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THE SUBGENERA *RACHIONOTOMYIA*, *TRICHOLEPTOMYIA* AND *TRIPTEROIDES* (MABINII GROUP) OF GENUS *TRIPTEROIDES* IN THE ORIENTAL REGION (DIPTERA: CULICIDAE)

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Peter F. Mattingly

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PETER F. MATTINGLY[2]

ABSTRACT

The subgenus *Rachionotomyia* is redescribed and 5 species currently included in *Tripteroides* s. str. are transferred to it. The genus *Tricholeptomyia* is resurrected from synonymy as a valid subgenus. One species is transferred to it from *Rachionotomyia*. It is taken to include all the unornamented Philippines spp. except *rozeboomi*. This is transferred temporarily to *Rachionotomyia* though probably requiring a new subgenus when better known. One species is transferred from the subgenus *Rachisoura* to *Tripteroides* s. str. The latter is redefined but further treatment is confined to inclusion of the early stages in the keys to *Rachionotomyia* from which many are currently indistinguishable. Further work on this subgenus is badly needed. It is noted that *Polylepidomyia* is resurrected from synonymy and that 2 species are transferred from *Rachionotomyia* to *Rachisoura*. These Australasian taxa are included with the other 3 in a key to subgenera but further discussion is reserved for another publication. A general conspectus of the tribe Sabethini is included together with keys to the Old World genera and a conspectus of genus *Tripteroides*. Diagnostic features of the Oriental subgenera are listed and the species here included are described in full. Two new species described, 2 others are resurrected from synonymy and one is raised from subspecies to species. Two new unassociated larvae are described but left unnamed. All available distribution records are given, those derived purely from the literature being listed and discussed separately. Notes on bionomics are included for each species. None of them is of known medical importance.

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INTRODUCTION

The tribe Sabethini contains some 200 currently recognized New World and 160 Old World species. Although somewhat neglected in comparison to the Anophelini and Culicini it is of much bionomic and phylogenetic interest as will be seen from the brief general conspectus below (p. 5). Among the New World genera *Trichoprosopon* Theobald is particularly close to *Tripteroides* Giles which is the subject of the present study, morphological characters for their separation being currently lacking. Lee (1946: 219) has put forward arguments for maintaining them as distinct. These I fully accept. I also think it most likely that such characters will be found, particularly if these 2 large genera are first divided into smaller ones. A start on this has been made by Zavortink (1979) in a valuable study of *Trichoprosopon* now nearing completion.

A particular difficulty in the case of *Tripteroides* has lain in the present chaotic state of the subgenera. It has been a major concern of the present study to rectify this at least in the case of the unornamented subgenera. The large and complex ornamented subgenus *Tripteroides* must await a further study. The genus *Tripteroides* has traditionally been pictured as comprising 2 sections each with its own very distinctive ornamentation. The unornamented section are dull colored and inconspicuous with exceptionally abundant whitish pleural scaling and somewhat resemble *Armigeres* Theobald. The ornamented species mostly have the back of the head bright blue, silvery scales on the pleura and the sides of the abdomen and silver markings on the anterior surface of the femora. They show in some cases a most striking resemblance to the Ethiopian culicine genus *Eretmapodites* Theobald. Edwards (1932: 73) included all the unornamented species then known in 2 subgenera, *Rachionotomyia* Theobald and *Rachisoura* Theobald, retaining all but 2 of the ornamented species in *Tripteroides* s. str. The 2 species in question, *affinis* (Edwards) and *dofleini* (Günther), are without silvery markings on the legs or abdominal tergites and Edwards preferred to include them in *Rachionotomyia*. In the current World Catalog (Knight and Stone 1977: 321) they appear under *Tripteroides* s. str. but in my view Edwards' treatment was correct and I have preferred to follow him. This view has been strengthened by the discovery of a new species from southern India (*coonorensis*, p. 30) closely resembling the unornamented *aranoides* complex in the adult but with the larva indistinguishable from that of *affinis*. The relationship between the 2 groups which this implies also accords with their geographical distribution, the known Sri Lankan and Indian species all falling in the subgenus *Rachionotomyia* except for one species of *Tripteroides* s. str. which penetrates into Assam and North Bengal, the others in this subgenus reaching no further west than Thailand. A few species of *Tripteroides* s. str., notably *aeneus* (Edwards), *hybridus* (Leicester) and *nitidoventer* (Giles), show some reduction of the ornamentation of the head or legs and grade perceptibly towards *Rachionotomyia*. The early stages of *aeneus* and *hybridus* are known though undescribed. Those of many other species in the subgenus are described at best imperfectly. When this situation is remedied further revision of the subgenera will almost certainly be needed. For the moment I feel the present conservative treatment to be best.

During the present study the unornamented Philippines species, with the exception of *rozeboomi* (Baisas and Ubaldo-Pagayon), have been observed to form a homogeneous group with excellent diagnostic characters in all stages. I have had no hesitation in establishing them as a distinct subgenus (*Tricholeptomyia* Dyar and Shannon). Taking all stages together I would indeed regard

this as the best characterized of all the subgenera. The unornamented Australasian species are currently assigned to *Rachionotomyia* except for those with enlarged maxillary spines or "horns" in the larva which are placed in *Rachisoura*. One ornamented species, *mabinii* (Baisas and Ubaldo-Pagayon), is also placed in *Rachisoura* in the World Catalog but aside from the presence of such "horns" disagrees with that subgenus, and agrees with *Tripteroides* s. str. in all major respects. I have therefore transferred it to the latter. The Oriental and Australasian species currently included in *Rachionotomyia* form 2 homogeneous groups differing consistently in length of male palp and in various features of the male terminalia. Two of the Australasian species currently included in this subgenus (*obscurus* Brug, *subobscurus* Lee) have the male palps much shorter than the others. The early stages of both are unknown. The adult female of *subobscurus* is also unknown but the female of *obscurus* has proved in the course of the present study to have terminalia (in particular the insula) highly characteristic of *Rachisoura*. In my view the combination of male palp and female terminalia renders their retention in *Rachionotomyia* no longer tenable and I have transferred them to the short palped Vanleeuweni Group of *Rachisoura* (Mattingly 1980: 166). The reason for their original inclusion in *Rachionotomyia* by Lee (1946: 273) appears to have been their narrow wing scales. However this is a very variable character in the Vanleeuweni Group and they are in fact very little narrower, if at all, than in *vanleeuweni* (Edwards) itself. Their removal from *Rachionotomyia* greatly enhances the value of the male palp length as a diagnostic character and in my view, when taken in conjunction with the differences in male terminalia justifies the separation of the Australasian species as a distinct subgenus (*Polylepidomyia* Theobald). As with *Tripteroides* s. str. the early stages are currently indistinguishable at subgeneric level but here again only a small minority of species have as yet been described in detail. This remains the principal desideratum for a proper understanding of the relationships, both internal and external, of genus *Tripteroides*.

MATERIAL AND METHODS

Apart from the Australasian material mentioned below, the 2 largest collections covered by the present study are those made by the SEATO Medical Research Laboratory, U. S. Army Medical Component, in Thailand* and the Malaysia Mosquito Project, University of Malaya. This material is housed and curated by the Medical Entomology Project (MEP) in the Smithsonian Institution. Other Smithsonian material housed with, and supplied to me by MEP includes material from India, notably a collection from Madras State (B. N. Mohan) which yielded an interesting new species and, of special importance, the residue of the collection made by the former 19th Medical General Laboratory, U. S. Army in the Philippines. The monograph of the Philippines *Tripteroides* by Baisas and Ubaldo-Pagayon (1953) was largely based on this collection. Fortunately nearly all their holotype and allotype material was deposited in the Smithsonian, together with paratype and other supporting material, shortly after their monograph was completed. Less fortunately much of the remaining material has since been lost though some was recovered and is now in the Smithsonian. Although, in certain cases, the adults and

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early stages can only be provisionally associated this is a particularly valuable collection, containing as it does most of the available material of subgenus *Tricholeptomyia*. Some early unassociated adults of *microcala* (Dyar) have survived at the Smithsonian in fair condition but the few surviving adults of *nepenthicola* (Banks) are almost worthless taxonomically.

Among smaller collections that in the British Museum includes almost all the existing types of species in the subgenus *Rachionotomyia*. Material from Sri Lanka, previously scanty, was supplemented by a collection from the Biosystematics of the Insects of Ceylon Project supervised by Karl V. Krombein, Smithsonian Institution. Some of the Indonesian material collected by Brug and his colleagues was already in the British Museum. The remainder was loaned by the Leiden Museum. The Amsterdam Museum lent original material of *tenax* (De Meijere). Professor W. W. Macdonald supplied additional material from Malaysia and the Thailand material was supplemented by the Thurman collection from the Smithsonian.

Comparative studies of the Australasian species at subgeneric level were based on a very large collection of New Guinea material from the Bishop Museum, the Solomon Islands material from the Smithsonian studied by Belkin (1950, 1955, 1962), earlier material in the British Museum including paratypes of species described by Lee (1946) and a collection made by myself in New Guinea under the auspices of the Bishop Museum.

The only holotypes not seen were those of *ceylonensis* (Theobald) in the Indian Museum, said to be in too poor condition to be of use, and *szechwanensis* Hsu which is said to be in the Szechwan Medical College, Chengtu. In the few cases in which no holotype exists I have marked lectotypes, full details of which are given.

Terminology largely follows that of Belkin (1962) except as regards the lateral plates of the phallosome. These are of little or not taxonomic value in subgenera *Rachionotomyia* and *Tricholeptomyia* but of considerable value in *Tripteroides* s. str., *Rachisoura* and *Polylepidomyia* (see Baisas and Ubaldo-Pagayon (1953: 31, Delfinado and Hodges 1968: 362, Mattingly 1980: 164). They require to be rotated and displayed in lateral view but need not be dissected out completely. It is usually sufficient simply to separate the 2 halves of the terminalia having first separated the IXth segment. Belkin (1950: 222) describes them as having "an apical ventral spur and two dorsal projections". Baisas and Ubaldo-Pagayon (1953: 32) substitute the term "ventral arm" for "ventral spur" and recognize only one dorsal projection which they term the "dorsal arm". Belkin (1962: 523) substitutes the terms "tergal apical arm", "sternal apical arm" and "dorsal postmedian arm", noting that the latter forms a bridge. This is clearly the smaller of the 2 "dorsal projections" of his previous account. It is figured by Baisas and Ubaldo-Pagayon (1953: 33) but not named as a separate arm. Finally Delfinado and Hodges (1968: 362, 364) omit any reference to dorsal arms or projections, describing only the "ventral projection" but noting that the aedeagus is tapered distally. It is this tapered portion that Belkin calls the "tergal apical arm". I prefer Delfinado's interpretation. In contrast to the other structures it is no more than a posterior prolongation of the main body of the phallosome. I therefore term it the "apical process". The "dorsal postmedian arm" of Belkin is very small and, since it is completely fused with its counterpart on the other lateral plate, is seen as a separate structure only when the two plates are separated. It is of no taxonomic value and is often hidden when the lateral plate is rotated. For this reason it is absent from most of the accompanying figures. On the only occasion on which it has been necessary to refer to it (p. 11) I have termed it

the "tergal arm". Belkin's "sternal apical arm", the "ventral projection" of Delfinado and Hodges, is a much larger, broader structure than either of the others. I have preferred to term it the "sternal lobe". It is absent in *Tricholeptomyia*.

Descriptions of the female terminalia have previously only been available for *Tr. (Tripteroides) bambusa* (Yamada) (Hara 1957: 49, La Casse and Yamaguti 1950: 48) and *Tr. (Polylepidomyia) caledonicus* (Edwards) (Coher 1949: 99). In the course of the present study I have dissected females of all the species of *Rachionotomyia* and *Tricholeptomyia* for which these are known, 26 of the 30 species of *Tripteroides* s. str. with known females and representative species from each of the currently recognized species groups of *Polylepidomyia* and *Rachisoura*. The number of dissections of individual species is too small to permit an assessment of their potential taxonomic value at this level though further exploration seems to be justified in a number of cases. At the subgeneric level they have proved invaluable for separating *Rachisoura* from *Polylepidomyia*, a notoriously difficult problem (Mattingly 1980: 164). The situation vis-à-vis *Tripteroides* s. str. and the other subgenera is also interesting, the spermatheca being simple in all but 5 species of the former, trilobed throughout the latter. Finally there is some interesting, apparently intraspecific, variation in *aranoides* (Theobald) (p. 25).

In the course of the present study particular attention has been paid to larval and pupal chaetotaxy and an attempt has been made to ascertain the full range of variation in numbers of setal branches in the available material of each species. This has led to the discovery of a small number of individual setae of great taxonomic value which would not otherwise have been detected. In other cases the extent of overlap between closely related species, especially in the *aranoides* complex, has been found to be small, permitting separation in a majority of cases. In the light of studies on the influence of the environment on setal branching (Colless 1956: 229 and see Mattingly 1975: 179) a better understanding of such factors may well lead to improved diagnosis. This, however, will call for coordinated field and laboratory studies of a kind which have yet to be undertaken. It is unlikely that the *aranoides* complex in particular can be fully resolved without studies of this kind.

TAXONOMIC TREATMENT

TRIBE SABETHINI

First established as a subfamily by Dyar (1906: 191), this group has since had a somewhat checkered history. Edwards (1932: 63) reduced it to a subtribe within the tribe Culicini. Lane and Cerqueira (1942: 482) and Lane (1953: 811) followed him in this but Thurman (1959: 20) recognized 5 tribes among them the Sabethini while Belkin (1962: 117) went further, recognizing 12 tribes and reducing the subfamilies Anophelinae and Toxorhynchitinae to tribes within the subfamily Culicinae. Knight and Stone (1977: 4) have since restored these to subfamilial rank but still retain the others as tribes. As an attempt to express relationships I have only one disagreement with this which is that in my view the genera *Ficalbia* Theobald and *Mimomyia* Theobald are more distantly related than their inclusion in the same tribe (Ficalbiini) would suggest. On the other hand the division of the Culicinae into 10 tribes, half of them monotypic, seems to me unduly cumbersome for practical purposes and in my keys to world genera (Mattingly 1971: 1) I preferred to recognize

only 2, the Culicini and Sabethini. I still prefer this treatment.

The characters traditionally considered diagnostic for the Sabethini are the presence in the adult of spiracular, and absence of postspiracular, bristles, absence of apical seta from pupal paddle and reduction of larval ventral brush to a single pair of setae. The first 2 are so far as is known constant throughout the tribe. The third is also constant except in 2 species of *Sabethes* Robineau-Desvoidy which have a single additional pair of small supernumary setae. The characters in question are also fully diagnostic when taken in combination though each taken individually is shared in whole or in part with 2 or more culicine genera. Spiracular bristles (or scales in the case of *Limatus* Theobald, are shared with *Culiseta* Felt, *Psorophora* Robineau-Desvoidy and *Uranotaenia* Lynch Arribalzaga, absence of paddle setae with *Mansonia* Blanchard, *Coquillettidia* Dyar and some *Mimomyia* and reduction of the ventral brush to 2 pairs of setae or less with a few *Culex* Linnaeus and the subgenus *Ingramia* Edwards (formerly *Ravenalites* Doucet) of *Mimomyia*. Each of these genera can, however, be recognized by other conspicuous features. These are detailed in the following description together with some other characters of special taxonomic or biological interest. A fuller description of this large tribe with more than 350 currently recognized species would be beyond the scope of the present study.

ADULT. Male antenna in some cases strongly plumose, in others barely distinguishable from that of the female; palps long or short in both sexes, those of the male in some cases resembling those of the female, in other cases much longer; spiracular scales or bristles present, postspiracular bristles absent (distinction from *Psorophora*), meron with upper edge above or in line with base of hindcoxa; hindtibia markedly shorter than first hindtarsal segment; wing surface with distinct microtrichia (distinction from *Uranotaenia*); upper surface of remigium without bristles (distinction from *Culiseta*); anal vein reaching wing margin well beyond base of fork of Cu (except in *Malaya* Leicester and some *Topomyia* Leicester); abdominal setae much reduced; cerci short and blunt; male dististyle simple to highly elaborate; basal lobe of basistyle variously developed, sometimes modified in part to form a claspette.

PUPA. Trumpets usually short (greatly elongated in *Tripteroides* sp. (see p. 18) and *Wyeomyia circumcincta* Dyar and Knab (Mattingly 1971, Fig. 25f), never modified for piercing plant tissues (distinction from *Mansonia* and some *Mimomyia*); paddles always devoid of apical seta.

LARVA. Head sometimes greatly narrowed in axil or pitcher breeding species; antenna short, unjointed (distinction from *Ingramia*); maxillary suture present, absent or present but reduced; thorax and abdomen often with numerous stellate setae; one or more pairs of thoracic setae often stout, spinose, certain abdominal setae sometimes similar (a pair of hooks on segment VII in some *Sabethes*); comb teeth in a patch or a single row, sometimes arising from a sclerotized plate, occasionally absent or reduced to 1 or 2 teeth; siphon usually very short, greatly elongated in a few species; pecten in some cases absent; setae 1a-S usually well developed, often numerous, rarely absent; dorsal setae usually also present (distinction from *Culex (Acallyntrum)*), with or without lateral setae in addition; ventral brush (setae 4-X) reduced to a single pair of setae which, however, are always present (distinction from some *Culex*).

KARYOTYPE. Known only for *Trichoprosopon digitatum* (Rondoni), *Tripteroides ?ceylonensis* and *Wyeomyia smithii* (Coquillett) (Aslamkhan 1971: 237).

DISTRIBUTION. Central America southwards to Argentina, eastern U. S. A. northwards to southern Canada and westwards to the western end of the Great Lakes, Japan, southern China, Taiwan, Philippines, eastern Australia south to Tasmania, Melanesia, Oriental Region westwards as far as Sri Lanka and Bombay Deccan, tropical and southern subtropical Africa (genus *Malaya* only).

BIONOMICS. Zavortink (1979: 14), reviewing the bionomics of *Trichoprosopon,* notes, "Under natural conditions the immature stages . . . all . . . occur in liquids associated with plants". The same is true, with minor exceptions of the whole of the Sabethini. The exceptions include a few records from rock holes but these, particularly when containing leaves or other rotting vegetation, have very much the character of organic containers and frequently harbor species more often associated with these. *Tripteroides sullivanae* Baisas and Ubaldo-Pagayon utilizes snail shells and the larva has some peculiar features which may suggest a specialized adaptation to these. Bored, split and cut or broken bamboos are a major habitat of Old World sabethines and these frequently constitute man made, as well as natural, breeding places. Wholly artificial containers are utilized by a few species but these are a small minority taking the tribe as a whole. Broad leaved cultivars such as *Musa, Alocasia* and *Colocasia* harbor a few species and some are known only from these. They can, however, hardly be said to constitute a wholly natural breeding place.

Zavortink notes, "Some leaf axil breeding sites do not contain open water but only a mucilaginous film that may be of plant origin between the appressed leaf bases." I would add to this that leaf axil breeders are by no means confined to broad leaved plants. The extreme example to the contrary in my experience is an undescribed species of *Topomyia* collected by Dr. Elizabeth Marks and myself in New Guinea. Larvae were found in leaf axils of *Alocasia holrungerii* and *Homalomena* sp. so narrow that the larvae could be extracted only by tearing the plant to pieces. Belkin (1962: 487) says, with reference to Sabethini in general, "Several species have been reported to crawl out of the water onto the sides of the breeding container." This also I can confirm from personal observation. I would add that larvae of *Malaya leei* (Wharton), as seen by myself, can crawl with quite extraordinary rapidity in a straight line across a wet glass plate. Such behavior must surely be adaptive to migration from one axil to another. It is certainly aided greatly by the reduction of the ventral brush and could be a very primitive type of behavior. The condition of the ventral brush, if secondary, must have been attained very early in the evolution of the Sabethini since it characterizes the entire tribe.

Such inaccessible breeding places as small leaf axils must afford considerable protection from predation which I believe to have played a major role in the evolution of the early stages of the Culicidae. Various sabethine species have themselves been recorded as predaceous but Zavortink, following Galindo, Carpenter and Trapido (1951: 133), notes that the behavior involved differs markedly from that of obligatory predators such as *Toxorhynchites* Theobald, *Psorophora* and *Lutzia* Theobald which devour the prey rather than merely sucking its juices as do *Trichoprosopon.* As noted by Assem (1959: 36) the enlarged larval maxillary horns of the "predaceous" *Tripteroides* spp. are equally well adapted to holding large food particles other than prey and these must be abundant in the *Nepenthes* pitchers in which these species breed. I am fully in accord with Zavortink in pleading for a reexamination of supposed predaceous behavior in the Sabethini.

Bradshaw and Lounibos (1977: 546) and Istock, Wasserman and Zimmer

(1975: 296) have studied the evolution of dormancy and obligatory autogeny respectively in the North American *Wyeomyia* with notes on general bionomics.

Information concerning adult biology is fragmentary. Species recorded as attacking man form only a small proportion of the tribe as a whole but some of the New World species at least are of potential medical importance. Arboviruses have been recovered from 4 genera (*Limatus, Sabethes, Trichoprosopon* s.l., *Wyeomyia* Theobald) and at least 9 different species. Details of these and their known hosts are given by Mattingly (in Smith 1973: 501). Five of them, covering all 4 genera, are recorded as attacking man. *Sabethes chloropterus* (Von Humboldt) in particular is regarded as an important potential vector of human yellow fever. Galindo (1958: 429) has made an interesting study of its laboratory bionomics as has Miyagi (1973: 196) for *Tripteroides bambusa*. The egg and oviposition behavior have been reviewed for the tribe as a whole by Mattingly (1969b: 74; 1974: 231).

Those species for which information is available are generally agreed to be diurnal. The impression gained from the literature and from my own observation is that these are often active in bright light or partial shade. Among the ornamented groups many species exhibit the bright metallic or iridescent colors traditionally associated with such behavior. Known vertebrate hosts are confined to mammals and birds. The genus *Malaya* are obligatory feeders on the regurgitations of ants. Their behavior has been studied and filmed by Macdonald (see Macdonald and Traub 1960: 91). His observations throw an interesting light on the complexities underlying the origins and evolution of this fascinating group. *Malaya jacobsoni* (Edwards), breeding like other members of the genus in leaf axils, feeds as adult on *Cremastogaster* ants as these in turn feed on the sugary exudations from the tips of young bamboos. Two seemingly unrelated major sabethine larval habitats are thus seen in this instance to be in fact intimately related.

SABETHINE GENERA. The following are currently recognized: New World. *Johnbelkinia* Zavortink, *Limatus* Theobald, *Phoniomyia* Theobald, *Runchomyia* Theobald, *Sabethes* Robineau-Desvoidy, *Shannoniana* Lane and Cerqueira, *Trichoprosopon* Theobald, *Wyeomyia* Theobald. Old World. *Malaya* Leicester, *Maorigoeldia* Edwards, *Topomyia* Leicester, *Tripteroides* Giles. Three of these (*Johnbelkinia, Runchomyia, Shannoniana*) were separated from *Trichoprosopon* only very recently (Zavortink 1979: 10). I have had no opportunity to study them in their present form. They are keyed collectively with *Trichoprosopon* in Mattingly (1971: 4). No keys for separating Old from New World genera are currently available. Detailed work on the larger genera would be beyond the scope of the present study and I have therefore confined myself to the keys to Old World genera which follow. The separation of *Trichoprosopon* from *Tripteroides* is particularly difficult. Zavortink's studies of the former have still to be completed. They will certainly contribute materially to the solution of this problem especially if they can be combined with studies on the remaining sections of *Tripteroides*, particularly the nominotypical subgenus.

KEYS TO OLD WORLD GENERA OF SABETHINI

ADULTS

1. Proboscis folded beneath the body when at rest, otherwise with conspicuous upward flexure, the apex strongly swollen, hairy with 2 pairs of long, curled bristles, remainder also very hairy. . . . . *Malaya*
Proboscis at most slightly swollen apically (except in *Topomyia spathulirostris* Edwards) otherwise unmodified, not conspicuously hairy. 2

2(1). Upper calypter without fringe; scutum with median longitudinal stripe of very broad, usually white or silvery, scales. . *Topomyia*
Upper calypter with at least 2 or 3 hairlike scales; scutum devoid of such ornamentation. 3

3(2). Numerous acrostichal bristles present; posterior pronotum with at least 3 bristles; known only from New Zealand. . . . *Maorigoeldia*
Acrostichal bristles almost always absent, where present confined to apex of scutum; posterior pronotum with at most 2 bristles, usually 1 or none; not known from New Zealand. . . . *Tripteroides*

PUPAE

1. Trumpets subcylindrical with inner and outer walls widely separated. 2
Trumpets more or less conical or with inner and outer walls closely apposed or both. . . . . *Maorigoeldia*, *Tripteroides*

2(1). Seta 6-VII relatively well developed, arising well cephalad of seta 9-VII. . . . . *Malaya*
Seta 6-VII usually less well developed and arising close to and laterad of seta 9-VII. . . . . *Topomyia*

LARVAE

1. Setae 5-P and 6-P large fan-shaped tufts arising from a common tubercle, 6-M and 7-T never modified to form stout spines. . . 2
Setae 5-P and 6-P otherwise, 6-M and/or 7-T often so modified. . 3

2(1). Either with abdominal segments IV-VI, at least, with 1 or more pairs of stellate setae or maxillae with conspicuous "horns" or siphon at least 6.0 length of saddle. . . . . *Topomyia*
Stellate setae never present on abdomen; maxillae never with horns; siphon at most about 4.0 length of saddle. . . . . *Malaya*

3(1). Comb of numerous scales in a triangular patch. . . . . *Maorigoeldia*
Comb teeth in a single, sometimes irregular, row, sometimes arising from a sclerotized plate, occasionally absent or reduced to a single tooth. . . . . *Tripteroides*

GENUS *TRIPTEROIDES* GILES

Tripteroides Giles, 1904: 369. Type-species *Runchomyia philippinensis* Giles, Camp Stotsenberg, Pampanga, Luzon. (Brunetti 1914: 58).

Rachionotomyia Theobald, 1905: 248. Type-species *Rachionotomyia ceylonensis* Theobald, 1905, Peradeniya, Ceylon.

Colonemyia Leicester, 1908: 233. Type-species *Colonemyia caeruleocephala* Leicester, 1908: 233, Bukit Kutu and Ulu Klang, Selangor, Malaya. Selection of Brunetti, 1914: 58.

Skeiromyia Leicester, 1908: 248. Type-species *Skeiromyia fusca* Leicester, 1908: 248, Kuala Lumpur area, Selangor, Malaya.

Squamomyia Theobald, 1910b: 28. Type-species *Squamomyia inornata* Theobald, 1910b: 28, Dawna Hills, Burma.

FEMALE. *Head.* Proboscis sometimes short and stout, more often very long and slender equaling or exceeding the abdomen, never conspicuously clubbed at apex. Palps at most one-third the length of the proboscis. Antenna with flagellar segments subequal, verticillary hairs sometimes longer than usual. Eyes contiguous. Back of head with all scales broad and flat except for a few narrow upright scales on nape. Orbital bristles at most 6 in number (at most 4 except in *Polylepidomyia* and *Rachisoura*). *Cibarial armature.* Absent in all species examined. *Thorax.* Anterior pronotal lobes widely separated. Scutal scales varying from very narrow, hairlike to very broad and from pale golden to almost black. Scutellar scales all broad and flat, usually all dark, pale in some species. Acrostichal bristles nearly always absent, when present confined to apex of scutum. Dorsocentral and prescutellar bristles present or absent. Postnotum with or without a tuft of setulae. Pleura usually densely scaled (less so in some *Tripteroides* s. str., bare of almost so in *purpuratus* (Edwards). Posterior pronotum with at most 2 bristles, usually 1 or none. Spiracular bristles always present, postspiracular and lower mesepimerals absent, prealars present but sometimes very small. Meron with upper edge in line with or slightly above base of hindcoxa. *Wing.* Alula with narrow fringe scales only. Upper calypter with hairlike scales. *Abdomen.* Apical bristles on tergites greatly reduced except on segment VIII where they are numerous and conspicuous. *Terminalia.* Cerci short and broad. Apex of postgenital plate varying from convex to deeply indented. Insula with strongly developed peripheral setae, with or without smaller setulae in the posterolateral corners, (otherwise in *Rachisoura*, see Mattingly 1980: 164). Spermatheca normally single or trilobed, rarely bilobed (p. 25). *Legs.* Femora pale below from base almost or quite to tip, with or without pale markings on anterior surface. Tibiae dark, these and, in part, the tarsi often pale below in the unornamented subgenera. Tarsi never with pale rings. All claws simple, paired (hindclaws apparently unpaired in *vanleeuweni* and possibly *argenteiventris* (Theobald). Pulvilli absent. *Wing.* Entirely dark scaled. Outstanding scales on upper surface varying from narrow, hairlike, to very broad, tending to be broadest toward wing tip. Upper fork cell usually longer than its stem, often much longer (barely equal in length to it in some *Tricholeptomyia*). Anal vein reaching wing margin well before base of fork of Cu. Alula with narrow scales confined to margin. Upper calypter with hairlike scales.

MALE. *Head.* Proboscis and palps much as in the female. Antenna in some cases strongly plumose, in others much less so, hardly differing between the sexes. *Legs.* Fore- and midclaws toothed or simple, unequal or subequal.

Hindclaws minute, paired except in *Tricholeptomyia*. Tarsi variously modified in a few *Tripteroides* s. str. (*knighti* Baisas and Ubaldo-Pagayan, *mabinii*, *tarsalis* Delfinado and Hodges). *Terminalia*. Dististyle usually slender, often slightly expanded apically, greatly expanded in a few *Tripteroides* s. str. and with a patch of large scales or flexible bristles in *Tp. (Trp.) monetifer* (Dyar) and *rozeboomi*. Basistyle with conical basal lobe provided with 1 or more conspicuously enlarged setae. IXth tergite with lobes usually well separated, occasionally fused. Paraprocts with 1 or a few small teeth at apex (untoothed in *Tp. (Trp.) alboscutellatus* Lee). Phallosome with a small tergal arm and with the main body more or less elongated posteriorly to form an apical process, with or without a sternal process which, when present, may be ridged or spiculate.

PUPA. Trumpets short, except in sp. aff. *caeruleocephalus* which has them greatly elongated (see p. 18), usually conical, less often more or less cylindrical. Seta 1-C very long, stout, except in *Tricholeptomyia*, usually single or bifid, rarely with 4 or more branches. Seta 1-I a well developed tuft except in *Tricholeptomyia*. Paddles without apical seta, the edges sometimes spiculate but never with hairlike fringe.

LARVA. Head unusually narrow in some nepenthicolous species, especially of *Tricholeptomyia*. Maxillary suture well developed except in *Rachisoura*, in which it is reduced and *Tricholeptomyia* in which it is absent or virtually so. Mouthbrushes with pectinate inner setae. Maxillae with hypertrophied spines ("horns") in *mabinii* and in all *Rachisoura*. Setae 6-M, often, and 7-T, usually, short, stout, spinose. Various other thoracic and abdominal setae usually stellate. Comb teeth in a single row, sometimes arising from a sclerotized plate. Acus absent. Siphon at most about 6.0 length of saddle, usually much shorter, except in sp. aff. *caeruleocephalus* (p. 19). Setae 1a-S in a single or double row (reduced to 1-2 or in some cases absent in *microcala* and *nepenthicola*), 2a-S in a single or double row, 1 or more lateral setae sometimes present between 1a-S and 2a-S. (A small lateral seta of distinctive appearance always present in *Tricholeptomyia*). Pecten present except in *Tr. (Trp.) collessi* Lee which has the entire siphon covered with pecten-like spinules (see Lee 1946: 272). In *Tr. (Trp.) marksae* (Dobrotworsky 1965: 59) the siphon is similar but the pecten teeth are apparently distinguishable. Setae 4-X reduced to single pair.

EGG. Known only for the following: *Tripteroides* s. str.; *bambusa* (Mattingly 1974: 231), *Tricholeptomyia; microcala* and (?) sp. indet. (Baisas and Ubaldo-Pagayon 1953: Pl. 9, 10, Mattingly 1969b: 75), *Polylepidomyia; atripes* (Skuse), *tasmaniensis* (Strickland) (Dobrotworsky 1965: 19, Mattingly 1969b: 76), *caledonicus, melanesiensis* (Belkin) (Iyengar 1969: 214, Mattingly 1974: 232), *Rachisoura; bisquamatus* Lee (Assem 1959: 51). The eggs of *bisquamatus* are described as "spherical . . . with one pole distinctly more pointed than the other". Those of *atripes* and *tasmaniensis* as figured by Dobrotworsky have one surface flattened and the other strongly arched. In the remaining species the eggs are ovoid and relatively narrow, broadest in *melanesiensis*. Those described by Baisas and Ubaldo-Pagayon are unusual in apparently being covered with slender scales rather than papillae, perhaps resembling *Trichoprosopon compressum* Lutz in that respect though that species is known to me only from a description. The eggs of *bambusa, caledonicus* and *melanesiensis* are ornamented with flattened papillae. The ornamentation is undescribed for the other species. Dehiscence is apical in *bambusa, microcala, caledonicus* and *melanesiensis*. It is undescribed for *atripes* and *tasmaniensis* but might be interesting since these eggs have some resemblance

in shape to those of *Maorigoeldia argyropus* (Walker) in which dehiscence is longitudinal (see Mattingly 1969b, Fig. 1).

KARYOTYPE. Known only for *?ceylonensis* (Aslamkhan 1971: 237) (see p. 28).

DISTRIBUTION. Oriental Region from India and Sri Lanka to Japan, Ryukyus, Taiwan and Philippines; Australasian Region east to Fiji and south to Tasmania.

BIONOMICS. Among the Oriental species only *aranoides* is on record as attacking man and this apparently only rarely (see p. 26). In contrast several species of all 3 Australasian subgenera are recorded as biting man at least occasionally (Belkin 1962: 507, Dobrotworsky 1965: 56, Lee 1946: 220, 232, Peters and Christian 1963: 40, 55).

The dominant larval habitats in *Rachionotomyia* are bamboos and pitcher plants with only *affinis* and occasionally *aranoides* utilizing tree holes. *Tricholeptomyia* are almost exclusively nepenthicolous. The Philippines *Tripteroides* s. str. mainly favor bamboos and pitcher plants with one species found in snail shells (Baisas and Ubaldo-Pagayon 1953: 19), but tree holes are used quite frequently by Malayan and Thailand species (Macdonald and Traub 1960: 88; Thurman 1959: 32). The recorded range of habitats of Australasian species is somewhat wider. Nepenthicolous species are found in all 3 subgenera but are few in number. Axils of broad leaved plants are used by several species and records from coconuts and artificial containers are numerous (Belkin 1950: 216, 1962; Lee 1946; Peters and Christian 1963: 62). Oviposition behavior has been described by Miyagi (1973: 199) from observations of a cage colony of *bambusa*. The eggs are said to be dropped or (p. 200) "projected" while on the wing or resting on the side of the oviposition vessel and a comparison is made with *Sabethes chloropterus*. It is not clear, however, that they are forcibly projected as in that species rather than merely dropped or lobbed as in *Toxorhynchites*. Certainly the type of behavior observed in *Sa. chloropterus* might be of value in species breeding in bored bamboos or in others, such as *Tp. (Trp.) bimaculipes* (Theobald) in New Guinea, utilizing tree holes with very small apertures but the eggs do not show any sign of the marked specialization observed in *Sa. chloropterus* (see Mattingly 1969b: 75). Miyagi observed *bambusa* eggs to be "capable of withstanding some degree of drying" and the same author (1976: 177) found some females of this species to be autogenous. There is some evidence for resistance to desiccation also in *aranoides* (see p. 26).

KEYS TO SUBGENERA OF *TRIPTEROIDES*

FEMALES

1. Scales on all or much of occiput with brilliant blue or silvery reflection; pleural scales with metallic silvery reflection; pale scales on abdominal tergites similar (except in some *distigma* (Edwards)); anterior surface of at least 1 femur, usually all 3, with discrete silvery markings; spermatheca in most cases single.
Tripteroides s. str. (p. 79)

Scales around eye margins white or whitish with subdued blue reflection at most; remainder of occiput wholly or largely dark, pale scales when present white or whitish; pleural scales at most snow white, never silvery (except in *affinis* and *dofleini*); pale scales on

abdominal tergites white or whitish, never silvery; anterior surface of all femora with continuous white line at most, in most cases entirely dark, never with discrete silvery markings; spermatheca trilobed in all known cases. 2

2(1). Palps 0.17-0.30 length of proboscis; orbital setae 3-6; outstanding scales on upper wing field all broad (Filipes Group) or broad only towards wing tip (Vanleeuweni Group); insula with 10-35 setae on either side of midline forming 2 longitudinal bands; Australasia and Melanesia only. . . . . *Rachisoura*

Palps at most 0.17 length of proboscis, usually shorter (except in *edwardsi* (Barraud)); orbital setae 1-6; broad outstanding scales on upper wing field, when present, confined to wing tip; insula as in Fig. 6-9, with a single row of peripheral setae (double in *edwardsi*) with or without 1 or more setulae in the posterior corners; Palaearctic, Oriental and Australasian regions. 3

3(2). Orbital setae 1-2; prescutellar bristles present in all cases, postnotals present except in *barraudi* Baisas and Ubaldo-Pagayon; hindclaws unpaired; Philippines only. . . . . *Tricholeptomyia* (p. 54)

Orbital setae 2-6; prescutellar bristles present or absent, postnotals absent except in *edwardsi*; hindclaws paired except in 1 or 2 *Polylepidomyia*; not known from Philippines except for *rozeboomi*. 4

4(3). Orbital setae 3-6; dorsocentral bristles present or absent, prescutellars always present; Australasian only. . . *Polylepidomyia*

Orbital setae 2-4; dorsocentral bristles absent, prescutellars present or absent; Oriental and Palaearctic only. . *Rachionotomyia* (p. 15)

MALES

1. Palps less than 0.2 length of proboscis; hindclaws single; lateral plate of phallosome without sternal lobe. . . . *Tricholeptomyia* (p. 54)

Palps various; hindclaws always paired; lateral plate of phallosome with sternal lobe. 2

2(1). Palps less than 0.2 length of proboscis; anterior surface of at least 1 femur, usually all 3, with discrete silvery markings; terminalia in most cases small and retracted. . *Tripteroides* s. str. (p. 79)

Palps and terminalia various; anterior surface of femora never with discrete silvery markings. 3

3(2). Palps 0.2-1.0 length of proboscis; terminalia large, conspicuous, usually fully exposed; dististyle slender, tapering; bristles on IXth tergite slender, sometimes flattened, never spinose; Australasian only. 4

Palps less than 0.2 length of proboscis; terminalia small, inconspicuous, normally retracted; dististyle stouter, tapering at most only slightly (except in *dofleini*); setae on IXth tergite spinose (except in *rozeboomi*); Oriental only. . . . . *Rachionotomyia* (p. 15)

4(3). Palps 0.7-0.9 length of proboscis; all outstanding scales on upper wing field narrow. . . . . *Polylepidomyia*
Either with palps at most about 0.3 length of proboscis or with outstanding scales on upper wing field broad at least on R_2 and R_3 or both. . . . . *Rachisoura*

PUPAE

1. Seta 1-C short or very short, 1-I very feebly developed (except in *delpilari* Baisas and Ubaldo-Pagayon). . . *Tricholeptomyia* (p. 54)
Seta 1-C very long, stout, conspicuous, 1-I a strongly developed tuft. 2

2. Seta 1-C normally single, occasionally split distally, (except in *brevirhynchus* Brug); dorsal sensillum, when present, restricted to segments III and IV. . . . . *Rachisoura*
Seta 1-C with 2-4 branches, usually bifid (single in *nepenthis* (Edwards), *nepenthisimilis* n. sp., *sullivanae* and sp. aff. *caeruleocephalus*); dorsal sensillum present on segments III-V or IV-V. . . . . *Polylepidomyia*, *Rachionotomyia* (p. 15)
Tripteroides s. str. (p. 79)

FOURTH STAGE LARVAE

1. Maxilla with conspicuous "horn" or "horns"; maxillary suture conspicuous but incomplete, not reaching posterior tentorial pit; seta 14-I-VI minute or absent. 2
Maxilla without enlarged "horn"; maxillary suture either inapparent or, if present, complete, reaching posterior tentorial pit; seta 14-I-VI present or absent. 3

2(1). Seta 15-C well developed, arising far back near collar, 6-M and 7-T conspicuous thickened spines; siphon with one or more lateral setae in addition to 2a-S (? always).
Tripteroides s. str. (Mabinii Group) (p. 80)
Seta 15-C arising well forward near mentum, often minute; thorax without modified pleural spines; siphon without lateral setae.
Rachisoura

3(1). Maxillary suture inapparent; seta 15-C arising well forward near mentum; seta 14 absent from all abdominal segments; siphon with minute branched lateral seta always present.
Tricholeptomyia (p. 54)
Maxillary suture strongly developed, reaching posterior tentorial pit; seta 15-C arising far back near collar (except in *coheni* Belkin); seta 14-I-VI usually well developed (minute or absent in a few *Polylepidomyia* and *Rachionotomyia*); lateral seta or setae on siphon, when present, resembling 2a-S.
Polylepidomyia, *Rachionotomyia* (p. 15)
Tripteroides s. str. (Nitidoventer Group) (p. 80)

SUBGENUS *RACHIONOTOMYIA* THEOBALD

Rachionotomyia Theobald 1905: 248. Type-species *Rachionotomyia ceylonensis* Theobald.
Skeiromyia Leicester 1908: 248. Type-species *Skeiromyia fusca* Leicester.
Squamomyia Theobald 1910b: 28. Type-species *Squamomyia inornata* Theobald.

FEMALE. Palps at most about one-sixth of the length of the proboscis (one-third in *edwardsi*). Occiput with broad, flat, dark scales with at most a subdued bronzy reflection, a white or whitish border to eyes, broadening ventrally, in some cases with subdued dull blue reflection (all or much of the occiput with brilliant blue reflection in Affinis Subgroup). Orbital setae 2-4, usually 3 except in Nepenthis Subgroup which often have 4. Scutal scales broad except in midline. Dorsocentral bristles absent, prescutellars present or absent, postnotals absent except in *edwardsi*. Pleural pale scales and lateral pale scales on abdominal tergites white or whitish, sometimes refringent but never with metallic silvery reflection except in Affinis Subgroup. Subspiracular scales always present. Femora pale below, anterior surface dark or at most narrowly pale below at base, never with discrete pale markings; tibiae and some tarsal segments in many cases paler below. All claws paired. Wing with outstanding scales on upper surface narrower over most of the field, broader toward tip especially on R_2 and R_3.

FEMALE TERMINALIA. Apex of postgenital plate with shallow emargination if any, deepest in *edwardsi* (Fig. 8). Insula with at most 8 peripheral setae on either side (more in *edwardsi* in which they form a double row) and 2-7 in each posterior corner. Spermatheca trilobed in all cases.

MALE. Palps as in female. Hindclaws always paired.

MALE TERMINALIA. Small, inconspicuous, seldom fully exposed. Dististyle relatively stout, tapering only slightly if at all towards tip (more slender in *dofleini*, Fig. 26, highly modified in *rozeboomi*, Fig. 28). Lateral plate of phallosome with spiculate sternal lobe, apical prolongation short but well formed except in *rozeboomi* which has it much reduced. Setae on IXth tergite stout and relatively short except in *rozeboomi*.

PUPA. Seta 1-C very long, stout, conspicuous, single or bifid, 1-I a strongly developed tuft, 1-III-VI always slender, delicate (sometimes multibranched and correspondingly conspicuous), 3-II-III strongly developed, much longer than 5-III (except in *dofleini*), 6-III-V always short and delicate, 5-IV always long, stout and conspicuous, very much longer and stouter than 1-IV, 3-VII much shorter than segment VIII (except in Affinis Subgroup), 9-VII-VIII always long and multibranched; dorsal sensillum present on segments III-V or IV-V; paddles various but always with apex at most bluntly pointed, never leaf-shaped.

LARVA. Maxilla without enlarged apical spines; maxillary suture conspicuous, complete, reaching the tentorial pit on or near the collar. Setae 6-M and 7-T short, stout, dark spines in all cases. Seta 14-I-VI strongly developed in most cases (minute or absent in *dofleini* and the Nepenthis Subgroup). Setae 8-M and 8-T strongly developed (except in *dofleini*). Lateral setae on siphon, when present, closely resembling setae 2a-S.

DISTRIBUTION. Sri Lanka, mainland of southern Asia from India to China, East Malaysia, Indonesia as far east as Flores, Taiwan.

BIONOMICS. Breeding places include all types of container habitat includ-

ing plant pitchers. Infrequent in domestic containers. Rarely, if ever, bite man.

KEYS TO GROUPS AND SPECIES OF *RACHIONOTOMYIA*

ADULTS

1. Occipital scales with brilliant blue reflection at least anteriorly; pleural scales with bright metallic silvery reflection (Affinis Subgroup). 2
   Scales around eye margins white or whitish with subdued blue reflection at most, other occipital scales with at most a dull bronzy reflection; pleural scales white or whitish. 3

2(1). Abdomen dark above with more or less uniform pale lateral border (Fig. 4). . . . . *affinis* (p. 43)
   Abdomen with pale lateral border emarginated at bases of tergites III-VII giving the appearance of discrete lateral patches encroaching dorsally towards apex (Fig. 4). . . . . *dofleini* (p. 46)

3(1). Back of head with pale ventrolateral scales extending well onto upper surface at sides; scutum with (? continuous) border of white scales, remaining scales with subdued but distinct iridescence (golden in part in *rozeboomi*); scutellum with lateral lobes white scaled; pleural scales exceptionally large and abundant (Edwardsi Group). 4
   Back of head with pale scales confined to eye margins and lower surface; scutum without pale border; scutal scales with subdued bronzy lustre only; all lobes of scutellum dark scaled; pleura heavily scaled but less so than in the above (Aranoides Group). 5

4(3). Palps about one-third of the length of the proboscis; postnotum with a tuft of stout bristles; upper calypter with about 20 hairlike scales. *edwardsi* (p. 49)
   Palps about one-eighth of the length of the proboscis; postnotum bare; upper calypter with 4-6 hairlike scales. . . . . *rozeboomi* (p. 50)

5(3). Clypeus usually with pale scales; posterior pronotal scales white or whitish (except in *coonorensis*) (Aranoides Subgroup). 6
   Clypeus bare; posterior pronotal scales mid- to dark brown (Nepenthis Subgroup). . . . . *nepenthis* (p. 38) *nepenthisimilis* (p. 41)

6(5). Scutum with numerous narrow white scales on anterior border and with dark scales relatively narrow (Fig. 3); scales on posterior pronotum midbrown. . . . . *coonorensis* (p. 30)
   Pale scales on anterior border of scutum less numerous, dark scutal scales broad except in midline (Fig. 3); scales on posterior pronotum white or whitish. 7

7(6). Abdominal tergites with conspicuous pale lateral patches (Fig. 5). *serratus* (p. 32)

Abdomen with more or less uniform pale lateral border (Fig. 1).
aranoides (p. 20)
ceylonensis (p. 26)
tenax (p. 33)

PUPAE

Excellent subgeneric characters are available for pupae of *Tricholeptomyia* and these are keyed separately on p. 55. In contrast those of *Tripteroides* s. str. and *Rachionotomyia* do not appear to be separable at this level, while even at the species level a few pupae bridge the 2 subgenera. I have accordingly combined the 2 subgenera in the following key, *Rachionotomyia* spp. being shown in **heavier type.** The pupae of *edwardsi, rozeboomi* and *serratus* (Barraud) are unknown.

1. Trumpets extremely broad; paddles leaf-shaped with asymmetrical tip (Fig. 49) (Mabinii Group, Subgenus *Tripteroides*). . *mabinii* (p. 81)
Trumpets narrower or paddles otherwise, generally both (Nitidoventer Group, Subgenus *Tripteroides;* Subgenus *Rachionotomyia*). 2

2(1). Paddles with apex spiculate. 3
Apex of paddle without spicules. 7

3(2). Most of the abdominal setae barbed, spinose. . . . . *sullivanae*
Abdominal setae quite otherwise. 4

4(3). Seta 3-VII well developed, from a little shorter than to longer than segment VIII. . . . . *monetifer*
tarsalis
This seta feebly developed, much shorter than segment VIII (Fig. 12). 5

5(4). Known only from Philippines and Celebes. . . . . *nitidoventer*
Not known from Philippines or Celebes. 6

6(5). Paddles very short, flattened or bluntly rounded at tip (Fig. 28).
ceylonensis (p. 26)
Paddles longer, more or less pointed at tip (Fig. 28).
aranoides (p. 20)
tenax (p. 33)

7(2). Setae 3-III and 5-III more or less equally developed or 5-III more strongly so. 8
Seta 5-III normally much smaller and more delicate than 3-III. . . . 10

8(7). Setae 3-III and 5-III both very large and conspicuous. 9
These setae feebly developed; known only from Philippines.
dyari
intermediatus
malvari

9(8). Setae 5-II much smaller and more delicate than 3-II (Fig. 26); known only from Sri Lanka. . . . . *dofleini* (p. 46)

Seta 5-II stout and dark, not or only slightly shorter than 3-II; not known from Sri Lanka. . . . . *vicinus*

10(7). Trumpets extremely long and narrow, about 25-40 as long as broad. sp. aff. *caeruleocephalus*
Trumpets quite otherwise. 11

11(10). Paddles not or only very slightly less than twice as long as their greatest breadth (Fig. 16); known only from southern India. ***coonorensis*** (p. 30)
Paddles shorter and broader; distribution otherwise. 12

12(11). Trumpets slender, tapering (Fig. 20). . . . . ***nepenthis*** (p. 38)
Trumpets shorter, broader or more cylindrical. 13

13(12). Paddles not or only slightly longer than broad, about 1.0-1.1 as long as their greatest breadth. . . . . *aeneus powelli* (part) *toffaletii*
Paddles distinctly longer than broad, at least 1.2 as long as their greatest breadth, usually longer. 14

14(13). Seta 3-VII as long as or longer than segment VIII. ***affinis*** (Fig. 24) (part), (p. 43) *cheni, denticulatus, indicus, malayi mendacis, powelli, proximus*
This seta shorter than segment VIII. . . . . ***affinis*** (part), (p. 43) ***nepenthisimilis*** (p. 41), *hybridus, plumosus, similis* (Fig. 22)

LARVAE

Larvae of *Rachionotomyia* and *Tripteroides* s. str. are not at present separable at subgeneric level. I have therefore combined the known Southeast Asian species of both subgenera in the following key. *Rachionotomyia* spp. are shown in **heavier type.** The larvae of *edwardsi, rozeboomi* and *serratus* are unknown.

1. Maxilla with a conspicuous horn (Fig. 50) (Mabinii Group, Subgenus *Tripteroides*). . . . . *mabinii* (p. 81)
Maxilla without such a horn (Nitidoventer Group, Subgenus *Tripteroides;* Subgenus *Rachionotomyia*). 2

2(1). Seta 4-X very large, at least 2.5 length of saddle. 3
This seta at most 1.5 length of saddle, usually less. 6

3(2). Seta 1-M small and inconspicuous, 6-M a small, only slightly thickened seta with 2 or more branches; known only from Philippines. . . . . *intermediatus, malvari*
Seta 1-M large and conspicuous, 6-M a stout spine with well developed tubercle; not known from Philippines. 4

4(3). Seta 14-I-VI strongly developed; comb without a comb plate (Fig. 30). . . . . ***Species no. 2*** (p. 53)

Seta 14-I-VI minute or absent; comb teeth with enlarged bases fused or almost fused to form a continuous plate. 5

5(4). Saddle edge with minute spicules only (Fig. 27); known only from Sri Lanka. . . . . ***dofleini*** (p. 46)
Saddle edge with at least 3-4 spines in addition to smaller spinules; not known from further west than Malaysia. . . . . *vicinus*

6(2). Setae 4-6, 12, 13-C flattened, bladelike; known only from Philippines. *sullivanae*
These setae of normal type. 7

7(6). Comb composed in whole or in part of coarse spines arising from a continuous sclerotized comb plate. 8
Comb plate absent or fragmentary. 12

8(7). Siphon about 6.5-7.0 length of saddle; seta 14-C with more than 20 branches. . . . . sp. aff. *caeruleocephalus*
Siphon less than 6.0 length of saddle, almost always much less, or seta 14-C with less than 10 branches, usually both. 9

9(8). Known only from Philippines. . . . . *monetifer, nitidoventer*
Not known from Philippines. 10

10(9). Seta 8-VII small, usually very small, and delicate (Fig. 19). ***tenax*** (p. 33)
This seta well developed. 11

11(10). Larger comb teeth simple or with fringe restricted to base; saddle fringe with at least the larger elements unfringed (Fig. 13, 15). ***aranoides*** (p. 20), ***ceylonensis*** (p. 26)
Larger comb teeth fringed to half way or beyond; larger elements in saddle fringe extensively fringed. . . . . *plumosus*

12(7). Known only from Philippines. *dyari, similis, simulatus, toffaletti*
Not known from Philippines. 13

13(12). Known only from China, Japan or Taiwan. . . . . *cheni, bambusa*
Not known from these areas (except *?powelli* from Hainan). . . . 14

14(13). Setae 1-S, 1a-S and 2a-S all or almost all single; comb teeth exceptionally long, the longest at least two-thirds of the length of the saddle (Fig. 29). . . . . ***Species no. 1*** (p. 51)
These setae all or almost all with 2 or more branches; comb teeth rarely about two-thirds of the length of the saddle, normally much shorter. 15

15(14). Seta 7-T without basal arm, 14-I-VI minute or absent; siphon without lateral setae. 16
Without this combination of characters. . . ***affinis*** (Fig. 25), (p. 43) ***coonorensis*** (Fig. 17), (p. 30) *aeneus, denticulatus, hybridus, indicus, malayi, mendacis, powelli, proximus, tarsalis*

16(15). Seta 4-T strongly developed with 12-29 branches, 1-I with 16-32, 1-VIII with 19-42 (Fig. 21). . . . . *nepenthis* (p. 38)
Seta 4-T feebly developed with 3-7 branches, 1-I and 1-VIII each with 10 branches or less (Fig. 23). . . . . *nepenthisimilis* (p. 41)

ARANOIDES GROUP

For differences from the Edwardsi Group see under that group. The latter is very distinct and most probably deserves recognition at the subgeneric level. Its members are, however, currently too imperfectly known for this to be considered advisable. For further discussion of this point see p. 49. Among the 3 subgroups recognized here the Affinis Subgroup differs strikingly in adult ornamentation. It is cited at the subgroup, rather than species group, level to emphasize the very marked differences from the Edwardsi Group which it shares with the other 2 subgroups.

ARANOIDES SUBGROUP

With the exception of *coonorensis* the members of this subgroup are clearly very closely related and may be regarded as constituting a single superspecies, the *aranoides* complex. Their precise status vis-à-vis one another can only be settled by further work in the field and the laboratory. In the meantime I have preferred to cite each taxon as a full species. On present evidence I would regard *tenax* as probably a full species and *ceylonensis* a geographical subspecies. Too little is known regarding *serratus* to admit of speculation as to its exact status. The position of *coonorensis* is somewhat doubtful. It differs from *aranoides*, and resembles the Nepenthis Subgroup, in the somewhat darker scales on the posterior pronotum, absence of spicules from the pupal paddle and absence of a comb plate in the larva, but resembles *aranoides*, and differs from *nepenthis*, in the presence of scales on the clypeus, pale scales on occiput, with subdued but distinct blue reflection, bifid seta 1-C of the pupa, presence of well developed basal arm on seta 7-T of the larva and restriction, so far as is known, of the breeding places to bamboo stumps. At the same time the larva is indistinguishable except on partial characters from that of *affinis*. It is thus annectant between all 3 subgroups.

1. *TRIPTEROIDES (RACHIONOTOMYIA) ARANOIDES* (THEOBALD) (Figs. 1, 2, 3, 6, 11, 12, 13, 28)

Wyeomyia aranoides Theobald 1901: 274.
Skeiromyia fusca Leicester 1908: 248.
Squamomyia inornata Theobald 1910b: 28.
Rachionotomyia aranoides of Edwards 1913: 241.
Tripteroides (Tripteroides) aranoides of Edwards 1932: 78.
Tripteroides (Rachionotomyia) aranoides of Stone 1963: 121.
Tripteroides (Tripteroides) szechwanensis Hsu 1964: 278.
Tripteroides (Rachisoura) szechwanensis of Knight and Stone 1977: 320.

FEMALE (Figs. 1, 3, 6). Wing 2.6-3.2 mm. *Head.* Proboscis long and slender, 1.2-1.4 length of forefemur, 1.1-1.3 length of abdomen. Palps about 0.14-0.17 of proboscis. Palps and proboscis entirely dark. Clypeus with numerous broad white scales on anterior half or more. Tori with small

pale scales on inner surface. Antennae about 0.5-0.6 the length of the proboscis. Occiput with broad, flat, dark brown scales with bronzy reflection, a narrow border of flat white scales, with faint blue reflection, round eye margins, somewhat expanded ventrolaterally. A few dark upright scales, with expanded tips on nape, 2-3 orbital bristles well out on either side. *Thorax.* (Figs. 1, 3). Scutum with broad or moderately broad brown scales with bronzy luster tending to be narrower in the midline and broader in the prescutellar area. Very broad, flat whitish to midbrown scales above paratergite. A few moderately broad whitish scales on the anterior promontory. No prescutellar bristles. Scutellar scales entirely dark. Postnotum bare. Anterior pronotal lobes with white scales anteriorly, darker behind. Posterior pronotum entirely covered with flat pale scales. A single posterior pronotal bristle present or none, 2-4 spiraculars. Broad white scales present on postspiracular and subspiracular areas, all but the anteroventral portion of the sternopleuron and most of the mesepimeron. Paratergite bare, 1-2 small, dark prealar and 2-4 lower sternopleural bristles present. *Legs.* Femora pale beneath to tip. Tibiae and first tarsal segments also frequently pale below, especially the hindtibia. Tarsi otherwise dark. All claws simple. Foreclaws unequal, the smaller more strongly curved. Midclaws subequal. Hindclaws minute, unequal, one more strongly curved. *Wing* (Fig. 1). Outstanding scales on upper wing field narrow, linear, broader on R_2 and R_3, especially toward the tips. Upper calypter with 3-5 hairlike scales. Upper fork cell 1.4-1.9 length of its stem. *Halter.* Head dark. *Abdomen* (Figs. 1, 6). Dark above with uniform pale lateral border. Sternites entirely pale, including VIII. *Terminalia* (Fig. 6). Postgenital plate usually more or less rectangular with apex level or more or less indented as in the figure. In some specimens the apex is convex and the general shape subconical (see under Taxonomic Discussion). IXth tergite with 2-6 bristles on either side. Insula with 2-8 peripheral bristles on each side and 2-7 smaller ones in the posterior corners (see under Taxonomic Discussion).

MALE (Figs. 2, 3, 11, 12). Wing 2.1-3.1 mm. Antenna strongly plumose, about half the length of the proboscis. Upper fork cell 1.3-2.0 length of its stem. Claws as figured (Fig. 3). Abdominal markings as in the ♀. *Terminalia* as figured (Fig. 11, 12). Dististyle at most slightly swollen on distal half, apex tapered. Basal lobe of basistyle with 7-12 relatively long, stout setae. Paraproct with 2-4 large teeth, with or without 1-2 smaller ones. IXth tergite with 3-6 spines on each lobe, the inner one usually broader than the others but sometimes all longer and more slender as on left of Fig. 14.

PUPA (Figs. 12, 28). Very much as described for *tenax* (p. 34). No constant difference in setal branching. Paddles (Fig. 28) tapering towards apex, 1.2-2.2 as long as their maximum breadth, very seldom less than 1.4, usually more or much more.

