

# Revision of the Oriental Opostegidae (Lepidoptera) with general comments on phylogeny within the family

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**SYNOPSIS.** Forty-five species of Opostegidae are here recognized from the Oriental Region; 17 species are redescribed, 21 are described as new and 7 are described but not named pending the availability of additional material. Fourteen new combinations are established. One species (*Opostega argentella* Bradley, 1957) is excluded from the Opostegidae. All primary types have been examined. The species revised fall into four genera: *Opostegoides* Kozlov (20 species), *Eosopostega* Davis (1 species), *Opostega* Zeller (1 species) and *Pseudopostega* Kozlov (23 species). Six species-groups are recognized in *Pseudopostega*. The phylogenetic relationships of the six genera of Opostegidae currently recognized worldwide have been re-examined and a cladogram of generic relationships based on 40 (mainly adult) characters is presented. The adult moths of all species treated are illustrated in colour, with line drawings of genitalia and with distribution maps.



## INTRODUCTION

Opostegidae is a very specialized, isolated family of primitive monotrysian Microlepidoptera with a world-wide distribution. Opostegids are minute, pale moths, distinguished by their very strongly enlarged antennal scape, very broad collar comprising smoothly arranged lamellar scales, and highly reduced wing venation with unbranched veins in the forewing. Opostegids differ from their sister-group, the Nepticulidae, in possessing a well developed and differentiated cucullar lobe bearing a conspicuous pectinifer; the lobe is connected to the valva by an elongate pedicellum. In the few Nepticulidae that possess a pectinifer it is sessile. The aedeagus is usually strongly reduced or completely unsclerotized (and by definition therefore absent), and there are other differences in morphology and biology highlighted below. For a long time it was believed that this relatively small group of moths represented a very uniform monogeneric taxon and no genera additional to *Opostega* were recognized until 1985. The relatively recent discovery of many peculiar genitalic features in opostegids, especially in the 'exotic' fauna, was followed by the erection of additional genera (Kozlov, 1985) and a little later by an exhaustive generic review of the world fauna of Opostegidae (Davis, 1989), which included a synoptic catalogue of all known species. With the discovery of three new *Opostegoides* species from far-eastern Russia (Sinev, 1990) and the synonymy of *Opostega angulata* Gerasimov, 1930 (Central Asia) with the previously European *Opostega spatulella* Herrich-Shäffer, 1855 (Puplesis *et al.*, 1996) the world opostegid fauna comprised 100 species prior to this revision. However, one of these species was wrongly placed: re-examination of the holotype of *Opostega argentella* Bradley, 1957 (Solomon Islands) shows it to be a member of the Gracillariidae (Phyllocnistinae) to which family it is here transferred. In the present revision we describe and name 21 new species, bringing the world total to 121 species; we describe a further seven species which may be new but these are not named as additional material is needed to verify their status.

The process of documentation of the world's Opostegidae diversity has a long but uneven 185 years' history (Fig. 49). The first opostegid species – *Pseudopostega auritella* (Hübner) (originally placed in the genus *Tinea*) was described in 1813. In total, 20 species were described during the 19th century, predominantly from 1880 to 1882 and particularly from 1893 to 1897. However, the most intensive discovery and description of species was from 1907 to 1923, when 47% of the presently-recognized species were described (synonyms not included). Among 24 authors involved in opostegid species documentation,

Edward Meyrick was responsible for the description of 53 species (16 species in the Oriental fauna), and Lord Walsingham for 11; all remaining authors described from 1 to 4 species except for Turner (6) and Kozlov (5).

No species is known to occur in more than one zoogeographic region (Davis, 1989). Prior to this revision, the distribution of species (excluding synonyms) among regions was as follows: Palaearctic Region – 19; Nearctic – 13 (including six species in Hawaii); Neotropical – 18; Afrotropical – 15; Australian – 18; Oriental – 17.

This revision of the species of the Oriental Region was prompted by the lack of documentation and illustrations, particularly of species described by Meyrick, and the resulting uncertainty of the taxonomic status of the described species. In addition, substantial unidentified material was available to us, collected over many years and deposited mainly in different European museums, together with material that we have collected recently in South-east Asia. We have included species from islands east of Wallace's line (notably Sulawesi), and therefore not strictly Oriental, for purely practical reasons. The result of this revision is an unexpectedly large increase in the known diversity of Oriental Opostegidae. We have increased the number of known species from 17 to 45 – an increase of 165%. Many species originally described in *Opostega* have been transferred to *Pseudopostega* or *Opostegoides*. The Oriental Opostegidae now comprise some 35% of the known world fauna of the family (Fig. 50) if documented but unnamed species are included. It should be noted, however, that Nielsen (1996) estimates an Australian fauna of up to 80 species of Opostegidae.

Opostegidae are very difficult to collect – they are minute and inconspicuous and adults are usually not common at light traps. The larvae are concealed feeders in plant tissue and, unlike Nepticulidae, only a few species make obvious mines. There are additionally severe problems in rearing Opostegidae – see under *Distribution and Biology*, below. So the material available to us probably still does not represent the real diversity of the Opostegidae of the Oriental Region which might be considerably richer than indicated here. No comparative data is available for other areas. Revisions are only available for a few geographically restricted areas of the Palaearctic (Zagulajev, 1981; Nieukerken, 1990; Puplesis *et al.*, 1996; Sinev & Kozlov, 1997). However, a revision on the Neotropical opostegids is in progress (Davis, in prep.).

Although most of the species reviewed here differ conspicuously from each other, some apparently undescribed species in our treatment have been left unnamed because of paucity or quality of material or doubt about identity or relationships. However, in a few cases where we have just a single specimen that



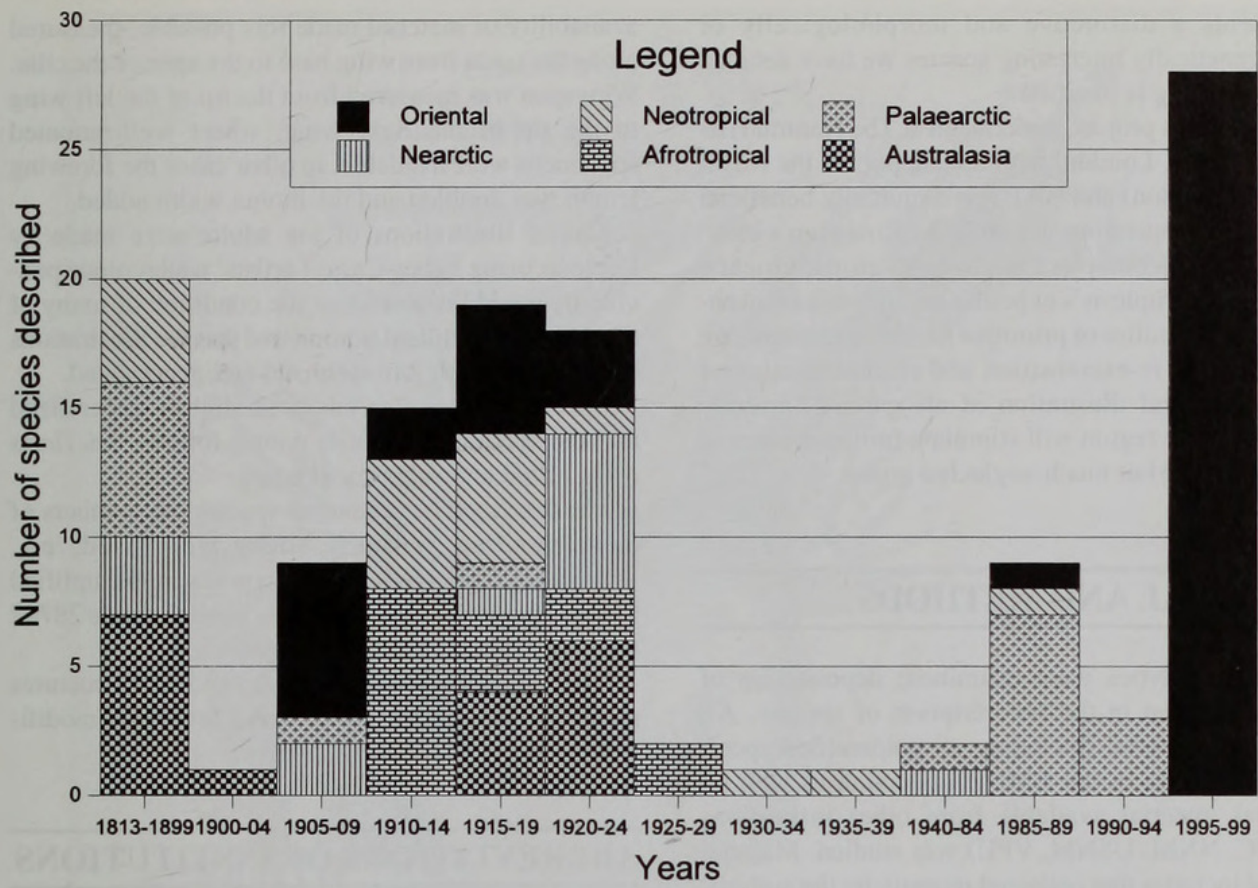


Fig. 49. Pattern of description of Opostegidae by region through time; note compression of periods 1813–1899 and 1940–1984 on horizontal axis; figures for 1995–1999 include species documented in this paper but not named. Synonyms are not included.

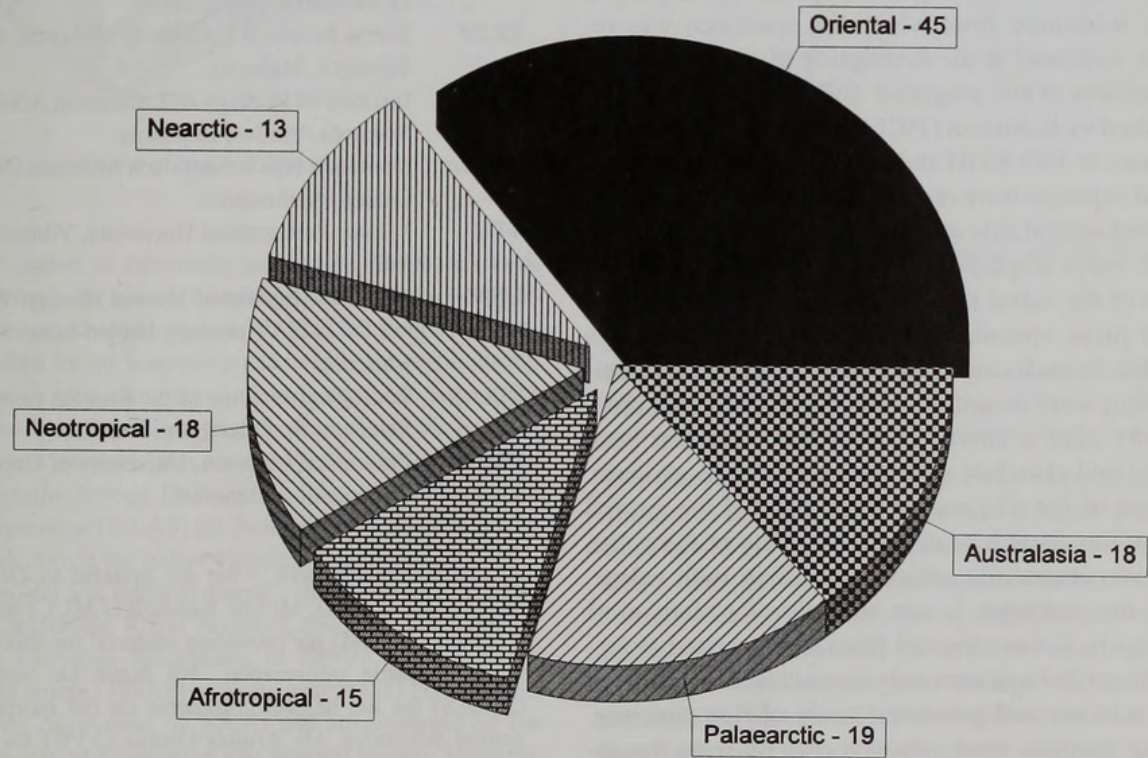


Fig. 50. Diversity of Opostegidae in major zoogeographical regions.



represents a distinctive and morphologically or phylogenetically interesting species we have decided that its naming is justified.

The present project, undertaken at The Natural History Museum, London, with the support of the Royal Society (London) and NATO, is a mutually beneficial scientific co-operation. It combines Robinson's interests in Microlepidoptera biodiversity in the Oriental Region with Puplesis's expertise and interest in inventorying the families of primitive Microlepidoptera. We hope that the re-examination and characterisation of 'old types' and illustration of all species currently known for the region will stimulate further studies of this intriguing but much-neglected group.

## MATERIAL AND METHODS

All primary types were examined; depositories of types are given in the redescription of species. All additional material (including all unidentified specimens) available in the BMNH collection as well all Oriental material available from other institutions (ZMUC, NNM, USNM, VPU) was studied. Material studied includes that collected recently by the authors, colleagues and collaborators – Malaysia (1981, 1986, 1989), Brunei (1982, 1992), Nepal (1983, 1984, 1995), Indonesia (1985) and Thailand (1986).

Types of all newly described species are deposited in the institution from which the specimen was received, indicated in the description of the species.

Genitalia were prepared following the method described by Robinson (1976). After maceration of the abdomen in 10% KOH and subsequent cleaning, male genital capsules were removed from the abdomen and mounted ventral side uppermost with the inner surface of one valva displayed. However, because of strong fusion of the valval process (apodeme) to the gnathos and/or juxta, spreading of one valva was not always possible. In such cases, rather than fragment the genitalia, they were mounted entire in the natural position, but only after a lateral view of the valva had been studied and sketched with the specimen in glycerin. Because of the diagnostic importance of the ventral view of the distal lobe of the main body of the valva, we have consistently avoided spreading both valvae. Since the aedeagus is not well developed in most opostegids, it was removed from and mounted alongside the genital armature only in cases where it covered other sclerites and prevented study of fine structure. Female genitalia were removed entirely from the abdomen, cleaned and mounted ventral side uppermost. Genitalia and abdominal pelts of both sexes were stained with Chlorazol Black or, occasionally, mercurochrome and mounted in Euparal.

Forewing length is expressed as a range, where

availability of material made this possible, measured along the costa from wing base to the apex of the cilia. Wingspan was measured from the tip of the left wing to the tip of the right wing, where well-mounted specimens were available; in other cases the forewing length was doubled and the thorax width added.

Colour illustrations of the adults were made by Puplesis using Faber-Castell artists' watercolour pencils. It should be noted that the condition of many of the specimens studied is poor, and that the illustrations of adults are therefore idealized and generalized.

Specimen label data has been slightly generalized and the spelling of locality names follows the *Times Atlas* (1968 and subsequent edns).

For described but unnamed species the numbers of corresponding genitalia slides were used, e.g. '*Opostegoides species 28702*' is a taxon exemplified by the specimen from which male genitalia slide 28702 (BMNH collection) has been made.

The terminology used for morphological structures mostly follows Davis, 1989, with a few slight modifications outlined below.

## ABBREVIATIONS OF INSTITUTIONS

BMNH	The Natural History Museum, London, UK (formerly British Museum (Natural History))
ELUH	Entomological Laboratory, University of Hokkaido, Sapporo, Japan
FRIM	Forest Research Institute of Malaysia, Kepong, Selangor, Malaysia
IELAS	Institute of Ecology of Lithuanian Academy of Sciences, Vilnius, Lithuania
NNM	Nationaal Natuurhistorisch Museum (Naturalis), Leiden, Netherlands
VPU	Vilnius Pedagogical University, Vilnius, Lithuania
USNM	National Museum of Natural History, Washington DC, USA (formerly United States National Museum)
ZIRAS	Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia
ZMUC	Zoological Museum, University of Copenhagen, Copenhagen, Denmark

**ACKNOWLEDGEMENTS.** We are grateful to Dr Erik van Nieukerken (NNM), Mr Ole Karsholt (ZMUC) and Dr Don R. Davis (USNM) for providing material for this study and much valuable information. We thank Dr Sergei Sinev (ZIRAS) for his helpful comments on the morphology of genital structures, Mr Arunas Diskus (VPU) for technical assistance with the Nepalese material, Mr Derek Adams (NHM Photographic Unit) for creating the digitized colour plates from Puplesis's pastel drawings and Dr Paul Williams (BMNH) for supplying the WORLDMAP base-map of eastern Asia for figures 175–179.





Fig. 51. Lateral view of head of *Opostegoides gorgonea*.

The first author is extremely grateful to Mr Kevin Tuck (BMNH) for help, advice, discussion, and generous support during the course of this project; Mr Paul Southwell is especially thanked for his hospitality and unselfish support during all Puplesis's long-term stays in London and Mr Simon Hill for various help (including graphic design) and his friendly attention and interest in this project. Puplesis is also indebted to Dr Virginijus Sruoga, Dr Remigijus Noreika (VPU) and Dr Jurate Puplesiene (IELAS) for their generous assistance with field-work during the Indian-Nepalese expedition of 1995.

This project was initiated during a study visit to BMNH by Puplesis under the Royal Society/Lithuanian Academy of Sciences Exchange Programme in 1996/7 and completed during his tenure (1997/8) of a one year NATO Postdoctoral Fellowship (sponsored by NATO and administered by the Royal Society of London) at The Natural History Museum. We are most grateful to the Royal Society of London and NATO for support. Puplesis thanks the Trustees and the Keeper of Entomology of The Natural History Museum, London, for study facilities and access to collections.

We thank Robert Hoare, Malcolm Scoble and Klaus Sattler

for their careful reviewing this paper, and for their many perceptive and useful suggestions.

## MORPHOLOGY

The morphology of opostegids has been extensively discussed by Davis (1989) and, to a lesser extent, by Buszko (1981) and Nieuwerkerken (1990). However, the more conspicuous morphological features are discussed below to provide a background for phylogenetic discussion and to justify amendments in terminology.

**Head.** Oval, slightly or strongly flattened (depressed) dorso-ventrally. Frons and vertex with tufts of erect piliform scales (collectively termed a tuft in species' descriptions). Lower part of face practically naked, with tiny microtrichia. Neck covered by very large and distinctive group of lamellar scales behind eyes forming a collar (the term used below for this structure). Clypeus very small, triangular or rounded.



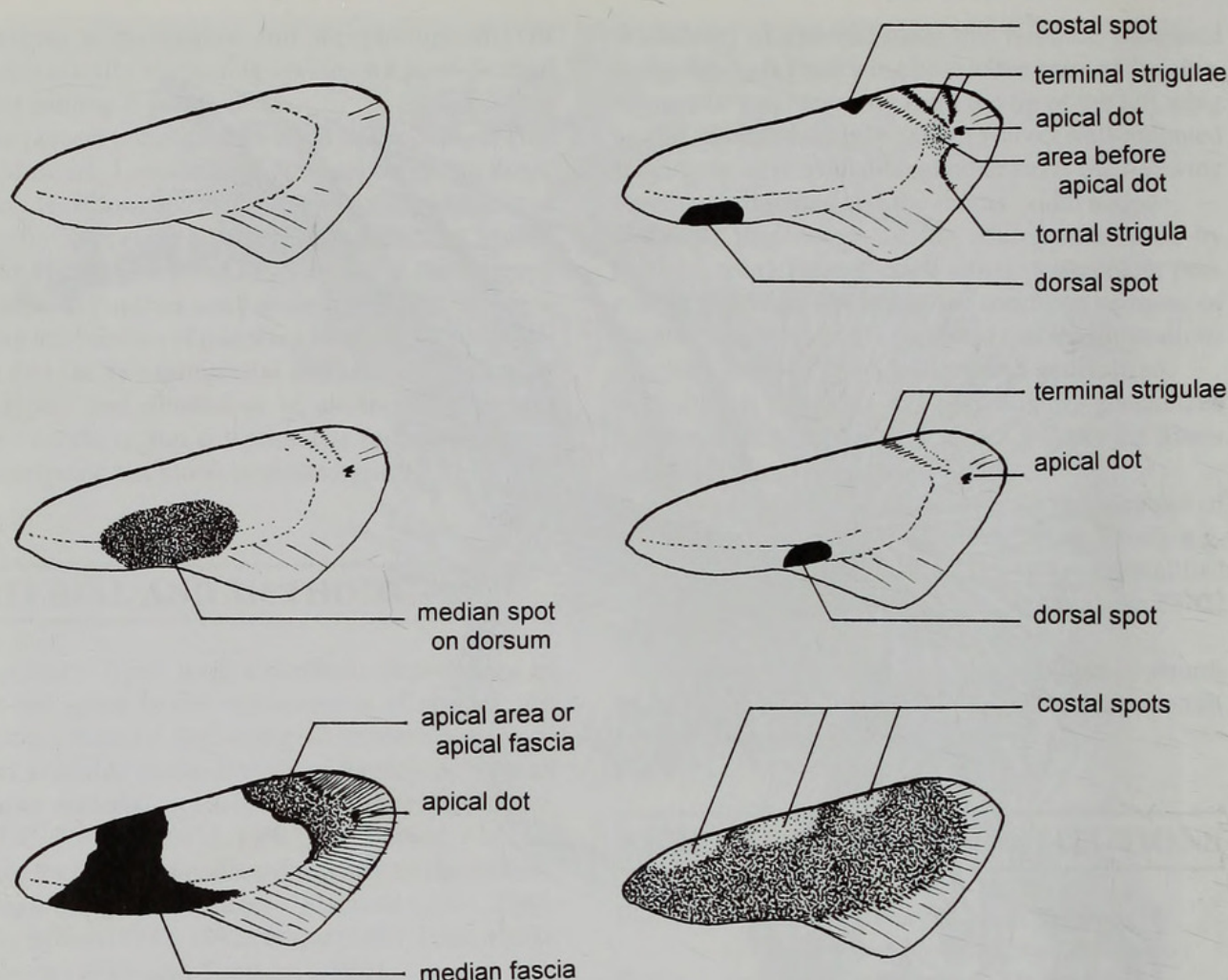


Fig. 52. Main types of opostegid forewing patterns with terminology used.

Mandibles absent. Maxillary palpi five-segmented, spined at apex. Haustellum greatly reduced, but sometimes exceeding length of maxillary palpus. Labial palpi three-segmented, much shorter than maxillary palpi. Ocelli and chaetosemata absent. Compound eyes large (but small in *Notiopostega*), occasionally only moderately large. Antennae long, but never as long as forewing. First segment of antenna (scape) greatly enlarged, even more so than in Neptculidae, the sister group, forming eye-cap which can entirely cover the eye (Fig. 51) (but small in *Notiopostega*). Antennal pedicel moderately short. Flagellum with 40–90 more or less cylindrical segments; most flagellomeres each with (among other types of sensilla) three palmately branched sensilla ascoidea, each with four to ten 'arms' (Davis, 1989).

**Thorax and appendages.** Tegulae small. Thorax depressed dorso-ventrally. Tegulae and thorax scales usually very similar to ground colour of forewing. Forewing relatively broad, without sexual dimorphism in colour or scaling (in contrast to Neptculidae, in which many have specialized sex scales). Forewing of both sexes with only scattered remnants of microtrichia, predominantly in subcostal region and along underside of hind margin of forewing base.

Microtrichia forming usually well defined, distinctive colour patches (Fig. 12), especially in *Opostegoides*. Most of forewing underside surface covered with brown or cream scales. Upperside of forewing with varying patterns of a few simple types (Fig. 52). Forewings of most species white to silvery-white with brown terminal strigulae and often with additional dorsal and/or costal spots; some species with broad, dark (usually brown) fascia on forewing (occasionally even two or three fasciae, including apical area); a few species with intense dark forewing coloration or with other pattern types.

Frenulum absent in both sexes; wing coupling mechanism comprising subcostal pseudofrenular bristles on hindwing. Hindwing narrow, lanceolate, with long cilia; colour usually uniform, except in a few cases where the base is scaled with much paler scales. Wing venation greatly reduced but remaining veins well defined. Forewing characterized by a few straight unbranched veins (Sc, R, M, Cu and A in the most complete configuration, or just Sc, R and M in the most reduced). Hindwing with Sc, Rs, M, Cu and A, with just the first and the last represented as separate veins. Wing venation is comprehensively figured by Davis (1989: figs 25–30).



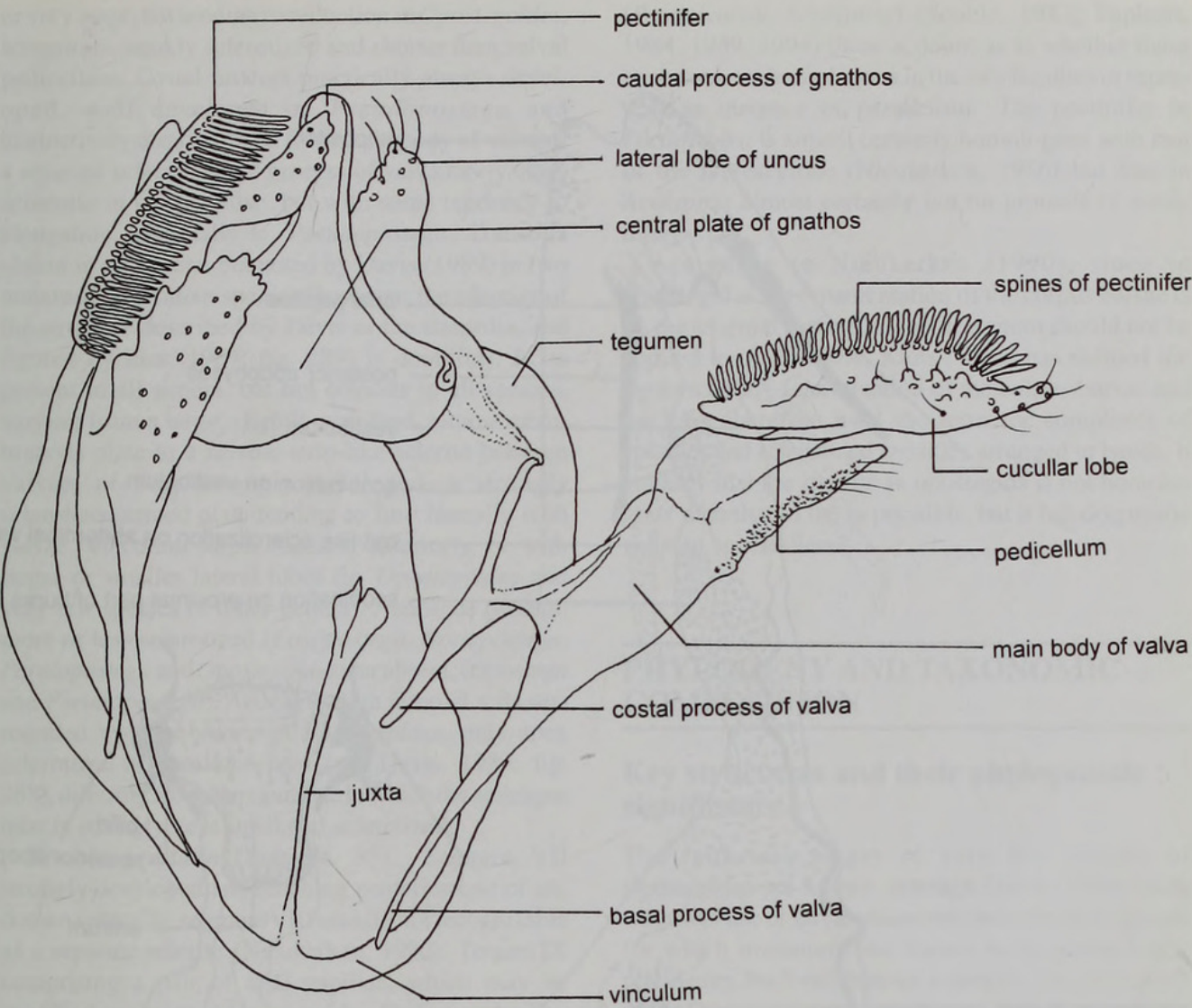


Fig. 53. Schematic drawing of male genitalia of a *Pseudopostega* species with terminology used.

Legs with pairs of unequal spurs: one pair on mid-tibia, two on hind-tibia; fore-tibia without epiphysis and with semi-erect, spinose setae.

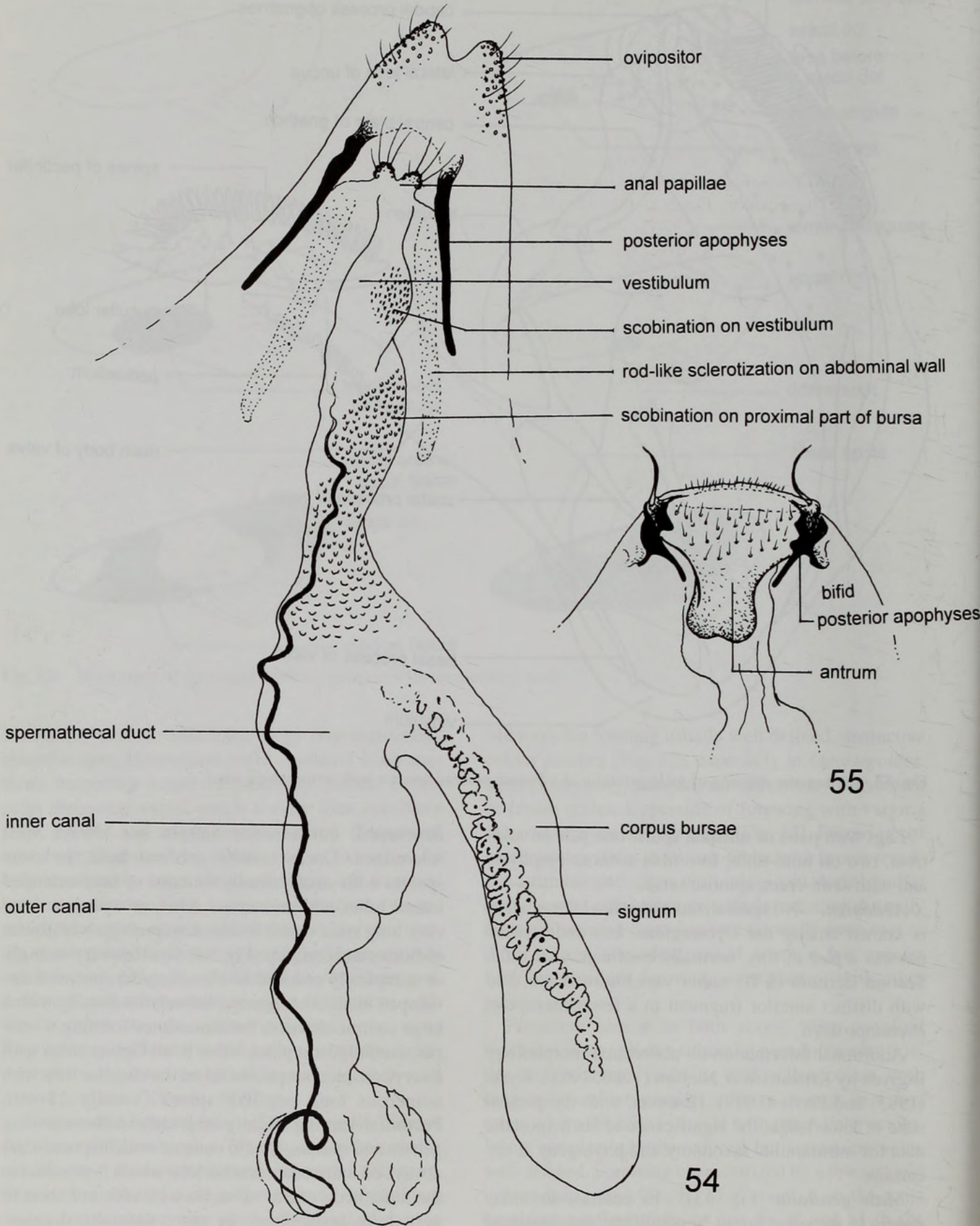
**Abdomen.** No specialized abdominal sex scaling is known among the Opostegidae, but males often possess a pair of tiny, normally confluent anal tufts. Second sternum (S II) rather variable in shape, and with distinct anterior fragment in a few genera, e.g. *Pseudopostega*.

Additional information on abdominal morphology is given by Kristensen & Nielsen (1980; 1981), Kyrki (1983) and Davis (1989). However, with the present state of knowledge, the significance of such sporadic data for intrafamilial taxonomy and phylogeny is uncertain.

**Male genitalia** (Fig. 53). In contrast to many genera in the sister group Nepticulidae, the opostegid genital capsule generally exhibits the presumed nepticuloid ancestral condition, with the sclerites of segment IX (tegumen and vinculum) forming a complete fused ring (annulus). Tegumen usually well

developed, but anterior margin not always well sclerotized. Uncus usually a broad band, in some species with small broadly rounded or very extended lateral lobes with numerous setae, or with just three very long setae on each side; *Eosopostega* with uncus elaborate and complex (Fig. 94). Gnathos very strongly or completely reduced in *Opostegoides*, but well developed in all other genera, the sclerite usually with a huge central element, but sometimes forming a simple, caudally bent plate. Valva in all Opostegidae with a very conspicuous pectinifer on the cucullar lobe with numerous long peg-like spines (usually 12–60). Pectinifer varying slightly or greatly in shape among genera and species, but (in contrast with Nepticulidae) always on a discrete cucullar lobe which is attached to the main body of the valva via a slender and short to very long pedicellum. In more specialized cases, pedicellum strongly wrinkled transversely and exceeding length of body of valva. Cucullar lobe in most genera very large, but relatively small in *Opostegoides* and *Eosopostega*. Main body of valva relatively large





Figs 54, 55. Schematic drawings of female genitalia with terminology used.



or very large, but tending to reduction in *Opostegoides*, sometimes weakly sclerotized and shorter than valval pedicellum. Costal process practically always developed; well developed in *Pseudopostega* and distinctively disarticulated from main body of valva as a separate sclerite. Basal process of valva rarely characteristic in Opostegidae, but with some tendency to elongation, especially in *Pseudopostega*. Transtilla absent in all genera, but noted by Davis (1989) in two unnamed Australian species [however, the identity of the structure described by Davis as the transtilla, and figured by him (1989: fig. 289) is doubtful]. Juxta present in all genera, but not obvious in all species, varying from a large, slightly wrinkled, almost membranous plate to a narrow strip-like sclerite between valvae, or very strongly developed, a strongly sclerotized armed plate tending to fuse laterally with valvae. Vinculum large, rounded anteriorly, or with larger or smaller lateral lobes (in *Opostegoides* and very few species of other genera). Aedeagus present, more or less sclerotized (*Eosopostega*, *Notiopostega*, *Paralopostega* and *Opostegoides*), or absent, (*Opostega* and *Pseudopostega*). Aedeagus with internal rods surrounded by membranes in *Opostegoides*, only apex sclerotized in *Paralopostega* (see Davis, 1989: fig. 288), differing from Nepticulidae in which the aedeagus tube is strongly developed and sclerotized.

**Female genitalia** (Figs 54, 55). Segment VII strongly developed and reaching posterior end of abdomen ventrally; segment VIII usually not recognizable as a separate sclerite (Nieukerken, 1990). Tergite IX comprising a pair of anal papillae, which may be modified or absent in *Opostegoides*. Posterior apophyses long and slender, or short and bifid (*Opostegoides*). Anterior apophyses lacking in most Opostegidae, except *Opostega*. An additional pair of rod-like sclerotizations may appear on inner side of abdominal wall apparently replacing absent apophyses anteriores (many *Pseudopostega*); in genitalia slides these can resemble a pair of 'real' apophyses, but they are not homologous. Antrum, represented by a sclerotized plate over caudal part of vestibulum, developed only in *Opostegoides*, usually with a shape characteristic of each species. Vestibulum lacking sclerotization in all other genera, but with fine but conspicuous scobination in most species; a large patch of scobination may also be present on proximal part of corpus bursae. Corpus bursae well developed, largely elongated or oval, just occasionally reduced and small; with spicules and tiny sclerotized wrinkles (sometimes indistinct) in many species. Spermathecal duct variously developed within the family, but always comprising a membranous outer canal, and a very well sclerotized, very slender inner canal, which usually is sinuous and convoluted (at least in the distal region).

**Remarks.** Although a pectinifer similar to that of Opostegidae is present in two genera of Nepticulidae

(*Pectinivalva*, *Acalyptris*) (Scoble, 1983; Puplesis, 1984, 1989, 1994) there is doubt as to whether these structures are homologous in the two families or represent an instance of parallelism. The pectinifer in *Pectinivalva* is almost certainly homologous with that of the Opostegidae (Nieukerken, 1986) but that in *Acalyptris* almost certainly not on grounds of parsimony.

According to Nieukerken (1990), since in Opostegidae the ornamentation of the corpus bursae is on the external surface, the term signum should not be applied to it. However, Klots (1956) has defined the signum as any sclerotization of the corpus bursae and we have therefore used the term for complexes of spicules and sclerotized wrinkles arranged in bands. It is likely that the signum in opostegids is not homologous with that in the nepticulids, but it has diagnostic value at species level.

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## PHYLOGENY AND TAXONOMIC COMPOSITION

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### Key structures and their phylogenetic significance

The immature stages of very few species of Opostegidae are known although Davis (1989) made extensive use of larval characters from the three genera for which immatures are known in reconstructing a phylogeny. No fossil data are available. The phylogeny of the Opostegidae proposed here is based on morphological characters of adults. Character states and their polarities and their value in determination of systematic relationships are discussed below.

**Broad collar.** All opostegids (except *Notiopostega*) possess a very conspicuous, well developed, flat, broad cluster of lamellar scales on the posterior of the head. This is clearly a more specialized modification of the occipital scales than the condition observed in the Nepticulidae, in which there may be a pair of small tufts of lamellar scales or a sparse collar of piliform scales. We therefore treat the enlarged collar as an apomorphic feature shared by most opostegids. The modification of the collar to a raised tuft on a thin, bicrenulate, transverse occipital ridge in *Notiopostega* (Davis, 1989) most likely represents a unique modification of the originally flattened collar and may be considered as an autapomorphy of *Notiopostega*. The strongly developed collar appears to support the monophyly of the opostegids, and its further modification an autapomorphy of *Notiopostega*.

**Large compound eyes.** This feature is conspicuous in all opostegids, except *Notiopostega*, which are characterised by a distinctly smaller interocular index (0.5, instead the 0.8–1.2 usual in this family, see Davis,



1989: 7). Smaller eyes were treated by Davis (1989) as a secondary reduction and one of the main autapomorphies of *Notiopostega*. The eye index of *Notiopostega* is very similar to that in many nepticulids. There is great variation in eye size between different species of opostegids and even more so in nepticulids. We suggest that the development of large compound eyes in the Opostegidae represents a significant evolutionary tendency in the family, but that the smaller eyes in *Notiopostega* are, as Davis suggests, probably a secondary reduction. Apart from this significance, the value of the interocular index appears to be of limited use as an indicator of systematic relationships within Opostegidae, as is the case in the Nepticulidae.

*Enlarged scape.* This feature is strongly correlated with eye size and the comments above on eye size apply equally to the antennal scape. The greatly enlarged scape of opostegids is on average much bigger than it is in the sister family Nepticulidae. The marked trend towards enlargement of the scape is an autapomorphy for the Opostegidae. In the case of *Notiopostega* the scape is considerably smaller, i.e., resembling that of most nepticulids, and this probably represents secondary reduction correlated with reduced eye size.

*Palately branched sensilla ascoidea.* These are a very distinctive autapomorphy of the Opostegidae. However, because of variation within species and limited available data this character is not currently useful for recognising phylogenetic relationships within the family.

*Strongly reduced wing venation.* In general, a feature such as strong reduction of venation is not useful for recognizing relationships within the family, because reduction in some cases may occur independently and may be more correlated with the size of species than with the phylogenetic position of the taxon. The most extreme reduction of the venation is exhibited in *Notiopostega* and characterizes this monobasic genus. On the other hand, strongly reduced wing venation with almost unbranched forewing veins represents a conspicuous feature characteristic of opostegids and is probably evidence of their monophyly.

*Absence of sex scaling of wings.* Development of different androconial patches on the wings is characteristic for the sister family (the Nepticulidae), but the Opostegidae retain the plesiomorphic condition in which sex scaling is not developed.

*Microtrichia patches on forewings base.* This feature is characteristic for most opostegids, and particularly well developed in *Opostega* and *Opostegoides*. However, it does not appear possible to use this feature in recognizing relationships within the family. In the Nepticulidae the plesiomorphic condition prevails in that microtrichia are scattered over the entire forewing and hindwing (Scoble, 1983).

*Development of subcostal pseudofrenular*

*setae.* This character is correlated with loss of the frenulum in both sexes and constitutes one of several synapomorphies for the Nepticuloidea (Davis, 1989). No distinct differences in wing-coupling mechanism could be recognized between genera of the Opostegidae.

*Loss of epiphysis and presence of semi-erect, spinose setae on legs.* This feature is more or less uniform for all Nepticuloidea and does not appear to be useful in the phylogenetic reconstruction of the family.

*Shape of anterior fragment of second abdominal sternum.* It is probable that this character is uninformative in Opostegidae; however, Nieuwerkerken (1986) made some use of this feature in the classification of Nepticulidae. The primitive shape of the anterior fragment in Nepticuloidea is probably trapezoidal (as in *Notiopostega*), but it appears to be very variable. Among the genera of Opostegidae the sclerotization of the second abdominal segment varies from a rather elaborated, well expressed anterior fragment, which is strongly sclerotized laterally, to indistinct and weakly sclerotized (in *Opostegoides*, *Opostega* and particularly in *Eosopostega*). These extreme cases most probably represent independently derived conditions from the ancestral, moderately developed and sclerotized second sclerite. However, the anterior fragment of the second sclerite is always distinct and conspicuous in *Pseudopostega*, and this feature can probably be treated as an autapomorphy for the genus.

*Tegumen and vinculum fused into complete ring.* It is axiomatic that the fused 'ring' is derived from a ninth segment clearly divided into tergum (tegumen) and sternum (vinculum). Those nepticulid genera which possess a divided ninth segment probably preserve the ancestral state of this feature in contrast to other Nepticuloidea. Therefore, a fused ring has probably evolved independently in the Nepticulidae and in the Opostegidae. It is noteworthy that the fused ring in the Opostegidae is remarkably compressed and distorted in *Opostegoides*, a state that may be treated as an autapomorphy in the context of the remaining opostegid genera, which express the corresponding plesiomorphic state.

*Band-shaped uncus.* We suggest that the unspecialized band-shaped uncus with very numerous setae represents the ancestral state, from which a range of more specialized forms was derived. We do not consider the alternative explanation tenable, viz., that the sclerotized and pointed uncus of *Eosopostega* is a retained plesiomorphy (expressed also in *Pectinivalva*) and that its modification to a band-like form is a synapomorphy of all other opostegid genera, for the form of the uncus in these two genera is very different. In *Eosopostega* the uncus is small, triangular and inverted V-shaped whereas in *Pectinivalva* it is hood-like. The structural modification of each appears not to be homologous. Three main lines of modification of a



hypothetically simple multisetose uncus can be recognized (Fig. 57). In most genera the uncus has developed lateral lobes, and the setae are segregated into two groups. In *Opostegoides* the uncus preserves the ancestral band-shaped form, but the number of setae is greatly reduced to six (or in very few cases four), and these remaining setae are thickened and elongated. The most marked modification of the uncus is characteristic of *Eosopostega*, where from a band-shaped uncus a sclerite in the shape of an inverted 'V' has been derived.

*Well developed gnathos.* The structure of the gnathos in Opostegidae differs from that found in most Neptculidae. Whilst neptculids usually have a strongly developed caudal process, this does not closely resemble the structure found in the more apomorphic opostegid genera. We believe that the two have evolved independently, and that a simple, band-like gnathos probably represents the plesiomorphic state amongst Opostegidae, from which great structural diversity has evolved (Fig. 58). The simple band-like gnathos is characteristic of *Notiopostega* and *Paralopostega*; in *Eosopostega*, the gnathos is strongly developed with stout lateral sclerotization, and in *Opostega* and *Pseudopostega* a caudal process has been developed. In the most derived cases the gnathos has a strongly-developed caudal process, which may even be spined laterally, and an elaborated main element – a central plate. It is noteworthy that the development of a caudal process from the gnathos is most marked in opostegid genera which have lost the sclerotization of the aedeagus. *Opostegoides* represents a special case, in which the gnathos is very strongly reduced or, usually, completely lost, a distinctive autapomorphy of the genus. The absence of the gnathos seems correlated with the presence of sclerotization of the aedeagus in this taxon. The gnathos appears to have great value for interpreting systematic relationships within the family.

*Pectinifer on cucullar lobe of valva.* Although a pectinifer is very conspicuous in all opostegids, we can recognise two distinct evolutionary trends in this structure (Fig. 59). We hypothesise the ground-plan state of the pectinifer as relatively small with numerous spines arranged on a simple, slightly elongated cucullar lobe which connects with the main body of the valva via a short, weakly differentiated pedicellum. Such a plesiomorphic state of the pectinifer may be seen in *Eosopostega*. In all other genera the pectinifer is either very enlarged and the cucullar lobe elaborated, or the pectinifer is small but carried on a greatly elongated pedicellum, which in the most derived cases is additionally wrinkled transversely. The modifications appear to have considerable phylogenetic significance. The presence of a pedicellum bearing a cucullar lobe with a pectinifer is an important autapomorphy of the Opostegidae as a whole. Al-

though pectinifers have been discovered in two genera of the Neptculidae (Scoble, 1982, 1983; Puplesis, 1990, 1994, Hoare *et al.*, 1997) they are not borne on a separate cucullar lobe. Therefore the pectinifer in *Pectinivalva* (Neptculidae) may represent a more ancestral state of the structure than that of any opostegid.

*Modifications of main body of valva.* The valva in ancestral opostegids was probably relatively simple with a short costal process, but most likely not a basal one. In most genera there is a trend towards enhanced development of the costal process and a broadening (or narrowing, in *Eosopostega*) of the main body of the valva. The greatest degree of specialization of the valva occurs in *Pseudopostega*, in which the costal process is not only greatly enlarged, but also separated from the main body of the valva, with evident posterior extension (which connects to the gnathos); additionally, the basal process of the valva is also developed, very long and sometimes well sclerotized (Fig. 60). Another direction of transformation of the valva is partial reduction of the main body of the valva, paralleled by enlargement of the pedicellum.

*Juxta shape.* The plesiomorphic condition of juxta is hypothesised here as an unspecialized, broad, slightly wrinkled lobe. However, convincing outgroup comparison is problematical, for the configuration of the juxta varies greatly in Neptculidae and is often absent. More derived states in Opostegidae involve elaboration of shape, sometimes (in most *Pseudopostega*) involving the formation of a narrow, rod-like element, or (in *Eosopostega*) two pairs of horn-like posterior processes. The latter modification resembles somewhat that in *Pectinivalva* but in that genus the juxta is far smaller and less elaborate. The shape of the juxta has some value in the recognition of systematic relationships in the case of just a few genera (Fig. 61).

*Anterior margin of vinculum.* Davis (1989) considered the concave vinculum (with more or less developed lateral lobes) as the plesiomorphic condition; we tentatively treat such an elaborated vinculum as an apomorphic condition developed in parallel in *Eosopostega* and *Opostegoides* (the shape differs somewhat in the two genera), as well as in a few *Pseudopostega* species. However, the vinculum is concave in many *Pectinivalva* (Neptculidae) and the polarity of this character must remain questionable.

