinervis.* As noted above, no conclusions were reached concerning the latter relationship. The relationships of the species of *Ventrilobus* are summarized by means of a cladogram (Fig. 71).

SUBGENUS *Araeostylus*

Araeostylus consists of four species (*A. lobatus, A. collessi, A. simplex,* and *A. bivittatus*) which form two monophyletic subgroups.

48. *Spines of cercus.* *A.* (*Ar.*) *lobatus* and *A.* (*Ar.*) *collessi* possess two large curved spines on the mesal surface of each cercus near the dorsal margin. These enlarged spines can be inferred to have a specialized sensory function, and to be synapomorphic. *A. lobatus* and *A. collessi* were thus inferred to form a monophyletic group within *Araeostylus.*

49. *Mesal lobe of cercus.* *A.* (*Ar.*) *simplex* and *A.* (*Ar.*) *bivittatus* possess a sclerotized cylindrical mesal lobe which appears to be inserted in the base of the cercus. The various cercal processes in *Australosymmerus s. lat.* are apparently not homologous: this is discussed under "Non-unique Apomorphies." Within *Araeostylus,* however, it was inferred that this lobe is apomorphic with respect to both unsclerotized lobes and to lobes produced from the ventral margin, the primitive condition in the *Ventrilobus–Araeostylus* group (see character 35). It was concluded, therefore, that *A.* (*Ar.*) *simplex* and *A.* (*Ar.*) *bivittatus* form a monophyletic group.

The relationships amongst the species of *Araeostylus* are summarized by means of a cladogram (Fig. 71). *Araeostylus* consists of two sister-groups, each containing two sister-species: *A. lobatus* is the sister-species of *A. collessi,* and *A. simplex* is the sister-species of *A. bivittatus.*

SUBGENUS *Vellicocauda*

The relationships of the species of *Vellicocauda* were inferred to be as follows:

50. *Spines of anterior tibia.* The anterior tibiae of *A.* (*Vl.*) *insolitus* and *A.* (*Vl.*) *confusus* lack the strong spines present on all tibiae of other species of *Australosymmerus s. lat.* Since the presence of strong spines on all tibiae is plesiomorphic in *Australosymmerus s. lat.* (see character 5), their absence on the fore tibiae of these two species was inferred to be apomorphic. *A. insolitus* and *A. confusus* thus form a monophyletic group within *Vellicocauda.*

The relationships of the three species of *Vellicocauda* are summarized by means of a cladogram (Fig. 72).

SUBGENUS *Melosymmerus*

The relationships of all the species included in *Melosymmerus* were determined. The inferred synapomorphies upon which these conclusions are based are as follows:

51. *Apical lobe of tergite 9.* *A.* (*M.*) *acutus* and *A.* (*M.*) *truncatus* possess a small flange-like median apical lobe on tergite 9, which is attached to the ventral side of the apical margin (Figs. 38, 39e). This condition deviates from that of tergite 9 in the male genitalia of the Mycetophilidae, in which the apical margin of tergite 9 is simple. This inferred apomorphy was considered to be synapomorphic in the two species because of the "identical" appearance of the lobes. It was con-

cluded on this basis that *A. acutus* and *A. truncatus* form a monophyletic group within *Melosymmerus.*

52. *Loss of microtrichia.* Within *Melosymmerus, A. bisetosus* and *A. pediferus* possess wings without microtrichia. The justification for inferring this condition to be apomorphic has been given under character 36. As noted under character 36, this condition appears to have arisen more than once in *Australosymmerus s. lat.*; this is discussed under "Non-unique Apomorphies." Within *Melosymmerus,* however, there is no reason to believe that the occurrences of this condition are due to convergence, so it was concluded that they are due to synapomorphy, and that *A. bisetosus* and *A. pediferus* form a monophyletic group within *Melosymmerus.*

53. *Ventral lobe of cercus.* The two species-pairs discussed above (*acutus–truncatus* and *bisetosus–pediferus*) possess a heavily sclerotized ventral lobe separated from the cercus by a deep emargination (Figs. 35, 36, 38, 39c, e). This condition is similar to one found elsewhere in *Australosymmerus s. lat.*; this is discussed under "Non-unique Apomorphies." Within *Melosymmerus,* however, there is no reason to conclude that its occurrence in these four species is due to convergence, so it was concluded that it is due to synapomorphy. The argument for inferring that the condition is apomorphic is the same as that given under characters 35 and 47. It was concluded that the four species form a monophyletic group within *Melosymmerus.*

The phylogenetic relationships of the five species of *Melosymmerus* are summarized by means of a cladogram (Fig. 73). *A.* (*M.*) *acutus* and *A.* (*M.*) *truncatus* are sister-species as are *A.* (*M.*) *bisetosus* and *A.* (*M.*) *pediferus*; the two species-pairs are sister-groups of one another. This group shares a sister-group relationship with *A.* (*M.*) *minutus.*

SUBGENUS *Calosymmerus*

The phylogenetic relationships of the three species of *Calosymmerus* have been inferred to be as follows:

54. *Apex of ventral lobe on cercus. A.* (*Cl.*) *magnificus* and *A.* (*Cl.*) *mexicanus* possess a ventral cercal lobe which tapers to a curved hook-like point (Figs. 41c, 42c) as opposed to the lobe of *A.* (*Cl.*) *bifasciatus,* which is truncate. Although the function of this lobe is not known, its appearance suggests that it has a clasping function in copulation, and is specialized for this. It was inferred that the pointed lobe is apomorphic with respect to the truncate lobe, that its occurrence in the two species was due to synapomorphy rather than to convergence and that the two species are sister-species.

55. *Fusion of tergite 9.* As discussed under character 38, fusion of tergite 9 to the basistyli was inferred to be apomorphic. *A.* (*Cl.*) *mexicanus* and *A.* (*Cl.*) *magnificus* have tergite 9 completely fused to the basistyli to form a complete ring. This condition was inferred to be apomorphic with respect to that shown by *A.* (*Cl.*) *bifasciatus,* because of its deviation from the primitive condition in the *Tantrus–Melosymmerus–Calosymmerus* group, in which tergite 9 is fused to the basistyli only at its base. It was inferred that the occurrence of the condition in the two species is due to synapomorphy rather than to convergence, and that the two species are sister-species.

The relationships of the three species of *Calosymmerus* are summarized by means of a cladogram (Fig. 73).

The 55 characters discussed above describe the phylogenetic relationships of 38 species of *Symmerus* and *Australosymmerus*. Within three subgenera, relationships between some species were not determined exactly, because no apomorphies were inferred credibly at the intra-subgeneric level for these species. In addition, the relationships of five examined species were not included in this analysis; these species are those for which credible inferences could not be made. Finally, it was concluded that a number of inferred apomorphic attributes have arisen more than once. These three problems are discussed in the following three sections.

Unspecified Intra-subgeneric Sister-group Relationships[36]

1. *Symmerus s. str.* As noted above, no conclusions were possible concerning the monophyly of the subgenus, but *S.* (*S.*) *annulatus, S.* (*S.*) *nobilis,* and *S.* (*S.*) *balticus* were shown to form a monophyletic group. A close examination of the remaining species (*S.* (*S.*) *lautus* and *S.* (*S.*) *antennalis*) failed to reveal any attributes which would indicate a sister-group relationship with any other species. The situation in the subgenus appears to correspond closely to Hennig's "Principle of Deviation" which, as stated by Brundin (1966: 29), is that "In every sister group pair one group is on the whole more plesiomorph than the other." It appears that the species included in *Symmerus s. str.*, especially *S. lautus* and *S. antennalis,* have deviated only slightly from the ancestral species of *Symmerus s. lat.*, and in this particular case the deviation has been so slight that I have not been able to infer the precise relationships.

2. *Psilosymmerus.* It was not possible to determine the precise relationships of three species of *Psilosymmerus* to the remaining species (43). It was inferred (4, 42) that *S. brevicornis*, *S. pectinatus*, and *S. nepalensis* form a monophyletic group within *Psilosymmerus.* Although the remaining species (*S.* (*P.*) *uncatus*, *S.* (*P.*) *coqulus*, and *S.* (*P.*) *vockerothi*) could possibly be inferred to form a monophyletic group based on the sensory patches of the dististylus (43), no conclusion was reached. If the latter species do not form a monophyletic group, any of them or any combination of them could represent the sister-group of the *brevicornis–pectinatus–nepalensis* group. This situation also corresponds with the implications of the rule of deviation, since the area of uncertain relationship is the plesiomorphic sister-group within *Psilosymmerus.*

3. *Australosymmerus s. str.* This subgenus was inferred to be a monophyletic group based on character 16. Within the subgenus, however, it was not possible to infer the relationships of all of the species. *A.* (*A.*) *nitidus* and *A.* (*A.*) *tillyardi* were inferred to form a monophyletic group based on character 44. Either or both of *A.* (*A.*) *stigmaticus* and *A.* (*A.*) *basalis* may share a sister-group relationship with the *nitidus–tillyardi* group. A close examination of these species revealed no attribute which could be inferred to be synapomorphic amongst them.

4. *Ventrilobus.* This subgenus was inferred to be a monophyletic group based on character 21. Within *Ventrilobus,* the relationships of *A. anthostylus, A. propinquus,* and *A. nebulosus* were inferred from characters 46 and 47. It was not possible to infer the precise relationships of *A.* (*V.*) *cornutus* or *A.* (*V.*) *fuscinervis* to the monophyletic *anthostylus–propinquus–nebulosus* group. The latter group could be the sister-group of either or both of *A.* (*V.*) *cornutus* and *A.* (*V.*) *fuscinervis*; no apomorphies were inferred which would indicate which alternative was most probable.

[36]Numbers in parentheses refer to characters discussed under Transformation Series and Monophyletic Groups.

As the foregoing discussion has indicated, some difficulty was encountered in determining the phylogenetic relationships of a number of species at the intra-subgeneric level. In general, one would expect this to be the case, since intra-subgeneric groups have evolved more recently than the other groups considered, so that distinct and easily recognizable synapomorphies are less likely to be present (although apomorphies, *per se*, are always present). To some extent credible synapomorphies are also more difficult to infer in plesiomorphic sister-groups of sister-pairs. This is implied by Hennig's rule of deviation.

Unassigned Species

1. *Australosymmerus peruensis*. This species shows inferred apomorphies 1 to 11 (placing it in *Australosymmerus s. lat.*) and bears two very long scutellar setae (placing it in the *Melosymmerus–Calosymmerus* group). No attributes were found which could be inferred to be synapomorphic in *A. peruensis* and one or the other of *Melosymmerus* and *Calosymmerus*. Therefore it was not possible to determine the sister-group relationships of this species.

2. *Australosymmerus naevius*. This species possesses attributes 1 to 11 and 36, which place it in the *Australosymmerus–Crionisca–Ventrilobus–Araeostylus* group of *Australosymmerus s. lat.* Within this group, *Ventrilobus–Araeostylus* is described by the presence of a tubular ventral lobe or process on the cercus (35). *A. naevius* possesses a ventral flange-like lobe at the base of the cercus, which may or may not be homologous with the processes in *Ventrilobus–Araeostylus*. I have not been able to reach any conclusion about this; nor has close examination revealed any other character which (in my opinion) could be inferred to be synapomorphic in *A. naevius* and in another group.

3. *Australosymmerus tonnoiri*. This species closely resembles *A. naevius*, and the problems in its placement are identical.

4. *Australosymmerus zonatus*. This species was represented in the material studied by one male specimen in poor condition, with the genitalia almost transparent through over-clearing. In addition, there is a strong possibility that the specimen is an aberrant one, since the long scutellar bristles do not occur in pairs. For these reasons, I have not attempted to place this species in the cladogram. An intuitive estimate of overall resemblance indicates that it is similar to members of *Calosymmerus*.

5. *Australosymmerus trivittatus*. I was not able to examine the male genitalia of this species, so it was not included in the cladistic analysis. An intuitive estimate of overall resemblance indicates that this species resembles those of *Australosymmerus s. str.*

Non-unique Apomorphies in Major Clades

The phylogenetic scheme described in the foregoing pages incorporates a number of apomorphies which have been inferred to have arisen more than once in the *Australosymmerus–Symmerus* group. Some of these apomorphies describe major clades (above the subgeneric level) in the *Australosymmerus–Symmerus* group. Since the major clades are especially important to the zoogeographic analysis which follows, a discussion of the non-unique apomorphies in the major clades is necessary. These attributes and the various groups in which they occur are as follows:

1. *Apical lobe of the basistylus*. Tapering or truncate tubular processes occur on the ventral apex of the basistylus of *Australosymmerus s. str.*; *A.* (*Araeostylus*)

lobatus; *A.* (*Araeostylus*) *bivittatus*; *A.* (*Melosymmerus*) *pediferus*; and *A.* (*Ventrilobus*) *cornutus.*

2. *Ventral processes of cercus.* Sclerotized or unsclerotized ventral cylindrical (as opposed to flange-like) processes occur on the cerci of *Ventrilobus–Araeostylus*; *A.* (*Tantrus*) *montorum*; *the acutus–truncatus–bisetosus–pediferus* group of *Melosymmerus*; and in *Calosymmerus.* Flange-like mesal processes occur in *Vellicocauda.*

3. *Fusion of lateral margin of sternite 9.* All species of *Australosymmerus s. lat.* possess sternite 9 fused to the basistyli at least at the base. Of these a number show no trace of demarcation between the sternite and the basistyli, along the lateral margin of sternite 9, although the apex may remain free. The groups showing fusion to this degree are *Melosymmerus*, *A.* (*Ventrilobus*) *nebulosus*, and *Araeostylus.*

4. *Loss of microtrichia.* Microtrichia appear to have been lost four times in *Australosymmerus s. lat.*: in the *Australosymmerus–Crionisca–Ventrilobus–Araeostylus* group; in *A.* (*Tantrus*) *montorum*; in the *bisetosus–pediferus* group of *Melosymmerus*; and in *Calosymmerus.*

5. *Fusion of tergite 9.* The condition in which tergite 9 is fused to the basistyli at its base occurs in the *Tantrus–Melosymmerus–Calosymmerus* group; *A.* (*Australosymmerus*) *nitidus*; *A.* (*Ventrilobus*) *nebulosus*; and *A. naevius.*

The criterion for inferring which apomorphies are synapomorphic in their occurrence and which occur as a result of parallelism is essentially one of parsimony. If the apomorphies given above were considered to be synapomorphic amongst the groups in which they occur, then the sister-group relationships would be altered throughout the phylogenetic scheme outlined in the preceding pages. In a situation in which inferred apomorphies are incompatible, one or the other must be (1) incorrectly inferred to be apomorphic or (2) incorrectly inferred to be synapomorphic. With two such conflicting apomorphies there are two alternative sister-group schemes possible. The one requiring the fewest independent origins of the other inferred apomorphies in the system was inferred to be synapomorphic in its occurrences.

The characters listed above represent the "fewest independent origins" which were required by the remainder of the system of inferences.

ZOOGEOGRAPHY

The cladistic analysis discussed in the preceding section describes two aspects of the history of *Symmerus* and *Australosymmerus*: firstly, which phylogenetic events have occurred and, secondly, the order in which they occurred in each phylogenetic line. The zoogeographic pattern provides a basis for inferring when some of these events might have occurred, and where. The results of some other phylogenetic studies of transantarctic insect groups are summarized, and the conclusions indicated by four kinds of zoogeographic evidence are discussed. Finally, a reconstruction of the history of *Symmerus* and *Australosymmerus* is presented.

Distribution of *Symmerus* and *Australosymmerus*

The geographic distribution of *Symmerus*, *Australosymmerus*, and their subgenera are shown in Figs. 74 to 78. *Symmerus s. lat.* (Fig. 74) has a holarctic distribution pattern and has been recorded from eastern and western North America, Japan, Taiwan, Nepal, and northern Europe. The subgenera of *Symmerus* (*Sym-*

merus s. str. and *Psilosymmerus*) are each holarctic also, but with different distributions in that *Psilosymmerus* has not been recorded from Europe, and *Symmerus s. str.* has not been recorded from Nepal and Taiwan, and western North America (Fig. 75). *Australosymmerus s. lat.* has been recorded from southeastern Australia, Tasmania, New Zealand (North and South Island), and in the New World from Mexico to Tierra del Fuego (Fig. 74). Within *Australosymmerus s. lat.*, *Australosymmerus s. str.* occurs in New Zealand (North and South Island), and southern Chile (Fig. 76). *Crionisca* occurs in southeastern Australia and Tasmania, and in southern Chile (Straits of Magellan) (Fig. 76). *Ventrilobus* occurs only in southeastern Australia and Tasmania (Fig. 77). *Araeostylus* and *Vellicocauda* have been recorded from southern Chile (Figs. 77, 78) while *Tantrus* has been recorded from the Ecuadorian Andes only (Fig. 78). *Melosymmerus* occurs from Mexico through the northern Andes and into southern Brazil (Fig. 78) while *Calosymmerus* has been recorded only from southern Mexico (Fig. 78).

Before the significance of these distributions in connection with the history of *Australosymmerus* and *Symmerus* are discussed, it is useful to examine the methods and results of some other researchers dealing with selected insect groups. These are summarized in some detail because relatively few studies have been based on Hennig's methods, and the exact methods used have not always been clearly stated.

Selected Phylogenetic Studies on Transantarctic Insect Groups

Hennig (1966*a*) compiled a list of all the groups of Diptera known to him which showed disjunct austral distribution patterns (AS-groups). He concluded that although many of these groups are used as evidence for an antarctic center of evolution, or for a migration route, none of the studies has produced significant evidence that these existed. He thought that more intimate study of these groups, according to his phylogenetic principles, might yield evidence which would indicate Antarctica's role in the history of these groups.

He reasoned that when and if AS-groups are shown to be monophyletic, one might conclude that there had been a connection between the southern areas such that each AS-group had originated in one southern area and dispersed to the others, or originated in another area and invaded the south. The logical possibilities are as follows: (1) the AS-groups originated in the north, straddled the Bering Sea, and migrated south on each side of the Pacific Ocean to South America and Australia–New Zealand; (2) the AS-groups originated in the north, migrated south on one side of the Pacific Ocean or the other, and reached other southern areas across the South Pacific; (3) as in (2), but reached other southern areas *via* Antarctica. Routes 2 and 3 Hennig called "direct" routes, as opposed to the "indirect" northern route.

Hennig reasoned that valid arguments for direct routes could be made if (1) one found entire complexes of closely-related AS-groups, and (2) if apomorphic character grades, forming part of larger character grades, could be found across the southern areas. He also noted that intermediate forms on Antarctic islands and Antarctic insect fossils would also provide valid evidence that direct routes were used, but that these had not been found at that time. On the other hand, he considered the following kinds of "evidence" to be invalid: the mere existence of AS-groups; the presence of primitive forms in the south; and the ecological argument that cold-adapted insects could not have crossed the equator.

Hennig concluded his survey with a discussion of the history of the southern areas and an indication of the way in which his principles could be applied to analyze the history of the AS-groups. He said (1966*a*: 60)

> If it could be shown that the dispersal of AS-groups could only have occurred across an antarctic land connection, and if it could be established when the last possibility for migration across this landbridge existed, then one could — at least for all AS-groups — indicate a *terminus post quem non* for the origin of the sister-group relationship between the Australian–New Zealand and the South American components of such AS-groups.

He concluded that the possibility did not exist because there was insufficient evidence for an antarctic land connection. On the other hand each AS-group must, at some level, share a sister-group relationship with a northern group, and one of the north–south bridges must have been decisive in the formation of this relationship.

Hennig continued with a discussion of Old and New World north–south connections. Based on the evidence of Darlington (1957) and others, North and South America were separated from one another during most of the Tertiary. If AS-groups used this route, they should be assignable to "arrived early" and "arrived late" strata. The criterion used for this was the systematic structure of the group: if the transition from north to south was accompanied by a significant gap in the systematic structure, then the invasion was early; if it was not, then the invasion was much more recent. Hennig placed the latest early immigration date between the Oligocene and the Miocene, rather than earlier, because this would include Darlington's "island-hoppers" (primates, hystericomorphs (Caviomorpha)) with the earlier immigration and the Miocene vespertilionid (Chiroptera) stratum with the Pliocene felid stratum. The reason for this is that the island-hoppers are distinctly separated from their northern sister-groups, whereas vespertilionids are not.

Hennig then turned to evidence concerning Old World connections, based largely on that given by Tillyard (1924) and Mackerras (1950). Mackerras divided the Australian fauna into Indo-Malayan, Lemurian, Bassian, and "autochthonous" elements. The Bassian element contains all AS-groups, which in Australia occur only in the south and the Dividing Range. The Bassian element was supposed to have entered Australia from the south before the boundary between Oligocene and Miocene, but possibly much earlier. Tillyard (1924) concluded that the two most recent connections between Australia–New Zealand and Asia were Late Cretaceous - Early Tertiary, and Late Tertiary. The coincidence between these dates and those given for New World connections was supposed by Hennig to be due to the extensive epeirogenic activity at the end of the Cretaceous.

Hennig concluded that the latest possible date for the origin of AS-groups, based on the discordance between northern and southern sister-groups, was middle Tertiary. This agreed with other evidence, especially that of Baltic Amber, which is Lower Oligocene or Upper Eocene, in which most northern groups are well differentiated with respect to southern groups.

This summary of Hennig's views raises the following questions with respect to the present study: (1) Is the systematic structure of the *Australosymmerus–Symmerus* group such that there is a discordance between northern and southern groups? (2) Did the AS element reach the south through eastern or western routes? (3) When did the AS element reach the south? (4) Is there non-geographic evidence to support the geographic evidence? (5) What was the role, if any, of Antarctica in the dispersal of *Australosymmerus* and *Symmerus?*

Brundin (1965, 1966) discussed the history of certain groups of Chironomidae (Diptera: Nematocera) and the role of Antarctica in their evolution. Using Hennig's principles, he found the following patterns in the distribution of these midges: (1) the sister-group of a New Zealand group lives in South America, or in South America and Australia–Tasmania; (2) there are no direct relationships between New Zealand and Australia; (3) a group from Australia–Tasmania always forms the apomorph sister-group of a southern South American group. He also found that in some of these chironomid phylogenies there are eight to 10 steps of increasing apomorphy in character grades restricted to the southern areas. This evidence fulfilled Hennig's requirements for demonstrating Antarctica's role as a center of evolution. The phylogenetic evidence for these chironomids provided the following sequence of isolation of the southern continents from Antarctica: (1) South Africa; (2) New Zealand; (3) South America; (4) Australia–Tasmania. Brundin concluded that the transantarctic relationships he found in the Chironomidae could be explained by the presence of a center of origin in a continuous orogenic belt, roughly corresponding to New Zealand, western Antarctica and western Patagonia, which had a moist, temperate climate during the Upper Jurassic.

Illies (1965) summarized his earlier work on the phylogeny and zoogeographic history of the Plecoptera, using Hennig's principles. He found five patterns of distribution in the Plecoptera: amphinotic (Australia–Tasmania, New Zealand, South America); gondwanian (Australia–Tasmania, New Zealand, South America, South Africa); Eastasiatic–Nearctic; and Arctogaeic–Neotropic (Ethiopia, Orient, Holarctica, Neotropica). He found that the primitive groups of Plecoptera showed an amphinotic distribution. He rejected theories of a northern origin, because the primitive groups did not invade South Africa, which he thought they should have, had they invaded the south from the north. He found that plecopteran distribution patterns met Hennig's requirements for evidence that the south (i.e., Antarctica) was a center of origin.

Briefly, Illies' analysis led him to explain the evolution of present-day plecopteran families in the following way: The primitive suborder Archiperlaria existed in the southern land which included Australia, South America, and Antarctica. The Archiperlaria gave rise to the more derived Setipalpia during or after a northern migration. The fossil evidence indicates that this south-to-north migration was completed by the Lower Permian at latest. This migration corresponds with the Permian Ice Age, which would allow the precursors of the Cordillera to act as a temperate-climate route across the tropics. The fossil record also indicates that some clades of the more derived suborder Filipalpia were differentiated in the same way. One northern subfamily of the south-originated Filipalpia reinvaded the southern hemisphere, reaching all southern areas except Antarctica. The latest possible date for this was Cretaceous, since they reached Madagascar which has been separated from Africa since the Cretaceous. The immigration routes were Africa to South Africa to Madagascar, and the Orient to Australia to New Zealand and South America via Antarctica.

Illies found that most genera of the Plecoptera are confined to particular zoogeographic regions. Of these regions, the Neotropical region shows evidence of three centers of evolution: the southern Andes, the eastern mountains of Brazil, and the northern mountains of Venezuela and Guiana. These correspond to the three continental shields separated by water in the Mesozoic. In Notogaea, Australia and New Zealand have no monophyletic genera in common, which indicated to Illies that they have been separated since the Cretaceous.

The three studies discussed above are based on four kinds of zoogeographic evidence. These are (1) entire complexes of sister-group relationships in one geographical region, which indicate (in the absence of evidence to the contrary) that the evolution of the complex has occurred there; (2) apomorphic character grades correlated with geographic grades, which indicate (in the absence of evidence to the contrary) the direction of "migration" of a phyletic line; (3) fossil evidence, which can indicate a latest possible date for the origin of particular sister-group relationships; (4) geological evidence, which can be used to indicate a latest or earliest possible date for invasions of particular geographical regions. These four types of evidence, with respect to *Australosymmerus* and *Symmerus*, are considered in the following paragraphs.

Zoogeographic Evidence in the Present Study

The geographical relationships of the sister-groups within *Australosymmerus s. lat.* and *Symmerus s. lat.* may be summarized as follows: The sister-group of an amphinotic group (*Australosymmerus s. lat.*) is a holarctic group (*Symmerus s. lat.*) (Fig. 74). The plesiomorphic sister-group of an Australian group is a southern Chilean group (*Ventrilobus* with *Araeostylus* (Fig. 77); the *A.* (*Crionisca*) *rieki* – *aculeatus* group with *A.* (*C.*) *magellani* (Fig. 76)). The plesiomorphic sister-group of a New Zealand group is also a southern Chilean group (the *A.* (*Australosymmerus*) *basalis–nitidus–trivittatus* group with *A.* (*A.*) *stigmaticus*) (Fig. 76). The plesiomorphic sister-group of a Mexican group is a Mexico – northern Andes – southern Brazil group (*Calosymmerus* with *Melosymmerus*) and the plesiomorphic sister-group of this group is also a northern Andes group (*Calosymmerus–Melosymmerus* with *Tantrus*) (Fig. 78). The plesiomorphic sister-group of this northern South America – Central American group is another southern Chilean group (*Calosymmerus–Melosymmerus–Tantrus* group with *Vellicocauda*) (Fig. 78). This group (*Calosymmerus–Melosymmerus–Tantrus–Vellicocauda*) is the apomorphic sister-group of the group containing the transantarctic subgenera.

The first type of evidence is the presence of complexes of closely related sister-groups confined to a geographical area. The summary of geographic relationships of sister-groups, above, indicates that the transantarctic relationships of *Australosymmerus* are of this kind. Two AS-groups (*Australosymmerus s. str.* and *Crionisca*) constitute subgenera, with the transantarctic relationships occurring at the intra-subgeneric level (Fig. 76). The two subgenera are sister-groups in a monophyletic group. The remaining AS-group constitutes an intrageneric category; the transantarctic relationships are at the subgeneric level (*Ventrilobus* and *Araeostylus*, which are sister-groups forming a monophyletic group) (Fig. 77). Furthermore, the two monophyletic groups (*Australosymmerus–Crionisca* group and *Ventrilobus–Araeostylus* group) are sister-groups forming a monophyletic intrageneric group, which contains no fewer than three independent transantarctic sister-group relationships.

The significance of this is shown by Hennig's (1966*a*: 18) statement:

> If we find AS groups within all taxonomic subdivisions, families, subfamilies, tribes and genera, etc., confined to the AS area, it would be difficult to avoid the conclusion that the evolution of these groups has taken place on the Antarctic continent. On the other hand, if sister-groups of all or most AS-groups occur on northern continents then Antarctica would be acceptable at most only as a migration route between Australia–New Zealand and South America (or vice-versa.

As shown above, the AS-groups in *Australosymmerus s. lat.* occur in a monophyletic intrageneric group. The apomorphic sister-group of this monophyletic group appears to have had a southern origin (see below). The plesiomorphic sister-group (*Symmerus s. lat.*) of this sister-pair (*Australosymmerus s. lat.*) is a northern group. This leads to the conclusion that the evolution of *Australosymmerus s. lat.* has been in the south, but *not* to the conclusion that the *Australosymmerus–Symmerus* group had a southern origin.

The second kind of evidence is the correspondence of morphological and geographical progression (progression rule of Hennig, 1966*b*). Although such a progression cannot always be found (Hennig 1966*a*: 23), when one is present it provides good evidence for the direction of dispersal of a group.

In *Australosymmerus s. lat.* the clade forming the apomorphic sister–group of the monophyletic AS-group complex shows a morphological-chorological progression extending northward from southern Chile to Mexico. This progression is represented from plesiomorphic to apomorphic and from south to north by *Vellicocauda*, *Tantrus*, *Melosymmerus*, and *Calosymmerus*. The progression indicates that the clade containing these subgenera originated in the south. It does not indicate in itself that *Australosymmerus s. lat.* originated in the south, but only that this "offshoot" did so.

The third kind of zoogeographic evidence is the evidence provided by fossils. *Symmerus* (*S.*) *balticus* is a fossil from Baltic Amber, which is generally dated as Upper Eocene (30 to 40 million years ago) to lower Oligocene (19 to 35 million years ago) (Ander 1942). The significance of this fossil is that it indicates a *terminus post quem non* for the origin of the *Symmerus–Australosymmerus* sister-group-relationship. All of the apomorphic attributes which describe *Symmerus s. lat.* existed at that time because they are shown in the fossil specimen. *Australosymmerus s. lat.* and *Symmerus s. lat.* are each based on apomorphic attributes represented in the other by corresponding plesiomorphic attributes. The fossil specimen shows all of the apomorphic attributes of *Symmerus s. lat.*; furthermore, all of the apomorphic attributes of *Australosymmerus s. lat.* are represented by the corresponding plesiomorphic attributes in this fossil (as in all other *Symmerus s. lat*). Therefore the species represented by the fossil specimen must have shared its most recent common ancestor with *Symmerus s. lat.* (more strictly, with a *Symmerus* species) rather than with *Australosymmerus.*

The fourth type of evidence is palaeogeographic evidence. The transition from north to south in the *Australosymmerus–Symmerus* group is accompanied by a relatively old dichotomy in the systematic structure of the *Symmerus–Australosymmerus* group. It was concluded that the dispersal was from north to south (because *Symmerus*, which is the plesiomorphic sister-group, occurs in the north), and, because of the apparent antiquity of the dichotomy between the two genera, that it took place before the formation of the mid-Tertiary water barrier between North and South America. The *terminus post quem non* for the formation of the *Symmerus–Australosymmerus* sister-group relationship, indicated by this evidence, is between the Oligocene and the Miocene. As noted above, the fossil gives a *terminus post quem non* of upper Eocene.

The *terminus ante quem non* for the origin of the *Symmerus–Australosymmerus* sister-group relationship may also be found from palaeogeographic evidence. There is a rapidly-growing body of evidence that Australia, New Zealand, South America, South Africa, India, and Antarctica were once joined together and have since drifted apart. Recent advances in plate tectonics (Dietz 1972; Dewey 1972) have provided an explanation of the mechanism of continental drift.

It does not seem likely to me that *Australosymmerus* can repeatedly have crossed water gaps to give rise to the pattern of transantarctic relationships which it shows, although this possibility cannot be ruled out. The alternative is that they did not cross water barriers, and if so, Antarctica must have had an important role in their dispersal. The sequence of the break-up of Gondwanaland, based on geological and biological evidence, was summarized by Edmunds (1972: 38) as follows:

> 1. India drifted to the north (evidence largely geological). 2. South Africa plus Madagascar drifted to the north with the continent pivoting so that the break with South America widened most rapidly at the south, leaving Africa and Brazil attached or close together in the tropics . . . 3. New Zealand plus New Caledonia drifted to the north. 4. New Caledonia separated from New Zealand. 5. Australia drifted north and Antarctica drifted south. (The direction and sequence of 5 in relation to 6 are based on geological evidence.) 6. South America drifted northwest in relation to Antarctica.

Edmunds also pointed out that the dates for these events were difficult to establish but that there was evidence that New Zealand drifted away about Lower Cretaceous, and that connections between Australia and Chile may have persisted to the end of the Cretaceous. The *terminus ante quem non* for the origin of the *Australosymmerus–Symmerus* sister-group relationship can only be inferred from negative evidence: the absence of *Australosymmerus* from India and South Africa. King (1962) thought that South Africa separated from Gondwanaland in Upper Jurassic - Lower Cretaceous times, but the evidence cited by Edmunds (1972) indicates that it was much earlier than this. The absence of *Australosymmerus* from South Africa indicates either that they were not present in Gondwanaland until after South Africa broke off, or that they were present, but have died out in South Africa.

If *Australosymmerus* did not cross water barriers, species of the genus must have been present in Gondwanaland by Lower Cretaceous, because present-day species live in New Zealand which became separated then. It also seems probable that representatives of the genus persisted in Antarctica until the Miocene. Both palaeobotanical evidence (Axelrod 1960; Cranwell 1963) and geological evidence (Harrington 1965) indicate that temperate and cold temperate conditions existed there probably until the Miocene. This climate, and the associated flora, appears to have been similar to those of present-day habitats of *Australosymmerus*.

The final important feature in the zoogeography of the *Symmerus–Australosymmerus* group is the south to north morphological–chorological progression of the *Vellicocauda–Tantrus–Melosymmerus–Calosymmerus* group. This shows evidence of two trans-equatorial dispersals: one which gave rise to *Calosymmerus* and one which gave rise to the *acutus–truncatus* group of *Melosymmerus*. There are two possible explanations. The first is that the phyletic line which gave rise to *Calosymmerus* crossed into Mexico before the mid-Tertiary water-barrier was established, and that the line which gave rise to the *acutus–truncatus* group crossed in the Miocene–Pliocene, after the land connection was re-established. This explanation is consistent with the cladistic scheme for the respective groups: *Calosymmerus* represents a distinct "gap" (i.e., the *Melosymmerus–Calosymmerus* sister-group relationship is relatively old) whereas the *acutus–truncatus* group of *Melosymmerus* is not separated by a "gap" (i.e., the sister-group relationship between *acutus–truncatus* and *bisetosus–pediferus* is relatively recent).

The second explanation is that both phyletic lines crossed in the Miocene–Pliocene, but that *Calosymmerus* evolved much more rapidly than the *acutus–truncatus* group.

SUMMARY

1. The phylogeny of *Symmerus* and *Australosymmerus* was analyzed by means of Hennig's method of "phylogenetic systematics" because there is no clearly formulated alternative to cladistic methods.

2. The primary difficulties with the method are (1) the recognition and categorization of attributes as plesiomorphic or apomorphic; (2) the recognition of convergence.

3. It was concluded that for the recognition and categorization of attributes as plesiomorphic and apomorphic, it was preferable to use criteria concerning deviation from a basic plan and inferred adaptive significance, rather than distributional criteria. The reason for this conclusion was that distributional criteria inevitably mask inferences of deviation from a basic plan or inferred adaptive significance, on which they are really based. It was concluded that making these inferences directly, and clearly stating them, gives rise to a more credible reconstructed phylogeny.

4. It was concluded that the fact that apomorphies are credibly established to be synapomorphic rather than convergent on the basis of minute correspondence in structurally rich characters is *not* a reason for discarding phylogenetic methods in favor of phenetic ones. Phenetic taxonomy does not allow inferences to be made concerning phylogeny, which is the phylogeneticist's main interest.

5. Important objections raised by Colless (1967*b*, 1969*a*) are (1) the necessity of reference to a higher "phenetic" classification; (2) the failure to comply with the tenets of the "hypothetico-deductive" system; and (3) the congruence of phenetic and phylogenetic classifications.

6. The tentative reference to a pre-existing high-level classification which is necessary in a phylogenetic study of a group of organisms of manageable size does lead to a regress which eventually includes all organisms, but this does not appear to be a serious problem. The work of phylogeneticists will be complete when the details of that regress are fully specified.

7. Phylogenies cannot be deduced and must rest upon inferences; therefore the inferences should be systematically stated. Phenetic taxonomy, as advocated by Colless at least, does not and cannot provide a basis for these inferences, even though phenetic taxonomy may perhaps be said to be more "scientific" because of its statistical impeccability.

8. The fact that symplesiomorphy is included in the result of cladistic reconstructions does not equate cladistic methods with phenetic ones. A "unanimous vote of 50 unit attributes linked in a single complex structure," to use Colless' (1969*b*: 142) example, would only be used in a cladistic reconstruction to establish the homology between two apomorphies to determine whether or not they were synapomorphic. The decision about relationships between taxa is ideally based on a number of synapomorphies.

9. There may be truth to the speculation that phenetic and cladistic classification are inevitably congruent, but because phenetic methods do not allow inferences concerning phylogeny to be made, this is beside the point.

10. Quantitative phyletic methods appear to have one defect in common: the use of parsimony as the *only* criterion for choosing between conflicting inferred

apomorphies means that the only justification for considering apomorphies synapomorphic is that the "parsimonious" classification demands it. Nevertheless some consideration of parsimony is implicit in any cladistic reconstruction.

11. There are groups which defy any attempt to infer synapomorphies amongst their members, and perhaps quantitative phyletic methods are the only alternative for inferring phylogeny in these cases.

12. For many of the characters used in the present study, it was not possible to reach conclusions concerning apomorphy. These were mainly "simple" characters for which probable transformation series could not be established and which had no obvious adaptive significance. A "basic plan" was inferred for the male genitalia of the Mycetophilidae, except for the aedoeagus. Deviation from this "basic plan" provided a basis for inferring credible apomorphies. In addition, many of the "simple" characters were sufficiently striking that some adaptive significance could be inferred.