LARVA (Fig. 13). *Head.* Palatal hairs* as figured. Seta 1-A as figured; 1-C relatively slender to moderately stout, not strongly curved, frequently directed inward, 4-C single, 5-C single, occasionally bifid, 6-C single, 7-C bifid to tetrafid, 11-C with 6-13 branches, 14, 15-C with 2-7. Mentum with 8-10 teeth on either side of the central tooth. *Thorax.* Seta 0-P with 6-21 branches, 1-P with 6-20, 3-P with 5-13, 4, 7-P with 6-17, 8-P with 7-20, 9-P with 2-5, 11-P single to pentafid, 13, 14-P with 10-30 branches; 1-M with 6-23, 6-M in some cases slightly longer than 7-T, in others slightly shorter, with

*Anteriomedian palatal hairs of Laffoon and Knight (1973: 34).

tip blunt, pectinate, 8-M with 6-20 branches, 9-M with 3-10, 13-M with 6-30, 14-M with 10-24; 1-T with 5-25, 4, 5-T with 5-23, 7-T normally with basal arm, the tip pointed or blunt and pectinate, 8-T with 3-22 branches, 9-T with 4-8, 13-T with 6-22. *Abdomen.* Seta 1-I with 4-21 branches, 2-I with 8-20, 5-I with 5-20, 6-I with 2-4, 7-I single or bifid, 9-I with 2-11 branches, 11-I with 7-22, 13-I with 7-24, 14-I with 4-17; 0-II with 3-11, 1-II with 6-21, 2-II with 4-19, 5-II with 4-17, 6-II normally bifid, occasionally single, 7-II single or bifid, 9-II with 3-8 branches, 11-II with 6-21, 13-II with 6-25, 14-II with 4-12; 0-III with 3-10, 1-III with 6-24, 2-III with 7-19, 5-III with 6-18, 6-III normally bifid, occasionally single, 9-III with 4-10 branches, 11-III with 7-22, 13-III with 7-24, 14-III with 4-14; 0-IV with 3-14, 1-IV with 6-25, 2-IV with 5-20, 5-IV with 5-14, 6-IV normally bifid, occasionally single, 9-IV with 4-10 branches, 11-IV with 8-17, 13-IV with 4-24, 14-IV with 4-14; 0-V with 4-11, 1-V with 7-25, 2-V with 6-20, 5-V with 4-17, 6-V single or bifid, 9-V with 5-12 branches, 11-V with 8-23, 13-V with 9-22, 14-V with 5-15; 0-VI with 4-12, 1-VI with 7-27, 2-VI with 7-23, 5-VI with 5-17, 6-VI single, 9-VI with 5-13 branches, 11-VI with 7-23, 13-VI with 5-27, 14-VI with 4-16; 0-VII with 5-16, 1-VII with 9-23, 2-VII with 6-20, 5-VII with 4-21, 8-VII with 4-16, 9-VII with 3-14, 11-VII with 5-16, 13-VII with 7-21. Comb with 3-10 large or moderately large teeth on a sclerotized comb plate, with or without 1 or more small intercalary teeth and with or without 1-12 small teeth ventrad of the plate, the larger teeth, at least, normally simple spines with at most a small fringe at base as figured, the smaller teeth sometimes broader and more extensively fringed. Seta 1-VIII with 10-28 branches, 3-VIII single to heptafid, 5-VIII with 2-7 branches, 14-VIII frequently minute or absent, at other times relatively well developed with up to 15 branches. Saddle fringe usually consisting only of narrow spines, sometimes with some of the smaller teeth broader and fringed. Seta 1-X single to trifid, 2-X with 3-6 branches, 4-X with 2-7. Anal papillae cylindrical, from 1.4-5.0 length of the saddle. Siphon 2.5-5.9 length of saddle. Pecten with 3-11 teeth on either side of the midline, confined to the apical 0.33 to 0.67 of the length of the siphon, the individual teeth as figured. Seta 1-S paired, with 2-5 branches, 1a-S 4-11 in number on either side, 2a-S 4-14 in all, the individual setae in both cases single to trifid, occasionally tetrafid, lateral setae, when present, 1-4 in number, single to trifid.

TYPE-DATA. 1. *Wyeomyia aranoides.* Unique female on pin in B. M. WEST MALAYSIA. Taiping. 22.xi or 21.xii.1899. L. Wray Jr. 2. *Skeiromyia fusca.* Male on pin, marked by me as lectotype, inscribed on the back of the mount "Larvae fr bamboo Pahang Rd Jungle 5 3/4 miles fr. Kuala Lumpur 25/3/03, allolectotype female inscribed "Larva fr. Pahang Rd Jungle Kuala Lumpur. *Uranotaenia* 12" and on the face of the mount "*Skeiromyia*", 2 paratype males, one inscribed "Larva fr (P)ahang Rd (J)ungle bamboo 5 3/4 miles fr Kuala Lumpur. Fly. 25/4/03. *Uranotaenia* 12" with terminalia on slip, the other without data, 2 paratype females, one without data, the other inscribed "Larva fr bamboo Ulu Klang Jungle 8 miles fr Kuala Lumpur 16/4/03. Fly clypeus scaled". These specimens were all marked by Edwards as cotypes. Leicester's type, if any, may be presumed to have been lost (James and Stanton 1912: 59) and these specimens may have been chosen from among his material by Stanton. All are in the B. M. 3. *Squamomyia inornata.* Unique male on pin in collection of Zoological Survey of India, Calcutta. BURMA. *Kawthule State:* Dawna Hills, 2000-3000 ft., 2 or 3.iii.1908, Annandale. 4. *Tripteroides szechwanensis.* Syntype male, female and larva. CHINA. *Szechwan;* Chengtu. 16.vi and 4.viii.1954 (Hsu 1964: 282).

DISTRIBUTION. INDIA. *Assam:* Shillong, 2♂, 1♀, 31 p. BURMA. *Shan State:* Aungban, 3♂, 1♀. THAILAND. *Ang Thong:* Ban Bang Chao Cha, Ban Khlong Wua, Ban Phi Tang, Ban Pho Thong. *Ayutthaya:* Ban Lain, Bhon Pring, Bhon Wa. *Chanthaburi:* Ban Dao Luang, Ban Laem Sing, Ban Tha Chin, Ban Wak, Khao Pha Bat, Khlong Kathin. *Chiang Mai:* Ban Bo Luang, Ban Chang Kien, Ban Choeng Doi Sutep, Ban Hua Muang, Ban Huai Kaeo, Ban Huai Tat, Ban Hu Lek, Ban Ka, Ban Kee Lek Mae Tang, Ban Khun Klang, Ban Mae Kung, Ban Mae Lan, Ban Mae Sa, Ban Pang Kwang, Ban Rong Rua Taeng, Ban San Khayom, Ban Talaw, Ban Than Kleap, Ban Thung La Khon, Chiang Aloa Rd., Chiang Mai, Chungdoa Rd., Doi Khun Tan, Doi Sutep, Fang, Huai Mae Lon, Huai Pao, Huai Phrao, Huts, Klong Loi, Mai Klang Waterfall, Ma So Waterfall, Mea Sai, Nam Tok Pha Ngoep, Neatang, Phrao, Saraphi, Wat Phra That, Wat Si Soda. *Chiang Rai:* Ban Doi Wow, Mae Kow Toon. *Chon Buri:* Bang Phra, Khao Yai Li. *Kanchanaburi:* Ban Ka, Ban Kea Lok, Ban Ku Phadu, Ban Lao, Ban La Wa, Ban Nong Phang Khung, Ban Wang Kalang, Huai Lin Thin, Huai Bongti, Huai Mae Nam Noi, Sangkhla. *Lampang:* Ban Pha Daeng, Ban Pang Kho, Ban Rai Na Dieo, Doi Pha Huat, Huai Boong, Huai Not, Pho Pratu Pha San Chao. *Mae Hong Son:* Ban Huai Yang, Ban Mae Ho Nua, Doi Chang. *Nakhon Nayok:* Huai Kaew, Huai Si Waterfall, Huai Suwat, Ka-ang Waterfall, Khao Yai, Pha Kleuy Mai, Sariga Waterfall. *Nakhon Ratchasima:* Ban Tha Maprang, Ban Wang Nam Khea, Pak Chong. *Nakhon Sawan:* Ban Hok Hak, Ban Kaeng, Ban-ko, Ban Nua Sathani, Ban Tak Hian Luan, Ban Talat Tai, Huai Krachang Ngam, Khao Luang Nur, Ko-klang Dact. *Nakhon Si Thammarat:* Ban Na, Ban Sai Koe, Ban Thuan Lek, Chaung Khao, Khao Luang. *Nan:* Ban Noi Rong Nok, Ban Pha Hang, Ban Pha Man, Ban Ta Lai, Ban Ta Loc, Bang Wang No. *Phangnga:* Khao Pak Chaung, Khao Sung, Nam Tai, Pathum, Phangnga, Tang Mai, Thap Wen. *Phrae:* Phrae. *Prachin Buri:* Ban Thung Fack. *Prachuap Khiri Khan:* Huai Yang Forest. *Ranong:* Ban Chatri, Ban Salak Phet, Khao Chatri, Khao Dan Bang Pra, Khao Pluching, Khlong Bang Yang, Khlong Ban Man, Kong Set Ta Kuat, Kraburi. *Surat Thani:* Ban Li Pa Noi, Ban Li Pa Yai, Ban Saket, Ban Thong Phlu, Khao Kwang, Khao Phlu, Khao Yai, Klong Chan Di, Koh Samui, Ma Phrao. *Tak:* Doi Sam Sao, Khao Salak Phra. *Thon Buri:* Bang Pakok. *Trat:* Ban Cham Rung, Ban Saphan Hin. 419♂, 491♀, 3 P, 970 L, 7 l, 491 lp. WEST MALAYSIA. *Johor;* Kota Tinggi. *Kedah;* Kg Bagan, Sintok F. R. *Kelantan;* Bertam, Gua Musang, Limau Kasturi. *Negeri Sembilan;* Palong F. R. *Pahang;* Bentong, Bentong Rd., Chegar Perah, Fraser's Hill, Kg Janda Baik, Kg Lamir, Kg Relong, K. Lipis, Mela, Merapoh, Padang Tungku, Pulau Tioman, Sungai Temau. *Pahang/Selangor;* The Gap. *Perak;* Chior F. R., Kg Gunong, Kg Jalong, Kg Kuala Dipang, Kg Serang Itek, K. Kangsar, Lasah, Lenggong, Maxwell's Hill, Pulai, Sungai Siput, Taiping (type-locality), Terong. *Perlis;* Kg Peng Besar, Kg Wang Kelian. *Selangor;* Ampang F. R., Bt Kutu, Bt Ulu Bakau, Jugra, Kg Tanjong Rabok, K. Kubu- Gap Rd., K. Lumpur, K. Selangor, Pahang Rd. Jungle, Ulu Gombak, Ulu Klang, Ulu Langat, Ulu Lui F. R. *Terengganu;* Dungun, K. Brang, K. Renggeh, K. Terengganu, Marang. 704♂, 868♀, 262 L, 65 p, 724 lp. EAST MALAYSIA. *Sabah.* Keningau; 1♂, 6♀. INDONESIA. *Java.* Bandoeng; 4♂, 8♀; Batavia; 8♀; Bogor; 5♂, 28 L; Buitenzorg; 3♂; Djajasana (Garoet); 2♂, 6♀, 1 l, 2 lp; Djakarta; 4♂, 6♀; Keara Tjondong (Bandoeng); 2♀; Maribaja (Lembang); 6♂, 1♀; Pasiripis (Lembang); 4♂, 3♀; Rawallo; 7♂, 17♀; Tjibodas; 1♂, 1♀; Tsjompet; 9 L. *Bali.* Batoeriti; 1♂, 1♀; Kintamani; 1♂, 1♀. *Flores.* Lekebai; 1♀. CAMBODIA. *Kirirom.* Kirirom. 1♂ terminalia. VIETNAM. *Quang Duc.* Bu-Prang, 2 L. TAIWAN. Chung-Keng Ho-Ping Tai-Chung; 5 L; Kechuan Fenlu Chiai; 2♂, 1♀; Kenkou Wu-Feng

Tai-Chung; 2 L; From Ku-Kuan to Pe-Leng Ho-Ping Tai-Chung Hsien; 1♀; Peak Lai-I Ping Tung; 1♀; Unnamed localities; 1♂, 4♀. *Additional records from literature.* INDIA. Barraud (1929a: 1059, 1934: 44) has records from Assam and the Darjeeling district which may refer either to the present species or to *ceylonensis* (see under *ceylonensis*, p. 29). His other records are more likely to refer to *ceylonensis*. BURMA. Records from Rangoon (Barraud 1934: 44; Jolly 1933: 28) probably refer to the present species since this is well outside the known range of any other member of the complex. For the record of *inornata* from the Dawna Hills see under Taxonomic Discussion. THAILAND. Thurman (1959: 30) has records from Buker Cabin area, Doi Chom Cheng, Mae Rim District and Tad Muay Falls in Chiang Mai changwat and Huey Bpong in Chiang Rai, based in part on material from tree holes and bamboos, and accordingly ascribable to the present species, and in part on specimens taken as adults which might be *tenax*, though this seems unlikely on distributional grounds. The general record by Iyengar (1953: 746) probably covers both this species and *tenax*. WEST MALAYSIA. *Pahang/Kelantan:* Gunong Tahan, *Selangor:* Kanching, Wardieburn Estate (Macdonald 1957: 10). No data are available on which an attribution might be based. EAST MALAYSIA. *Sarawak:* Unnamed localities (Moulton 1915: 48), Kampong Pangkalan Kuap (Macdonald et al. 1965: 337), Kuching (Macdonald et al. 1967: 148). These records are similarly unattributable. INDONESIA. *Sumatra.* Brug (1931: 16) has records from bamboos at Ranau See and Tjoeroep, supported by a figure of the larval comb, which are probably attributable to the present species. I have not seen any early stages from this island. Brug and Edwards (1931: 257) have a record from Kotta Tjane which could be either of this species or of *tenax*. VIETNAM. Borel (1930: 153) has a record from bamboos in forest at Gianhan attributable to the present species. His figure of the larva is in reasonable agreement. PHILIPPINES. Valder et al. (1971: 85) have a record of *"aranoides"* from Amlan, Negros Oriental, based on light trap collections. I presume this to be a misidentification. CHINA. *Hainan.* The record by Chu (1957: 146) refers to material from bamboos and tree holes and may be presumed to refer to the present species. Chu (1958: 111) adds no further data. *Szechwan.* The only available record is from the type-locality of *szechwanensis* given above. Larvae were found in bamboo stumps and, on one occasion, a ground pool As indicated below under Taxonomic Discussion, I see no reason to regard them as other than *aranoides*. *Yunnan.* Records from Chefang (Chow 1949a, b) are from bamboo stumps and are similarly attributable.

TAXONOMIC DISCUSSION. Among the 5 members of the *aranoides* complex recognized here, *serratus* is the only one which can be distinguished from the others on adult characters. The type of *ceylonensis*, as of the present species, is a unique adult, but this name can be ascribed with confidence to the Sri Lanka (Ceylon) species on distributional grounds (see p. 29). The name *tenax* can be ascribed with confidence to the pitcher plant species but can only be excluded provisionally from the synonymy since its known distribution overlaps with that of *aranoides* and the breeding place of the type specimen of the latter is unknown. The pitcher plant species is not known, however, from the type-locality or anywhere else in Perak and I feel justified, therefore, in attaching the name *aranoides* to the bamboo species. In my view the latter, besides differing from *tenax* in preferred breeding places (bamboos vs. pitcher plants) is a more northerly species. It extends eastwards from Assam to southern China and southwards through West Malaysia to approximately the southern limit of the central highlands then disappears to reappear again in

Indonesia as do some anophelines (Reid 1950: 52). In contrast to this *tenax* is a southern form extending from Indonesia through Singapore and Johor into Pahang and Selangor and northwards along the west coast to just south of the Burma-Thailand border about half way up the Isthmus of Kra.

As regards names retained in synonymy; Leicester (1908: 249) describes his *Skeiromyia fusca* as breeding in bamboos and several of his cotypes, including the lectotype, are labelled as from these. According to Daniels (1908a: 5) he also identified some specimens from pitcher plants as *fusca* but there is no evidence that these were included in his type-series. I therefore regard the present synonymy as firmly established. According to a note in the MEP archives (Scanlon ms.) the type of *Squamomyia inornata* lacks the abdomen, mid- and hindlegs and one wing. The B. M. has 2 slides, one with a male abdomen and the other with the upper part of a leg. They are labelled by Theobald *'Squamomyia inornata* n. sp. ♂" and may well be part of the type, though not labelled as such. This material, Theobald's description and the distribution all appear consistent with the attribution to the present species. I have been unable to obtain any material of *Tripteroides szechwanensis* but the description and distribution are similarly consistent with the present attribution and distribution are similarly consistent with the present attribution, see Mattingly (1980).

The status of *tenax* vis-à-vis the present species must remain in doubt until it can be investigated in the field. As noted under *tenax* (p. 37) they appear to be quite distinct, at least on the character of seta 8-VII of the larva with the solitary exception of some material from unnamed pitcher plants at Kota Tinggi in Johor where some intergrading occurs. This might suggest local hybridization were it not well south of the known limits of *aranoides* in West Malaysia. It could be an environmental effect (see p. 40) but in this case I would have expected to see more of it elsewhere, especially in view of the extensive material of both species available. Its geographical basis is not clear since *tenax* occurs well to the north apparently without intergrading. Until further light can be thrown on this problem it seems best to maintain the 2 as distinct species.

Barr and Chellapah (1963: 185) note the presence in Singapore of 2 forms of *aranoides*, one commoner in pitchers of *Nepenthes ampullaria* and *rafflesiana*, the other in *N. gracilis*. They do not describe these forms and on the basis of my Singapore material I presume them to be referring chiefly to differences in hairiness. As noted under *tenax* (p. 40) this variation is continuous and, I suspect, largely environmental. It badly needs investigating under controlled conditions in the laboratory. On the character of seta 8-VII all the extensive Singapore material I have examined conforms unequivocally to *tenax*. It is probably also significant that Colless (1957: 112) fails to mention *'aranoides"* under species breeding in small simple containers (including bamboos) but only among those breeding in pitcher plants. Nor have I seen any material from Sumatra referable otherwise than to *tenax*. All my material from that island came from pitcher plants except for 1♂ and 1♀ from Mandailing and 1♀ from Toba Meer from unrecorded breeding places. The unique female from Flores is from an unknown breeding place and could be *tenax*. It is included under *aranoides* because this is the only species so far seen from the Lesser Sundra Islands but material from these islands is very scanty.

Females from Java show considerable variation in terminalia. Those from Djajasana and Rawallo dissected by me have the spermathecal lobes approximately equal in size to the smallest seen from West Malaysia. Others from Bandoeng and Djakarta have them much larger, about half as large again as the

largest from West Malaysia, while 1 of 3 from Bandoeng and all 3 dissected from Djakarta have the smaller lobes fused. In these specimens the spermatheca accordingly has only 2 lobes approximately equal in size. Correlated with this is an increase in the number of bristles on the insula (7-8 peripheral bristles vs. 3-6 and 4-7 vs. 2-6 in the posterior corners). A female from Batavia is intermediate with respect both to the spermathecal lobes and to the insula. I do not think that taxonomic treatment is called for at present, particularly as associated early stages are available only for the typical form. *Tripteroides (Trp.) plumosus* (Brug) from Java has a very similar larva to those of the present species and *tenax*. The separation of the dorsal comb teeth from the remainder and the absence of teeth ventrad of the comb plate are not diagnostic of this species as was suggested by Brug (1931: 18). As far as can be seen from the 2 larval skins which are all that remain of his material the heavily sclerotized, but at the same time extensively fringed, larger comb teeth are distinctive.

BIONOMICS. Almost all published evidence suggests that this and other members of the *aranoides* complex are only rarely attracted to man (Chow 1949a: 127; Macdonald and Traub 1960: 89; Macdonald et al. 1967: 148; Senior-White 1920: 320). This is fully borne out by the very large collections available to me. Jolly (1933: 28) describes the present species as a day biter, but gives no figures and may well have based this observation on only a small number of recoveries.

On present evidence this species is overwhelmingly a bamboo breeder. Of the various isolates seen by me, 534 came from bored, cut or split bamboos, 38 from tree holes, log holes or stump holes, 9 from leaf axils or bracts, 8 each from plant pitchers and ground pools or other ground water, and 5 from artificial containers or coconuts.

The eggs are undescribed but Macdonald (1957: 10) found a small batch in a bamboo pot at Fraser's Hill attributable either to this species or to *tenax*. These were slowly dried, stored for 10 days and then immersed in water. Sporadic hatching followed from 4 to 10 days after. Jolly (1933: 28) found the present species in Rangoon only from August to November. Chow (1949b: 467) found it in Yunnan from June until some time before the end of the year. It would appear therefore either that the eggs are drought resistant or that the adults are capable of prolonged aestivation.

2. *TRIPTEROIDES (RACHIONOTOMYIA) CEYLONENSIS* (THEOBALD) (Figs. 14, 15, 28)

Rachionotomyia ceylonensis Theobald 1905: 248.
Rachionotomyia ceylonensis of Edwards 1913: 241.
Rachionotomyia aranoides of James 1914: 263; Senior-White 1920: 320, 1926: 190, and 1927: 66; Edwards 1922: 444 (part), 1926: 117 (part); Barraud 1929a: 1059 (part).
Tripteroides (Tripteroides) aranoides of Edwards 1932: 78 (part); Stone et al. 1959: 66 (part).
Tripteroides aranoides of Barraud 1934: 42 (part); Wijesundara 1942: 455; Carter 1950: 87.
Tripteroides (Rachionotomyia) aranoides of Stone 1963: 121; Knight and Stone 1977: 317.
?*Culex singalesi* Theobald *in* Green 1901: 368 *(nomen nudum)*.
?*Culex singalesi* Marlatt 1903: 122 *(nomen nudum)*.

FEMALE. Wing 2.2-3.8 mm. *Head.* Proboscis 1.2-1.4 length of fore-femur, 1.1-1.2 of abdomen. Palps 0.14-0.17 of proboscis. Palps and proboscis entirely dark. Clypeus with numerous flat white scales. Tori with small pale scales on inner surface. Antenna about 0.5 length of proboscis or a little more. Occiput with broad, flat, dark scales with bronzy reflection and a conspicuous border of whitish scales around eye margins with pronounced blue reflection under appropriate illumination, small, dark upright scales on nape, 2-3 stout, dark, orbital bristles far out on either side. *Thorax.* Scutum covered with broad, flat brown scales with bronzy luster, directed outward except in the midline where they are somewhat narrower and directed more posteriorly, broad or moderately broad whitish scales on anterior border. Broad scales above paratergite whitish to midbrown. No prescutellar bristles. Scutellar scales entirely dark. Postnotum bare. Anterior pronotal lobes with whitish scales on anterior border. Posterior pronotum entirely covered with broad pale scales. No posterior pronotal bristle seen, 2-5 spiraculars. Subspiracular and postspiracular areas, all but the anteroventral part of the sternopleuron, mesepimeron and coxae white scaled. Paratergite bare. 1-2 prealar and 2-5 lower sternopleural bristles present. *Legs.* As described for *aranoides* (p. 21). *Wing.* Outstanding scales on upper surface narrow, linear, broader on R_2 and R_3, especially toward the tip. Upper calypter with 4-10 hairlike scales. Upper fork cell 1.5-1.6 length of its stem. *Halter.* Head dark. *Abdomen.* As in *aranoides* (Figs. 1, 6) dark above with uniform whitish lateral border. Sternites all pale. *Terminalia.* As in *aranoides* (Fig. 6).

MALE (Fig. 14). Wing 2.0-3.2 mm. Antenna strongly plumose, about half the length of the proboscis or slightly more. Upper fork cell 1.2-1.5 the length of its stem. Claws as in *aranoides* (Fig. 3). Abdominal markings as in the ♀. Terminalia (Fig. 14) as in *aranoides*. Basal lobe of basistyle with 6-8 setae longer and stouter than the others. Paraproct with 3-4 large teeth and 1 smaller one. IXth tergite with 3-5 flattened spines on each lobe, one broader than the others.

PUPA (Figs. 14, 28). Very much as in *tenax* and *aranoides*, differing from these only in the paddle which is shorter and less pointed, at most 1.3 as long as its greatest breadth. The overall range of variation is illustrated in Fig. 28.

LARVA (Fig. 15). Closely resembles that of *aranoides*. Palatal setae slender. Seta 1-A single, arising near tip of antenna; 1-C stout or moderately stout, not very strongly curved, 4-C single, 5,6-C single or bifid, 7-C with 2-5 branches, 11-C with 7-13, 14-C with 2-7, 15-C with 4-9. Mentum with 8-10 teeth on either side of the main central tooth. *Thorax.* Seta 0-P with 8-18 branches, 1-P with 6-17, 3-P with 6-12, 4-P with 7-13, 7-P with 9-12, 8-P with 10-16, 9-P with 2-6, 11-P with 2-4, 13-P with 11-20, 14-P with 15-25; 1-M with 9-18, 6-M from shorter than to slightly longer than 7-T, without basal denticle, its tip pectinate, 8-M with 5-15 branches, 9-M with 5-8, 13-M with 11-24, 14-M with 9-20; 1-T with 9-19, 4-T with 7-19, 5-T with 8-17, 7-T with basal arm which is itself sometimes further divided, 8-T with 4-11 branches, 9-T with 5-7, 13-T with 12-24. *Abdomen.* Seta 1-I with 7-14 branches, 2-I with 7-18, 5-I with 6-14, 6-I with 2-3, 7-I single or bifid, 9-I with 3-8 branches, 11-I with 8-16, 13-I with 12-19, 14-I with 5-10; 0-II with 5-9, 1-II with 8-15, 2-II with 7-16, 5-II with 7-15, 6-II and 7-II single or bifid, 9-II with 3-8 branches, 11-II with 9-15, 13-II with 11-19, 14-II with 6-10; 0-III with 4-10, 1-III with 10-16, 2-III with 8-17, 5-III with 5-14, 6-III single or bifid, 9-III with 5-20 branches, 11-III with 9-17, 13-III with 11-17,

14-III with 5-12; 0-IV with 5-11, 1-IV with 10-17, 2-IV with 7-18, 5-IV with 7-15, 6-IV single or bifid, 9-IV with 5-11 branches, 11-IV with 9-20, 13-IV with 11-17, 14-IV with 5-13; 0-V with 5-11, 1-V with 6-18, 2-V with 8-17, 5-V with 8-13, 6-V single, 9-V with 5-13 branches, 11-V with 9-17, 13-V with 11-18, 14-V with 5-12; 0-VI with 4-9, 1-VI with 10-17, 2-VI with 9-14, 5-VI with 8-13, 6-VI single, 9-VI with 6-11 branches, 11-VI with 10-15, 13-VI with 9-17, 14-VI with 4-10; 0-VII with 6-13, 1-VII with 9-17, 2-VII with 7-14, 5-VII with 7-19, 8-VII with 7-13, 9-VII with 5-11, 11-VII with 7-18, 13-VII with 7-17. Comb with 6-9 large teeth and 1-6 smaller intercalary teeth arising from a sclerotized comb plate, the larger teeth relatively slender spines, some of the smaller and more ventral sometimes broader, 1 or 2 of the most ventral sometimes arising off the comb plate. Seta 1-VIII with 10-23 branches, 3-VIII with 2-6, 5-VIII single to tetrafid, 14-VIII often apparently absent, sometimes well developed as in Fig. 15. Edge of saddle with slender spines. Seta 1-X with 2-3 branches, 2-X with 4-7, 4-X with 3-7. Anal papillae more or less cylindrical from about 1.1-2.3 length of the saddle. Siphon about 2.2-3.0 length of the saddle. Pecten with 4-8 teeth on either side of the midline, individual teeth as in Fig. 15, the delicate lateral fringe barely perceptible. Seta 1-S paired with 2-4 branches, 1a-S with 2-3, 4-6 in number on either side of the midline, 2a-S 6-10 in number, with 2-3 branches, lateral setae 2-4 on either side, single to trifid.

KARYOTYPE. The description by Aslamkhan (1971: 237) is based on material from Dinajpur District, Bangladesh. This is taken provisionally to have been the present species on distributional grounds.

TYPE-DATA. Holotype female on pin. SRI LANKA. Peradeniya, x.1901, in B. M.

DISTRIBUTION. BANGLADESH. *Chittagong Division;* Sylhet District, Chaklapungee; 1♀, Ramgarga; 7♂. INDIA. *Assam:* Sibsagar District, Golaghat; 2♂, 2 L, 1 l, 1 lp. *Bengal:* Darjeeling District, Old Jalpaiguri; 7♂, 6♀, 5 L, 5 p, 5 lp; Pashok; 1 L; Sukna; 37♂, 31♀, 41 L, 15 p, 39 lp. *Bombay Deccan:* Belgaum District, Nagargali; 2♂, 2♀, 4 lp. *Nilgiri Hills:* Gudalur; 20♂, 30♀, 5 p; Nandateei Estate; 6♂, 6♀; Silver Cloud Estate; 1♂, 3♀; *Tamil Nadu:* Salem District, Yercaud, Shevaroy Hills, 4500 ft.; 1♀. SRI LANKA. *Central Province:* Kandy District, Aluwiharie; 2♂; Peradeniya (type-locality); 77♂, 79♀, 55 L, 100 p, 47 lp; Udawattekele; 14♂, 11♀, 23 L, 14 lp; Wakarwatte; 1♀; Matale District, Suduganga; 2♂, 4♀; Nuwara Eliya District, Badulla; 3♀. *Northwestern Province:* Puttalam District, Kala-oya; 1♂, 1 lp; *Southern Province:* Galle District, Sinharaya Forest, Kanneliya; 1♂, 1 lp; *Western Province:* Colombo District, Colombo; 1♂, 3♀; Gampaha; 1♀, 1 p; Ganemulla; 3♀; Kalatuwawa; 2♂, 3♀, 1 L, 5 p, 1 lp; Wagu; 1♂, 1♀, 2 p; Kalutara District, Badureliya; 1♀, 1 lp; Sinharaja Forest, Morapitiya; 19♂, 19♀, 6 L, 5 p, 28 lp.

Additional records from literature. ANDAMAN IS. Barraud (1929a: 1060, 1934: 44) has a record of *"aranoides"* which may refer to the present species. INDIA. Records by Barraud *(loc. cit.)* from Yellapur and Kedra, N. Kanara and from Kumtai in the Sibsagar District of Assam probably refer to the present species. His others from Assam are dealt with below under Taxonomic Discussion.

TAXONOMIC DISCUSSION. Theobald (1905: 249) based the genus *Rachionotomyia* on the unique holotype of the present species by reason of the presence on the scutellum of a "large thick tapering blunt process backwards, covered with flat scales of dull grey hues . . . . " Banks, in a note attached to the type and dated 21 Sept. 1908 (quoted in full by Edwards 1913: 241) suggests

that the process is an exudate from the internal tissues with scales adventitiously attached. In my view it is purely an artifact comprising a small piece of Canada balsam with scales transferred from various parts of the specimen including the wing fringe. I certainly agree with Banks, and Edwards, that it is of no taxonomic significance. Though treated here as a distinct species pending further investigation this may well be a geographical subspecies of *aranoides*. The 2 ranges appear to make contact, if at all, along the southern edge of the Brahmaputra Valley in Assam. Here *aranoides* occurs in Shillong at about 5,000 ft. in the Khasi Hills while Barraud (1929a: 1060, 1934: 44) has a record, probably of that species, from Haflong at about 4,000 ft. in the Cachar Hills. In contrast the only material of *ceylonensis* seen by me from Assam comes from localities in the floor of the valley below 500 ft. On the other hand, Barraud *(loc. cit.)* has records from the south-facing slopes running up to Darjeeling, from Tindharia, Sureil and Mungpoo (Mongapo) between 2,500 and 5,000 ft. but material from these is no longer available. The unassociated adults from Bangladesh come from low altitude and can be attributed with some confidence to the present species.

Adults of *ceylonensis* tend to have more extensive pale scaling on the anterior border of the scutum than do those of *aranoides* and the broad scales above the paratergite more often pale, but these differences are not constant. The pupal paddles afford the best diagnostic character, being more rounded and almost always shorter than the shortest seen in *aranoides*. Fig. 28 shows the extremes of variation in both species. These will be seen to be much greater in *aranoides* than in *ceylonensis*. There is, however, no sign of clinal variation in the former, relatively short paddles being apparently at least as common in Malaysia as in northern Thailand. The larvae appear to be indistinguishable.

Culex singalesi is a *nomen nudum* attributed by Marlatt (1903: 122) to Theobald in Green (1901). The latter includes it, in a footnote to his list of mosquitoes recorded from Ceylon, among additional names sent him by Theobald. I am indebted to Dr. Ward for the suggestion that this is probably a manuscript name for *ceylonensis* subsequently changed by Theobald. This I accept. It appears from surviving correspondence in the B. M. that the additional names are based on "a second small batch" of mosquitoes sent to Theobald by Green in November 1901. His covering letter is marked by Theobald "List sent 14/12/01". This hardly leaves time for publication of the circular containing Green's list in December 1901 which is the date it bears. However, publications do not in fact always appear on the date attributed to them.

The figure of the cibarium in Barraud and Covell (1928: Fig. 44), attributed to *aranoides*, is based on material of unknown provenance, probably Indian and provisionally attributable to the present species.

BIONOMICS. Barraud (1929a: 1060) states, "All the specimens bred out were from larvae found in bamboos," but later (1934: 44) amends this to, "HABITAT. - Bamboos, occasionally tree-holes". Isolates from India seen by me were distributed as follows: cut and bored bamboos 32, tree hole 1, banana stump 1. The Bangladesh material came from bamboo stumps apart from 1 resting female. Senior-White (1920: 320) says [in Ceylon], "This species is a tree-hole breeder. It was bred in large numbers in November from bamboo stumps . . . and two ♂♂ were bred from water in a hollow *Erythrina* tree . . . in the same month." Though oddly expressed, I take this to be equivalent to Barraud's statement. Wijesundara (1942: 455) records 47 isolations from bamboos and 3 from tree holes. Isolates from Sri Lanka seen by me were distributed as follows: cut and bored bamboos 34, tree holes, stump holes,

root holes and log holes 7, leaf axils *(Colocasia, Bromelia* spp., pineapple, "Bottle gas plant") 8, coconut shell 1, ground pool 1. Senior-White (1926: 193) records the following ranges of variation in physical factors in the breeding places: pH 5.8-7.6, solute concentration (conductivity x 10^6) 100-999, dissolved oxygen requirement nil. According to Senior-White (1920: 320), "The ♀ does not bite."

3. *TRIPTEROIDES (RACHIONOTOMYIA) COONORENSIS* NEW SPECIES
(Figs. 3, 5, 16, 17)

FEMALE (Figs. 3, 5). Wing 3.0-3.9 mm. *Head.* (Fig. 3). Proboscis very slender, 1.3 length of forefemur, 1.2-1.3 of abdomen. Palps 0.12-0.14 of proboscis. Clypeus usually with pale scales. Tori bare. Antenna about 0.5 length of proboscis. Occiput with flat, dark scales with bronzy reflection and a border of white scales around eye margins, with subdued blue reflection, expanding ventrolaterally. Small dark upright scales with expanded tips on nape. 2-3 orbital bristles well out on either side. *Thorax.* Scutal ornamentation as described for *affinis* but with narrow white scales on anterior border much more numerous and dark scales much narrower. 1-3 prescutellar bristles present, usually 3. All scutellar scales dark. Postnotum bare. Scales on anterior pronotal lobes mainly white, those on posterior pronotum midbrown. One posterior pronotal bristle and 2-6 spiraculars present. Almost the whole pleuron except for the anteroventral portion of the sternopleuron with broad white scales. Coxae white scaled. Paratergite with white scales encroaching slightly onto scutum. 1-3 prealar bristles present, 2-3 lower sternopleurals. *Legs.* Femora pale below to tip. Claws simple, much as described for *affinis* but the hindclaws more strongly curved. *Wing.* Much as in *affinis* (Fig. 10). Upper calypter with 5-6 hairlike scales. Upper fork cell 1.3-1.7 length of its stem. *Halteres.* Head entirely dark. *Abdomen* (Fig. 5). Dark above with continuous lateral border of pale creamy scales and small apicolateral encroachments barely visible from above. Venter pale except for sternite VIII which is dark. *Terminalia.* Much as in *affinis* (Fig. 7). IXth tergite with 7 setae in the specimen examined; insula with 5 peripheral setae on either side of midline and 4 on each side in the posterolateral corners.

MALE (Fig. 16). Wing 3.2-3.6 mm. Antenna less than half the length of proboscis. Upper fork cell 1.3-1.5 length of its stem. Claws (Fig. 3) much as in *aranoides* but more strongly curved. *Terminalia* (Fig. 16). Apparently indistinguishable from those of *aranoides*. Basal lobe of basistyle with 8 long, stout setae. Lobes of IXth tergite widening towards base, the space between them consequently V-shaped rather than U-shaped (distinction from *affinis*, Fig. 24), with 4-5 spines at tip, the tergal spine flattened, darkened and blunt-tipped. Paraproct with 2 stout teeth only, no smaller ones (a possible distinction from both species). Apex of main body of phallosome with a well developed pointed lobe as in *aranoides*.

PUPA (Fig. 16). Very similar to that of *affinis* but with the paddles longer and much more constant in length. Differs mainly as follows: seta 4-I with 2-3 branches, 6-I mostly single (bifid in one specimen), 7, 9-I single in all cases; 4-II with 2-4 branches, usually 2-3; 4-III single or bifid, usually single, 5-III as for *affinis* but longer than 3-III on one side of one specimen; 5-V bifid or trifid; 5-VI single to trifid, 7-VI single in all cases; 3-VII single or bifid (longer than segment VIII in all specimens but one). Paddles 1.9-2.4 as long

as their greatest breadth.

LARVA (Fig. 17). Closely resembles that of *affinis*. Head. Setae 1-A and 1-C as described for *affinis*, 1-C strongly curved inwards though less so than in Fig. 25. Seta 4-C single to trifid, 5,6-C single or bifid, 7-C with 3-6 branches, 11-C with 8-15, 14-C with 2-5, 15-C with 3-7. Mentum with 8-10 teeth on either side of the central tooth. *Thorax*. Seta 0-P with 9-19 branches, 1-P with 12-22, 3-P with 8-14, 4-P with 9-15, 7-P with 12-19, 8-P with 11-26, 9-P with 5-6, 13-P with 25-32, 14-P with 22-39; 1-M with 13-21, 6-M simple, either blunt or sharp pointed, 8-M with 8-24 branches, 9-M with 6-11, 13-M with 12-23, 14-M with 14-25; 1-T with 13-21, 4-T with 6-15, 5-T with 14-20, 7-T with well developed basal arm in all cases, the longer arm usually, and the shorter always, sharp pointed, from 1.5-3.0 length of 6-M (usually more than 2.0 of 6-M), 8-T with 7-19 branches, 9-T with 6-9, 13-T with 13-22. *Abdomen*. Seta 1-I with 11-21 branches, 2-I with 10-18, 5-I with 11-16, 6-I double, 7-I single to trifid, 9-I with 3-7 branches, 11-I with 10-17, 13-I with 12-22, 14-I with 7-12; 0-II with 5-13, 1-II with 12-20, 2-II with 11-17, 5-II with 9-18, 6-II single or bifid, 7-II bifid, 9-II with 5-11 branches, 11-II with 10-17, 13-II with 14-21, 14-II with 7-12; 0-III with 8-16, 1-III with 13-21, 2-III with 10-15, 5-III with 12-16, 6-III bifid, 9-III with 6-13 branches, 11-III with 12-19, 13-III with 16-21, 14-III with 7-12; 0-IV with 10-16, 1-IV with 14-20, 2-IV with 10-16, 5-IV with 13-22, 6-IV double, 9-IV with 12-14 branches, 11-IV with 13-18, 13-IV with 15-20, 14-IV with 8-12; 0-V with 11-17, 1-V with 17-24, 2-V with 13-17, 5-V with 15-23, 6-V double, 9-V with 14-18 branches, 11-V with 16-18, 13-V with 16-20, 14-V with 9-14; 0-VI with 10-15, 1-VI with 15-24, 2-VI with 13-15, 5-VI with 12-25, 6-VI single or double, 9-VI with 10-18 branches, 11-VI with 16-19, 13-VI with 16-17, 14-VI with 8-11; 0-VII with 9-16, 1-VII with 17-25, 2-VII with 13-15, 5-VII with 14-22, 8-VII with 10-14, 9-VII with 7-10, 11-VII with 10-15, 13-VII with 14-16. Comb as in Fig. 17 with 12-21 teeth in a straight, closely packed row, the more dorsal sharp spines, the more ventral fringed scales, the 2-3 most dorsal a little more widely spaced. Seta 1-VIII with 17-20 branches, 3-VIII with 5-9, 5-VIII with 3-5, 14-VIII, where present, minute, single to hexafid. Saddle edge with long, slender spines. Seta 1-X single, 2,4-X each with 3-6 branches. Anal papillae variable, broad and leaf-shaped in some specimens, much narrower in others, from about 1.2-3.0 length of the saddle. Siphon 3.0-3.7 length of saddle. Pecten with 2-7 teeth on either side of the midline, the individual teeth as in *affinis* and similarly confined to the apical two-thirds, or thereabouts, of the siphon. Seta 1-S with 3-5 branches, 1a-S, 2a-S and lateral setae with 2-3. Setae 1a-S 4-8 in number on either side of midline, 2a-S 3-7 in all, lateral setae 1-4, absent in one specimen.

TYPE-DATA. Holotype male, #6, on pin with associated larval and pupal skins on slide, U.S.N.M. type no. 76706. INDIA: Coonor, Sim's Park, 1968. B. N. Mohan. Allotype female, #50, on pin with associated larval and pupal skins on slide, both in U. S. N. M. INDIA: Coonor, 1968. B. N. Mohan.

DISTRIBUTION. INDIA. *Madras State:* Coonor (type-locality); 8♂, 15♀, 1 L, 4 p, 20 lp; Grant Hill, Wellington, 7♂, 5♀, 1 l, 8 lp.

TAXONOMIC DISCUSSION. Although the adults differ strikingly in the ornamentation of the back of the head and scutum, there appears to be no single character completely diagnostic for the larvae of this species and *affinis*. The present species is much less variable in the larval and pupal stages than *affinis*, at least to judge from the limited series of specimens available, and specimens of the latter with reduced larval comb or short pupal paddles are easily distinguished. The range of variation in setal branch numbers can be

given only approximately for the larva, since so much of the material comprises badly distorted larval skins. This applies particularly to the posterior abdominal segments. The overlap with *affinis* is certainly extensive but reduction in size of larval seta 14-VIII of the present species is matched in only 2 of my *affinis* larvae. The very short seta 6-M in most larvae of the present species is also diagnostic from almost all the larvae of *affinis* seen by me and differences in the shape of the anal papillae may provide a useful additional partial character.

BIONOMICS. All the available specimens came from bamboo stumps, the condition of which is not recorded. It would be interesting to know whether variations in the degree of weathering of these was associated with the variability, particularly of the larval comb, observed in *affinis*. No information is available as to adult biology.

4. *TRIPTEROIDES (RACHIONOTOMYIA) SERRATUS* (BARRAUD) (Fig. 5)

Rachionotomyia aranoides var. *serrata* Barraud 1929a: 1059.
Tripteroides aranoides var. *serrata* Barraud 1934: 43.
Tripteroides (Tripteroides) aranoides serratus of Thurman 1959: 31.

FEMALE (Fig. 5). Wing 3.2-3.4 mm. *Head.* Proboscis long and slender, 1.3 length of forefemur, 1.1 of abdomen. Palps about one-seventh of the length of the proboscis. Anterior half of clypeus with abundant flat white scales. Inner surface of tori with similar, but smaller, scales. Antenna about 0.5 length of proboscis. Occiput with flat dark brown scales and a conspicuous border of white scales, with faint bluish reflection, round eye margins, expanding ventrolaterally. Small brown upright scales with expanded tips on nape. Three orbital bristles well out on either side. *Thorax.* Scutum with broad, flat, dark brown scales with bronzy reflection, narrower and directed backward in midline, otherwise directed outward and backward. Some moderately broad pale scales on anterior promontory. Broad scales above paratergite brown. No prescutellar bristles. Scutellum entirely dark scaled. Postnotum bare. Anterior pronotal lobes with broad, pale scales, some dark ones posteriorly. Posterior pronotum entirely covered with broad pale scales, no posterior pronotal bristle, 2-4 spiraculars. Pleura entirely covered with broad, pale scales except for the anterior portion of the postspiracular area, the anteroventral portion of the sternopleuron and parts of the mesepimeron. Paratergite bare. 1-2 prealar and 3 lower sternopleural bristles present. Femora and tibiae and much of first hindtarsal white scaled below. *Legs.* Legs otherwise dark. Claws much as in *aranoides*. *Wing.* Outstanding scales on upper surface narrow, broader on the veins of the upper fork cell, especially toward the tip. Upper calypter with 5-7 hairlike scales. Upper fork cell 1.5-2.0 length of its stem. *Halter.* Head dark with a conspicuous spot of white scales on under surface. *Abdomen* (Fig. 5). Tergites dark above with pale lateral patches, triangular on segments III-VII with the apices directed posteriorly, in one specimen, but not the other, the bases of these triangles extend upward so as to be visible dorsally. Sternites entirely pale, including VIII. *Terminalia.* Not seen.

MALE. Wing 3.2-3.4 mm. Antenna strongly plumose, a little more than half the length of the proboscis. Upper fork cell 1.6-1.8 length of its stem. Claws much as in *aranoides* (Fig. 3). Abdominal markings as in the ♀ but with

the lateral pale patches failing to reach the apex of tergites III-VII in the lectotype and invisible from above in both specimens. *Terminalia* (of Thailand specimens) very much as figured for *aranoides* (Figs. 11, 12). IXth tergite with 3-5 spines on each lobe.

EARLY STAGES. Unknown.

TYPE-DATA. Hololectotype female and allolectotype male and 1 male and female paratype, on pins, Bombay Deccan, Nagargali, viii. 1921, P. J. Barraud, in B. M. Prof. Scanlon (ms. in M.E.P. files, Smithsonian Institution) notes that there are a further 5 males and 3 females with the same data in the collection of the Zoological Survey of India, Calcutta.

DISTRIBUTION. INDIA. Bombay Deccan. Nagargali (type-locality); 2♂, 2♀. THAILAND. Chiengmai Prov., Doi Sutep; 5 slides of ♂ terminalia.

TAXONOMIC DISCUSSION. Thurman (1959: 31) recorded a single collection of 18 specimens which included typical *aranoides* and *serratus* and "some intergrades". She felt it desirable "to treat the form as a subspecies for the time being, assuming that N. Thailand is an area of overlap between the Malayan and Indian forms, but recognizing the possibility that *T. a. serratus* is only a color variant and later may be deemed a synonym of *T. a. aranoides*." The Indian form to which she refers is treated here as a distinct species, *ceylonensis* (p. 26). If the present form were to be accorded infraspecific status it would probably require to be named as of that species rather than *aranoides*. I have not seen any of Thurman's material other than male terminalia. All the specimens available to me are well preserved, well marked and strikingly distinct from *aranoides* and *ceylonensis*. For this reason and in the absence of early stages or recorded breeding places, the former likely to be more useful taxonomically than the adults, I prefer to treat it for the present as a distinct species. In my view all the members of the very interesting *aranoides* complex should be treated for the time being as of equal status pending fuller investigation in the field and laboratory.

BIONOMICS. The original series appear to have been captured as adults. The Thailand specimens were netted as adults in damp jungle (Thurman 1959: 31).

5. *TRIPTEROIDES (RACHIONOTOMYIA) TENAX* (DE MEIJERE) (Figs. 18, 19)

Ficalbia tenax De Meijere 1910: 928.
Sheiromyia fusca of Daniels 1908a: 5 *nec* Leicester (*lapsus* for *Skeiromyia fusca*).
Rachionotomyia aranoides (Theobald) of Edwards 1923: 2 and 1926: 116 *(partim)*, Edwards and Given 1928: 337, Dover 1928: 24 and Brug 1931: 15 *(partim)*.
Tripteroides (Tripteroides) aranoides of Edwards 1932: 78 (partim).
Tripteroides (Rachionotomyia) aranoides of Brug 1934: 149 and Lever 1950: 98.
Tripteroides aranoides of Barraud 1934: 42 *(partim)*, Causey 1937: 411, Colless 1957: 113, Macdonald 1957: 10 *(partim)*, Macdonald and Traub 1960: 88 and Barr and Chellapah 1963: 185.

FEMALE. Wing 2.2-3.4 mm. *Head.* Proboscis long and slender, 1.2-1.3 length of forefemur, 1.0-1.1 of abdomen. Palps about 0.14-0.17 of proboscis. Palps and proboscis entirely dark. Anterior portion of clypeus with numerous flat white scales. Tori with a few small white scales on inner sur-

face. Antenna about 0.5 length of proboscis. Occiput with flat, dark brown scales with bronzy reflection and a narrow border of white scales, with faint bluish reflection, round eyes expanding ventrolaterally. Some small dark upright scales, with expanded tips on nape. 2-3 orbital bristles far out on either side. *Thorax*. Scutum thickly covered with broad, flat, brown scales with bronzy luster, tending to be narrower in the midline. A few moderately broad whitish scales on and to the sides of the anterior promontory. Broad scales above paratergite whitish to midbrown. No prescutellar bristles. A single very unequal pair of posterior dorsocentrals seen in one specimen. Scutellar scales entirely dark. Postnotum bare. Anterior pronotal lobes with whitish scales on anterior border, dark scales behind. Posterior pronotum entirely covered with broad pale scales, 1 small posterior pronotal or none, 2-4 spiraculars. Subspiracular area, postspiracular area, all but the anteroventral part of the sternopleuron, most of the mesepimeron and the coxae white scaled. Paratergite bare. Two prealar and 2-3 lower sternopleural bristles present. *Legs*. Femora dark above, pale below to tip. Tibiae and some tarsal segments usually paler below. Claws much as described for *aranoides*. *Wing*. Outstanding scales on upper surface narrow, linear, somewhat broader on R_2 and R_3, especially on the distal portion of these veins. Upper calypter with 2-6 hairlike scales. Upper fork cell 1.3-2.0 length of its stem. *Halter*. Head dark. *Abdomen*. Dark above with uniform lateral border of whitish scales, much as in *aranoides* (Fig. 1). Sternites entirely pale (VIII somewhat darkened in specimens from Gunong Benom). *Terminalia*. Postgenital plate as figured for *aranoides* (Fig. 6) but tending to be narrower and with the apex convex or at most very slightly excavated. IXth tergite with 2-5 bristles on either side. Insula with 3-5 stout peripheral bristles on each side and 3-4 smaller ones in the posterior corners.

MALE (Fig. 18). Wing 1.8-3.1 mm. Antenna strongly plumose, about half the length of the proboscis or a little more. Upper fork cell 1.3-1.4 the length of its stem. Claws very much as in *aranoides* (Fig. 3). Abdomen with uniform lateral border of pale scales as in the ♀. *Terminalia* (Fig. 18) much as in *aranoides*. Basal lobe of basistyle with 6-9 setae longer and stouter in varying degrees than the remainder. Paraproct with 2-3 large teeth, with or without 1-2 smaller ones. IXth tergite with 3-5 flattened spines on each lobe, the inner one somewhat broader than the others.

PUPA (Fig. 18). Apparently indistinguishable from that of *aranoides*. Setae 1-4-C single or bifid, 5-C single to tetrafid, 6-8-C single or bifid, 9-C single, 10-C single to trifid, 11,12-C single or bifid; 1-I with 2-6 branches, 2-I single, 3-I single or bifid, 4-I bifid to tetrafid, 5-I single 6-I single to tetrafid, 7,9-I single; 1-II single to tetrafid, 2,3-II single, 4-II bifid or trifid, 5-II single to trifid, 6-II single, very variable, sometimes short and very delicate, at others long and strongly developed as in Fig. 18, 7-II single, 9-II, where present, single to trifid; 2,3-III single, 4-III single to trifid, 5-III single or bifid, 6-III single to trifid, 7-III single or bifid, 8-III single to trifid, 9-III single, 10,11-III single or bifid; 1-IV single or bifid, 2-IV single, 3-IV single to trifid, 4,5-IV single or bifid, 6-8-IV single to trifid, 9-IV single, 10,11-IV single or bifid; 1-V single to trifid, 2-V single, 3-V single or bifid, 4-V single to trifid, 5-V single, 6-8-V single to trifid, 9,10-V single, 11-V single to trifid; 1-VI single to trifid, 2,3-VI single, 4-VI single or bifid, 5-VI single, 6,7-VI single or bifid, 8-VI single to pentafid, 9,10-VI single, 11-VI single to trifid; 1-VII single or bifid, 2-4-VII single, 5-7-VII single or bifid, 8-VII single to trifid, 9-VII with 2-11 branches, 10-VII single, 11-VII single to trifid; 4-VIII single, 9-VIII with 8-22 branches. Paddles bluntly

pointed and spiculate at apex, varying in length from about 1.35 to 2.00 their greatest breadth.

LARVA (Fig. 19). Very similar to that of *aranoides*, differing in details given in the key (and see below under Taxonomic Discussion). *Head.* Seta 1-A as described for *affinis;* 1-C short, moderately stout, only slightly curved, 4-6-C single, 7-C single to trifid, 11-C with 3-9 branches, 14-C with 2-5, 15-C with 3-6. Mentum with 6-8 teeth on either side of the central tooth, usually 6-7. *Thorax.* Seta 0-P with 2-11 branches, 1-P with 3-19, 3-P with 2-9, 4-P with 2-12, 7-P with 3-15, 8-P with 5-18, 9-P with 1-4, 13-P with 5-25, 14-P with 4-29; 1-M with 3-21, 6-M shorter than 7-T, the tip blunt and minutely pectinate, 8-M with 2-10 branches, 9-M with 2-5, 13-M with 4-23, 14-M with 3-24; 1-T with 2-14, 4-T and 5-T single or with up to 15 and 18 branches respectively, 7-T simple, or, more often, with well developed basal arm, sometimes with both conditions in the same specimen, 8-T single or with up to 7 branches, 9-T with 2-7 branches, 13-T with 8-37. *Abdomen.* Seta 1-I with 5-14 branches, 2-I with 4-15, 5-I with 4-11, 6-I single to tetrafid, 7-I single or bifid, 9-I single to heptafid, 11-I with 5-14 branches, 13-I with 8-19, 14-I with 2-10; 0-II single to nonafid, 1,2-II with 4-15 branches, 5-II with 5-11, 6-II single to pentafid, 7-II single or bifid, 9-II single to heptafid, 11-II with 5-13 branches, 13-II with 7-17, 14-II with 2-11; 0-III with 2-9 branches, 1-III with 5-16, 2-III with 4-14, 5-III with 4-11, 6-III single to trifid, 9-III with 3-9 branches, 11-III with 4-12, 13-III with 7-17, 14-III with 1-11; 0-IV with 3-14, 1-IV with 5-19, 2-IV with 4-17, 5-IV with 4-13, 6-IV single or bifid, 9-IV with 3-11 branches, 11-IV with 6-16, 13-IV with 6-19, 14-IV single or with up to 11 branches; 0-V with 3-10 branches, 1-V with 6-19, 2-V with 4-19, 5-V with 5-10, 6-V single or bifid, 9-V with 3-10 branches, 11-V with 5-16, 13-V with 5-18, 14-V with 2-9; 0-VI with 3-11 branches, 1-VI with 5-20, 2-VI and 5-VI with 3-11, 6-VI single or bifid, 9-VI with 4-12 branches, 11-VI with 4-16, 13-VI with 5-18, 14-VI single to hexafid; 0-VII with 2-11 branches, 1-VII with 2-20, 2-VII single or with up to 16 branches, 5-VII with 2-10, 8-VII small and delicate, single to 9-branched, usually arising more posteriorly than in *aranoides*, closer to setae 9 and 12, 9-VII with 2-9 branches, 11-VII single or with up to 14, 13-VII with 3-15. Comb with 5-10 large teeth with or without 1-5 small intercalary ones, all arising from a sclerotized plate or occasionally with 1-2 of the most ventral arising off the plate. The individual teeth vary considerably. Often, as in Fig. 19, the 2-3 most dorsal are simple, strongly sclerotized, spines, the remainder being less strongly sclerotized, fringed scales. Often, however, more of the dorsal teeth are of the first type and there are correspondingly fewer scales. Less often even the most dorsal comb tooth is fringed. Seta 1-VIII with 3-17 branches, 3-VIII single to pentafid, 5-VIII single or bifid, 14-VIII, where present, minute or very small, single to trifid. Saddle fringe consisting wholly or mainly of laterally fringed spines and apically fringed scales. Seta 1-X single to trifid, 2-X bifid to pentafid, 4-X single to tetrafid. Anal papillae cylindrical, 1.4-3.1 length of saddle. Siphon 2.2-3.6 length of saddle. Pecten of 2-6 teeth on either side confined to the apical one-third to two-thirds of the siphon, individual teeth as in *aranoides*, sometimes broader. Seta 1-S bifid or trifid, 1a-S 3-6 in number on either side of midline, single to trifid, usually bifid, 2a-S 5-9 in all, single or bifid, rarely trifid, lateral setae, where present, 1-3, single or bifid.

TYPE-DATA. Lectotype female, No. 54, on pin. JAVA: Tjibodas, 1909. Jensen. Allolectotype male, No. 27, on pin, with same data. Both in University Zoological Museum, Amsterdam.

DISTRIBUTION. THAILAND. *Ranong.* Ban Phon Rang; 10♂, 11♀, 8 L, 20 p, 1 lp; Muang Hat Som Paen; 1♂, 5♀, 3 p, 1 lp; Unnamed locality; 10♂, 3♀, 1 p, 7 lp. WEST MALAYSIA. *Johor.* Kg Sg Tiram; 4 L; Kota Tinggi; 4♂, 21♀, 7 L, 26 lp. *Melaka.* Melaka; 7♂, 7♀, 4 lp. *Negeri Sembilan.* Seremban; 2♀. *Pahang.* Cameron Highlands; 3♂, 3♀, 2 lp; Central Highlands; 8♂, 7♀, 4 L, 5 lp; Fraser's Hill; 28♂, 28♀, 11 L, 47 lp. Mt. Brinchang; 19♂, 3♀. Gunong Benom; 19♂, 10♀, 1 L, 6 p, 9 lp; Kuantan; 34♂, 52♀, 3 L, 5 p, 2 lp; Ulu Yam (The Gap); 13♂, 8♀, 1 p, 2 lp. *Pinang.* Pinang. 2♂, 2 lp. *Selangor.* K. Selangor; 4♂, 7♀, 3 p, 4 lp. SINGAPORE. Singapore I.; 179♂, 238♀, 87 L, 47 p, 184 lp; P. Blakang Mati; 20♂, 35♀, 17 L, 10 p, 44 lp; P. Ubin; 1♀, 1 lp. EAST MALAYSIA. *Sabah.* Kotakinabalu. 1♀. INDONESIA. *Java.* Gunong Karang; 1♂, 1♀; Gunung Salak; 1♀; Tjibodas (type-locality); 3♂, 4♀; Tjisaroea; 3♂, 2♀. *Kalimantan;* Tarakan; 3♂, 1♀, 1 L; Pontianak; 1♂; *Sumatra;* Balige; 1♂; Dermajoe; 2♂, 2♀; Fort de Kock; 1♂; Sibolga; 1♀; Toba Meer; 7♂, 3♀. VIET-NAM. *Da Lat;* Mang Ninh; 4♂, 6♀, 9 lp; *Da Nang;* Da Nang; 1♂.

