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Setodini of the People's Republic of China (Trichoptera: Leptoceridae, Leptocerinae)

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(Trichoptera: Leptoceridae, Leptocerinae)[1]

By

Yang Lian-fang[2] and John C. Morse[3]

ABSTRACT

The Chinese species of the long-horned caddisfly tribe Setodini are reviewed, based on the recent revision by Schmid. Twenty-two species of Setodini are reported from China, including six species previously described in paraphyletic Setodes and one in monophyletic Trichosetodes, twelve species being described as new to science in Setodes and one in Trichosetodes, and two unnamed species of Setodes whose females are described. Of the previously described species, three species of Setodes are reported for China for the first time, including S. fluvialis Kimmins, 1963b, S. pulcher Martynov, 1910, and S. punctatus Fabricius, 1793. Setodes iris Hagen, 1858, has been reported from China, but probably does not occur here. Descriptions, illustrations, and keys are provided for males of the 20 named species of Setodini, for females of 14 of the named (and the two unnamed) species of Setodes, and for females of both species of Trichosetodes. Characters of the larvae and pupae of Setodes and Trichosetodes, and especially of S. punctatus are reviewed. The Chinese species of Setodini are most closely related to those of the Palearctic and Oriental Biogeographic Regions.

INTRODUCTION

This is the second in a series of publications reviewing the Leptoceridae (Trichoptera) species of The People's Republic of China, the first (Yang and Morse, 1988) having concerned the genus Ceraclea Stephens (Leptoceridae). This series is designed to assist Chinese biologists to know the aquatic insect fauna of Southeast Asia sufficiently to use it in assessment of quality of surface water.

As was suggested by the results of the first publication in this series, most of the aquatic insect species of China are unknown. In this contribution, documenting a fauna of at least 22 (20 named) species of Setodini in China, 13 species (65%) are described as new to science, although the fauna reported here is a sample from only 16 localities (plus two unspecified localities). Most of the known species of these genera occur in the Oriental Biogeographic Region outside of China, including 131 species and subspecies of the world fauna of Setodes

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Rambur, 1842 (70% of 186 species and subspecies; Schmid, 1988[4]), and 19 species of the world fauna of Trichosetodes Ulmer, 1915 (63% of 30 species; Schmid, 1988[5]). Thus, it is very likely that further collecting will increase the numbers of known Chinese species in these genera considerably.

The monophyletic tribe Setodini was recognized by Morse (1981) to include four genera: Episetodes Martynov, 1936; Hemileptocerus Ulmer, 1922; Setodes, and Trichosetodes. Schmid (1958) considered Episetodes a synonym of Setodes; in his recent revision (1988), he included the only species of Episetodes in Trichosetodes, making them synonymous. Hemileptocerus includes only two species confined to Africa. Schmid (1988) added the genus Sericodes Schmid, 1988, to the tribe to include two African species.

The revision by Schmid (1988) provided the first summary of Chinese species of Setodini. Previous publications concerned only descriptions of individual species. Schmid (1988) recognized that Setodes dicopennis Hwang, 1958, actually is a species of Leptocerus. Otherwise, the following four species of Setodini were reported previously from China:

S. argentatus Matsumura, 1906
S. iris Hagen, 1858
S. pellucidulus Schmid, 1988
T. insularis Schmid, 1988

Of these four species, we have seen specimens of T. insularis only. The record of S. iris by Li (1951) probably is in error. In the course of our investigations, we also examined Chinese specimens of S. fluvialis Kimmins, 1963b (previously known only from Burma), S. pulcher Martynov, 1910 (previously known only from Siberia and the Ussuri Region of the U.S.S.R and from North Korea), and S. punctatus Fabricius, 1793 (previously known from most of the Palearctic Region outside of China). Many other species of Setodes and Trichosetodes occur in the Palearctic and Oriental Regions outside the borders of China; these species may be discovered in China during future studies. Twelve species of Setodes are described and named below along with two unassociated females; one new species of Trichosetodes is described. This brings to at least 18 the number of named Setodes species known for China and to two the number of Chinese Trichosetodes species.

[4] Schmid listed 174 species and 3 subspecies of Setodes. To these should be added S. fragilis Olah, 1985, from Bhutan; S. mubalei Jacquemart, 1961, from Zaire; S. obscurus Schmid and Levanidova, 1986, from southcentral USSR near Krasnoyarsk; S. shirasensis Kobayashi, 1984, from Japan; and five species nomina dubia described by Hagen from Sri Lanka in 1858 (S. ino) and 1859 (S. cloe, gazella, najas, and lais).

[5] Schmid listed 29 species of Trichosetodes. To these should be added T. victoriana Kimmins, 1956, from Uganda.

CHECKLIST OF SPECIES

In the checklist below, the classification of Schmid (1988) is used, along with his informal categories in quotation marks (" "). The 22 Chinese species of Setodini presently reported are as follows:

Setodini Morse, 1981
- Genus Setodes Rambur, 1842
  - "Primitive Branch"
    - "Isolated Species"
      - punctatus (Fabricius, 1793)
      - species A
      - diversus, n. sp.
    - "Argentiferus Group"
      - trilobatus, n. sp.
      - bispinus, n sp.
    - "Tejasvin Group"
      - schmidi, n. sp.
      - carinatus, n. sp.
    - "Hungaricus Group"
      - ancala, n. sp.
  - ["Derived Branch"]
    - "Isolated Groups and Species"
      - "Pulcher Group"
        - pulcher Martynov, 1910
        - pellucidulus Schmid, 1988
        - yunnanensis, n. sp.
        - species B
      - "Isolated Species"
        - argentatus Matsumura, 1906
    - "White Species"
      - "Parisamchuddha Group"
        - hainanensis, n. sp.
    - "Curled Species Branch"
      - "Fluvialis Group"
        - fluvialis Kimmins, 1963b
      - "Aparimeya Group"
        - "Manimekhala Subgroup"
          - brevicaudatus, n. sp.
          - longicaudatus, n. sp.
        - "Aethiopicus Subgroup"
          - quadratus, n. sp.
          - distinctus, n. sp.
    - "Strange Species"
      - "Isolated Species"
        - iris Hagen, 1858
- Genus Trichosetodes Ulmer, 1915
  - "Isolated and Insufficiently Known Species"
    - insularis Schmid, 1988
    - lasiophyllus, n. sp.

SPECIMENS EXAMINED

Specimens used in this research were collected by Prof. Tian Li-xing, Mr. Li Yu-wen, Mr. Sun Chang-hai, Mr. Xue Ying-gen, Mr. Du Jian, and Mr. Zhang Man-qing or were obtained from the following institutions:

Bei-jing Agricultural University (BAU)
Nan-jing Teacher's College (NTC)
Northwest Agricultural University (NWAU)
Shang-hai Institute of Entomology (Academia Sinica; SIE)

We are grateful to each of these individuals and institutions for their assistance in this work.

Localities of specimens studied are indicated with arabic numbers beside them in Figure 1. The localities are as follows:

1. Chang-bai-shan Mountain, Ji-ling Province (N42.20, E128.10)
   Setodes pulcher
   Setodes sp. B
2. "Chu-san" [possibly Tu-shan Mountains], He-bei Province (N40.80, E118.80)
   Setodes argentatus
3. "Hong San" [possibly Hu-shan Mountains], Jiang-xi Province (N28.10, E115.00)
   Setodes argentatus
4. Hua-xi, Gui-chou Province (N26.25, E106.40)
   Setodes carinatus
   Setodes quadratus
5. Jian-yang, Fu-jian Province (N27.30, E118.10)
   Setodes diversus
6. Jin-xiu, Guang-xi Province (N24.10, E110.10)
   Setodes ancala
7. Jing-hong, Yun-nan Province (N22.00, E100.80)
   Setodes sp. A
8. Mao-yang, Guang-dong Province (N19.10, E109.70)
   Setodes hainanensis
   Setodes distinctus
   Trichosetodes insularis
9. "Ta Hian" [possibly Tan-hsien], Hai-nan Island, Guang-dong Province (N19.49, E109.23)
   Setodes pellucidulus
10. Wu-da-lian-chi, Hei-long-jiang Province (N48.45, E125.55)
    Setodes punctatus
    Setodes pulcher
11. Wu-yi, Fu-jian Province (N27.70, E117.70)
    Setodes schmidi
    Setodes longicaudatus
    Trichosetodes lasiophyllus
12. Wu-yuan, Jiang-xi Province (N29.15, E117.53)
    Setodes bispinus
13. Yi-xing, Jiang-su Province (N31.30, E119.80)
    Setodes quadratus

14. Ying-jiang, Yun-nan Province (N24.60, E97.90)
    Setodes yunnanensis
15. Yun-yang, Si-chuan Province (N31.10, E108.80)
    Setodes fluvialis
    Setodes brevicaudatus
16. Zhen-ba, Shaan-xi Province (N37.50, E107.90)
    Setodes trilobatus
17. Li's (1951) unspecified locality in northeastern China (Hei-long-jing, Liao-ning, and Ji-ling Provinces).
    Setodes argentatus
18. Li's (1951) unspecified locality in China.
    Setodes iris

Types of new species described herein are deposited in the collections of The Department of Plant Protection, Nan-jing Agricultural University (NAU) unless otherwise indicated.

SYSTEMATIC TREATMENT

Complete bibliographies, including synonyms, of each species described before 1961 can be found in Fischer's Trichopterorum Catalogus (1966, 1972). No attempt will be made here to complete these bibliographies to the present. However, all species described since 1960, as well as new synonyms and significant redescriptions, are included. Synonyms listed by Fischer are not repeated here unless a new opinion has been reported. The sex, repository collection, and type locality of each holotype is indicated respectively, following the original description citation for each species.

In the descriptions, the terminology for wing venation follows that of Hamilton (1972) and the terminology for genitalic structures generally follows that of Nielsen (1957), Morse (1975), and Schmid (1988) for males and Nielsen (1980) for females. Abbreviations are indicated with the text and illustrations to designate the following structures:

Males:

ba.pl	= basal plate of inferior appendages
bd	= baso-dorsal lobe of an inferior appendage
bv	= baso-ventral lobe of an inferior appendage
end	= endophallic membranes
inf.app	= inferior appendage (paired)
IX	= abdominal segment IX
ma.po	= positive manille (posterior concavity of sternum IX with elevated lateral and posterior margins)
ma.ne	= negative manille (posterior concavity of sternum IX without elevated margins)
me	= mesal lobe of an inferior appendage
par	= paramere spine (usually paired)
phb	= phallobase
phc	= phalicata
ph.sh	= phallic shield
scl.lb	= sclerotized lobe (paired) of base of parameres
scl.st	= sclerotized strip (often paired) of phallic shield

sup.app = superior appendage (paired)
t = tubule (sclerotized ejaculatory duct, often exposed)
X = abdominal segment X

Females:

camp = campanulate plate of spermathecal sclerite
go.pl = gonopod plate of sterna VIII and IX (e.gon.VIII and e.gon.IX of Nielsen, 1980)
IX = abdominal segment IX
IXa = "anterior, horizontal area IXa" (Nielsen, 1980)
IXb = "low sclerotic bulge IXb" (Nielsen, 1980)
lam = lamella (paired; "IXd" of Nielsen, 1980)
lat.fl = ventro-lateral flange of a lamella
ov = ovoid structure of spermathecal sclerite
sb = sclerotized bands of spermathecal sclerite
sf = supporting flanges of campanulate plate
sp.sc = spermathecal sclerite
sup.app = superior appendage (paired; "IXc" of Nielsen, 1980)
vent.lat = ventro-lateral lobe of a lamella
X = abdominal segment X

Wings:

1A = first anal vein
2A = second anal vein
Cu_1 = first cubital vein
Cu_2 = second cubital vein
discoidal = discoidal cell
E = empusal vein
J = jugal bar
MA = anterior branch of median vein
m-cu = media to cubitus crossvein
MP = posterior branch of median vein
P = plical vein
R = radial vein
s = sectoral crossvein
S_1 = first sectoral vein
S_2 = second sectoral vein
S_3 = third sectoral vein
S_4 = fourth sectoral vein
thyridial = thyridial cell

The importance of the recent work by Schmid (1988) cannot be underestimated. He increased the number of known species of Setodini 114% from 103 species to 220 species and subspecies and presented information about some fascinating evolutionary novelties in the male genitalia of these insects. He established the basic phylogenetic relationships that we use in this paper. He admitted that his work, which we think is otherwise exceptional, is incomplete in terms of various unresolved polytomies and in terms of branching patterns occasionally unsubstantiated with explicit homologues. His classification includes several apparently monophyletic species groups and isolated species. The majority of the species are included in a paraphyletic "genus Setodes," with monophyletic genera Hemileptocerus, Sericodes, and Trichosetodes branching from

within it. However, a more thoroughly resolved phylogeny of the species of Setodini is outside the scope of the work reported here and, indeed, may not be possible from morphological characters alone, as Schmid (1988) indicated. Our intent is to report only on the Chinese fauna and their immediate relatives, not on the entire tribe of 233 named species. Accordingly, we have incorporated our new species into Schmid's (1988) phylogeny and classification to the best of our ability.

We sincerely appreciate the encouragement of Prof. Tian Li-xin for undertaking this research. Dr. Fernand Schmid kindly cooperated in dialogue about his revision while it was still in progress and in the loan of the published product. Our work was accomplished while the senior author was a Visiting Scholar at Clemson University during 1987-89.

Setodes Rambur, 1842

Type species: Setodes punctella Rambur, 1842, subsequent selection of Milne, 1934 (a synonym of Phryganea viridis Fourcroy, 1785).

Taxonomy: The genus name Setodes was used in a broad sense by Brauer (1857) and most subsequent trichopterologists until 1934 to include the species of Leptocerus, reserving the latter name for species of Athripsodini (Leptoceridae). Milne (1934) selected type species for Setodes and Athripsodes which restricted the name Setodes to its modern scope. Until the appearance of Schmid's (1988) revision, however, many species which had been described in Setodes during that 77-year period (and even later) were not assigned after 1934 either to Setodes or to Leptocerus, including 61 species listed by Fischer (1966, 1972) as "Setodes or Leptocerus." Although Morse (1981) assigned these genera to separate monophyletic tribes, it was left to Schmid (1988) to sort the species to their appropriate genera.

Diagnoses: Larvae of species of Setodes were described by Hickin (1943, 1967, Setodes argentipunctellus MacLachlan, 1877b), Ross (1944, ?Setodes), Akagi (1957, Setodes species), Botosaneanu (1959, Setodes hungaricus Ulmer, 1908), Murgoci (1959, Setodes species "larva anthodiscus", perhaps S. argentipunctellus according to Botosaneanu and Sykora, 1963), Botosaneanu and Sykora (1963, Setodes punctatus), Merrill and Wiggins (1971, Setodes incertus [Walker, 1852] and Setodes species [probably S. stehri {Ross, 1941} according to Unzicker et al. 1982]), Wiggins (1977, Setodes incertus), and Wallace (1981, Setodes punctatus and S. argentipunctellus). Larvae of these species may be distinguished from those of other leptocerid genera either by their possession of a pair of tooth-edged plates surrounding the anal region and extending onto the anal prolegs (Fig. 41D) or by their possession of two pairs of rows of strong posteriorly directed spines in this anal and proleg region (Wallace, 1981).

The pupa of Setodes hungaricus was described by Botosaneanu (1959) and that of S. punctatus by Botosaneanu and Sykora (1963). They differ from those of other known leptocerid pupae by the presence of teeth on the mandibles (Fig. 42C) and by the very conspicuous spinous projections midlength on the mesal surfaces of the caudal appendages (Fig. 42B).

Adults of Setodini were described in detail by Schmid (1988). They may be distinguished from those of other leptocerid tribes by the following characters: (1) The median (M) vein is branched only once in the fore and hindwings (into M_{1+2} and M_{3+4}, Fig. 2), that branch being petiolate (occurring beyond the "cord," the line of anastomosis of crossveins and apparent crossveins). (2) The

hindwing is as narrow as the forewing and acute apically. (3) The base of sector (S) is absent in the hindwing. (4) The branches of S in the hindwing are arranged with the first branch arising beyond the fork of S_3 and S_4 (Fork II). (5) The "false vein" before the cubitus (Cu_1) vein in the hindwing is [usually] absent. (6) On the vertex of the head, the epicranial stem is long and the dorsal triangle is small (Ross, 1944, fig. 737). (7) The katepisternum of the mesothorax is constricted antero-dorsally, without a short closing sulcus (Ross, 1944, fig. 739). Adults of species of paraphyletic Setodes lack certain characters found in the other genera of Setodini: (1) The scape of each male antenna is not unusually long and does not have the hair pencil characteristic of Trichosetodes species. (2) Each forewing is without the thickened and fused subcostal (Sc) and radial (R) veins and shortened discoidal cell and each hindwing retains a vestige of the base of the sectoral (S) vein unlike Hemileptocerus species. (3) The male phallus lacks the basally coiled parameres of Sericodes species.

Distribution: Species of Setodes are known from all biogeographic regions except the Neotropical Region.

Phylogenetic Relationships: The tribes Mystacidini and Setodini share the following unique homologue in the male genitalia (Morse, 1981): a ventral sclerotized strip from the phallic shield bracing the phallobase ("phallothèque" of Schmid, 1988) against the elongate and fused bases of the inferior appendages (basal plate of Nielsen, 1957; "tendon des appendices inférieurs" of Schmid, 1988). Thus, Mystacidini and Setodini probably are sister lineages. According to Morse (1981), evidence for the monophyly of Setodini includes the following homologue: the position of the first branch of sector (S) in the hindwing is more apical than usual, situated beyond the fork of S_3 and S_4 (Fork II; or the origin of the open discoidal cell is beyond the radio-median crossvein [r-m] auctt.; Fig. 2). This simple character resembles the superficially similar ones in distantly related Leptocerus and some species of Ceraclea (Pseudoleptocerus). Also, as in Nectopsychini and some species of Leptocerus, the base of S is atrophied in Setodini hindwings. As inferred by Schmid (1988), Setodes is paraphyletic, with the genera Hemileptocerus, Sericodes, and Trichosetodes excluded apparently from within it. Therefore, until a resolution of the several outstanding phylogenetic questions remaining in Setodini can be made, we prefer to think of Setodes as an informal group. [JCM would prefer to indicate the name in quotation marks, "Setodes," to indicate this problem.]

PRIMITIVE BRANCH

Schmid (1988) included in this Branch six species groups and 13 isolated species, considering them to constitute a monophyletic group, but without identifying specifically the homologues (or synapomorphies) by which he inferred their monophyly, except that the "madhuvarna" type of forewing coloration (clear yellow gold and riddled with small brown spots, nearly invisible and often aligned transversely to the veins; sometimes with some small indistinct areas of silver), typical of this Branch, is primitive and monophyletic. He indicated that the wing venation is without peculiarities and the male genitalia are essentially simple, fundamentally little specialized, and not very different from those of the theoretical ancestor of Setodes. We notice, however, that the known females of these species each have, apparently uniquely, the gonopod plate suspended below the abdomen and projecting posteriorly.

Isolated Species

The following three species appear to constitute a monophyletic group as suggested especially by the homologous bi-lobed female lamellae seta apart from segment IX and the gonopod plate by a conspicuous vertical groove on each side.

Setodes punctatus (Fabricius, 1793)

Phryganea punctata Fabricius, 1793, p. 80; holotype gender and deposition unknown; type locality = Paris, France.
Setodes punctatus (Fabricius), Malicky (1983), illustrations of male and female.

Description: Body pale yellowish brown. Forewings of the "madhuvarna" type, covered with very pale fulvous pubescence, with five or six longitudinal series of distinct, silvery spots rather closely spaced.