13. For each attribute used in the cladistic analysis, the inferred plesiomorphic and apomorphic state was described, and the reason for the inference was stated. The monophyletic group described by each synapomorphy was identified.

14. Description of the monophyletic groups at each level specified are phylogenetic reconstruction, which was summarized by means of cladograms.

15. Five species were not assigned to sister-groups, because it was not possible to infer apomorphies to place them exactly, or because they were represented by inadequate material.

16. Relationships within four subgenera were not fully specified, because it was not possible to infer synapomorphies which would define these relationships.

17. Five apomorphies were inferred to have arisen more than once in major clades (above the subgeneric level), with parsimony as the criterion.

18. Within limitations imposed by the available evidence, it appears that the history of *Symmerus* and *Australosymmerus* has been as follows: The ancestor of the two genera lived in the northern hemisphere. One phyletic line descended from this ancestor dispersed to the southern hemisphere, and reached the region now represented by South America by the early Tertiary, at least, but probably much earlier. This phyletic line gave rise to *Australosymmerus*. The other phyletic line remained in the northern hemisphere and gave rise to *Symmerus*.

19. The *terminus post quem non* for the origin of this sister-group relationship, based on fossil evidence, is Upper Oligocene, but it was probably much earlier.

20. If representatives of *Australosymmerus* did not cross large water gaps, they must have been present in Gondwanaland before the break-off of New Zealand (Lower Cretaceous) but not before the break-off of South Africa. This would explain the existence of transantarctic relationships, but would not in itself explain that in each AS-group, the apomorphic group of the sister-pair is always in Australia or New Zealand while the plesiomorphic sister in each sister-pair is always in Chile.

21. A possible explanation of this situation is that the ancestor of the transantarctic sister-group complex, and of each sister-pair, lived in southern South America when this region formed part of Gondwanaland, and that each of the phyletic lines in the complex dispersed through Antarctica to Australia or New Zealand. The subsequent break-up of Gondwanaland would produce the morphological–chorological distribution of the present-day transantarctic sister-group complex.

22. A weakness of the foregoing explanation lies in the fact that the transantarctic morphological–chorological progression does not form part of a larger morphological–chorological progression. In other words, this argument would be stronger if the direction of the dispersal was indicated by a progression of three or more steps rather than two. This has been discussed by Hennig (1966*a*).

23. An alternative explanation for the existence of the transantarctic relationships of *Australosymmerus* is that species of the genus could cross water gaps, and did so in the early Tertiary. Water gaps between the southern continents were narrower then than they are now and Antarctica was suitable, with respect to flora and climate, for the dispersal and evolution of *Australosymmerus* until the Miocene. If *Australosymmerus* dispersed from West Antarctica - Chile to Australia and New Zealand, both the existence and the nature of the transantarctic relationships would be explained.

24. The apomorphic sister-group of the transantarctic sister-group migrated northward, probably reaching northern South America before the end of the Oligocene. *Calosymmerus* probably crossed into Mexico before the water barrier between North and South America was formed in the mid-Tertiary.

25. A subordinate phyletic line of *Melosymmerus* also crossed into Mexico, probably after the land connection between North and South America had been re-established during the Miocene–Pliocene.

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[37]Abbreviations used are those of *World List of Scientific Periodicals.*

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GLOSSARY

(Modified from Hennig, 1966*b*: 89, 146)

Apomorphic: state *b* is apomorphic with respect to state *a* when *b* has been derived from *a* through a transformation series.

Paraphyletic group: a group based on symplesiomorphic attributes, the members of which share a common ancestor, but do not share a common ancestor restricted to them.

Plesiomorphic: state *a* is plesiomorphic with respect to state *b* when *b* has been derived from *a* through a transformation series.

Sister-groups: species which arose from a stem species by one and the same splitting process.

Sister-pair: two sister-groups which together form a monophyletic group.

Symplesiomorphy: plesiomorphy in the same transformation series occurring in different species.

Synapomorphy: apomorphy in the same transformation series occurring in different species.

APPENDIX I

Statistics of Color Variation of
Symmerus coqulus Garrett

Population	N	Σx	Σx^2	$\bar{x}$	s
Hixon, B.C.	72	1033	15013	14.347	1.646
Cowichan Lake, B.C.	18	193	2131	10.722	1.904
Washington St.	17	188	2122	11.059	1.638
Lily Pond, Calif.	65	735	8699	11.307	2.461

APPENDIX II

Characters Examined in Study[38]

1. *Color pattern of vertex*: unpatterned; or dark anteriorly, fading posteriorly; or ocelli enclosed in a distinct or indistinct triangular or transverse macula; or each ocellus enclosed in a dark ring, the rings merging or not.
*2. *Size differentiation of dorsal head setae*: vestmental setae only present; or vestmental setae and 1 to 6 larger postorbital setae present; or vestmental, postorbital, and 1 pair of interocellar setae may be present.
3. *Color differentiation of dorsal head setae*: postorbital or interocellar setae may be darker or lighter than vestmental setae.
4. *Length of median ocellus*: may be 0.3 to 0.9 lateral ocellus in length.
5. *Length of lateral ocellus*: may be 3 to 5 times ommatidial diameter in length.
6. *Length of eye hairs*: may be 1 to 3 times ommatidial diameter in length.
*7. *Emargination of dorsal margin of eye*: dorsal margin ranges from scarcely emarginate to reaching lateral margin of median ocellus.
8. *Position of lateral ocellus*: may be separated from dorsal margin of eye by 0.3 to 2.0 times its own diameter.
9. *Setae of ventral surface of scape*: absent, minute and fine, or short and coarse.
10. *Apical setae of scape*: minute to short, forming a partial to complete ring.
11. *Setae of ventral surface of pedicel*: absent, minute and fine, or short and coarse.
12. *Apical setae of pedicel*: minute to short, forming a partial to complete ring.
13. *Shape of flagellum*: filiform, fusiform, laterally compressed, ventrally serrate or ventrally pectinate.
14. *Size of flagellar segment 15*: may be 0.25 to 1.5 times as long as preceding segment.
15. *Color of flagellar segment 15*: same color as preceding segment, distinctly paler, or almost white.
16. *Color pattern of frons*: prefrons and postfrons the same color, or different colors, or with diffuse markings.
17. *Setae of frons*: postfrons bare or with short setae.
18. *Setae of clypeus*: short to long setae present.
19. *Shape of clypeus*: broader than long or longer than broad.

THORAX

20. *Color pattern of pronotum*: unpatterned or with diffuse markings.
21. *Setae of pronotum*: absent, or present and short to long.
22. *Color pattern of humerus*: unpatterned or with diffuse markings.
23. *Setae of humerus*: absent or present; if present, short to long, with or without 1 to 4 distinctly longer ones.

[38]Characters marked with an asterisk (*) are those for which apomorphies were inferred in the cladistic analysis.

24. *Color pattern of mesonotum*: longitudinal vittae present or absent; if present, 2, 3 or 5 in number; median vitta divided by a pale line or not; vittae fused or distinctly separated.
25. *Vestmental setae of mesonotum*: present or absent.
26. *Marginal setae of mesonotum*: moderately long to extremely long on some or all of anterolateral, lateral, and posterior margins and intervittal lines.
27. *Color pattern of scutellum*: unpatterned, or with dorsal surface darker than remainder.
*28. *Setae of scutellum*: in addition to the undifferentiated fringe, 1 pair of very long, or 2 unequal pairs of very long, or 2 equal pairs of very long setae present; or long setae absent.
29. *Color pattern of postnotum*: unpatterned; or with a pale or dark posterior macula; or with anterior and lateral portions pale.
30. *Setae of postnotum*: absent, or present; if present, short to moderately long, pale to dark.
31. *Setae of propleuron*: short to long, with or without 1 to 5 distinctly longer ones.
32. *Setae of prosternum and precoxal bridge*: fringe or row of short to long setae present.
33. *Color pattern of pleurites*: unpatterned, or with distinct or diffuse dark or pale markings.
34. *Setae of anepisternite*: present in dorsal corner to dorsal half of anterior margin; short to long; with or without one or more differentiated in size and/or color.
*35. *Setae of pleurotergite*: setae absent, or present and long.

Legs

36. *Color pattern of coxae*: each coxa unpatterned and concolorous with others; or each coxa unicolorous but not concolorous with others; or some or all coxae with diffuse or distinct dark or pale markings.
37. *Setae of fore coxa*: some or all of anterior, lateral and posterior surfaces clothed in short to long setae.
38. *Setae of mid coxa*: as for fore coxa.
39. *Setae of hind coxa*: as for fore coxa; with a posterolateral band, fringe or row of moderately long to long bristles distinguished from others by size or by size and color.
40. *Color pattern of femora*: as for coxae.
41. *Vestmental setae of femora*: minute to moderately long.
42. *Ventral setae of femora*: some or all femora with or without a complete or incomplete fringe of short to moderately long fine setae.
43. *Pilosity of femora*: femora not pilose, or some femora pilose ventrally.
44. *Color pattern of tibiae*: as for coxae.
*45. *Tibial combs*: each consisting of 1 to 6 spines, 0.5 to 5.0 times tibial diameter in length; or of many smaller ones.
*46. *Apical spines of tibiae*: some or all of anterior, anterodorsal, dorsal, posterodorsal, or posterior portion of apex of some or all tibiae with 1 or more short to long stiff spines, with or without a ventral fringe of minute ones; or apical spines not differentiated from comb spines.
47. *Color pattern of tarsi*: unpatterned, or some or all tarsi pale at base to dark towards apex.

Wing

*48. *Length and termination of subcosta*: ending free with portion distal to humeral cross-vein approximately as long as the cross-vein; or ending in the costa with the portion distal to the cross-vein 3 times the cross-vein in length.
49. *Course of the basal portion of R_s*: nearly straight; or sharply angled near apex, so that the apex looks like the base of the distal portion of R_s; or smoothly curved; or sharply bent near the middle to form an obtuse or right angle.

50. *Course of the basal portion of R_4*: smoothly curved; or slightly angled; with or without a proximally-projecting stub.
51. *Course of basal portion of M_1*: forming a symmetrical fork with M_2 or not; if not, then basal portion of M_1 smoothly curved or slightly angled.
*52. *Microtrichia*: present or absent; if present, uniformly dense, or sparse except along veins.
53. *Density of macrotrichia*: dense over entire surface of wing; or sparse on basal third, dense on apical two-thirds.
*54. *Color of microtrichia*: brown; or differentiated into yellow and brown or black.
*55. *Color of wing markings*: when marked, membrane and veins brown, or black and yellow.
*56. *Discreteness of wing markings*: consisting of distinct bands or maculae or indistinctly defined marks or spots.

Abdomen

57. *Posterior margin of segments 1 to 7*: some or all tergites and sternites with a narrow posterior marginal unpigmented band; or pale posterior band absent.[39]
58. *Size of tergite 8*: may be 0.1 to 1.0 sternite 8 in length.
59. *Size of sternite 8*: may be 0.17 to 0.67 sternite 7 in length.

Male Genitalia

60. *Length of sternite 9*: may be 0.2 to 1.5 times basistylus in length.
61. *Apical margin of basistylus*: entire, notched or bifurcate, with or without lateral lobes.
62. *Shape of sternite 9*: transverse, crescentic, broadly triangular, narrowly triangular, parallel-sided, or expanded apically.
*63. *Fusion of sternite 9 to basistylus*: free, or fused to basistylus; if fused, extreme base to entire lateral margin fused.
64. *Dorsal process of sternite 9*: absent; or consisting of a short rod, or flattened, blade-like apodeme; apically bifurcate or simple; base with buttresses or simple.
65. *Fusion between basistyli*: ventral margin of basistylus free to completely fused.
*66. *Shape of basistylus*: cylindroconical; or open mesally, deep and rather narrow; or open dorsally and mesally, flattened.
*67. *Apical margin of basistylus*: articulatory emargination very small to 0.2 times basistylus in length; with or without dorsal or ventral notches and lobes.
*68. *Structure of dorsal portion of aedoeagus*: consisting of a pair of dorsal, dorsolateral, or lateral plates; fused mesally or free; ranging from narrow strips to a hood-like dorsal plate or produced dorsally to form a massive dorsal apodeme.
*69. *Apicoventral process of aedoeagus*: consisting of 2 small plates, free or fused to form a larger one, which is free or fused to ventral articulatory process; plate small or very large, flat or scoop-like, with apex truncate, pointed, or hooked.
*70. *Ventral articulatory process of aedoeagus*: absent; or consisting of a slender basal rod attached to apicoventral plate; or of a small X-shaped sclerite, with the ventral pair of apodemes projecting basally; fused to dorsal portion of aedoeagus or free; small to massive; "arms" of "X" free or joined by septum.
*71. *Basal apodeme of aedoeagus*: absent or present; if present, articulating with ventral articulatory process, or fused to it; small and inconspicuous to very large and extending to abdominal segment 6 or 7; anterior margin rounded or emarginate; anterior portion simple, expanded, longer than wide or wider than long; longitudinal dorsally-concave groove present or absent; heavily sclerotized to transparently thin.
*72. *Length of dististylus*: may be 0.5 to 1.3 times basistylus in length.
*73. *Shape of dististylus*: cylindrical, short, and stout or long and thin; with or without expansions or lobes at base, apex, or midlength; straight, curved or angled.

[39]This band is *not* the same as a yellow pigmented posterior marginal band.

*74. *Membranous interruption of diststylus*: absent or present; if present, membrane present at basal to apical one-third, or over all or part of ventral surface of distal half; accompanied or not by 45 to 90 degree angle in axis of diststylus.

*75. *Structure of apex of diststylus*: membranous or sclerotized; tapered or greatly expanded; with or without a plate or strip bearing stiff setae or teeth arranged in one or two rows or in a rosette.

*76. *Fusion of tergite 9*: free, or fused to basistylus; if fused, extreme base to entire length fused.

*77. *Apical margin of tergite 9*: straight, or with a shallow or deep V-shaped emargination; apical notch present or absent.

*78. *Apical processes of tergite 9*: flange-like apicomedian lobe inserted on ventral side of apical margin present or absent; completely reflexed apical lobe present or absent; corners produced ventromesally or simple.

*79. *Size of cercus*: may be 0.2 to 3.0 times tergite 9 in length.

*80. *Shape of cercus*: slender, tapering, with or without a basal expansion and with apex rounded or truncate; or circular; or slightly deeper than long; or roughly quadrate.

*81. *Dorsal processes of cercus*: mesally-directed sclerotized pointed lobe present or absent.

*82. *Mesal processes of cercus*: pointed sclerotized cylindrical lobe present or absent; slender unsclerotized, setose lobe present or absent; diagonal flange-like lobe continuous with or distinct from truncate apicoventral lobe present or absent.

*83. *Ventral processes of cercus*: cylindrical, tapering or truncate, thick or narrow, sclerotized or unsclerotized, detached or continuous ventral process present or absent.

*84. *Point of attachment of cercus*: on apical margin of tergite 9, or on margin but extending to midlength of ventral surface of tergite 9 mesally; or under ventral margin.

85. *Mesal setae of cercus*: fine and slender, or strong, black and spine-like; erect, decumbent or reflexed; occupying apical half of mesal surface or entire mesal surface.

*86. *Marginal spines of cercus*: apex, and/or dorsal margin, and/or dorsal apex with a stout curved spine, or spines absent.

87. *Shape of sternite 10*: rectangular, diamond-shaped, transverse, or square; entire or divided into two or three sclerites; apical or dorsal or lateral lobes present or absent; apical, lateral, or basal emarginations present or absent.

88. *Size of sternite 10*: may be 0.3 to 1.0 tergite 9 in width; may be 0.03 to 0.3 tergite 9 in length.

89. *Strength of sclerotization of sternite 10*: completely membranous to thin but strongly sclerotized.

90. *Setae of sternite 10*: absent or present; if present, small and sparse.

91. *Development of anal lobe*: absent or present; if present, triangular.

92. *Setae of anal lobe*: absent or present; if present, small and sparse.

Female Genitalia

93. *Apical margin of sternite 8*: slightly invaginated to invaginated for half the length of sternite 8, or sternite 8 completely divided; if invaginated strongly, lobes twisted or not.

94. *Apical spines of sternite 8*: long, slender, weak; or long, stout, and strong; or large, strong, and swollen basally.

95. *Length of cercal segment 2*: may be 0.2 to 0.65 segment 1 in length.

Body Color

96. *Combinations of body color*: combination of beige, flavous, testaceous, brown and brownish black; or combination of brownish black, yellow, and sometimes white; or combination of vivid yellow and deep brownish black or black.

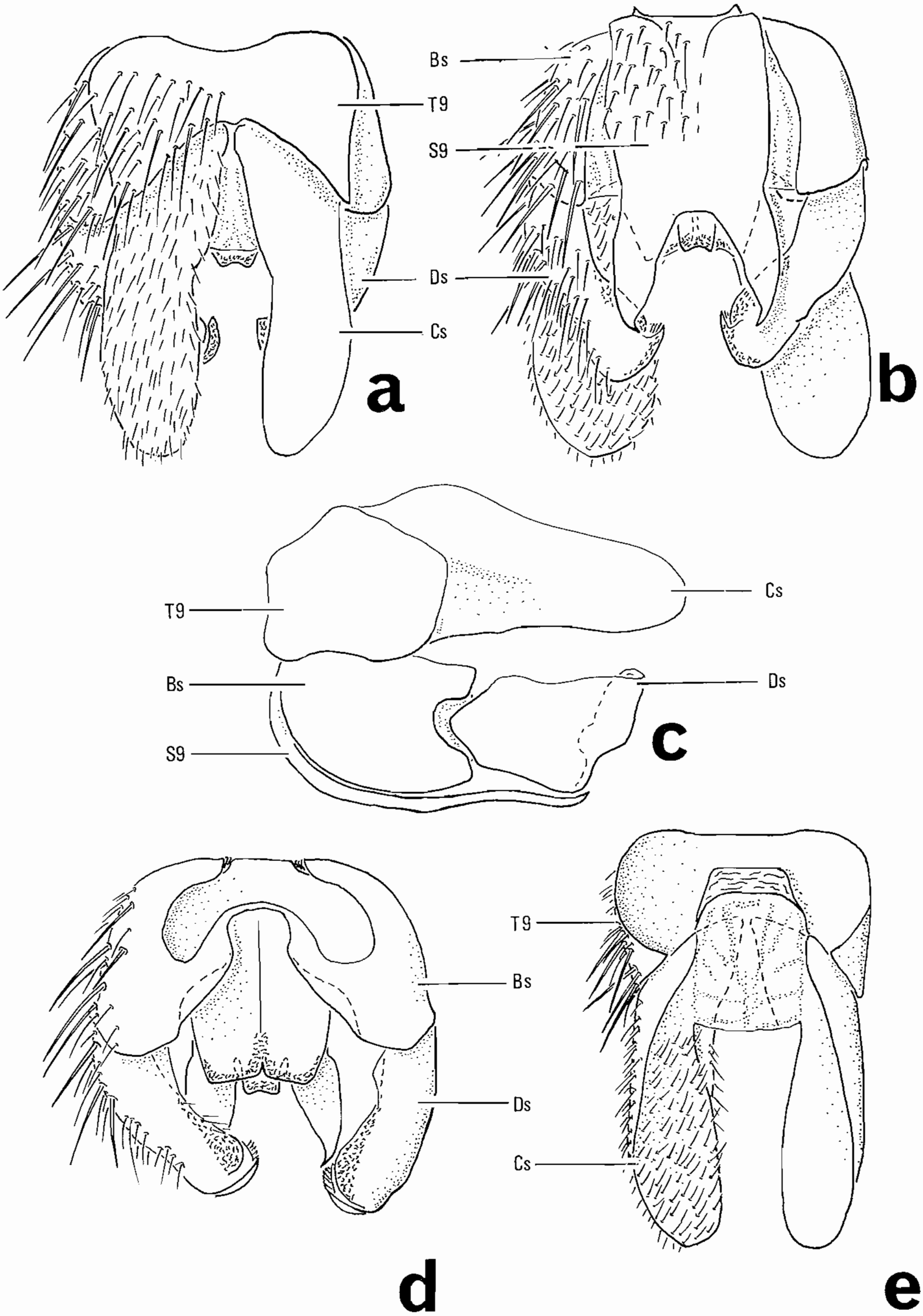


FIG. 1. Male genitalia of *Symmerus* (*Symmerus*) *annulatus* (Meigen). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10. ABBREVIATIONS: Bs, basistylus; Cs, cercus; Ds, dististylus; S9, sternite 9; T9, tergite 9.

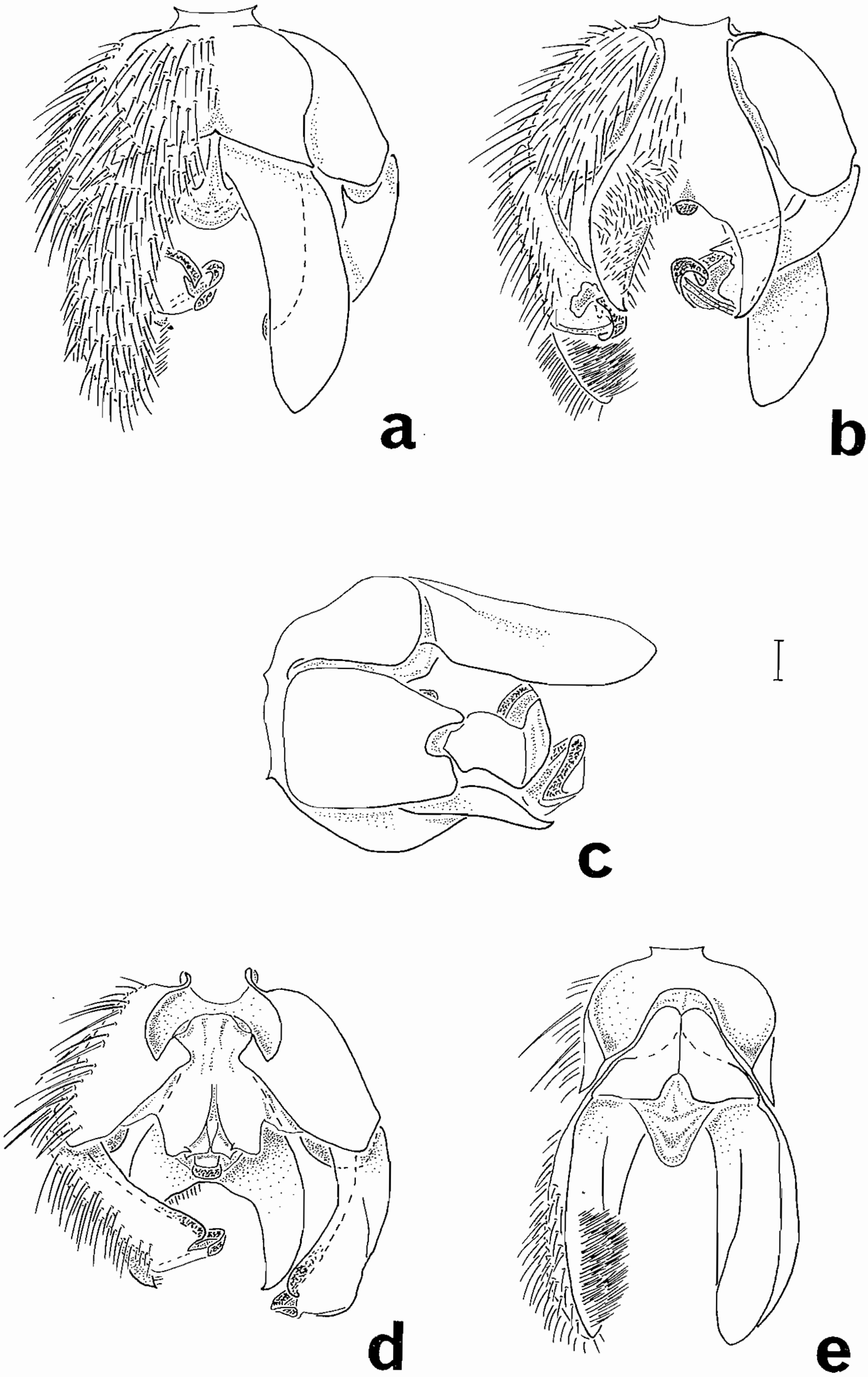


FIG. 2. Male genitalia of *Symmerus* (*Symmerus*) *nobilis* Lackschewitz. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

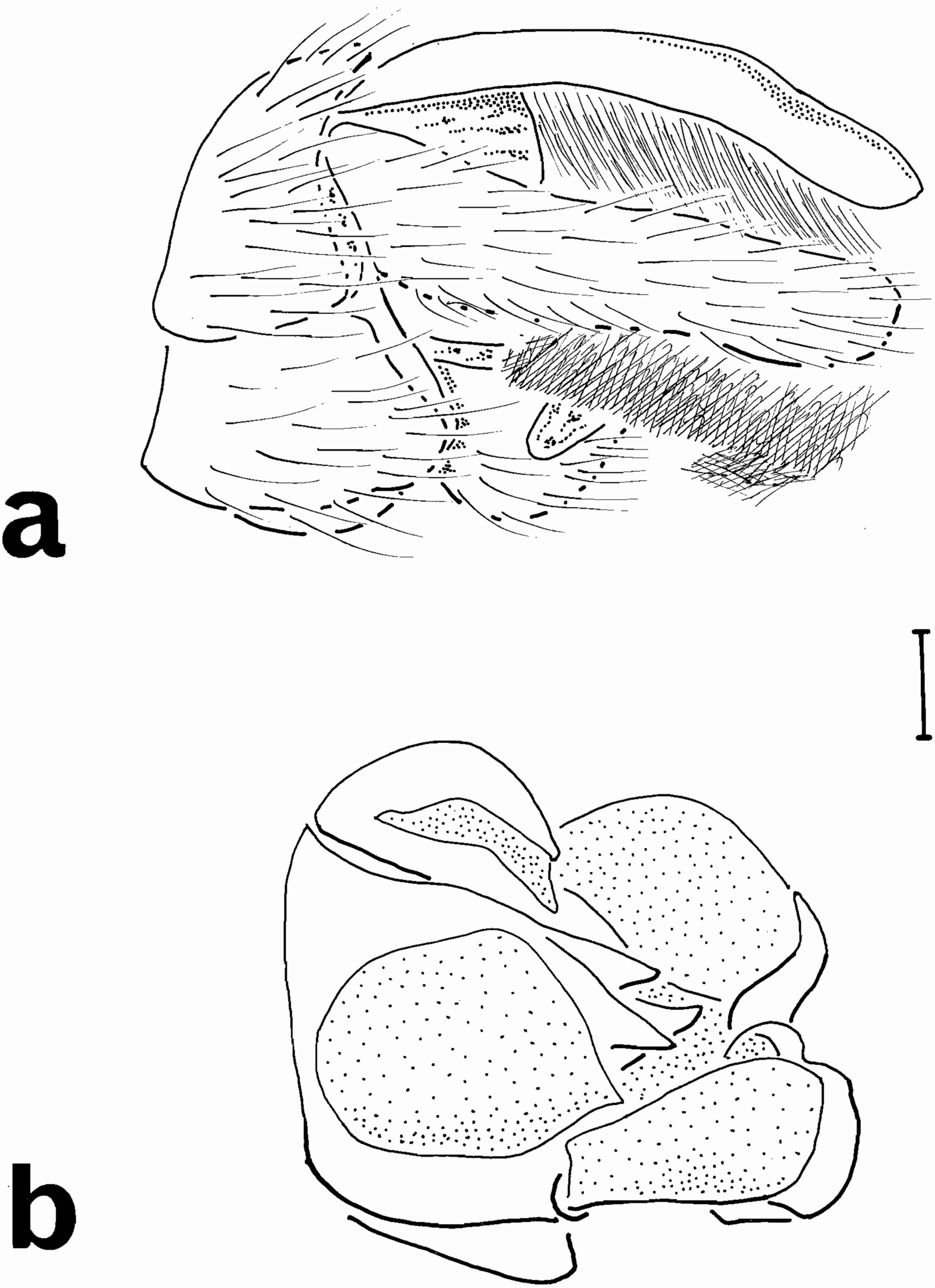


FIG. 3. Male genitalia of *Symmerus* (*Symmerus*) *balticus* Edwards. (a) dorsolateral view; (b) lateroventral view.

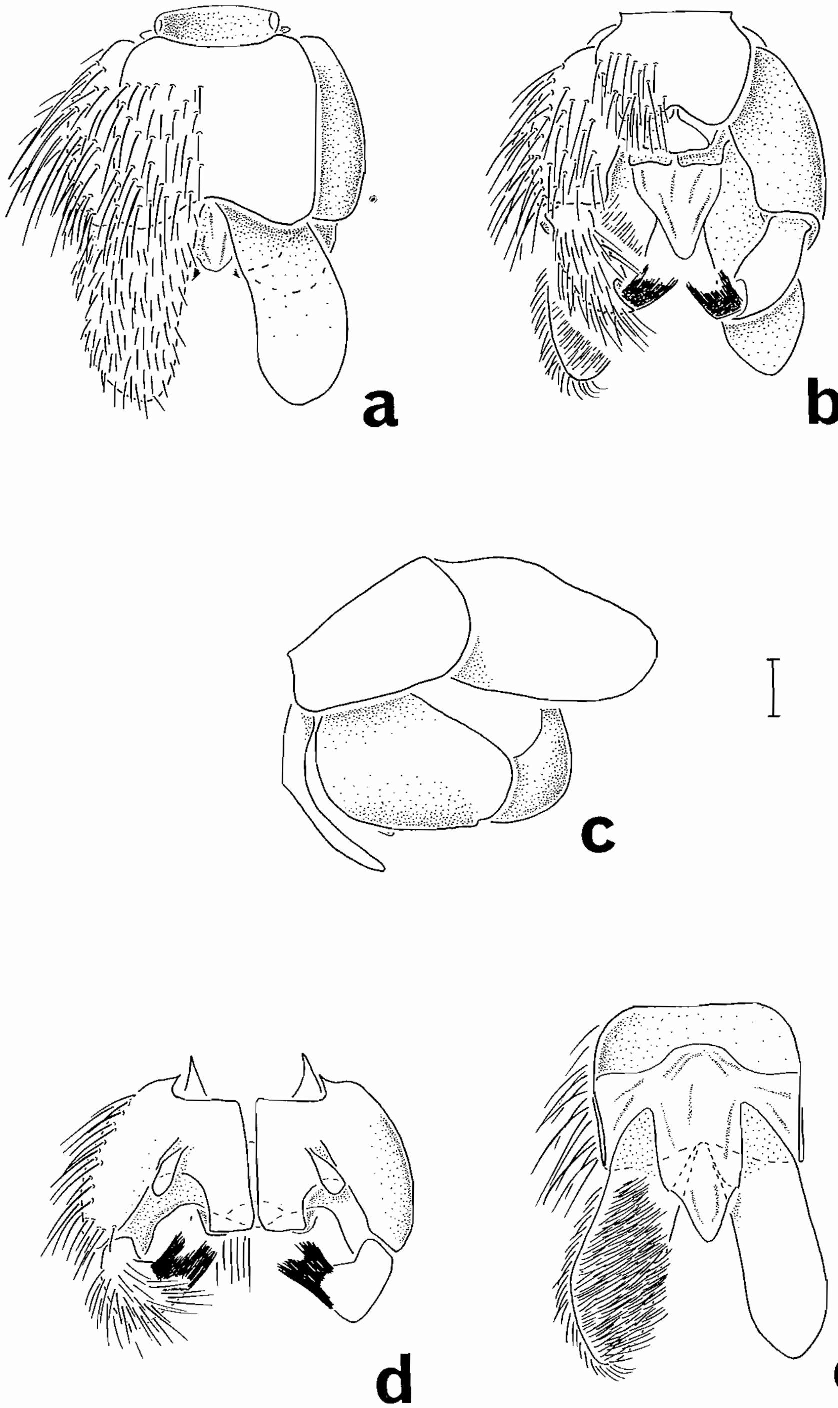


FIG. 4. Male genitalia of *Symmerus* (*Symmerus*) *lautus* (Loew). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

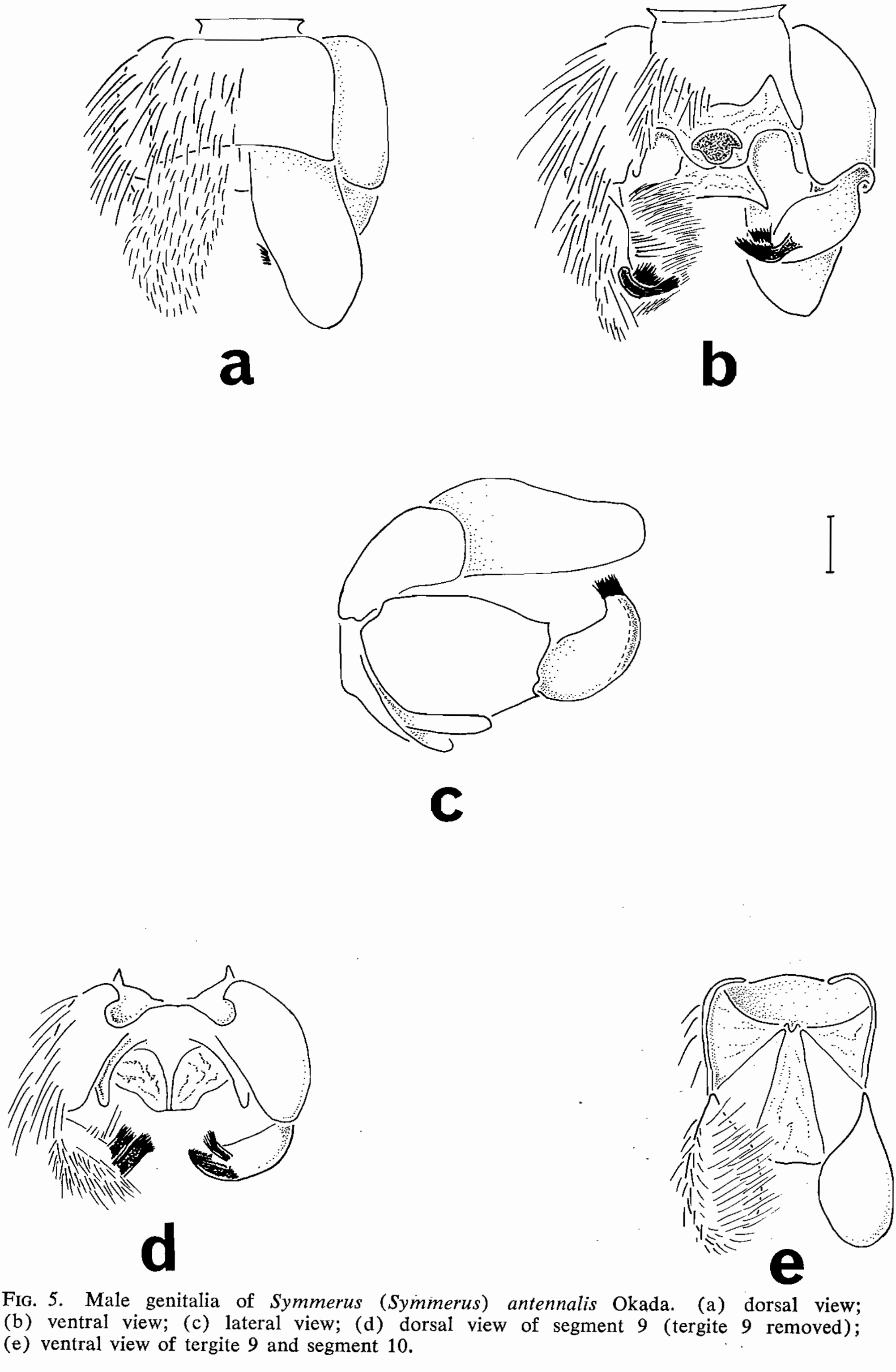


FIG. 5. Male genitalia of *Symmerus* (*Symmerus*) *antennalis* Okada. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