*Unsclerotized aedeagus.* Strong sclerotization of the aedeagal tube is a common (shared) feature within the Neptculidae. However, in the Opostegidae the aedeagal tube is never sclerotized strongly and it may be supposed that this is a general tendency throughout the family. In some cases the aedeagus has just a more or less sclerotized apical region or rod-like inner part; in two genera sclerotization (and thus the aedeagus) is completely lost (synapomorphy for *Opostega* + *Pseudopostega*) (Fig. 62). Generally, presence or absence of aedeagal sclerotization is an important



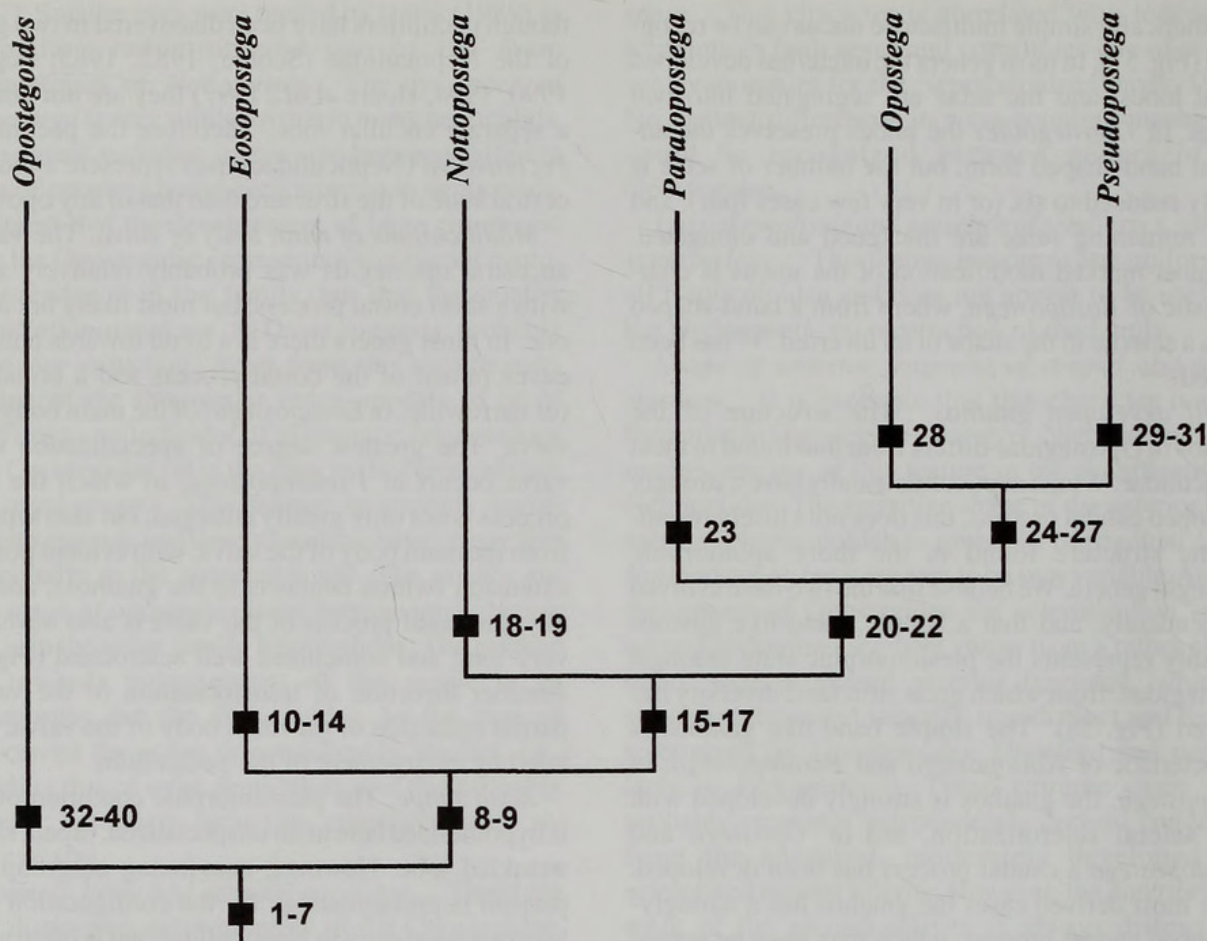


Fig. 56. Cladogram of the Opostegidae. Numbers 1 through 40 refer to apomorphic character states listed in the text.

diagnostic and phylogenetic feature in the Opostegidae.

*Bilobed anal papillae in female genitalia.* The similarity of females of *Opostegoides* and those of the primitive nepticulid genus *Pectinivalva* is considered as evidence that primitive Nepticuloidea had not developed anal papillae. Bilobed or otherwise specialized anal papillae in *Paralopostega*, *Opostega* and *Pseudopostega* are considered as a novelty within the Opostegidae (Fig. 63).

*Abdominal tip (ovipositor).* The most generalized abdominal tip in the Opostegidae is a rounded multisetose pad. Modification of this ground-plan appears to occur in two distinct ways: by flattening of the abdominal tip and replacement of a large number of small setae by a few very strongly thickened ones or by development of lateral lobes and separation of the setae into two lateral clusters. In the latter case the abdominal tip may also be greatly elongated (Fig. 64).

*Distally bifid posterior apophyses.* The posterior apophyses (as in Nepticulidae also) are typically slender, rod-like sclerites (Figs 54, 65). Broad, distally bifid apophyses are undoubtedly autapomorphic within the Nepticuloidea and only found in *Opostegoides*.

*Presence of anterior apophyses.* This feature

(known in some opostegids) probably corresponds to the ancestral condition since it is shared with the sister group – the Nepticulidae.

*Presence of sclerotized antrum.* Throughout this study the presence of a sclerotized antrum was treated as a plesiomorphy, and its reduction or absence as a synapomorphy for all opostegid genera except *Opostegoides*. However, following reviewers' comments, we agree that this interpretation is probably wrong but we are unable now to alter artwork. Although an antrum is characteristic of a few nepticulid genera, including the primitive *Pectinivalva*, the vestibular sclerites in the latter genus are not homologous with those of *Opostegoides*; furthermore, an undescribed Australian genus that is the sister-group of *Pectinivalva* lacks vestibular sclerotization (Hoare, in press), adding force to the argument that these structures represent an apomorphy of *Pectinivalva* within the Nepticulidae. The vestibular sclerotization of *Opostegoides* is most probably autapomorphic (vide Fig. 64) and the lack of a sclerotized antrum a symplesiomorphy of all other opostegid genera.

*Scobination of vestibulum and corpus bursae.* The value of this feature in elucidating phylogenetic rela-



tionships is limited, because it appears to be strongly homoplasious. However strong development of scobination in *Paralopostega* + *Opostega* + *Pseudopostega* supports the monophyly of this group of genera. The separation of the zone of scobination into two clearly demarcated areas probably supports the monophyly of *Opostega* + *Pseudopostega*.

## Phylogeny of the Opostegidae

The cladogram of the Opostegidae (Fig. 56) is based on 40 apomorphies listed below (apomorphic state given first, plesiomorphic state given last). Polarity of characters has been determined by outgroup comparison with other families of pre-Ditrysian heteroneurous Lepidoptera. The first seven synapomorphies support the monophyly of the family. For the family as a whole there is in addition a strong and characteristic tendency towards enlargement of the antennal scape and compound eyes. There are also numerous other features supporting the monophyly of the group (see Davis, 1989).

1. Collar very well developed, broadened caudally, comprising only lamellar scales/collar poorly developed, of sparse piliform scales or represented by a pair of small lateral tufts of lamellar scales (Nepticulidae), or absent (Incurvarioidea; Tischerioidea; Palaephatoidea).
2. Flagellomeres with palmately branched sensilla ascoidea/palmately branched sensilla ascoidea absent (all other groups).
3. Microtrichia of wings reduced, tending to form isolated zones at forewing base/microtrichia distributed over entire surface of forewing and hindwing (Nepticulidae; Incurvarioidea; Tischerioidea; Palaephatoidea).
4. Frenulum lost in both sexes/frenulum retained in male (Nepticulidae; Incurvarioidea; Tischerioidea; Palaephatoidea).
5. Wing venation strongly reduced, veins of forewing simple, unbranched/some veins branched (see above).
6. Cucullar lobe of valva separate and connected with main body of valva via pedicellum and bearing a pectinifer/separate cucullar lobe and pedicel not developed (the pectinifer present in some Nepticulidae is borne on the body of the valva as it is in most Incurvarioidea; a pectinifer is absent in Tischerioidea and Palaephatoidea).
7. Aedeagus with sclerotization reduced or completely lacking (aedeagus membranous thus, by definition, absent)/aedeagus present, strongly sclerotized (other groups).

It has proved impossible to identify convincing synapomorphies of all opostegid genera excluding the

highly autapomorphic *Opostegoides*. The two characters (8, 9 below and in Fig. 56) are respectively very weak and now considered more probably a symplesiomorphy (see above). Other features characterising this lineage are also symplesiomorphies: a tendency towards development of the costal process of the valva and some connection between the valva and gnathos; preservation of the plesiomorphic state of the annulus (vinculum + tegumen – segment IX) – the more or less transverse condition, without dorso-ventral compression; retention of the gnathos and the anterior fragment of the second abdominal sternite.

The node at the base of the tree presented here is thus so poorly supported that it should probably be collapsed to yield an unresolved trichotomy of *Opostegoides* + *Eosopostega* + [all other genera]. Further information on immature stages could provide convincing evidence to root *Opostegoides* higher in the phylogeny (cf. larval synapomorphies 33–35 of Davis, 1989), leaving *Eosopostega* in the basal position on the tree.

8. Juxta complex, of specialized shape (but absent in *Eosopostega issikii*)/juxta simple, unspecialized, a weakly wrinkled lobe, sometimes indiscernible (*Opostegoides* and some Nepticulidae).
9. Antrum of female genitalia reduced/antrum a sclerotized plate (*Opostegoides*, some primitive Nepticulidae – but not homologous and now thought to be a symplesiomorphy – see above).

Retention of some plesiomorphies is characteristic of *Eosopostega*. The pectinifer is relatively small and borne on a small cucullar lobe, which connects with the main body of the valva via a short pedicellum. Females of *Eosopostega* are unknown so this clade cannot be defined by any features of the female genitalia. Characters 10–14 are synapomorphies of *Eosopostega* species. Character 13 is tentative as the juxta appears to be lost in *Eosopostega issikii*; however, it is possible that the falcate ventral lobes on the valvae of *issikii* represent the detached halves of the juxta that are fused laterally with the ventral margins of the valvae (compare Fig. 94 with Davis, 1989: figs 276 and 277):

10. Uncus highly specialized and sclerotized, inverted 'V'-shaped, with fixed number of setae (4 + 4) (not homologous with *Pectinivalva* – see above)/uncus lobate.
11. Gnathos very complex, with strongly developed lateral processes/gnathos simple, band-shaped (*Notiopostega*, *Paralopostega*).
12. Valva modified to a relatively narrow but elongated sclerite/valva broad (most *Notiopostega*, *Paralopostega*, *Opostega* and *Pseudopostega*).
13. Juxta greatly specialized, paired, with remarkable



- horn-like posterior processes (but absent in *Eosopostega issikii*? – see above)/juxta unpaired, comparatively simple, without posterior processes.
14. Vinculum anterior margin concave, with lateral lobes (paralleled in *Opostegoides* and few species of *Pseudopostega*) (see above)/vinculum anterior margin not concave, without lateral lobes.

Three characters, 15–17 (below) are synapomorphies of *Notiopostega* + *Paralopostega* + *Opostega* + *Pseudopostega*. Despite the comparatively primitive condition of the uncus, some modification from the presumed plesiomorphic state is evident in this lineage. There is a tendency toward the development of a bilobed uncus with two lateral patches of setae in all four genera. The vinculum preserves its anteriorly smoothly rounded shape – a symplesiomorphy of all four genera.

15. Great enlargement of cucullar lobe of valva and pectinifer/cucullar lobe relatively small [some *Pectinivalva* species have a very large pectinifer so the polarity of this character is slightly uncertain].
16. Valva broadened or very broad/valva at most only moderately broad.
17. Juxta reduced, narrow/juxta broad, forming a lobe or lobes between the valvae.

Two characters (18, 19) are autapomorphies of *Notiopostega*. This lineage also exhibits the greatest reduction of wing venation and secondary reduction in the size of the eyes and antennal scape (Davis, 1989). Notable plesiomorphic features are the band-shaped gnathos and weakly developed pedicellum and costal process of the valva (see Davis, 1989; fig. 274); the female genitalia lack anal papillae and scobination on the corpus bursae (symplesiomorphy with *Opostegoides*).

18. Collar raised/collar decumbent.
19. Transverse occipital ridge present/cranium smoothly rounded (Davis, 1989).

Characters 20–22 are synapomorphies of *Paralopostega* + *Opostega* + *Pseudopostega*. In this lineage, in contrast to *Notiopostega*, a more or less well developed (or even very strongly developed) costal process of the valva is also characteristic.

20. Strong tendency towards reduction or loss of the aedeagus/aedeagus with moderate sclerotization (*Eosopostega*, *Notiopostega*).
21. Anal papillae present/anal papillae absent (*Notiopostega*, *Opostegoides*, some primitive Nepticulidae).

22. Strong development of scobination in female genitalia/scobination weakly developed or indistinct.

*Paralopostega* may be characterized by a quite distinctive larval morphology, the antenna with one large, apical basiconic sensillum instead of three or four small sensilla (Davis, 1989); however, the immature stages of comparatively few Opostegidae are known. The genus retains the possibly ancestral-type band-shaped gnathos and, in contrast to the *Opostega* + *Pseudopostega* lineage, still exhibits distinctive apical sclerotization of the aedeagus; however, these features must be treated as plesiomorphies. We recognise one synapomorphy of *Paralopostega* species:

23. Juxta with strong transverse caudal sclerotization/juxta lacking such sclerotization.

The lineage *Opostega* + *Pseudopostega* may be supported by the absence of muscles  $m_5$  and  $m_6$  in the male genitalia (Kozlov, 1987); however, this feature needs further study. We recognise otherwise four synapomorphies of this clade:

24. Strong tendency towards development of caudal process of gnathos/gnathos without differentiated caudal process.
25. Very strong development of costal process of valva/costal process weak or undeveloped, only weakly sclerotized (the long costal process in *Eosopostega* is here treated as a parallelism).
26. Aedeagus absent – i.e., entirely membranous/aedeagus retaining some sclerotization.
27. Female genital scobination in two clearly demarcated areas/scobination not clearly demarcated or very indistinct.

*Opostega* is characterized by the presence of an anterior pair of apophyses in the female genitalia; however, this feature most probably represents a plesiomorphy. We recognise one autapomorphy of *Opostega*:

28. Juxta broad and elaborated caudally/juxta neither broadened nor elaborated caudally (most Opostegidae).

In *Pseudopostega* there is additional sclerotization of abdominal tergite VIII, resembling a second pair of apophyses, and usually a fairly well developed ovipositor. Davis (1989) noted also that the metafurcal apophyses are fused to the secondary arms of the metafurcasternum, as in Tischeriidae. However, the universality within *Pseudopostega* of the latter characteristic is unknown. We recognise three autapomorphies of the genus:

29. Anterior fragment of second abdominal segment



very well sclerotized and elaborated/anterior fragment weakly sclerotized and indistinct (*Eosopostega*, *Opostega*, *Opostegoides*).

30. Costal process of valva separate from main body of valva/basal process not separated from main body of valva (all other genera).
31. Juxta tending to form a median rod-like sclerite/juxta broad or unspecialized.

One of the most distinctive and diagnostic features of *Opostegoides* is the presence of partial sclerotization in the aedeagus. Perhaps the presence of aedeagal sclerotization should be treated as a plesiomorphy shared with *Eosopostega*, *Notiopostega* and *Paralopostega*. However, representatives of *Opostegoides* possess sclerotized inner rods surrounded by a membranous sheath and, in contrast to the other three genera, lack the 'normal' aedeagal tube of Nepticuloidea. Although the anterior fragment of the second abdominal sternite is only weakly sclerotized and developed, this sclerite appears to be slightly more elongated than in the ground-plan. This distinctive lineage also expresses a characteristic combination of plesiomorphies: short basal process of valva, unspecialized broad lobe-like juxta, undeveloped (absent) anal papillae in female genitalia (shared with *Notiopostega*), weak development or absence of scobination on corpus bursae, etc. We recognise nine synapomorphies of *Opostegoides* species:

32. Annulus (vinculum + tegumen) modified, more strongly compressed dorso-ventrally and oblique in lateral view than in nepticuloid groundplan/annulus only moderately compressed and oblique.
33. Setae on uncus strongly thickened and elongated, reduced to a fixed set of 3 + 3 (occasionally 2 + 2)/setae numerous, short and slender (all other genera).
34. Gnathos very strongly reduced or completely lacking/gnathos normally developed (all other genera).
35. Pedicellum of valva very greatly extended, transversely wrinkled/pedicellum short or very short, not transversely wrinkled (other genera).
36. Number of spines in pectinifer reduced to about 12–20/pectinifer with about 31 spines (*Eosopostega*).
37. Strong tendency towards reduction of main body of valva which is simple, small to very small and weakly sclerotized, usually equal to pedicellum length or even shorter/main body of valva relatively large (all other genera).
38. Vinculum anteriorly concave, with slightly to strongly developed lateral lobes (paralleled in *Eosopostega*)/lateral lobes of vinculum not developed (groundplan of all remaining genera except *Opostegoides* and *Eosopostega*).

39. Female abdominal tip (ovipositor) distinctly flattened and with strongly thickened setae/ovipositor not flattened, setae not thickened (other genera).
40. Apophyses posteriores distinctly shortened, broadened and bifid/apophyses simple, slender (other genera, probably including *Eosopostega*, females of which are unknown).

### Taxonomic composition of the family

Until 1985 the Opostegidae was a monogeneric family. The reasons for this 'lumped' classification perhaps lay in the minimal attention the group had received from specialists and, more probably, because of the conspicuous but consistent external features of the moths as well as their uniformly modified wing venation. However, on the basis of the discovery of a sclerotized aedeagus in some east Asiatic species, the new genus *Opostegoides* were erected and the genus *Opostega* was split into two subgenera (*Opostega* and *Pseudopostega*) by Kozlov (1985). In the later extensive worldwide phylogenetic treatment of the Opostegidae by Davis (1989) the status of *Opostegoides* was confirmed, *Pseudopostega* was raised to generic rank and three new genera (*Eosopostega*, *Notiopostega* and *Paralopostega*) were additionally described from East Asia, Patagonia and Hawaii respectively. These unexpected and sudden changes in the taxonomic concept of the family were met with some suspicion by lepidopterists, and some doubts were expressed in unpublished communications. In the earliest phase of the present project we thought it likely that we would place all the Oriental species within two or perhaps three genera. However, the phylogenetic analysis produced a cladogram which, despite its novelty and the difference in configuration from that proposed by Davis (1989), supported all previously recognized lower-level clades. The three basal lineages shown in Fig. 56 represent highly distinctive and easily-diagnosed taxa within the family. The attempt to divide Opostegidae into two subfamilies (Oposteginae and Opostegoidinae) by Kozlov (1985) is not supported by the cladogram suggested by Davis (1989), nor persuasively by that presented here. Opostegoidinae was established when only *Opostegoides* was known to possess a sclerotized aedeagus and lack anal papillae in the female genitalia. Although in the first dichotomy of our cladogram *Opostegoides* diverges from all other opostegids, a monophyletic lineage strongly supported by at least nine autapomorphies, the monophyly of the alternate lineage is by no means as well supported and, as discussed above, may well be disproven when further material of, particularly, immature stages is available for study. The division of the Opostegidae into subfamilial ranks seems superfluous for a not very diverse Microlepidoptera family with only six genera.



## DISTRIBUTION AND BIOLOGY

Prior to 1985 all species of Opostegidae were treated as belonging to *Opostega* with a worldwide distribution; with no supraspecific classification no detailed consideration of the biogeography of the family was possible. Erection of five additional genera changed not only the taxonomic composition of the Opostegidae, but also the biogeographical concept of the family. The genera *Notiopostega* and *Paralopostega* appear to be endemic to the Valdivian Forest of Chile and Hawaii respectively (Davis, 1989). The genus *Eosopostega*, originally described from southern Japan, is newly recorded here from the Oriental Region (Indonesia: Moluccas) and now shows some indications of being more widespread in East and South-East Asia. *Opostegoides*, initially described from East Asia (Kozlov, 1985) and later from Europe, North America, South-East Asia and Australia (Davis, 1989) appears diverse throughout the whole Oriental Region and probably has a worldwide distribution. *Pseudopostega* has the widest, cosmopolitan distribution: it is very well represented in the Oriental Region and according to Davis (1989) occurs in all remaining regions, including the Australian and Neotropical.

The distribution of *Opostega* remains uncertain. Types of a large number of species still placed in *Opostega* – some 25% of those presently known – are not dissected and their true taxonomic position is unverified. All '*Opostega*' species described from the Oriental Region appear to belong to *Pseudopostega* and *Opostegoides* with a single exception – *Opostega chalcophylla* Meyrick. There is presently no evidence of the occurrence of *Opostega* outside the Palaearctic and Oriental regions.

The distribution of individual species indicates that many are very localised, being known from single locality or very limited area only, but our knowledge is hampered by collecting having been very limited. All data on species distribution should be considered very preliminary. The type localities of world Opostegidae species were mapped by Davis (1989); distribution maps of the Oriental species are given in detail here (Figs 175–179). Species records occupy the whole Oriental Region, and extend to islands beyond Wallace's line (reviewed by us for purely practical reasons). Re-examination of the type of *Opostega argentella* Bradley, 1957, from the Solomon Islands revealed that this species belongs to the Phyllocnistinae, not the Opostegidae. Most opostegid species found in the Oriental region (about 73% or 33 species) are known from a single area; 11 species are from different but isolated sites in India (including Assam), four from Thailand, three from Sri Lanka, as well as three from Nepal and three from West Malaysia. We thought that the opostegid fauna of Sumba

Island (southern Indonesia, beyond Wallace's line) might be very different from the remaining oriental fauna and represent an Australian element. However, just one species (*P. sumbae* sp. n.) is endemic to that island and the six remaining species are widely distributed in the Oriental Region, including Sri Lanka, Thailand and even Taiwan. It is very possible that the related *Pseudopostega machaerias* (Meyrick) and *P. parvilineata* sp. n. are vicariant species, *machaerias* being replaced by *parvilineata* in the southern islands of the Oriental Region (i.e., Indonesia). The most widespread currently known species are *Pseudopostega epactea* (Meyrick), *P. frigida* (Meyrick), *P. myxodes* (Meyrick), *P. saturella* sp. n. and *P. zelopa* (Meyrick). They form just 11% of the presently known species of the Oriental Region. Perhaps surprisingly, almost all the very widely distributed species are known from Sumba Island. No species is shared between the Oriental and any other zoogeographic region.

Still very little is known about the biology of opostegids. Life histories or host-plant relationships of only very few species (Stainton, 1868, Sorhagen, 1886, Swezey, 1921; Kumata, 1984, Davis, 1989, Puplesis, in prep.) have been discovered.

Larvae of opostegids are mostly known to be cambium miners, sometimes leaf-miners, or both, on Boraginaceae (Meyrick, 1916), Betulaceae, Fagaceae, Polygonaceae, Ranunculaceae, Rutaceae, Saxifragaceae (Davis, 1989) and, most recently recorded, Salicaceae (Puplesis *et al.*, 1996; Puplesis, in prep.). Life histories, morphology and biology of the immature stages were reviewed by Davis (1989). For most species (about 90%) host-plant data are still lacking. Among the Oriental species revised here just one, *Pseudopostega myxodes* (Meyrick) (*q.v.*), has been reared.

The marked lack of data on the biology of Opostegidae (in contrast to the wealth of data on Nepticulidae, for example) is due to the concealed mode of life of the larvae in plant tissue. Very long and very slender tunnels (mines) are produced (only occasionally other types) which are often very indistinct and difficult to recognise, or even invisible externally. Additionally, the larvae of at least some species (see Grossenbacher, 1910) mine for four to six weeks, making it probably impossible to rear moths from collected cut samples of mined bark or twigs, which quickly dry out. Larvae of some species (Puplesis, in prep) mine leaves but may need to transfer to the bark tissue of young twigs to complete their development. As far as is known, pupation takes place in the upper soil layer and in debris, creating additional difficulties in finding or rearing opostegids. Although a univoltine life history is indicated for at least some species (Davis, 1989), very different (but poor) data for adults collected in tropical areas during a whole



year suggests many species could be continuous-brooded.

Most species, including those of the Oriental fauna, are attracted to light but it is believed that some species may be diurnal (Davis, 1989).

KEY TO THE GENERA OF OPOSTEGIDAE

- 1 Aedeagus sclerotized ..... 2
- Aedeagus not sclerotized (i.e., absent) ..... 5
- 2 Gnathos present and obvious; pedicel of valva short; apophyses posteriores of female genitalia rod-like, not bifurcated; antrum absent ..... 3
- Gnathos absent or barely visible; pedicel greatly extended, half as long as main body of valva; apophyses posteriores of female genitalia bifurcated; antrum present ..... *Opostegoides*
- 3 Juxta paired or absent – see above); gnathos very complex with strongly developed lateral processes; vinculum with lateral lobes; uncus inverted ‘V’-shaped (East and South-East Asia only) ..... *Eosopostega*
- Juxta not paired, simple; gnathos a simple transverse band; vinculum rounded anteriorly, without lateral lobes (Western hemisphere only) ..... 4
- 4 Juxta sclerotized caudally; anal papillae present in female genitalia; corpus bursae large; apophyses posteriores long and narrow; head collar decumbent; width of scape greater than eye diameter (Hawaii only) ..... *Paralopostega*
- Juxta not sclerotized caudally, weakly developed; anal papillae absent in female genitalia; corpus bursae very small; apophyses posteriores relatively wide and short; head collar raised; width of scape less than eye diameter (Chile only) ..... *Notiopostega*
- 5 Juxta represented by a median rod-shaped sclerite, occasionally with irregular folded sclerotization medially; basal process of valva split from main body; apophyses anteriores absent in female genitalia ..... *Pseudopostega*
- Juxta a broad plate, usually elaborated caudally; valva not split; short apophyses anteriores present in female genitalia ..... *Opostega*

CHECK-LIST OF THE SPECIES OF THE ORIENTAL REGION

OPOSTEGIDAE Meyrick, 1893  
(=OPOSTEGIDES Meyrick, 1893: 479)  
Type genus: *Opostega* Zeller, 1839.

- OPOSTEGOIDES Kozlov, 1985
- 1. *tetroa* (Meyrick, 1907) **comb. n.**
  - 2. *pelorrhoea* (Meyrick, 1915) **comb. n.**
  - 3. *uvula* (Meyrick, 1915) **comb. n.**
  - 4. *nephelozona* (Meyrick, 1915) **comb. n.**
  - 5. *index* (Meyrick, 1922) **comb. n.**
  - 6. *epistolaris* (Meyrick, 1911) **comb. n.**
  - 7. *malaysiensis* Davis, 1989
  - 8. *gorgonea* sp. n.
  - 9. *argentisoma* sp. n.
  - 10. *thailandica* sp. n.
  - 11. *species 28702*
  - 12. *species 28644*
  - 13. *species 28640*
  - 14. *species 28641*
  - 15. *species 1005*
  - 16. *longipedicella* sp. n.
  - 17. *spinifera* sp. n.
  - 18. *flavimacula* sp. n.
  - 19. *cameroni* sp. n.
  - 20. *auriptera* sp. n.

EOSOPOSTEGA Davis, 1989

- 21. *armigera* sp. n.

OPOSTEGA Zeller, 1839

- 22. *chalcophylla* Meyrick, 1910

PSEUDOPOSTEGA Kozlov, 1985

- The *machaerias* group
- 23. *machaerias* (Meyrick, 1907) **comb. n.**
  - 24. *parvilineata* sp. n.
  - 25. *epactaea* (Meyrick, 1907) **comb. n.**
  - 26. *frigida* (Meyrick, 1906) **comb. n.**
  - 27. *similantis* sp. n.
  - 28. *myxodes* (Meyrick, 1916) **comb. n.**
  - 29. *species 28623*

- The *velifera* group
- 30. *velifera* (Meyrick, 1920) **comb. n.**
  - 31. *nepalensis* sp. n.
  - 32. *sumbae* sp. n.

- The *saturella* group
- 33. *saturella* sp. n.
  - 34. *javae* sp. n.
  - 35. *amphivittata* sp. n.

- The *nigrimaculella* group
- 36. *nigrimaculella* sp. n.
  - 37. *alleni* sp. n.

- The *indonesica* group
- 38. *indonesica* sp. n.

- The *fungina* group
- 39. *fungina* sp. n.

- Unattributed to a group
- 40. *zelopa* (Meyrick, 1905) **comb. n.**
  - 41. *euryntis* (Meyrick, 1907)
  - 42. *spilodes* (Meyrick, 1915) **comb. n.**



43. *subviolacea* (Meyrick, 1920) **comb. n.**

44. *strigulata* **sp. n.**

45. *species* 404

**Note.** *Opostega argentella* Bradley, 1956 (Solomon Is) is here transferred to Gracillariidae (Phyllocnistinae) (*Phyllocnistis argentella* (Bradley), **comb. n.**). *Opostega ischnophaea* Meyrick, 1930 (India) was transferred to *Petasobathra* (Lyonetiidae) by Davis (1989).

## SPECIES REVIEW

### OPOSTEGOIDES Kozlov, 1985

Type species: *Opostega minodensis* Kuroko, 1982.

**SHORT DIAGNOSIS.** Anterior fragment of second abdominal segment weakly sclerotized and indistinct. Annulus (vinculum + tegumen) strongly compressed dorso-ventrally; vinculum anterior margin concave, with lateral lobes. Uncus lobate and oblique in lateral view; setae on uncus strongly thickened and elongated, reduced to a fixed set of 3 + 3 (occasionally 2 + 2). Gnathos very strongly reduced or completely lacking. Main body of valva with strong tendency towards reduction, simple, small to very small but comparatively broad, weakly sclerotized, usually equal to pedicellum length or even shorter; basal process not separated from main body of valva; pedicellum very greatly extended, transversely wrinkled; number of spines in pectinifer reduced to about 12–20. Juxta simple, without posterior processes.

Female abdominal tip (ovipositor) distinctly flattened and with strongly thickened setae; apophyses posteriores distinctly shortened, broad and bifid.

#### *Opostegoides tetraea* (Meyrick, 1907) **comb. n.**

(Figs 1, 66, 67, 175)

*Opostega tetraea* Meyrick, 1907: 986.

*Opostega tetraea* Meyrick; Davis, 1989: 75 [lectotype designated].

**MALE** (Fig. 1). Forewing length: 5.3–5.9 mm. Wingspan: 11.6–13.0 mm. Head: palpi cream; piliform scales on vertex white, collar and scape white; flagellum pale ochreous. Thorax cream anteriorly, otherwise orange-brown; tegulae ochreous orange anteriorly, whitish cream posteriorly. Forewing pattern comprising two very large white shining spots (which may be fused into one elongate spot) with a broad surround of purplish-brown scales on an ochreous orange background. Underside of forewing brown. Cilia from yellow-ochre to ochreous cream. Hindwing pale ochre or brown, depending on angle of view, cilia pale ochre.

Legs pale ochreous cream or pale ochre. Abdomen brown on upperside and whitish cream to pale ochre on underside.

**FEMALE.** Unknown.

**MALE GENITALIA** (Figs 66, 67). Uncus very broad, with three lateral setae. Valva with large cucullar lobe bearing pectinifer and supported by a long and slender pedicel; pectinifer consisting of about 32 long slender spines, which almost cover cucullar lobe and are arranged in a single row; main body of valva simple, broadest distally and rounded; basal process of valva short. Juxta wrinkled laterally. Vinculum very broad; lateral lobes very large and broadly rounded, anterior emargination shallow, but very broad. Aedeagus with large internal sclerotized rod, which is strongly broadened apically.

**BIOLOGY.** Adults collected in December–January. Larval biology unknown.

**DIAGNOSIS.** This large opostegid (13 mm wingspan) differs markedly from all other known opostegid species in its unique forewing pattern.

**DISTRIBUTION.** Sri Lanka.

**MATERIAL EXAMINED.** Lectotype ♂, **Sri Lanka:** Maskeliya: 1 ♂, xii.1904 (*de Mowbray*) (BMNH).

Paralectotypes: 1 ♂, data as lectotype, genitalia slide no. 28661 (BMNH); 1 ♂ (no locality) 1904 (*J.P[ole]*) (BMNH).

#### *Opostegoides pelorrhoea* (Meyrick, 1915) **comb. n.**

(Figs 2, 70–72, 154, 155, 175)

*Opostega pelorrhoea* Meyrick, 1915: 352.

*Opostega pelorrhoea* Meyrick; Davis, 1989: 74.

**MALE.** Forewing length 3.8–5.0 mm. Wingspan 9.0–10.7 mm. Head: palpi cream; piliform scales on vertex white to pale yellow; collar and scape white (ivory to snow-white); flagellum creamy brown to cream. Thorax white anteriorly, usually grey-brown posteriorly; tegulae white, but darkened with brown anteriorly. Forewing generally white to creamy white with brown to fuscous scales forming a diffuse, irregular and variable pattern. Usually there is a fuscous brown dorsal patch and brown costal patch; additionally, however, numerous pale brown (occasionally fuscous brown) scales may be scattered irregularly in the distal half of the forewing and sometimes at the base as well. Occasionally some specimens may have a very weakly developed dorsal patch and just the distal half of the forewing darkened by brown and dark brown scales. Apical dot always evident, black; two parallel terminal strigulae pale brown, indistinct. Underside of forewing brown, excluding a large basal area. Cilia cream to



brownish cream, occasionally grey-brown. Hindwing creamy brown to pale greyish ochre; underside of hindwing covered with brown scales, except basal 0.15–0.20; cilia of hindwing cream to brownish cream. Legs cream. Abdomen pale greyish brown on upperside and ochreous brown to cream on underside.

**FEMALE.** Very similar to male.

**GENITALIA ♂** (Figs 70–72). Uncus broad, with three strong lateral setae. Valva with large cucullar lobe bearing pectinifer and supported by a relatively broad and wrinkled pedicel; pectinifer consisting of about 16–22 spines; main body of valva strongly sclerotized and very roughly papillated at distal end; basal process weakly sclerotized, costal process strongly sclerotized and may be slightly curved. Juxta strongly wrinkled distally or in middle, more or less rectangular. Vinculum with large to moderately large lateral lobes and very broad (deep or shallow) anterior emargination. Aedeagus with a large, internal sclerotized rod, which broadens distally or may be split longitudinally.

**GENITALIA ♀** (Figs 154, 155). Abdominal tip bluntly rounded. Posterior apophysis short, bifurcated distally. Antrum sclerotized, narrowed anteriorly. Corpus bursae highly modified, forming a pair of similar-sized, long parallel sacs that taper slightly anteriorly from a swollen common base, inverted U-shaped. Spermathecal duct very long, twice length of corpus bursae; outer canal slender, bulbous at distal (anterior) end; inner canal sinuous, distally with 1.0–1.5 convolutions.

**BIOLOGY.** Adults collected in May and July. Larval biology unknown.

**DIAGNOSIS.** Differs from other species known by the irregularly marked forewing and relatively large cucullar lobes of the valva. In the female genitalia the configuration of the corpus bursae is unique within the Opostegidae.

**DISTRIBUTION.** India (eastern); Nepal. At the collecting site on Phulchoki in oak forest this species was common.

**MATERIAL EXAMINED.** Holotype ♂, **India:** Assam, Khasi Hills, vii.1906, genitalia slide no. 28653 (BMNH).

Other material: **Nepal:** 2♂, 6♀, Kathmandu District, Phulchoki, 27–31.v.1983 (Allen, Brendell, Robinson & Tuck), genitalia slide nos. 28683♂, 28684♀ (BMNH).

**REMARKS.** Nepalese specimens differ slightly from the Indian holotype in the larger cucullar lobe of the valva, fewer pectinifer spines, smaller lateral lobes of the vinculum, longitudinally split rod-like sclerotization of aedeagus (entire in the holotype), and brighter white coloration and may prove eventually to

be a separate species. The difference in coloration between recently-collected Nepalese specimens and the older Indian holotype may just be due to the age of the latter.

***Opostegoides uvida* (Meyrick, 1915) comb. n.**

(Figs 3, 68, 69, 175)

*Opostega uvida* Meyrick, 1915: 352.

*Opostega uvida* Meyrick; Davis, 1989: 75.

**MALE** (Fig. 3). Forewing length ~4.5–4.6 mm. Wing-span ~9.6–9.9 mm. Head: palpi cream; piliform scales on vertex, collar and scape whitish; flagellum pale ochreous, but basal third whitish. Thorax and tegulae white. Forewing generally ochreous brown, but basally almost white; middle of forewing with diffuse and very oblique brown fascia. Terminal strigulae and apical dot absent. Underside of forewing deep brown. Cilia brownish cream. Hindwing brown, shade varying depending on angle of view; cilia brownish. Legs pale ochreous cream. Abdomen dark brown with yellow lustre on upperside, yellow-brown on underside.

**FEMALE.** Unknown.

**GENITALIA ♂** (Figs 68, 69). Uncus broad and relatively long, with three strong lateral setae. Valva with moderately large cucullar lobe bearing pectinifer and supported by a more or less smoothly sclerotized pedicel; pectinifer consisting of about 22 long, distally tapered spines; main body of valva triangular, with numerous very long setae at distal end; basal process not developed, valva fused basally with vinculum; costal process short and well sclerotized. Juxta narrowed, broadly rounded and wrinkled caudally. Vinculum with broad lateral lobes and triangular anterior emargination. Aedeagus with a large internal sclerotized rod which broadens distally.

**BIOLOGY.** The single specimen known was collected in November. Larval biology unknown.

**DIAGNOSIS.** Differs from all other known Oriental *Opostegoides* in the pale brownish wings and well sclerotized valva.

**DISTRIBUTION.** Sri Lanka.

**MATERIAL EXAMINED.** Holotype ♂, **Sri Lanka:** Maskeliya, 1.xi.1905 (Pole), genitalia slide no. 28654 (BMNH).

***Opostegoides nephelozona* (Meyrick, 1915) comb. n.**

(Figs 4, 74, 75, 175)

*Opostega nephelozona* Meyrick, 1915: 352.

*Opostega nephelozona* Meyrick; Davis, 1989: 74.



MALE (Fig. 4). Forewing length ~4.5 mm. Wingspan ~10.1 mm. Head: palpi cream, laterally dark brown; piliform scales on vertex cream; collar and scape white; flagellum very long, white, except distal one-sixth. Thorax generally white, but distally very pale brown; tegulae white. Forewing mostly white, medial (predominantly dorsal) and apical regions weakly darkened with very pale ochre. Terminal strigulae and apical dot absent. Underside of forewing cream. Cilia white or whitish cream. Hindwing whitish cream; cilia whitish. Legs cream, distally brownish cream. Colour of abdomen unknown.

FEMALE. Unknown.

GENITALIA ♂ (Figs 74, 75). Uncus broad, extended laterally into small lobes, each of them bearing three setae. Valva with relatively small cucullar lobe bearing pectinifer and supported by a transversely wrinkled, relatively very long pedicel; pectinifer consisting of about 24 long spines; main body of valva small, bulged medially, abruptly narrowed basally and distally; basal process not developed, costal process slightly sinuous and well sclerotized. Juxta barely wrinkled, therefore almost invisible, but very long, stretching distally over uncus. Vinculum with short and broad lateral lobes, anterior emargination rather shallow. Aedeagus with an unusually small, distally strongly sclerotized rod.

BIOLOGY. The single specimen known was collected in February. Larval biology unknown.

DIAGNOSIS. Distinguishable mainly by the distinctive shape of main body of the valva which is medially bulged and by the ill-defined forewing pattern.

DISTRIBUTION. Sri Lanka.

MATERIAL EXAMINED. Holotype ♂, **Sri Lanka**: Maskeliya, ii.1906 (*Pole*), genitalia slide no. 28650 (BMNH).

***Opotegoides index* (Meyrick, 1922) comb. n.**

(Figs 5, 146, 176)

*Opotega index* Meyrick, 1922: 557.

*Opotega index* Meyrick; Davis, 1989: 74.

MALE. Unknown.

FEMALE (Fig. 5). Forewing length ~2.5 mm. Wingspan ~5.5 mm. Head: palpi whitish; piliform scales on vertex, collar and scape white; flagellum brownish anteriorly, white posteriorly. Thorax and tegulae white. Forewing white, with dark brown costal spot and single terminal strigula. Apical dot black; small area just before apical dot very pale yellow. Dorsum of forewing with inconspicuous and diffuse pale brown spot. Underside of forewing brown, except apex. Cilia brown costally, almost white at tornus. Hindwing and

cilia cream. Legs cream, but forelegs darkened with grey-brown laterally, midlegs with brown on tarsus. Abdomen greyish on upperside, whitish on underside.

GENITALIA ♀ (Fig. 146). Abdominal tip very broadly rounded. Posterior apophysis short, bifurcated distally. Antrum sclerotized, long and broad, slightly narrowed anteriorly. Corpus bursae oval, with some tiny spicules posteriorly. Spermathecal duct almost twice as long as corpus bursae, apparently fused with it; outer canal very slender; inner canal very long, sinuous, slightly convoluted distally.

BIOLOGY. Unknown.

DIAGNOSIS. This species may be differentiated from all currently known *Opotegoides* by the presence of a brown costal spot on the forewing.

DISTRIBUTION. India (Assam).

MATERIAL EXAMINED. Holotype ♀, **India**: Assam: Shillong, 1922 (*T.B.F[lletcher]*), genitalia slide no. 28652 (BMNH).

***Opotegoides epistolaris* (Meyrick, 1911) comb. n.**

(Figs 6, 73, 147, 175)

*Opotega epistolaris* Meyrick, 1911: 108.

*Opotega epistolaris* Meyrick; Davis, 1989: 74 (lectotype designated).

MALE (Fig. 6). Forewing length 3.5 mm. Wingspan 7.7 mm. Head: palpi cream; piliform scales on vertex, collar, scape and flagellum white. Thorax and tegulae white. Forewing white with a small elongated dark brown dorsal spot. Terminal strigula weakly expressed, oblique, brown; cilia with broad brown line parallel to strigula. Apical dot fuscous brown, with an adjacent tiny area of yellowish scales. Underside of forewing brown, except basal area. Cilia brownish costally, white elsewhere. Hindwing brown; underside brown, much paler basally. Cilia of hindwing brownish. Legs brownish cream to yellowish cream, but forelegs and tarsi of all legs darkened with brown. Abdomen brown on upperside, lustrous white on underside.

FEMALE. Similar to male. Forewing length 4.1 mm. Wingspan 8.8 mm. Dorsal spot of forewing tending to be larger and a little paler. Otherwise as in male.

GENITALIA ♂ (Fig. 73). Uncus broad, with three strong setae laterally. Valva with relatively small almost rounded cucullar lobe bearing pectinifer and supported by a long pedicel that is transversely wrinkled distally; pectinifer consisting of about 20 long spines; main body of valva with broad and rounded inner lobe, more or less square-ended distally; basal process absent, valva triangularly narrowed basally but not



extended into a process; costal process short and well sclerotized. Juxta broad, wrinkled laterally. Vinculum with large triangular lateral lobes; anterior emargination very broad and almost semicircular. Aedeagus large but without the usual internal sclerotized rod which is characteristic of most of *Opostegoides* species.

GENITALIA ♀ (Fig. 147). Abdominal tip broad and blunt. Posterior apophysis short, but bifurcated distally. Antrum sclerotized, most strongly at anterior margin. Corpus bursae a large bulbous sac. Outer canal of spermathecal duct broad, about 0.6–0.8 size of corpus bursae size; inner canal sinuous, but not convoluted, very long, twice length of corpus bursae, with a small oval sac distally.

BIOLOGY. Adults collected in May. Larval biology unknown.

DIAGNOSIS. This species is a little difficult to separate from many other *Opostegoides* species using only external features, but the shape of valva (notably the bulged inner lobe) in the male provides a good character for its distinction.

DISTRIBUTION. India (south).

MATERIAL EXAMINED. Lectotype ♂, **India**: [Nilgiri Hills], N. Coorg: Dibidi, 13.v.1907 (*Newcome*), genitalia slide no. 28625 (BMNH) (see Remarks).

Paralectotype: 1 ♀ [recorded incorrectly as a male in original description], data as lectotype, genitalia slide no. 28639 (BMNH).

REMARKS. This species was described from two specimens, recorded by Meyrick as males. In fact both sexes are represented; the male was designated as lectotype by Davis (1989). A further seven subsequently-collected specimens identified as '*epistolaris*' by Meyrick were in his collection; they represent *Pseudopostega epactea* and three other *Opostegoides* species.

### *Opostegoides malaysiensis* Davis, 1989

(Figs 7, 76–78, 175)

*Opostegoides malaysiensis* Davis, 1989: 52.

MALE. Forewing length 2.7–2.8 mm. Wingspan ~6.0–6.1 mm. Head: palpi white, fuscous laterally; piliform scales on vertex, collar and scape white with silvery reflections; flagellum pale cream becoming darker in apical third. Thorax, tegulae and forewing silvery white. Markings of forewing very weakly expressed – an indistinct pale brownish dorsal spot and blackish apical dot; apex of forewing at base of cilia (usual position of terminal strigulae) with very pale ochre-yellow shadow (in Genting Highlands specimen but not in holotype). Cilia whitish. Underside of forewing pale ochreous cream. Hindwing and cilia white. Legs

white, but forelegs strongly marked with grey-fuscous. Abdomen brownish cream on upperside, white on underside.

FEMALE. Unknown (see Remarks).

GENITALIA ♂ (Figs 76–78). Uncus broad, somewhat simple, with two strong lateral setae. Valva with tapered cucullar lobe bearing pectinifer and supported by slender pedicel; pectinifer consisting of 20–22 long spines; main body of valva small, slightly bulged in apical half and roughly papillated at distal end; basal process fused with vinculum, costal process well sclerotized and straight. Juxta distinctly wrinkled. Vinculum with semicircular emargination and large lateral lobes. Aedeagus with a long internal sclerotized rod, which is swollen and angled at apex. [The figure of the holotype in Davis, 1989 (fig. 279) is slightly idealized, because the preparation is damaged and uncus is partly missing.]

BIOLOGY. Adults collected at light in August and September. Davis's (1989) comment that the species is univoltine is not supported by collecting data. Larval biology unknown.

DIAGNOSIS. *O. malaysiensis* differs from all known Oriental *Opostegoides* species in possessing a medially and apically swollen valva. Externally the species is inseparable from other *Opostegoides* species possessing a dorsal spot on the forewing but differs in details of the genitalia. From *longipedicella* it may be differentiated by the shorter pedicellum, from *spinifera* by the absence of spines on the valva and by the unspecialized juxta, from *gorgonea* by the distally almost rounded valva, from *argentsoma* by the slender pedicellum and less lustrous forewing, from *flavimacula* by the broad vinculum lobes and absence of a forewing costal spot, and from the unnamed *species 1005* by the paler dorsal spot and indistinct coloration of the apical area of the forewing.

DISTRIBUTION. West Malaysia.

MATERIAL EXAMINED. Holotype ♂, **West Malaysia**: Cameron Highlands: Berinchang, 29.viii.1986 (*Kumata*), genitalia slide no. 3680 D.R. Davis (ELUH [erroneously given as FRIM in original description]).

Other material: 1 ♂, **West Malaysia**: Western Pahang, Genting Highlands, 17.xi.1981 (at light) (*Tuck*), genitalia slide no. 28809 (BMNH).

REMARKS. This species was described by Davis from two specimens, a male (holotype with very pale forewing pattern) and a female with a darker forewing pattern. The latter is attributed here to *gorgonea*, below. It appears that the original description of the external features of *malaysiensis* was made predominantly from the female specimen because of the poor condition of the holotype and is thus applicable to *gorgonea*.



***Opostegoides gorgonea* sp. n.**

(Figs 8, 79, 149, 150, 175)

[*Opostegoides malaysiensis* Davis, 1989: 52, figs 253, 309 (partim – ♀ paratype only). Misidentification.]

[*Opostegoides malaysiensis* Davis; Robinson, Tuck & Shaffer, 1994: 22, figs 31, pl.2, fig.2. Misidentification.]

**MALE.** Forewing length 2.8–2.9 mm. Wingspan 6.5–6.6 mm. Head: palpi white, laterally fuscous; piliform scales on vertex, collar and scape snow-white; flagellum brown in distal 0.60–0.65, whitish proximally. Thorax and tegulae snow-white. Forewing snow-white, with ochreous brown angular reflection, slightly variable, with dorsal spot and two almost fused fuscous brown terminal strigulae. Apical dot black, preceded by small yellowish brown area. Underside of forewing cream with some indistinct patches of brownish scales (one close to costa, another close to dorsum). Cilia brownish on costal side, whitish elsewhere. Hindwing relatively narrow, whitish; cilia whitish. Abdomen white.

**FEMALE** (Fig. 8). Forewing length 2.6–3.1 mm. Wingspan 5.7–6.8 mm. Otherwise as in male.

**GENITALIA ♂** (Fig. 79). Uncus relatively narrow, with two small, well differentiated lateral lobes, each with three long setae. Valva with very small cucullar lobe bearing pectinifer and supported by a very long transversely wrinkled and distally curved pedicel; pectinifer consisting of about 16–18 long spines; main body of valva small, extended distally into a sharply pointed process; basal process absent, costal process very well developed, long, strongly differentiated. Juxta hardly wrinkled, apparently fused with valva, caudal margin strongly but smoothly sclerotized. Vinculum with narrow, pointed and inwardly bent lateral lobes; anterior emargination very prominent, U-shaped. Aedeagus with short but broad internal sclerotized rod.

**GENITALIA ♀** (Figs 149, 150). Abdominal tip very broadly rounded. Posterior apophysis short, slightly bifurcated distally. Antrum weakly sclerotized, broadened anteriorly. Corpus bursae very small. Spermathecal duct very large; posterior half of outer canal very broad, helical, anterior half very narrow; inner canal with about 5 very wide convolutions in posterior half and with very numerous small convolutions in anterior half (see Remarks).

**BIOLOGY.** Adults collected at light in August. Larval biology unknown.

**DIAGNOSIS.** This species is remarkable among all known *Opostegoides* in possessing, in the male, a distinctive extended valva, very long and distally bent pedicellum, and narrow and bent vinculum lobes; the

female genitalia are characterised by the strongly reduced corpus bursae and very large and convoluted spermathecal duct. Externally *gorgonea* is almost indistinguishable from other *Opostegoides* species possessing a dorsal spot in the forewing; it differs from *malaysiensis* in the well developed terminal strigulae of the forewing and distinct ochreous area proximad of the apical dot. It is strongly differentiated from other externally similar species by the male and female genital structure.