Male genitalia (Fig. 3): Segment IX with very narrow tergum, broad and setose sternum. Superior appendages (sensu Nielsen, 1957) triangular, hairy. Tergum X forming hood-like dorsal plate, in dorsal view with base about twice as broad as tapered and rounded apex, this apex in lateral view with rather blunt angle. Inferior appendages polytomous with lower and middle branches stout and obtuse, each slightly dilated and turned mesad near apex, lower branches broadly truncate and convergent in ventral view; slender dorsal process arising from base of middle branch; upper branch long and slender, extending above tergum X, curved caudad in apical quarter, bearing small clavate projection postero-mesally at one-third distance from base. Phallus with phallobase short; phalicata very long, slender, evenly curved downward, trough-shaped in apical four-fifths with single longitudinal dorso-mesal groove, lateral margins parallel in dorsal view, apically with small mesal sclerotized ejaculatory duct extending beyond two lateral membranous lobes; pair of parameres slender, symmetrical, curved parallel with phalicata and reaching to its apex.

Female genitalia (Fig. 23): "The 9th dorsal segment is large, concave in the middle, from it proceeds a nearly quadrate, large, flattened plate [tergum X], trisinuate on its apical edge, and probably representing the united superior appendages [probably not, these probably represented by pair of rounded flanges at base of tergum X]. Lateral valves very broad, shorter than the plate, with a broad excision near the upper end of the external margin; they are greenish, but the edge is testaceous, fringed with testaceous hairs. Viewed in front the apex of the abdomen forms an excessively deep cavity, in which are seen the walls of the tubular piece, which is shorter than the valves" (MacLachlan, 1877a). Gonopod plate projecting separately into a smooth plate, roughly quadrate in ventral view, with apical portion dilated and divided into triangular lobes.

Length of forewing: Male - 5.8 mm, female - slightly smaller.

Larva (Fig. 41A-D; Botosaneanu and Sykora, 1963): Very delicate final instar larva 7 mm or more in length. Head and thoracic sclerites pure yellow with darker yellow muscle scars; extremely indistinct spots on posterior part of fronto-clypeus and posteriorly on dorsal and ventral aspects of epicranium (Fig. 41B); contrasting and characteristic black design posteriorly on pronotum (Fig. 41A), otherwise pronotum and mesonotum pure yellow without any darker yellow spots; metanotal sclerites very indistinct (Fig. 41C). Black spot at base of each coxa and black spots on pleura. Abdominal segment I with about 20 dorso-lateral

and eight sternal setae on each side (Wallace, 1981). Anal region surrounded by tooth-edged plates (Fig. 41D).

Case (Fig. 41E-F; Botosaneanu and Sykora, 1963): 12 mm. Regularly constructed of fine sand, distinctly curved, and relatively solid (Fig. 41E). Posterior silken seal with round opening one-third as large as seal (Fig. 41F).

Pupa (Fig. 42; Botosaneanu and Sykora, 1963): 7 mm. Three pairs of conical, sclerotized swellings dorsally on head, arranged in triangle: two of these swellings flanking bases of antennae (median swellings larger than lateral ones), third (largest of all) more anterior. Mandibles each with row of teeth in middle of mesal edge (Fig. 42C). Caudal processes each with spinous swelling in middle (Fig. 42B).

Diagnosis: According to Schmid (1988), the male of this species resembles those of species of the Uttamavarna and Hungaricus Groups, madhuvarna, and abhirakta in the form of the inferior appendages. However, none of these or other known species have so many branches of these appendages. Furthermore, it differs from all of these except S. uttamavarna in the rounded tergum X with superior appendages separate from it. The female of S. punctatus most closely resembles that of the unnamed Setodes species described below, especially in the very large ventro-lateral plates of the lamellae and the apically cleft gonopod plate. However, the triangular lobes of the gonopod plate of S. punctatus are much broader and more widely separated and the horizontal dorsal plate, or tergum X ("dorsal keel" of Holzenthal, 1982, and Holzenthal and Harris, 1985; "ecaille vulvaire" of Schmid, 1988; possibly "X" or "d.i.gon.IX" of Nielsen, 1980) above the lamellae is slightly tri-lobed in dorsal view, rather than rounded as in the unnamed species. Larvae and pupae of too few species of Setodes are known to provide meaningful diagnoses for these developmental stages.

Distribution: According to Schmid (1988), this species is widely distributed in all of Europe and Siberia, from Morocco to Finland and from Iran to the Ussuri River. We now can add that the eastern range extends somewhat further south than was previously known, into northern China: Wu-da-lian-chi, Hei-long-jiang Province (N48.45, E125.55; Fig. 1, #10), 8 August 1987.

Phylogenetic relationships: Schmid (1988) classified S. punctatus as an "Espèce isolée," or species Incertae Sedis, whose phylogenetic relationships are unknown. The female of this species shares with the following unnamed species the very unusual, broad, ventro-lateral accessory plates of the lamellae. These probably are sister species, but their relationship with other lineages of Setodes remains undecided.

Setodes species A

Description: Head and body yellowish with pale yellow hairs. Forewings transparent, covered with golden hairs with dispersed silvery spots and with one or two faint fuscous points in apical portion and 10-12 points along distal margin.

Female genitalia (Fig. 24): Superior appendages broad and truncate , not projecting beyond tergum IX, covered with many short setae. Tergum X slightly contracted at base, widely rounded at apex in dorsal view. Lateral regions of IX with many long setae; deeply concave posteriorly between lower lateral margins, gonopod plate, and bases of lamellae. Lamellae bilobed, with dorso-mesal lobe semicircular and ventro-lateral lobe rounded-triangular in lateral view. Gonopod plate broad in basal one-third, abruptly tapering to narrow, bilobed apex. Spermathecal plate pear-like.

Male and immature stages unknown.

Length of forewing: Female - 6.8 mm.

Diagnosis: The females of only this and the preceding species have such large ventro-lateral lobes on the lamellae. Setodes species A differs from it in that these lobes are more nearly triangular in S. species A, tergum X is more rounded apically, and the gonopod plate is much narrower apically. The pear-shaped spermathecal sclerite also is distinctive.

Distribution: This species has been found only in southern China: Jing-hong, Yun-nan Province (N22.00, E100.80; Fig. 1, #7).

Phylogenetic relationships: For reasons mentioned above, this species appears to be closely related to S. punctatus.

Setodes diversus, n. sp.

Description: Specimens preserved in alcohol and bleached to uniformly pale yellow color.

Male genitalia (Fig. 4): Segment IX with tergum very narrow, sternum broad and setose. Superior appendages distinctively projecting from segment IX, semicircular, nearly contiguous basally. Tergum X long, rectangular, bilobed in dorsal view, dorsal edge downcurved from about middle then sloping to pointed apex in lateral view. Inferior appendages generally trichotomous: lower branch horizontal, dilated in middle and pointed apically in lateral view, in ventral view stout basally with distal half tapering and divergent to rounded apex; middle branch projecting dorso-caudad, broad and truncate apically in lateral view; upper branch vertical, clavate and turned somewhat caudad apically, with four baso-mesal digitate processes each bearing seta. Phalicata long, slender, arched about 90 degrees in middle in lateral view; narrow and parallel-sided basally in dorsal view, with distal half gradually broadened to trough-like, subtruncate apex; parameres slender, symmetrical.

Female genitalia (Fig. 25): Tergum IX concave in middle. Superior appendages projecting somewhat, separated mesally by broad, rounded excision. Tergum X in dorsal view sub-quadrate, with pair of deep sinuous longitudinal grooves, bilobed apically; in lateral view truncate apically. Pleuron IX separated from lamella on each side by deep vertical groove. Lamellae bilobed, each with upper lobe broad and truncate in lateral view, lower lobe smaller, sinuate and with long digitate setose process mesally. Gonopod plate sub-hexagonal, longer than broad, with small cleft at posterior apex. Spermathecal sclerite with stout, lightly sclerotized tube anteriorly projecting into segment VIII, its distal walls recurved to form cap-like structure.

Length of forewing: Male - 5.5 mm, female - 5.8 mm.

Immature stages unknown.

Type material: Holotype MALE, Jian-yang, Fu-jian Province (N27.30, E118.10; Fig. 1, site #5), 23 October 1974, Li Fa-sheng. Paratype 1 female, collected with holotype.

Etymology: Latin, "turned away from a certain point," with reference to the divergent lower branches of the inferior appendages in ventral view.

Diagnosis: The male of this species resembles that of S. punctatus in the long tergum X and in the general appearance of the inferior appendages and phallus, but differs from it in the following characters: (1) tergum X acute in lateral view and bilobed in dorsal view, (2) inferior appendages with four digitate processes at base of upper lobe much shorter than those on S. punctatus, and (3) phalicata broad and nearly truncate apically.

Distribution: This species is known only from the type locality in southeastern China.

Phylogenetic relationships: The crescent-shaped male inferior appendages each with an array of digitate processes on the base of the upper lobe and especially the bilobed female lamellae are homologues indicating the close relationship of this species with the two preceding ones. Inferences about which two of them are sister species should await discovery of the male of S. species A.

Argentiferus Group

Forewings of species of this Group yellowish gold and covered with very distinct tiny gold spots aligned transversely over length of wing and composed of ordinary hairs and not scales. Some of these marks also present on head and thorax. Costal fringe of anterior wings of male poorly developed. Eyes particularly large and globose (Schmid, 1988).

Male genitalia: Segment IX little elongate laterally. Segment X roof-shaped, simple and thick. Superior appendages entirely integrated into preceding or free at their extremity. Inferior appendages in large crescent, forming large apical horizontal lower branch and another basal vertical upper branch, between which is found small lobes. Phallus not very large or arched. Parameres present or absent.

Distribution: India, Burma, Thailand, Sumatra, and now both Oriental and Palearctic China.

Phylogenetic relationships: Schmid (1988) considered this Group to be the sister lineage of the Tejasvin Group + Twelve Isolated Species + the Puruchringa Group + the Hungaricus Group, but did not provide explicit evidence for that relationship. He commented only that, by its multilobed inferior appendages, this Group resembles S. punctatus, madhuvarna, and abjirakta, but he believed by a parallel specialization, rather than actual ancestry.

Setodes trilobatus, n. sp.

Description: Head and body yellowish brown. Forewings of the "madhuvarna" type, pale yellow, uniformly with golden yellow setae, mixed with silvery spots, with several fuscous spots along apical margin.

Male genitalia (Fig. 5): Segment IX reduced dorsally to narrow transverse band. Superior appendages widely separated, positioned on sides of two broad lobes (probably of tergum X). Tergum X long, with lateral margins slightly concave in dorsal view; distal margin with one mesal tongue-like process and two smaller lateral processes projecting posteriorly. Inferior appendages each trifurcate, with lower branch setose and broad, blunt apex slightly crenulate; mesal branch straight, directed dorsad, flattened, with apex curved mesad; upper branch slender, sinuate, slightly clavate. Phallus with large phallobase, semicircular in lateral view; parameres originating dorsally near phallobase, curved posteriorly and ventrally, dilated subapically, pointed apically; phalicata narrow and arched, with subdistal one-third expanded dorso-laterally into two broad lobes, abruptly narrowed and beak-like apex directed downward.

Female genitalia (Fig. 26): Tergum IX in dorsal view narrow, with projections IXa and IXb of Nielsen (1980) evident, IXa inconspicuous and undivided, IXb more conspicuous and divided; superior appendages positioned laterad of lobes IXb. Tergum X hood-like, deeply concave dorso-laterally,

somewhat expanded laterally at middle, and slightly trisinuate apically. Pleura IX produced posteriorly into two pairs of rounded lobes, on each side lower lobe and edge of pleuron setose. Lamellae truncate in lateral view, each with ventro-lateral flange. Gonopod plate convex mesally, broadened posteriorly, with bilobed apical margin. Spermathecal plate broad with length at least twice as long as width, slightly constricted in middle in ventral view; ventro-mesal spermathecal process much lower than rest of plate in lateral view.

Length of forewing: Male - 6.8 mm, female - 7.2 mm.

Immature stages unknown.

Type material: Holotype MALE, Zhen-ba, Shaan-xi Province (N37.50, E107.90; Fig. 1, #16), 29 May 1973, Tian-tao. Paratype female, collected with type specimen.

Etymology: Greek, "having three lobes," with reference to the shape of tergum X.

Diagnosis: This species resembles most closely S. argentiferus MacLachlan, 1871, argentiguttatus Schmid, 1988, and venustus Ulmer, 1951, especially in the shapes of the inferior appendages and of the phallus. It differs from these by lacking any mesal lobe of the middle branch of the inferior appendage and by this branch being directed dorsad rather than caudad. It differs from all other known species of Setodes in the trilobed appearance of tergum X in dorsal view. The females of other species of the Argentiferus Group have not been described. The female of S. trilobata appears somewhat, but not especially, close to those of the three preceding species. The ventro-lateral lobes of the lamellae are only small flanges in this species and the gonopod plate is bilobed, but not otherwise resembling those of S. punctatus, species A, and diversus.

Distribution: Known only from the type locality in northern China.

Phylogenetic relationships: Both this species and S. venustus appear to belong in the presumably monophyletic Argentiferus Group as evidenced by the three-branched inferior appendages which each have a setose ventral branch and slender middle and upper branches, the latter slightly clavate, and by the phalicata expanded dorsally into two broad lobes in the subapical one-third, beyond which it is constricted into a slender beak. (Although S. venustus was placed by Schmid [1988] in the Uttamavarna Group, the species of the Argentiferus Group and Setodes venustus do not have the deeply cleft tergum X nor the ventrally fused inferior appendages of the Uttamavarna Group.) Within the Argentiferus Group, S. trilobatus and S. venustus probably are sister lineages in an unresolved trichotomy with the lineage of S. argentiferus + argentiguttatus + argentivarius Kimmins, 1963b + the following new species. The latter four species share uniquely in this Group a long lower branch of each inferior appendage.

Setodes bispinus, n. sp.

Description: Head and body yellowish brown with pale yellow hairs. Forewing less acute than for most Setodes species, covered with golden yellow hairs, with five or six longitudinal series of distinct silvery spots, each one placed in an apical cellule and each surrounded by fuscous scale-like hairs.

Male genitalia (Fig. 6): Segment IX narrow dorsally, broad ventrally, sternum produced posteriorly as acute tooth. Superior appendages partly fused to base of dorsal surface of tergum X, appearing as setiferous mounds. Tergum X about 4X as long as wide and narrow in middle in dorsal view, with tips of

bilobed apex diverging then converging and with pair of small spines projecting laterally from near base of apical lobes. Inferior appendages polytomous, each with lower branch slender and sinuate, upturned and convergent about one-third length from tip; middle region with three setose processes, including one capitate process more ventral than others, one longer tapering process in middle, and one more dorsal stout truncate process with slender clavate projection from its posterior surface; upper branch long and evenly curved dorsad then caudad. Phalicata narrow and parallel-sided in dorsal view, broader and downcurved in middle in lateral view, with stout spine near middle of ventral edge and with slender upturned apex. Each paramere divided about one-quarter length from base into two branches, with upper branch shorter than phalicata and with lower branch longer than phalicata, slightly dilated and turned 90 degrees mesad subapically to cross as slender hooks ventrally beneath phalicata.

Length of forewing: Male - 5.5 mm.

Female and immature stages unknown.

Type material: Holotype MALE, Wu-yan, Jiang-xi Province (N29.15, E117.53; Fig. 1, #12), 6 August 1985, Zheng Jian-zhong.

Etymology: Latin, "two-spined," with reference to the divided structure of each paramere spine.

Diagnosis: Among members of the Argentiferus Group, males of this species most closely resemble those of S. argentiguttatus in the structure of the middle processes and upturned lower branch of each inferior appendage. From this and all other species it is unique in (1) the semi-circular shape of the distal lobes of tergum X and the subapical spine on each side, (2) the more slender lower branch of each inferior appendage, (3) the short upturned apex and ventral spine of the phalicata, and (4) the divided parameres.

Distribution: Known only from the type locality in eastern China.

Phylogenetic relationships: The presence of three distinct processes (the dorsal-most process with a posterior projection) in the middle of each inferior appendage and the upturned apex of the lower branch of this appendage are homologues by which it may be inferred that S. argentiguttatus and bispinus are sister species. The long narrow shape of tergum X in these species and S. argentiferus suggests that the three of them constitute a monophyletic group.

Tejasvin Group

Description: Inferior appendages of male forming two large branches, broad, obtuse and of subequal size: lower apical branch horizontal and simple and upper median branch hiding small slender subapical lobe (Schmid, 1988; note that S. shirasensis Kobayashi, 1984, omitted by Schmid, also belongs in this Group). Females of three species known, with reticulations laterally on lamellae.

Distribution: India, Japan, and now Oriental China.

Phylogenetic relationships: According to Schmid (1988), this Group is very poorly homogeneous. However, we think that the characters of the male inferior appendages and the unique reticulations on the lamellae of the known females provide good evidence for their monophyly. He considered this Group the sister lineage of the "12 Isolated Species" + Puruchringa Group + Hungaricus Group, although without explicit evidence.

Setodes schmidi, n. sp.

Description: Head and body yellowish brown. Forewing whitish yellow covered with light yellow hairs, with fuscous spots dispersed over wing.

Male genitalia (Fig. 7): Segment IX rather short, dorsal half forming band about half as broad as ventral half. Terga IX and X fused, tergum X with pair of longitudinal submedian carinae and pair of apico-lateral carinae and with broad rounded mesal excision apically in dorsal view. Superior appendages long and broad, fused with tergum X laterad of submedian carina. Inferior appendages each with two branches: lower branch about one-third as broad as upper branch in lateral view, tapered apically, sinuate in ventral view; upper branch stout, with truncate and serrate apex and with subapico-mesal process directed mesad. Phallic shield broad and triangular in lateral view; phalicata slender, bent about 90 degrees at one-quarter distance from base, with apico-dorsal margin serrate; parameres slender, almost reaching tip of phalicata.

Female genitalia (Fig. 27): Tergum IX fused with tergum X in vulvar scale, projecting backward as semicircular plate; lower portions of pleura IX setose, their ventral margins extending internally and nearly meeting at midventral line, postero-ventral corners acute and projecting in both lateral and ventral views. Superior appendages free, not fused with terga, about twice as long as broad, with pair of tiny scoli dorso-mesally, each bearing single long seta. Gonopod plate apparently vestigial. Lamellae each with oval region of reticulations ventro-laterally at base and with posterior margin sinuate in lateral view and sloping to acute, slightly upturned ventral apex. Spermathecal sclerite complex, extending into segment VIII: posteriorly connected to genital opening by pair of sclerotized bands (sb) curved outward in middle; these bands supporting ovoid structure (ov), straight in lateral view but positioned at angle to main axis of body (Fig. 27A); flat sclerotized plate (camp) cephalad of ovoid structure campanulate in ventral view, supported by broad flat flanges (sf) posteriorly spread in elliptical shape, with mesal groove in posterior half, this groove containing fine dark transverse ridges.

Length of forewing: Male - 5.2 mm, female - 5.0 mm.

Immature stages unknown.

Type material: Holotype MALE, Wu-yi, Fu-jian Province (N27.70, E117.70; Fig. 1, #11), Sun Chang-hai. Paratypes 1 male, 2 females, collected with holotype.

Etymology: We take pleasure in naming this species in honor of our colleague, Dr. Fernand Schmid, whose contributions to the knowledge of Asian Trichoptera and especially to Asian Setodini have laid the foundation for this and all future investigations of this fauna.

Diagnosis: Males of this species resemble most closely those of S. kadrava Schmid, 1988, shirasensis Kobayashi, 1984, and the following species in the superior appendages fused to tergum X, the excised apex of tergum X, the spinulose-serrate subapico-dorsal surface of the phalicata, and the paired parameres. They resemble those of S. kadrava and the following species in the longer lower branch of each inferior appendage and those of shirasensis in the truncate upper branch of this appendage. They differ from those of S. kadrava and shirasensis by (1) the slightly constricted base and longer and more acute apex of tergum X in lateral view, (2) the relatively longer ventral branch and more truncate dorsal branch of each inferior appendage, and (3) the longer phalicata (reaching well beyond tergum X) and the relatively longer parameres (nearly reaching the tip of the phalicata). From those of the following species,

they differ by (1) the broader excision of the apex of tergum X in dorsal view, (2) the truncate apex of the upper lobe of each inferior appendage, and (3) the longer parameres. The females of this species differ from those of S. shirasensis and the following species, the only other species of the Tejasvin Group for which the females are known, by the narrower and more sloping lamellae in lateral view, the more prominent postero-ventral corners of pleura IX. From those of the following species, the females of S. schmidi differ in the straight shape and more nearly horizontal position of the ovoid structure of the spermathecal sclerite and in the shorter mesal groove of the campanulate sclerite, extending only from the posterior end of the sclerite to the anterior apex of the supporting flanges.

