

ON THE LEPTOCERINAE OF THE INDIAN SUB-CONTINENT AND NORTH EAST BURMA (TRICHOPTERA)

By D. E. KIMMINS

SYNOPSIS

Two genera and thirty species are described as new, as a result of study of British Museum (Nat. Hist.) accessions, largely Assam material from the McLachlan collection, and material from N.E. Burma, on loan from the Naturhistoriska Riksmuseum, Stockholm. Accessions from other parts of the sub-continent have also been studied, and figures of male genitalia from paratype specimens of Ceylonese species described by Hagen are given. The genus *Oecetodella* Ulmer has been placed as a synonym of the genus *Oecetis* McLachlan.

THIS paper forms the tenth part of a series continuing the work begun by Mosely in 1933, under the title "Indian Caddis Flies", dealing with the regions covered by the "Fauna of British India". Since the commencement of my series of papers, Dr. F. Schmid, of Lausanne, has made extensive collections in Ceylon and the Himalayan areas of India and Pakistan, and his papers have added much to our knowledge of the fauna of these regions. The present paper is evidence, however, that much still remains to be done.

The author wishes to express his thanks to the authorities of the Naturhistoriska Riksmuseum, Stockholm, for their patience concerning the long-standing loan of the material collected by Dr. R. Malaise in N. E. Burma in 1934.

In recording the location of material studied, the abbreviations "STOCKHOLM" and "BMNH" are used for the Naturhistoriska Riksmuseum and the British Museum (Natural History) respectively.

Triaenodes cloe (Hagen)

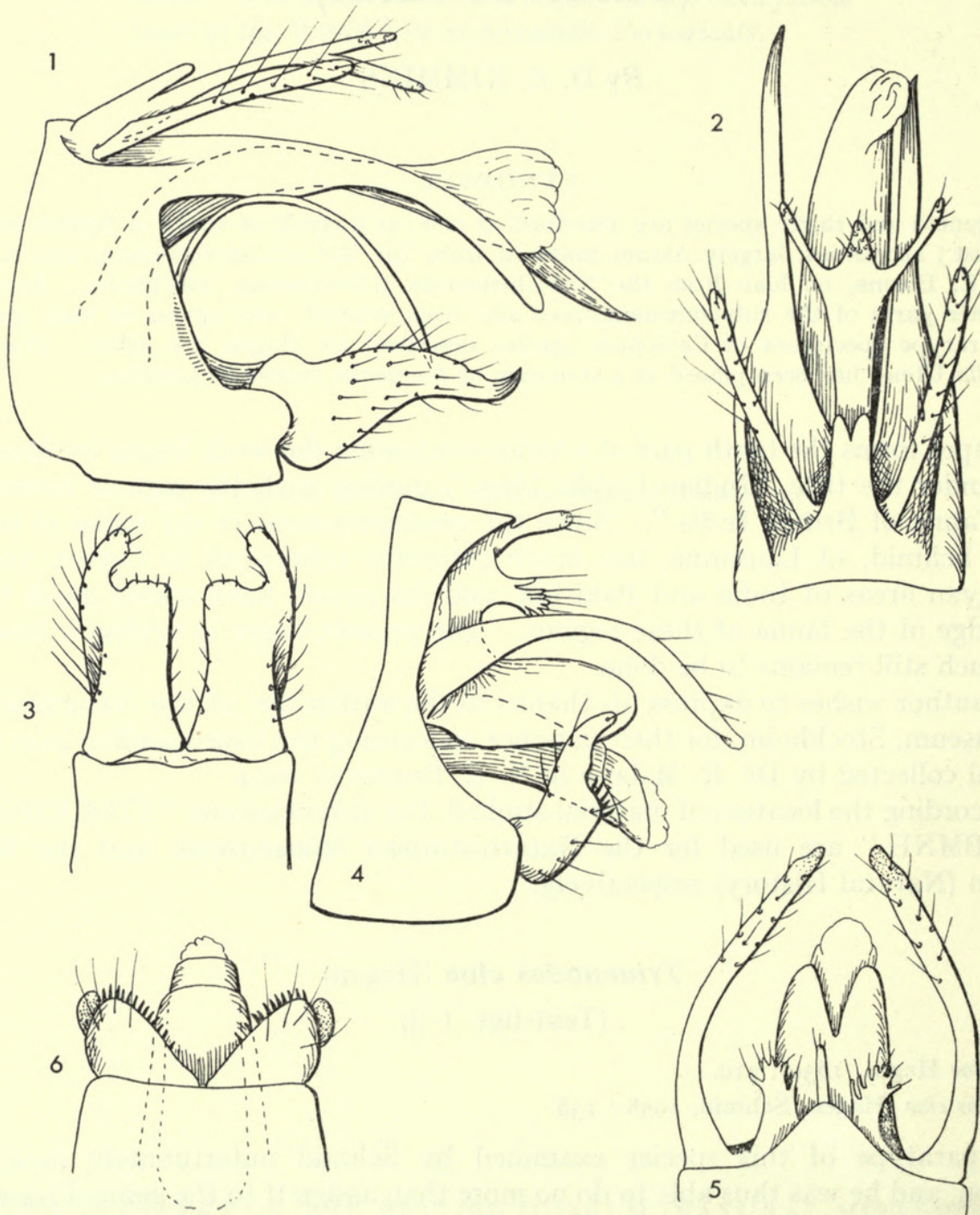
(Text-figs. 1-3)

Setodes cloe Hagen, 1859 : 210.

Triaenodes cloe (Hagen) Schmid, 1958 : 138.

The paratype of this species examined by Schmid unfortunately lacked its abdomen, and he was thus able to do no more than assign it to the genus *Triaenodes*. In the British Museum (Nat. Hist.), there is a male paratype of *Setodes cloe* Hagen, which is also a *Triaenodes*. I therefore give a description and figures of the male genitalia.

♂ GENITALIA. Ninth segment moderately long, narrowed dorsally. Tenth tergite fused to ninth, the median lobe elongate, dilating slightly to a trilobed apex, the centre lobe triangular in dorsal view, the two lateral branches slightly longer, divergent and slender. Lateral lobes of tenth tergite appearing as long, downcurved, spiniform processes of the lateral margins of the ninth segment, slightly unequal in length. Aedeagus long, slender, membranous apically. Clasper in side view tapering sinuously to an acute apex, in ventral view elongate-rectangular, with the outer apical angle produced and incurved. From the base of each clasper arises a slender spine, arching upwards and then downwards. In the paratype these spines are asymmetric, the right-hand one being abbreviated.



FIGS. 1-6. *Triaenodes* spp. 1-3, *T. cloe* (Hagen), Genitalia of ♂ paratype. 1, lateral; 2, dorsal (claspers omitted); 3, claspers, ventral; 4-6, *T. longicerca* sp. n. ♂ genitalia. 4, lateral; 5, dorsal (claspers omitted); 6, claspers and aedeagus, ventral.

Paratype ♂, CEYLON : Nietner. *Setodes cloe* Hagen. (M. C. Z.) Type No. 10987. In exchange from Dr. N. Banks. B.M.1931-280. *Triaenodes cloe* (Hagen), ♂ Paratype, det. D. E. Kimmins, 1962.

T. cloe (Hagen) is clearly related to *T. lankarama* Schmid, but differs in the shape of the claspers, both ventrally and laterally.

Triaenodes longicerca sp. n.

(Text-figs. 4-6)

♂. Insect a uniform brownish colour, due probably to long immersion in alcohol. Wings with fuscous pubescence, fore wings with margin denuded, hind wings with a fuscous fringe along the posterior margin. From the anal lobe of the hind wing arises a pencil of silky, fuscous hairs, nearly half as long as the hind wing. In the fore wing, the stem of *M* is complete.

♂ GENITALIA. Ninth segment moderately long ventrally, lateral margin widely excised, dorsal margin triangularly produced at its centre. Tenth tergite about half as deep as ninth segment, dorsally with a short, median finger, with below it, on either side, a palmate lobe, fringed with setae. The lower part of the tenth tergite forms a hood over the aedeagus, about three-quarters as long as the latter and with an acute, median excision of its apex. Cerci pigmented, long and slender, arched inwards and downwards. Aedeagus slender, enclosed within a sleeve or trough with a rounded, ventral apical margin. Clasper directed upwards, in side view tapering from about midway to form a digitate process. In ventral view, the base of the clasper is broadly triangular, its inner surface heavily armed with stout setae.

♀ Unknown.

Length of fore wing, ♂, 6.5 mm.

Holotype ♂ (mounted as microscope preparations), N. E. BURMA : Kambaiti, 6,700 ft., 12.vii.1934 (*R. Malaise*), STOCKHOLM.

This species should be easily recognisable by its long, curved cerci and by the long pencil of hairs arising from the anal lobe of the male hind wing.

Triaenodes interna McLachlan.

PAKISTAN : Peshawar District, Taru, v.1915, 4 ♂, 3 ♀ (*T. B. Fletcher*), BMNH.

KASHMIR : Srinagar, viii-ix.1923, 2 ♂ (*T. B. Fletcher*), iv.1932, 1 ♂ (*Yale N. India Exped.*), Gagirbal, iv.1932, 1 ♂ (*Yale N. India Exped.*), BMNH.

These specimens belong to the variety *capitata* Martynov.

Previously recorded distribution : PALESTINE to TURKESTAN.

Triaenodes sp.

N. E. BURMA : Kambaiti, 7,000 ft., 30.iv.1934, 4 ♀ (*R. Malaise*), STOCKHOLM.

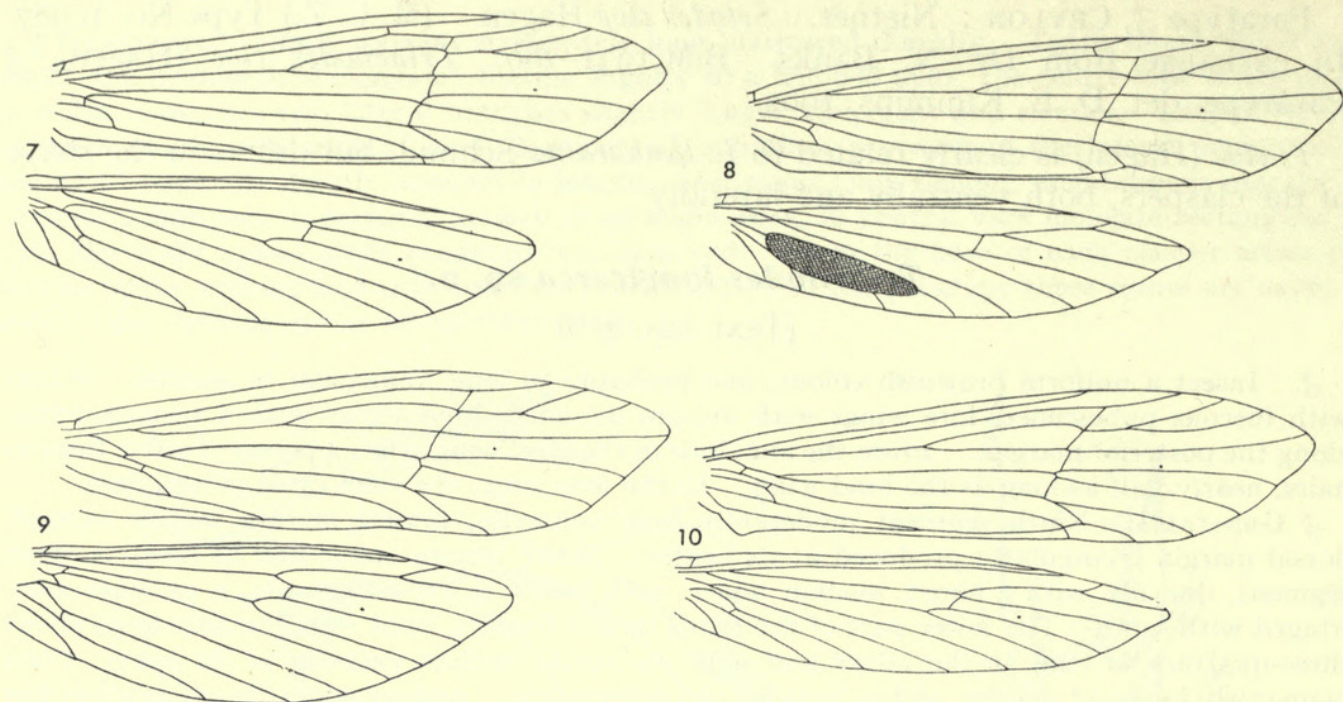
In the absence of associated males, these females are left undetermined.

Adicella biramosa Martynov

Adicella biramosa Martynov ; Schmid, 1958 : 133, pl. 24, figs. 12-15.

Adicella syriaca Ulmer ; Ulmer, 1915 : 74 (Ceylon).

Examination of the female from CEYLON (Peradeniya, ii.1911, *J. C. F. Fryer*), BMNH, determined as *A. syriaca* by Ulmer, justifies Schmid's doubts. It agrees very well with Schmid's figure of the female genitalia of *Adicella biramosa* Martynov.



FIGS. 7-10. *Adicella* spp., ♂ wings. 7, *maculata* sp. n.; 8, *najas* (Hagen), paratype; 9, *castanea* sp. n.; 10, *bifasciata* sp. n.

***Adicella maculata* sp. n.**

(Text-figs. 7, 11-16)

Head fulvous, with yellowish pubescence. Antennae about two and a half times as long as fore wing, creamy white, with faint blackish annulations. Palpi with fulvous pubescence. Thorax fulvous, legs luteous. Fore wing densely clothed with pale golden pubescence, ornamented with spots and streaks of brown pubescence, the streaks forming a V about midway, its point directed apically. The brown pubescence borders the costa and at the apical margin encloses six pale yellow spots. Hind wing with sparse, fuscous pubescence. Venation much as in *A. reducta*, but in fore wing the discoidal cell is shorter and fork R_2 is longer than its footstalk. Apices of wings more pointed and hind wing is relatively broader.

♂ GENITALIA. Tenth segment fused to ninth, trilobed, the median lobe slender, digitate, shorter than the side lobes, which form a deep hood with an excised apex, the apices of the side lobes in side view rounded. Cerci short, ovate in side view, more strongly dilated on their inner sides in dorsal view. Aedeagus cylindrical, curved downwards and terminating in a bifid, membranous apex. Clasper from side with upper and lower margins slightly divergent, base constricted, concave on inner surface, upper apical angle produced in a flattened lobe, which is rounded in ventral view, digitate from side. Lower apical angle curved inwards to form a rounded hook.

♀ GENITALIA. Ninth segment moderately short, its apical dorsal margin produced in a short, bifid process. Ventral margin lightly sclerotized, somewhat obscure. Cerci short, stout, triangular in side view, broadly rounded in dorsal aspect. Lateral gonapophyses small, shorter than cerci, apical margin widely excavate in side view. Tenth segment forming a short, transparent hood, only slightly exceeding the cerci.

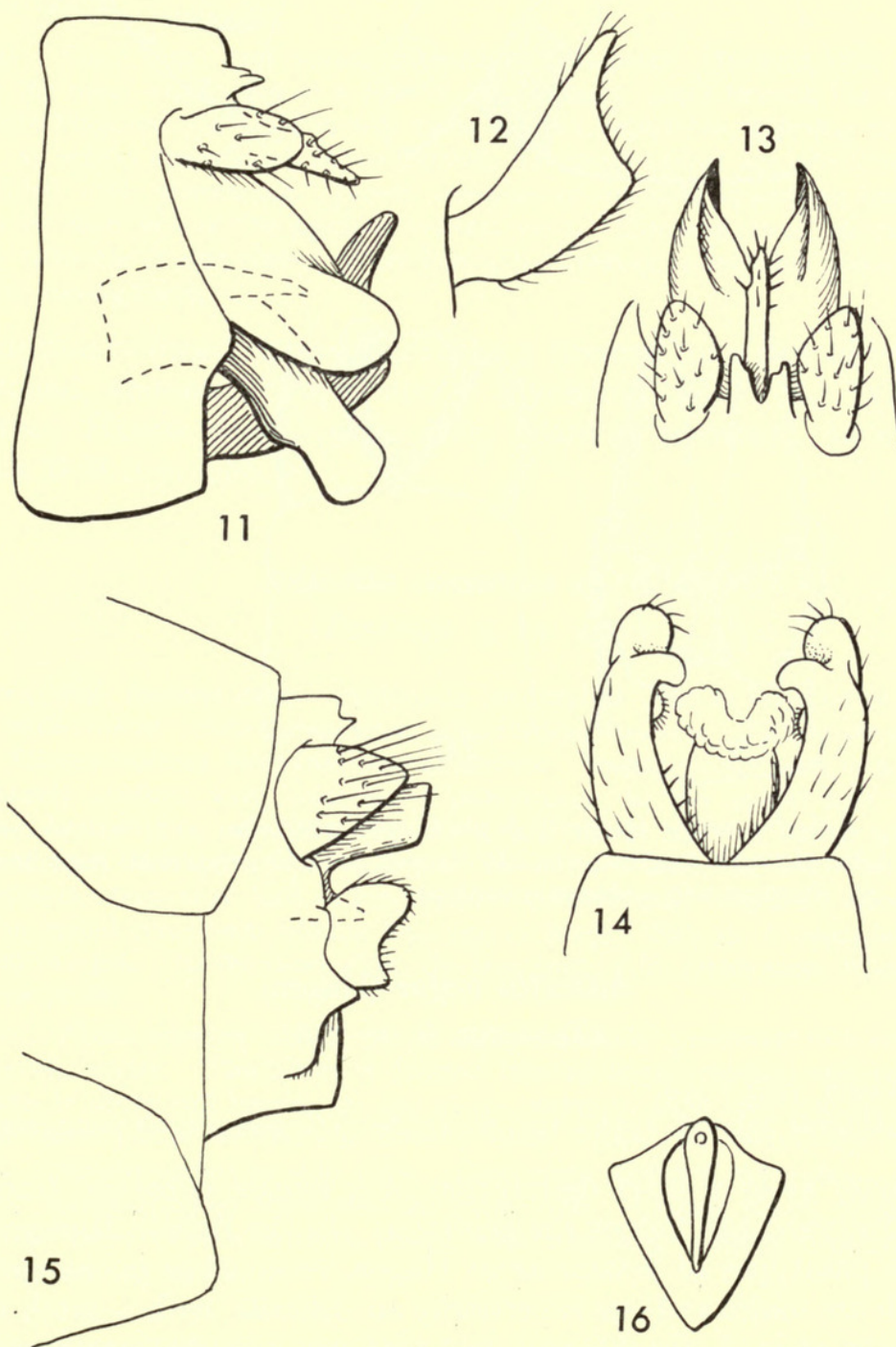
Length of fore wing, ♂, ♀, 5-7 mm.

Holotype ♂ (mounted as microscope preparations), INDIA : Assam, Khasi Hills (*McLachlan* collection), BMNH.

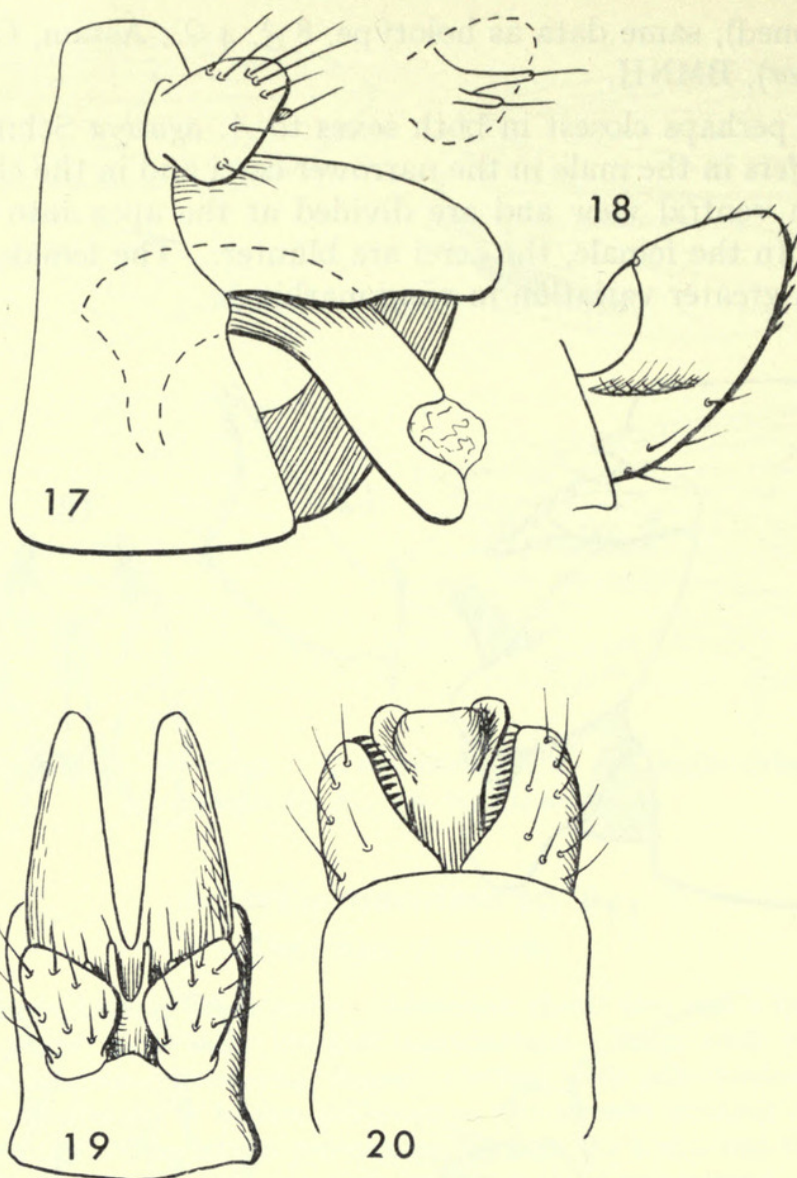
Allotype ♀ (pinned, abdomen in glycerine), same data as holotype, BMNH.

Paratypes (pinned), same data as holotype, 8 ♂, 4 ♀ ; Assam, Cherrapunji, 12 ♂, 4 ♀ (*native collector*), BMNH.

This species is perhaps closest in both sexes to *A. agastya* Schmid, from Ceylon, from which it differs in the male in the narrower cerci and in the claspers, which are more incurved in ventral view and are divided at the apex into upper and lower incurved lobes. In the female, the cerci are blunter. The females associated with the males show a greater variation in wing markings.



FIGS. 11-16. *Adicella maculata* sp. n., genitalia. 11, ♂ lateral ; 12, ♂ left clasper, lateral ; 13, ♂ ninth and tenth tergites, dorsal ; 14, ♂ claspers and aedeagus, ventral ; 15, ♀ lateral ; 16, ♀ vaginal structure, ventral.



FIGS. 17-20. *Adicella najas* (Hagen) ♂ paratype, genitalia. 17, lateral, with inset of median lobe of tenth tergite ; 18, left clasper, lateral ; 19, ninth and tenth tergites, dorsal ; 20, claspers and aedeagus, ventral.

***Adicella najas* (Hagen)**

(Text-figs. 8, 17-20)

Setodes najas Hagen, 1859 : 210.

Adicella najas (Hagen) Schmid, 1958 : 135, pl. 25, fig. 6 (♀ genitalia of paratype).

Schmid (1958) gives a brief description of a female paratype from the Hagen collection at Harvard and figures the genitalia. In the British Museum (Nat. Hist.) are two more paratypes of *Setodes najas* Hagen, received in exchange from Dr. N. Banks. Both are males and one is certainly an *Adicella*, with a patch of androconia in the hind wing as in *A. ino* (Hagen), but with genitalia distinct from that species. The other paratype is definitely not an *Adicella*, and is made the type of a new genus and species later in this paper.

This discovery rather confuses the position as to the identity of *S. najas* Hagen, a question which can only be resolved by a study of the remainder of the type series in Harvard and by the designation of a lectotype, if this has not already been done. In the meantime, one can only hope that the ♂ *Adicella* in the British Museum is conspecific with the female studied by Dr. Schmid and accept it as the male of *Adicella najas* (Hagen). The colour and markings of the fore wing agree reasonably with Schmid's brief description of the female of *najas*. The venation of the hind wing agrees with Schmid's figure of *A. ino*, but the patch of androconia is brown, not black.

♂ GENITALIA. Cerci short and broad, somewhat triangular. Median lobe of tenth tergite not exceeding the cerci, consisting of a pair of bifid fingers, inner branch the longer. Lateral lobes moderately long and spatulate in side view, convex exteriorly, tapering to rounded apices from above. Aedeagus cylindrical, down-curved, its upper apical angle excised in side view, the excision filled with membrane. Lower margins of excision diverging and appearing as rounded lobes on each side of the apex in ventral view. Claspers stout, short and upcurved, apex obliquely truncate in side view. From beneath, tapering to rounded apices, inner margins thickly set with strong teeth.

This description is based upon a paratype ♂ (pinned, one pair of wings mounted between celluloid, abdomen cleared and in glycerine), (M. C. Z.) Type No. 10982. Ceylon, Nietner, Hagen. *Setodes najas* Hag. (Banks's writing). In exchange from Dr. N. Banks, B.M.1931-280.

Adicella castanea sp. n.

(Text-figs. 9, 21-23)

Head fuscous, with fuscous hairs. Antennae incomplete, but at least twice as long as fore wing, clothed with creamy white pubescence, articulations fuscous. Palpi fulvous, with fuscous pubescence. Thorax fuscous, with fuscous pubescence. Legs fulvous, with creamy pubescence. Fore wing densely clothed with castaneous pubescence, in the apical half with indefinite, yellowish areas, and with a pale, longitudinal streak about midway along the costa. Hind wing sparsely clothed with golden pubescence. In the fore wing, the discoidal cell is about as long as its footstalk, more than half as long as the thyridial cell. Fork R_2 about as long as its footstalk. The apical cross-vein linking Cu_2 and A longer than in *A. maculata*, more or less parallel to wing margin. In the hind wing, the free part of R_5 arises more than its own length beyond the fork of R_s .

♂ GENITALIA. Ninth segment short, apical margin dorsally produced in a rounded lobe and fused to the tenth tergite. The latter is divided into an upper median and two lateral lobes. The median lobe is short and broad, excised at its centre to form two rounded, serrate plates. From beneath these plates extend the lateral lobes, linked by membrane basally, slightly incurved, their apices rounded in side view. Cerci long, slender, incurved. Aedeagus short, nearly straight, terminating in some inflated membrane. Clasper short, in side view angled upwards near the base. From beneath broad, with rounded, spatulate apices, inner margins armed with short, strong teeth.