**DISTRIBUTION.** West Malaysia. This is a fairly common species in the montane forest on Gunung Brinchang.

**MATERIAL EXAMINED.** Holotype ♂, **West Malaysia:** Cameron Highlands, Gunung Brinchang, 15–23.viii.1986 (Robinson), genitalia slide no. 28630 (BMNH).

Paratypes 1 ♂, 9 ♀, data as holotype, genitalia slide nos. 28631 ♀, 28633 ♀, 28634 ♀, 28635 ♀, 28636 ♀, 28637 ♀, 28810 ♀ (BMNH). 1 ♀, **West Malaysia:** Berinchang, Cameron Highlands, 31.viii.1986 (Kumata), genitalia slide 3689 D.R. Davis [ELUH] (paratype of *Opostegoides malaysiensis*).

**REMARKS.** The female paratype of *Opostegoides malaysiensis* (Davis, 1989: 52, figs 253, 309) is referable to this species (see Remarks for *malaysiensis*). In his description the spermathecal duct was incorrectly identified as a modified corpus bursae, and the corpus bursae as an 'enlarged lateral (accessory) lobe'. Davis suggested that such female genitalia 'appear so highly modified that they may be unique not only for the family but for the entire Lepidoptera as well' (Davis, 1989: 52). However, in spite of its remarkable morphology, there is no feature of the spermathecal duct that is fundamentally different from those of other opostegid species. An enlarged spermathecal duct is characteristic of many Opostegidae species, and also (S. Yu. Sinev, pers. comm.) Stathmopodidae.

***Opostegoides argentsoma* sp. n.**

(Figs 9, 80, 148, 175)

**MALE.** Forewing length 2.4–2.6 mm. Wingspan 5.3–5.5 mm. Head: palpi whitish; piliform scales on vertex white, occasionally creamy; collar and scape snow-white with strong silver reflections; flagellum silvery white, darkened in distal half with brownish or grey-brown. Thorax, tegulae and forewing silvery-white. Forewing with two usually indistinct brown or ochreous brown terminal strigulae and a black apical spot, occasionally with a very pale brown dorsal spot. Underside of forewing cream. Cilia generally white, but slightly darkened with brown apically. Hindwing white to pale cream, usually with some silvery reflections; cilia cream or whitish. Abdomen white with silvery reflections.



FEMALE (Fig. 9). Similar to male.

GENITALIA ♂ (Fig. 80). Uncus with weakly-differentiated lateral lobes, each with three long setae. Valva with moderately large cucullar lobe bearing pectinifer and supported by a relatively broad, but apically constricted pedicel; pedicel slightly wrinkled longitudinally; pectinifer consisting of about 28 long, slender spines; main body of valva moderately developed with a well sclerotized apical lobe; basal process weakly developed, small; costal process strongly sclerotized and well differentiated. Juxta hardly wrinkled, indistinct. Vinculum with almost triangular lateral lobes; anterior emargination large. Aedeagus with a long and slender internal sclerotized rod; apex of aedeagus square, sclerotized.

GENITALIA ♀ (Fig. 148). Abdominal tip very broadly rounded. Posterior apophysis short, slightly bifurcated distally. Antrum strongly sclerotized, outline sinuous laterally and anteriorly. Corpus bursae small, abruptly narrowed distally. Spermathecal duct almost as small as corpus bursae; outer canal oval; inner canal sinuous and with anterior rhomboidal sclerite.

BIOLOGY. Adults collected in October. Larval biology unknown.

DIAGNOSIS. Indicative external features of this species include its small size and the silvery angular reflection of the forewing. But otherwise it is almost inseparable from many other *Opostegoides* species possessing a forewing dorsal spot. The male genitalia are most similar to those of *malaysiensis* and two unnamed *Opostegoides* species (28644 and 28641) but these have a wider emargination of the vinculum and/or a more slender pedicel and lack the characteristic strong silver sheen of the collar and forewing of *argentsoma*.

DISTRIBUTION. Indonesia (Kalimantan) [Borneo].

MATERIAL EXAMINED. Holotype ♂, **Indonesia (Kalimantan)**: Balikpapan, Mentawir River, 50m, x.1950 (Wegner), genitalia slide no. Pupl. 019 (NNM).

Paratypes, 4♂, 1♀, data as holotype, genitalia slide nos. E.v.N.3051♂, Pupl. 018♀ (NNM).

### *Opostegoides thailandica* sp. n.

(Figs 10, 81, 176)

MALE (Fig. 10). Forewing length ~2.7–2.8 mm. Wingspan ~6.0 mm. Head: palpi silvery white; piliform scales on vertex dull white; collar and scape white with strong silvery lustre; flagellum white in proximal 0.3–0.4, becoming more brown in distal half. Thorax, tegulae and forewing white with strong silvery lustre. Forewing with flattened or slightly triangular greyish brown dorsal spot. First terminal strigula brown, the

second shorter, fuscous brown. Apical dot black. Underside of forewing fuscous brown, except small basal area close to costa. Cilia brown. Hindwing dark grey-brown, cilia grey-brown. Legs greyish cream with some silvery lustre, front of forelegs darkened with brown. Colour of abdomen unknown.

FEMALE. Unknown.

GENITALIA ♂ (Fig. 81). Uncus with triangular lateral lobes bearing four long setae. Valva with small rounded cucullar lobe bearing pectinifer; pedicel unusually broadened towards distal end, smoothly sclerotized, without transverse wrinkles; pectinifer consisting of about 16 long spines covering more than two-thirds of cucullar lobe; main body of valva very weakly developed, very small, but with strongly papillated and sclerotized distal lobe; basal process not differentiated; valva constricted at base, with narrow and weakly sclerotized zone of fusion with vinculum; costal process long and well sclerotized. Juxta almost invisible. Vinculum with large, anteriorly rounded lateral lobes, anterior emargination very broad. Aedeagus with two well sclerotized and unusually broad internal lobes caudally.

BIOLOGY. The single specimen known was collected in October. Larval biology unknown.

DIAGNOSIS. This species is outstanding among all others of the genus in possessing: marked silvery lustre of the forewing and thorax, dark hindwing, uniquely broadened pedicellum and unusually weakly developed main body of the valva with very characteristic distal lobe, and a remarkably shaped aedeagus.

DISTRIBUTION. Thailand (700–900 m).

MATERIAL EXAMINED. Holotype ♂, **Thailand**: Loei Province, Phu Luang Wildlife Sanctuary, 700–900m, 8–14.x.1984 (Karsholt *et al.*), genitalia slide no. Pupl. 403 (ZMUC).

REMARKS. We justify the description of this species based on just a single specimen on the grounds of its distinctive appearance and unusual features that clearly separate it from other members of the genus (see Diagnosis).

### *Opostegoides species 28702*

(Figs 13, 83, 176)

MALE (Fig. 13). Forewing length 3.2 mm. Wingspan 7.2 mm. Head: palpi, piliform scales on vertex, collar, scape and flagellum white. Thorax and tegulae white. Forewing white with brown oblique strigulae and parallel, fuscous brown darkening on cilia. Apical dot black. Underside of forewing brown, except for large pale cream area at base. Cilia brownish costally, elsewhere white. Hindwing white on upperside, but



darkened with brown scales on underside, cilia ochreous cream or brownish cream. Legs cream, but front of forelegs and tarsi of remaining legs darkened with fuscous or fuscous-brown. Abdomen ochreous on upperside and whitish on underside.

FEMALE. Unknown.

GENITALIA ♂ (Fig. 83). Uncus broad, without differentiated lobes and with three strong setae laterally. Valva with moderately large cucullar lobe bearing pectinifer and supported by a pedicel that broadens slightly towards apex; pectinifer consisting of about 18–20 long spines; main body of valva with small papillated lobe at distal end; basal process invisible in ventral view, costal process relatively long. Juxta practically invisible. Vinculum with extraordinarily long and relatively slender lateral lobes; anterior emargination very broad and deep, more or less U-shaped. Aedeagus with two parallel, very slender, internal sclerotized rods which differ greatly in length and are joined by a much less sclerotized, almost invisible plate.

BIOLOGY. Adult collected in February. Larval biology unknown.

DIAGNOSIS. This species resembles many other *Opostegoides* species, but it is distinguishable by genital and/or external features as follows: from *malaysiensis*, *argenisoma*, *spinifera*, and *species 28641* by the distinctively elongated vinculum lobes; from *longipedicella* by the presence of a dorsal spot, relatively short pedicel and very long vinculum lobes; from *thailandica* by the absence of strong silvery reflections on the forewing, white hindwing, longer vinculum lobes and a less sclerotized aedeagus; from *flavimacula* by the absence of a costal spot and slender sclerotization of the aedeagus; from *gorgonea* by the blackish dorsal spot, very long vinculum lobes, short pedicel and distally almost rounded valva; from *epistolaris* by the white hindwing and very long vinculum lobes; from *species 28644* by the shorter dorsal spot, white hindwing and very long vinculum lobes; from *species 28640* by the darker dorsal spot, very long vinculum lobes and relatively large main body of the valva; and from *species 1005* by the dark brown terminal strigula.

DISTRIBUTION. Brunei (upper montane forest).

MATERIAL EXAMINED. 1 ♂, **Brunei**: Bukit Pagon, 1680 m (5520'), LP 308 (upper montane forest), 15–20.ii.1982 (Robinson), genitalia slide no. 28702 (BMNH).

REMARKS. This taxon may well be a distinct species of *Opostegoides*. However, as it is known from just one specimen, and because of its strong resemblance to *epistolaris*, it is described but not named.

### *Opostegoides species 28644*

(Figs 11, 12, 84, 85, 176)

MALE (Figs 11, 12). Forewing length 4.1 mm. Wing-span 8.9 mm. Head: palpi cream, lustrous; piliform scales on vertex, collar and scape white; flagellum whitish in proximal quarter, gradually darkening with brown distally. Thorax and tegulae white. Forewing white with a relatively large and elongated dark brown dorsal spot; two parallel oblique terminal strigulae, the first ochreous and diffuse, the second fuscous and sharp; poorly defined fuscous apical dot. Underside of forewing brown, except basally, where yellowish cream scales form two elongated spots. Cilia from brownish costally to brownish white in tornus. Hindwing greyish brown on upperside and underside, cilia ochreous brown or brown. Legs generally ochreous cream, lustrous, but forelegs slightly darkened with fuscous. Colour of abdomen unknown.

FEMALE. Unknown.

GENITALIA ♂ (Figs 84, 85). Uncus a broad transverse band, with three strong lateral setae. Valva with relatively small and more or less square (in ventral view) cucullar lobe bearing pectinifer and supported by a moderately long, transversely wrinkled and distally swollen pedicel; pectinifer consisting of about 34–36 spines; main body of valva large, but without broad and rounded inner lobe; basal process absent; costal process short and weakly differentiated. Juxta weakly sclerotized and weakly wrinkled. Vinculum with very broadly separated, large triangular lateral lobes; anterior emargination very broad, shallow and almost triangular. Aedeagus large and with conspicuous large, internal, sclerotized rod.

BIOLOGY. Adult collected in January. Larval biology unknown.

DIAGNOSIS. This species differs from all other known *Opostegoides* in the unusually long dorsal spot and in the widely separated large lobes of the vinculum, as well as the distally broadening main body of the valva.

DISTRIBUTION. India.

MATERIAL EXAMINED. 1 ♂, **India**: [Anamalais: Castlecroft Estate, 4000 ft], 23.i.1912 (Fletcher), genitalia slide no. 28644 (BMNH).

REMARKS. This taxon may well be a distinct species of *Opostegoides*. However, as it is known from just one old specimen and is not highly distinctive it is described but not named.

### *Opostegoides species 28640*

(Figs 14, 82, 176)



MALE (Fig. 14). Forewing length 2.7–2.8 mm. Wingspan ~6.0 mm. Head: palpi whitish; piliform scales on vertex, collar and scape white; flagellum white. Thorax and tegulae white. Forewing white with a small, flattened brown dorsal spot; with two parallel brown terminal strigulae, the first short, and with relatively large deep black apical dot. Underside of forewing brownish cream. Hindwing and cilia of both wings practically white. Legs generally whitish, but forelegs darkened with metallic-fuscous scales. Colour of abdomen unknown.

FEMALE. Unknown.

GENITALIA ♂ (Fig. 82). Uncus relatively narrow (in comparison with closely related species), band-shaped, with three strong setae laterally. Valva with small rounded cucullar lobe bearing pectinifer and supported by an angled pedicel that is transversely wrinkled in the distal half; pectinifer consisting of about 16–18 rather weakly sclerotized spines; main body of valva very small, without inner lobe; basal process not evident; costal process moderately short, but well differentiated. Juxta slightly wrinkled, shape not distinct. Vinculum with triangular but anteriorly rounded lateral lobes; emargination broad and almost semicircular. Aedeagus with slender, strongly sclerotized internal rod.

BIOLOGY. Adult collected in December. Larval biology unknown.

DIAGNOSIS. Differs from all known species in the tiny, very reduced main body of the valva. The white hindwing differentiates this species from those which also possess a dorsal forewing spot.

DISTRIBUTION. India (Bombay region).

MATERIAL EXAMINED. 1 ♂, **India**: Bombay, 29.xii.1924 (*R.M[axwell]*), genitalia slide no. 28640 (BMNH).

REMARKS. This taxon may well be a distinct species of *Opostegoides*. However, as it is known from just one old specimen and is not highly distinctive it is described but not named.

### *Opostegoides species 28641*

(Figs 15, 86, 87, 175)

MALE (Fig. 15). Forewing length ~3.0 mm. Wingspan ~6.6–6.7 mm. Head: palpi brownish cream; piliform scales on vertex, collar and scape white; flagellum white in proximal quarter, gradually becoming pale brown distally. Thorax white; tegulae darkened anteriorly with pale ochreous brown. Forewing white with a small, flattened brown dorsal spot; a tiny blackish apical dot and, probably, terminal strigulae (however colour and position of strigulae not clear in the single damaged specimen available). Underside of forewing

covered by very pale brown or even pale brownish cream scales, which do not contrast with irregularly shaped basal areas of cream scales. Hindwing and cilia of both wings practically white. Legs generally white with silvery lustre, but forelegs slightly darkened with ochreous brown scales. Colour of abdomen unknown.

FEMALE. Unknown.

GENITALIA ♂ (Figs 86, 87). Uncus relatively narrow (in comparison with closely related species), forming a transverse band, with three strong setae laterally. Valva with relatively small and more or less oval (in ventral view) cucullar lobe bearing pectinifer and supported by a moderately long, angled pedicel that is transversely wrinkled in the distal half; pectinifer consisting of about 22 spines; main body of valva relatively small, but without inner lobe; basal process not evident; costal process moderately short but well differentiated. Juxta strongly sclerotized and wrinkled, especially laterally and at caudal margin; juxta almost trapezoidal and rather conspicuous. Vinculum with moderately large, irregularly-shaped lateral lobes; anterior emargination very broad, angular. Aedeagus large, with slender, internal, sclerotized rod.

BIOLOGY. Adult collected in February. Larval biology unknown.

DIAGNOSIS. Externally this species most resembles those *Opostegoides* possessing a dorsal spot on the forewing but having a white hindwing. From these it differs in features of the male genitalia as follows: from *argentsoma* by the slender and longer pedicellum; from *gorgonea* by the distally rounded valva and simple uncus; from *species 28702* by the shorter vinculum lobes and angled pedicel of the valva; from *species 28640* by the much larger genitalia and longer vinculum lobes. This species is almost inseparable externally from *species 1005*. However, the distally brownish antennae and yellowish tint of the forewing apical area in the latter species suggest that the two may be different.

DISTRIBUTION. India.

MATERIAL EXAMINED. 1 ♂, **India**: [Nilgiri Hills], N. Coorg, 900 m (3000'), ii.1924 (*N[ewcome]*), genitalia slide no. 28641 (BMNH).

REMARKS. This taxon may well be a distinct species of *Opostegoides*. However, as it is known from just one old and damaged specimen and is not highly distinctive it is described but not named.

### *Opostegoides species 1005*

(Figs 16, 151, 176)

MALE. Unknown.

FEMALE (Fig. 16). Forewing length 2.2–2.3 mm.



Wingspan ~5.3 mm. Head: palpi, piliform scales on vertex, collar and scape snow-white; flagellum generally white, but distal 0.2 brownish. Thorax and tegulae snow-white. Forewing snow-white with small, irregular ochreous spot on dorsum; two oblique and parallel terminal strigulae, the first ochreous and diffuse, the second fuscous brown, sharp, but slender; area between strigulae ochreous yellow. Apical dot weakly developed, almost invisible, fuscous-brown. Underside of forewing brownish, but yellowish cream in entire basal area. Cilia from dark cream to white. Hindwing white, distal one-quarter cream, cilia snow-white. Legs creamy white, but forelegs darkened with fuscous. Colour of abdomen unknown.

GENITALIA ♀ (Fig. 151). Abdominal tip bluntly rounded. Posterior apophysis short, apparently bifurcated distally, laterally forming very broad plate-like extensions. Antrum sclerotized, generally narrow, but gradually broadened anteriorly. Corpus bursae elongate, with an indistinct anterior signum. Spermathecal duct long; outer canal slender; inner canal very convoluted, with about 7 or 8 broad twists; spermathecal duct broadening into a large oval sac anteriorly.

BIOLOGY. Adult collected at light in April. Larval biology unknown.

DIAGNOSIS. Most similar to *malaysiensis*, but differing in the darker dorsal forewing spot and in the yellowish area between the first and second terminal strigulae; the costal spot is also darker than that of *species 28641* but the single specimen known of the latter is damaged and comparison of the costal pattern is impossible.

DISTRIBUTION. Nepal.

MATERIAL EXAMINED. 1 ♀, **Nepal**: 70 km W of Kathmandu, Baikuntapuri, 19.iv.1995 (*Puplesis*), genitalia slide no. RP1005 (VPU).

REMARKS. This taxon may well be a distinct species of *Opostegoides*. However, it is known from just a single female (and most species definitions are based largely on diagnostic characters of males) so it is described but not named. It is conceivable that it may represent the opposite sex of *species 28641*.

### *Opostegoides longipedicella* sp. n.

(Figs 17, 88, 89, 176)

MALE (Fig. 17). Forewing length 3.0–3.2 mm. Wing-span 6.7–7.0 mm. Head: palpi white; piliform scales on vertex white; collar, scape and flagellum creamy white. Thorax, tegulae and forewing creamy white, practically without pattern; indistinct ochreous terminal strigulae on cilia; brown apical dot present on one specimen, indistinct on the other. Underside of forewing ochreous cream. Cilia generally white, except small

area beyond apical dot, where they tend to be pale ochreous. Hindwing white to very pale ochreous cream; cilia white. Legs ochreous cream, whiter towards the end of the leg. Abdomen brownish ochreous on upperside, cream on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 88, 89). Uncus broad, simple, without differentiated lateral lobes, with four strong setae laterally. Valva with small cucullar lobe bearing pectinifer and supported by a long, well sclerotized pedicel which extends distally beyond the cucullar lobe; cucullar lobe covered by numerous tiny sharply pointed spines directed backward towards main body of valva; pectinifer consisting of about 16 spines that are well sclerotized basally, but only weakly sclerotized distally; main body of valva well sclerotized, with tiny but very strongly papillated distal lobe; basal process short, usually indistinct (especially in ventral view); costal process well sclerotized, short. Juxta strongly wrinkled laterally and with characteristic proximal sclerotization; caudal margin of juxta wrinkled, but moderately sclerotized. Vinculum with small, sometimes weakly differentiated lateral lobes, which tend to be more or less square; anterior emargination shallow to very shallow. Aedeagus with a slender, internal, sclerotized rod, with a well sclerotized and characteristically rounded terminal lobe.

BIOLOGY. Unknown.

DIAGNOSIS. Easily differentiated from all other Oriental *Opostegoides* by the pedicellum extending beyond the pectinifer. Externally *longipedicella* differs from most species of the genus in the absence of a forewing dorsal spot; it may be separated from species that also lack the spot by its distinctive genitalia features.

DISTRIBUTION. India (Assam).

MATERIAL EXAMINED. Holotype ♂, **India**: Assam, Margherita, 18?? (*Doherty*), genitalia slide no. 28803 (BMNH).

Paratype: 1 ♂, data as holotype, genitalia slide no. 28804 (BMNH).

### *Opostegoides spinifera* sp. n.

(Figs 18, 90, 176)

MALE (Fig. 18). Forewing length ~2.3 mm. Wing-span ~5.1–5.2 mm. Head: palpi, piliform scales on vertex, collar and scape white; flagellum with distinct fuscous darkening on distal half, but tip of antenna (0.15 length of flagellum, the terminal 12 or so segments) and basal half of flagellum remaining creamy white. Thorax and tegulae white. Forewing white with two brown terminal strigulae: the first short, rather broad and diffuse, the second very slender, sharply defined and less oblique, fuscous brown. Apical dot



black. Underside of forewing fuscous brown, except small elongated cream area close to costa. Cilia brown costally, whitish cream tornally. Hindwing and its cilia ochreous cream. Abdomen grey-brown on upperside, whitish cream on underside.

**GENITALIA ♂** (Fig. 90). Uncus moderately broad, with more or less differentiated lateral lobes. Valva with moderately large, elongated cucullar lobe bearing pectinifer and supported by a slightly curved pedicel, which is transversely wrinkled and densely spined outwardly; pectinifer consisting of 18 spines; main body of valva relatively large, constricted beyond the middle, distally produced into a rounded, sclerotized, setose lobe; outer margin of valva covered with irregular, minute, nodular sclerotizations in middle third; basal process absent, valva weakly sclerotized at base and broadly rounded; costal process well differentiated and sclerotized, strongly separated from main body together with large caudal plate. Juxta very complex: most of it is almost membranous and slightly wrinkled in concentric circles; distally with two angular lateral lobes with sclerotized corners; proximally the juxta gives rise to a remarkable, well sclerotized, triangular and apically pointed central plate. Vinculum with moderately developed, broad, triangular, lateral lobes; emargination relatively narrow, more or less U-shaped. Aedeagus with a slender, apically slightly furcate, internal sclerotized rod.

**BIOLOGY.** Adult collected in December. Larval biology unknown.

**DIAGNOSIS.** Easily recognizable among all other *Opostegoides* by the spined valva and uniquely shaped juxta. Externally *spinifera* differs from most species of the genus by the absence of dorsal or costal spots. It may be differentiated from *longipedicella*, *argentsoma* and *malaysiensis*, also characterised by the lack of dorsal or costal spots, by its distinctive genital features.

**DISTRIBUTION.** Indonesia (Sulawesi).

**MATERIAL EXAMINED.** Holotype ♂, **Indonesia:** Sulawesi Utara, Dumoga-Bone National Park, Hog's Back Camp, lowland forest, 492 m, x.1985 (*Project Wallace*), genitalia slide no. 28807 (BMNH).

**REMARKS.** This species is described from only a single specimen as it is convincingly different from its congeners, its distinctive features including the spined pedicel and main body of the valva together with the remarkably shaped juxta. This is the first *Opostegoides* species recorded with a centrally sclerotized juxta plate (similar to *Pseudopostega*, in which plate-like juxta sclerites are very common). The strong separation of the costal process from the main body of the valva is highly unusual within *Opostegoides* and is similar to the state observed in *Pseudopostega*.

### *Opostegoides flavimacula* sp. n.

(Figs 19, 93, 175)

**MALE** (Fig. 19). Forewing length ~2.9–3.0 mm. Wingspan ~6.6–6.7 mm. Head: palpi cream-white; piliform scales on vertex white; collar and scape white with some silvery reflections; flagellum brown. Thorax and tegulae cream-white. Forewing cream-white with relatively large ochreous yellow, more or less rectangular costal spot and with two almost parallel strigulae, the first brownish yellow and the second, which is narrower, dark brown. Apical dot black. Underside of forewing cream-white. Hindwing and cilia of both wings white. Abdomen brownish and lustrous on upperside, whitish on underside.

**FEMALE.** Unknown.

**GENITALIA ♂** (Fig. 93). Uncus with two widely separated lateral lobes, each bearing three long setae. Valva with moderately large cucullar lobe bearing pectinifer and supported by a simple pedicel; pectinifer consisting of about 12 long narrow spines; main body of valva small, roughly papillated distally, without any medial extensions; basal process very weakly sclerotized, fused with vinculum and therefore practically invisible; costal process very long and very sharply pointed. Juxta slightly wrinkled. Vinculum with very long, narrow, pointed lateral lobes; anterior emargination very broad and relatively deep. Aedeagus with a large internal sclerotized rod that is more or less elliptical.

**BIOLOGY.** The single specimen known was collected in August. Larval biology unknown.

**DIAGNOSIS.** The large ochreous rectangular costal spot of this species distinguishes it among other *Opostegoides*. In the male genitalia the very long costal process of the valva together with the very long and very slender vinculum lobes separate *flavimacula* from all other known Oriental species.

**DISTRIBUTION.** West Malaysia.

**MATERIAL EXAMINED.** Holotype ♂, **West Malaysia:** Cameron Highlands, Dunhelen Bungalow, 1680m, 22–25.viii.1986 (*Robinson*), genitalia slide no. 28632 (BMNH)

**REMARKS.** We justify the description of this species from just a single specimen on the grounds that it may be easily separated from other members of the genus by its distinctive appearance and the shape of the aedeagus and vinculum lobes.

### *Opostegoides cameroni* sp. n.

(Figs 20, 91, 92, 175)

**MALE** (Fig. 20). Forewing length ~3.8 mm. Wingspan 8.5 mm. Head: palpi, piliform scales on vertex,



collar and scape white; proximal two-thirds of flagellum whitish posteriorly, brown anteriorly; distal one-third entirely dark brown. Thorax and tegulae white. Forewing white in basal 0.20–0.25; distally yellow-cream with diffuse, smoky markings; a weakly developed, brown to yellow-brown medial fascia and a similarly coloured apical area just before cilia. Terminal strigulae fuscous brown; the first distinct, the second obscure. Apical dot well developed and distinct, black. Underside of forewing bright cream. Hindwing and cilia of both wings pale cream. Abdomen distinctly fuscous on upperside, but first and last segments cream, yellowish cream on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 91, 92). Uncus broad, band-shaped, with six regularly spaced strong setae. Valva with small cucullar lobe bearing pectinifer and supported by a smooth pedicel that is gradually broadened distally; pectinifer consisting of about 12 long slender spines; main body of valva small, roughly papillated at distal end and weakly sclerotized in the middle; basal process very weakly sclerotized, but easily visible, elongate; costal process well sclerotized, elongate, apex pointed. Juxta with a few medial wrinkles and a roughly sclerotized caudal margin. Vinculum with very long lateral lobes; anterior emargination very broad and relatively deep. Aedeagus with a broad but relatively short internal sclerotized rod.

BIOLOGY. The single specimen known was collected in December. Larval biology unknown.

DIAGNOSIS. This species is easily differentiated by its forewing pattern comprising diffuse irregular dark markings in the middle and apex of the wing. It may be distinguished from the superficially similar *pelorrhoea* by the slender vinculum lobes and by the sclerotization of the aedeagus being comparatively short and markedly broadened caudally whereas in *pelorrhoea* the sclerotization is elongate and of similar breadth for most of its length.

DISTRIBUTION. West Malaysia.

MATERIAL EXAMINED. Holotype ♂, **West Malaysia**: Cameron Highlands, Gunong Brinchang, 1980m, 23–31.x.1989 (Robinson & Tobin), genitalia slide no. 28685 (BMNH).

REMARKS. Although described from a single specimen, we are confident that this represents a distinct species by dint of its distinctive wing pattern and genitalia.

### *Opostegoides auriptera* sp. n.

(Figs 21, 152, 175)

MALE. Unknown.

FEMALE (Fig. 21). Forewing length: ~2.8 mm. Wing-span: ~6.2 mm. Head: palpi whitish; piliform scales on vertex and scape white; flagellum whitish to cream depending upon angle of view. Thorax and tegulae white. Forewing white with distinctive oblique bright orange spot on dorsum occupying about two-thirds length and width of wing; with two weakly expressed brownish oblique costal strigulae and black apical dot. Underside of forewing brown, except basal area. Cilia brownish costally, white elsewhere. Hindwing greyish or dark grey-brown, depending upon angle of view; cilia greyish cream. Legs ochreous cream to ochreous white, but forelegs with dark brown scales anteriorly. Abdomen bright cream on upperside and underside.

GENITALIA ♀ (Fig. 152). Abdominal tip broad and blunt with two very strong lateral setae. Antrum strongly sclerotized but not very hard if touched with a pin during preparation. Posterior apophysis short and greatly elaborated, with small lateral lobes, strongly sclerotized marginally, resembling a second pair of apophyses. Vestibulum membranous and wrinkled, without any scobination. Corpus bursae relatively small, oval, with a pair of signa, each comprising a very distinctive ring of spines resembling a string of beads. Spermathecal duct very complex; inner canal very strongly but neatly convoluted in caudal half and broadly coiled in anterior half; outer canal forming a small and very membranous lateral sac close to vestibulum and a larger and more sclerotized oval sac at the anterior end. In a fresh (and not squashed) genitalia preparation the broad convolutions of the inner canal have a very distinct appearance, resembling a compact chain of broad, overlapping rings.

BIOLOGY. The single specimen known was collected in April, but it is likely that the flight season is very much longer. Larval biology unknown.

DIAGNOSIS. This species differs from all other Opostegidae in having a large bright orange spot on the forewing dorsum. The female genitalia are characterized by the unique strongly convoluted inner canal of the spermathecal duct and by the small corpus bursae.

DISTRIBUTION. Thailand.

MATERIAL EXAMINED. Holotype ♀, **Thailand**: Khao Yai NP, 1200m, 17.iv.1987 (Allen), genitalia slide no. 28705 (BMNH).

REMARKS. Like the preceding species, this is described from only a single individual but is considered to be sufficiently distinctive for its naming to be justified.

### *EOSOPOSTEGA* Davis, 1989

Type species: *Eosopostega issikii* Davis, 1989



**SHORT DIAGNOSIS.** Anterior fragment of second abdominal segment weakly sclerotized and indistinct. Annulus (vinculum + tegumen) only moderately compressed and oblique; vinculum anterior margin concave, with lateral lobes. Uncus highly specialized and sclerotized, inverted 'V'-shaped, with fixed number of setae (4 + 4); setae numerous, short and slender. Gnathos very complex, with strongly developed lateral processes. Valva modified to a relatively narrow but elongated sclerite; basal process not separated from main body; pedicellum short or very short, not transversely wrinkled; pectinifer with about 31 spines. Juxta greatly specialized, paired, with remarkable horn-like posterior processes (but possibly absent in the type species – see above).

Female genitalia unknown.

### *Eosopostega armigera* sp. n.

(Figs 22, 94–98, 177)

**MALE** (Fig. 22). Forewing length: ~3.0 mm. Wingspan: ~6.6 mm. Head: palpi white, piliform scales on vertex, collar and scape white; flagellum whitish cream proximally and pale ochreous cream distally. Thorax and tegulae white. Forewing white with silvery reflections, apically with a relatively large black dot and three ochreous brown strigulae; the area before the first and palest strigula is slightly darkened with yellow. Underside of forewing cream. Cilia white. Hindwing and cilia white. Legs ochreous cream to whitish, except forelegs, which are slightly darkened with grey-brown. Colour of abdomen unknown.

**FEMALE.** Unknown.

**GENITALIA** ♂ (Figs 94–98). Uncus very well developed, inverted V-shaped, ventrally thickened distally and with 8 long setae. Gnathos with very evident, strongly sclerotized lateral arms, main body inverted V-shaped. Valva with relatively small cucullar lobe bearing oval pectinifer which consists of about 31 long, slender spines; valval main body large and partially covering cucullar lobe when viewed from ventral side; main body distally well sclerotized and ovals rounded; basal process of valva not discrete, practically absent; costal process of valva long and slightly sinuous. Juxta extremely well developed, with a pair of large, caudally directed lobes, each bearing two sharp processes; juxta fused basally with valvae. Vinculum very broad, with broadly rounded but weakly differentiated lateral lobes; anterior emargination very shallow. Aedeagus present, with pair of broad lobate apical sclerotizations.

**BIOLOGY.** Unknown.

**DIAGNOSIS.** Externally resembles a few white species of *Pseudopostega* and *Opostegoides*; however the male genitalia are very easily recognized by the broad

inverted V-shaped uncus, slender valva, well developed juxta and laterally strongly sclerotized gnathos. Differs from the other currently known species of the genus (the Japanese *E. issikii* Davis) by the distally deeply bifurcate juxta lobes, broader uncus and by the broadly rounded lateral lobes of the vinculum.

**DISTRIBUTION.** Indonesia (Moluccas).

**MATERIAL EXAMINED.** Holotype ♂, **Indonesia**, Moluccas, Obi Labo, 160–260 m, vii–xi.1953 (Wegner), genitalia slide no. Pupil. 013 (NNM).

### *OPOSTEGA* Zeller, 1839

Type species: *Elachista salaciella* Treitschke, 1833

**SHORT DIAGNOSIS.** Anterior fragment of second abdominal segment weakly sclerotized and indistinct. Annulus (vinculum + tegumen) only moderately compressed and oblique; vinculum anterior margin convex, without lateral lobes. Uncus lobate; setae numerous, short and slender. Gnathos simple, band-shaped. Valva broad; basal process not separated from main body of valva; pedicellum short or very short, not transversely wrinkled; pectinifer with about 30 spines. Juxta unpaired, comparatively simple, without posterior processes.

Ovipositor not flattened, setae not thickened. Apophyses posteriores simple, slender.

### *Opostega chalcophylla* Meyrick, 1910

(Figs 23, 99–101, 177)

*Opostega chalcophylla* Meyrick, 1910: 229.

*Opostega chalcophylla* Meyrick; Davis, 1989: 73.

**MALE** (Fig. 23). Forewing length: 3.5–3.8 mm. Wingspan: 7.9–8.2 mm. Head: palpi grey; piliform scales on vertex white; collar and scape generally greyish white, but sometimes collar darker than scape, greyish; flagellum ochreous brown to brown. Thorax, tegulae and forewing uniformly grey-brown with strong metallic lustre, a somewhat darker brown area before cilia composed of more abundant dark brown scales; other pattern elements absent, no black apical dot or cilia-line visible. Underside of forewing brown, except small basal area close to costa. Cilia grey-brown. Hindwing relatively broad, brown; cilia brownish to brown. Legs pale ochreous, but forelegs and midlegs (sometimes hindlegs also) darkened with brown anteriorly. Abdomen brown on upperside, yellowish ochreous on underside.

**FEMALE.** Unknown.

**GENITALIA** ♂ (Figs 99–101). Uncus with two large but shallow, broadly rounded, laterally setose lobes; emargination between them extremely shallow or absent. Gnathos with well developed, caudally di-



rected, inverted V-shaped process; central plate not developed. Valva with moderately large, more or less oval cucullar lobe bearing pectinifer which comprises about 26–28 spines arranged in a simple row; distal part of cucullar lobe extended into a short rectangular process; pedicellum very short; main body of valva very broad, uniformly strongly sclerotized and abundantly papillated on almost the entire surface; valva triangularly narrowed basally, but basal process absent; costal process strongly sclerotized, relatively long. Juxta weakly wrinkled, plate-like, narrow in basal half and abruptly broadened in apical half. Vinculum very short and broad, broadly rounded anteriorly.

**BIOLOGY.** Adults collected in May and September. Larval biology unknown.

**DIAGNOSIS.** Differs from all known Oriental species in the uniformly brown forewings. In the male genitalia the species is recognizable by the distinctive shape of the juxta (abruptly broadened in distal half), very broad valva and the gnathos in the shape of an inverted 'V'.

**DISTRIBUTION.** Central and eastern Himalayas and Assam (eastern India and Nepal).

**MATERIAL EXAMINED.** Lectotype ♂: **India:** eastern Himalayas, Kurseong, 7.ix.1909 (*N.A.*), genitalia slide no. 28662 (BMNH).

Paralectotype: 1 ♂, data as lectotype, genitalia slide no. 28811 (BMNH).

Other material: 1 ♂ [? – abdomen in glue], Assam: Khasi Hills, 1906 (*D.[oncaster]*) (BMNH); 1 ♂, Sikkim: Gangtok, 6000 ft, 21.v.28 (*Bailey*) (BMNH). **Nepal:** 1 ex. [without abdomen], Phulchoki, 2000–2500 m, oak-laurel forest, 22.v.1984 (*Allen*) (BMNH).

## **PSEUDOPOSTEGA** Kozlov, 1985

Type species: *Tinea auritella* Hübner, 1813

**SHORT DIAGNOSIS.** Anterior fragment of second abdominal segment very well sclerotized and elaborated. Annulus (vinculum + tegumen) only moderately compressed and oblique; vinculum anterior margin convex, without lateral lobes but concave and with lateral lobes in a few species. Uncus lobate; setae numerous, short and slender. Gnathos simple, band-shaped. Valva broad; costal process separate from main body; pedicellum short or very short, not transversely wrinkled; pectinifer with about 25–35 spines, in a few species with as many as 55. Juxta unpaired, comparatively simple, tending to form a median rod-like sclerite.

Ovipositor not flattened, setae not thickened. Apophyses posteriores simple, slender.

### **The *machaerias* group**

The *machaerias* group is distinguished by the very large gnathos with usually huge central plate and very

strongly developed (sometimes additionally spined) caudal process. The juxta tends to be bifurcated distally. The vinculum is usually very broadly rounded or even slightly concave anteriorly, in a few species gradually narrowed. Species are externally rather variable; the forewing is usually white with few brown or fuscous markings, occasionally with a broad median fascia or pale yellowish with a costal spot in the apical half of the wing.

Diagnostic features within the group are forewing markings (occasionally hindwing colour as well), shape of costal process of gnathos and anterior margin of plate, length of uncus lobes, width of vinculum, and sometimes the shape and sclerotization of the cucullar lobe of the valva.

### ***Pseudopostega machaerias* (Meyrick, 1907) comb. n.**

(Figs 25, 26, 102–104, 177)

*Opostega machaerias* Meyrick, 1907: 986.

*Opostega machaerias* Meyrick; Davis, 1989: 74.

**MALE** (Figs 25, 26). Forewing length: 2.4–2.9 mm. Wingspan: ~5.5–6.3 mm. Head: palpi cream; piliform scales on vertex white to pale yellowish, collar and scape white; flagellum brownish cream to brown, especially dark in basal three-quarters. Thorax and tegulae white. Forewing white with two oblique brown spots before middle which may be joined via a slender connection in the wing-fold area; with two apical and closely parallel strigulae, the first broad and dark brown, the second slender and fuscous; no apical dot expressed. Underside of forewing brownish, except small pale area at base close to costa. Cilia brownish cream to whitish. Hindwing brownish, cilia brownish cream to grey-brown. Legs ochreous cream, except forelegs which are slightly darkened by brownish to brown scales. Abdomen brownish to brown on upperside and cream to whitish cream on underside.

**FEMALE.** Unknown.

**GENITALIA ♂** (Figs 102–104). Uncus with two small, broad but shallow lobes directed caudally; emargination between lobes shallow. Gnathos well developed, with large but relatively slender, caudal process with rounded apex; central plate of gnathos with anteromedial emargination dividing it into two broad and rounded lateral lobes. Valva with large, moderately sclerotized and rather broad cucullar lobe bearing pectinifer of about 28 spines arranged in a single row; main body of valva broad or obliquely narrowed distally; basal process of valva straight, distally pointed and moderately sclerotized; costal process strongly sclerotized and shorter. Juxta with well sclerotized stripe-like central region. Vinculum very broad anteriorly.



**BIOLOGY.** Adults collected in March and October. Larval biology unknown.

**DIAGNOSIS.** Easily distinguished externally from most white Oriental opostegids except *spilodes* by the presence of a brown median spot on the forewing. The male genitalia are most similar to those of *parvilineata* but differ in the broad vinculum, short uncus lobes and deeply divided gnathos central plate.

**DISTRIBUTION.** Sri Lanka; Thailand. This species may be widely distributed in the continental part of the Oriental region, since it was originally described from a mountainous region of Sri Lanka and now is also recorded from southwestern Thailand. We suspect that this species is vicariant with the closely-related *parvilineata* which appears to replace *machaerias* in the southern islands of the Oriental region (i.e., Indonesia).

**MATERIAL EXAMINED.** Holotype ♂, **Sri Lanka**, Maskeliya, iii.1906 (*Pole*) genitalia slide no. 28648 (BMNH).

Other material: 1 ♂, **Thailand**: Kanchanaburi, 30 m, 10–11.ix.1986 (*Robinson*) genitalia slide no. 28704 (BMNH).

**REMARKS.** No significant external or genitalia differences were found between the Sri Lankan type and the single specimen collected recently in Thailand. It is possible that *spilodes*, of which only a single female specimen is known, may prove to be a junior synonym of *machaerias*.

### *Pseudopostega parvilineata* sp. n.

(Figs 24, 105–107, 156, 177)

**MALE.** Forewing length: ~2.8 mm. Wingspan: ~6.3 mm. Head: palpi whitish; piliform scales on vertex and scape white; flagellum brown. Thorax and tegulae white. Forewing white with distinctive dark markings: small oblique more or less triangular fuscous dorsal spot, deep black apical dot and three black oblique strigulae: two long strigulae on costal margin and one minute curved strigula on tornal side which may occasionally be very indistinct. Slender oblique area before first costal strigula darkened by fuscous-brown; small area before apical dot shadowed by golden ochre-bistre scales. Underside of forewing brown, except a small basal area close to costa. Cilia brown to dark brown (closer to apical dot). Hindwing brown (or appearing pale grey-brownish, depending on angle of view); cilia brown. Legs ochreous cream, except forelegs which are brown. Abdomen brown on upperside and almost cream on underside.

**FEMALE** (Fig. 24). Forewing length: 3.0–3.4 mm. Wingspan: ~7.0 mm. Flagellum brown to dark brown. Thorax from entirely white to fuscous posteriorly.

Hindwing grey-brown to brown or dark grey (depending on angle of view). Forelegs brown to fuscous brown. Abdomen ochreous or brownish on upperside and brownish cream to cream on underside. Otherwise as in male.

**GENITALIA** ♂ (Figs 105–107). Uncus with two more or less well developed, widely separated and roughly papillated lobes. Emargination between lobes V-shaped. Gnathos strongly developed, with stout rounded caudal process and huge almost rectangular central plate; uniformly well sclerotized, central plate without anterior medial emargination. Valva with large cucullar lobe bearing long pectinifer of about 30 spines arranged in a single row; cucullar lobe strongly sclerotized and roughly papillated, distinctly narrowed distally; main body of valva broad and strongly papillated distally; basal process of valva long, straight and strongly sclerotized; costal process of valva not as long, straight and very well sclerotized, connected with weakly developed lateral arms of gnathos by membranous joint. Juxta with stripe-like central sclerotization, elsewhere very membranous and just weakly wrinkled (predominantly in caudal region). Vinculum rounded anteriorly, but not very broad.

**GENITALIA** ♀ (Fig. 156). Abdominal tip more or less triangular and divided into two broadly rounded apical lobes, each with numerous long setae directed outwards. Anal papillae forming a well sclerotized (especially caudally) oval plate with moderately long but not very strong setae. Posterior apophysis slender and very long. Longitudinal rod-like sclerotizations of abdominal wall (resembling another pair of apophyses and represented in some *Pseudopostega* species) absent. Vestibulum membranous and with a patch of fine scobination. Corpus bursae large, elongated, with very distinct and strong (but very small) comb-like scobination concentrated in an oval area from one-quarter to one-third from genital opening; signum slender and long, consisting of numerous pointed or blunt spines and covering corpus bursae on both sides. Spermathecal duct almost as long as corpus bursae or even longer; posterior half of outer canal very membranous and broad; anterior half much more sclerotized and almost oval; inner canal of spermathecal duct very long, convoluted at anterior end.

**BIOLOGY.** Adults have been collected at light in March and October and it is likely that they occur throughout the year. Larval biology unknown.

**DIAGNOSIS.** This species resembles *machaerias*, but differs in the anteriorly narrowed vinculum, elongate uncus lobes and undivided central plate of the gnathos. It is easily distinguishable from other species of the group by the shape of the uncus lobes and the caudal process of the gnathos.



**DISTRIBUTION.** Indonesia (Sulawesi Utara). A further specimen of unknown provenance may be attributable to this species (see below). See also the distribution of *machaerias*.

**MATERIAL EXAMINED.** Holotype ♂, **Indonesia:** Sulawesi Utara, Dumoga-Bone National Park, Clarke Camp, 1140 m, lower montane forest, iii.1985 (*Project Wallace/Allen*) (genitalia slide 28700; BMNH).

Paratypes: 3 ♀ ♀, data as holotype, genitalia slide no. 28701 (BMNH); 1 ♀, Sulawesi Utara, Danau Mooat (near Kotamobagu), 1200 m, 20–22.x.1985 (*Project Wallace/Robinson*), genitalia slide no. 28699 (BMNH).

There is also one additional female specimen in BMNH from labelled: 'Cardew, 15.iii.1898', 'Walsingham Coll.'. However, despite its resemblance to the type, it is excluded from the type series because of its poor condition, questionable provenance and some doubt about its taxonomic position.

***Pseudopostega epactaea* (Meyrick, 1907)  
comb. n.**

(Figs 27, 112, 113, 157, 177)

*Opostega epactaea* Meyrick, 1907: 985.

*Opostega epactaea* Meyrick; Davis, 1989: 74.

**MALE** (Fig. 27). Forewing length: 2.6–3.3 mm. Wingspan: 5.9–7.2 mm. Head: palpi whitish to cream; piliform scales on vertex whitish or very pale yellowish, especially from front; collar and scape white; flagellum pale brownish cream to brown. Thorax and tegulae white. Forewing white with a few brown and brownish markings; with small and indistinct to large brown dorsal spot and four terminal strigulae (three costal, long and almost parallel; one tornal and very short); a black apical dot preceded by a very small brownish ochre patch. Forewing background usually pure white, but Javan specimens are darkened irregularly with brown. Underside of forewing brown, but elongated area along costa cream or yellowish cream. Cilia cream to brownish, brown closer to costal margin. Hindwing pale ochreous or brown (in Indonesian specimens), cilia greyish cream to brown. Legs white to ochreous cream, darkened with fuscous on tarsi. Abdomen brown or ochreous-grey on upperside, white or whitish cream, usually lustrous, on underside.

**FEMALE.** Very similar to male.

**GENITALIA** ♂ (Figs 112, 113). Uncus with two small, shallow, triangular widely separated lobes directed caudally; emargination between lobes broad, shallow. Gnathos well developed with anteriorly bifurcate caudal process and huge almost oval plate. Valva with large cucullar lobe bearing pectinifer and supported by a short pedicel; pectinifer of 28–32 close-set spines

arranged in a single row; main body of valva broad and sclerotized distally; basal process straight, pointed distally and very long; costal process of valva strongly sclerotized and much shorter than basal process. Juxta usually slightly wrinkled, with long, slender median process. Vinculum long, gradually narrowed anteriorly, rounded apically.

**GENITALIA** ♀ (Fig. 157). Abdominal tip with pair of well developed, triangular setose lobes. Posterior apophysis long and slender. Vestibulum membranous with a lateral patch of small spicules. Anal papillae forming a conspicuous oval sclerotization, with moderately long setae. Corpus bursae strongly elongated, with a patch of comb-like scobination posteriorly and with a very weakly developed signum on main part of sac. Spermathecal duct huge; membranous posterior region of outer canal broad, anterior region bulbous; inner canal of spermatheca as long as corpus bursae, sinuous and terminating in a large and complex plate.

**BIOLOGY.** Adults collected at light in February–April and December. Larval biology unknown.

**DIAGNOSIS.** Although this species is very similar to, or even indistinguishable externally from a few other *Pseudopostega* or *Opostegoides* species, the male genitalia provide good diagnostic features. *Pseudopostega epactaea* can be easily distinguished from all other species by the anteriorly bifurcated gnathos process, the tiny uncus lobes and the distinct anterior narrowing of the vinculum.

**DISTRIBUTION.** Sri Lanka; India (south); Java; Taiwan. Probably very widely distributed throughout the Oriental region.

**MATERIAL EXAMINED.** Lectotype ♂, **Sri Lanka:** Maskeliya, ii.1906 (*Pole*), genitalia slide no. 28646 (BMNH).

Paralectotypes: 5 ♂ ♀, same locality as lectotype, ii–iii.1906, genitalia slide no. 28647 ♀ (BMNH).

Other material: 1 ♂, same locality as lectotype, iv.1907 (BMNH). **India:** 1 ♂, [Nilgiri Hills], N. Coorg, Dibidi, xii.1911 (*L.N[ewcome]*), genitalia slide no. 28645 (BMNH). **Indonesia:** 1 ♂, 1 ♀, Eastern Java, Nongkodjadar, 1300 m (at light) (*Wegner*), 10.iii–18.iv.1940 (NNM). **Taiwan:** 1 ♀, Fudieda, (*S.I[ssiki]*), 13.viii.1933, genitalia slide no. 28642 (BMNH).

***Pseudopostega frigida* (Meyrick, 1906)  
comb. n.**

(Figs 28, 108–111, 158, 178)

*Opostega frigida* Meyrick, 1906: 416.

*Opostega frigida* Meyrick; Davis, 1989: 74.