Distribution: Known only from the type locality in southeastern China.

Phylogenetic relationships: Males of S. schmidi, kadrava, shirasensis, and the following species share unique spines or serrations on the subapico-dorsal surface of the phalicata, implying that these species constitute a monophyletic group. Among these, only the males of this and the following species have tergum X constricted basally and conspicuously pointed apically in lateral view, suggesting that they are sister species.

Setodes carinatus, n. sp.

Description: Specimens in alcohol much denuded. Yellowish brown. Forewing covered with golden yellow hairs with traces of fuscous spots dispersed over wing, especially apparent in apical portion; fringe in this region very long, mixed brown and pale yellow hairs.

Male genitalia (Fig. 8): Segment IX a slender, sinuate ring, with ventral portion triangular in lateral view, about 3.5 times as broad as dorsal portion, and setose. Superior appendages fused with tergum X. Tergum X fused with tergum IX, constricted basally and acute apically in lateral view, deeply and narrowly excised apically in dorsal view, with two pairs of longitudinal carinae: submedian pair from apex to base and lateral pair in middle of tergum, these carinae on either side of the superior appendages. Inferior appendages bifid, with lower branch slender, tapered, basally directed downward then curved gradually caudad to acute apex; upper branch broader, subtriangular in lateral view, with abruptly incurved apex bearing four to five stout setae. Phallic shield very large, hemispherical; phalicata angled 120 degrees about one-third distance from base, trough-shaped and with dense fringe of short setae dorsally on apical quarter; parameres slender, coiled about 230 degrees from base, shorter than phalicata.

Female genitalia (Fig. 28): Tergum IX fused with tergum X as vulvar scale, produced as bilobed plate. Lower portions of pleura IX reticulate and setose, their ventral margins extending internally and nearly meeting at midventral line, postero-ventral corners elevated, acute and projecting in lateral view, small and inconspicuous in ventral view. Superior appendages free, not fused with terga, about twice as long as broad, with pair of small scoli dorso-mesally, each bearing few short setae. Gonopod plate apparently vestigial. Lamellae subtriangular in lateral view, each with oval region of reticulations ventro-laterally at base and with spinous digitate process postero-ventrally. Spermathecal sclerite complex, extending into segment VIII: posteriorly connected to genital opening by pair of sclerotized bands (sb) broadened anteriorly; these bands supporting ovoid structure (ov), bent about 90 degrees in lateral view (Fig. 28A), with posterior portion nearly vertical and anterior portion longitudinal; flat sclerotized plate (camp) cephalad of ovoid structure campanulate

in ventral view, supported by broad flat flanges (sf) posteriorly spread in diamond shape, with mesal groove in posterior two-thirds of campanulate sclerite, this groove containing fine dark transverse ridges.

Length of forewing: Male - 5.2-5.6 mm, female - 5.6-5.7 mm.

Immature stages unknown.

Type material: Holotype MALE, Hua-xi, Gui-zhou (N26.25, E106.40; Fig. 1, #4), Li Fa-sheng. Paratypes 2 males, 2 females, collected with holotype.

Etymology: Latin, "with keel," with reference to the two pairs of ridges on tergum X of the male.

Diagnosis: Males of this species resemble most closely those of S. kadrava, shirasensis, and schmidi in the superior appendages fused to tergum X, the excised apex of tergum X, the spinulose-serrate subapico-dorsal surface of the phalicata, and the paired parameres. They resemble those of S. kadrava and schmidi in the longer lower branch of each inferior appendage. They resemble those of S. schmidi in the constricted base and long, acute apex of tergum in lateral view. They differ from those of all these species by (1) the pair of longitudinal carina on tergum X, (2) the very narrow excision of the apex of tergum X in dorsal view, (3) the subtriangular dorsal branch of each inferior appendage, (4) the more strongly curved lower branch of that appendage, and (5) the very large phallic shield. The females of this species differ from those of S. shirasensis and schmidi, the only other species of the Tejasvin Group for which the females are known, by (1) the reticulations and small suspended postero-ventral corners on the lower portions of pleura IX, (2) the subtriangular lamellae in lateral view, and, (3) at least from those of schmidi, the straighter posterior supporting bands, bent ovoid structure, and diamond-shaped supporting flanges and longer median groove of the campanulate plate of the spermathecal sclerite.

Distribution: Known only from the type locality in southcentral China.

Phylogenetic relationships: Males of S. carinatus, schmidi, kadrava, and shirasensis share unique spines or serrations on the subapico-dorsal surface of the phalicata, implying that these species constitute a monophyletic group. Among these, only the males of this species and S. schmidi have tergum X constricted basally and long and conspicuously pointed apically in lateral view, suggesting that they are sister species.

Hungaricus Group

Description (Schmid, 1988): In male genitalia, segment X entirely sclerotized, elongate, deeply divided longitudinally into two horns generally arched basad. Inferior appendages often multibranched and not fused with each other. Basal plate (sensu Nielsen, 1957; "tendon" of Schmid, 1988; Fig. 9A, ba.pl) slender and without lobe and parameres almost always present, paired, and symmetrical. Females of only S. hungaricus Ulmer, 1908, and the following new species known; genitalia of these with very large plate-like tergum X and with spermathecal sclerite displaced posteriorly in vaginal opening.

Distribution: Known previously from Moroco, the Balkan and Carpathian Mountains, and Turkey in the Palearctic Region and from India, Sri Lanka, the Philippines, and now China in the Oriental Region.

Phylogenetic relationships (Schmid, 1988): The Group is heterogeneous and perhaps composite. It is possible that the European, Philippine, and Oriental species will one day be separated into three different groups or subgroups.

Setodes ancala, n. sp.

Description: Specimens denuded in alcohol. Head and body uniformly pale yellow. Forewings with traces of relatively long hairs along veins more erect than usual and arranged plumosely, like veins of a feather; apex not quite acute.

Male genitalia (Fig. 9): Pleural region of segment IX projecting backward on each side about one-third length of ventral region, dorsal region very narrow. Superior appendages ovoid, not fused with terga. Tergum X deeply divided into two long spiniform downcurved branches, each bearing short spine laterally near middle. Inferior appendages generally crescent-shaped, each four-branched as follows: lowermost branch about three times as long as sternum IX, slender, constricted and upcurved in middle in lateral view; lower middle branch very slender with apex incurved; upper middle branch shorter than others, flattened and broadened and incurved apically; uppermost branch slender, quite sinuate, slightly capitate, with scattered seta-bearing scoli. Phallobase plate-like; endothecal membranes present but without evident parameres; phalicata slender basally in lateral view, abruptly arched about 120 degrees near midlength with pair of flanges laterally, distal half mostly parallel-sided and slightly sinuate to abruptly constricted slender, acute apex; linear sclerotization of unknown homology or function evident inside distal portion.

Female genitalia (Fig. 29): Semimembranous constriction between sterna VIII and IX. Segment IX long, pleural regions projecting posteriorly as triangular lobes in lateral view, ventral margin sinuate in lateral view and strongly projecting posteriorly and slightly mesally, these margins setose and separated on ventral midline by longitudinal membranous strip, with gonopod plates apparently absent. Tergum X projecting posteriorly as broad plate, acute in lateral view, with pair of shallow subdorsal surface concavities. Superior appendages small, setose, nearly completely fused with terga. Lamellae short, subrectangular, positioned diagonally in lateral view, each with lateral flange arising on ventral edge, dorsal apex with fringe of long setae, ventral apex with long stout hooks. Spermathecal sclerite campaniform in ventral view, positioned posteriorly on floor of vaginal opening.

Length of forewing: Male - 5.6 mm, female - 5.2 mm.

Immature stages unknown.

Type material: Holotype MALE, Jin-xiu, Guang-xi Province (N24.10, E110.10; Fig. 1, #6), 14 August 1984, Tian Li-xin. Paratypes, two females, same data as holotype.

Etymology: Latin, "arched arm," with reference to the shape of the long, elbowed lower branch of each inferior appendage.

Diagnosis: Males of this species resemble those of various species of the Primitive Branch with the crescent-shaped inferior appendages, including species in the Argentiferus Group. The long and deeply divided tergum X, however, distinguishes it from all species in the Primitive Branch except those of the Hungaricus Group. From members of the Hungaricus Group, males may be distinguished by the sharp spine on the lateral surface of each branch of tergum X, the very long and elbowed lowermost branch of each inferior appendage, and, from most of them, by the absence of parameres. Females of this species have a broad and projecting tergum X like some other species in the Primitive Branch, but the ventral edges of segment IX are not remarkably suspended below the lamellae. Unlike the females of S. hungaricus, the only other species of the Hungaricus Group for which the females are known, segment IX is quite long,

its ventral edges are conspicuous and separated by membrane, and the lamellae are positioned diagonally.

Distribution: Known only from the type series in southern China.

Phylogenetic relationships: This species has the group characteristics mentioned above at least for the male genitalia. The males of the species share with S. monicae Schmid, 1988, endophallic membranes without parameres and especially slender processes of tergum X, probable homologues suggesting that they are sister species, although each species exhibits numerous autapomorphies. Setodes falcatus Ulmer, 1930, and tenuifalcatus Martynov, 1936, also have crescent-shaped inferior appendages; S. argentoaureus Ulmer, 1915, flavipennis Banks, 1937, and spinosellus Ulmer, 1930, also have especially slender processes of tergum X; these similarities, which may be homologues, again suggest that these Indian and Philippine species probably are closely related.

DERIVED BRANCH

No such Branch was named by Schmid (1988), but was illustrated in his figure 44 and was implied by his sister Primitive Branch. No homologues for this Branch were mentioned specifically.

Isolated Groups and Species

According to Schmid (1988) this category does not form a taxonomic entity, but it serves as a necessary receptacle for a certain number of isolated groups and species which resist classification. He placed here six groups of species and 24 isolated species which do not have any relationships among themselves, species that have genitalia with a degree of specialization only moderately advanced. They are sufficiently more specialized than the species of the Primitive Branch not to be included there and are much less evolved than the White and Curled Species.

Pulcher Group

Description (Schmid, 1988): Coloration of anterior wings gilded, with or without clear and dark marks. Venation and costal fringe of anterior wings of male without particularities.

Male genitalia (Schmid, 1988): Little sclerotized and entirely translucent except for apical points of parameres; strongly modified in their form and their proportions because of very considerable development of parameres. Segment IX regularly short on all its circumference and with its apico-lateral border broadly concave; its apico-dorsal part elongated posteriorly to form with segment X short roof over parameres. Segment X reduced to small horizontal plate presenting some thickened chitinizations and inserted very high on apico-dorsal border of segment IX. In spite of, or perhaps because of, small size of segment X, conserving large superior appendages (sensu Nielsen, 1957; "appendices préanaux" of Schmid, 1988), generally partially free. Inferior appendages simple, massive, and strongly concave on meson; internal border raised again and forming small simple lobes. Basal plate (sensu Nielsen, 1957; "tendon" of Schmid, 1988) very short. Phallic apparatus very modified in its shape and size, but not in its components. Phallobase minuscule. Endotheca membranous and inseparable from base of parameres. Phalicata ("edéage") relatively small, strongly arched basad, slender basally, very thick in middle and thinned into head of pickax at

its extremity. Parameres paired, symmetrical, and completely membranous and erectile; sclerotized only at their extremity, there terminating in point or spine.

For this Group, the females of only three species (S. pulcher, a new species, and species B) are known. The female genitalia of these species resemble each other in the ventral constriction between abdominal segments VIII and IX (evident also in groups such as the Guttatus Group) and the broad projection ventrally beneath and between the lamellae, on which is positioned the externally exposed spermathecal sclerite.

Schmid (1988) cited three species for this Group, including the first two mentioned below. The general shape of the male genitalia, especially segment X, suggest that Setodes curvisetus Kobayashi, 1959, and minutus Tsuda, 1942b, both from Japan, may also belong to this Group.

Distribution: Known from India, Siberia and the Amur and Bikin Rivers in the U.S.S.R., North Korea, Japan, and both Palearctic and Oriental China.

Phylogenetic relationships: That these species constitute a monophyletic group is strongly suggested by the highly modified, erectile parameres of the male and by the peculiar broad projection in the females ventrally beneath and between the lamellae with the spermathecal sclerite exposed on its dorsal surface.

Setodes pulcher Martynov

Setodes pulcher Martynov, 1910, pp. 380-382, figs. 23-26; syntypes = 2 females; syntype repository = Leningrad Museum [?]; syntype localities = on Amur River (near Khabarovsk) and Tunguska in Siberia. Martynov, 1935, pp. 276-279, figs. 93-98, males and females, Bikin River near Bikin. Botosaneanu, 1970, p. 312, pl. XXXV, fig. 1, males, People's Democratic Republic of Korea.

Setodes sp. Botosaneanu, 1970, p. 312, pl. XXXV, figs. 2,3, females, People's Democratic Republic of Korea.

Description (Martynov, 1935): "Head and thorax pale-yellow; antennae somewhat brownish, broadly annulated with whitish in their basal portions; palpi pale yellow; legs whitish yellow. Anterior wings pale, clothed with yellow pubescence, but in their distal portion several small white spots and small groups of black hairs may be discerned; DC [discoidal cell] elongated but shorter than its pedicel; 1st fork with short pedicel; fork of media beginning at the same level with it; cross-vein rs-m deriving from the end-portion of DC, third cross-vein placed a little farther from it. Hind wings pale; RS [Sectoral vein] disappearing at the cross-vein rs-m [base of S_4]; 1st fork long enough; fork of M short, beginning at the same level with that of RS [S]" (cf. Fig. 2).

Male genitalia (Fig. 10): Segment IX with tergum longer than sternum, its latero-posterior margins each with broad excision in lateral view; in dorsal view tergum IX slightly expanded laterally. Superior appendages broad, fused with tergum X basally, each with apex free, serrate. Tergum X rather short, with median tongue-like process apically. Inferior appendages forked, with lower branch broad, oval in lateral view, upper branch much narrower and shorter with apex truncate and with dorso-mesal edge curved inward and strongly serrate. Phalicata somewhat in the pattern of S. fluvialis Kimmins, 1963b, abruptly arched downward about midway then tapering to acute apex, with simple bump just basad of mid bend in lateral view. Paramere spines short and stout, each with apex directed outward.

Female genitalia (Fig. 30): Sternum VIII with large, posterior sternal pockets, trapezoidal with rounded corners in ventral view. Segment IX short, with dorsal portion as long as ventral portion. Superior appendages broad and semicircular, mostly fused with tergum IX. Tergum X broad and short, its apical margin widely excavated half its length in dorsal view, upturned in lateral view. Lamellae unusually narrow and long, constricted in middle in lateral view, each then broadened into bilobed, serrate apex, with upper lobe twice as large as lower lobe, upper lobe fringed with long normal setae, lower lobe incurved and bearing long hook-like setae. Between lamellae, ventro-posterior margin of segment IX [gonopod plates ?] produced backward, rhomboid shaped in ventral view, forming posteriorly open chamber that is closed dorsally by tergum X. Spermathecal sclerite small, sampan-shaped, exposed externally on floor of this chamber.

Length of forewing: Male - 6.8 mm, female - 6.3 mm.

Immature stages unknown.

Diagnosis: Males of this species may be distinguished from those of others in this Group by the relatively prominent tergum X, the bilobed inferior appendages each with a broad lower lobe, the conspicuously broadened middle region of the phalicata, and the thick and outcurved parameres. The females of this species (including those described by Botosaneanu and presumed by us to be this species) differ from those of the new species of this Group and species B below in the much more clearly defined posterior ventral pockets of abdominal segment VIII. From the new species of this Group, it differs by its shorter segment IX, and its much longer and basally more slender lamellae.

Distribution: Previously Siberia, Amur and Bikin Rivers, and North Korea; now also northern China as follows: Chang-bai Mountain, Ji-ling Province (N40.20, E128.10; Fig. 1, #1), and Wu-da-lian-chi, Hei-long-jiang Province (N48.45, E125.55; Fig. 1, #10).

Phylogenetic relationships: The prominent tergum X of this species, S. curvisetus, and minutus and their apparently outcurved paramere spines suggest that the three species may constitute a monophyletic unit within this Group. However, until details of the latter two species can be examined, especially details of the phallus, this unit must be considered very tentatively justified.

Setodes pellucidulus Schmid

Setodes pellucidulus Schmid, 1988, p. 42; holotype = male; type repository = Harvard Museum of Comparative Zoology, Cambridge, Massachusetts, United States of America; type locality = "Ta Hian" [possibly Tan-hsien; N19.49, E109.23; Fig. 1, #9], Hainan Island, Guang-dong Province, People's Republic of China.

Description (Schmid, 1988): Only two known specimens entirely denuded and coloration of their anterior wings no longer visible.

Male genitalia (Fig. 11; Schmid, 1988): Segment IX especially short on all its circumference. Segment X forming horizontal concavity at apex of segment IX, notched in middle and appearing, in lateral view, as small triangular wing. Superior appendages (sensu Nielsen, 1957; "appendices préanaux" of Schmid, 1988) entirely fused with segment IX in very large verrucae, subcircular and inconspicuous at outline. Inferior appendages subcircular, little higher than long and slightly irregular at their upper border; their internal lateral border formed of some small inconspicuous lobes. Phalicata ("edéage") of generally similar form

to that of other species in Group, but of less irregular thickness. Apical point of parameres relatively thick, of triangular cross section, and bearing some hairs basally.

Length of forewing: Male - 4.5 mm.

Female and immature stages unknown.

Diagnosis: Males of this species may be distinguished from those of others in the Group by the subcircular inferior appendages and the paramere spines each with triangular cross section and basal hairs.

Distribution: Known only from the two type specimens from "Ta Hian" (possibly Tan-hsien), Hai-nan Island, Guang-dong Province (N19.49, E109.23; Fig. 1, #9).

Phylogenetic relationships: The very reduced tergum X and the similarly simple inferior appendages each lacking upper and lower branches (but with small baso-mesal process) suggests that this species, S. khechara Schmid, 1988, and the new species in this Group are sister species in an unresolved trichotomy.

Setodes yunnanensis, n. sp.

Description: Head and body pale yellow. Forewing conspicuously narrow, three times as long as broad, with traces of mixed yellowish brown and whitish yellow hairs.

Male genitalia (Fig. 12): Segment IX short and tall, its apico-lateral margins with wide excisions, its dorsal portion fused with tergum X. Superior appendages subtriangular, rounded and free of tergites apically, fused somewhat basally with tergum IX. Tergum X in dorsal view generally slightly concave with middle region slightly convex, thus with rounded lateral corners more prominent than middle; in lateral view oblique and rounded apically just beyond superior appendages. Inferior appendages rectangular in lateral and ventral views, edges serrate, each with small basal process truncate apically and apico-mesal projection obvious in both lateral and ventral views. Phallobase short, phallic shield (not illustrated) large and pocket-like; phalicata strongly compressed, semi-lunar in lateral view, dorsal margin thicker and sinuate subapically, acute apex directed ventrad; paramere spines short and slender.

Female genitalia (Fig. 31): Triangular anterior region of sternum VIII membranous. Segments VIII and IX distinctly separated by membranous constriction, especially ventrally. Segment IX synsclerotized, not divided on meson ventrally, although sternum deeply grooved anteriorly, terga IX and X fused. Dorso-mesal region of segment IX ("IXa") single prominent acute projection; apico-mesal region tongue-like in dorsal view, prominently angled in lateral view; lateral pair of broad lobes below this apico-mesal region and basally fused with it, these lobes narrower basally and concave apically in dorsal view. Superior appendages partially fused with combined terga IX + X, approximate on meson. Lamellae short, broad, hairy, serrate in lateral view, dorsally with fringe of longer apical setae, ventrally with short incurved apical spines. Broad bilobed plate [gonopod plates?] ventrally caudad of sternum IX, below and between lamellae, with triangular spermathecal sclerite lying exposed on its dorsal surface.