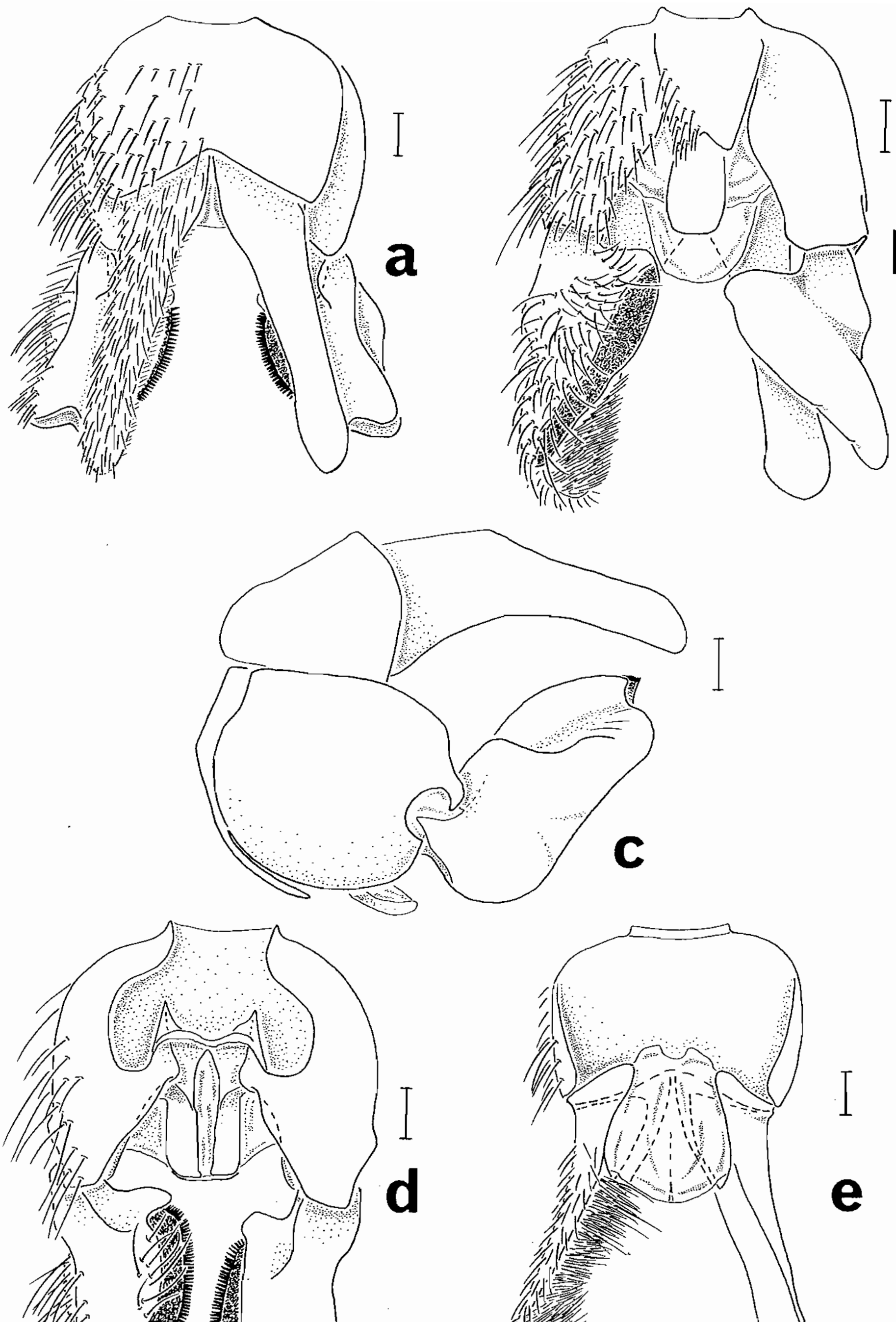


FIG. 6. Male genitalia of *Symmerus* (*Psilosymmerus*) *coqulus* Garrett. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

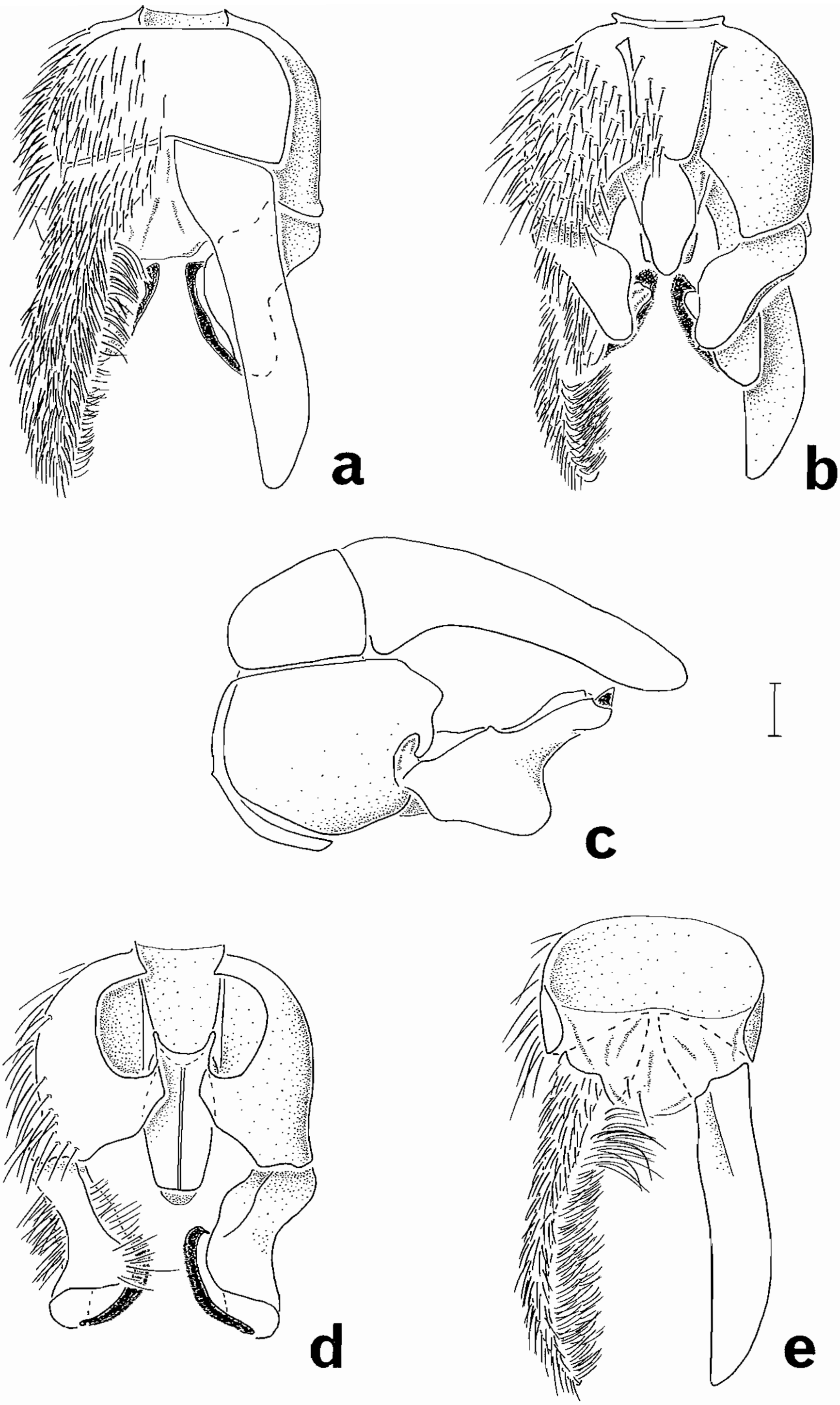


FIG. 7. Male genitalia of *Symmerus* (*Psilosymmerus*) *vockerothi* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

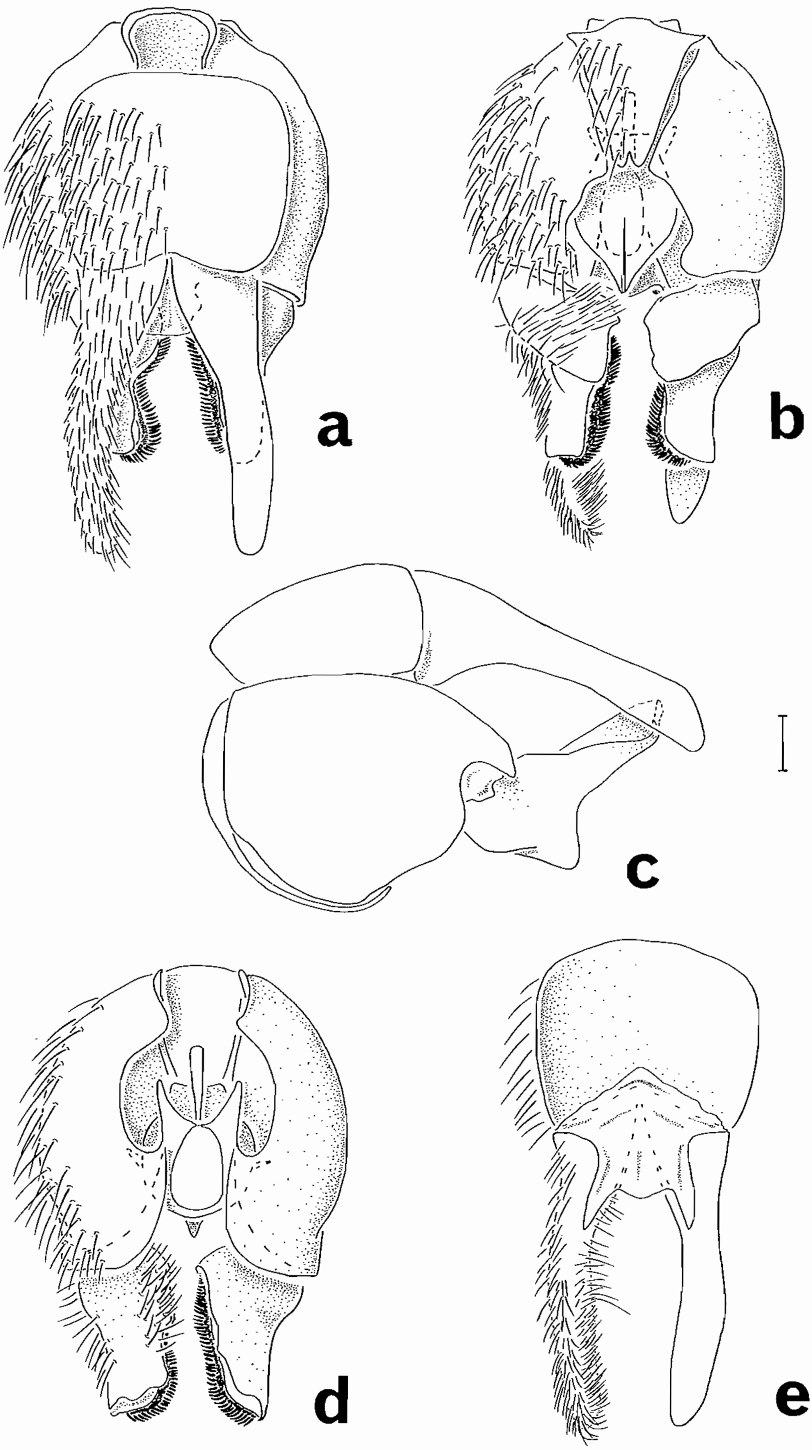


FIG. 8. Male genitalia of *Symmerus* (*Psilosymmerus*) *uncatus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

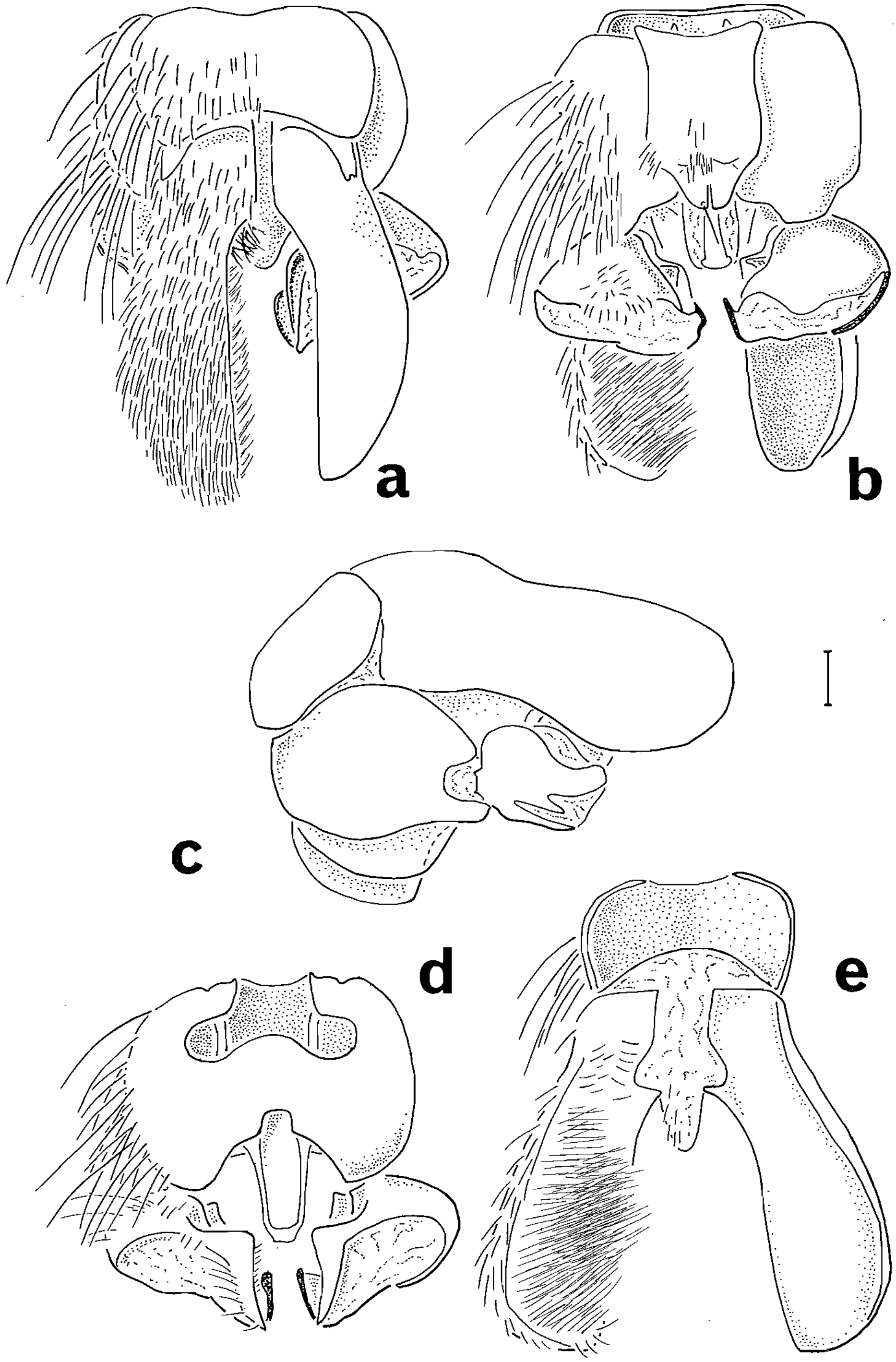


FIG. 9. Male genitalia of *Symmerus* (*Psilosymmerus*) *brevicornis* Okada. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

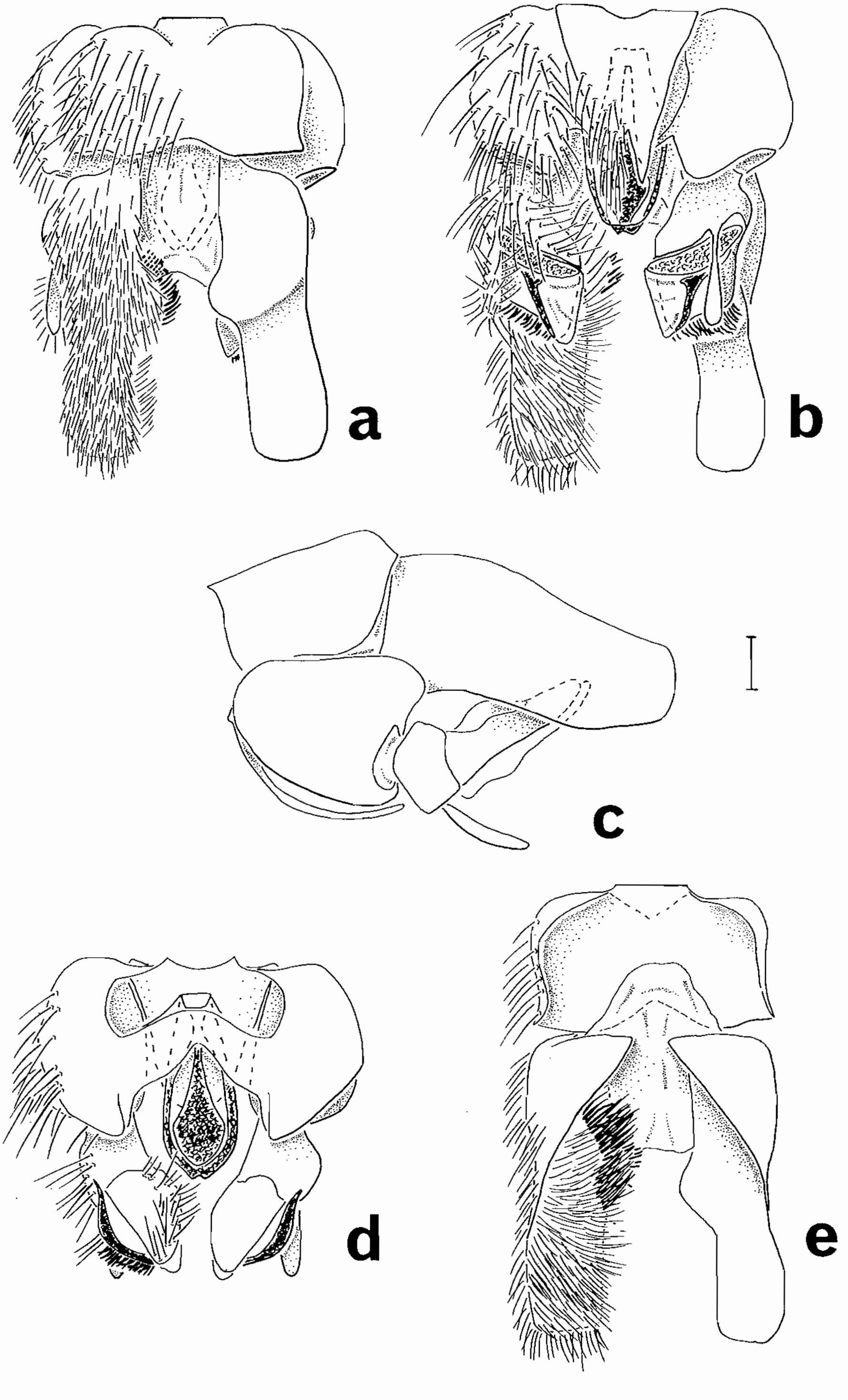


FIG. 10. Male genitalia of *Symmerus* (*Psilosymmerus*) *pectinatus* Saigusa. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

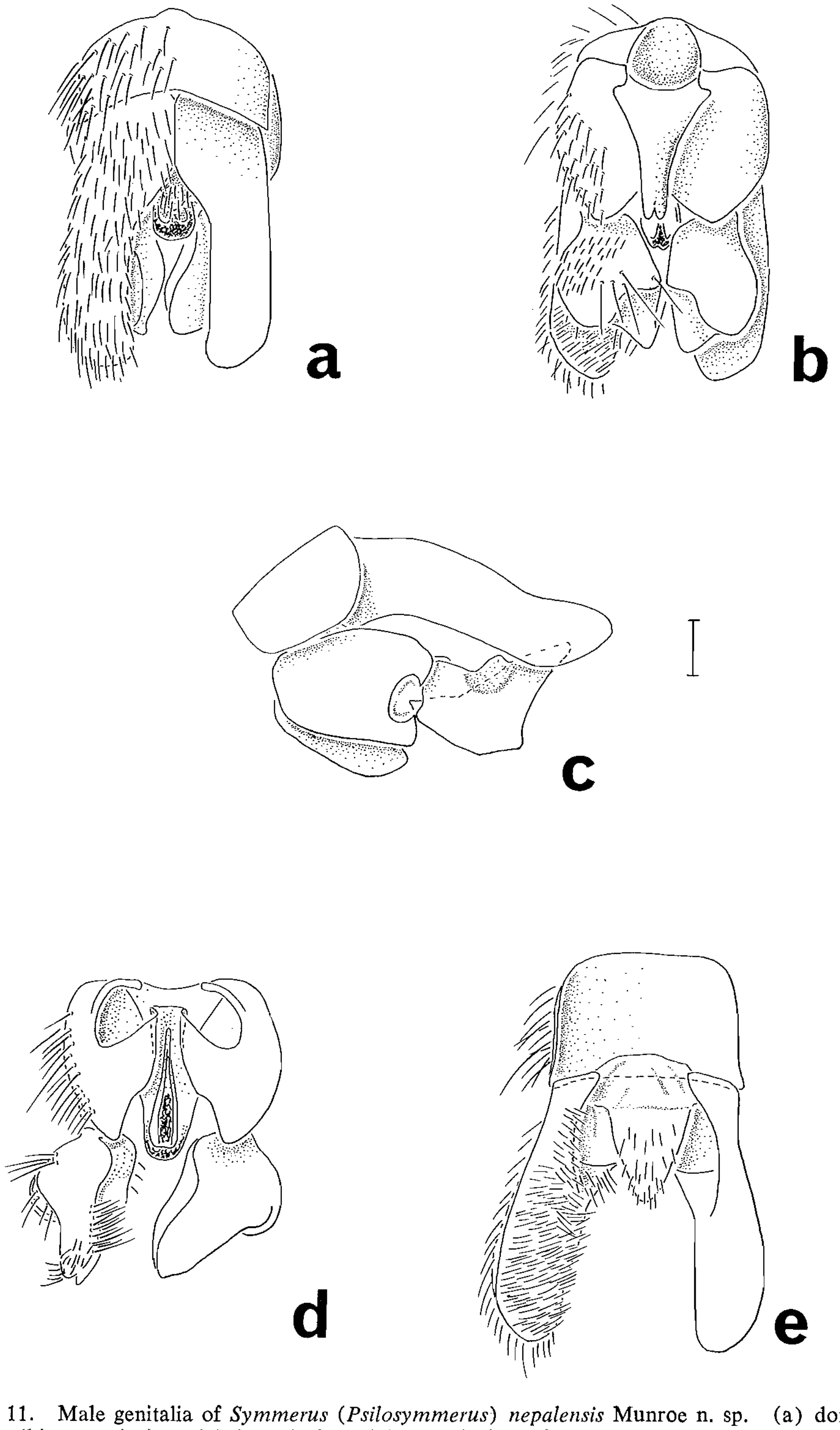


FIG. 11. Male genitalia of *Symmerus* (*Psilosymmerus*) *nepalensis* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

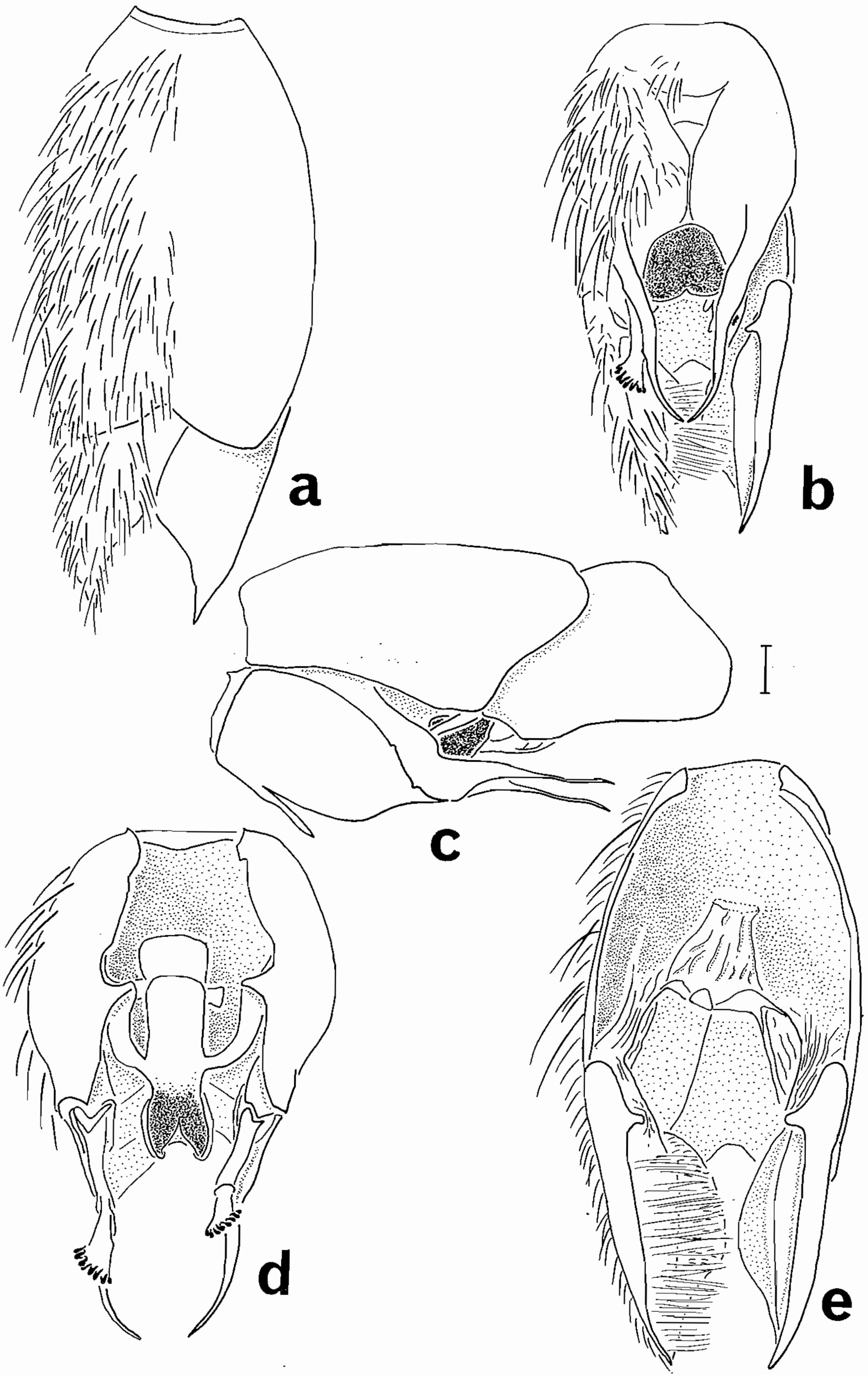


FIG. 12. Male genitalia of *Australosymmerus* (*Australosymmerus*) *stigmaticus* (Phillippi). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

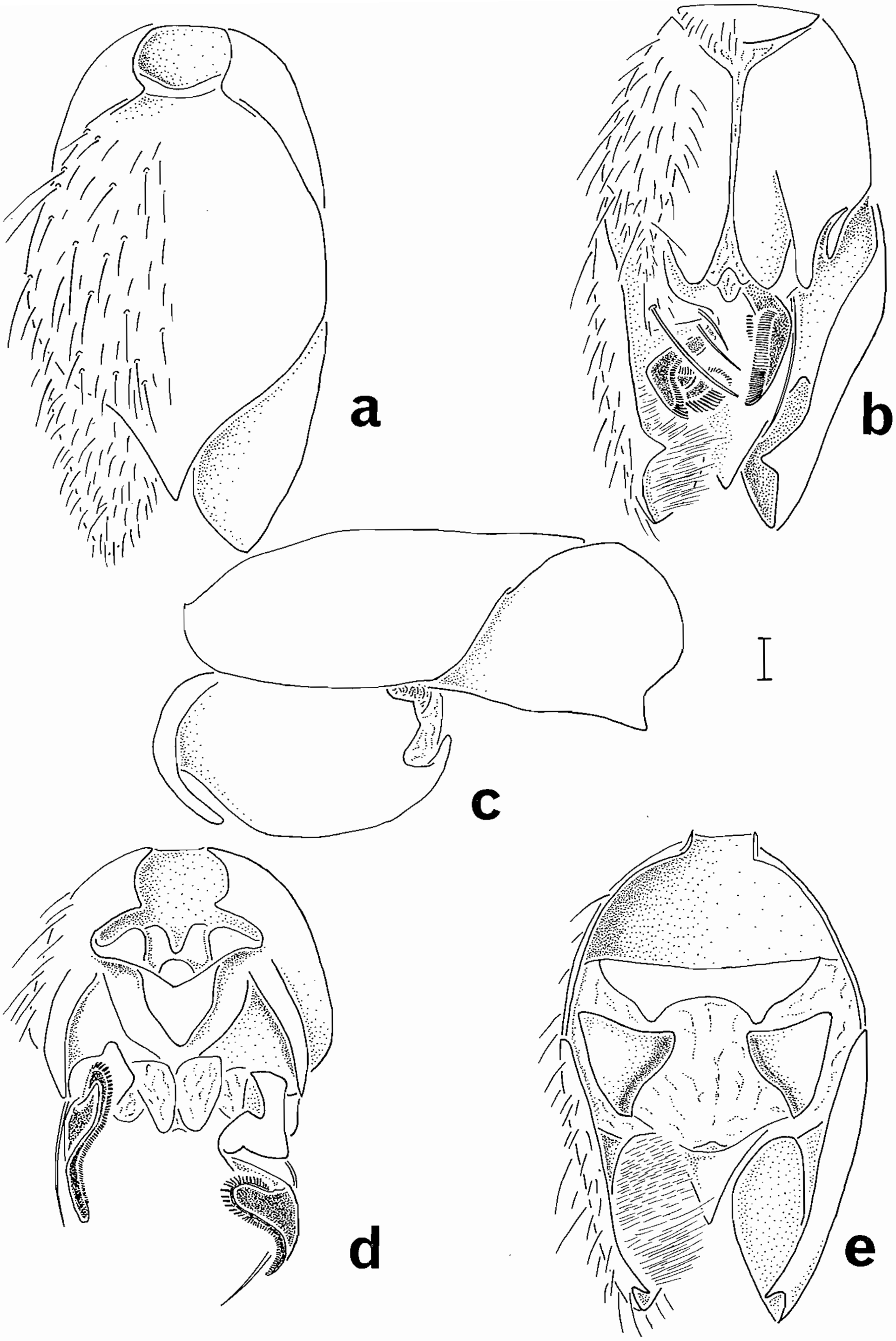


FIG. 13. Male genitalia of *Australosymmerus* (*Australosymmerus*) *basalis* (Tonnoir). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

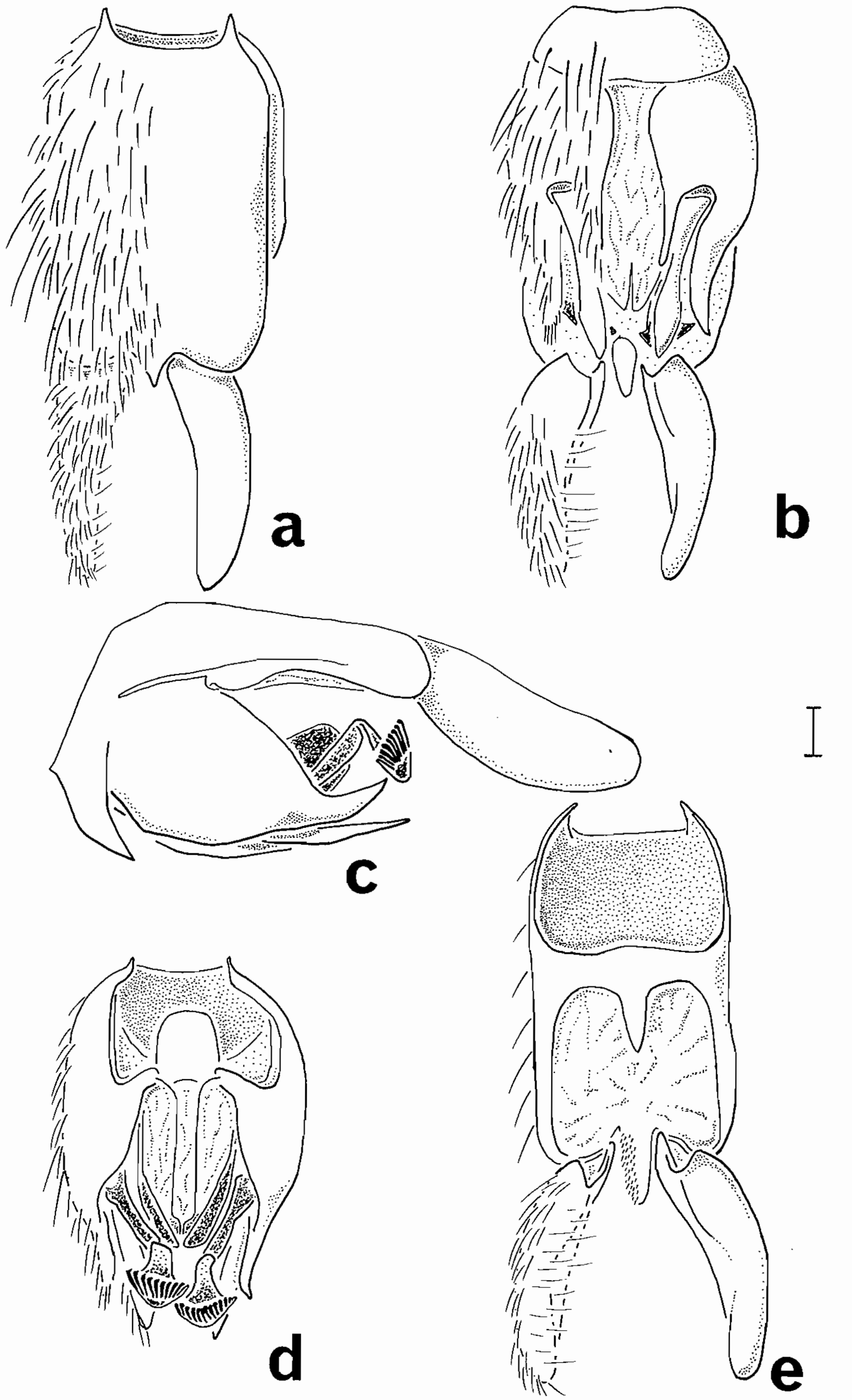


FIG. 14. Male genitalia of *Australosymmerus* (*Australosymmerus*) *nitidus* (Tonnoir). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

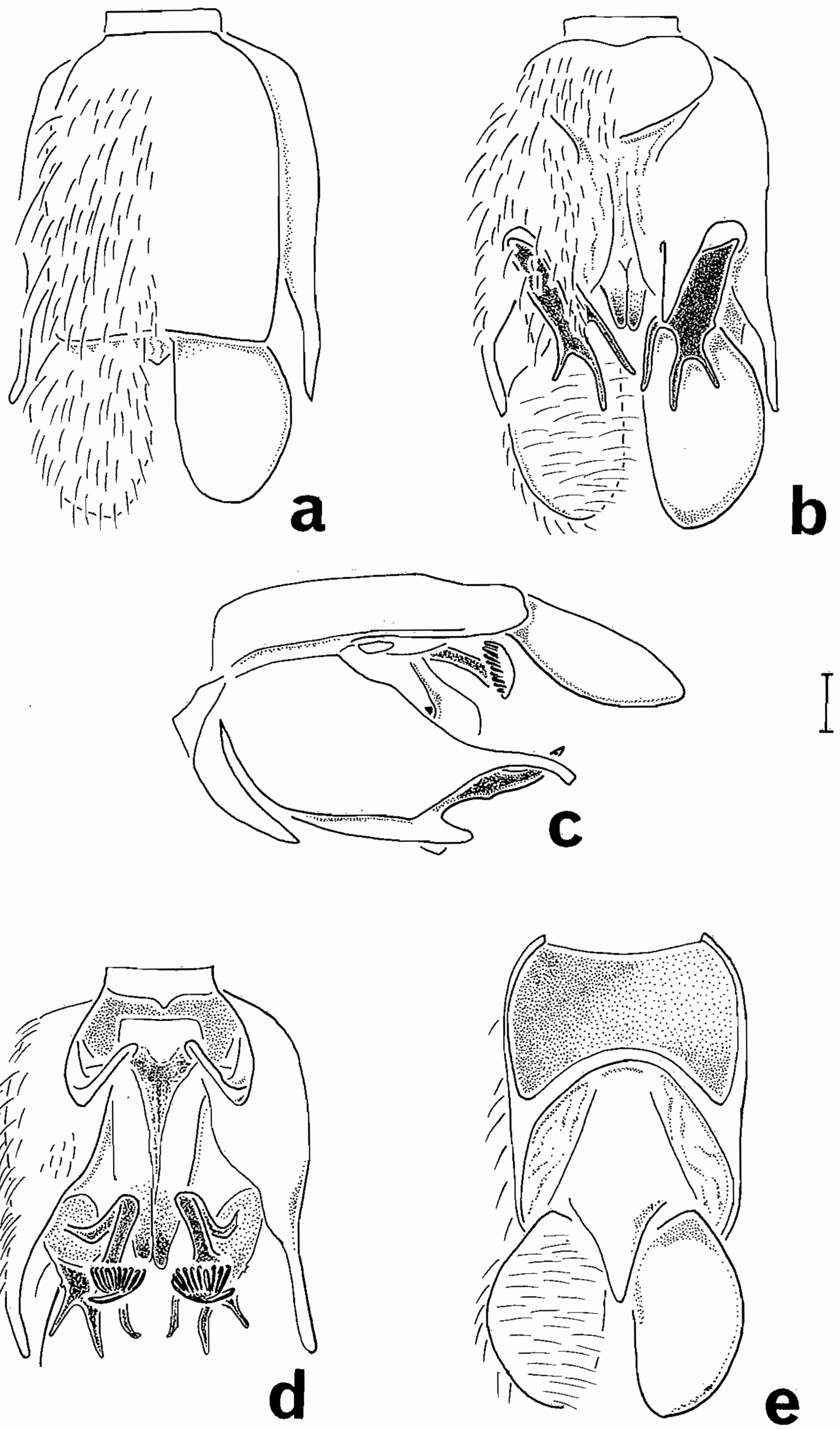


FIG. 15. Male genitalia of *Australosymmerus* (*Australosymmerus*) *tillyardi* (Tonnoir). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

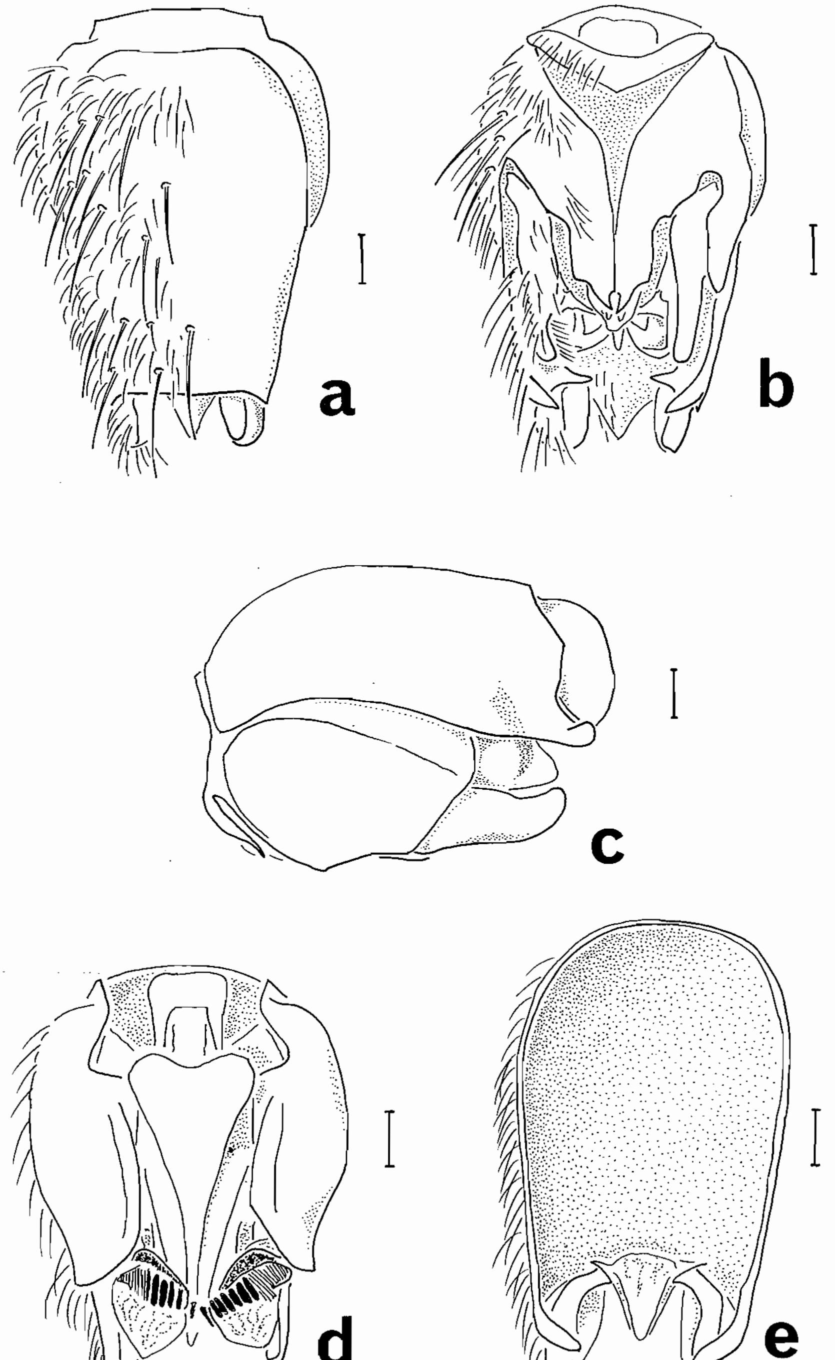


FIG. 16. Male genitalia of *Australosymmerus* (*Crionisca*) *rieki* (Colless). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

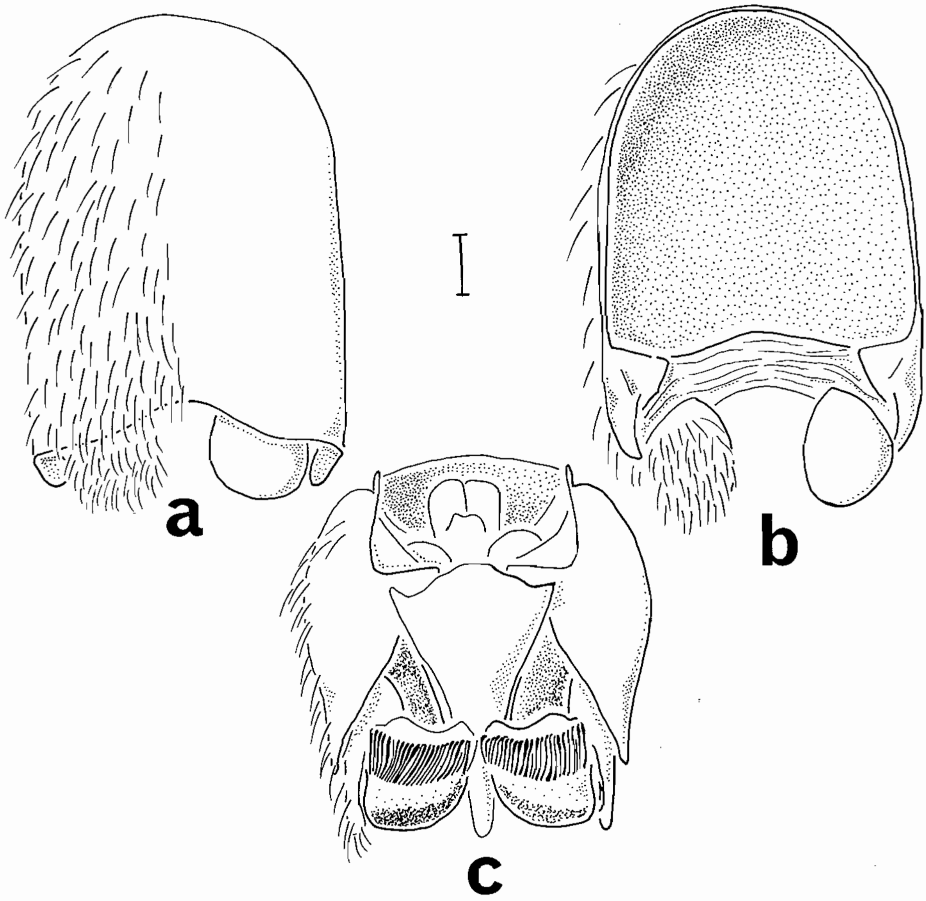


FIG. 17. Male genitalia of *Australosymmerus* (*Crionisca*) *aculeatus* (Edwards). (a) dorsal view; (b) ventral view of tergite 9 and segment 10; (c) dorsal view of segment 9 (tergite 9 removed).