**MALE** (Fig. 28). Forewing length: ~2.8–2.9 mm. Wingspan: ~6.3–6.6 mm. Head: palpi whitish to cream



or greyish cream; piliform scales on vertex, collar and scape white; flagellum brownish. Thorax, tegulae and forewing white. Forewing with small, fuscous, highly characteristic shallowly triangular costal spot at about two thirds the length of the forewing, spot usually fuscous brown, occasionally deeper black and relatively very large, occupying 0.4 width; dorsal spot only present in some specimens, often indistinct, occasionally well developed, triangular, dark brown; terminal strigula narrow but distinctive, dark brown to black; apical dot represented by a few black scales at tornal end of strigula. Underside of forewing brown, except for distinctive yellowish cream and elongate basal spot close to costal margin. Cilia pale brownish cream to dark grey. Hindwing brownish to grey-brown, cilia brownish or greyish. Legs brownish cream, except forelegs and tarsi of all legs, which are darkened frontally by fuscous scales. Abdomen brownish to blackish on upperside, lustrous cream or whitish on underside.

**FEMALE.** Externally similar to male, but tending to be slightly larger; forewing length 2.9–3.0 mm, wingspan ~6.6–7.0 mm.

**GENITALIA ♂** (Figs 108–111). Uncus with two unusually long and slender lateral lobes directed caudally; emargination between lobes U-shaped. Gnathos very well developed, with huge caudally directed process, which is usually broadly rounded, but sometimes may be truncate or almost truncate at apex; central plate of gnathos well developed and with shallow anterior emargination; lobe covered laterally and on part of caudal process with tiny sharp spicules. Valva with large, moderately sclerotized and broad cucullar lobe bearing pectinifer of 24–26 spines arranged in a single not very compact row; pedicellum long and pointed distally; main body of valva slightly narrowed at distal end; basal process of valva straight, distally pointed and laterally well sclerotized; costal process as long as basal process, slightly bent and strongly sclerotized. Juxta with well sclerotized stripe-like central region, which tends to broaden towards apex and bifurcate at the end. Vinculum very broad and with very smooth and shallow emargination at anterior margin.

**GENITALIA ♀** (Fig. 158). Abdominal tip with two ill-defined lobes bearing very long setae and separated by shallow emargination. Posterior apophysis slender and long, broad and well developed basally. Anal papillae forming a very distinctive, rounded sclerotization bearing numerous long, strong setae. Vestibulum membranous with a patch of small blunt, pointed or comb-like spicules. Corpus bursae large, elongate, with large patch of comb-like scobination posteriorly and with very obvious signum around main part of bursa. Spermathecal duct large, as long as corpus bursae or longer; membranous outer canal relatively broad; inner canal very long and sinuous.

**BIOLOGY.** Adults collected at light in February and April–October. The frequency of multiple specimens from single localities (below) suggests that this is a common species. Larval biology unknown.

**DIAGNOSIS.** Currently there are just three other species with a dark costal spot on the forewing known from the Oriental region: *P. myxodes*, *P. nigrimaculella* and *Opostegoides index*. *Pseudopostega frigida* differs from all of them in genital features. The male genital structure is most similar to that of *similantis*, but differs in the undivided gnathos plate and broader cucullar lobe of the valva.

**DISTRIBUTION.** Sri Lanka; Nepal; Thailand; Indonesia (Sumba). Probably very widely distributed throughout the Oriental Region.

**MATERIAL EXAMINED.** Lectotype ♂, **Sri Lanka:** Peradeniya, ii.1905 (*Green*), genitalia slide no. 28626 (BMNH).

Paralectotypes: 10 ♂ ♀, data as lectotype (BMNH).

Other material: **Sri Lanka:** 1 ex. (♂?), Maskeliya, ii.1906 (*Pole*) (BMNH). **Nepal:** 2 ex., Chitwan National Park, Sauraha, 3–6.vi.1983 (*Allen, Brendell, Robinson & Tuck*) (BMNH); 1 ♂, 3 ♀, 70 km W of Kathmandu, Baikuntapuri, 19–21.iv.1995 (*Puplesis*), genitalia slide nos RP1006, RP1007, RP1008, RP1009 (VPU). **Thailand:** 1 ♂, Chiang Mai, 325 m, 15–30.x.1984 (*Karsholt et al.*), genitalia slide no. Pupl. 402 (ZMUC). **Indonesia:** 1 ♂, eastern Sumba, Bajog, 25 m, vi.1949 (*Sutter & Wegner*), genitalia slide no. Pupl. 012 (NNM); 1 ♀, western Sumba, Wainangura, 450 m, viii.1949 (*Sutter & Wegner*) (NNM); 1 ♀, central Sumba, Lindi Watju, 27.ix–15.x.1949 (*Sutter & Wegner*) (NNM).

**REMARKS.** Although 18 specimens were reported in the original description (Meyrick, 1906), there are just the lectotype and 10 paralectotypes in the Meyrick collection in the BMNH; the whereabouts of the remaining seven specimens is unknown.

### *Pseudopostega similantis* sp. n.

(Figs 29, 114, 159, 176)

**MALE** (Fig. 29, 114, 159, 176). Forewing length: ~3.1–3.2 mm. Wingspan: ~7.0–7.1 mm. Head: colour of palpi unknown, most likely cream; piliform scales on vertex and scape white; flagellum pale ochreous brown to brown. Thorax and tegulae white. Forewing white with three brown oblique strigulae, black small apical dot and weakly developed brownish dorsal spot; dorsal spot indistinct or absent; costal spot absent; small area before apical dot shadowed by golden ochre-bistre scales. Underside of forewing brown, except for an elongated yellowish cream basal area along costa. Cilia ochreous cream. Hindwing and cilia ochreous cream to greyish ochreous. Legs ochreous cream, except forelegs and mid- and hind tarsi which



are darkened with brown. Abdomen ochreous brownish on upperside and almost white or creamy white on underside.

**FEMALE.** Similar to male.

**GENITALIA** ♂ (Fig. 114). Uncus with two long and relatively slender, widely separated lobes. Emargination between lobes V-shaped, very wide. Gnathos very well developed, with huge terminally rounded or almost truncate caudal process; central plate large, deeply divided anteriorly, with some very indistinct spines mainly on caudal margin. Valva with large cucullar lobe bearing pectinifer of 52–56 spines arranged in two equal overlapping rows; cucullar lobe well sclerotized, with tiny setae, distally distinctly narrowed; main body of valva well developed, slightly bifurcate distally; basal process moderately long and straight; costal process as long as basal process. Juxta with stripe-like central sclerotization, elsewhere membranous and just very weakly wrinkled. Vinculum broad, rounded, slightly truncated anteriorly.

**FEMALE** (Fig. 159). Abdominal tip almost rounded, lobes not differentiated. Anal papillae forming small, conspicuous, sclerotized oval or suboval plate, with moderately long but not very strong setae. Posterior apophysis slender and very long. Abdominal wall without longitudinal rod-like sclerotizations resembling another pair of apophyses. Vestibulum membranous and with a patch of fine scobination. Corpus bursae large, elongated, posteriorly with small patch of spinose scobination; signum almost indistinct, band-shaped, consisting of perpendicular sclerotization and inconspicuous spines. Spermathecal duct elongate, as long or longer than ductus bursae; outer canal membranous and broad; inner canal very long, slightly sinuous and convoluted at anterior end.

**BIOLOGY.** Adults collected in July (Taiwan) and September–October (Indonesia). Larval biology unknown.

**DIAGNOSIS.** Externally very similar to or inseparable from many other white-coloured opostegids. However the male genitalia differ distinctly from all other species except *P. frigida* in the very long uncus lobes and huge caudal process of the gnathos. *Pseudopostega similantis* may be separated from the closely related *frigida* by the deeply divided gnathos plate, narrowed cucullar lobes of the valva, broader spermathecal duct in the female genitalia and by the absence of a costal spot on the forewing.

**DISTRIBUTION.** Indonesia (Sumba); Taiwan. The two Taiwanese specimens were collected in a botanical garden and the species may be an introduction.

**MATERIAL EXAMINED.** Holotype ♂, **Indonesia:** Sumba (central), Lauggaliru, 500–800m, x.1949 (*Sutter & Wegner*), genitalia slide no. Pupl. 010 (NNM).

Paratypes: 2 ♀, **Indonesia:** Sumba (central), Lindi Watju (*Sutter & Wegner*), 27.ix–15.x.1949, genitalia slide no. Pupl. 011 (NNM).

Excluded from paratype series: 1 ♂, 1 ♀, **Taiwan:** Ping Tung Co, Kenting Botanical Garden (subtropical forest) (*Davis*), 22–25.vii.1980, genitalia slide 28806 ♀ (USNM).

***Pseudopostega myxodes* (Meyrick, 1916)  
comb. n.**

(Figs 30, 31, 115–118, 161, 178)

*Opostega myxodes* Meyrick, 1916: 619.

*Opostega myxodes* Meyrick; *Davis*, 1989: 74.

**MALE** (Fig. 30, 31). Forewing length: 2.7–3.3 mm. Wingspan: ~6.3–7.5 mm. Head: palpi cream to yellowish cream or brownish cream; piliform scales on vertex, collar and scape golden cream to dull yellow; flagellum brownish or greyish cream. Thorax and tegulae usually dull yellow, but sometimes tegulae darkened with brown. Forewing generally golden cream to yellowish with very glossy whitish-ochreous iridescence, with distinct shallowly triangular brown or fuscous brown spot on costa close to cilia, and with distinctive brown cilia-line with a preceding weaker and finer line; basal area may be darkened by brown scales, darkest distally, varying in shape and degree of contrast; apical dot usually absent, occasionally developed, ochreous brown. Underside of forewing brownish, cilia cream. Hindwing and cilia cream or dull yellowish to occasionally pale brown. Legs yellowish cream to brownish cream. Abdomen brown to yellow-brown on upperside and yellowish cream laterally and on underside.

**FEMALE.** Similar to male.

**GENITALIA** ♂ (Figs 115–118). Uncus with two small triangular and widely separated lobes directed caudally. Gnathos very well developed, huge and very densely spined with broader and more slender spines laterally; apical part of gnathos varying considerably in shape, but generally broadly spatulate and without spines; base of gnathos triangular, very broad basally. Valva with large cucullar lobe bearing pectinifer and supported by slender and slightly curved pedicel; pectinifer of about 22 moderately spaced spines arranged in a single row; main body of valva broad and sclerotized distally; basal process straight, distally pointed and weakly sclerotized, costal process of valva strongly sclerotized and slightly curved. Juxta usually strongly wrinkled, easily visible and with slender and short to very long median process. Vinculum rounded anteriorly.

**GENITALIA** ♀ (Fig. 161). Abdominal tip with pair of well developed, broad, blunt setose lobes; zone around



lobes more strongly sclerotized than any other part of posterior abdomen. Posterior apophysis long and slender. Vestibulum membranous, with lateral patch of small rather blunt spicules. Anal papillae forming obvious triangular sclerotization with some very long and broad setae. Corpus bursae greatly elongated, densely covered by mostly blunt scobination over caudal one-third to one-fifth; no spicules visible in anterior half of corpus bursae, but south Indonesian specimens with sparsely distributed spines. Spermathecal duct long, posterior region of outer canal sometimes with narrow, very membranous, medial section abruptly bulged, anterior section narrow, sometimes gradually broadening towards the end; inner canal of spermatheca as long as corpus bursae or longer, sinuous and terminating in a large sclerotized plate.

**BIOLOGY.** Host-plant: *Cordia myxa* L. (Boraginaceae). From the reared specimen (see Remarks) and the few others known, larvae mine leaves in September–October; adults fly in October–November and probably later.

**DIAGNOSIS.** Externally a very distinctive species, characterised by the yellowish forewing with a shallow triangular fuscous spot on the costa. The male genitalia are distinctive, notably the large, laterally densely spined gnathos.

**DISTRIBUTION.** It is likely that *myxodes* is widely distributed in the Oriental region; it was originally described from northeastern India (the lower Ganges valley) and is now known also from Timor and the Sumba islands (southernmost Indonesia).

**MATERIAL EXAMINED.** Holotype ♂, **India:** Patna region, Pusa, 12.ix.1910 (Fletcher), genitalia slide no. 28651 (BMNH).

Other material: 1 ♀, same locality as holotype, mining leaves of *Cordia myxa*, 2.ix.1915, genitalia slide no. 28688 (BMNH). **Indonesia:** 2 ♂♂, SW Timor, 1500–3000', x–xii.1891 (Doherty), genitalia slide nos. 28687, 28686 (BMNH); 3 ♂♂, 4 ♀♀, Sumba: Lindi Watju, 27.ix–15.x.1949 (Sutter & Wegner), genitalia slide nos. Pupl. 008 ♂, Pupl. 009 ♀ (NNM).

**REMARKS.** Meyrick's original statement referred to the host-plant (1916: 619) but infers that the specimen he had was not reared: 'Mr. Fletcher also has a female example, quite similar, which was bred in October from a larva mining in leaf of *Cordia myxa* (Boraginaceae)'. Fletcher ([1921: 180]) makes it clear that there was more than one specimen reared: 'Larvae were found at Pusa on 24th September 1915 mining leaves of *Cordia myxa*. The larva pupates outside of the mine on any convenient surface in a dull-white cocoon of uniform texture, pupation occurring in an

inner cocoon spun inside the outer one. The moths emerged on 1st and 2nd October.' The single female referred to by Meyrick is probably that listed below; we have compared it with the holotype and the matched Indonesian females and we are confident that it is conspecific. Davis (1989) did not mention this hostplant record.

There is external and genital variation in this species: in contrast to the Indian specimens (including the type), the basal area of the wing in the most (but not all) Indonesian specimens is darkened by brown scales and the hindwing tends to be a little darker. Additionally, the corpus bursae has scattered spines in the middle region, not present in the Indian specimen. The spermathecal duct broadens more gradually towards the anterior end in Indonesian specimens, but abruptly broadens in the Indian specimen. However, these differences are minor and we have seen only limited material; we suggest that at present the differences be treated as within the species' range of variation or possibly representing minor geographic variation.

### *Pseudopostega species 28623*

(Figs 32, 119, 120, 177)

**MALE** (Fig. 32). Forewing length: ~2.9–3.0 mm. Wingspan: ~6.6 mm. Head: palpi cream; piliform scales on vertex, collar and scape white; flagellum grey-brown. Thorax and tegulae white. Forewing white with broad dark brown median fascia characterized by small triangular indentation in proximal margin which is marked by darker scales; with black apical dot and two parallel cilia-lines. Underside of forewing dark brown, except basal third and apical margin; cilia shades of brown. Hindwing grey-brown, cilia pale ochreous grey. Legs pale yellowish ochre or ochreous cream; forelegs almost fuscous. Colour of abdomen unknown.

**FEMALE.** Unknown.

**GENITALIA** ♂ (Figs 119, 120). Uncus with two tiny, slender and very widely separated lobes directed subcaudally; emargination between lobes rather shallow. Gnathos with caudally-directed, broad and distally truncated process covered by minute spines and bearing a large sclerotized plate with a shallow distal emargination. Valva with large cucullar lobe bearing pectinifer and supported by a short pedicel; pectinifer of about 24 spines arranged in a single row; valval lobe distally triangular; basal process of valva straight, pointed apically and relatively short, moderately sclerotized; costal process strongly sclerotized, shorter than basal process. Juxta damaged, probably weakly wrinkled and with slender elongate median process (No. 28623, BMNH). Vinculum broadly rounded anteriorly.



**BIOLOGY.** The single specimen known was collected at light in June. Larval biology unknown.

**DIAGNOSIS.** Externally very similar to *euryntis*, from which it differs by the small triangular proximal indentation on the fascia, darker (grey-brown) antenna, and greyish to grey hindwing. This specimen resembles also *javae*, from which it is easily distinguishable by the structure of the male genitalia.

**DISTRIBUTION.** Nepal (Kathmandu valley, 1400 m).

**MATERIAL EXAMINED.** — **Nepal:** 1 ♂, Kathmandu, British Embassy, 1400 m, 12–13.vi.1984 (*Allen*) genitalia slide no. 28623 (BMNH).

**REMARKS.** The single male specimen available represents a species apparently distinguishable from all others by the shape of the gnathos and uncus. However, in the absence of additional material, we err on the side of caution and do not formally describe and name it.

### The *velifera* group

This species-group is distinguished by the brown forewing, unusual in opostegids, and a similarly brown tuft of piliform scales on the head. The male genitalia are characterized by the well developed caudal process and central plate of the gnathos. The abdominal tip is distally narrowed in all females and the anal papillae form a non-bilobed plate. The corpus bursae and spermathecal duct vary greatly in shape and sclerotization. The most useful features for recognizing species within the group are those of the female genitalia. All three species are easily separable by the comparative length of the spermathecal duct and the length, width and scobination of the corpus bursae.

### *Pseudopostega velifera* (Meyrick, 1920) comb. n.

(Figs 33, 121–123, 163, 177)

*Opostega velifera* Meyrick, 1920: 357.

*Opostega velifera* Meyrick; Davis, 1989: 74

**MALE** (Fig. 33). Forewing length: ~2.4 mm. Wing-span: ~5.6 mm. Head: palpi cream; piliform scales on vertex deep brown; collar and scape pale yellowish; flagellum brownish cream. Thorax and tegulae dark brown. Forewing generally brown; pattern indistinct, but with three pale yellowish cream spots along costal margin; forewing covered otherwise with a mixture of dark brown and brownish to almost cream scales; dark scales are particularly common around the pale costal spots. There is no black apical dot visible. Underside of forewing yellow-brown, except for small irregular areas close to base. Cilia brownish cream. Hindwing brownish, cilia brownish cream. Legs cream with brown markings. Abdomen brown-ochreous brown.

**FEMALE.** Similar to male. Forewing ~2.2 mm; wing-span ~5.2–5.3 mm. Generally tending to be paler than the male, the forewing pattern less developed, hindwing brownish cream.

**GENITALIA ♂** (Figs 121–123). Uncus with two large triangular lobes directed caudally, pointed at apices; emargination between them V-shaped. Gnathos with well developed caudally directed process which is narrowed towards apex, and with diamond-shaped central plate; caudal process distinctly curved ventrad (visible in a lateral view, not in a permanent preparation). Valva with large and very long cucullar lobe bearing pectinifer of about 36 spines arranged in a simple row; distal part of cucullar lobe extended into a caudal process; lobe of central body distally broad and coarsely papillate; basal process of valva straight, tapered distally but weakly sclerotized and not easily visible; costal process strongly sclerotized, relatively long. Juxta weakly wrinkled and without the median process which is very common in other representatives of the genus. Vinculum simple, gradually narrowing anteriorly and irregularly rounded at anterior end.

**GENITALIA ♀** (Fig. 163). Abdominal tip truncate. Posterior apophysis slender but not very long. Anal papillae forming a caudally rounded semicircular sclerotization over apophyses. Vestibulum membranous and with a patch of fine scobination. Corpus bursae oval, distinctly broadening towards anterior end, caudally with a more or less compact patch of fine, individually comb-like scobination; main part of corpus bursae with signum and with numerous scattered individually comb-like scobination. Spermathecal duct short; outer canal broad; inner canal simple, hardly convoluted.

**BIOLOGY.** Adults collected in April. Larval biology unknown.

**DIAGNOSIS.** The brown forewing and tuft of piliform scales on the head distinguish *velifera* from all other Oriental opostegids, except the other members of the *velifera* group, *nepalensis* and *sumbae*. From these closely related species *velifera* differs in the very broad female corpus bursae and short but broad spermathecal duct. It differs from *nepalensis* additionally in that the collar is always yellowish and there are irregular yellowish cream areas along the forewing costa (absent in *nepalensis*).

**DISTRIBUTION.** India (Bombay).

**MATERIAL EXAMINED.** Holotype ♂, **India:** Bombay, Surat, 24.iv.1919 (*M[axwell]*) genitalia slide no. 28620 (BMNH).

Other material: 2 ♀ ♀, data as holotype, but 30.iv.1922, genitalia slide no. 28619 (BMNH).



*Pseudopostega nepalensis* sp. n.

(Figs 34, 162, 177)

MALE. Forewing length: ~2.5 mm. Wingspan: ~5.6 mm. Head: palpi yellow laterally, shadowed with brown frontally; piliform scales on vertex fuscous brown; scape yellowish cream; background of collar generally pale yellow but densely covered with brown and grey scales; flagellum brownish cream. Thorax and tegulae brown irrorated with dark brown to yellowish cream scales; numerous scales have pale cream apices and such scales are notably abundant in the apical third of the forewing. Forewing pattern not developed, without clear pale spots as in *P. velifera*, without black apical dot. Underside of forewing brownish, except for small irregular areas close to base. Cilia yellow-brown to brownish grey. Hindwing yellow-cream; cilia pale yellow. Legs brownish yellow to yellow, forelegs darkened anteriorly by grey-brown scales. Colour of abdomen unknown.

FEMALE (Fig. 34). Similar to male. Forewing 2.4–2.6 mm; wingspan ~5.5–5.8 mm. Tending to be darker and with more contrast in coloration.

GENITALIA ♂. Unknown (see Remarks).

GENITALIA ♀ (Fig. 162). Abdominal tip slender but almost truncate. Posterior apophysis slender, rather long. Anal papillae forming a caudally truncate sclerotization over apophyses. Vestibulum membranous and with a patch of fine thorn-like scobination. Corpus bursae elongate, slender, with scobination only caudally in the area of the ductus area, with long signum which curves into spermathecal duct. Spermathecal duct as long as corpus bursae; outer canal broad for entire length; inner canal very long and slightly convoluted.

BIOLOGY. Adults collected at light in April. Larval biology unknown.

DIAGNOSIS. The brown forewing and tuft of piliform scales on the head distinguish *nepalensis* from all other Oriental opostegids except the other members of the *velifera* group, *velifera* and *sumbae*. From these it differs by the very long spermathecal duct in the female genitalia and, additionally, from *velifera* by the absence of irregular yellow-cream areas along the forewing costa.

DISTRIBUTION. Nepal (tropical forest zone).

MATERIAL EXAMINED. Holotype ♀, **Nepal**: 70 km W of Kathmandu, Baikuntapuri, 19–20.iv.1995 (*Puplesis*) genitalia slide no. RP1011 ♀ (VPU).

Paratypes: 1 ♂ [lacking abdomen], 2 ♀ ♀, same data as holotype, genitalia slide no. RP1010 (VPU).

REMARKS. The abdomen of the single male speci-

men is lost so the holotype has been selected from among the available female examples.

*Pseudopostega sumbae* sp. n.

(Figs 35, 160, 177)

MALE. Unknown.

FEMALE (Fig. 35). Forewing length: ~2.1–2.2 mm. Wingspan: ~5.0 mm. Head: palpi cream; piliform scales on vertex brown to deep brown; collar and scape yellow-cream; flagellum very pale brownish or brownish cream. Thorax and tegulae brown. Forewing generally brown, except for rather broad ochreous yellow costal margin; with numerous tiny cream-tipped scales on distal half and especially on apex of forewing; apical dot absent. Underside of forewing brown, except for elongated basal area close to costal margin and sometimes narrow basal area along dorsum. Cilia ochreous brown. Hindwing brown; cilia ochre-brown. Legs ochreous cream with anterior brown markings on forelegs and sometimes on mid-tibia and tarsus. Abdomen ochreous brown on upperside, yellow-ochre on underside.

GENITALIA ♀ (Fig. 160). Abdominal tip tapered and with tiny, weakly developed, but well sclerotized lateral lobes. Posterior apophysis slender and rather short. Anal papillae forming a caudally truncate sclerotization with long setae. Two rod-like sclerotizations of the abdominal wall over the apophyses resemble an additional pair of apophyses. Vestibulum membranous, with a patch of variously-shaped pointed spicules. Corpus bursae elongate, simple, without signum, but with sparse and inconspicuous spines. Spermathecal duct very small; outer canal narrow, weakly sclerotized; inner canal short, distally with 1.5–2.0 convolutions.

BIOLOGY. Adults collected in May–June and September–October. Larval biology unknown.

DIAGNOSIS. The brown forewing and tuft of piliform scales on the head distinguish *sumbae* from all other Oriental opostegids except the members of the *velifera* group, *velifera* and *nepalensis*. From these closely related species *sumbae* differs in the female genitalia: the comparatively very small corpus bursae without signum and remarkably tiny spermathecal duct. Additionally it differs from *nepalensis* in the yellowish cream costal margin of the forewing (brown in *nepalensis*).

DISTRIBUTION. Indonesia (southern): Sumba I.

MATERIAL EXAMINED. Holotype ♀, **Indonesia**: Sumba: Lindi Watju, 27.ix–15.x.1949 (*Sutter & Wegner*), genitalia slide no. Pupl. 005 (NNM)

Paratypes: **Indonesia**: Sumba: 2 ♀, Loko Jengo, ix.1949 (*Sutter & Wegner*) genitalia slide nos. Pupl.



006, Pupil. 007 (NNM); 1 ex. (♀?, without abdomen) Melolo, v-vi.1949 (Sutter & Wegner) (NNM).

REMARKS. In most characters *sumbae* is very close to the previously described members of this species-group. However, the simple genitalia are remarkable, the weakly sclerotized corpus bursae and small spermathecal duct making this species distinctive. The description of *sumbae*, albeit based on female examples only, allows us to portray more of the significant morphological diversity within this tiny species-group.

### The *saturella* group

All currently known species are characterized by a broad or narrow brown fascia on the forewing. The *saturella* group is further distinguished by (very unusually for this genus) an irregularly sclerotized juxta, distinctively shaped gnathos (with the caudal region more or less triangular and the anterior margin extended into a distinctive projection), remarkably pointed female ovipositor with a non-bilobed sclerite formed by the anal papillae (sometimes additionally with a tiny, caudally directed tooth).

### *Pseudopostega saturella* sp. n.

(Figs 36, 124–128, 164–167, 175)

MALE (Fig. 36). Forewing length: ~2.2 mm. Wingspan: ~5.0 mm. Head: palpi cream; piliform scales on vertex pale ochreous yellow; collar and scape white; flagellum brown. Thorax and tegulae white. Basal half of forewing white; apical half with very broad brown fascia edged proximally by narrow but distinct line of black scales; proximal edge of fascia more or less transverse, but indented medially towards base of forewing; apex of forewing brown, paler than fascia and separated from it in some (but not all) specimens by even paler narrow irregular band. Apical dot represented by few dark brown scales, sometimes indistinct. Underside of forewing brown, except small yellow-cream basal area. Cilia brownish, or even brownish cream, without cilia-line. Hindwing ochreous brown to brown; cilia ochreous brown. Legs ochreous cream, except forelegs, which are dark grey. Abdomen black on upperside, greyish yellow on underside. (See also Remarks.)

FEMALE. Forewing length: 2.2–2.5 mm. Wingspan: 5.0–5.6 mm. Palpi varying from lustrous white to brownish cream. Piliform scales on vertex varying from pale yellow to almost cream. Proximal edge of fascia sometimes (especially in old material) dark brown, but always contrasting with the distal brown fascia. Apical dot varying from brown to black. Forelegs dark grey to grey. Abdominal scaling variable, usually brownish or pale yellow-ochre on upperside and underside. Otherwise as in male.

GENITALIA ♂ (Figs 124–128). Uncus with two small distally rounded and widely separated lobes. Gnathos very well developed, with huge triangular and pointed central part, elaborated lateral arms and distally strongly sclerotized triangular posterior plate. Valva with large cucullar lobe bearing long pectinifer, consisting of about 32 spines arranged in a single row; valval distal lobe broad and sclerotized; basal process of valva straight, short and strongly sclerotized; costal process of valva, long, straight and well sclerotized. Juxta irregularly shaped at caudal margin and with a few strong longitudinal wrinkles in central area. Vinculum rounded anteriorly.

GENITALIA ♀ (Figs 164–167). Abdominal tip forming a triangular and apically pointed ovipositor; each lateral lobe bearing numerous long setae directed outward and short setae directed inward. Posterior apophysis slender and long. Anal papillae forming well sclerotized tiny plate, with long strong setae and almost always with caudal tooth at centre. Abdominal wall with longitudinal rod-like sclerotizations which look like another pair of apophyses. Vestibulum membranous and with a patch of fine scobination. Corpus bursae large, oval (may be considerably squashed in permanent slides), with a band-like signum comprising numerous pointed and blunt spines. Posterior region of bursae with comb-like scobination; shape of bursal scobination may vary. There are usually no spicules in the anterior region of the corpus bursae. Spermathecal duct short; outer canal membranous and without spicules; inner canal relatively short and strongly convoluted in distal half.

BIOLOGY. Adults have been collected at light in February–March, June–July and in September–November, but it is likely that the flight season is throughout the entire year. Larval biology unknown.

DIAGNOSIS. This species has a very distinctive wing pattern, and may be easily recognized from other Oriental opostegids. It differs from its closest relatives, *javae* and *amphivittata*, in forewing coloration and genital structure. From the former it is easily distinguishable by the dark apex of the forewing, less elaborate gnathos and longer setae of the cucullar lobe. From the latter it may be distinguished by the broad postmedian fascia (narrow in *amphivittata*), and narrow spermathecal duct in the female genitalia (broad in *amphivittata*).

DISTRIBUTION. This species is probably widely distributed in the eastern part of the Oriental Region, as it is known from numerous sites in Indonesia (Java, Sulawesi, Sumba and other small southern islands) and central Thailand.

MATERIAL EXAMINED. Holotype ♂, **Indonesia:** Sulawesi Utara, Dumoga-Bone N.P., lowland forest,



200–300 m, iii.1985 (*Project Wallace*), genitalia slide no. 28692 (BMNH).

Paratypes: 2 ♀ ♀, data as holotype but x.1985 (*Project Wallace*), genitalia slide nos. 28690 & 28691 (BMNH). **Indonesia:** 3 ♀ ♀, Pura (southern islands close to Flores): x–xi.1891 (*Walsingham Coll.*), genitalia slide nos. 28689 & 28695 (BMNH); 3 ♂, Java, Udjangkulon, Tjigeunter, 16.vii.1955 (*Sutter & Wegner*) (NNM); 1 ♂, 1 ♀, Java, Gedangon.. [?], xi.1941 (*Sodin..[?]*) (NNM); 1 ex. (without abdomen), Java, 3.vi.1940 (*Diakonoff*) (NNM); 1 ♂, 7 ♀, Sumba, Lindi Watju, 400–500 m, 27.ix–15.x.1949 (*Sutter & Wegner*), genitalia slide no. Pupl. 001 ♂ (NNM). **Thailand:** 1 ♀, Nakhon Nayok Province, KhaoYai National Park, ca. 700 m, 29.ix–6.x.1984 (*Karsholt et al.*), genitalia slide no. Pupl. 400 (ZMUC).

REMARKS. There are no distinctive external differences between males and females except that the female abdomen tends to be paler than that of the male.

### *Pseudopostega javae* sp. n.

(Figs 37, 129, 171, 179)

MALE. Forewing length: ~2.3 mm. Wingspan: ~5.1–5.2 mm. Head: palpi cream; piliform scales on vertex pale white to pale yellow-cream; collar and scape white; flagellum brownish cream to brown. Thorax and tegulae white. Basal and apical third of forewing white; broad median fascia brown, distinctly broadened in dorsal two-thirds to three-fifths; fascia edged proximally by darker brown scales. Apical dot represented by few dark brown scales and surrounded by cream to ochreous cream scales. Underside of forewing brown, except for small elongated yellow-cream basal area parallel to costa. Cilia cream. Hindwing ochreous cream or cream; cilia cream. Legs ochreous cream, except forelegs and tarsi which may be darkened with fuscous. Abdomen grey-brown to ochreous brown on upperside, brownish or yellow-cream to cream on underside.

FEMALE (Fig. 37). Similar to male in external features.

GENITALIA ♂ (Fig. 129). Uncus with two small distally rounded and widely separated lobes. Gnathos very well developed, rather abruptly narrowed in caudal two-fifths, with short spine-like posterior and very long stripe-like anterior projections; lateral arms not very evident. Valva with large cucullar lobe bearing long pectinifer, consisting of about 38 spines arranged in a single row; distal valval lobe broad and sclerotized; basal process of valva straight and tapered; costal process of valva relatively large and well sclerotized. Juxta membranous at caudal margin and with a few strong longitudinal wrinkles in central part. Vinculum rounded anteriorly.

GENITALIA ♀ (Fig. 171). Abdominal tip forming a triangular and apically pointed ovipositor; each papilla with numerous long setae directed outward and short setae directed inward. Posterior apophysis slender and long. Anal papillae forming a well sclerotized tiny plate, with long strong setae and always with caudal tooth at centre. Abdominal wall with indistinct longitudinal rod-like sclerotizations which may look like another pair of apophyses. Vestibulum membranous with a patch of fine scobination. Corpus bursae large, ovoid, with a band-like signum comprising numerous pointed and blunt spines. Posterior part of bursa close to vestibulum with comb-like scobination. Spermathecal duct short but broad; outer canal membranous; inner canal relatively short and with a few distal convolutions.

BIOLOGY. Adults collected in July. Larval biology unknown.

DIAGNOSIS. Differs externally from other species of the *saturella*-group (*saturella*, *amphivittata*) in the forewing apex being whitish. However, this character occurs also in *euryntis*, *fungina* and *species* 28623, which possess very different genitalia. In male genitalia *jvae* is most similar to *saturella*, but differs in the well isolated anterior process of the gnathos, as well as the caudal spine-like extension of the gnathos and broader vinculum. The female genitalia of *jvae*, *saturella* and *amphivittata* are practically inseparable.

DISTRIBUTION. Indonesia (Java).

MATERIAL EXAMINED. Holotype ♂, **Indonesia:** W. Java, Ujung Kulan, Tjigeunter, 16.vii.1955 (*Wegner*), genitalia slide no. Pupl. 016 (NNM).

Paratypes, 2 ♀, data as holotype, genitalia slide no. Pupl. 017 (NNM).

### *Pseudopostega amphivittata* sp. n.

(Figs 38, 168, 177)

MALE. Unknown.

FEMALE (Fig. 38). Forewing length: 2.3–2.6 mm. Wingspan: 5.1–5.5 mm. Head: palpi usually cream, sometimes whitish or grey; piliform scales on vertex pale yellowish cream to whitish; collar and scape white, occasionally shadowed with ochreous; flagellum brownish to brownish grey. Thorax and tegulae white. Basal two-thirds of forewing white; apical third with oblique dark brown fascia, narrowest at dorsum; some areas of fascia, especially costal zone, may be darker, blackish brown, but without distinct black proximal edge. Postfascial area brownish, with usually very distinct blue and purple iridescence. Apical dot represented by a few black to dark brown scales. Underside of forewing dark brown to grey brown. Cilia pale brown or ochreous brown to brownish cream; no cilia-



line. Hindwing grey brown to brown; cilia greyish brown. Colour of legs variable: forelegs dark brown to greyish; mid- and hindlegs cream with strong metallic lustre to ochreous without distinct metallic lustre. Abdomen ochreous brown to blackish on upperside and ochreous yellow on underside.

GENITALIA ♀ (Fig. 168). Extremely similar to those of the related *saturella* and *javiae*. Anal papillae forming sclerotization just occasionally with caudal tooth at centre. Spermathecal duct relatively short, but tending to be broader and longer than in *saturella* or *javiae*.

BIOLOGY. Adults collected at light in March and October. Larval biology unknown.

DIAGNOSIS. Differs from all known Oriental opostegids (including representatives of the *saturella* group) by the very specific forewing pattern, in which the narrow dark brown postmedian fascia is followed by a brown apical area. Female genitalia similar to those of *saturella*, but differing externally in the apical markings of the forewing: the brown fascia is distinctly darker, without a black proximal edge, much more slender and distinctly oblique.

DISTRIBUTION. Indonesia (Sulawesi) (sympatric with *saturella*).

MATERIAL EXAMINED. Holotype ♀, **Indonesia**: Sulawesi, Dumoga-Bone National Park Edwards' Camp, 664 m (lowland forest), x.1985 (*Project Wallace*) genitalia slide no. 28693 (BMNH).

Paratypes, 2 ♀ ♀, data as holotype; 2 ♀ ♀ as holotype but Hog's Back Camp, 492 m; 1 ♀ as holotype but lowland forest, 200–300 m, iii.1985, genitalia slide nos. 28694 & 28696 (BMNH).

### The *nigrimaculella* group

In the *nigrimaculella* group the valva possesses a small rounded apophysis on the inner side, the gnathos is narrowed caudally, the genital capsule is broad, and the vinculum broadly rounded anteriorly. Externally the moths are white with a few apical markings. The shape of the gnathos, juxta and uncus, as well as the forewing markings and hindwing colour are the most diagnostic features within this group.

### *Pseudopostega nigrimaculella* sp. n.

(Figs 39, 132, 178)

MALE (Fig. 39). Forewing length: ~3.5 mm. Wingspan: ~7.6 mm. Head: labial palpi cream, maxillary palpi fuscous laterally; piliform scales on vertex, collar and scape white (almost snow-white); flagellum pale ochreous brown. Thorax and tegulae white. Forewing snow-white with very small black costal spot close to apex, tiny black apical dot and brownish strigula on cilia base; dorsum with very indistinct

mark comprising a few pale brownish scales. Underside of forewing dark brown, except basal area. Cilia generally white, except small area beyond apical dot. Hindwing pale grey-brown; cilia pale ochreous brown. Legs ochreous, forelegs darkened with fuscous brown. Abdomen brown on upperside, yellowish cream on underside.

FEMALE. Unknown.

GENITALIA ♂ (Fig. 132). Uncus with two triangular lateral lobes; emargination between lobes relatively narrow, V-shaped; very broad and distally truncate projection of tegumen developed behind uncus lobes. Gnathos narrowing towards rounded apex; caudally directed process not well differentiated from generally triangular central plate; small posterior projections of gnathos connected with costal apophyses of valva. Valva with large and very elongated cucullar lobe with long pectinifer comprising about 40–42 spines arranged in a simple row; pedicel large, smoothly narrowed apically, basally fused with valva and bearing a small ovoid sclerite; valval main body very narrow and long (in ventral view), weakly papillated at apex; basal process not differentiated, valva fused basally with vinculum; costal process relatively long, well sclerotized and connected via membranous joint with gnathos. Juxta represented by a narrow stripe-like central region which broadens at base. Vinculum very broad and rounded anteriorly.

BIOLOGY. The single specimen known was collected in October. Larval biology unknown.

DIAGNOSIS. Externally this species exhibits a distinctive black costal spot, which separates it from all currently known Oriental opostegids, except *Pseudopostega frigida*, *P. myxodes* and *Opostegoides index*. However, from *myxodes* it easily distinguishable by the snow-white forewing, and from all three by the genital structure. The male genitalia of *nigrimaculella* are separable from those of the morphologically closest species – *species* 28805 – by the triangular uncus lobes and characteristic shape of the gnathos.

DISTRIBUTION. Thailand (700–900 m).

MATERIAL EXAMINED. Holotype ♂, **Thailand**: Loei Province, Phu Luang Wildlife Sanctuary, 8–14.x.1984 (*Karsholt et al.*) genitalia slide no. Pupl. 401 (ZMUC).

### *Pseudopostega alleni* sp. n.

(Figs 40, 133, 178)

MALE (Fig. 40). Forewing length: ~3.0 mm. Wingspan: ~6.6–6.7 mm. Head: palpi cream; piliform scales on vertex, collar and scape white (almost snow-white); flagellum very pale ochreous. Thorax and tegulae white. Forewing snow-white with apical markings:



three dark brown strigulae, intense black apical dot and small pale yellow-orange area mostly before the apical dot. Underside of forewing brown, except basal elongated area close and parallel to costa. Cilia whitish or white. Hindwing relatively broad, greyish brown; cilia cream. Legs pale ochreous or ochreous cream, forelegs shadowed anteriorly with brown. Abdomen fuscous brown on upperside, pale ochreous cream on underside.

FEMALE. Unknown.

GENITALIA ♂ (Fig. 133). Uncus large, with two well sclerotized and well differentiated lateral lobes; emargination between lobes U-shaped. Gnathos with broad central plate with broadly rounded apex; lateral arms of gnathos narrow, connected via membranous joint to costal apophyses of valvae. Valva with large, elongate cucullar lobe bearing pectinifer on long pedicel; pectinifer a little shorter than cucullar lobe, comprising about 40 spines arranged in a single row; main body of valva narrow (in ventral view), weakly papillated distally; basal process moderately short, not well differentiated; costal process of valva as long as basal process, strongly sclerotized and without evident anterior extension. Juxta a short and relatively broad stripe-like central region, clearly trifurcated distally. Vinculum broad and rounded anteriorly.

BIOLOGY. The single specimen known was collected in June. Larval biology unknown.

DIAGNOSIS. *Pseudopostega alleni* is externally very similar to some other white *Pseudopostega* and *Opostegoides* species, the male genitalia recognizable by the distinctive shape of the gnathos, uncus and juxta. It differs externally from *nigrimaculella*, which it closely resembles, in the dark hindwing and in having two brown terminal strigulae instead of a costal spot; the male genitalia differ from those of *nigrimaculella* in having a distally broad and rounded gnathos process, a U-shaped emargination of the uncus, and a distally trifurcate juxta.

DISTRIBUTION. Thailand.

MATERIAL EXAMINED. Holotype ♂, **Thailand**: Uthai Thani District, Khao Nang Rum, 6–8.vi.1986 (Allen) genitalia slide no. 28805 (BMNH).

REMARKS. The specimen described represents a distinctive species with good defining characters in the male genitalia. Despite misgivings about describing new species from single specimens, we are confident enough of this taxon to name it.

### The *indonesica* group

This group is designated to accommodate a single species which is characterized by very unusually shaped male genitalia. The cucullar lobe of the valva is

distinctly triangular, the vinculum narrow and bilobed. This presently monobasic species-group is not only morphologically distinctive but appears to represent an isolated lineage within the genus.

### *Pseudopostega indonesica* sp. n.

(Figs 41, 134–137, 169, 179)

MALE (Fig. 41). Forewing length: 2.1–2.3 mm. Wing-span: ~4.8 mm. Head: palpi white to cream, with silver lustre; piliform scales on vertex, collar and scape white (almost snow-white); flagellum pale ochreous. Thorax and tegulae white. Forewing snow-white with conspicuous burnt ochre fascia that broadens posteriorly to double its costal width at posterior margin; proximal and distal margins of fascia narrowly and irregularly marked by distinctly darker chestnut-brown scales. Apical dot intense black to indistinct, ochreous brown or absent. Cilia line brownish, faint, indistinct or absent. Underside of forewing brown, especially in fascia area, but whitish cream at base. Cilia generally whitish, but pale brown in places. Hindwing pale ochreous greyish or greyish cream (depending on angle of view); cilia greyish cream. Legs ochreous cream to whitish cream, except forelegs (dark grey) and hind tarsus (marked also with dark grey). Abdomen brown to fuscous brown on upperside and cream on underside.

FEMALE. Similar to male. Forewing underside not covered by brown scales. Abdomen tending to be paler on upperside.

GENITALIA ♂ (Figs. 134–137). Uncus with two very distinctive, long, distally rounded and roughly setose lobes; emargination between lobes broad, U-shaped. Very broad and distally rounded membranous projection of tegumen visible behind uncus lobes. Gnathos very well developed, with large central plate smoothly rounded distally and with strongly sclerotized elaborated lateral arms; posterior arms hinged to costal apophyses of valvae; a rounded lobe behind central plate of gnathos. Valva with unique, distinctly triangular cucullar lobe, which is strongly tapered at base and covered by about 25 strong setae in the distal half. Pectinifer longer than cucullar lobe of valva, consisting of about 38 spines arranged in a row, which may sometimes appear double; pedicel relatively broad and simple; valval lobe distally broad and unusually smooth, without papillae, with just a few (2–3) rather weak setae; inner side of valva extended triangularly mesad, but not strongly sclerotized; basal process long and pointed; costal process of valva relatively short, well sclerotized and evidently hinged with gnathos by anterior extension. Juxta with a narrow stripe-like central region. Vinculum well sclerotized laterally, bilobed anteriorly; anterior emargination triangular or rectangular.



GENITALIA ♀ (Fig. 169). Abdominal tip rounded but distinctly and abruptly narrowed; anal papillae not separated, with numerous setae. Anal papillae very deeply divided and well sclerotized, with one central and two lateral sclerotized extensions anteriorly. Posterior apophysis slender and very long. Vestibulum membranous, wrinkled, but not strongly sclerotized and without evident scobination. Corpus bursae narrow and very tiny, almost as long as posterior apophyses; no visible scobination on bursa. Spermathecal duct short, almost as short as ductus bursae or shorter; outer canal membranous, very weakly developed, very slender; inner canal sinuous, slightly convoluted in distal half.

BIOLOGY. Adults collected in late September–October. Larval biology unknown.

DIAGNOSIS. Well differentiated externally from all currently known Oriental species by the ferruginous-brown median fascia of the forewing. The male genitalia differ in the very distinctively shaped cucullar lobe of the valva; in contrast with the other species it is triangular, and very narrow at the base.

DISTRIBUTION. Indonesia (Sulawesi; Sumba). Probably more widely distributed. In Sulawesi it occurs in lowland forest.

MATERIAL EXAMINED. Holotype ♂, **Indonesia**: Sulawesi Utara, Dumoga-Bone National Park (lowland forest), Hog's Back Camp, 492 m, x.1985 (*Project Wallace*), genitalia slide no. 28697 (BMNH).

Paratypes: 1 ♂, 4 ♀ ♀, **Indonesia**: Sumba, Lindi Watju, 27.ix–15.x.1949 (*Sutter & Wegner*), genitalia slide nos. Pupl. 002 ♂, Pupl. 003 ♀ (NNM).

### The *fungina* group

This group is designated to accommodate a single species which is characterized by very unusually shaped male genitalia. It differs from all other *Pseudopostega* in: cucullar lobe of valva probably secondary reduced, extremely small and smoothly rounded, pectinifer very narrow and more or less triangular, pedicellum greatly extended, juxta strongly sclerotized and distal region elaborated. This presently monobasic species-group is not only morphologically distinctive but appears to represent an isolated lineage within the genus.

### *Pseudopostega fungina* sp. n.

(Figs 42, 138–140, 179)

MALE (Fig. 42). Forewing length: ~2.3 mm. Wing-span: ~5.1–5.2 mm. Head: palpi ochreous cream; piliform scales on vertex probably cream (head rubbed), collar and scape white; flagellum pale yellow-ochre. Thorax and tegulae white. Forewing white with some

silvery lustre, with broad dark brown fascia slightly wider at posterior margin than at costa and occupying about one-third of wing; fascia with strong gold and purple iridescence, depending on angle of view. Apex with a few brown scales scattered close to costal margin; otherwise without (at least in the single specimen available) any distinct strigulae or other apical markings. Underside of forewing white basally, covered by brown scales in fascia zone; apex predominantly creamy white with some brownish scales. Cilia whitish. Hindwing pale ochreous cream; cilia dark cream. Legs ochreous cream. Abdomen brownish on upperside and cream or whitish cream on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 138–140). Uncus with two very distinctive long, distally rounded and roughly setose lobes; emargination between lobes broad, V-shaped, since lobes gradually broaden towards bases. Broad membranous projection of tegumen present behind uncus lobes but not easily visible. Gnathos very well developed, central plate very broad, smoothly rounded distally, with posteriorly directed lateral arms connected by membranes to costal apophyses of valvae. Valva with very unusual, small oval cucullar lobe on long sinuous pedicellum and with very distinctive pectinifer resembling a mushroom. Pectinifer comprising about 11 spines, visible in ventral view, arranged in a distally slender row. Main body of valva relatively broad and unusually long, almost entirely without distinctive papillae apically; inner side of valva more or less smooth, without any inward projections. Basal part of valva less sclerotized, fused with vinculum and without differentiated basal process; outer margin of valva well sclerotized along entire length; costal process relatively short, very well sclerotized, caudal extension forming a plate-like sclerite. Juxta with relatively broad (especially in distal half) central stripe, with strongly bent and pointed process at apex; sclerotization of juxta stronger at its distal (caudal) end. Vinculum almost parallel-sided, anterior corners very broadly rounded.

BIOLOGY. The single specimen known was collected in August. Larval biology unknown.

DIAGNOSIS. The dark brown median fascia of the forewing together with the white apical area make this species externally similar to *javae*, *euryntis* and *species* 28623. However, the unique shape of the pectinifer and cucullar lobe of the valva, together with the very long uncus and apically elaborated juxta clearly separate this species from all others known to us.

DISTRIBUTION. India (NE): lower Ganges river valley.

MATERIAL EXAMINED. Holotype ♂, **India**: Patna region, Pusa, 7.viii.1929 (*Fletcher*) genitalia slide no. 28698 (BMNH).



**REMARKS.** The single male specimen described represents a distinctive species with unique characters in the male genitalia. Despite misgivings about describing new species from single specimens, we are confident enough of this taxon to name it.

### Species not attributed to a species-group

#### *Pseudopostega zelopa* (Meyrick, 1905) comb. n.

(Figs 43, 141–145, 170, 179)

*Opostega zelopa* Meyrick, 1905: 613.

*Opostega zelopa* Meyrick; Davis, 1989: 75.