Length of forewing: Male - 6.5 mm, female - 6.4-6.6 mm.

Immature stages unknown.

Type material: Holotype MALE, Ying-jiang, Yun-nan Province (N24.60, E97.90; Fig. 1, #14), 27 May 1985, Tian Li-xin. Paratypes: 4 males, 15 females, same data as holotype.

Etymology: Named for the province of the type locality.

Diagnosis: Males of this species most closely resemble those of S. pellucidulus and khechara in the short and inconspicuous tergum X and plate-like inferior appendages. It differs from S. pellucidulus in the more slender paramere spines and from both of these in the more rectangular inferior appendages and broader lateral aspect of the phalicata. Females of this species differ from those of S. pulcher and species B below, the only other species of this group for which the females are known, in the membranous constriction between abdominal segments VIII and IX without a sclerotized posterior ventral pocket of segment VIII, the longer segment IX, and the much stockier lamellae.

Distribution: Known only from the type locality in extreme southcentral China.

Phylogenetic relationships: The especially reduced male tergum X and plate-like inferior appendages each with a small baso-mesal projection are homologues by which the monophyly of S. pellucidulus, khechara, and this species may be inferred.

Setodes species B

Description: Specimen somewhat denuded in alcohol. Head and thorax pale yellow, with pale setae; forewings pale, covered with pale yellow pubescence, appearing slightly broader than those of S. pulcher; abdomen creamy white.

Female genitalia (Fig. 32): All parts of genitalia heavily sclerotized except sternum IX semimembranous. Sternum VIII posteriorly essentially membranous, without evident posterior sternal pockets. Segment IX broadest laterally and dorsally, very narrow ventrally. Superior appendages mostly fused with tergum IX, free portion of each evident as narrow transverse setose flange, separate mesally and continuing as longitudinal carinae on tergum X. Tergum X at base half as broad as segment IX, as long as lamellae, rounded apex with rectangular excision in dorsal view and with lateral lobes upturned in lateral view. Lamellae capitate, especially in lateral view, in which basal one-third constituting "neck" with narrowest part one-quarter as broad as widest part of distal "head;" apex tapering ventrally to small blunt projection with long mesal setae hooked apically. Massive snowpea-shaped structure (gonopod plates ?) beneath and between lamellae with acute setose ventral apex, pair of oblique ventro-lateral flanges present, with spermathecal sclerite lying above this structure and fused with it. Spermathecal sclerite large, sampan-shaped, extending anteriorly beyond sternum IX and posteriorly almost to apex of snowpea-shaped structure, with mesal process mammiform in ventral view. Genital chamber very well-sclerotized, extending anteriorly into abdominal segment VIII, broad in all views.

Male and immature stages unknown.

Length of forewing: Female - 8.0 mm.

Diagnosis: The single specimen was captured with S. pulcher and is about the same color. However, although the large structure beneath and between the lamellae clearly places it into the Pulcher Group, it is larger than the other known females of the Group, the genitalia are much more darkly sclerotized, the spermathecal sclerite is longer and more nearly sampan-shaped and with a mammiform median process, and the genital chamber is much more expansive. Unlike S. pulcher, whose genitalia otherwise more closely resemble those of this species, there is no pair of posterior pockets ventrally between segments VIII and IX.

Distribution: Known only from northeastern China, Chang-bai Mountain, Ji-ling Province (N40.20, E128.10; Fig. 1, #1).

Phylogenetic relationships: The slender, capitate shape of the female lamellae appears to be homologous with that of those of S. pulcher, suggesting that these species may belong to the same monophyletic group within the Pulcher Group.

Isolated species

According to Schmid (1988), the 23 species he placed here are all entirely isolated, sometimes to some extreme degrees.

Setodes argentatus Matsumura

Setodes argentata Matsumura, 1906, p. 24 (under Hydropsychidae); holotype sex and deposition unknown; type locality = Japan. Li, 1951, p. 879, northeastern China (Hei-long-jing, Liao-ning, and Ji-ling Provinces). Schmid, 1988, "Hong San" [possibly Hu-shan Mountain], southeastern Jiang-xi Province (N28.10, E115.00; Fig. 1, #3), China.

Oecetis turbata Navás, 1933, pp. 20-21, fig. 35; holotype = male (Schmid, 1950); holotype deposition = Navás Collection (Schmid, 1950) [now in Barcelona ?]; type locality = "Chu-san" [possibly Tu-shan Mountains, He-bei Province; N40.80, E118.80; Fig. 1, #2], China; synonym of S. argentatus according to Schmid, 1988.

Setodes uenoi Tsuda, 1942a, pp. 234-235, figs. 9-10; holotype sex = presumably male; holotype deposition = presumably Nara Women's University, Japan; type locality = Kei-zan-chin, North Korea; synonym of S. argentatus according to Schmid, 1988.

Description (Schmid, 1988, fig. 13): Coloration of the forewings of "argentolineatus" type [with background color varying from clear gold to beige gold to burnt gold or rarely relatively dark brown; wing surface filigreed with silver lines with fine dark borders, causing them to stand out more, these lines longitudinal, covering total wing surface and generally also present length of costal border and at apex of post-costal border, always constituted of elongate and longitudinal scales even though rest of wing and dark borders covered with ordinary hairs; also, silver line present on each scape, lines present laterally on each side of vertex and mesonotum, sometimes with median line on vertex and mesonotum; tegulae also silver; posterior surfaces of middle tibiae and first segment of each middle tarsus bearing also very fine silver line very narrowly bordered with dark color, this dark color extending sometimes to extremity of tarsus in certain species; in repose, hind legs hidden beneath forewings, but middle legs visible, lying beside costal border; silver lines of wings and legs then parallel, such that total visible surface appearing gold and silver lined.] With lines of silver of apical area short and more or less aligned. On apex of wing crescent design present composed of three distinct marks.

Male genitalia (Schmid, 1988; Fig. 13): Segment IX forming long apico-ventral lobe depressed and spatulate at its extremity. Segment X entire, relatively thick basally, greatly thinned in middle and rest of its length and forming, in its apical part and long and strong spine, heavily sclerotized and asymmetrically twisted. Superior appendages [sensu Nielsen, 1957, "appendices préanaux" of Schmid, 1988] large and completely free. Inferior appendages

forming two upper lobes, side by side and crossed, and single lower lobe shaped as slender horn [also with short baso-mesal hook]. Phalicata strongly arched basad, slender in its basal part, then enlarged and forming deep V-shaped groove for reception of segment X. Parameres absent.

Female and immature stages not described adequately for diagnosis.

Length of forewing (Tsuda, 1942a): Male - 7 mm.

Diagnosis (Schmid, 1988): The males of this species resemble those of S. lineatus Banks 1913 (of which unispinus Martynov, 1936, is a synonym) in a crescent design at the apex of each forewing, the projecting sternum IX, and the crossed upper lobes of each inferior appendage. However, the number of gold bands on each forewing is less in this species and tergum X is undivided.

Distribution: Previously known from Japan, North Korea, and, in northeastern China, Jiang-xi, Hei-long-jing, Liao-ning, and Ji-ling Provinces. We have not seen specimens.

Phylogenetic relationships: Although this species and S. lineatus share similar characters mentioned in the diagnosis above, Schmid (1988) did not consider the two species closely related. Its relationships with other species, either with those of the Primitive Branch (suggested by Schmid for S. lineatus) or others also are unknown.

White Species

Diagnosis (Schmid, 1988): Wings white, costal fringe of male forewings very long and thick, and all integument weakly sclerotized.

Distribution: India and now Oriental China.

Phylogenetic relationships (Schmid, 1988): This category does not form a taxonomic entity, but Schmid found it useful to place here a certain number of species which have in common the above diagnostic characteristics.

Parisamchuddha Group

Diagnosis (Schmid, 1988): Costal fringe of male forewings long and very thick in nearly all species. Forewings white, silky and glossy. Two black marks always present, minuscule but quite visible to naked eye, and situated at same place in all species: one in sub-thyridial cell [= cell Cu] slightly beyond origin of thyridial cell, other between S_5 ["R_{4+5}"] and S_4+M ["M"] at level of bifurcation of S_4+M. Gilded and slightly clear marks also present and large number of minuscule somber spots, relatively regularly distributed. Forewings more regularly narrowed than in species of Primitive Branch, less enlarged at level of apex of discoidal cell and about 5.5 to 6.0 times longer than broad. In hindwings, apical part of costal border forming angle with basal part. Venation not unusual in more-primitive species, but modified in both fore- and hindwings and in both sexes of four more-advanced species.

Male genitalia (Schmid, 1988): Always translucent and very little sclerotized. Segment IX robust, with its apico-lateral border concave and relatively well developed dorsally; without manille [ventral groove]. Segment X large, thick, obtuse, in simple and subhorizontal roof shape. Superior appendages [sensu Nielsen, 1957; "appendices préanaux" of Schmid, 1988] fused to segment X, but always clearly visible because of their projecting relief and pilosity. Inferior appendages each roughly crescentic and concave posteriorly, relatively large, many-branched and sometimes multilobed. Basal plate [sensu Nielsen, 1957; "tendon des appendices inférieurs" of Schmid, 1988] slender and

horizontal. Phallic apparatus profoundly modified. Parameres lost. Endotheca obliterated or sclerotized and phalicata in continuity with minuscule phallobase; first directed upward then curved downward and vertical on its apical half; apical half divided longitudinally into two parallel and symmetrical branches or into three symmetrical or twisted and asymmetrical branches, two lateral and one median; microtubule visible at base of these branches in primitive species. Females of no species of this group are known other than those of the following new species.

Distribution: India and now Oriental China.

Phylogenetic relationships (Schmid, 1988): The Parisamchuddha Group is certainly monophyletic, but very heterogeneous. Its only really constant character is the color of the forewings. A sister group relationship for the group with any others of the White Species has not been specifically inferred.

Setodes hainanensis, n. sp.

Description: Body creamy white, hairs on palpi and legs slightly pale grey. Wings completely hyaline, colorless, specimens denuded to such extent that hair pattern on wings indiscernible. Venation of the two wings not modified as in some species of this group.

Male genitalia (Fig. 14): Segment IX shaped rather like that of S. forcipatus Kimmins, 1963b, and gonus Mosely, 1939, short dorsally but abruptly elongated ventrally, with sternum nearly four times as long as tergum. Superior appendages in dorsal view ovoid and widely separated, with pair of small triangular projections between them. Tergum X represented by pair of slender semisclerotized digitate processes each with basal half fused with its superior appendage and with distal half extending beyond superior appendages and bearing few thin hairs. Inferior appendages each crescentic and three-branched, with lower branch slender and as long as sternum IX, its acute apex curved upward and inward; middle branch short and broad, slightly constricted basally, and with blunt apex; upper branch slender and curved upward and backward. Phallobase narrow, ring-like; phalicata falciform, three-branched, and slightly asymmetrical, trough-like from base to level of origin of short spine-like ventral branch just beyond middle, lateral branches distinct from this point, tapering to very slender and acute and crossed apices; microtubule extending through length of phallus to exposed end about three-quarters distant from base.

Female genitalia (Fig. 33): Segment IX fused indiscernibly with segment X dorsally, with short and broad triangular lobe on each side and with ventral edges of pleura suspended ventrally, projecting posteriorly, and recurved laterally, nearly touching on posterior ventral meson. Tergum X twice as long as lamellae, roof-like, triangular in dorsal view, clavate in lateral view, with pair of shallow longitudinal surface concavities dorsally near base. Superior appendages short and triangular, not fused with terga apically. Lamellae each consisting of two lobes joined ventrally, dorso-mesal lobe taller and shorter and more rounded in lateral view and fringed with long setae, ventrolateral lobe with short stout spines apically, both lobes semicircular in ventral view. Gonopod plate between setose edges of segment IX semisclerotized. Spermathecal sclerite campanulate, positioned posteriorly on ventral wall of vaginal opening, with single sinuous sclerotized ribbon extending to anterior margin of segment VII.

Length of forewing: Male - 5.1 mm, female 5.3-5.5 mm.

Immature stages unknown.

Type material: Holotype MALE, Mao-yang, Hai-nan Island, Guang-dong Province (N19.10, E109.70; Fig. 1, #8), 19 April 1986, You Da-shou. Paratypes, 2 females, same data as holotype.

Etymology: Named for the island home of the type series.

Diagnosis: Among the White Species, males of this species resemble those of S. chandravarna Schmid, 1988, and the two species of the Alukcha Group in the very long lower branch of each inferior appendage. However, unlike S. chandravarna, the branches of tergum X are very small and, unlike species of the Alukcha Group, there are no lateral branches of tergum X. Within the Parisamchuddha Group, the tripartite phalicata is nearly symmetrical, like that of S. abhrayita Schmid, 1988, but the branches of tergum are much smaller, the three branches of each inferior appendage are much longer, and the median branch of the phalicata is much shorter.

Distribution: Known only from the type locality on Hai-nan Island.

Phylogenetic relationships: With reference to Schmid's (1988, fig. 49) phylogeny of this Group, this species clearly is most closely related to the five species whose phalicata is divided into three branches; however, its wing venation is not modified in the manner described for most of the species in this part of the phylogeny. Since no homologues are apparent to indicate that the species is the sister lineage to S. abhrayita, we can say only that it is a lineage of an unresolved trichotomy that includes abhrayita and the monophyletic group with modified wing venation.

Curled Species Branch

Description (Schmid, 1988): Forewing coloration of "argentolineatus" type [see description under S. argentatus above]. Background color more or less dark gold; in more specialized species and simultaneously in several lineages, gold lines tending to become shorter in apical area and, in some species, even reduced to shape of oval pearls. Venation and costal fringe of male forewings rarely and weakly modified.

Male genitalia (Schmid, 1988): Generally taller than long. Segment IX rather short, ventrally often forming manille, either negative [simple concavity, as in Fig. 17C] or positive [with pair of projecting lateral borders, as in Fig. 18C]. Segment X of reduced size, strongly sclerotized and serving as stop to limit elevating movements of phallic apparatus; however, roof-like in Gutika and Chandrakita Groups. Superior appendages [sensu Nielsen, 1957; "appendices préanaux" of Schmid, 1988] always entirely free, slender, several times longer than broad and directly a little obliquely upward on each side of segment X.

Inferior appendages not in a crescent, generally vertical, forming two or three branches or lobes, or with their apical border cut into three or four points. Basal plate [sensu Nielsen, 1957; "tendon" of Schmid, 1988] broad or slender, concave in V-shape dorsally and with its two upper lateral borders often reinforced.

Phallic apparatus situated very high under segment X and always strongly curved ventrally. Endotheca absent or sclerotized, with no discontinuity between phallobase and phalicata. [Actually, these three regions are distinct. The phallobase is very short, scarcely extending posteriorly beyond the phallic shield. Parameres arise from a membranous endotheca just beyond this shield. The phalicata constitutes most of the length of the phallus.] Phalicata more or less strongly curved ventrally in middle, its apical part vertical. In primitive groups, curvature with median dorsal carina, lower lateral flanges, or flanges

extending on sides of vertical part of phalicata, for insertion of parameres, all occasionally very developed. Apex of phalicata undivided and generally slightly erectile. Ejaculatory duct not visible in phalicata. Near middle of vertical part, dorsal edge (tipped into apical position) exhibiting slight discontinuity in form and chitinous texture, gonopore opening. Parameres paired, generally symmetrical, sometimes asymmetrical and inserted on dorsal surface of base of phallic apparatus; arched ventrally like phalicata in variably accentuated and sometimes extreme curve; in groups at end of lineage, reduced to varying degrees or absent.

Phylogenetic relationships: The principal character of this Branch is the strong ventral curve of the components of the phallic apparatus, the fact that the genitalia collectively are modified in function to that curvature, and the nature of the association of the parameres and the phalicata which is equally influenced by that curvature (Schmid, 1988). Based on these homologues, Schmid (1988) was convinced that the Branch is monophyletic. The Branch is composed of six species groups and of four isolated forms; however, Schmid (1988) decided that it is possible to reconstruct the order of their differentiation only in an approximate fashion because, except for the Gutika and Chandrakita Groups, these groups are not closely related to each other.

Fluvialis Group

Description (Schmid, 1988): Anterior wings with light gold background color and long silver lines over complete surface of wing. Venation and costal fringe of anterior wings of male without particularities.

Male genitalia (Schmid, 1988): Segment IX moderately elongated, apico-lateral angle not well-marked and ventral manille [posterior concavity] absent. Segment X of moderate or large size. Inferior appendages each with large upper vertical branch divided into two joined lobes and with inferior branch in long slender horizontal spur curved dorsad. Basal plate [sensu Nielsen, 1957; "tendon des appendices inférieurs" of Schmid, 1988] obviously longer than broad and weakly concave on its upper surface. Phalicata small, arched at right angle ventrad with its vertical part subequal to its horizontal part; at its curve provided with median dorsal carina and sometimes with lower lateral flanges. Parameres forming robust cylinders inserted laterally at very base of phallic apparatus, more or less curved ventrad and more or less sinuous.

Distribution: Known from India, Bhutan, Burma, Thailand, and now Oriental China.

Phylogenetic relationships: Males of both of the known species of this Group (S. fluvialis and gangaja Gordon and Schmid, 1988 [in the work by Schmid, 1988]) have a unique, conspicuously projecting dorsal carina on the phalicata about one-quarter as long as the phalicata. This apparent homologue implies that the two are sister species.

Setodes fluvialis Kimmins

Setodes fluvialis Kimmins, 1963b, pp. 282-283, figs. 61-64; holotype = male; type repository = Stockholm; type locality = northern Burma, Waingmaw, near Myitkyina; Schmid, 1988, p. 60, pl. X, figs. 1-2 [but see comment below].

Description: Head and body golden yellow, mesonotum with two narrow, longitudinal silvery stripes. Forewings with silvery streaks margined with blackish hairs.

Male genitalia (Fig. 15): Tergum IX narrow above, with small lobe projecting from center of apical margin bearing six long setae. Tergum X saddle-like, broad and short, with apical margin pilose, trisinuate and upturned, with lateral margins produced downward in lobes rounded in lateral view. Superior appendages slender, slightly clavate. Inferior appendages each with long slender ventral branch curved slightly dorsad, stout bifid upper branch broadly incurved and forming narrow rectangular plate with serrate margins in caudal view. Phalicata abruptly arched downward about midway then tapering to acute apex; erect dorsal projection just basad of bend rhomboidal in dorsal view with median longitudinal depression and small distal notch. Parameres stoutly cylindrical, each abruptly downturned at one-third distance from base, at which point paramere laterally compressed and somewhat convolute, spiniform distally with bifid apex.

Female genitalia (Fig. 34): Segment IX as broad as deep ventrally, dorsally narrower; pleural regions projecting posteriorly in acute process on each side separated from base of lamella by semicircular excision; gonopod plates and segment IX fused imperceptibly ventrally into broad plate rugose laterally and projecting backward to pair of acute lobes. Superior appendages semicircular in dorsal view, separated by distance equal to width of one of them, with row of four to six long setae between them. Tergum X oval in dorsal view, strongly constricted basally, slightly bilobed distally. Lamellae slender, slightly sinuate, and slightly clavate in lateral view, directed obliquely downward, each with high dorsolateral ridge and rugose pattern dorsally and ventrally at base. Spermathecal plate broad with lateral margins sinuate in ventral view. Sclerotization of genital chamber evident within segment IX in lateral view, with irregular anterior margins.

Length of forewing: Male - 5.3 mm, female - 4.5 mm.

Immature stages unknown.

Diagnosis: Our male specimens and the illustrations provided by Kimmins (1963b) of the holotype from Burma are virtually identical. They differ in small details from those of Schmid (1988). For example, the parameres of Schmid's specimens are acute and not bifid, the shape of the phalicata and its dorsal projection in lateral view are somewhat different, and the lower lobe of the dorsal branch of each inferior appendage is acute rather than blunt. We suspect that Schmid may have had before him specimens of an unnamed species. The male of this (or these) species differs from that of S. gangaja in the shorter tergum X, the shorter ventral branch of each inferior appendage, and the narrower dorsal projection and smaller lateral flanges of the phalicata.