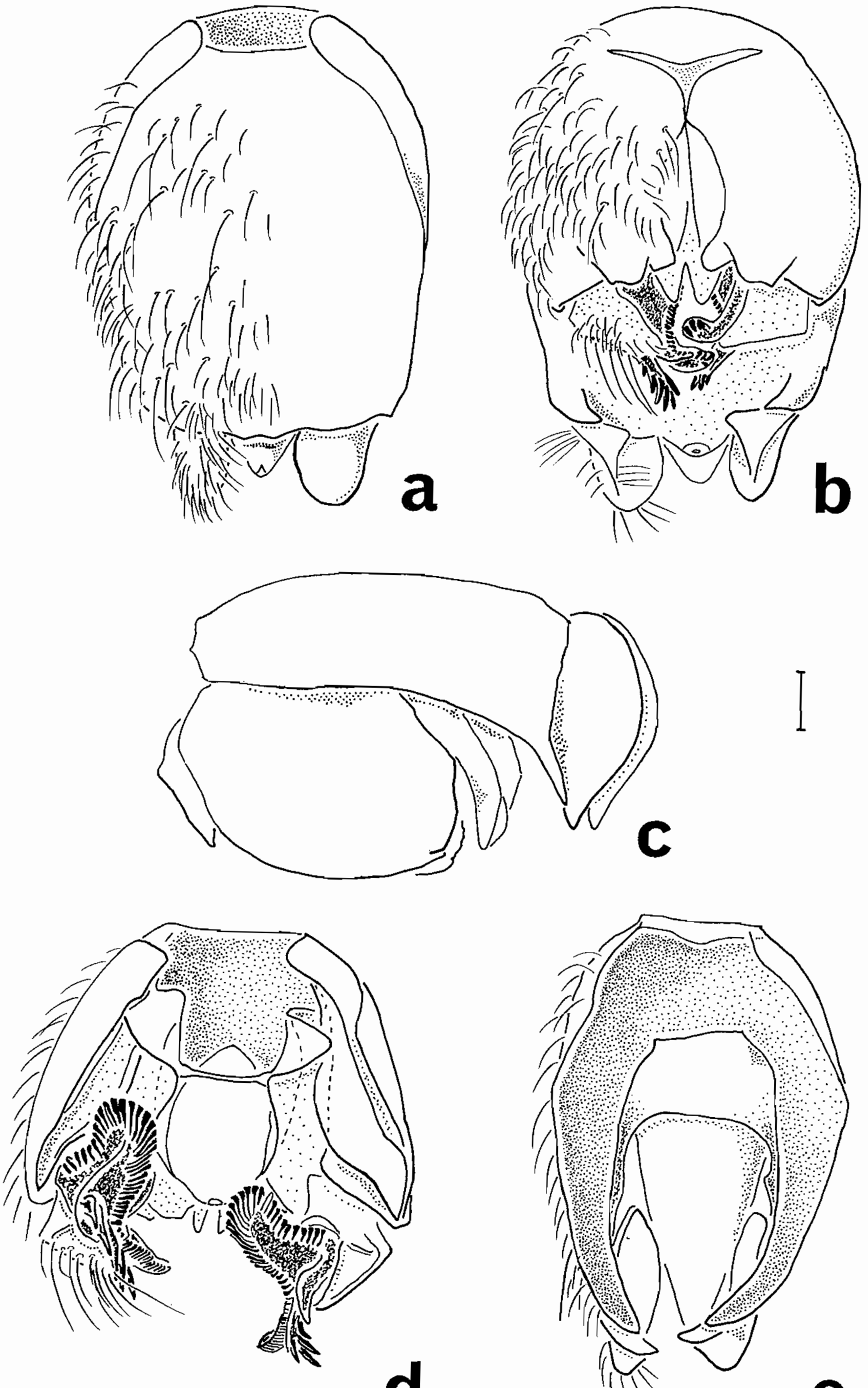


FIG. 18. Male genitalia of *Australosymmerus* (*Crionisca*) *magellani* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

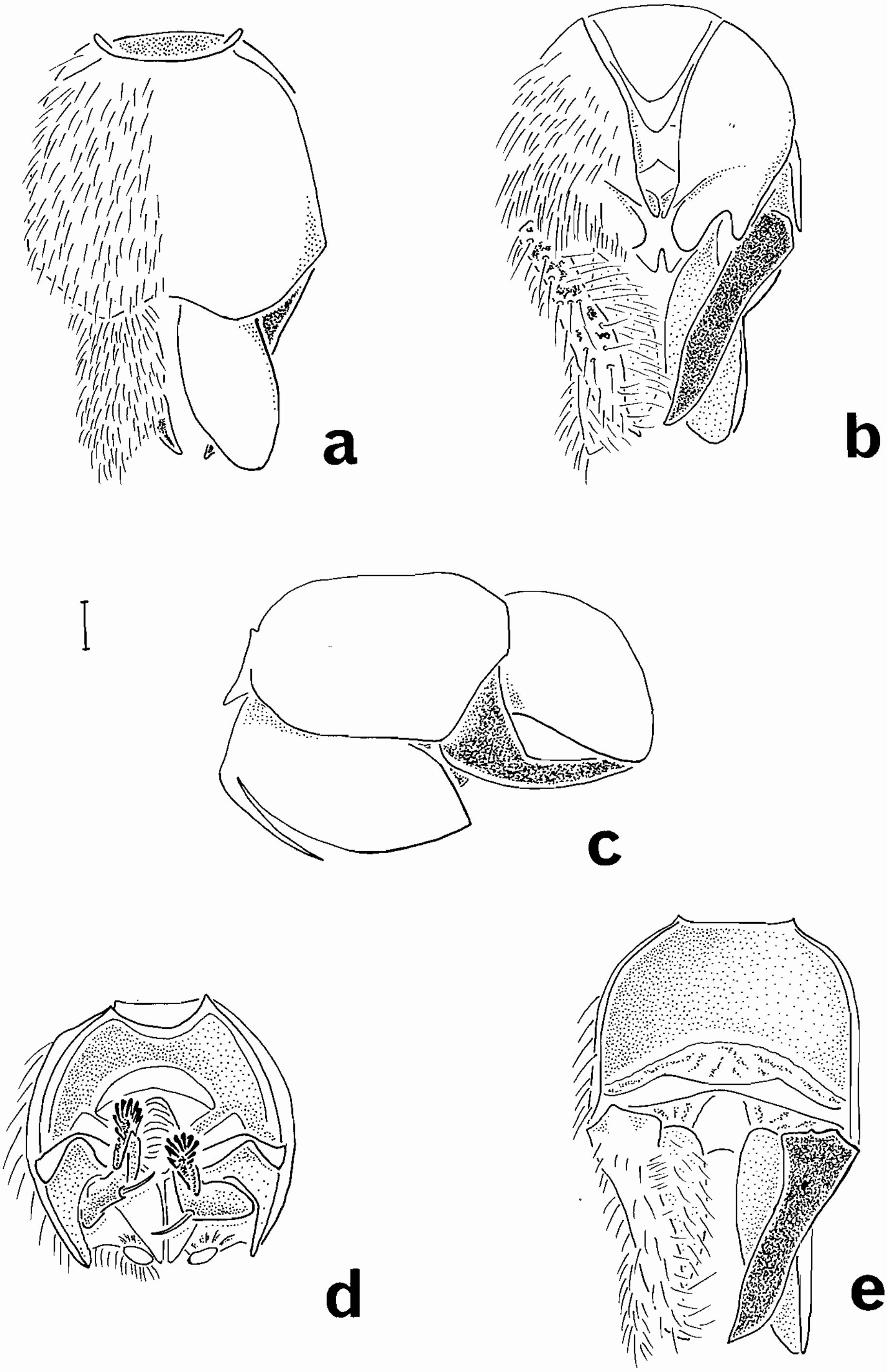


FIG. 19. Male genitalia of *Australosymmerus* (*Ventrilobus*) *fuscinervis* (Edwards). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

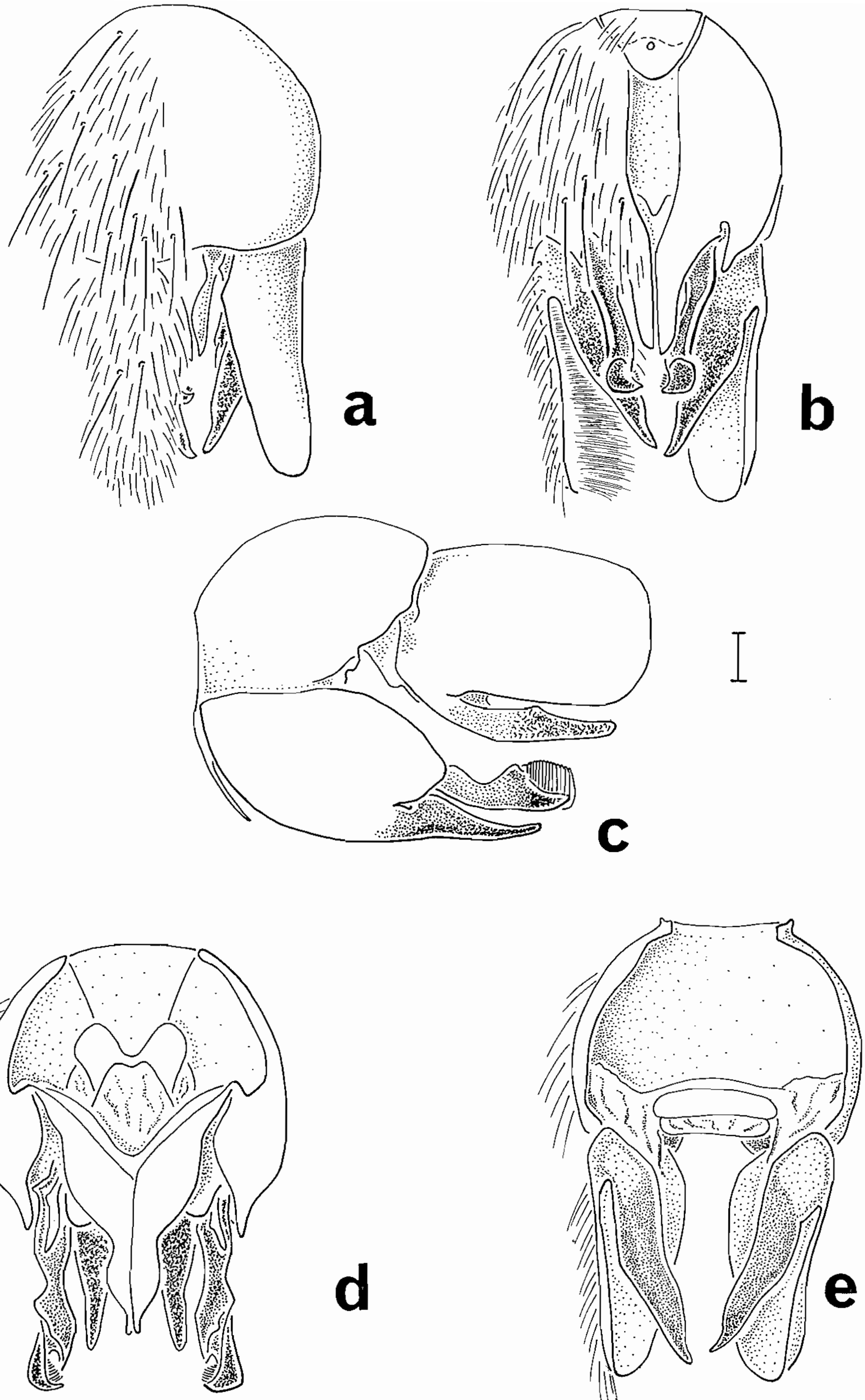


FIG. 20. Male genitalia of *Australosymmerus* (*Ventrilobus*) *cornutus* Colless. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

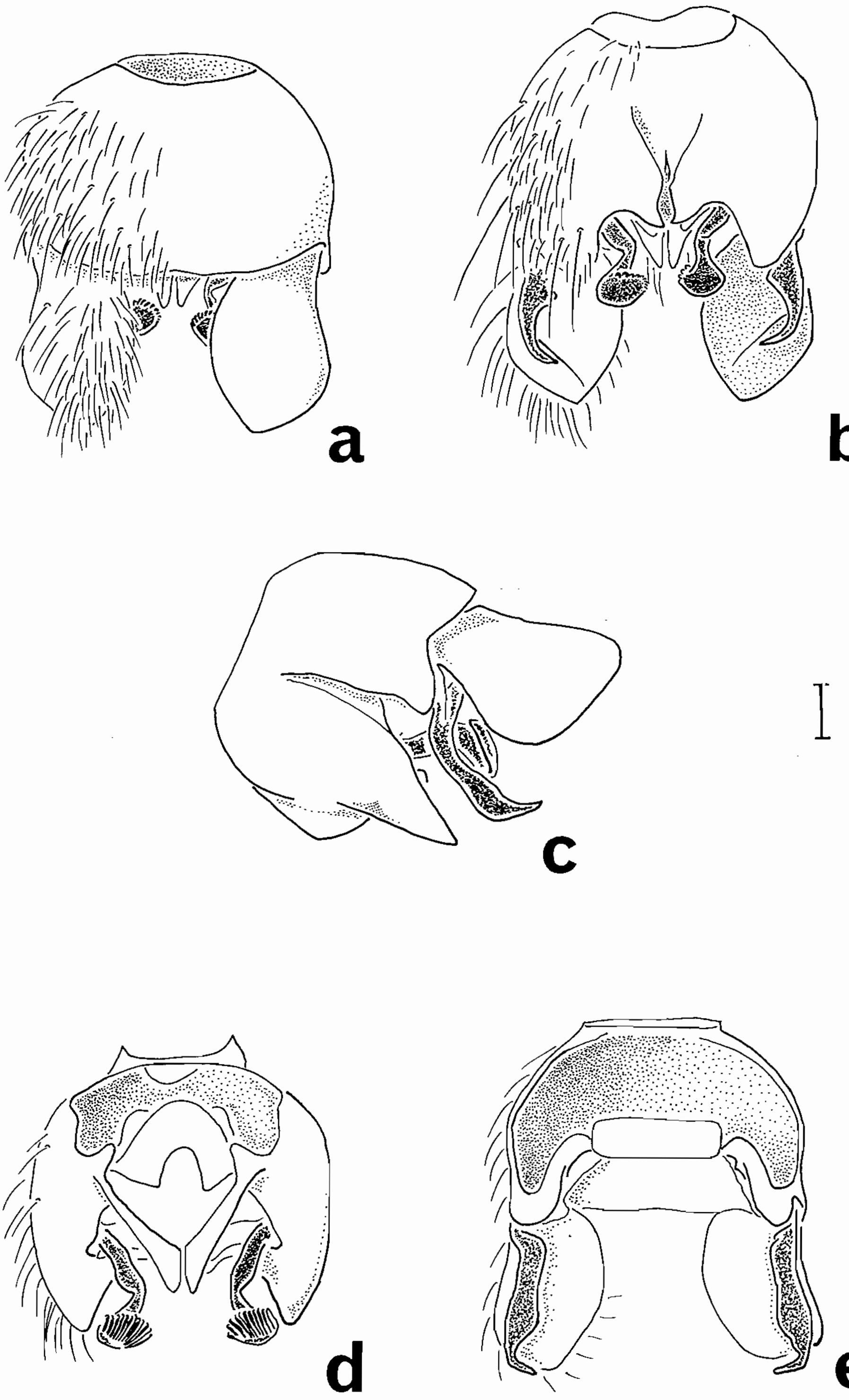


FIG. 21. Male genitalia of *Australosymmerus* (*Ventrilobus*) *nebulosus* Colless. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

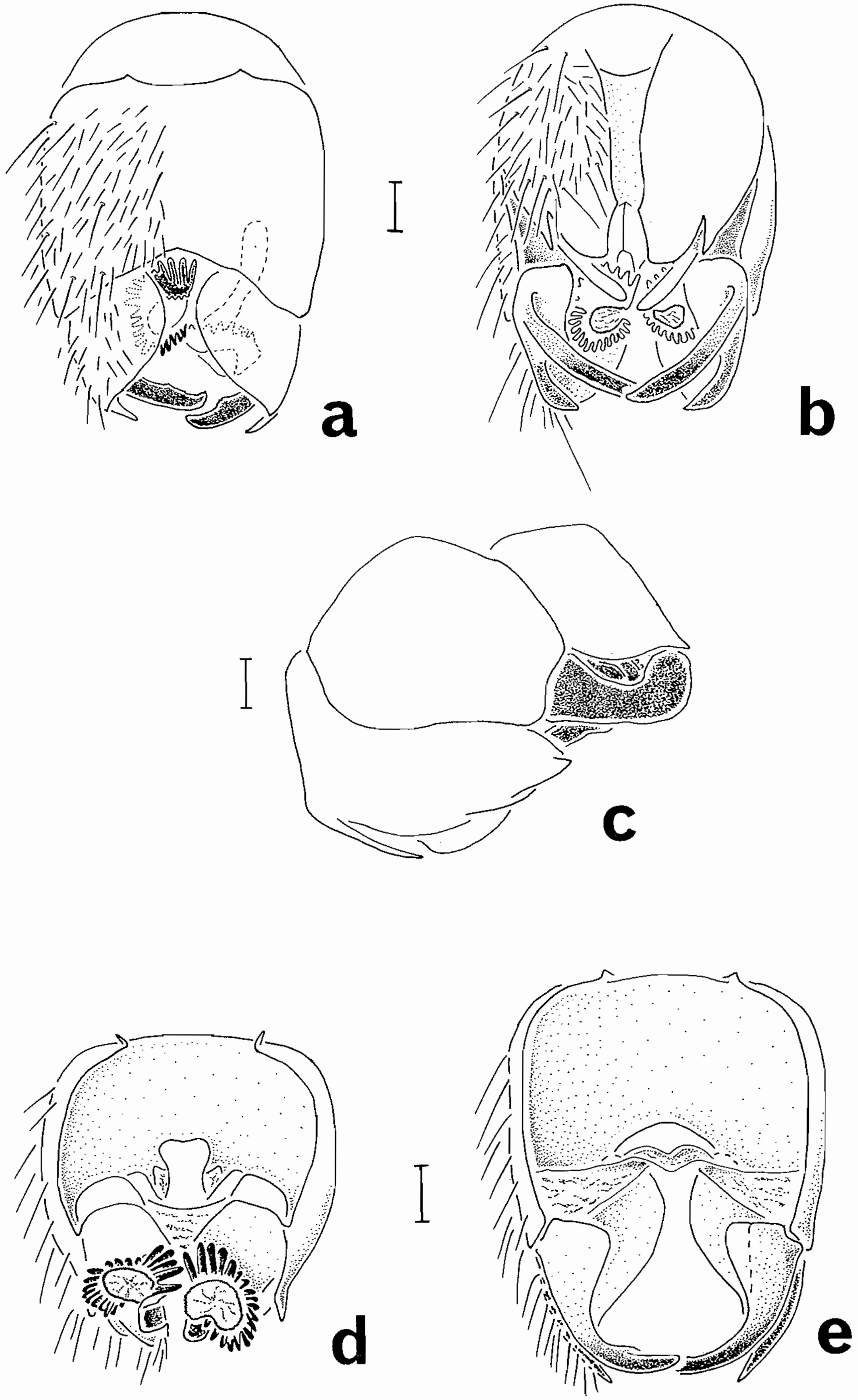


FIG. 22. Male genitalia of *Australosymmerus* (*Ventrilobus*) *anthostylus* Colless. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

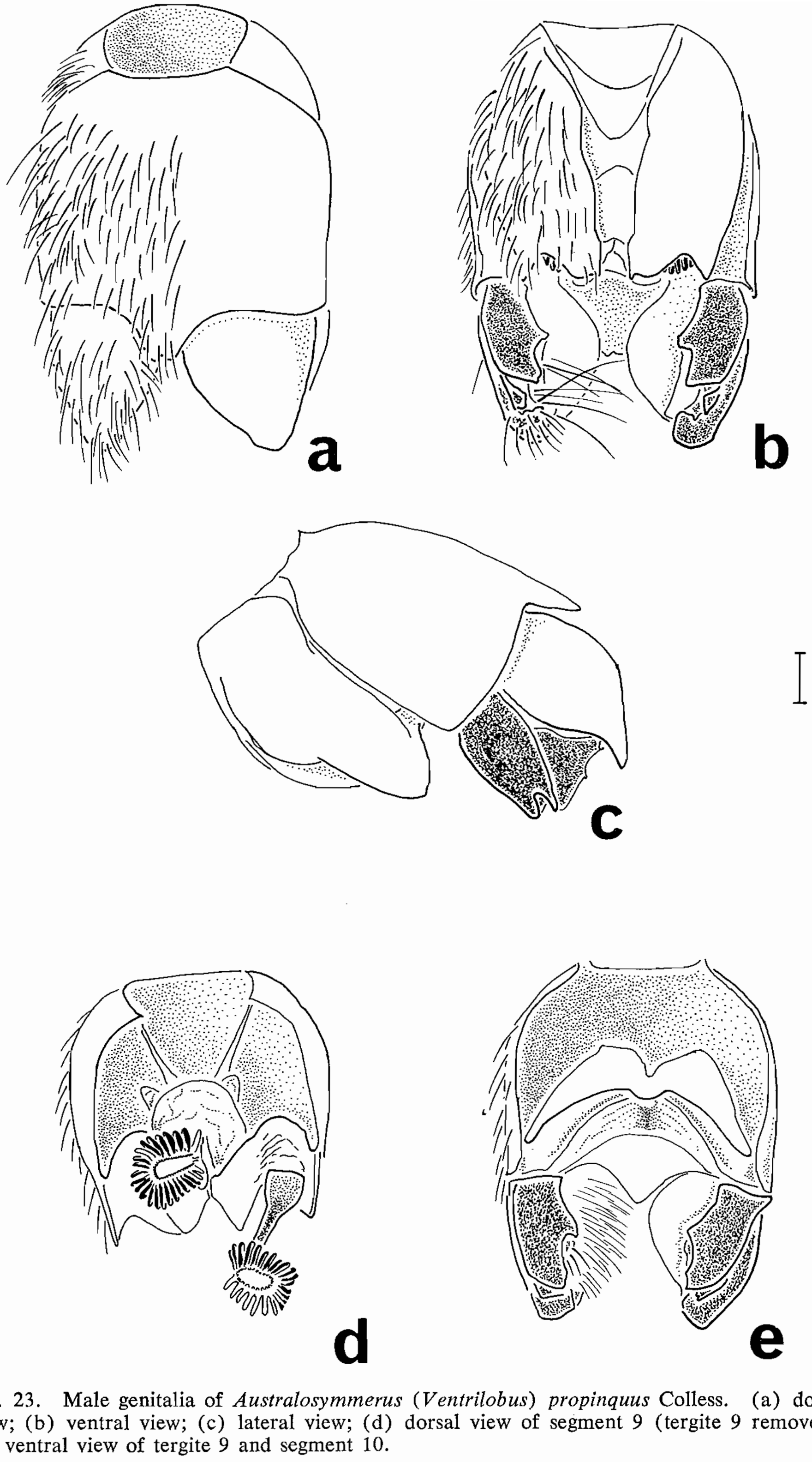


FIG. 23. Male genitalia of *Australosymmerus* (*Ventrilobus*) *propinquus* Colless. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

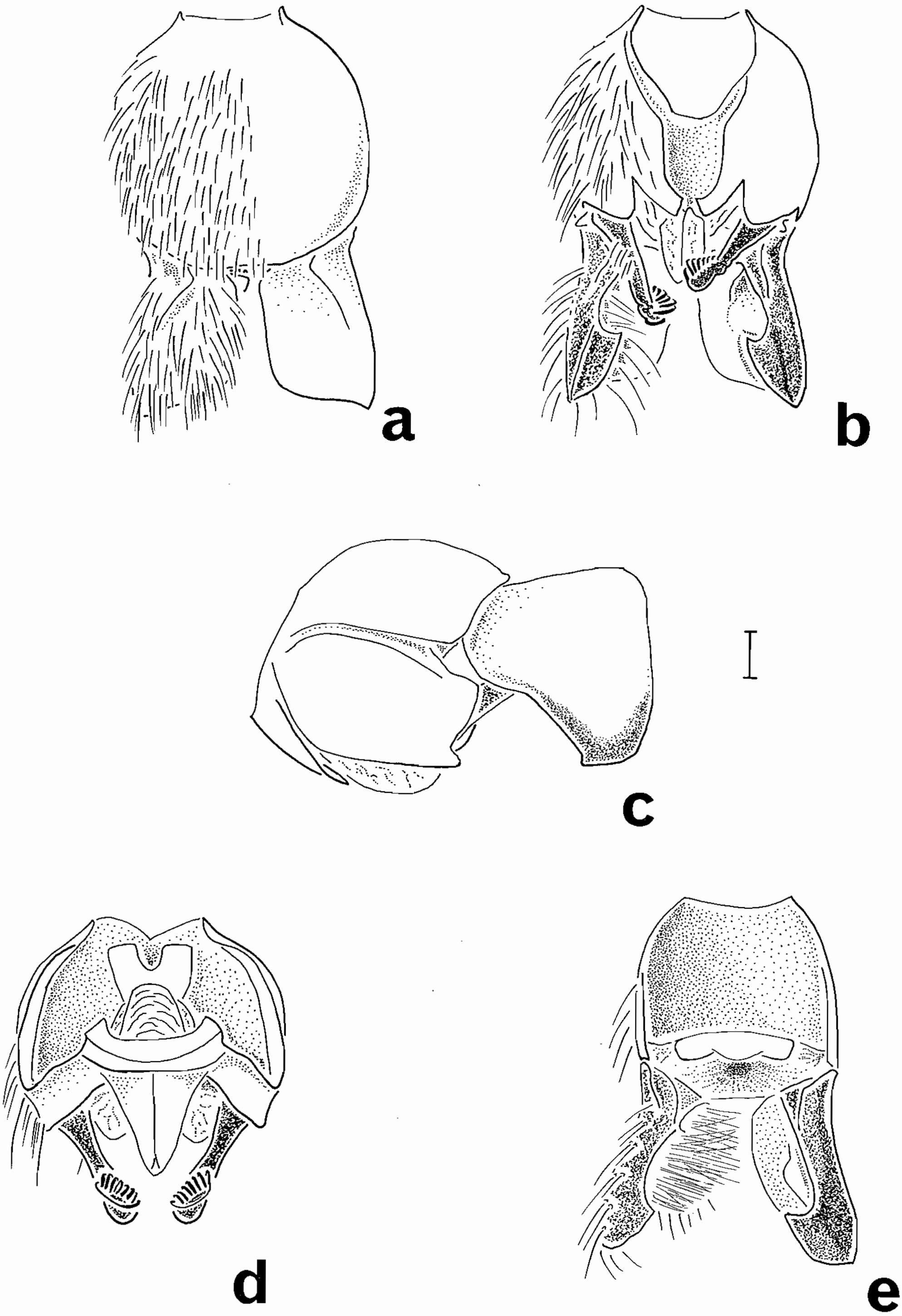


FIG. 24. Male genitalia of *Australosymmerus naevius* Colless. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

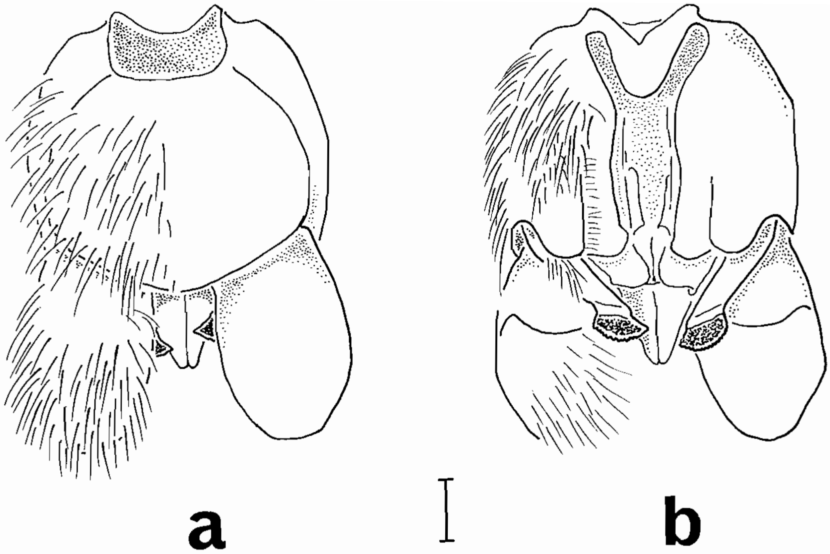


FIG. 25. Male genitalia of *Australosymmerus tonnoiri* Colless. (a) dorsal view; (b) ventral view.