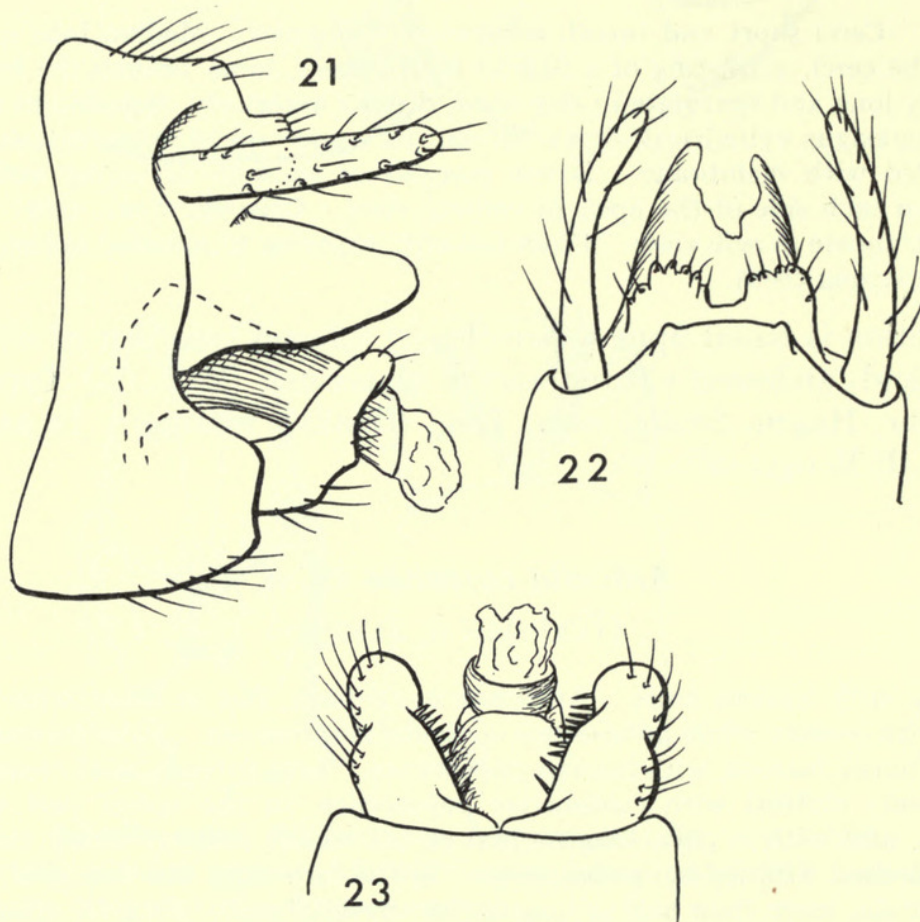
♀ Unknown.

Length of fore wing, ♂, 6 mm.

Holotype ♂ (pinned, one pair of wings and abdomen mounted as microscope preparations), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.

Paratype ♂ (pinned, abdomen in glycerine), Assam, Cherrapunji (*native collector*), BMNH.

This species appears to be most closely allied to *Adicella pulcherrima* Ulmer, from Java, Sumatra and New Guinea. Both have long, slender cerci and rather short, broad claspers. *A. castanea* has rather shorter and stouter cerci, and the median lobe of the tenth segment is more strongly developed. The apices of the claspers are rounded, not obliquely truncate, in ventral view.



FIGS. 21-23. *Adicella castanea* sp. n. ♂ genitalia. 21, lateral; 22, ninth and tenth tergites, dorsal; 23, claspers and aedeagus, ventral.

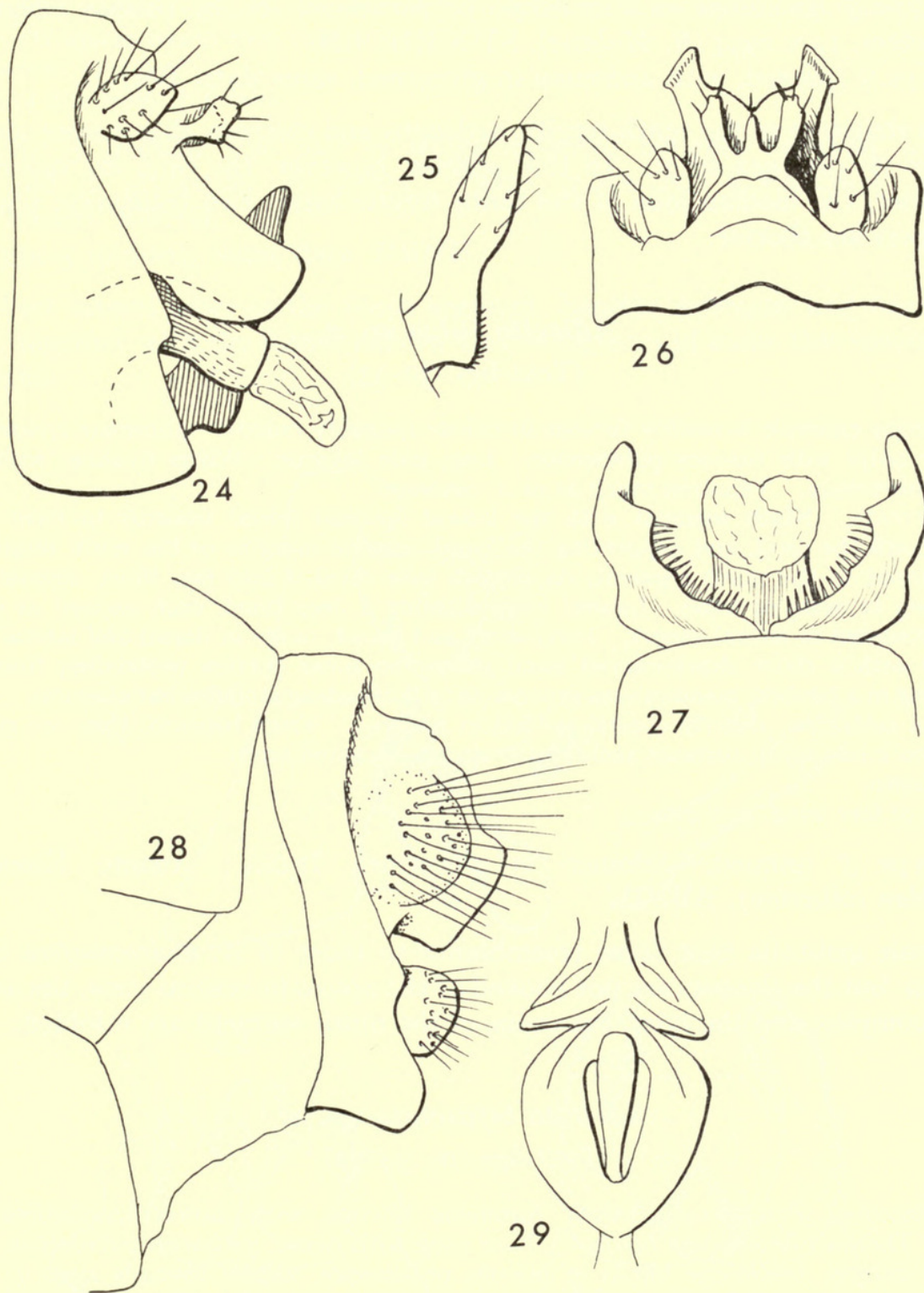
Adicella trifida sp. n.

(Text-figs. 24-29)

Specimens rather rubbed. Head tawny, with golden brown hairs. Basal segments of antennae tawny, segments of basal half creamy white, apices fuscous, which colour gradually predominates towards apex of antenna. Palpi tawny, with darker pubescence. Thorax tawny, with golden brown hairs. Legs luteous. Both wings with traces of golden brown pubescence.

♂ GENITALIA. Ninth segment produced dorsally at its centre and fused to the tenth segment. Cerci short, ovate. Median lobe of tenth segment trifid, a little longer than cercus, the median branch laterally compressed, shorter than lateral branches. In side view, the lateral branches are narrow basally, expanding into irregularly clavate apices. Lateral lobes of tenth tergite

fused to form a downwardly directed hood, excised at its apex in dorsal view, the arms of the excision obliquely truncate. Aedeagus short, cylindrical, arched downwards, with membrane extruded from apex. Clasper angled upwards at its base, with a triangular projection on lower margin at base in side view. From beneath, the claspers are divergent, curving inwards, inner margins fringed with stout teeth.



FIGS. 24-29. *Adicella trifida* sp. n. genitalia. 24, ♂ lateral ; 25, ♂ left clasper, lateral ; 26, ♂ ninth and tenth tergites, dorsal ; 27, ♂ claspers and aedeagus, ventral ; 28, ♀ lateral ; 29, ♀ vaginal structure, ventral.

♀ GENITALIA. Ninth tergite with lower angles produced downwards on each side, in lateral aspect appearing synscleritous, ninth sternite membranous. Lateral gonapophyses small, rounded. Tenth segment fused to ninth, cerci appearing as low convex mounds, with long setae.

Length of fore wing, ♂, 7.5 mm., ♀, 8 mm.

Holotype ♂ (mounted as microscope preparations), N. E. BURMA : Kambaiti, 2,000 metres, 12.v.1934 (*R. Malaise*), STOCKHOLM.

Allotype ♀ (pinned, with abdomen in glycerine), same data, BMNH.

In the structure of the tenth tergite, aedeagus and claspers, this species somewhat resembles *A. castanea* sp. n. In that species, however, the cerci are much longer and slender, the median lobe of the tenth tergite forms two transverse plates and the claspers are shorter.

Adicella fulva sp. n.

(Text-figs. 30-33)

The unique example is mainly fulvous in colour (possibly faded). Antennae creamy white. Maxillary palpi with fuscous pubescence. Legs pale luteous. Wings hyaline, with sparse, fuscous pubescence. Venation much as in *A. castanea*.

♂ GENITALIA. Ninth segment with the lateral margins folded inwards to form rounded lobes beneath the cerci, and supporting the basal, ventral margins of the tenth tergite. The latter is fused to the ninth segment, its median lobe divided into two short, slender fingers, terminating in pairs of setae. Lateral lobes forming a deep hood, each excised at its apex, which is rounded in lateral aspect. Cerci short and broad, ovate in dorsal and lateral aspects. Aedeagus with a short, down-curved basal sleeve, an inner portion protruding from it and terminating in a bilobed, membranous process (details of aedeagus somewhat obscure). Claspers straight in side view, slightly constricted about midway. From beneath, they are gently in-curved, the inner apical surfaces armed with strong, socketed teeth.

♀ Unknown.

Length of fore wing, ♂, 5 mm.

Holotype ♂ (pinned, abdomen in glycerine), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.

The male genitalia bear some resemblance to those of *A. androconifera* Schmid, from Iran, but the claspers are not hooked at the apices in ventral view, the aedeagus is more complex and the lateral margins of the ninth segment are infolded.

Adicella bifasciata sp. n.

(Text-figs. 10, 34-37)

Head fuscous, with fulvous hairs. Antennae fulvous, with darker annulations. Palpi fulvous. Thorax fuscous, legs fulvous. Fore wing with dense, yellowish pubescence, marked with two narrow, transverse bands of fuscous pubescence, angled towards apex of wing at their centres, and with fuscous marginal spots in the apical cells. Hind wing with sparse, fuscous pubescence. The hind wing is definitely narrower than the fore wing.

♂ GENITALIA. Ninth segment with ventral apical margin produced in two small, triangular teeth, with a shallow excision between them. Cerci short, narrowly ovate. Tenth tergite

fused to ninth segment, median lobe reduced to a pair of short, slender fingers. Lateral lobes very short, ovate from the side, incurved, with acute apices in dorsal aspect. Aedeagus with a short, slightly curved basal sleeve. Inner portion extruded in holotype, narrowly ligulate, with a clavate apex when seen from behind, narrow, with a hooked apex in side view. From its ventral surface near the base arises a membranous sac, bearing short teeth. Clasper in side view short, directed upwards and sinuous. From behind, the claspers are broader, incurved, with truncate apices armed with teeth.

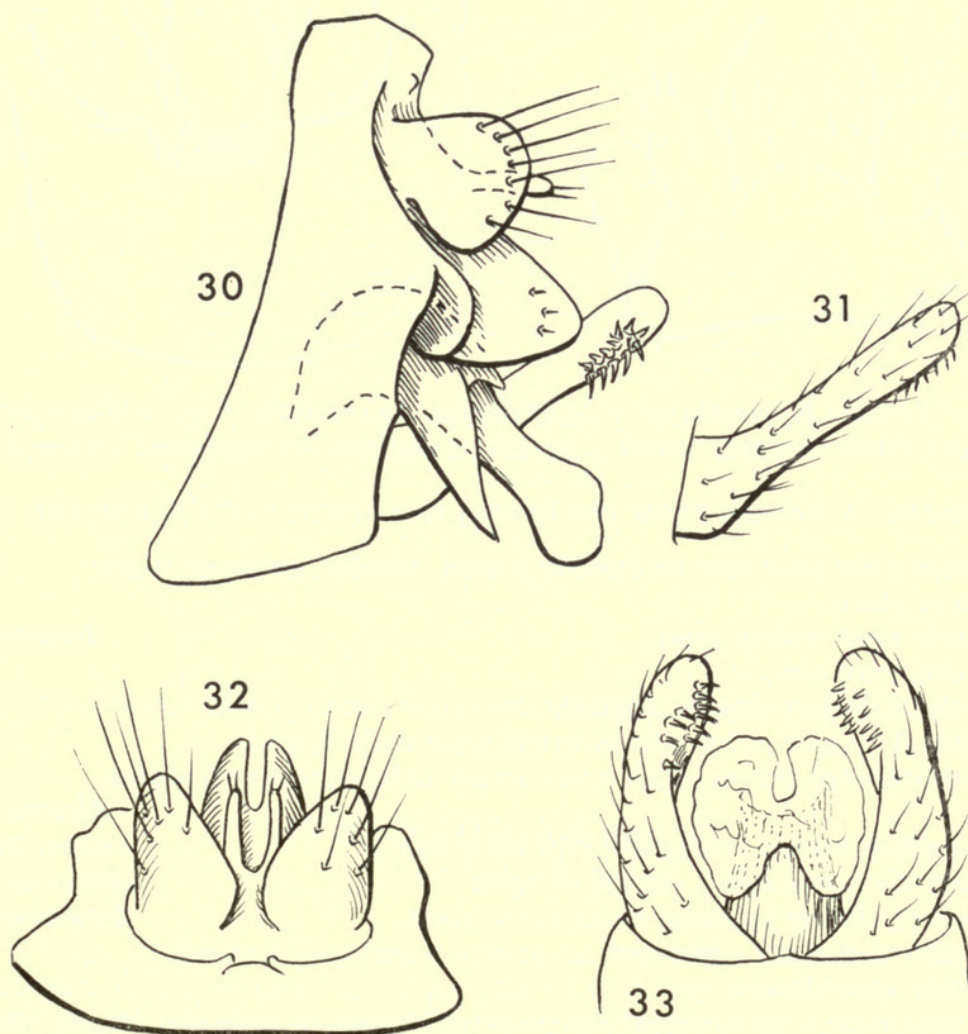
♀ Unknown.

Length of fore wing, ♂, 6 mm.

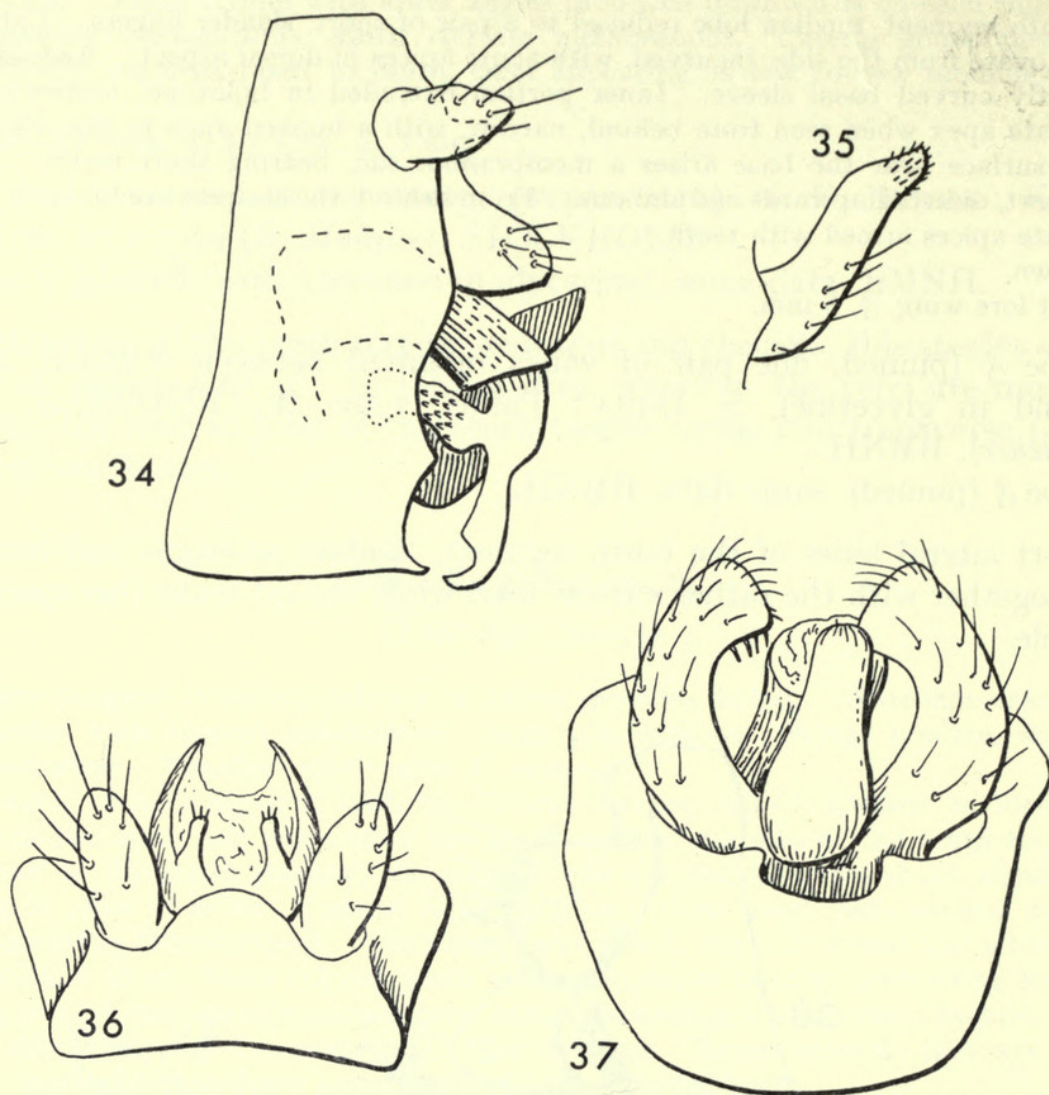
Holotype ♂ (pinned, one pair of wings mounted between celluloid, abdomen cleared and in glycerine), S. INDIA : Palnis, 7,000 ft., Kodaikanal, viii.1921 (*T. B. Fletcher*). BMNH.

Paratype ♂ (pinned), same data, BMNH.

The short lateral lobes of the tenth segment, ligulate aedeagus and form of the claspers, together with the rather narrow hind wing, should make this species easily recognisable.



FIGS. 30-33. *Adicella fulva* sp. n. ♂ genitalia. 30, lateral ; 31, left clasper, lateral ; 32, ninth and tenth tergites, dorsal ; 33, claspers and aedeagus, ventral.

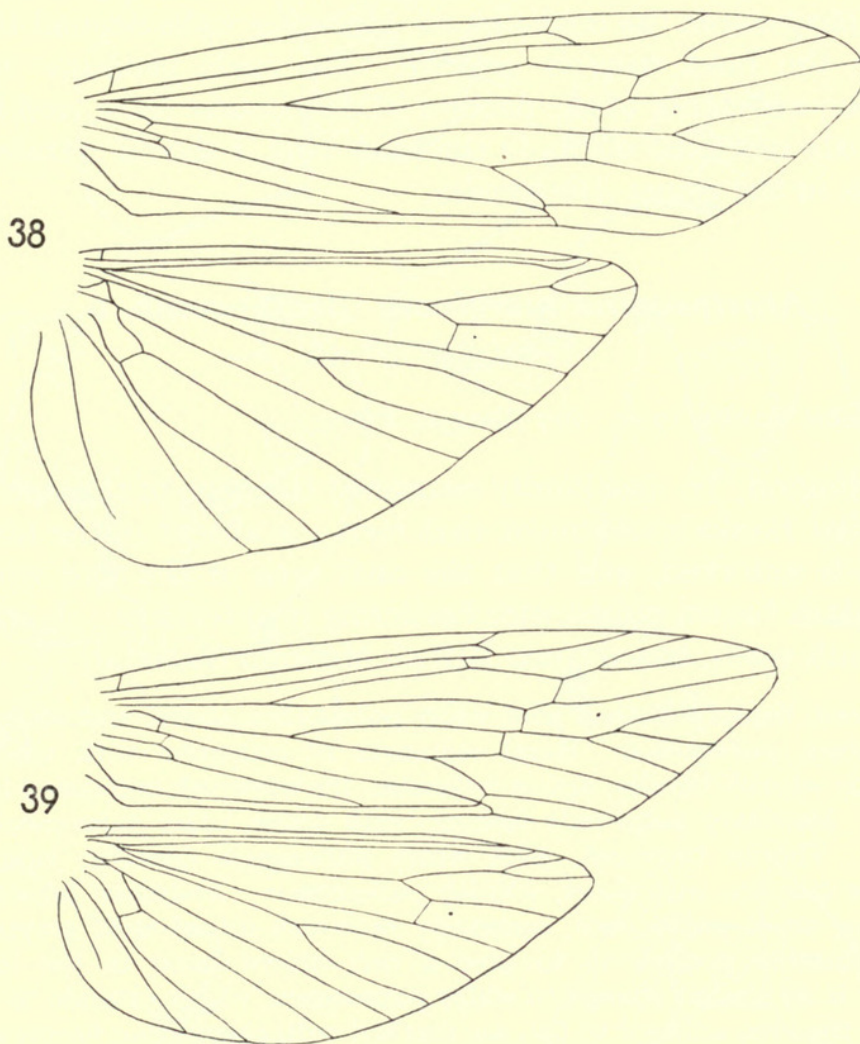


FIGS. 34-37. *Adicella bifasciata* sp. n. ♂ genitalia. 34, lateral ; 35, left clasper, lateral ; 36, ninth and tenth tergites, dorsal ; 37, ninth segment, claspers and aedeagus, ventral.

KEY TO MALES OF *Adicella* FROM THE INDIAN SUB-CONTINENT, CEYLON AND BURMA

1	Clasper in side view produced at apex in a long, slender, recurved finger	<i>ino</i> (Hagen)	
-	Clasper not as above		2
2	Clasper in side view widely bifid	<i>biramosa</i> group	3
-	Clasper in side view simple		6
3	Basal branch of clasper slender, digitate		4
-	Basal branch of clasper not much narrower than main branch		2
4	Fore wing ochraceous yellow, with a few small, indistinct brown marks	<i>dharasena</i> Schmid	
-	Fore wing reddish brown, margined with brownish	<i>narendraya</i> Schmid	
5	Basal branch of clasper stout, obtuse at apex	<i>dhruvasena</i> Schmid	
-	Basal branch of clasper tapering to an acute apex	<i>biramosa</i> Martynov	
6	Clasper in side view short and stout		7
-	Clasper in side view slender		9
7	Clasper in side view with upper apical angle produced in a slender finger, forming a rounded lobe in ventral view, lower apical angle also produced inwards in a rounded lobe	<i>maculata</i> sp. n.	
-	Clasper in side view stout, upcurved, apex obliquely truncate		8

8	Posterior wing with an elongate area of androconia in cubito-anal area	<i>najas</i> (Hagen)
–	Posterior wing without androconia	<i>agastya</i> Schmid
9	Cerci long, slender	<i>castanea</i> sp. n.
–	Cerci short	10
10	Lateral lobes of tenth tergite much longer than cerci	<i>trifida</i> sp. n.
–	Lateral lobes of tenth tergite only slightly longer than cerci	11
11	Cerci in side view clavate	<i>fulva</i> sp. n.
–	Cerci in side view ovate	<i>bifasciata</i> sp. n.



FIGS. 38–39. *Athripsodina marginata* (Banks), wings. 38, ♂ ; 39, ♀.

***ATHRIPSODINA* gen. n.**

(Text-figs. 38–39)

♂. Spurs 2, 2, 2. Antenna about twice as long as fore wing. Maxillary palpus with basal segment short, second about three times as long as first, third four-fifths as long as second, fourth slightly longer, and fifth slightly shorter, than third. Fore wing about four times as long as wide, apex acutely rounded. Discoidal cell nearly twice as long as thyridial cell, nearly three times as long as its footstalk. Forks R_2 and Cu_{1a} present, the former with a long footstalk. M in hind wing unforked.

♀. Antenna about one and a half times as long as fore wing. Fork M_1 present in fore wing, discoidal cell only one and a half times as long as thyridial cell. M in hind wing unforked.

Type-species, *Leptocerus marginatus* Banks, 1911.

Athripsodina is closely related to *Athripsodes* Billberg, in having fork M_1 present in the female fore wing, but differing in having M in the hind wing unforked in both sexes, as in *Ptochoecetis* Ulmer and *Parasetodes* McLachlan. In *Ptochoecetis* the media in the fore wing forks at the anastomosis and fork R_2 in the hind wing is wanting. In *Athripsodina* the media in the fore wing forks beyond the anastomosis and fork R_2 in the hind wing is present. The male genitalia of *Athripsodina marginata* (Banks) are rather of the pattern of *Athripsodes fulva*, and had it not been for the consistently unforked media in the hind wing, I should certainly have placed *marginata* Banks in the genus *Athripsodes*.

***Athripsodina marginata* (Banks) comb. n.**
(Text-figs. 38-45)

Leptocerus marginatus Banks, 1911 : 105 (Bengal, Pusa).

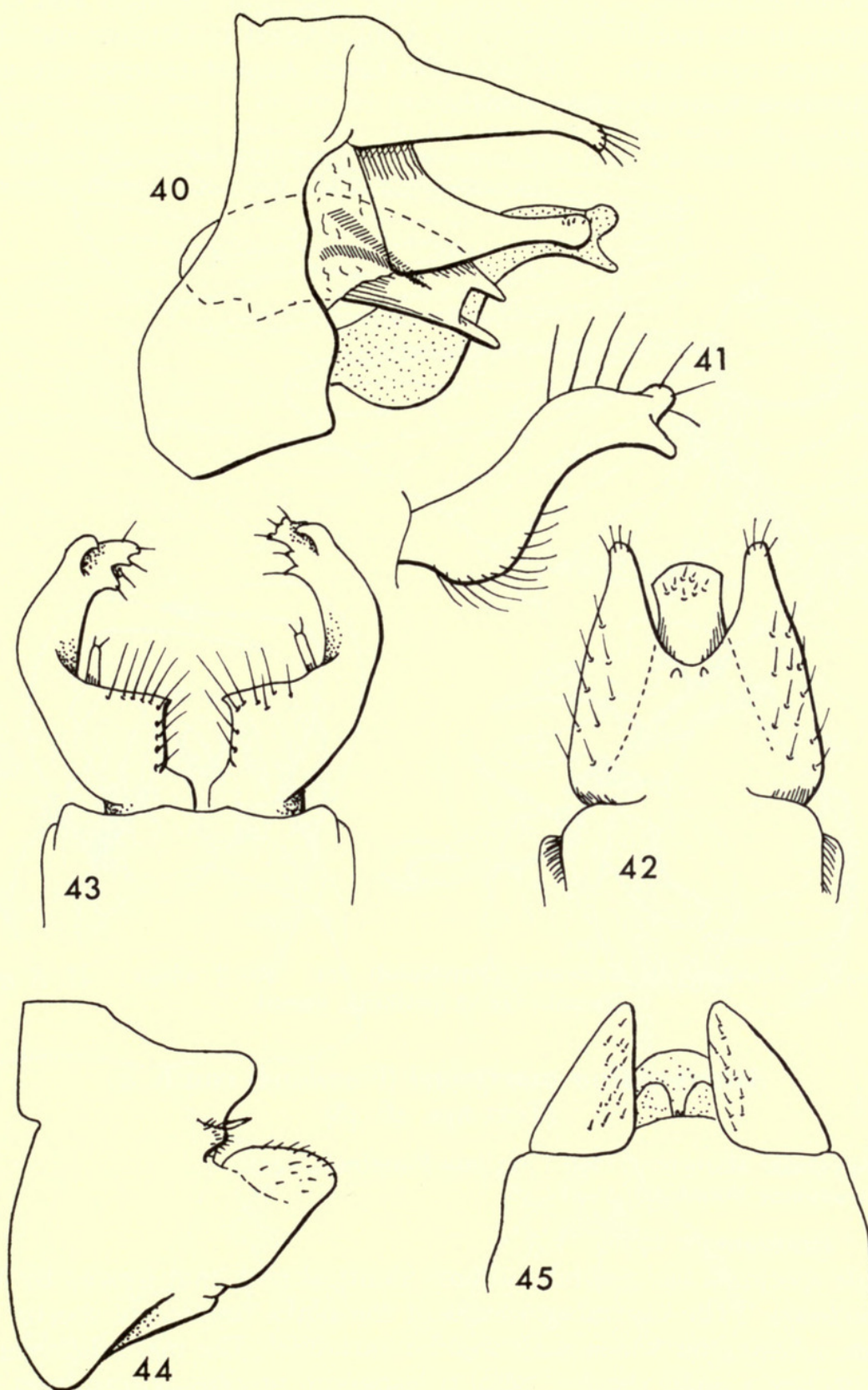
Dr. P. J. Darlington, Jr., has kindly examined the type of this species for me and has confirmed that Banks's statement that fork 3 is absent in the hind wing means that the media is unforked, and that the anal area of the fore wing is white, in contrast to the dark brown pubescence bordering it anteriorly. I am giving a full description of both sexes, based upon British Museum material.