Distribution: At least northern Burma and now southcentral China: Yun-yang, Si-chuan Province (N31.10, E108.80; Fig. 1, #15).

Phylogenetic relationships: If Schmid's (1988) material from India is a different species, then it is probably the sister species of this one, as indicated by the male's short, saddle-shaped tergum X and long incurved region of the dorsal branch of each inferior appendage.

Aparimeya Group

Description (Schmid, 1988): Anterior wings with more or less dark gold background color and silver lines tending to become shorter in apical region. Costal fringe and venation of male anterior wings rarely and very weakly modified.

Male genitalia (Schmid, 1988): Always taller than long. Segment IX generally tall and short and with ventral surface having tendency to become oblique posteriorly and very often forming manille [posterior concavity], generally negative [simple concavity] although sometimes positive [with pair of projecting lateral borders]. Segment X small, strongly sclerotized, in semicircle open posteriorly and serving as stop for elevating movements of phallic apparatus. Inferior appendages each composed of two branches or with apical border forming three or four points. Basal plate [sensu Nielsen, 1957; "tendon" of Schmid, 1988; Fig. 16A, ba.pl] generally very broad, strongly concave and with its two upper lateral borders strongly reinforced. Phallic apparatus always very large. Phalicata curved at right angle or pointed ventrad and its vertical part very long and variably erectile; carinae, ventral winglets or dorsal recurved flanges on curve for insertion of parameres, their development being progressive within each subgroup and sometimes attaining some extreme degrees. Parameres very long and slender, symmetrical or asymmetrical, arising from base of phallic apparatus, whether without discontinuity or forming overarching curve, describing ample curve above phalicata.

Distribution: Tropical Africa, India, Thailand, and now Oriental China.

Phylogenetic relationships: Schmid (1988) considered the Group homogeneous. It probably is monophyletic as evidenced by the unusually angled phalicata and very long and curved parameres.

Manimekhala Subgroup

Description (Schmid, 1988): Forewings with rather dark gold background color and silver lines broadly bordered with dark. Costal fringe of male anterior wings composed of very short hairs bristling and parallely recurved. Venation of forewings with fork of M well before Fork I and posterior border of apical area not especially convex.

Male genitalia (Schmid, 1988): Segment IX quite elongated laterally and forming voluminous apico-lateral angle; ventral surface oblique posteriorly and with shallow manille negative, without projecting borders [as in Fig. 17C; but positive, with projecting borders in one of the new species, Figs. 16A, 16C]. Segment X short. Inferior appendages robust and each composed of two branches: vertical dorsal branch with short bifurcation apically and stubby baso-ventral branch curved slightly dorsad. Basal plate [sensu Nielsen, 1957; "tendon des appendices inférieurs" of Schmid, 1988; Fig. 16A, ba.pl] very tall and strongly concave. Phalicata curved nearly to right angle ventrad and with its upper apical angle well-marked, variably developed, but always broad; no distinct upper median carina, but entire vertical part of phalicata provided with asymmetrical recurved flanges for parameres. Parameres inserted on phallic apparatus in overarching curve, on either side with two small parallel flanges situated on segment X [These are labeled "end. ?" in pl. X, fig. 5, of Schmid, 1988, but actually are a pair of lobes of the fused bases of the parameres.]; of medium size, relatively thick and asymmetrical, either of thickness and position

or of thickness only, right paramere being more or less reduced; left paramere slightly desclerotized before its apex.

Female genitalia: Not described previously. In two new species postero-lateral margins of segment IX produced on each side into two bare flanges. Ventrally pleura IX projecting prominently ventrally and caudally as recurved flanges as long as lamellae. Spermathecal sclerite with pair of sclerotized strips extending far into abdomen anteriorly.

Distribution: The three species previously described occur in the Garhwals and in Assam in India; the two described here extend the range of the Subgroup into central and southeastern China.

Phylogenetic relationships: The asymmetrical male parameres of the six included species and the projecting lateral and ventral margins of female segment IX suggest that the Subgroup is monophyletic. Schmid (1988) considered the Kantyamrita Subgroup to be its sister lineage based on the uniquely shared shape of each inferior appendage, with the upper branch angled and the lower branch stubby. According to him, these share uniquely with the Aethiopicus Subgroup a phalicata with a dorsal carina and recurved dorsal flanges.

Setodes brevicaudatus, n. sp.

Description: General color of head and body pale yellow. Forewings golden yellow with several streaks of silver pubescence, each streak ringed with dark brown hair.

Male genitalia (Fig. 16): Segment IX narrow dorsally, with only small membranous process bearing two long setae; postero-lateral margins strongly projecting caudally; "positive" ventral manille shaped as posterior triangular depression bordered on each side by thin triangular plate projecting caudo-ventrally. Superior appendages free of other structures, slightly clavate, about five times as long as broad, longer than tergum X. Tergum X short, semicircular in dorsal view, closely surrounding base of phallus. Inferior appendages each with vertical dorsal branch hooked caudad near apex, bifid with one process directed mesad and the other caudad, and with triangular projection near its base; baso-ventral branch about two-thirds as long as dorsal branch, horizontal, slightly curved dorsad, its ventral base with small hook in lateral view. Phallobase small, narrow in lateral view; pair of sclerotized strips (scl.st) from dorsal edge of phallobase and its phallic shield extending to mesal apices of lateral lobes of tergum X; parameres with pair of compressed, sclerotized lobes (scl.lb) longer than superior appendages projecting caudally and slightly dorsally on either side of base of parameres; right paramere only short spine, left paramere foliaceous, arching high above genitalia then downward beneath flange of phalicata to short sclerotized apical hook; phalicata with basal third slender, then bent ventrad at right angle, broad recurved flange on dorsum of vertical portion of left side for reception of paramere, flange on right side absent.

Female genitalia (Fig. 35): Segment IX long dorsally; broad laterally, each side with two short, tall, bare posterior flanges, upper one further caudad than lower one; ventral edges of pleura each prominently recurved and projecting caudally to slightly beyond lamellae. Superior appendages short, triangular, widely separated. Tergum X broad basally and with pair of triangular lobes apically in dorsal view. Lamellae somewhat quadrate in lateral view, each with ventral apex produced, incurved, and bearing several short stout spines. Gonopod plates displaced posteriorly and fused as single plate, visible in ventral view between projections of pleura IX, short, acutely bilobed apically.

Spermathecal sclerite visible apically beyond gonopod plates and fused with them, bearing pair of sclerotized ribbons extending cephalad to anterior one-third of segment VII.

Length of forewing: Male - 4.3 mm, female - 4.5 mm.

Immature stages unknown.

Type material: Holotype MALE, Yun-yang, Si-chuan Province (N31.10, E108.80; Fig. 1, #15), 8 August 1983, Tian Li-xing. Paratypes 1 male, 1 female, collected with type specimen.

Etymology: Latin, "with short tail," with reference to the relatively short baso-ventral branch of each inferior appendage.

Diagnosis: Within the Manimekhala Subgroup, males of this and the next species are distinctive in that the right paramere spine is reduced to a small stub. This species differs from the next one in that it has a positive manille with projecting borders, shorter baso-ventral lobe of each inferior appendage, and a shorter and more foliaceous left paramere spine. Females of this species are distinctive in the short, tall, bare posterior flanges of pleura IX.

Distribution: Known only from the type locality in southcentral China.

Phylogenetic relationships: The highly reduced right paramere spine of the males in this and the following species imply that they are sister species. These two species share with S. mahabichu Schmid, 1988, and manimekhala Schmid, 1988, a foliaceous left paramere spine, by which we may infer that these four constitute a monophyletic group.

Setodes longicaudatus, n. sp.

Description: Head and body light yellowish brown, forewings pale yellow, clothed with golden yellow hair, with traces of six or seven silver stripes bordered by dark hairs.

Male genitalia (Fig. 17): Segment IX narrow dorsally with small papilla bearing two setae, broadly triangular laterally, ventrally with shallow triangular negative manille (without raised lateral borders). Superior appendages slender, about one-tenth as broad as long. Segment X short, semicircular in dorsal view. Inferior appendages each with dorsal branch compressed, its base projecting backward in rounded process, apex bifid with mesal process broad and long and with lateral process terminating in slender digit; baso-ventral branch as long as dorsal branch, gradually upcurved, in ventral view with apex abruptly more slender. Phallobase short, consisting on no more than phallic apodeme; pair of dorsal sclerotized strips connecting phallic shield with mesal apices of lateral lobes of segment X; parameres fused mesally and with pair of compressed lobes laterally at base, right paramere reduced to stubby spike, left paramere spine foliaceous with long hooked apex; phalicata slender and tubular in basal half, bent about 120 degrees at midlength, with broadly recurved flange on left side in vertical part.

Female genitalia (Fig. 36): Segment IX broadest laterally, pleura each with two posterior flanges, including short and tall upper flange and lower flange about as long as tall, projecting further caudad than upper flange; prominent ventral edges of pleura IX recurved laterally and projecting posteriorly as far as apices of lamellae. Superior appendages short, setose, triangular, and widely separated. Tergum X slightly constricted basally in dorsal view, apically with two rounded lobes. Lamellae somewhat quadrate, posterior margin convex, apico-ventral corner with small incurved digitate process bearing several small stout setae. Gonopod plates fused mesally and terminating apically in pair of acute

points. Spermathecal sclerite barely visible beyond points of gonopod plates and fused with these plates, bearing pair of sclerotized ribbons extending to anterior margin of segment VIII. Sclerotized region of genital chamber broad, extending nearly to anterior margin of segment IX.

Length of forewing: Male - 5.0 mm, female - 4.9 mm.

Immature stages unknown.

Type material: Holotype MALE, Wu-yi, Fu-jian Province (N27.20, E117.7; Fig. 1, #11), 6 May 1986, Sun Chang-hai. Paratype one female, collected with holotype.

Etymology: Latin, "with long tail," with reference to the relatively long baso-ventral branch of each inferior appendage.

Diagnosis: Within the Manimekhala Subgroup, this species most closely resembles S. brevicaudatus preceding, especially in the very short right male paramere spine. It differs from that species, however, in the male in the much larger basal lobe of the dorsal branch of each inferior appendage, the much longer baso-ventral branch of that appendage, and the longer and more hooked left paramere spine. In the female, tergum X is shorter and, in dorsal view, its apical lobes are rounded; on each pleuron, the lower posterior flange is longer, as long as tall; and the sclerotized ribbons of the spermathecal sclerite are shorter.

Distribution: Known only from the type locality in southeastern China.

Phylogenetic relationships: As discussed above, S. brevicaudatus probably is the sister species of this one.

Aethiopicus Subgroup

Description (Schmid, 1988): Anterior wings with relatively dark gold background color and with silver lines not shortened in apical area. Costal fringe of forewings of males composed of very short, bristle-like and parallely recurved hairs. Venation of forewings with fork of M beginning sometimes basad of Fork I and with posterior border of apical region variably convex.

Male genitalia (Schmid, 1988): Segment IX short and forming very obtuse apico-lateral angle; positive manille [apico-mesal depression with projecting lateral borders] nearly always present. Furthermore, sternite VIII prolonged posteriorly and its apical border able to recurve apex of phalicata. Segment X large and massive, but only slightly prominent. Inferior appendages situated rather low and composed of two branches; upper branch subvertical and lower branch subhorizontal, both prominent; furthermore, internal surface of upper branch forming variably developed and prominent lobe. Basal plate [sensu Nielsen, 1957; "tendon des appendices inférieurs" of Schmid, 1988] low, but distinctly concave. Phalicata curved ventrad in sharp angle; at curve, phalicata forms not one but two parallel dorso-median carinae, separated by deep furrow, prolonged more or less anteriorly and extending in lateral recurved flanges ventrally for variable length along the vertical part of phalicata. Parameres symmetrical in overarching curve, their extreme base protected laterally by two rounded flanges, situated on segment X [actually beneath and between its lateral arms] and producing concavity between them.

Female genitalia: Only the female of S. aethiopicus Kimmins, 1963a, has been described previously by Kimmins (1963a). We add here a description of the following species. These two are similar to those of the Manimekhala Subgroup as follows: prominent ventral processes of segment IX and anterior long sclerotization of spermathecal sclerite present. They differ from those described

for the Aparimeya Group by the following: segment IX with bridge connecting sides antero-ventrally and with only one setose postero-lateral flange.

Distribution: Known previously from central Africa and Mysore, India, now extended to southeastern China.

Phylogenetic relationships: Schmid (1988) depicted this Subgroup as monophyletic, with the Manimekhala + Kantyamrita Subgroups as the sister lineage. Purported homologues are the pair of parallel and symmetrical dorso-median carinae of the male phalicata and the more slender and prominent inferior appendages. However, we are not convinced that the Subgroup is monophyletic, but rather is likely paraphyletic, with the above two Subgroups excluded taxonomically from within it. The lateral lobes at the base of the male parameres and the recurved dorsal flanges of the phalicata are homologues by which we concur that the three Subgroups at least constitute a monophyletic group. The relationship of the Akilbicha Subgroup with these species remains unresolved.

Setodes quadratus, n. sp.

Description: Head and body yellowish brown. Forewings densely clothed with golden brown hairs with silver streaks surrounded by dark brown hairs, each wing with two long longitudinal streaks nearly half as long as wing, one running from wing base along Cu vein to origin of Fork V, other along P vein to arculus, with nine to ten short streaks dispersed on remaining surface of wing. Forewing apical margin convex, not acute.

Male genitalia (Fig. 18): Segment IX narrow dorsally with setose median papilla; lateral margins projecting posteriorly in broad triangle in lateral view; ventrally with positive manille, postero-median triangular concavity with projecting setose lateral borders triangular in lateral view. Superior appendages clavate, about five times as long as broad. Segment X very short, U-shaped in dorsal view, with pair of submedian bumps; truncate or slightly excavated at ends of lateral arms. Inferior appendages roughly quadrate in lateral view, clothed with dense setae mesally; postero-ventral corner produced as stout acute process, its upper mesal margin serrated and setose; upper margin produced in long digitate projection with bifid apex, with one fork capitate and truncate and projecting mesad, other slender and projecting caudad to acute apex. Phallobase very short, consisting only of phallic apodeme; pair of dorsal sclerotized strips from phallic shield extending to inner apices of lateral arms of segment X; parameres very long and slender and symmetrical, broadly overarching genitalia; fused internally, with pair of broad recurved plates basally between lateral arms of segment X. Phalicata bent about 140 degrees ventrad, smooth dorsally without evident carinae, with shallow indentation on dorsal edge just beyond bend, then proceeding to very acute apex.

Female genitalia (Fig. 37): Segment IX broadest laterally, single postero-lateral flange oblique, short, as tall as lamellae, densely setose; antero-ventral surface with pair of rugose areas; ventral edges prominent and recurved laterally somewhat as in Manimekhala Subgroup, projecting posteriorly nearly as far as lamellae, connected anteriorly by sclerotized bridge. Region between postero-lateral flange of segment IX and lateral base of lamellae on each side with deep groove. Postero-ventral sclerotization, possibly representing gonopod plates, with short and narrow median notch. Superior appendages triangular and setose, separated mesally by distance about one-quarter width of one appendage. Tergum X pentagonal and with obtuse apical angle in dorsal view, truncate in lateral view. Lamellae oblique with parallelogram shape in lateral view, with

ventrally projecting baso-lateral triangles and caudo-mesally projecting postero-ventral processes with stout spines. Spermathecal sclerite bearing single, cylindrical ribbon extending to anterior margin of segment VIII. Sclerotized region of genital chamber triangular in lateral view.

Length of forewing: Male - 6.5-6.7 mm, female - 6.0-6.5 mm.

Immature stages unknown.

Type material: Holotype MALE, Hua-xi, Gui-chou Province (N26.25, E106.40; Fig. 1, #4). Paratypes 3 males, 3 females, Yi-xing, Jiang-su Province (N31.30, #119.80; Fig. 1, #13), 4 June 1987, Sun Chang-hai.

Etymology: Latin, "with square shape," with reference to the shape of each male inferior appendage in lateral view.

Diagnosis: Males of this species resemble those of others in the Aparimeya Group in the angled phalicata and the greatly overarching paramere spines. They resemble those of the Manimekhala, Kantyamrita, and Aethiopicus Subgroups in the membranous endothecal region and the pair of flanges beside the fused bases of the paramere spines. They differ from all of these, however, in the lack of dorsal carinae or recurved flanges or ventral winglets on the phalicata. Females of this species resemble those of the known species (S. aethiopicus, longicaudatus, and brevicaudatus) in the characters mentioned for the Aparimeya Group and those of S. aethiopicus in the characters mentioned for the Aethiopicus Subgroup. It differs from these in the presence of a deep groove on each side at the base of the lamella and the presence of a pair of rugose areas antero-ventrally.

Distribution: Known only from the type localities in southern and eastern China.

Phylogenetic relationships: This species is placed in the Aethiopicus Subgroup because (1) the male has a pair of sclerotized plates on the base of the paramere spines like members of the Manimekhala and Kantyamrita and Aethiopius Subgroups; (2) unlike members of the Manimekhala Subgroup, its paramere spines are symmetrical; (3) unlike members of the Kantyamrita Subgroup, it has no recurved flanges on the dorsum of the phalicata. Therefore, it seems to belong to the apparently paraphyletic Aethiopicus Subgroup. Both this species and S. vitanka Schmid, 1988, have the lateral arms of male segment X truncate or slightly excavated and the bordering projections of the positive manille triangular, suggesting that they may be sister species. The lack of any carinae or flanges on the phalicata of S. quadratus probably is an autapomorphy.

Setodes distinctus, n. sp.

Description: Specimens in alcohol much denuded; appearing uniformly pale yellow except abdomen creamy white; forewings with whitish yellow setae.

Male genitalia (Fig. 19): Segment IX reduced dorsally to narrow transverse band, indistinguishably fused with segment X, high above superior appendages and remainder of genital capsule; postero-lateral margins diagonal; very broad ventrally, without manille (postero-ventral concavity). Superior appendages relatively short, paddle-shaped. Segment X slender and elevated anteriorly; lateral arms projecting posteriorly in U-shape to length of superior appendages, bilobed apically with outer apical lobe directed caudo-ventrally and inner subapical lobe fused with lateral plates of base of paramere spines. Inferior appendages each tri-branched and crescent-shaped; uppermost branch slender, clavate, curved caudad, this branch without basal lobe but with three or four scoli in row along caudo-mesal surface; middle branch subtriangular, with

digitate dorsal apex, smaller digitate process subapically on caudal margin, lower caudal margin serrate; lower branch slender and tapering to blunt apex. Phallus positioned relatively low in genital capsule, about one-quarter distance from ventral surface; phallobase short; very long pair of sclerotized strips of phallic shield extending to lateral arms of tergum X; endothecal membranes extensive; paramere spines very long, overarching rest of genitalia, completing about 215 degrees of a circle, with pair of lateral plates at base fused with inner lobes of segment X; phallus compressed, in lateral view parallel-sided and straight in basal third, broader and curved ventrad in middle third with pair of narrow dorsal ridges, somewhat hooked and tapering to acute apex in distal third.

Length of forewing: Male - 5.7-6.0 mm.

Female and immature stages unknown.

Type material: Holotype MALE, Mao-yang, Hai-nan Island (N19.10, E109.70; Fig. 1, #8), 19 April 1986, You Da-shou. Paratype one male, collected with holotype.

Etymology: Latin, "separate" or "different," referring to the very unusual male genitalia.

Diagnosis: Among the Setodes species whose males have a pair of plates beside the base of the paramere spines (Manimekhala, Kantyamrita, and Aethiopicus Subgroups), this is the only one with such a narrow and dorsally elevated and fused terga IX and X, such a broad sternum IX without a manille, a tri-branched crescentic inferior appendage without a basal lobe on the upper branch, or a phallus positioned so low in the genital capsule. The very narrow dorsal ridges of the phalicata also are unique, being much broader in most other species or absent in S. quadratus. The most startling characteristic is the fused condition of the basal flanges of the paramere spines with the inner lobes of segment X. We have never before observed the fusion of distal portions of structures having such different origins!