Additional records from literature. THAILAND. Causey (1937: 411) has a record from "pitcher plants on the edge of the Twin Lakes" which probably refers to the present species. I have not been able to identify this locality but it seems (*fide* Peyton) that Causey's collections during the month in question (iv.1933) were made in the southern part of the Kra Isthmus, south of the 2 localities near Ranong listed above which thus represent the northern limits of this species as at present known. WEST MALAYSIA. *Kelantan:* Bukit Kedah, *Perak.* Gunong Jasar (Lever 1950: 98), *Pahang:* Bukit Mentig (Lever *loc. cit.*), Pekan (Daniels 1908b: 263). These records are all from pitcher plants and probably, therefore, attributable to the present species. *Pahang/Kelantan:* Gunong Tahan, *Selangor:* Kanching, Wardieburn Estate (Macdonald 1957: 10). No data as to breeding places are available and these records could refer either to the present species or to *aranoides*. EAST MALAYSIA. *Sarawak.* Records of *"aranoides"* (Moulton 1915: 48, Macdonald et al. 1965: 337, 1967: 148) are similarly unattributable. INDONESIA. *Java.* Brug (1931: 16) has a record from pitchers of *Nepenthes gymnamphora* at Tjibeureum. SUMATRA. Brug *(loc. cit.)* has records from pitcher plants (including *Rafflesia arnoldii*) from Hoeta Gindjang, Padang, Samosir, Siborong-borong and Tjoeroep. All are probably attributable to this species, a conclusion supported by his figure of the larval comb. Brug and Edwards (1931: 257) have a record of *"aranoides"* from Kotta Tjane which could refer either to the present species or to *aranoides*.

TAXONOMIC DISCUSSION. The lectotypes designated here were chosen from 5 syntypes in the Amsterdam Museum, bred out from pitcher plants. Associated skins are no longer available, though it is possible they may yet be found among slides, labelled only with letters or numbers, left there by De Meijere (*fide* Dr. Van Leeuwen). I have not seen any early stages from Java, but have no reason to doubt that this species is conspecific with the member of the *aranoides* complex found in pitchers elsewhere in Indonesia and in Malaysia. Edwards (1926: 117) and Macdonald and Traub (1960: 88) have hinted at the possible occurrence in Singapore and West Malaysia of 2 distinct species confused under the name *aranoides*. The reference is to the bamboo breeding and pitcher plant breeding forms which usually differ strikingly in the degree of setal branching exhibited by the larvae. The extremes of variation in individual setae overlap in all cases and no single seta appears to be diagnostic. The modal classes, however, are clearly very different in the 2 cases and in my view they should be treated as distinct species at least until evidence to the contrary is produced. Environmental factors affecting the

hairiness of the larvae may play a part and this needs to be investigated in the laboratory (see under *nepenthis*, p. 40). Differences in the comb teeth and the teeth on the edge of the saddle are usually pronounced but here again the variability of *aranoides* leads to some intergrading. The only constant diagnostic character which I have been able to find is the smaller size, and usually more posterior situation of seta 8-VII. Where larvae are available this almost always allows the 2 species to be diagnosed with confidence.

Distribution records in the previous section based only on adults are confined to cases where these are known to have been bred from pitcher plants. They should be treated as provisional but on present evidence the occurrence of *aranoides* in this type of breeding place is so infrequent that at least the majority are probably correct. For distinction from *Tr. (Trp.) plumosus* see under *aranoides* (p. 26).

BIONOMICS. All the specimens listed here were bred from pitcher plants (*Nepenthes* spp.) except for those from Da Lat which are labelled as from "H. b. t. flower" and a single isolate from Nipah palm in Singapore. Named species of pitcher plant include *N. gracilis* and *rafflesiana* in West Malaysia, these and *N. ampullaria* in Singapore and *N. ampullaria* in Kalimantan. Lever (1950: 98) has records from *N. sanguinea* in the Cameron Highlands. Edwards and Given (1928) found *"Rachionotomyia aranoides"* to be by far the most abundant pitcher plant mosquito in Singapore. Colless (1957) lists *"Tripteroides aranoides"* and *Culex eminentia* (Leicester) as by far the commonest, particularly near the coast, with the former recovered from 219 out of 222 pitchers examined on Blakang Mati island and the latter from 33. The reference is clearly to the present species which is the only one to be found in the very abundant material available to me from Singapore. No information is available as to adult bionomics.

NEPENTHIS SUBGROUP

Relationships between this subgroup and the Aranoides and Affinis subgroups are somewhat obscure. On adult characters there is a close resemblance to *aranoides* and its relatives and an equally marked difference from the brilliantly ornamented *affinis* and *dofleini*. Certain differences from the early stages of *aranoides* and its immediate relatives are shared in whole or in part with the Affinis Subgroup, notably the absence of spicules from the pupal paddle, suppression of the basal arm on seta 7-T of the larva (partial only in *affinis* and *dofleini*) and absence of larval comb plate (*affinis* only). However *coonorensis* is annectant to the Aranoides Subgroup in these respects (see p. 20) and it is here that I suspect the closest affinities of the present subgroup to lie. On the evidence of geographical distribution and ethology it might be thought of as a Malaysian offshoot of a more northerly bamboo breeding stock comparable to other independent plant pitcher breeding offshoots in Sri Lanka (*dofleini*) and Malaya and Indonesia *(tenax)* but this is highly speculative. The unbranched seta 1-C of the pupa is a unique feature unknown elsewhere either in *Rachionotomyia* or *Polylepidomyia* and found in only 2 of the known species of *Tripteroides* s. str. (See key on p. 14).

6. *TRIPTEROIDES (RACHIONOTOMYIA) NEPENTHIS* (EDWARDS) (Figs. 3, 5, 9, 10, 20, 21)

Rachionotomyia nepenthis Edwards 1915: 285.
Rachionotomyia nepenthis of Moulton 1915: 48 and Edwards 1922: 444, 1923: 2; Edwards and Given 1928: 387 and Dover 1928: 24 (as *nepenthes*).
Tripteroides (Tripteroides) nepenthis of Edwards 1932: 78, Brug and Bonne-Wepster 1947: 183, Stone et al. 1959: 69 and Knight and Stone 1977: 324.
Tripteroides nepenthis of Barraud 1934: 42, Macdonald 1957: 10, Macdonald and Traub 1960: 89 and Mattingly 1975:179 (part).
?Tripteroides nepenthis of Barr and Chellapah 1963: 184.

FEMALE (Figs. 5, 9, 10). Wing 2.7-3.1 mm. *Head.* Proboscis long and slender but somewhat less so than in *aranoides*, 1.1-1.2 length of fore-femur, 1.0-1.2 length of abdomen. Palps about 0.12-0.13 of proboscis. Palps and proboscis entirely dark. Clypeus and tori bare. Antenna a little more than 0.6 length of proboscis. Occiput with broad, flat, dark scales with bronzy reflection, a narrow, relatively inconspicuous border of dull whitish scales around eye margins, broadening ventrolaterally. Upright scales on vertex tending to be broader than in *nepenthisimilis*, yellowish to pale brown in color. 3-4 orbital bristles present far out on either side. *Thorax.* Scutum with dark bronzy scales, narrower and directed posteriorly in midline, broad and directed obliquely outwards at sides. Some narrow, whitish scales on anterior promontory. 1-2 prescutellar bristles, or none, on either side. Scutellum dark scaled on all lobes. Postnotum bare. Anterior pronotal lobes dark scaled with some relatively inconspicuous pale scales on anterior border. Posterior pronotum entirely covered with broad, mid-to dark brown scales. One posterior pronotal bristle or none, 1-2 spiraculars. Subspiracular and hypostygial areas, upper and posteroventral portions of sternopleuron and most of mesepimeron with snow white scales. Paratergite bare; postspiracular area almost so. 1-2 prealar and 3-4 lower sternopleural bristles present and a delicate upper mesepimeral tuft. No lower mesepimeral. *Legs.* Femora and tibiae pale below to tip. Tarsi pale below in part. Fore- and midclaws simple, unequal, the smaller more strongly curved. Hindclaws minute, subequal, simple, curved only at tip. *Wing* (Fig. 10). Outstanding scales on upper wing field narrow, broader towards tips of R_2 and R_3. Alula with narrow fringe scales only. Upper calypter with 4-5 hairlike scales. Upper fork cell 1.7-2.1 length of its stem. *Halter.* Stem pale, head dark. *Abdomen* (Fig. 5). Tergites dark above with pale lateral border tending to extend inward slightly at the apex of some segments. Sternites pale. *Terminalia* (Fig. 9). IXth tergite with 2-4 bristles on either side, insula with 3-4 peripheral bristles on either side and 2-3 in the posterior corners.

MALE (Figs. 3, 20). Wing 2.6-2.9 mm. Antenna strongly plumose, between 0.60 and 0.67 of the length of the proboscis. Upper fork cell 1.3-2.0 the length of its stem. Claws as figured (Fig. 3). Foreclaws very unequal, the larger toothed, midclaws unequal, simple, hindclaws unequal, simple, curved only at tip. *Terminalia* (Fig. 20). Basal lobe of basistyle with 4-6 bristles longer and stouter than the remainder, paraproct with 3 well formed teeth at tip, IXth tergite with 6-8 stout spines on each lobe, the lobes long and relatively closely approximated.

PUPA (Fig. 20). Trumpet relatively long and narrow, about 4.7-6.0 as long as its breadth at half way. Seta 1-C very long, stout, single; 1-I well

developed; 1-II with 4-6 branches, 6-II long, single, 1.4-2.6 length of the following segment (bifid and shorter on one side of one specimen); 1-III with 2-6 branches; 1-IV and 1-V with 2-4, 5-IV and 5-V about 1.5-2.5 length of the following segment; 1-VI single to trifid, 5-VI 0.8-1.7 length of the following segment, one or other of these 3 setae very occasionally double on one side; 9-VII with 3-9 branches; 9-VIII with 7-12. Paddles 1.4-1.8 as long as their greatest breadth, without spicules at apex.

LARVA (Fig. 21). *Head.* Palatal hairs relatively slender, much as in *aranoides*. Seta 1-A minute, subapical; 1-C short, moderately stout, often directed inward as in Fig. 23, 4-6-C single, 7-C single to tetrafid, 11-C and 14-C with 3-8 branches, 15-C with 8-12. Mentum with 6-7 teeth on either side of the central tooth. *Thorax.* Seta 0-P with 11-19 branches, 1-P with 23-35, 3-P with 4-8, 4-P with 2-6, 7-P with 17-25, 8-P with 12-21, 9-P single, 11-P with 2-4 branches, 13-P with 20-32, 14-P with 24-34; 1-M with 26-48, 6-M 1.1-1.5 length of 7-T, 8-M with 10-15 branches, 9-M with 2-3, 13-M with 17-31, 14-M with 20-38; 1-T with 22-46, 4-T with 12-29, 5-T with 19-48, 7-T without basal arm, 8-T with 5-19, 9-T with 2-4, 13-T with 19-45. *Abdomen.* Seta 1-I with 16-32 branches, 2-I with 15-26, 5-I with 13-25, 6-I with 2, 7-I single, 9-I with 3-5 branches, 11-I with 14-26, 13-I with 21-40, 14-I where seen minute, single; 0-II with 6-15 branches, 1-II with 18-36, 2-II with 17-26, 5-II with 12-21, 6-II and 7-II single, 9-II with 4-7 branches, 11-II with 13-25, 13-II with 23-43, 14-II as on I; 0-III with 7-17 branches, 1-III with 18-31, 2-III with 16-26, 5-III with 10-15, 9-III with 4-10, 11-III with 14-26, 13-III with 18-40, 14-III as on I; 0-IV with 7-19 branches, 1-IV with 17-32, 2-IV with 16-29, 5-IV with 8-16, 6-IV single, 9-IV with 5-12 branches, 11-IV with 16-26, 13-IV with 19-37, 14-IV as on I, 0-V with 11-24 branches; 1-V with 24-41, 2-V with 15-28, 5-V with 3-8, 6-V single, 9-V with 5-15 branches, 11-V with 19-28, 13-V with 19-37, 14-V as on I; 0-VI with 14-25 branches, 1-VI with 21-44, 2-VI with 17-31, 5-VI with 3-5, 6-VI single, 9-VI with 12-17 branches, 11-VI with 18-29, 13-VI with 18-38, 14-VI as on I; 0-VII with 15-31 branches, 1-VII with 25-39, 2-VII with 14-30, 5-VII with 2-6, 8-VII with 6-15, 9-VII with 7-13, 11-VII with 17-31, 13-VII with 19-33. Comb with 12-20 teeth ranging from stout, simple spines dorsally to slender fringed scales ventrally, as illustrated. Comb plate absent. Seta 1-VIII with 19-42 branches, 3-VIII with 2-4, 5-VIII with 2-3, 14-VIII minute or absent. Saddle fringed with a few moderately long, slender spines, one or more usually with delicate ventral fringe, with or without some small spicules in addition. Seta 1-X single, 2-X single or double, 4-X with 7-15 branches. Anal papillae slender, 1.9-3.2 length of saddle. Siphon 3.2-3.7 length of saddle. Pecten with 5-7 teeth on either side of the midline, distributed over most of the length of the siphon. Individual teeth as figured. Seta 1-S paired, single to pentafid, 1a-S 10-11 and 2a-S 8-13 in all, bifid or trifid in both cases. Lateral setae absent.

TYPE-DATA. Holotype male on pin with terminalia on slip, in B. M. EAST MALAYSIA. Sarawak. Juching. J. Hewitt, 2 paratype males, 2 paratype females on pins with same data. All in B. M.

DISTRIBUTION. WEST MALAYSIA. *Johor;* Kota Tinggi; 1♂, 1♀, 3 L, 2 lp. *Kuantan.* 14th mile, Pekan Road; 9♂, 10♀, 16 lp. *Selangor;* Batang Berjuntai (K. Selangor); 31♂, 40♀, 5 L, 6 p, 24 lp; Bt Cheeding; 2♂, 1♀, 2 lp. SINGAPORE. *Singapore I.* Macritchie Reservoir; 1♂, 2 L, 1 p, 1 lp; Nee Soon Rifle Range; 5♂, 4♀, 3 L, 3 lp; Thompson Rd Reservoir; 1♀; Unnamed locality; 1♂, 1♀, 3 L, 3 lp. EAST MALAYSIA. *Sarawak;* Kuching (type-locality); 3♂, 2♀.

Records from literature. The description by Edwards (1926: 117) of the

larvae of *Rachionotomyia nepenthis*, sent from Singapore by Given, as having "Main hair tufts of thorax each with about 35 . . . branches", together with other details, shows clearly that it was the present species which he had before him. Subsequent records (Edwards and Given 1928: 337; Edwards 1932: 78; Barraud 1934: 42; Brug and Bonne-Wepster 1947: 183; Stone, Knight and Starcke 1959: 69; Knight and Stone 1977: 324) were all based on the type-series and on Given's larvae. From such of their material as I have seen, it also appears that the record by Macdonald and Traub (1960: 89) also refers to this species. The reference by Barr and Chellapah (1963: 184) to "*T. nepenthis* (Edwards) and a related species" in Singapore is evidently to the present species and *nepenthisimilis* (p. 42).

TAXONOMIC DISCUSSION. In his type description Edwards (1915: 285) describes the hindtarsus of the male as having "a single minute claw". In spite of this, all 3 males remaining from the 4 seen by him have this claw double. None had the tarsus removed and there is no trace of any preparation made from the fourth specimen. The claws are very small, nearly straight and only narrowly divergent. It is easy to see, therefore, how Edwards may have been misled. Later workers have used this as a diagnostic character and some confusion has resulted. It was probably responsible in part for suggestions as to the occurrence of a second, related species (Macdonald and Traub 1960: 189; Barr and Chellapah 1963: 184). An additional reason, however, has clearly been the occurrence of 2 forms of larva, relatively hairy and non-hairy respectively. In a preliminary study (Mattingly 1975: 179) I noted that the statistical distribution of branch numbers of some metathoracic setae is consistent with the operation of an environmental factor similar to that invoked by Barr (1958: 102) to account for differences in comb spine number in *Aedes fitchii* (Felt and Young). A comparable factor was invoked by Rosen and Rozeboom (1954: 529) to account for variations in hairiness in the *Aedes scutellaris* complex and the existence and general nature of this factor was demonstrated by Colless (1956: 229) in *Aedes albopictus* (Skuse) in Singapore. Mouthbrush dimorphism has also been shown to be induced by a similar factor in the larval environment (McGregor (1963: 325)) and has been detected in a number of culicine genera (Mattingly 1969a: 53). Further study of the present species and *nepenthisimilis* has revealed the existence of other marked discontinuities in setal branch numbers (see key on p. 20) as well as in a small but apparently reliable adult character. I have therefore felt it desirable to treat these discontinuities, at least provisionally, as genetically fixed and to cite the 2 forms as distinct species. This does not, of course, exclude the possibility of an environmental factor operating within these species as also in the *aranoides* and possibly the *microcala/nepenthicola* complexes (p. 24, 63). The genetics of setal branch number also remain largely unexplored and interesting epigenetic factors may be involved (Wood and Dalingwater 1975: 555; Wood 1976: 33). The subject is one of considerable taxonomic importance which could, if neglected, detract from otherwise valuable work (Wolff and Nielsen 1977: 176).

BIONOMICS. All available records are from pitcher plants. These where named are invariably *Nepenthes ampullaria*. Barr and Chellapah (1963: 184) have a record of "*T. nepenthis*" from *N. rafflesiana*, but this may refer either to the present species or to *nepenthisimilis*. One isolate from Kota Tinggi includes larvae of *aranoides* and *tenax* as well as of *nepenthis*, but involved more than one different plant. Another, from Batang Berjuntai also includes *aranoides*, apparently from the same plant. *T. nepenthisimilis* occurs alone in 3 isolates and *nepenthis* in 5 small isolates from Malaya. In the remaining 11 isolates from Singapore and Malaya the 2 occur together.

7. *TRIPTEROIDES (RACHIONOTOMYIA) NEPENTHISIMILIS* NEW SPECIES (Figs. 22, 23)

Tripteroides nepenthis of Mattingly 1975: 179 (part).

FEMALE (Fig. 22). Wing 2.8-3.2 mm. *Head.* Proboscis slender, 1.2-1.3 length of forefemur, 1.1-1.2 of abdomen. Palps about 0.11-0.13 of proboscis. Palps and proboscis entirely dark, clypeus and tori bare. Antenna slightly more than half length of proboscis. Occiput with broad, flat dark brown scales with bronzy reflection and a narrow, indistinct border of whitish scales around eye margins, only slightly expanded ventrolaterally. Numerous dark upright scales with expanded tip on nape. 3-4 orbital bristles well out to either side. *Thorax.* Scutum with mid-to dark brown spindle-shaped scales, narrow and directed posteriorly in midline, broader and directed outward at sides. A few narrow, whitish scales on anterior promontory. 1-2 prescutelar bristles present on either side. Scutellum with dark scales on all lobes. Postnotum bare. Scales on anterior pronotal lobes dark, those on anterior border slightly paler. Posterior pronotum entirely covered with broad mid-brown scales. A single well developed posterior pronotal bristle present, 2-3 spiraculars. Subspiracular and hypostygial areas, upper and postero-ventral portions of sternopleuron and most of mesepimeron with broad, flat, snow white scales. Paratergite bare; postspiracular area almost so. 2-3 prealar and 4-6 lower sternopleural bristles present. *Legs.* Femora and tibiae pale below to tip. Tarsi also extensively pale below. All claws simple, fore- and midclaws unequal, the smaller more strongly curved, hindclaws subequal, both almost straight. *Wing.* Outstanding scales on upper wing field narrow, linear, broader on distal portions of R_2 and R_3. Upper calypter with 3-6 hair-like scales. Upper fork cell 1.9-2.1 length of its stem. *Halter.* Head dark. *Abdomen.* Much as in *nepenthis* (Fig. 5). Tergites dark above with a pale lateral border which tends to extend inward slightly at the apex of some segments. Sternites pale. *Terminalia* (Fig. 22). As in *nepenthis.* IXth tergite with 2-3 bristles on either side, insula with 2-3 peripheral bristles on either side and 2-3 in each posterior corner in the specimens examined.

MALE. Wing 2.3-3.0 mm. Antenna strongly plumose, about two-thirds of the length of the proboscis. Upper fork cell 1.5-2.0 length of its stem. Claws as figured for *nepenthis* (Fig. 3). Foreclaws very unequal, the larger toothed, midclaws very unequal, simple, hindclaws minute, unequal, curved only at tip. *Terminalia.* As figured for *nepenthis* (Fig. 20). Basal lobe of basistyle with 5-6 setae longer and stouter than the remainder. Paraprocts with 3 well formed teeth at tip. IXth tergite with 6 stout spines on each lobe, the lobes relatively long and closely approximated.

PUPA (Fig. 22). Much as in *nepenthis* but with integument markedly paler. Trumpet shorter, about 3.2-4.4 as long as its breadth at middle, usually less than 4.0. Seta 1-II single to trifid, 6-II always short, 0.4-1.0 length of the following segment; 1-III-VI bifid or trifid; 5-IV 0.8-1.5, 5-V 1.0-1.6 and 5-VI 0.8-1.6 length of the following segment; 9-VII with 4-10 branches; 9-VIII with 7-17. Paddles 1.3-1.6 length of their greatest breadth with apices devoid of spicules.

LARVA (Fig. 23). *Head.* Palatal hairs relatively slender, much as in *aranoides.* Seta 1-A as figured; 1-C moderately stout, often directed inward as in the figure. Setae 4-6-C single, 7-C single or double, 11-C with 3-8 branches, 11-C with 2-4, 15-C with 3-5, mentum with 8 teeth on either side

of the central tooth. *Thorax*. Seta 0-P with 7-13 branches, 1-P with 12-26, 3-P with 4-7, 4-P single, 7-P with 12-22 branches, 8-P with 12-23, 9-P single, 11-P with 2-6 branches, 13-P with 11-20, 14-P with 11-22; 1-M with 10-23 branches, 6-M about 0.4-0.8 length of 7-T, 8-M with 5-12 branches, 9-M with 2-4, 13-M with 10-27, 14-M with 7-17; 1-T with 9-22, 4-T with 3-7, 5-T with 9-24, 7-T simple, without basal arm, 8-T with 4-13 branches, 9-T with 2-4, 13-T with 8-23. *Abdomen*. Seta 1-I single to heptafid, 2-I with 8-17 branches, 5-I with 7-11, 6-I with 2-3, 7,9-I single or bifid, 11-I with 7-10 branches, 13-I with 10-27, 14-I minute, where seen single; 0-II, where present, minute and single to moderately developed with up to 7 branches, 1-II with 6-14 branches, 2-II with 10-18, 5-II with 6-10, 6-II single or bifid, 7-II single or bifid, 9-II with 2-4 branches, 11-II with 5-11, 13-II with 9-25, 14-II as on I; 0-III with 4-9 branches, 1-III with 7-15, 2-III with 6-13, 5-III with 4-9, 6-III single, 9-III with 4-5 branches, 11-III with 6-13, 13-III with 8-17, 14-III as on I; 0-IV with 5-15 branches, 1-IV with 6-15, 2-IV with 5-12, 5-IV with 4-11, 6-IV single, 9-IV with 3-7 branches, 11-IV with 6-14, 13-IV with 9-15, 14-IV as on I; 0-V with 7-16 branches, 1-V with 8-23, 2-V with 6-13, 5-V with 4-7, 6-V single, 9-V with 4-8 branches, 11,13-V with 7-15, 14-V as on I; 0-VI with 9-14 branches, 1-VI with 12-25, 2-VI with 6-13, 5-VI with 3-5, 6-VI single, 9-VI with 4-7 branches, 11-VI with 6-12, 13-VI with 3-12, 14-VI as on I; 0-VII with 6-13 branches, 1-VII with 14-35, 2-VII with 7-18, 5-VII with 3-6, 8-VII with 6-11, 9-VII with 4-5, 11-VII with 3-5, 13-VII with 3-7. Comb with 9-17 slender spines and, more ventrally, fringed scales as figured, no comb plate. Seta 1-VIII with 7-10 branches, 3-VIII with 2-3, 5-VIII single, 14-VIII minute or absent. Saddle fringed with a few slender spines and small spicules. Setae 1,2-X single, 4-X with 2-6 branches. Anal papillae narrow to moderately broad, lanceolate, 2.0-3.3 length of saddle. Siphon 3.1-3.6 length of saddle. Pecten with 4-6 teeth on either side of the midline, confined to basal half of siphon. Individual teeth as figured. Seta 1-S paired, single or bifid, 1a-S 6-12 in number, bifid or trifid, 2a-S 7-11 in number with 2-4 branches. Lateral setae absent.

TYPE-DATA. Holotype female with terminalia on slide, No. 403-13, U.S.N.M. type no. 76707, allotype male, No. 403-24, both with associated skins on slides, in U.S.N.M.

DISTRIBUTION. WEST MALAYSIA. *Johor*; Kota Tinggi; 2♂, 2♀, 2 lp. *Selangor;* Batang Berjuntai (K. Selangor) (type-locality); 55♂, 56♀, 19 L, 8 p, 35 lp. SINGAPORE. *Singapore I.;* Macritchie Reservoir; 1♂, 1♀, 1 L, 1 lp; Nee Soon Rifle Range; 1♂, 5♀, 3 L, 5 lp; Unnamed locality; 1♂. KALIMANTAN. Tarakan; 5♂, 3♀, 4 lp.

Records from literature. Previous records, other than that by Barr and Chellapah (1963), all appear to refer to *nepenthis* (see p. 40).

TAXONOMIC DISCUSSION. The present species was treated provisionally as a non-hairy larval form of *nepenthis* in a preliminary study (Mattingly 1975: 179). The most striking larval difference from that species is still the very small seta 4-T. However, further investigation has revealed large discontinuities in branch numbers of other setae, notably 1-I and -II, 9-, 11- and 13-VI, 11- and 13-VII and 1-VIII. It seems, therefore, that the 2 are in fact distinct species and I am confirmed in this view by the difference in the pupal trumpet (see p. 18). Separation of adults from those of *nepenthis* may not always be possible. The upright scales on the vertex are usually distinctive (see p. 38) but some intergrading occurs. The possible role of environmental factors in relation to larval branch numbers in these species and others in the present genus is discussed under *nepenthis* (p. 40).

BIONOMICS. All available records are from pitcher plants which, where named, are invariably *Nepenthes ampullaria*. Barr and Chellapah (1963: 184) record "*T. nepenthis*" from *N. rafflesiana* but it is not known whether this record refers to the present species or to *nepenthis*. For larval synecology see under *nepenthis* (p. 40).

AFFINIS SUBGROUP

The 2 species included in this subgroup differ from all other members of the Aranoides Group in the brilliant blue ornamentation of the occiput and the silvery scales on the pleura. In view of this striking ornamentation they might be thought to merit treatment as a species group rather than subgroup. They are retained here at subgroup level in order to emphasize the distinctive characters of the Edwardsi Group which in my view merit treatment at a higher level. When their unknown sexes and early stages are discovered the members of the Edwardsi Group are likely to be transferred to a separate subgenus or subgenera. Should this happen then in my view the present subgroup should be upgraded to species group level. At the same time it should be noted that the 2 species concerned differ markedly in the early stages despite their resemblance in adult ornamentation with *dofleini* resembling *aranoides* in the possession of a comb plate and *affinis* resembling *coonorensis* in its absence. As already indicated (p. 2) the true relationship between the ornamented and unornamented *Tripteroides* remains obscure. Further understanding must depend on a detailed study of the ornamented subgenus *Tripteroides* s. str. but this is beyond the scope of the present paper.

8. *TRIPTEROIDES (RACHIONOTOMYIA) AFFINIS* (EDWARDS)
(Figs. 4, 7, 10, 24, 25)

Phoniomyia caeruleocephala of Theobald 1910a: 577 *nec* Leicester 1908.
Rachionotomyia affinis Edwards 1913: 241 (nom. nov. for *caeruleocephala* Theobald).
Tripteroides (Tripteroides) affinis of Edwards 1932: 78, Thurman 1959: 31 and Harrison et al. 1974: 148.
Tripteroides affinis of Barraud 1934: 44 and Carter and Wijesundara 1948: 136.

FEMALE (Figs. 4, 7, 10). Wing 2.5-3.0 mm. *Head.* Proboscis very slender, 1.3-1.5 length of forefemur, 1.1-1.2 of abdomen. Palps 0.12-0.13 of proboscis. Palps and proboscis dark. Clypeus bare or with a few small pale scales anteriorly. Tori with a few small, dark scales on inner surface. Antenna about 0.5 length of proboscis. Occiput with silvery scales anteriorly, dark scales behind, the former with deep blue reflection, white scales ventrolaterally, small, black upright scales with expanded tips on nape. 3-4 orbital bristles well out on either side. *Thorax.* Scutum densely covered with moderately broad dark brown scales with dull bronzy luster, narrower in midline, a few narrower whitish scales on anterior border. Prescutellar bristles absent. Scutellum with broad, flat, dull brown scales. Postnotum bare. Anterior pronotal lobes with flat dark brown scales and some broad, flat, whitish scales on outer anterior corners. Posterior pronotum with small, flat brown scales, 1 posterior pronotal bristle, 1-3 spiraculars. Bright metallic silvery scales on subspiracular area, all but the anteroventral portion of the sternopleuron, the whole mesepimeron and the coxae. Paratergite with broad, dark scales. 1-4 prealar bristles present and 2 lower sternopleurals. *Legs.* Femora dark above, pale below almost to tip. Foreclaws moderately curved, one slightly larger than the other. Midclaws subequal. One hindclaw larger and less strongly curved than the other. *Wing* (Fig. 10). Outstanding scales on upper surface narrow, linear, somewhat broader towards tips of R_2 and R_3. Upper

surface narrow, linear, somewhat broader towards tips of R_2 and R_3. Upper calypter with 4-7 hairlike scales. Upper fork cell 1.3-1.7 length of its stem. *Halter*. Head entirely dark. *Abdomen* (Fig. 4). Dark above with a continuous, more or less uniform, lateral border of pale yellow scales. Venter entirely pale yellow, except for sternite VIII which is dark. *Terminalia* (Fig. 7). Apex of postgenital plate without indentation. IXth tergite with 6 small bristles in each of 3 specimens examined. Insula with 6-8 stout peripheral setae on either side and 2-4 smaller ones in each posterior corner.

MALE (Fig. 24). Wing 2.1-2.6 mm. Antenna strongly plumose, about half the length of the proboscis or a little more. Upper fork cell 1.1-1.5 length of its stem. Foreclaws, one large and toothed, the other about two-thirds as long and simple. Midclaws similar except that both are simple. Hindclaws minute, curved, equal, simple. All claws much as in *aranoides*. *Abdomen*. With continuous pale lateral border as in the ♀. *Terminalia* (Fig. 24). Dististyle strongly curved when seen in lateral view, with small subterminal claw at apex and numerous minute setulae on distal half. Basal lobe of basistyle with 6-7 stout setae. Paraproct with 2 large, conspicuous teeth and 1-2 smaller ones. Lateral plate of phallosome with a spiculate sternal lobe and with minute spicules also on apical prolongation. Lobes of IXth tergite narrow, elongated, widely separated at base, each with 3-6 flattened spines at apex, the inner one broader and darker than the remainder.

PUPA (Fig. 24). Trumpets short, dark, appearing cylindrical in some aspects, conical in others. Seta 1-C very long and double, 2-C with 2-4 branches, 3-C single to trifid, 4-C with 2-4 branches, 5-C with 2-5, 6-C single, 7-C single or double, 8-C with 3-6 branches, 9-C single, 10-C with 3-5 branches, 11-C single, 12-C single or double; 2,3-I single, 4-I with 2-6 branches, 5-I single to tetrafid, 6-I single to trifid, 7,9-I single or bifid; 1-II with 4-10 branches, 2-II single or bifid, 3-II single, 4-II with 2-6 branches, 5-II with 2-4, 6-II single, longer than the following segment, 7-II single to trifid, 8-II, where present, single or bifid, 9-II single, 10,11-II single or bifid; 1-III single to pentafid, 2,3-III single, 4-III with 2-4 branches, 5-III slender, delicate, single to tetrafid, single and about two-fifths the length of the following segment in one specimen, much shorter in all others as in Fig. 24, always much shorter than 3-III, 6-III single or bifid, 7-III single to tetrafid, 8-III single to trifid, 9-III single, 10,11-III single or bifid; 1-IV single to tetrafid, 2-IV single, 3-IV single to tetrafid, rarely arising mediad of 5-IV, 4-IV with 2-4 branches, 5,6-IV single to trifid, 7,8-IV with 2-3 branches, 9-IV single, 10-IV single to trifid, 11-IV single, 1-V single to trifid, 2-V single, 3-V single or double, 4-V with 2-4 branches, 5-V usually single, occasionally double, 6-V single to trifid, 7,8-V with 2-4 branches, 9-V single, 10-V single or double, 11-V single; 1-VI single to tetrafid, 2-VI single, 3,4-VI single to trifid, 5-VI as 5-V, 6-VI single or bifid, 7-VI single to trifid, 8-VI with 2-6 branches, 9-VI single, 10-VI single or double, 11-VI single; 1-VII single to trifid, 2-VII single, 3-VII single, rarely less than two-thirds of the length of the following segment, usually longer, 4-VII single or bifid, 5-VII single to tetrafid, 6-VII with 2-4 branches, 7-VII single to trifid, 8-VII with 3-5 branches, 9-VII with 8-14 branches, length of or longer than segment VIII, 10,11-VII single to trifid; 4-VIII single, 9-VIII with 12-19 branches. Paddles flattened or bluntly pointed at apex, entirely devoid of spicules, variable in length, from about 1.2 to 1.8 as long as their greatest breadth.

LARVA (Fig. 25). *Head*. Seta 1-A arising near tip of antenna, single or double, usually single; 1-C short and stout, strongly curved, often bent inwards through about 90 degrees, though not always so strongly as in the figure. Seta

4-C single to trifid, 5-C single to pentafid, 6-C single to trifid, 7-C with 2-8 branches, 11-C with 6-17, 14-C with 3-16, 15-C with 3-15. Mentum with 7-10 teeth on either side of the central tooth. *Thorax.* Seta 0-P with 8-25 branches, 1-P with 11-24, 3-P with 5-19, 4-P with 7-20, 7-P with 10-20, 8-P with 12-30, 9-P with 3-5, 13-P with 12-42, 14-P with 19-35; 1-M with 12-33, 6-M single, usually pectinate at tip as in Fig. 25, 8-M with 8-36, 9-M with 5-11, 13-M with 11-29, 14-M with 9-34; 1-T with 10-33, 4-T with 6-26, 5-T with 10-30, 7-T usually with a basal arm, occasionally simple, both arms usually pectinate, or excavated, at tip, 1.2-2.3 length of 6-M, usually about 1.5, 8-T with 6-21 branches, 9-T with 5-9, 13-T with 11-32. *Abdomen.* Seta 1-I with 9-26 branches, 2-I with 8-23, 5-I with 8-19, 6-I with 2-4, 7-I single or bifid, 9-I with 2-10 branches, 11-I with 7-22, 13-I with 14-29, 14-I with 5-15; 0-II with 5-18, 1-II with 10-29, 2-II with 9-23, 5-II with 10-23, 6-II with 2-3, 7-II single or bifid, 9-II with 3-12 branches, 11-II with 9-20, 13-II with 10-31, 14-II with 6-18; 0-III with 5-19, 1-III with 11-28, 2-III with 8-23, 5-III with 10-21, 6-III bifid, 9-III with 5-14 branches, 11-III with 10-23, 13-III with 10-30, 14-III with 5-14; 0-IV with 8-23, 1-IV with 12-32, 2-IV with 9-23, 5-IV with 10-30, 6-IV bifid, 9-IV with 7-20 branches, 11-IV with 9-28, 13-IV with 11-29, 14-IV with 8-15; 0-V with 7-23, 1-V with 13-34, 2-V with 9-24, 5-V with 10-29, 6-V bifid, 9-V with 8-20 branches, 11-V with 9-24, 13-V with 10-29, 14-V with 6-16; 0-VI with 10-23, 1-VI with 12-32, 2-VI with 11-25, 5-VI with 12-21, 6-VI single or bifid, 9-VI with 8-25 branches, 11-VI with 8-23, 13-VI with 11-30, 14-VI with 6-15; 0-VII with 9-23, 1-VII with 11-29, 2-VII with 8-25, 5-VII with 11-31, 8-VII with 6-25, 9-VII with 6-18, 11-VII with 6-32. Comb often as in Fig. 25 with up to 25 narrow teeth, the more dorsal sharp pointed spines, the more ventral fringed scales, but sometimes much reduced with ventral scales few or none and dorsal spines thickened with expanded bases and sometimes separated by small intercalary spines. Seta 1-VIII with 14-39 branches, 3-VIII with 4-15, 5-VIII with 4-21, 14-VIII usually well developed, as in Fig. 25, but occasionally minute, with 2-23 branches. Saddle edge with well developed, slender spines, varying in length with the sclerotization of the general integument but always conspicuous. Seta 1-X single to pentafid, 2-X with 3-7 branches, 4-X with 2-6. Anal papillae cylindrical, 1.3-2.9 length of the saddle. Siphon 2.6-3.4 length of saddle. Pecten with 2-5 slender teeth on either side of the midline, fringed ventrally from base to apex, varying in arrangement but always confined to the apical two-thirds of the siphon and in some strongly sclerotized larvae, with long siphon, confined to the tip. Seta 1-S with 3-5 branches, setae 1a-S 4-7 in number on either side of midline with 2-3, rarely 4, branches 2a-S 2-10 in number in a double or irregular single line with 2-5 branches (one or two occasionally single). Between setae 1a-S and 2a-S are 1-6 lateral setae on either side, each single to pentafid.

TYPE-DATA. Holotype female on pin with wing on slide. SRI LANKA: Hakgala, iii.1907. E. G. Green. Allotype male on pin with same data. Both in B. M.

DISTRIBUTION. INDIA. *Bombay Deccan:* Belgaum; 2♀, 1 lp; *Nilgiri Hills*: 1♀; *Tamil Nadu:* Yercaud, Shevaroy Hills, 4500; 1♀. SRI LANKA. *Central Province:* Nuwara Eliya District, Hakgala (type-locality); 1♂, 1♀; Badulla; 1 L; Kandy District, Kandy; 2♂, 2♀; Peradeniya; 8♂, 15♀, 11 p, 10 lp; Uda Wattekele Forest; 11♂, 10♀, 1 L, 9 p, 10 lp; Matale District, Matale; 1♂, 1 lp; Imbulpitiya; 3♂, 1♀, 7 L, 1 lp; *Southern Province:* Galle District, Sinharaja Forest, Kanneliya; 7♂, 7♀, 10 L, 4 p, 10 lp; Kottawa; 1♂, 1 p; *Sabaragamuwa Province;* Ratnapura District, Veddagala, Sinharaja Forest

Reserve; 1♂, 4♀, 4 L, 1 p, 8 lp; *Western Province:* Kalumara District, Morapitiya, Sinharaja; 1 p; Colombo District, Kalatuwawa; 1♂, 3 L, 1 p. THAILAND. *Chiang Mai*: Doi Sutep; 1♂.

Additional records from the literature: INDIA. *Coorg:* Santi Kappa (Barraud, 1929a: 1060). SRI LANKA. Rakwara (= ? Rakwana, Sabaragamuwa Province, Barraud 1934: 45). THAILAND. *Chiang Mai:* Chiang Mai; Farng District (Thurman, 1959: 32).

TAXONOMIC DISCUSSION. As with some other larvae of the Aranoides Group variation in numbers of setal branches is very extensive. It appears, however, to be continuous and correlates only partially with the other very variable character, namely the number and appearance of the comb teeth. At one extreme the comb has up to 25 slender, closely packed teeth, the more ventral of which are delicately fringed all round. At the other extreme it is reduced to as few as 5 coarse spines with or without one or two small spinules in the gaps between them. Between these extremes a variety of conditions are exhibited rendering the variation virtually continuous. It is not clear how far this variation is genetic and how far it is influenced by the larval environment. I suspect that the latter plays a considerable part but this requires further investigation in the field. As indicated in the keys (p. 18, 19) the pupa is only partially separable from that of *nepenthisimilis* and the larva from that of *coonorensis*. A useful partial character for separation from the latter is however available in the well developed seta 14-VIII of many *affinis* larvae. This may also permit separation from some of the various larvae of *Tripteroides* s. str. which at present appear inseparable. These need more detailed study than is within the scope of the present study.

BIONOMICS. Immatures have been collected from tree holes, stump holes, root holes and log holes, bamboo stumps and internodes and rock holes, sometimes in association with *ceylonensis*. The water contents are described as colored in all cases in which a description is given. Nothing is known as to vertebrate hosts.

9. *TRIPTEROIDES (RACHIONOTOMYIA) DOFLEINI* (GÜNTHER)
(Figs. 4, 8, 26, 27)

Ficalbia dofleini Günther 1913: 204 and 259.
Tripteroides dofleini (Günther) of Barraud 1934: 45 and Carter and Wijesundara 1948: 135.

FEMALE (Figs. 4, 8). Wing 2.4-3.3 mm. *Head.* Proboscis slender, 1.3 length of forefemur, 1.1-1.2 of abdomen. Palps 0.12-0.14 of proboscis. Palps 0.12-0.14 of proboscis. Palps and proboscis entirely dark. Clypeus and tori bare. Antenna about 0.5-0.6 length of proboscis. Occiput covered with broad, flat, dark scales with brilliant blue metallic reflection. Small patches of broad, flat, white scales below at sides. Numerous conspicuous black, upright scales, with expanded tips, on nape. 2-3 orbital bristles well out on either side. *Thorax.* Scutum covered with dense, moderately broad, dark brown scales with bronzy reflection. No pale scales on anterior border. A single small prescutellar bristle seen in one specimen. Scutellum with broad, flat, dark brown scales on all lobes. Postnotum bare. Anterior pronotal lobes with small, flat, dark brown scales, no pale scales. Posterior pronotum covered with small, flat, pale brown scales, 1 posterior pronotal bristle present and 2-3 spiraculars. Subspiracular area, mesepimeron and all but the anteroventral portion of the sternopleuron covered with broad, flat scales,

silvery white in color but less brilliantly so than in *affinis*. Paratergite with broad, dark scales. 2-4 prealar bristles present. 1-5 conspicuous lower sternopleural bristles, usually 3, and in one specimen a single upper sternopleural. *Legs*. Femora pale below to tip. Claws very much as in *affinis*. *Wing*. Outstanding scales on upper surface narrow, ligulate, somewhat broader toward tips of R_2 and R_3, much as in *affinis* or slightly broader. Upper calypter with 5-8 hairlike scales. Upper fork cell 1.7-1.9 length of its stem. *Halter*. Head entirely dark. *Abdomen* (Fig. 4). Tergites dark above with broad basal lateral yellowish patches, the latter more or less solid on segment I or I and II, emarginated basally on segments III-VII or II-VII. Sternites pale yellowish except for the VIIIth which is dark. *Terminalia* (Fig. 8). Postgenital plate somewhat more attenuated towards apex than in *affinis*, the apex rounded or with shallow emargination as in the figure. IXth tergite with 4-6 bristles on either side. Insula much as in *affinis* with 6-7 peripheral setae on either side and 2-5 smaller ones in the posterolateral corners.

MALE (Fig. 26). Wing 2.1-2.8 mm. Antenna strongly plumose, between 0.5 and 0.6 length of proboscis. Upper fork cell 1.4-1.9 length of its stem. Claws very much as in *affinis* (p. 44). *Abdomen*. Tending to have the pale border of the abdomen even more deeply interrupted at the bases of the posterior tergites than in the ♀. *Terminalia* (Fig. 26). Closely resembling those of *affinis*, differing as follows: basal lobe of basistyle with 6-8 stout bristles which are, in part somewhat longer; lobes of IXth tergite more closely approximated, especially toward base, with 5-6 spines on each, the innermost spine differing only slightly from the others.

PUPA (Fig. 26). Resembles that of *affinis* but with a tendency to reduction in branch numbers of the smaller setae. Differs markedly in the much more strongly developed seta 5-III. Setae 2, 4-C and 4-II single or double; 5-III long and stout, single to trifid, normally longer than 3-III, usually much longer; 3-IV usually arising mediad of 5-IV as in the figure, 6-IV and 7-IV single in all specimens examined; 7-V single or double; 9-VIII considerably longer than paddle. Paddles blunt tipped, about 1.4-1.9 as long as their greatest breadth, usually 1.6-1.7, their apex devoid of spicules.

LARVA (Fig. 27). *Head*. Seta 1-C short, moderately stout, not strongly curved but in some cases directed inward toward midline, 4-6-C single, 7-C bifid or trifid, 11-C with 4-7 branches, 14-C with 2-4, 15-C with 3-6. Mentum with 6-7 teeth on either side of the central tooth. *Thorax*. Seta 0-P feebly developed with 2-5 branches, 1-P with 4-10, 3-P with 1-5, usually bifid or trifid, 4-P with 2-4, 7-P with 2-8, 8-P with 3-8, 9-P with 2-3, 13-P with 9-17, 14-P with 7-13; 1-M with 4-7, 6-M normally simple, occasionally toothed at base, with apex blunt (more so than is usual in *affinis*) and pectinate at tip, 8-M very small with 2-6 branches, 9-M with 2-4, 13-M with 4-9, 14-M with 4-13; 1-T with 5-9, 4-T with 3-7, 5-T with 3-9, very variable in size, usually very small, of the same order of size as 8-M in the figure, occasionally much larger, as figured, 7-T usually with well developed basal arm, occasionally simple, the larger arm blunt tipped though generally less conspicuously so than 6-M, and from about the same length as 6-M to almost 2.0 its length, 8-T bifid to tetrafid, usually minute or very small, occasionally about half the length of 7-T though with the branches still slender, 9-T with 2-3 branches, 13-T with 7-17. *Abdomen*. Seta 1-I with 5-12 branches, 2-I with 4-7, 5-I with 4-12, 6-I single or double, usually double, 7-I single, 9-I with 2-4, 11-I with 5-9, 13-I with 6-13; 14-I-VI rarely seen, present as a small 3-branched seta on segment I of one specimen, as a larger seta with 4-5 branches on segment II of the same specimen and as a

moderately developed seta with 5 branches on one side of segment I of one other specimen, otherwise apparently absent; seta 0-II with 3-5 branches, 1-II with 4-9, 2-II with 3-6, 5-II with 4-10, 6-II single or bifid, 7-II single, 9-II with 2-3 branches, 11-II with 5-10, 13-II with 5-12; 0-III with 3-5, 1-III with 4-9, 2-III with 4-8, 5-III with 4-7, 6-III single or bifid, 9-III with 2-3 branches, 11-III with 6-11, 13-III with 5-12; 0-IV with 3-5, 1-IV with 3-11, 2-IV with 3-9, 5-IV with 3-7, 6-IV single or bifid, 9-IV with 3-4 branches, 11-IV with 7-10, 13-IV with 5-11; 0-V with 3-5, 1-V with 4-11, 2-V with 4-7, 5-V with 3-7, 6-V single or bifid, 9-V with 3-5 branches, 11-V with 5-10, 13-V with 4-11; 0-VI with 2-5, 1-VI with 4-6, 2-VI with 3-6, 5-VI with 4-6, 6-VI single or bifid, 9-VI with 3-4 branches, 11-VI with 5-10, 13-VI with 5-11; 0-VII with 3-6, 1-VII with 3-7, 2-VII with 3-5, 5-VII with 2-7, 8-VII minute with 2-3, 9-VII with 2-5, 11-VII with 3-7, 13-VII with 4-8. Comb arising from a lightly sclerotized comb plate and comprising 4-8 stout spines, simple or delicately fringed at base, mostly curved when seen in lateral view, usually in 2-3 groups with the spines in the dorsal group stouter and more widely separated from one another than the others. Seta 1-VIII with 4-9 branches, 3-VIII single, 5-VIII single or bifid, 14-VIII absent. Saddle edge with a few minute spicules only. Seta 1-X single, 2-X bifid or trifid, 4-X single or bifid, at least 3.5 length of saddle. Anal papillae cylindrical, 2.0-4.0 length of the saddle. Siphon about 2.5-2.9 length of saddle. Pecten with 2-6 slender teeth with delicate fringe, on either side of the midline, confined to the apical two-thirds or less of the siphon. Seta 1-S single or bifid, 1a-S 2-4 in number on either side of the midline, 2a-S 4-8 in number, in an irregular double row. Between these are 1-3 lateral setae on either side. All of these setae single or double.

TYPE-DATA. From correspondence with Prof. Dr. H.-J. Elster of the University of Freiburg-im-Breisgau and Dr. P. Lögler of the Museum für Naturkunde in that city I have satisfied myself that the whole of Günther's material was destroyed during the Second World War. Article 75(a) of the International Code of Zoological Nomenclature (Stoll et al. 1964) stipulates, "A neotype is to be designated . . . only in exceptional circumstances. . . when necessary in the interests of stability of nomenclature". In my view no such circumstances exist in the present case. I have therefore refrained from designating a neotype.

DISTRIBUTION. SRI LANKA. *Southern Province:* Galle District, Sinharaja Forest, Kanneliya, 64♂, 42♀, 56 L, 57 p, 46 lp; Udugama (type-locality): 7♂, 3♀. *Western Province:* Kalumara District, Morapitiya, 2♂, 1♀, 3 lp; Colombo District, Kalatuwawa; 4♂, 1♀, 11 L, 3 p, 2 lp.

Additional records from the literature: SRI LANKA. *Southern Province:* Galle District, Yakalamulla (Carter and Wijesundara 1948: 137); *Western Province:* Palawatte (Carter and Wijesundara 1948: 135).

TAXONOMIC DISCUSSION. Günther's very long description of the larva is more of anatomical than of taxonomic interest. However, his figures of the head and terminal segments appear to leave no doubt that this is the species which he had before him. Confirmation comes from the fact that his material was collected from *Nepenthes* pitchers. So far as is known neither of the other species of *Tripteroides* occurring in Sri Lanka has been recovered from these. Despite the resemblance to *Tp. affinis* (and to the more strikingly ornamented section of the genus) in the possession of bright blue head scales the larval characters suggest a closer relation to the *aranoides* complex. From all members of this complex, however, with the exception of *tenax*, as also from *affinis* and *coonorensis*, it differs in the great reduction in setal branching, the ranges of branch numbers of some setae being apparently discontinuous while for many

it is very nearly so.

BIONOMICS. The specimens from Kanneliya, Udugama, Kalatawawa, Yakalamulla and Pelawatte all came from pitcher plants which are clearly the preferred breeding place. Those from Morapitiya came from a yellow bamboo stump (with *Aedes albopictus* and *Culex* sp.) and a coconut shell (with *Ae. albopictus*).

EDWARDSI GROUP

The species placed for convenience in the present group are too imperfectly known for their taxonomic treatment to be other than highly provisional. One *(edwardsi)* is known only from the adult female, the other *(rozeboomi)* only from the adult male. They agree with one another and with the other species placed in *Rachionotomyia* well enough to be assigned provisionally to that subgenus on the basis of their general ornamentation. At the same time, however, they differ in some striking features, notably the insula of *edwardsi* (Fig. 8), the dististyle and IXth tergite of *rozeboomi* and the scutal and scutellar ornamentation of both. The dististyle of *rozeboomi* recalls that of some *Tripteroides* s. str. (*monetifer*, Baisas and Ubaldo-Pagayon 1953, Fig. 2.1, *plumosus*, Brug 1931: 18), as does the phallosome, but neither species shows any resemblance to that subgenus in ornamentation. The insula of *edwardsi* is unique, so far as I have been able to ascertain, in the genus. Either or both may require a new subgenus when better known.

10. *TRIPTEROIDES (RACHIONOTOMYIA) EDWARDSI* (BARRAUD) (Figs. 2, 3, 5, 8)

Heizmannia edwardsi Barraud 1929b: 264.
Tripteroides (Tripteroides) edwardsi Barraud of Edwards 1932: 78.

FEMALE (Figs. 2, 3, 5, 8). Wing 3.6-3.9 mm. *Head* (Fig. 2). Proboscis relatively short and stout, slightly swollen toward apex, 1.1 length of forefemur, 0.85 of abdomen. Palps unusually long, almost or quite one-third of the length of the proboscis. Proboscis and palps entirely dark. Clypeus bare. Tori with small, flat, dark scales on inner face. Antenna about 0.8 length of proboscis. Occiput with broad, flat, dark scales with red and green iridescence, border of snow-white scales around eye margins and ventrolaterally, extending well onto dorsal surface at sides. Dark upright scales on nape. Two stout orbital bristles and a smaller one well out to either side. *Thorax* (Fig. 3). Scutum with broad dark scales with subdued red, green and gold iridescent reflection and with a lateral border of broad, flat, snow-white scales from shoulders to posterior margin and similar scales on either side of the anterior promontory. Prescutellar bristles absent. Scutellum with broad, flat, dark scales on midlobe, broad, flat, snow-white scales on lateral lobes. Postnotum with a tuft of dark bristles. Anterior pronotal lobes and posterior pronotum densely covered with broad white scales. One posterior pronotal bristle or none, 2-3 minute spiraculars, 2 very small lower sternopleurals and 1-2 minute prealars. Lower anterior portion of sternopleuron bare, remainder of pleuron and paratergite densely covered with broad, white scales. *Legs*. Fore- and midfemora pale below to tip. Hindfemur similar but dark at extreme tip. Claws much as in *affinis*. *Wing*. Outstanding scales on upper

surface narrow, a little broader than in *affinis*. Upper calypter with about 20 hairlike scales. Upper fork cell 1.8-2.1 length of its stem. *Halter*. Head entirely dark. *Abdomen* (Fig. 5) dark above. Tergites with irregular lateral white patches incomplete, as figured, in the type but less so in the only other available specimen. Venter entirely white except for sternite VIII which is dark. *Terminalia* (Fig. 8). Postgenital plate narrowing markedly toward apex and with relatively deep apical emargination. IXth tergite with 3 long, stout bristles on one side, 4 on the other. Insula with numerous peripheral setae in a double row and with 5-6 in each posterior corner.

MALE, PUPA and LARVA unknown.

TYPE-DATA. Cotype female, now marked by myself as hololectotype, on pin. INDIA: Yellapur, 6.x.1921. P. J. Barraud, in B. M. Barraud (1929b, 1934) mentions a second cotype female in the former Malaria Survey of India collection in Masauli. I have not seen this.

DISTRIBUTION. INDIA. North Kanara District, Yellapur (type-locality); 1♀; *Mysore State:* Shimoga District, Sorab Taluk, Hosur; 1♀.

TAXONOMIC DISCUSSION. Barraud describes the dark scales on the vertex as "grey" and the scales on the scutal disc as "very dark brownish-grey". This is roughly the appearance under diffuse light but under indirect illumination the iridescence is quite conspicuous, providing a further interesting link with genus *Heizmannia* Ludlow. The spiracular bristles are very small and difficult to detect among the dense pleural scaling but they are undoubtedly present in both specimens so that the assignment to the Sabethini can be made with confidence. Other features, including the female terminalia, are fully consistent with inclusion in the present genus.

BIONOMICS. Barraud (1929b) states that of the 2 cotype females one was "caught in forest on the 6th" and the other "bred from larva found in hollow bamboo". It would appear from the date that the former is the lectotype. No information is available regarding the Shimoga specimen.

11. *TRIPTEROIDES (RACHIONOTOMYIA) ROZEBOOMI* BAISAS AND UBALDO-PAGAYON
(Figs. 3, 6, 28)

Tripteroides (Tripteroides) rozeboomi Baisas and Ubaldo-Pagayon 1953: 109.

FEMALE. Unknown.

MALE (Figs. 3, 6, 28). *Head.* Antenna moderately plumose, about 0.5-0.6 length of proboscis. Proboscis slender, about 1.3-1.5 length of forefemur. Palps about 0.12-0.14 length of proboscis. Palps and proboscis entirely dark. Clypeus bare. Tori with a few minute dark scales on inner surface. Occiput with whitish scales with subdued blue reflection covering all but the central portion, dark scales forming a discrete patch surrounded by pale scales except on nape. Upright scales on nape mid-brown. Two orbital bristles present well out on either side. *Thorax.* Scutum badly rubbed in all specimens. Anterior and lateral margins with broad white scales forming a (? continuous) border. Remaining scales moderately narrow with subdued red, blue and gold iridescence, narrower and golden anterolaterally. Prescutellar bristles absent. Midlobe of scutellum rubbed, apparently dark scaled; lateral lobes with large white scales. Postnotum bare. Anterior pronotal lobes densely covered with broad white scales. Posterior pronotum with broad white scales. No posterior pronotal bristle seen. One small spiracular bristle

present. Pleuron almost entirely covered with large, broad, flat white scales except for the anteroventral portion of the sternopleuron. Three small prealar bristles and 6-7 well developed lower sternopleural bristles present in holotype, not clearly seen in other specimens. *Legs*. Femora pale below; legs otherwise dark. Claws as figured (Fig. 3), all simple except for the larger foretarsal claw which has a small tooth toward tip. *Wing*. Outstanding scales on upper surface narrow, somewhat broader on distal portions of R_2 and R_3. Upper calypter with 4-6 hairlike scales. *Halter*. Head dark. *Abdomen* (Fig. 6). Tergites with whitish lateral border extending inward to form apicolateral triangular patches on segments III-VI, the apices of the triangles extending inward to form a more or less complete apical band on VI and an incomplete one on V. Tergites VII and VIII dark in the type, missing in the other specimens. Sternites white scaled except for the VIIIth which is dark. *Terminalia* (Fig. 28). Only those of the holotype (previously undissected) are any longer available. Dististyle short and stout with very numerous long, flexible hairs on the distal two-thirds. Basal lobe of basistyle with 5 setae distinctly thicker than the remainder. Paraproct relatively slender with 3-4 teeth at apex. Phallosome as figured. (The lateral view is taken from Baisas and Ubaldo-Pagayon 1953, Pl. I, Fig. 33). IXth tergite with lateral lobes broad, shallow, closely apposed, each with 16 stout apical bristles (14-16 according to Baisas and Ubaldo-Pagayon).

EARLY STAGES. Unknown.

TYPE-DATA. Holotype male, No. 2064.6, on pin, with terminalia on slide, in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Mindanao;* Zamboanga Prov., Pasonanca, Zamboanga City (type-locality); holotype and 2 paratype ♂♂. Two further paratypes with identical data, included by Baisas and Ubaldo-Pagayon in their description, are believed lost.

TAXONOMIC DISCUSSION. See above under subgenera.

BIONOMICS. The type-series is described as "caught wild at side of ravine in dense jungle". No further information is available.

UNGROUPED SPECIES

The 2 species whose descriptions follow are known only from the larval stage and cannot therefore be assigned with confidence to the appropriate subgenus. Although placed provisionally in *Rachionotomyia* they show sufficient resemblance to certain Philippines *Tripteroides* s. str. to suggest that they may prove to belong to that subgenus when adult characters become available.

12. *TRIPTEROIDES (?RACHIONOTOMYIA)* Species No. 1 (Fig. 29)

FEMALE, MALE, PUPA. Unknown.