Head warm brown, densely clothed with white pubescence above, and on frons with whitish and yellowish brown pubescence. Basal segments of antennae with whitish pubescence, remaining segments whitish basally, apices brownish, the brownish increasing in length towards apex of antenna. Maxillary palpi pale fuscous, with dense, paler pubescence, segments four and five flexible. Thorax brownish, with white pubescence dorsally, sides pale yellowish brown. Legs pale fuscous, with short, whitish pubescence. Abdomen brownish. Fore wing clothed with dense, short pubescence, anteriorly brownish mixed with greyish, the brownish gradually predominating posteriorly to give a rich brown band in the intercubital area. Beyond Cu_2 there is an abrupt change to white pubescence, which extends to the anal margin. The main veins in the area anterior to Cu_2 are marked with alternating brown and grey streaks, the latter the longer. Hind wing hyaline, with very sparse pubescence.

♂ GENITALIA. Cerci fused with ninth segment to form a broad hood, its apical margin with a deep, U-shaped excision. Tenth tergite sub-triangular in dorsal view, its apex slightly dilated and convex. In side view, it is deep basally, tapering to a slender, slightly clavate apex. Aedeagus short and stout, upper and lower apical margins produced in slender fingers. Within the aedeagus are two short spines. The clasper in side view is curved sinuously upward and then caudad, terminating in a bifid apex. From beneath, the claspers form a pair of calipers, each with a wide, triangular projection on the inner, basal margin, and with a slender, digitate process about midway, directed caudad. Lower apical process short and curved, upper larger and irregularly dentate.

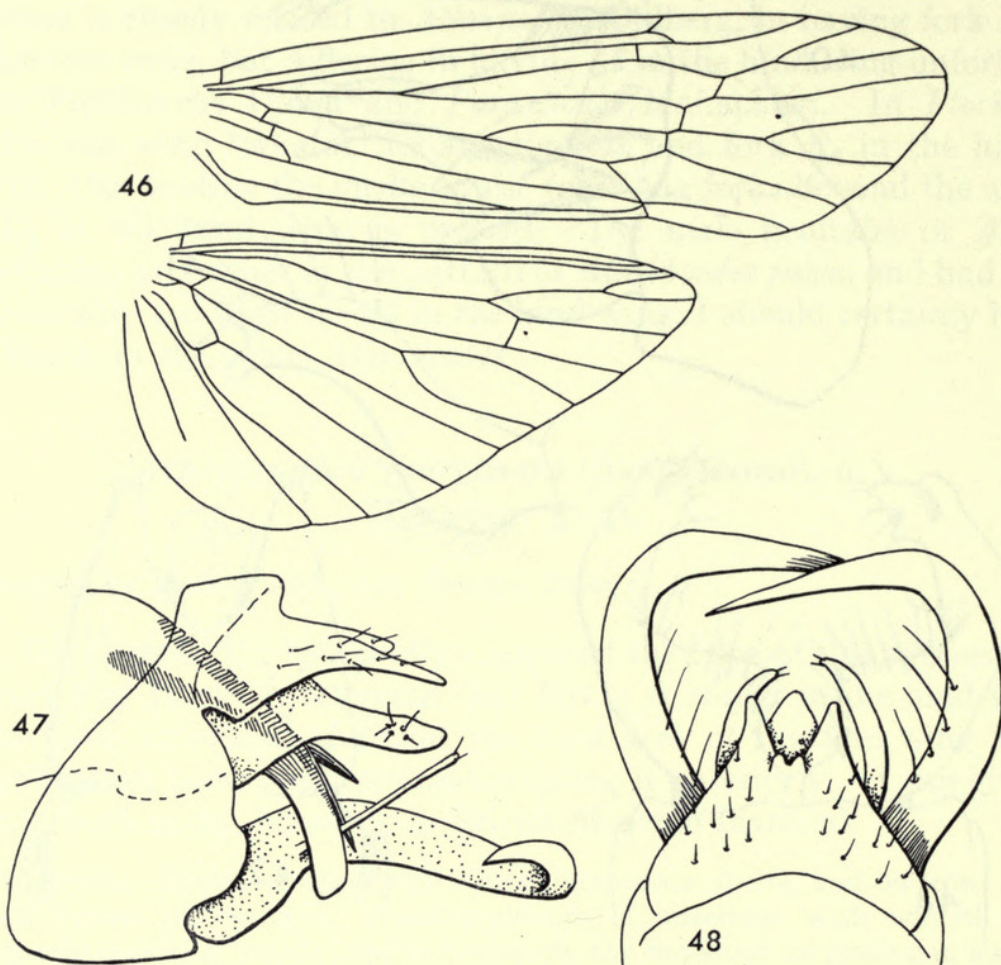
♀ GENITALIA. Ninth and tenth segments fused, dorsal apical margin of the tenth projecting as a rounded knob with, beneath it, a thin, transverse, bilobed plate. Lateral gonapophyses ovate in side view, triangular from beneath.

Length of fore wing, ♂, 8-11 mm., ♀, 6-10 mm.



FIGS. 40-45. *Athripsodina marginata* (Banks), genitalia. 40, ♂ lateral ; 41, ♂ left clasper, lateral ; 42, ♂ ninth and tenth tergites, dorsal ; 43, ♂ claspers, ventral ; 44, ♀ lateral ; 45, ♀ ventral.

The material examined is from Pusa, Bihar (the type locality) and consists of 5 ♂, 9 ♀, taken in the months February to April, August to October and December, during the years 1910-1916. The examples taken August-October are noticeably smaller than those taken in other months.



FIGS. 46-48. *Athripsodina martynovi* (Forsslund) var. 46, ♂ wings ; 47, ♂ genitalia, lateral ; 48, ♂ genitalia, dorsal.

***Athripsodina martynovi* (Forsslund) comb. n.**
(Text-figs. 46-48)

Leptocerus forcipatus Martynov, 1936 : 253 (nec Forsslund, 1935).

Leptocerus martynovi Forsslund, 1940 : 48.

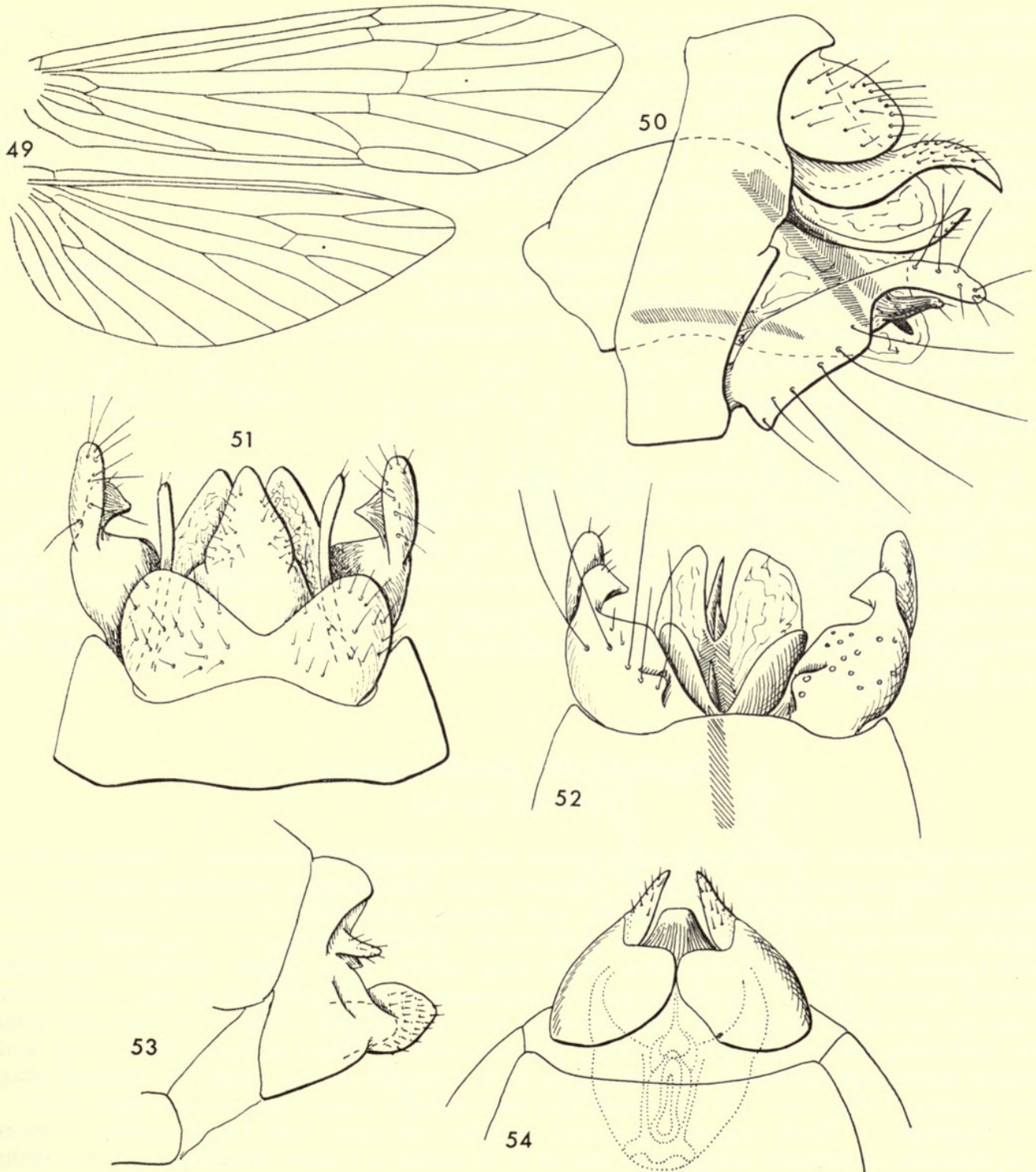
CEYLON : Bintenne, x.1928. 1 ♂.

The single specimen has genitalia almost identical with that figured by Martynov for his *forcipatus*. The central processes of the ninth tergite are shorter than the lateral ones, a character which may well be variable. The main difference is that each clasper has a long, slender, semi-transparent process arising from the inner surface near the base. This is not shown in Martynov's figure, but may have been overlooked. Martynov makes no mention of the unforked media in the hind wing, but it seems unlikely that such similar male genitalia could have evolved independently in what are otherwise distinct genera.

***Athripsodes unguifera* sp. n.**

(Text-figs. 49-54)

The specimens have been in alcohol for nearly thirty years and are now a uniform, reddish brown colour, wings sparsely pubescent. In the fore wing of the male, the radial sector and the media fork at about the same level, roughly one-third from the base of the wing. In the female fore wing there is the usual additional apical cell.



FIGS. 49-54. *Athripsodes unguifera* sp. n. 49, ♂ wings ; 50, ♂ genitalia, lateral ; 51, ♂ dorsal ; 52, ♂ claspers and aedeagus, ventral ; 53, ♀ genitalia, lateral ; 54, ♀ ventral.

♂ GENITALIA. Ninth segment rather short, its apical dorsal margin produced at its centre in a shallow, convex lobe. Tenth tergite trifid, its median lobe broadly triangular in dorsal view, sides gently sinuous. From the side, it tapers sinuously to an acute apex, resembling a talon. The lateral lobes of the tenth tergite are slender, nearly as long as median lobe, slightly upcurved and acute, appearing to arise from the lateral margins of the ninth segment. Cerci fused at their inner basal angles, forming a transverse plate or hood, with a wide, V-shaped excision. The aedeagus is stout, subcylindrical, its lower apical margin with a deep, V-shaped excision. The aedeagus encloses membrane and three stout spines. Claspers in shape resembling those of *A. alboguttata*, rather stouter at base, particularly in ventral view. The hinged apical branch is produced mesally at its apex in an acute triangle.

♀ GENITALIA. Ninth tergite moderately produced at centre of its apical margin, the sides produced downwards and then mesally to form two thin, rounded lobes, meeting ventrally. Lateral gonapophyses short, foliate. Between them and projecting beyond the produced margins of the ninth tergite is a short, triangular subgenital plate, with a truncate apex. Tenth segment membranous, cerci short and tapering to acute apices.

Length of fore wing, ♂, 7 mm., ♀, 6.5 mm.

Holotype ♂ (mounted as microscope preparations), N. E. BURMA : Kambaiti, 6,700 ft., 12.vii.1934 (*R. Malaise*), STOCKHOLM.

Allotype ♀ (mounted as microscope preparations), same data, BMNH.

Paratypes, same locality, 6-7,000 ft., 1934 ; 4.iv., 12 ♂, 5 ♀ ; 30.iv., 5 ♂, 14 ♀ ; 11.v., 4 ♂, 4 ♀ ; 12.v., 9 ♂, 8 ♀ ; 23.v., 1 ♂ ; 7-9.vi., 7 ♂, 6 ♀ ; 12.vii., 5 ♀ (*R. Malaise*), STOCKHOLM, BMNH.

In the possession of slender lateral lobes to the tenth tergite and in the partly fused cerci, this species resembles *A. ensifera* (Martynov), from the Amur region. The latter species also has stout spines in the aedeagus, although only two. The ventral margin of the ninth sternite in *ungulifera* is not produced in slender rods, the claspers are stouter basally, with differently formed apical branches, the median lobe of the tenth tergite is broader basally and more sinuous in side view and the cerci are broader.

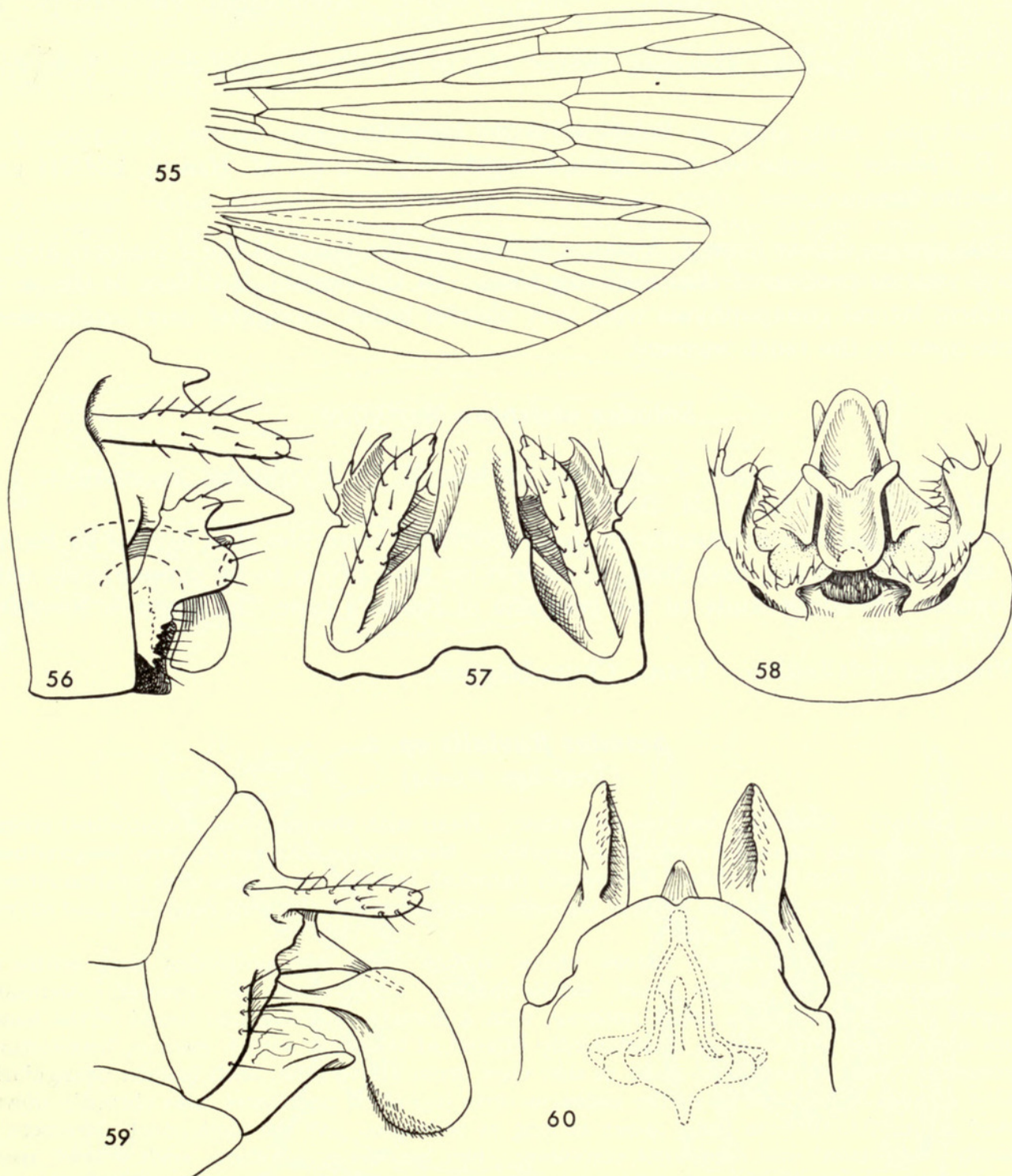
Tagalopsyche fletcheri sp. n.

(Text-figs. 55-60)

Head dark brown, with fuscous setae, mixed with fine, golden pubescence. Antennae about twice as long as fore wing, two basal segments with fuscous setae, remaining segments pale chocolate. Maxillary palpi long, fuscous, with fuscous pubescence, articulations marked with whitish pubescence. Thorax fuscous, with sparse, golden pubescence. Legs pale fuscous, with fuscous and whitish pubescence. Fore wing narrow, apex acutely rounded, membrane fuscous, densely clothed with short, fuscous pubescence, intermingled with golden, which forms vague patches in the apical half. The veins are also speckled with white pubescence and along the anal veins are several tufts of erect, piceous setae. Fringes piceous. Hind wing with fuscous membrane and sparse, fuscous pubescence, denser along the veins. In the hind wing, the so-called "false vein" (*MP* of Martynov) before *Cu*₁ is rather more evident than usual.

♂ GENITALIA. Ninth segment narrowed dorsally and fused with tenth tergite. Viewed from beneath, the ventral margin is produced at its centre in a short, transverse process, wider at its apex, the apical margin with a wide and shallow, V-shaped excision. Seen from behind, this process is also produced dorsally, so that it forms a triangle with rounded angles and a concave centre, the whole heavily pigmented. Tenth tergite forming a deep, triangular hood,

with a pair of blunt processes on its dorsal surface near the base. Cerci about as long as tenth tergite, slender, digitate, slightly incurved. Aedeagus short, strongly arched downwards and with the lateral margins beyond midway produced upwards and outwards in triangular lobes. Clasper arising from a narrow base, thin and foliate, its upper angle clavate in side view, with an excised apex, upper margin incurved and serrate along its dorsal margin. Lower angle of clasper extended inwards, parallel to margin of ninth segment, its apical margin produced in small papillae or teeth, each terminating in a seta.



FIGS. 55-60. *Tagalopsyche fletcheri* sp. n. 55, ♂ wings ; 56, ♂ genitalia, lateral ; 57, ♂ ninth and tenth tergites, dorsal ; 58, ♂ ninth segment, claspers and aedeagus from below and behind ; 59, ♀ genitalia, lateral ; 60, ♀ ventral.

♀ GENITALIA. Cerci about as long as ninth segment, slender, digitate. Tenth segment fused to ninth, extending as a narrow, triangular plate or hood, thin and transparent, nearly as long as cerci, with a triangular projection on each side at the base. Lateral gonapophyses with very slender, short bases, apices somewhat reniform in side view, directed downwards, concave internally, lower margins setose.

Length of fore wing, ♂, 7–8 mm., ♀, 8 mm.

Holotype ♂ (pinned), INDIA : Palnis, 7,000 ft., Kodaikanal, viii.1921 (*T. B. Fletcher*), BMNH.

Allotype ♀ (pinned, abdomen cleared and in glycerine), same data as holotype, BMNH.

Paratypes, same data as holotype, 6 ♂ ; same locality, 21.viii, 9.ix.1929, 2 ♂ (*T. B. Fletcher*) ; same locality, 23–24.iii.1936, 16 ♂, 2 ♀ (*G. M. Henry*), BMNH and Colombo Museum.

This species differs from *T. brunnea* (Ulmer) in the shape of the ♂ claspers and in the ♂ ventral process of the ninth segment. In the female, it differs in the more reniform lateral gonapophyses with very slender bases, straighter cerci and a more acute apex to the tenth segment.

Setodes unispina Martynov

N. BURMA : Washaung, c. 200 m., 20 km. E. of Myitkyina, 14.vii.1934, 4 ♂ (*R. Malaise*), STOCKHOLM, BMNH.

Such wing pattern as remains on these specimens resembles that figured by Banks for his *Setodes lineata*, and Martynov's species may prove to be synonymous with *S. lineata*. Pending study of the genitalia of Banks's type, the name *S. unispina* should be used.

Previous distribution. INDIA, Chota Nagpur.

Setodes fluvialis sp. n.

(Text-figs. 61–64)

♂ (in alcohol). General colour tawny yellow. Head with three narrow, longitudinal stripes of silvery, scale-like hairs. Antennae incomplete. Mesonotum with two narrow, longitudinal, silvery stripes. Fore wing almost completely denuded, but the membrane with hyaline streaks and scattered silvery, scale-like hairs in the cells, suggesting that the wing originally had silvery streaks.

♀ GENITALIA. Ninth tergite narrow above, with a small lobe projecting from centre of apical margin. Tenth tergite short, saddle-shaped. Cerci short and slender. Aedeagus abruptly arched downwards about midway, with a dorsal projection just basad of the bend. From above, this projection is rhomboidally dilated at its apex, with a median, longitudinal depression. Apex of aedeagus acute in side view, from above bifid, each branch triangularly dilated at apex. At the base of the aedeagus arise two stout parameres, also abruptly downturned at one fourth from base, about as long as aedeagus. At the angle, each paramere is laterally compressed and somewhat convolute, then becoming spiniform, with a bifid apex. Clasper with a long, slender ventral branch and a stout, bifid upper branch. The uppermost of the two forks is incurved, with serrate margins.

♀ Unknown.

Length of fore wing, ♂, 6 mm.

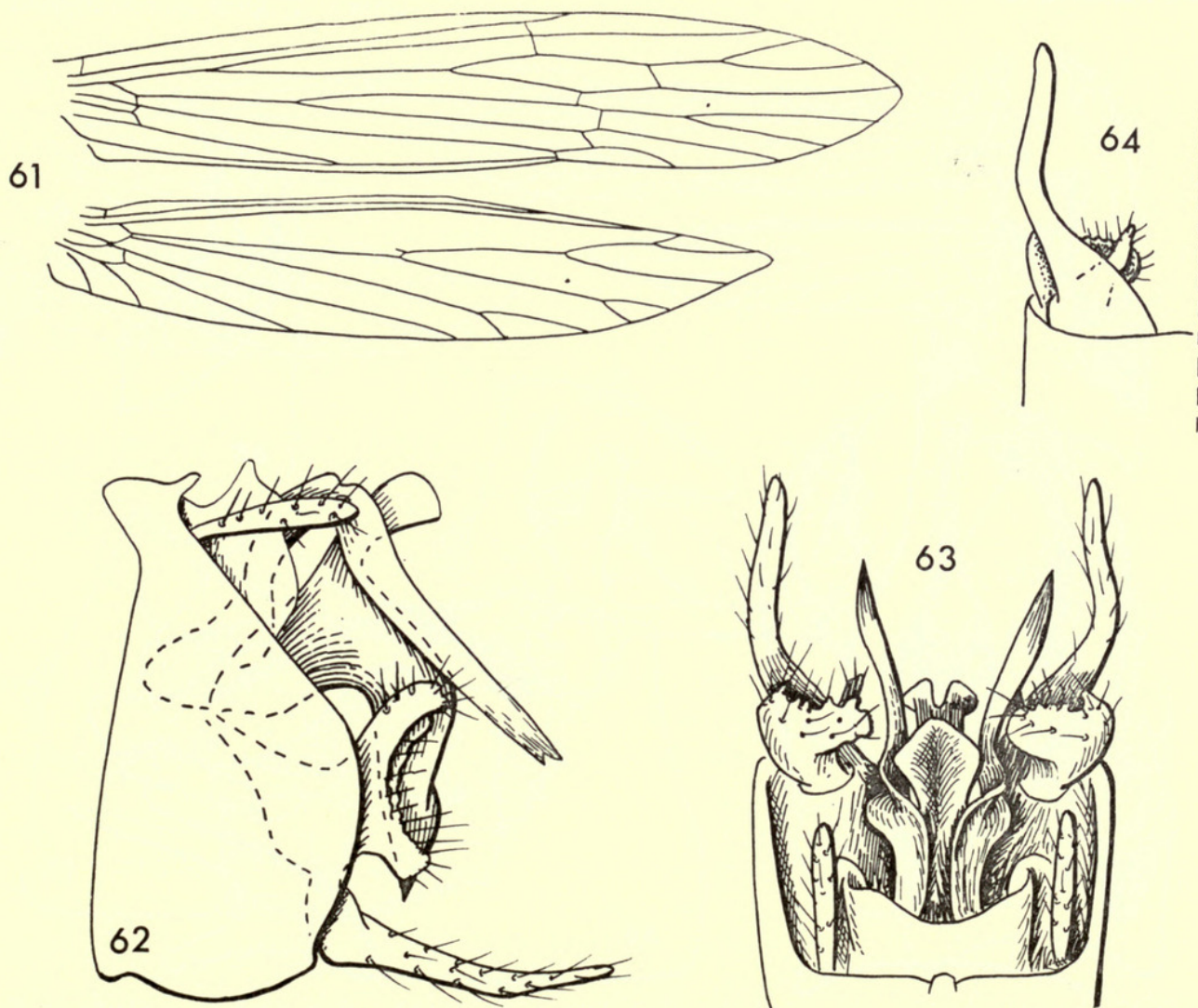
Holotype ♂ (mounted as microscope preparations), N. BURMA : Waingmaw, 175 m., near Myitkyina, 15.iii.1934 (*R. Malaise*), STOCKHOLM.