**MALE** (Fig. 43). Forewing length: 2.2–3.3 mm. Wing-span: ~5.0–7.2 mm. Head: palpi yellowish cream; piliform scales on vertex white to very pale yellow-ochre or pale yellow; collar and scape white; flagellum brown. Thorax and tegulae white. Forewing pattern comprising brown markings on a white background: with dark brown antemedial fascia strongly broadened at dorsum (and sometimes edged anteriorly with fuscous scales) and with brown apical area, the latter narrowly and irregularly edged with black scales. Although the wing pattern is distinctive, there is some variation in width and tint of the antemedial fascia which may be only slightly broadened on the dorsum (as in specimens from Sumba) and the brown apical area may be only weakly expressed. Apical dot black, but not always well defined. Terminal strigula dark brown, at base of cilia, not always evident. Underside of forewing brown except small irregularly shaped cream basal area. Cilia brown costally, brownish ochreous more dorsally. Hindwing brown or grey to ochreous brown, upper and underside basally with whitish scales with a silver sheen; this whitish basal spot may be very evident (most south Indonesian specimens), or not so distinct (other specimens). Cilia of hindwing brownish ochre. Legs cream with some metallic lustre but forelegs and tarsi darkened with fuscous brown. Abdomen brown-grey to fuscous brown on upperside and yellowish or greyish cream on underside.

**FEMALE.** Similar to male; whitish scales on hindwing base also present. Abdomen usually ochreous brownish on upperside.

**GENITALIA** ♂ (Figs 141–145). Uncus with two slender, elongate lateral lobes directed caudally; they may be tiny or rather well developed; emargination between lobes from very shallow and broad to U-shaped. Gnathos with well developed, caudally directed central process, which is rounded distally, and with narrow but strongly sclerotized lateral arms; gnathos central plate, usually well developed in most other representatives of this genus, practically absent. Valva with large

cucullar lobe bearing pectinifer and supported by a slender pedicel; pectinifer consisting of about 26–36 spines arranged in a single row; main body of valva distally triangular or oval and well sclerotized; basal process of valva straight, pointed distally and relatively well sclerotized; costal process strongly sclerotized, usually distinctly shorter than basal process, but sometimes equal in length. Juxta weakly wrinkled and with relatively slender, long to very long median process, which broadens at its distal end, and occasionally may also broaden slightly before the middle. Vinculum relatively very large, more or less rectangular anteriorly, but shape probably variable. Aedeagus absent although some membranous parts of the ductus ejaculatorius may be visible.

**GENITALIA** ♀ (Fig. 170). Abdominal tip almost rounded, lateral lobes weakly developed, blunt and setose. Posterior apophysis slender and long. Anal papillae forming a distinctly bilobed plate, which is moderately sclerotized but not easily visible. Vestibulum membranous, with a patch of fine, blunt scobination. Corpus bursae strongly elongated, caudally with fine comb-like pectination, more distally with coarser blunt spines, which are scattered in an oval area. Spermathecal duct long, but shorter than corpus bursae; outer canal broad; inner canal hardly convoluted, simple.

**BIOLOGY.** Adults collected at light in March, April–June and August–October. Larval biology unknown.

**DIAGNOSIS.** Despite some variation of forewing pattern, this species is externally distinctive, characterized by the broad brown antemedial fascia and brown apical area of the forewing. In the male genitalia *zelopa* is distinguished by the inverted V-shaped gnathos in combination with a very long, distally slightly concave uncus and apically broadened juxta.

**DISTRIBUTION.** India (Assam), Nepal, Sri Lanka, Thailand, Indonesia (Timor and Sumba). It is likely that this species is widespread throughout the Oriental region. In tropical forest in Nepal it is very abundant, and judging from the material available this is also the case in Sumba.

**MATERIAL EXAMINED.** Holotype ♀, **Sri Lanka:** Pundalu-oya (*Green*), v.1903 (BMNH), (see Remarks, below).

Other material: **India:** 1 ♂, Assam: Khasi Hills, v.1907, genitalia slide no. 28621 (BMNH); **Nepal:** 1 ♂, Terai, Dharan, sal & secondary forest, 18.viii.1984 (*Allen*) (BMNH); 51 ♂ ♀, 70 km W of Kathmandu, Baikuntapuri, 19.iv.1995 (*Puplesis*), genitalia slide nos. RP1001 ♂, RP1002 ♂, RP1012 ♀ (VPU). **Thailand:** 1 ♀, Uthai Thani Distr., Khao Nang Rum, 1.iii.1986 (*Allen*), genitalia slide no. 28622 (BMNH). **Indonesia:** 1 ♀, SW Timor, xi–xii.1891 (*Doherty*),



genitalia. slide no. 28806 (BMNH); Sumba: 2♂, 2♀, Lindi Watju, 27.ix–15.x.1949 (Sutter & Wegner), genitalia slide nos. Pupl. 004, Pupl. 020 (NNM); 2♂, 7♀, Melolo, v–vi.1949 (Sutter & Wegner) (NNM).

**REMARKS.** Meyrick's original description was based on a single female specimen from Sri Lanka (Ceylon) collected by Green. Although Davis (1989: 75) noted that the type was in the BMNH, no specimen labelled as such exists. A female specimen labelled 'Pundaluya, Ceylon, EEG, 5.03' in Meyrick's hand (a precise match to the published label data, including the idiosyncratic spelling of Pundaloya) and completely corresponding to Meyrick's original description has been found by us among unidentified material. This specimen was evidently not labelled as *zelopa* in Meyrick's collection. Meyrick's notebook (one of a series recording all material received) does not include any reference to 'zelopa' specimens received from Green but it is probable that this specimen was in one of two consignments received from Green in 1905, one in January and one in July, both of which contained taxa that were not identified at the time of listing. We are sure that this female specimen served as the type for the original description but was for some reason treated subsequently by Meyrick in an unusual way, and not placed above an identification label in his collection (see Clarke, 1955, for a detailed description of the arrangement of Meyrick's collection). Accordingly we list this specimen as holotype above.

This species shows some variation in forewing pattern (some specimens have a much broader brown fascia and narrower brown apical area), hindwing shape and scaling (whitish scaling is only weakly visible in Thai or east Indian material) and genitalia (uncus, cucullar lobe of valva and vinculum may vary in width and shape). However, despite these differences, we treat this as a single, widely distributed but morphologically rather variable species. Even among specimens from one small island (Sumba) there are differences in both external and genital morphology (different number of spines in pectinifer, different shape of cucullar lobe and valval processes, etc.).

### *Pseudopostega euryntis* (Meyrick, 1907)

(Figs 44, 174, 178)

*Opostega euryntis* Meyrick, 1907: 985.

*Pseudopostega euryntis*, Davis, 1989: 76.

**MALE.** Unknown (see Remarks).

**FEMALE** (Fig. 44). Forewing length: ~3.3–3.4 mm. Wingspan: ~7.7–7.8 mm. Head: palpi ochreous cream; piliform scales on vertex, collar and scape creamy white or cream; flagellum pale ochreous. Thorax and tegulae cream. Forewing cream with broad dark brown transverse median fascia broadest on dorsum. Apical

dot black, with weakly expressed short dark brown strigula on costa before cilia (see Remarks). Under-side of forewing brown except for basal one-quarter and apex. Cilia cream. Hindwing pale ochreous; cilia ochreous cream. Legs pale yellow-ochre; forelegs darkened with brown. Abdomen colour unknown, probably brown on upperside.

**GENITALIA ♀** (Fig. 174). Abdominal tip rounded, not divided into lobes. Posterior apophysis slender and very long. Anal papillae distinctly separated. Corpus bursae elongate; no pattern of scobination is visible in the single preparation available (see Remarks). Spermathecal duct weakly developed, very short; outer canal invisible in available preparation; inner canal short and slightly convoluted.

**BIOLOGY.** The single specimen known was collected in June. Larval biology unknown.

**DIAGNOSIS.** Externally, the combination of a dark brown forewing median fascia with a white apical area differentiates this species clearly from other Oriental taxa except *Pseudopostega javae*, *fungina* and *species* 28623. It differs from the last in having a cream hindwing and indistinct proximal indentation of the fascia, from *fungina* in the intense dark brown fascia, and from *jvae* in the rounded abdominal tip, bilobed anal papillae and weakly developed corpus bursae and spermathecal duct in the female genitalia.

**DISTRIBUTION.** India (south). A record of this species from Sri Lanka (Davis, 1989) should be treated with caution (see Remarks).

**MATERIAL EXAMINED.** Holotype ♀, **India:** [Nilgiri Hills], N. Coorg, Dibidi, 18. vi.1906 (*Newcome*) genitalia slide no. 28624 (BMNH).

**REMARKS.** This species was originally described from a single female specimen in very poor condition. The distal half of the left forewing of the holotype has been lost, and the distal part of the right forewing is mouldy, the apical markings thereby obscured. Some features of the genitalia of the holotype are obscured as it was not possible to make an adequate preparation. The abdomen was mouldy and possibly rotten, with little sclerotization, so the bursa was not removed from the abdomen for fear of further damage.

A male specimen has been attributed to this species and illustrated by Davis (1989: fig. 302); it is a specimen from Taiwan (2 km W of Meishan, 29.vi–2.vii.1990 – Davis, pers. comm.). We think it unlikely that this specimen is conspecific with *euryntis*; it is from a locality far distant from that of the type specimen and, although Davis's specimen was not available for examination, appears very similar to the widely distributed *zelopa*. Its genitalia, characterized by a distally pointed gnathos and juxta, suggest it could possibly represent an unnamed species.



***Pseudopostega spilodes* (Meyrick, 1915)  
comb. n.**

(Figs 45, 173, 178)

*Opostega spilodes* Meyrick, 1915: 351.*Opostega spilodes* Meyrick; Davis, 1989: 75.

MALE. Unknown.

FEMALE (Fig. 45). Forewing length: ~2.8 mm. Wing-span: ~6.3 mm. Head: palpi cream; piliform scales on vertex, collar and scape white; flagellum ochreous brown. Thorax and tegulae white. Forewing white with two irregular brown spots, one on dorsum, another closer to costal margin, just before middle of forewing; apical dot black, elongated; with two terminal strigulae, one more elongate but not very sharp, the other, close to tornal margin, very short but distinctive. Underside of forewing brownish. Cilia creamy to brownish towards costa. Hindwing brown, cilia creamy brown. Legs brownish. Abdomen ochreous brown on upperside and underside.

GENITALIA ♀ (Fig. 173). Abdominal tip broad and slightly bilobed. Posterior apophysis relatively short. Anal papillae forming a posteriorly bilobed plate bearing few very long setae. Vestibulum membranous, with a lateral variably scobinated patch. Corpus bursae elongate, with a relatively large patch of comb-like scobination caudally and without any sclerotization on main part of sac. Spermathecal duct much shorter than corpus bursae; membranous outer canal narrow, inner canal slightly sinuous, anteriorly with 1.0–1.5 convolutions.

BIOLOGY. The single specimen known was collected in December. Larval biology unknown.

DIAGNOSIS. Among other white *Pseudopostega* species *spilodes* is recognizable by the combination of two brown spots on the forewing and, in the female genitalia, a long spermathecal duct and relatively short posterior apophyses.

DISTRIBUTION. India (southern).

MATERIAL EXAMINED. Holotype ♀, **India**: [Nilgiri Hills], N. Coorg, 14.xii.1906 (*Newcome*) genitalia slide no. 28649 (BMNH).

***Pseudopostega subviolacea* (Meyrick, 1920)  
comb. n.**

(Figs 46, 172, 179)

*Opostega subviolacea* Meyrick, 1920: 357.*Opostega subviolacea* Meyrick; Davis, 1989: 75.

MALE. Unknown.

FEMALE (Fig. 46). Forewing length: ~2.8 mm. Wing-

span: ~6.3 mm. Head: palpi bright cream; piliform scales on vertex pale orange-ochreous; collar and scape pale yellowish cream; flagellum pale ochreous. Thorax, tegulae and most of forewing yellowish ochreous. Apex of forewing marked by very narrow oblique dark brown fascia, outside this an ochreous brown area just before cilia. Apical dot a few dark fuscous scales. Underside of forewing pale greyish ochreous. Cilia cream to brown. Forewing unusually narrow. Hindwing brownish cream, cilia cream or brownish cream. Legs ochreous cream. Abdomen ochreous on upperside, cream on underside.

GENITALIA ♀ (Fig. 172). Abdominal tip truncate. Posterior apophysis slender and long. Anal papillae forming a very tiny, more or less triangular sclerite with a few long setae. Vestibulum membranous with a patch of small blunt and pointed spicules. Corpus bursae large, strongly swollen, with some signa-like sclerotization on main part of sac and with tiny spicules at posterior end. Spermathecal duct with very narrow and very membranous outer canal and relatively short and sinuous inner canal.

BIOLOGY. Adults collected in August–September. Larval biology unknown.

DIAGNOSIS. Externally this species is distinguished by the generally yellow-ochre forewing with slender and oblique brown apical fascia. The female genitalia are recognizable by the very broad corpus bursae and the more or less triangular tiny sclerite over the apophyses.

DISTRIBUTION. India (western, lowlands).

MATERIAL EXAMINED. Holotype ♀, **India**: Gujarat, Kharaghoda, 17.viii.1919 (*R. M[axwell]*) genitalia slide no. 28655 (BMNH).

Other material: 1 ex. (very poor condition, mouldy), data as holotype but 1.ix.1919 (BMNH).

***Pseudopostega strigulata* sp. n.**

(Figs 47, 130, 131, 179)

MALE (Fig. 47). Forewing length: ~2.3 mm. Wing-span: ~5.1–5.2 mm. Head: palpi cream; piliform scales on vertex, collar and scape white; flagellum pale ochre. Thorax and tegulae creamy white. Forewing creamy white (distally more yellowish) with five brownish, mostly oblique costal strigulae and unusually large black apical dot. Underside of forewing ochreous cream. Cilia ochreous cream. Hind wing and its cilia ochreous cream. Legs ochreous cream to pale ochreous. Abdomen brownish on upperside and greyish cream on underside.

FEMALE. Unknown.

MALE GENITALIA (Figs. 130, 131). Uncus extremely



large, with two large and apically pointed lateral lobes directed caudally. Gnathos with slender but very long, well sclerotized caudal process and broad, plate-like lateral arms; central plate of gnathos not developed; caudal process of gnathos plate-shaped in lateral view, curved dorsad and sharply pointed at apex. Valva with large, elongated-oval cucullar lobe with pectinifer consisting of about 36 spines arranged not very compactly in a simple row; pedicel moderately long, appressed to main body of valva which is more or less oval in ventral view, broadly rounded distally and stretching over pedicel; main body of valva narrowed basally, but basal process very weakly differentiated, unusually very short; costal process of valva long and very well sclerotized, connected with juxta and gnathos via caudal extensions. Juxta distinctly wrinkled laterally, but without the central stripe usual in this genus. Vinculum broad, very broadly rounded anteriorly.

BIOLOGY. Unknown.

DIAGNOSIS. Externally this species is characterized by its distinctive forewing pattern, with five strigulae and a relatively large apical dot. The male genitalia of *strigulata* differ from those of all other Oriental species in the very long but (in ventral view) very slender caudal process of the gnathos and large uncus lobes.

DISTRIBUTION. India (Assam).

MATERIAL EXAMINED. Holotype♂, **India**: Assam, Margherita, 18 [??] (*Doherty*) genitalia slide no. 28706 (BMNH).

REMARKS. The single male specimen described represents a distinctively patterned species with unique characters in the male genitalia. We are confident enough that this single specimen represents a new taxon to name it.

### *Pseudopostega species 404*

(Figs 48, 153, 178)

MALE. Unknown.

FEMALE (Fig. 48). Forewing length: ~3.5 mm. Wingspan: ~7.5–7.6 mm. Head: palpi cream; piliform scales on vertex, collar and scape white; flagellum pale ochre. Thorax and tegulae white. Forewing white with dark brown terminal strigulae (see Remarks). Underside of forewing ochreous. Cilia cream. Hindwing brownish ochreous, cilia pale greyish brown. Legs ochre with dark brown markings on front of forelegs. Abdomen dark brown on upperside, ochreous cream on underside.

GENITALIA ♀ (Fig. 153). Abdominal tip distinctly bilobed posteriorly, with a pair of very long marginal setae. Posterior apophysis slender and long; well developed and broad basally. Anal papillae as paired

round sclerites, with numerous short, long and very long setae. Vestibulum membranous, with a patch of very tiny spicules arranged in comb-like rows and extending into the ductus bursae. Corpus bursae relatively small, elongate, with very distinct signum comprising numerous different spines on the external surface of the bursa. Spermathecal duct longer than corpus bursae; membranous outer canal relatively narrow; inner canal very long and sinuous.

BIOLOGY. Adult collected in December. Larval biology unknown.

DIAGNOSIS. This species is distinguished by its very simple forewing pattern which may, however, be insufficient to distinguish it from some other white Opostegidae. The female genitalia differ from those of all other Oriental species in the distinctive paired and rounded anal papillae, very long spermathecal duct and characteristic signum on the corpus bursae.

DISTRIBUTION. Philippines.

MATERIAL EXAMINED. 1 ♀, **Philippines**: N of Batu Batu, Tawi Tawi, 22.x.1961 (*Danish Noona Dan Exp.*) genitalia slide no. Pupil. 404 (ZMUC).

REMARKS. The single specimen known (ZMUC) is in poor condition. The distal half of the right wing is broken off and the apex of the left forewing is damaged so we cannot tell whether there are additional apical markings such as a dot (usually present in representatives of this genus).

## REFERENCES

- Buszko, J. 1981. Opostegidae (in Polish). *Klucze do oznaczania owadów Polski*, 27 (5): 1–12.
- Clarke, J.F.G. 1955. *Catalogue of the type specimens of Microlepidoptera in the British Museum (Natural History) described by Edward Meyrick*. 1. vii + 332 pp., London.
- Davis, D.R. 1989. Generic revision of the Opostegidae, with a synoptic catalog of the world's species (Lepidoptera: Nepticulidae). *Smithsonian Contributions to Zoology*, 478: 1–97.
- Fletcher, T.B. [1921]. Life histories of Indian insects. Microlepidoptera. *Memoirs of the Department of Agriculture, India*, 6: 1–217.
- Grossenbacher, J.G., 1910. Medullary spots: a contribution to the life history of some cambium miners. *New York Agricultural Experiment Station Technical Bulletin*, 15: 49–65.
- Hoare, R.J.B. in press. A new genus of primitive Nepticulidae (Lepidoptera) from eastern Australia, with a revised diagnosis of nepticulid subfamilies. *Zoological Journal of the Linnean Society*.
- Hoare, R.J.B., Johansson, R., van Nieukerken, E. J. & Nielsen, E.S. 1997. Australian Nepticulidae (Lepidoptera): redescription of the named species. *Entomologica Scandinavica*, 28: 1–26.
- Hübner, J. 1796–[1838]. *Sammlung europäischer Schmetterlinge*. 7 [9 parts]. Augsburg.
- Kozlov, M.V. 1985. New and little known Opostegid moths (Lepidoptera, Opostegidae) from Asiatic part of the USSR (in Russian). *Trudy Zoologicheskogo Instituta, Leningrad*, 135: 49–58.



- Kozlov, M.V. 1987. Imaginal morphology and the phylogeny of the moth families Opostegidae, Nepticulidae, and Tischeriidae (Lepidoptera, Nepticulomorpha) (in Russian). *Zoologicheski Zhurnal, Moskva*, **66** (6): 847–859.
- Klots, A.B. 1956. Lepidoptera. Pp. 97–111. In: Tuxen, S.L. (ed.) *Taxonomist's glossary of genitalia in insects*. 284 pp., Munksgaard, Copenhagen.
- Kristensen, N.P. & Nielsen, E.S. 1980. The ventral diaphragm of primitive (non-Ditrysian) Lepidoptera: a morphological and phylogenetic study. *Zeitschrift für zoologische Systematik und Evolutionsforschung*, **18** (2): 123–146.
- Kumata, T. 1984. Cambium miners making pith flecks in broad-leaved trees (in Japan). *Hoppo Ringyo [Northern Forestry]*, **36** (5): 6–15.
- Kuroko, H. 1982. Opostegidae. In: Inoue, H., Sugi, S., Kuroko, H., Moriuti, S. & Kawabe, A., *Moths of Japan*. **1** (966 pages), **2** (552 pages) + 392 plates. Kodansha, Tokyo.
- Kyrki, J. 1983. Adult abdominal sternum II in ditrysian superfamilies – morphology and phylogenetic significance (Lepidoptera). *Annales Entomologici Fennici*, **49** (4): 89–94.
- Meyrick, E. 1893. Descriptions of Australian Microlepidoptera. *Proceedings of the Linnean Society of New South Wales*, **5**: 132–182.
- Meyrick, E. 1905. Descriptions of Indian Microlepidoptera. *Journal of the Bombay Natural History Society*, **16** (4): 580–619.
- Meyrick, E. 1906. Descriptions of Indian Microlepidoptera. *Journal of the Bombay Natural History Society*, **17** (2): 403–417.
- Meyrick, E. 1907. Descriptions of Indian Microlepidoptera. *Journal of the Bombay Natural History Society*, **17** (4): 976–994.
- Meyrick, E. 1910. Notes and Descriptions of Indian Microlepidoptera. *Records of the Indian Museum*, **5** (4/22): 217–232.
- Meyrick, E. 1911. Descriptions of Indian Microlepidoptera. *Journal of the Bombay Natural History Society*, **21** (14): 104–131.
- Meyrick, E. 1915. *Exotic Microlepidoptera*. Vol. **1**, Pt. 11: 321–384.
- Meyrick, E. 1916. *Exotic Microlepidoptera*. Vol. **1**, Pt. 20: 609–640.
- Meyrick, E. 1920. *Exotic Microlepidoptera*. Vol. **2**, Pt. 12: 353–384.
- Meyrick, E. 1922. *Exotic Microlepidoptera*. Vol. **2**, Pt. 18: 545–576.
- Meyrick, E. 1930. *Exotic Microlepidoptera*. Vol. **4**, Pt. 1: 1–32.
- Nieukerken, E.J. van. 1986. Systematics and phylogeny of Holarctic genera of Nepticulidae (Lepidoptera, Heteroneura: Monotrysis). *Zoologische Verhandelingen*, **236**: 1–93.
- Nielsen, E.S. 1996. 8. Opostegidae. P. 28. In: Nielsen, E.S., Edwards, E.D. & Rangs, T.V. (eds) *Checklist of the Lepidoptera of Australia. Monographs on Australian Lepidoptera*, **4**. xiv + 529 pp, CSIRO, Melbourne.
- Nieukerken, E.J. van. 1990. Opostegidae. In: Johansson, R., Nielsen, E.S., van Nieukerken, E.J. & Gustafsson, B. The Nepticulidae and Opostegidae (Lepidoptera) of North West Europe. *Fauna Entomologica Scandinavica*, **23** (1): 357–372.
- Robinson, G.S., 1976. The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. *Entomologist's Gazette*, **27**: 127–132.
- Robinson, G.S., Tuck, K.R. & Shaffer, M., 1994. *A Field guide to the smaller moths of South- East Asia*. Malaysian Nature Society, Kuala Lumpur. 309 pp.
- Puplesis, R. 1984. Obzor vidov roda *Microcalyptris* (Lepidoptera, Nepticulidae) s opisaniem novykh vidov iz pustyn' Mongolii i SSSR (in Russian). *Nasekomye Mongolii*, **9**: 484–507.
- Puplesis, R. 1990. The genus *Acalyptris* Meyrick (Lepidoptera, Nepticulidae) in the USSR: distribution and taxonomy. *Nota Lepidopterologica*, **13** (1): 62–88.
- Puplesis, R. 1994. The Nepticulidae of Eastern Europe and Asia. Leiden, Backhuys Publishers, 291 pp + 840 figs.
- Puplesis, R., Diskus, A., Noreika, R. & Saparmamedova, N. 1996. Revised check-list of mining Lepidoptera (Nepticuloidea, Tischerioidea & Gracillarioidea) from Central Asia. *Tijdschrift voor Entomologie*, **139**: 11–22.
- Scoble, M.J. 1982. A pectinifer in the Nepticulidae (Lepidoptera) and its phylogenetic implications. *Annals of the Transvaal Museum*, **37** (7): 123–129.
- Scoble, M.J. 1983. A revised cladistic classification of the Nepticulidae (Lepidoptera) with description of new taxa mainly from South Africa. *Transvaal Museum Monograph*, **2**: i–iii, 1–105.
- Sinev, S.Y. 1990. Novye dannye po sistematike molei-opostegid (Lepidoptera, Opostegidae) Dal'nego Vostoka SSSR (in Russian). *Novosti faunistiki i sistematiki*, Kiyev, 100–106.
- Sinev, S.Y. & Kozlov, M.V. 1997. Sem. Opostegidae (in Russian). Pp. 320–323. In: Ler, P.A. (ed.), *Key to the insects of Russian Far East*. Vol. **5**. Trichoptera and Lepidoptera. Pt. 1. Vladivostok, Dal'nauka Publishers.
- Sorhagen, L. 1886. *Die Kleinschmetterlinge der Mark Brandenburg*. 368 pages. Berlin.
- Stainton, H.T. 1868. New British Tineina. *The Entomologist's Annual*, **1868**: 127–133.
- Swezey, O.H., 1921. *Opostega* in the Hawaiian islands. *Proceedings of the Hawaiian Entomological Society*, **4** (3): 531–538.
- Treitschke, F., 1833. *Die Schmetterlinge von Europa*. **9** (2): 1–294. Leipzig: Ernst Fleischer.
- Zagulajev, A.K., 1978. Sem. Opostegidae (in Russian). In Medvedev, G.S. (ed.), *Opredelitel' nasekomykh Evropeyskoy chasti SSSR*. Leningrad, Nauka Publishers, **4** (1): 64–65.
- Zeller, P.C., 1839. Versuch einer naturgemässen Eintheilung der Schaben. *Isis von Oken*, **32** (3): 167–219.



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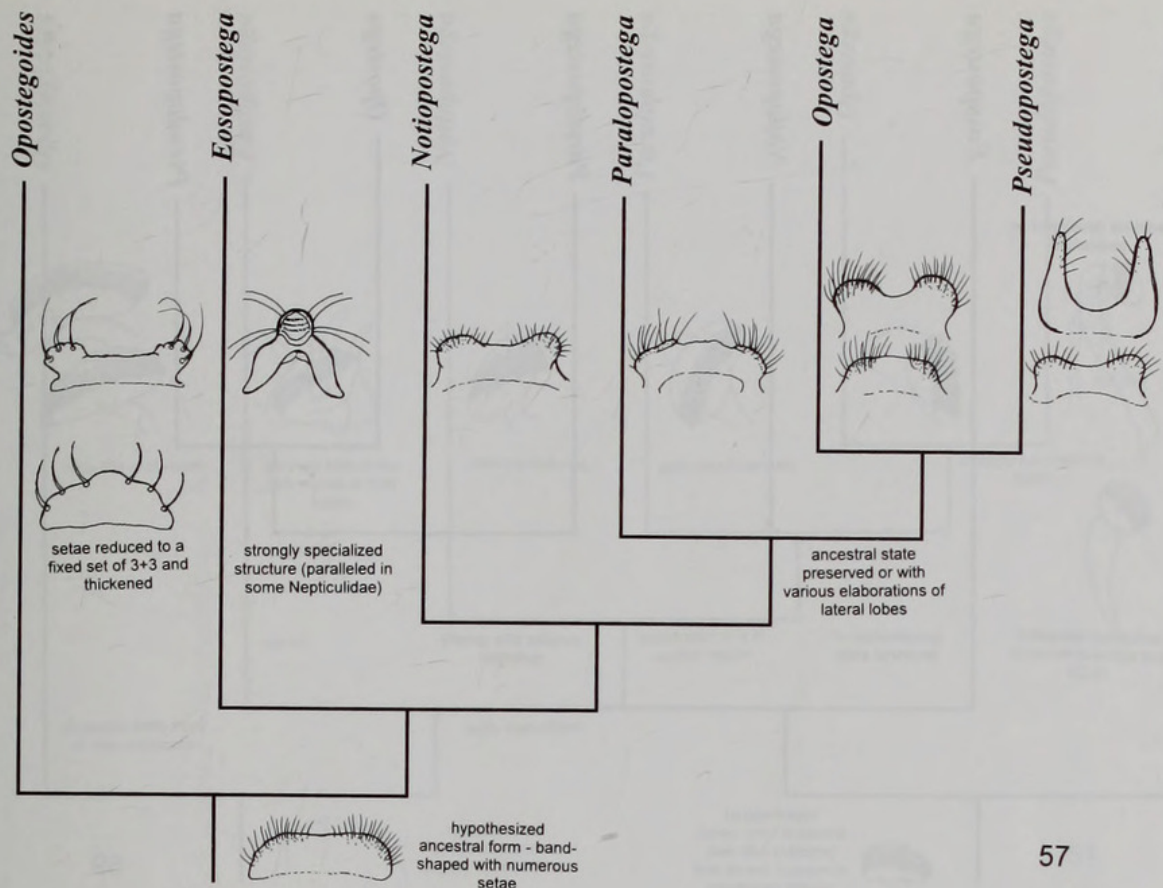


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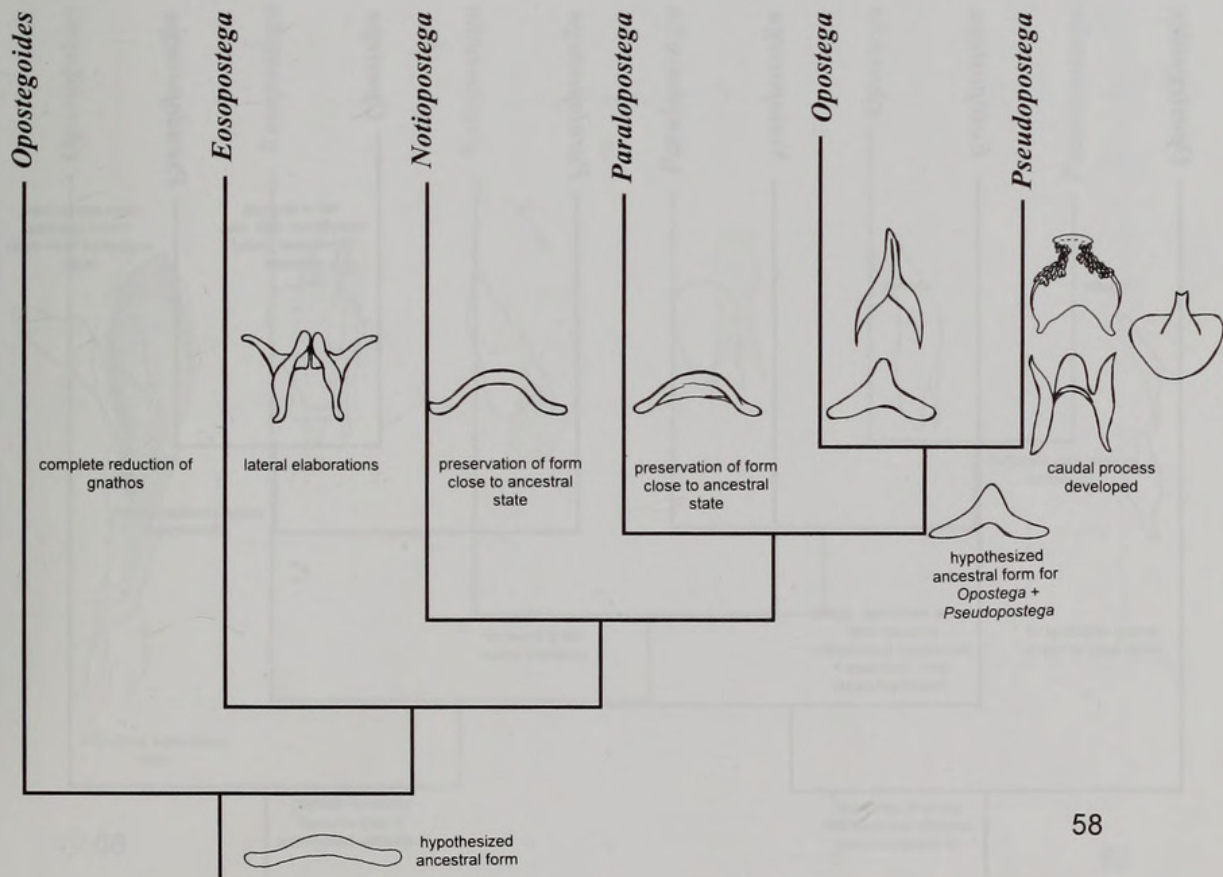


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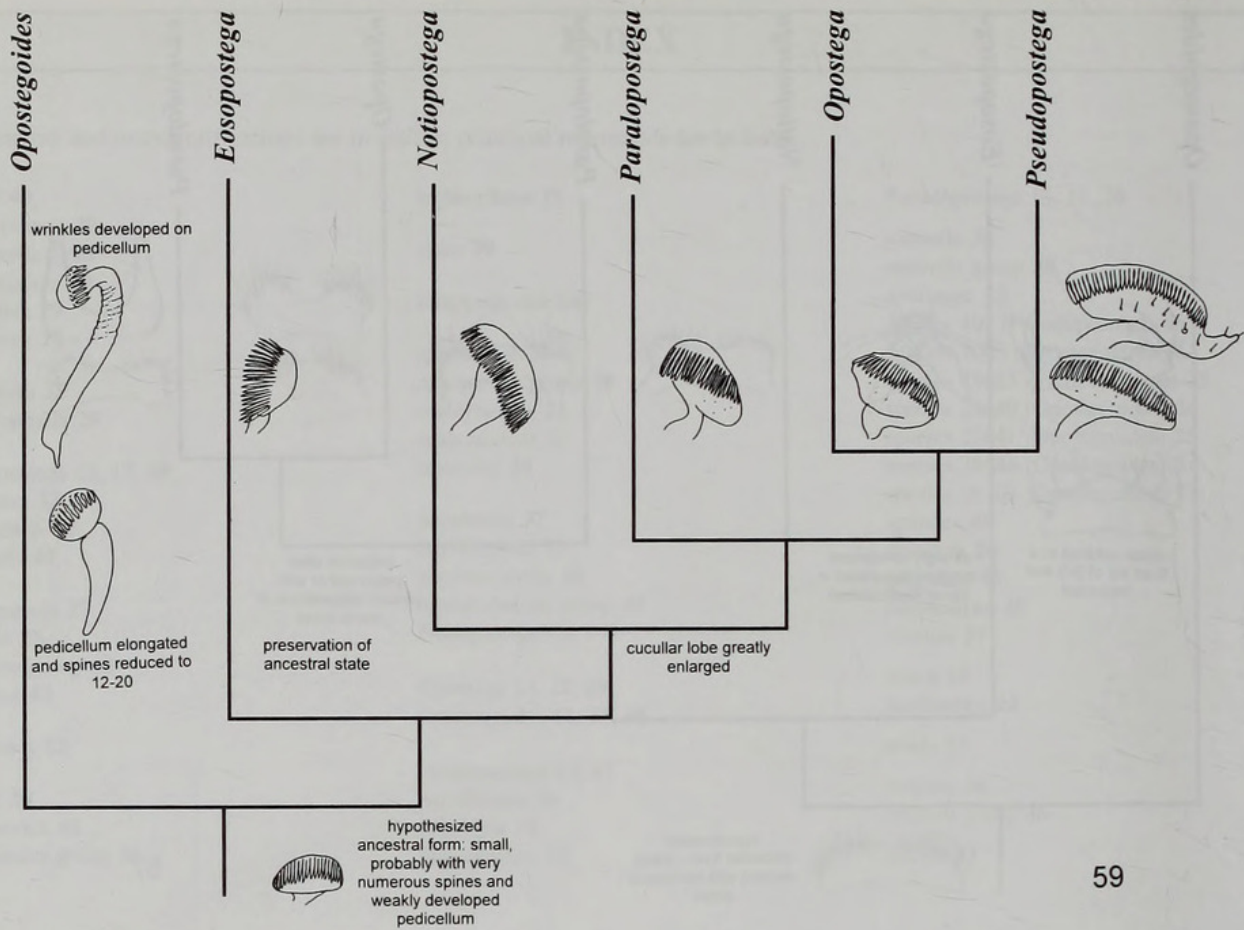


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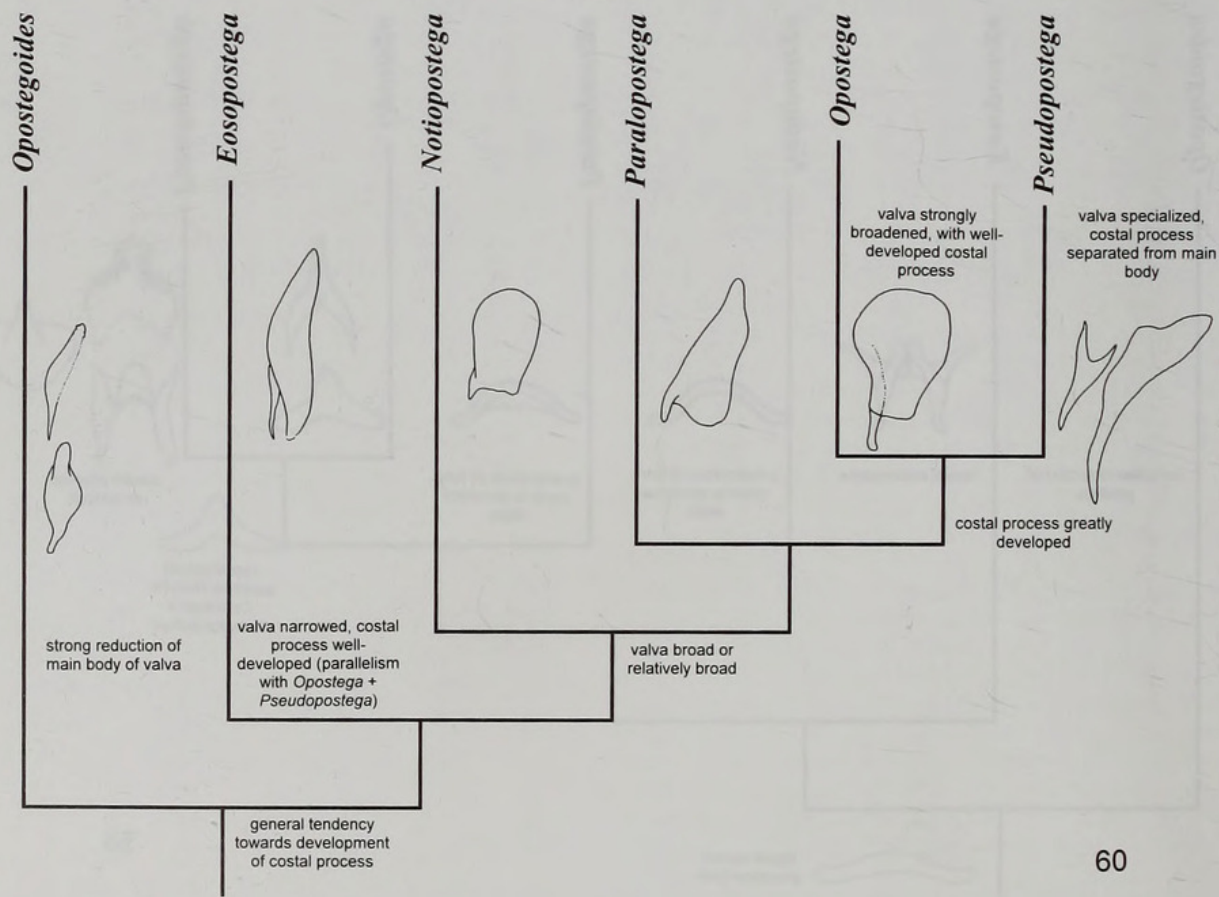
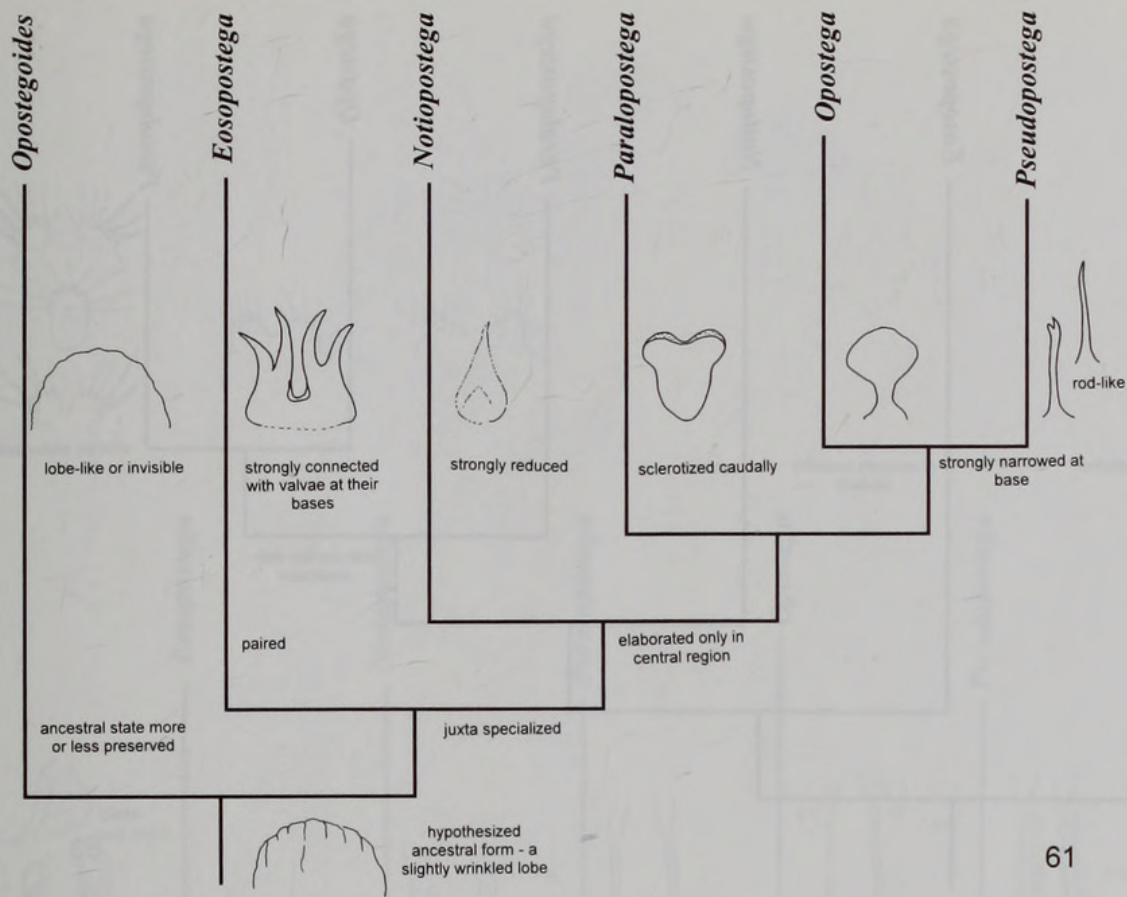