LARVA (Fig. 29). *Head*. Mouthbrushes with inner setae pectinate. Palatal hairs slender, numerous, much as in *aranoides*. Seta 1-C moderately stout and curved, directed inward as in the figure. Seta 1-A single, other setae single except as follows: 7-C with 2-3 branches, 8-C single to trifid, 9-C with 2-3 branches, 11-C with 5-9, 14-C with 3-6, 15-C with 5-7. Mentum with 10-12 teeth on either side of the central tooth. *Thorax*. Seta 0-P with 11-17 branches, 1-P with 16-24, 3-P with 5-8, 4-P with 5-12, 7-P with

7-10, 8-P with 11-19, 9-P single to trifid, 11-P bifid or trifid, 13-P with 16-19 branches, 14-P with 14-24; 1-M with 13-24, 8-M with 10-18, 9-M with 2-4, 13-M with 14-17, 14-M with 13-20; 1-T with 11-18, 4-T with 12-16, 5-T with 11-18, 7-T with strongly developed basal arm and in one case a smaller arm in addition, 8-T with 8-11 branches, 9-T single to tetrafid, 13-T with 10-13. *Abdomen.* Seta 1-I with 8-12 branches, 2-I with 11-15, 5-I with 9-13, 6-I with 2, 9-I with 5-8, 11-I with 10-14, 13-I with 11-20, 14-I with 5-7; 0-II with 5-8, 1-II with 10-12, 2-II with 10-15, 5-II with 9-13, 6-II with 2, 9-II with 5-8, 11-II with 8-12, 13-II with 12-17, 14-II with 5-7; 0-III with 6-8, 1-III with 11-12, 2-III with 9-15, 5-III with 8-11, 6-III single or bifid, 9-III with 5-7 branches, 11-III with 10-14, 13-III with 9-17, 14-III and 0-IV with 6-7; 1-IV with 10-13, 2-IV with 10-15, 5-IV with 5-9, 6-IV single or bifid, 9-IV with 5-8 branches, 11-IV with 8-10, 13-IV with 12-14, 14-IV with 6-7; 0-V with 5-8, 1,2-V with 11-14, 5-V with 8-9, 6-V single or bifid, 9-V with 7-10 branches, 11-V with 9-11, 13-V with 11-13, 14-V with 6; 0-VI with 6-11, 1-VI with 10-15, 2-VI with 11-12, 5-VI with 7-11, 8-VI with 3,9-VI with 6-8, 11-VI with 7-10, 13-VI with 7-11, 14-VI with 6-9; 0-VII with 7-9, 1-VII with 10-19, 2-VII with 10-15, 5-VII with 12-14, 6-VII single or bifid, 8-VII with 5-8 branches, 9-VII with 6-9, 11-VII with 9, 13-VII with 6-9. Comb with 9-11 teeth. Individual teeth as figured, the longest at least two-thirds of the length of the saddle. Seta 1-VIII with 16-21 branches, 3-VIII with 3-6, 5-VIII with 3-4. Saddle edge with 4-5 long, slender spines on either side and a number of smaller spinules. Seta 2-X with 3-4 branches, 4-X with 2-3, at most slightly longer than saddle. Other setae on segment X single. Seta 3-X about 6.0-7.0 length of saddle. Anal papillae about 2.0 length of saddle. Siphon 3.0-3.1 length of saddle. Pecten with 6-10 teeth on either side. Individual teeth as figured. Seta 1-S single, paired, 1a-S long and single, 5-8 in number in a single line, 2a-S single, one or two occasionally bifid, 7-8 in all in 2 rows. 0-2 lateral setae present, resembling 2a-S.

DISTRIBUTION. EAST MALAYSIA. *Sabah.* Gunong Kinabalu; 4 L; Gunong Terus Madi; 3 L.

TAXONOMIC DISCUSSION. I have placed this species provisionally in *Rachionotomyia* because it does not resemble, in the larval stage, any of the species of *Tripteroides* s. str. known from East or West Malaysia or Indonesia but does show some resemblance to the atypical larvae of *affinis* mentioned on p. 45. On the other hand it bears a distinct resemblance to larvae of 2 Philippines species (*dyari* Bohart and Farner, *simulatus* Baisas and Ubaldo-Pagayon) belonging to the nominotypical subgenus. It differs from these in that neither of them has comb teeth longer than about two-thirds of the length of the saddle, at least in specimens seen by me, while both have setae 2a-S and the lateral setae on the siphon much reduced, but it could well belong to the same subgenus. The larvae from Mt. Terus Madi are immature and have been excluded from the above description though agreeing well, as far as can be seen, with the present species.

BIONOMICS. The larvae from Mt. Kinabalu were collected from pitcher plants at 8,000-9,000 ft. The plants are described as forming "a zone of v. large pot-bellied pitchers with fluted (spiky) rims, (? *rajah*)". Those from Mt. Terus Madi were collected from undescribed pitcher plants at about 8,900 ft. I am grateful to Dr. Donald Colless for this very interesting material.

13. *TRIPTEROIDES* (*RACHIONOTOMYIA*) Species No. 2 (Fig. 30)

FEMALE, MALE, PUPA. Unknown.

LARVA (Fig. 30). *Head.* Mouthbrushes with inner setae stout, lightly pectinate. Palatal setae slender, numerous. Seta 1-A slender, single; 1-C moderately stout, not strongly curved, directed inward, 7-C single to trifid, 9-C with 2, 11-C with 2-5, 14-C single to trifid, 15-C bifid to pentafid, other setae single. Mentum with 9-11 teeth on either side of the central tooth. *Thorax.* Seta 0-P with 5-13 branches, 1-P with 6-15, 3-P with 3-5, 4-P with 4-9, 7-P with 5-10, 8-P with 9-12, 9-P with 2-3, 11-P single to trifid, 13-P with 12-18 branches, 14-P with 12-21; 1-M with 3-6, 8-M with 4-11, 9-M with 4-5, 13-M with 7-13, 14-M with 5-12; 1-T with 4-9, 4-T with 4-12, 5-T with 9-11, 7-T with 1-3 basal arms, 8-T with 3-4 branches, 9-T with 4-8, 13-T with 9-11. *Abdomen.* Seta 1-I with 9-14 branches, 2-I with 10-14, 5-I with 8-10, 6-I with 2-3, 9-I with 2-5, 11-I with 8-12, 13-I with 12-18, 14-I with 6-10; 0-II with 3-7, 1,2-II with 9-11, 5-II with 7-11, 6-II with 2, 9-II with 4-8, 11-II with 8-11, 13-II with 11-14, 14-II with 7; 0-III with 4-8, 1-III with 8-11, 2-III with 8-10, 5-III with 8-9, 6-III with 2, 9-III with 4-8, 11-III with 9-11, 13-III with 12-13, 14-III with 6-11; 0-IV with 6-9, 1-IV with 10-15, 2-IV with 7-11, 5-IV with 6-9, 6-IV with 2, 9-IV with 4-8, 11-IV with with 8-15, 13-IV with 11-13, 14-IV with 7-8; 0-V with 6-9, 1-V with 10-14, 2-V with 5-11, 5-V with 6-9, 6-V single or double, 9-V with 4-9 branches, 11-V with 8-11, 13-V with 11-12, 14-V and 0-VI with 6-7; 1-VI with 9-11, 2-VI with 6-11, 5-VI with 7-8, 8-VI with 3-4, 9-VI with 7, 11-VI with 7-9, 13-VI with 8-10, 14-VI with 5-7; 0-VII with 5-9, 1-VII with 5-11, 2-VII with 2-9, 5-VII with 5-7, 6-VII single, 8-VII bifid, 9, 11-VII with 5-8 branches, 13-VII with 4-9. Comb with 8-13 teeth as figured, much as in the preceding species but with the teeth shorter, the longest at most two-thirds of the length of the saddle. Seta 1-VIII with 8-12 branches, 3, 5-VII single or bifid. Saddle edge with 2-4 simple spines on either side and some smaller spinules. Seta 2-X with 2-4 branches, other setae on segment X single, 3-X about 7.0-8.0 and 4-X about 4.5-6.0 length of saddle respectively. Anal papillae 2.1-2.7 length of saddle, broad or moderately broad. Siphon 2.3-2.5 length of saddle. Pecten with 4-8 teeth on either side of the midline, the individual teeth as figured, much as in the preceding species but tending to be smaller. Seta 1-S paired, single, 1a-S single, 4-6 in a single line, 2a-S 6-10 in 2 rows, single or the distal pair split into 2-3 at tip. No lateral setae.

DISTRIBUTION. EAST MALAYSIA. *Sabah.* Gunong Kinabalu: 3 L, Gunong Terus Madi: 4 L.

TAXONOMIC DISCUSSION. This larva differs from the preceding one in being, in general, less hairy with minimal overlap in branch numbers of some cephalic and thoracic setae, notably 11-C, 14-C, 15-C, 1-P, 3-P, 13-M, 14-M, 4-T and 5-T and wide discontinuity in 1-M and 8-T. There is also some discontinuity among the abdominal setae. In my view this would justify their being treated provisionally as distinct species and I am confirmed in this opinion by the very striking difference in seta 4-X (Fig. 29, 30). The material from Terus Madi also includes some early instar larvae (and one more mature but incomplete) resembling the present species in the very long seta 4-X but with this seta trifid to hexafid and with the comb teeth shorter, at most one-third of the length of the saddle. These may be earlier stages of the present species or they may represent a third new species. The material

is in very poor condition and does not warrant a fuller description.

BIONOMICS. As for Species no. 1 except that the present species is not included among material from 9,000 ft. on Kinabalu.

SUBGENUS *TRICHOLEPTOMYIA* DYAR AND SHANNON

Tricholeptomyia Dyar and Shannon 1925: 72. Type-species *Wyeomyia nepenthicola* Banks.

FEMALE. Palps about 0.08-0.15 length of proboscis; occiput with broad, flat, dark scales and a narrow pale border to eyes, sometimes some pale scales in midline or on nape; 1-2 orbital setae present, usually 2. Scutal scales mostly narrow or very narrow (moderately broad in *apoensis*), dorsocentral bristles present or absent, prescutellars always present, postnotals present (except in *barraudi*); pleural scales and lateral pale scales on abdominal tergites white or whitish, never silvery, subspiracular scales present (? always). Femora with anterior surface entirely dark, tibiae and some tarsal segments often paler below. Hindclaws unpaired. Outstanding scales on upper surface of wing narrow or very narrow, somewhat broader in some cases toward tips of R_2 and R_3.

FEMALE TERMINALIA. Apex of postgenital plate always emarginate, sometimes deeply so. Insula with 3-10 peripheral bristles and at most 3 in the posterolateral corners, often none. Spermatheca always trilobed.

MALE. Palps as in female. Hindclaws unpaired.

MALE TERMINALIA. Small, sometimes retracted but often exposed. Dististyle relatively stout, clubbed apically, lateral plate of phallosome without sternal lobe. Setae on IXth tergite pointed, relatively long and slender, never spinelike (except in *christophersi* Baisas and Ubaldo-Pagayon).

PUPA. Seta 1-C short or very short, 1-I poorly developed, often single, except in *delpilari*, other principal abdominal setae various, short and slender in some species, longer or stouter in others, 9-VII and -VIII small in *apoensis* Baisas and Ubaldo-Pagayon and *barraudi*, well developed in other species. Dorsal sensillum present on segments III-V. Paddles always spiculate, often quite heavily so.

LARVA. Maxilla without enlarged apical spines; maxillary suture inapparent; setae 6-M and 7-T short, stout, spinose (except in *delpilari* and *nepenthicola* which have 6-M relatively long and slender. Seta 14-I-VI minute. Setae 8-M and 8-T small, often minute, absent or not seen. Lateral seta on siphon minute, delicate but always present, usually branched, wholly unlike setae 2a-S.

DISTRIBUTION. Known only from Philippines.

BIONOMICS. Breeding places almost exclusively pitcher plants, a single record from a log hole and one from a rock hole. Adults not known to bite man. Natural hosts unknown.

KEYS TO GROUPS AND SPECIES OF *TRICHOLEPTOMYIA*

ADULTS

1. Scutellum with pale scales on all lobes. 2
   Scutellum entirely dark. 3

2(1). Proboscis short and stout, palps about one-seventh of the length of the proboscis; dorsocentral bristles absent; postnotal bristles present. *belkini* (p. 74)
Proboscis long and slender, palps about one-tenth of the length of the proboscis (Fig. 2); 1-2 dorsocentral bristles present; postnotum bare. . . . . *barraudi* (p. 59)

3(1). Abdominal tergites III-VII with complete, or almost complete, apical pale bands (Fig. 6). . . . . *roxasi* (p. 70)
werneri (p. 72)
Abdominal tergites all dark above. 4

4(3). 3-4 dorsocentral bristles present. . . . . *christophersi* (p. 61)
Dorsocentrals absent. 5

5(4). Abdominal tergites with lateral pale borders widening conspicuously towards the apex of each segment (Fig. 4). . . . . *apoensis* (p. 57)
Abdomen with more or less uniform pale lateral border (Fig. 4). . . 6

6(5). Lobes of male IXth tergite with apices expanded (Fig. 47).
delpilari (p. 76)
Lobes of male IXth tergite more uniformly rounded at apex (Fig. 37) . 7

7(6). Cleft between lobes of male IXth tergite usually very shallow (Fig. 37).
microcala (p. 63)
Cleft between lobes of male IXth tergite usually much deeper (Fig. 39).
nepenthicola (p. 67)

PUPAE

1. Seta 1-I a conspicuous tuft, (Fig. 47) (Delpilari Group).
delpilari (p. 76)
This seta otherwise (Nepenthicola Group). 2

2(1). Seta 5-IV much longer and stouter than 1-IV (Fig. 41, 43).
roxasi (p. 70)
werneri (p. 72)
Seta 5-IV of the same order of length as, or smaller than, 1-IV. . . 3

3(2). Setae 1, 6-III-VI feebly developed, relatively inconspicuous. 4
One or both of these setae stout, dark, conspicuous at least on VI and usually also on some other segments. 5

4(3). Setae 9-VII, VIII single or bifid and 3-6-branched respectively, one-half length of paddle or less (Fig. 33). . . . . *barraudi* (p. 59)
These setae much longer, with 8-11 and 14-18 branches respectively (Fig. 35). . . . . *christophersi* (p. 61)

5(3). Setae 1-III-V short, slender, relatively inconspicuous; paddles more or less oval, broadly rounded or flattened at tip (Fig. 31).
apoensis (p. 57)
These setae longer, stouter, conspicuous; paddles tapering to a point. . 6

6(5). Setae 1-I and 6-III-V short, slender, delicate, 1-I with 3-5 branches (Fig. 45). . . . . *belkini* (p. 74)
These setae longer, stouter, more conspicuous, single or bifid (Fig. 37, 39). . . . . *microcala* (p. 63)
nepenthicola (p. 67)

LARVAE

1. Seta 1-M minute, delicate, inconspicuous. 2
This seta stout, dark, strongly developed, conspicuous. 4

2(1). Head broad and very dark; siphon at least 2.0 length of saddle; setae 2a-S 10 or more in number (Fig. 48). . . . . *delpilari* (p. 76)
Head narrow, lightly pigmented; siphon less than 1.5 length of saddle; setae 2a-S 3-7 in all. 3

3(2). Seta 5-M about equal in length to the thorax or shorter; setae 1, 5, 6, 7-II at most about 0.5, 1.0, 1.5 and 1.3 length of the following segment respectively (Fig. 42). . . . . *roxasi* (p. 70)
Seta 5-M about 1.3-1.6 length of thorax; setae 1, 5, 6, 7-II at least about 0.7, 1.2, 1.8 and 1.7 length of the following segment respectively (Fig. 44). . . . . *werneri* (p. 72)

4(1). Comb teeth with hypertrophied median denticle in the form of a fringed scale; setae 1a-S at most 2 in number; seta 5-VII with 7-12 branches (Fig. 46). . . . . *belkini* (p. 74)
Comb spines with median denticle sharp pointed as usual; setae 1a-S 3-10 in number; seta 5-VII single to trifid. 5

5(4). Pecten teeth coarsely denticulate; setae 1, 5, 9-M and 6- and 7-I-II short, usually very short (Fig. 34). . . . . *barraudi* (p. 59)
Pecten teeth delicately fringed; these setae longer, usually much longer. 6

6(5). Seta 1-C flattened, sculptured when seen in plane view; palatal setae slender; mentum strongly arched (Fig. 36). . *christophersi* (p. 61)
Seta 1-C of normal type; palatal setae very coarse; mentum flattened (Fig. 40). 7

7(6). Setae 13, 14-P arising from a common tubercle, with 1-7 and 3-12 branches respectively; setae 1-I-VI all of the same general order of length. 8
Setae 13, 14-P well separated, single or bifid; setae 1-I and -II much shorter than 1-IV-VI (Fig. 32). . . . . *apoensis* (p. 57)

8(7). Setae 1-M and 1-V-VI finely attenuated, 6-M generally shorter than 7-T, occasionally up to 1.2 its length, 2-I-II with at most 8 branches, usually fewer (Fig. 38). . . . . *microcala* (p. 63)
Setae 1-M and 1-V-VI stout, blunt tipped, 6-M at least 1.3 length of 7-T, generally longer, 11-I-II with 5-19 and 7-20 branches respectively (Fig. 40). . . . . *nepenthicola* (p. 67)

NEPENTHICOLA GROUP

Included in this group are all the species in Group A of Baisas and Ubaldo-Pagayon (1953: 14) except *rozeboomi* which is transferred to subgenus *Rachionotomyia* and *delpilari* which is felt to merit a separate monotypic group. For differences from the latter see keys to early stages (p. 55-56). Setae 8-M and 8-T are also smaller in the present group, being minute tufts often absent or not seen.

NEPENTHICOLA SUBGROUP

Several members of the Nepenthicola Group have distinctive features (narrow larval head in *christophersi, microcala, nepenthicola, roxasi* Baisas and Ubaldo-Pagayon and *werneri* Baisas and Ubaldo-Pagayon, absence of postnotal setae in *barraudi*). These appear to be outweighed, however, by the combination in *belkini* of short, stout proboscis in both sexes of adult with larval comb teeth unique in the genus. It has therefore been preferred to place the latter by itself in a monotypic subgroup while retaining all the other species in this one.

14. *TRIPTEROIDES (TRICHOLEPTOMYIA) APOENSIS* BAISAS AND UBALDO-PAGAYON
(Figs. 4, 7, 31, 32)

Tripteroides (Tripteroides) apoensis Baisas and Ubaldo-Pagayon, 1953: 68.

FEMALE (Figs. 4, 7). Wing 3.5-4.8 mm. Proboscis slender, about 1.1-1.2 length of forefemur, 0.9-1.1 of abdomen, palps about 0.1 of proboscis. Palps and proboscis entirely dark. Clypeus bare. Tori with small, broad, pale scales on inner surface. Antenna about 0.5 length of proboscis. Occiput with broad, flat, dark scales, appearing paler in some lights, over most of surface, a border of pale scales around eye margins, broadening ventrolaterally, a few dark upright scales, paler toward tip, on nape. 1-2 orbital bristles far out on either side. *Thorax.* Scutum with moderately broad, midbrown, lanceolate scales, appearing paler in some lights and with broader, whitish scales on anterior and lateral margins. 2-4 prescutellar bristles present on either side, no dorsocentrals. Scutellum with dark scales on all lobes. Postnotum with a small tuft of dark bristles. Anterior and posterior pronota with flat, whitish scales. A single posterior pronotal bristle present and 3-4 spiraculars. Postspiracular area and anteroventral portion of sternopleuron bare. Remainder of pleuron covered with broad, whitish scales. Paratergite bare. About 4-7 lower sternopleural bristles present, no prealars so far as can be seen. *Legs.* Femora pale below almost to tip. All claws simple. Fore- and midclaws subequal, hindclaws unpaired. *Wing.* Outstanding scales on upper surface narrow. Upper calypter with 4-5 hairlike scales. Upper fork cell 1.0-1.2 length of its stem. *Halter.* Head dark. *Abdomen* (Fig. 4). Tergites with pale lateral borders extended to form conspicuous pale apicolateral triangles which, however, are invisible from above. Sternites pale except for VIII which is dark. *Terminalia* (Fig. 7). Postgenital plate shallow with broad apical emargination. IXth tergite with 10-12 bristles on either lobe. Insula with 6-7

stout peripheral bristles and 1-2 smaller ones in the posterolateral corners.

MALE (Fig. 31). Wing 2.4-3.8 mm. Antenna strongly plumose, a little less than half the length of the proboscis. Upper fork cell 1.1-1.2 length of its stem. One foreclaw large and toothed, the other much smaller and simple. Hind- and midclaws simple, the former unpaired. *Terminalia* (Fig. 31). Dististyle swollen on about the apical half. Basal lobe of basistyle with 2-3 setae stouter than the remainder, one of them much longer than the other(s). Paraproct with 2-4 large teeth at apex and 2-3 smaller ones. Phallosome as figured. IXth tergite with lobes well separated distally, converging at base, each with 10-15 setae extending down the inner surface to the base.

PUPA (Fig. 31). As figured. Trumpets very broad. All setae short or very short. 1-C only a little longer than 2,3-C. 8-C stout, dark, single to tetrafid, 1-C slender, simple or lightly frayed, single to trifid. Seta 6 usually, and 9 always, relatively stout and dark on III-VI. Setae 9-VII and 9-VIII at most about two-thirds of the length of the following segment and the paddle respectively, usually less, with 2-5 and 3-10 branches respectively. Paddles broadly rounded at tip, lightly spiculate on both edges, 1.2-1.4 as long as their greatest breadth.

LARVA (Fig. 32). Head narrow, about 1.2 as long as broad. Seta 1-C small, sometimes very small. Other setae single except as follows: 5-C with 5-8 branches, 7-C with 3-7, 9-C with 2-6, 10-C with 2-7, 11-C with 4-6, 12-C single to pentafid, 13-C single or bifid, 14-C with 2-3 branches, 15-C with 2-5. *Thorax*. Setae 1, 5-M exceptionally long, exceeding the anterior margin of the head, 7-T without basal arm, about 1.3-1.6 length of 6-M. These and other setae single except as follows: Setae 0, 4-P with 2-5 branches, 2, 6, 8, 13-P and 14-P single or bifid; 2, 3-M single or bifid, 4-M single to tetrafid, 7-M single to trifid, 13-M with 2-5 branches, 14-M with 3-5; 2-T with 3-5, 4-T with 2-4, 5-T single or bifid, 6-T single to trifid, 8-T bifid or trifid, 13-T single to trifid; 1-I single to trifid, 2-4-I single to tetrafid, 5, 9, 10-I single or bifid, 11-I single to pentafid, 13-I single to tetrafid; 1-II single or bifid, 2-II single to trifid, 3-II single or bifid, 4-II bifid or trifid, 5-II single or bifid, 8-II single to tetrafid, 9-II single or bifid, 10-II single to tetrafid, 11-II bifid to pentafid, 12-II single to trifid, 13-II single or bifid; 1, 2-III single or bifid, 3-III single to tetrafid, 5-III single or bifid, 7-III single to trifid, 8-III bifid or trifid, 9-III single or bifid, 11-III with 2-5 branches, 13-III single or bifid; 2-IV single to trifid, 5-IV single or bifid, 7, 8-IV single to trifid, 9, 10-IV single or bifid, 11-IV bifid to pentafid, 13-IV single or bifid; 2-V single or bifid, 3, 4-V bifid or trifid, 5-V single or bifid, 7-V bifid to trifid, 8-V single to tetrafid, 9-V single or bifid, 10-V single to trifid, 11-V single or bifid; 3, 4-VI single to trifid, 7-VI bifid or trifid, 8-VI bifid to tetrafid, 9-VI single or bifid, 10-VI single to trifid, 12-VI with 2-3 branches, 13-VI with 3-5; 3, 4-VII single to trifid, 6-8, 10, 12, 13-VII with 2-6 branches. Comb with 5-10 teeth as figured. Seta 1-VIII single or bifid, 2-VIII single to tetrafid, 3-VIII with 3-10 branches, 4-VIII with 3-6, 5-VIII with 3-10. Saddle edge with numerous small, apically fringed scales and laterally fringed spines. All setae on segment X single. Seta 3-X about 3.5-4.5 length of saddle. Anal papillae short and broad, variable in shape, sometimes more pointed than in the figure, about 0.8-1.2 length of the saddle. Siphon about 1.1-1.2 length of saddle. Pecten of 3-8 large teeth on either side of midline, the individual teeth as figured with delicate ventral fringe. Seta 1-S single, unpaired, 1a-S single, 4-7 in number in a single line, 2a-S single, 4-7 in number on either side of the midline, lateral seta with 5-7 branches.

TYPE-DATA. Holotype male, No. 1150-3, allotype female, No. 1150-9,

both on pins with associated skins on slides in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Mindanao.* Bukidnon Province, Sumilao, 70 L; Maluko, Tagalaon, 3♂, 2♀, 5 p; Davao Province, Taglawig, Tagum (type-locality), 3♂, 1♀, 1 p, 2 lp; east slope, Mt. McKinley, 2♀, 1 p, 12 L, 1 l, 2 lp; east slope, Mt. Apo, 3♂, 2♀, 1 p, 1 L; unnamed localities, 5♂, 3♀.

TAXONOMIC DISCUSSION. This species resembles the others with narrow larval head, except for *barraudi,* in possessing postnotal bristles. It resembles *barraudi* rather closely however in larval chaetotaxy and may be most closely related to that species.

BIONOMICS. Specimens from the type-locality came from pitcher plants at ground level, those from Mt. McKinley from arboreal pitcher plants and those from Mt. Apo from both (Baisas and Ubaldo-Pagayon 1953: 18). One male was taken as adult on Mt. McKinley and another on Mt. Apo and 2 males and 2 females were reared from larvae recorded as from deeply shaded log holes in forest on Mt. McKinley. Baisas and Ubaldo-Pagayon (1953: 68) consider this record probably erroneous.

15. *TRIPTEROIDES (TRICHOLEPTOMYIA) BARRAUDI* BAISAS AND UBALDO-PAGAYON (Figs. 2, 3, 7, 33, 34)

Tripteroides (Tripteroides) barraudi Baisas and Ubaldo-Pagayon, 1953: 75.

FEMALE (Figs. 3, 7). Wing 3.2-3.4 mm. *Head.* Proboscis long and slender, slightly swollen at tip, 1.0-1.1 length of forefemur, 1.0 of abdomen. Palps about 0.1 of proboscis. Palps and proboscis entirely dark. Clypeus bare. Tori with conspicuous white scales on inner surface. Antenna about 0.5 length of proboscis. Occiput with flat, dark brown scales and a continuous border of white scales around eye margins, broadening ventrolaterally. Some small dark upright scales with expanded tips on nape. 1-2 orbital bristles present well out to either side. *Thorax* (Fig. 3). Scutum with relatively broad white scales on anterior promontory, narrow pale golden scales elsewhere, a narrow lateral border of broader white scales above the paratergite and from there posteriorly. 1-2 dorsocentral and 2-3 prescutellar bristles present on either side. Scutellum with all lobes pale scaled. Postnotum bare. Anterior pronotal lobes and posterior pronotum entirely covered with small, flat white scales. One posterior pronotal bristle, 2-3 spiraculars. Most of the pleuron, except for the postspiracular area and the antero-ventral portion of the sternopleuron, covered with flat white scales. Paratergite bare. Four lower sternopleural and 2 prealar bristles present. *Legs.* Femora pale below to tip. Foreclaws simple, subequal, midclaws similar, hindclaw only slightly curved, unpaired. *Wing.* Outstanding scales on upper wing field narrow, almost hairlike, somewhat broader toward tip of R_2. Upper calypter with 4-5 hairlike scales. Upper fork cell 1.2-1.7 length of its stem. *Halter.* Head dark. *Abdomen.* Tergites dark above, with I appearing paler in certain lights, with lateral pale longitudinal bands expanding anteriorly to form small pale triangles invisible from above, much as in *apoensis* (Fig. 4). Sternites entirely pale except for the VIIIth which is dark. *Terminalia* (Fig. 7). Postgenital plate with broad, shallow invagination at apex. IXth tergite with 12 bristles on either lobe in the specimen examined. Insula with 9-10 peripheral setae on either side, without posterolateral setae on the general surface.

MALE (Figs. 2, 33). Wing 3.2-3.4 mm. Antenna strongly plumose, about

0.5 length of the proboscis. Upper fork cell 1.1 length of its stem. Foreclaws very unequal, the larger toothed. Midclaws unequal, simple. Hindclaw minute, simple, unpaired. *Terminalia* (Fig. 33). Dististyle relatively long and slender, moderately swollen apically. Basal lobe of basistyle with 1-2 setae markedly longer than the others. Paraproct with 2 large and 2-3 smaller teeth at apex. Phallosome as figured. Lobes of IXth tergite closely approximated at base, divergent apically, with 15-18 stout bristles on each.

PUPA (Fig. 33). Trumpets large and very broad. Seta 1-C short, delicate, trifid, 8-C a stout, dark, plumose bristle. All abdominal setae very short, mostly single as figured. Seta 9-VII single or bifid, about half as long as segment VIII at most, 9-VIII with 3-6 branches, at most a little more than half the length of the paddle. Paddles as figured, lightly spiculate on both borders.

LARVA (Fig. 34). *Head* narrow, about 1.2 as long as broad. Mouthbrushes with most of the inner setae delicately pectinate as usual but with a few of them modified, either longer than the others and simple or, in a few cases, stouter and with 2-3 very coarse teeth. Palatal hairs very broad and coarsely toothed. Seta 1-C short, stout, dark, little curved, if at all, 5-C with 4-8 branches, 7-C with 3-7, 9-C with 6-16, 10-C with 2-5, 11-C with 4-8, 12-C single or bifid, 13-C single or bifid or split into 2-4 at tip, 15-C with 3-7 branches. Other head setae single. *Thorax*. All setae short, as figured, single (often frayed) except as follows: 0-P with 4-9 branches, 1-5-P single or bifid, 6-P single or trifid, 7-P single or bifid, 8-P single to tetrafid, 11-P bifid or trifid, 13-P single to trifid, 14-P with 3-6 branches; 4-M single to pentafid, 6-M 1.1-2.0 length of 7-T, 8-M with 5-10 branches, 11-M single to tetrafid, 13-M with 5-11 branches, 14-M with 7-10; 1-T single or bifid, 2-T with 2-3 branches, 4-T with 3-8, 5-T with 2-3, 7-T without basal arm, 8-T with 4-9 branches, 11-T with 2-3, 13-T with 5-8. *Abdomen*. Seta 1-I single or bifid, 2-I single to tetrafid, 5-I single to trifid, 9-I with 2-4 branches, 11-I with 2-5, 13-I with 3-4; 1,2-II single or bifid, 5-II single to trifid, 8-II single to pentafid, 9-II bifid to tetrafid, 11-II single to trifid, 12-II single to pentafid, 13-II single or bifid; 2,4-III single to trifid, 5-III single or bifid, 7-III single to trifid, 8,9-III with 2-4 branches, 11-III with 2-3, 13-III single or bifid; 5-IV single or bifid, 7-IV single to trifid, 8-IV bifid to tetrafid, 9-IV single to trifid, 11-IV bifid or trifid; 2-V single or bifid, 5,7-V single to trifid, 8-V with 3-6 branches, 9-V with 2-4, 11-V single to trifid; 2-VI single or bifid, 5-VI single to trifid, 7-VI single or bifid, 8-VI with 3-7 branches, 9-VI with 2-4, 11-VI single to trifid, 13-VI with 3-8 branches, 6-VII and 7-VII with 2-4 branches, 8-VII with 2-7, 9-VII single to tetrafid, 12-VII single or bifid, 13-VII with 4-7 branches. Comb of 5-11 coarsely fringed spines, as figured. Seta 1-VIII single to trifid, 3-VIII with 4-10 branches, 4-VIII single, 5-VIII with 6-10 branches, 14-VIII minute, single. Saddle edge with sharp pointed spinules. All setae on anal segment single. Seta 3-X 1.4-2.4 length of saddle. Anal papillae short, pointed, 1.1-1.2 length of saddle. Siphon 1.3-1.6 length of saddle. Pecten with 5-7 teeth on either side of the midline, the individual teeth very large, as figured. Seta 1-S single, unpaired, 1a-S single, 3-7 in number in a single line, 2a-S single, 3-6 on either side of the midline, lateral seta with 2-8 branches.

TYPE-DATA. Holotype male, No. 559-b, on pin with terminalia on slide, associated skins lost, allotype female, No. 561-17, with claws, pharynx and associated larval and pupal skins on slides. Both in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Luzon*. Mt. Province, Banaue-Bontoc Road (type-locality); 2♂, 5♀, 17 L, 1 P, 4 l, 2 lp; Banaue, 1♀, 4 L; Quezon

Province, Baler, Tayabas, 1 L.

TAXONOMIC DISCUSSION. A unique female adult, in the U.S.N.M., collected in the general area of the type-locality, but subsequent to the publication of the original description, differs from the type-series in much larger size (wing 4.2 mm.), presence of 3 pairs of dorsocentral bristles, longer anterior fork cell (1.7 its stem) and absence of pale lateral markings from the abdominal segments posterior to the second. It is accompanied by 4 whole larvae from the same locality and with the same serial number (#50). These agree with the larva of the present species except that one of them has the larger setae more strongly developed, notably seta 6-IV which is approximately equal in length to the following segment and setae 5-I-VI with 4-6 branches, 11-I-VI with 7-8, 9-10, 12, 10, 9-10 and 5-6 respectively and 2-VII and 5-VII bifid. This may be no more than a hairy form of the present species but it seems to call for further investigation.

Baisas and Ubaldo-Pagayon (1953:75) cite the absence of pale scales from the tori as distinguishing the present species from *apoensis*. In fact, however, there are conspicuous white scales in this position in all their surviving specimens including the types. The presence of such scales distinguishes these two species from all others in the subgenus except *microcala* (and ? *nepenthicola*). The same authors (1953: 77) note the presence among the inner mouthbrush setae of the larva of some which are exceptionally coarsely serrated. As indicated above, however, these are present in only a few of their larvae. The very coarse palatal setae (Fig. 34) (not mentioned by Baisas and Ubaldo-Pagayon) are constantly present and are distinctive from other species except *apoensis*, *microcala* and *nepenthicola* (cp. Fig. 36). The equally coarse pecten teeth are diagnostic from all other species, being most closely approximated by those of *roxasi* and *werneri* (Figs. 42, 44). Finally the abdominal chaetotaxy of the larva approximates quite closely to that of *apoensis*, to which the present species is perhaps most closely related, except that the latter has setae 6-I-VI and 7-I-II very much longer.

BIONOMICS. The type-series was bred out from pitcher plants on the ground. Baisas and Ubaldo-Pagayon (1953: 18) also give records from Famy Jungles, Famy, Laguna Prov. and Bongabon-Baler Road, Baler, Quezon Prov. from ground and arboreal pitcher plants in both cases but this material is now believed lost. No data are available for the material, mentioned above, which was collected in the area of the type-locality subsequent to the publication of the original description.

16. *TRIPTEROIDES (TRICHOLEPTOMYIA) CHRISTOPHERSI* BAISAS AND UBALDO-PAGAYON
(Figs. 3, 4, 8, 35, 36)

Tripteroides christophersi Baisas and Ubaldo-Pagayon 1953: 86.

FEMALE (Figs. 3, 4, 8). Wing 3.8-3.9 mm. *Head.* Proboscis long and slender, 1.3 length of forefemur, 1.1 of abdomen. Palps 0.09 of proboscis. Palps and proboscis entirely dark. Clypeus bare. Tori bare or with a few minute hairlike scales on inner surface. Antenna about 0.5 length of proboscis. Occiput with flat dark scales with subdued bronzy reflection and a narrow border of flat white scales around eye margins expanding somewhat ventrolaterally. A few dark upright scales with expanded tips on nape. Two orbital bristles far out on either side. *Thorax.* Scutum (Fig. 3) uniformly

covered with narrow brown scales with pale golden reflection, some narrow white scales on anterior border. 2-3 prescutellar and 3-4 dorsocentral bristles present on either side. Scutellum with dark scales on all lobes. Postnotum with a group of small dark bristles. Anterior pronotal lobes with small flat whitish scales anteriorly, larger and darker scales behind. Posterior pronotum with moderately broad whitish scales. A single posterior pronotal bristle, 3-4 spiraculars. Subspiracular area, upper and posteroventral portions of sternopleuron and most of the mesepimeron covered with flat whitish scales, the subspiracular patch relatively small. Paratergite bare, 4-5 prealar and 3-4 lower sternopleural bristles present. Most of pleuron, except anteroventral portion of sternopleuron, with broad white scales. Pleural integument yellowish with relatively pale brown shading on individual sclerites, contrasting sharply with the darker brown of the scutal integument. *Legs*. Femora dark above, pale below to tip. Claws (undissected); fore- and mid-pairs unequal, hindclaws apparently unpaired. *Wing*. Outstanding scales on upper surface very narrow, linear. Upper calypter with 4-6 hairlike scales. Upper fork cell 1.2-1.3 length of its stem. *Halter*. Head entirely dark. *Abdomen* (Fig. 4). Dark above, lateral borders of tergites narrowly and uniformly pale. Sternites creamy white except for VIII which is dark. *Terminalia* (Fig. 8). Postgenital plate shallow with anterior margin deeply indented. IXth tergite very slightly indented with 13 bristles on one side and 15 on the other. Insula with 10 peripheral bristles on either side, no bristles in posterolateral corners.

MALE (Fig. 35). *Wing* 3.2-3.8 mm. Antenna moderately plumose, about half the length of the proboscis. Scutal scales reddish brown in the holotype, distinctly darker than in the female, much as in the female in the paratype male. Upper fork cell about 1.0-1.2 length of its stem. Foreclaws very unequal, the larger toothed, midclaws similar to the foreclaws but both simple, hindclaws small, relatively straight, simple. *Abdomen*. Tergal markings as in the female. *Terminalia* (Fig. 35). Dististyle somewhat variable, as figured or rather shorter and more strongly swollen distally. Basal lobe of basistyle with 2-3 bristles longer and stouter than the others. Apex of paraproct with 2 large teeth and 4 smaller ones, clearly visible only on one side of one specimen. Phallosome as figured. IXth tergite shallow with lobes closely approximated, each with 16-19 setae.

PUPA (Fig. 35). Trumpets appearing tubular when furled as in the figure, broad and conical when flattened, much as in *barraudi* (Fig. 33). Seta 1-C very delicate, visible only on one side of one specimen in which it is double, 8-C long, relatively stout, plumose; 1-I a single, delicate seta lightly feathered towards the tip (bifid on one side of one specimen), 1-II-VII short, delicate, single on II-VI, single or bifid on VII; 3-IV slender, delicate as on other segments; 5-II-VII slender, delicate, single on II-VI, bifid or trifid on VII; 6-II-VII slender, single or bifid on II, single on the remaining segments; 9-II-VI spinose (a stout, 6-branched tuft nearly as long as 9-VII on one side of one specimen), 9-VII with 8-11 branches, 9-VIII with 14-18. Paddles tapering with apex flattened, with broad bands of spicules laterally, with finer spicules over much of general surface, about 1.3 their greatest breadth.

LARVA (Fig. 36). *Head*. Narrow, about 1.2 as long as broad. Palatal setae relatively slender. Seta 1-C stout, flattened, sculpted as in the figure. Remaining setae slender, delicate, single except as follows; 5-C with 4-5 branches, 7-C with 2-5, 9-C with 5-10, 10-C with 3-6, 11-C with 3-8, 12, 13-C single or bifid, 15-C trifid to pentafid. *Thorax*. Larger setae stout, single except for 13-T. Smaller setae mostly slender, delicate, single except

as follows; 0-P with 2-10 branches, 4-P single to trifid, 8-P single to pentafid, 11-P single to trifid, 13-P single to tetrafid, 14-P with 2-6 branches; 2-4-M single or bifid, 11-M single to trifid, 13-M with 7-13, 14-M with 8-14, 6-M 1.5-1.9 length of 7-T; 2-T with 3-5, 4-T with 4-10, 5-T single to trifid, 6-T single or bifid, 7-T without basal arm, 8-T with 5-16 branches, 11-T single or bifid, 13-T normally double, occasionally single or trifid. *Abdomen.* Larger setae stout, unbranched, smaller setae slender, delicate, unbranched except as follows; 2-I single to tetrafid, 4-I with 2-4 branches, 9-I single to trifid, 13-I stout, spinose, usually bifid, occasionally trifid; 2-II single to trifid, 4-II trifid to heptafid, 8-II single or bifid, 9-II single to tetrafid, 10, 11-II single or bifid, 13-II stout, spinose, bifid; 2-4-III single or bifid, 7-III single to 13-branched, 8-III single or bifid, 9-III single to trifid, 13-III stout, spinose, single or bifid; 2-IV single or bifid, 7-IV trifid to heptafid, 8-10-IV single or bifid; 13-IV stout, spinose, single or bifid; 2-V single or bifid, 4-V bifid to tetrafid, 7-V bifid to pentafid, 8-V single or bifid, 9-V single to trifid, 13-V stout, spinose, single or bifid; 2-VI single to trifid, 4-VI single or bifid, 7-VI single to trifid, 8-VI tetrafid to heptafid, 9-VI single to tetrafid, 13-VI with 5-13 branches; 2-VII single to trifid, 4-VII single or bifid, 6-VII bifid to pentafid, 7-VII single to trifid, 8-VII trifid to heptafid, 9-VII single to tetrafid, 13-VII with 2-6 branches. Comb with 7-11 strongly toothed spines. Seta 3-VIII with 2-7 branches, 5-VIII with 4-9. Saddle edge with a few minute spicules at base of caudal setae, otherwise smooth. All setae on anal segment single, 3-X 3.0-4.0 length of saddle. Anal papillae relatively slender, pointed, 1.5-2.0 length of saddle. Siphon 1.4-1.5 length of saddle. Pecten teeth large and conspicuous, 6-10 in number on either side of the midline, occupying about the distal 0.60 to 0.75 of the length of the siphon. Seta 1-S single or bifid, usually unpaired, 1a-S 4-10 in number, single (one occasionally bifid), 2a-S 6-8 in number single, lateral seta with 3-5 branches.

TYPE-DATA. Holotype male, No. P561, on pin with terminalia on slide, allotype female, No. P559-3, on pin with associated larval skin on slide. Both in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Luzon.* Mt. Province, Banaue-Bontoc Road, 2-3,000 ft. (type-locality); 2♂, 2♀, 21 L, 1 p, 1 l, 1 lp, Baler, Tayabas; 15 L, Unnamed locality; 30 L.

TAXONOMIC DISCUSSION. This species appears to be most closely related to *barraudi* from which, however, it is easily distinguished by the presence of postnotal bristles and by the early stages as indicated in the keys (p. 55, 56).

BIONOMICS. Specimens from the type-locality were collected as early stages from pitcher plants at ground level. Early stages of *barraudi* formed part of the same collections. It is not known whether these came from the same individual pitchers (Baisas and Ubaldo-Pagayon 1953: 86).

17. *TRIPTEROIDES (TRICHOLEPTOMYIA) MICROCALA* (DYAR)
(Figs. 9, 37, 38)

Rachionotomyia microcala Dyar 1929: 61.
Tripteroides (Tripteroides) microcala of Edwards 1932: 78, Bohart 1945: 29, Baisas and Ubaldo-Pagayon 1949: 65 and 1953: 97, Stone et al. 1959: 68, Basio et al. 1970: 449, Basio 1971: 85 and Knight and Stone 1977: 323.

FEMALE (Fig. 9). Wing 2.8-3.8 mm. *Head.* Proboscis long, relatively

slender but distinctly shorter and stouter in some specimens than in others, strongly curved apically, 0.95-1.30 length of forefemur, 1.0-1.1 length of abdomen. Palps 0.09-0.14 of proboscis. Palps and proboscis entirely dark apart from a few pale scales below at extreme base. Clypeus bare, tori usually bare (? rubbed), occasionally with pale scales on inner surface. Antenna from a little less than 0.5 to slightly over 0.6 length of the proboscis. Occiput with broad, flat, dark brown scales with bronzy reflection (dull brown, evidently much faded, in the type-series with some inconspicuous pale scaling on nape), a narrow line of whitish scales around eye margins expanding ventrolaterally, some narrow, dark upright scales on nape. 1-2 slender orbital bristles well out on either side. *Thorax*. Scutum with narrow gray-brown scales (faded to very pale brown in the type-series), directed posteriorly in the median area, broader and directed obliquely outward in lateral areas. Small white scales on anterior margin and similar, but narrower scales on lateral margins. 2-3 prescutellar bristles present on either side, no dorsocentrals. Scutellum with flat brown scales on all lobes. Postnotum with 4-8 small bristles. Anterior pronotal lobes and posterior pronotum with small, flat, whitish scales, similar but rather larger scales on subspiracular area, upper and posteroventral portions of sternopleuron and most of mesepimeron. Postspiracular area and paratergite bare. A single posterior pronotal bristle, 3-4 spiraculars, 2 prealars and 2-5 lower sternopleurals. *Legs*. All femora pale below to tip. Claws all simple, much as in *nepenthicola*. Foreclaws unequal, one more strongly curved. Midclaws subequal. Hindclaw unpaired. *Wing*. Outstanding scales on upper wing field all very narrow. Upper calypter with 2-5 hairlike scales. Upper fork cell 1.0-1.2 length of its stem. *Halter*. Knob dark, stem pale. *Abdomen*. As in male *nepenthicola* (Fig. 5). Tergites dark above with very narrow, continuous lateral pale border. *Terminalia* (Fig. 9). Postgenital plate deeply cleft, as in the figure, in the allotype and 1 paratype (the other undissected), variable in the other material (see under Taxonomic Discussion). IXth tergite with 3-13 bristles on either lobe. Insula with 3-7 peripheral bristles and 1-3 in the posterolateral corners.

MALE (Fig. 37). Wing 2.8-3.0 mm. Antenna moderately plumose, slightly less than 0.5 length of the proboscis. Upper fork cell 0.9-1.2 length of its stem. Claws much as in *nepenthicola;* fore- and midclaws very unequal, the former with the larger claw toothed, hindclaw unpaired. *Terminalia* (Fig. 37). As in *nepenthicola*. Dististyle appearing broader or narrower according to aspect. Basal lobe of basistyle with 2 bristles longer and stouter than the remainder, one much shorter and more slender than the other. Paraproct with 1-2 large teeth and 1-4 smaller ones. IXth tergite with lobes closely approximated, each with 7-14 bristles, the cleft between them usually shallower than in *nepenthicola* but with some variation in both species.

PUPA (Fig. 37). Closely similar to that of *nepenthicola* (Fig. 39). Trumpet very broad. Seta 1-C short, slender, 8-C longer, stouter, single to trifid; 1-I-V single or bifid; 6-III-VI single, occasionally bifid on one side, 0.3-0.7 length of the following segment; 9-VII with 2-7 branches; 9-VIII with 4-12. Paddles usually bluntly pointed at apex, occasionally attenuated as shown in the figure, extensively spiculate on both edges, only slightly emarginated at base.

LARVA (Fig. 38). Closely resembles that of *nepenthicola*. *Head*. Very narrow. Seta 4-C with 2-13 branches, 5-C with 2-5, 6-C single, 7-C single to heptafid, 9-C with 3-8 branches, 10-C with 2-4, 11-C very small and delicate with 3-7 branches where seen, 14-C with 2-3, 15-C with 2-5. *Thorax*. Seta 0-P with 3-8 branches, 1-P single or bifid, 4,7-P single to

trifid, 8-P single to pentafid, 13-P single to tetrafid, 14-P with 3-9 branches; 1-M single, very long, flexible and finely tapered at tip, 6-M straight or slightly curved, simple, normally shorter than 7-T, often much shorter (but see under Taxonomic Discussion), 13, 14-M minute, 13-M with 4-6 branches, 14-M, where seen, with 3-4; 1-T short, single, 2-T with 2-5 branches, 4-T with 2-4, 5-T single or bifid, 7-T simple, without basal arm, 13-T with 5-16 branches. *Abdomen.* Seta 1-I variable in length, often quite short, sometimes shorter than 5-I, single or bifid, 2, 3-I single to trifid, 5-I bifid, 6, 7-I single, 9-I single to trifid, 11-I with 3-8 branches, 13-I single to heptafid; 0-II-VII minute, 1-II-VII single, usually very long and flexible (but see under Taxonomic Discussion); 2-II single or bifid, 3-II single to trifid, 5-II with 2 branches, 9-II with 2-4, 11-II with 2-8, 13-II single or bifid; 14-II-VI minute; 2-III single, 5-III bifid, 7-9-III single to trifid, 11-III with 2-7 branches, 13-III single; 2-IV single, 3, 5-IV single or bifid, 7-IV single to trifid, 8-IV and 9-IV single or bifid, 11-IV single to pentafid, 13-IV single; 2-V single, 3, 5-V single or bifid, 7-V single to tetrafid, 8-V bifid to tetrafid, 9-V single or bifid, 11-V single to tetrafid, 13-V single; 2-VI single, 3-VI single or bifid, 5-VI single to tetrafid, 7-VI with 2-4 branches, 8-VI with 2-6, 9-VI single or bifid, sometimes spinose, 11-VI single or bifid, 13-VI with 2-5 branches; 2-VII single, 3-VII single to tetrafid, 5-VII single or bifid, 6-VII single to hexafid, 8-VII bifid to hexafid, 9, 11-VII single or bifid, the former spinose, 13-VII with 2-4 branches. Comb with 8-19 teeth, individual teeth as in *nepenthicola*. Seta 1-VIII single to trifid, 3-VIII with 4-8 branches, 5-VIII with 3-6, 14-VIII minute or absent. Saddle edge with small fringed scales. All setae on X single, 3-X about 4.5-7.0 length of saddle. Anal papillae 1.0-1.7 length of saddle. Siphon 1.3-1.7 length of saddle. Pecten with 3-7 teeth on either side of the midline, individual teeth as in *nepenthicola*. Seta 1-S unpaired, single, 1a-S single, 0-2 in number in all, 2a-S single, 1-4 in number on either side of the midline, lateral seta minute, single to hexafid.

EGG. Baisas and Ubaldo-Pagayon (1953: 198 and Pl. 9) figure an egg, found associated with first instar *microcala* larvae in a pitcher, which they consider to be probably attributable to this species. See also Mattingly (1969b: 75).

TYPE-DATA. Holotype male with terminalia on slide, allotype female and 2 paratype females, all numbered 41861, on pins, allotype and 1 paratype with terminalia on slides, in U.S.N.M., the holotype with additional number 2384.

DISTRIBUTION. PHILIPPINES. Laguna Prov., Famy Jungles (Sierra Madre); 33♂, 26♀, 32 L, 25 lp; Mountain Prov., Banaue (north), Banaue-Bontoc Road; 5♂, 12♀, 3 P, 33 L, 6 l, 16 lp; Pampanga Prov., Bamban River, near Camp Stotsenberg (type-locality); 1♂, 3♀; Quezon Prov., Baler, Tayabas, Bongabon-Baler Road (Sierra Madre); 9♂, 4♀, 15 L, ? Prov., Unnamed locality; 1♂, 4L.

Records from literature. Baisas and Ubaldo-Pagayon (1953: 19) give additional records from Mt. Maquiling *(sic)*, Los Banos (Sierra Madre), in Laguna Province and from Llavac jungles, Infanta (Sierra Madre) in Quezon Province. The same authors (1953: 100) have a record from Balatoc in Mountain Province. Basio, White and Reisen (1970: 449) have a record from the Mt. Makiling area. Basio (1971: 86) has a record from an unnamed locality in Zamboanga Province. This is from Mindanao and may refer to the material elsewhere ascribed to *delpilari* ? var. (Baisas and Ubaldo-Pagayon 1953: 10) and *nepenthicola* (Basio 1971: 86).

TAXONOMIC DISCUSSION. Dyar's holotype lacks the distal portion of the

proboscis and parts of the tarsi. All but the first 3 abdominal segments are mounted with the terminalia. Apart from this it is in fair condition, except for marked fading. The paratypes are also badly faded and each is severely damaged, although collectively they are complete except for the antenna. Only one has the proboscis complete and in this specimen it is distinctly shorter than the forefemur in contrast to all of Baisas and Ubaldo-Pagayon's specimens which I have measured. It is also markedly shorter than in Bank's surviving male of *nepenthicola* or the allotype of *mus* (Dyar). Bohart (1945: 29) notes that the proboscis is distinctly shorter than in "the other 2 Philippine species of the subgenus". This could be significant since he evidently had access to fresh topotypical material of the present species. Unfortunately, however, his monograph covers 7 species, all placed in subgenus *Tripteroides*, and it is not clear whether the 2 singled out for comparison included *nepenthicola* or not. Baisas and Ubaldo-Pagayon (1953: 10, 97) considered the present species and *nepenthicola* to be inseparable as adults. However, they did not themselves examine the types and it is not clear that they took into account the length of the proboscis. This character requires further investigation, preferably in topotypical adults with associated larval skins, but until such material is available there would appear to be insufficient evidence for changing the current nomenclature.

Having concluded that the present species and *nepenthicola* are inseparable as adults, Baisas and Ubaldo-Pagayon chose the name *microcala* for the species with the early stages described above on the ground that it is the commoner of the two. I cannot see that this is relevant. In my view, if an arbitrary choice had to be made, a better choice would have been the name *mus* which has priority and is based on a type-specimen with the proboscis as in Baisas and Ubaldo-Pagayon's material. They appear to have been unaware of the availability of this name which is nowhere mentioned in their monograph. It is currently placed in the synonymy of *nepenthicola* (see p. 67). It is, however based solely on 2 adult specimens so that its removal would now be almost equally arbitrary. I cannot therefore feel justified in changing the accepted nomenclature at this point.

The female terminalia were not studied by Baisas and Ubaldo-Pagayon and since they are no longer available for *nepenthicola* they cannot be used for comparison. They do, however, possess some interesting features calling for further investigation. The postgenital plate of the allotype (shown offset in Fig. 9) is imperfect but it is clearly very deeply cleft as in the paratype shown in the same figure. At the same time the insula of both specimens is unusually hairy as is the IXth tergite, the former having 5-7 peripheral bristles on either side and 1-3 in each of the posterolateral corners and the latter 10-13 bristles on either lobe. In contrast, females of Baisas and Ubaldo-Pagayon's from Famy have the postgenital plate with only a shallow cleft, much as in *delpilari* (Fig. 8) or even shallower, insula with only 3-4 peripheral bristles and 2 in each corner and IXth tergite with 3-5 setae on each lobe. One of their females from Banaue, however, (the only one dissected) is intermediate, having the postgenital plate much as figured for *delpilari* but insula with 6 peripheral setae on either side and 2 in the corners and 7-9 setae on the lobes of the IXth tergite. Once again there is a distinct suggestion that the name *microcala* is wrongly assigned but there is clearly some geographical variation and further study is needed, particularly of associated topotypical material.

Aside from the question of nomenclature there remains the question as to whether the present species and *nepenthicola* are genuinely distinct. This can

only be decided by reference to the early stages. The pupae appear to be quite inseparable but there are larval differences which eventually decided Baisas and Ubaldo-Pagayon to treat them as good species. Characters regarded by them as diagnostic are: 1. Seta 6-M shorter than 7-T in *microcala*, longer than 7-T in *nepenthicola*. 2. Seta 1 on mesothorax and abdomen finely tapering in *microcala*, stouter, stiffer and ending in a coarse point in *nepenthicola*. 3. Abdominal setae 5 and 11 usually shorter and with fewer branches in *microcala* (Baisas and Ubaldo-Pagayon 1953; 60, 103 and Pl. 19). In point of fact not all of these differences are constant. Seta 6-M is nearly always shorter than 7-T but it is longer in 5 of the 130 larvae available. Seta 1-M is finely attenuated in all cases but 1-I is very variable and conforms more nearly with the description of *nepenthicola* in 40/130 larvae. Seta 1-II is as described for *microcala* in all but 4 of these larvae, but in one of the 4 it is stout and blunt tipped also on III and IV. Setae 1-V-VII are finely attenuated in all larvae except in one case on VII. Seta 5-I-VII is consistently shorter than in *nepenthicola* especially on I and II where there is only a very slight overlap in absolute length affecting 2 or 3 specimens of either species. In contrast seta 11, on the abdomen, is often shorter in *nepenthicola* than in the present species, though with more numerous branches on segments I-V in the great majority of larvae.

It will be seen from the foregoing (and from the key on p. 56) that while constant differences between the larvae of this species and *nepenthicola* are small they do exist, at least so far as can be judged from the available material. They are, moreover, buttressed by partial differences which are diagnostic in the great majority of cases. This being so, I have little hesitation in maintaining them as distinct species. They clearly belong to an actively speciating complex deserving of further study at the field and laboratory level.

BIONOMICS. The type-series was collected from a single pitcher plant. Other published records are all from arboreal and terrestrial pitcher plants (Bohart 1945: 29, Baisas and Ubaldo-Pagayon 1953: 19, Basio, White and Reisen 1970: 449, Basio 1971: 85) except for one by Baisas and Ubaldo-Pagayon from "tree holes?". This species and *nepenthicola* frequently occur in collections with the same serial number, though it is not clear that this necessarily implies that they were found in the same pitchers or even the same plants. Basio, White and Reisen consider this, like *nepenthicola*, to be essentially a high altitude species. Nothing is known regarding adult bionomics.

18. *TRIPTEROIDES (TRICHOLEPTOMYIA) NEPENTHICOLA* (BANKS) (Figs. 5, 39, 40)

Wyeomyia nepenthicola Banks 1909: 550.
Wyeomyia (Dodecamyia) mus Dyar 1920: 175.
Wyeomyia nepenthicola of Edwards 1922: 444.
Tricholeptomyia nepenthicola of Dyar and Shannon 1925: 73.
Tripteroides (Tripteroides) nepenthicola of Edwards 1932: 78, Bohart 1945: 30, Baisas and Ubaldo-Pagayon 1949: 65 and 1953: 103, Stone et al. 1959: 67 and Basio 1971: 86.
Tripteroides mus of Stone and Knight 1957: 119.
Tripteroides (Rachionotomyia) nepenthicola of Stone 1963: 121 and Knight and Stone 1977: 318.
Tripteroides (Tripteroides) nephenthicola of Basio et al. 1970: 441, 449 *(lapsus)*.

FEMALE. Wing 2.9-3.4 mm. *Head.* Proboscis long, relatively slender, curved down strongly on apical one-third, 1.1-1.2 length of forefemur. Palps 0.09 of proboscis. A few small pale scales at base of palp. Palps and proboscis otherwise entirely dark. Clypeus bare. Tori with small, flat pale scales on inner surface (bare in *mus*, ? rubbed). Antenna slightly less than 0.5 proboscis. Occiput with broad, flat dull brown scales and a narrow band of whitish scales around eye margins broadening ventrolaterally. A few narrow black upright scales and a small spot of broad pale scales on nape. 1-2 slender, pale orbital bristles well out to either side. *Thorax.* Scutum with narrow brown scales, directed backward in midline, broader and directed obliquely outward and backward in lateral areas. Small, broad white scales on and at the sides of anterior promontory. Lateral margins with narrow white scales above paratergite and posterior to this as far as wing root. Dorsocentral bristles absent. 2-3 small prescutellar bristles present on either side. Scutellum with broad, flat brown scales on all lobes. Postnotum with 2 pairs of small, black bristles. Anterior pronotal lobes and posterior pronotum with small, flat whitish scales. Similar but somewhat larger and whiter scales on subspiracular area, all but the anteroventral portion of the sternopleuron and all or most of the mesepimeron. Paratergite bare. A single posterior pronotal bristle, 3-4 spiracular bristles, 2-3 of them unusually large, 2-3 prealars and 2 lower sternopleurals. *Legs.* All femora pale below to tip. All claws simple. Foreclaws curved, unequal, midclaws curved, subequal, hindclaws almost straight except at tip, unpaired. *Wing.* Outstanding scales on upper wing field very narrow. Upper calypter with 3-5 hairlike scales. Upper fork cell 1.1 length of its stem. *Halter.* Knob dark, stem pale. *Abdomen.* First 2 segments as in the male (Fig. 5), remainder not seen. *Terminalia.* Not seen.

MALE (Figs. 5, 39). Wing 2.8-3.2 mm. Antenna moderately plumose, slightly less than half length of proboscis. 2-3 well developed prescutellar bristles present on either side. Upper fork cell 0.8-1.2 length of its stem. Claws much as figured for *roxasi* (Fig. 3). *Terminalia* (Fig. 39). Dististyle relatively short. Basal lobe of basistyle with 2 bristles longer and stouter than the rest, 1 shorter than the other. Paraprocts with 2-3 large teeth and 1-3 smaller ones at apex. Phallosome as figured. IXth tergite with lobes short, moderately to closely approximated, each with 8-16 short, stout setae.