In male genitalia, this species recalls *S. iris* Hagen, from Ceylon, and the wings are probably similarly streaked with white on a gold ground. *S. fluvialis* has a similar short, arched tenth tergite and slender cerci, strongly arched aedeagus and parameres. The aedeagus and parameres are, however, relatively shorter and the claspers are differently formed. Both species have a long, slender ventral branch to the clasper, but the two separate upper branches of *iris* are, in *fluvialis*, fused into a bifid branch.

***Setodes exposita* sp. n.**

(Text-figs. 65–68)

♂ (pinned, rather rubbed). Head fulvous, with sparse, golden hairs. Antennae fulvous (incomplete). Palpi fulvous. Thorax fulvous, legs luteous. Wings hyaline, much denuded, fore wing with traces of pale golden pubescence and about six small patches of fuscous pubescence in the costal area. Hind wing with *Rs* obsolete from the base of the discoidal cell, fork *R*₂ wanting.



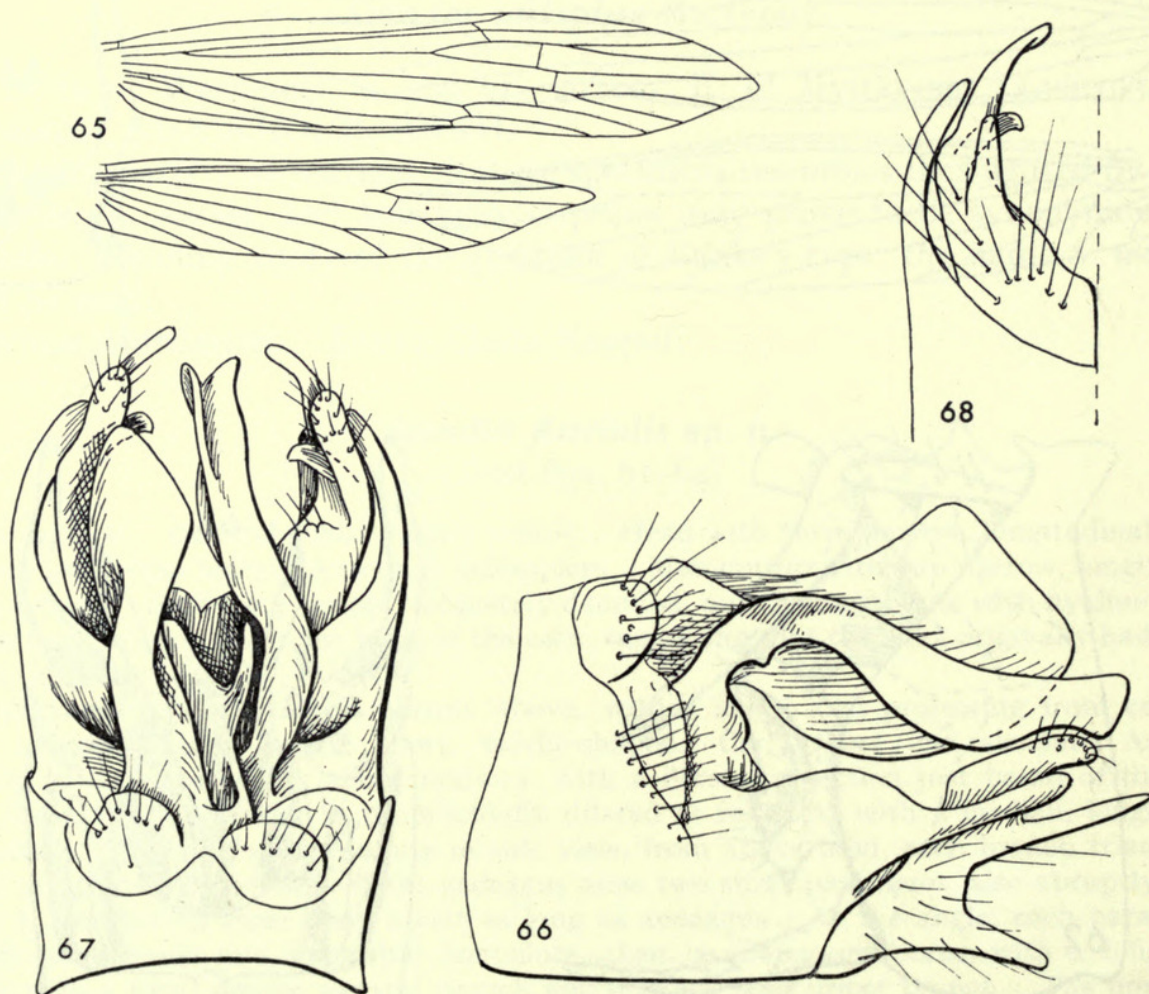
FIGS. 61–64. *Setodes fluvialis* sp. n. ♂. 61, wings ; 62, genitalia, lateral ; 63, dorsal ; 64, left clasper, ventral.

♂ GENITALIA. Ninth segment long ventrally, short dorsally. Lateral margins in the lower half produced distally in a long, slender finger, extending outside and almost to the apex of the clasper. The base of this process is extended mesally to the base of the aedeagus. Cerci reduced to two rounded, flattened plates. Beyond them extends the tenth tergite, very asymmetric, the right-hand side forming a large plate, set on edge, clavate apically, reaching almost to the apex of the aedeagus. The left side of the tenth tergite forms a small, apically directed hook or spine. The whole tergite tends to be displaced to the right side of the abdomen and beneath it is the aedeagus, which is somewhat to the left of the median line. In side view, the aedeagus is narrow basally, sinuous, slightly dilated before the apex, which is truncate. From above, the apical half has a median, longitudinal groove. Claspers with a common basal apodeme, dividing into four apical branches. The uppermost is sausage-shaped and below it at its base is a hinged, claw-like branch, hidden in side view by the spiniform process of the ninth segment. The third and longest branch is blade-like, slightly incurved and separated by a wide excision from the fourth branch, directed caudad.

♀ Unknown.

Length of fore wing, ♂, 8 mm.

Holotype ♂, in alcohol, (one pair of wings and abdomen mounted as microscope preparations), N. E. BURMA: Kambaiti, 2,000 m., 15.v.1934 (R. Malaise), STOCKHOLM.



FIGS. 65-68. *Setodes exposita* sp. n. ♂. 65, wings; 66, genitalia, lateral; 67, dorsal; 68, left clasper, ventral.

The large, asymmetric tenth tergite and the complex claspers of the male should make this species easily recognisable.

***Setodes argentivaria* sp. n.**

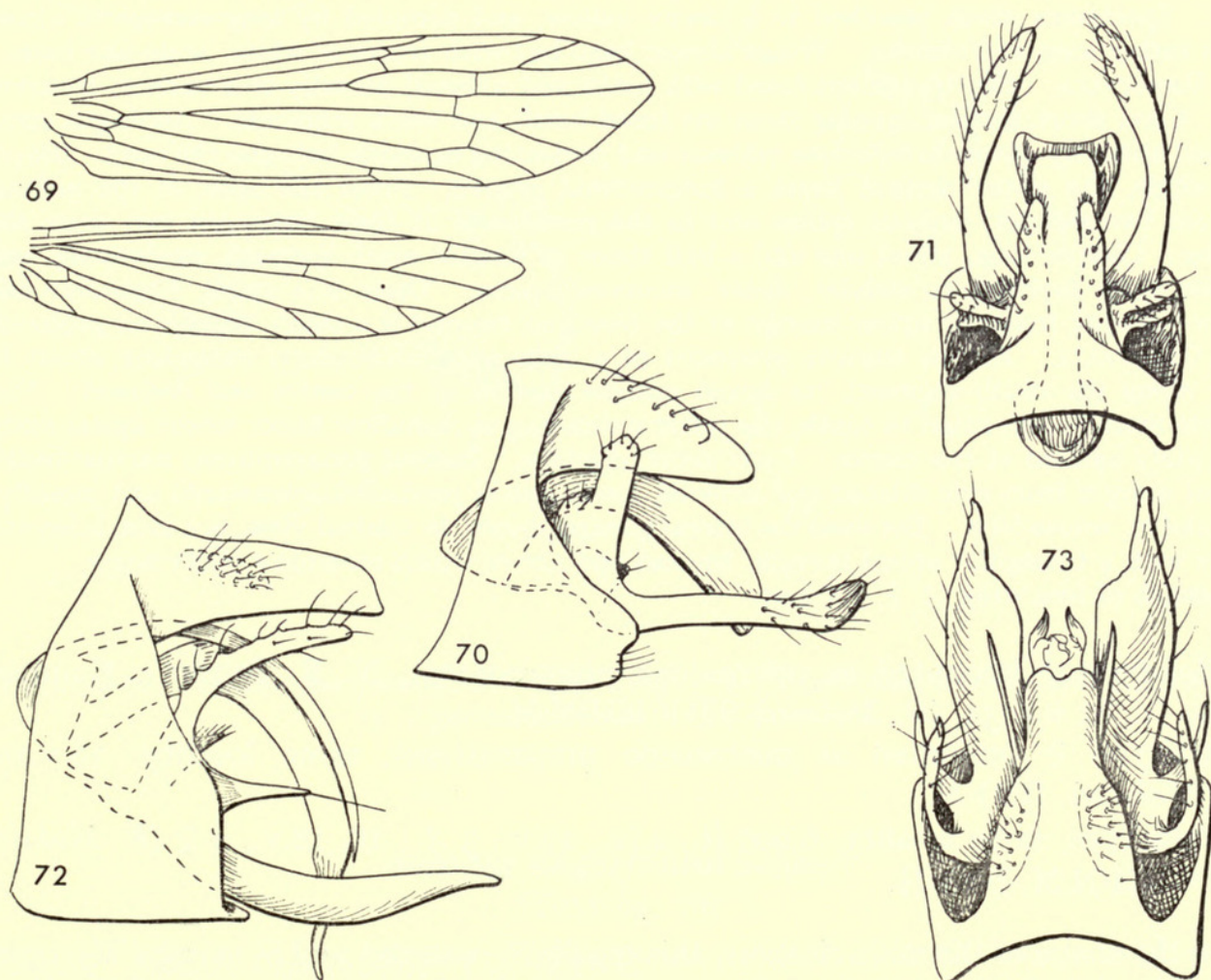
(Text-figs. 69-71)

♂ (in alcohol). General colour pale tawny yellow. Antennae faintly annulated with fuscous. Legs pale yellowish. Fore wing with fairly dense, golden yellow pubescence, speckled with darker yellow along the costa and with numerous silvery spots. Hind wing with sparse, yellowish pubescence. Wings less narrow than in *S. fluvialis* and *S. exposita*, with broader apical forks. *Rs* in fore wing arising at level of medio-cubital fork.

♂ GENITALIA. Ninth segment dorsally very short, its ventral apical margin slightly produced at centre. Tenth tergite fused to ninth, forming an elongate hood. In side view it tapers to a rounded apex, from above truncate. Cerci partly fused to tenth tergite, apices digitate in dorsal aspect. Aedeagus arched in side view, apex trough-shaped from above. Clasper long, slender, slightly incurved, with a stout basal branch, which is directed upwards. From above, the apex of the basal branch is broad, forming a transverse ridge.

♀ Unknown.

Length of fore wing, ♂, 4 mm.



FIGS. 69-73. *Setodes* spp. 69-71, *S. argentivaria* sp. n. ♂. 69, wings; 70, genitalia, lateral; 71, dorsal; 72-73, *S. argentifera* McLachlan, genitalia of ♂ type. 72, lateral; 73, dorsal.

Holotype ♂ (mounted as microscope preparations), S. SHAN STATES : Shwenyang, N. end of Lake Inle, 900 m., 26.viii.1934 (*R. Malaise*), STOCKHOLM.

Paratypes (in alcohol), same date, 26 ♂, STOCKHOLM, BMNH.

This species recalls *S. argentifera* McL. (Text-figs. 72–73), with its silvery spots on the fore wing. It is however much smaller and the male genitalia, although similar, differ considerably in detail. The tenth tergite is produced in a hood in both species but in *argentivaria*, the cerci are less reduced, and there are no parameres. The lower branch is narrower in dorsal view and the basal branch more compact. Figures of the genitalia of the type of *argentifera* are given for comparison.

***Setodes forcipata* sp. n.**

(Text-figs. 74–78)

♂. Specimens much bleached to a tawny yellow, and denuded by long storage in alcohol. Legs rather long and slender. Wings almost bare but with traces of white, scale-like hairs.

♂ GENITALIA. Ninth segment fused with tenth and reduced dorsally to a narrow, transverse rib. Cerci short, slender, arising from the fused ninth and tenth segments. Aedeagus strong, arched abruptly downwards before midway and projecting upwards between the cerci. Beyond the angle, the upper surface bears a longitudinal groove. From the apex of the aedeagus project two slender, sinuous spines and in the membrane at their bases are two more short spines. Clasper long, about one and a half times as long as ninth segment, moderately broad at the base, tapering to slender, acute, incurved apices. There is a small, finger-like basal branch arising from the upper margin at the base and beyond it a small, triangular projection.

♀ GENITALIA. Eighth sternite produced in a large subgenital plate, extending about half way along the ninth segment, its apical margin excised at the centre and deflexed. Ninth tergite more or less fused to tenth, the latter extending as a shallow hood, whose apical margin is acutely excised at the centre. Cerci short, digitate. Lateral gonapophyses narrow basally, apical margin from side dilated and sinuous, lower apical produced downwards and mesally in a rounded, setose lobe. Between the lateral gonapophyses, in ventral view, is a thin, sclerotized plate with a triangular apical margin, beyond and above which extends a short finger.

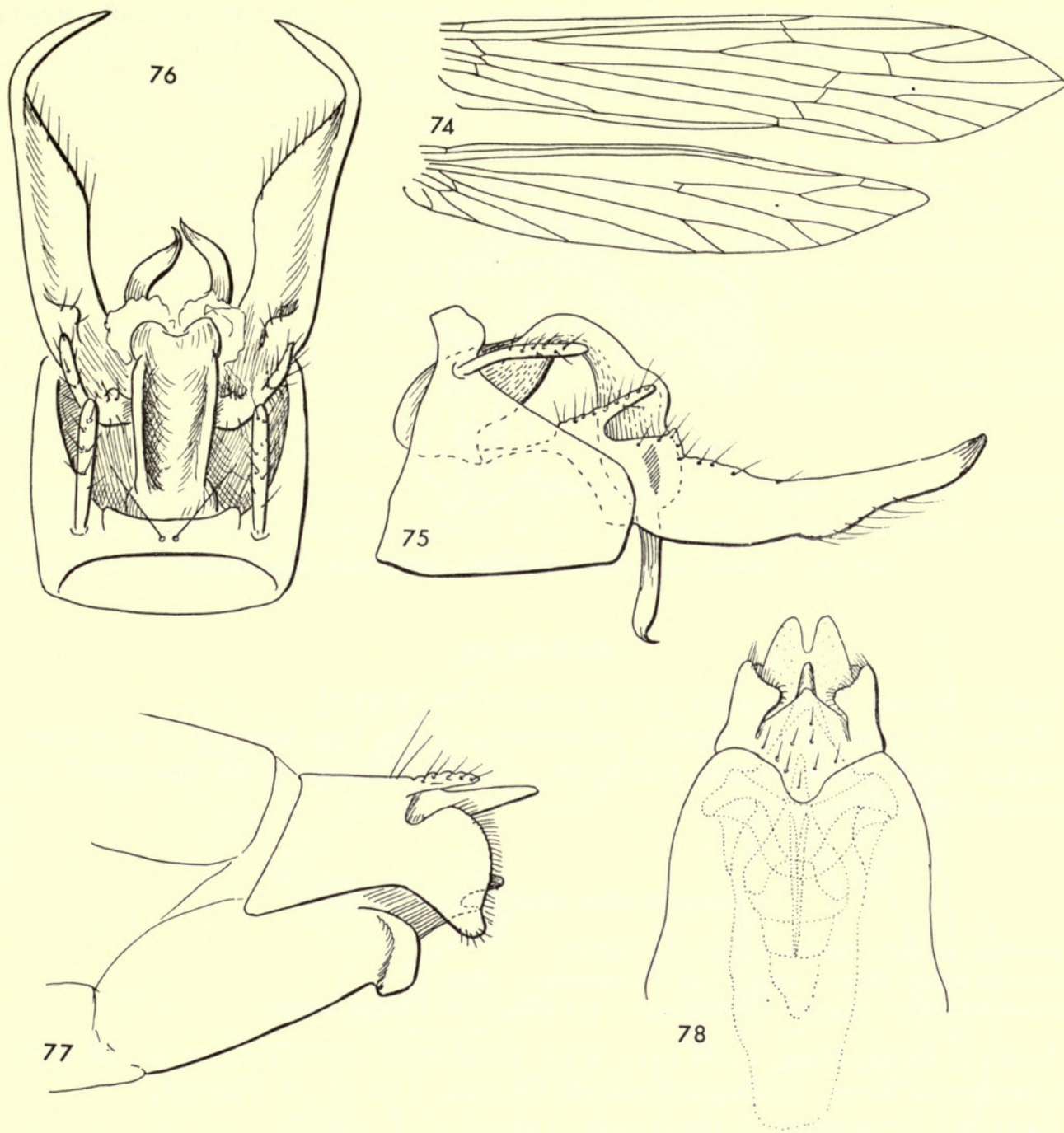
Length of fore wing, ♂, ♀, 5.5 mm.

Holotype ♂ (mounted as microscope preparations), N. E. BURMA : Kambaiti, 7,000 ft., 11.v.1934, (*R. Malaise*) STOCKHOLM.

Allotype ♀ (mounted as microscope preparations), same locality, 18.v.1934 (*R. Malaise*), BMNH.

Paratypes, same locality, 6,000 ft., 4.iv., 17.v., 3 ♂ ; 16, 18.v., 2 ♀ (*R. Malaise*), STOCKHOLM, BMNH.

In the shape of the male claspers, this recalls *S. crossotus* and *S. moselyi* Martynov, from the Amur region, but it differs from them in the less developed tenth tergite and in the shape of the aedeagus. The latter somewhat resembles the structure figured by Martynov as the tenth tergite in *S. amurensis*.



FIGS. 74-78. *Setodes forcipata* sp. n. 74, ♂ wings ; 75, ♂ genitalia, lateral ; 76, ♂ dorsal ; 77, ♀ genitalia, lateral ; 78, ♂ ventral.

***Setodes nagarjouna* Schmid**
(Text-fig. 79)

INDIA : Assam, Cherrapunji, 1 ♂, BMNH.

The male genitalia of this example differ slightly from the figure given by Schmid (1961 : pl. 18, fig. 1). The processes of the tenth tergite are stouter basally and then more suddenly constricted ; the ventral branch of the clasper is more curved

caudad. In view of the limited material available to me, and the difference in locality, it is proposed to consider the Assam male as no more than a variety.

Previous distribution. PAKISTAN : N.W. Frontier Province, Balakot.

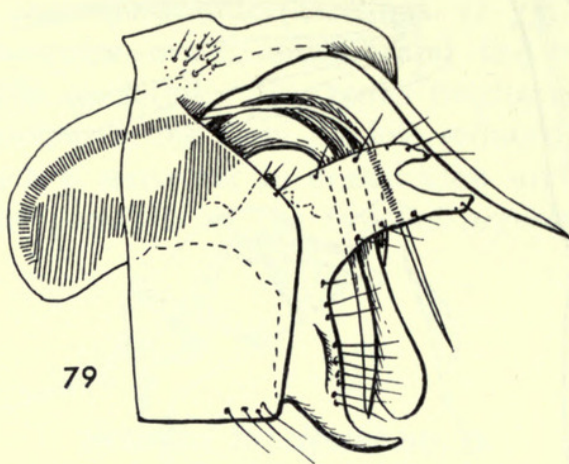


FIG. 79. *Setodes nagarjouna* Schmid, var., ♂ genitalia, lateral.

Setodes sp.

INDIA : Assam, Cherrapunji, 3 ♀ (2 incomplete), BMNH.

These examples have yellowish pubescence on the fore wing, with a pattern of elongate, snow-white streaks and spots. In the absence of an associated male, they are left undetermined.

Parasetodes maculata (Banks)

Leptocella maculata Banks, 1911 : 104 (India).

Leptocella bakeri Banks, 1914 : 177 (Philippines). **Syn. n.**

Parasetodes bakeri (Banks) Ulmer, 1951 : 415 (Sumatra, Ceylon, India).

INDIA : Bihar, Pusa, 23.vii.1924, 9 ex. (*Mukerjee*), 23.vii.1913, 2 ex. (*R.M.P.*) ; Brahmaputra River, Goalundi-Gauhati, vii.1919, 2 ex. (*T. B. Fletcher*).

CEYLON : Peradeniya, ii, iii, vi.1911, 3 ex. (*J. C. F. Fryer*).

BURMA : 1899 (*McLachlan collection*), 1 ex. ; Prome, 18.ii.1918, 1 ex. (*A. G. R.*), all above in BMNH.

Also recorded from MALAYA and SIAM.

Mystacides khasica sp. n.

(Text-figs. 80-83)

Head piceous, antennae with basal segments pale reddish brown, remaining segments luteous, more or less annulated with fuscous. Palpi piceous, with dense, reddish black pubescence. Thorax piceous, legs fuscous, with paler pubescence. Wing membrane fuscous, with a metallic sheen. Anterior wing with dense, coppery brown pubescence, arranged in three transverse bands, one near the base, one about mid-way, across the base of the discoidal cell and the third

at the apex. The dense pubescence also extends along the costal area. Between these bands the membrane exhibits the iridescent metallic sheen. Posterior wing with sparse, coppery brown pubescence.

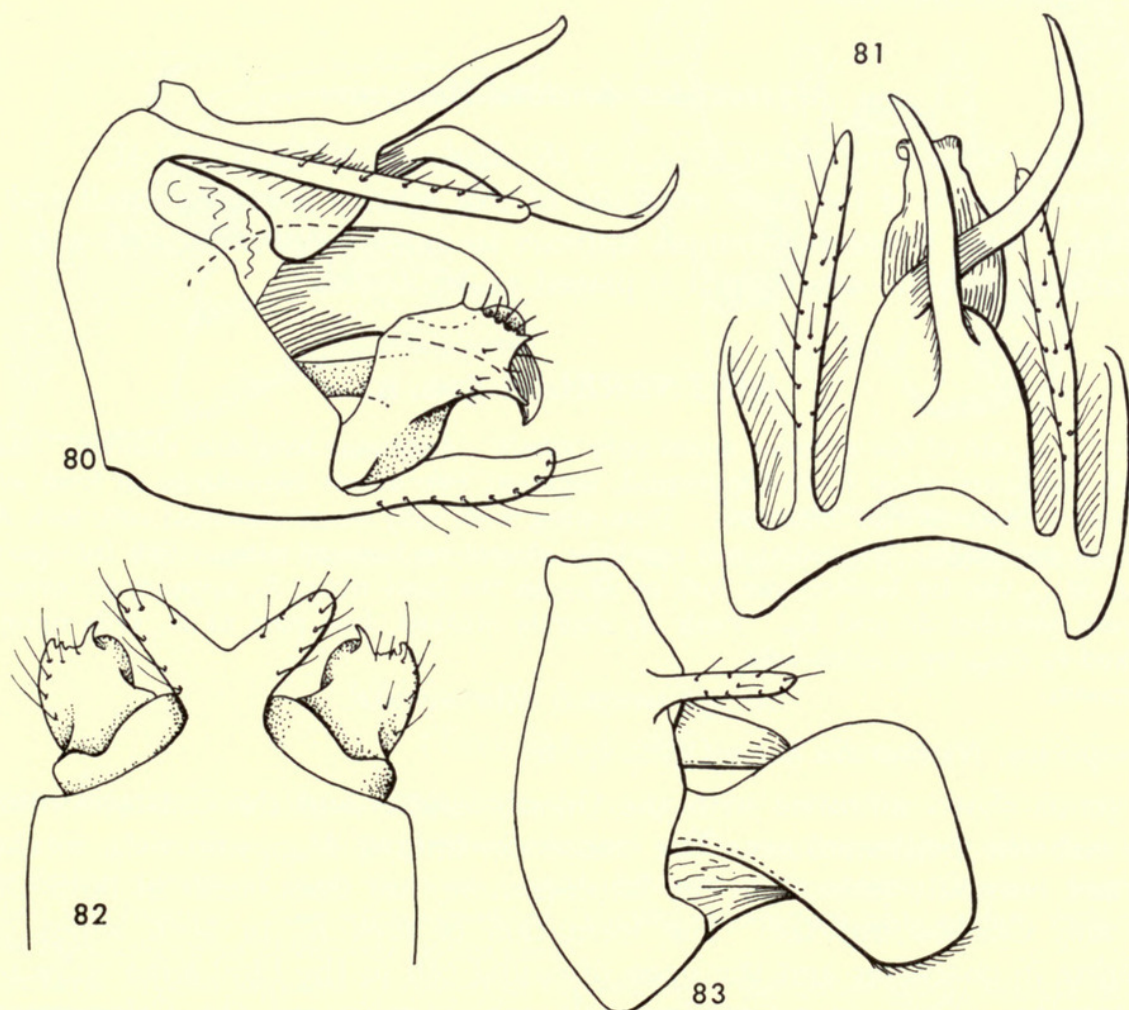
♂ GENITALIA. Ninth segment narrowed dorsally and from its apical margin arises a pair of long, slender cerci, one on each side of the tenth tergite. Ventral margin of the ninth segment produced at its centre in a bifid process, the arms of which diverge approximately at right angles to each other. Tenth tergite produced in a pair of asymmetric spines, the right spine the longer, sinuous and passing beneath the left. Aedeagus stout, curving downwards and in side view tapering to an acute apex. Claspers with inner basal margins fused and hinged to base of aedeagus. In side view they are somewhat clavate apically, the lower margin before the apex produced in a short spine. The apex of the clasper is grooved, the outer lateral margin being finely serrate and the inner forming a rounded lobe.

♀ GENITALIA. Of the general pattern of *M. azurea*, but the lateral gonapophyses are roughly triangular rather than quadrangular, the anterior and posterior margins not being parallel and the base is relatively narrower.

Length of fore wing, ♂, ♀, 8 mm.

Holotype ♂ (pinned), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.

Allotype ♀ (pinned, abdomen cleared and in glycerine), INDIA : Khasi, 5,000ft., Shillong, 25.v.1928 (*T. B. Fletcher*), BMNH.



FIGS. 80-83. *Mystacides khasica* sp. n. genitalia. 80, ♂ lateral ; 81, ♂ ninth and tenth tergites, dorsal ; 82, ♂ ninth segment and claspers, ventral ; 83, ♀ genitalia, lateral.

Paratypes (pinned), INDIA : Khasi Hills, 6 ♂, 5 ♀ (*McLachlan collection*) ; Khasis, 5,000 ft., Shillong, i.vi.1924, 7.ix.1927, 11.vi.1928, 2 ♂, 1 ♀ (*T. B. Fletcher*), 10.v.1924, 2 ♂ (*B. B. Bose*), v.1929, 1 ♂ (*D. P. Singh*) ; Shillong, 31.v.1918, 1 ♂, 1 ♀ (*V. P. Rao*) ; Shillong, iii.1893, 1 ♂ ; Assam, Cherrapunji (*native collector*), 1 ♀ : Bhimtal, 4,500 ft., 3.x.1922, 1 ♀ (*T. B. Fletcher*), BMNH.