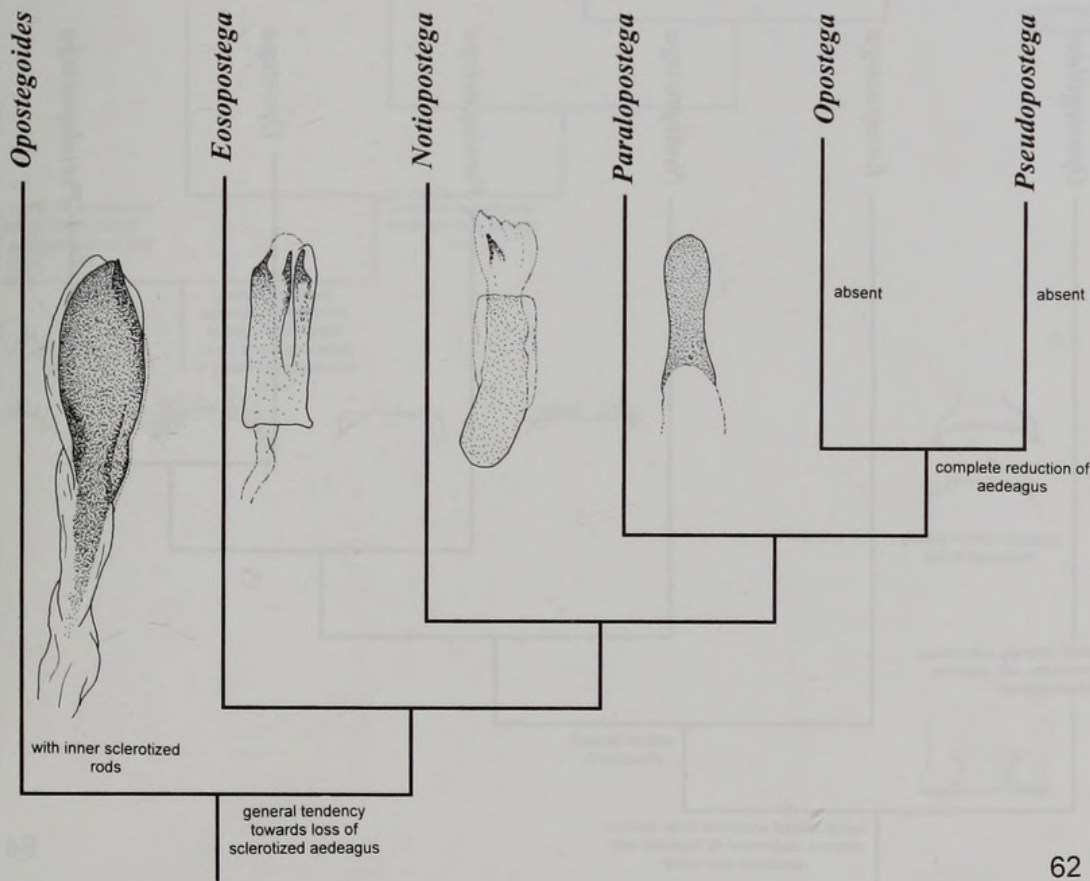
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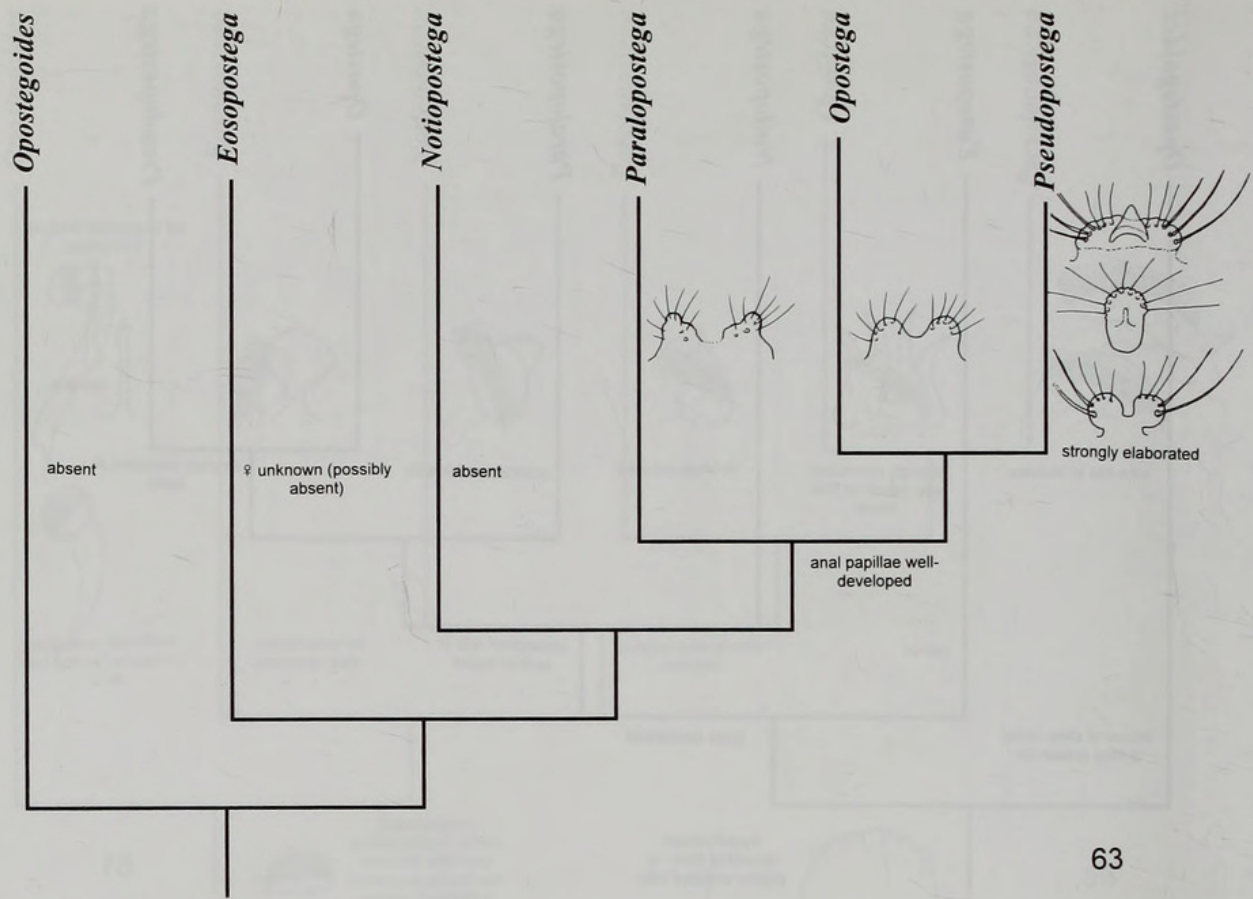
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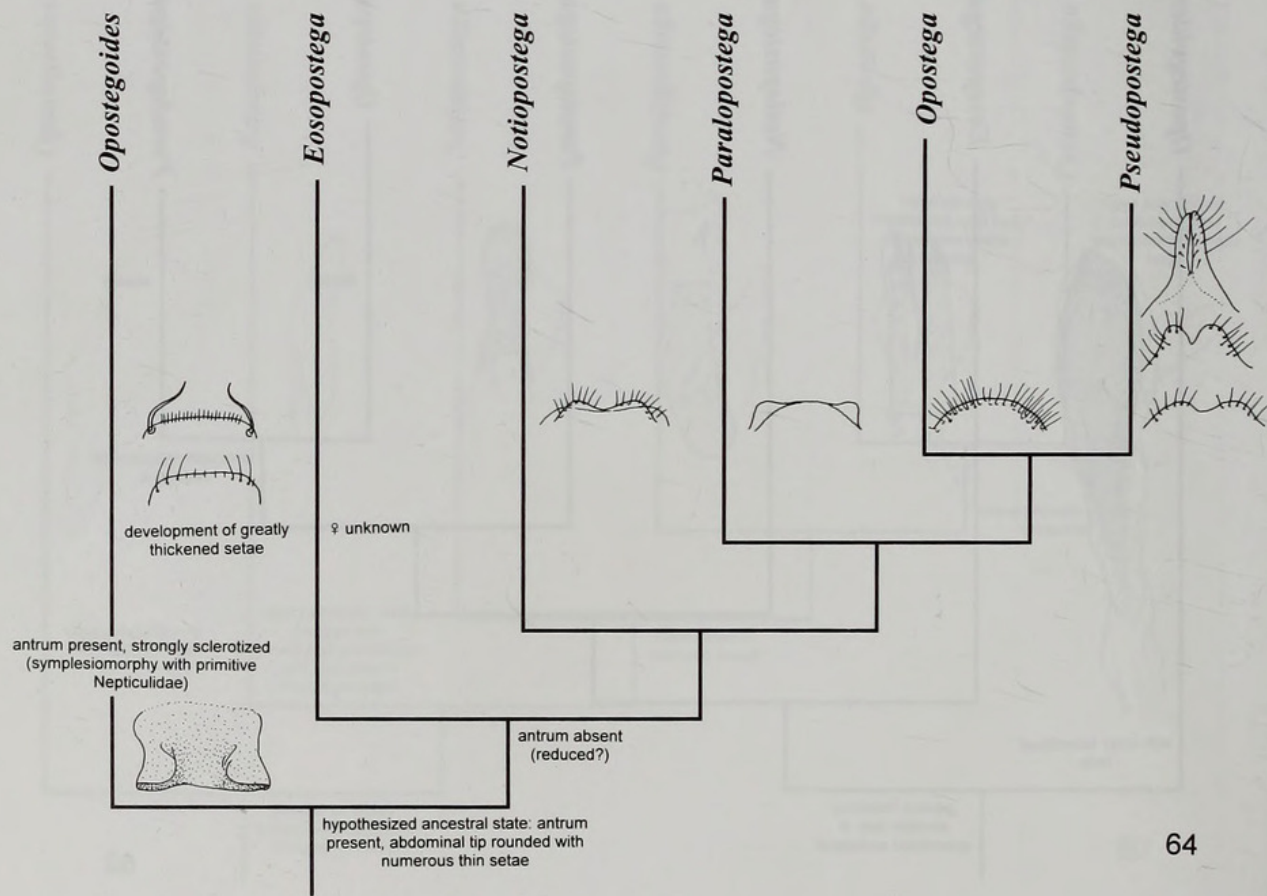
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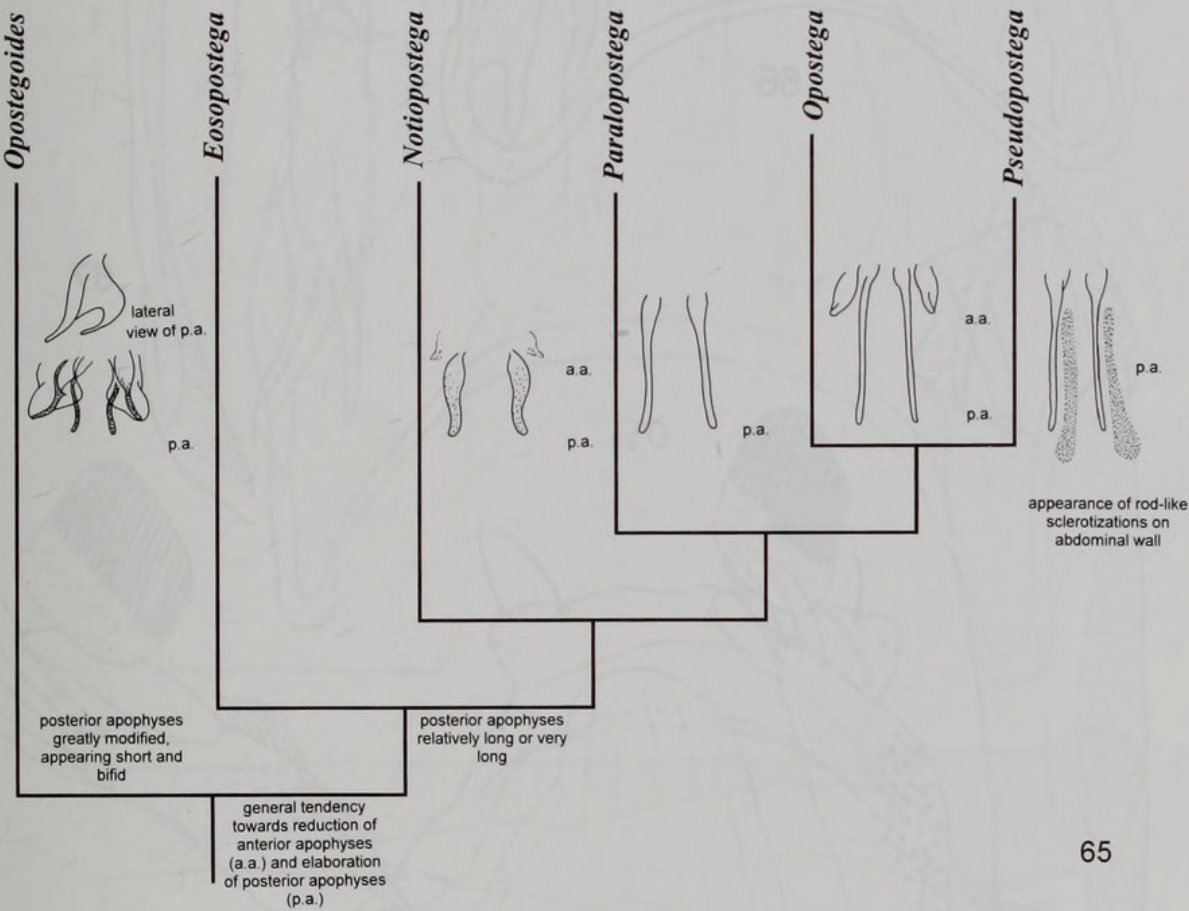
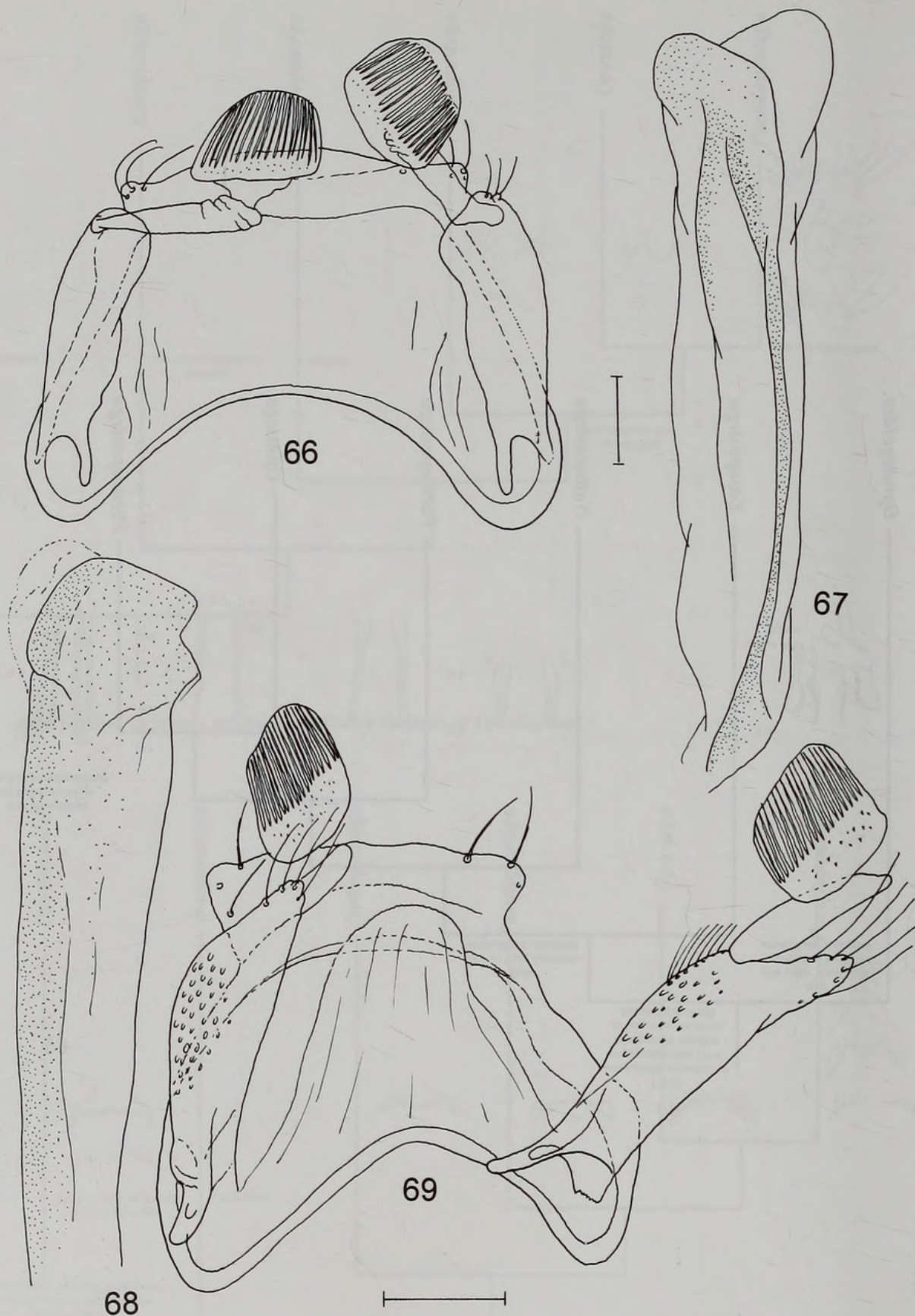