PUPA (Fig. 39). Trumpet very broad. Seta 1-C short, slender, 8-C longer and stouter, single to trifid; 1-I single or bifid, 1-III-V stout, single or bifid; 6-III-VI similar (trifid on one side of VI in one specimen), 0.4-0.8 length of the following segment on III and IV, 0.4-0.7 and 0.3-0.7 on V and VI respectively; 9-VII with 3-8 branches, 9-VIII with 6-13. Paddles 1.1-1.3 as long as their greatest breadth, as figured or more smoothly rounded at apex, i.e. with a similar variation to that found in *microcala* (Fig. 37).

LARVA (Fig. 40). Head very narrow, almost half as long again as broad. Mouthbrushes with inner setae pectinate as usual. Palatal setae broad and coarse toothed, much as in *barraudi* (Fig. 34). Seta 1-A as figured; 1-C small, at most moderately stout, 4-C with 4-17 delicate branches, 5-C single to hexafid, 6-C single, 7-C with 2-10 branches, 9-C with 3-8, 10-C with 2-4, 11-C very small and delicate with 2-6 branches where seen, 14-C single to trifid, 15-C bifid to pentafid, mentum with 4-6 teeth on either side of the central tooth. *Thorax.* Seta 0-P with 3-7 branches, 1-P single to trifid, 4-P single to tetrafid, 7-P single or bifid, 8-P with 3-7 branches, 13-P with 2-7, 14-P with 3-12; 1-M straight, relatively stout, slightly blunted at tip as in the figure, 6-M straight, without basal arm, 1.3-3.2 length of 7-T, usually

more than 2.0, 13,14-M minute, 13-M with 2-8 branches, 14-M, where seen, with 2-6; 1-T short, single to trifid, 2-T single to pentafid, 4,5-T minute, single to pentafid, 7-T with basal arm on one side of one specimen, otherwise simple, 8-T minute with 2-6 branches, 13-T with 6-18. *Abdomen.* Seta 1-I-VII stout, straight, single, more or less blunt tipped as figured for 1-M; 2-I with 2-7 branches, 3-I single to trifid, 5-I with 2-5 branches; 6-I-VI and 7-I-II single, 9-I with 2-3 branches, 11-I with 5-19, 13-I with 2-10; 0-II-VII minute, 2-II single to tetrafid, 3-II single to trifid, 5-II with 2-3 branches, 9-II with 2-4, 11-II with 7-20, 13-II single to trifid, 14-II-VI minute; 2-III single to trifid, 7-III single to trifid, 8,9-III single or bifid, 11-III with 4-18 branches, 13-III single; 2-IV single to trifid, 3-IV single or bifid, 5-IV with 2-4 branches, 7-IV single to tetrafid, 8-IV single to trifid, 9-IV single to bifid, 11-IV with 5-21 branches, 13-IV single; 2-V single to pentafid, 3-V single to trifid, 5-V with 2-3 branches, 7-V with 2-4, 8-V with 2-5, 9-V single to trifid, 11-V with 3-14 branches, 13-V single or bifid; 2-VI single to pentafid, 3-VI single, 5-VI single to trifid, 7-VI with 2-4 branches, 8-VI with 3-8, 9-VI stouter than on I-V, occasionally a small but conspicuous spine, 11-VI single or bifid, 13-VI minute with 3-4 branches; 2-VII single to tetrafid, 3,5-VII single to trifid, 6-VII with 3-6 branches, 8-VII with 3-8, 9-VII single or bifid, as on VI, 11-VII single or bifid, 13-VII minute with 2-6 branches. Comb with 11-18 teeth, the individual teeth as figured. Seta 1-VIII single to tetrafid, 3-VIII with 3-13 branches, 5-VIII with 3-8, 14-VIII minute or absent. Saddle edge with a few small, delicate fringed scales. All setae on segment X single, 3-X about 6.5-9.0 length of saddle. Anal papillae slender, cylindrical 1.2-2.4 length of the saddle. Siphon 1.4-1.9 length of saddle. Pecten with 4-7 teeth on either side of the midline, individual teeth as figured. Seta 1-S single or bifid, unpaired, 1a-S single or bifid, 1-2 in all, 2a-S single, 1 occasionally bifid, 2-4 in number on either side of the midline, lateral seta small and very delicate with 2-7 branches.

TYPE-DATA. Banks' types are lost. His remaining specimens, all in the U.S.N.M., are fragmentary. They comprise 2 males with the same reference number as his type-series (8159, see Banks 1909: 551) and 1 male and 1 female with the reference number 11390. All 4 specimens bear Banks' own identification label. Both males numbered 8159 have terminalia on slides. One is reduced to head, thorax and 1 leg and the other to part of the abdomen, on a paper point. I have marked the former, with the accompanying slide, as lectotype. The female numbered 11390 is the best of the available specimens for external characters and I have marked this as allolectotype. *Tripteroides mus* is represented solely by the male on pin with terminalia on slide, chosen as lectotype by Stone and Knight (1957: 119 and the allotype female on pin, both fragmentary, in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Luzon.* Laguna Prov., Famy Jungles (Sierra Madre); 4 P, 19 L, 4 l, 3 lp; Los Banos (type-locality of *mus*); 1♂, 1♀; Mountain Prov., Trinidad, Benguet (type-locality); 3♂, 1♀; Banaue (north), Banaue-Bontoc Road; 4♂, 1♀, 1 P, 20 L, 1 l, 3 lp; Quezon Prov., Baler, Tayabas, Bongabon-Baler Road (Sierra Madre); 3♂, 4 L, 2 lp.

Records from literature. Baisas and Ubaldo-Pagayon (1953: 19) give additional records from Mt. Maquiling (sic), Los Banos (Sierra Madre), in Laguna Province and from Llavac jungles, Infanta (Sierra Madre) in Quezon Province. The same authors have a record from Baguio (? = Baguio, Mindanao and not the locality of the same name in Luzon). Basio, White and Reisen (1970: 449) have a record from the Mt. Makiling area. Basio (1971: 86) describes this species as widely distributed from Luzon

to Mindanao but gives no further details.

TAXONOMIC DISCUSSION. The only female surviving from Banks' series is very incomplete, lacking the antennae, wings and abdomen. The foregoing description is based on this specimen supplemented by the only female remaining from the material described by Baisas and Ubaldo-Pagayon and the allotype of *mus*. Both these are also incomplete. The former is reduced to thorax, wings, forefemur, mid- and hindlegs, claws (on slide) and first 2 segments of abdomen. The latter lacks hindtibia and tarsi and abdomen. All the material, with the possible exception of the types of *mus* which are affected by phenol, appears to have faded as shown by the fact that Banks describes the scutal scaling (of the male) as "blue-black" while Baisas and Ubaldo-Pagayon imply that the color of these scales is as in *delpilari* in which they are described as "dark brown". Banks' males are also fragmentary. The antenna is missing in all cases but 1 wing is available as are a slide of the claws and 2 slides of terminalia. The type of *mus* is reduced to thorax, legs and terminalia (on slide). The hindclaws are missing. Baisas and Ubaldo-Pagayon's material includes 7 pinned males, some in fair condition, and 7 slides of terminalia. Banks' female differs from the remainder of the material in having the prescutellar bristles very feebly developed (in contrast to the males). However, some of the unassociated females attributed by Baisas and Ubaldo-Pagayon to *microcala* also have these bristles rather poorly developed. The lobes of the IXth tergite in Baisas and Ubaldo-Pagayon's males are less closely approximated than in Banks' males or in the holotype of *mus* but with some variation. As noted by Baisas and Ubaldo-Pagayon (1953: 9) the synonymy of this species vis-à-vis *delpilari*, *microcala* and *mus* is highly conjectural. In view of the fragmentary nature of the type material it seems likely to remain so. I would not feel justified in altering the accepted synonymy on the available evidence. For further discussion see under *microcala* (p. 66).

BIONOMICS. Banks' material is said to have been "collected as larva from pitchers of *Nepenthes alata* Bl." The types of *mus* came from pitchers of *"Nepenthes"*. Baisas and Ubaldo-Pagayon's material came from "ground and arboreal pitcher plants".

19. *TRIPTEROIDES (TRICHOLEPTOMYIA) ROXASI* BAISAS AND UBALDO-PAGAYON
(Figs. 3, 6, 9, 41, 42)

Tripteroides (Tripteroides) roxasi Baisas and Ubaldo-Pagayon 1953: 103.

FEMALE (Figs. 3, 6, 9). Wing 3.2-3.7 mm. *Head.* Proboscis long and slender, about 1.1-1.3 length of forefemur, 1.0-1.3 of abdomen. Palps about 0.08-0.10 of proboscis. Palps and proboscis entirely dark. Antenna about 0.5-0.6 of proboscis. Clypeus bare. Tori with a few minute, flat scales on inner surface. Occiput with broad, flat, dark brown scales without iridescent reflection, a narrow border of broad, white scales, with bluish tinge around eye margins, expanding ventrolaterally, and a small, indistinct spot of similar scales in midline towards nape. Some narrow, dark upright scales on nape. Eyes contiguous. 2 orbital bristles far out to either side. *Thorax.* Scutum with narrow, curved white scales on anterior margin, a median longitudinal band of very narrow pale to mid-brown scales, directed backward, and similar but somewhat broader scales, directed obliquely outward, laterad of these. Dorsocentral bristles absent. 2-4 pairs of prescu-

tellars present. Scutellum with broad, flat, pale brown scales on all lobes. Postnotum with a conspicuous tuft of bristles, relatively long, stout and dark in some, but not all, specimens. Anterior pronotal lobes with small, flat white scales on anterior margin and anterolateral corners, similar, but pale brown scales elsewhere. Posterior pronotum with small, flat white scales with pronounced blue reflection. One posterior pronotal bristle, 1-3 spiraculars. Subspiracular area, upper and lower posterior portions of sternopleuron and most of mesepimeron covered with broad, white scales. Paratergite bare. One small and one larger prealar and 2-4 lower sternopleural bristles present and a well developed upper mesepimeral tuft. No lower mesepimeral. *Legs*. Femora pale below to tip. Claws (Fig. 3) simple, one fore-and one midclaw somewhat longer and less curved than the other. Hindclaw unpaired. *Wing*. Outstanding scales on upper surface narrow, linear, slightly broader toward tips of R_2 and R_3. Alula with narrow fringe scales only. Upper calypter with about 5-8 hairlike scales. Upper fork cell 1.3-1.4 length of its stem. *Halter*. Head dark. *Abdomen* (Fig. 6) with pale apicolateral triangles on segments I-VII continuing narrowly to base on anterior segments and extending inwards to form narrow apical bands on II-VII, these bands absent or incomplete on I and II. Sternites I-VII pale, VIII dark. *Terminalia* (Fig. 9). Postgenital plate shallow with apex indented. IXth tergite with 9 bristles on one lobe, 11 on the other. Insula with 7 peripheral bristles on either side, without posterolateral bristles.

MALE (Figs. 3, 41). Wing 3.0-3.2 mm. Antenna moderately plumose, about 0.5 length of proboscis. Upper fork cell about 0.9-1.1 length of its stem. Claws as in Fig. 3. *Terminalia* (Fig. 41). Dististyle relatively short, markedly swollen on the distal half especially when seen in side view as in the figure. Basal lobe of basistyle with 2 setae longer and stouter than the others. Paraproct with 2-3 teeth at apex. Phallosome as figured. Lobes of IXth tergite closely approximated, each with 10 or more setae.

PUPA (Fig. 41). As figured. Setae 1-C and 1-I greatly reduced. Setae 5-IV, V relatively stout, single, plumose (5-IV double on one side of one specimen). The remaining setae, except 9-VII, VIII all small or very small. 9-VII and VIII with 7-10 and 12-19 branches respectively. Paddle edges with minute spicules only visible under high power, still smaller spicules over all or most of the general surface. Paddles about 1.1-1.3 as long as their greatest breadth.

LARVA (Fig. 42). *Head* very narrow, about 1.3-1.4 as long as broad. Seta 1-C stout, but less so than in *werneri*. Remaining head setae all small or very small, single except as follows: 4-C with 2-3 branches, 5-C 3-7, 7-C 2-5, 9-C 5-9, 10-C 2-7, 11-C 4-7, 15-C single to tetrafid, 8-C not seen. *Thorax*. Setae 0-7-P arising from a common tubercle, the larger setae stout and single on all segments (7-T bifid in one specimen); seta 6-M 1.1-1.2 length of 7-T, smaller setae mostly minute, single except as follows; 0-P with 3-6 branches, 4, 13-P single to trifid, 14-P single or bifid; 1-M minute with 4-10 branches, 8-M with 4-9, 11-M single or bifid, 13-M with 5-10 branches, 14-M with 5-9; 1-T with 3-7, 2-T single to trifid, 4-T with 3-9 branches, 5-T single to tetrafid, 6-T single to pentafid, 8-T with 5-7 branches. *Abdomen*. Larger setae stout and single, linked by transverse, lightly sclerotized bands on segments I-VI. Seta 11-I double on one side of one specimen, 13-I-III bifid or trifid, single on segment I of one specimen. Smaller setae mostly minute, single except as follows; setae 2, 9-I with 2-5 branches, 3, 4-I single or bifid; 2-II with 2-4 branches, 3-II single or bifid, 4, 8-II single to trifid, 9-II with 2-4 branches; 2-III with 2-5, 3-III single or bifid, 4-III single to trifid, 7-III

single to tetrafid, 8-III single to trifid, 9-III with 2-5 branches; 2-IV with 3-4, 3,4-IV single to trifid, 7-IV with 2-6 branches, 8-IV single to trifid, 9-IV with 2-5 branches, 13-IV with 3-8 (a stout, unbranched spinule on one side in the holotype); 2-V with 2-4, 3-V single or bifid, 4-V single to trifid, 7-V single or bifid, 8-V single to trifid, 9-V single to pentafid, 10,12-V single or bifid, 13-V with 2-8 branches; 2-VI with 2-5, 4-VI single to trifid, 7-VI single or bifid, 8-VI with 3-7 branches, 9-VI with 3-5, 10-VI single or bifid, 13-VI with 5-7 branches; 2-VII with 3-4, 6-VII with 2-5, 7-VII single or bifid, 8-VII with 3-5 branches, 9-VII with 4-7, 10-VII single or bifid, 13-VII with 3-7 branches. Comb with 3-7 strongly toothed spines. Seta 1-VIII with 5-8 branches, 2-VIII single or bifid, 3-VIII single to pentafid, 5-VIII with 2-5 branches. Saddle edge with small fringed spicules. All setae on anal segment single, 3-X 2.0-3.0 length of saddle. Anal papillae variable in shape, cylindrical or ovate, 1.0-2.0 length of saddle. Siphon 0.9-1.0 length of saddle. Pecten teeth large and conspicuous, 5-8 in number on either side of the midline occupying about the distal 0.6-0.8 of the siphon. All setae on siphon single except the small lateral seta which has 4-6 branches. (One seta 2a bifid in one specimen). Seta 1 paired in holotype, otherwise unpaired, 1a in a single row, 2-4 in number, 2a 4-6 in all, in 2 rows.

TYPE-DATA. Holotype male, No. 1093-10, on pin, allotype female, No. 1093-12, on pin, both with associated larval and pupal skins on slides. Both in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Mindanao.* Sumilao, Bukidnon (type-locality); 11♂, 9♀, 4 L, 5 p, 6 lp.

TAXONOMIC DISCUSSION. As indicated by Baisas and Ubaldo-Pagayon, this species is very closely related to *werneri,* differing mainly in the degree of development of the larger larval setae. The adults appear indistinguishable. The small difference in pupal paddles and somewhat shorter siphon may or may not prove taxonomically significant when more material is available. For further discussion see under *werneri* (p. 73-74).

BIONOMICS. All the available specimens were bred from terrestrial pitcher plants (Baisas and Ubaldo-Pagayon 1953: 19, 103).

20. *TRIPTEROIDES (TRICHOLEPTOMYIA) WERNERI* BAISAS AND UBALDO-PAGAYON
(Figs. 6, 10, 43, 44)

Tripteroides (Tripteroides) werneri Baisas and Ubaldo-Pagayon 1953: 111

FEMALE (Figs. 6, 10). Wing 4.1 mm. (3.5 mm. in the allotype *fide* Baisas and Ubaldo-Pagayon). *Head.* Proboscis long and slender, 1.4 length of forefemur, 1.2 of abdomen. Palps about 0.08 of proboscis. Palps and proboscis entirely dark. Clypeus bare. Tori without scales. Antenna about 0.5 length of proboscis. Occiput with flat brownish scales without iridescent reflection, a wide border of broad creamy scales around eye margins, expanding ventrolaterally, whiter with bluish reflection at sides, and a narrow indistinct median longitudinal line of whitish scales. Upright scales on nape not seen. Two orbital bristles arising well out to either side. *Thorax.* Scutum with some small, broad, whitish scales on anterior promontory, narrow, curved, pale brown scales on anterolateral areas and some remnants of still narrower scales in the median area, otherwise denuded. No dorsocentral bristles, 4 pairs of prescutellars. Scutellum denuded. Postnotum with a tuft

of pale, slender bristles. Anterior pronotal lobes with small, broad, flat whitish scales on anterior margin and anterolateral corners, similar, but pale brown scales elsewhere. Posterior pronotum with flat white scales with subdued bluish reflection. One posterior pronotal bristle, 3 stout and 2 finer spiraculars. Subspiracular area, all but the anteroventral portion of the sternopleuron and much of the mesepimeron covered with broad, flat, whitish scales. Paratergite bare. Four well developed lower sternopleural and 2 very small prealar bristles present. *Legs*. Femora pale below to tip. Claws not mounted, all simple, apparently much as in *roxasi* (Fig. 3), the hindclaw unpaired. *Wing*. Outstanding scales on upper surface narrow, slightly broader toward tip of R_2 and R_3. Upper calypter with 5-6 hairlike scales. Upper fork cell 1.3 length of its stem. Halter. Head dark. *Abdomen* (Fig. 6). Tergites dark above with narrow, but more or less complete, pale apical bands on segments III-VII, slightly broader laterally. Ventral and ventrolateral aspects not clearly visible in the available specimens but apparently much as in *roxasi* (p. 71). Sternites pale except for the VIIIth which is dark. *Terminalia* (Fig. 10). Postgenital plate excavated apically. IXth tergite with very numerous bristles (13 on one side, 14 on the other) extending onto the main surface. Insula with 9 peripheral bristles on one side, 10 on the other, but without posterolateral bristles.

MALE (Fig. 43). Wing 3.5-4.0 mm. Antenna moderately plumose, about 0.5 length of proboscis. Scutum with a narrow median longitudinal stripe of narrow, pale brown scales, pointing backward, and with similar but broader scales, directed outward, to the sides of this, otherwise as described for the female. Scutellum with broad, flat, pale brown scales on all lobes. Upper fork cell about 1.1-1.2 length of its stem. Claws much as in *roxasi* (Fig. 3). Apical pale band on tergite II only narrowly interrupted in the middle. *Terminalia* (Fig. 43). Dististyle relatively short, swollen on the apical half. Basal lobe of basistyle with 2 setae longer and stouter than the others. Paraproct with 2-3 large and 2 smaller teeth at apex. Phallosome as figured. Lobes of IXth tergite closely approximated and with numerous stout apical setae.

PUPA. As figured (Fig. 43). Closely similar to that of *roxasi* (p. 71). Paddles with 2-3 rows of minute marginal spicules (somewhat exaggerated in the figure) visible only under high magnification, slightly longer than in the longest *roxasi* and without the minute spiculation on the general surface seen in that species, about 1.2-1.3 as long as their greatest breadth.

LARVA (Fig. 44). Closely resembles that of *roxasi* differing strikingly, however, in the greater development of the large, unbranched thoracic and abdominal setae as noted in the key (p. 56). The smaller setae are mostly minute setulae, as in *roxasi*. These differ slightly in range of branch numbers but there is much overlapping. Examples are setae 4-C with 2-6 branches, 10-C with 3-6, 15-C with 2-5, 8-M with 3-6, 14-M with 1-7; 2-I single or bifid, 4-I, 9-II and 2-III single to trifid, 13-VI with 2-9 branches, 5-VIII single to octafid, 14-VIII not seen. Other differences are as follows: seta 1-C considerably stouter, comb with 6-8 teeth, siphon 1.1-1.3 length of saddle, pecten with 4-9 teeth on either side.

TYPE-DATA. Holotype male, No. 1121-5, on pin with associated larval and pupal skins on slide, allotype female, No. 1121-4, on pin with terminalia on slide. Both in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Mindanao*. Davao City, eastern slope of Mt. McKinley (type-locality); 2♂, 2♀, 7 L, 1 l, 2 lp, eastern slope of Mt. Apo; 2 L.

TAXONOMIC DISCUSSION. The differences between this species and *roxasi*

are small and I agree with the suggestion by Baisas and Ubaldo-Pagayon that they may well be conspecific. These authors point to the similar situation as between *microcala* and *nepenthicola* which also differ mainly in the degree of development of various unbranched larval setae. The situation vis-à-vis *aranoides* and *tenax* and *nepenthis* and *nepenthisimilis* seems to me also to be comparable, though here the difference is mainly in the degree of branching of the setae concerned. The holotype and allotype of the present species were collected at approximately 5,800 ft., as were the whole larvae. Of the other 2 adults, the male was collected resting on a tree at about 3,800 ft. and the female on the wing at about 3,000 ft. Although Baisas and Ubaldo-Pagayon treat these as paratypes their association with the holotype appears to have been made purely on distributional grounds since the adults are considered by them to be indistinguishable from those of *roxasi*. The distribution of the present species is said to extend from 3,000 to 7,000 ft. which would suggest that all but one of the whole larvae, which were collected some days after the types, were found partly at lower and partly at higher altitudes. This is not, however, stated. *Tripteroides roxasi* has been found only at lower altitudes (2,000 ft. or less). It thus seems possible that the marked difference in setal development may be, at least in part, a temperature effect. In my view there is sufficient variation among the small number of larvae available to render this quite possible. Nevertheless, having regard to the particular interest attaching to larval chaetotaxy in the present genus I prefer to maintain them as separate species until the matter can be properly investigated.

BIONOMICS. Apart from the 2 specimens taken as adults this species is known only from arboreal pitcher plants (a further small difference from *roxasi* which was found in pitcher plants on the ground).

BELKINI SUBGROUP

The short, stout proboscis in both sexes of adult and the curious larval comb teeth are unique in the subgenus. The comparatively broad larval head might be thought to relate the only species here included to *apoensis* and *barraudi* rather than to the other species in the Nepenthicola Group, all of which have the head very narrow. Apart from this there appears to be little indication as to its immediate affinities.

21. *TRIPTEROIDES (TRICHOLEPTOMYIA) BELKINI* BAISAS AND UBALDO-PAGAYON (Figs. 2, 4, 7, 45, 46)

Tripteroides (Tripteroides) belkini Baisas and Ubaldo-Pagayon 1953: 80.

FEMALE (Figs. 2, 4, 7). Wing 2.7-3.2 mm. *Head* (Fig. 2). Proboscis shorter and stouter than in other members of the subgenus, distinctly swollen apically, 1.0-1.1 length of forefemur, equal in length to abdomen. Palps about 0.15 of proboscis. Palps and proboscis entirely dark. Clypeus and tori bare. Antenna about two-thirds of the length of the proboscis. Occiput with flat, dark brown scales with bronzy reflection and a narrow border of white scales around eye margins expanding ventrolaterally. Some narrow dark upright scales with expanded tips on nape. 1-2 orbital bristles present far out on each side. Scutum with very narrow dark scales with golden or bronzy reflection. No white

scales on anterior border so far as can be seen. 3-4 prescutellar bristles present, no dorsocentrals. Scutellum entirely covered with snow white scales. Postnotum with a small tuft of bristles. Anterior and posterior pronotum with broad white scales. A single posterior pronotal bristle, 3-4 unusually large spiraculars. Pleura badly rubbed, broad white scales present on subspiracular area and most of sternopleuron and mesepimeron. Paratergite bare. 3-4 prealar bristles present and 4-5 lower sternopleurals. *Legs*. Femora pale below to tip, more broadly so toward base. All claws simple, fore- and mid-pairs each with one distinctly smaller than the other, hindclaws unpaired. *Wing*. Outstanding scales on upper surface narrow. Upper calypter with 4-6 hairlike scales. Upper fork cell equal in length to its stem. *Halter*. Head entirely dark. *Abdomen* (Fig. 4). First tergite pale scaled, the others dark above with narrow, whitish lateral longitudinal bands tending to expand posteriorly to form small apicolateral triangles on segments IV-VII. Sternites entirely pale except for VIII which is dark. *Terminalia* (Fig. 7). Apex of postgenital plate deeply cleft. IXth tergite with 15 setae on either lobe in the specimen examined. Insula with 4-5 peripheral setae on either side and 2-3 in the posterolateral corners.

MALE (Figs. 2, 45). Wing 2.6 mm. Antenna moderately plumose, about two-thirds of the length of the proboscis. Upper fork cell 0.9-1.0 length of its stem. Foreclaws, one large and toothed, the other much smaller and simple. Midclaws also very unequal, both simple. Hindclaws slender, only slightly curved, simple, unpaired. *Abdomen*. As in the female but with the apicolateral pale triangles tending to be better developed and in 3 specimens forming complete, or almost complete, apical pale bands. *Terminalia* (Fig. 45). Dististyle without special features. Basal lobe of basistyle with 2-3 bristles longer and stouter than the remainder. Paraproct with 2-3 large teeth and 1 small one at apex. Phallosome as figured. Lobes of IXth tergite each with 15-18 flattened setae.

PUPA (Fig. 45). Trumpets similar in shape to those of related species but smaller. Seta 1-C small and delicate, of the same order of length as the other cephalothoracic setae. 1-I slender, short with 3-5 branches, 1-II-V more strongly developed than other setae on these segments but shorter than the following segments; 9-VII shorter than the following segment, with 4-7 branches, 9-VIII shorter than, or about equal in length to, the paddles, with 11-16 branches. All other setae very small, as figured. Paddles short and narrow, 1.3-1.5 as long as their greatest breadth, the edges minutely spiculate, as figured in the holotype, less conspicuously so in the other specimens.

LARVA (Fig. 46). *Head*. Relatively broad, approximately equal in length to its greatest breadth. Palatal setae relatively slender, much as in *christophersi* (Fig. 36). Seta 1-C moderately stout, not strongly curved, 4-C with 5-8 branches, the inner 1 or 2 tending to be longer and stouter, 5-C with 3-4, 7-C with 2-5, 9-C, where seen, with 4, 10-C with 3-4, 11-C with 3, 12, 13-C single or bifid, 15-C bifid to pentafid. *Thorax*. Seta 0-P with 3-6 branches, 1-P with 2-4, 4-P single to tetrafid, 7-P single or bifid, 8-P with 3-6 branches, 13-P with 2-3, 14-P with 5-7; 1-M single to tetrafid, 2-M bifid to tetrafid, 4-M single to trifid, 6-M 1.4-2.0 length of 7-T, 7-M single or bifid, 13-M with 6-10 branches, 14-M, where seen, with 4-6 branches; 1-T with 3-8 branches, 2-T and 4-T, where seen, with 5 and 2-4 respectively, 5-T with 3, 7-T without basal arm, 8-T with 3-7, 13-T with 5-12. *Abdomen*. Seta 1-I with 4-9 branches, 2-I with 5-10, 3-I with 2-5, 5-I with 6-10, 9-I with 2-4, 11-I with 9-20, 13-I with 3-8, short and spinose; 1-II with 4-9, 2-II with 5-9, 4-II single to tetrafid, 5-II with 5-10 branches, 8-II with 2-3, 9-II with 2-4,

11-II with 10-19, 12-II with 2-4, 13-II with 3-7, as figured or more nearly normal; 1-III with 3-7, 2-III with 4-9, 4-III single to tetrafid, 5-III with 5-9 branches, 7-III with 2-5, 8-III with 2-4, 9-III single to trifid, 11-III with 13-20, 13-III single to heptafid, as described for 13-II; 1-IV-VII long, stout, single, 2-IV with 4-10 branches, 5-IV with 5-10, 7-IV with 2-4, 8-IV with 2-5, 9-IV with 2-4, 11-IV with 15-24, 13-IV, V slender, single, 2-V with 3-8 branches, 4-V single or bifid, 5-V with 4-10 branches, 7-V with 3-4, 8, 9-V with 2-5, 11-V with 13-22; 2-VI with 3-7, 5-VI with 4-11, 8-VI with 5-8, 9-VI with 3-5; 2-VII with 4-7, 5-VII with 7-12, 6-VII with 5-9, 7-VII with 2-3, 8-VII with 5-12, 9-VII with 6-7, 12-VII with 2-6. Comb with 6-10 teeth, each with coarse lateral denticles and the median denticle modified to form a flattened scale with fringed apex. Seta 1-VIII with 3-9 branches, 3-VIII with 4-8, 4-VIII single to trifid, 5-VIII tetrafid or pentafid. Saddle edge with minute fringed scales. All setae on anal segment single. Seta 3-X about 4.5-5.5, anal papillae about 1.0-1.5 and siphon about 1.4-1.6 length of the saddle. Pecten with 4-9 teeth in all, arising close to the midline and confined to the apical half to three-fifths of the siphon. Seta 1-S single or bifid, unpaired, 1a-S reduced to 1-2 unbranched setae, 2a-S all single, 5-7 in number, lateral seta minute with 4-5 branches.

TYPE-DATA. Holotype male, No. 2023-1, on pin with associated larval and pupal skins and terminalia on slides, allotype female, No. 2023-5, on pin with associated skins on slide. Both in U.S.N.M.

DISTRIBUTION. PHILIPPINES. *Palawan.* Bacungan, Puerto Princesa (type-locality); 7♂, 6♀, 3 P, 3 l, 2 lp, 3 L.

TAXONOMIC DISCUSSION. This species is quite distinct in all stages and appears to present no taxonomic problems.

BIONOMICS. All the available material came from arboreal pitcher plants (Baisas and Ubaldo-Pagayon 1953: 18, 80). The remarkable comb teeth are probably associated with the fact that the inner mouthbrush setae are more slender than in other species.

DELPILARI GROUP

The only included species, *delpilari,* possesses most of the key features of subgenus *Tricholeptomyia* (single hindclaw of male, very short seta 1-C of pupa, absence of larval maxillary suture, small setae 8-M and 8-T (though larger than in the Nepenthicola Group), minute lateral seta on siphon). At the same time it differs from all other species in the subgenus, and is annectant to other subgenera in the strongly developed seta 1-I of the pupa, broad larval head and strongly developed siphonal setae 1a and 2a. The narrow, or moderately narrow, head of other species in the subgenus is possibly associated with the confined spaces at the base of the pitchers in which the larvae are found. Suppression of the pupal float hair may be similarly adaptive. The larval bionomics of the present species seem likely to differ significantly from those of the others.

22. *TRIPTEROIDES (TRICHOLEPTOMYIA) DELPILARI* BAISAS AND UBALDO-PAGAYON
(Figs. 4, 8, 47, 48)

Tripteroides (Tripteroides) delpilari Baisas and Ubaldo-Pagayon 1953: 91.

FEMALE (Figs. 4, 8). Wing 2.9-3.8 mm. *Head.* Proboscis long and slender, about 1.2 length of forefemur, 1.1 of abdomen. Palps about 0.1 of proboscis. Palps and proboscis entirely dark. Clypeus and tori bare. Antenna about 0.5 length of the proboscis. Occiput with flat, dark scales with bronzy reflection, the narrow white border to the eyes very narrow, expanding ventrolaterally as usual, a few dark upright scales with expanded tips on nape. 2 orbital bristles far out to either side. *Thorax.* Scutal scales narrow, mid- to dark brown with reddish reflection, narrower in the central region, where they are directed backward, somewhat broader and directed obliquely toward the sides. Pale scales present on anterior border and forming two small patches above the wing roots. Dorsocentral bristles absent. 2-4 prescutellars present. Scutellum with dark scales on all lobes. Postnotum with a conspicuous tuft of dark bristles. Anterior pronotal lobes with white scales with faint metallic reflection on anterior border, somewhat darker scales behind. Posterior pronotum with only moderately broad, whitish scales. A single posterior pronotal and 2-3 spiracular bristles present, 1-2 of the latter unusually large. Subspiracular area, upper and posteroventral positions of sternopleuron and most of the mesepimeron with broad, whitish scales. Postspiracular area and paratergite bare. 4-6 prealar and about 4-6 lower sternopleural bristles present. *Legs.* Femora pale below to tip. Fore- and midclaws subequal, one member of each pair a little smaller than the other. Hindclaw simple, unpaired. Wing. Outstanding scales on upper surface narrow. Upper calypter with 3-7 bristle-like scales. Upper fork cell 1.1-1.2 length of its stem. *Halter.* Head dark. *Abdomen* (Fig. 4) with tergites dark except for a uniform, narrow, pale lateral border, invisible from above. Sternites pale except for VIII which is dark. *Terminalia* (Fig. 8). Postgenital plate with apex deeply indented. IXth tergite with 6-7 bristles on either lobe. Insula of normal shape (somewhat crumpled in the figure) with 5-7 peripheral bristles on either side and 2 smaller ones in the posterolateral corners (absent in one of the two specimens dissected).

MALE (Fig. 47). Wing 2.8-3.2 mm. Antenna moderately plumose, about 0.5 length of the proboscis. Upper fork cell 1.1-1.5 length of its stem. Claws much as in *roxasi* (Fig. 3). Hindclaw unpaired. *Terminalia* (Fig. 47). Dististyle relatively short. Basal lobe of basistyle with 1 seta much longer than the remainder and 1-2 others markedly thickened. Paraproct and phallosome as figured. IXth tergite with lobes closely approximated each with 11-14 short, stout setae.

PUPA (Fig. 47). Trumpets unusually small, with little or no apical expansion in any of the available specimens. Seta 1-C slender, single, shorter than 8-C which is stout with 2-4 branches; 1-I strongly palmate; 5-IV single or bifid, length of or a little longer than the following segment; 9-VII about half the length of segment VIII or less with 7-12 branches; 9-VIII shorter than the paddles with 11-19 branches. Other setae all very small as figured. Paddles more or less triangular with spicules on both borders but general surface bare, 1.2-3.0 as long as their greatest breadth.

LARVA (Fig. 48). Head broad, about as broad as, or a little broader than, long, very dark, contrasting sharply with the remainder of the larva. Mouthbrushes with inner setae pectinate as usual. Palatal setae relatively slender, much as in *christophersi* (Fig. 36). Seta 5-C single to pentafid, 7-C with 3-5 branches, 8-C absent, 9-C with 5-10 branches, 10-C single to hexafid, 11-C with 2-9 branches, 14-C single or bifid, 15-C with 2-9 branches. *Thorax.* Seta 0-P with 11-22 branches, 1-P single or bifid, 7-P with 2-4 branches, 8-P with 4-9, 13-P with 2-5, 14-P with 3-8; 1-M minute with 8-12,

2-M single or bifid, 6-M single, unusually long and slender, 8-M with 10-17 branches, 13, 14-M with 10-20; 1-T with 6-14, 2-T with 2-10, 4-T with 7-11, 5-T with 2-10, 7-T without basal arm, about 0.7-0.8 length of 6-M, 8-T with 8-16 branches, 13-T with 4-12. *Abdomen.* Seta 2-I single or bifid, 4-I with 3-6 branches, 5-I single or bifid, 9-I with 3-5 branches, 11-I with 3-12, 13-I with 3-7 varying in development from one specimen to another; 1-II with 6-8, 2-II single or bifid, 4-II with 3-7 branches, 5-II single or bifid, 9-II with 2-4 branches, 11-II with 5-15, 13-II single to tetrafid, minute; 1-III with 2-7 branches, 5-III with 3-10, 7-III with 4-9, 8-III single or bifid, 9-III with 2-5 branches, 11-III with 10-19; 5-IV with 3-11, 7-IV with 5-11, 8-IV single or bifid, 9-IV with 3-4 branches, 11-IV with 13-25, 13-IV with 1-3; 4-V with 3-6, 7-V with 3-8, 8-V single or bifid, 9-V with 3-4 branches, 11-V with 14-24, 13-V single or bifid; 7-VI single to trifid, 8-VI with 10-28 branches, 9-VI with 3-9, 11-VI single to tetrafid, 13-VI with 3-8 branches; 6-VII with 8-16, 8-VII with 10-26, 9-VII with 5-15, 10-VII with 3-11, 11-VII single to trifid. Comb with 9-12 teeth as figured, sometimes with an additional very small ventral tooth. Seta 1-VIII with 5-21 branches, 3-VIII with 4-12, 5-VIII single to heptafid. All 3 of these very small and delicate. Saddle edge with small pointed, fringed spinules. All setae on segment X single. Seta 3-X about 5.5-6.5 length of saddle. Anal papillae slender, pointed, about 1.5-2.3 length of saddle. Siphon 2.0-2.2 length of saddle. Pecten with 8-12 teeth on either side of the midline, the individual teeth as figured, large and conspicuous. Seta 1-S single, unpaired, 1a-S and 2a-S unpaired and in a single row, 7-12 and 10-15 in number respectively, lateral seta with 2-5 branches.

TYPE-DATA. Holotype male, No. P684-6, on pin with associated larval and pupal skins on slide, allotype female, No. P696-1, with associated skins and terminalia on slides. Both in USNM.

DISTRIBUTION. PHILIPPINES. *Luzon.* Laguna Prov., Sierra Madre jungles, 1,000 ft., about 24 km from Famy (type-locality); 3♂, 1♀, 22 L, 3 lp; Quezon Prov., Baler, Tayabas (Sierra Madre); 1 L, 1 lp; Mountain Prov., Banaue; 1♀; Unnamed localities; 1♂, 1♀.

Records from literature. Baisas and Ubaldo-Pagayon (1953: 18) give additional records from Mt. Maquiling (Sierra Madre), Los Banos, Laguna Prov. and Infanta, Llavac Jungles (Sierra Madre), Quezon Prov. The same authors (1953: 10) have a record from Mindanao (as ? var.) but see under *nepenthicola* (p. 69).

TAXONOMIC DISCUSSION. Although apparently indistinguishable from *microcala* (and probably *nepenthicola*) as adult this species differs from these and other species in the subgenus in numerous larval and pupal characters, the broad, dark larval head and strongly setose siphon and the strongly developed seta 1-I and reduced setae 9-VII and -VIII being the most conspicuous. The long, stout seta 1-IV, shared only with *roxasi* and *werneri* in the present subgenus, is annectant to subgenus *Rachionotomyia* as are the well developed pupal float hair and the broad larval head and strongly developed siphonal setae 1a and 2a, though not the small lateral seta on the siphon which is diagnostic of subgenus *Tricholeptomyia*.

BIONOMICS. The series as a whole came with one exception from both arboreal and terrestrial pitcher plants. The holotype and allotype were collected at about 1,000 ft. (Baisas and Ubaldo-Pagayon 1953: 18, 19). The larva and pupa from Baler came from a rock hole. The possible bionomic significance of some of the unusual features of the larva and pupa is noted under the species group (p. 76).

SUBGENUS *TRIPTEROIDES* GILES

Tripteroides Giles 1904: 369. Type-species *Runchomyia philippinensis* Giles.

FEMALE. Palps about 0.05-0.15 length of the proboscis. Occiput with scales, at least on the forepart, with brilliant or deep blue reflection (silvery in *aeneus*, *hybridus* and *nitidoventer*). Orbital setae 1-3 in number, usually 2. Scutal scales narrow, usually very narrow, hairlike. Dorsocentral and prescutellar bristles usually present. Postnotum bare. Pleural scales and lateral pale scales on abdominal tergites with silvery metallic reflection. Subspiracular scales often absent, other pleural scaling sometimes reduced. All femora with discrete silvery markings on anterior surface except in *aeneus* which has them confined to the mid- or mid- and hind- and *distigma* in which they are confined to the hindfemur; tibiae and tarsi entirely dark. Scales on upper surface of wing narrow to moderately broad, usually broader on R_2 and R_3.

FEMALE TERMINALIA. Apex of postgenital plate with shallow emargination at most. Insula with 2-8 peripheral setae on either side, usually 3-5, and 1-10 in each posterolateral corner. Spermatheca usually single in Oriental species, trilobed in Australasian species except for *littlechildi* (Edwards).

MALE. Palps very short, much as in female. Hindclaws always paired.

MALE TERMINALIA. Mostly small, often retracted. Dististyle usually short and relatively stout, somewhat expanded apically, greatly broadened in some species, of more or less uniform width in others, never uniformly tapering. Lateral plate of phallosome always with sternal lobe which is usually ribbed or spiculate. Apical prolongation variously developed.

EARLY STAGES. Separable from those of *Rachionotomyia* only at species level (see keys, p. 17, 18).

DISTRIBUTION. Oriental region from northeastern India to Philippines and Taiwan, Japan, northern Australia, New Guinea, Solomons, Santa Cruz Is., Fiji.

BIONOMICS. Most types of container habitat are utilized, including exceptionally small tree holes and in a few cases plant pitchers. *Tripteroides bimaculipes* occurs frequently in artificial containers. Lee (1946: 232) notes that this species bites freely in scrub and around jungle margins. I can confirm this from my own observations in New Guinea. It prefers to bite at the edge of shade and is attracted to the tip of the nose or an outstretched finger. Among the Philippines species *monetifer* and *nitidoventer* are recorded as entering houses and biting man, and these species were repeatedly taken in a carabao-baited trap (Baisas and Ubaldo-Pagayon 1953: 15). Malayan species have been taken in catches but are said never to be troublesome; a female was taken attacking man at 30 ft. in the tree tops (Macdonald and Traub 1960: 10). The wild hosts are unknown.

KEYS TO GROUPS OF SUBGENUS *TRIPTEROIDES*

ADULTS

The female of *mabinii* is no longer available for study. It appears from the description by Baisas and Ubaldo-Pagayon (1953: 60) to be inseparable from those of a number of species in the Nitidoventer Group.

Male with 1-2 verticillary hairs on segments 1-4 of antennal flagellum distinctly longer and stouter than the others, first hindtarsal segment with a conspicuous row of numerous long, flexible bristles at base, foreclaws exceptionally large and with unusually well developed empodium. . . . . Mabinii Group

Male with antennal hairs unmodified (except in *antennalis* Bohart and Farner), first hindtarsal segment and foreclaws otherwise (somewhat similar in *denticulatus* Delfinado and Hodges). . . . Nitidoventer Group

EARLY STAGES

See keys on p. 17, 18.

NITIDOVENTER GROUP

This is a very large group, as at present constituted, containing 48 currently recognized species. The majority of these are comparatively uniform but there are a number with distinctive features clearly meriting recognition at species group level. These include modifications of the fore- and midtarsi in *tarsalis* (Delfinado and Hodges 1968: 372) and, to a less extent in a number of other species, thick tufts of hairs on 5 or more segments of male antenna in *antennalis* (Baisas and Ubaldo-Pagayon 1953: 115), suppression of blue scaling on occiput in *aeneus, hybridus* and *nitidoventer,* suppression of silver markings on one or more femora in *aeneus* and *distigma* and the enormously elongated pupal trumpets of an undescribed species near *caeruleocephalus* (first noted by Daniels 1908b: 266 and ascribed by him to that species). Edwards, in a marginal, longhand note on Daniels' paper, suggested that this was a misidentification of a species of *Mimomyia* which the pupa in question strikingly resembles. Recently, however, associated skins have become available and these confirm Daniels' diagnosis. Further discussion of these and other potential species group characters would be beyond the scope of the present paper which is concerned only with the monotypic Mabinii Group.

MABINII GROUP

Baisas and Ubaldo-Pagayon (1953: 6) placed the only included species, *mabinii,* in subgenus *Rachisoura* in which it is still retained in the current World Catalog (Knight and Stone 1977: 320). Belkin (1962: 521) considered that it should be transferred from this subgenus and I fully agree. At the same time I cannot feel that the possession of enlarged larval maxillary "horns" is alone sufficient to justify the establishment of a new monotypic subgenus. Baisas and Ubaldo-Pagayon (1953: 26) note that 1 or 2 verticillary hairs on the first 2 flagellar segments of the male antenna are "distinctly longer and more stout than the others". Later (p. 61) they repeat this statement but name instead the 3rd and 4th flagellar segments. In fact there is a slight thickening of 1 or 2 of these hairs on all the first 4 segments. It is not very conspicuous but is interesting as recalling the more extensive modification of the verticillary hairs in one member of subgenus *Tripteroides (antennalis).* The modification of the male hindtarsus and foreclaw can also be matched in other species of that subgenus while agreement in all the subgeneric diagnostic characters is

close. Baisas and Ubaldo-Pagayon (1953: 6) note that the present species differs from the Philippines *Tripteroides* s. str. in certain larval characters (tubercles of pleural setae sharp pointed, seta 7-T without basal arm, setae 2 on abdominal segments with fused tubercles, seta 0 on abdomen minute, seta 14 absent from abdominal segments other than VIII). Should these differences be confirmed in other larvae of the nominotypical subgenus, many of which are undescribed or inadequately described, the question might need to be reconsidered but on present evidence I feel the treatment adopted here is to be preferred.

23. *TRIPTEROIDES (TRIPTEROIDES) MABINII* BAISAS AND UBALDO-PAGAYON (Figs. 2, 3, 5, 49, 50)

Tripteroides (Rachisoura) mabinii Baisas and Ubaldo-Pagayon 1953: 3.
Tripteroides (Rachisaura) mabinii Baisas and Ubaldo-Pagayon 1953: 60. *(lapsus).*

FEMALE. Not seen. The unique allotype was retained in the Division of Malaria, Manila and is believed lost. It was described by Baisas and Ubaldo-Pagayon (1953: 35, 61) who note the following differences from the male described below: Wing 4.5 mm. Palps marginally longer relative to proboscis. Proboscis marginally shorter relative to forefemur. Torus rather smaller relative to clypeus, not darkened toward base. Antenna with third and fourth flagellar segments unmodified, verticils 8-9 in number on each segment as compared to 14-15 in the male. Median silvery spot on fore- and midfemora not fused with the basal silvery line, completely fused with, and indistinguishable from, this line on the hindfemora. First hindtarsal segment equal in length to hindtibia. Bristles at base of first hindtarsal segment shorter and fewer. Claws paired and simple on all legs. Foreclaws slightly longer than midclaws. The latter approximately equal in length to the hindclaws.

MALE (Figs. 2, 3, 5, 49). Wing 3.9 mm. *Head* (Fig. 2). Proboscis relatively long and slender, about 1.1 length of forefemur, much shorter than abdomen. Palps about one-sixth length of the proboscis. Clypeus bare. Tori with minute, hairlike scales on inner surface. Antenna about 0.7 length of proboscis. One or 2 verticillary hairs on third and fourth flagellar segments longer and stouter than the remainder. Eye margins with border of bright peacock blue iridescent scales. Remainder of occiput with bronzy scales showing deeper blue iridescence under appropriate illumination. Small patches of silvery scales below at sides. Quite numerous, relatively conspicuous, narrow black scales with expanded tips in a single row on nape. Two orbital bristles present well out on either side. *Thorax.* Scutum thickly covered with very narrow brown scales with bright pale gold reflection. Scutal integument mid-brown. One pair of prescutellar bristles present, no acrostichals or dorsocentrals. Scutellum with broad, flat, dark brown scales with bronzy reflection. Postnotum dark brown, bare. Anterior pronotal lobes with broad, flat, dark brown scales. Posterior pronotum with a few minute, very narrow dark scales and some small, flat, inconspicuous brown scales above. A single small posterior pronotal bristle and 3 spiraculars present. Flat dark scales with brilliant silver reflection present on subspiracular area, about the upper two-thirds of the sternopleuron and the anterior portion of the mesepimeron. Paratergite bare. Two lower sternopleural bristles and 3 prealars present.

Legs. Forefemur with 2 conspicuous silver spots on lower anterior surface at about a half and four-fifths of the distance from base respectively, the former almost continuous with a narrow silvery basal line. Midfemur similar. Hindfemur with a similar subapical spot and a more or less uniform anteroventral silvery line on about the basal three-fifths. First hindtarsal with a conspicuous row of numerous long, flexible bristles at base. Claws (Fig. 3) paired on all legs. Foreclaws one very large, toothed, curved, the other smaller, simple, more or less straight, empodium unusually well developed. Midclaws simple, one shorter, stouter and more strongly curved than the other. Hindclaws simple, relatively straight, subequal. *Wing*. Both wings largely denuded. Outstanding scales moderately broad on veins R_2 and R_3 apparently narrow, linear elsewhere. Upper calypter with 3-5 hairlike scales. Upper fork cell about 1.1 length of its stem. *Halter*. Head dark except for a patch of dull silvery scales on upper surface. *Abdomen* (Fig. 5). Tergites dark above with blue iridescent reflection. Tergite I with small lateral silvery spots, II and III with silvery lateral patches continuous from base, spreading inward apically to form triangular spots, IV-VI with similar spots but these interrupted at base. Remaining segments dissected away with only the terminalia preserved. Sternites largely denuded, the remaining scales pale yellow with bluish metallic reflection, the VIIIth dark according to Baisas and Ubaldo-Pagayon. *Terminalia* (Fig. 49). Dististyle moderately long, swollen on the distal one-third. Basal lobe of basistyle with 4 setae markedly stouter than the remainder. Paraproct with 5-8 teeth, 2-3 of which have secondary denticles. Phallosome as figured, the ventral arm with 9-10 strongly recurved teeth. IXth tergite with the lobes relatively broad and closely approximated, each with 14-16 apical setae.

PUPA (Fig. 49). As figured. Baisas and Ubaldo-Pagayon (1953: 63) give a few additional details as to variation in the allotype skin and 1 other whole pupa but nothing which appears to be taxonomically significant.

LARVA (Fig. 50). As figured. Segments VII and VIII are badly distorted in the only available skin and can only be partly figured with any confidence. Baisas and Ubaldo-Pagayon were unable to add any information of value from the lost allotype skin.

TYPE-DATA. Holotype male, No. P 1075-1, with tarsal claws, terminalia and larval and pupal skins on slide. PHILIPPINES: Mindanao; Parang-Malabang Highway near Cotabato/Lanao boundary, 14.v.1946, J. W. Enke.

DISTRIBUTION. Known only from the type-locality.

TAXONOMIC DISCUSSION. See under Mabinii Group (p. 80).

BIONOMICS. The type-series was bred from cut bamboo(s).

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LIST OF FIGURES

1. *Tripteroides (Rachionotomyia) aranoides* - adult female.
2. *Tripteroides (Rachionotomyia) aranoides* - male head, *edwardsi* - female head; *(Tricholeptomyia) barraudi* - male head, *belkini* - male and female head; *(Tripteroides) mabinii* - male head.
3. *Tripteroides (Rachionotomyia) aranoides* - female thorax and male claws, *coonorensis* - female head and thorax, *edwardsi* - female thorax, *nepenthis* - male claws, *rozeboomi* - male claws; *(Tricholeptomyia) barraudi* and *christophersi* - female thorax, *roxasi* - male and female claws; *(Tripteroides) mabinii* - male claws.
4. *Tripteroides (Rachionotomyia) affinis* and *dolfleini, (Tricholeptomyia) apoensis, belkini, christophersi* and *delpilari* - female thorax.
5. *Tripteroides (Rachionotomyia) coonorensis, edwardsi, nepenthis* and *serratus* - female abdomen; *(Tricholeptomyia) nepenthicola* and *(Tripteroides) mabinii* - male abdomen.
6. *Tripteroides (Rachionotomyia) aranoides* - female abdomen and terminalia, *rozeboomi* - male abdomen; *(Tricholeptomyia) roxasi* and *werneri* - female abdomen.
7. *Tripteroides (Rachionotomyia) affinis, (Tricholeptomyia) apoensis, barraudi* and *belkini* - female terminalia.
8. *Tripteroides (Rachionotomyia) dofleini* and *edwardsi, (Tricholeptomyia christophersi* and *delpilari* - female terminalia.
9. *Tripteroides (Rachionotomyia) nepenthis, (Tricholeptomyia) microcala* and *roxasi* - female terminalia.
10. *Tripteroides (Rachionotomyia) affinis* and *nepenthis* - female wing; *(Tricholeptomyia) werneri* - female terminalia.
11. *Tripteroides (Rachionotomyia) aranoides* - male terminalia.
12. *Tripteroides (Rachionotomyia) aranoides* - pupa and male terminalia.
13. *Tripteroides (Rachionotomyia) aranoides* - larva.
14. *Tripteroides (Rachionotomyia) ceylonensis* - pupa and male terminalia.
14. *Tripteroides (Rachionotomyia) ceylonensis* - larva.
16. *Tripteroides (Rachionotomyia) coonorensis* - pupa and male terminalia.
17. *Tripteroides (Rachionotomyia) coonorensis* - larva.
18. *Tripteroides (Rachionotomyia) tenax* - pupa and male terminalia.
19. *Tripteroides (Rachionotomyia) tenax* - larva.
20. *Tripteroides (Rachionotomyia) nepenthis* - pupa and male terminalia.
21. *Tripteroides (Rachionotomyia) nepenthis* - larva.
22. *Tripteroides (Rachionotomyia) nepenthisimilis* - pupa and male terminalia.
23. *Tripteroides (Rachionotomyia) nepenthisimilis* - larva.
24. *Tripteroides (Rachionotomyia) affinis* - pupa and male terminalia.
25. *Tripteroides (Rachionotomyia) affinis* - larva.
26. *Tripteroides (Rachionotomyia) dofleini* - pupa and male terminalia.
27. *Tripteroides (Rachionotomyia) dofleini* - larva.
28. *Tripteroides (Rachionotomyia) rozeboomi* - male terminalia; *aranoides* and *ceylonensis* - pupal paddles.

29. *Tripteroides* sp. no. 1 - larva.
30. *Tripteroides* sp. no. 2 - larva.
31. *Tripteroides (Tricholeptomyia) apoensis* - pupa and male terminalia.
32. *Tripteroides (Tricholeptomyia) apoensis* - larva.
33. *Tripteroides (Tricholeptomyia) barraudi* - pupa and male terminalia.
34. *Tripteroides (Tricholeptomyia) barraudi* - larva.
35. *Tripteroides (Tricholeptomyia) christophersi* - pupa and male terminalia.
36. *Tripteroides (Tricholeptomyia) christophersi* - larva.
37. *Tripteroides (Tricholeptomyia) microcala* - pupa and male terminalia.
38. *Tripteroides (Tricholeptomyia) microcala* - larva.
39. *Tripteroides (Tricholeptomyia) nepenthicola* - pupa and male terminalia.
40. *Tripteroides (Tricholeptomyia) nepenthicola* - larva.
41. *Tripteroides (Tricholeptomyia) roxasi* - pupa and male terminalia.
42. *Tripteroides (Tricholeptomyia) roxasi* - larva.
43. *Tripteroides (Tricholeptomyia) werneri* - pupa and male terminalia.
44. *Tripteroides (Tricholeptomyia) werneri* - larva.
45. *Tripteroides (Tricholeptomyia) belkini* - pupa and male terminalia.
46. *Tripteroides (Tricholeptomyia) belkini* - larva.
47. *Tripteroides (Tricholeptomyia) delpilari* - pupa and male terminalia.
48. *Tripteroides (Tricholeptomyia) delpilari* - larva.
49. *Tripteroides (Tripteroides) mabinii* - pupa and male terminalia.
50. *Tripteroides (Tripteroides) mabinii* - larva.