This species is closely related in genital structure to *Mystacides azurea* (L.) and to *M. indica* Martynov (W. Himalayas). From *M. azurea* the male differs in the longer, more slender processes of the tenth tergite and in the form of the claspers. Both have the apex of the latter divided into an inner and an outer lobe, but *khasica* has the ventral margin of the outer lobe below the apex produced into an acute, incurved hook, and the ventral margin near the base is not so strongly produced in an acute process. *M. indica* apparently does not have the apex of the clasper divided into inner and outer lobes, but the ventral margin below the apex is strongly produced in a curved spine. The ventral process of the ninth segment is less deeply excised. *M. dentata* Martynov carries the development of the subapical spine on the ventral margin to a much greater degree. *M. dentata*, *indica* and *khasica* may possibly prove to be sub-species of *M. azurea*, but the first two species were based on rather limited material.

Mystacides dentata Martynov

N. BURMA : Washaung, 16.iii.1934, 1 ♂ (*R. Malaise*), STOCKHOLM.

Martynov's figure of the male genitalia of this species is rather small and badly reproduced. This Burmese example appears to agree reasonably well with it and on the limited material available it is placed as *M. dentata*.

NIETNERELLA gen. n.

Spurs 2, 4, 4, one of the anterior spurs very small. Antennae long and slender. Maxillary palpi with segments three to five subequal, segment two about two-thirds as long as three, segment one a little shorter than two. Fore wing with very short discoidal cell, fork R_2 with a very short footstalk. Thyridial cell reaching almost to base of wing. The free part of R_5 falls upon M_{1+2} shortly beyond the fork of M . In the hind wing, R_1 appears to terminate in a cross-vein between Sc and R_2 . Fork R_2 shortly stalked, free part of R_5 falls upon M_{1+2} . M_{3+4} linked to Cu_{1a} by a cross-vein.

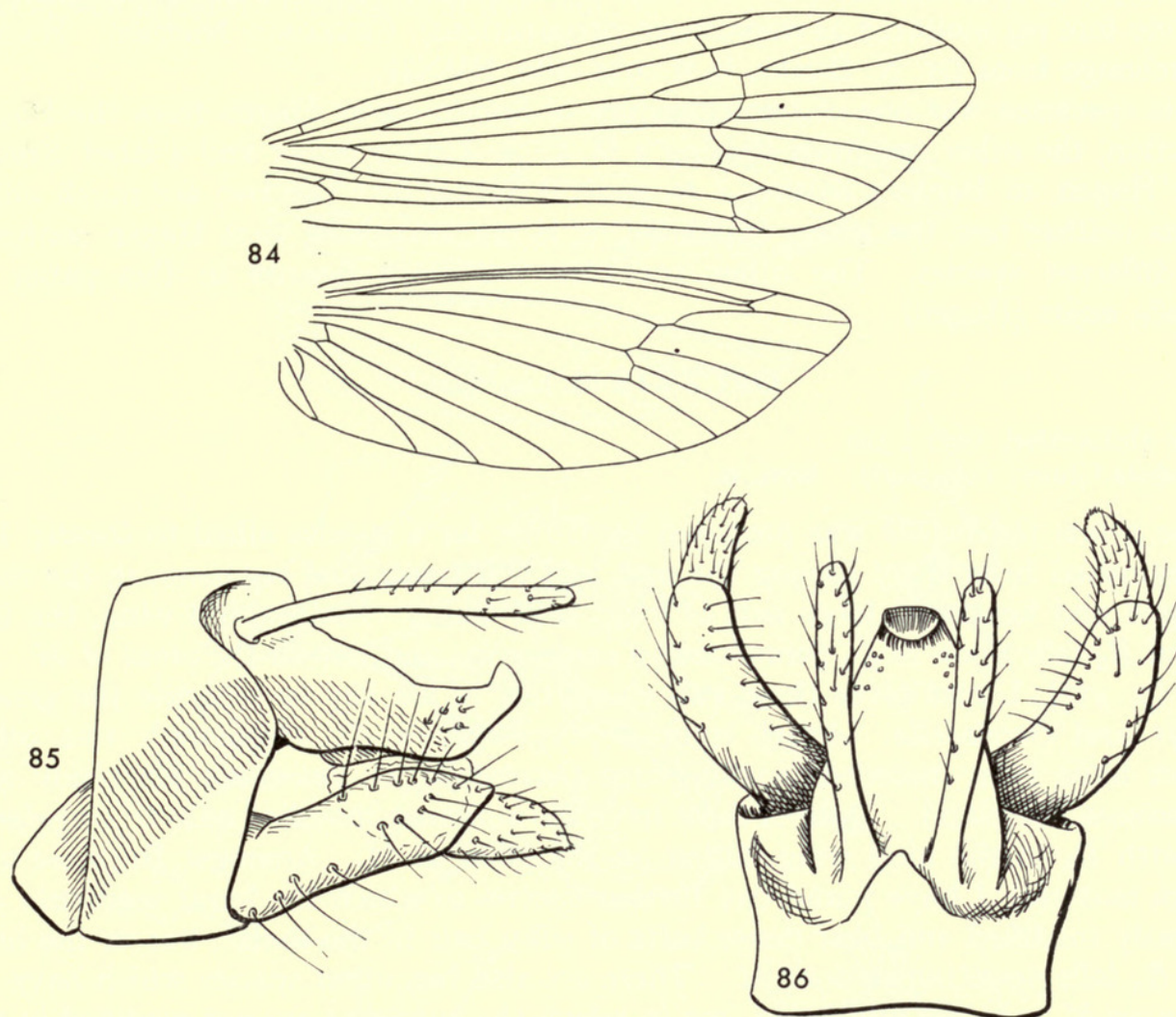
♀ Unknown.

Type-species, *Nietnerella hageni* gen. sp. n.

This genus shows affinities with the Odontoceridae and the Calamoceratidae as well as with the Leptocerinae. The cross-vein linking M_{3+4} and Cu_{1a} in the hind wing is not normally present in the Leptocerinae, but does occur in both Odontoceridae and Calamoceratidae. The formation of fork R_4 in both wings is very Leptocerine in character and the open discoidal cell in the hind wing rules out the Odontoceridae. There is no median cell, which rules out the Calamoceratidae. The presence of four spurs on the median tibia has not been previously recorded in the Leptocerinae, but less importance is attached to the spur formula as a generic

character than was the case. The genus is therefore placed in the Leptocerinae, pending the discovery of more material of both sexes.

This genus shares with *Leptorussa* Mosely the character of four spurs on the hind tibia, but may be distinguished from it by having four spurs on the median tibia also, and by the cross-vein linking M_{3+4} and Cu_{1a} in the hind wing.



FIGS. 84-86. *Nietnerella hageni*, gen. sp. n. ♂. 84, wings ; 85, genitalia, lateral ; 86, dorsal.

***Nietnerella hageni* sp. n.**
(Text-figs. 84-86)

Setodes najas Hagen, 1859 : 210 (partim).

♂ (pinned). Head fulvous, with yellowish hairs. Antennae (incomplete) luteous, towards the base finely annulated with fuscous. Palpi fulvous, with sparse, fuscous pubescence. Thorax and legs fulvous. Fore wing somewhat denuded, pubescence pale golden, with obscure, transverse bars and spots of fuscous pubescence.

♂ GENITALIA. Ninth segment produced at the centre of the dorsal apical margin in a short triangle. Side-pieces broadly rounded. Tenth tergite fused to ninth, broad at base in dorsal view, tapering to a narrow, truncate, upturned apex. In side view, it forms a hood above the aedeagus, the upturned apex being triangular. Aedeagus slender, cylindrical, arched downwards

beyond midway, with some obscure membrane extruded from its apex. Clasper stout, two-segmented, the terminal segment less than half the length of the basal, in side view tapering to a narrow, finely spiny apex. From above, the claspers are divergent and slightly incurved.

♀ Unknown.

Length of fore wing, ♂, 7 mm.

Holotype ♂ (pinned, one pair of wings mounted dry between celluloid, abdomen and one fore leg mounted as microscope preparations), CEYLON : Nietner. Hagen. In exchange from Dr. N. Banks, B.M.1931-280, BMNH.

This specimen was one of two examples of *Setodes najas* Hagen from the Hagen collection, the other specimen bearing a M. C. Z. Type number and a label, *Setodes najas* Hagen, in Banks's writing. In general appearance the two are much alike, and as neither had the wings expanded, it is not surprising that Hagen confused two different species. The other specimen has been figured in this paper as *Adicella najas* (Hagen).

OECETIS McLachlan

Oecetis McLachlan, 1877 : 329.

Oecetodella Ulmer, 1930 : 467. **Syn. n.**

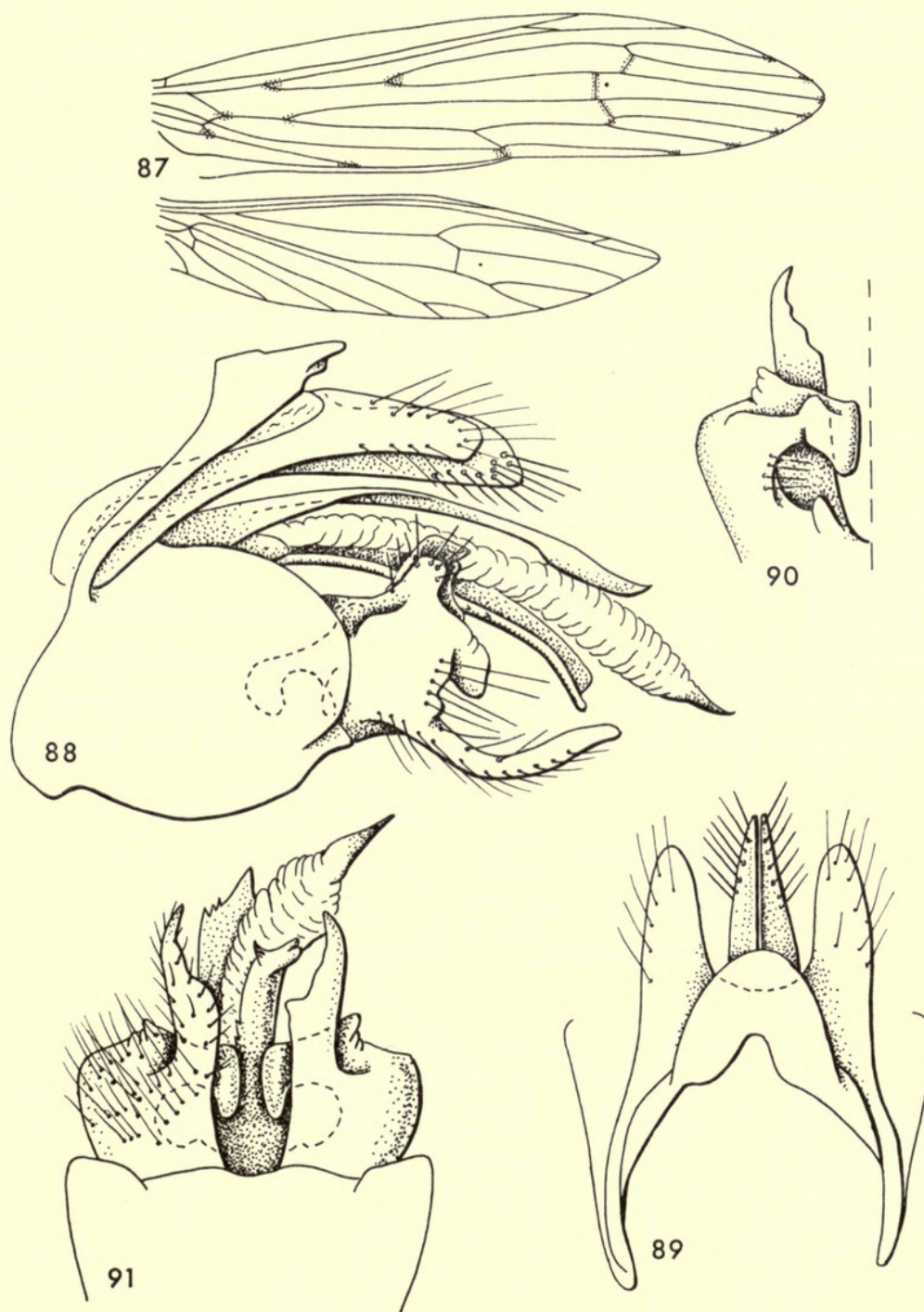
The genus *Oecetodella* was proposed by Ulmer for a species allied to *Oecetis*, but distinguished from it by having the first and third antennal segments in the male enlarged and bearing a large tuft of long, silky hairs. In the hind wing, the free part of R_5 falls upon M_{1+2} (simulating a cross-vein) and not on the stem of M . In 1951 (p. 412), Ulmer gives these two characters in his key to separate the genera *Oecetis* and *Oecetodella*. Apart from its type-species (*O. singularis*), two other species have been included in the genus *Oecetodella*, *O. antennata* Martynov and *O. laminata* Forsslund. Both of these have the antennae modified as in *O. singularis*, but with R_5 in the hind wing falling on the stem of M . Amongst Burmese and Indian material, I have found two further species in which the basal segments are variously modified and bear dense tufts of silky hair in the males, but in the hind wing R_5 falls upon the stem of M . There are also two other species which have R_5 falling on M_{1+2} in the hind wing, but in which the antennae are not modified in the male. Thus the combination of characters upon which Ulmer based his genus has proved unreliable. One could, of course, drop the venational character and rely on the unisexual character of the male antenna, but this would mean that the females could not be placed generically. I am therefore placing *Oecetodella* Ulmer in the synonymy of *Oecetis* McLachlan.

***Oecetis penicillata* sp. n.**

(Text-figs. 87-91)

♂ (in alcohol, colour probably somewhat faded). Head fulvous, with fulvous and fuscous hairs. Antennae more than twice as long as fore wing, fulvous, finely annulated with fuscous at articulations; basal segment moderately elongate, second short, third about one and a half times as long, and about as wide basally, as basal segment, tapering to apex. This segment bears on its lower, outer surface a dense pencil of silky, fuscous hairs, extending at least twice the length of the third segment. The inner surfaces of the third to about the eleventh segments

are densely clothed with short, fulvous hairs. Pronotum fulvous, meso- and metanota pale fuscous, mesoscutellum and postnotum paler. Legs fulvous. Fore wing hyaline, marked with fuscous at the forks of the veins, the cross-veins of the anastomosis and the apices of the veins. Margins heavily fringed, veins ciliate. Costal margin of fore wing convex beyond the stigma, so that the apex appears slightly swept back. Anastomosis irregular, the free part of R_5 being basad of the other two cross-veins. In the hind wing, the free part of R_5 falls upon M well before the bifurcation of that vein.



FIGS. 87-91. *Oecetis penicillata* sp. n. ♂. 87, wings ; 88, genitalia, lateral ; 89, ninth and tenth tergites, dorsal ; 90, right clasper, dorsal ; 91, ninth sternite, claspers and aedeagus, ventral.

♂ GENITALIA. Dorsal part of ninth segment forming a narrow arch, the centre of its apical margin produced in a rounded lobe. Lower part of ninth segment large. Tenth tergite produced on each side in a pair of spatulate processes, possibly cerci, and between them can be seen the median lobe, in the form of a pair of closely adpressed processes. From above, the latter taper to narrow apices, projecting somewhat beyond the apices of the cerci. Aedeagus long, consisting ventrally of a narrow, shallow trough with a slightly excised apex, and two processes, the upper sclerotized, slender, about as long as the aedeagus, dilating into a blade with an acute apex. The second process arises beneath the upper, and is largely membranous and extensile, with a sclerotized, thorn-like tooth. Clasper rather complex, stout basally, with its lower apical angle produced in a sinuous, tapering spur with an acute apex. The upper apical angle is produced mesally in a truncate branch, supporting the aedeagus from beneath.

♀ Unknown.

Length of fore wing, ♂, 8.5 mm.

Holotype ♂ (mounted as microscope preparations), N. BURMA : Myitkyina, 175 m., 4.iii.1934 (*R. Malaise*), STOCKHOLM.

Paratypes (in alcohol), same date, 9 ♂, STOCKHOLM, BMNH.

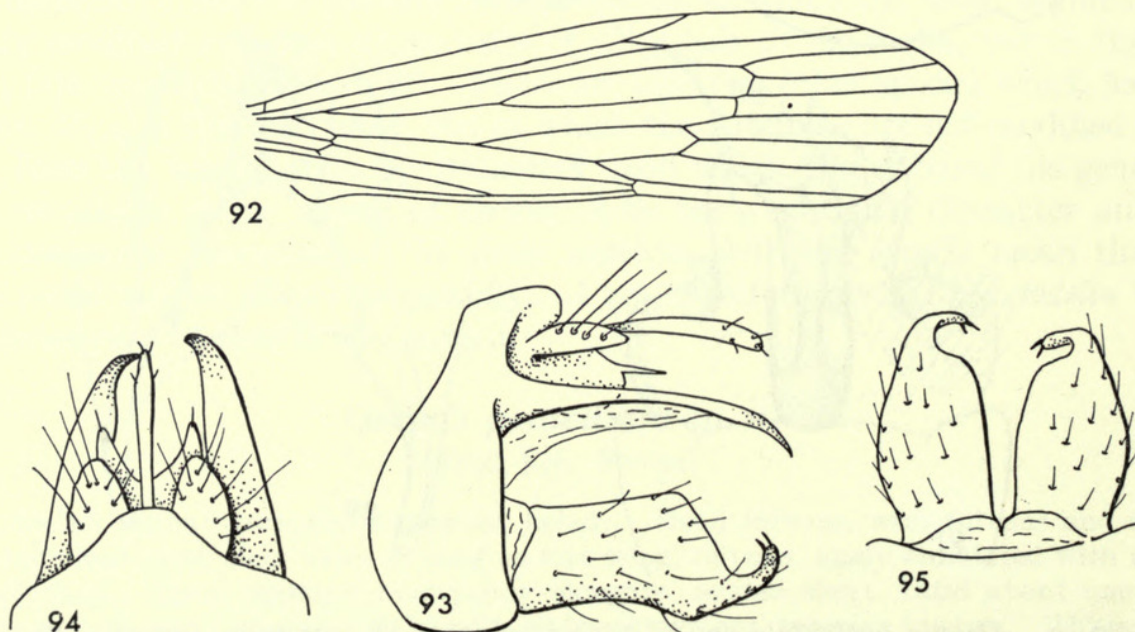
The dense pencil of hairs on the third segment of the antenna suggests a relationship with *Oecetodella antennata* Martynov, from the Amur region, and there are also general resemblances in the male genitalia. *O. penicillata*, however, differs in having its cerci completely fused with the tenth tergite (though projecting beyond it), the median lobe of the tenth tergite forming two adpressed lobes, and the structure of the aedeagus and claspers is quite different.

***Oecetis lais* (Hagen)**

(Text-figs. 92-95)

Setodes lais Hagen, 1859 : 210.

In the British Museum (Nat. Hist.) is a single male paratype of this species, received in exchange from Dr. N. Banks. A preparation has been made of the



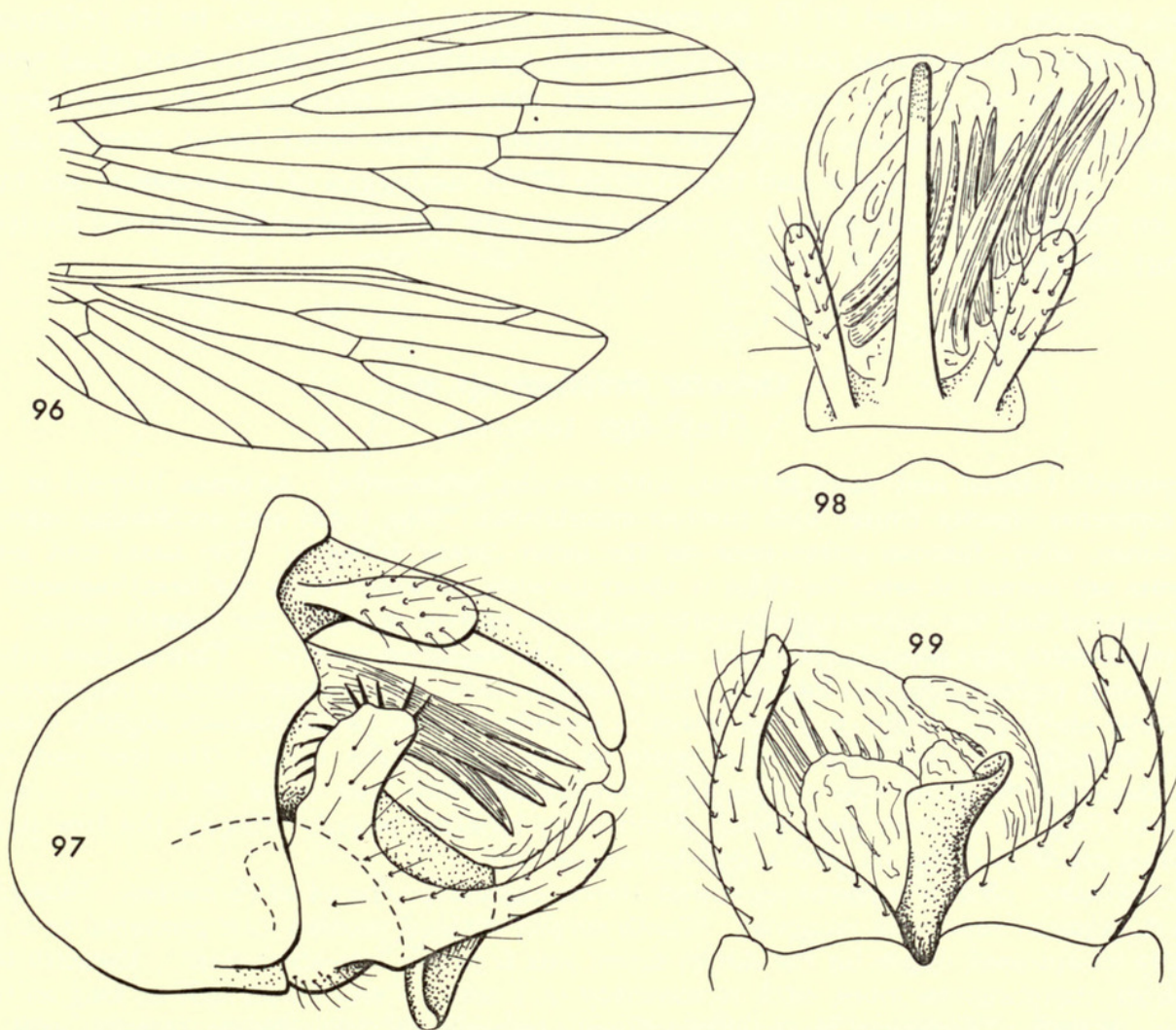
FIGS. 92-95. *Oecetis lais* (Hagen), ♂ paratype. 92, wings ; 93, genitalia, lateral ; 94, ninth and tenth tergites, dorsal ; 95, claspers, ventral.

genitalia and they very closely resemble those of *Oecetis sumanasara* Schmid. There may be differences in venation, as Schmid says that in *sumanasara* the discoidal cell of the fore wing is shorter than in *O. naravitta*, in which the discoidal cell is a little shorter than the thyridial cell. In *O. lais*, the discoidal cell is slightly longer than the thyridial cell. I do not propose therefore to place *sumanasara* in the synonymy of *lais*, and am figuring the fore wing and genitalia of the latter. In the paratype of *O. lais*, the aedeagus is missing and the clasper in ventral view appears stouter, with shorter apical processes, although the latter may be a question of aspect. Schmid describes the tenth tergite of *sumanasara* as having two pairs of slender branches, one long, the other short. In *lais*, the long branch is single and the short branch paired, slender in side view, forming the triangular lateral angles of the tenth tergite in dorsal view.

***Oecetis multispinosa* sp. n.**

(Text-figs. 96-99)

♂ (pinned). Head, basal segments of antenna and the palpi fulvous, remaining segments of the antenna creamy white. Antennae incomplete. Thorax and legs fulvous. Fore wing



FIGS. 96-99. *Oecetis multispinosa* sp. n. ♂. 96, wings ; 97, genitalia, lateral ; 98, tenth tergite and aedeagus, dorsal ; 99, ninth sternite, claspers and aedeagus, ventral.

hyaline, margins densely fringed, membrane and veins with sparse, fulvous pubescence. The anastomosis is regular, in slightly oblique steps, lightly shaded with fuscous, as is the fork of Cu_1 and the junction of Cu_{1p} and Cu_2 . Hind wing hyaline, fringed with fuscous hairs and with sparse, fuscous ciliation on the veins. The free part of R_5 meets the stem of M at less than its own length before the fork of M .

♂ GENITALIA. Eighth tergite with a densely reticulated area. Ninth segment reduced dorsally to a narrow, transverse band. Ventral margin sinuous, with a small, median excision. Tenth tergite extended in a long, digitate process, slightly down-curved at its apex. Cerci about half as long as tenth tergite, slender from above, elongately clavate from the side. Aedeagus stout, down-curved, somewhat asymmetrically trough-shaped. It supports a membranous structure, enclosing more than a dozen stout, arched spines. Clasper bifid from the side, the branches enclosing a wide, rounded excision. The upper or basal branch is shorter than and twice as wide as the apical branch, directed upwards and armed with stout teeth. From beneath, the claspers are broad basally, divergent, then incurving and tapering to blunt apices.

♀ Unknown.

Length of fore wing, ♂, 7 mm.

Holotype ♂ (with one pair of wings and abdomen mounted as microscope preparations), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.

This species is related to *O. biramosa* Martynov, from Orissa, in its reticulated eighth tergite and general pattern of the male genitalia. It differs from that species in having only the eighth tergite reticulated, the longer process of the tenth tergite, the shorter, more clavate cerci and the stouter, more erect basal branch of the clasper. Martynov's figure and description of the aedeagus of *O. biramosa* are made from an uncleared example and in consequence are not sufficiently detailed to decide in what characters it may differ.

Oecetis fletcheri sp. n.

(Text-figs. 100–104)

♂ (pinned). Head and palpi fulvous, with fulvous pubescence. Antenna fulvous at base, later segments creamy white, with fuscous annulations. The basal and succeeding segments bear dense, silky, fuscous pubescence on the outer, lower surfaces. The basal and second segments are normal in size, the third is about as wide, or wider, than the basal segment, but not elongated and the following segments gradually narrow down to the normal width. The silky pubescence also gets progressively shorter as the segments narrow. Thorax dark fulvous, with fulvous pubescence, legs luteous. Fore wing hyaline, with sparse, fuscous pubescence on membrane and longer ciliae on veins, margins densely fringed. Anastomosis slightly concave, shaded with fuscous and with fuscous spots on the forks of the veins. The free part of R_5 arises basad of the cross-vein closing the discoidal cell and falls on M at its fork. M_{3+4} is linked to Cu_{1a} by a short cross-vein. Hind wing hyaline, heavily fringed, the free part of R_5 falling on M at about its own length before the fork.