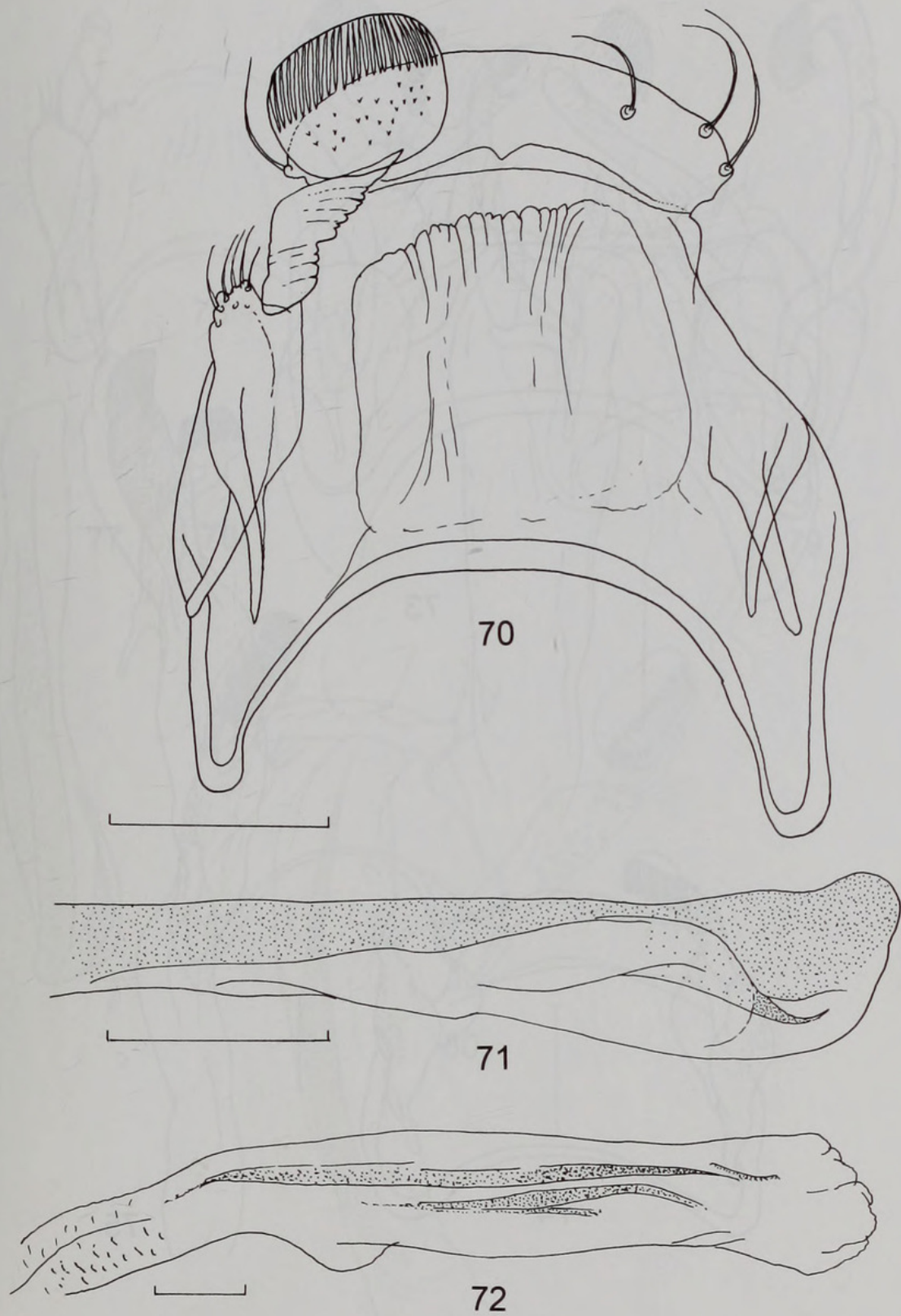
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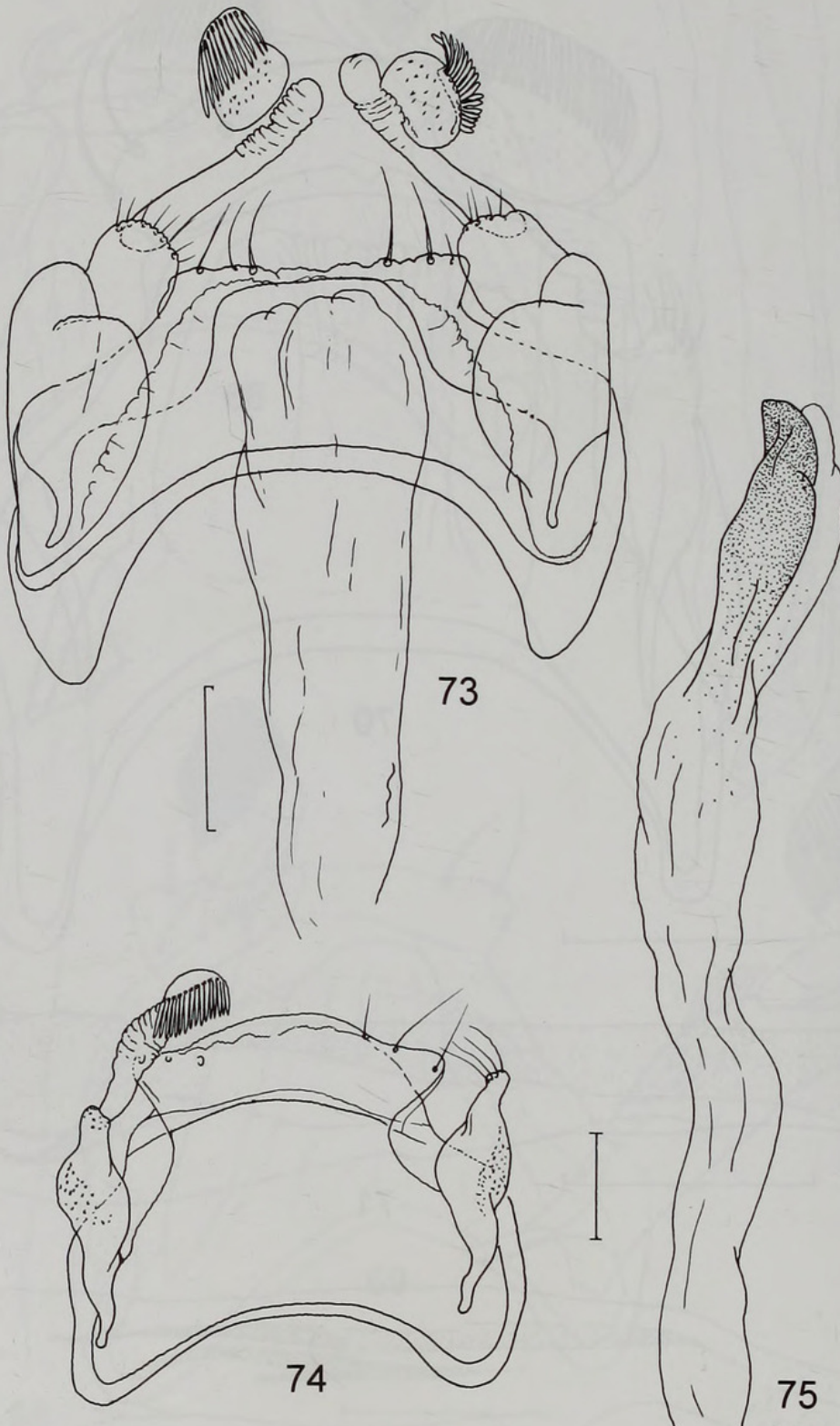
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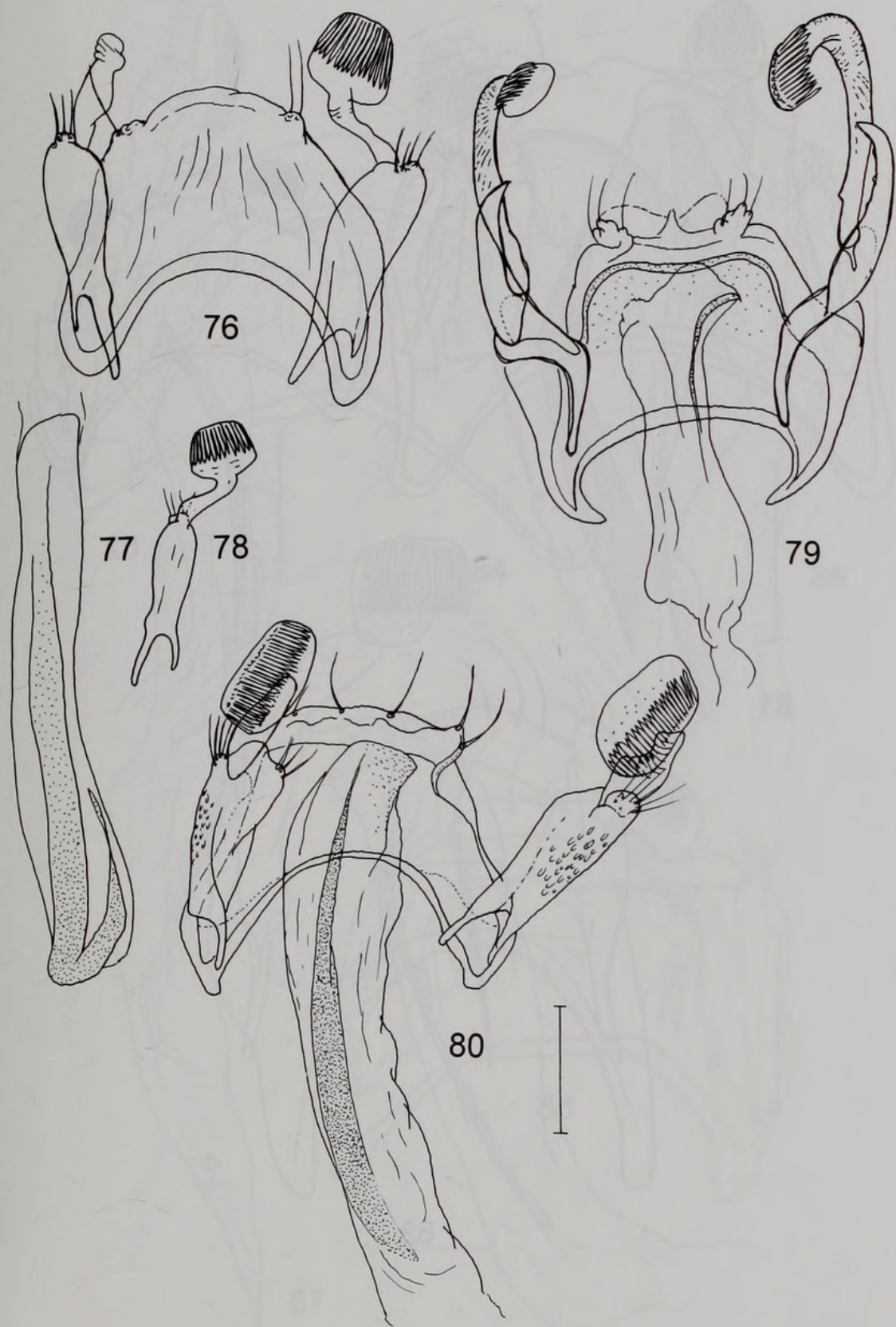
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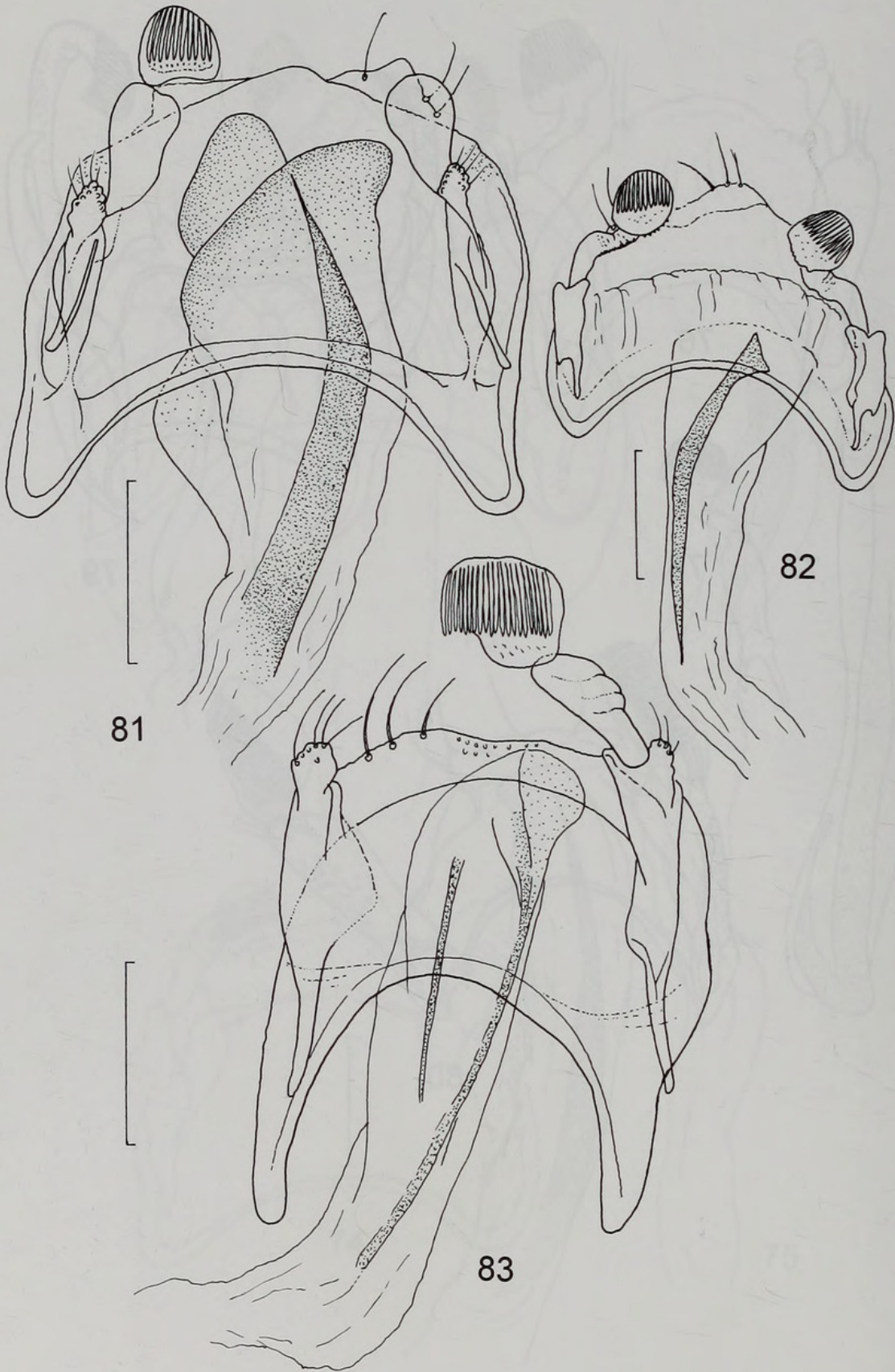
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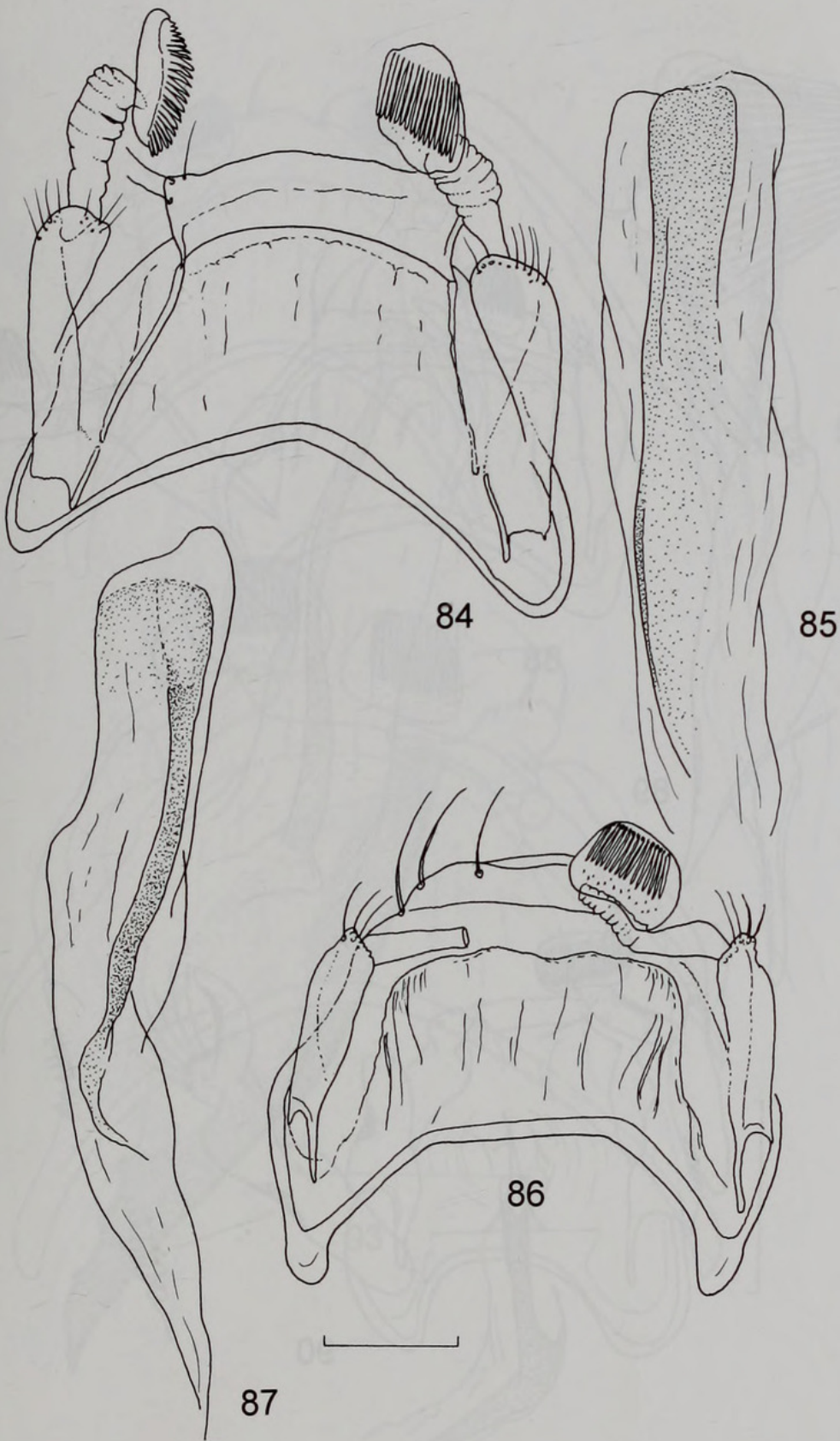
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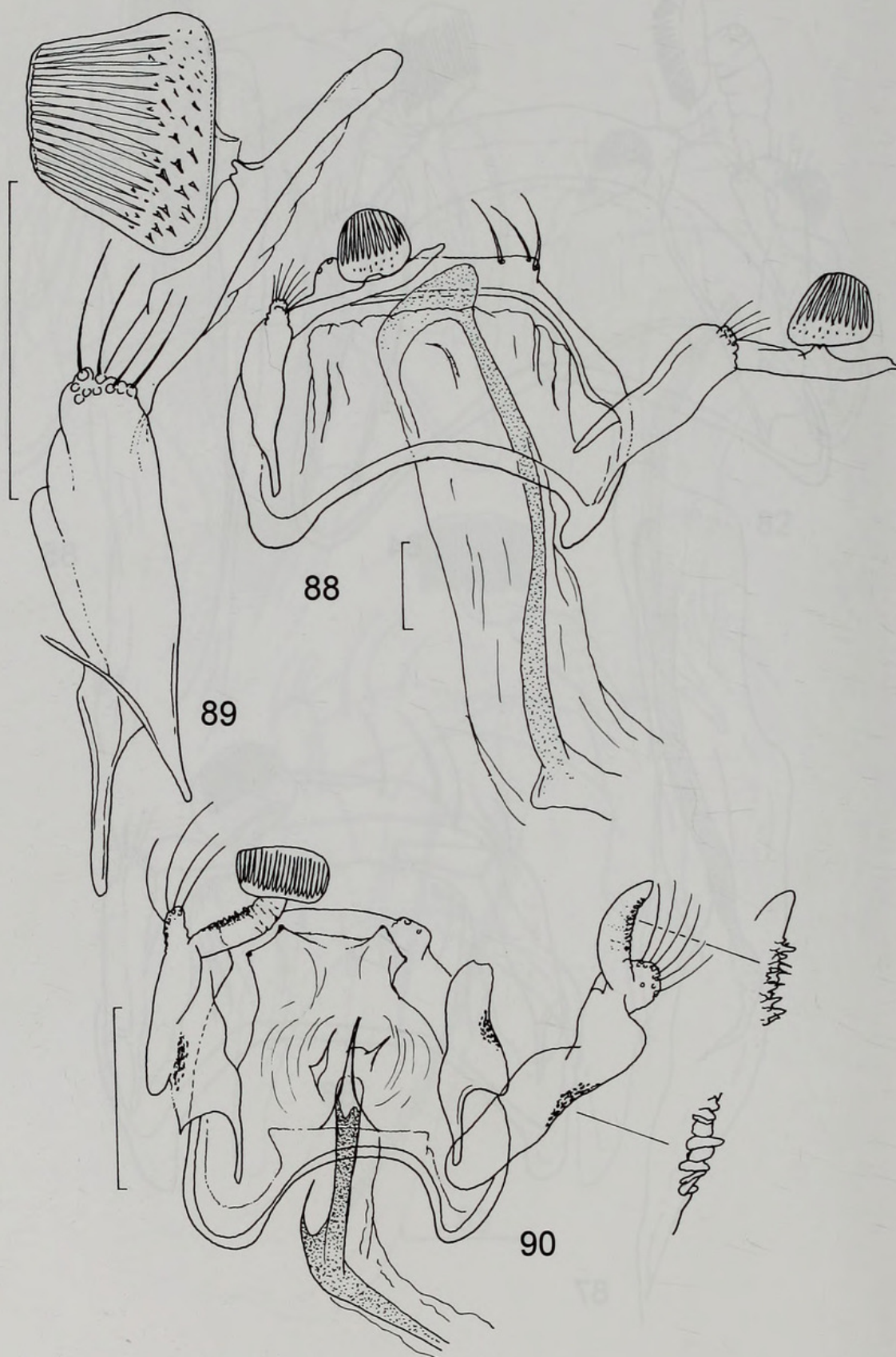
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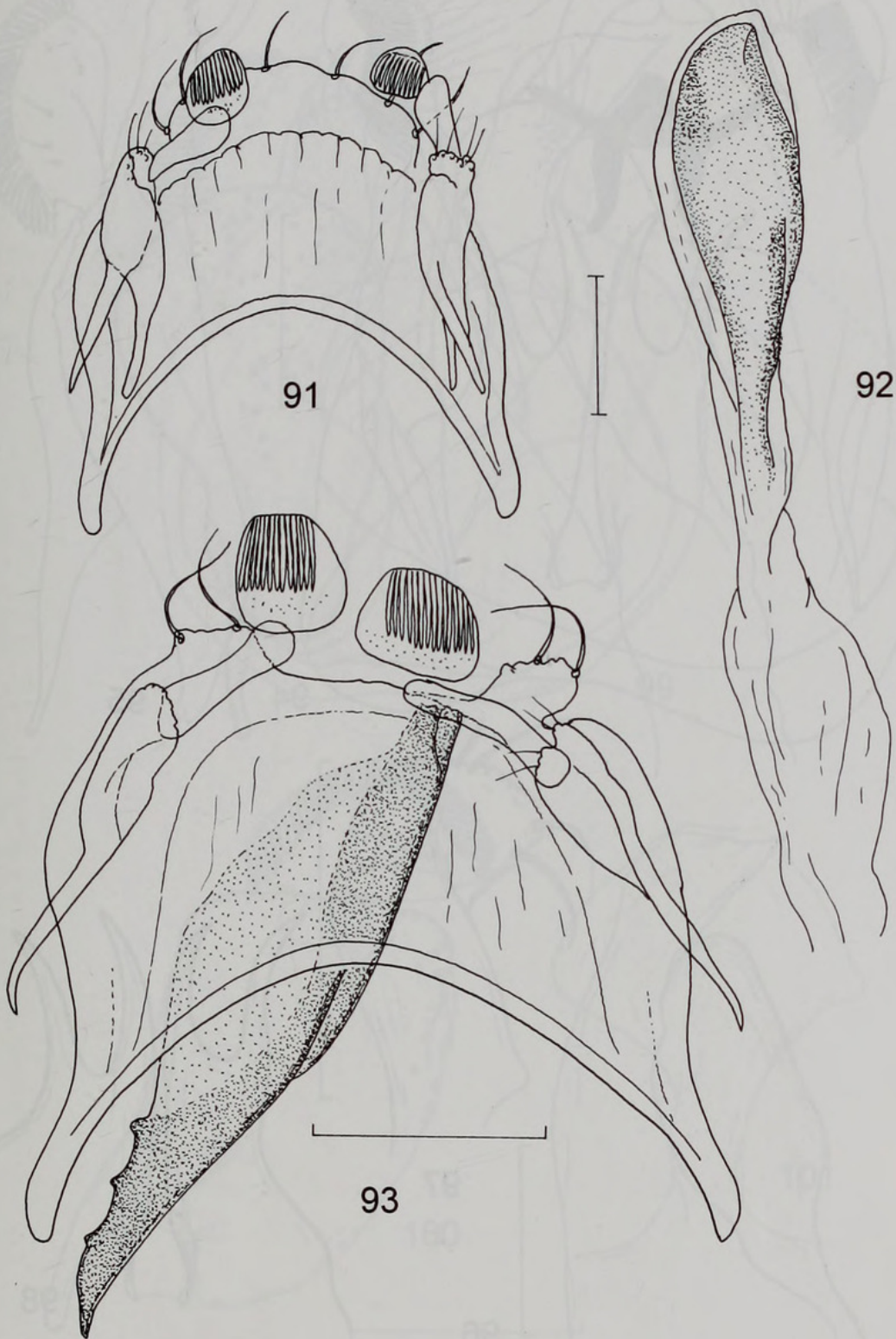
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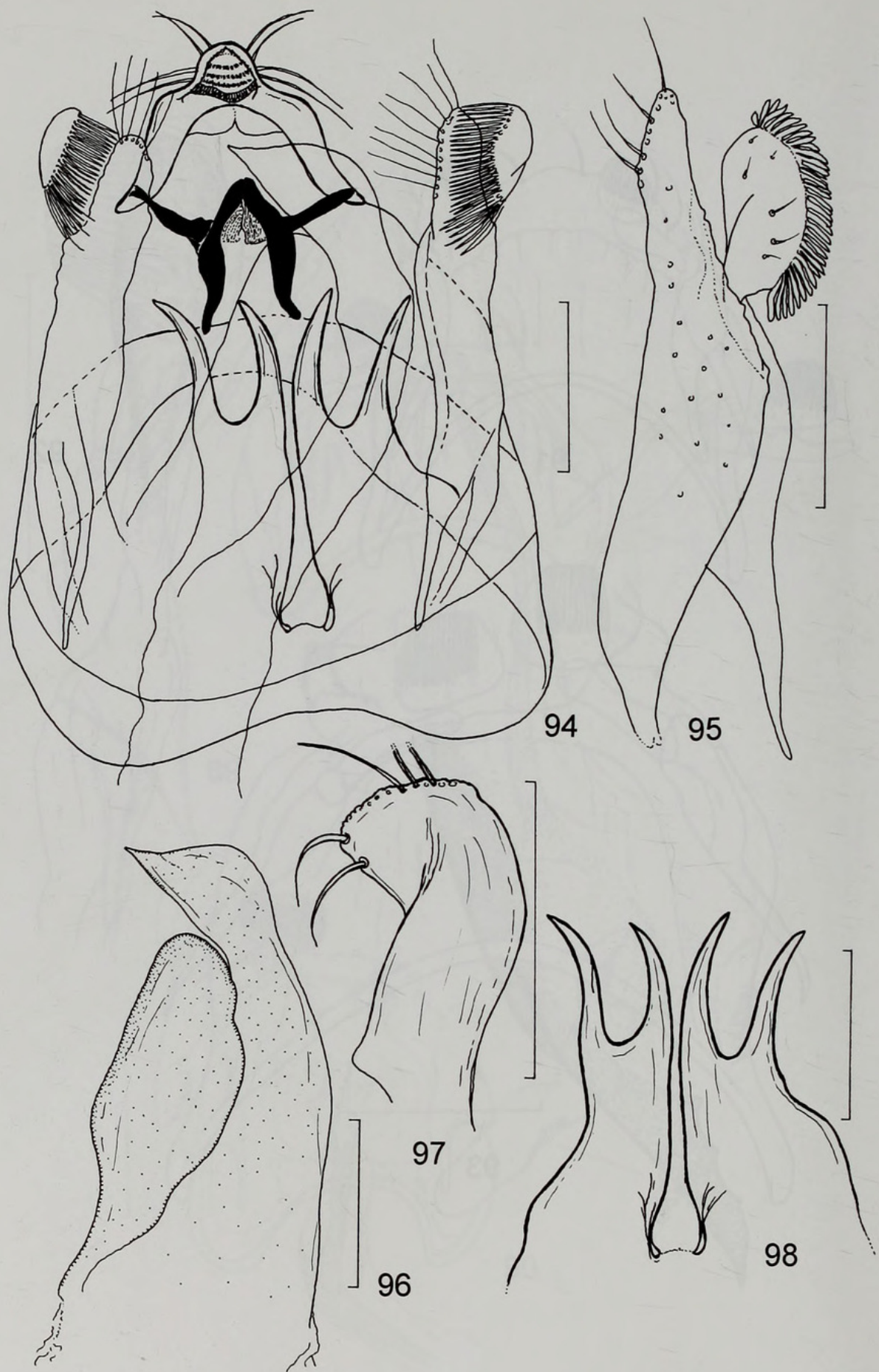
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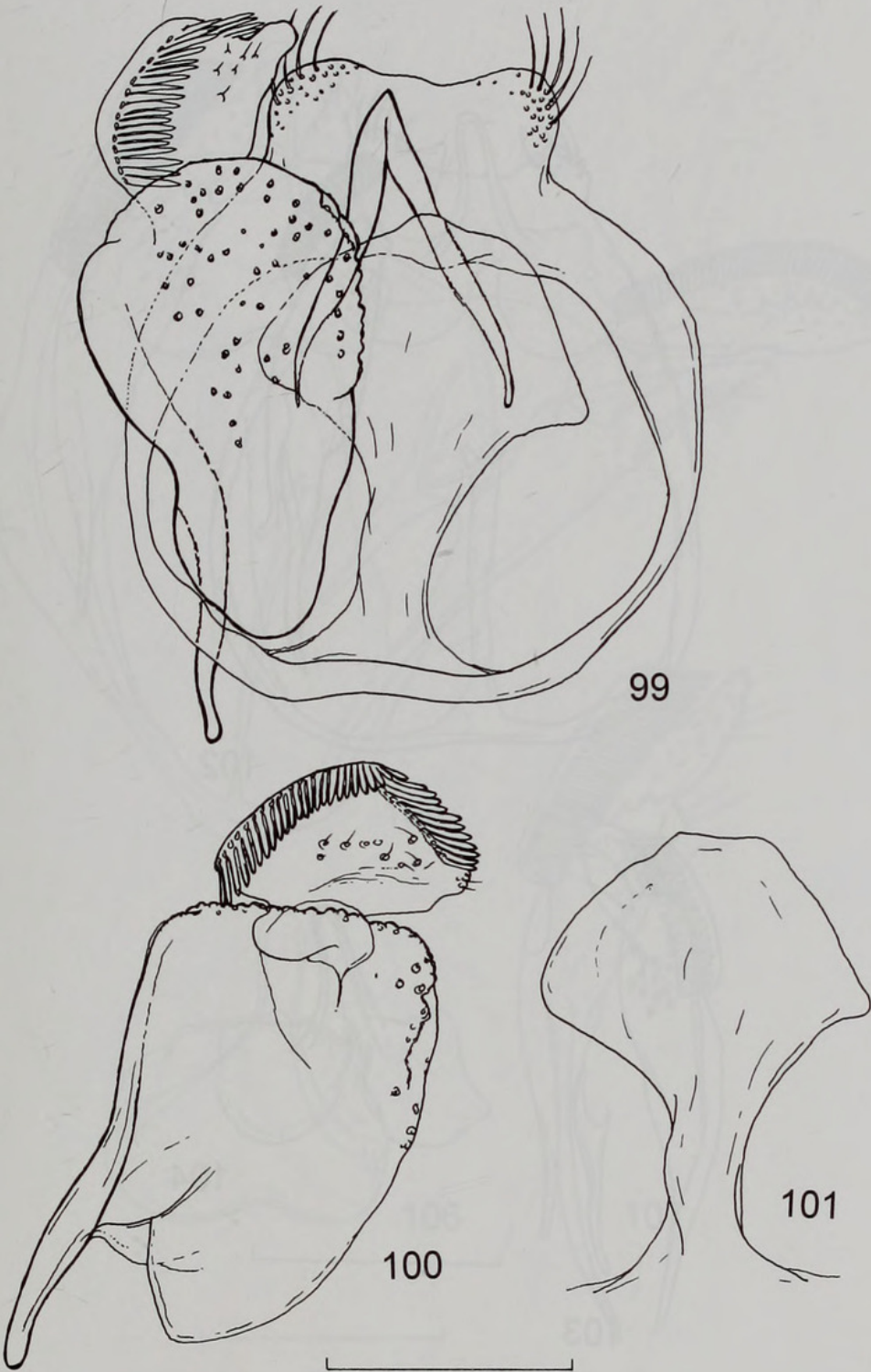
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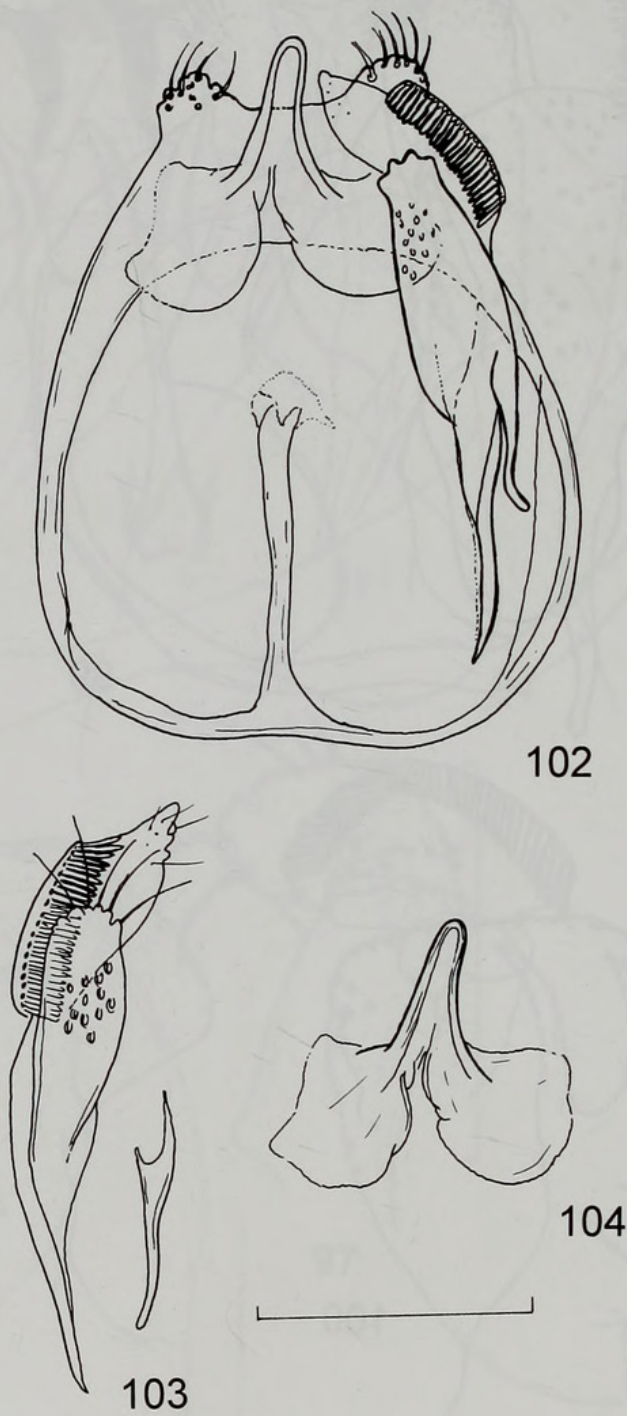
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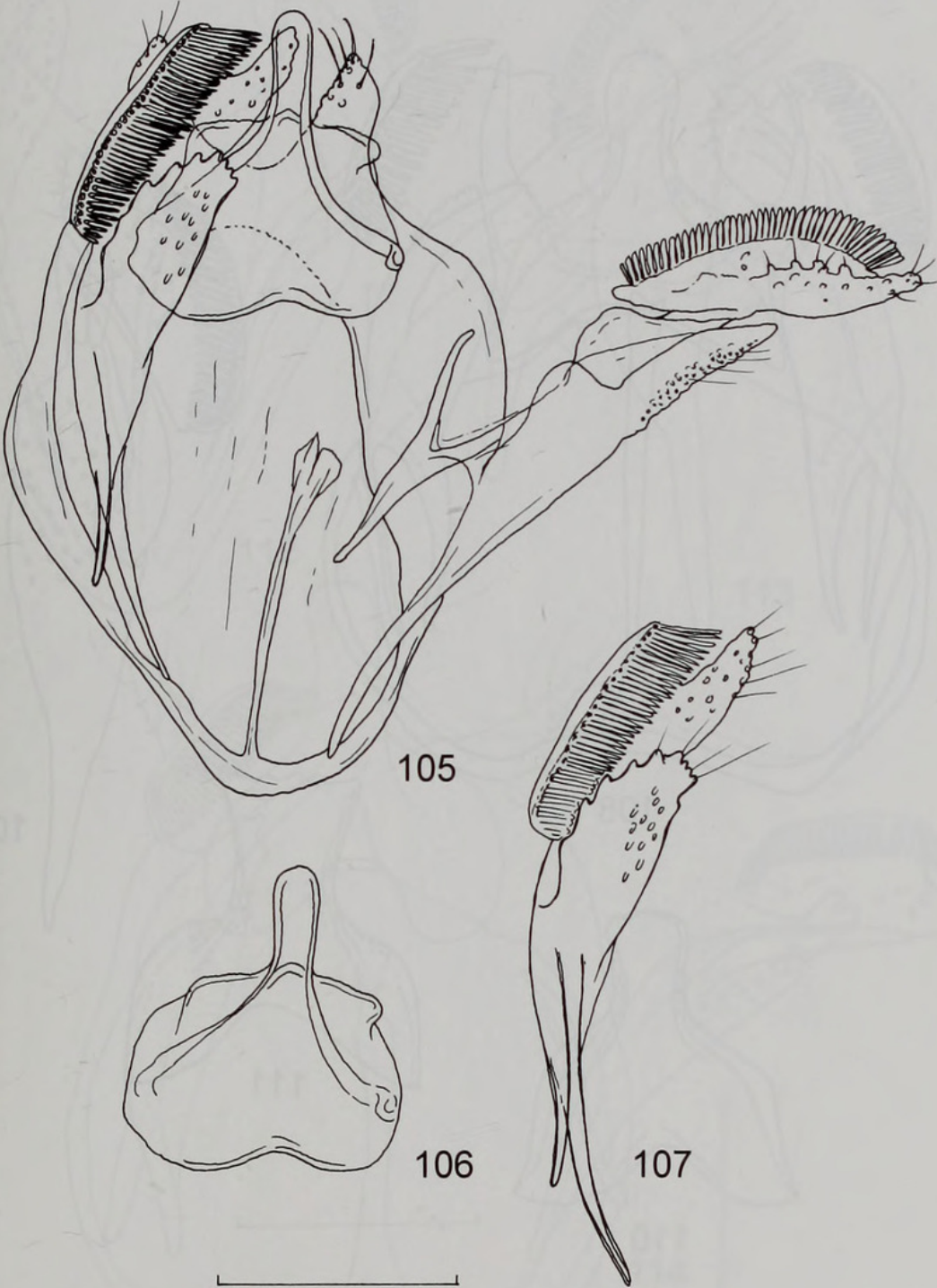
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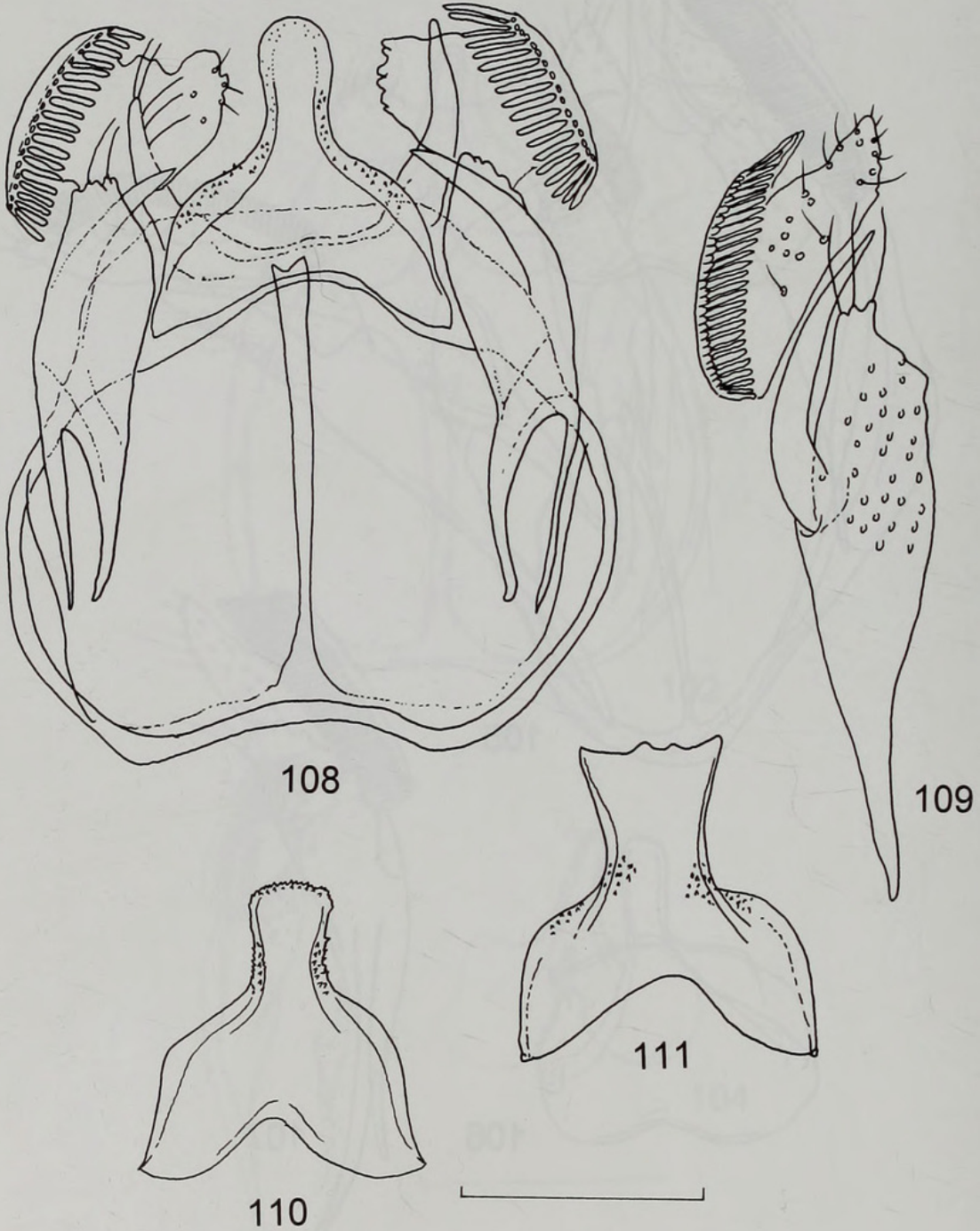
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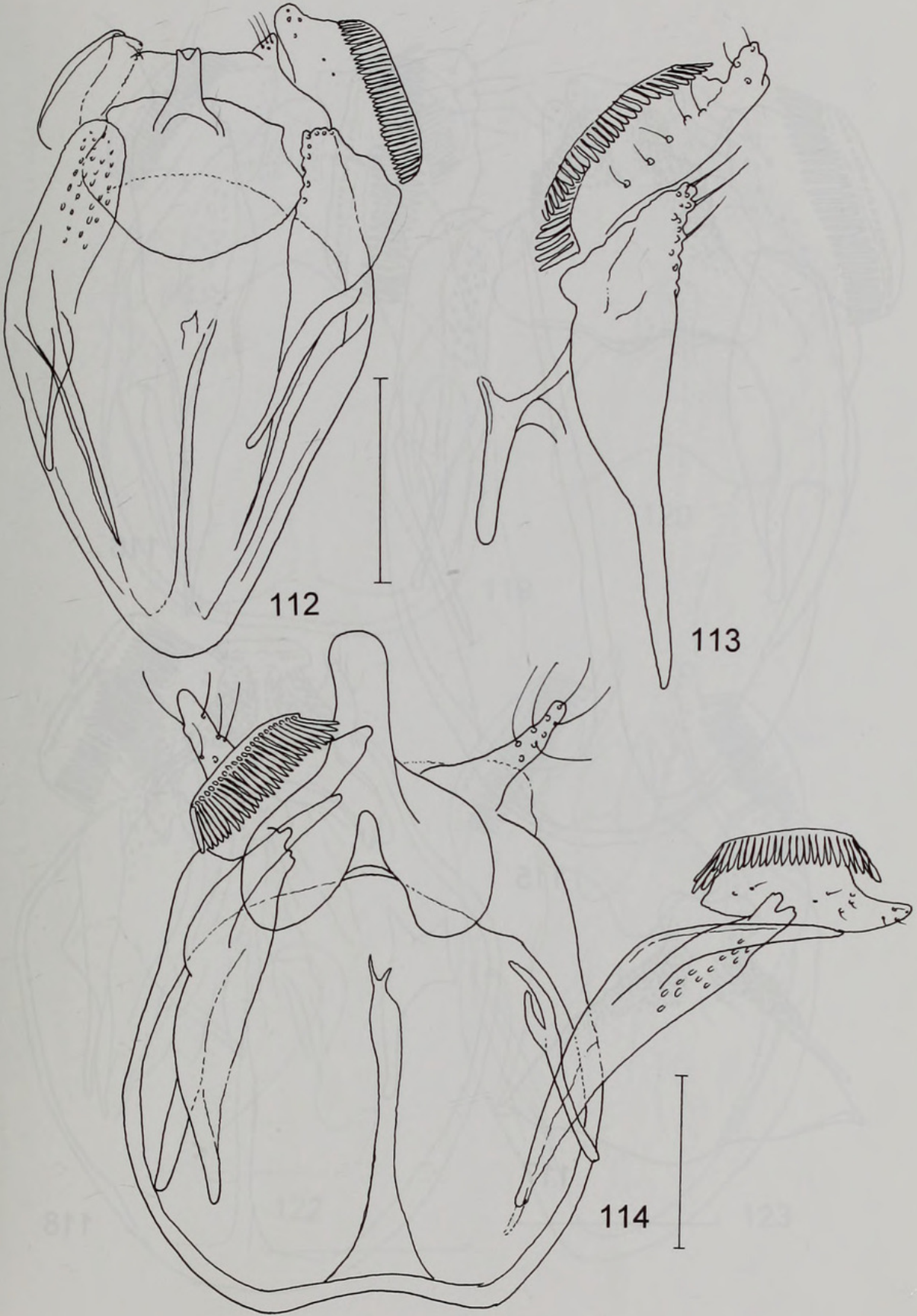
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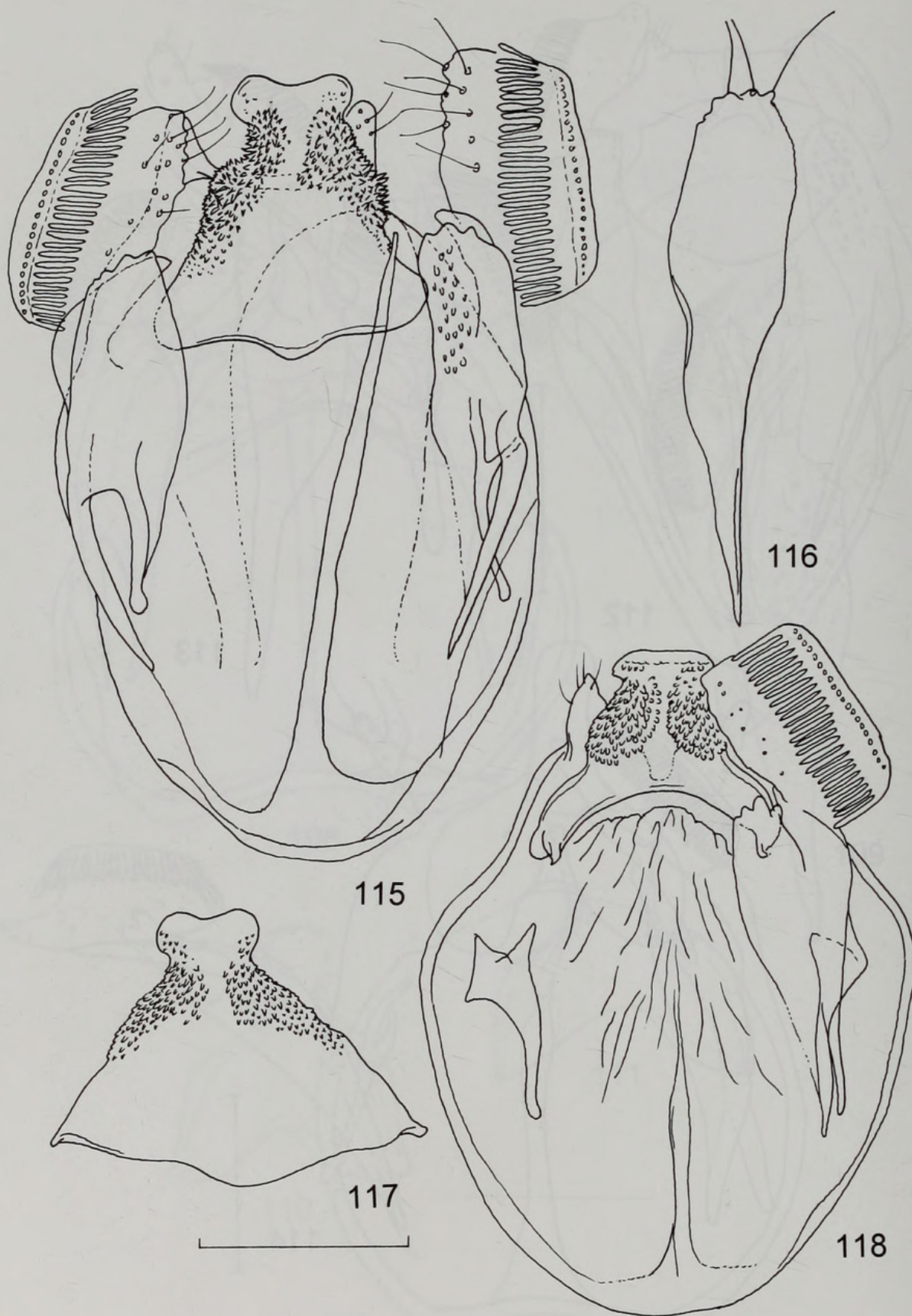
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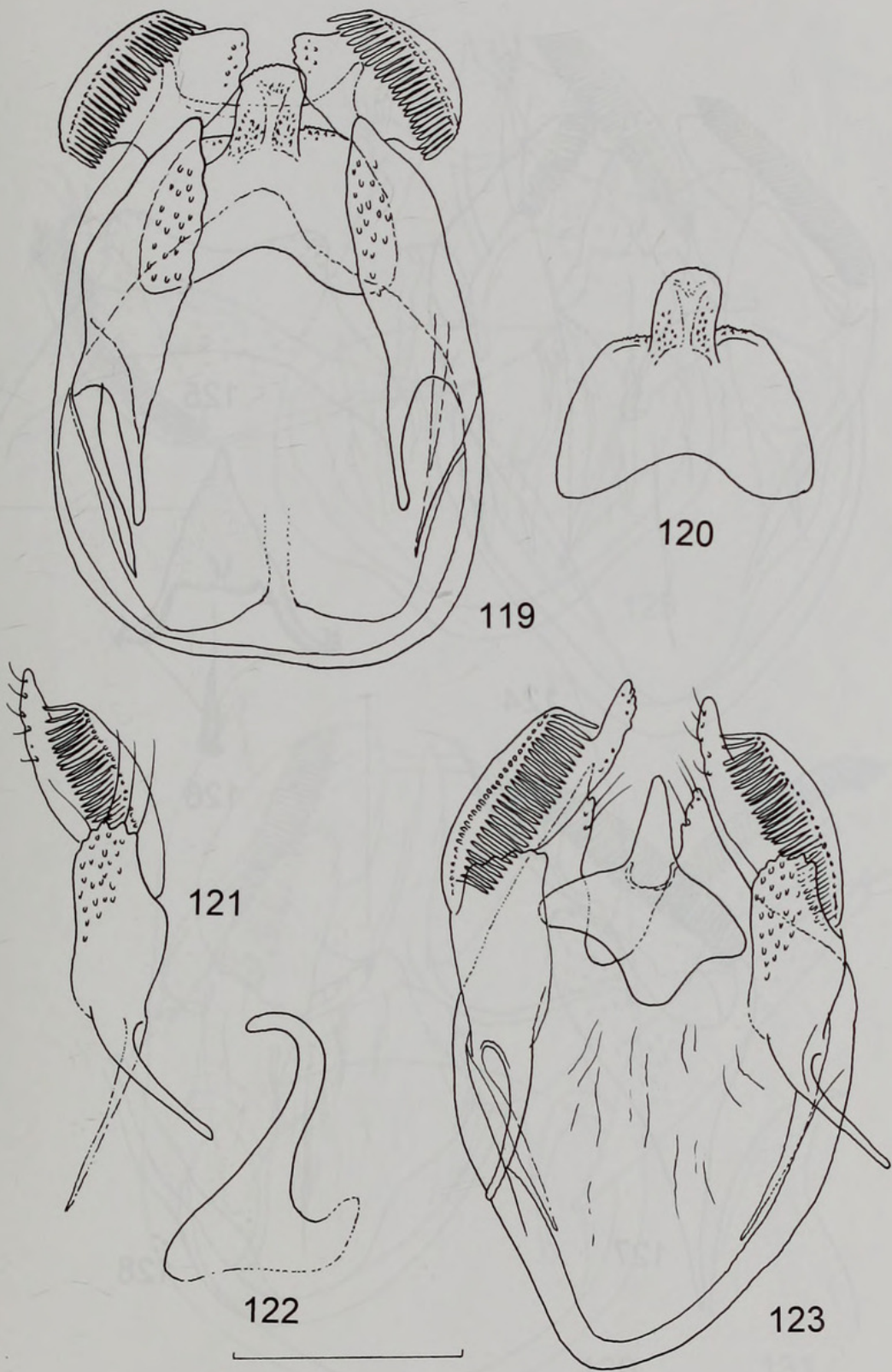
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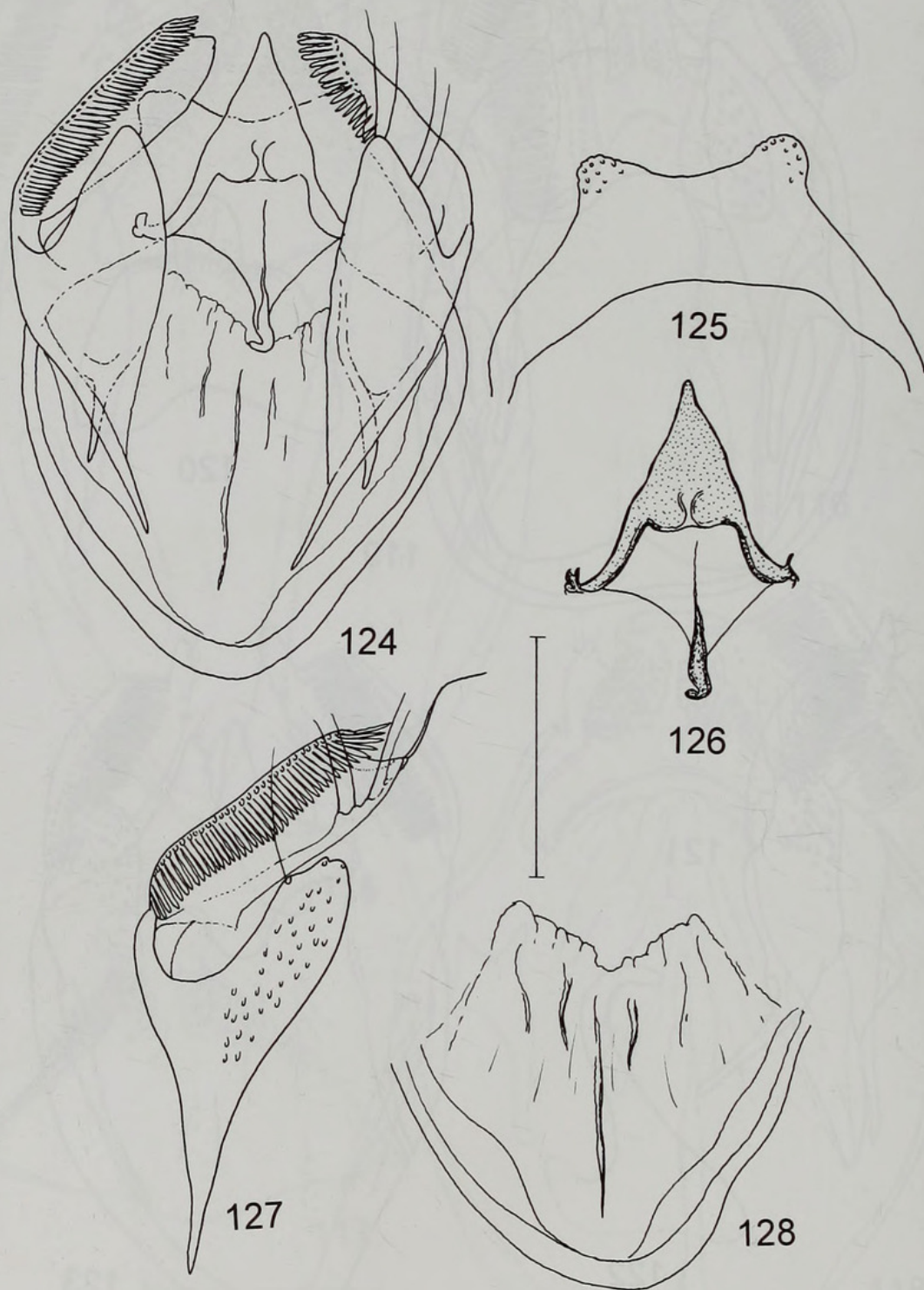
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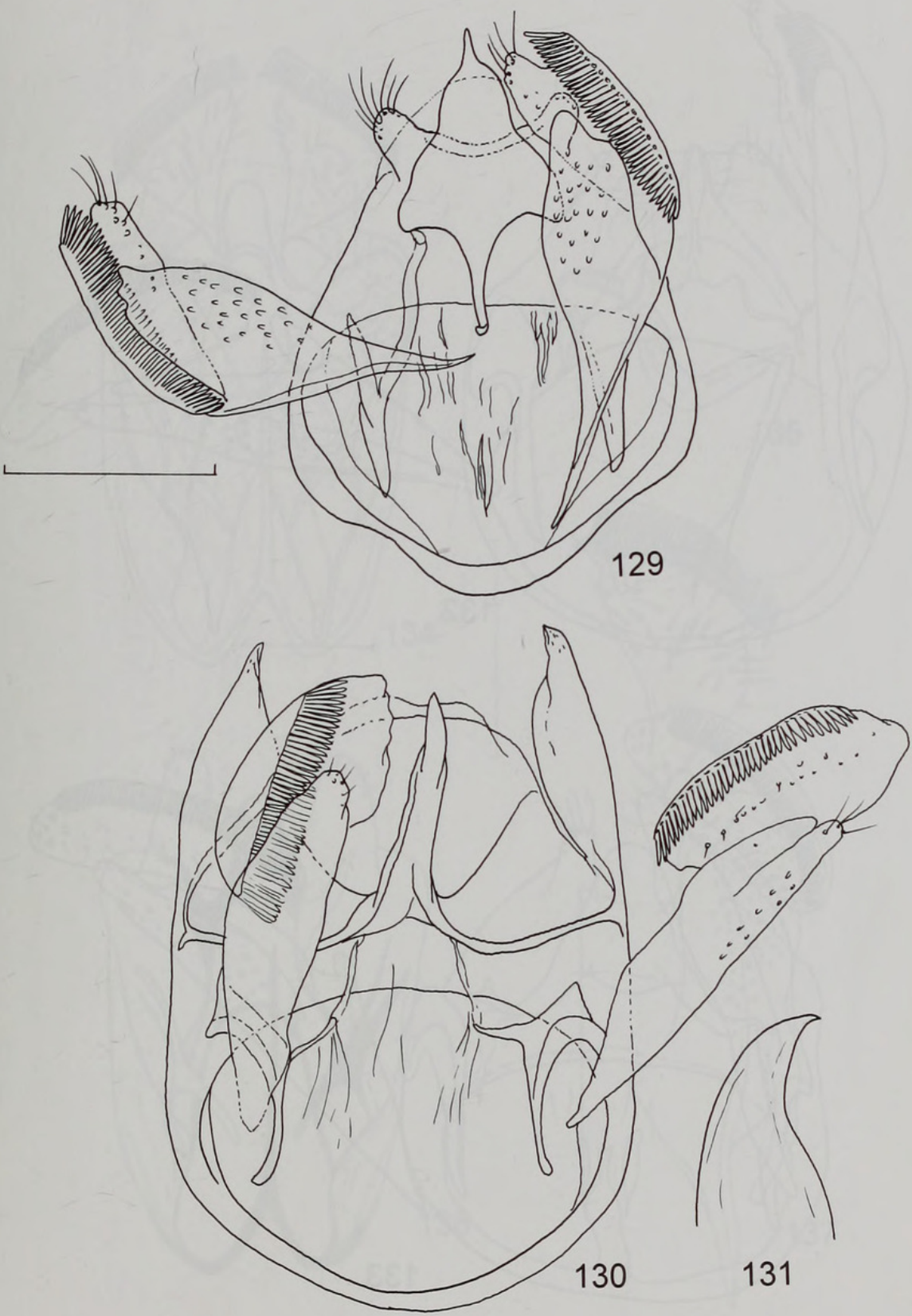
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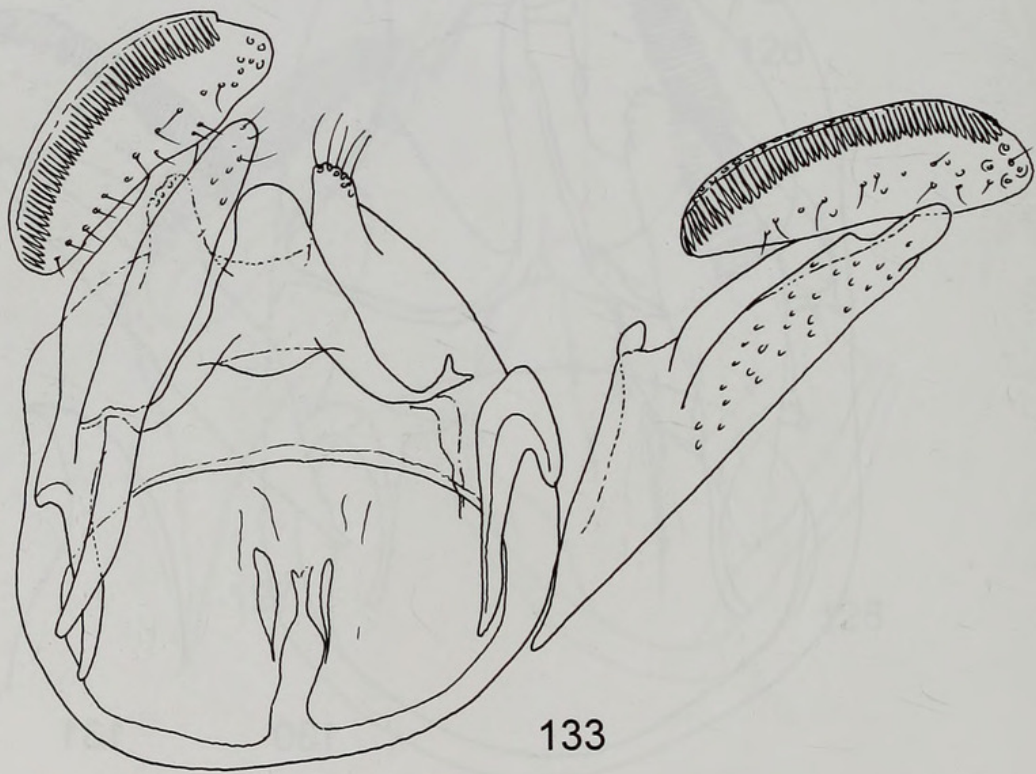
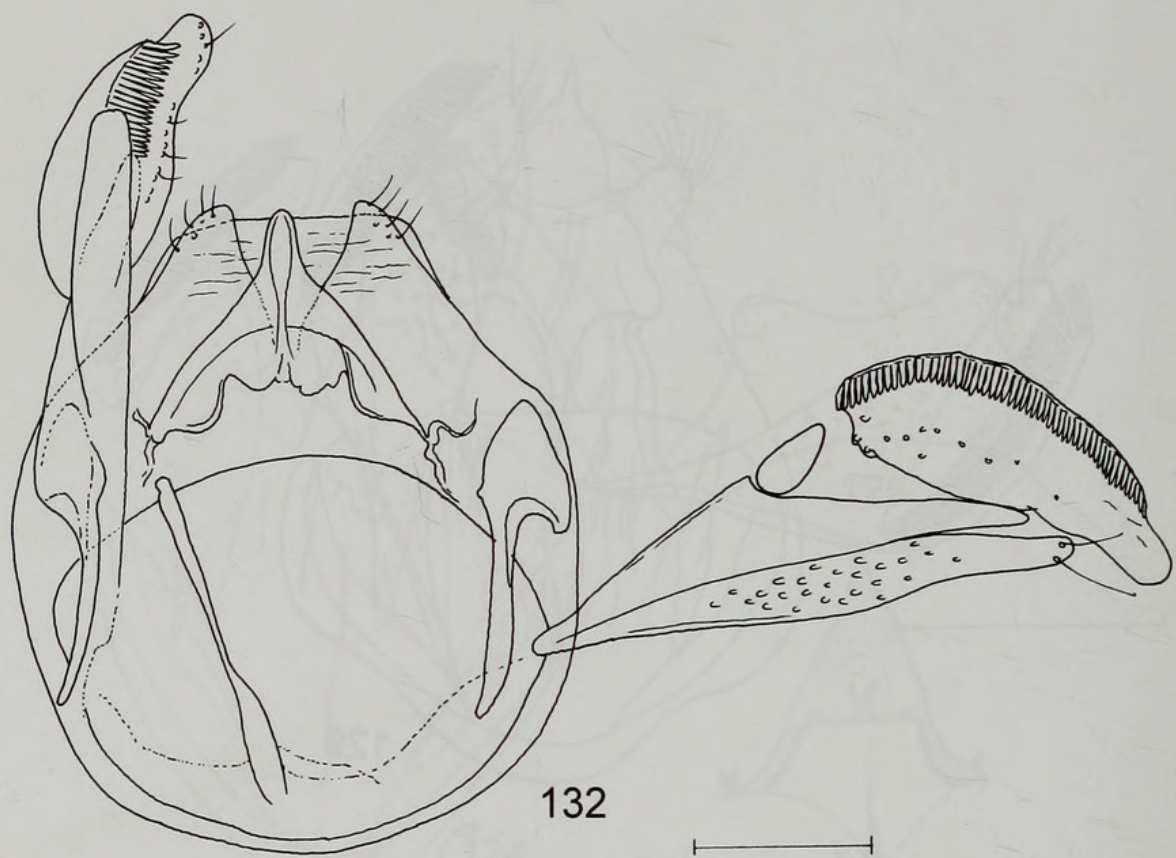
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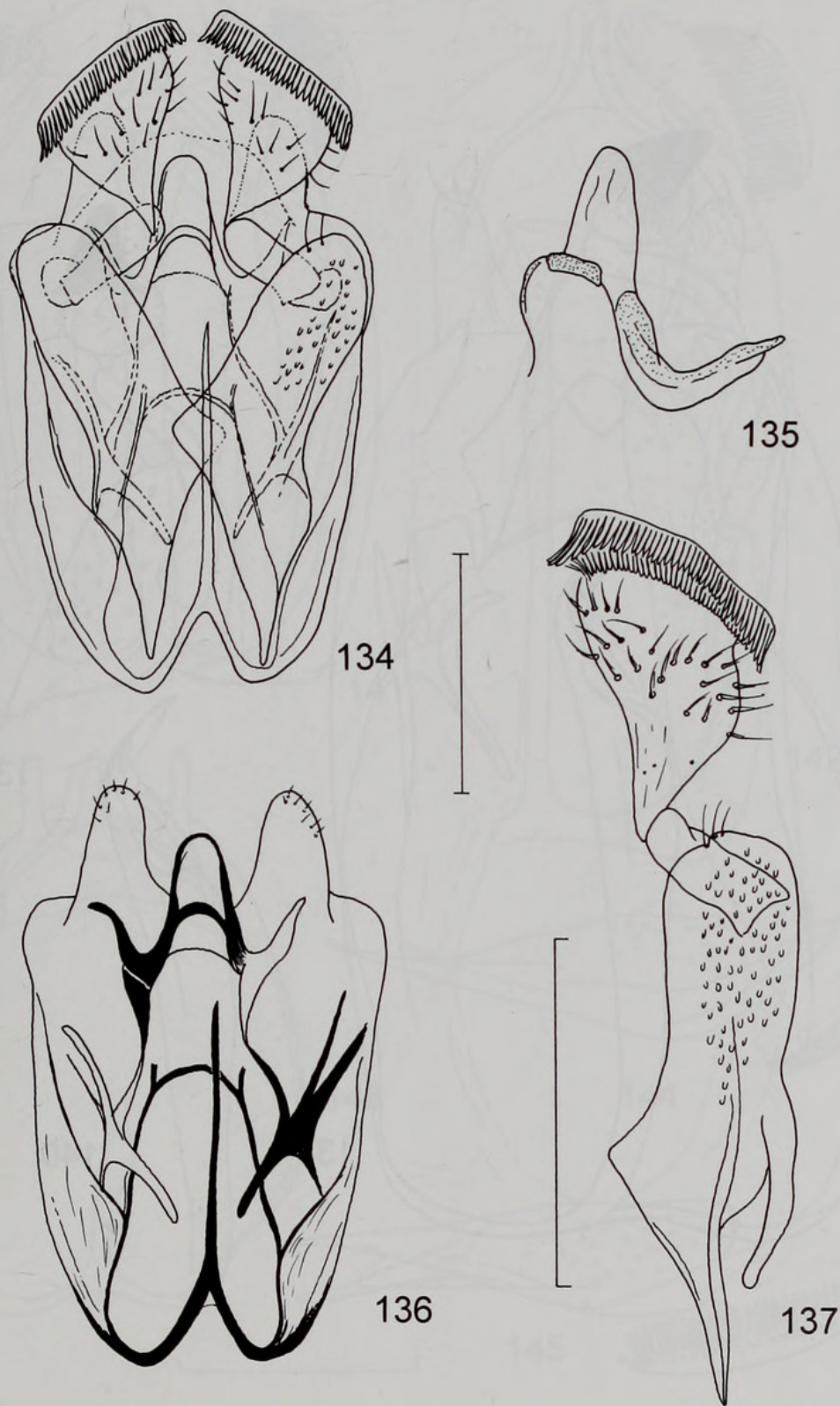
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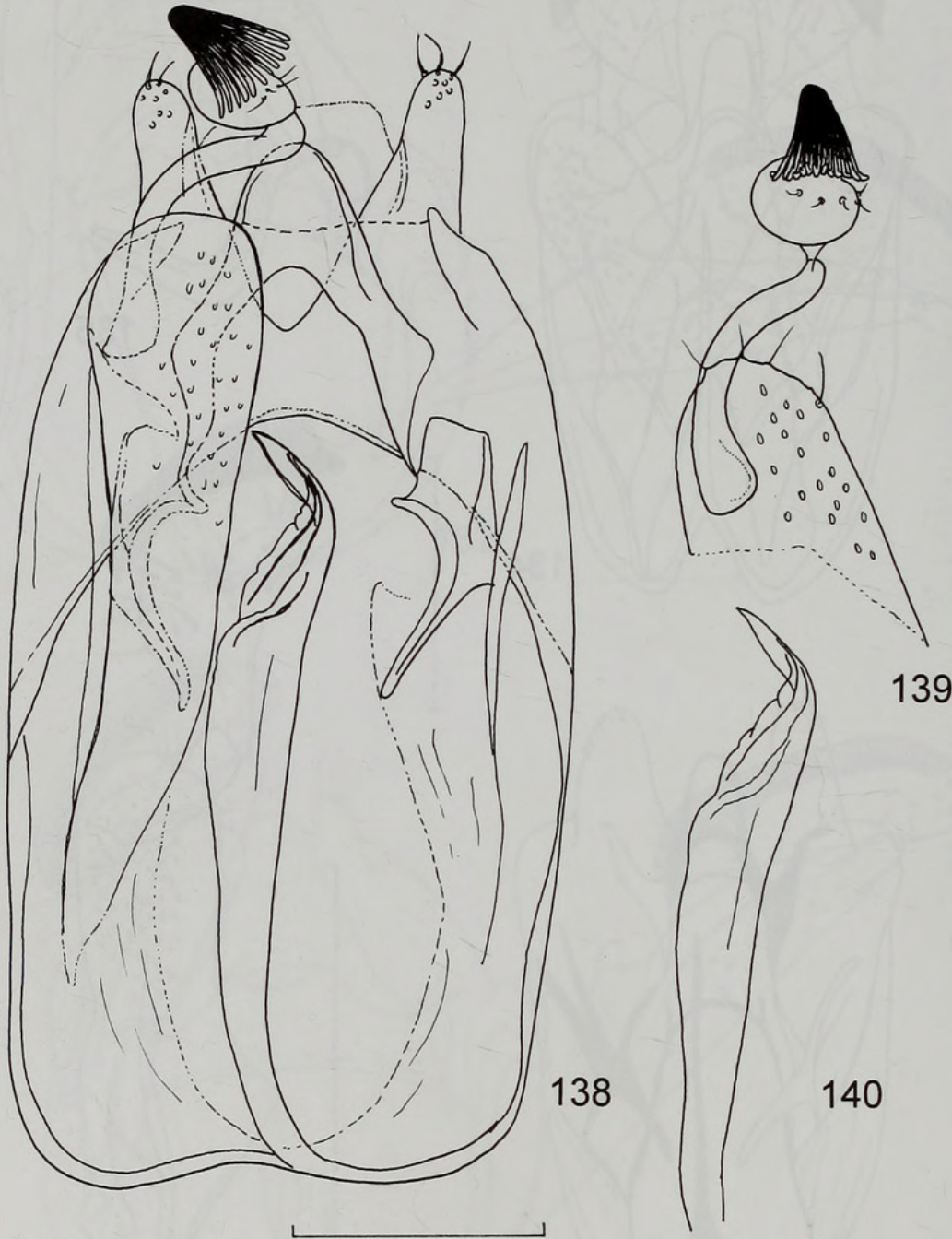
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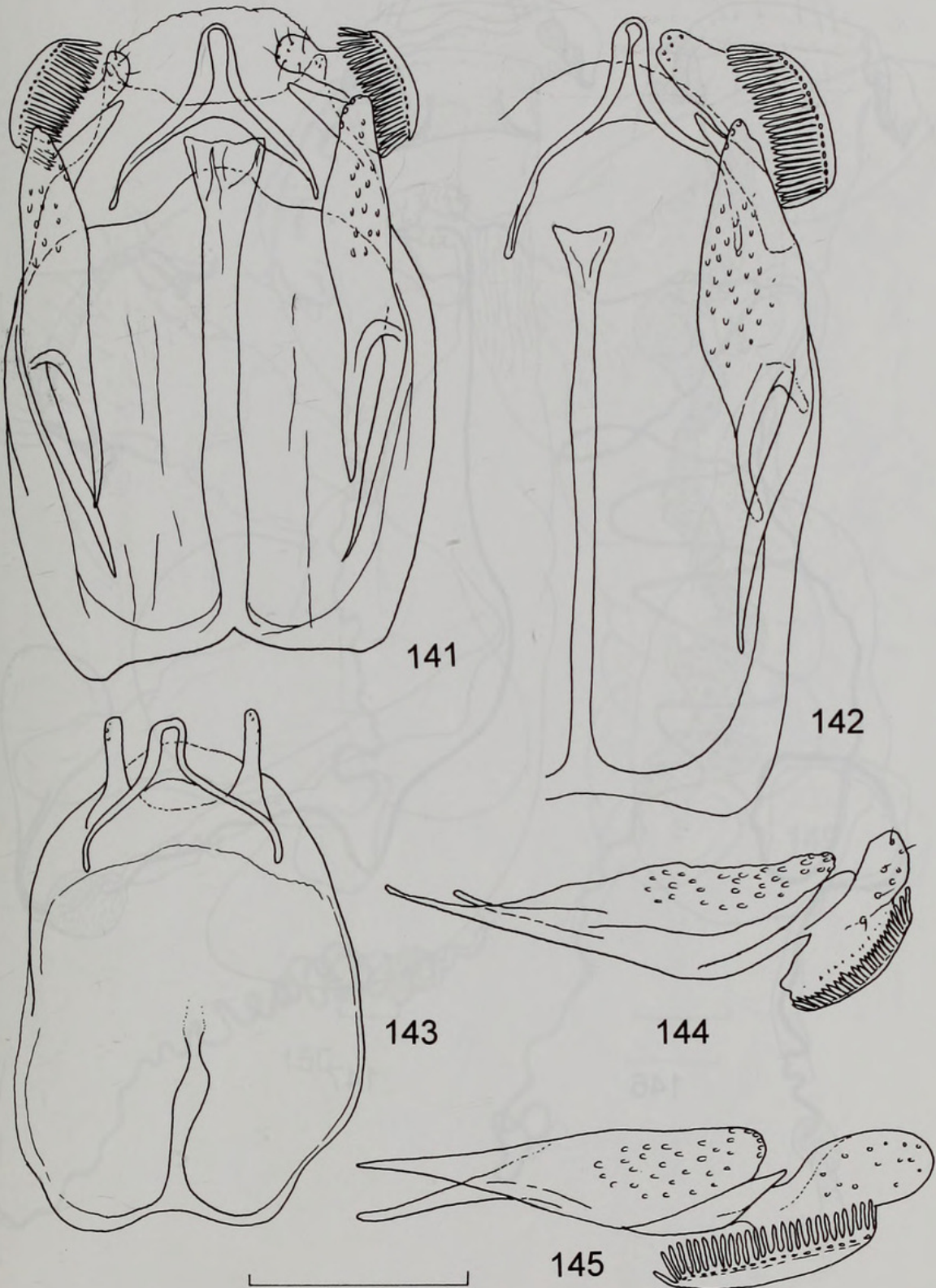
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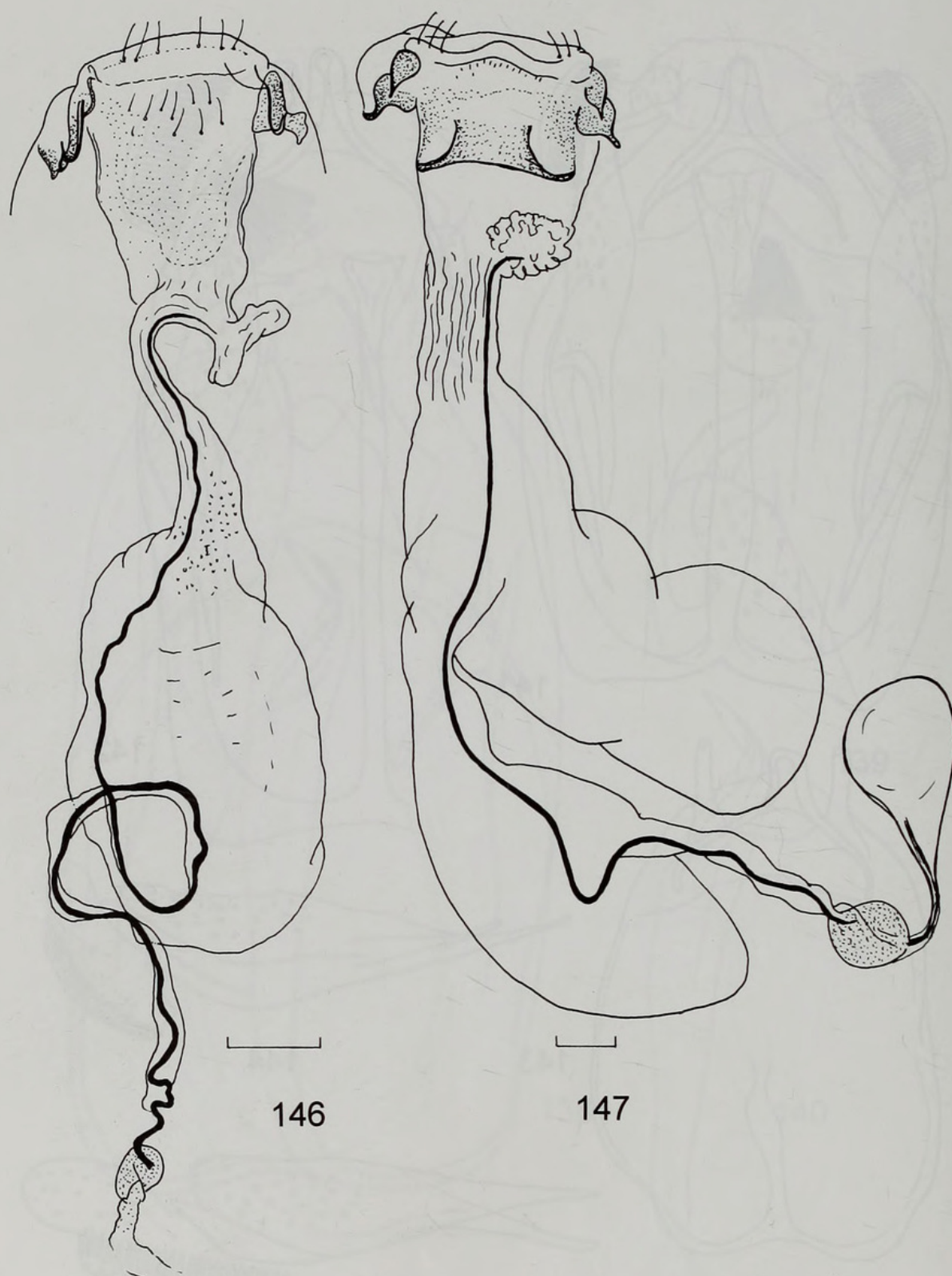
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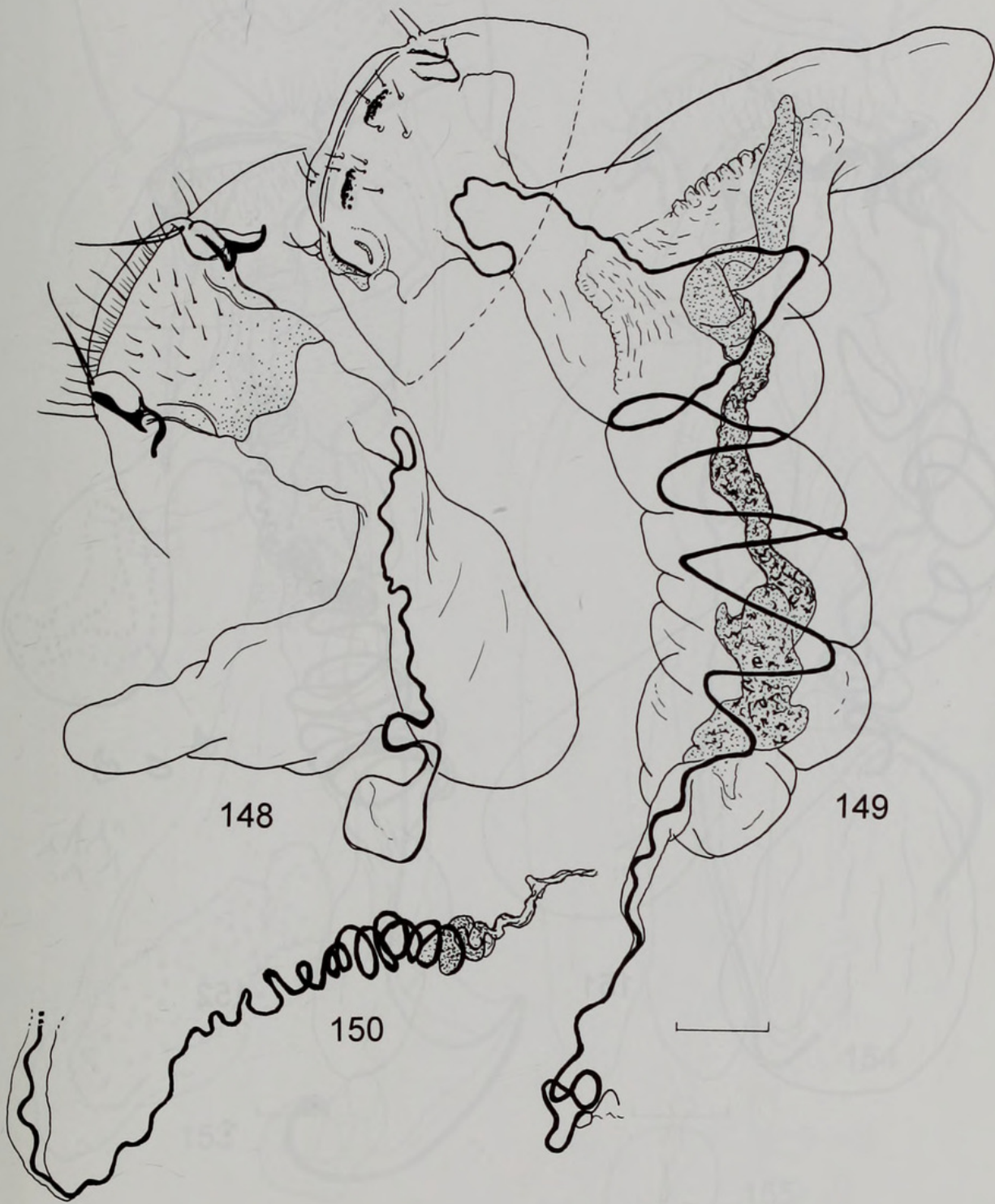
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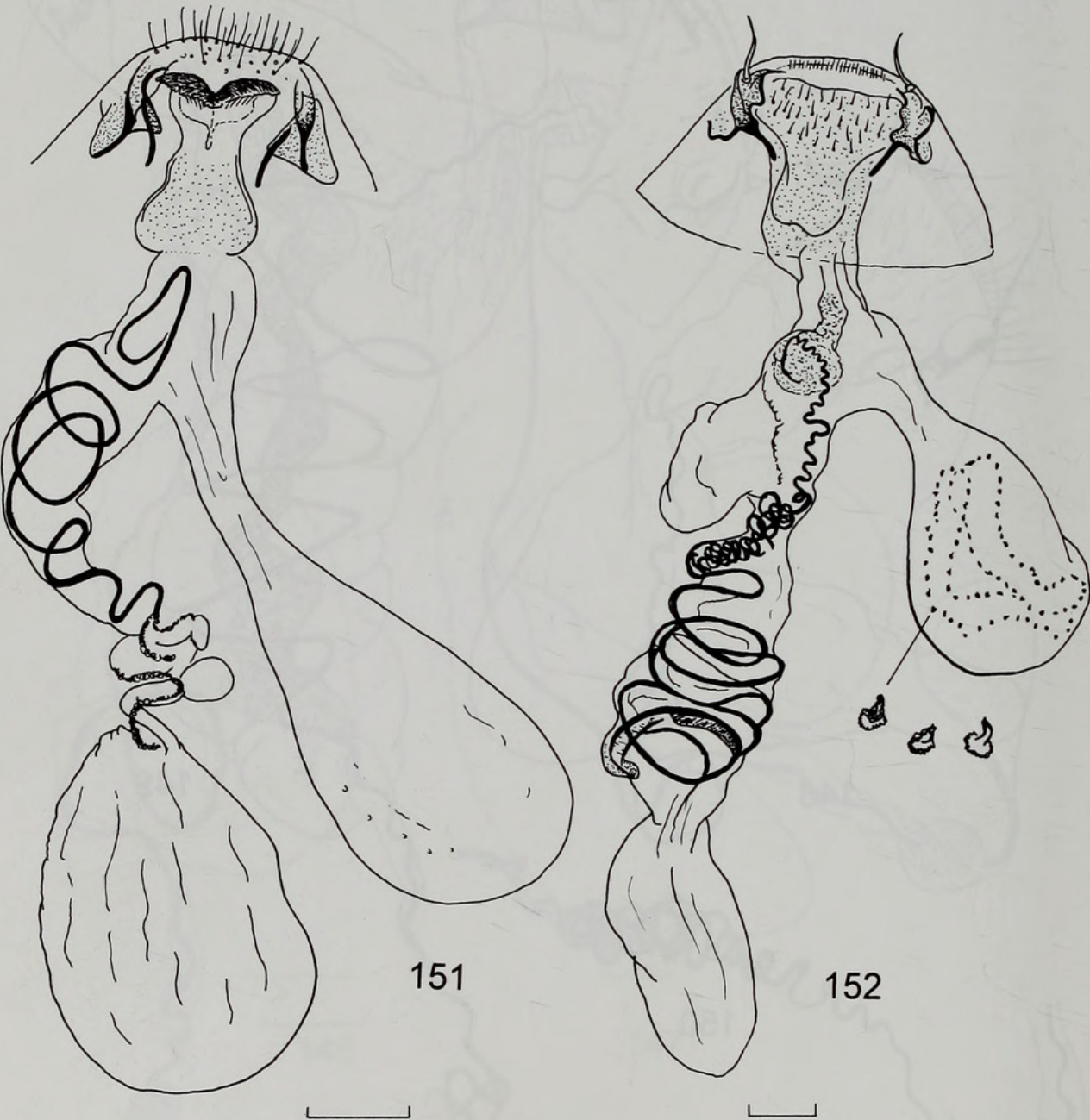
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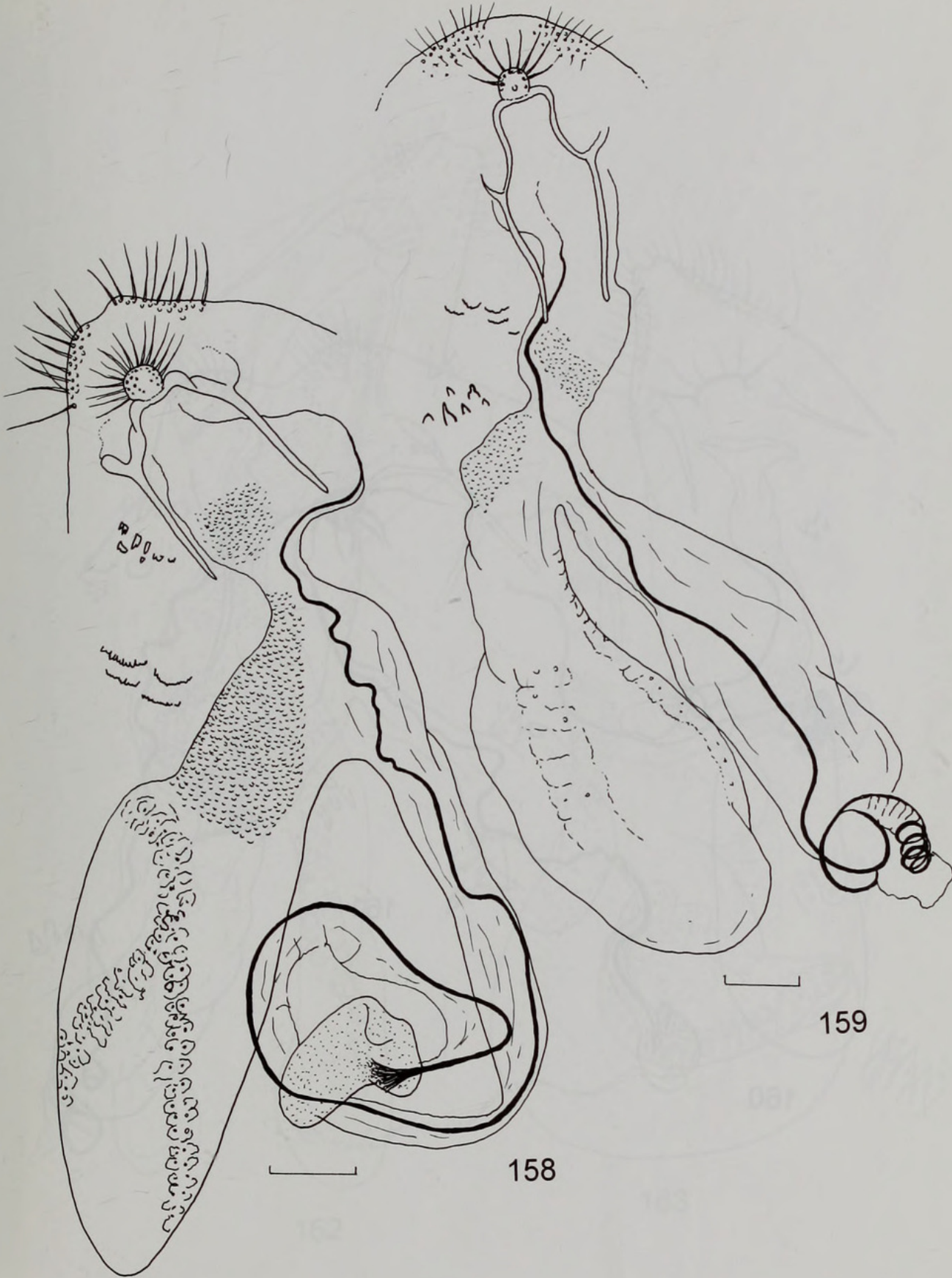
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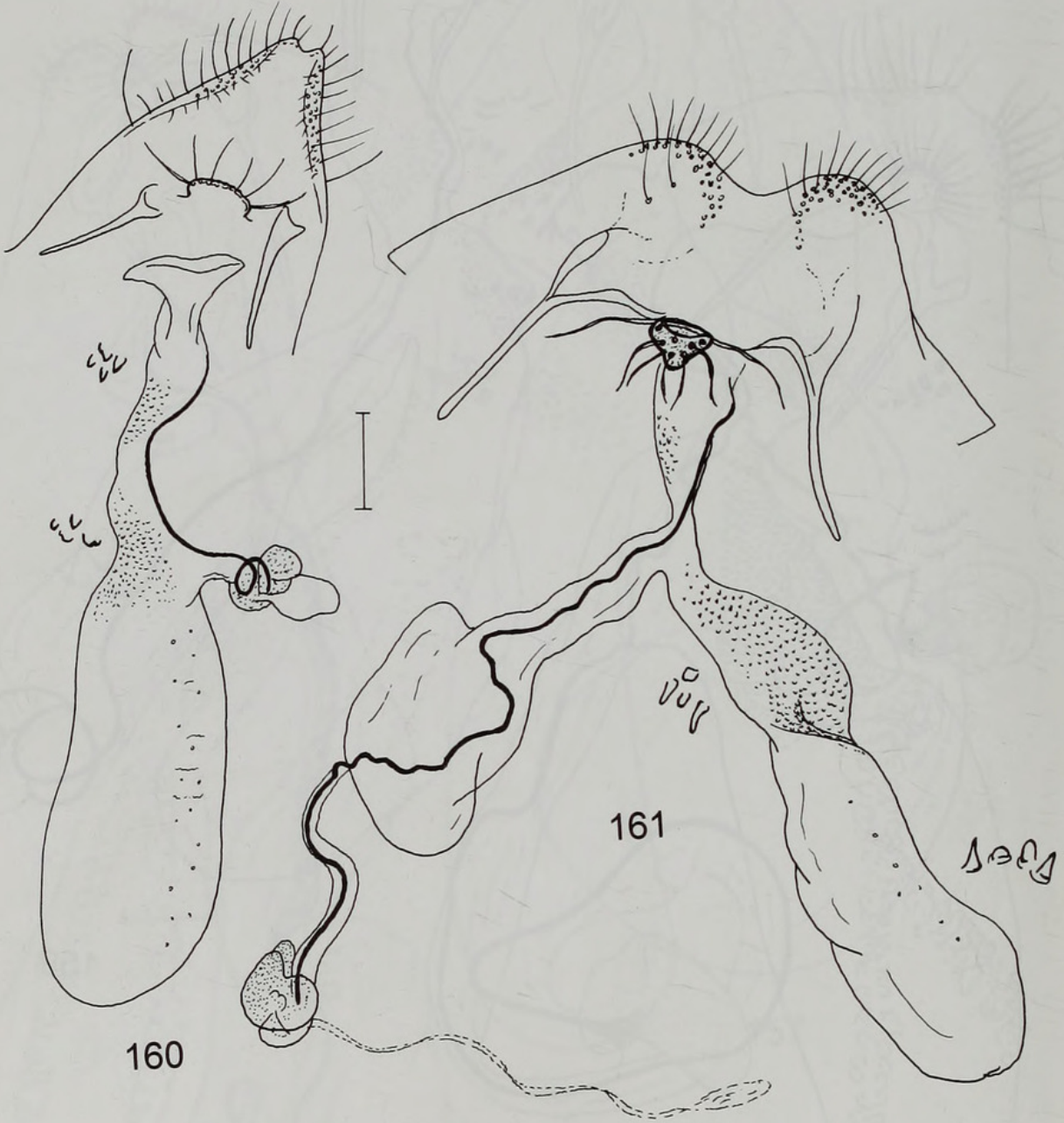
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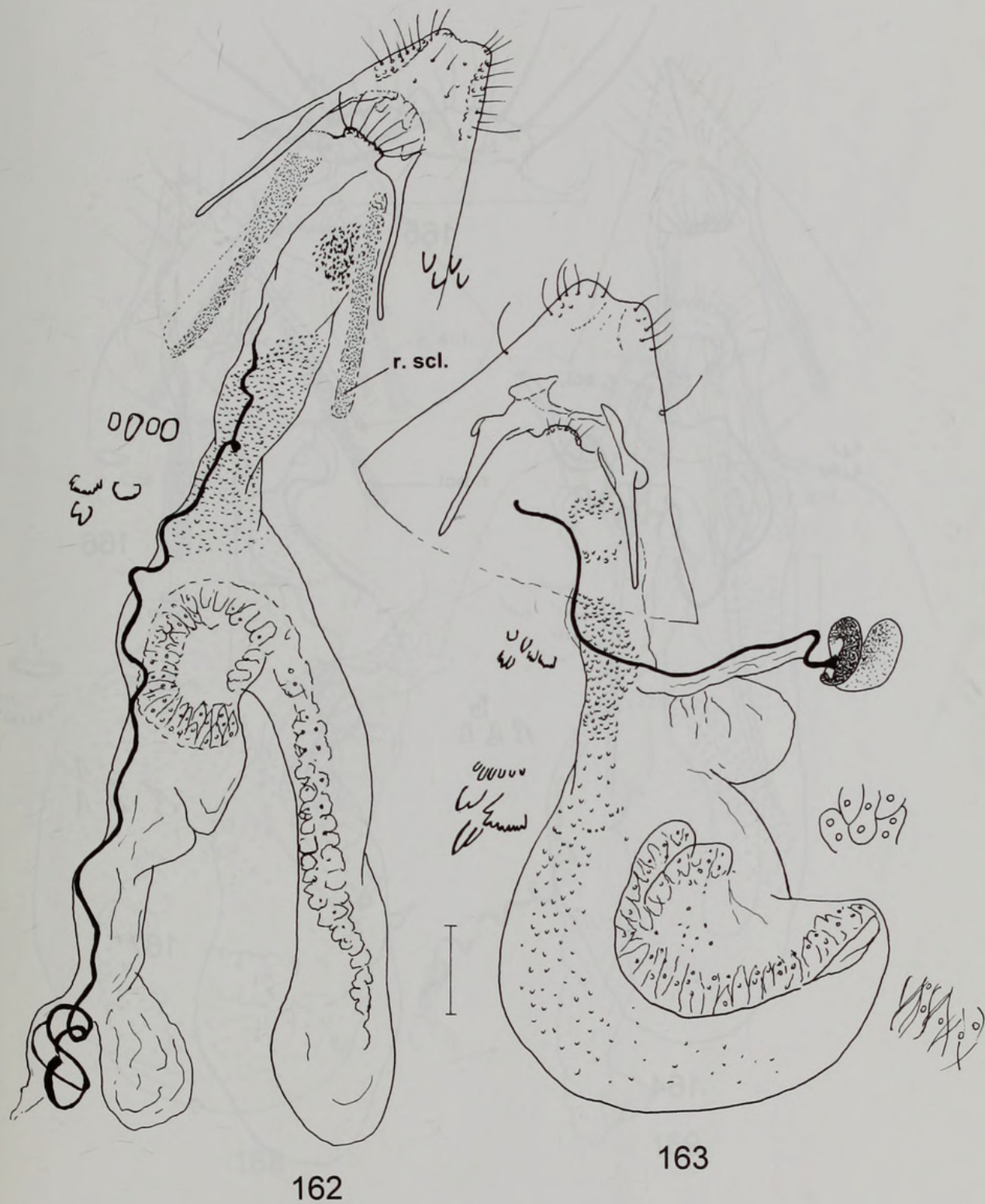
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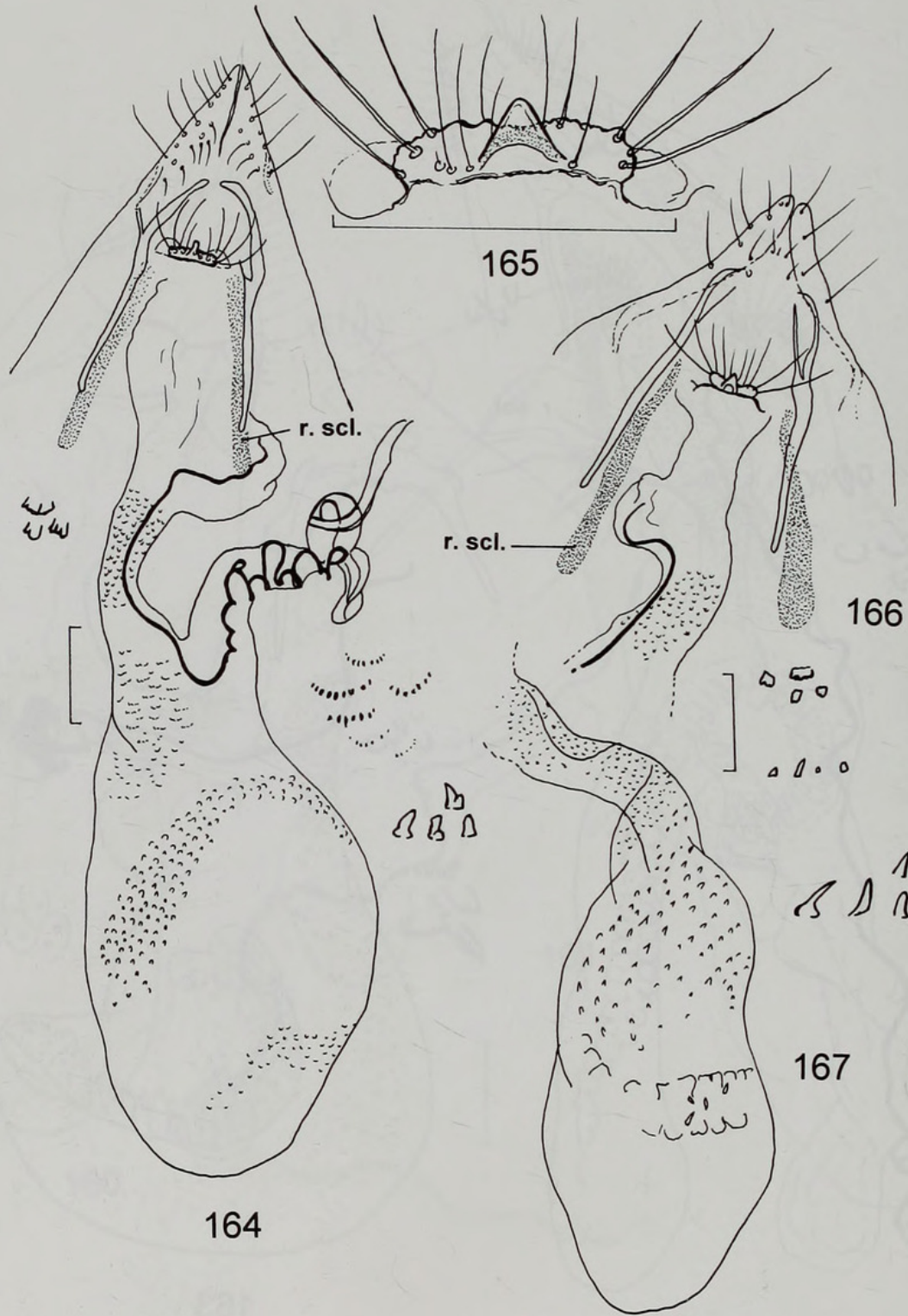
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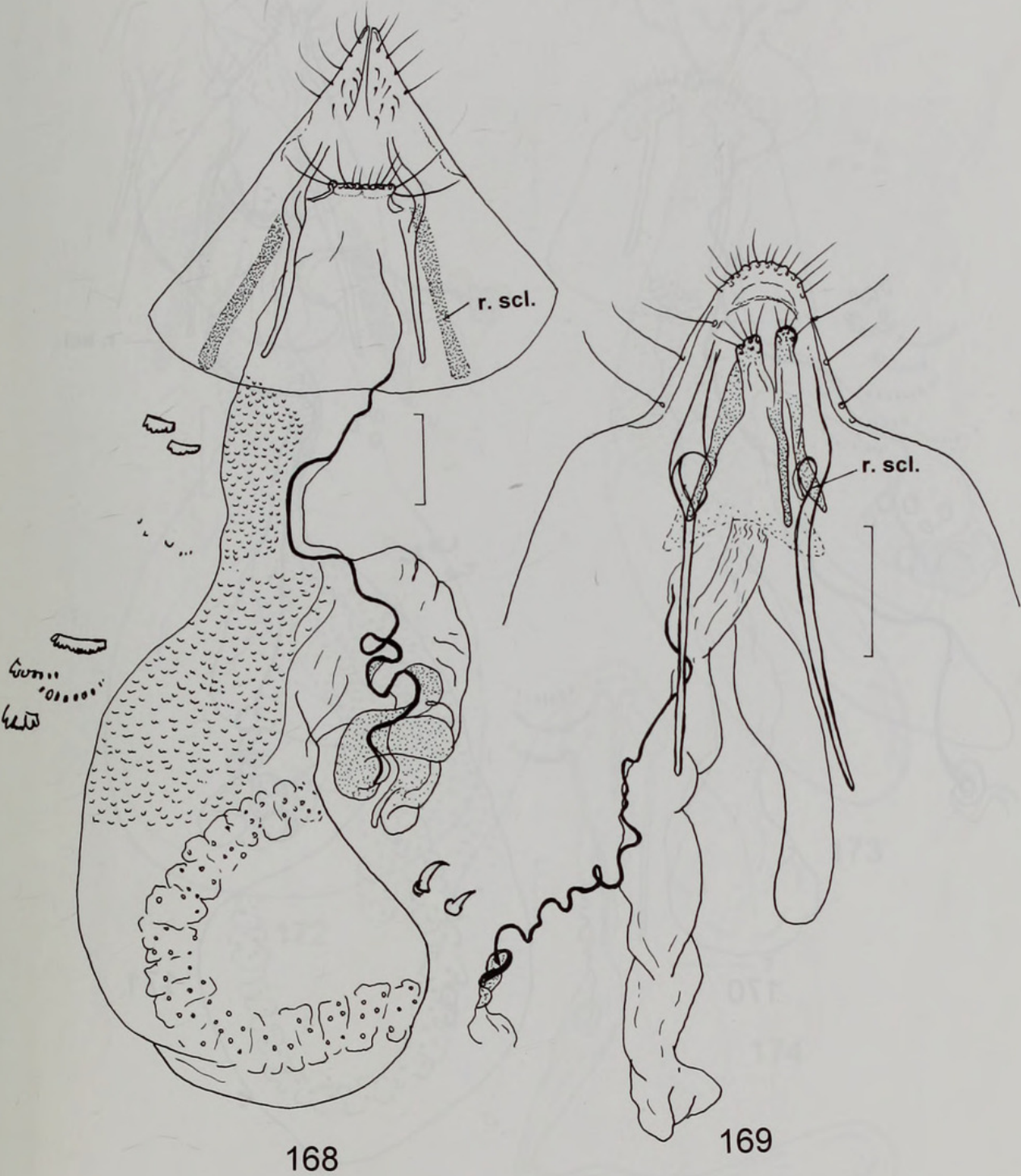
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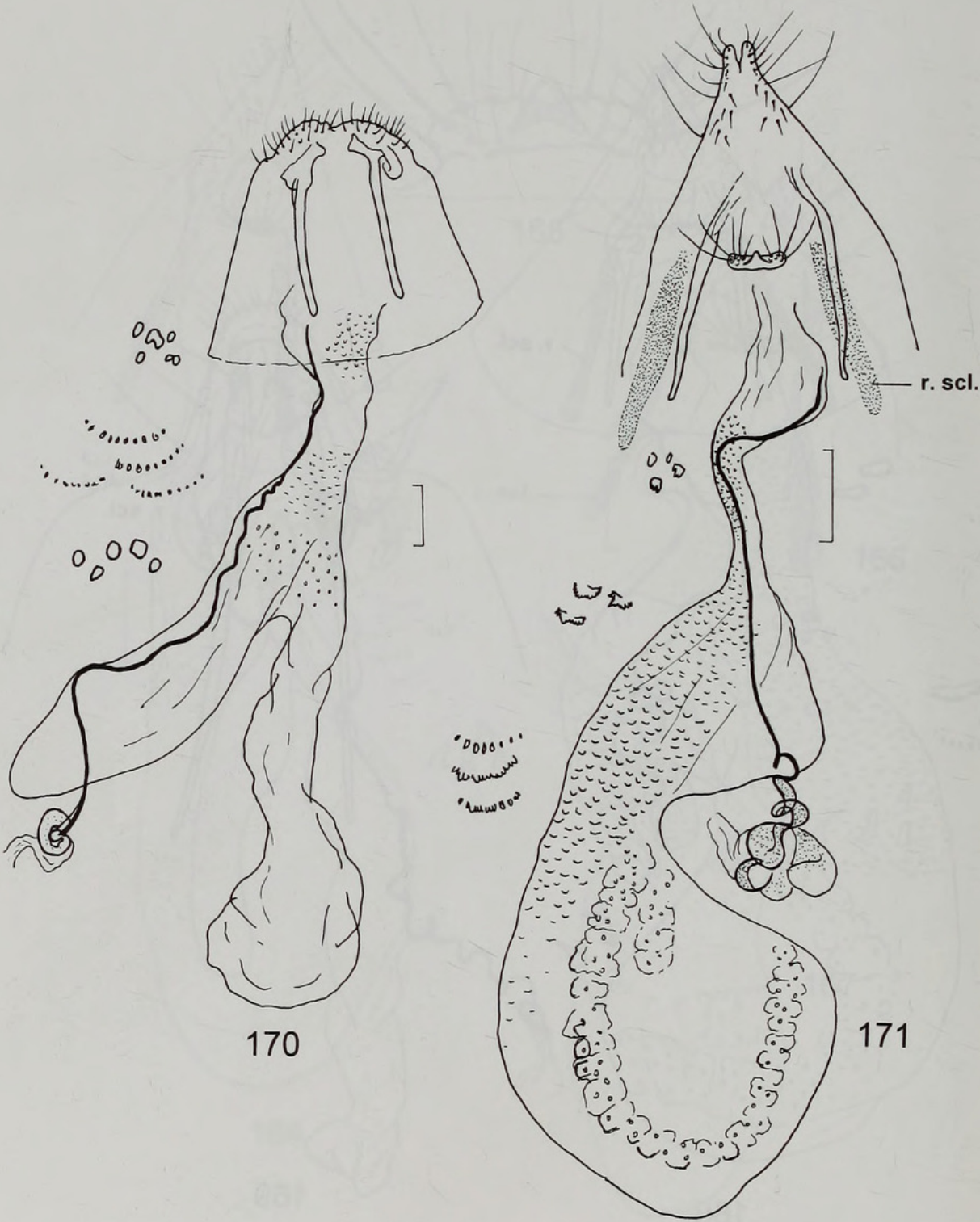
**Figs 164–167.** Female genitalia of *Pseudopostega saturella*, Indonesia: Sulawesi. 164, paratype (28695 – BMNH); 165, anal papillae, paratype (28690 – BMNH); 166, caudal region of genitalia, paratype (28691 – BMNH); 167, bursa of same specimen. r. scl. = rod-like sclerotization on abdominal wall. Scale: 0.1 mm.