FIGURE ABBREVIATIONS

Female Terminalia

CERC = cercus
INS = insula
IX-T = IXth tergite
PGP = postgenital plate

Male Terminalia

BL = basal lobe of basistyle
DIST = dististyle
IX-T = IXth tergite
PH = phallosome
PR = paraproct

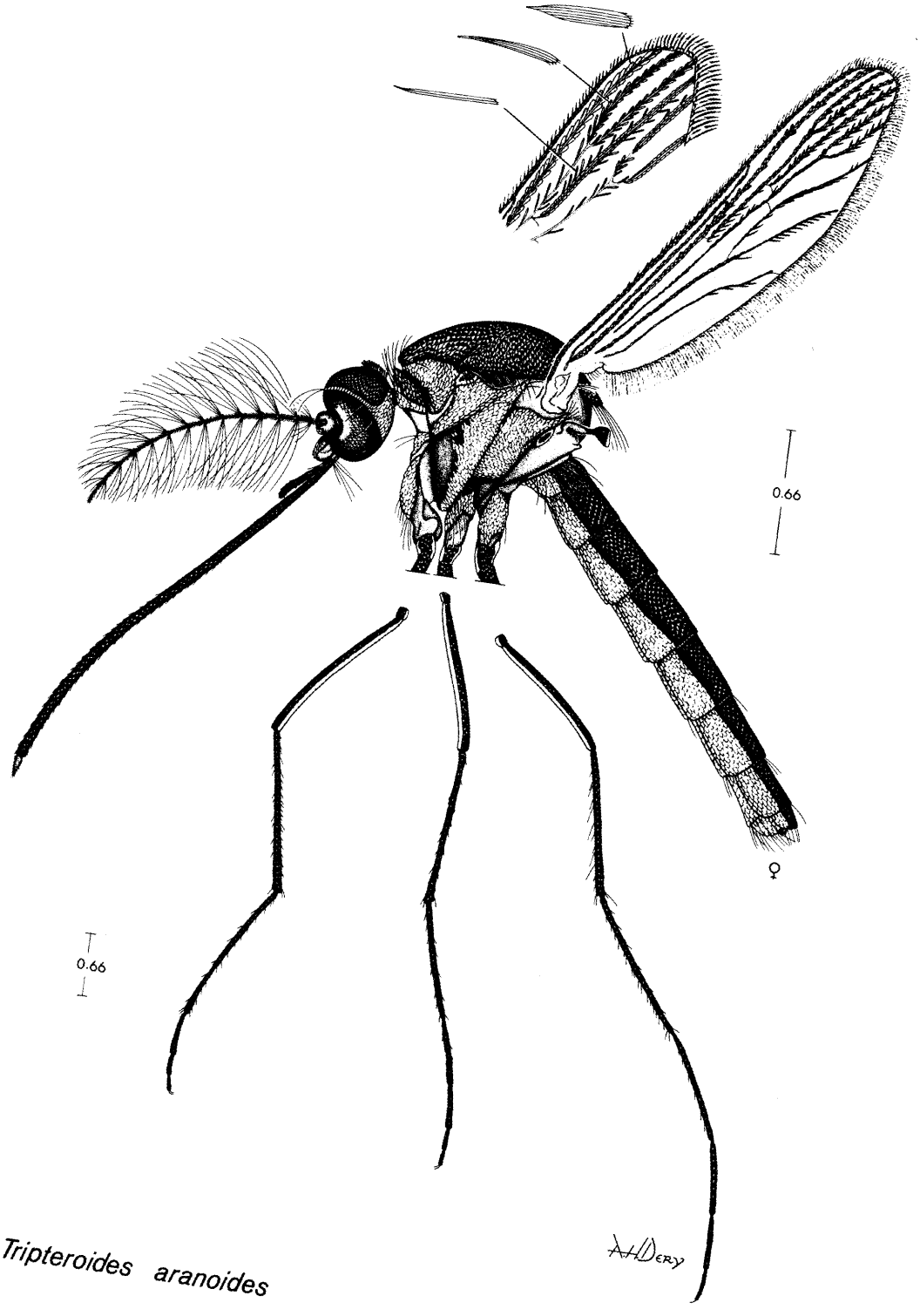
Pupa

C = cephalothorax
I-IX = abdominal segments I-IX
P = paddle
sp = spiracle

Larva

A = antenna
C = head
CS = comb scale
I-VIII, X = abdominal segments I-VIII, X
M = mesothorax
MP = mentum
P = prothorax
PAL = palatal setae
PT = pecten tooth
S = siphon
T = metathorax

Fig.1



Tripteroides aranoides

Fig. 2

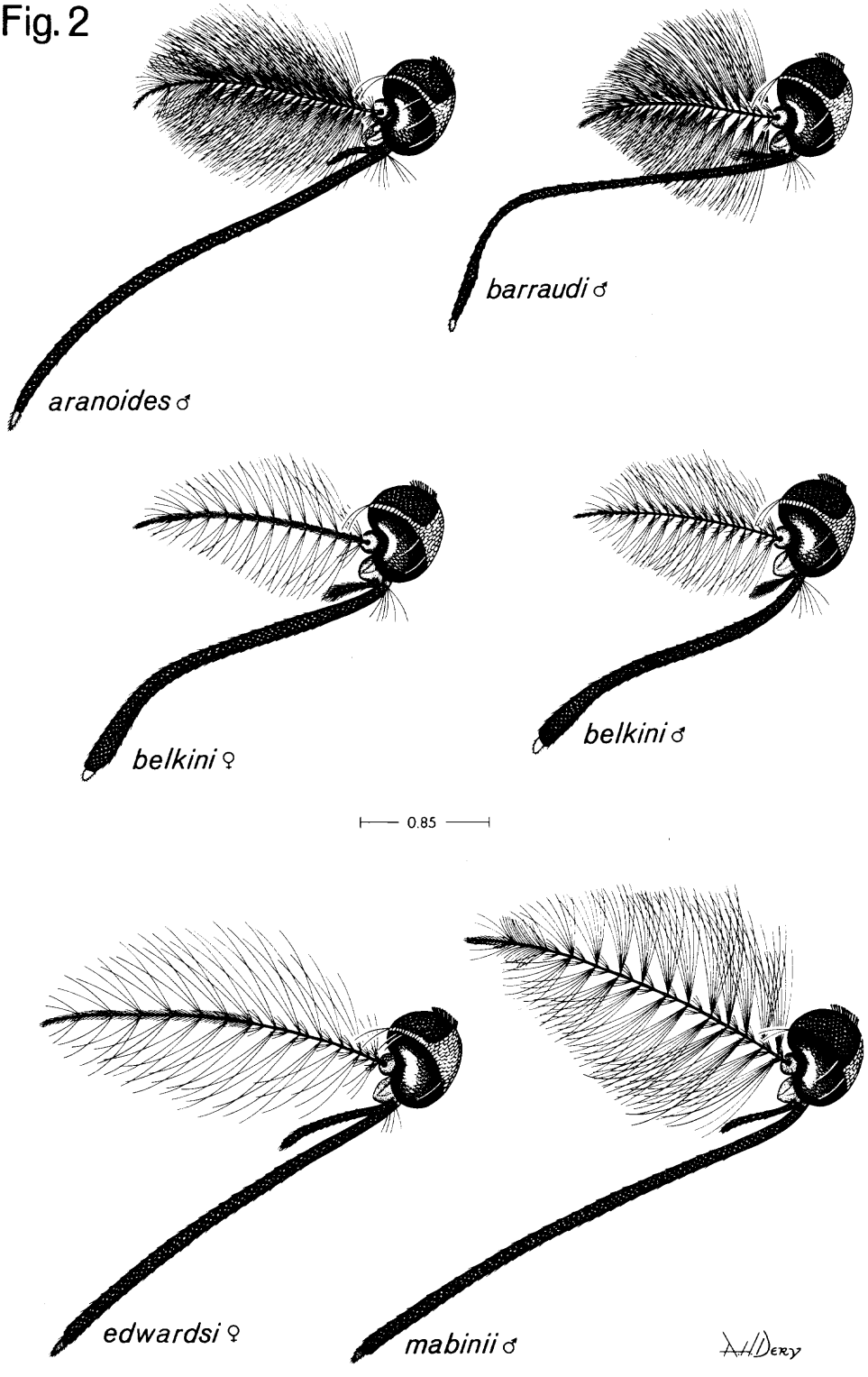
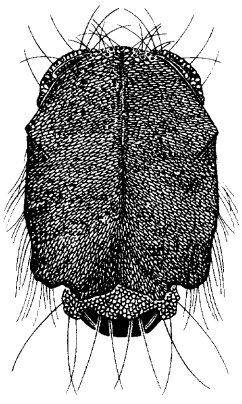
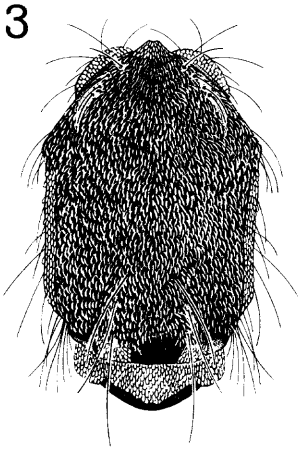

barraudi ♂
aranoides ♂
belkini ♀
belkini ♂
0.85
edwardsi ♀
mabinii ♂
A. H. Dery

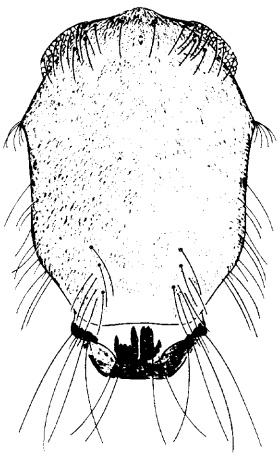
Fig. 3



aranoides ♀

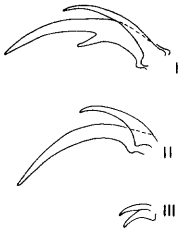


barraudi ♀

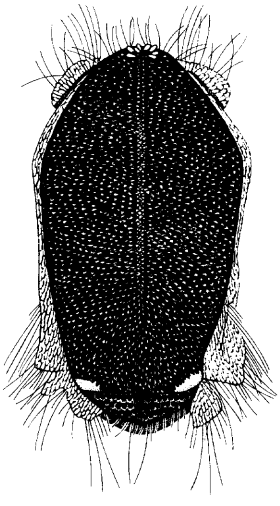


christophersi ♀

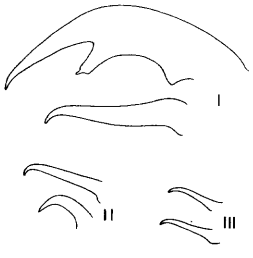
0.66



aranoides ♂

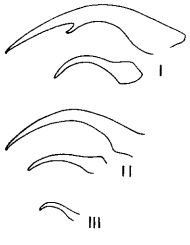


edwardsi ♀



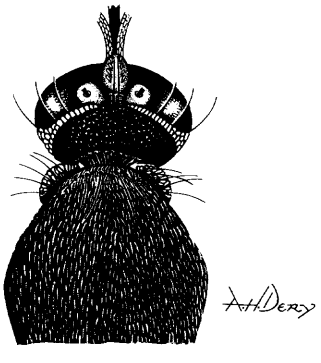
mabinii ♂

nepenthis ♂

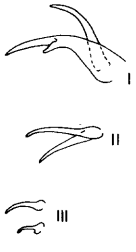


roxasi ♂

roxasi ♀



coonorensis ♀



rozeboomi ♂

Fig. 4

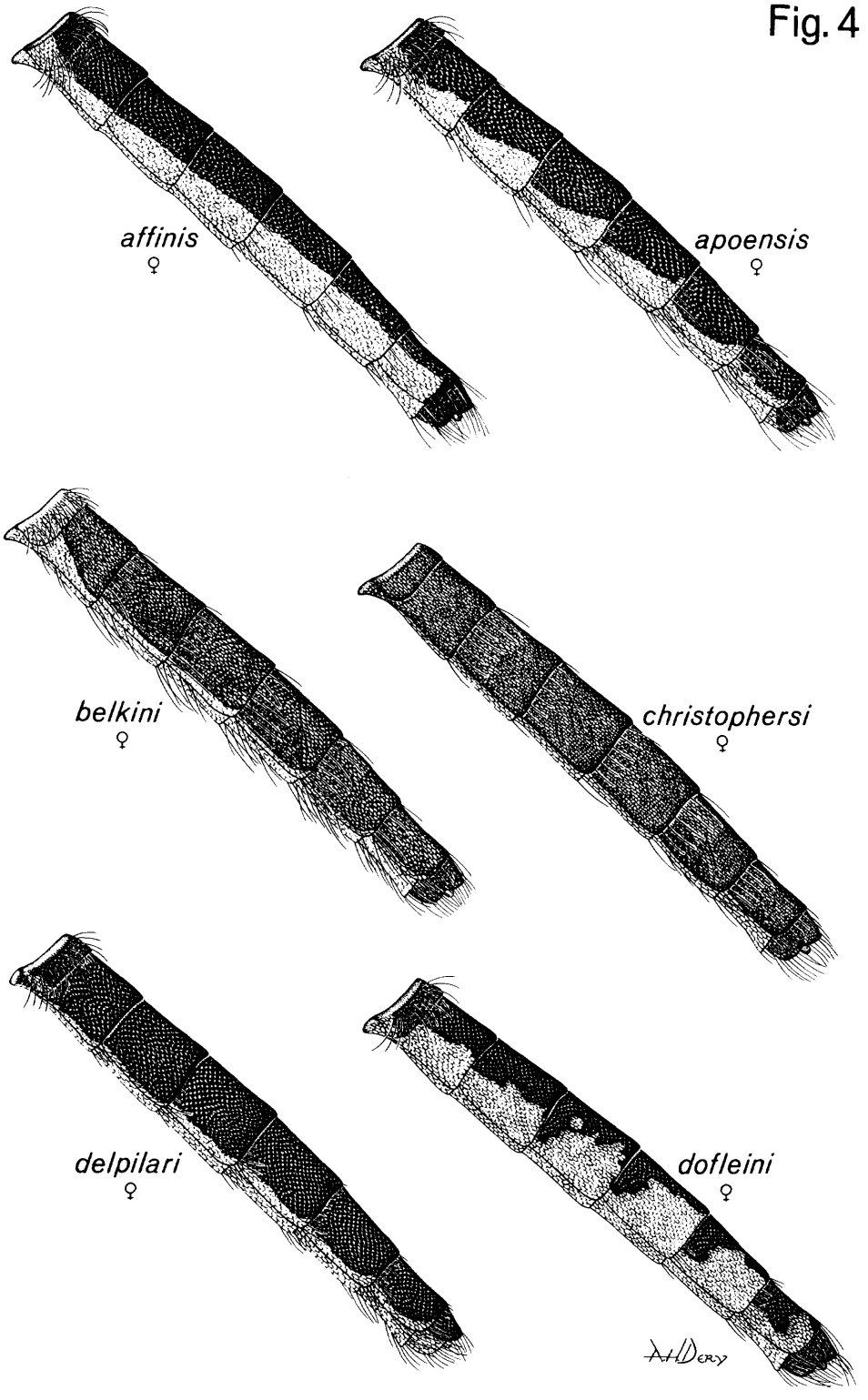

affinis
♀
apoensis
♀
belkini
♀
christophersi
♀
delpilari
♀
dofleini
♀

Fig. 5

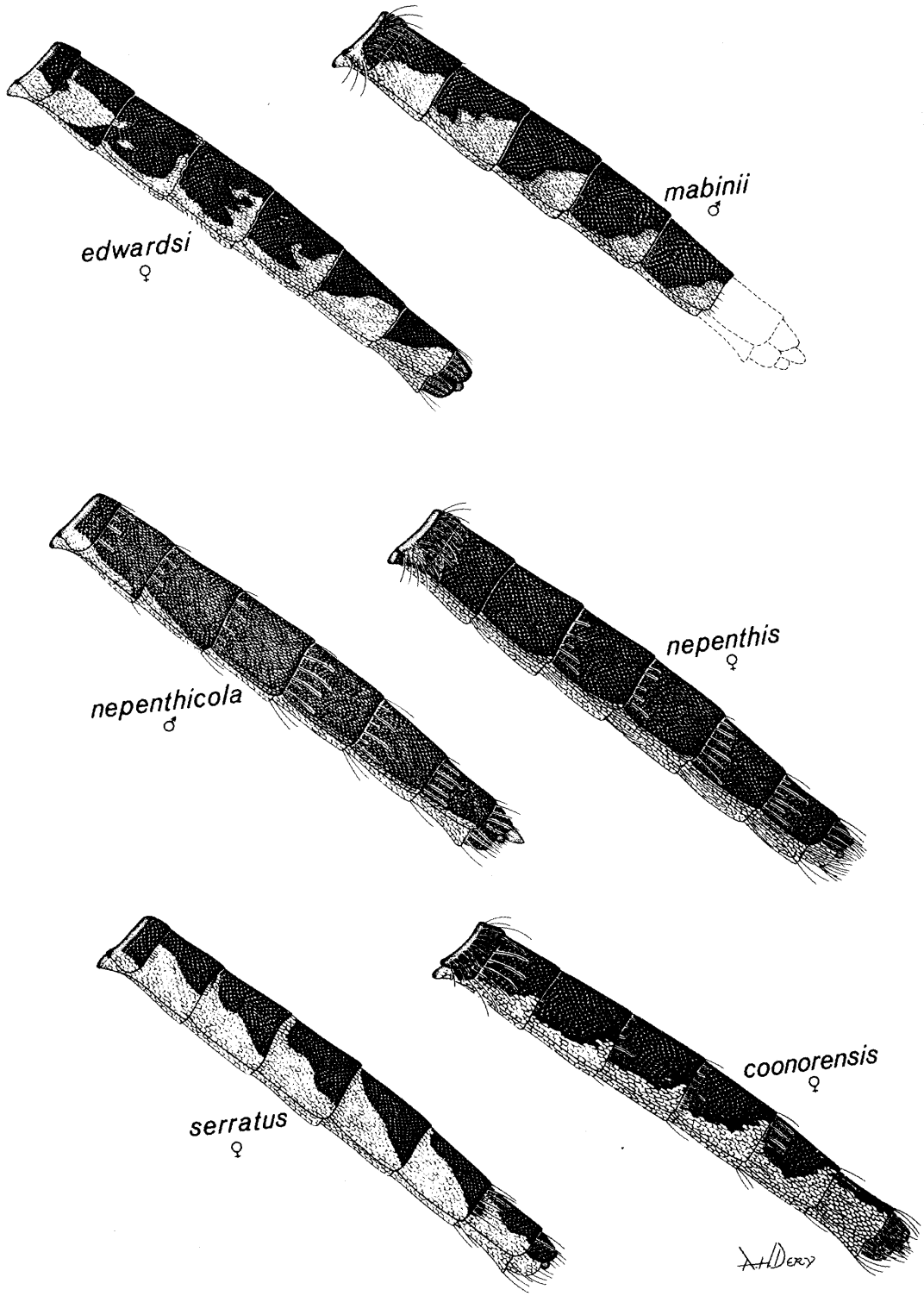
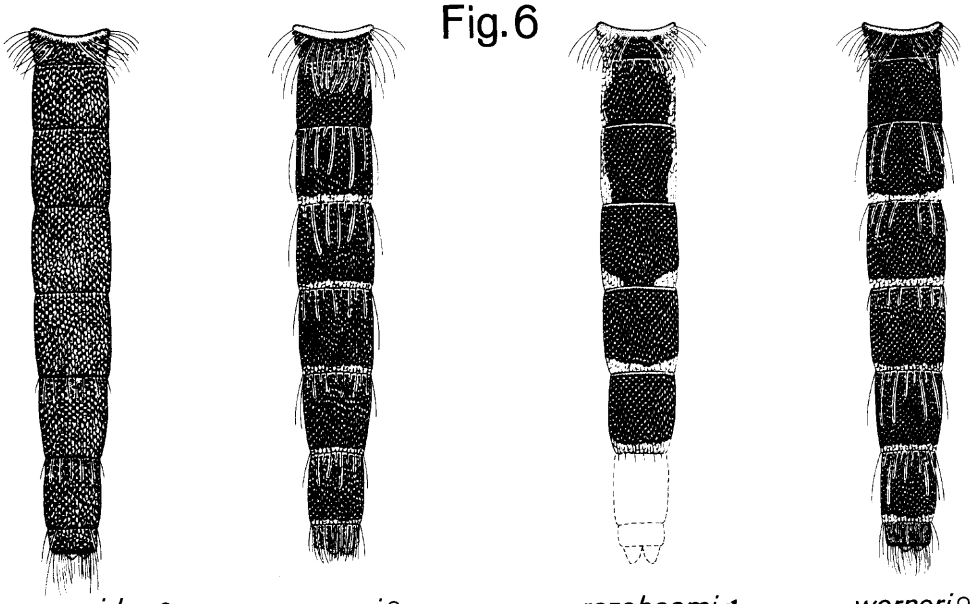
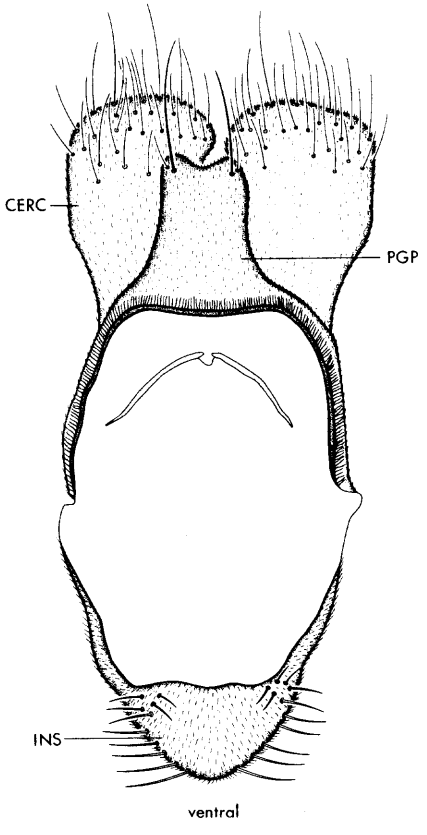
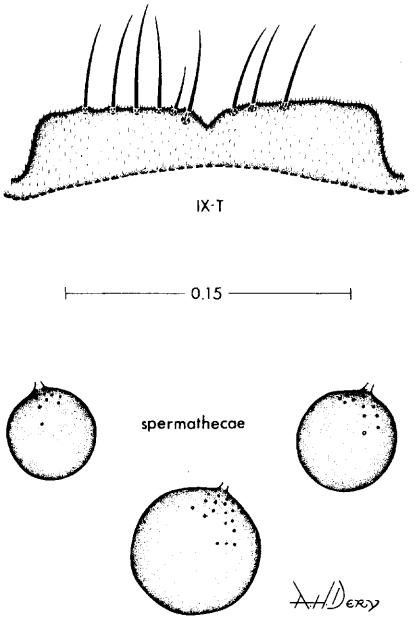

edwardsi
♀
mabinii
♂
nepenthicola
♂
nepenthis
♀
serratus
♀
coonorensis
♀

Fig.6



aranoides ♀ *roxasi* ♀ *rozeboomi* ♂ *werneri* ♀





aranoides ♀

Fig. 7

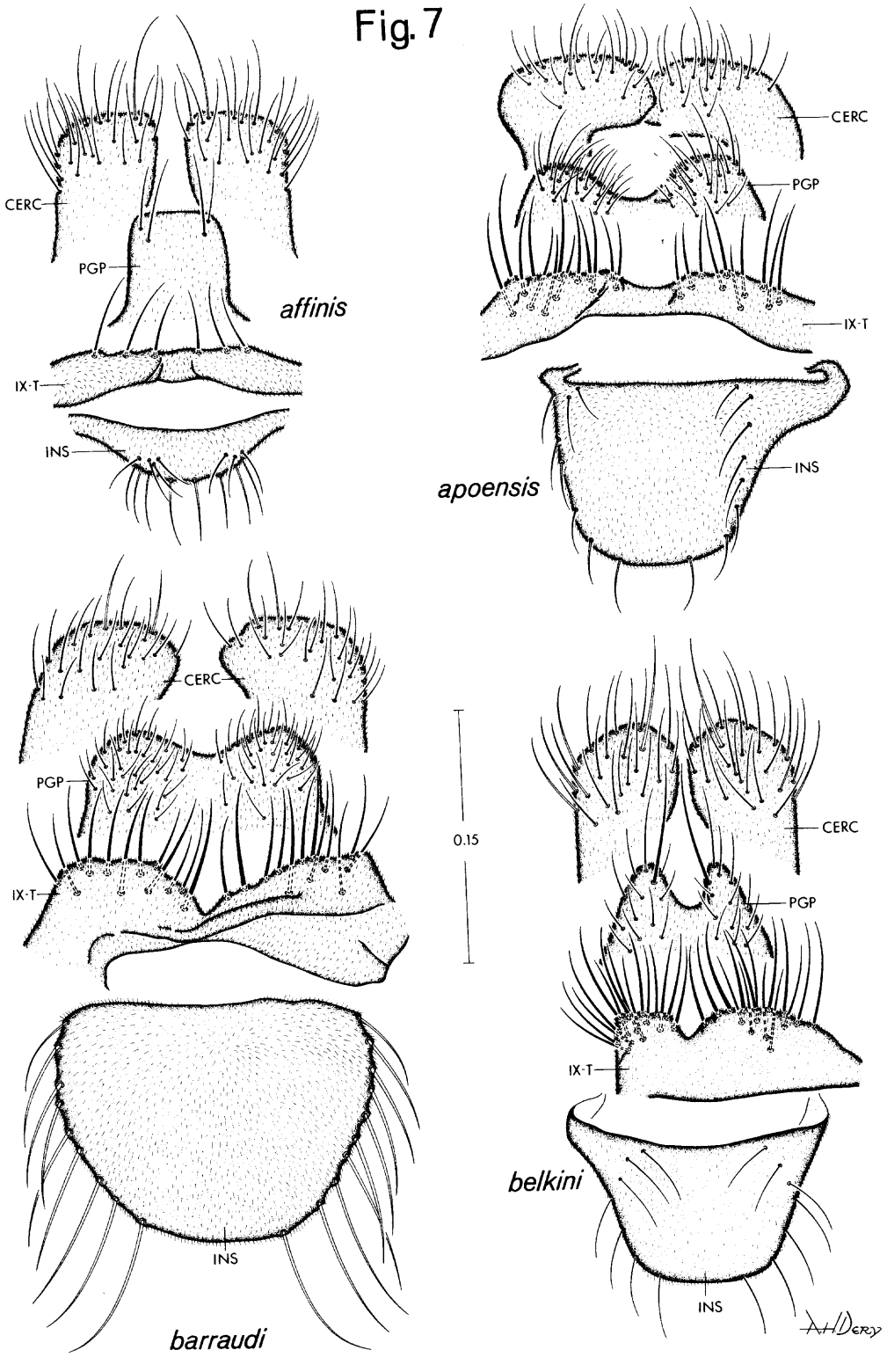

CERC
PGP
affinis
IX-T
INS
CERC
PGP
IX-T
INS
apoensis
CERC
PGP
IX-T
INS
barraudi
0.15
CERC
PGP
IX-T
INS
belkini

Fig. 8

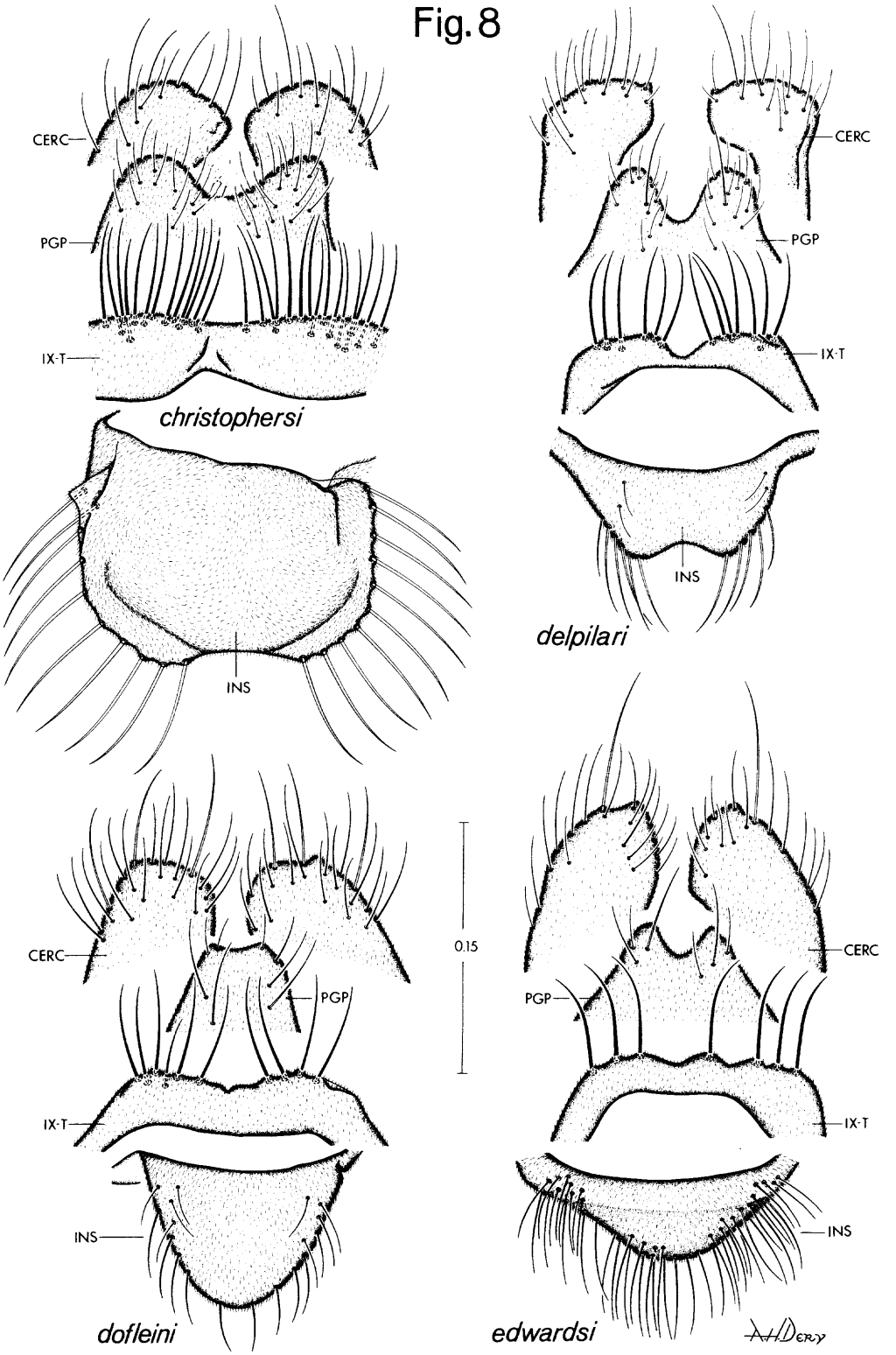
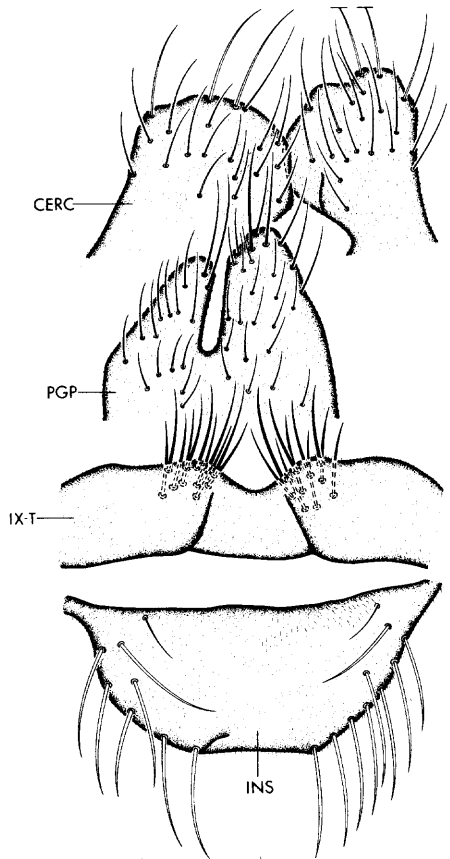
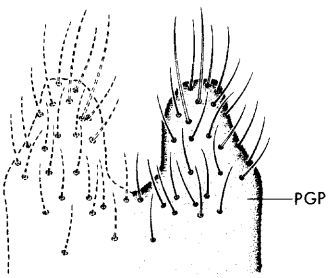
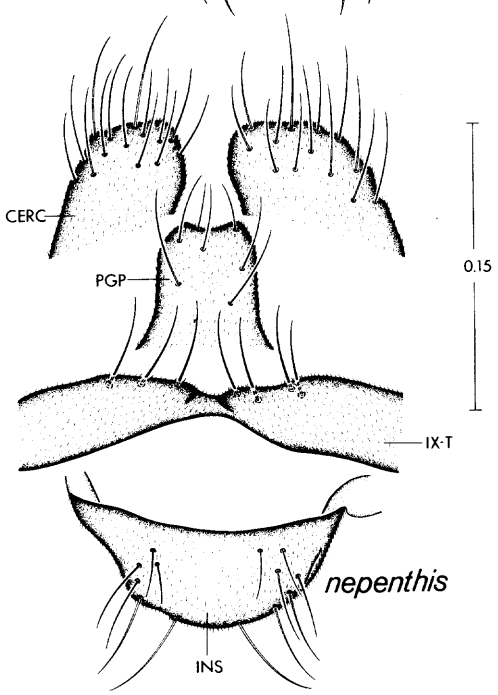

CERC
PGP
IX-T
christophersi
INS
CERC
PGP
IX-T
INS
delpilari
0.15
CERC
PGP
IX-T
INS
dofleini
CERC
PGP
IX-T
INS
edwardsi

Fig. 9



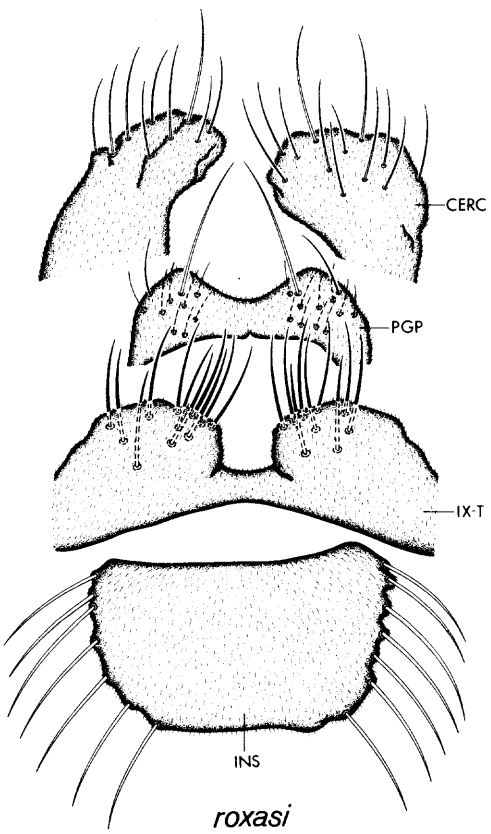


microcala



nepenthis

0.15



roxasi

Fig.10

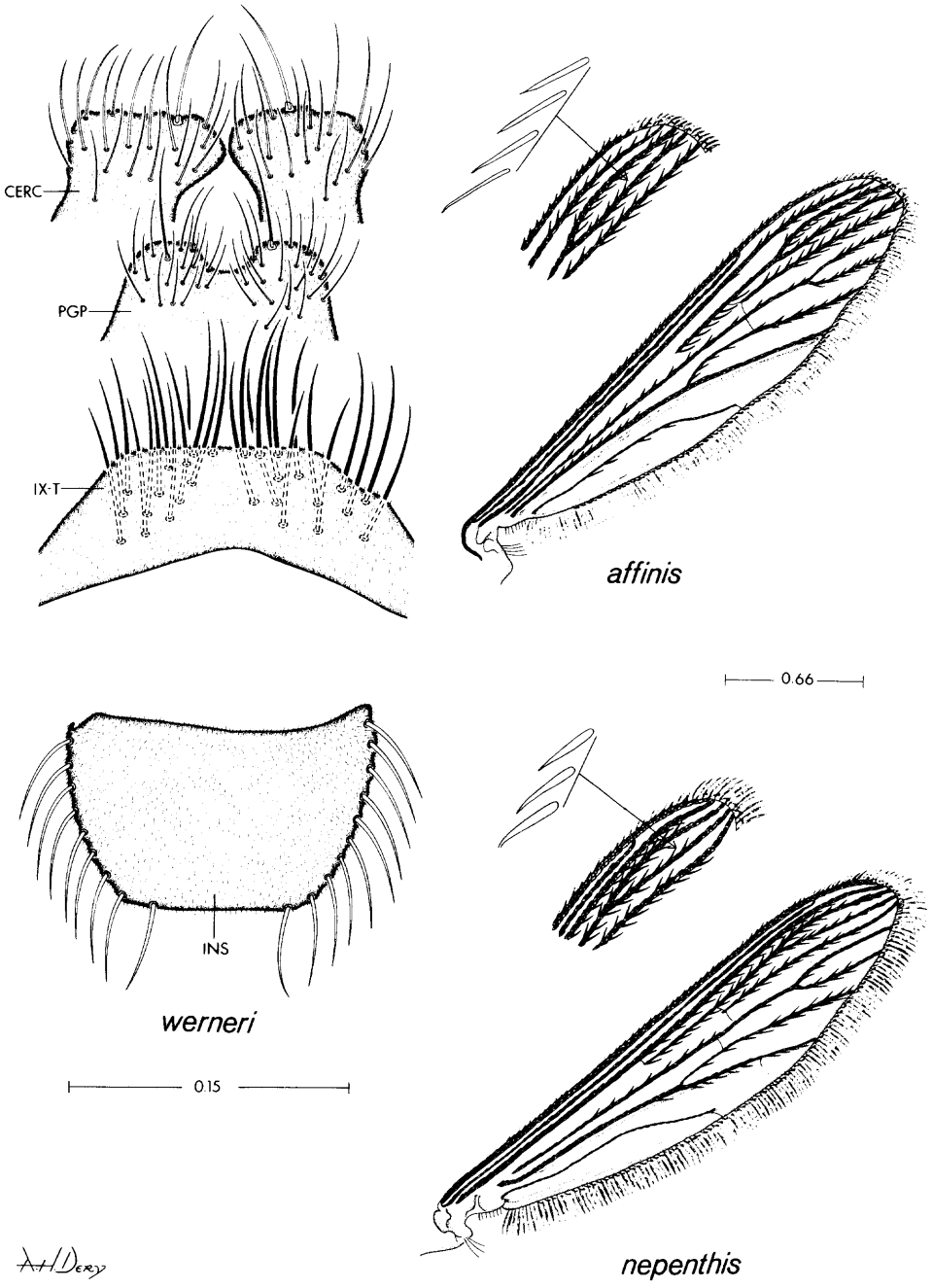
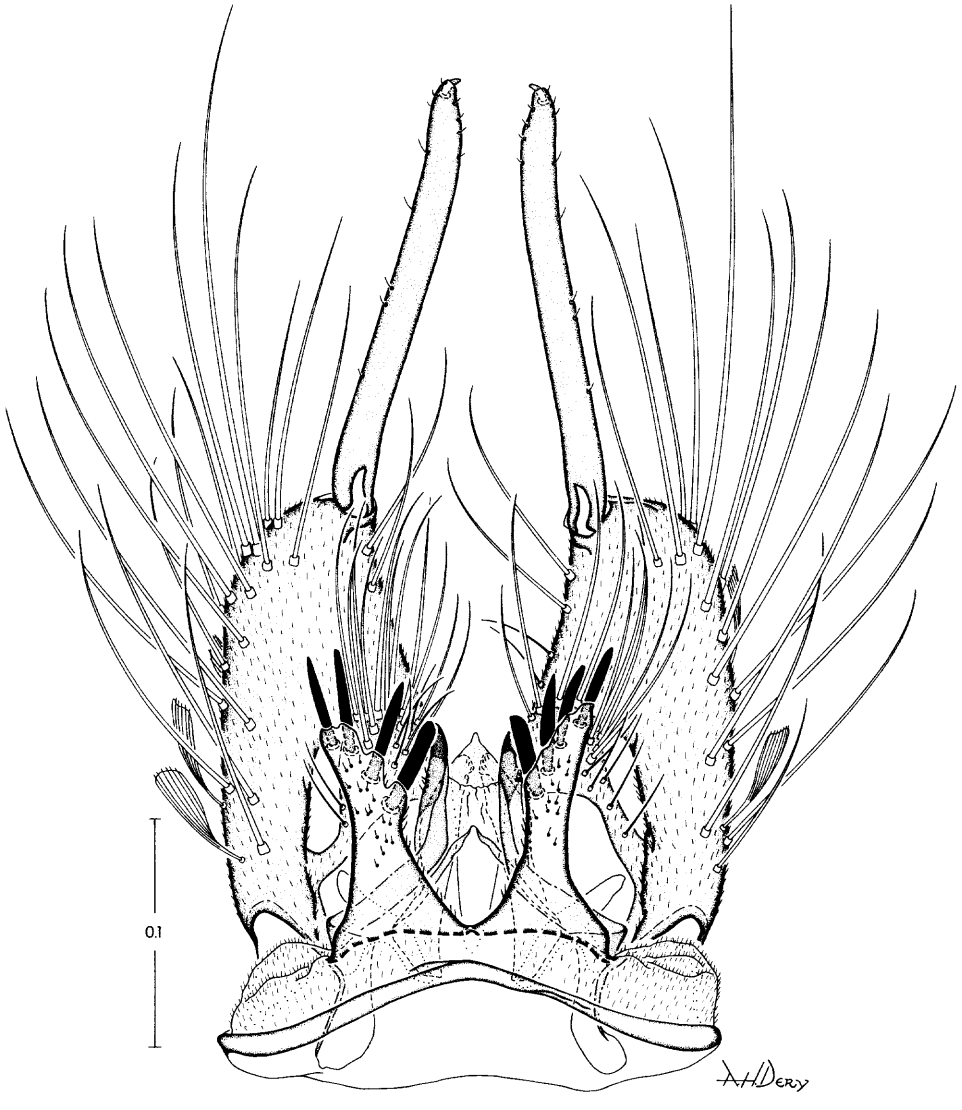
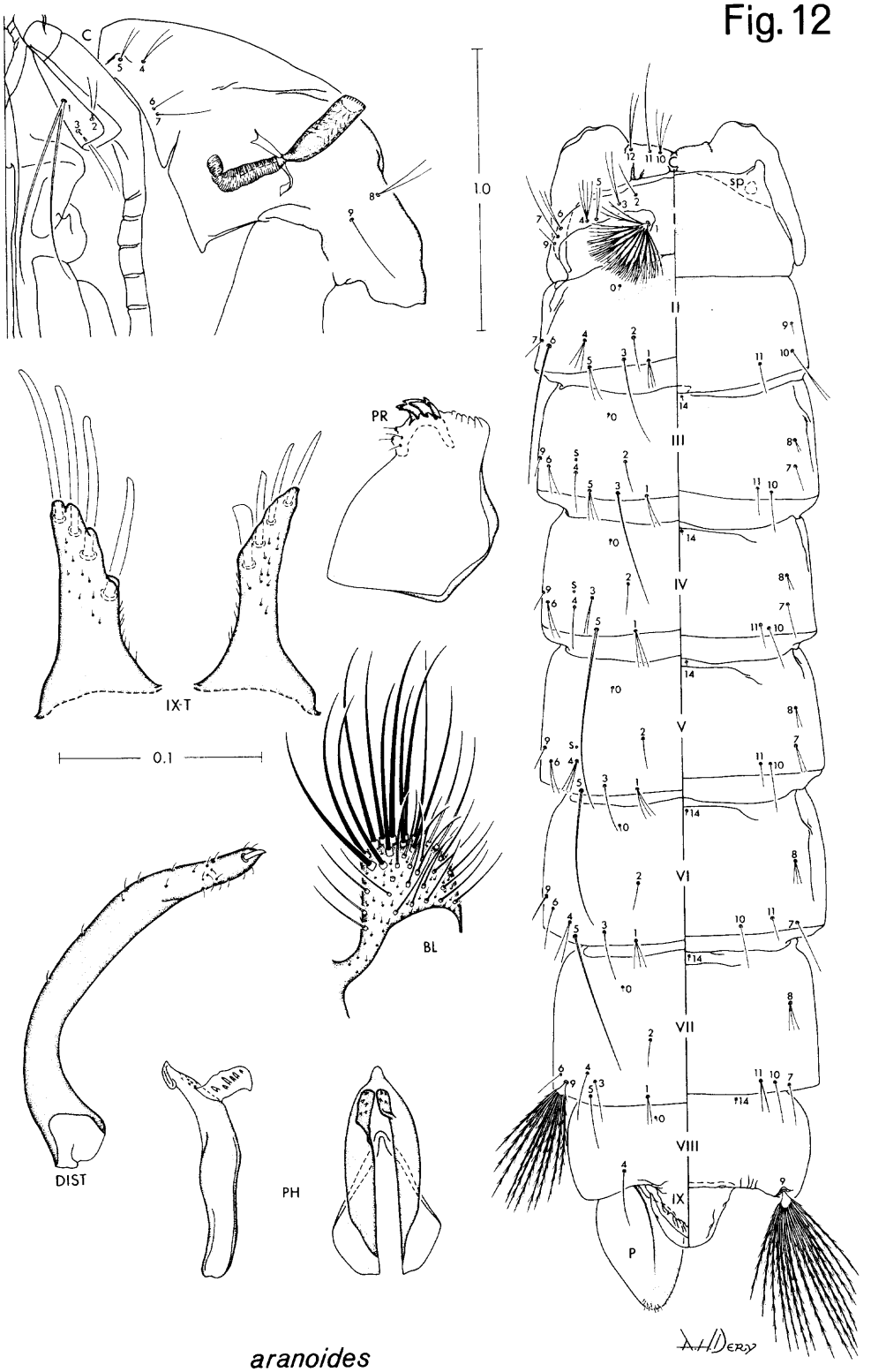