Distribution: Known only from the type locality on Hainan Island.

Phylogenetic relationships: Only the pair of flanges at the base of the paramere spines of the male provide a clue concerning the relationships of this species. Since the paramere spines are symmetrical and the phalicata lacks large triangular recurved dorsal flanges, it seems most appropriate to include it with the apparently paraphyletic Aethiopicus Subgroup. No unique homologues with other individual species of this Subgroup are readily evident.

Strange Species

Description (Schmid, 1988): Male scape about as long as head. Forewings always of "argentolineatus" coloration type [see description under S. argentatus above], with silver lines shortened and thickened in apical region of certain species. Shape and venation of forewings modified in eight species and only in males.

In species with unmodified forewings, forewings more regularly narrowed than in species of Primitive Branch, less broad a level of apex of discoidal cell and about 5.5 times longer than broad. Venation without peculiarities except that three bifurcations of hindwings short. False vein of hindwings adjoining Cu ["Cu2"] present in certain species and not in others. Costal fringe of forewings long, silky, and composed of ordinary hairs.

In eight dimorphic species, series of 12 modifications present in form, venation, and pilosity of [male] forewings. These specializations linked, always present together. (1) Wings not broader than in unmodified species, but clearly

more obtusely oval apically. (2) Apical region elongated. (3) Veins thickened, especially R ["R1"], including C, apical part of Sc, and sometimes Sc of hindwings. (4) However, Sc, P ["Cu2"], and to lesser degree E and 1A and 2A very greatly thinned and nearly evanescent. (5) All veins except Sc, P ["Cu2"], and E and 1A and 2A precisely covered with short erect hairs, constituting also costal fringe. (6) Veins tending to become parallel. (7) Cells tending to become narrow. (8) Discoidal cell very long and narrow. (9) Thyridial cell especially shortened. (10) Length of discoidal cell directly related to anterior position of point of fusion of C and Sc. (11) Fork I not petiolate, but with line of contact, sometimes very long, with discoidal cell. (12) Bifurcation of M remaining petiolate except in S. akunchita Schmid, 1988. Curiously, position of nigma ["tache ocellaire"] not affected by these modifications. In hindwings, three bifurcations short and false vein adjoining Cu ["Cu2"] always clearly visible. These modifications tending to become accentuated gradually, but irregularly, S. akutila Schmid, 1988, being least modified and akunchita occupying extreme position. In females, shape and venation similar to species with unmodified wings, but thyridial cell of forewings short and three bifurcations of hindwings strongly terminalized.

Male genitalia (Schmid, 1988): Segment IX robust laterally and ventrally; in six species upper lateral surfaces strongly cut out; in six other species manille either negative [simple postero-ventral concavity] or positive [postero-ventral concavity with projecting lateral borders] or both at the same time, and sometimes of considerable size. Segment X size variably of medium or small size, strongly sclerotized, forming roof above base of phallic apparatus and serving as stop for elevating movements of phallus. Superior appendages ["appendices préanaux"] always free; very long in species with upper lateral surfaces of segment IX strongly excised (characters probably linked) and short and oval in others.

Inferior appendages of more varying shape, but not truly in crescent; in six species inserted high above manille and bilobed, lower lobe being more strongly sclerotized than upper one. Basal plate [sensu Nielsen, 1957; "tendon des appendices inférieur"] as broad as inferior appendages, concave in U-shape dorsally and with two upper borders reinforced; sometimes greatly reduced or absent.

Phallic apparatus with parameres absent, endotheca disappeared or obliterated and phalicata in sclerotic continuity with phallobase; extremely varied form and structure; divided longitudinally into two or three asymmetrical little flags in five species; in four others, provided with two annexed, paired, asymmetrical spines inserted in upper middle; five other forms with single unpaired and asymmetrical spine.

Phylogenetic relationships: Schmid (1988) considered these species monophyletic, citing several "generally ineffable" reasons for his conclusion. We concur, noting the probably homologous general form of the phallus as evidence, presuming the paired or single (fused?) annexed spines or dorsalmost "little flag" of these species to be of common structural origin. Schmid (1988) attempted to infer the phylogenetic relationships of the Strange Species using the Bertin (1969) ordered matrix method and the PAUP maximum parsimony method of Swofford (1983). Using nine characters, his efforts with the 11 species and species groups produced two broadly overlapping character groups and 34 different phylogenetic trees, respectively, but their results were inconclusive. For example, the two trees shown by Schmid (1988) from the 34 trees produced by the PAUP program suggest that the sister group of S. iris either is ekachringa or the complex of all Strange Species except ekachringa.

Isolated Species

Setodes iris Hagen, 1858

Setodes iris Hagen, 1858, p. 486; holotype gender and deposition unknown; type locality = Sri Lanka. Ulmer, 1915, redescription. Li, 1951, p. 879, listed from China as a pest of rice, but without more specific data. Schmid, 1958, 1988, redescriptions.

Description (Schmid, 1958, 1988): One of most beautiful species of genus. Forewings with old gold color and bearing about 20 white marks broadly circled with brown, especially large and broadly encircled near apical posterior angle of wing and especially narrow and elongate near base of wing; this color pattern derived from "argentolineatus" type like those of S. aparimeya and of species of Gutika Group. Fore and hindwings relatively very wide, particularly forewings of which posterior apical region very convex, as in species of Akilbicha Subgroup. Costal fringe of forewings and venation without peculiarities. In hindwings, false vein adjoining Cu ["Cu1"], but nearly invisible.

Male genitalia (Schmid, 1988; Fig. 20): Segment IX relatively short throughout its circumference, especially dorsally. Slight negative manille present [triangular concavity on sternum IX]. Segment X very small, obtuse and slightly longer than tall. Superior appendages ["appendices préanaux"] short. Inferior appendages large and each forming three slender and well separated lobes: superior lobe very long and arched dorsad, inserted so high as to resemble lobe of basal plate ["lobe tendinique"]; median lobe short and with posterior face concave; inferior lobe large tapering and sharp; external surface of each inferior appendage bearing stopping prominence in basal median position. Basal plate ["tendon"] broad and strongly concave dorsally. Phallic aparatus modified in strange manner: main mass directed obliquely dorsad, high above other genital pieces and [curved into] horizontal position, with complex relief; creased with deep dorsal longitudinal furrow; lower surface concave and apico-lateral angles in very slender cones; lower surface bearing long regular cylinder directed vertically ventrad, resembling drilling probe, probably copulatory part of phallus; more apically two paired attached spines, symmetrical, very long, both directed vertically ventrad, arched against each other and posteriorly and finely dentate in middle [posterior surface]; tubule not evident.

Female genitalia (Schmid, 1958; Fig. 38): Segment IX well developed and differentiated in two clearly distinct parts. Dorsal part of segment X in rounded horizontal plate. Lamellae ["valves du X^me^ segment"] short and widened obliquely dorsad and posteriad.

Length of forewing (Ulmer, 1915): male - 5.5 mm.

Immature stages unknown.

Diagnosis: The very peculiar vertical portion of the phalicata is found only in this species and S. sarvapunya Schmid, 1988, in the genus Setodes. The male of S. iris differs from the latter, however, in that iris has only a negative manille [simple postero-ventral concavity on sternum IX], a much longer and acute ventral lobe of each inferior appendage, fine dentations on the paramere spines, and broader wings without thickened veins.

Distribution: Schmid (1988) indicated that the species is known only from Sri Lanka, despite Li's (1951) record. We are inclined to agree with Schmid, suspecting that Li's identification was in error; nevertheless, the species is included here for completeness.

Phylogenetic relationships: The peculiarly complex form of the phallus in this species and S. sarvapunya strongly suggest that they are homologous; the differences between the two species are remarkable, but most of these differing characters are each autapomorphous in one or the other of them or is of such simple design as to be less likely homologous. The highly concordant suite of characters in the male forewings argues against a sister group relationship for these two species, however, as noted by Schmid (1988).

Trichosetodes Ulmer, 1915

Trichosetodes Ulmer, 1915, pp. 65-66; distinct from Setodes according to Schmid (1958, 1988), Marlier (1962), and Botosaneanu (1970).

Type species: Trichosetodes argentolineatus Ulmer, 1915, monobasic.

Episetodes Martynov, 1936, p. 265; synonym of Setodes according to Schmid, 1958; synonym of Trichosetodes according to Schmid, 1988.

Type species: Episetodes angustipennis Martynov, 1936, monobasic.

Description: Generally resembling Setodes in all ontogenetic forms.

Larvae of T. imperfectus Ulmer, 1951, were described by Ulmer (1955) and redescribed from Ulmer's work by Marlier (1962). Diagnostic characters used to distinguish Trichosetodes from other genera of Leptoceridae included the following (Ulmer, 1955): (1) mandibles chisel-shaped, hollowed out mesally, with two edges, usually with distinct teeth; (2) labrum with lateral brushes, on foresurface no secondary bristles (i.e., with only the usual six, Marlier, 1962); (3) maxillary lobes and palps distinctly separated on midline and not extending far beyond labrum; (4) segment VIII with row of chitinous points on each side; (5) ventral apotome large, broad and long-rectangular [longer than broad]; (6) hind tibiae not secondarily divided; (7) hind legs not natatorial, but bordered with more or less numerous dispersed hairs or bristles; (8) clypeus not parallel-sided, not especially broad in apical part; (9) middle leg without scoli and claws undivided; (10) Hind femora, tibiae, and tarsi subequal in length; (11) head and thorax very clear amber-colored, without dark spots and points; and (12) case of sand grains, more or less rough, conical, delicate, curved. Setodes larvae with yellow head and pronotum with dark marks.

Pupae of T. imperfectus; handschini Ulmer, 1951; and thienemanni Ulmer, 1951, were described by Ulmer and redescribed from Ulmer's work by Marlier (1962). Diagnostic characters include the following (Ulmer, 1955): (1) Labrum hard, bounded by chitinous carina, with one or two pairs of stiff long bristles close together in middle of anterior edge, almost as long as width of labrum, and with some shorter similar ones more laterally, and with anterior edge notched at least once; (2) mandibles with uniformly small teeth; (3) anal processes on the whole rod-like, not broad basally then abruptly narrowed; (4) tibial spurs 0, 2, 2 [respectively, on legs of one side]; (5) first three segments of male antennae thick and long; and (6, Marlier, 1962) anterior hook-plates on abdominal segments III through VII. Setodes pupae have normal leptocerid antennae and anterior hook-plates on abdominal segments III through VI.

Adults (Schmid, 1988): Scape of male bearing brush of long hairs, generally inserted on prominent, rounded, internal apical angle of this segment; sometimes inserted on entire internal dorsal surface of scape. This brush weakly or strongly developed. Generally closed on itself, able to open like fan. Hairs generally fine and silky, white or brown or on contrary slightly thickened and blunt. Male scape as long as head to half again as long and of simple form.

Pedicel reduced, subspherical, and barely longer than thick. First segment of flagellum six to ten times longer than thick, of slightly irregular form basally and bearing brush of short hairs inserted or not on external prominence. Scape of female as long as head or slightly longer [often not as long] and of simple form. Tibial spurs 0, 2, 2 [respectively, on the three legs of one side].

Color of anterior wings always of "argentolineatus" type [see description under S. argentatus above]. Disposition of silver lines varying slightly among species, but most posterior always following curve of Cu_{1a} [Cu_1]. Pilosity of forewings almost always entirely scaly. Membrane of female forewings often slightly coriaceous and scales larger than in male. Costal fringe of male forewings strongly developed, thick and complete; simple, double, or triple and composed of ordinary or hooked hairs, sometimes accompanied by short row of very long hairs lying on wing membrane.

Forewings longer, narrower and more tapered at their extremity than in Setodes, about six times longer than broad; without harmonious proportions of most species of Setodes but broadest at midlength rather than at level of apex of discoidal cell. Hindwings as broad or slightly broader than forewings, glabrous basally as in Setodes. Apical part of costal border forming very obtuse angle with basal part. Venation very close to that of Setodes. In forewings, only Forks I and V present, Fork I generally petiolate. [We consider Fork II also to be present, evidenced by the corneous point, or nigma, positioned in it near its origin.] Sc and R ["R_1"] thick and confluent from level of origin of discoidal cell. R ["R_1"] very long and ending at edge of wing very near apex of S_1 ["R_2"]. Discoidal cell always more than four times longer than broad and narrowed apically by slightly obliqueness of S_3 ["R_{4+5}"] toward S_{1+2} ["R_{2+3}"]. Three transverse crossveins of anastomosis situated between S_3 ["R_{4+5}"] and P ["Cu_2"] irregularly disposed, but situated at level of middle of length of discoidal cell. Bifurcation of M petiolate and often situated at level of origin of Fork I. In hindwings, R ["R_1"] extremely long, as in forewings. Subradial cell very broad. Bifurcations more apical than in Setodes and dividing of forks shorter. Supplementary false vein always present before and coupled to Cu_1 ["Cu_{1a}"]. Wings with slight sexual dimorphism: female wings even more tapered than those of male and discoidal cell of forewings even more narrowed apically.

Male genitalia (Schmid, 1988): Segment IX tending to be reduced dorsally, very short at dorsal surface of abdomen; sometimes top of its lateral surfaces entirely absent. Segment X reduced to tiny roof-like scale or vestigial piece, half or completely internal, but more often entirely absent. Armature of segment X composed of superior appendages [sensu Nielsen, 1957; "appendices préanaux" of Schmid, 1988] always present, large, entirely free and never reduced and of one or two pairs of symmetrical or asymmetrical lateral branches, sometimes totally absent. Inferior appendages indistinguishable from those of Setodes. Their basal plate ["tendon"] concave in U-shape dorsally and with its two upper lateral borders reinforced; lobes of basal plate sometimes present, either internal or external. Phallic apparatus profoundly modified and strongly and uniformly sclerotized. Phallobase absent [actually represented by phallic apodeme] and phalicata united to phallobase without sclerotic discontinuity [i.e., endophallic membranes absent]; phalicata frequently divided longitudinally into two or three asymmetrical branches. Parameres always absent. Tubule [= ejaculatory duct] always present, either external or internal, generally very long; if seemingly absent, presumed to be present but not visible.

Female genitalia (Schmid, 1988): Generally distinguishable from those of Setodes by thick, plump, and well-sclerotized sternite VIII.

Distribution: Reported from the Ethiopian, Oriental, and eastern Palearctic Biogeographic Regions.

Phylogenetic relationships: The monophyly of this Group was defended by Schmid on the basis of the following characters: (1) Sexual dimorphism in the first three segments of the antennae, the shape of the wings, the costal fringe of the forewings, and the pilosity and texture of the membrane of the forewings; (2) Sc and R ["R_1"] of the forewings thick and confluent; (3) the discoidal cell of the forewings is narrowed apically, and more so in the males than in the females; (4) the bifurcations of the veins in the hindwings are more strongly terminalized [closer to the apex of the wing]; and (5) the male genitalia show a strong tendency to reduction of segment X and the dorsal part of segment IX. He considered the "Strange Species" as the sister group of Trichosetodes, although he was unable to provide specific homologues to demonstrate the monophyly of this informal group [not for lack of effort, however, as one can see by studying his text!] Evidence for the sister group relationship was based on the following homologues: (1) Scape of the male long, (2) wings narrow, (3) costal border of each hindwing angled, (4) bifurcations of veins in hindwings apical, (5) false vein present in each hindwing [plesiomorphous in Leptocerinae], (6) a tendency to sexual dimorphism, (7) male parameres absent, and (8) tubule of the male phalicata present.

Isolated and Insufficiently Known Species

Trichosetodes insularis Schmid, 1988

Trichosetodes insularis Schmid, 1988, pp. 103-104; holotype gender = male; holotype deposition = Harvard Museum of Comparative Zoology; type locality = Ta Hau, Hai-nan Island, People's Republic of China.

Description (Schmid, 1988): Brush of male scape in moderate plume of fine brown hairs, inserted at internal apical angle of segment. Costal fringe of male forewings composed of relatively long ordinary hairs. Subcostal cell concave above and provided with white club-shaped hairs. [Our specimens much denuded in alcohol: wings pale yellowish brown, with traces of brown scales along bases of Sc, R, and Cu; mesonotum pale brown, rest of body yellowish white.]

Male genitalia (Fig. 21; Schmid, 1988): Segment IX rather well elongated laterally, with quite prominent apico-lateral angle, and considerably shortened dorsally, reaching dorsal surface of abdomen [and with pair of conical projections each bearing two setae]. [Superior appendages digitate, half as long as broadest part of segment IX.] Segment X absent or virtually so, with two strong symmetrical lateral branches, in simple [vertical] lamina, directed horizontally caudad, each gradually tapering to acute apex. Inferior appendages large rounded wings, strongly crenulated and setiferous, protecting laterally a densely tuberculate and spiniferous median region; apico-ventral part drawn out in strong point directed ventrad, then horizontally caudad. Basal plate ["tendon des appendices inférieurs"] long and slender [and without dorsal processes]. [Pair of sclerotized strips connecting phallic shield with bases of lateral arms of segment X.] Phalicata simple, not divided longitudinally, asymmetrical, little sclerotized and slightly curved ventrad; apical part in lateral view appearing simple and digitate; in dorsal view obviously asymmetrical, right side concave with tubule, left side with large sub-basal dorsal lobe in strong rounded stop raised above all other appendages.

Female genitalia (Fig. 39): Segment IX nearly as long dorsally as laterally, with pair of ventro-lateral rhomboid sclerotized flaps with stout setae. Gonopod plate triangular, fused antero-ventrally with segment IX, with pair of grooves submedially near point of fusion. Superior appendages fused with tergum X, but their rounded setose outline clearly visible. Segment X acute in lateral view, projecting in broad thin plate with rounded apex in dorsal view, covering most of lamellae. Lamellae capitate in lateral view, rounded and with row of setae apically, except ventral apex expanded in triangular region with short stout setae mesally. Spermathecal sclerite subpentagonal, with lightly sclerotized process projecting to anterior edge of segment VIII. Sclerotization of genital chamber also extending to anterior part of segment VIII.

Length of forewing: Male - 4.7 mm, female - 3.8 mm.

Immature stages unknown.

Diagnosis: In no other known species of Trichosetodes is there a vertical sub-basal dorsal process on the male phalicata. Females of the genus are insufficiently known to provide meaningful diagnoses other than the description given above.

Distribution: Known only from Hai-nan Island, off the southeastern coast of China, including the following location near the type locality: Mao-yang, Hai-nan Island, (N19.10, E109.70; Fig. 1, #8), 19 June 1986.

Phylogenetic relationships: Although Schmid (1988) placed this species among his "Isolated and Insufficiently Known Species," the males bear some resemblance to those of T. handschini and thienemanni of the Atisudhara Group and the following species, including the possibly homologous thickly setose vestiture on the mesal surfaces of the inferior appendages.

Trichosetodes lasiophyllus, n. sp.

Description: Specimens in alcohol much denuded, uniformly yellowish brown; wings pale fuscous with traces of white and silver longitudinal streaks. Basal segments of antennae typically elongated, cylindrical, with long hair tuft on apex of each scape.

Male genitalia (Fig. 22): Segment IX narrow and lightly sclerotized dorsally, elevated far above rest of genitalia, with pair of bare conical projections antero-dorsally; with pair of conical setiferous projections postero-dorsally; broadening laterally to truncate ventro-lateral margin in lateral view; very wide ventrally, without manille (postero-ventral concavity) or caudal projections. Superior appendages free, short, clavate. Segment X lateral arms about one-quarter as long as superior appendages, triangular in dorsal view, globose to subtruncate in lateral view. Basal plate without dorsal processes. Inferior appendages broad and foliaceous with rectangular flange on dorso-lateral surface near base and acute apex directed caudad; inner surface convex, covered with dense white setae. Phallobase consisting only of phallic apodeme; pair of sclerotized strips extending dorsally from phallic shield to lateral arms of segment X; phalicata divided into two branches, one above other, both angled ventrad then caudad, upper branch slender and compressed and angled near base and spiraling to acute apex with one or two subapical points, lower branch broad and depressed and concave dorsally and with edges twisted to left or right near apex.