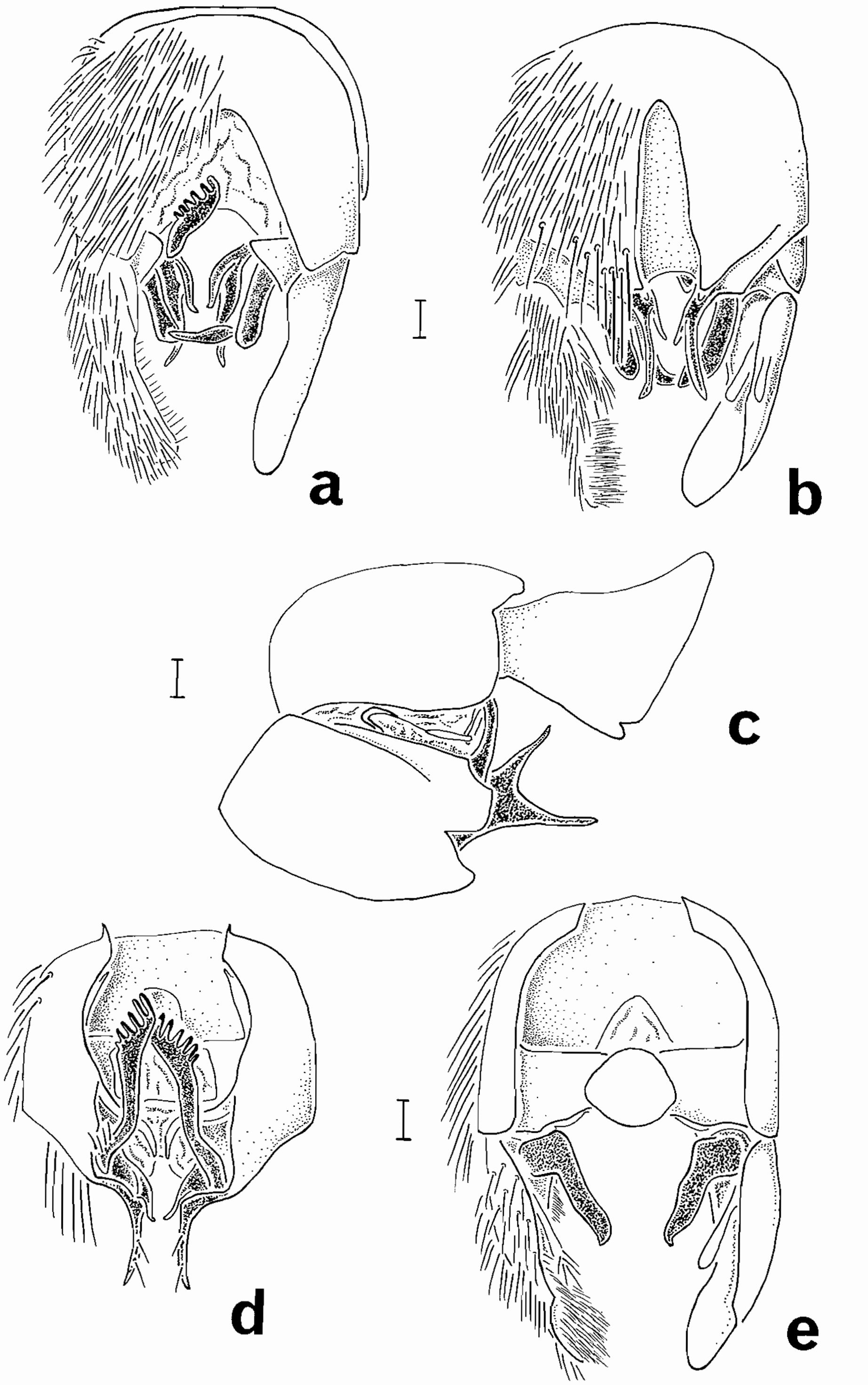


FIG. 26. Male genitalia of *Australosymmerus* (*Araeostylus*) *bivittatus* (Freeman). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

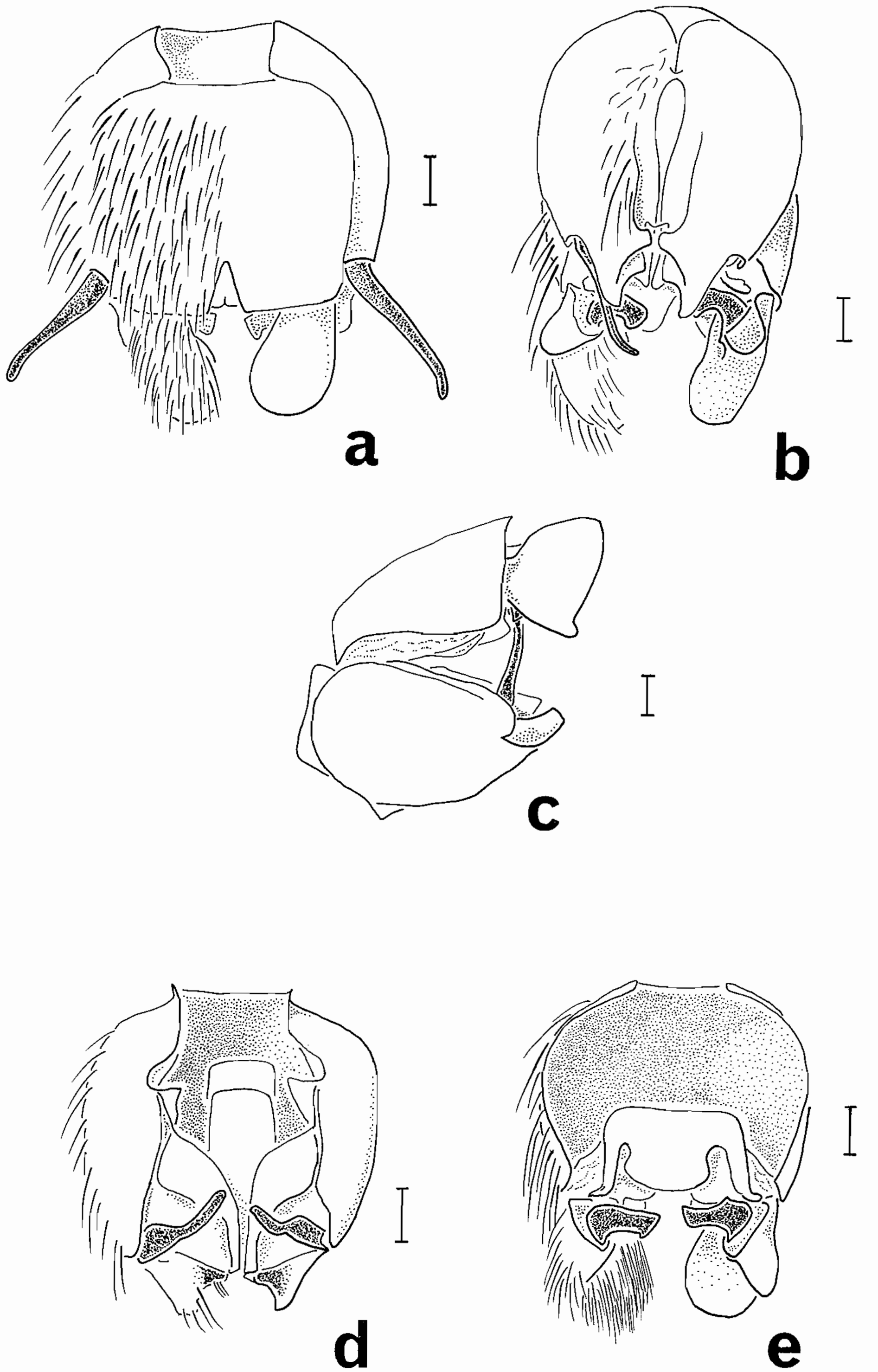


FIG. 27. Male genitalia of *Australosymmerus* (*Araeostylus*) *simplex* (Freeman). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

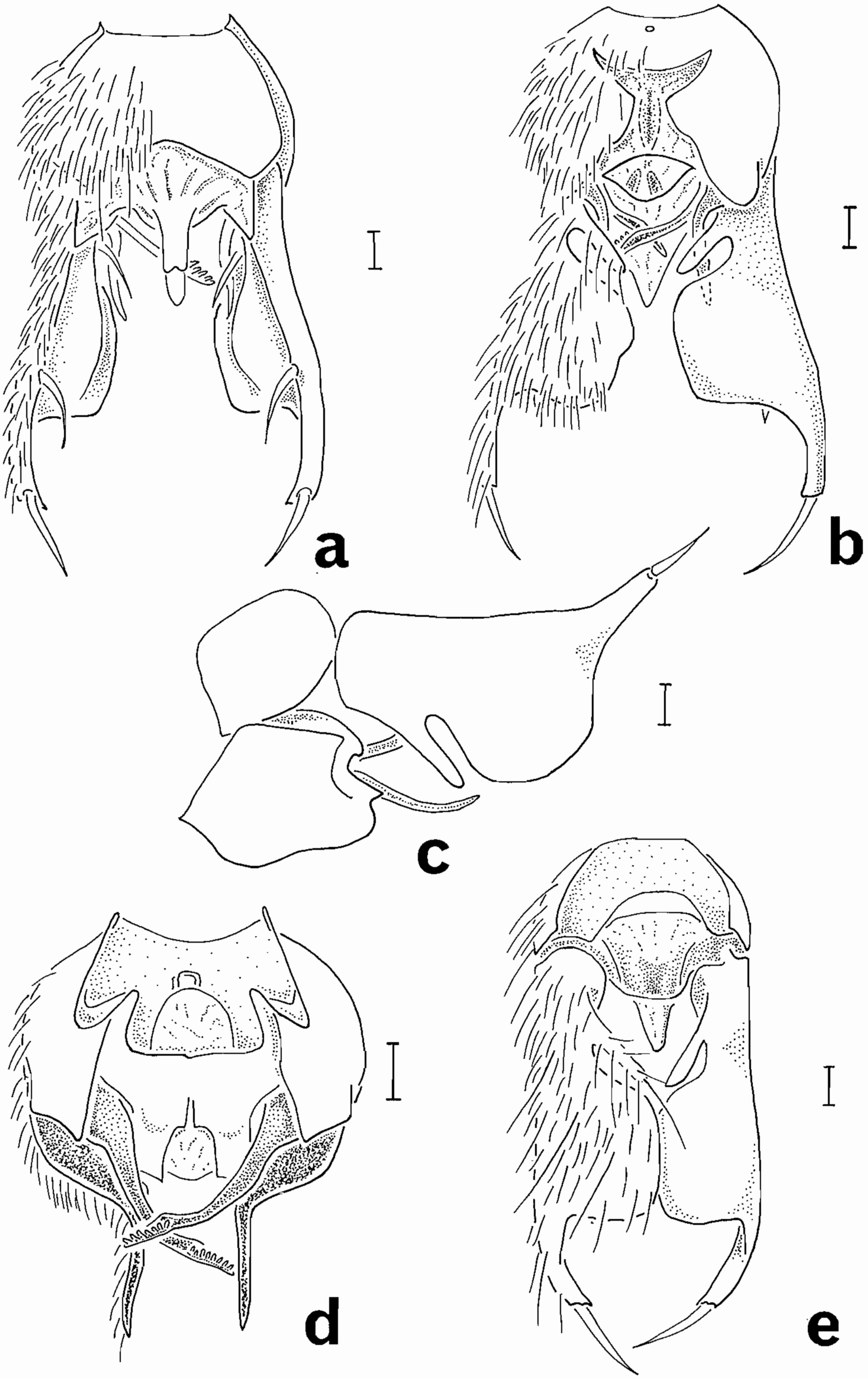


FIG. 28. Male genitalia of *Australosymmerus* (*Araeostylus*) *lobatus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

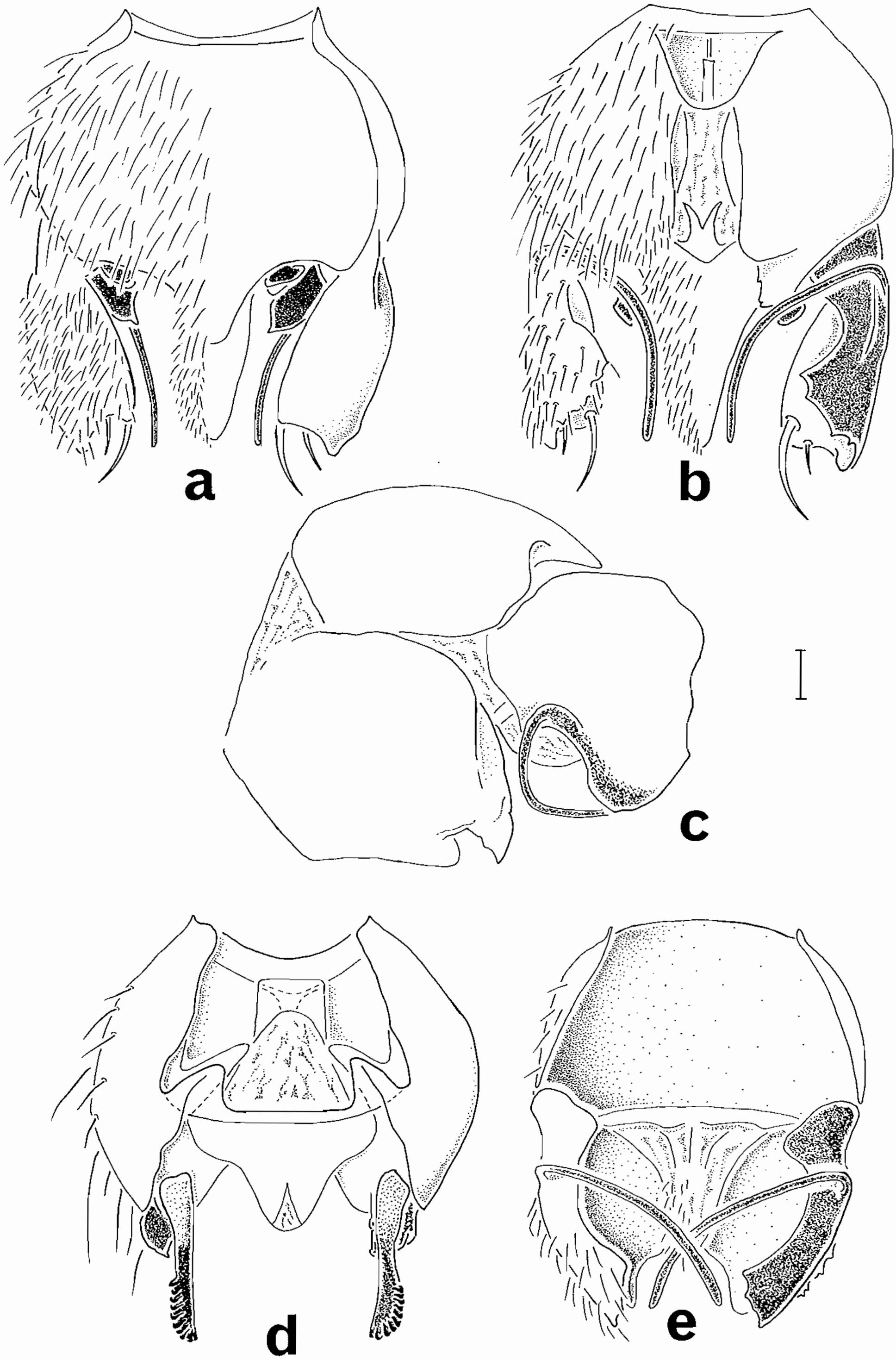


FIG. 29. Male genitalia of *Australosymmerus* (*Araeostylus*) *collessi* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

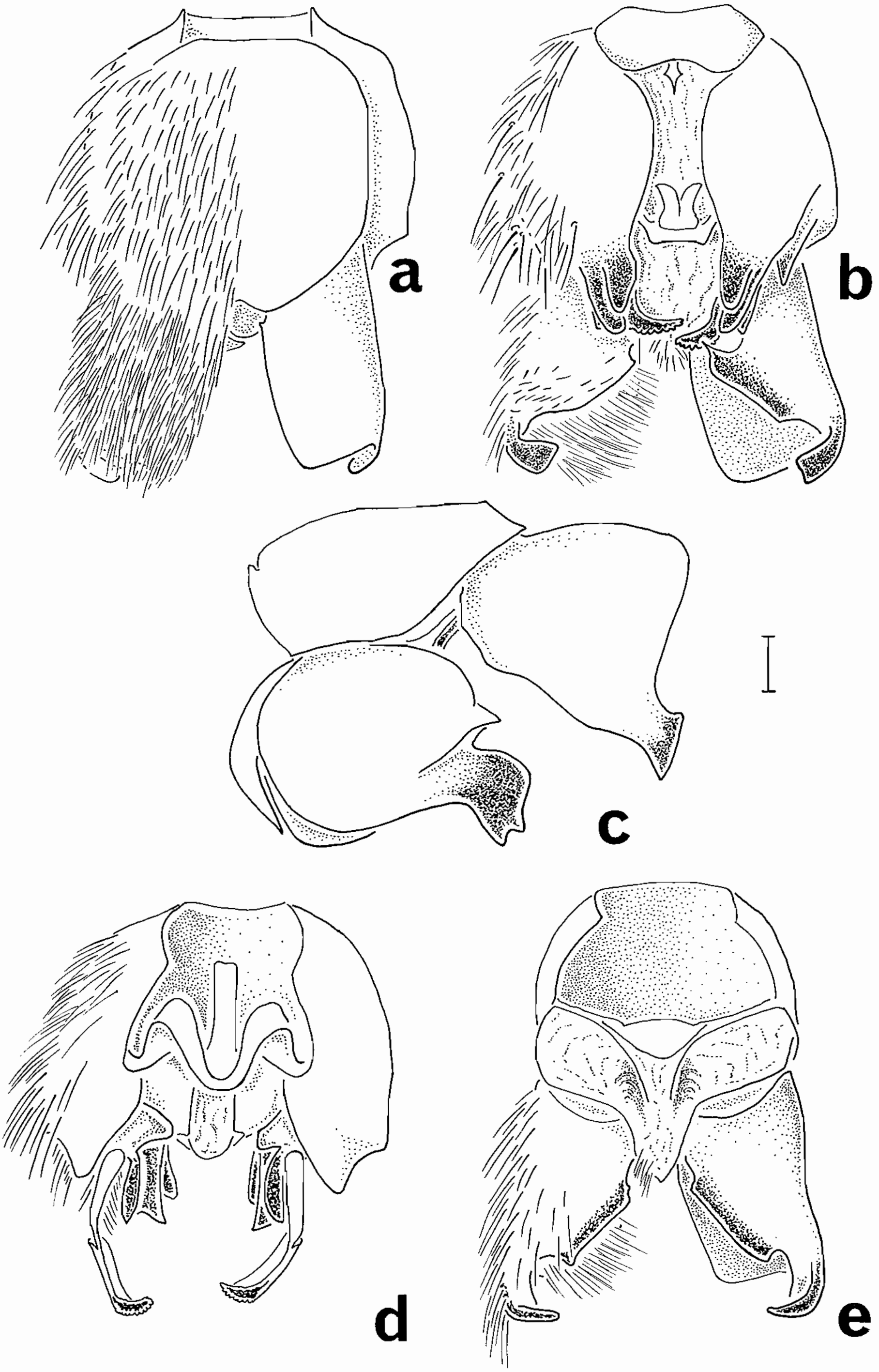


FIG. 30. Male genitalia of *Australosymmerus* (*Vellicocauda*) *insolitus* (Walker). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

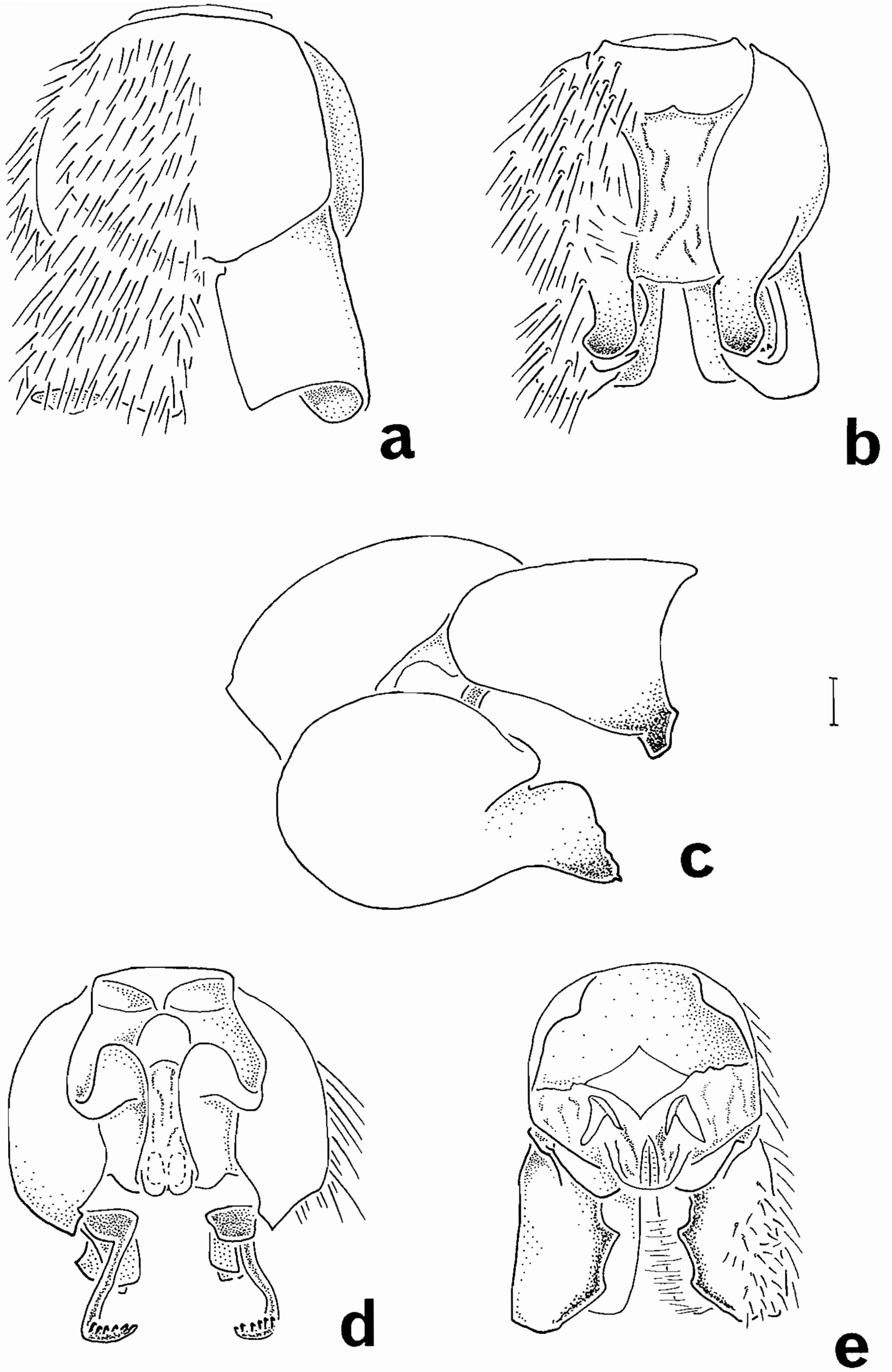


FIG. 31. Male genitalia of *Australosymmerus* (*Vellicocauda*) *confusus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

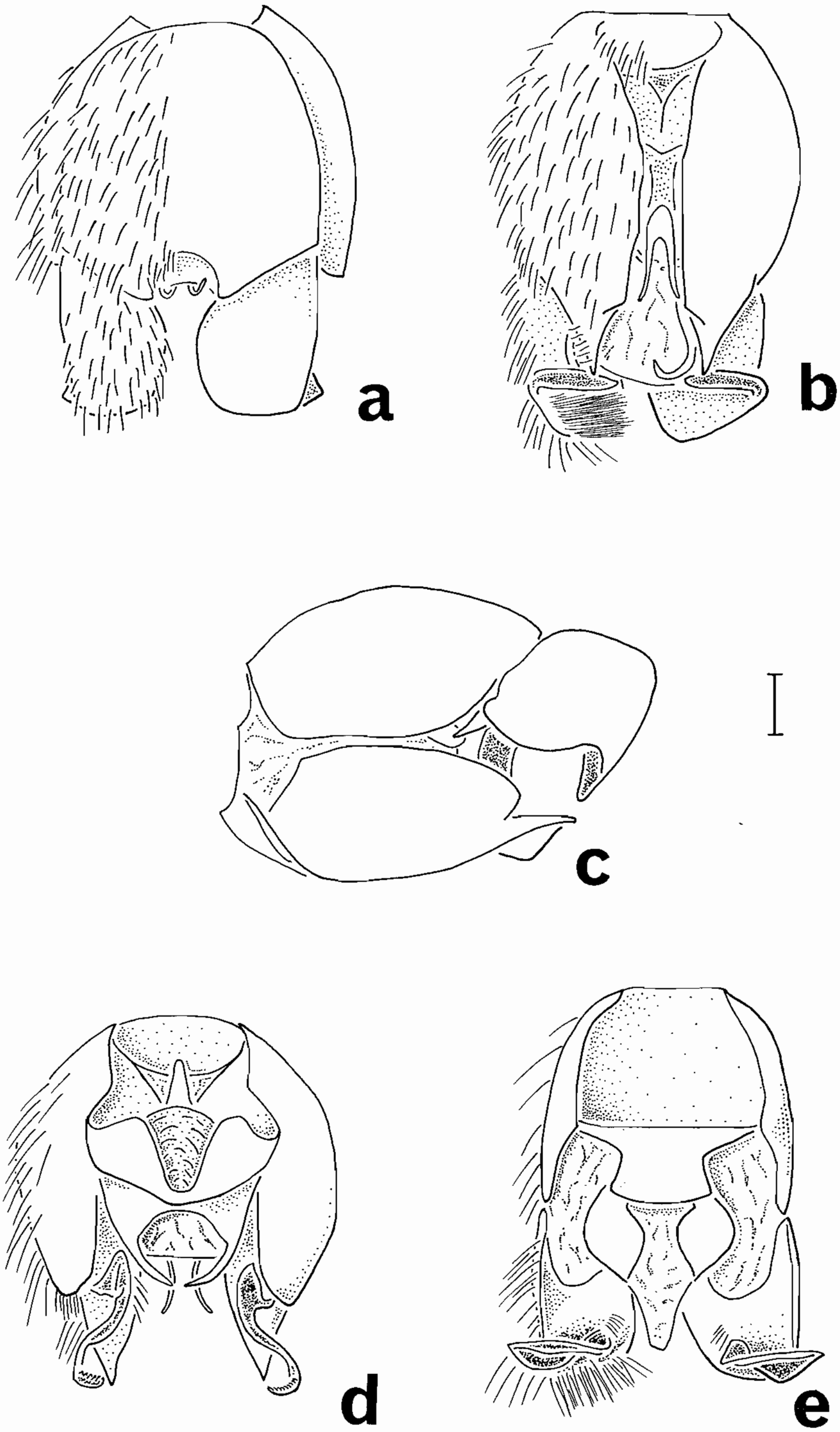


FIG. 32. Male genitalia of *Australosymmerus* (*Vellicocauda*) *maculatus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

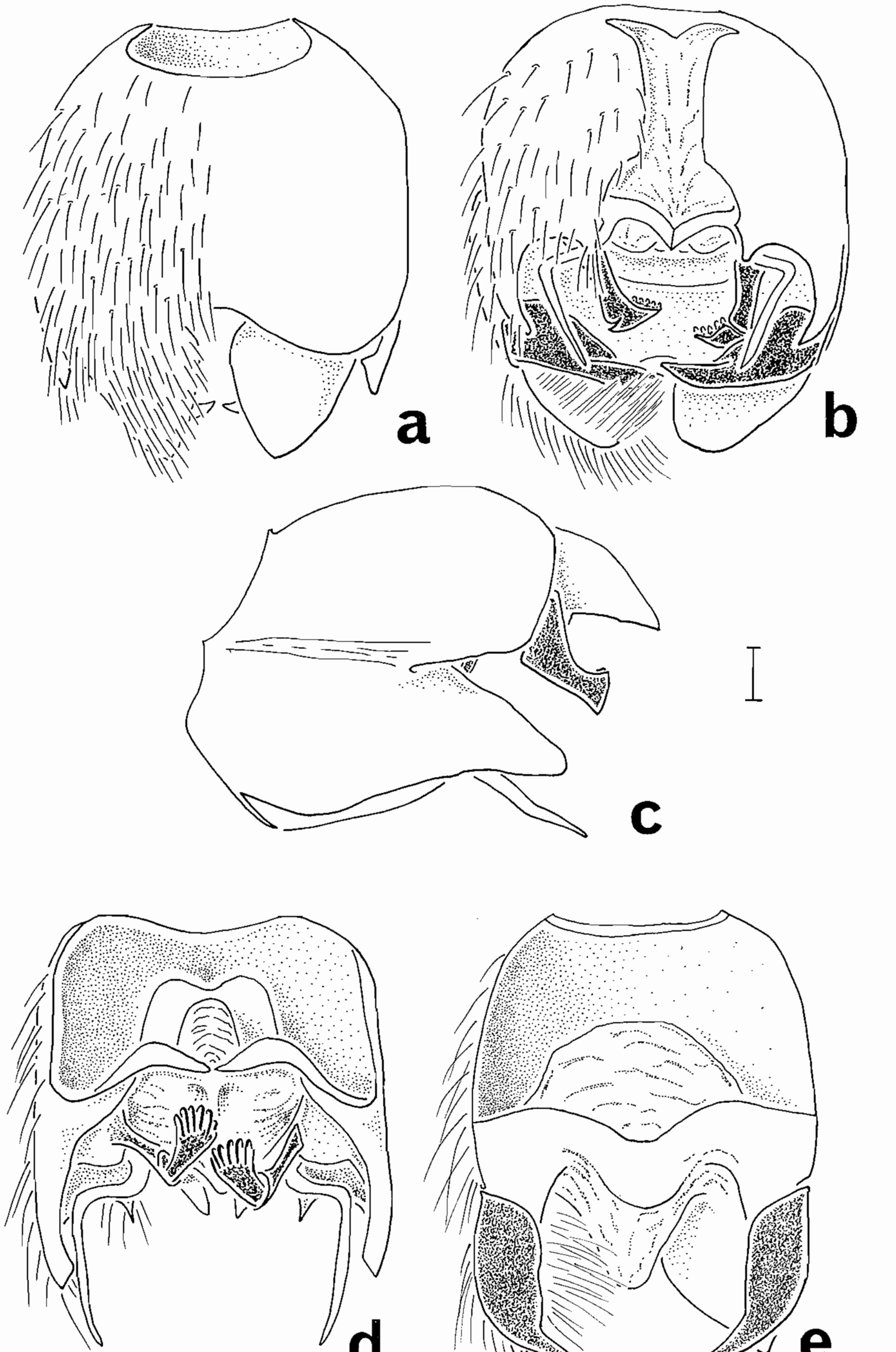


FIG. 33. Male genitalia of *Australosymmerus* (*Tantrus*) *montorum* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

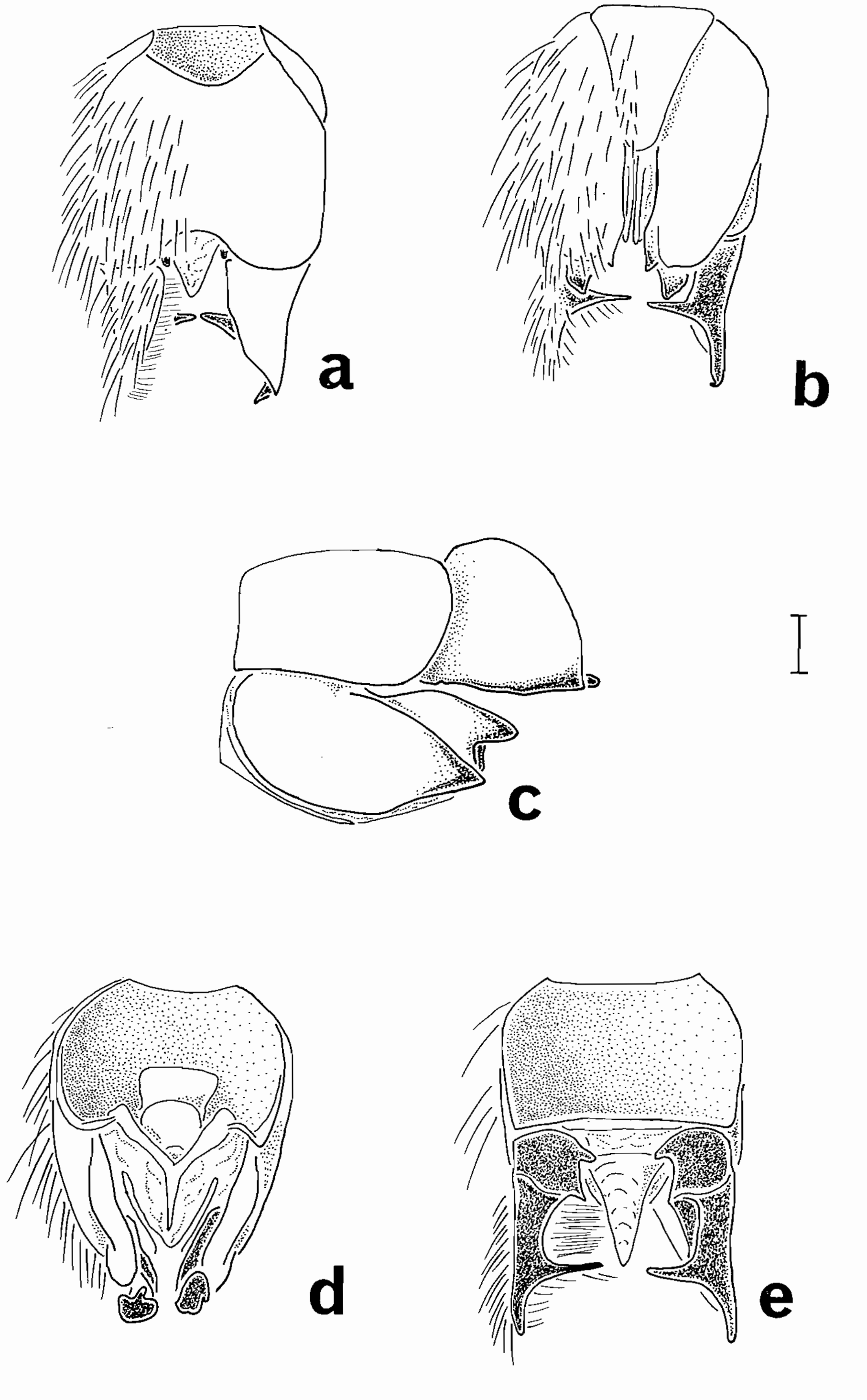


FIG. 34. Male genitalia of *Australosymmerus peruensis* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

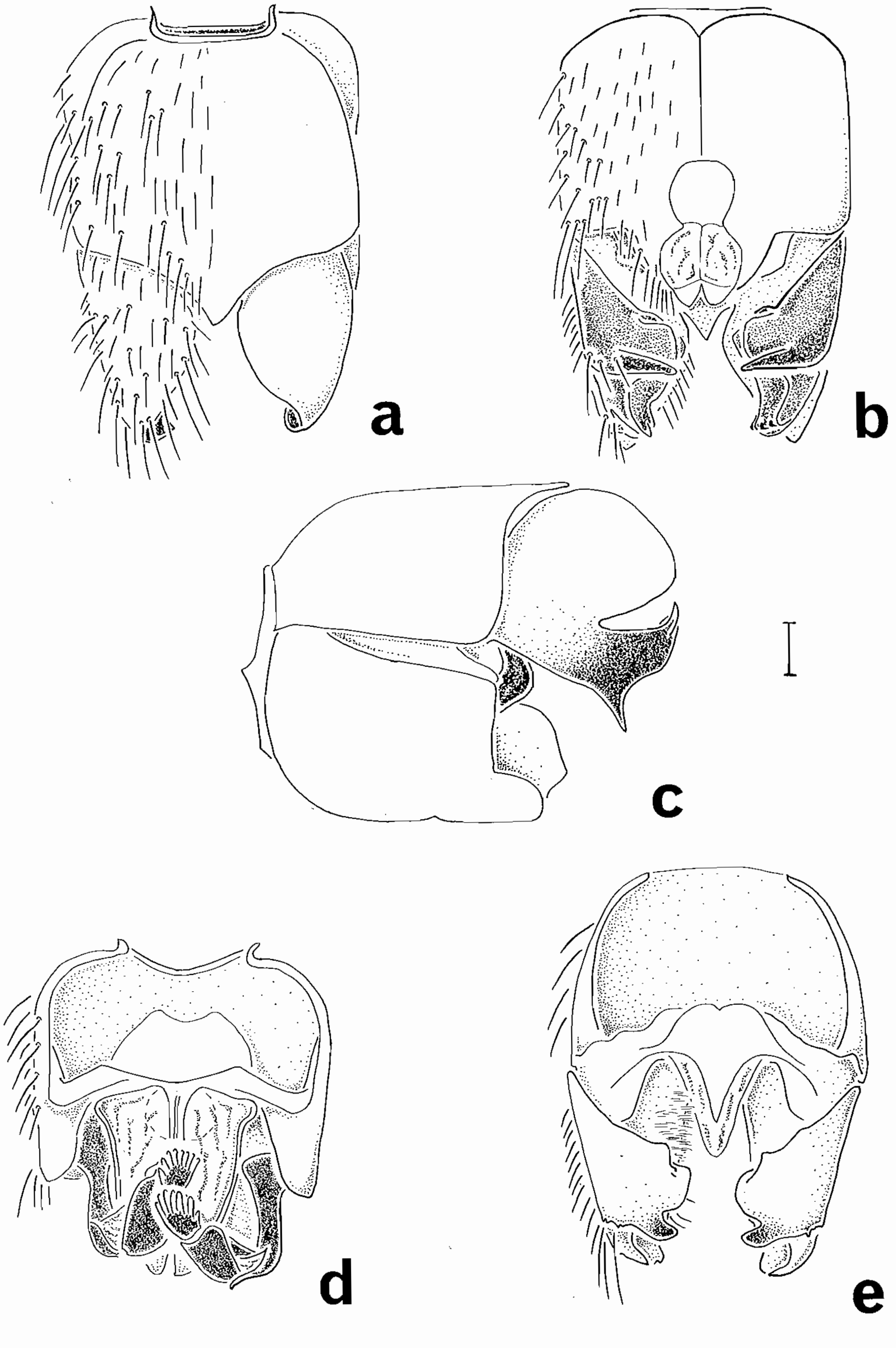


FIG. 35. Male genitalia of *Australosymmerus* (*Melosymmerus*) *bisetosus* (Edwards). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

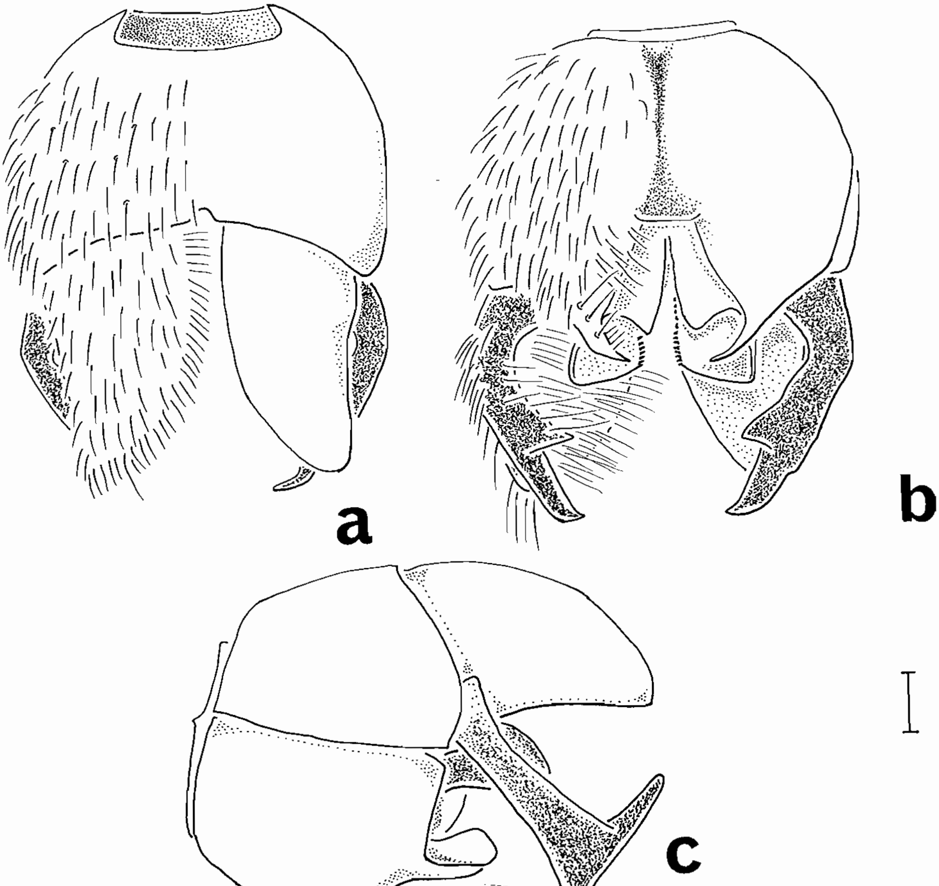


FIG. 36. Male genitalia of *Australosymmerus* (*Melosymmerus*) *pediferus* (Edwards). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