Fig.11



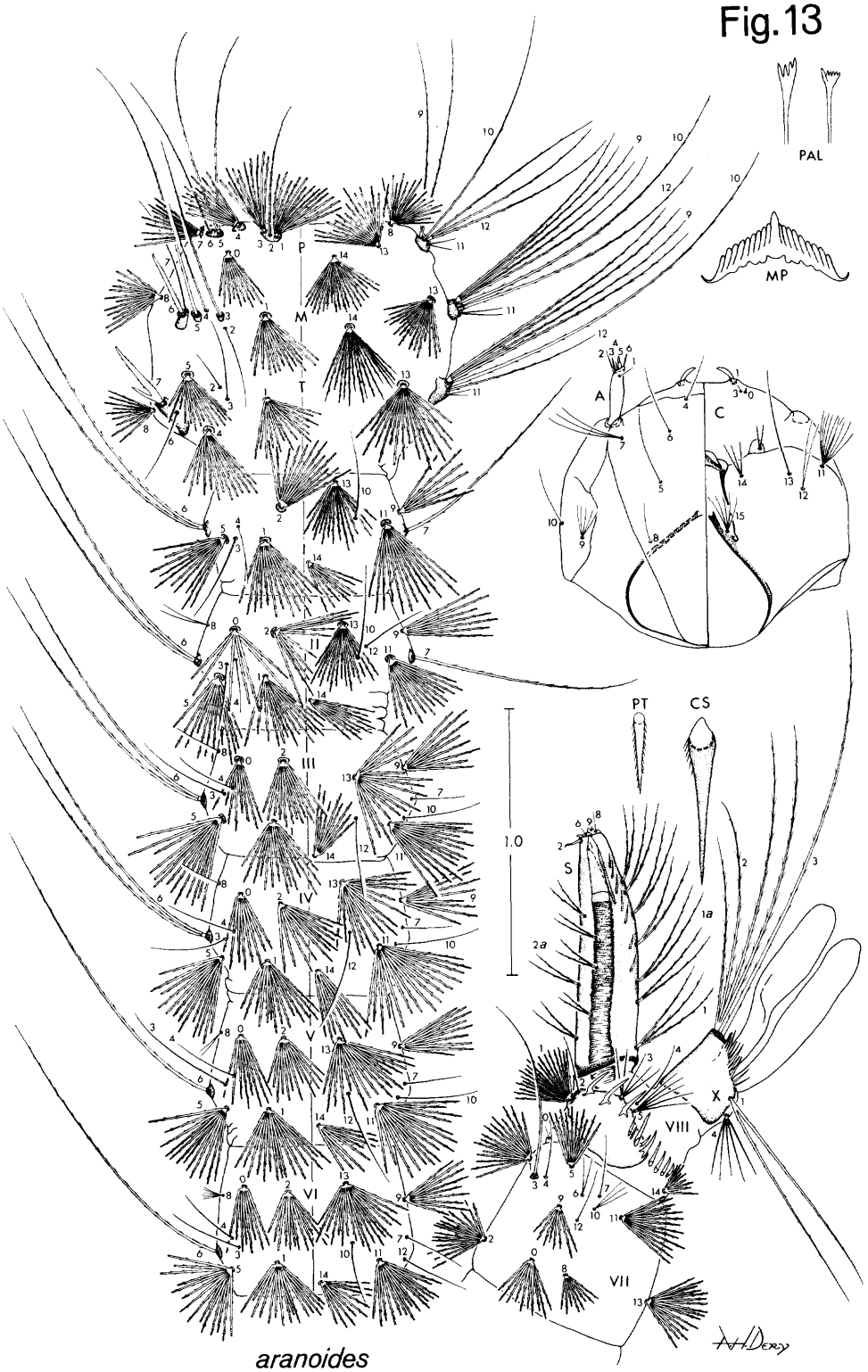
aranoides

Fig. 12



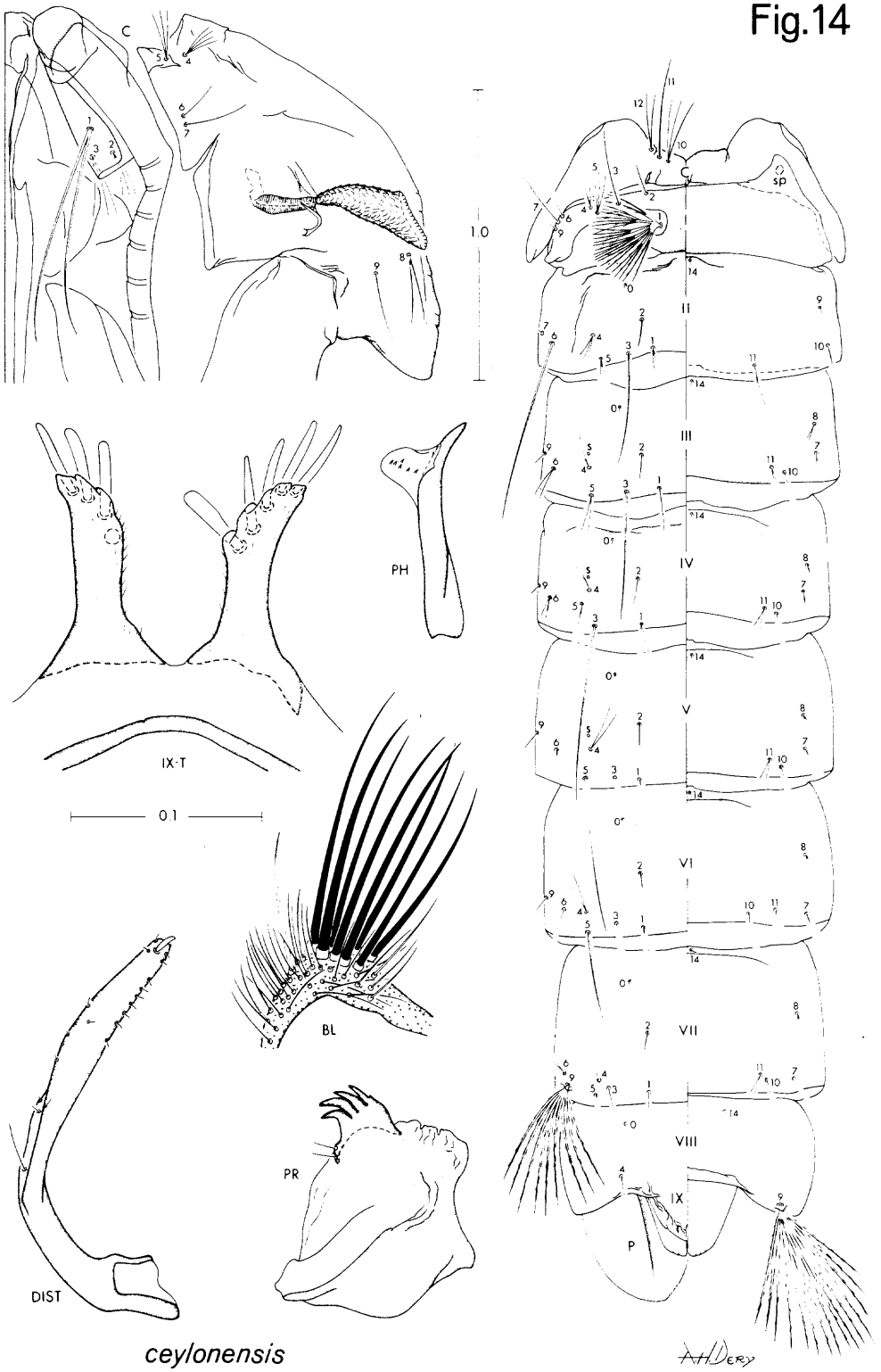
aranoides

Fig.13



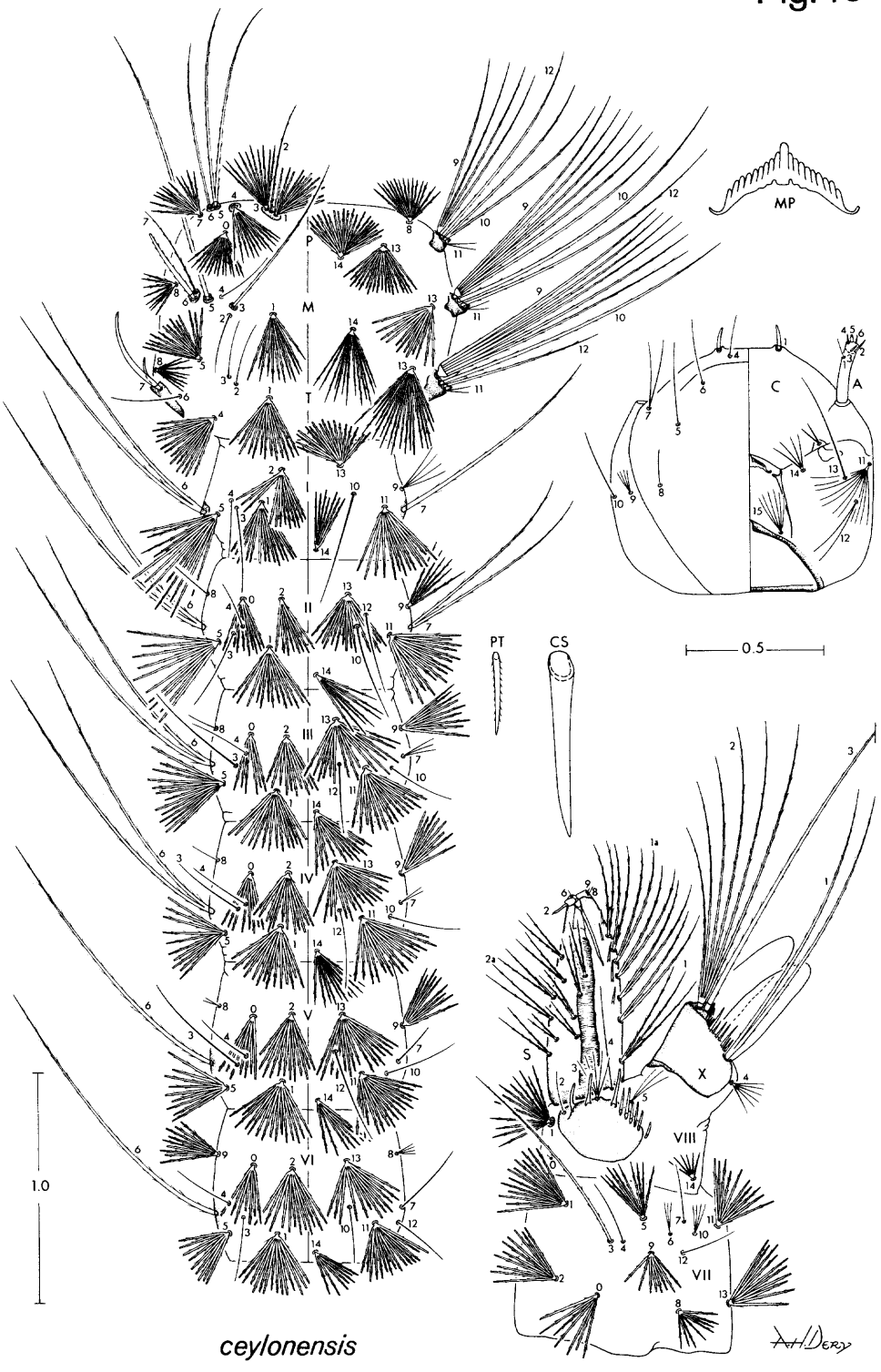
aranoides

Fig.14



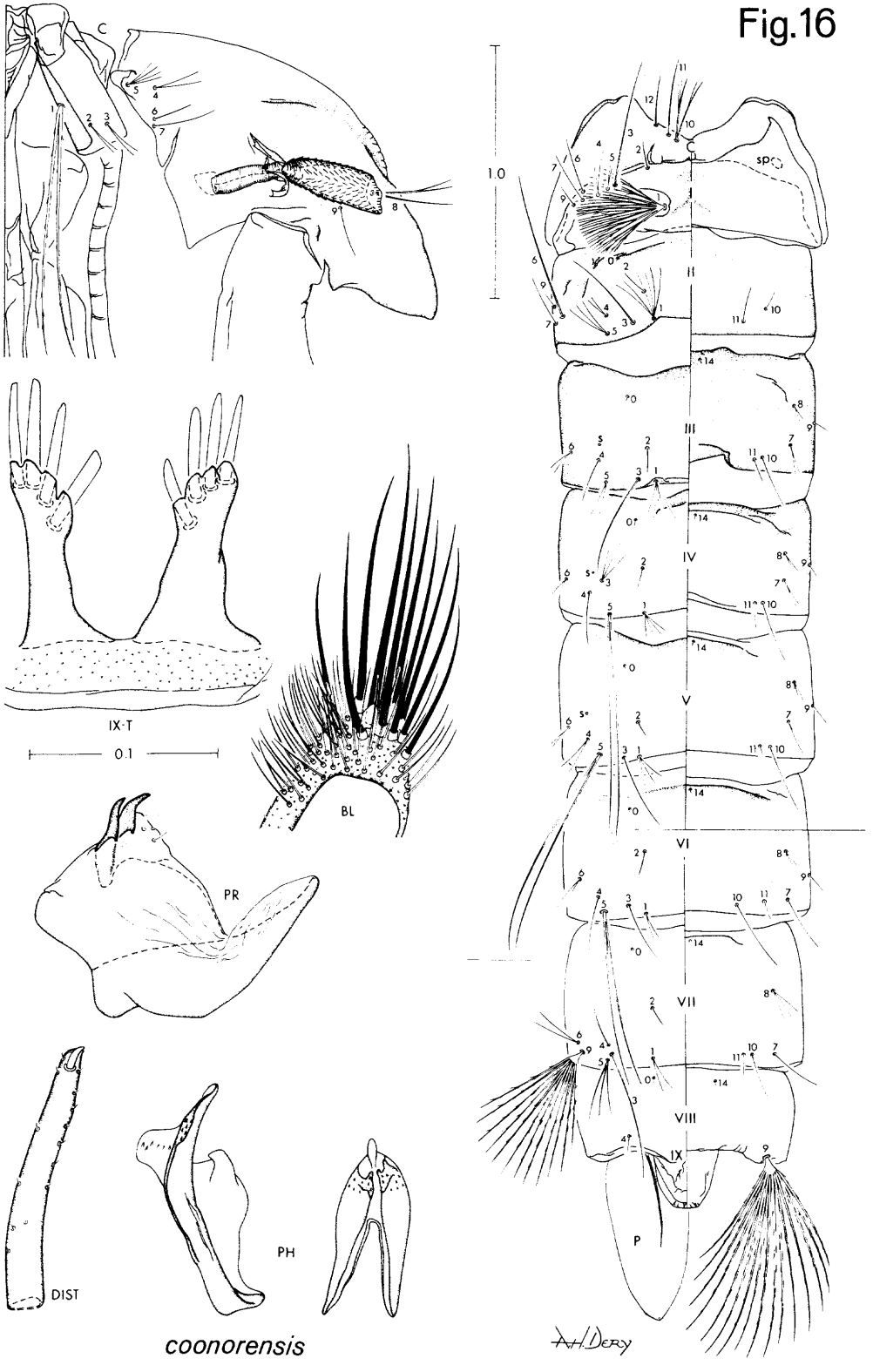
ceylonensis

Fig. 15



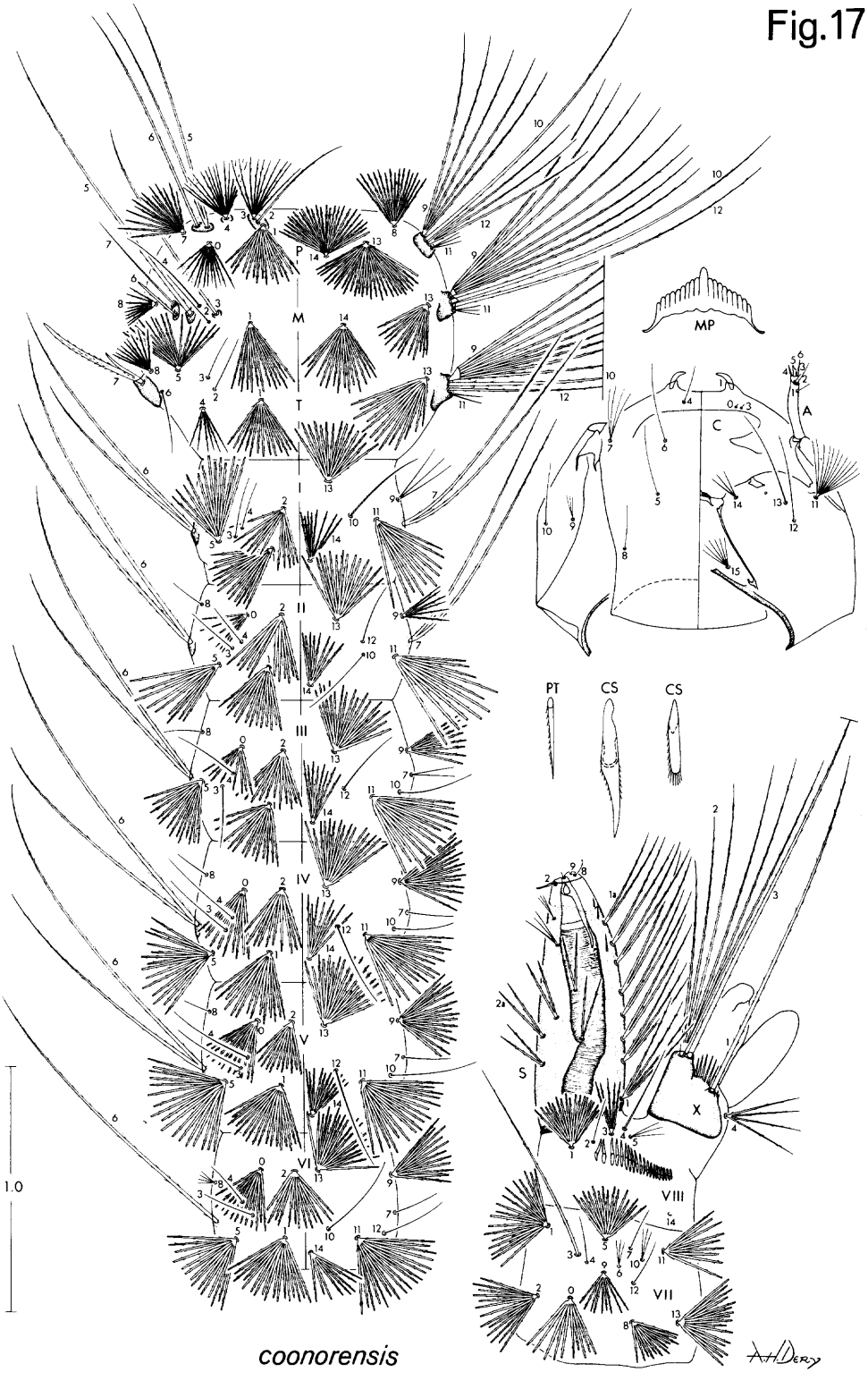
ceylonensis

Fig.16



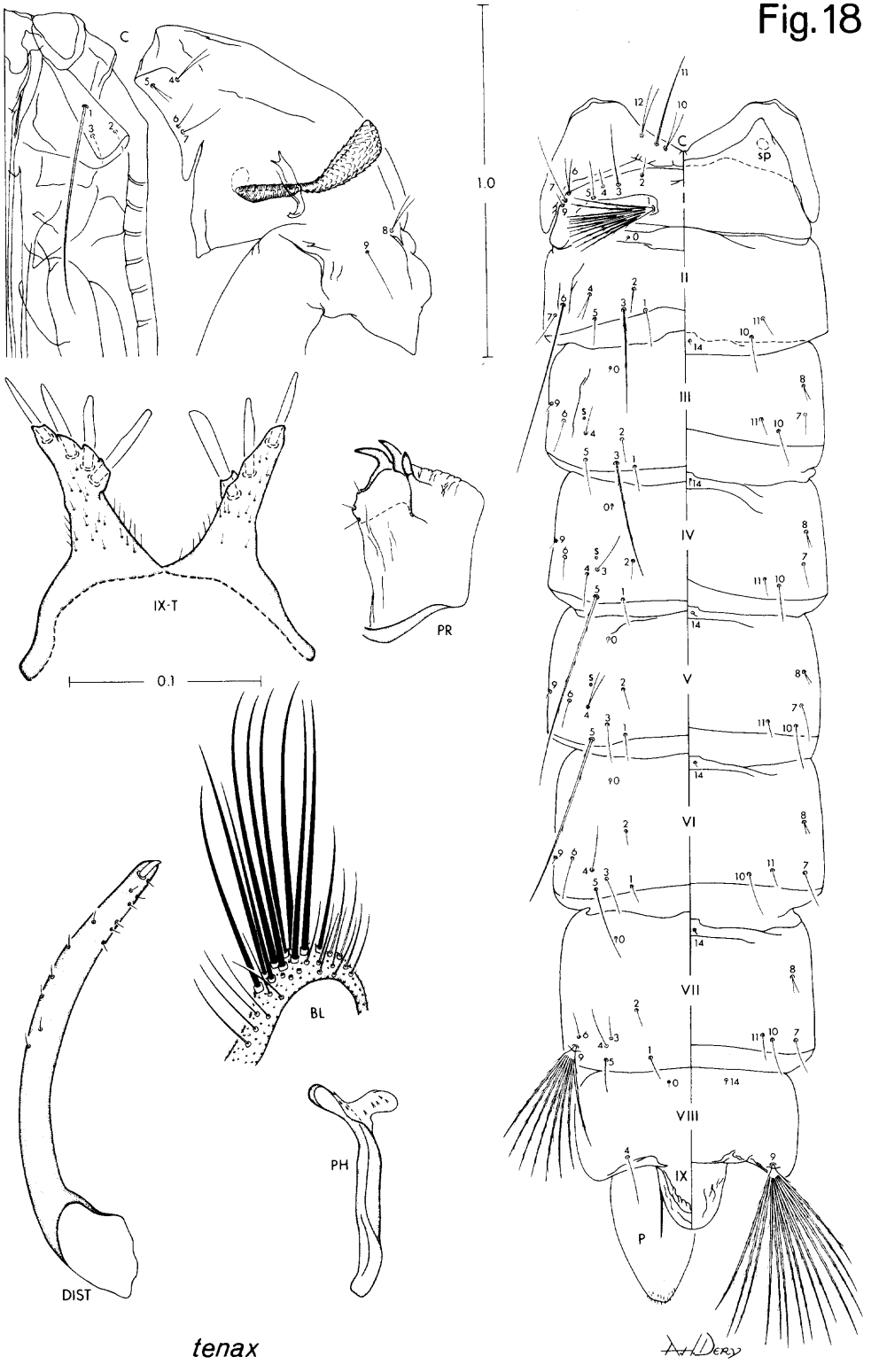
coonorensis

Fig.17



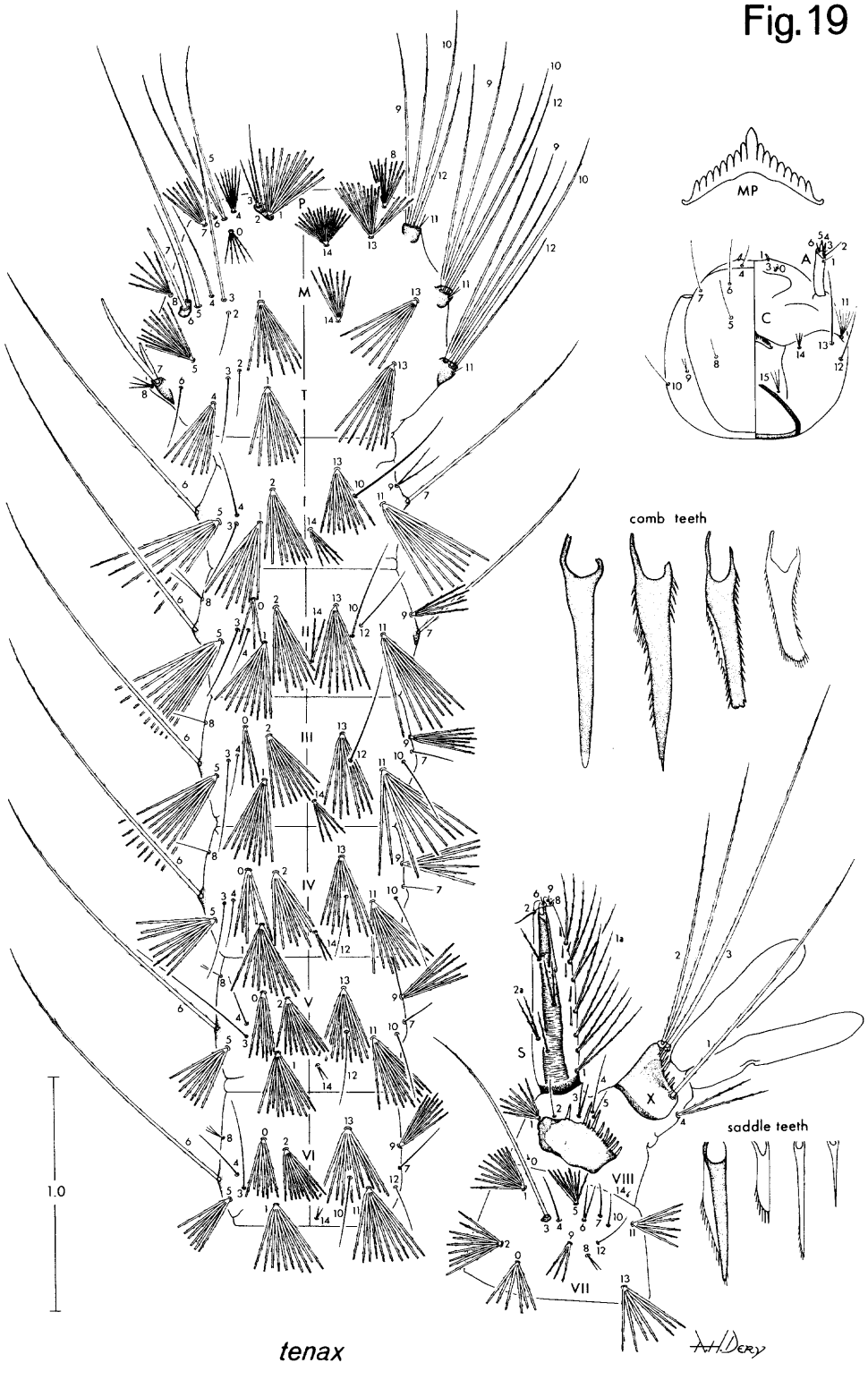
coonorensis

Fig. 18



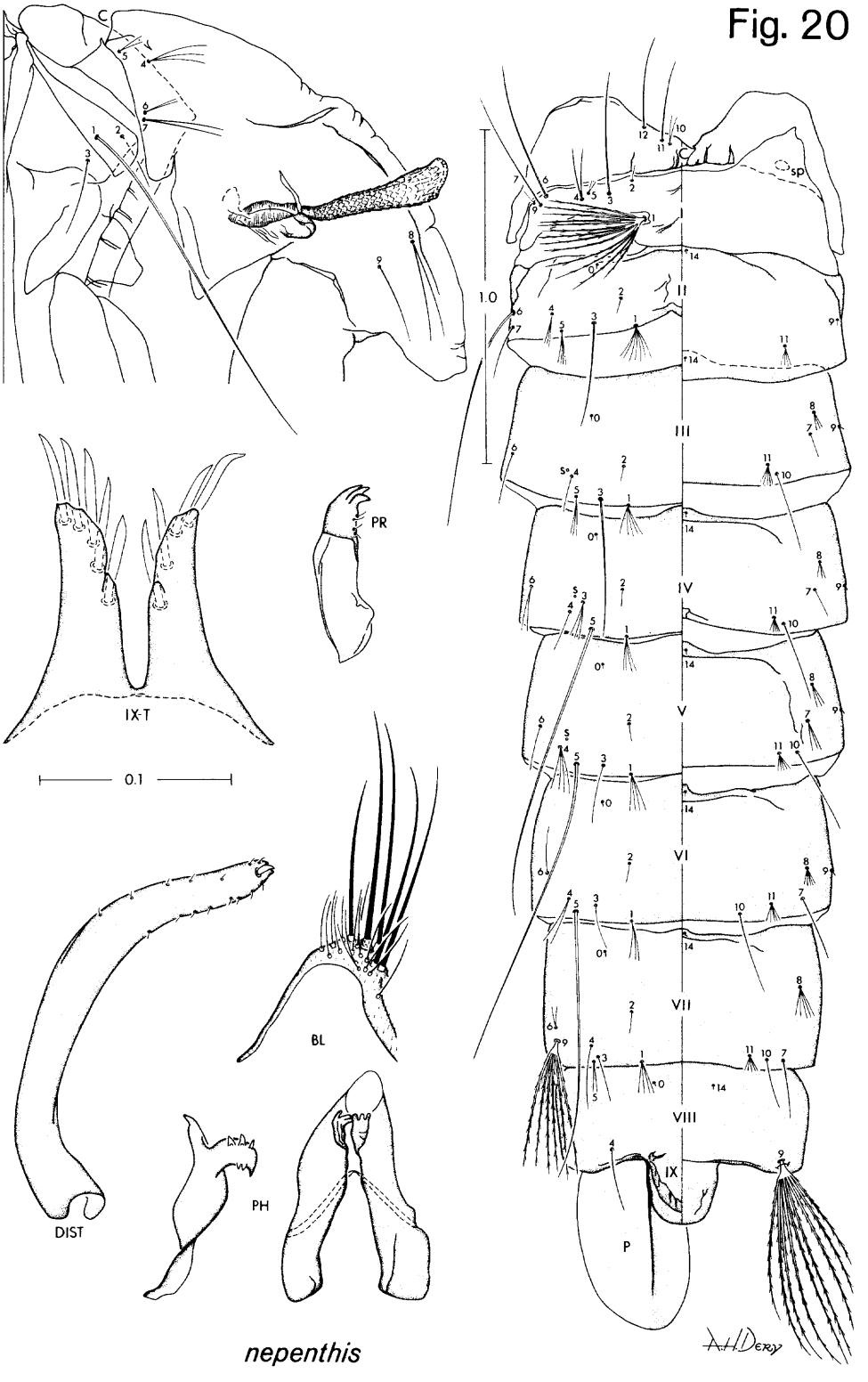
tenax

Fig.19


MP
A
C
comb teeth
saddle teeth
P
M
T
I
II
III
IV
V
VI
VII
VIII
S
X
1a
2a
1.0

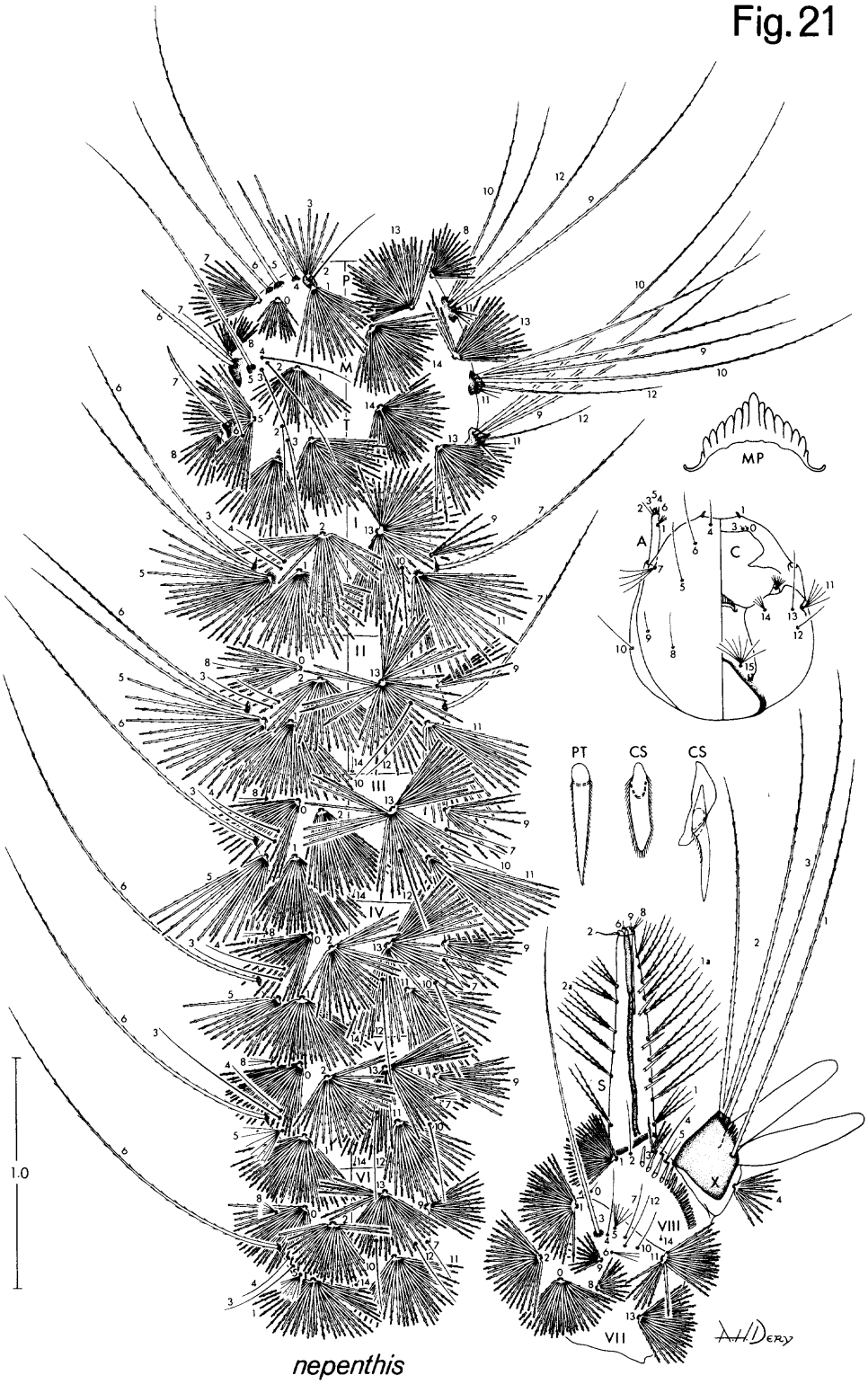
tenax

Fig. 20



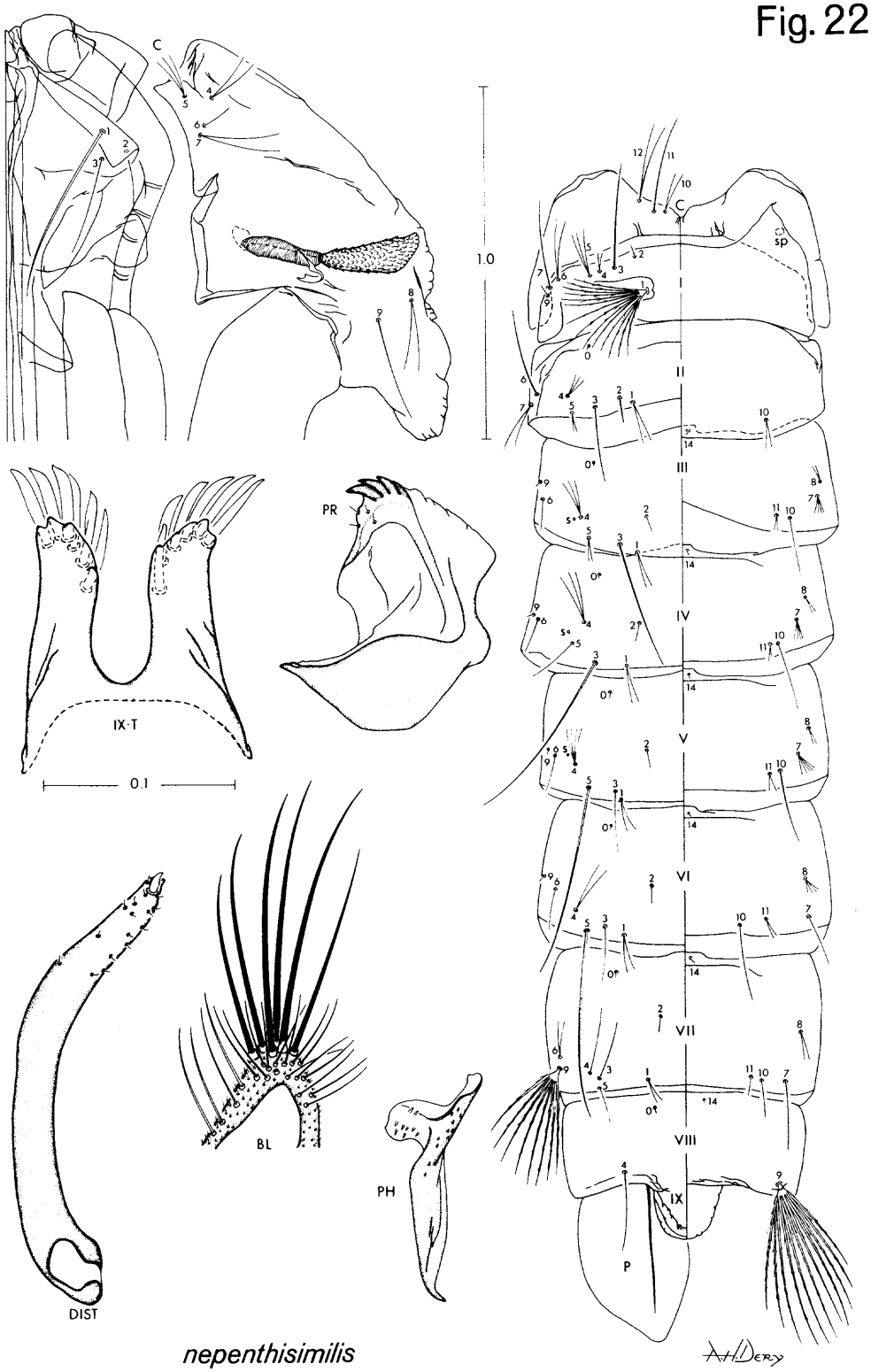
nepenthis

Fig. 21



nepenthis

Fig. 22



nepenthisimilis

Fig. 25

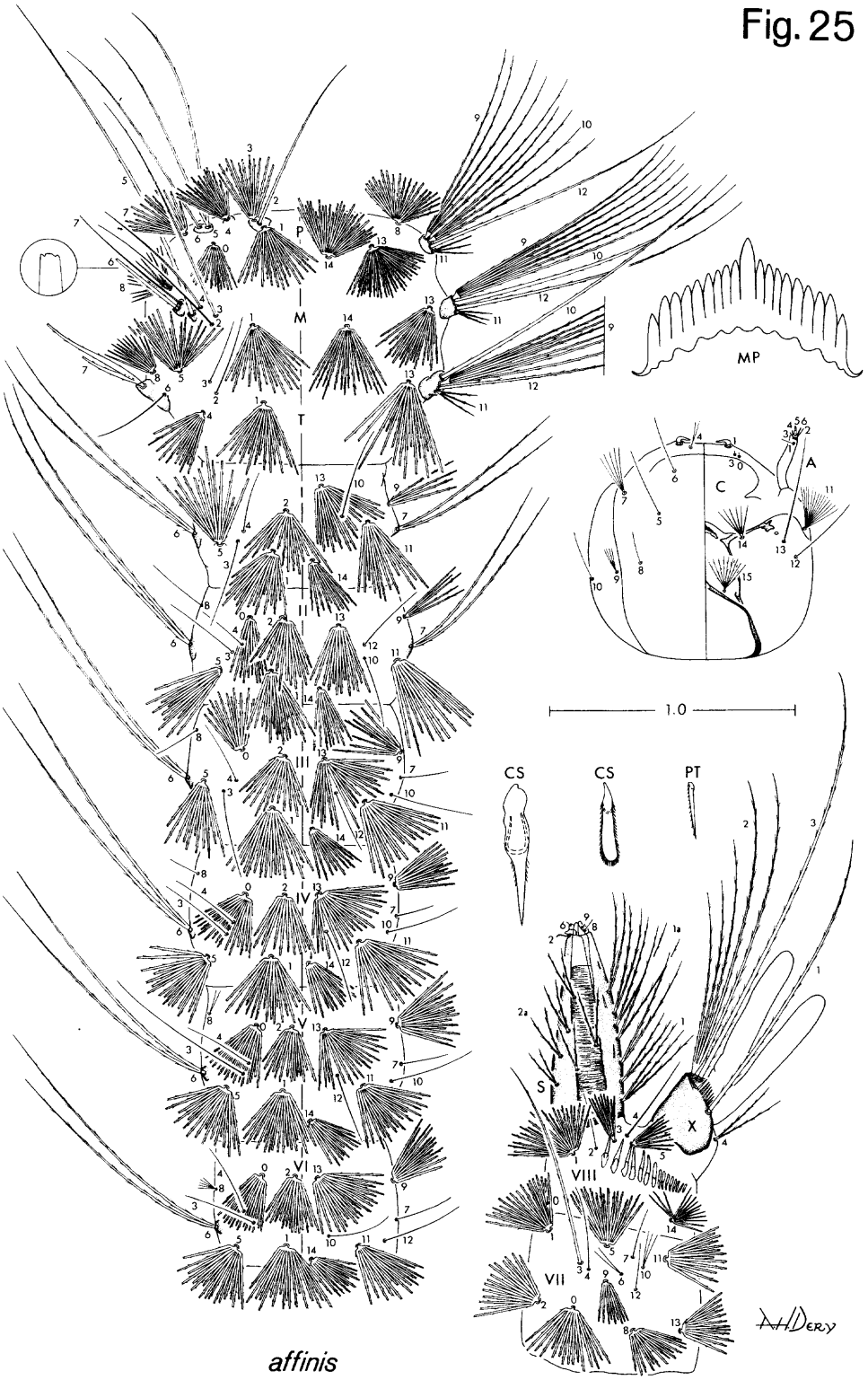
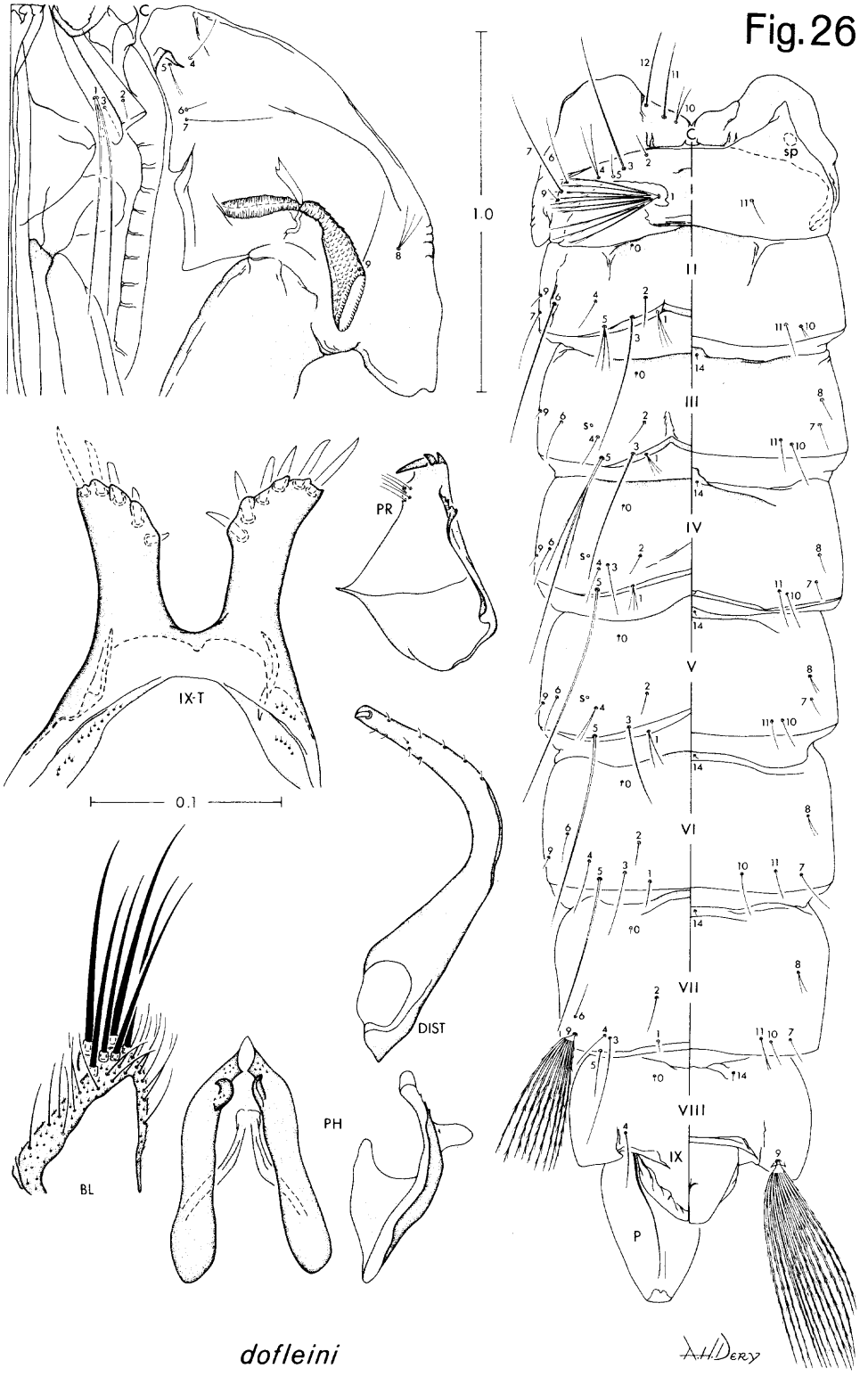
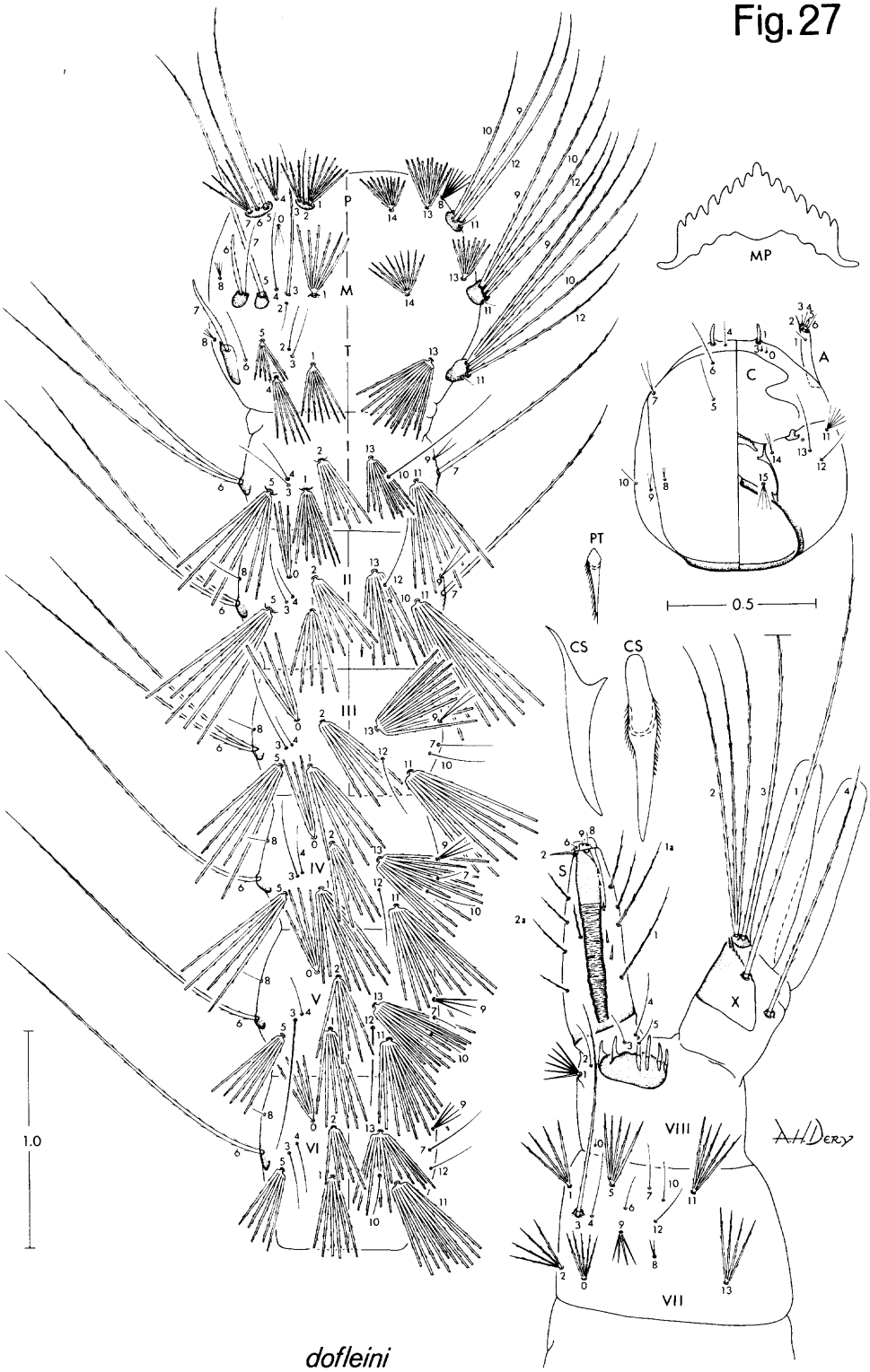


Fig. 26



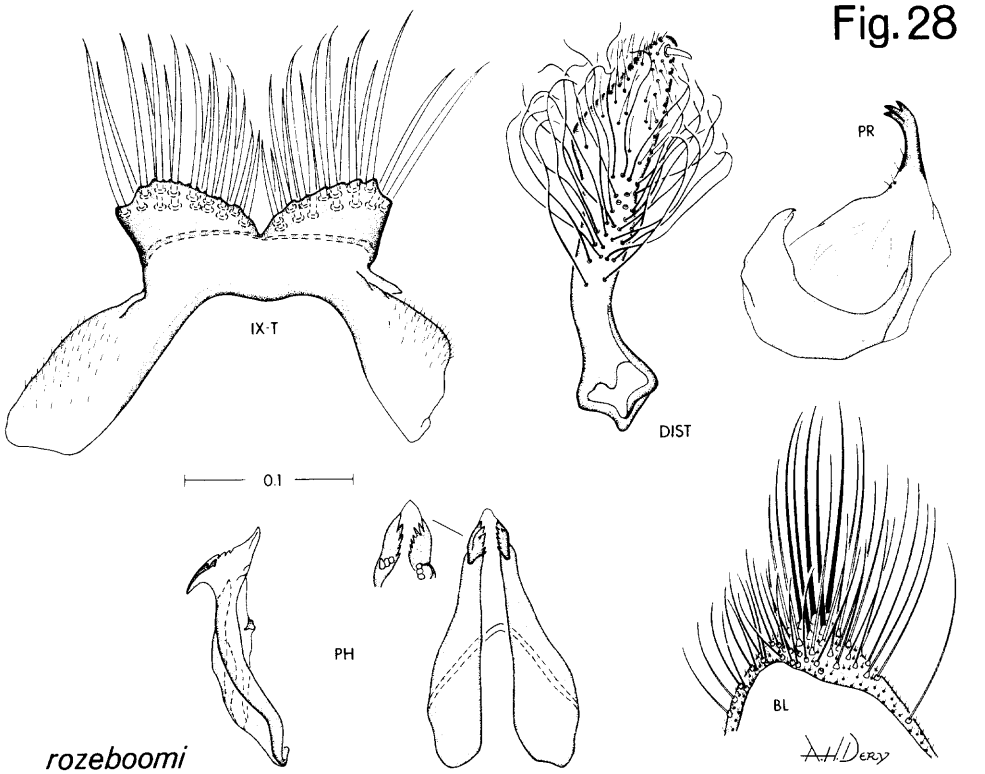
dofleini

Fig. 27



dofleini

Fig. 28



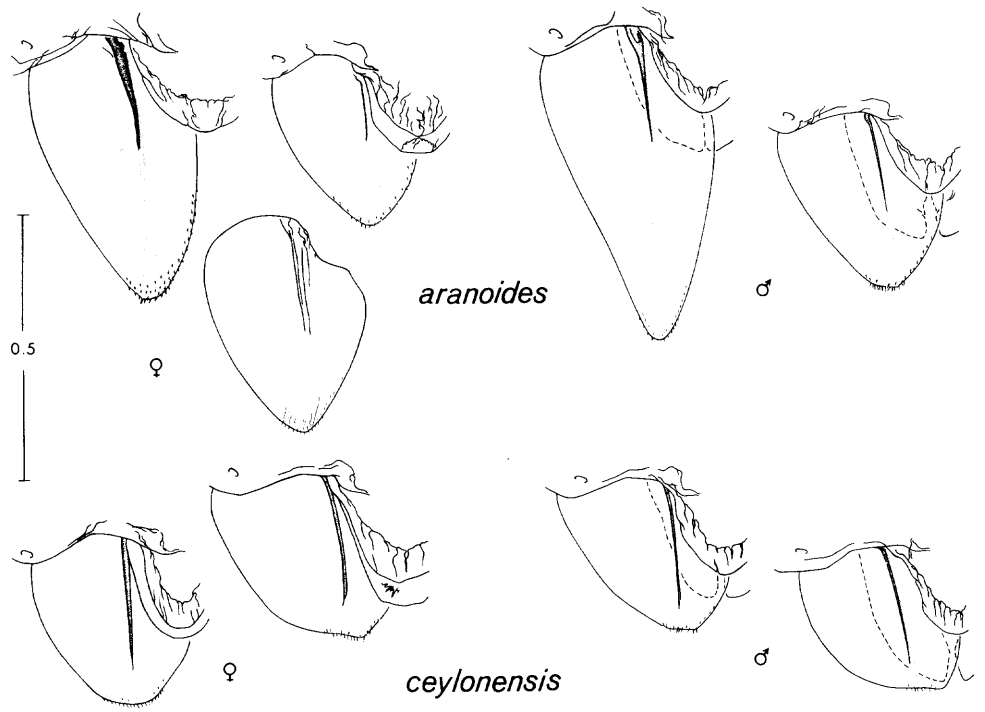
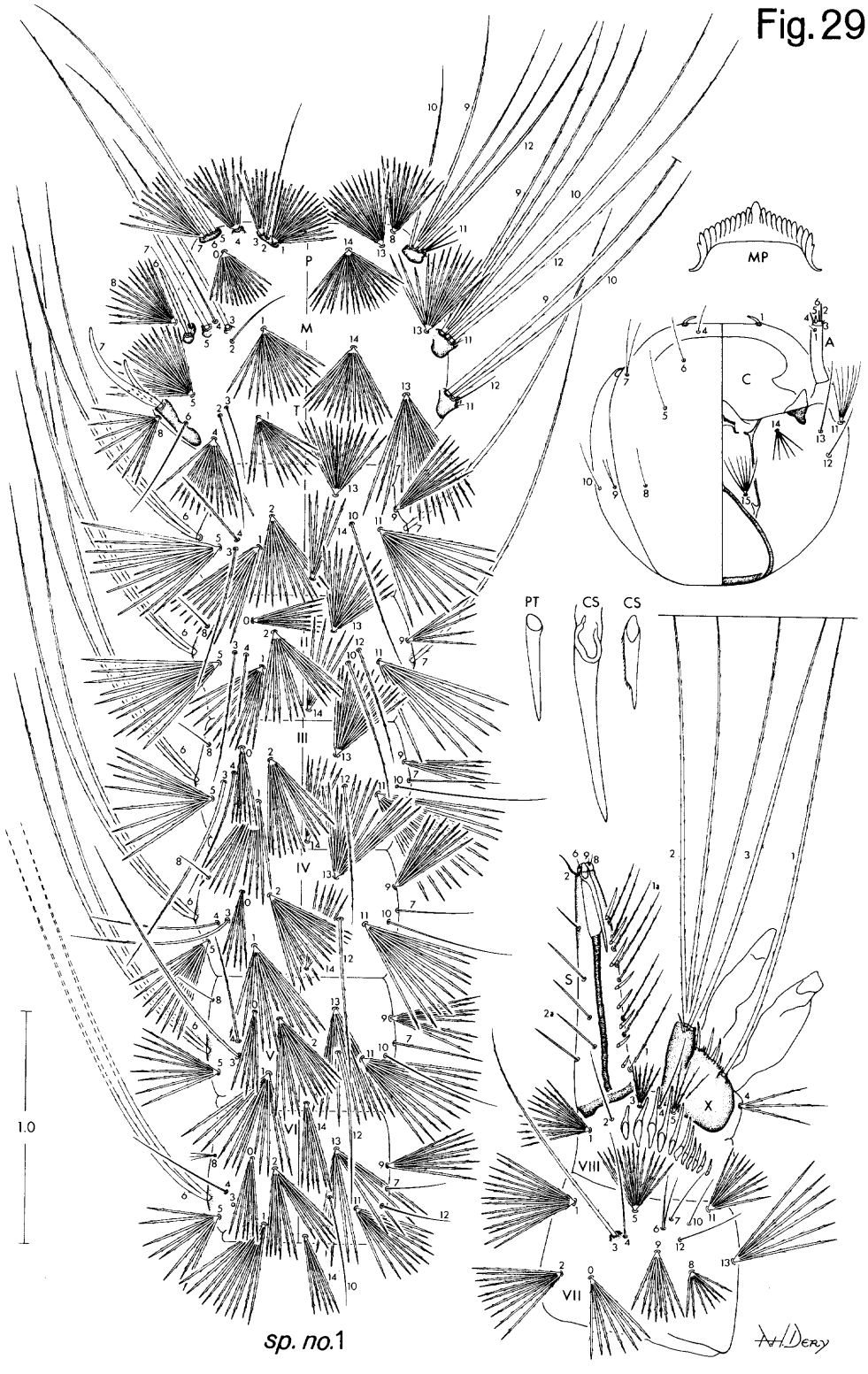
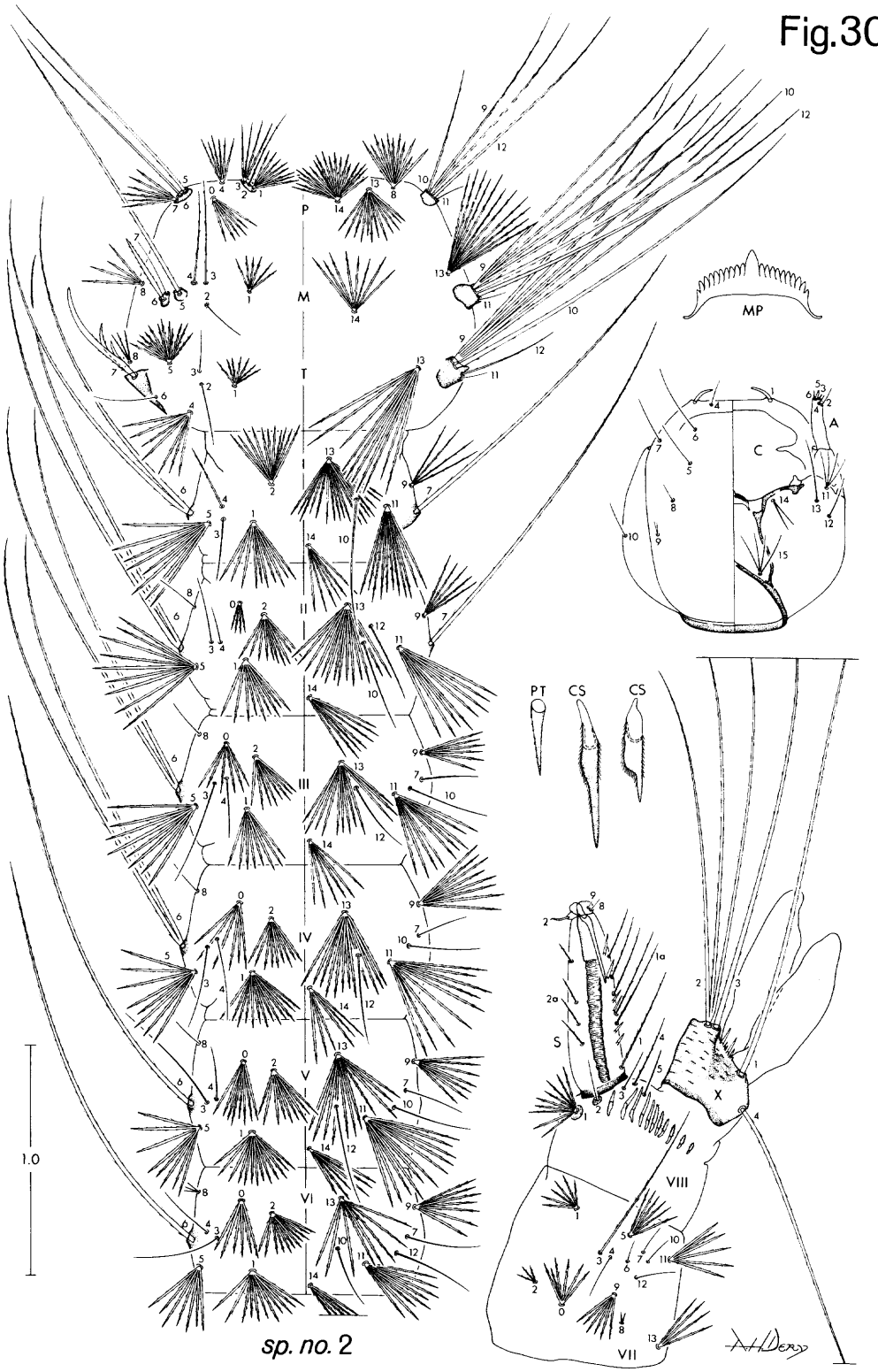


Fig. 29



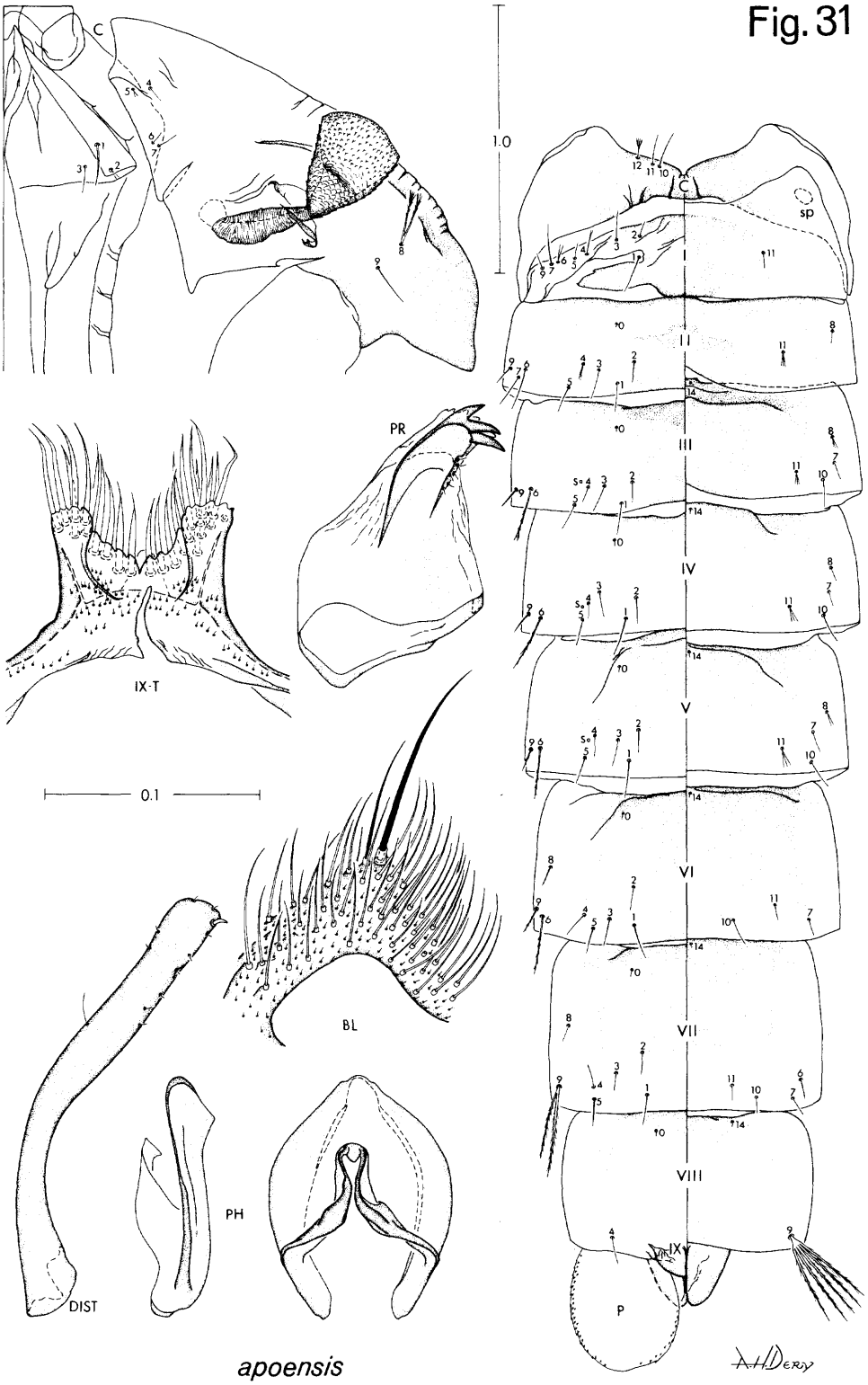
*sp. no.*1

Fig.30



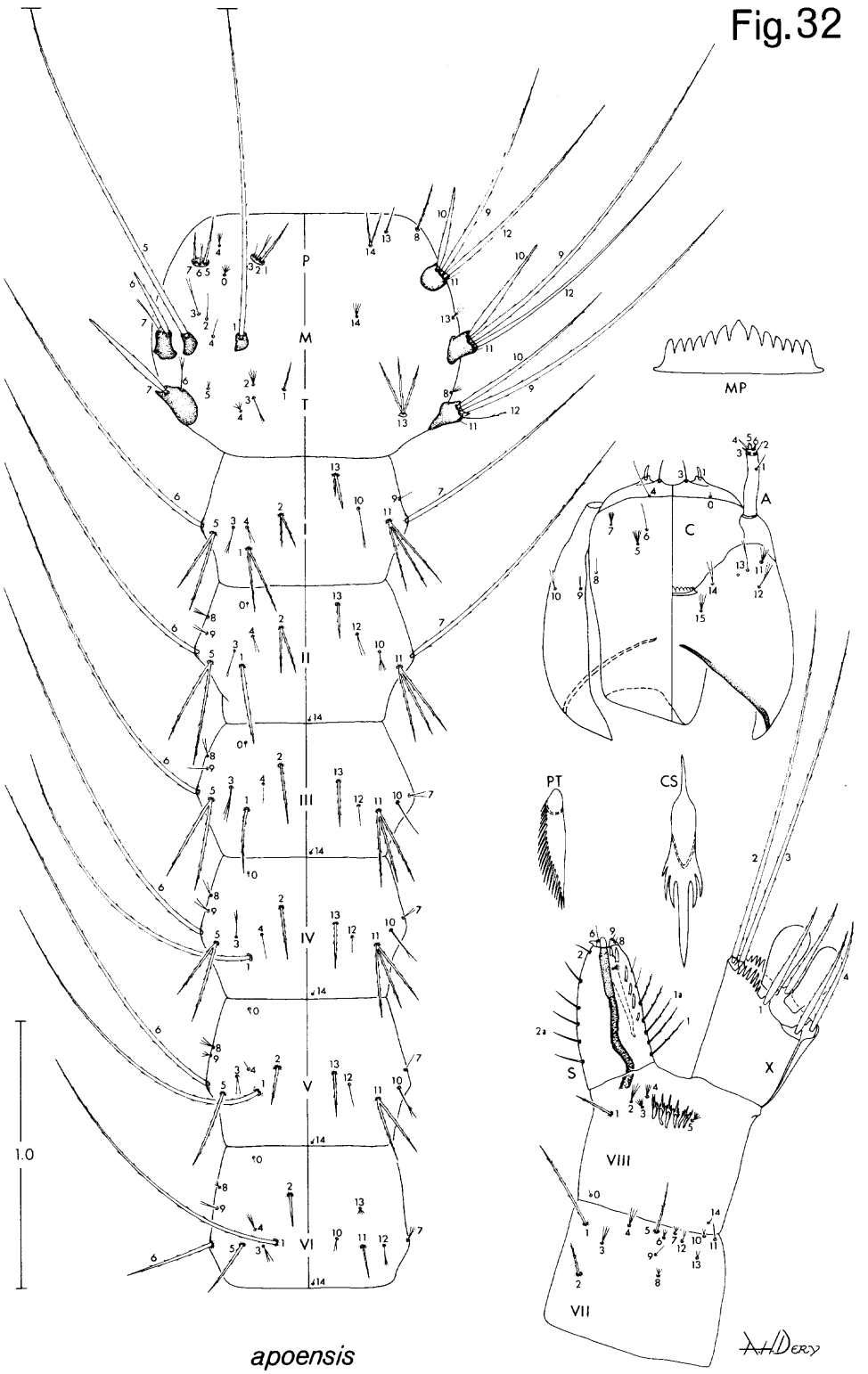
sp. no. 2

Fig. 31



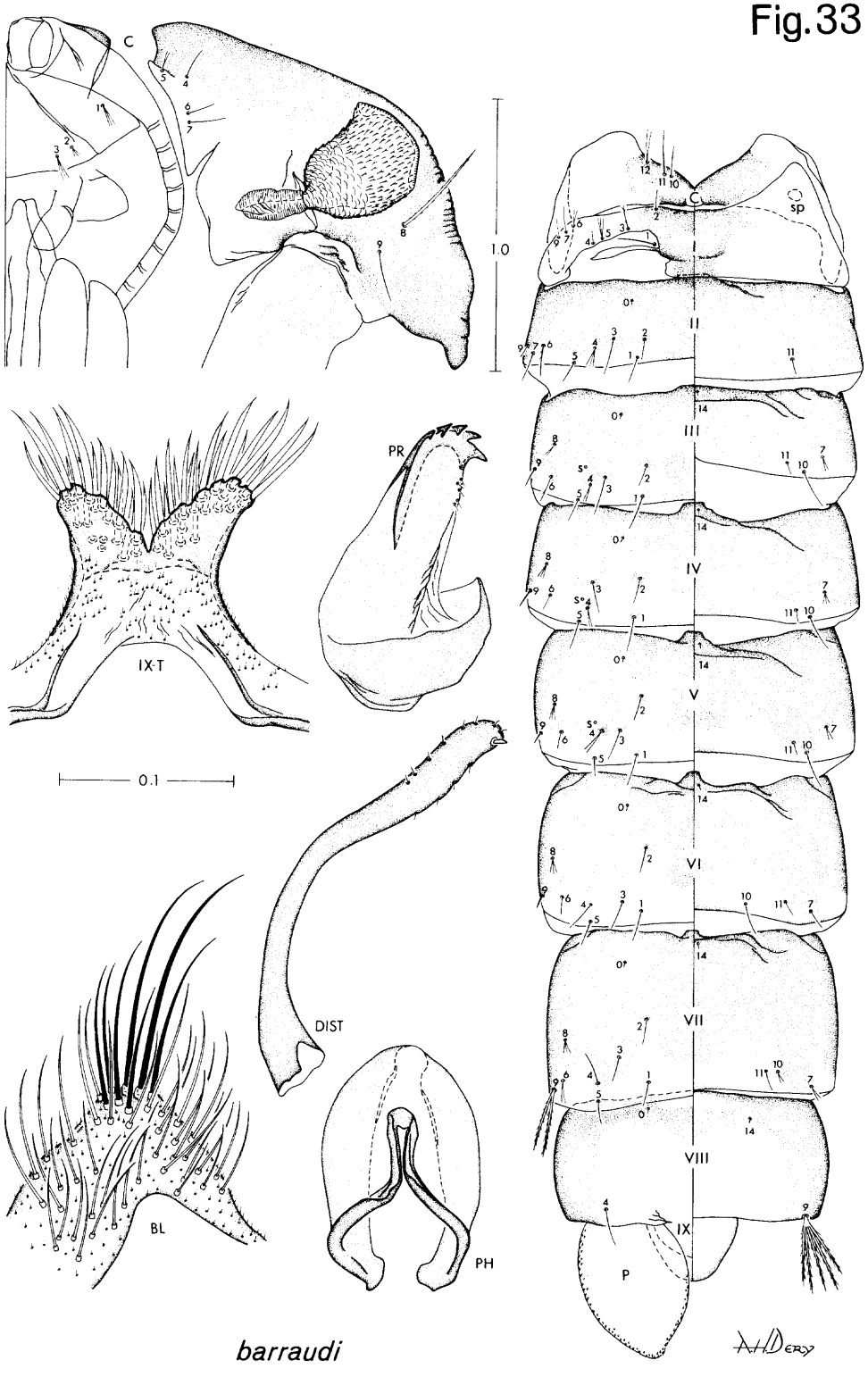
apoensis

Fig.32



apoensis

Fig.33



barraudi

Fig. 34

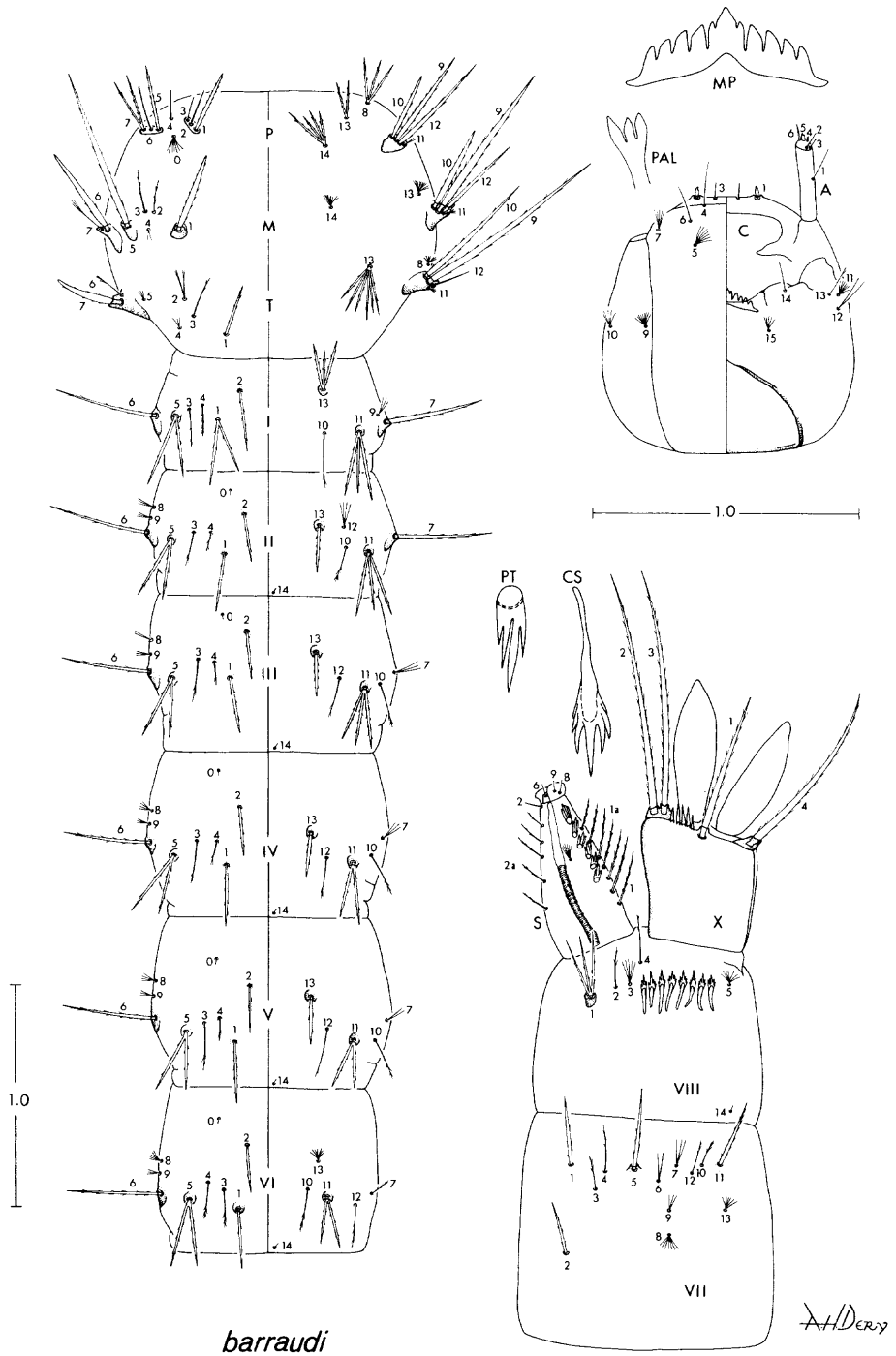
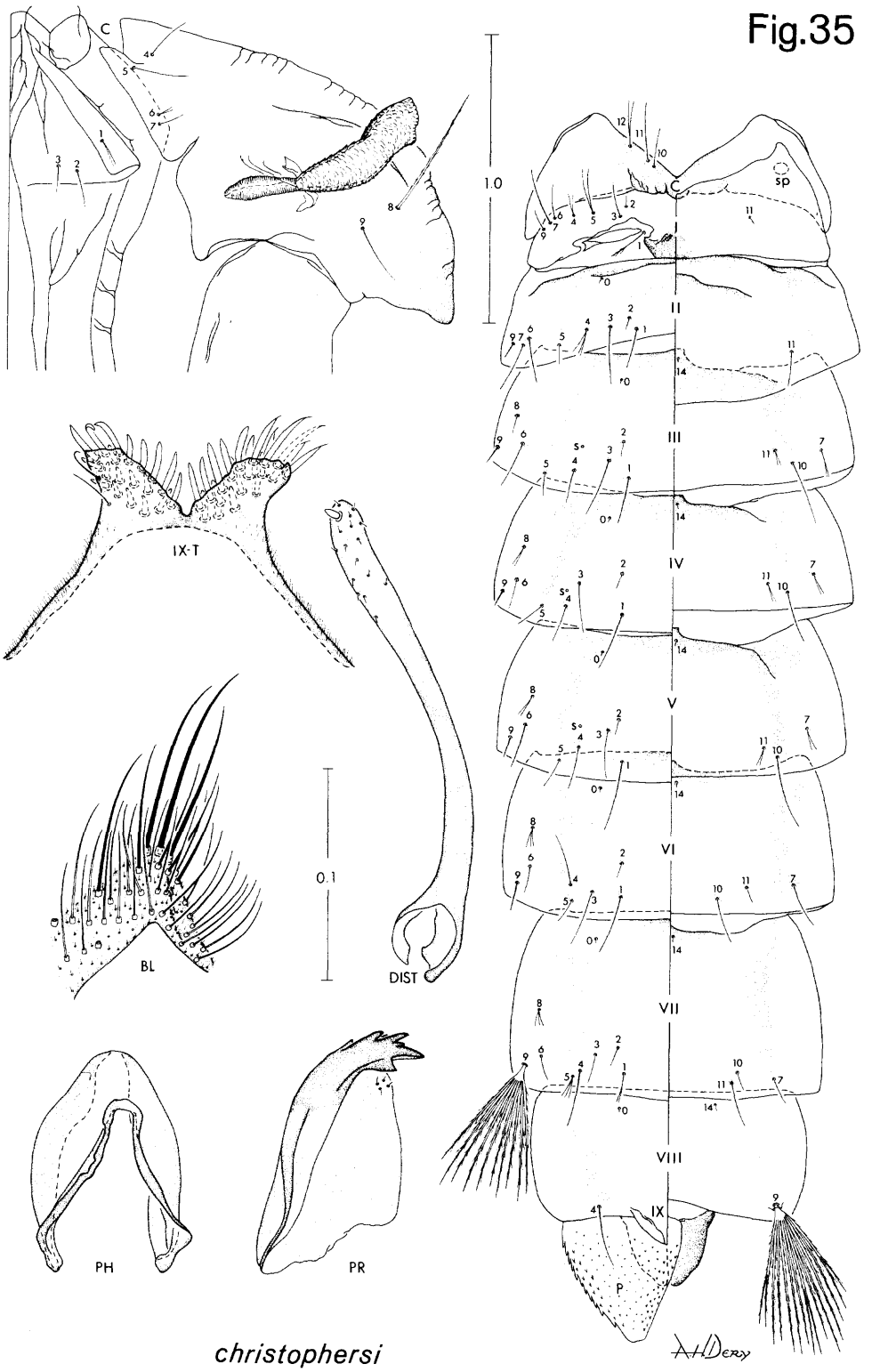
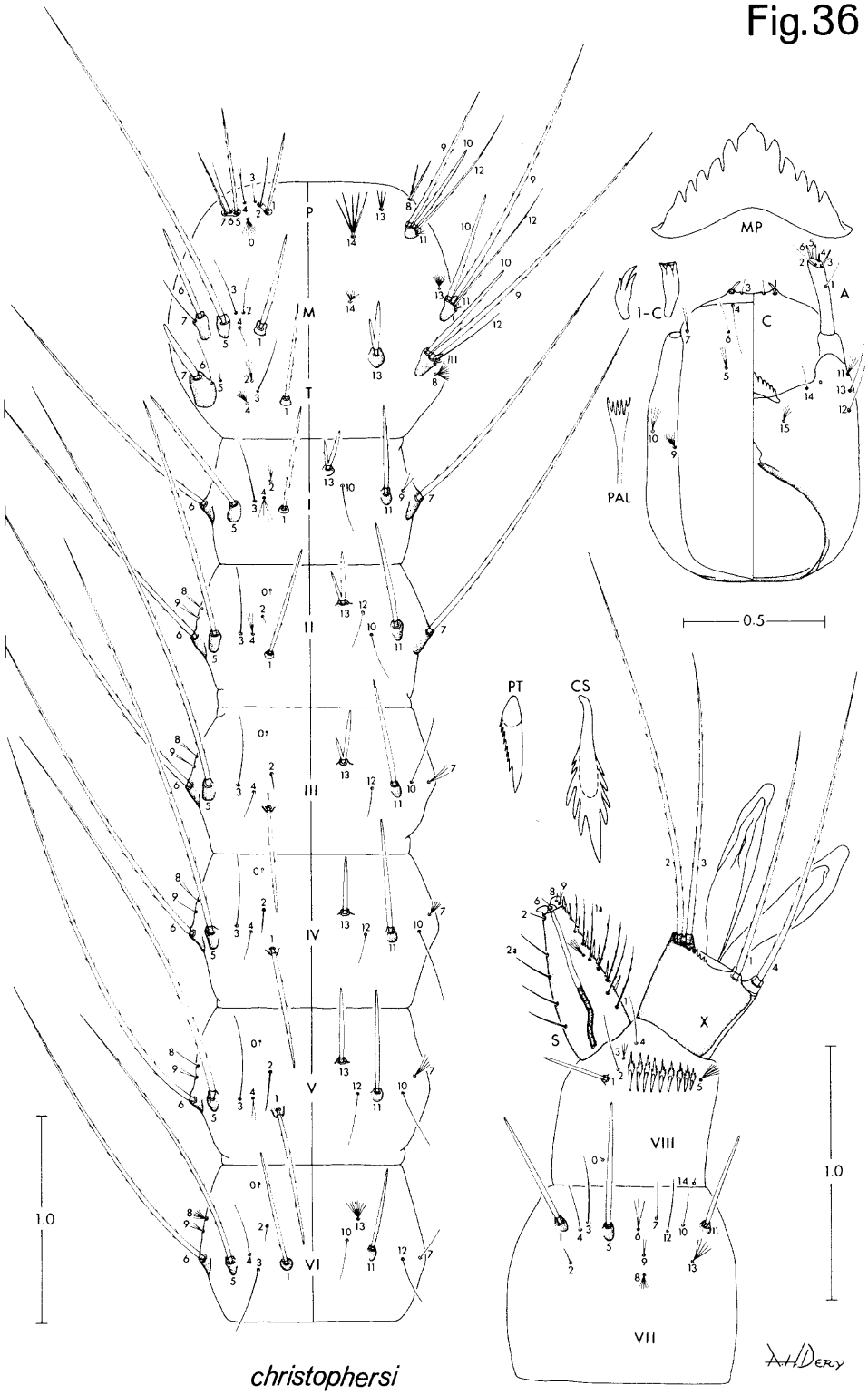