♂ GENITALIA. Ninth segment narrowed above, slightly produced at its centre. Side-pieces of ninth segment short and incurved. Tenth tergite with its median lobe produced in a long, laterally compressed finger (in the dorsal figure this is rather fore-shortened). Beneath it are two short, membranous lobes, each terminating in a seta. Cerci about half as long as tenth tergite, digitate. Aedeagus large, downcurved, forming an asymmetric trough, with two acute teeth ventrally, one at apex and the other about half way. Protruding from the trough are two membranous fingers, one containing two stout spines. Claspers caliper-like in ventral

view, with a small tooth on the upper margin before the apex. At the base of each clasper is an upwardly and mesally curved branch, nearly as long as the main branch.

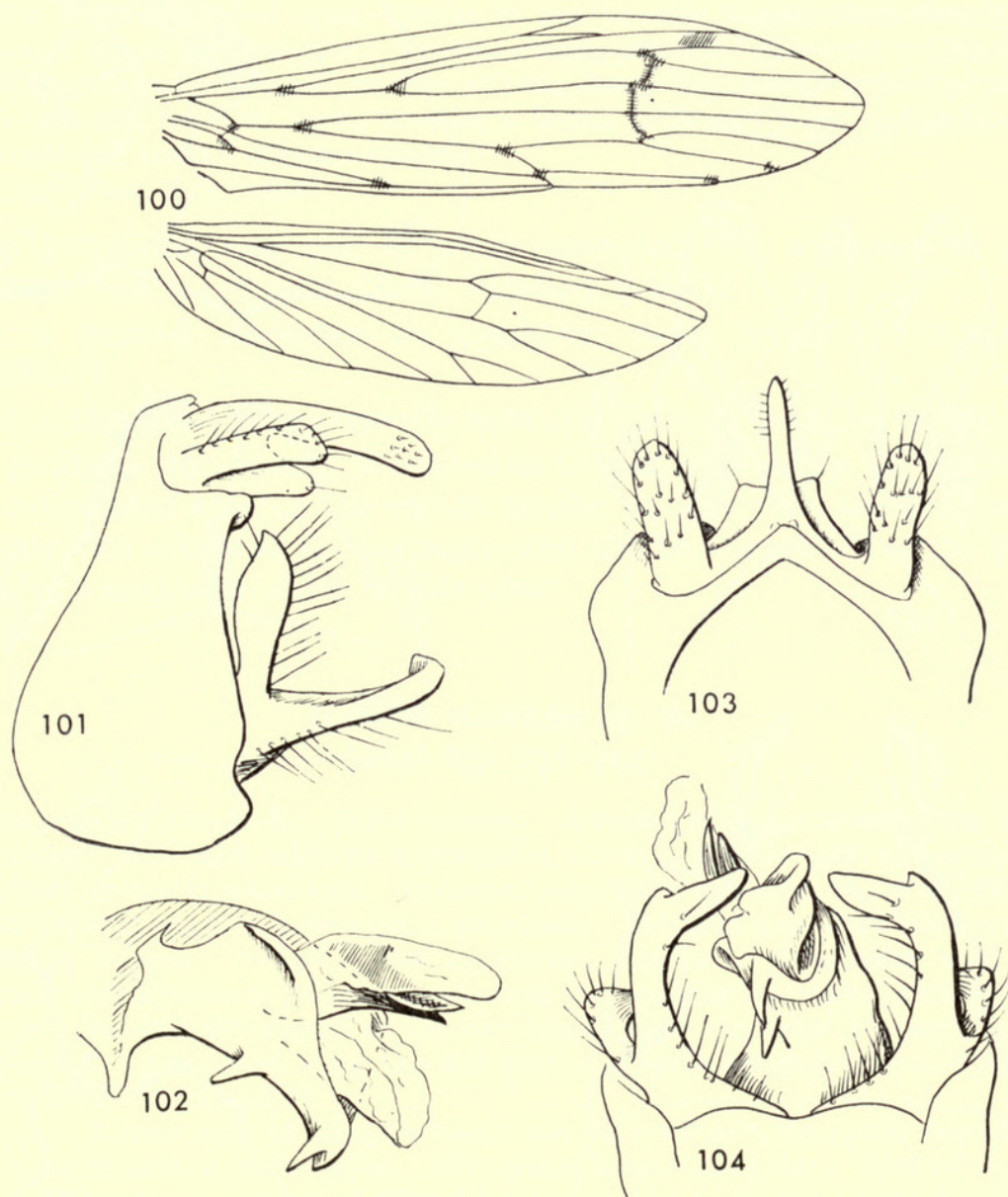
♀ Unknown.

Length of fore wing, ♂, 8 mm.

Holotype ♂ (one wing mounted dry, abdomen and one antenna in glycerine), INDIA : Assam, Khasis, 5,000 ft., Shillong, 26.ix.1927 (*T. B. Fletcher*), BMNH.

Paratypes, same locality and collector, 12.viii.1927, 1 ♂ ; Khasis, Cherrapunji, vii.1894, 1 ♂ (*native collector*), BMNH.

At first glance, the structure of the male antenna recalls that of *O. penicillata* sp. n., but in that species the third segment is greatly elongated and most of the hair-tufts arise from that segment. In *fletcheri*, the third segment is widened but not lengthened and the tufts arise from the second to thirteenth segments. The



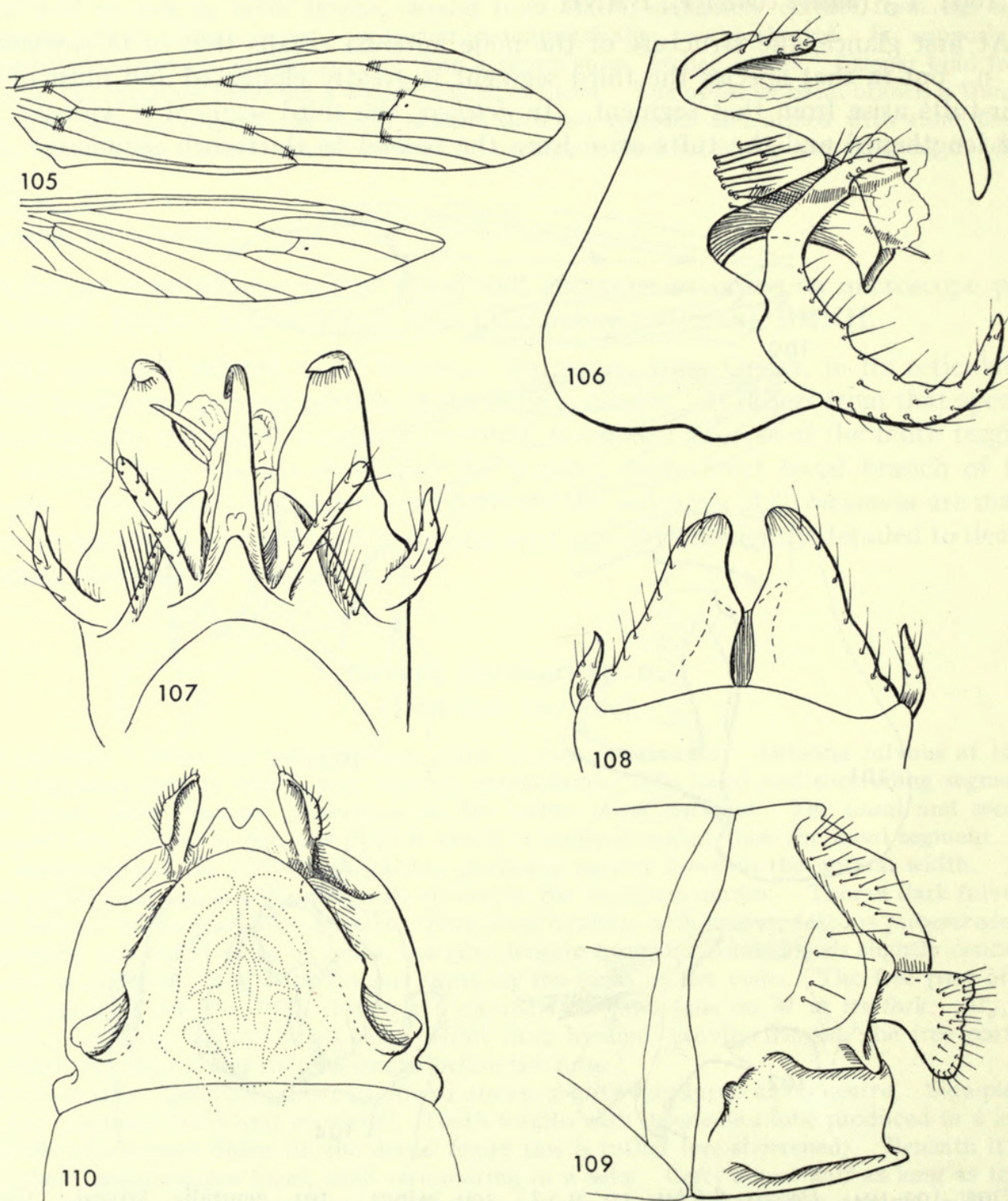
FIGS. 100-104. *Oecetis fletcheri* sp. n. ♂. 100, wings ; 101, genitalia, lateral ; 102, aedeagus, lateral ; 103, ninth and tenth tergites, dorsal ; 104, ninth sternite, claspers and aedeagus, ventral.

genitalia are, however, quite different and in the bifid structure of the claspers are related to *O. multispinosa* sp. n.

***Oecetis cristata* sp. n.**

(Text-figs. 105-110)

♂ (pinned). Head and basal segment of antenna fulvous, with fulvous and silvery hairs, remaining segments of antenna luteous, with faint, fuscous annulations. Palpi fulvous, with



FIGS. 105-110. *Oecetis cristata* sp. n. 105, ♂ wings ; 106, ♂ genitalia, lateral ; 107, the same, dorsal ; 108, ♂ claspers, ventral ; 109, ♀ genitalia, lateral ; 110, ♀ ventral.

pale fuscous pubescence. Thorax dark fulvous, legs fulvous, with pearly pubescence. Membrane of fore wing smoky hyaline, apex of wing somewhat swept back. Forks of veins and anastomosis shaded with fuscous and bearing erect tufts of fuscous hairs. Membrane with fine, fulvous pubescence, veins with fulvous ciliae, intermingled with small areas of silvery ciliae. Margins with dense fringes of fulvous, with some areas of silvery, hairs. Veins of anastomosis in an almost straight line. Hind wing hyaline, with fuscous fringes and fuscous ciliae on veins. Free part of R_5 falling on M_{1+2} .

♂ GENITALIA. Dorsal part of ninth segment produced centrally in a triangle with a rounded apex. Side-pieces large, triangular, with stiff, dense setae. Tenth tergite produced in a long, tapering spine, down-curved near its apex. Cerci short, slender, divergent, about as long as side-pieces. Aedeagus short, curved, trough-shaped, apex truncate. Within the trough are a large and a small spine, embedded in membrane. Clasper bifid, from the side with the branches somewhat caliper-like, slender and of about equal length. From beneath, the lower branch is broad, tapering to an upcurved apex.

♀ GENITALIA. Ninth segment produced at centre of its apical, dorsal margin in a small, triangular lobe with a rounded apex, similar to but broader basally than that in the male. Side-pieces rather broad and truncate. Ventral margin produced in a wide, rounded subgenital plate. Lateral gonapophyses small, narrow at base, lower apical angle produced in a rounded lobe. Tenth segment fused to ninth, forming a short, deep anal tube, obliquely truncate in side view, dorsal and ventral margins excised.

Length of fore wing, ♂, ♀, 7 mm.

Holotype ♂ (pinned, one pair of wings mounted dry, abdomen in glycerine), INDIA : Bihar, Pusa, 24.vi.1911, (*T. B. Fletcher*), BMNH.

Allotype ♀ (pinned, abdomen in glycerine), same locality, 8.iii.1915 (*T. B. Fletcher*), BMNH.

The label of the holotype incorrectly indicates Pusa as being in Bengal.

In male genitalia, this species is related to *O. multispinosa* sp. n., but it differs in having no reticulated area on the eighth tergite, the cerci are slender, not clavate, there are only two spines in the aedeagus and the two branches of the clasper are of about equal length and width in side view.

Oecetis mekana sp. n.

(Text-figs. III-III4)

♂ (in alcohol, rather bleached). Head fulvous. Antenna fulvous, articulations finely annulated with piceous. The third segment is elongated, about as long as basal and second together, slightly sinuously arched in basal half. It is now completely denuded, but it is possible that in life it may carry a long pencil of hairs as in *O. pencillata*. Palpi fulvous, with fulvous pubescence. Thorax and legs fulvous. Wings almost completely denuded. Fore wing with membrane hyaline, marked with fuscous at the forks and along the anastomosis, which is broken, the cross-vein closing the discoidal cell distad by its own length from the other two cross-veins, which are close together. In the hind wing, the free part of R_5 falls upon the stem of M more than its own length from the fork of M .

♂ GENITALIA. Dorsal part of ninth segment not very narrow, its apical margin produced in a shallow triangle with rounded apex. Side-pieces large, triangular. Ventral apical margin of ninth segment produced in a broad, rounded lobe, excised medially. Cerci fused with tenth tergite, forming a broad, transverse plate, beyond which extends a short, digitate median lobe. Aedeagus short, stout, the ventral part forming a shallow trough, the upper part terminating in four asymmetric, short spines. The area between is filled with membrane. Claspers broad

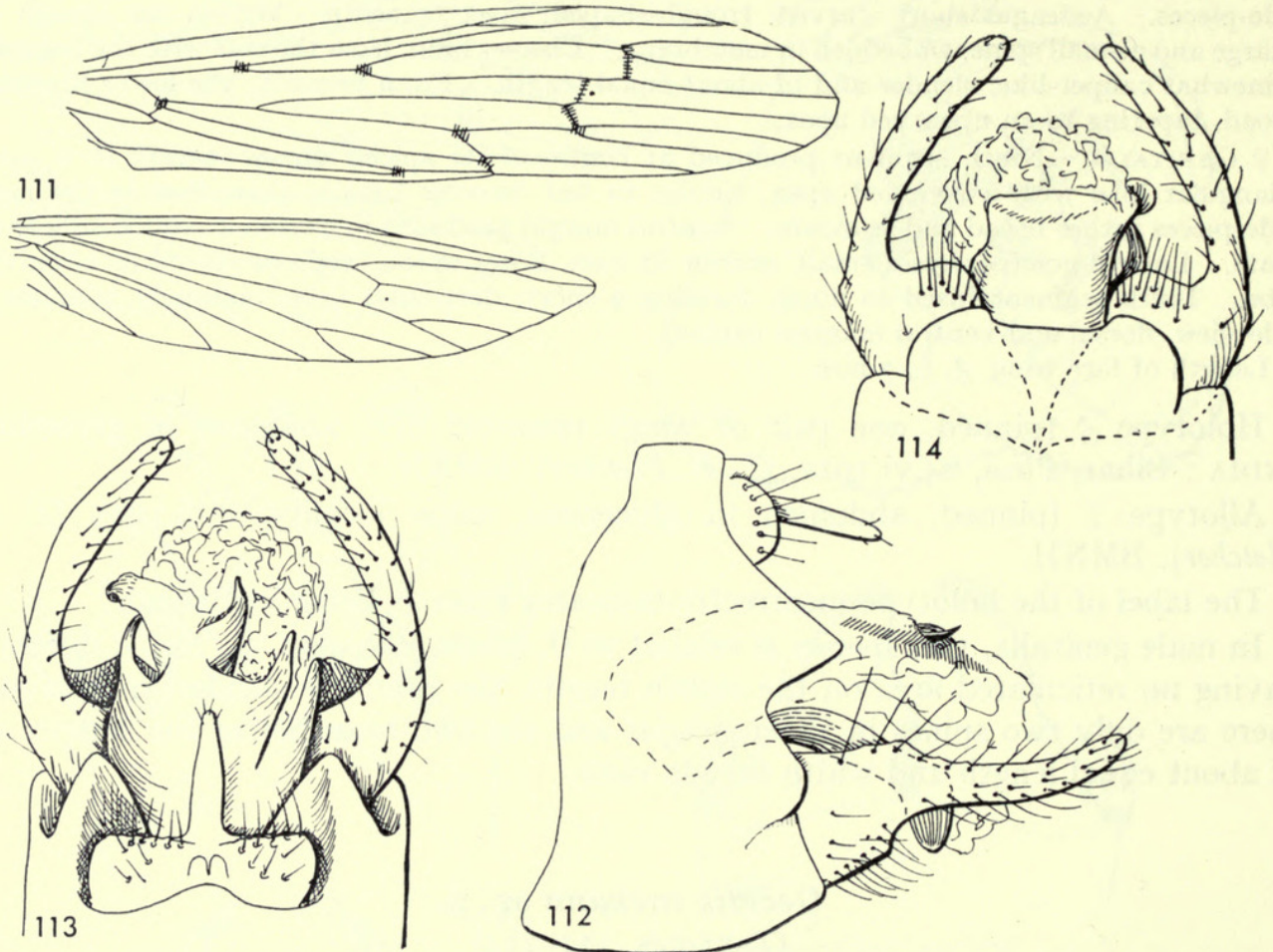
at their bases in ventral view, then suddenly constricted and incurved. From the side they are also broad basally but not so suddenly constricted.

♀ Unknown.

Length of fore wing, ♂, 6 mm.

Holotype ♂ (mounted as microscope preparations), TENASSERIM : Mekane, 90 km. E. of Moulmein, 200 m., 2-8.xi.1934 (*R. Malaise*) STOCKHOLM.

The broad fused cerci and the structure of the aedeagus should make this species easily recognisable.



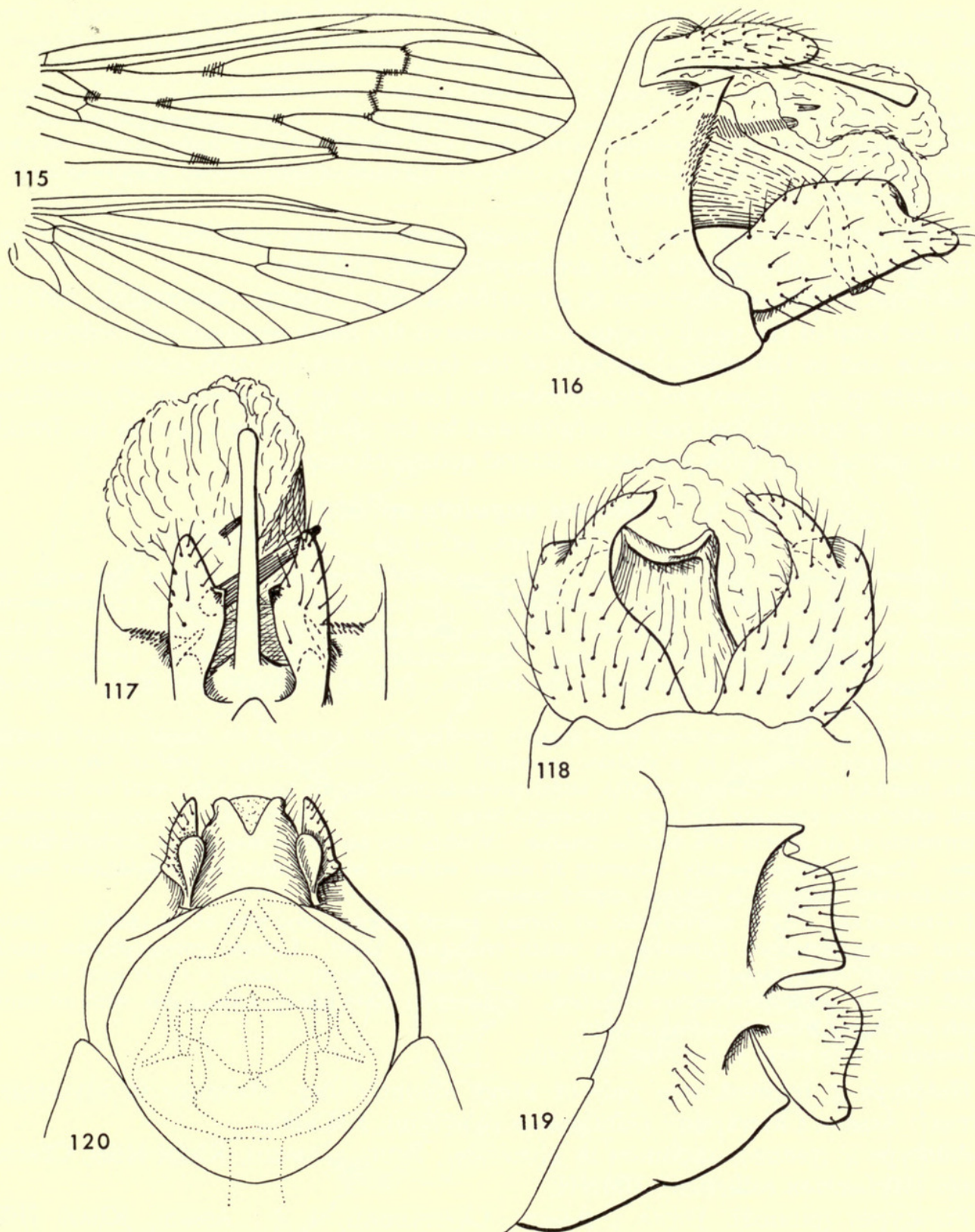
FIGS. 111-114. *Oecetis mekana* sp. n. ♂. 111, wings ; 112, genitalia, lateral ; 113, dorsal ; 114, ninth sternite, claspers and aedeagus, ventral.

Oecetis villosa sp. n.

(Text-figs. 115-120)

♂ (pinned). Head fulvous, with slightly darker hairs, antennae fulvous, scarcely annulated, palpi fulvous with pale fuscous pubescence. Thorax and legs fulvous. Membrane of fore wing hyaline, forks and anastomosis shaded with fuscous. Anastomosis broken, cross-vein closing the discoidal cell about its own length beyond the others. Margins of fore wing and the veins densely clothed with long, fuscous hairs. Hind wing hyaline, margins and veins densely hairy. The free part of R_5 falls on M_{1+2} , shortly beyond the fork of M .

♂ GENITALIA. Tergites of seventh and eighth segments reticulated. Dorsal part of ninth segment narrow, the centre of its apical margin produced in a small triangle. Side-pieces of the ninth segment acutely triangular, the lower margin with an area of dense, acute serrations. Tenth tergite produced in a long, slender finger, about twice as long as cerci. The latter are



FIGS. 115-120. *Oecetis villosa* sp. n. 115, ♂ wings ; 116, ♂ genitalia, lateral ; 117, ♂ ninth and tenth tergites, aedeagus, dorsal ; 118, ♂ ninth sternite, claspers and aedeagus, ventral ; 119, ♀ genitalia, lateral ; 120, ♀ ventral.

stout, slightly dilated about midway in side view, triangularly dilated on inner margin in dorsal view, the dilatation ending in a small, down-turned tooth. Aedeagus large, trough-shaped, its apex turned down in a broad lip. The trough is filled with membrane containing a large and a small spine. Clasper stout in side view, about twice as long as deep, the upper apical angle more abruptly angled mesally in a claw than the lower angle.

♀ GENITALIA. Dorsal apical margin of ninth segment produced at its centre in a small triangle. Ventrally there is a large, ovate subgenital plate. Lateral gonapophyses narrow basally, lower apical angle produced downwards and dilated. Upper apical angle rounded. Tenth segment forming a short anal tube, obliquely truncate apically, lower margin excised.

Length of fore wing, ♂, 7.5 mm., ♀, 7 mm.

Holotype ♂ (pinned, one pair of wings mounted dry, abdomen in glycerine), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.

Allotype ♀ (pinned, abdomen in glycerine), INDIA : Assam, Cherrapunji, BMNH.

In the form of the tenth tergite, side-pieces of the ninth segment and aedeagus of the male and in the general pattern of the female genitalia, this species resembles *O. cristata* sp. n. It may be distinguished in the male by the presence of reticulated areas on the seventh and eighth tergites and by the stout claspers, and in the female by the shorter anal tube and larger lateral gonapophyses.

Oecetis angulata sp. n.

(Text-figs. 121-126)

♂ (pinned). General colour fulvous. Antennae about three times as long as fore wing, the third segment long, slightly arched near the base, giving the appearance of a transverse impression on the under side. Fore wing hyaline, with moderately dense, fulvous pubescence, marginal fringes dense but not very long. Anastomosis only slightly broken, faintly shaded with fuscous and a pale fuscous spot at the arculus. In hind wing, free part of R_5 falls on M well before its fork.

♂ GENITALIA. Ninth segment only slightly produced at centre of its dorsal apical margin, ventral margin produced in a shallow, rounded lobe. Cerci forming a pair of low, convex warts, fused to surface of tenth tergite, which projects only slightly beyond the cerci in a truncate hood, with sides tapering to apex. Aedeagus large, globular, its lower apical margin extended downwards at its centre in a narrow tongue. Within the aedeagus is a single, slightly curved spine. Clasper broad basally, tapering to about midway and continuing as a slender finger, which in ventral aspect is sharply angled inwards.

♀ GENITALIA. Ninth tergite with its dorsal, apical margin produced at its centre. Lower lateral angles produced outwards in small, triangular lobes. Lateral gonapophyses small, ovate in side view, densely fringed with setae. Tenth segment forming a short anal tube, to which the low, rounded cerci are attached. Subgenital plate lightly sclerotized, with an acute tooth projecting from its apical margin.

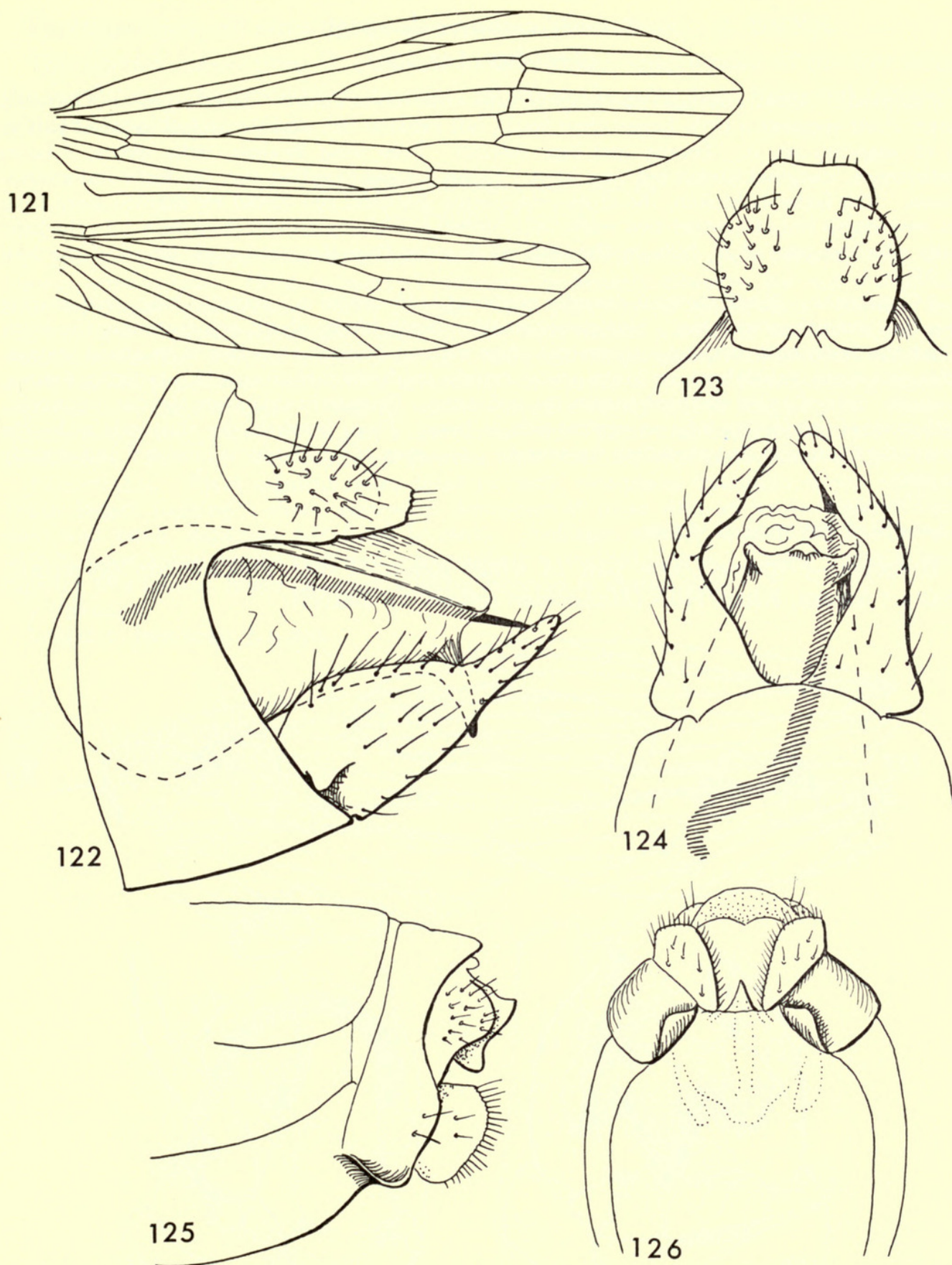
Length of fore wing, ♂, 6-7 mm., ♀, 6 mm.