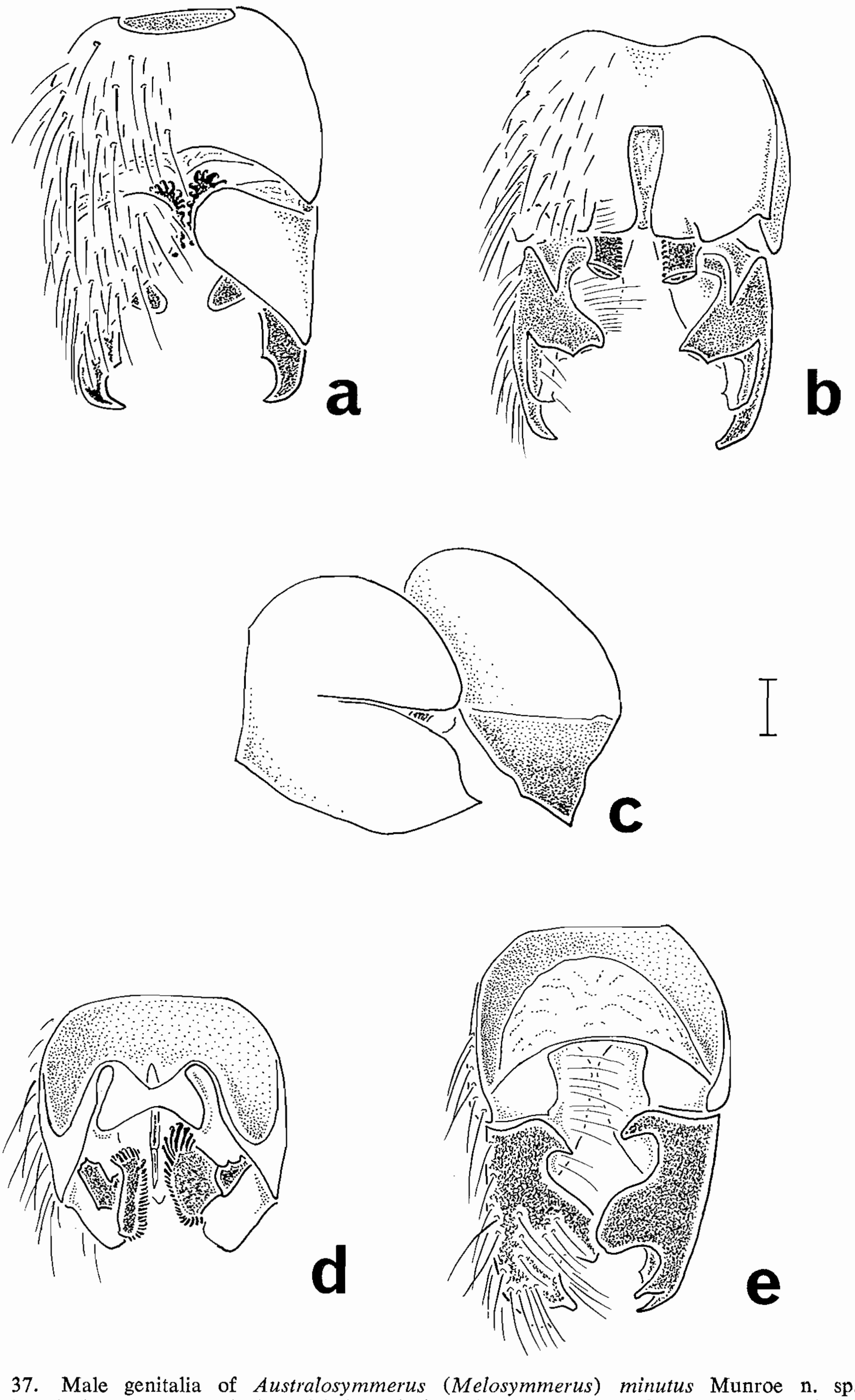


FIG. 37. Male genitalia of *Australosymmerus* (*Melosymmerus*) *minutus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

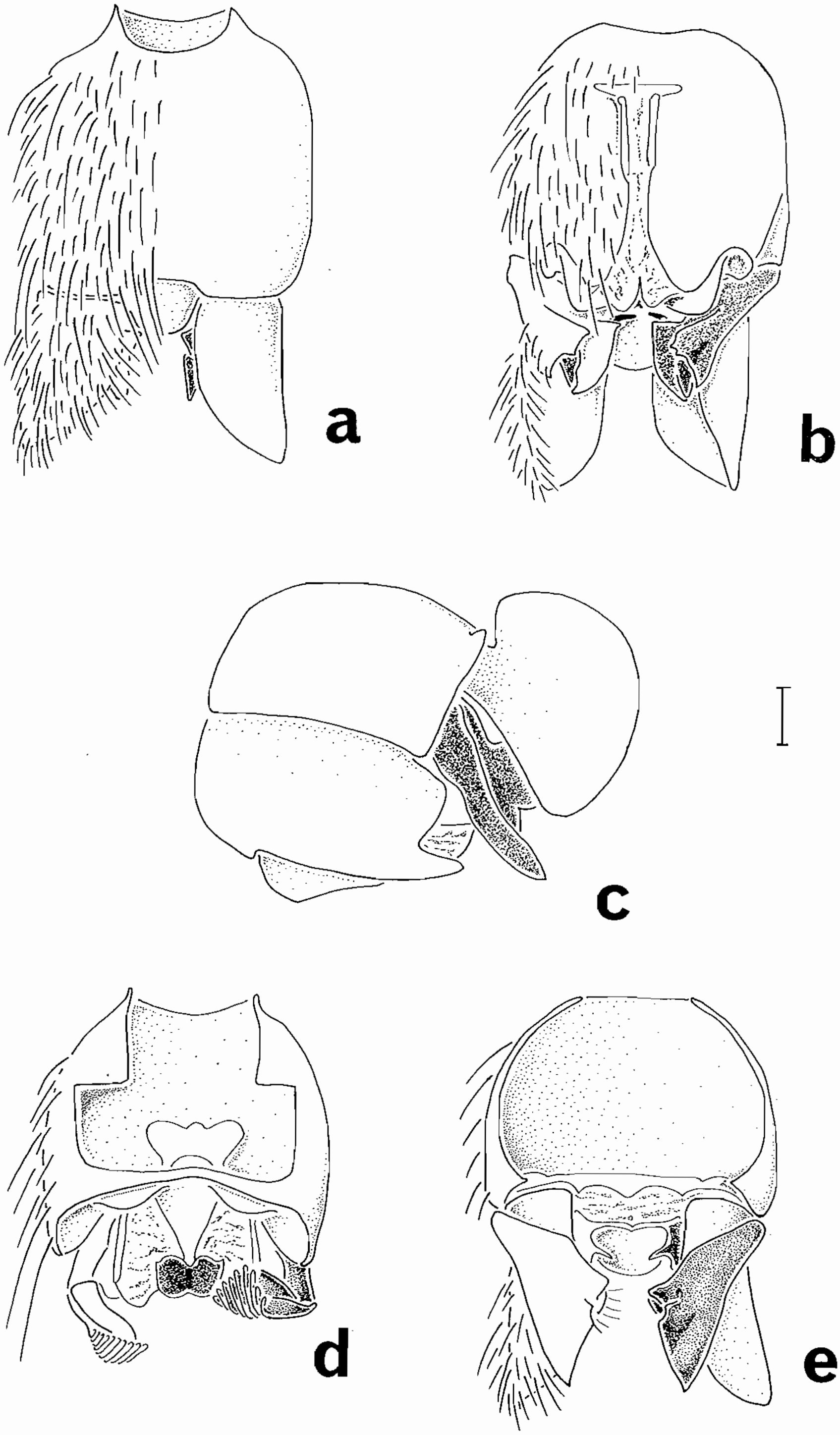


FIG. 38. Male genitalia of *Australosymmerus* (*Melosymmerus*) *acutus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

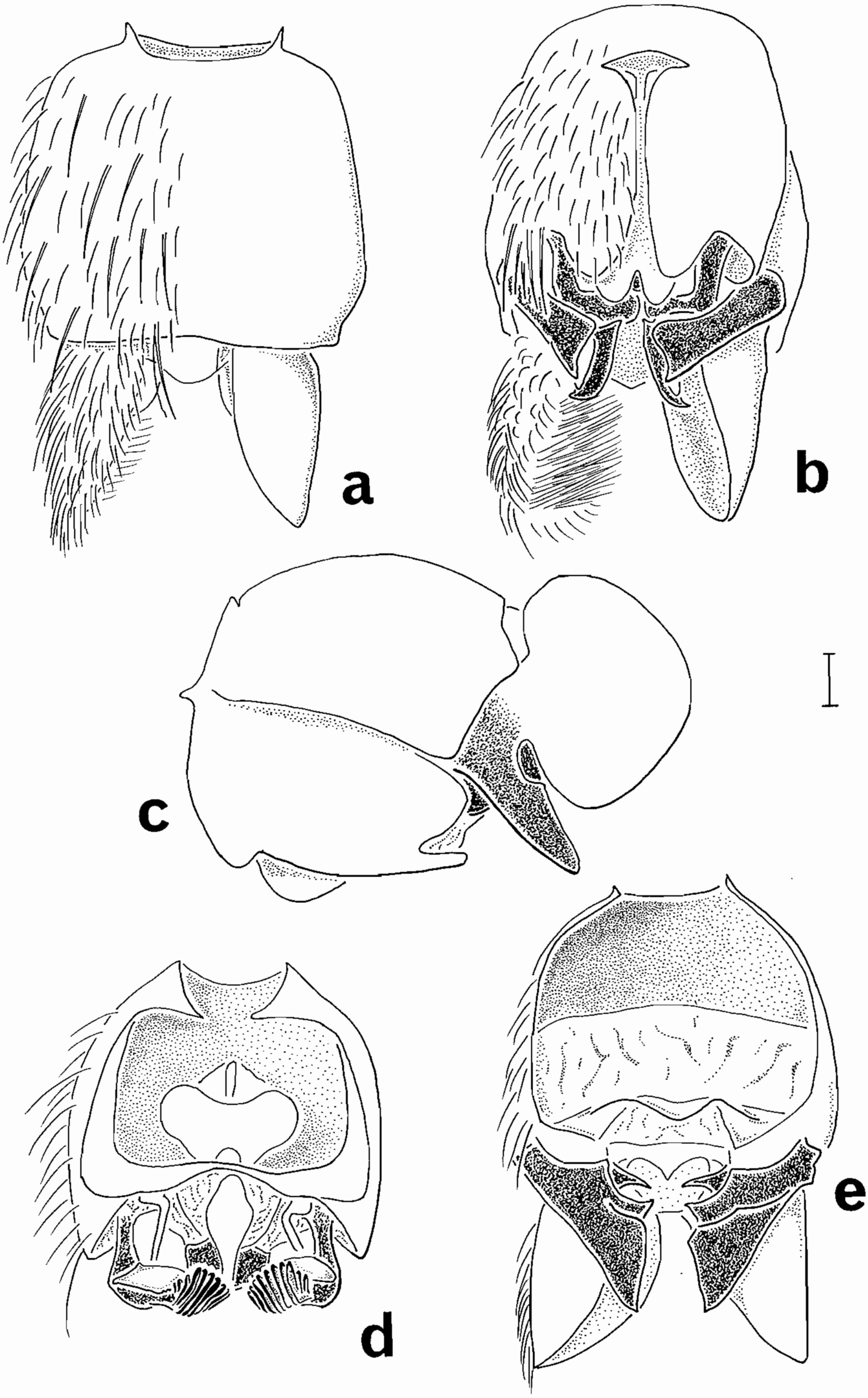


FIG. 39. Male genitalia of *Australosymmerus* (*Melosymmerus*) *truncatus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

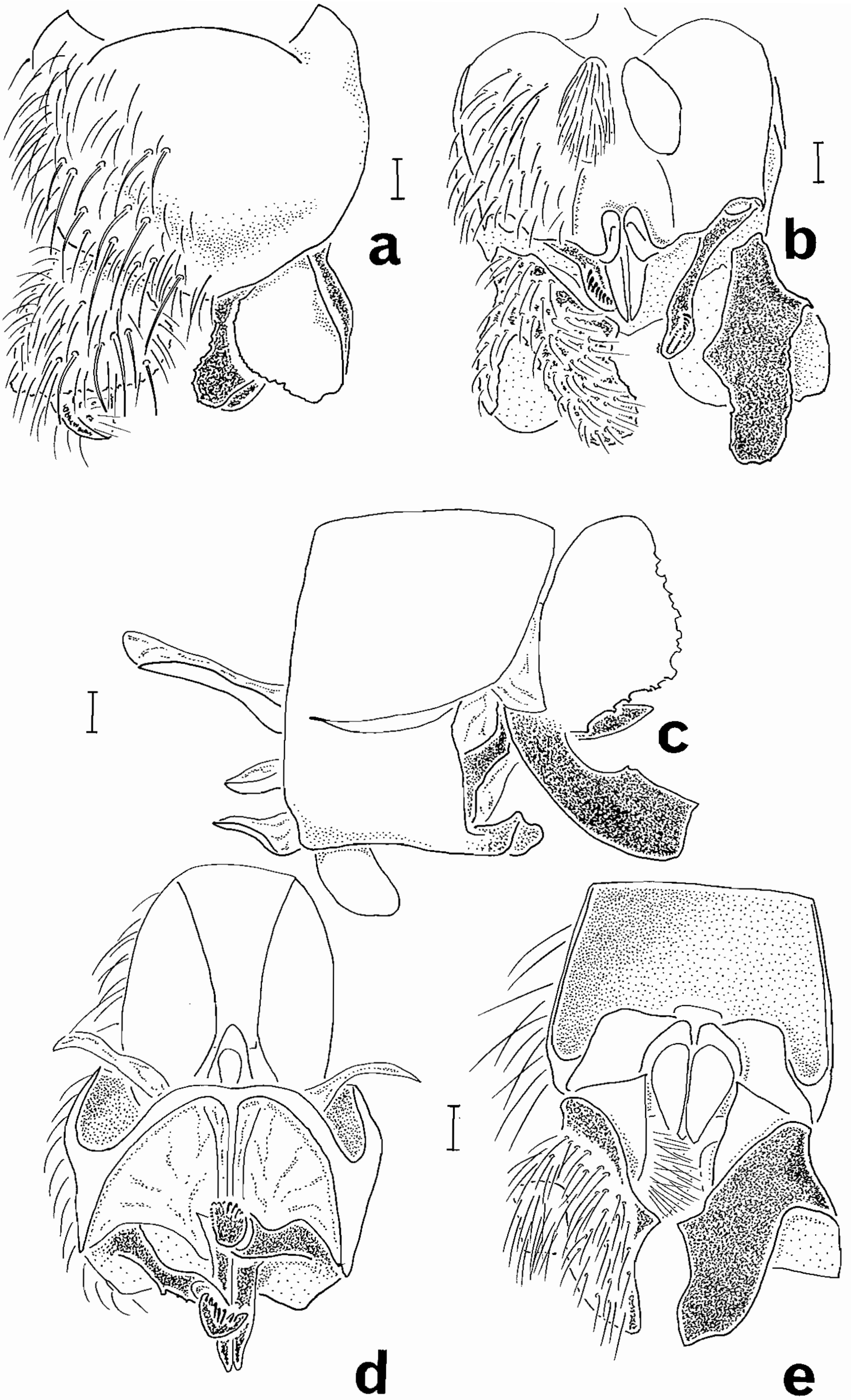


FIG. 40. Male genitalia of *Australosymmerus* (*Calosymmerus*) *bifasciatus* (Williston). (a) dorsal view; (b) ventral view; (c) lateral view; (d) dorsal view of segment 9 (tergite 9 removed); (e) ventral view of tergite 9 and segment 10.

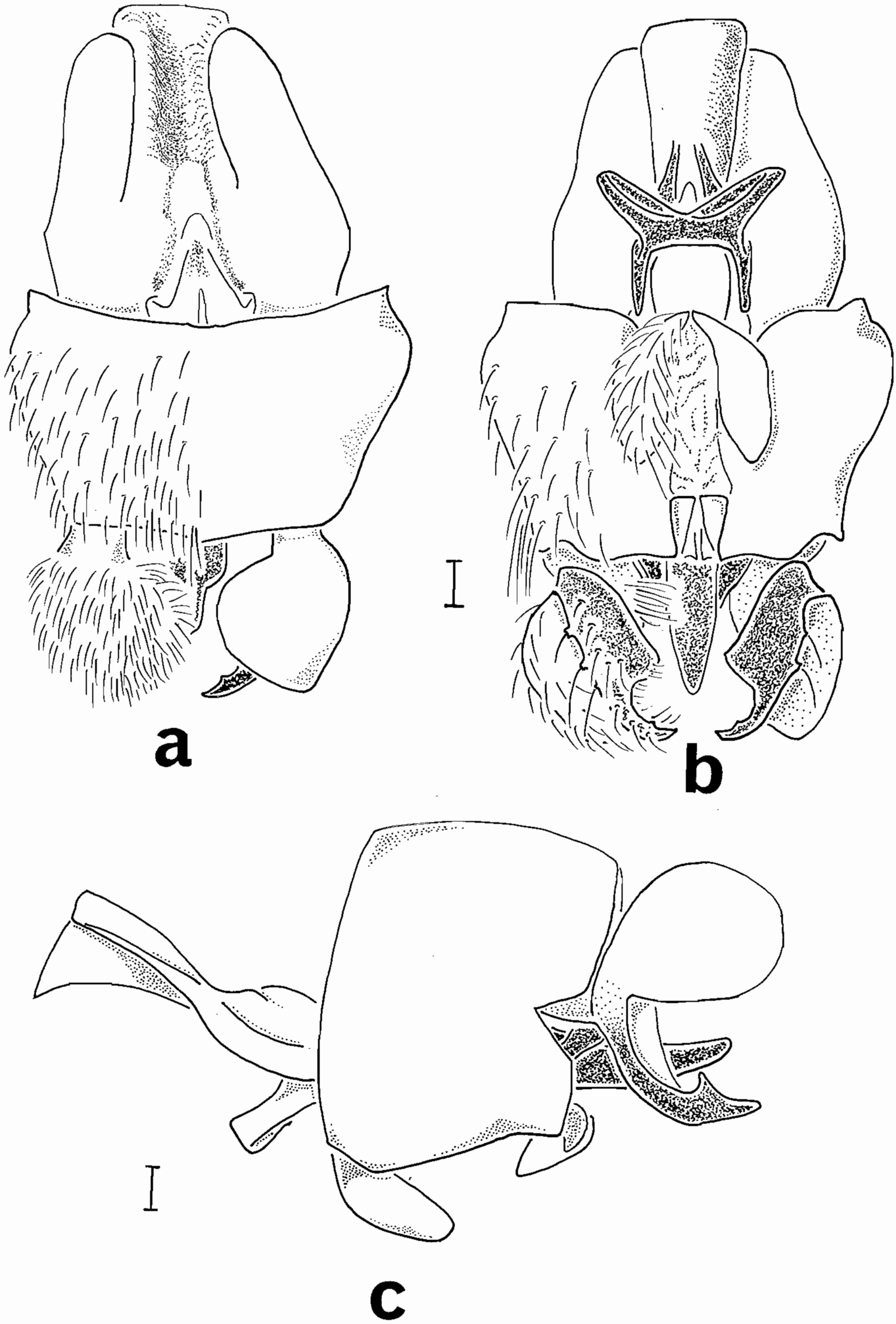


FIG. 41. Male genitalia of *Australosymmerus* (*Calosymmerus*) *magnificus* Munroe n. sp. (a) dorsal view; (b) ventral view; (c) lateral view.

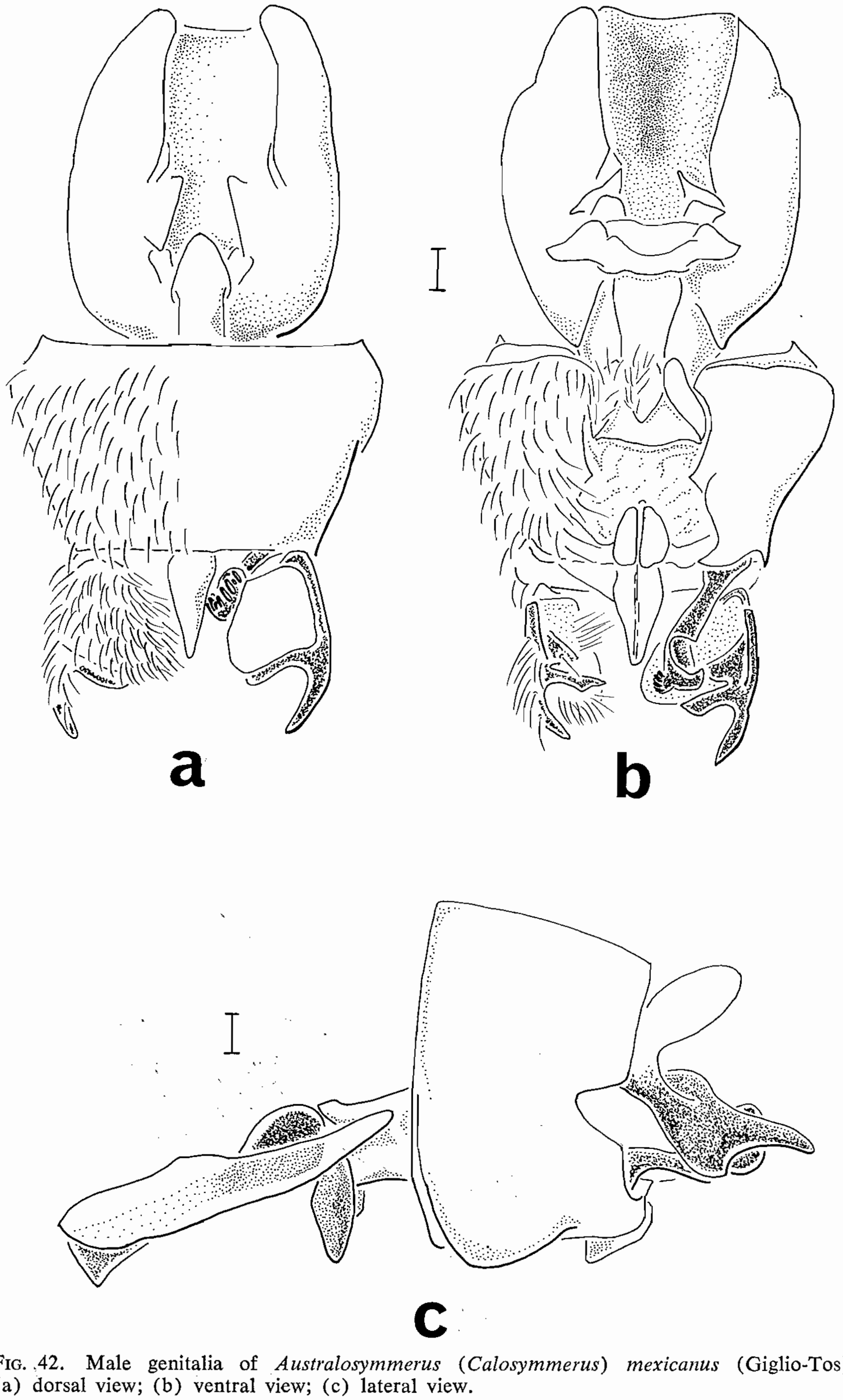


FIG. 42. Male genitalia of *Australosymmerus* (*Calosymmerus*) *mexicanus* (Giglio-Tos). (a) dorsal view; (b) ventral view; (c) lateral view.

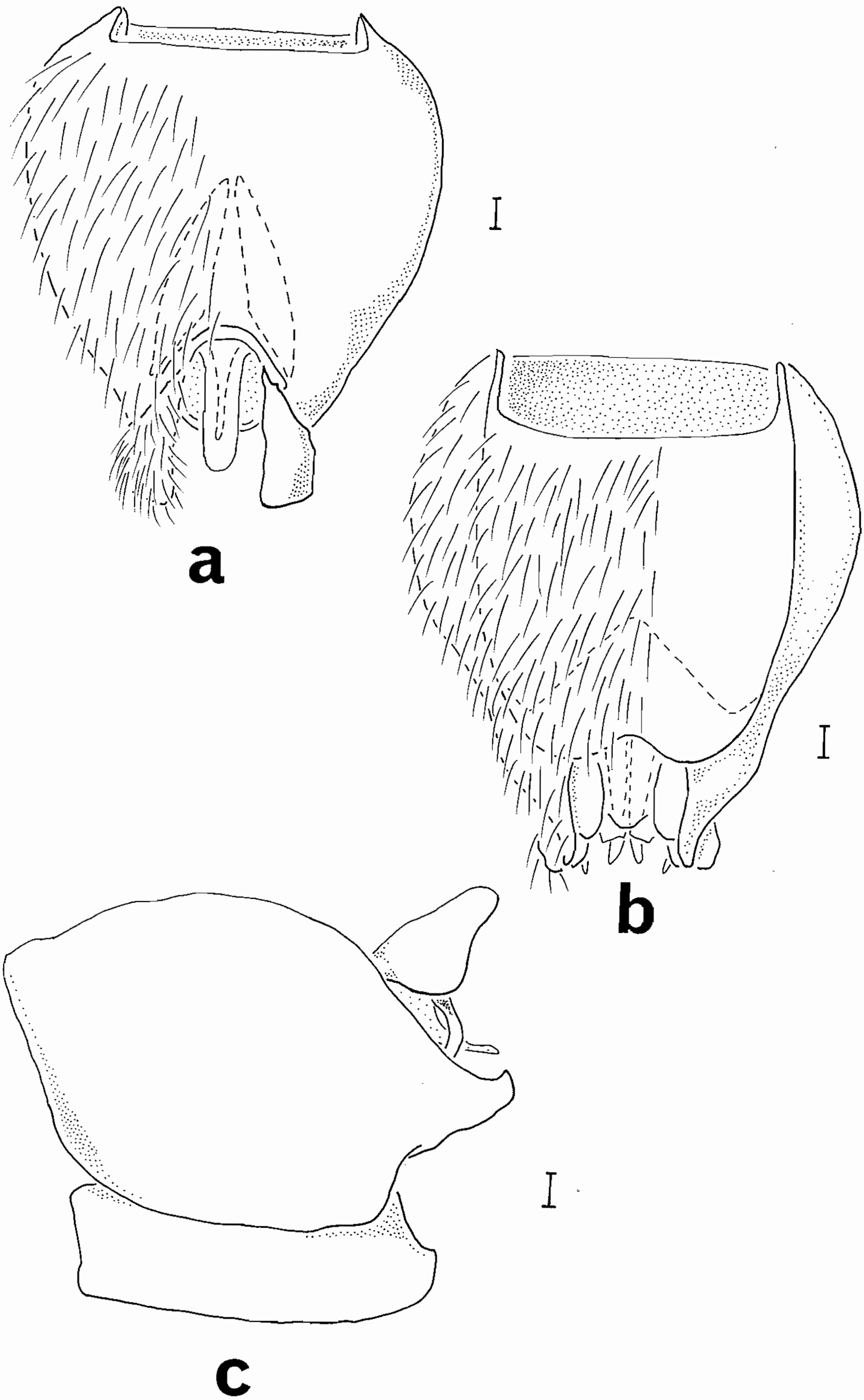
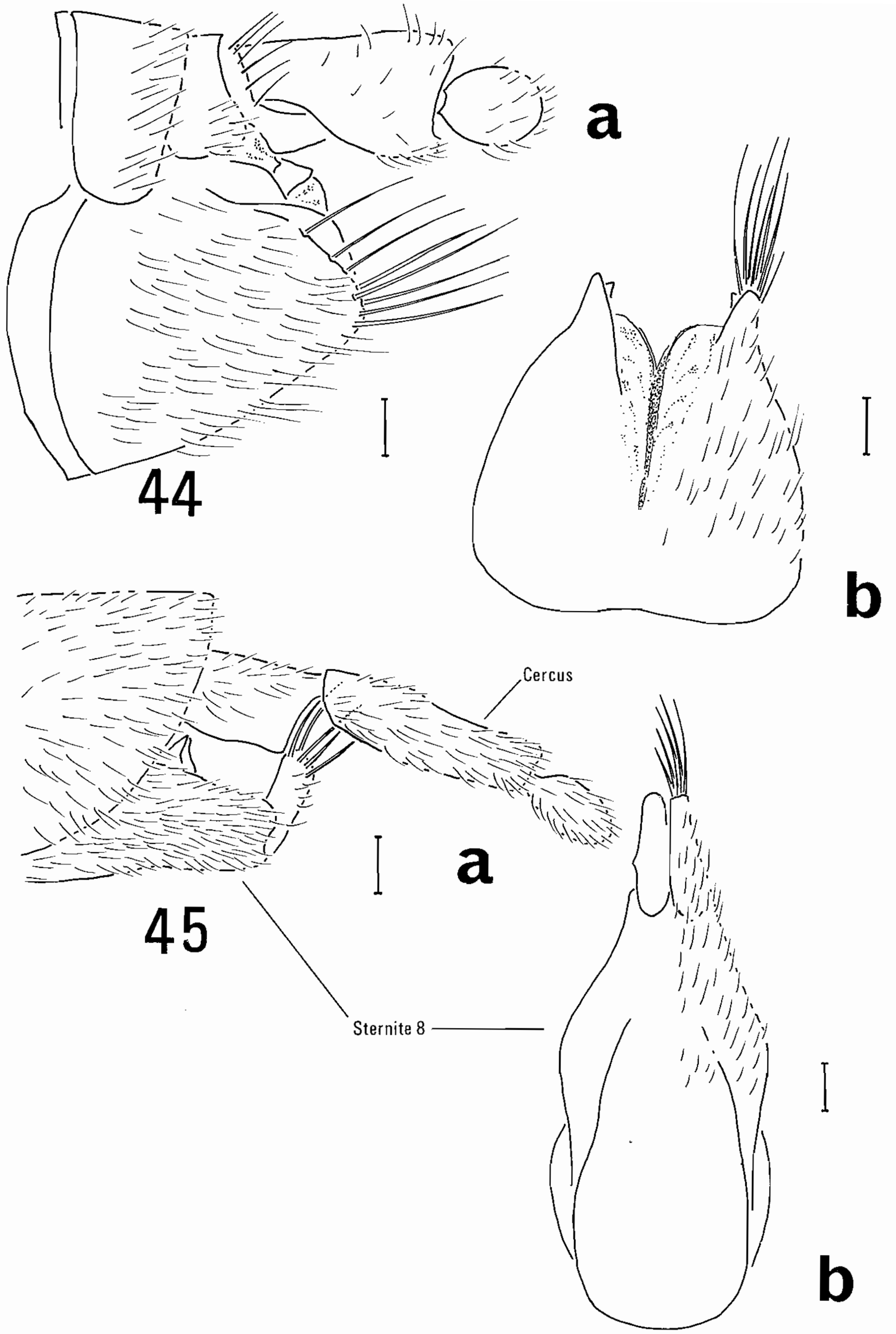
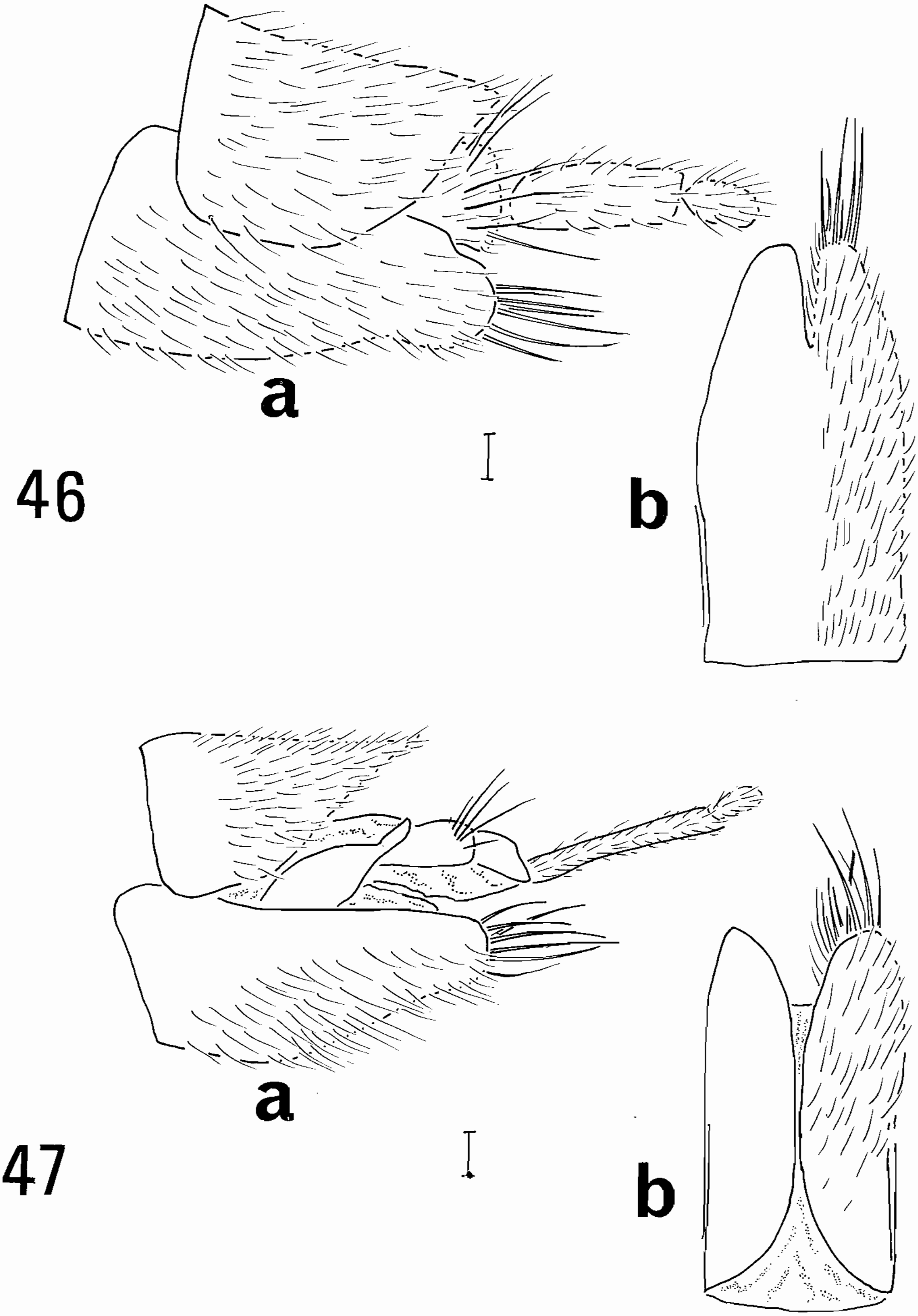


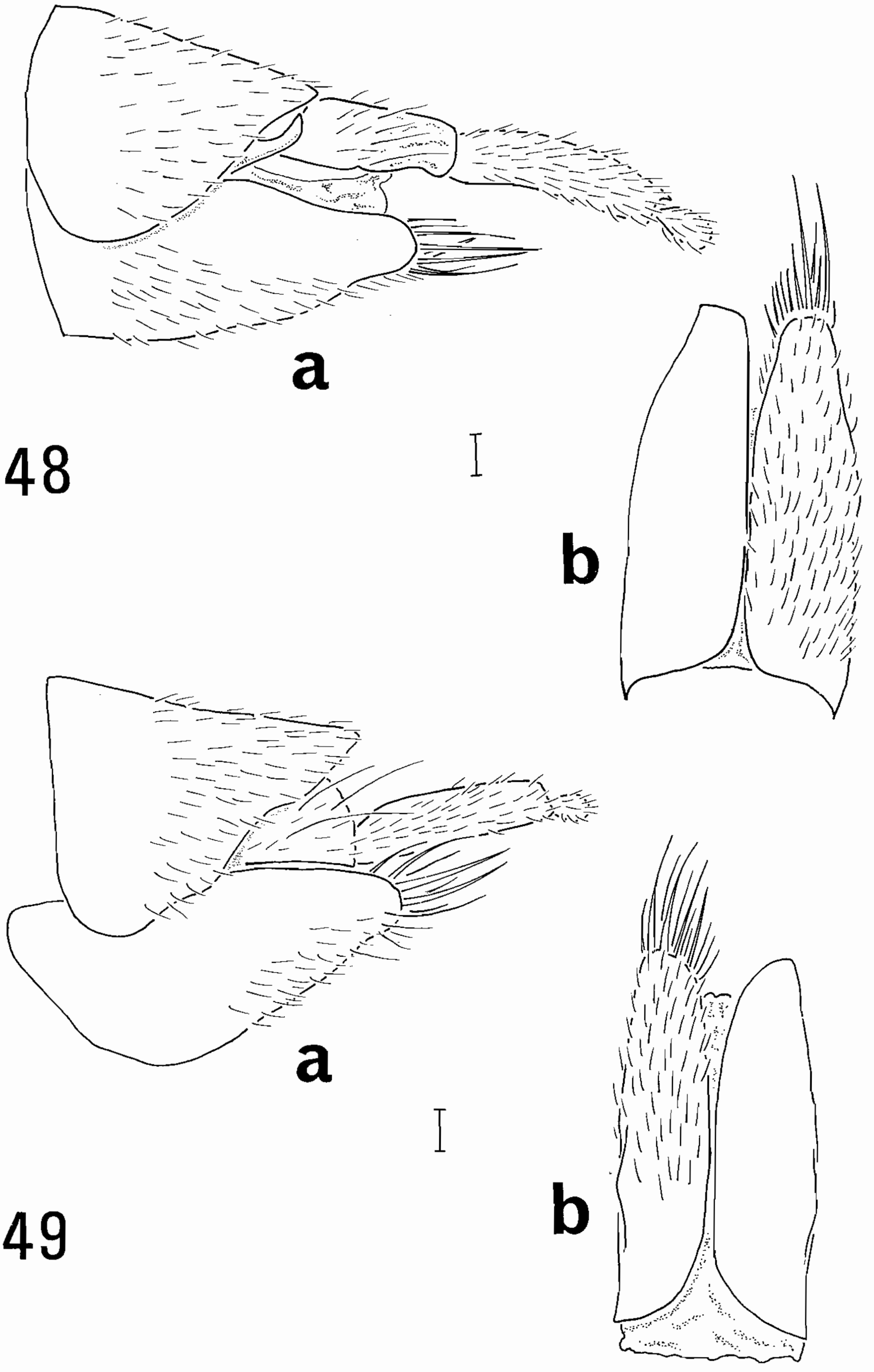
FIG. 43. Male genitalia of *Australosymmerus zonatus* (Giglio-Tos). (a) dorsal view; (b) ventral view; (c) lateral view.