Female genitalia (Fig. 40): Segment IX dorsally fused imperceptibly with segment X, ventrally projecting anteriorly in rounded lobe and with pair of rounded setose lobes on either side of gonopod plate. Gonopod plate bare,

broadly triangular with rounded apex in lateral and ventral views, fused with segment IX. Superior appendages fused with terga, their positions indicated by convex areas of very short setae. Segment X semicircular in dorsal view. Lamellae oval in lateral view, oblique, attached near upper anterior angle, posterior edge with row of setae, lower posterior angle with short stout setae mesally. Spermathecal sclerite triangular, with lightly sclerotized anterior process projecting into segment VIII. Sclerotization of genital chamber above spermathecal sclerite extending to anterior edge of segment IX.

Length of forewing: Male 4.5 mm, female 4.0 mm.

Immature stages unknown.

Type material: Holotype MALE: Wu-yi, Fu-jian Province (N27.70, E117.70; Fig. 1, #11), 6 May 1986, Sun Chang-hai. Paratypes: one male, 8 females, collected with holotype; one male, one female, Jian-yang, Fu-jian Province (N27.30, E118.10; Fig. 1, #5), 24 October 1974, Li Fa-sheng.

Etymology: Greek, "hairy leaf," with reference to the shape of each inferior appendage and the dense setae on its mesal surface.

Diagnosis: The male somewhat resembles T. handschini in the shape of the genitalia, but differs in missing two long processes of tergum X and the upper branch of each inferior appendage is reduced to a small rectangular lobe. No other species of Trichosetodes has such a dense covering of white setae on the mesal surfaces of its male inferior appendages. Female genitalia of this species are similar to those of the preceding one, but the ventro-lateral lobes of segment IX of this species are half as large, segment X is much smaller in dorsal view, and the anterior process of the spermathecal sclerite is longer.

Distribution: Known only from the type localities in southeastern China.

Phylogenetic relationships: If the dense setae on the mesal surfaces of the male inferior appendages is a homologous character for T. handschini, thienemanni, and insularis, then this species bears it also to an advanced degree, suggesting that these four species constitute a monophyletic group, possibly within the Atisudhara Group.

HISTORICAL BIOGEOGRAPHY

The phylogenetic evidence from the study of these species is less convincing than usual, providing difficulties for subsequent inferences such as those of historical biogeography. Nevertheless, certain generalizations are possible for the Chinese Setodini that may be useful.

There is one species (S. fluvialis) that occurs in the Oriental Biogeographic Region both in China and elsewhere (at least Burma - Kimmins, 1963b; possibly also Bhutan and India - Schmid, 1988). There are seven to ten historical tracks between Oriental China and the Oriental Region outside of China, including (#1) S. bispinus with argentiferus (India), argentiguttatus (Thailand), and/or argentivarius (Burma); (possibly #2) schmidi and carinatus with kadrava (eastern India) and/or shirasensis (Palearctic Japan); (#3) ancala with monicae (Mysore, India); (#4, possibly one additional track) pellucidulus and/or yunnanensis with khechara (Manipur, India); (#5) hainanensis with abhrayita, himaruna Schmid, 1988, vratachakora Schmid, 1988, pratachandradynti Schmid, 1988, and nyuna Schmid, 1988 (all from India); (#6) brevicaudatus and longicaudatus with mahabichu and/or manimekhala (both from India); (#7) quadratus with vitanka (Mysore, India); (#8, possibly one additional track) T.

insularis and/or lasiophyllus with handschini (Java) and/or thienemanni (Sumatra).

There is one species (S. pulcher) that occurs in the Palearctic Biogeographic Region both in China and in several non-Chinese localities in eastern continental Asia.

There is possibly one track between Oriental China (S. schmidi and carinatus) and Palearctic Japan (S. shirasensis).

One species (S. trilobatus) in the Palearctic Region of China is part of a track involving both Chinese and non-Chinese parts of the Oriental Region (venustus in Sumatra and/or argentiferus [India] + argentiguttatus [Thailand] + argentivarius [Burma] + bispinus [Oriental China]).

Clearly, present evidence suggests that most of the Chinese Setodini fauna is part of a generalized track involving Oriental China and non-Chinese parts of the Oriental Biogeographic Region. Palearctic relationships are weak. Otherwise, relatively recent historical relationships of Chinese Setodini with other Biogeographic Regions do not seem to exist.

KEY TO ADULTS OF CHINESE SETODINI SPECIES

1. Genitalia with inferior appendages (Fig. 3A) and phallus (Fig. 3D) . . . . . Males, 2
   Genitalia with lamellae and internal spermathecal sclerite (Figs. 24A, 25D) . . . . . Females, 21

2. Scape of each antenna longer than head and bearing brush of long hairs. . . . . Trichosetodes, 20
   Scape of each antenna not longer than head and without brush of hairs . . . . . Setodes, 3

3. Abdominal segment IX with tergum longer than sternum and with apico-lateral edges concave in lateral view (Fig. 11A); each inferior appendage in lateral view small, not crescent-shaped, its baso-ventral lobe absent (Figs. 10A, 11A) or very small (Fig. 12A); parameres spines short, stout, at end of long eversible membranes (Fig. 11D) 4
   Abdominal segment IX broadest ventrally (Fig. 3A) or laterally (Fig. 15A); each inferior appendage larger, crescent-shaped, its baso-ventral lobe and often other processes prominent (Fig. 3A) 6

4. Tergum X with median tongue-like process (Fig. 10A, 10B). . . . . .Setodes pulcher Martynov
   Tergum X truncate or notched in dorsal view (Fig. 12B) 5

5. Phalicata strongly compressed (Figs. 12C, 12D), semi-lunar in lateral view (Fig.12A). . . . . .Setodes yunnanensis, n. sp.
   Phalicata broad dorsally, more or less parallel-sided in lateral view (Fig. 11D) . . . . . .Setodes pellucidulus Schmid

6. Baso-ventral lobe of each inferior appendage more than three times as long as sternum IX on midline, constricted and angled 45 degrees upward at middle (Figs. 9A, 9C) . . . . . Setodes ancala, n. sp.
Baso-ventral lobe of each inferior appendage no more than twice as long as sternum IX (Figs. 7A, 7C), not constricted at middle (Fig. 6A) and usually only gradually curved upward (Fig. 3A) 7

7. Phallic shield large, triangular or semicircular in lateral view (Figs. 7D, 8D); phalicata apico-dorsal margin serrate with short setae (Figs. 7D, 8D); inferior appendages each with two thick branches (Figs. 7A, 8A) 8
Phallic shield small (Fig. 15D) or inconspicuous, generally not obscuring phallobase in lateral view (Fig. 4D); phalicata not serrate and without setae (Fig. 4D); inferior appendages each with three or more branches (Fig. 3A) 9

8. Inferior appendages each with upper branch stout, truncate and serrate apically, lower branch nearly straight and directed caudad (Fig. 7A) . . . . . .Setodes schmidi, n. sp.
Inferior appendages each with upper branch subtriangular, not serrate apically, lower branch initially directed ventrad, then curved caudad (Fig. 8A) . . . . .Setodes carinatus, n. sp.

9. Abdominal segment X appearing as pair of digitate processes, each projecting from apex of its respective superior appendage (Fig. 14B); inferior appendages each three-branched, very long and slender (Fig. 14A). . . . .Setodes hainanensis, n. sp.
Abdominal segment X distinct, single (Figs. 3B, 13B), trilobed (Fig. 5B), divided only apically (Fig. 4B), or forming short U-shaped or V-shaped piece shorter than superior appendages (Fig. 18B, 20B); inferior appendages either with more than three branches (Fig. 6A) or not so long and slender 10

10. Abdominal segment X much more than twice as long as superior appendages (Figs. 3A, 13A). 11
Abdominal segment X U-shaped or V-shaped in dorsal view, with lateral projections not extending beyond superior appendages (Figs. 18B, 20B). 15

11. Abdominal segment X with pair of lateral, subapical lobes (Fig. 5A) or spines (Fig. 6A). 12
Abdominal segment X sometimes divided apically (Fig. 4B), but without subapical lobes or spines. 13

12. Inferior appendages each with three simple lobes, baso-ventral lobe about twice as broad as either of the others (Fig. 5A); phallus with phalicata apically beak-like, straight, directed ventrad and with parameres undivided (Fig. 5D) . . . . . Setodes trilobatus, n. sp.
Inferior appendages each with five or six lobes, baso-ventral lobe about as broad as any other (Fig. 6A); phallus with phalicata apically curled dorsad and having midventral spine and with parameres divided from about middle (Fig. 6D). . . . . Setodes bispinus, n. sp.

13. Abdominal segment X very long and slender, exceeding other genitalic structures (Fig. 13A) . . . . . .Setodes argentatus Matsumura
Abdominal segment X not slender and not exceeding other genitalic structures (Fig. 3A) 14

14. Abdominal segment X rounded apically in lateral and dorsal views (Figs. 3A, 3B), not divided. . . . Setodes punctatus (Fabricius)
Abdominal segment X divided apically (Fig. 4B). . . . . Setodes diversus, n. sp.

15. Phalicata consisting of straight vertical piece suspended beneath high, arching basal portion of phallus (Fig. 20A) . . . . . Setodes iris Hagen
Phalicata consisting of ventrally curved piece arising near base of phallus (Figs. 15D, 16D) 16

16. Paramere spines stout, abruptly angled ventro-caudad, bifid apically (Fig. 15D) . . . . . .Setodes fluvialis Kimmins
Paramere spines slender, gradually curled ventrad or antero-ventrad (Figs. 18D, 19D), sometimes with right spine reduced and left spine foliaceous (Figs. 16B, 16D, 16E). 17

17. Right paramere spine reduced and left spine foliaceous (Figs. 16B, 16D, 16E) 18
Paramere spines symmetrically developed (Fig. 18B) 19

18. Inferior appendages each with baso-ventral lobe about as long as sternum IX, middle lobe short and triangular (Figs. 16A, 16C). . . . . Setodes brevicaudatus, n. sp.
Inferior appendages each with baso-ventral lobe about 1.5 times as long as sternum IX (Fig. 17C), middle lobe broad and rounded apically (Fig. 17A) . . . .Setodes longicaudatus, n. sp.

19. Inferior appendages more or less quadrate in lateral view (Fig. 18A), with dorsal lobe arising caudally, basal plate vertical . . . . . Setodes quadratus, n. sp.
Inferior appendages more or less crescentic in lateral view (Fig. 19A), with dorsal lobe arising basally, basal plate horizontal. . . . . .Setodes distinctus, n. sp.

20. Abdominal segment X with two lateral branches extending to level of apices of inferior appendages (Fig. 21A) . . . . . Trichosetodes insularis Schmid
Abdominal segment X inconspicuous, its lateral branches much shorter than superior appendages (Figs. 22A, 22B) . . . . . .Trichosetodes lasiophyllus, n. sp.

21. Basal segment of each antenna slender, cylindrical. . . . . Trichosetodes, 37
Basal segment of each antenna rather stout at base, tapering to apex . . . . . .Setodes, 22

22. Abdominal segment IX without pair of longitudinal sclerotized strips suspended ventrally, although single suspended plate (Figs. 23A, 23C, 25A, 25C) or pair of acute ventral posterior projections (Figs. 27A, 27C, 28A, 28C) may be present 23
Abdominal segment IX with pair of longitudinal sclerotized strips suspended ventrally, recurved laterally, and projecting posteriorly (Figs. 33A, 33C, 35A, 35C). 33

23. Apparent gonopod plate very large, postioned posteriorly below and between lamellae; sterna VIII and IX separated by constriction (Figs. 30A, 30C) . . . . .Setodes pulcher Group, 24
Apparent gonopod plate not so large and not filling space below and between lamellae; sterna VIII and IX not separated by obvious constriction (Figs. 25A, 25C) 26

24. Sternum VIII posterior pocket, between sterna VIII and IX, with large trapezoidal sclerotized plate (Fig. 30C). . . . . .Setodes pulcher Martynov
Sternum VIII posterior pocket membranous (Fig. 31C). 25

25. Sternum VIII with membranous anterior triangular region; segment IX broad ventrally; apparent gonopod plate broadly excised apically (Fig. 31C) . . . . . .Setodes yunnanensis, n. sp.
Sternum VIII completely sclerotized; segment IX very narrow ventrally; apparent gonopod plate with acute setose triangular projection apically (Fig. 32C). . . . . Setodes sp. B

26. Lamellae each with ventro-lateral lobe (Fig. 23A, lat.lob) or flange (Fig. 26A); segment IX and lamellae without reticulate surfaces. 27
Lamellae each without ventro-lateral lobe or flange (although ventro-mesal projection usually present, Fig. 28C); segment IX and sometimes lamellae with reticulate surface sculpturing (Figs. 27A, 34A). 31

27. Segment IX more than three times as long as lamellae (Fig. 29A); no gonopod plate suspended ventrally. . . . . Setodes ancala, n. sp.
Segment IX as long as, or longer than, lamellae in lateral view (Fig. 23A); apparent gonopod plate suspended conspicuously ventrally (Figs. 25A, 25C, 26A, 26C) 28

28. Apparent gonopod plate not separated from segment IX, rounded in lateral view (Fig. 26A), broadly bilobed in ventral view (Fig. 26C). . . . . Setodes trilobatus, n. sp.
Apparent gonopod plate distinctly separated from segment IX (Fig. 23A), divided apically into two triangular projections (Fig. 25C). 29

29. Apparent gonopod plate more or less quadrate in ventral view, with apical portion slightly broadened and divided into two large triangular lobes (Fig. 23C) . . . . Setodes punctatus (Fabricius)
Apparent gonopod plate more or less pentagonal (Fig. 24C) or hexagonal (Fig. 25C). 30

30. Apparent gonopod plate more or less pentagonal (Fig. 24C) . . . . . Setodes sp. A
Apparent gonopod plate more or less hexagonal, narrow anteriorly (Fig. 25C). . . . . .Setodes diversus, n. sp.

31. Lamellae narrow, clavate in lateral view, without reticulate surface sculpturing (Fig. 34A); spermathecal sclerite broad with sinuate lateral margins (Fig. 34D). . . . . Setodes fluvialis Kimmins
Lamellae broad, more or less triangular in lateral view, with reticulate surface sculpturing (Fig. 27A) in addition to that on segment IX; spermathecal sclerite twice as long as broad and consisting of three parts (Fig. 27D): (1) posterior sclerotized bands (sb), (2) middle ovoid structure (ov), and (3) anterior flat campanulate sclerotized plate (camp) supported by pair of flanges (sf). 32

32. Segment IX postero-ventrally with pair of acute projections strongly set off from rest of segment laterally in ventral view (Fig. 27C); spermathecal sclerite with ovoid structure (ov) flat in lateral view (Fig. 27A) and supporting flanges (sf) of campanulate structure (camp) ovoid in ventral view (Fig. 27D). . . . . Setodes schmidi, n. sp.
Segment IX postero-ventrally with pair of small laterally recurved projections not conspicuously set off from rest of segment laterally in ventral view (Fig. 28C); middle ring-like structure of spermathecal sclerite rhomboid (Fig. 28D). . . . . .Setodes carinatus, n. sp.

33. Lamellae each with ventro-lateral lobe (vent.lat) in addition to ventro-mesal lobe (Fig. 33A); tergum X twice as long as lamellae. . . . . Setodes hainanensis, n. sp.
Lamellae without ventro-lateral lobes (Fig. 39A); tergum X not as long as lamellae. 34

34. Segment IX ventral longitudinal sclerotized strips broad basally, diverging at 60 degree angle (Fig. 38C). . . .Setodes iris Hagen
Segment IX ventral longitudinal sclerotized strips more or less parallel-sided, diverging at 35 degree angle (Fig. 37C) or less 35

35. Segment IX with deep diagonal groove postero-laterally at base of each lamella, bounded anteriorly by narrow flange as tall as lamella, densely setose (Fig. 37A), with pair of rugose regions antero-ventrally (Fig. 37C) . . . . . Setodes quadratus, n. sp.
Segment IX with groove inconspicuous and not setose (Fig. 36A), without rugose areas 36

36. Spermathecal sclerite with sclerotized ribbons extending to anterior margin of segment VIII (Fig. 36A); tergum X much shorter than lamellae, with pair of broadly rounded lobes in dorsal view (Fig. 36B); segment IX in lateral view with pair of flanges as long as broad between lamellae and longitudinal sclerotized strips (Fig. 36A). . . . Setodes longicaudatus, n. sp.
Spermathecal sclerite with sclerotized ribbons extending to anterior one-third of segment VII (Fig. 35A); tergum X as long as lamellae, with pair of triangular lobes in dorsal view (Fig. 35B); segment IX in lateral view with pair of very narrow flanges below lamellae and above longitudinal sclerotized strips (Fig. 35A). . . . . Setodes brevicaudatus, n. sp.

37. Tergum X acute in lateral view (Fig. 39A); setose ventro-lateral flaps of segment IX larger, covering one-quarter of gonopod plate ventrally (Fig. 39C) . . . . .Trichosetodes insularis Schmid
Tergum X rounded in lateral view (Fig. 40A); setose ventro-lateral flaps of segment IX smaller, covering only edges of gonopod plate ventrally (Fig. 40C) . . .Trichosetodes lasiophyllus, n. sp.

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FIGURES

Fig. 1. Map of collection sites in China, with Chang-jiang (Yang-tze) River indicated. The sites are named in the text beginning on page 4.

Fig. 2. Wings of Setodes pulcher Martynov, specimen from Chang-bai Mountain, Ji-ling Province (abbreviations explained on page 5).

Figs. 3-22. Male genitalia of Setodini species (abbreviations explained beginning on page 5). Views are as follows:

A = left lateral view of genitalia, phallus not shown (Fig. 3) or only base of phallus shown (Figs. 4-22);
B = dorsal view of genitalia, with phallus omitted (Figs. 8, 9, 12) or showing base of phallus only (Figs. 7, 10) or exposed portion of phalicata only (Figs. 3, 13, 15, 21, 22) or base of parameres only (Figs. 16-19) or entire phallus (Figs. 4-6, 14, 20);
C = ventral view of genitalia, with phallus omitted (Figs. 5, 8, 9, 13, 15, 18, 22) or showing apex of phalicata only (Figs. 3, 4, 7, 10, 12, 16, 17, 21) or base of phallus and apex of phalicata (Figs. 14, 19), or entire phallus (Fig. 6);
D = left lateral view of phallus;
E = caudal view of phallus;
F = dorsal view of phallus;
G = caudal view of left inferior appendage (Fig. 15) or of genitalia without phallus (Fig. 21);
H = right lateral view of phallus.

Fig. 3. Setodes punctatus (Fabricius), specimen from Wu-da-lian-chi, Hei-long-jiang Province.

Fig. 4. Setodes diversus, n. sp., holotype.

Fig. 5. Setodes trilobatus, n. sp., holotype.

Fig. 6. Setodes bispinus, n. sp., holotype.

Fig. 7. Setodes schmidi, n. sp., holotype.

Fig. 8. Setodes carinatus, n. sp., holotype.

Fig. 9. Setodes ancala, n. sp., holotype.

Fig. 10. Setodes pulcher (Martynov), specimen from Chang-bai Mountain, Ji-ling Province.

Fig. 11. Setodes pellucidulus Schmid, redrawn from work by Schmid, 1988.

Fig. 12. Setodes yunnanensis, n. sp., holotype.

Fig. 13. Setodes argentatus Matsumura, A and E redrawn from work by Schmid, 1988; B and C redrawn from paper by Schmid, 1950 (S. turbata).

Fig. 14. Setodes hainanensis, n. sp., holotype.

Fig. 15. Setodes fluvialis Kimmins, specimen from Yun-yang, Si-chuan Province.

Fig. 16. Setodes brevicaudatus, n. sp., holotype.

Fig. 17. Setodes longicaudatus, n. sp., holotype.

Fig. 18. Setodes quadratus, n. sp., holotype.

Fig. 19. Setodes distinctus, n. sp., holotype.

Fig. 20. Setodes iris Hagen, A redrawn from work by Schmid, 1988; B and E redrawn from paper by Ulmer, 1915.