Holotype ♂ (pinned, one pair of wings mounted dry, abdomen in glycerine), INDIA : Assam, Cherrapunji (*McLachlan collection*), BMNH.

Allotype ♀ (pinned, abdomen in glycerine), INDIA : Assam, Khasi Hills, Cherrapunji (*McLachlan collection*), BMNH.

Paratypes (pinned), INDIA : Assam, Cherrapunji, 1 ♂ ; Assam, Khasi Hills (*McLachlan collection*), 3 ♂, 4 ♀, BMNH.

This species differs from *O. meghadouta* Schmid in its cerci fused to the tenth tergite, which exceeds the cerci, and in the form of the claspers, which taper more gradually in side view and are incurved ventrally.



FIGS. 121-126. *Oecetis angulata* sp. n. 121, ♂ wings ; 122, ♂ genitalia, lateral ; 123, ♂ ninth and tenth tergites, dorsal ; 124, ♂ ninth sternite, claspers and aedeagus, ventral ; 125, ♀ genitalia, lateral ; 126, ♀ ventral.

Oecetis assamensis sp. n.

(Text-figs. 127-130)

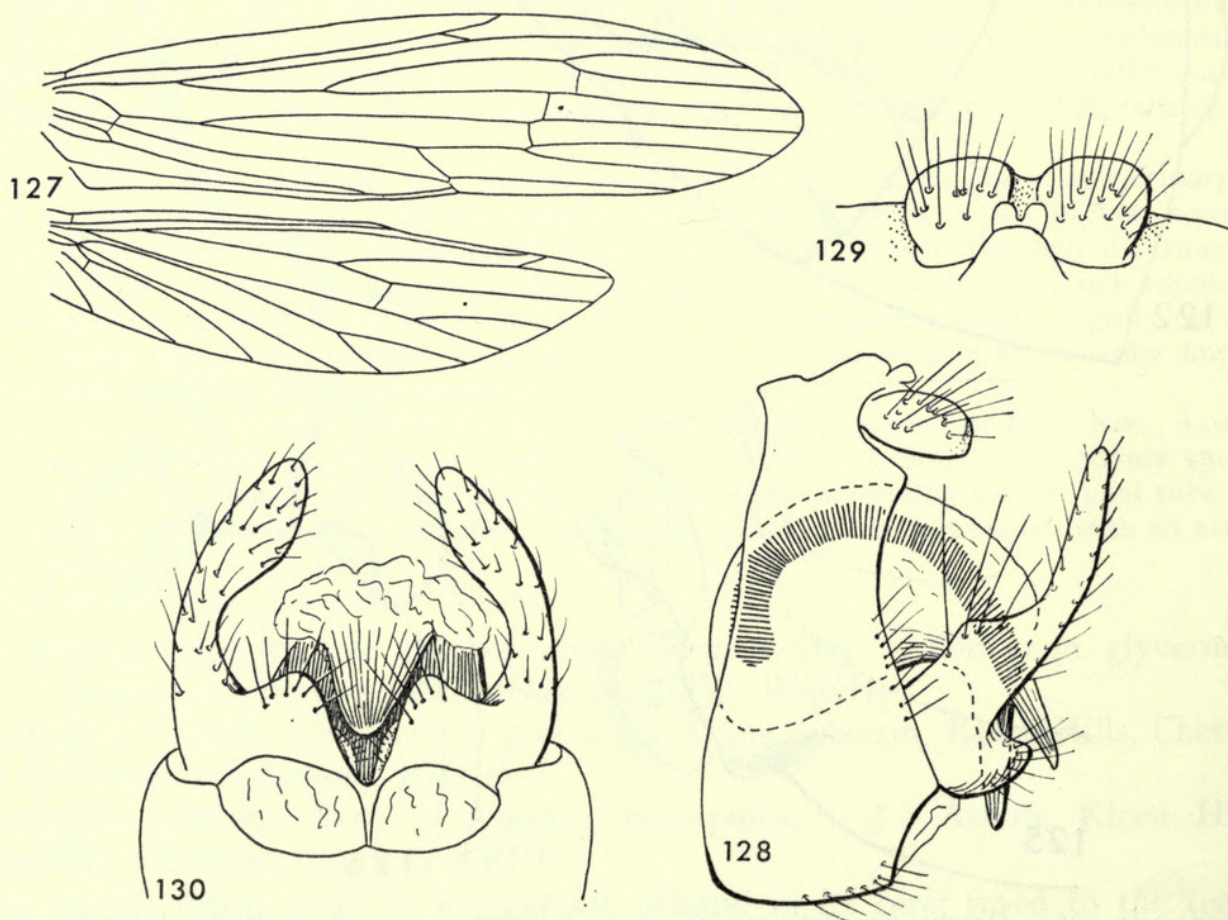
♂ (pinned). Head, antennae and palpi fulvous, with fulvous hairs. Basal segment of antenna large, third segment a little longer than basal, not inflated but slightly arched in basal half as in *O. angulata* sp. n. Thorax and legs fulvous. Fore wing hyaline, with sparse, fulvous pubescence, marginal fringes not very long. Faint, fuscous clouding over the forks and anastomosis. The latter is broken, the cross-vein closing discoidal cell distad by slightly more than its own length from the other two veins, M_{3+4} linked to Cu_{1a} by a short cross-vein. In the hind wing, the free part of R_5 falls on the stem of M more than its own length basad of the fork of M .

♂ GENITALIA. Ninth segment dorsally produced at its centre in a rounded lobe, surmounting two tiny, membranous lobes. Side-pieces small. Tenth tergite short, not exceeding the cerci, which are fused to it, making a transverse plate with an excision at centre of its apical margin. Aedeagus large, subglobose, its lower apical margin produced downwards in a tapering tongue. A single, curved spine enclosed within the aedeagus. Clasper in side view slender, upcurved, with a stout, projecting lobe on ventral side at base. From beneath, the clasper is wide, the basal lobe triangular and exceeding the margin; the apex of the clasper is incurved and slightly clavate.

♀ Unknown.

Length of fore wing, ♂, 8 mm.

Holotype ♂ (pinned, one pair of wings mounted dry, abdomen in glycerine), INDIA : Assam, Khasi Hills (*McLachlan collection*), BMNH.



FIGS. 127-130. *Oecetis assamensis* sp. n. ♂. 127, wings; 128, genitalia, lateral; 129, tenth tergite, dorsal; 130, ninth sternite, claspers and aedeagus, ventral.

Paratypes (pinned) same data, 2 ♂ ; Assam, Cherrapunji, 1 ♂, BMNH.

This species differs from *O. angulata* in the broken anastomosis of the fore wing, the tenth tergite not exceeding the cerci, which are broader than long, and the more slender claspers.

***Oecetis submaculosa* sp. n.**

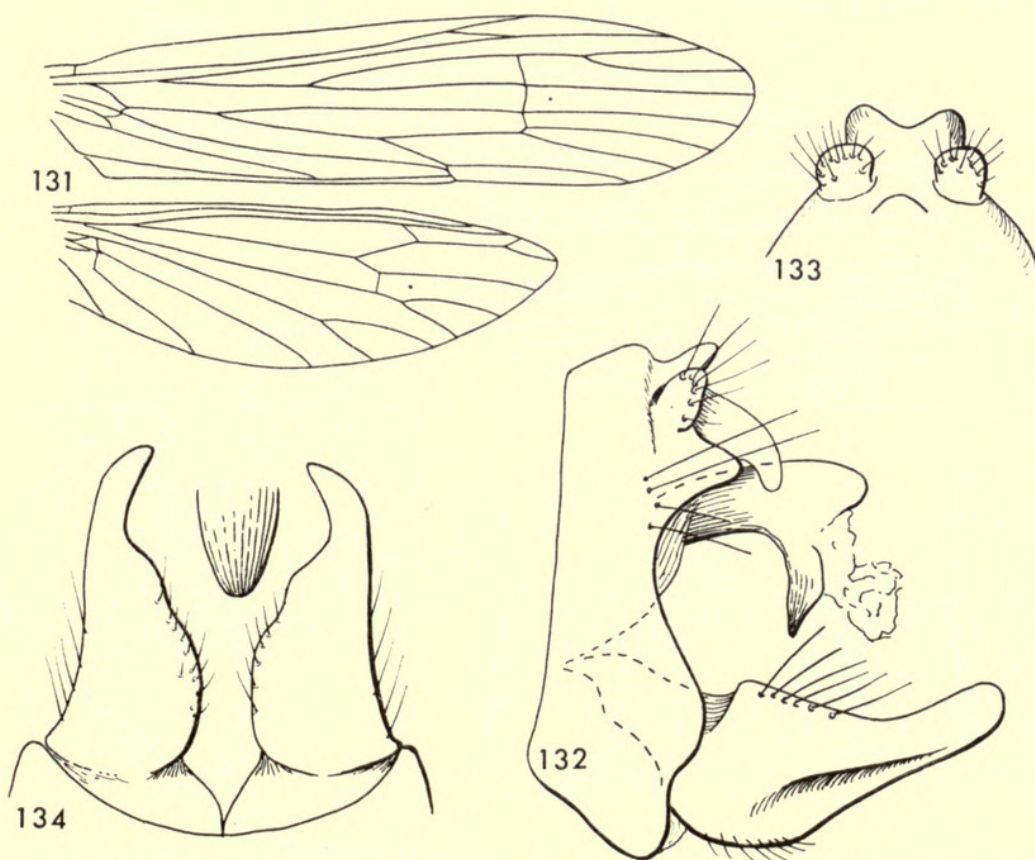
(Text-figs. 131-134)

♂ (pinned). Head fulvous, with pale fulvous hairs. Antennae pale fulvous, with fine, fuscous articulations. Third segment of antennae moderately elongate, but not arched nor with fine, silky pubescence. Palpi fulvous, with pale fuscous pubescence. Thorax pale fuscous, with fulvous pubescence. Legs fulvous, hind femora somewhat darker. Fore wing membrane hyaline, without fuscous shading. Marginal fringes short, membrane clothed with short, fulvous pubescence, with which are mixed small areas of fuscous pubescence, giving the appearance of faint speckles. Fork R_2 with a footstalk, about half as long as fork. Anastomosis straight, M_{3+4} joined to Cu_{1a} by a short cross-vein. Hind wing hyaline, with pale fulvous pubescence. Free part of R_5 falling on the stem of M about its own length basad of the fork.

♂ GENITALIA. Ninth segment short, fused to tenth, side-pieces triangular, apices rounded. Tenth tergite forming a short, somewhat down-curved plate with an excised apex. Cerci short and small, quadrate, not fused to tenth. Aedeagus slender, expanding apically and with its lower apical margin produced downwards in a rounded tongue. Clasper broad at base, tapering to a narrow, finger-like apex, slightly incurved in ventral view.

♀ Unknown.

Length of fore wing, ♂, 9 mm.



FIGS. 131-134. *Oecetis submaculosa* sp. n. ♂. 131, wings ; 132, genitalia, lateral ; 133, tenth tergite, dorsal ; 134, claspers and apex of aedeagus, from below and behind.

Holotype ♂ (pinned, one pair of wings mounted dry, abdomen in glycerine), INDIA : United Provinces, Gorakhpur, 17.xii.1918 (A. G. R.), BMNH.

This species differs from all other *Oecetis* dealt with in this paper in having fork R_2 in fore wing stalked ; in this it resembles *O. angustipennis* (Martynov), but that species has entirely different genitalia.

***Oecetis rectangulara* sp. n.**

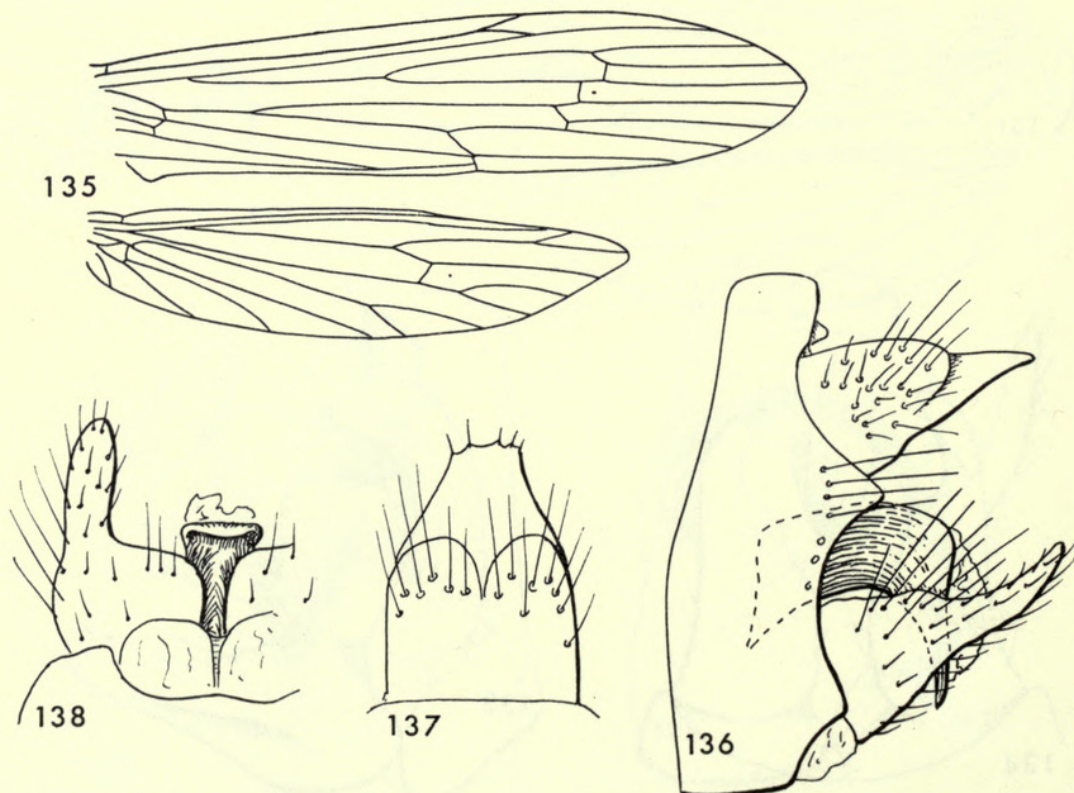
(Text-figs. 135-138)

♂ (pinned). General colour fulvous, antennae luteous, apart from two basal segments, which are fulvous. Third segment not modified. Fore wing hyaline, with sparse, fulvous pubescence. Forks and anastomosis faintly shaded with fuscous, the latter in oblique steps, anterior cross-vein the most distal, basal part of M_{3+4} oblique and joined to Cu_{1a} by a short cross-vein. Free part of R_5 in hind wing falls on stem of M more than its own length basad of fork.

♂ GENITALIA. Ninth segment rather short, dorsal apical margin scarcely produced. Side pieces triangular. Tenth tergite in side view projecting in a narrow, straight beak, in dorsal view tapering to a serrate apex. Cerci fused to tenth tergite, about half its length, forming flattened warts. Aedeagus short, trough-shaped, its apex produced downwards in an acute beak. The trough contains membrane but no spine. Clasper in side view broad basally, tapering to a slender, slightly upcurved apex. In ventral view, the apex appears as a digitate projection of a broad, quadrate plate.

♀ Unknown.

Length of fore wing, ♂, 7 mm.



FIGS. 135-138. *Oecetis rectangulara* sp. n. ♂. 135, wings ; 136, genitalia, lateral ; 137, tenth tergite, dorsal ; 138, left clasper and aedeagus, from below and slightly behind.

Holotype ♂ (pinned, with one pair of wings mounted dry, abdomen in glycerine), INDIA : Assam, Cherrapunji, BMNH.

Paratype ♂ (pinned), same data, BMNH.

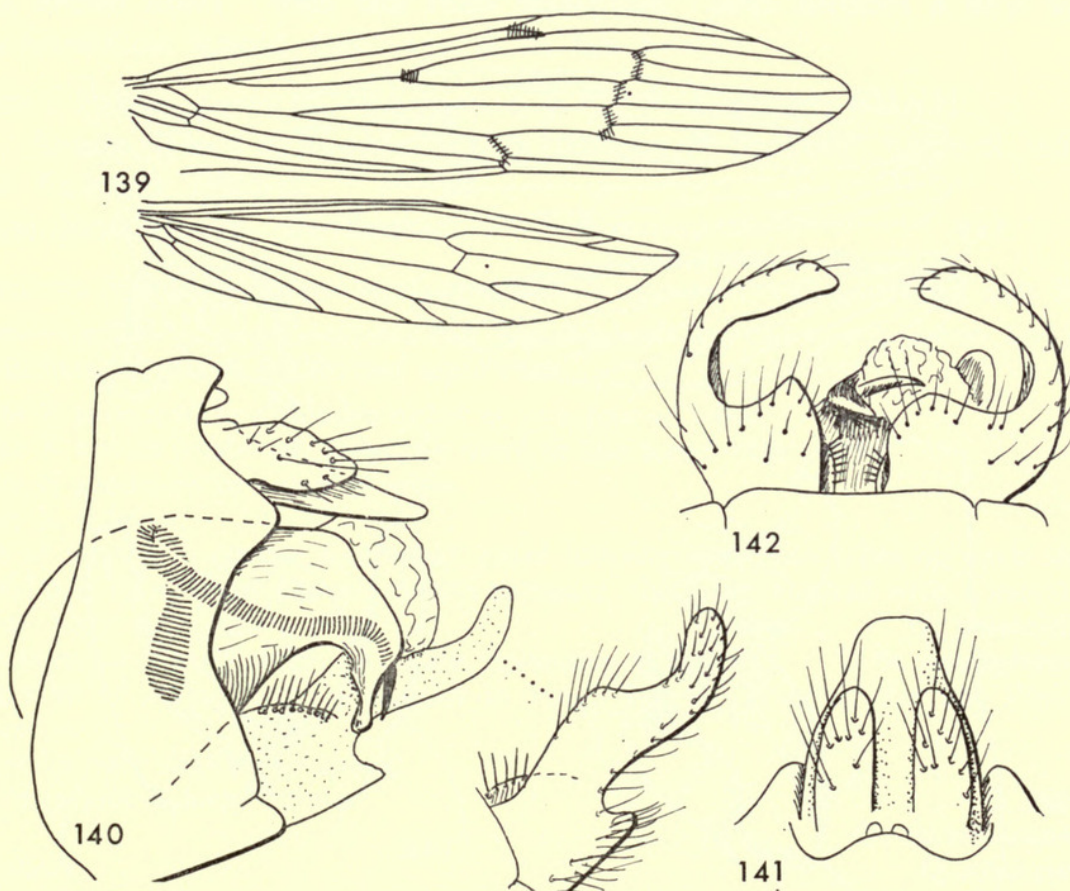
This species differs from *O. assamensis* in its longer tenth tergite, which extends beyond the cerci, the absence of a curved spine within the aedeagus, and in the apical branches of the claspers being straight, not incurved, and enclosing a rectangular space.

***Oecetis kambaitensis* sp. n.**

(Text-figs. 139-142)

♂ (in alcohol, much denuded). General colour fulvous. Antennae incomplete, third segment long, slightly arched in basal half. Thorax brownish, legs fulvous. Fore wing hyaline, arculus and anastomosis shaded with pale fuscous. The latter is oblique, slightly stepped, M_{3+4} linked by a cross-vein to Cu_{1a} . In hind wing, free part of R_5 falls on the stem of M more than its own length basad of fork.

♂ GENITALIA. Apical dorsal margin of ninth segment slightly produced in a rounded lobe. Side-pieces bluntly triangular. Tenth tergite about half as long again as cerci, broad at base, tapering to a rounded apex. Cerci spindle-shaped, with blunt apices, closely appressed, but not fused, to tenth tergite. Aedeagus globular at base, containing a spirally-twisted spine, apex



FIGS. 139-142. *Oecetis kambaitensis* sp. n. ♂. 139, wings ; 140, genitalia, lateral, left clasper detached ; 141, ninth and tenth tergites, dorsal ; 142, ninth sternite, claspers and aedeagus, ventral.

of aedeagus produced downwards in a narrow lip. Clasper broad at base, in side view with basal margin visible as a projecting lobe. Main part of clasper sinuous in side view, strongly curved mesally in ventral view.

♀ Unknown.

Length of fore wing, ♂, 7.5 mm.

Holotype ♂ (mounted as microscope preparations), N.E. BURMA : Kambaiti, 6,000 ft. 4.iv.1934 (R. Malaise), STOCKHOLM.

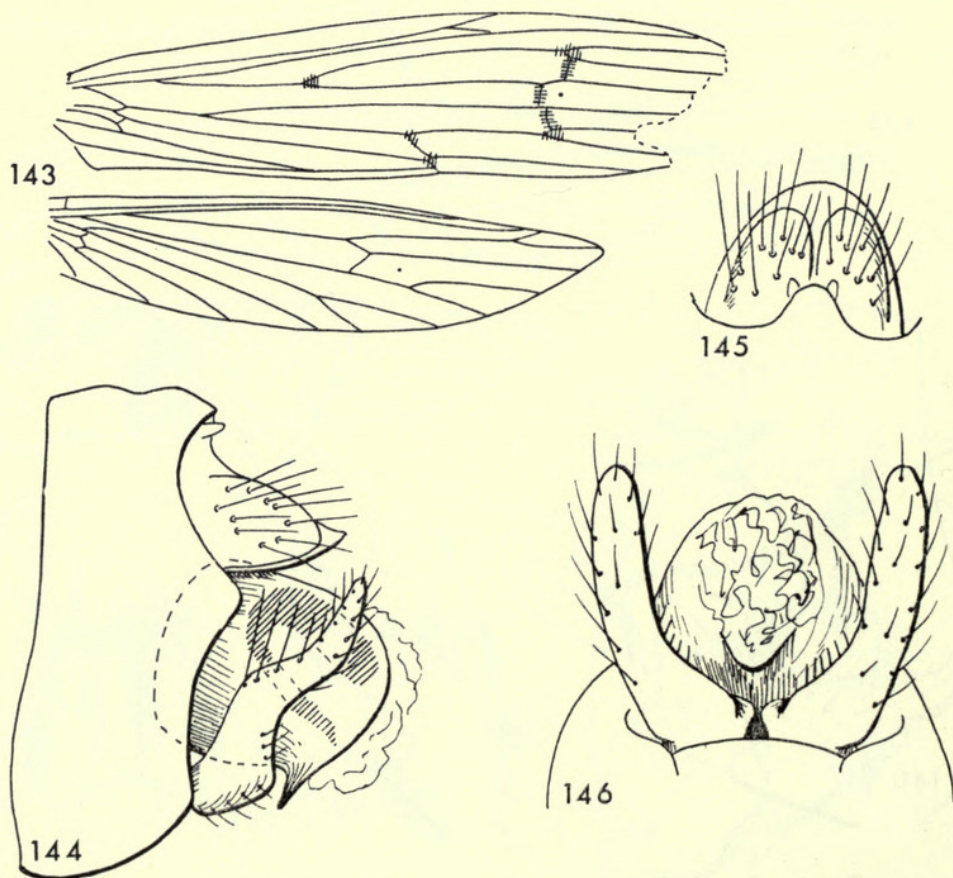
In venation and in general structure of genitalia, this species resembles *O. assamensis*, but it differs in having the tenth tergite extending beyond the elongate cerci, which are not fused to it. The main part of the clasper is narrower and much more strongly curved mesally.

***Oecetis sinuata* sp. n.**

(Text-figs. 143-146)

♂ (in alcohol). Insect much denuded, general colour fulvous. Antennae incomplete, third segment very slightly arched at its base. Fore wing hyaline, apex missing, forks and anastomosis lightly shaded with fuscous. Anastomosis broken, the free part of R_5 basad of the other two cross-veins. In hind wing, free part of R_5 falls on the stem of M about twice its own length basad of the fork.

♂ GENITALIA. Apical dorsal margin of ninth segment produced at its centre in a short, narrow lobe with a rounded apex. Side-pieces short and deep. Tenth tergite forming a



FIGS. 143-146. *Oecetis sinuata* sp. n. ♂. 143, wings ; 144, genitalia, lateral ; 145, ninth and tenth tergites, dorsal ; 146, ninth sternite, claspers and aedeagus, ventral.

rounded hood with a flattened apex. Fused to its upper surface are the two ovate cerci. Aedeagus short, globose, enclosing a stout, curved spine. Its lower apical margin is produced downwards in a short, triangular tongue. Clasper moderately slender, sinuate in side view, digitate and divergent in ventral view.

♀ Unknown.

Length of fore wing, ♂, c. 7 mm.

Holotype ♂ (mounted as microscope preparations), N.E. BURMA : Kambaiti, 6,000 ft. 4.iv.1934 (*R. Malaise*), STOCKHOLM.

This species is distinguished from *O. assamensis* and *O. kambaitensis* by the slender, more or less parallel-sided clasper, which is not dilated basally and not incurved apically.

***Oecetis nervisquamosa* (Schmid) comb. n.**

Setodes (err. pro *Setodellina*) *nervisquamosa* Schmid, 1958 : 153, pl. 29, figs. 14-15.

INDIA : Assam, Cherrapunji, 1 ♂, BMNH.

N. BURMA : Washaung, c. 200 m., 20 km. E of Myitkyina, 14.vii.1934, 1 ♂ (*R. Malaise*), STOCKHOLM.

Previous distribution. CEYLON.

***Oecetis nerviciliata* (Schmid) comb. n.**

Setodellina nerviciliata Schmid, 1958 : 152, pl. 29, figs. 10-13.

S. INDIA : Palnis, 7,000 ft., viii.1921, 1 ♂, (*T. B. Fletcher*), BMNH.

INDIA : Assam, Khasi Hills (*McLachlan collection*) ; Shillong, 5,000 ft., 26.vi.1928, 1 ♂ (*T. B. Fletcher*), BMNH.

Previous distribution. CEYLON.