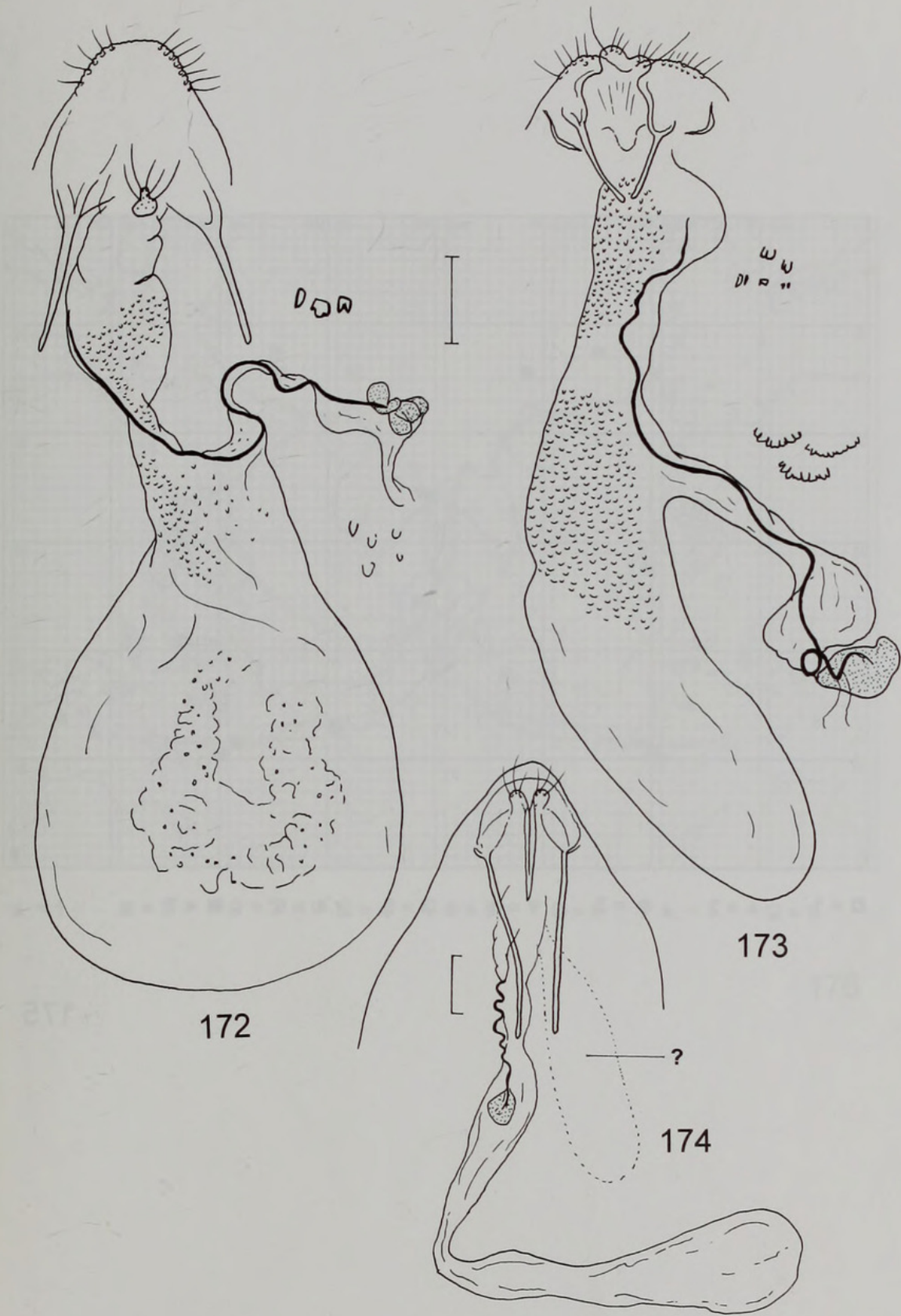
**Figs 168, 169.** Female genitalia of *Pseudopostega* species. 168, *amphivittata*, holotype, Indonesia: Sulawesi (28693 – BMNH); 169, *indonesica*, paratype, Indonesia: Sumba (Pupl. 003 – NNM). r. scl. = rod-like sclerotization on abdominal wall. Scale: 0.1 mm.





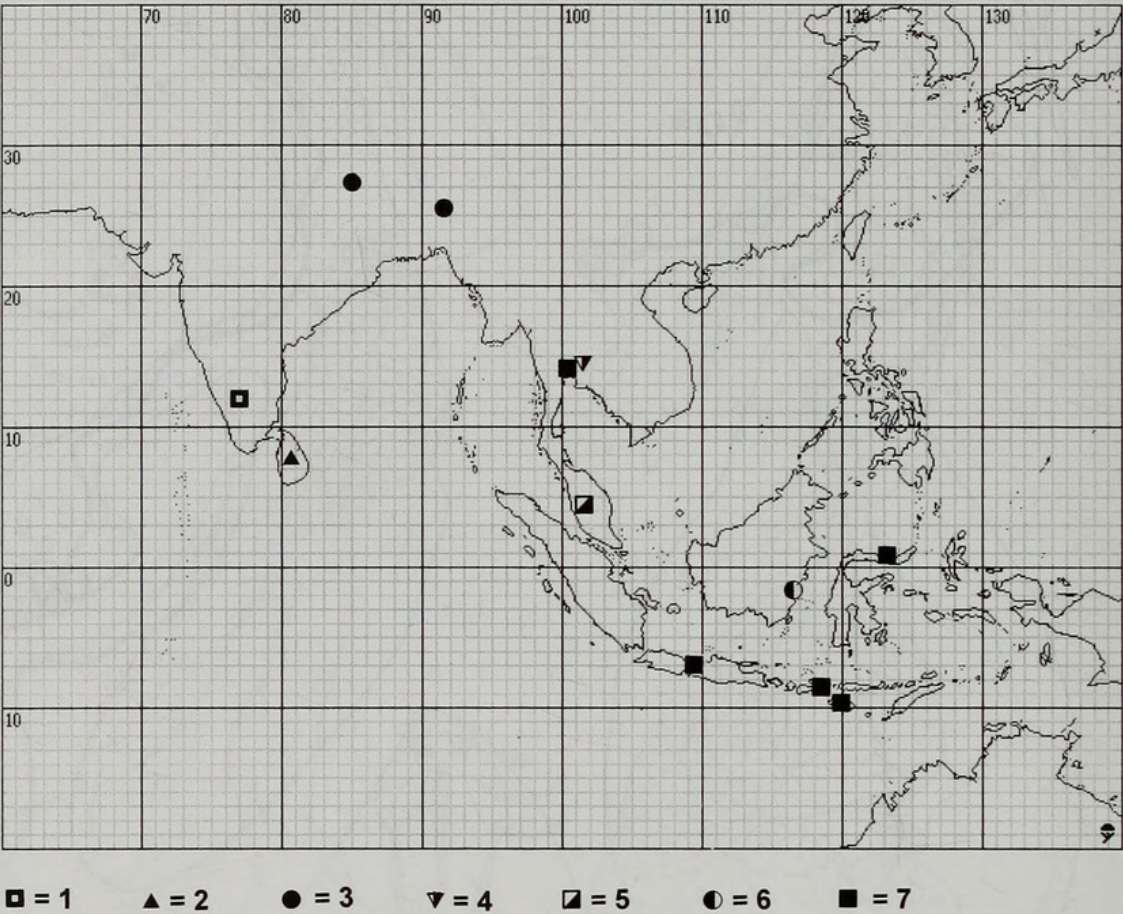
**Figs 170, 171.** Female genitalia of *Pseudopostega* species. 170, *zelopa*, Nepal (RP 1012 – VPU); 171, *jvae*, paratype, Indonesia: Java (Pupl. 017 – NNM). r. scl. = rod-like sclerotization on abdominal wall. Scale: 0.1 mm.





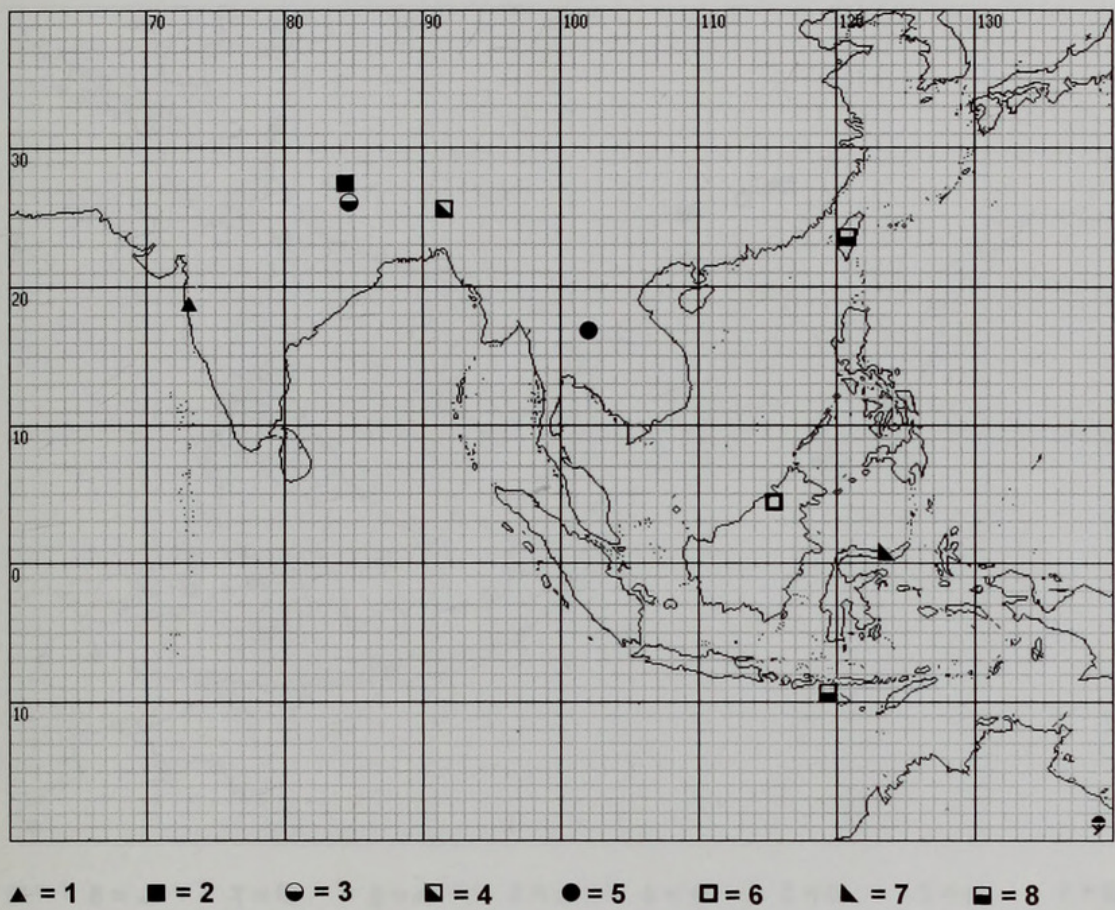
**Figs 172–174.** Female genitalia of *Pseudopostega* species. 172, *subviolacea*, holotype, India (28655 – BMNH); 173, *spilodes*, holotype, India (28649 – BMNH); 174, *euryntis*, holotype, India (bursa reconstructed) (28624 – BMNH). Scale: 0.1 mm.





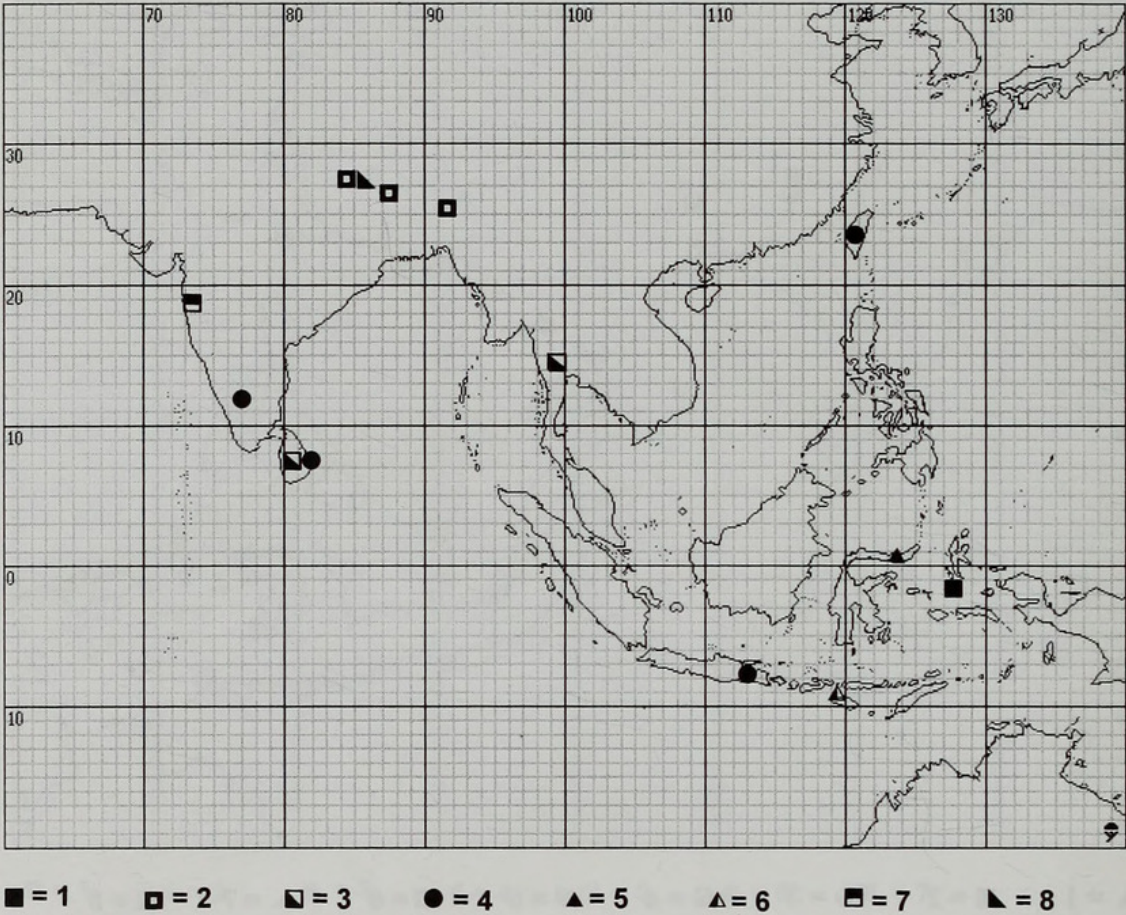
**Fig. 175.** Distribution of Oriental Opostegidae. Key: 1, *Opostegoides epistolaris* and species 28641; 2, *O. tetraea*, *uvida* and *nephelozona*; 3, *O. pelorrhoea*; 4, *O. auriptera*; 5, *O. malaysiensis*, *gorgonea*, *flavimacula* and *cameroni*; 6, *O. argentisoma*; 7, *Pseudopostega saturella*.





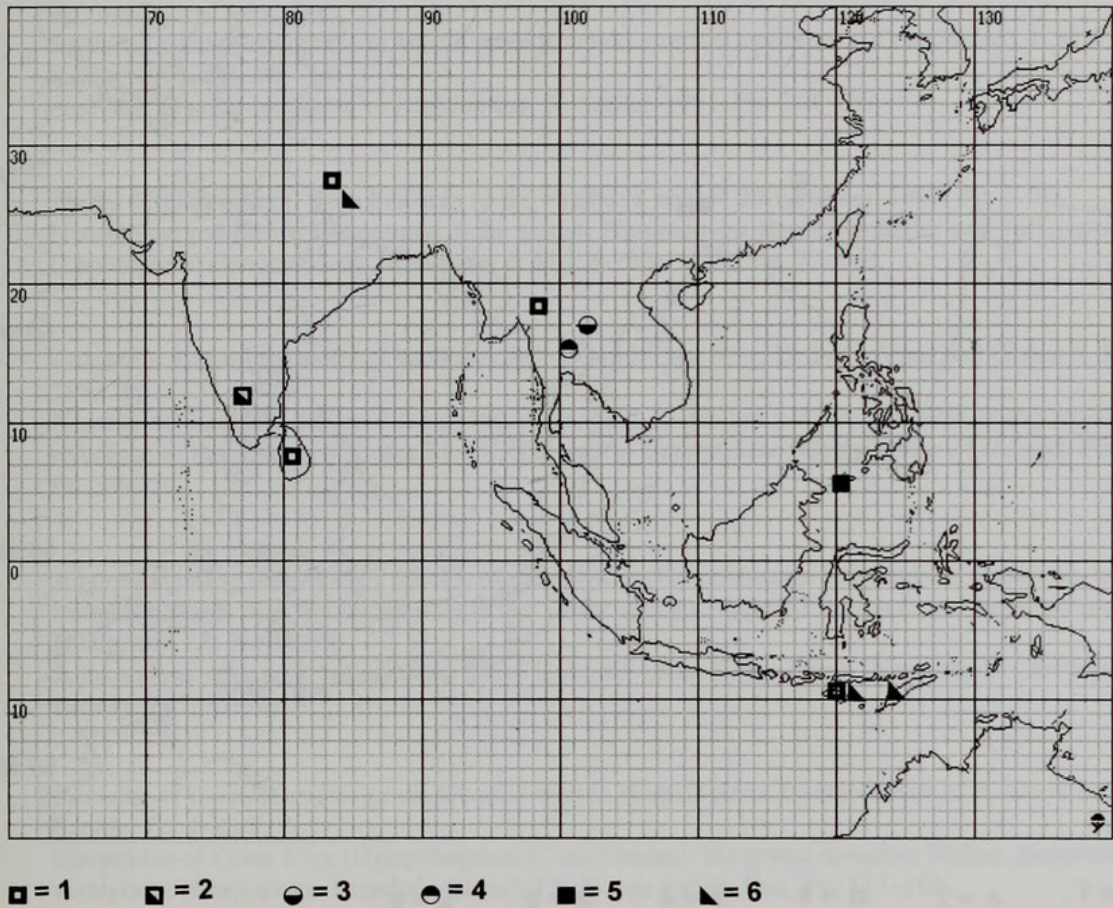
**Fig. 176.** Distribution of Oriental Opostegidae. Key: 1, *Opostegoides species* 28640; 2, *O. species* 1005; 3, *O. species* 28644; 4, *O. index* and *longipedicella*; 5, *O. thailandica*; 6, *O. species* 28702; 7, *O. spinifera*; 8, *Pseudopostega similantis*.





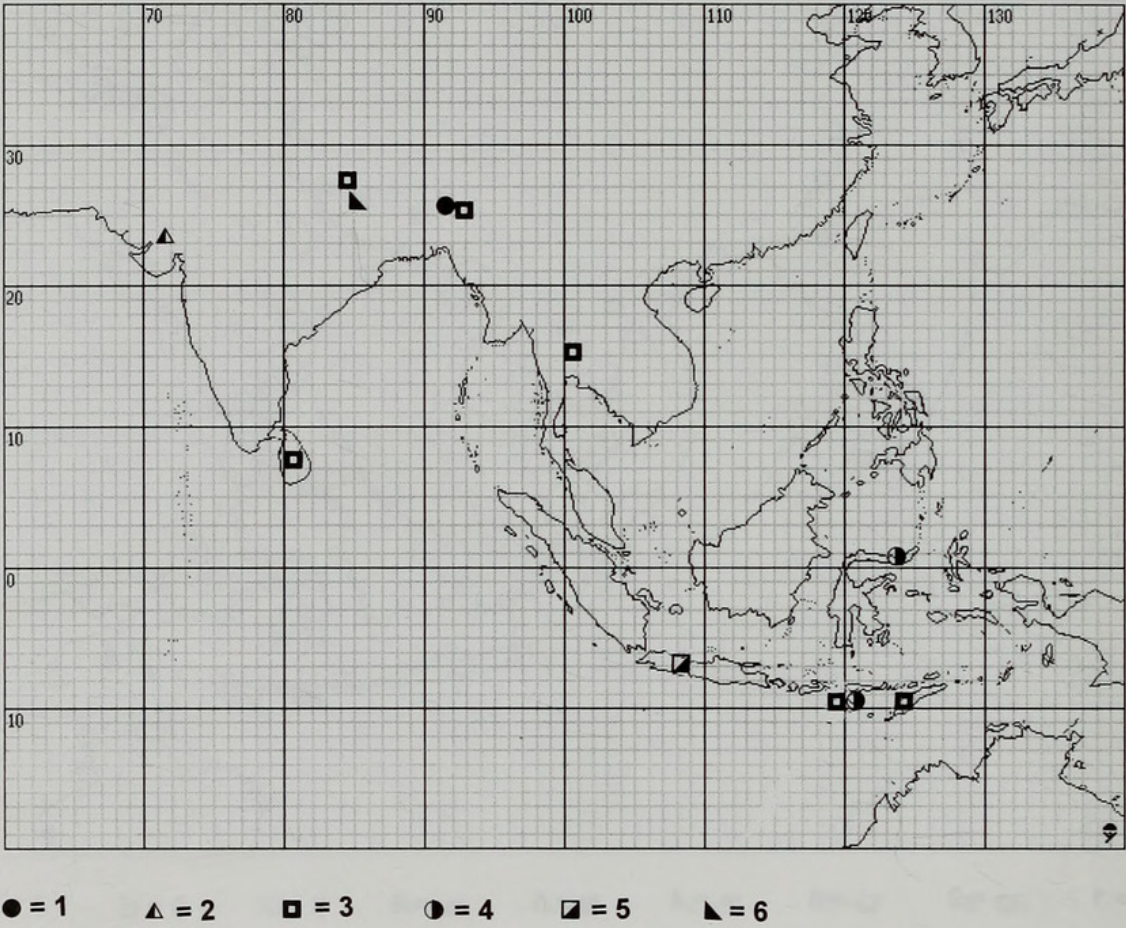
**Fig. 177.** Distribution of Oriental Opostegidae. Key: 1, *Eosopostega armigera*; 2, *Opostega chalcophylla*; 3, *Pseudopostega machaerias*; 4, *P. epactaea*; 5, *P. parvilineata* and *amphivittata*; 6, *P. sumbae*; 7, *P. velifera*; 8, *P. nepalensis* and species 28623.





**Fig. 178.** Distribution of Oriental *Pseudopostega* species. Key: 1, *frigida*; 2, *spilodes* and *euryntis*; 3, *nigrimaculella*; 4, *alleni*; 5, *species 404*; 6, *myxodes*.





**Fig. 179.** Distribution of Oriental *Pseudopostega* species. Key: 1, *strigulata*; 2, *subviolacea*; 3, *zelopa*; 4, *indonesica*; 5, *javae*; 6, *fungina*.





1999. "Revision of the Oriental Opostegidae (Lepidoptera) with general comments on phylogeny within the family." *Bulletin of the Natural History Museum. Entomology series* 68, 1–92.

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