MP
PAL
A
C
1.0
PT
CS
S
X
VIII
VII
P
M
T
I
II
III
IV
V
VI
1.0
barraudi
A.H.Deny

Fig.35



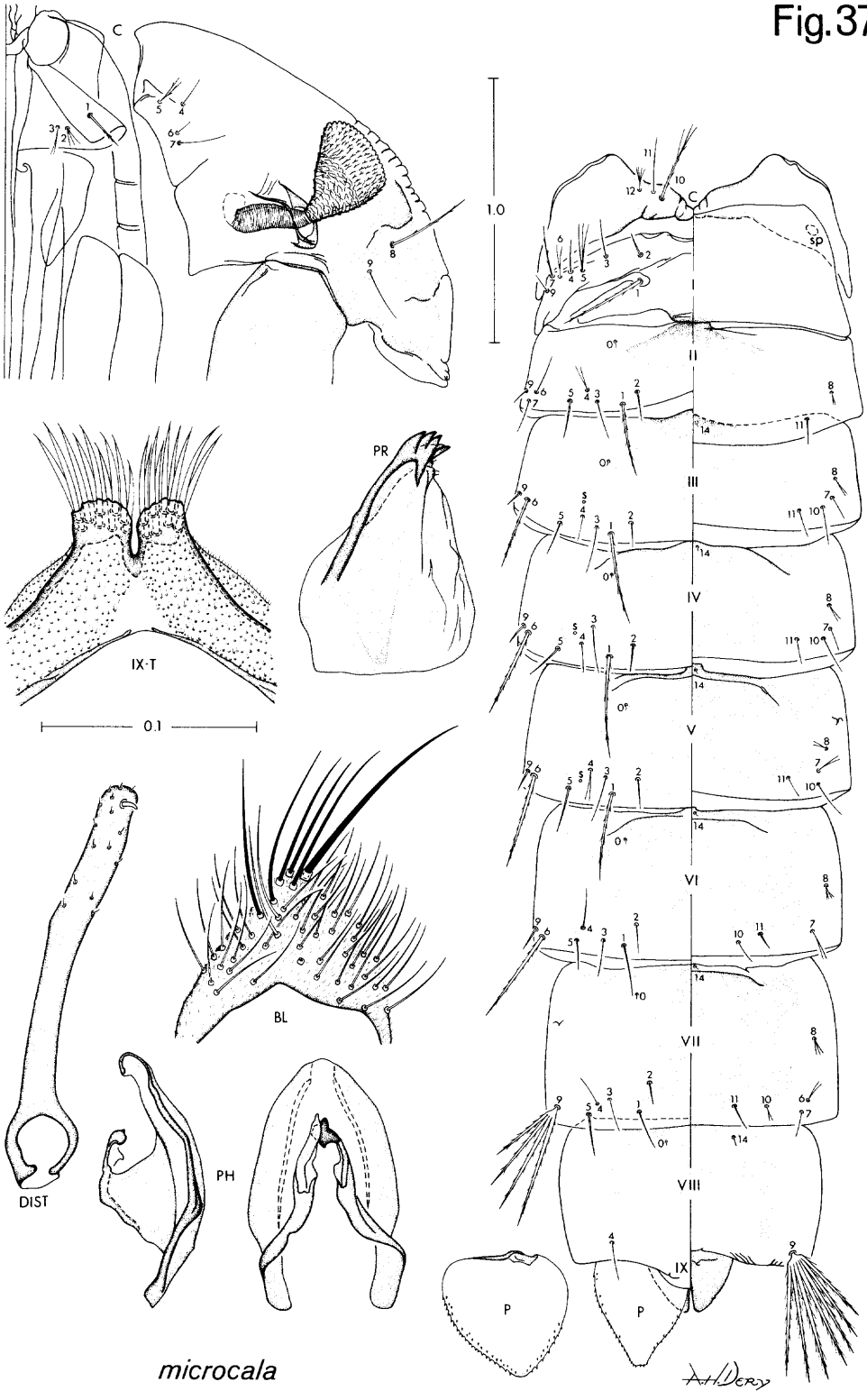
christophersi

Fig.36



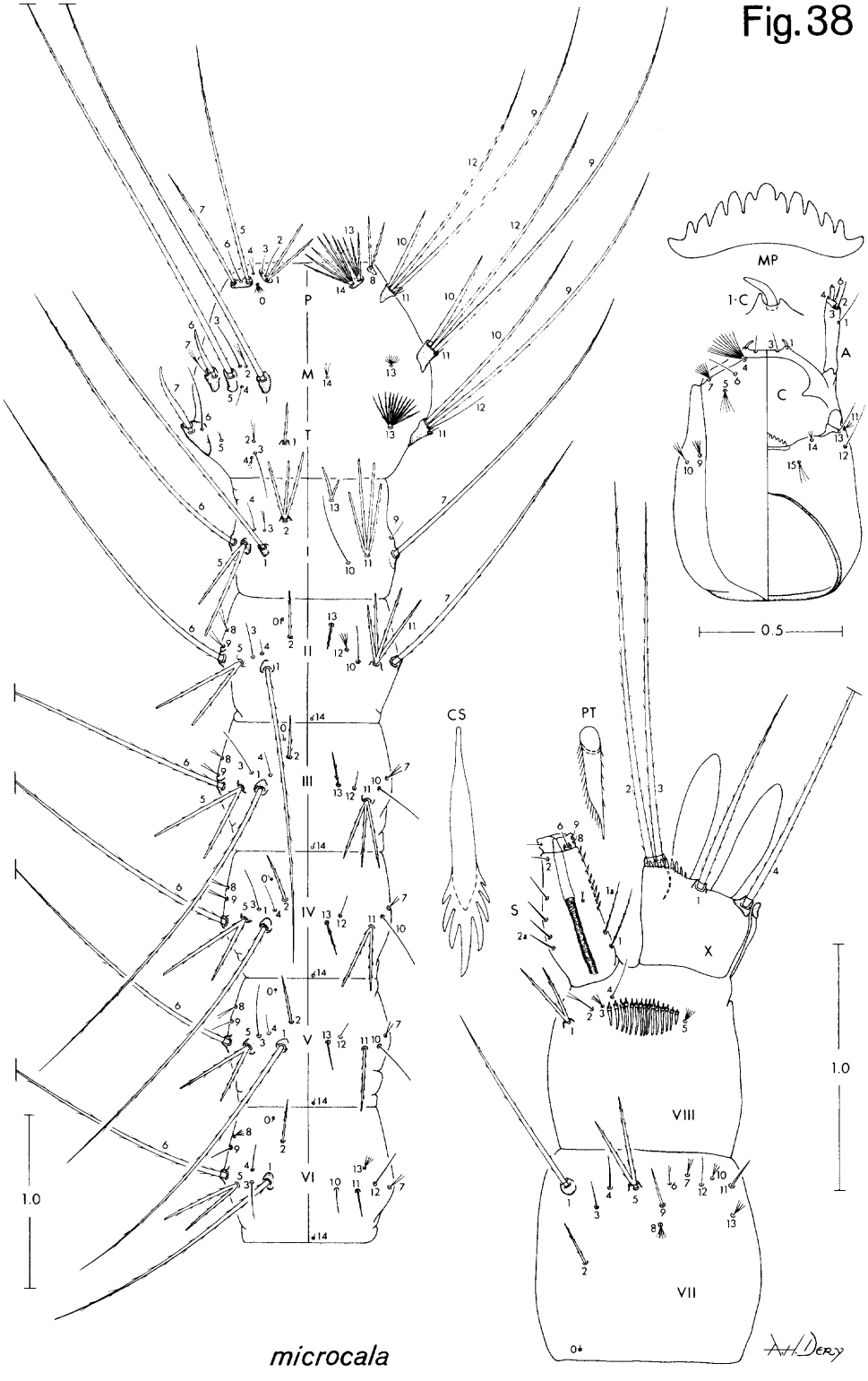
christophersi

Fig.37



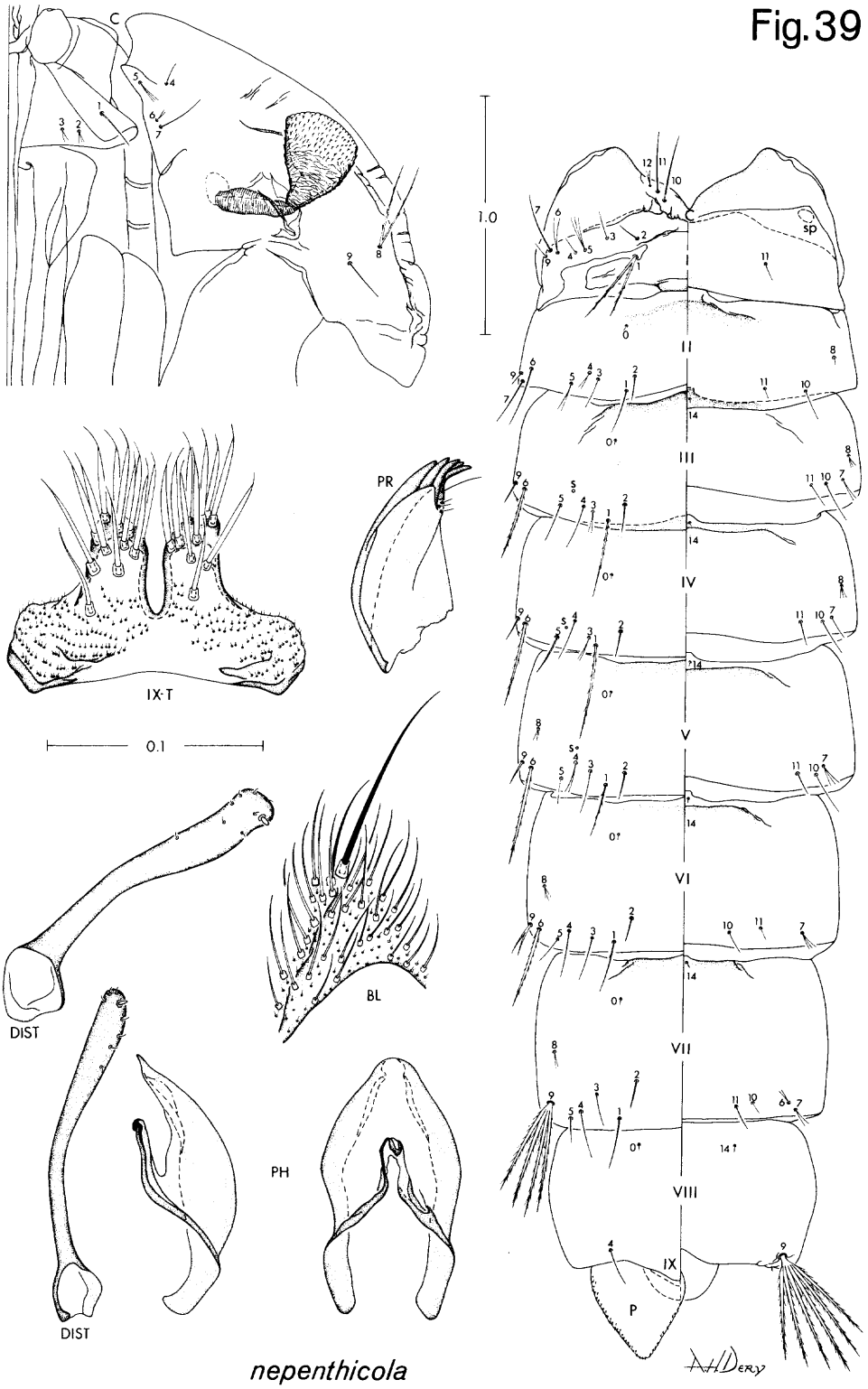
microcala

Fig. 38



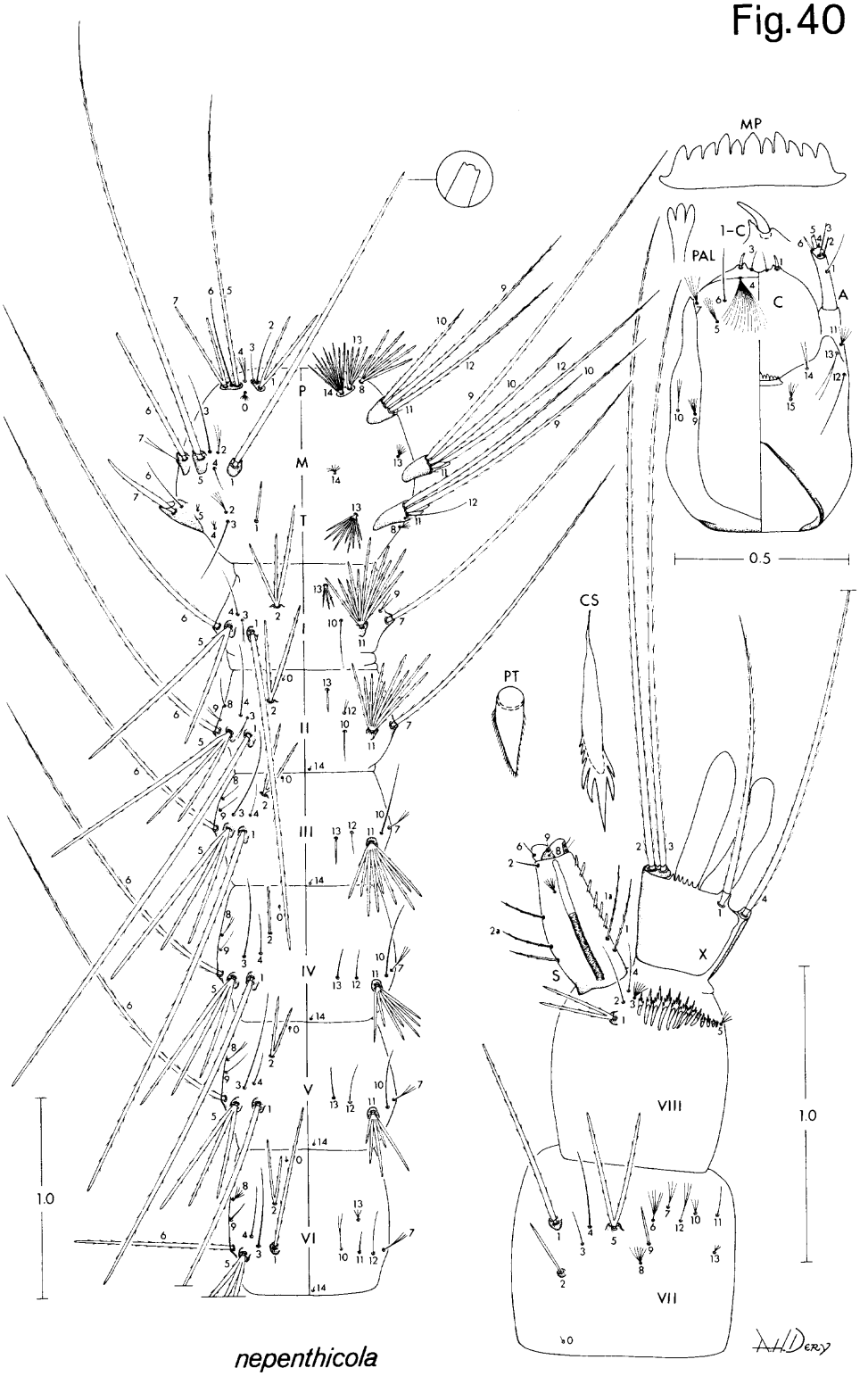
microcala

Fig. 39



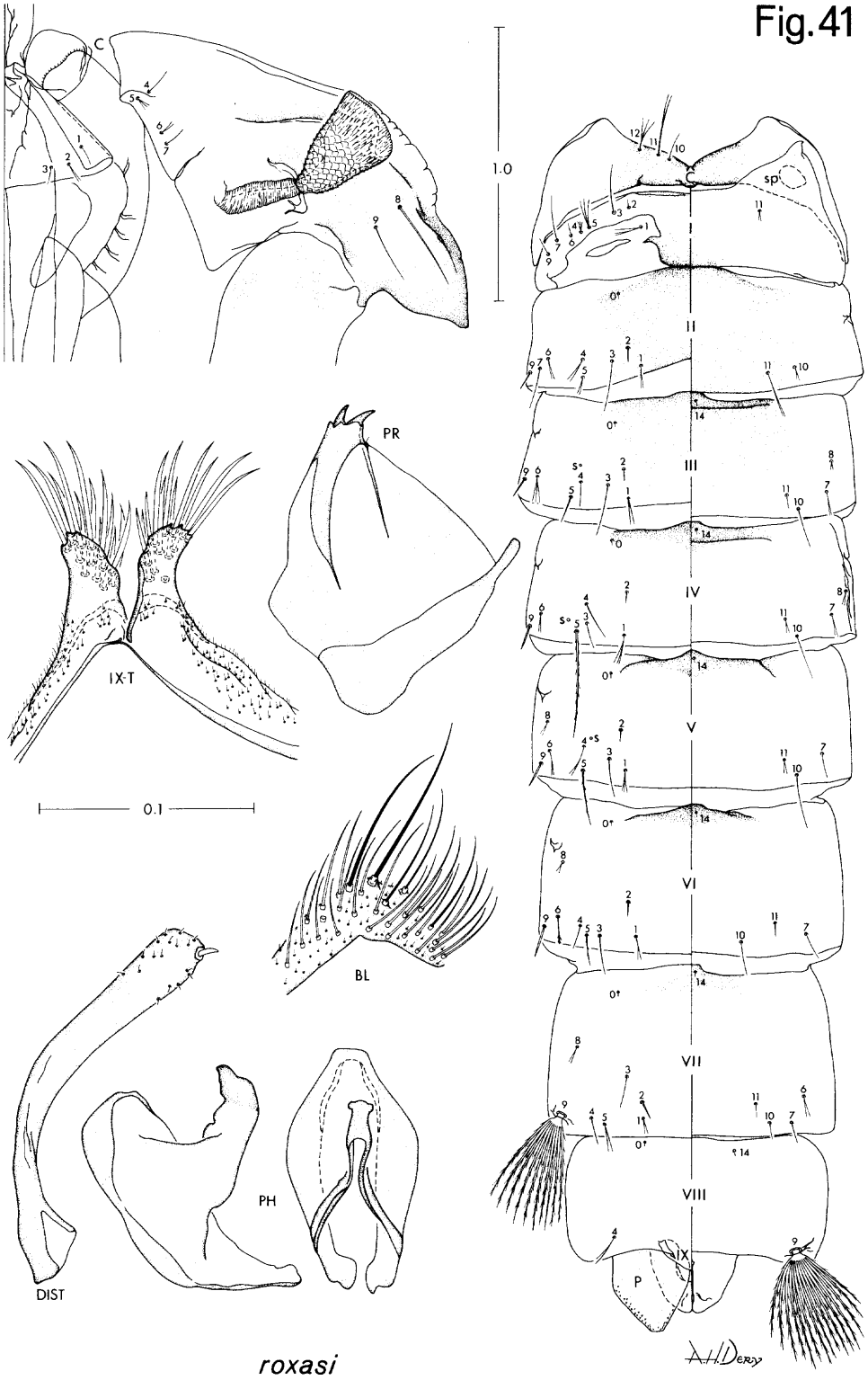
nepenthicola

Fig. 40



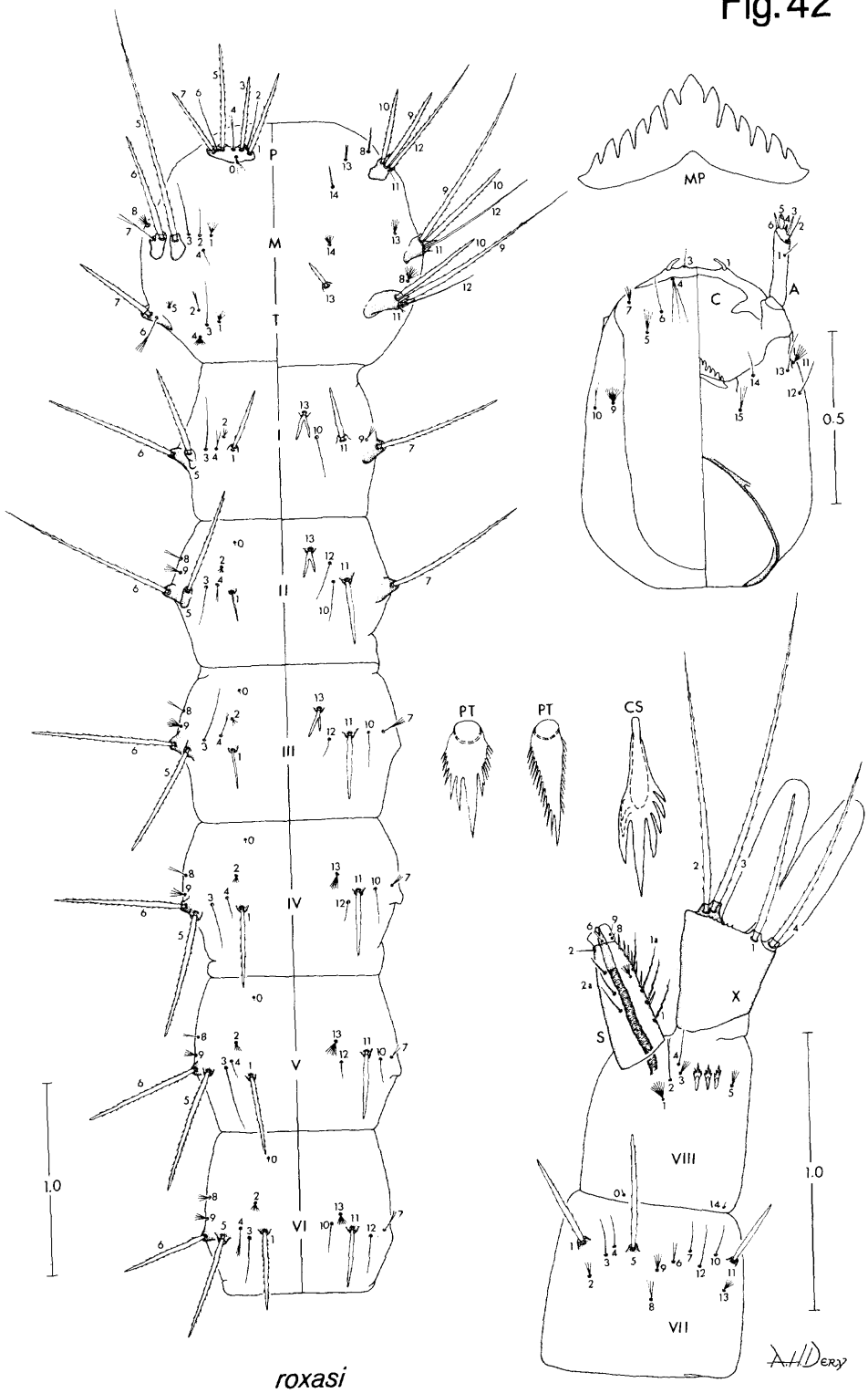
nepenthicola

Fig.41



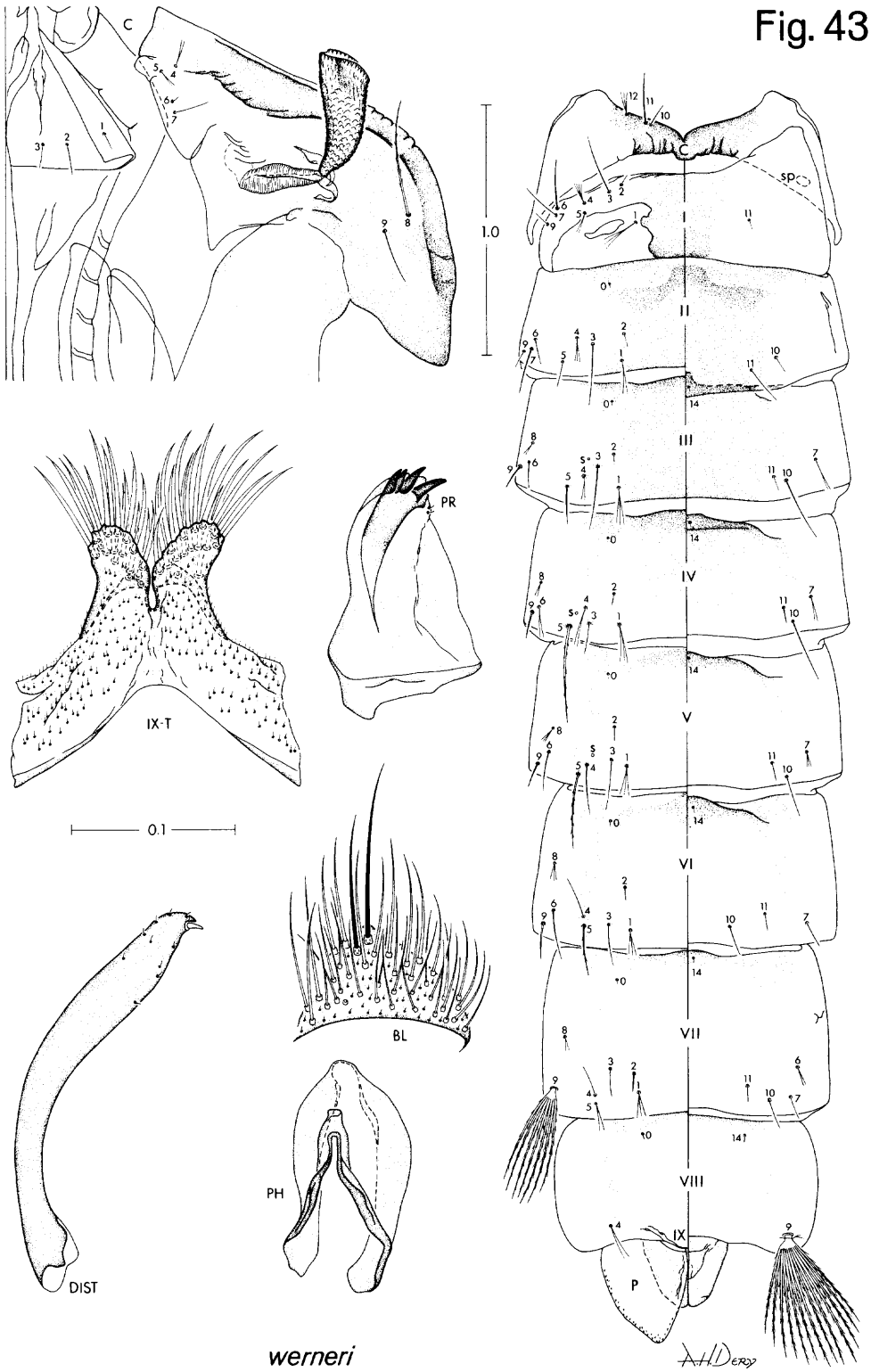
roxasi

Fig. 42



roxasi

Fig. 43



werneri

Fig.44

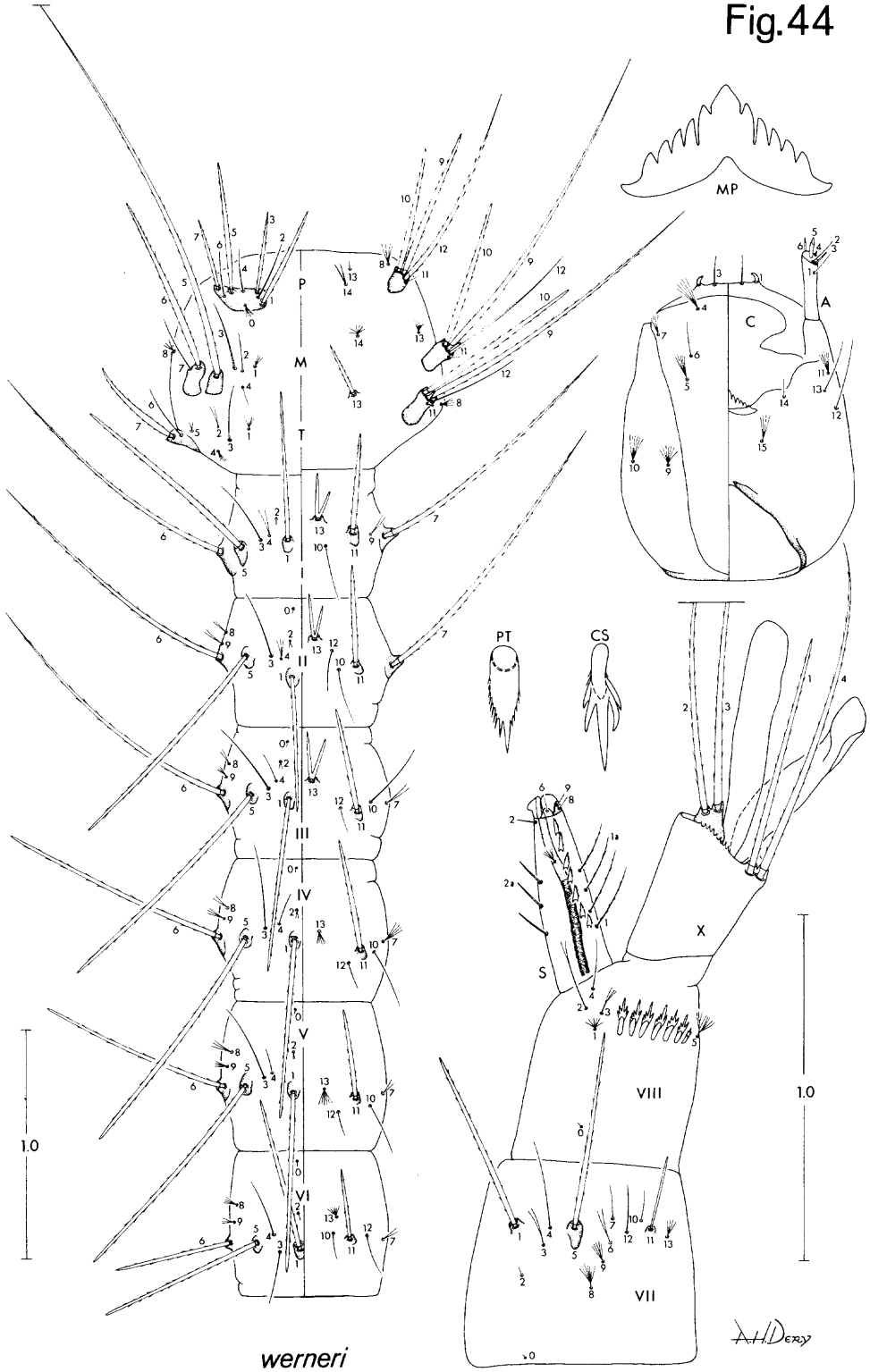
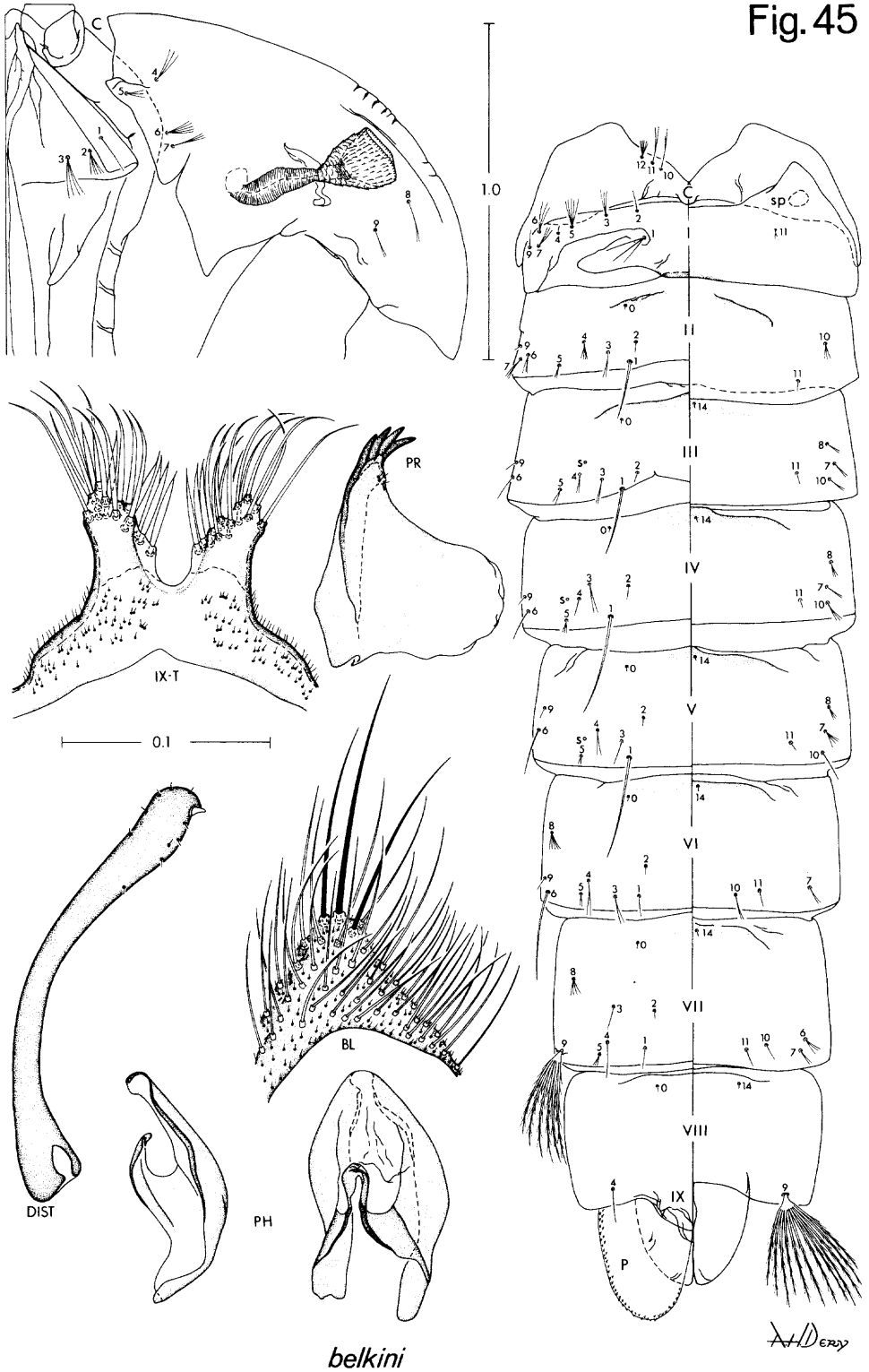
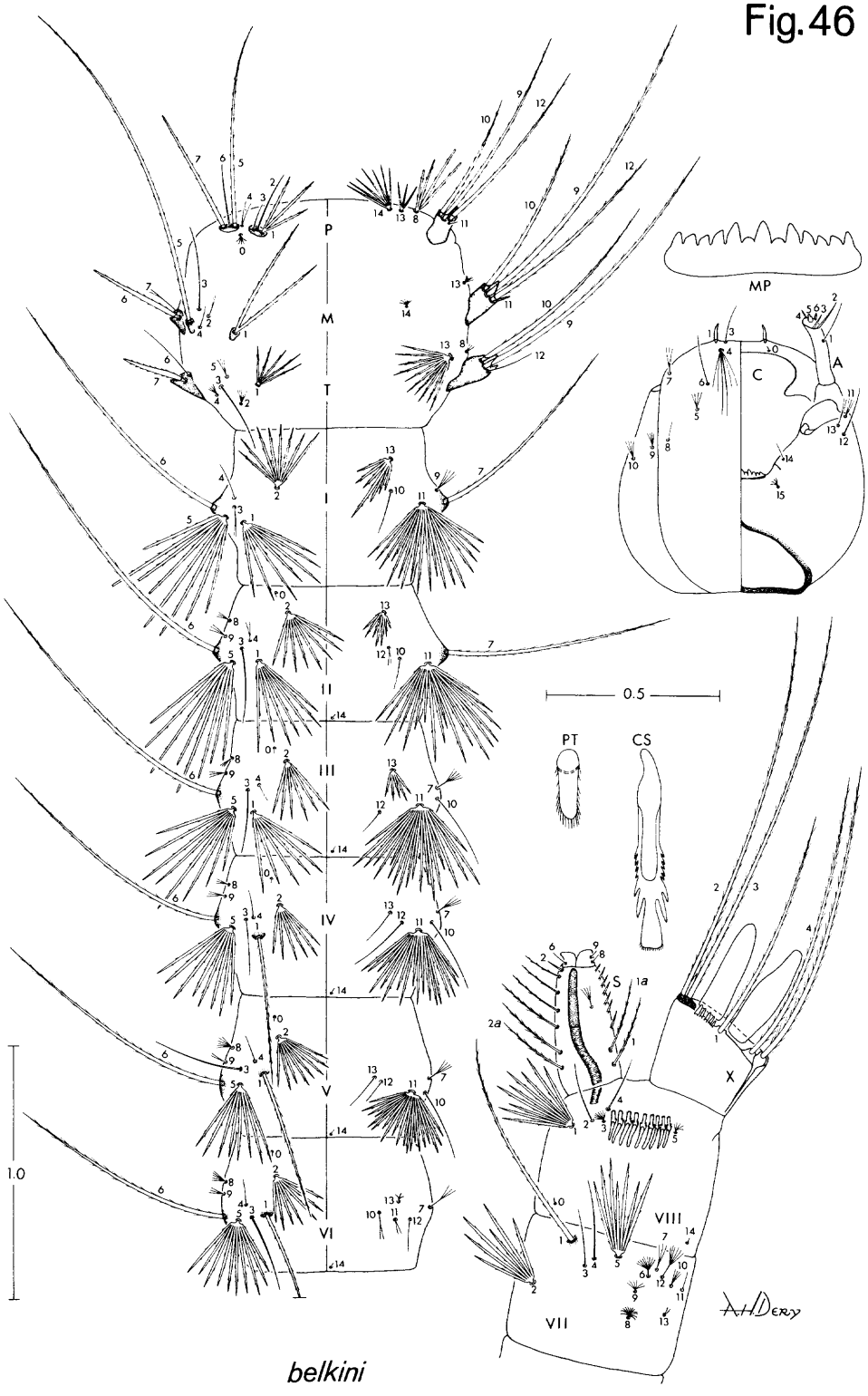


Fig. 45



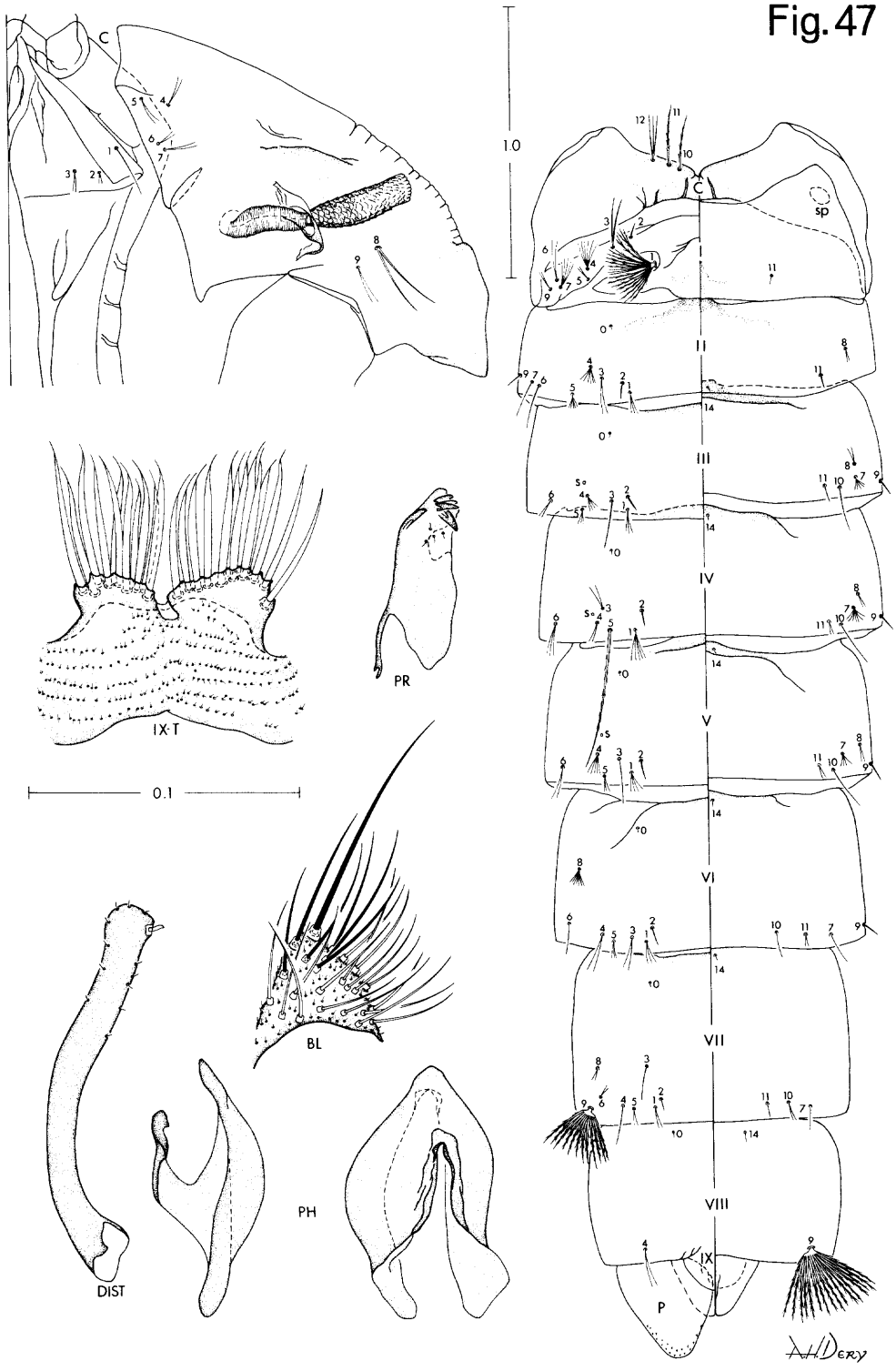
belkini

Fig. 46



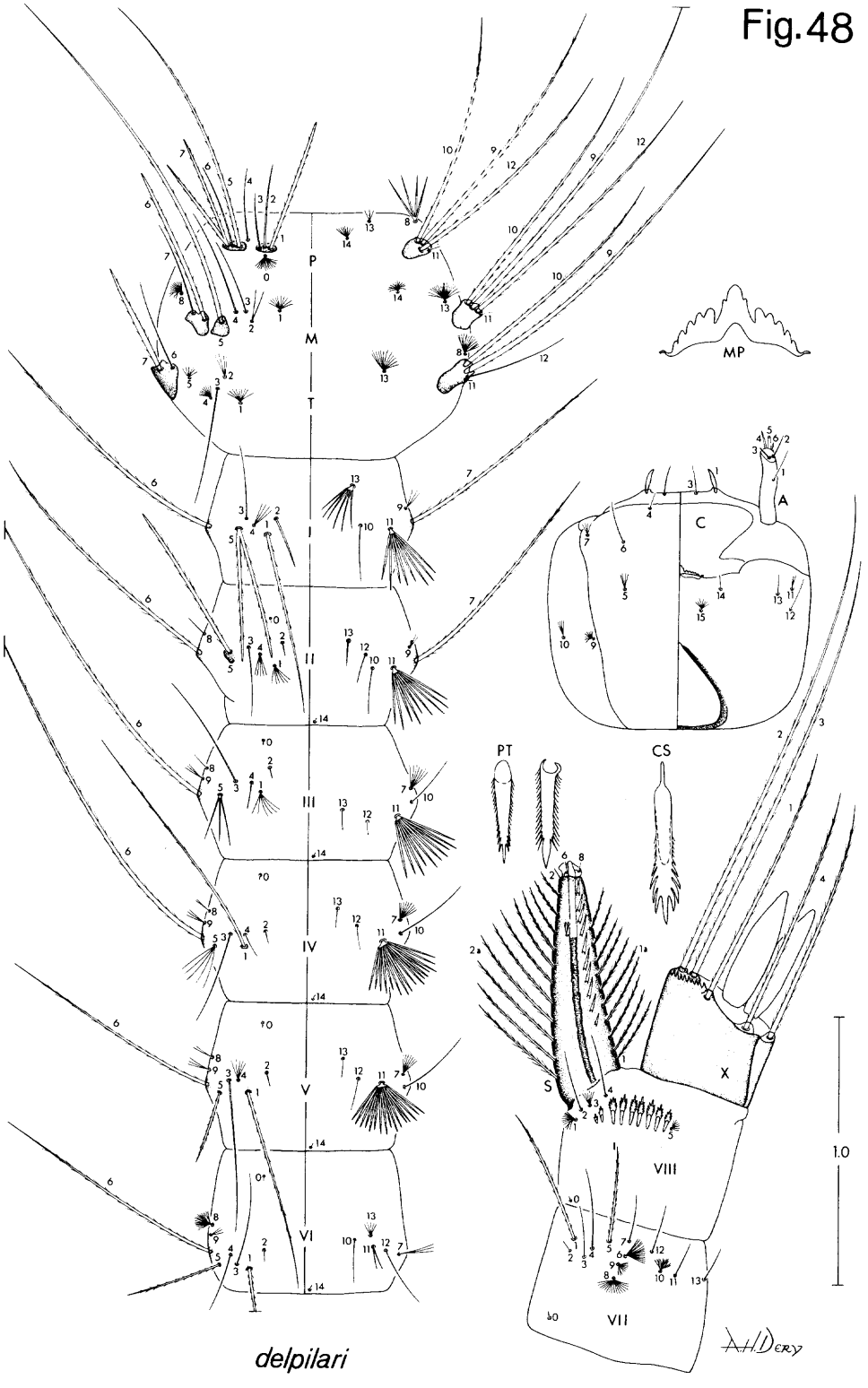
belkini

Fig. 47



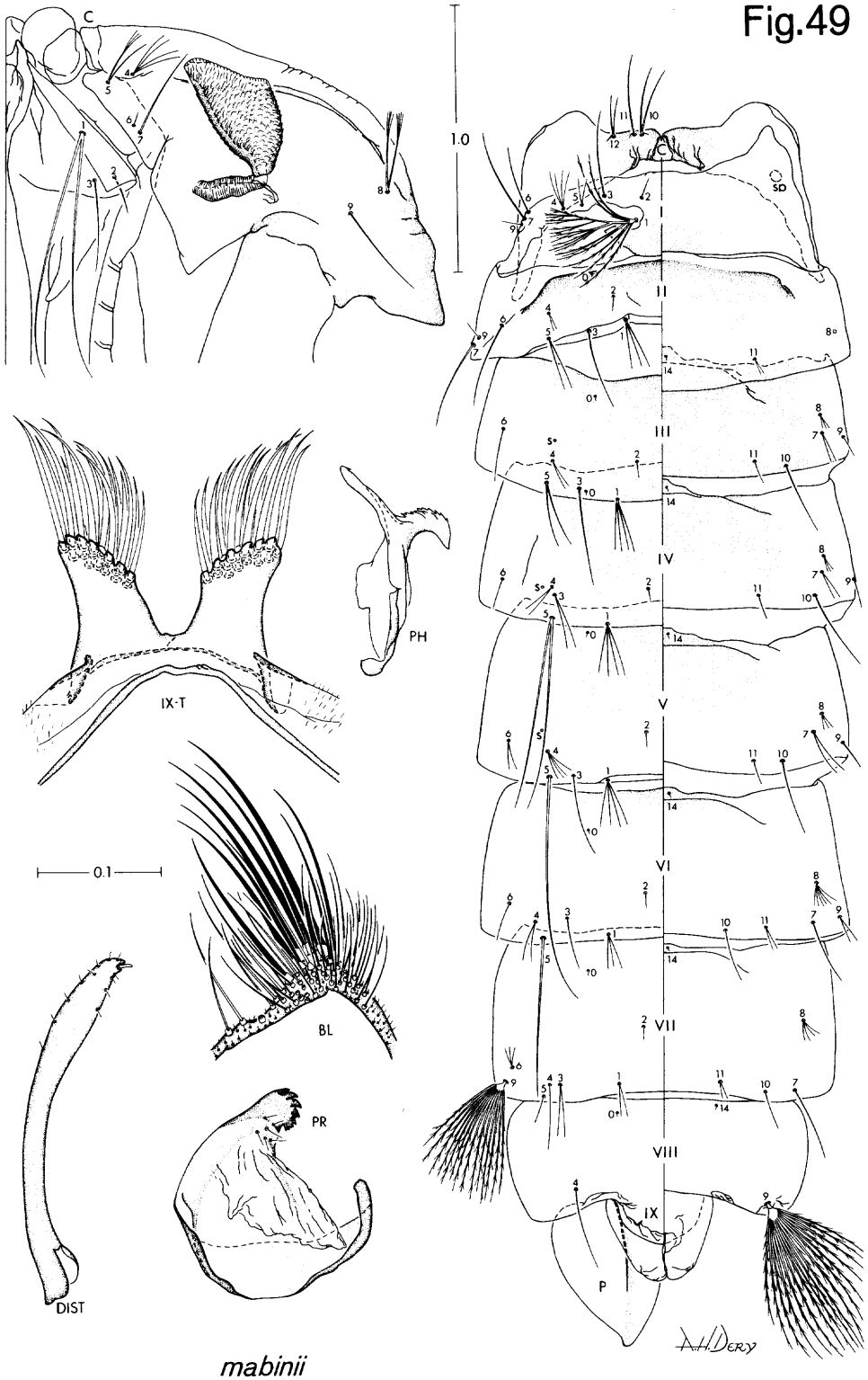
delpilari

Fig.48



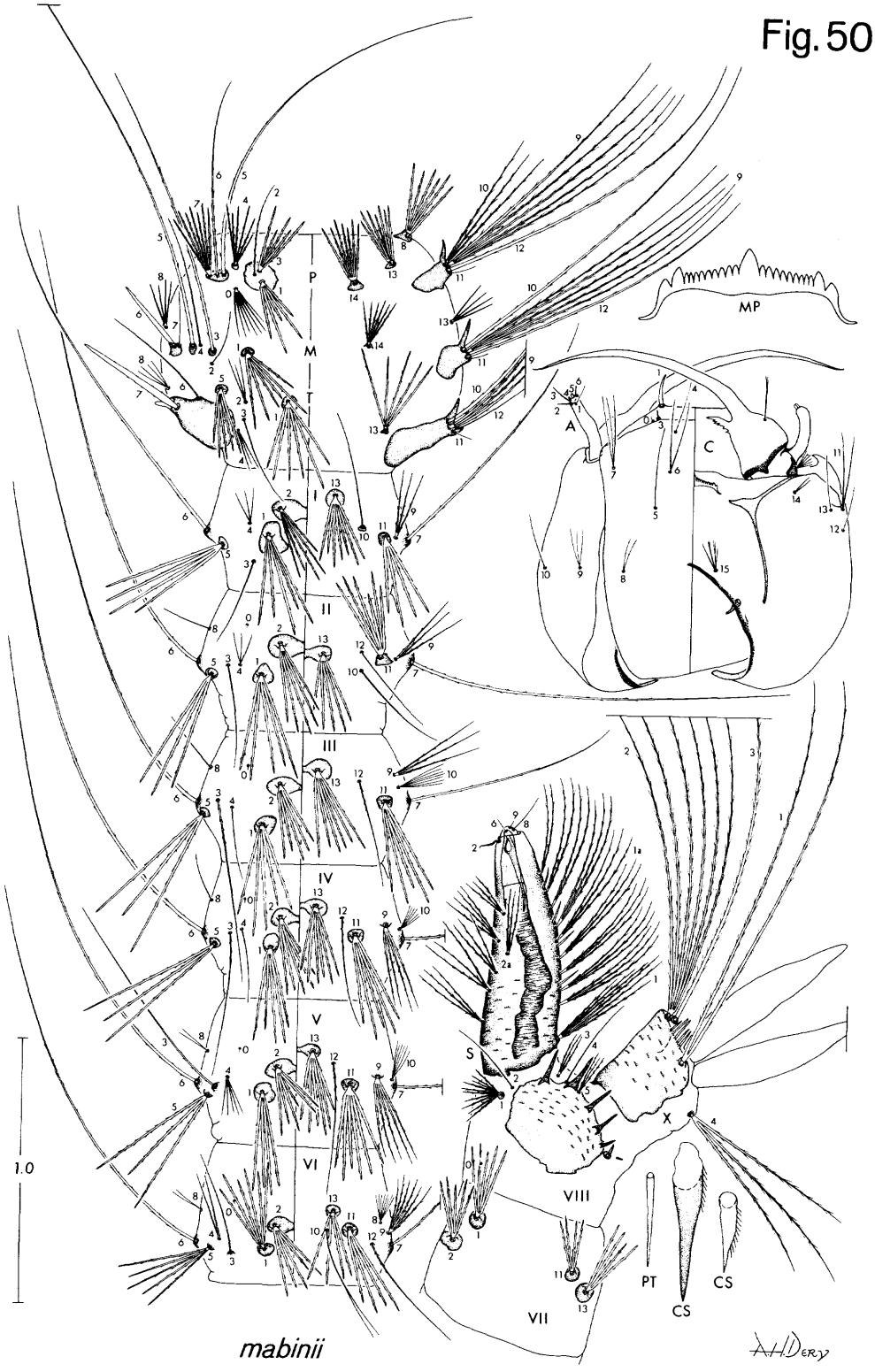
delpilari

Fig.49



mabinii

Fig. 50



APPENDIX: CURRENT TAXONOMIC CHANGES

NEW TAXA

CHANGES IN TAXONOMIC STATUS

LECTOTYPE SELECTIONS

NEW COMBINATIONS

INDEX

Valid names are in roman type, while synonyms, rejected names and non-valid combinations are italicized. Italicized pages designate the primary treatment of the species. The letter "k" after a page number indicates a key. Numbers in parentheses refer to figures for that species.