KEY TO THE MALES OF *Oecetis* FROM THE INDIAN SUB-CONTINENT, CEYLON AND BURMA

Martynov's species *O. tenuis*, *indivisa* and *angustipennis* key out to couplet 26, but his figures are not sufficiently detailed for further separation.

- | | | |
|---|---|------------------------------|
| 1 | Tergite X produced in a slender finger or in a pair of lobes | 2 |
| - | Tergite X not so produced, generally more or less fused with cerci | 20 |
| 2 | Tergite X produced in a pair of lobes | 3 |
| - | Tergite X digitate | 4 |
| 3 | Lobes of tergite X closely appressed, cerci forming spatulate lobes on each side.
Basal and third segments of antenna elongate, the latter clothed with a pencil of
dense, long, silky hair | <i>O. penicillata</i> sp. n. |
| - | Lobes separated, cerci short, quadrate. Antennae normal | <i>O. malighawa</i> Schmid |
| 4 | Side-pieces of segment IX produced in long, flattened blades, curving slightly
downwards | 5 |
| - | Side-pieces only slightly produced | 6 |
| 5 | Lobe of tergite X long | <i>O. lais</i> (Hagen) |
| | | <i>O. sumanasara</i> Schmid |
| - | Lobe short | <i>O. eburnea</i> Schmid |
| 6 | Clasper with one or more basal branches | 7 |
| - | Clasper without a basal branch | 16 |
| 7 | Basal branch of clasper more than half as long as apical branch in side view | 8 |
| - | Basal branch less than half as long as apical | 14 |

- | | | |
|----|---|----------------------------------|
| 8 | Tergite VIII reticulated | 9 |
| - | Tergite VIII not reticulated | 12 |
| 9 | Cerci elongate, clavate | 10 |
| - | Cerci shorter, not clavate | 11 |
| 10 | Basal branch of clasper longer than apical | <i>O. lingua</i> Schmid |
| - | Basal branch shorter than apical | <i>O. fahieni</i> Schmid |
| 11 | Tergites VIII, VII and part of VI reticulated | <i>O. biramosa</i> Martynov |
| - | Only tergite VIII reticulated | <i>O. multispinosa</i> sp. n. |
| 12 | Basal branch of clasper trifid | <i>O. hamata</i> Ulmer |
| - | Basal branch simple | 13 |
| 13 | Apical branch of clasper from below slender, incurved. Antenna with basal and third segments elongate, densely clothed with long, silky hairs | |
| | | <i>O. fletcheri</i> sp. n. |
| - | Apical branch from beneath broad. Antenna normal. | <i>O. cristata</i> sp. n. |
| 14 | Basal and apical branches of clasper slender | <i>O. dhatusena</i> Schmid |
| - | Basal branch stouter than apical | 15 |
| 15 | In hind wing, R_{4+5} falls upon M_{1+2} | <i>O. bengalica</i> Martynov |
| - | In hind wing, R_{4+5} falls upon the stem of M | <i>O. scutulata</i> Martynov |
| 16 | Claspers slender in side view, or only slightly thickened at base | 17 |
| - | Claspers stout at base in side view | 18 |
| 17 | Cerci short, forming a transverse plate in dorsal view | <i>O. mekana</i> sp. n. |
| - | Cerci longer, flattened, divergent | <i>O. ceylanica</i> (Ulmer) |
| 18 | Tergite X elongate, slender | <i>O. villosa</i> sp. n. |
| - | Tergite X shorter, broad | 19 |
| 19 | Clasper in side view abruptly narrowed from about half way along upper margin | <i>O. meghadouta</i> Schmid |
| - | Clasper gradually tapering from half way to apex | <i>O. naravitta</i> Schmid |
| 20 | Clasper in side view stout at base, tapering to an acute apex | 21 |
| - | Clasper in side view either more or less slender throughout, or else with an abrupt narrowing shortly beyond the base | 23 |
| 21 | Aedeagus large, globular, with a single enclosed spine | <i>O. angulata</i> sp. n. |
| - | Aedeagus not large and globular, without enclosed spine | 23 |
| 22 | Cerci large, fused to tergite X, whose apex is not bifid. Fork R_2 in fore wing sessile | <i>O. rectangula</i> sp. n. |
| - | Cerci small, not fused to tergite X, whose apex is bifid. Fork R_2 in fore wing stalked | <i>O. submaculosa</i> sp. n. |
| 23 | Clasper broad at base, abruptly constricted ventrally near base, strongly incurved in ventral view | 24 |
| - | Clasper more or less slender throughout in side view, subparallel in ventral view | 25 |
| 24 | Tergite X not projecting beyond cerci | <i>O. assamensis</i> sp. n. |
| - | Tergite X projecting beyond cerci | <i>O. kambaitensis</i> sp. n. |
| 25 | Clasper in side view with upper and lower margins sinuous | <i>O. sinuata</i> sp. n. |
| - | Clasper with only upper margin sinuous | 26 |
| 26 | Main veins in fore wing with scales | <i>O. nervisquamosa</i> (Schmid) |
| - | Main veins in fore wing without scales, although tufts of hairs may be present | 27 |
| 27 | Veins in fore wing with tufts of black hairs | <i>O. punctatissima</i> (Schmid) |
| - | Veins with two rows of long, black hairs | <i>O. nerviciliata</i> (Schmid) |

Leptocerus inlensis (Martynov)

Setodes inlensis Martynov, 1936 : 254, figs. 16-18.

S. SHAN STATES : Lake Inle, S. end, 900 m., 10-15.ix.1934, numerous ex. (R. Malaise), STOCKHOLM, BMNH.

Recorded distribution. S. SHAN STATES, CEYLON, INDIA.

***Leptocerus burmanus* sp. n.**

(Text-figs. 147, 150-152)

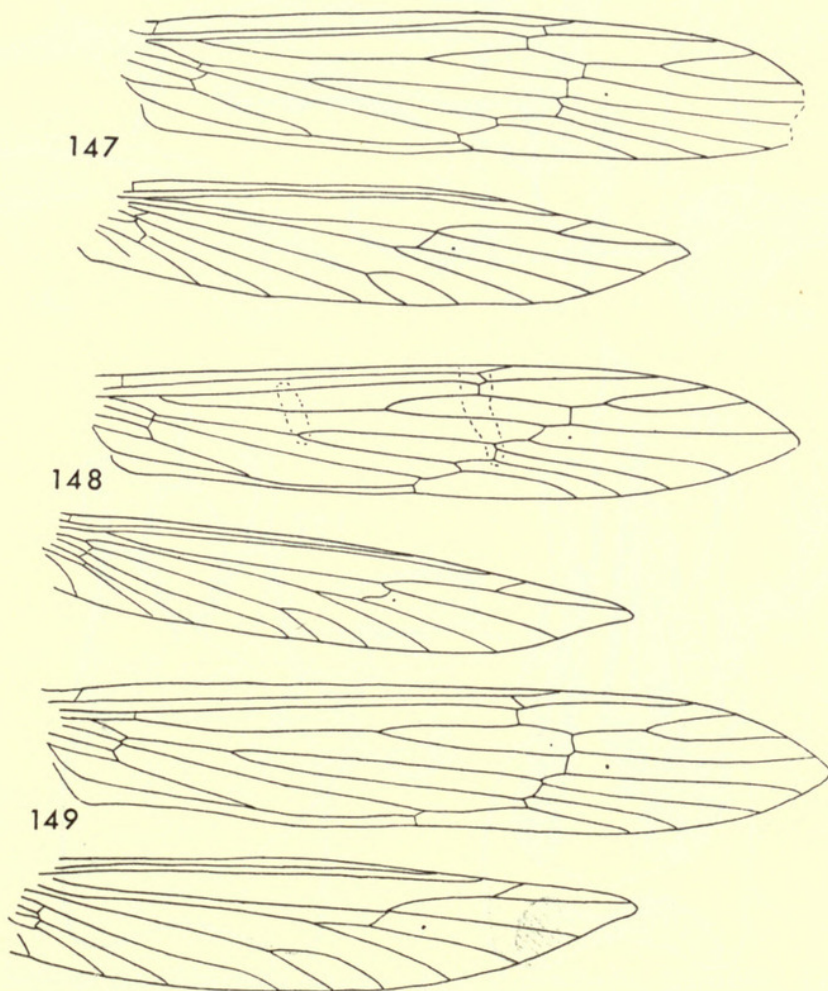
♂ (in alcohol). General colour dark fuscous ; wings rather denuded, fore wing with traces of dark castaneous pubescence and with a white patch on anterior margin about the level of the middle of the discoidal cell.

♂ GENITALIA. Ninth segment short dorsally, apical margin ventrally with a wide, V-shaped excision, filled with membrane. Tenth tergite long, median lobe sinuously spiniform in side view, apex downcurved and acute ; from above, it is slightly off-centre. Lateral lobes also spiniform, shorter than median lobe, a little asymmetric, each terminating in two short setae. Cerci reduced to low, rounded warts. Aedeagus trough-shaped, apex rounded and downcurved, filled with membrane and with a single slender paramere, flexibly attached to the dorsal surface. Claspers fused at inner basal angles, enclosing, with the excision of the ninth segment, a membranous, cordate area, and with a short, rounded lobe overlapping the basal angles of the claspers. The clasper is two-branched, the basal branch somewhat rhomboidal in ventral view, reniform in side view and with the inner surfaces set with stout setae. Upper branch arising near the base of the lower branch, slender, sinuous from above.

♀ Unknown.

Length of fore wing, ♂, 5.5 mm.

Holotype ♂ (mounted as microscope preparations), N. BURMA : Washaung, 16.iii.1934 (*R. Malaise*), STOCKHOLM.



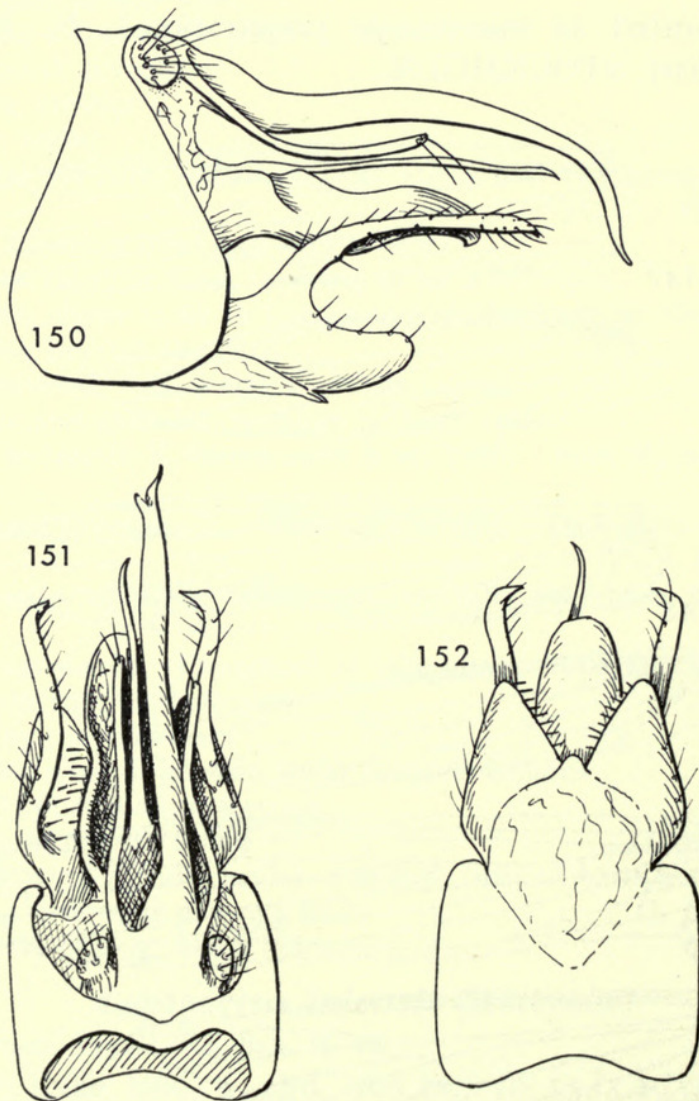
FIGS. 147-149. *Leptocerus* spp. n. ♂ wings. 147, *burmanus* ; 148, *cherrensis* ; 149, *bosei*.

In the male genitalia, this species shows some analogy with *L. interruptus* (F.). Both have the long tenth tergite, but in *burmanus* the median lobe is reduced to a single process and the cerci are more developed. The membranous area between the base of the claspers and the apical margin of the ninth segment is crossed by a sclerotized rib in *L. interruptus*, dividing it into two areas.

***Leptocerus cherrensis* sp. n.**

(Text-figs. 148, 153-159)

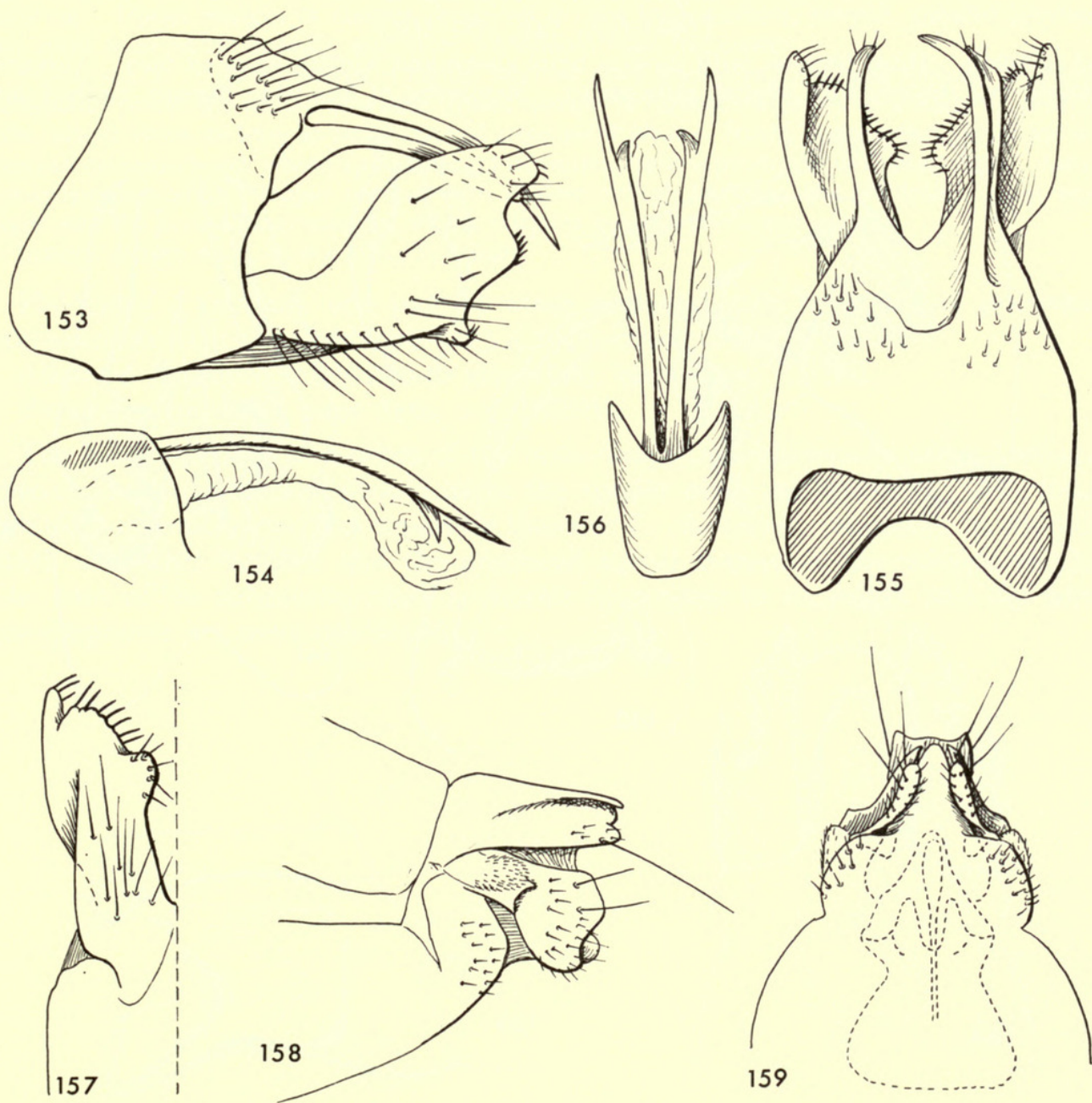
♂ (pinned). Head piceous, with piceous pubescence. Basal segment of antenna fuscous, with whitish pubescence, the remaining segments with pale, fuscous pubescence, in basal half with whitish annulations. Palpi fuscous. Thorax piceous, legs pale fuscous. Wings narrow, fore wing with dense, dark chocolate (? in life black) pubescence, a conspicuous streak of snow-white pubescence running from the costal margin across the middle of the discoidal cell to the apex of the thyridial cell. In the apical area of the wing, the membrane is sprinkled with snow-white hairs and there is a suggestion of another smaller white band at the level of the thyridial cell. Hind wing with sparse, fuscous pubescence.



FIGS. 150-152. *Leptocerus burmanus* sp. n. ♂. 150, genitalia, lateral ; 151, dorsal ; 152, ninth segment, claspers and aedeagus, ventral.

♂ GENITALIA. Ninth and tenth tergites fused. The median lobe of the latter is long and spiniform, arising asymmetrically from the left half of the tergite, curving gently downward. Lateral lobes also spiniform, nearly as long as median lobe, but less sclerotized and terminating in a few bristles. Two areas of setae at the lateral lobes may represent the cerci. Aedeagus with a cup-like base, from which arise two spiniform parameres with bifid apices and with a digitate, membranous structure between them. Claspers fused basally, in side view narrow at base, dilating to a broad apex with a sinuous margin armed with stout setae. From below, the apical margin is obliquely sinuous.

♀ GENITALIA. Apical margin of eighth sternite more sclerotized, forming a short, transverse lobe with rounded lateral margins, and with the centre of its apical margin further produced in a triangular lobe. Ninth and tenth tergites fused, making a rectangular hood. Lateral gona-



FIGS. 153-159. *Leptocerus cherrensis* sp. n. 153, ♂ genitalia, lateral ; 154, ♂ aedeagus, lateral ; 155, ♂ genitalia, dorsal ; 156, ♂ aedeagus, dorsal ; 157, ♂ left clasper, ventral ; 158, ♀ genitalia, lateral ; 159, ♀ ventral.

pophyses narrow basally, dilating to an irregularly clavate apex in side view. At their bases is a slightly dilated, membranous lobe. Lower margin of gonapophyses incurved.

Length of fore wing, ♂, 6 mm., ♀, 5 mm.

Holotype ♂ (pinned, abdomen and one pair of wings mounted as microscope preparations), INDIA : Assam, Cherrapunji, BMNH.

Allotype ♀ (pinned, abdomen in glycerine), same data, BMNH.

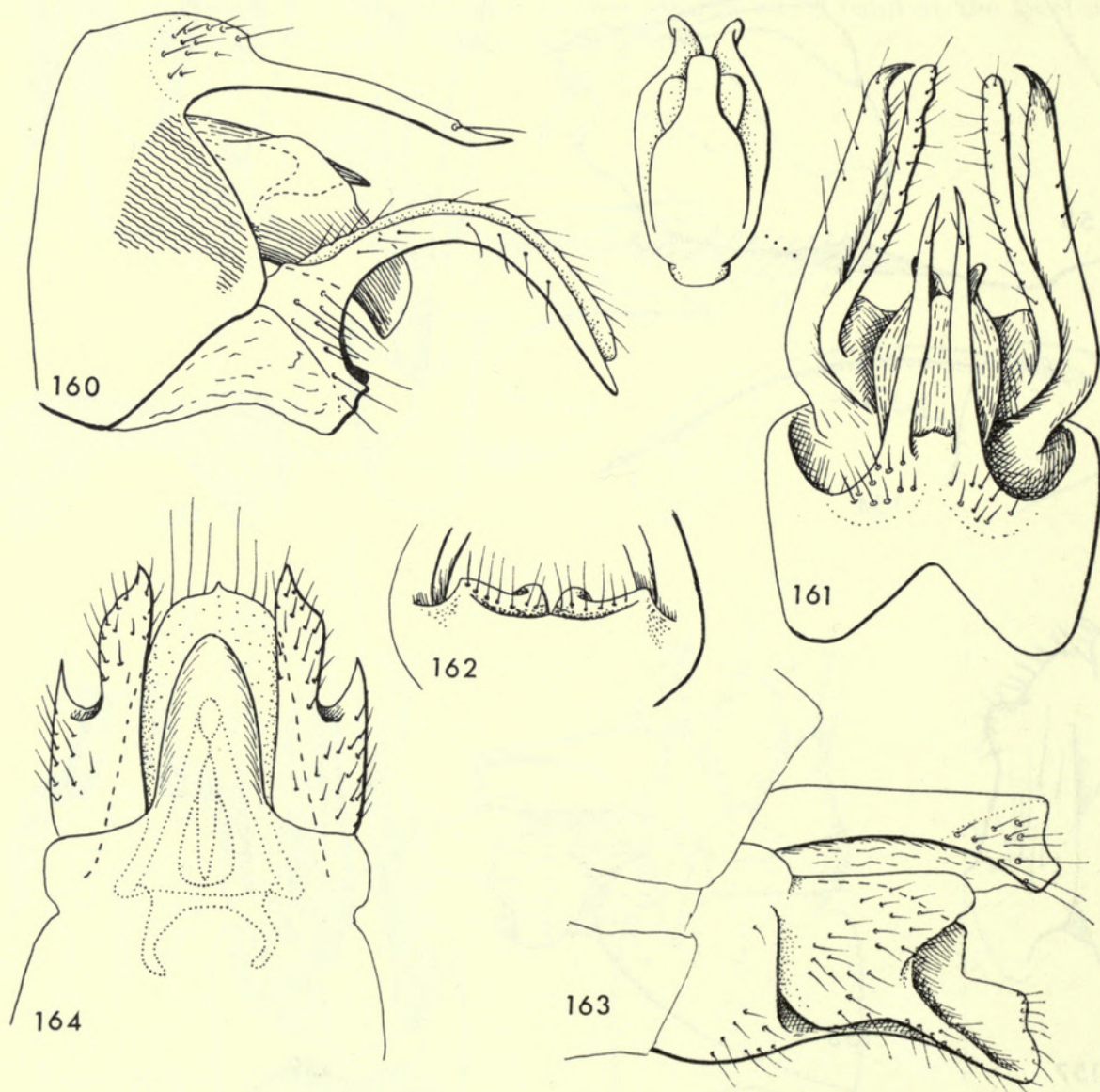
Paratypes, pinned, same data, 23 ♂, 1 ♀, BMNH.

I know of no close relative of this species. The wing markings recall the *neavei*-group of African *Leptocerus*, but the genitalia are entirely different.

***Leptocerus bosei* sp. n.**

(Text-figs. 149, 160-164)

♂ (pinned). Head piceous, with piceous hairs above and whitish hairs on face. Antennae fuscous, legs fuscous with whitish pubescence. Membrane of fore wing fuscous, clothed with



FIGS. 160-164. *Leptocerus bosei* sp. n. 160, ♂ genitalia, lateral ; 161, ♂ dorsal, with inset of aedeagus ; 162, ♂ base of claspers, ventral ; 163, ♀ genitalia, lateral ; 164, ♀ ventral.

dark fuscous pubescence, a snow-white area on costal margin over the $sc-r_1$ and r_1-r_2 cross-veins, extending into the discoidal cell, and another, smaller spot across R_s about midway between the forks of M and R_s . Hind wing membrane pale fuscous, with sparse, dark fuscous pubescence.

♂ GENITALIA. Ninth segment rather short dorsally, well developed laterally, ventral apical margin excavated and linked to basal margin of claspers by membrane, the claspers being hinged to ninth segment by their upper basal angles. Tenth tergite fused to ninth, short, produced apically in a pair of long, slender, subparallel spines. At their bases, the dorsal surface of the segment bears two areas of short setae. Aedeagus short, stout, its upper surface produced in a thin, spatulate median lobe, lower part of aedeagus trough-shaped, terminating in a pair of divergent lobes. Claspers with short, wide, fused bases, the area between the upper and lower apical margins impressed, upper margin with two rounded lobes mesally, separated by an excision. Upper margin of clasper produced in two long, slender, curved, parallel processes, the outer more acute apically and more sclerotized than the inner.

♀ GENITALIA. Apical margin of eighth sternite more sclerotized, forming a broad, transverse subgenital plate, the centre of whose apical margin is further extended in a narrow, parabolic lobe, about twice as long as basal part of subgenital plate. Ninth and tenth tergites fused to form an elongate hood, whose apical margin in ventral view is produced in a small cusp. Lateral gonapophyses large. Upper surface with a deep trough between the produced upper apical angle and the raised inner margin, which projects beyond the upper margin.

Length of fore wing, ♂, 6.5 mm., ♀, 6 mm.

Holotype ♂ (pinned, one pair of wings and abdomen mounted as microscope preparations), INDIA : Jubblepore, 15.ii.1946, (B. B. Bose), BMNH.

Allotype ♀ (pinned, abdomen in glycerine), same data, BMNH.

Paratypes (pinned), same data, 2 ♀, BMNH.

The parallel, curved branches of the male clasper are unlike any other *Leptocerus* species known to me and should make the species easily recognisable. The female genitalia in general pattern resemble those of *L. cherrensis*, especially in the fused ninth and tenth tergites and the produced apical margin of the subgenital plate. The base of the subgenital plate is shorter in relation to its length and the lateral gonapophyses are more developed.

BIBLIOGRAPHY

- BANKS, N. 1911. Notes on Indian Neuropteroid Insects. *Proc. ent. Soc. Wash.* **13** : 99-106, pl. 6.
- 1915. On a collection of neuropteroid insects from the Philippine Islands. *Proc. ent. Soc. Wash.* **15** : 170-180, pls. 8-9.
- FORSSLUND, K. -H. 1940. The Synonymy of some Trichoptera. *Entomologist*, **73** : 48.
- HAGEN, H. A. 1859. Synopsis der Neuropteren Ceylons (Pars II). *Verh. zool. bot. Ges. Wien*, **9** : 199-212.
- McLACHLAN, R. 1874-1880. *A monographic Revision and Synopsis of the Trichoptera of the European Fauna*, pp. i-iv, 1-523, Supplements parts I-II, pp. i-ciii, pls. 1-59. London, J. van Voorst.
- MARTYNOV, A. B. 1936. On a collection of Trichoptera from the Indian Museum. Part II-Integripalpia. *Rec. Indian Mus.* **38** : 239-306, figs. 1-73.
- SCHMID, F. 1958. Trichoptères de Ceylan. *Arch. Hydrobiol.* **54** : 1-173, Text-figs. i-v, pls. 1-34.
- 1961. Trichoptères du Pakistan. 4me partie. *Tijdschr. Ent.* **104** : 187-230, pls. 13-25.
- ULMER, G. 1915. Trichopteren des Ostens, besonders von Ceylon und Neu-Guinea. *Dtsch. ent. Z.* **1915** : 41-75, figs. 1-47.
- 1930. Trichopteren von den Philippinen und von den Sunda-Inseln. *Treubia* **11** : 373-498, figs. 1-147.
- 1951. Köcherfliegen (Trichopteren) von den Sunda-Inseln (Teil I). *Arch. Hydrobiol. Suppl. Bd.* **19** : 1-528, pls. 1-28.

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Kimmins, Douglas Eric. 1963. "On the Leptocerinae of the Indian sub-continent and North East Burma (Trichoptera)." *Bulletin of the British Museum (Natural History) Entomology* 14, 263–316.

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