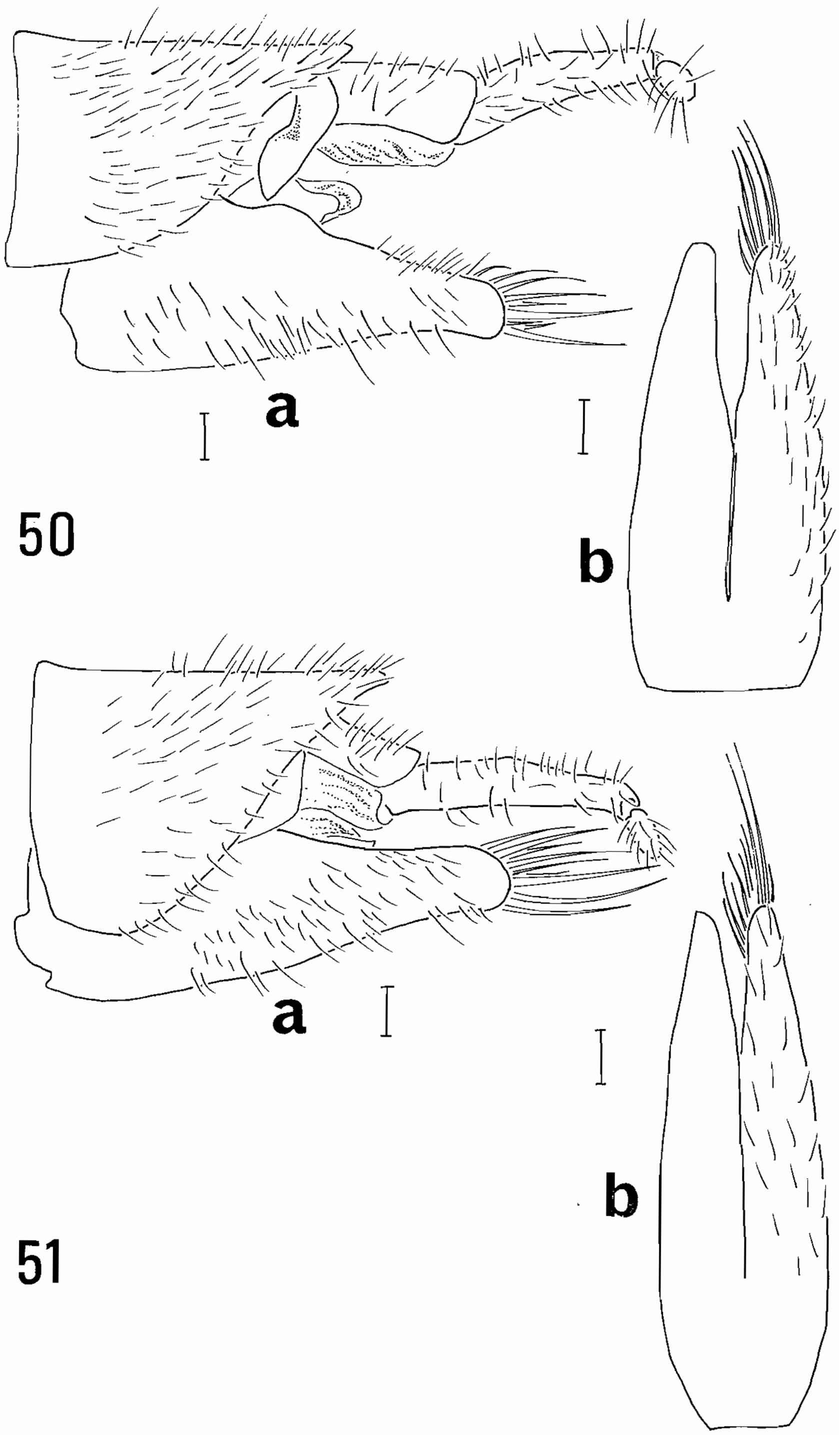
FIGS. 44–45. Female genitalia of (44) *Symmerus* (*Symmerus*) *annulatus* (Meigen) and (45) *Australosymmerus* (*Australosymmerus*) *stigmaticus* (Phillippi). (a) lateral view; (b) ventral view of sternite 8.



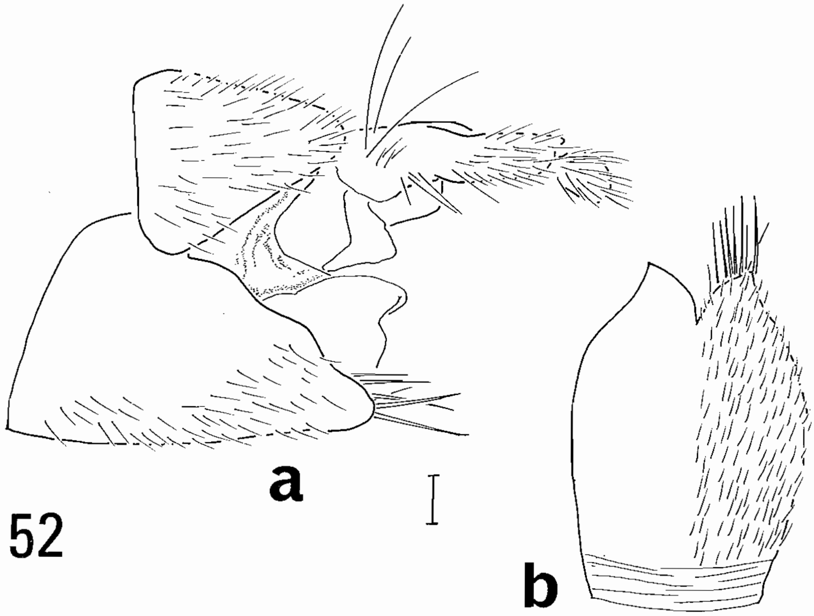
FIGS. 46–47. Female genitalia of (46) *Australosymmerus* (*Australosymmerus*) *basalis* (Tonnoir) and (47) *A.* (*A.*) *nitidus* (Tonnoir). (a) lateral view; (b) ventral view of sternite 8.

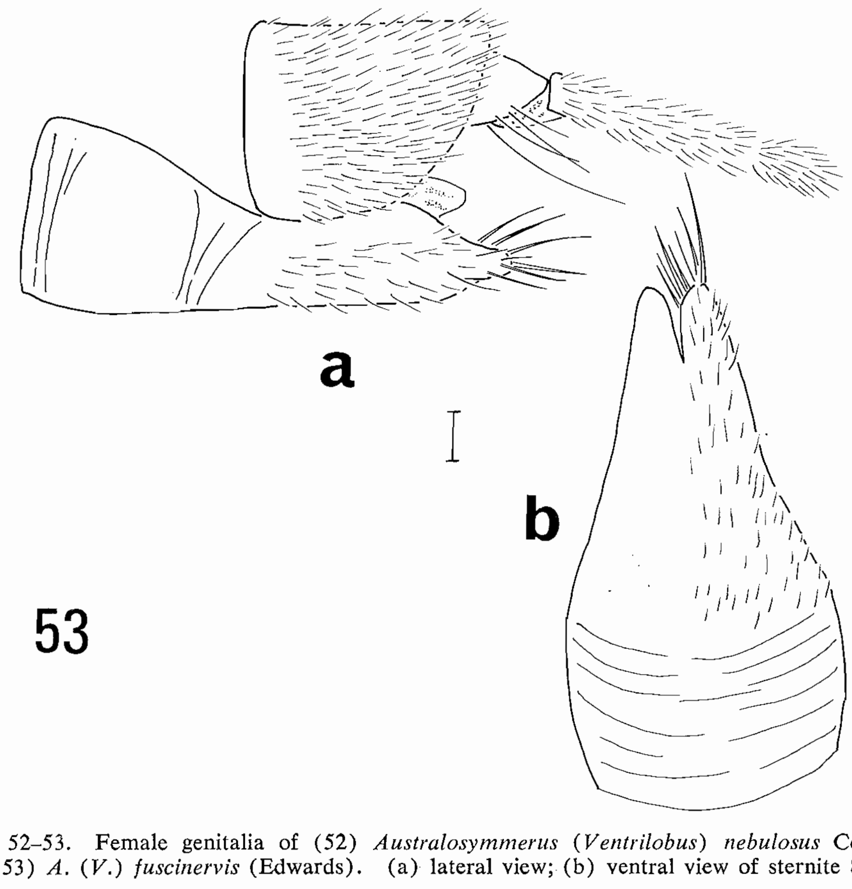


FIGS. 48–49. Female genitalia of (48) *Australosymmerus* (*Australosymmerus*) *tillyardi* (Tonnoir) and (49) *Australosymmerus trivittatus* (Edwards). (a) lateral view; (b) ventral view of sternite 8.

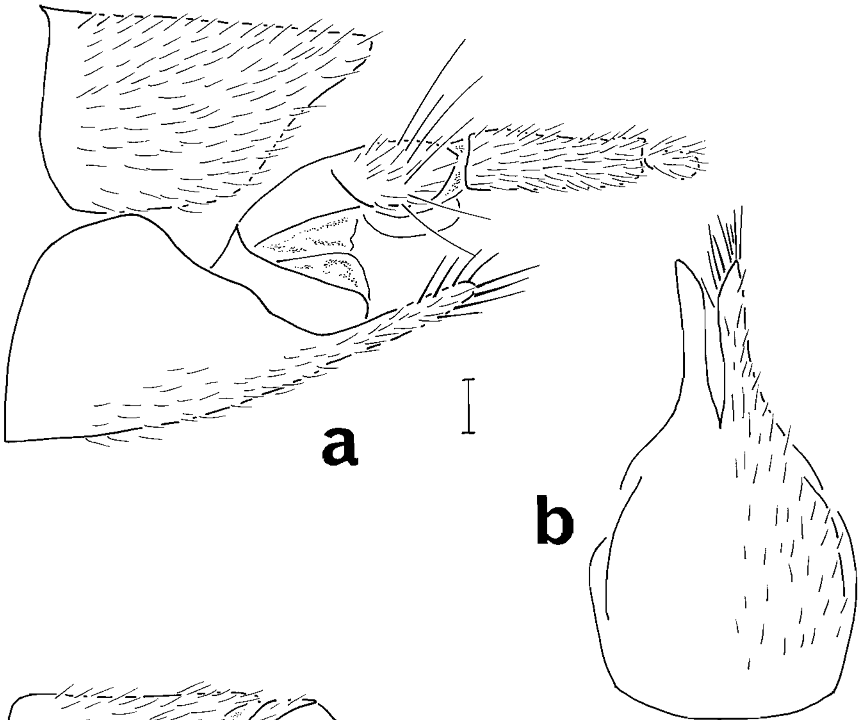


FIGS. 50–51. Female genitalia of (50) *Australosymmerus* (*Crionisca*) *rieki* (Colless) and (51) *A.* (*C.*) *aculeatus* (Edwards). (a) lateral view; (b) ventral view of sternite 8.





FIGS. 52–53. Female genitalia of (52) *Australosymmerus* (*Ventrilobus*) *nebulosus* Colless and (53) *A.* (*V.*) *fuscinervis* (Edwards). (a) lateral view; (b) ventral view of sternite 8.



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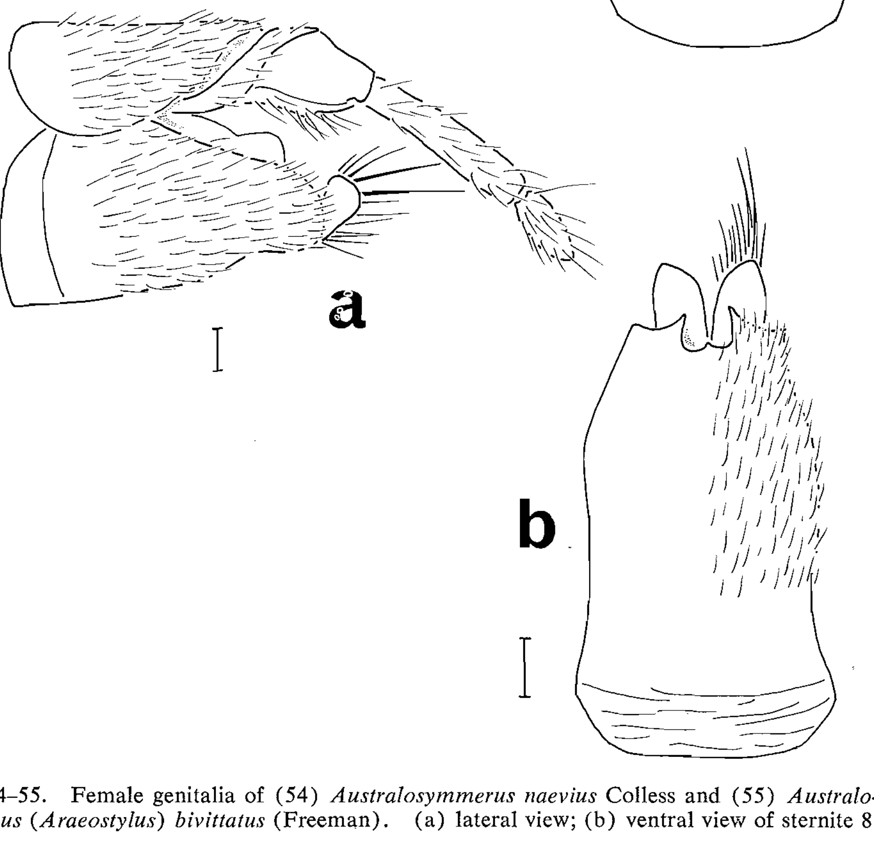
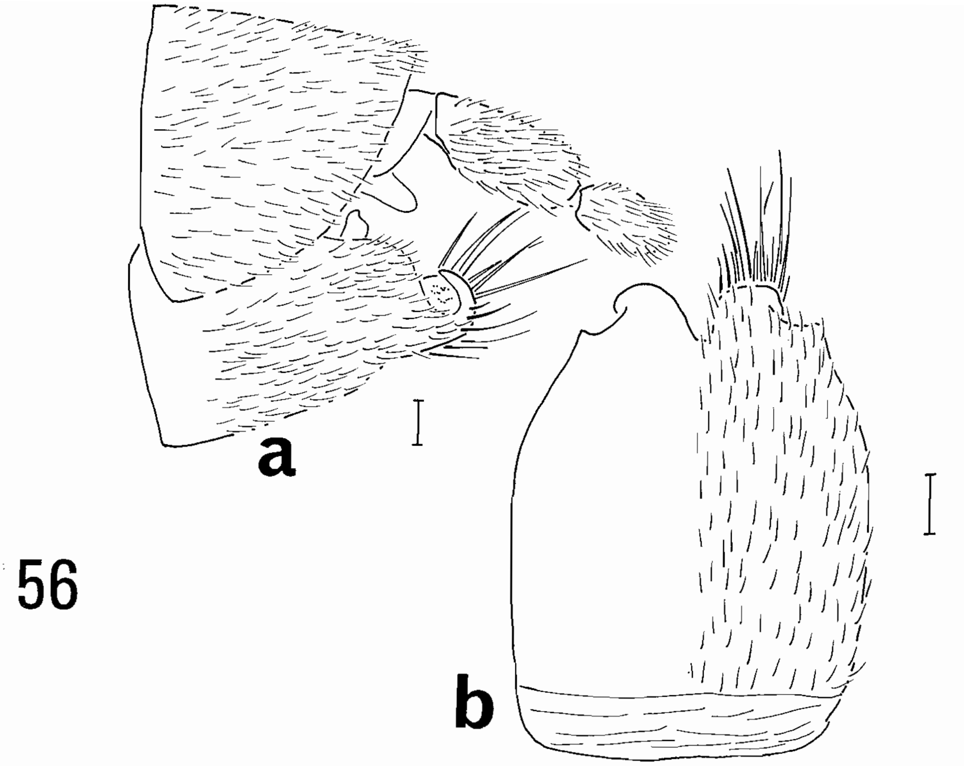
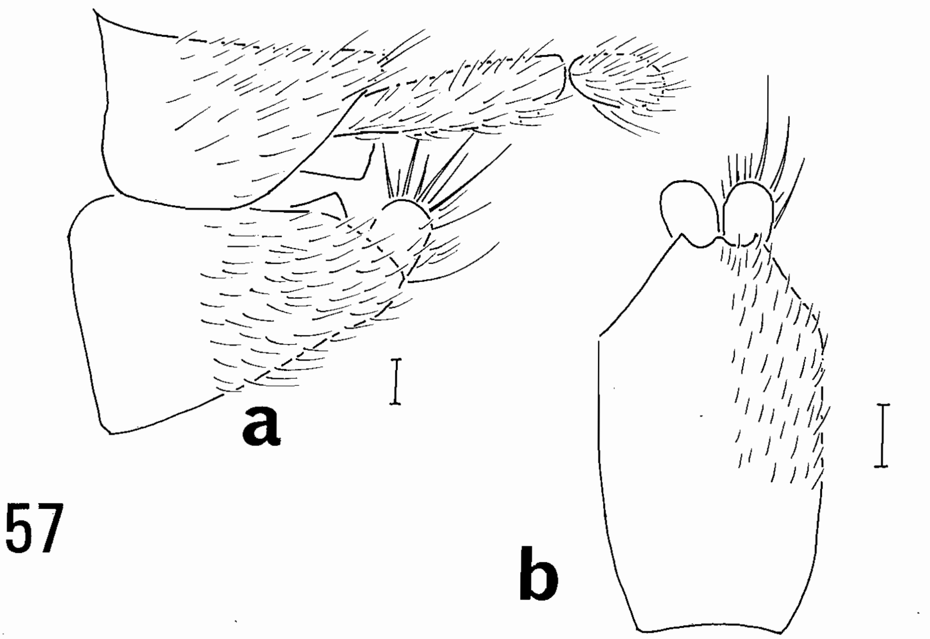


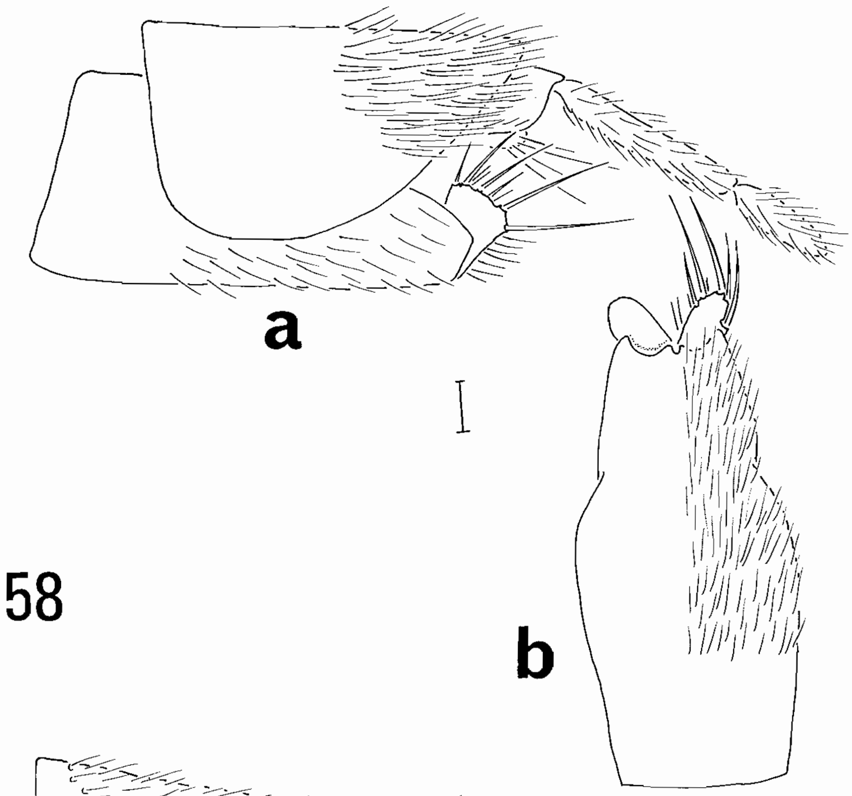
55

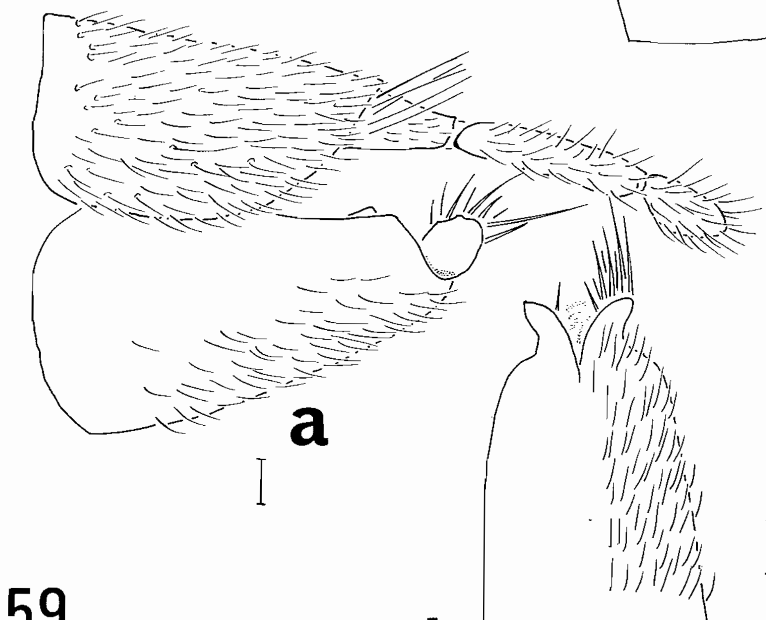
FIGS. 54–55. Female genitalia of (54) *Australosymmerus naevius* Colless and (55) *Australosymmerus* (*Araeostylus*) *bivittatus* (Freeman). (a) lateral view; (b) ventral view of sternite 8.



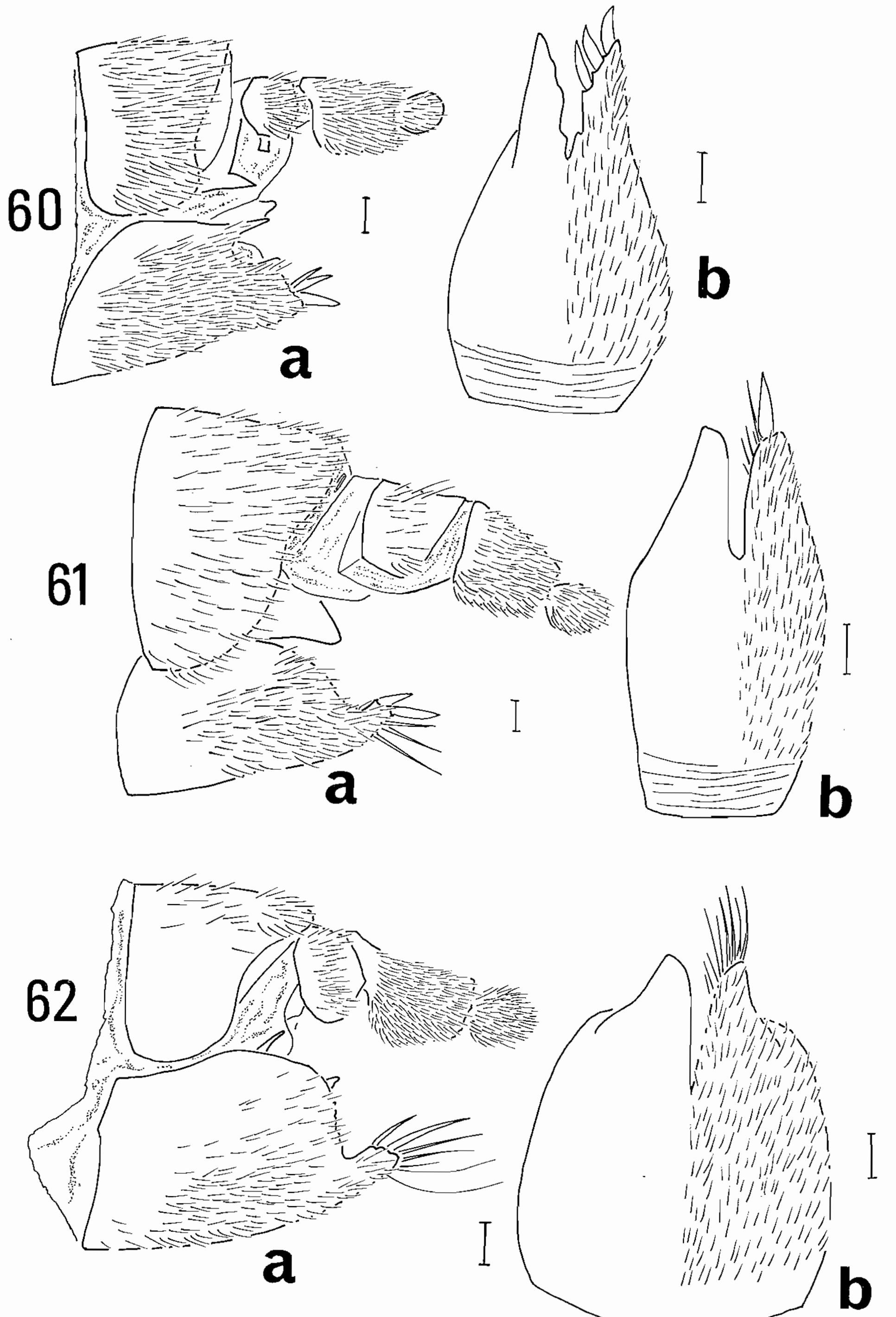


FIGS. 56–57. Female genitalia of (56) *Australosymmerus* (*Araeostylus*) *simplex* (Freeman) and (57) *A.* (*A.*) *lobatus* Munroe n. sp. (a) lateral view; (b) ventral view of sternite 8.





FIGS. 58–59. Female genitalia of (58) *Australosymmerus* (*Araeostylus*) *collessi* Munroe n. sp. and (59) *Australosymmerus* (*Vellicocauda*) *insolitus* (Walker). (a) lateral view; (b) ventral view of sternite 8.



FIGS. 60–62. Female genitalia of (60) *Australosymmerus* (*Melosymmerus*) *acutus* Munroe n. sp., (61) *A.* (*M.*) *bisetosus* (Edwards), and (62) *A.* (*M.*) *pediferus* (Edwards). (a) lateral view; (b) ventral view of sternite 8.

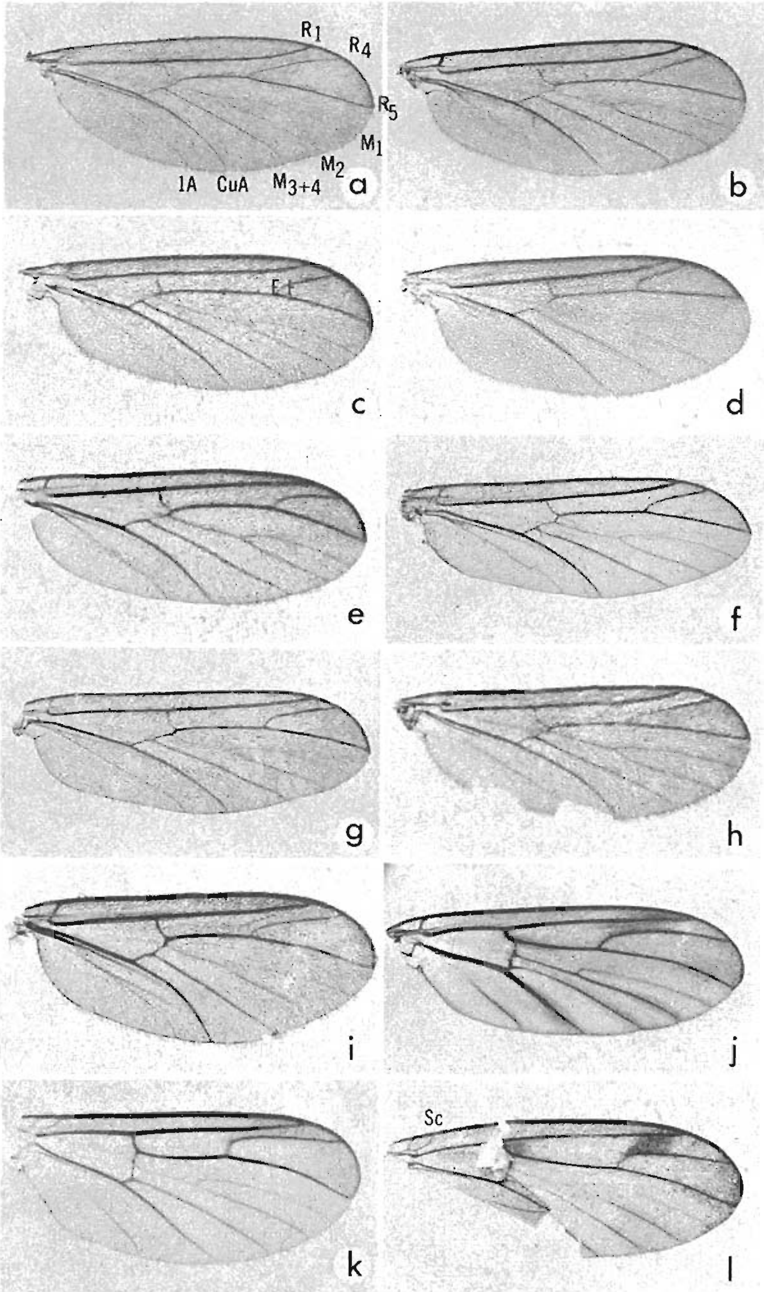


FIG. 63. Wings of *Symmerus* and *Australosymmerus*. (a) *S.* (*Symmerus*) *annulatus* (Meigen); (b) *S.* (*Symmerus*) *nobilis* Lackschewitz; (c) *S.* (*Symmerus*) *lautus* (Loew); (d) *S.* (*Symmerus*) *antennalis* Okada; (e) *S.* (*Psilosymmerus*) *coqulus* Garrett; (f) *S.* (*Psilosymmerus*) *vockerothi* Munroe n. sp.; (g) *S.* (*Psilosymmerus*) *uncatus* Munroe n. sp.; (h) *S.* (*Psilosymmerus*) *brevicornis* Okada; (i) *S.* (*Psilosymmerus*) *nepalensis* Munroe n. sp.; (j) *A.* (*Australosymmerus*) *stigmaticus* (Phillippi); (k) *A.* (*Crionisca*) *aculeatus* (Edwards); (l) *A.* (*Crionisca*) *magellani* Munroe n. sp. ABBREVIATIONS: Sc, subcosta; R_1, R_4 and R_5, first, fourth and fifth radial veins, respectively; M_1, M_2 and M_{3+4}, first, second and third plus fourth medial veins, respectively; CuA, anterior cubital vein; 1A, anal vein.

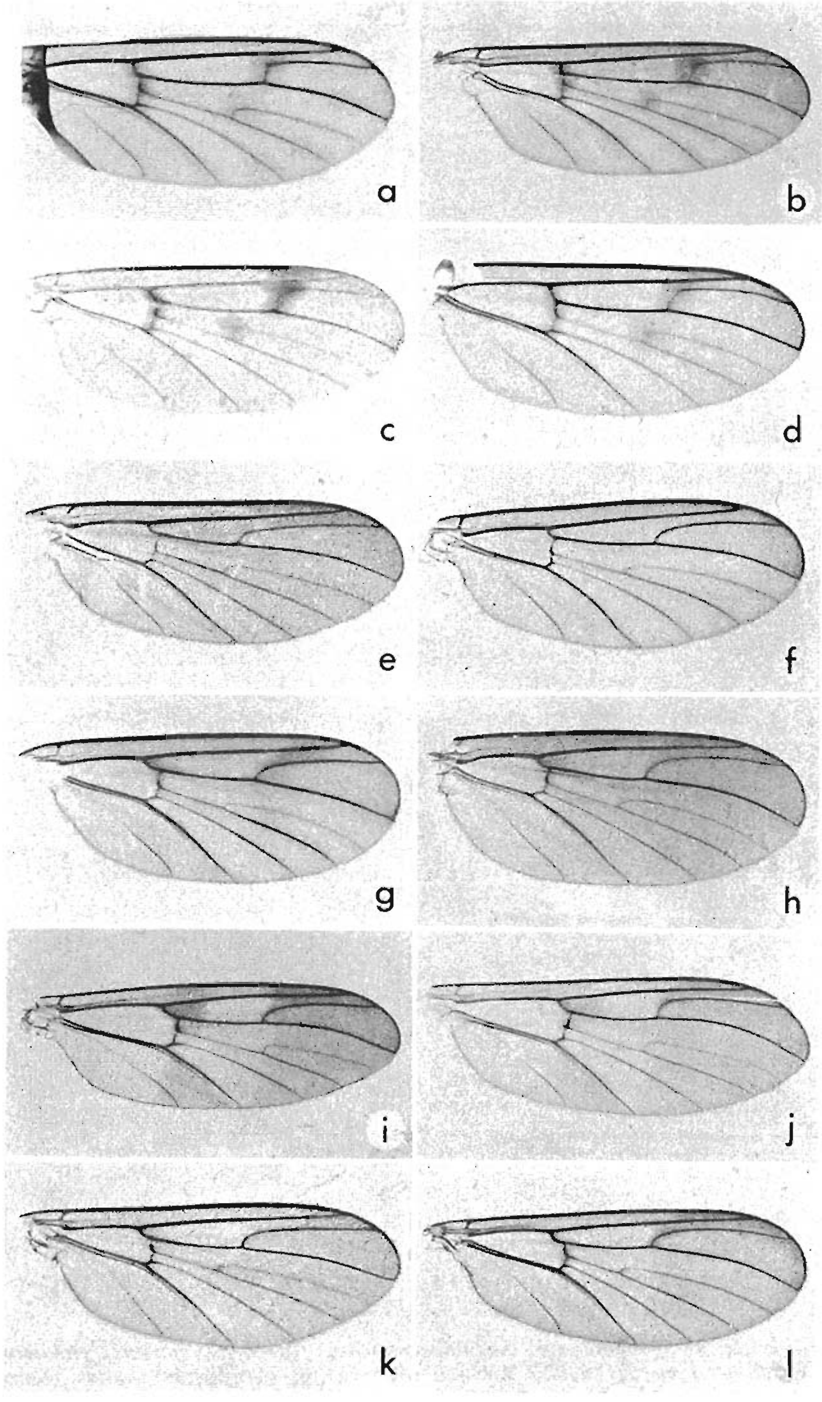


FIG. 64. Wings of *Australosymmerus*. (a) *A.* (*Ventrilobus*) *fuscinervis* (Edwards); (b) *A.* (*Ventrilobus*) *propinquus* Colless; (c) *A. naevius* Colless; (d) *A. tonnoiri* Colless; (e) *A.* (*Araeostylus*) *bivittatus* (Freeman); (f) *A.* (*Araeostylus*) *simplex* (Freeman); (g) *A.* (*Araeostylus*) *lobatus* Munroe n. sp.; (h) *A.* (*Araeostylus*) *collessi* Munroe n. sp.; (i) *A.* (*Vellicocauda*) *insolitus* (Walker); (j) *A.* (*Vellicocauda*) *confusus* Munroe n. sp.; (k) *A.* (*Vellicocauda*) *maculatus* Munroe n. sp.; (l) *A.* (*Tantrus*) *montorum* Munroe n. sp.

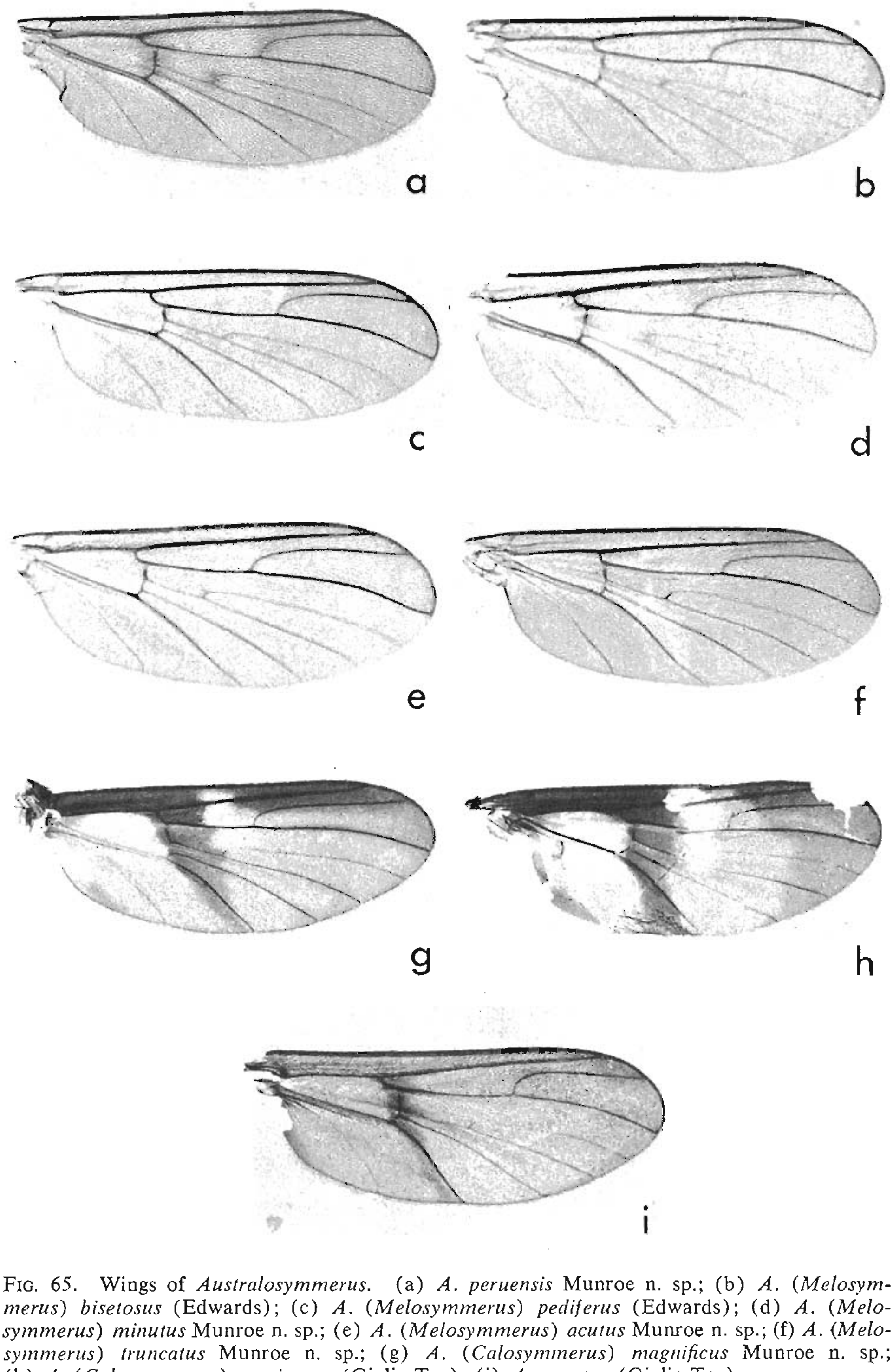


FIG. 65. Wings of *Australosymmerus*. (a) *A. peruensis* Munroe n. sp.; (b) *A.* (*Melosymmerus*) *bisetosus* (Edwards); (c) *A.* (*Melosymmerus*) *pediferus* (Edwards); (d) *A.* (*Melosymmerus*) *minutus* Munroe n. sp.; (e) *A.* (*Melosymmerus*) *acutus* Munroe n. sp.; (f) *A.* (*Melosymmerus*) *truncatus* Munroe n. sp.; (g) *A.* (*Calosymmerus*) *magnificus* Munroe n. sp.; (h) *A.* (*Calosymmerus*) *mexicanus* (Giglio-Tos); (i) *A. zonatus* (Giglio-Tos).

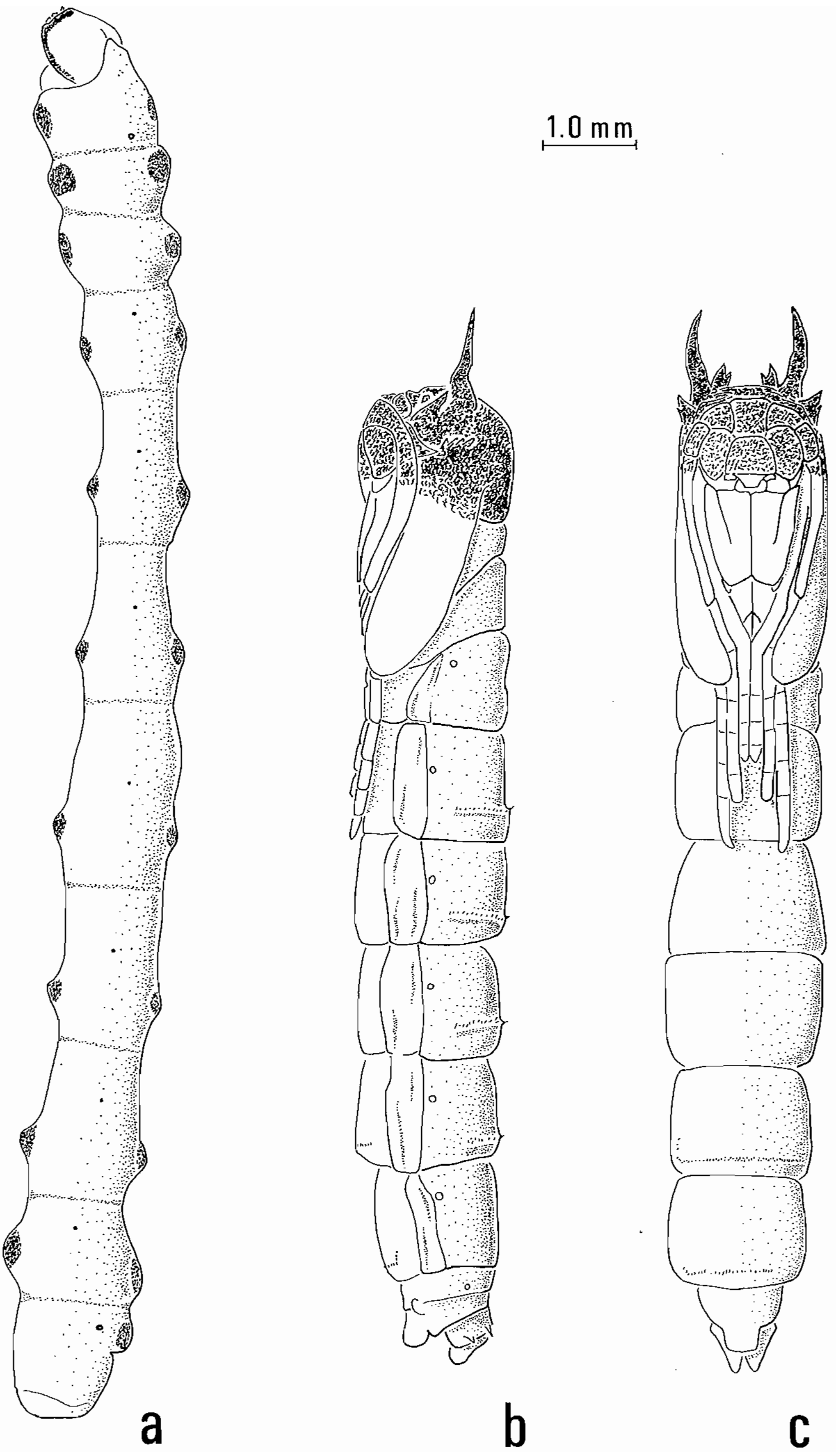


FIG. 66. Immature stages of *Symmerus* (*Psilosymmerus*) *coqulus* Garrett. (a) mature larva; (b) lateral view of pupa; (c) ventral view of pupa.

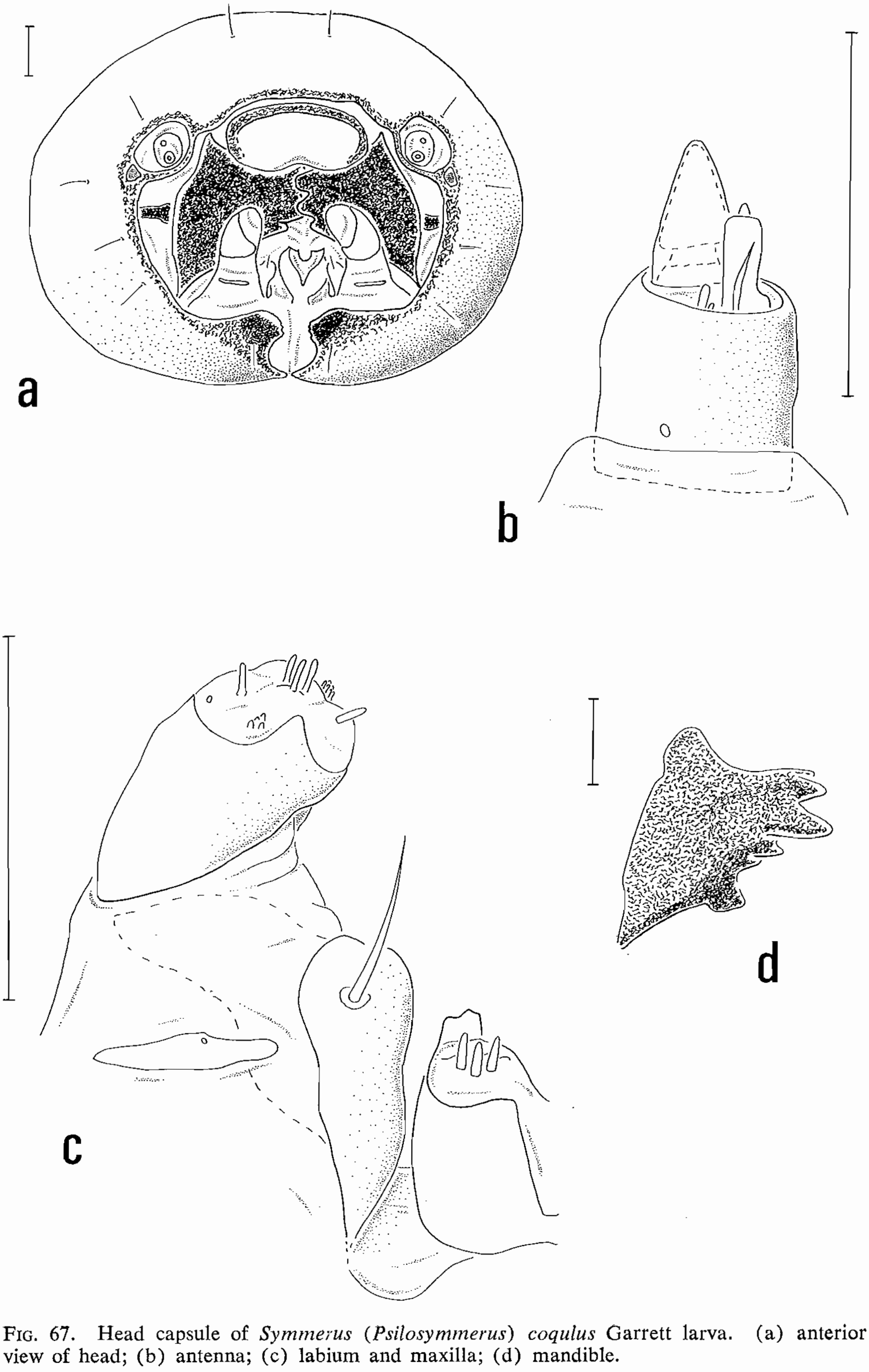
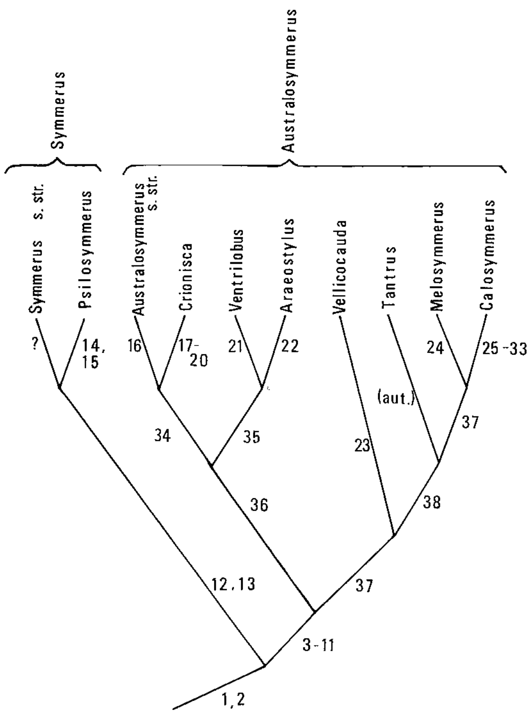
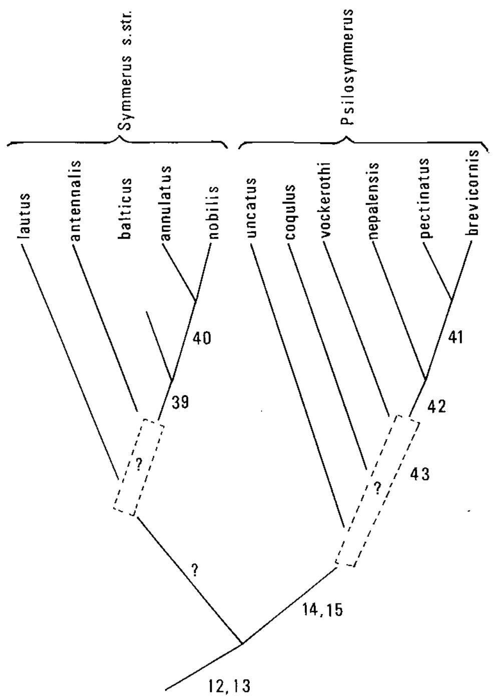
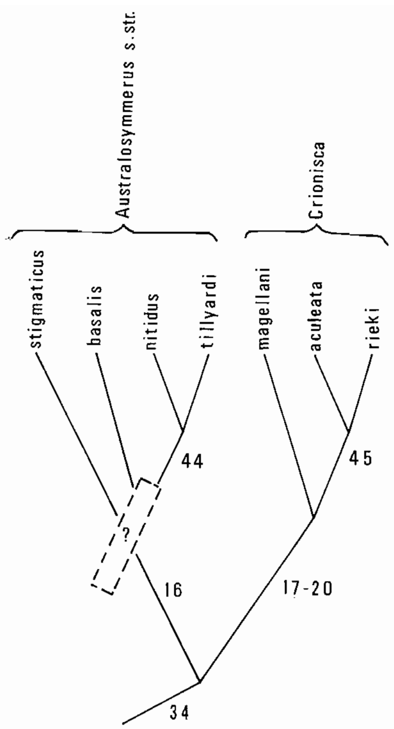


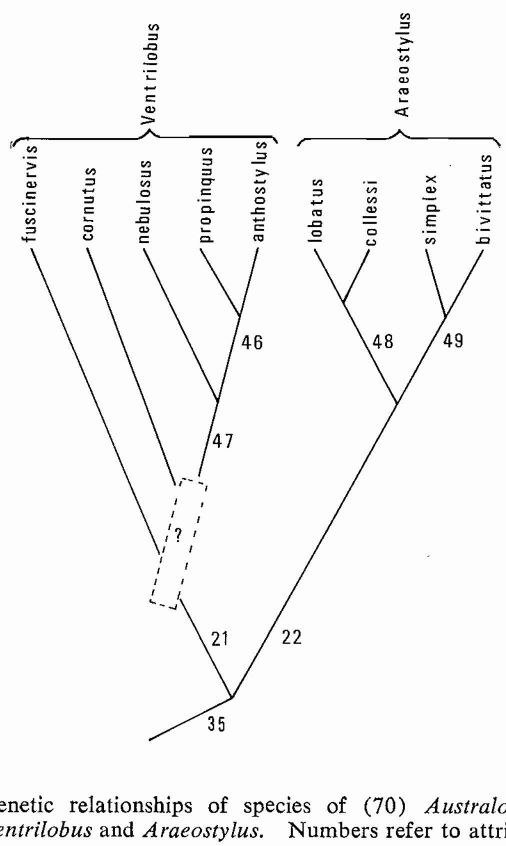
FIG. 67. Head capsule of *Symmerus* (*Psilosymmerus*) *coqulus* Garrett larva. (a) anterior view of head; (b) antenna; (c) labium and maxilla; (d) mandible.



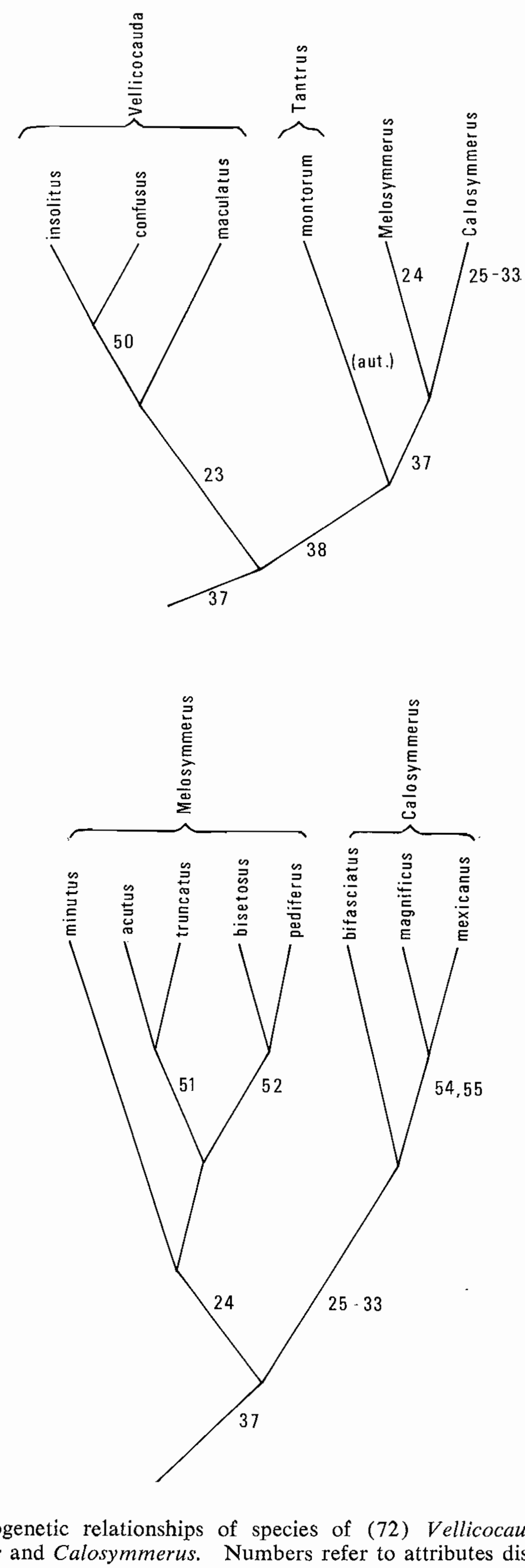


FIGS. 68–69. Phylogenetic relationships of (68) *Symmerus* and *Australosymmerus* and their subgenera and (69) species of *Symmerus s. str.* and *Psilosymmerus*. Numbers refer to attributes discussed in text.





FIGS. 70–71. Phylogenetic relationships of species of (70) *Australosymmerus s. str.* and *Crionisca* and (71) *Ventrilobus* and *Araeostylus*. Numbers refer to attributes discussed in text.



FIGS. 72–73. Phylogenetic relationships of species of (72) *Vellicocauda* and *Tantrus* and (73) *Melosymmerus* and *Calosymmerus*. Numbers refer to attributes discussed in text.

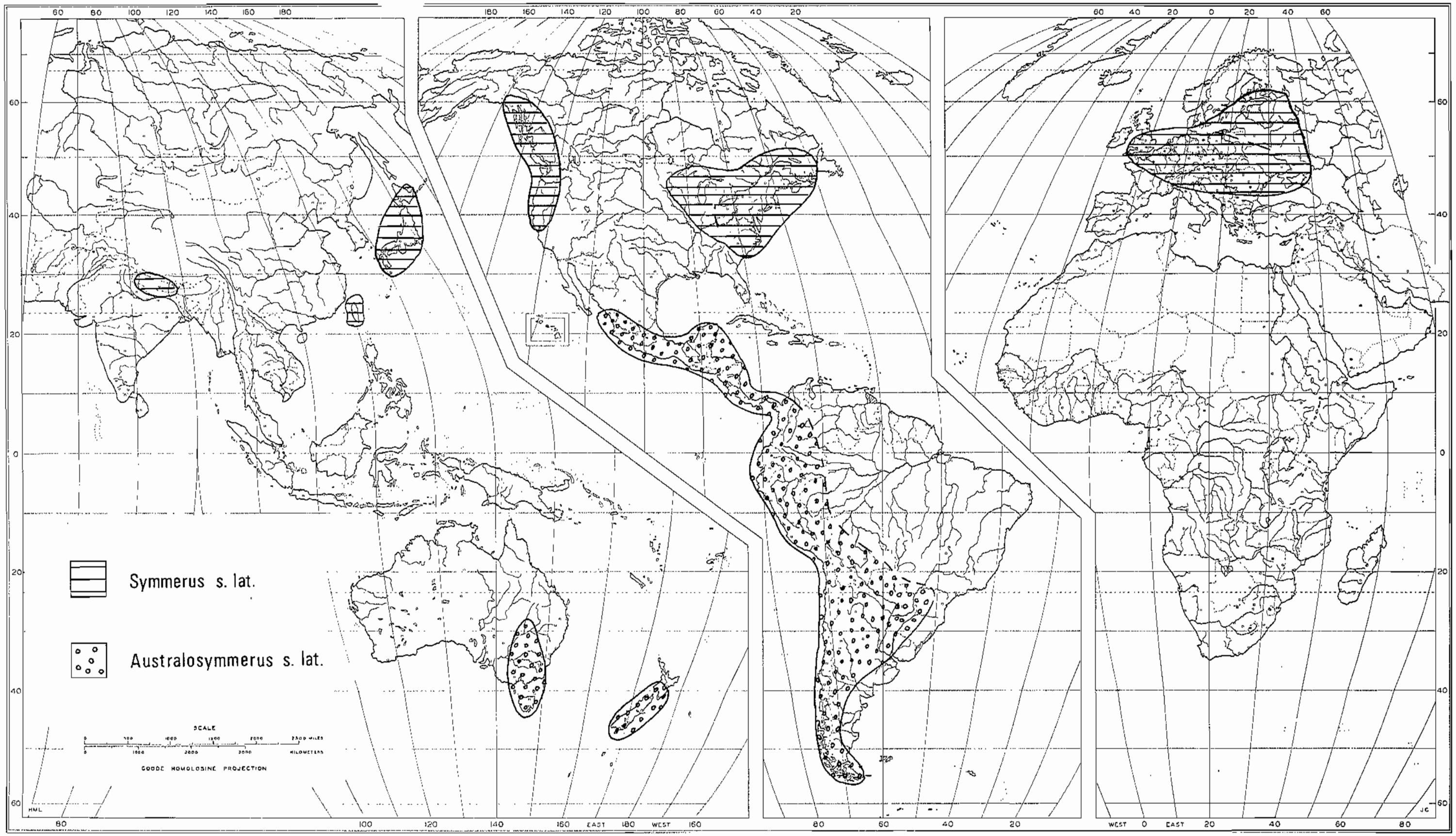


FIG. 74. Distribution of *Symmerus s. lat.* and *Australosymmerus s. lat.*

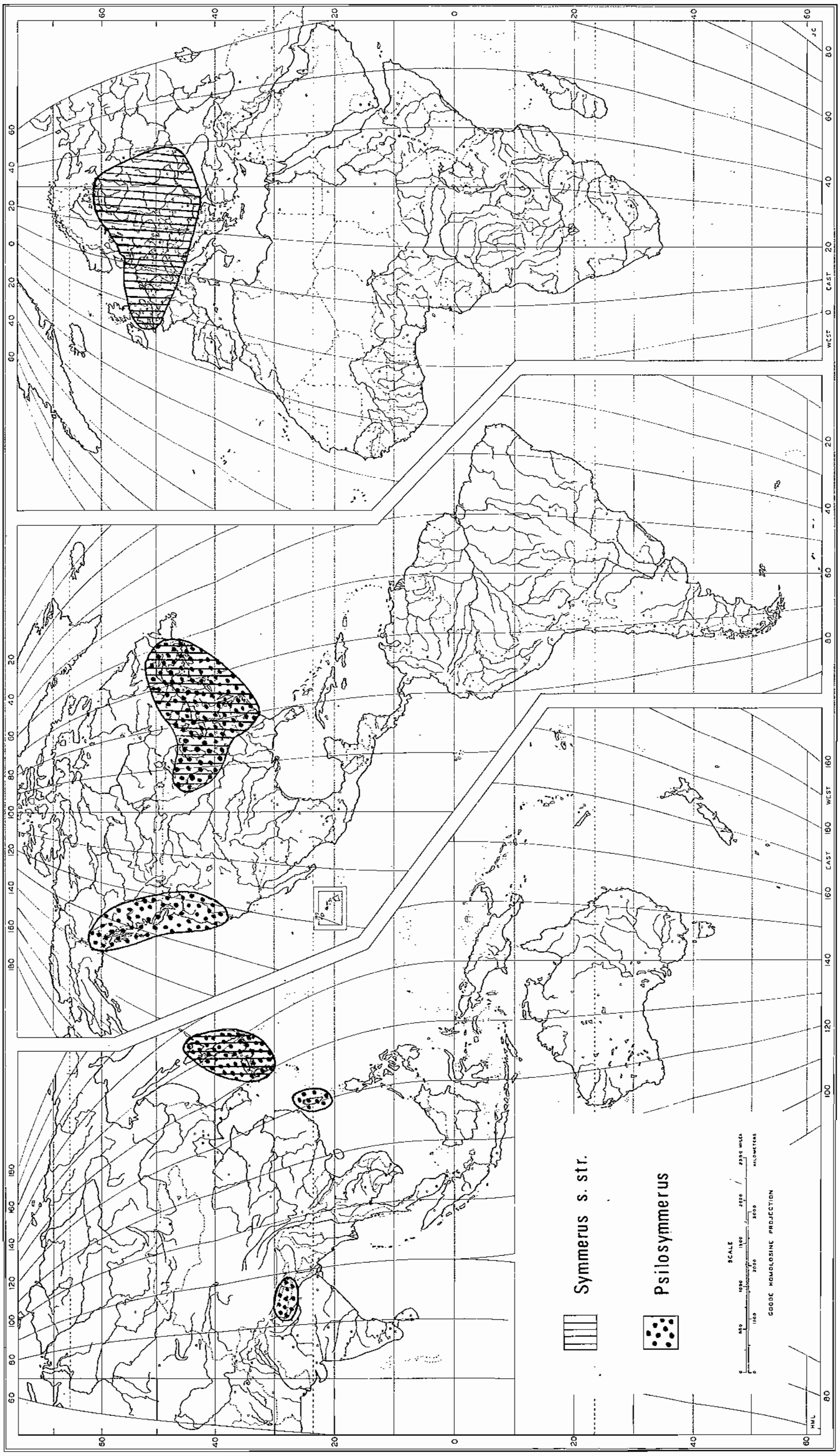


FIG. 75. Distribution of *Symmerus s. str.* and *Psilosymmerus*.

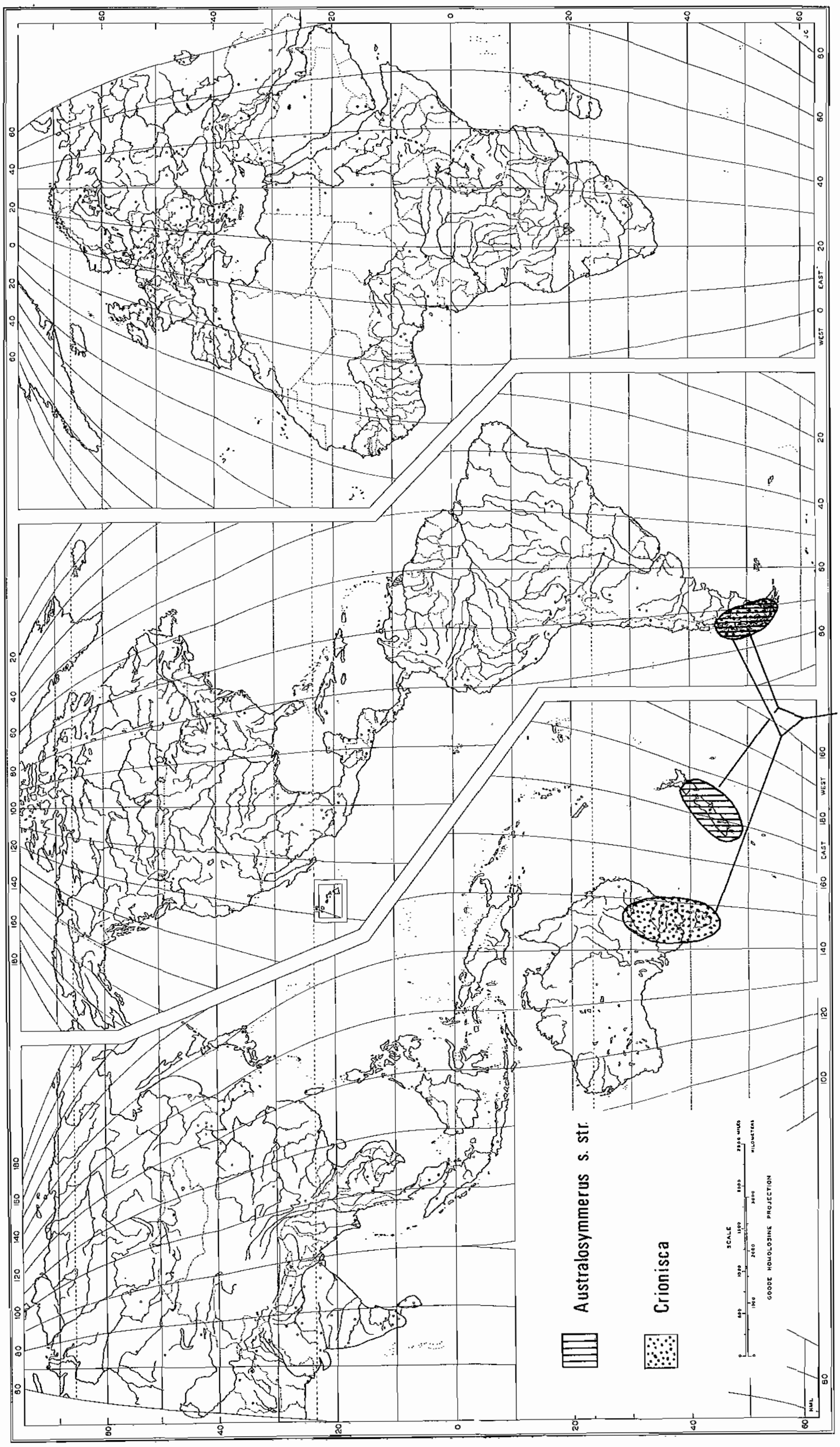


FIG. 76. Distribution of *Australosymmerus s. str.* and *Crionisca.*

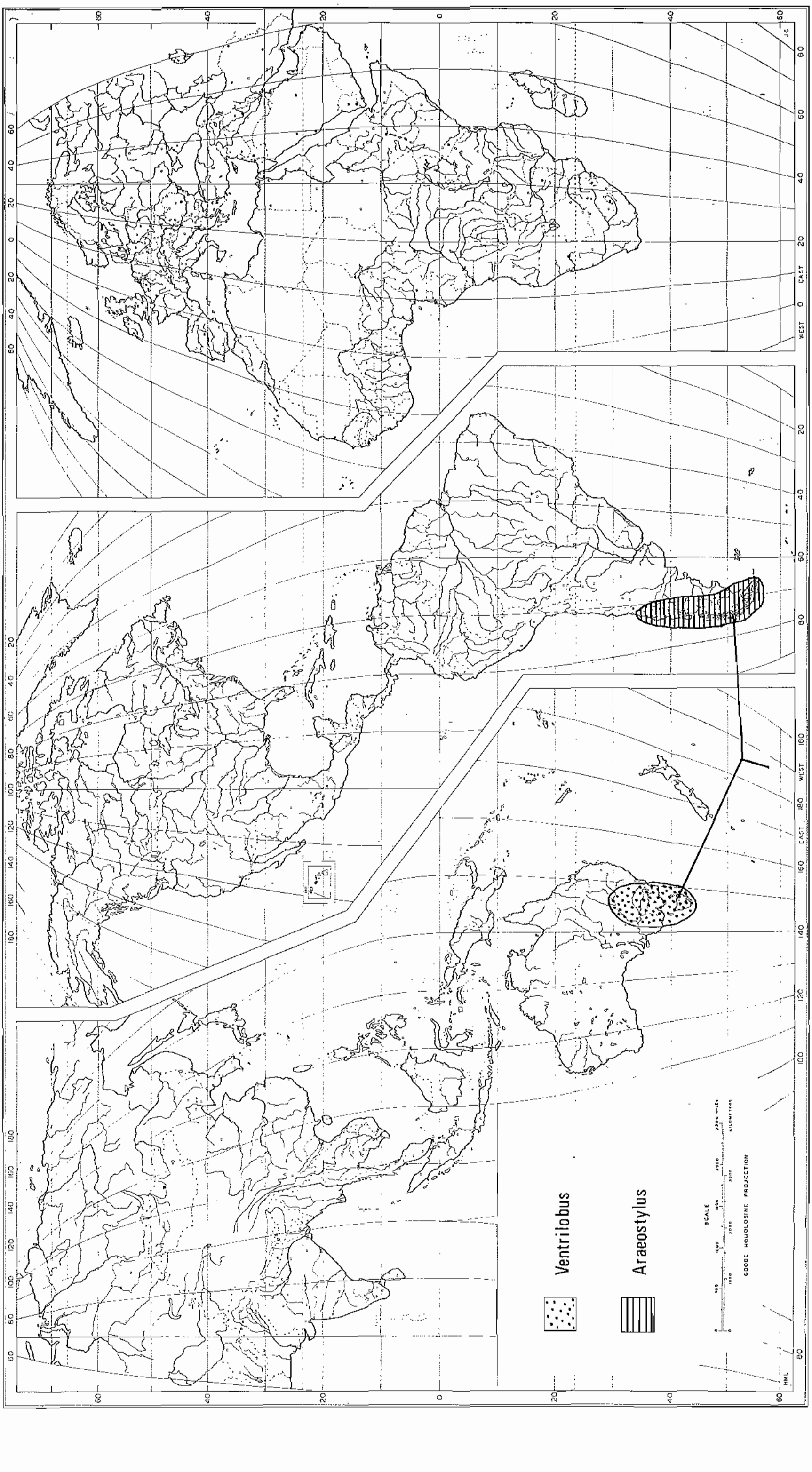


FIG. 77. Distribution of *Ventrilobus* and *Araeostylus*.

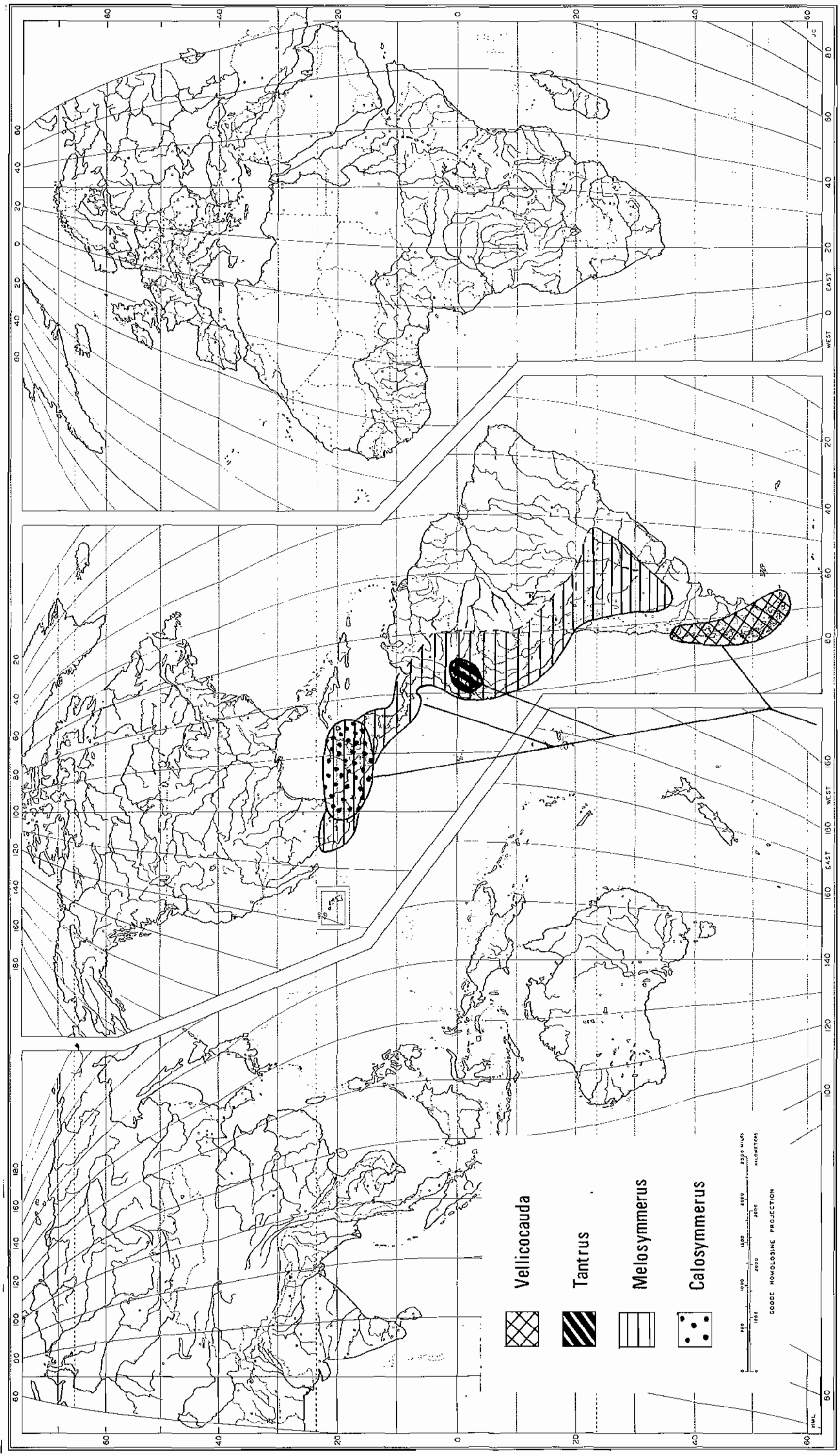


FIG. 78. Distribution of *Vellicocauda*, *Tantrus*, *Melosymmerus*, and *Calosymmerus*.