Fig. 21. Trichosetodes insularis Schmid, redrawn from work by Schmid, 1988.

Fig. 22. Trichosetodes lasiophyllus, n. sp., holotype.

Figs. 23-40. Female genitalia of Setodini species (abbreviations explained on page 5). Views are as follows:

A = left lateral view of genitalia, with spermathecal sclerite omitted (Figs. 23, 30, 38) or shown at least in outline (Figs. 24-29, 31-37, 39, 40);
B = dorsal view of genitalia, with spermathecal sclerite omitted (Figs. 23, 27, 28, 32, 34) or shown at least in outline (Figs. 24-26, 29-31, 33, 35-37, 39, 40);
C = ventral view of genitalia, with spermathecal sclerite omitted (Figs. 23, 24, 36) or showing its anterior end only (Figs. 25, 28, 39) or at least most of its outline (Figs. 26, 27, 29-35, 37, 38, 40);
D = ventral view of spermathecal sclerite.
E = left lateral view of genital chamber as seen through wall of segment IX.

Fig. 23. Setodes punctatus (Fabricius), redrawn from work of Malicky, 1983.

Fig. 24. Setodes species A, specimen from Jing-hong, Yun-nan Province.

Fig. 25. Setodes diversus, n. sp., paratype from Jian-yang, Fu-jian Province.

Fig. 26. Setodes trilobatus, n. sp., paratype from Zhen-ba, Shaan-xi Province.

Fig. 27. Setodes schmidi, n. sp., paratype from Wu-yi, Fu-jian Province.

Fig. 28. Setodes carinatus, n. sp., paratype from Hua-xi, Gui-zhou Province.

Fig. 29. Setodes ancala, n. sp., paratype from Jin-xiu, Guang-xi Province.

Fig. 30. Setodes pulcher Martynov, specimen from Chang-bai Mountain, Ji-ling Province.

Fig. 31. Setodes yunnanensis, n. sp., paratype from Ying-jiang, Yun-nan Province.

Fig. 32. Setodes species B, specimen from Chang-bai Mountain, Ji-ling Province.

Fig. 33. Setodes hainanensis, n. sp., paratype from Mao-yang, Hai-nan Island, Guang-dong Province.

Fig. 34. Setodes fluvialis Kimmins, specimen from Yun-yang, Si-chuan Province.

Fig. 35. Setodes brevicaudatus, n. sp., paratype from Yun-yang, Si-chuan Province.

Fig. 36. Setodes longicaudatus, n. sp., paratype from Wu-yi, Fu-jian Province.

Fig. 37. Setodes quadratus, n. sp., paratype from Yi-xing, Jiang-su Province.

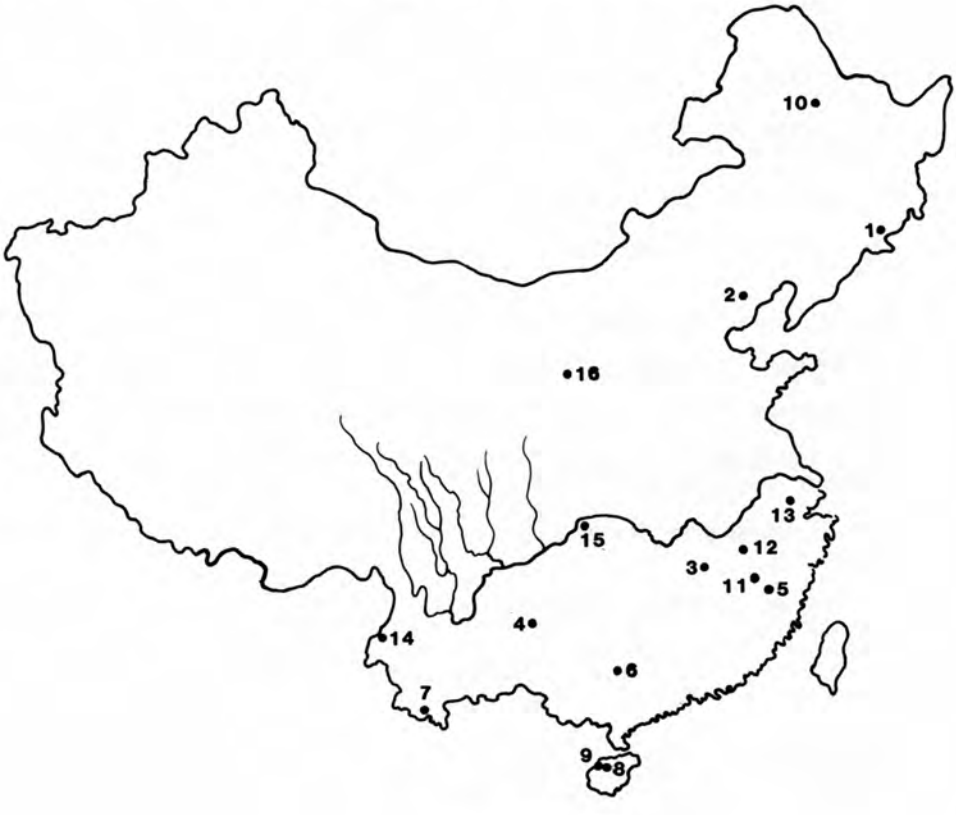
Fig. 38. Setodes iris Hagen, redrawn from paper by Schmid (1958).

Fig. 39. Trichosetodes insularis Schmid, specimen from Mao-yang, Hai-nan Island, Guang-dong Province.

Fig. 40. Trichosetodes lasiophyllus, n. sp., paratype from Wu-yi, Fu-jian Province.

Fig. 41. Setodes punctatus (Fabricius), last instar larva: A = right lateral view of pronotum, B = dorsal view of head, C = dorsal view of meso- and metanota, D = caudal view of abdomen, E = right lateral view of larval case, F = caudal view of larval case (all redrawn from paper by Botosaneanu and Sykora, 1963).

Fig. 42. Setodes punctatus (Fabricius), pupa: A = dorsal view of labrum, B = dorsal view of caudal appendages, C = dorsal view of right mandible (all redrawn from paper by Botosaneanu and Sykora, 1963).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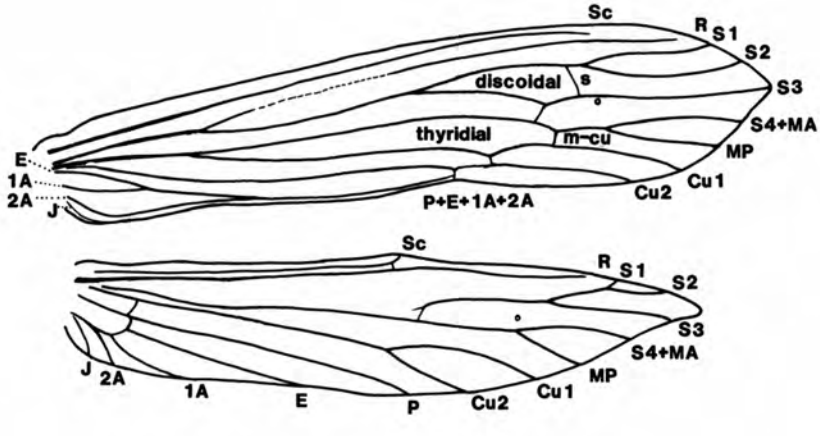
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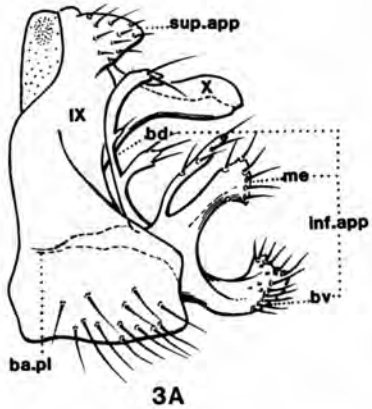

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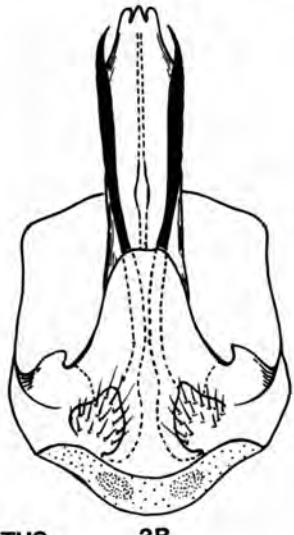

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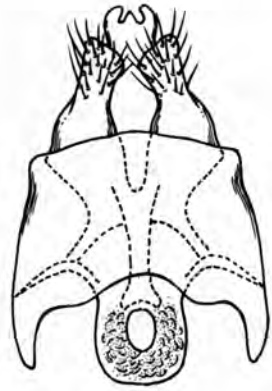
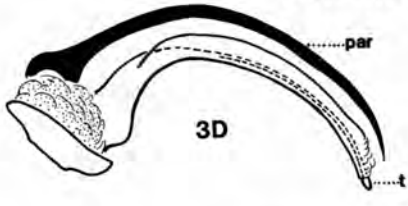


3C

PUNCTATUS



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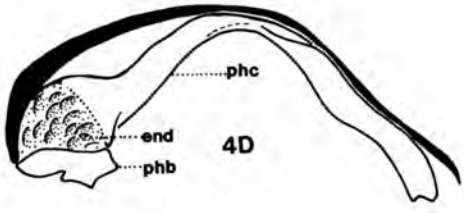

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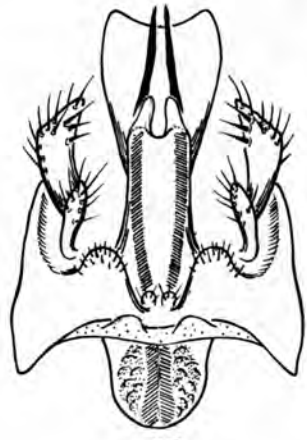
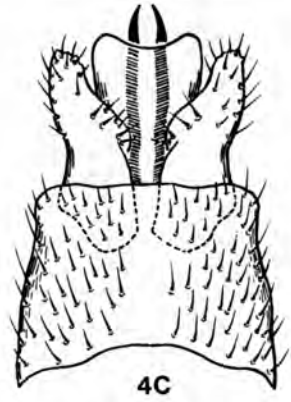


4B

DIVERSUS

4A



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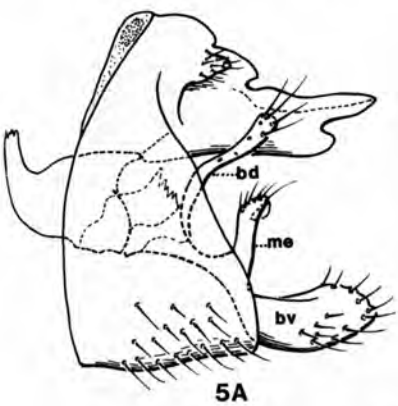

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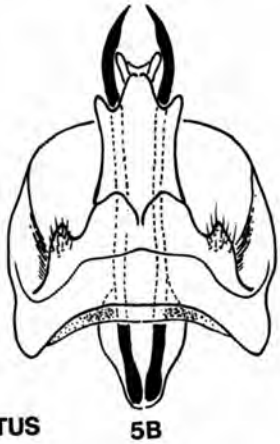
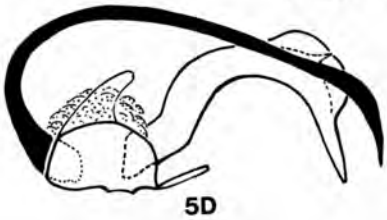


5B

5E

TRILOBATUS



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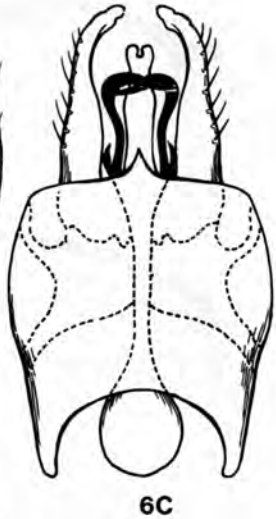

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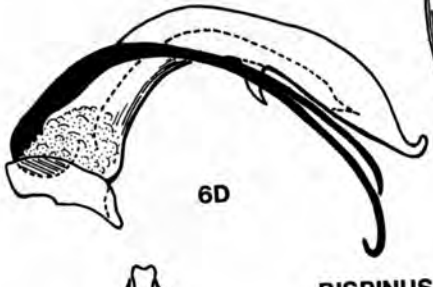

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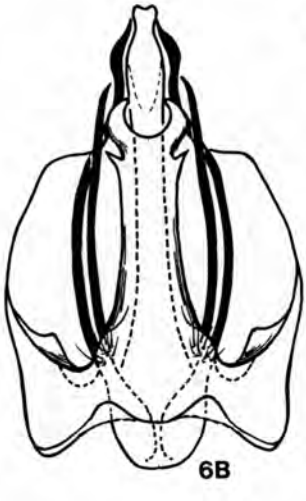

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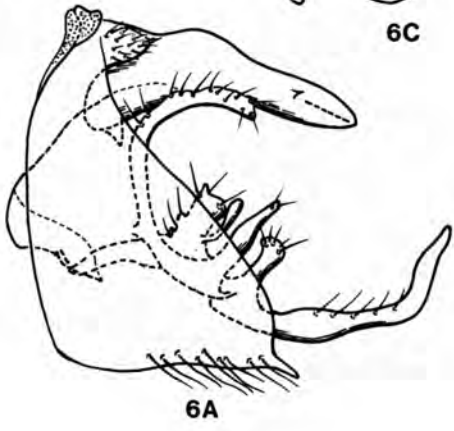

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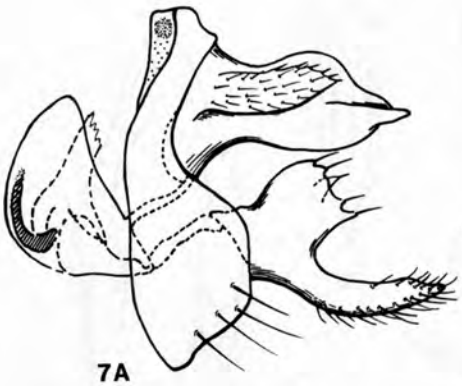

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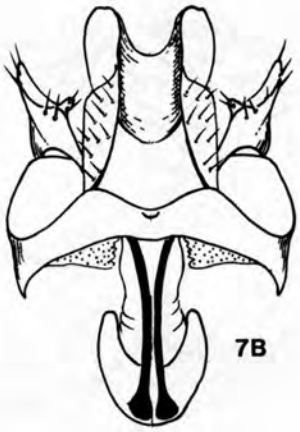
SCHMIDI



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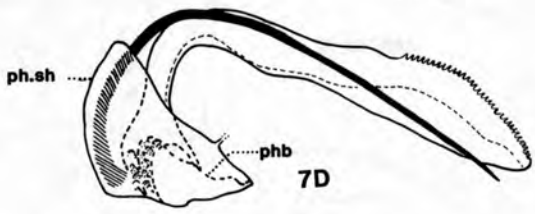

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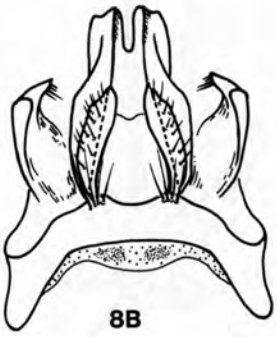

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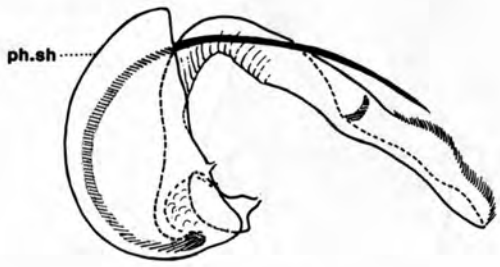
CARINATUS

8A



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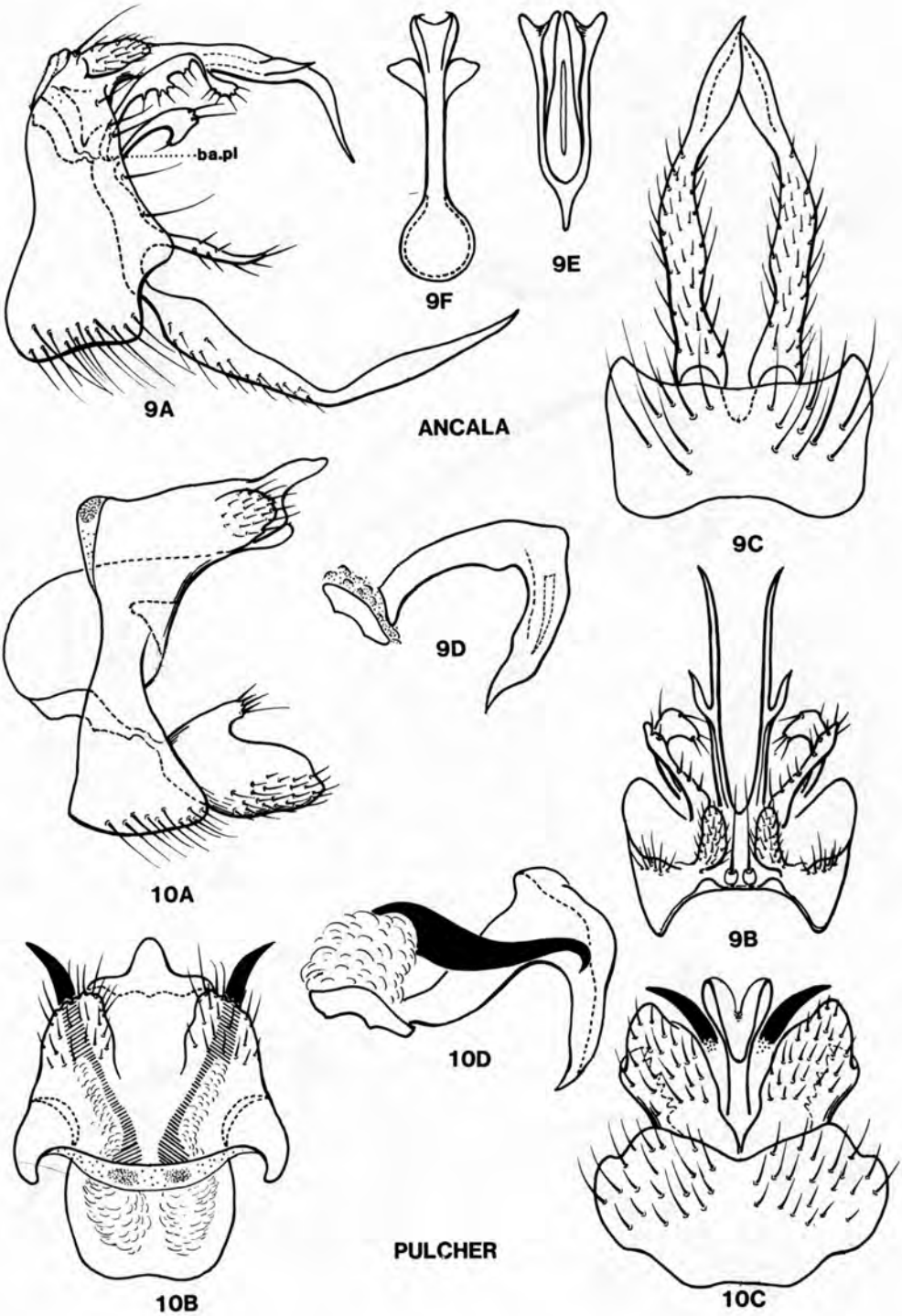
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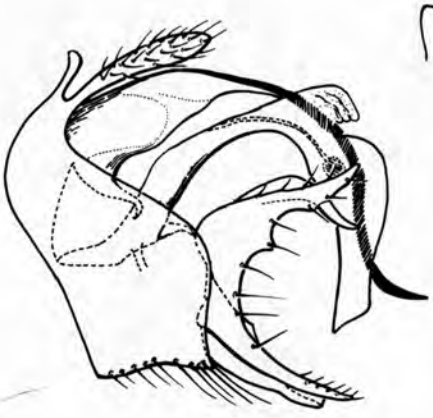

13A

ARGENTATUS

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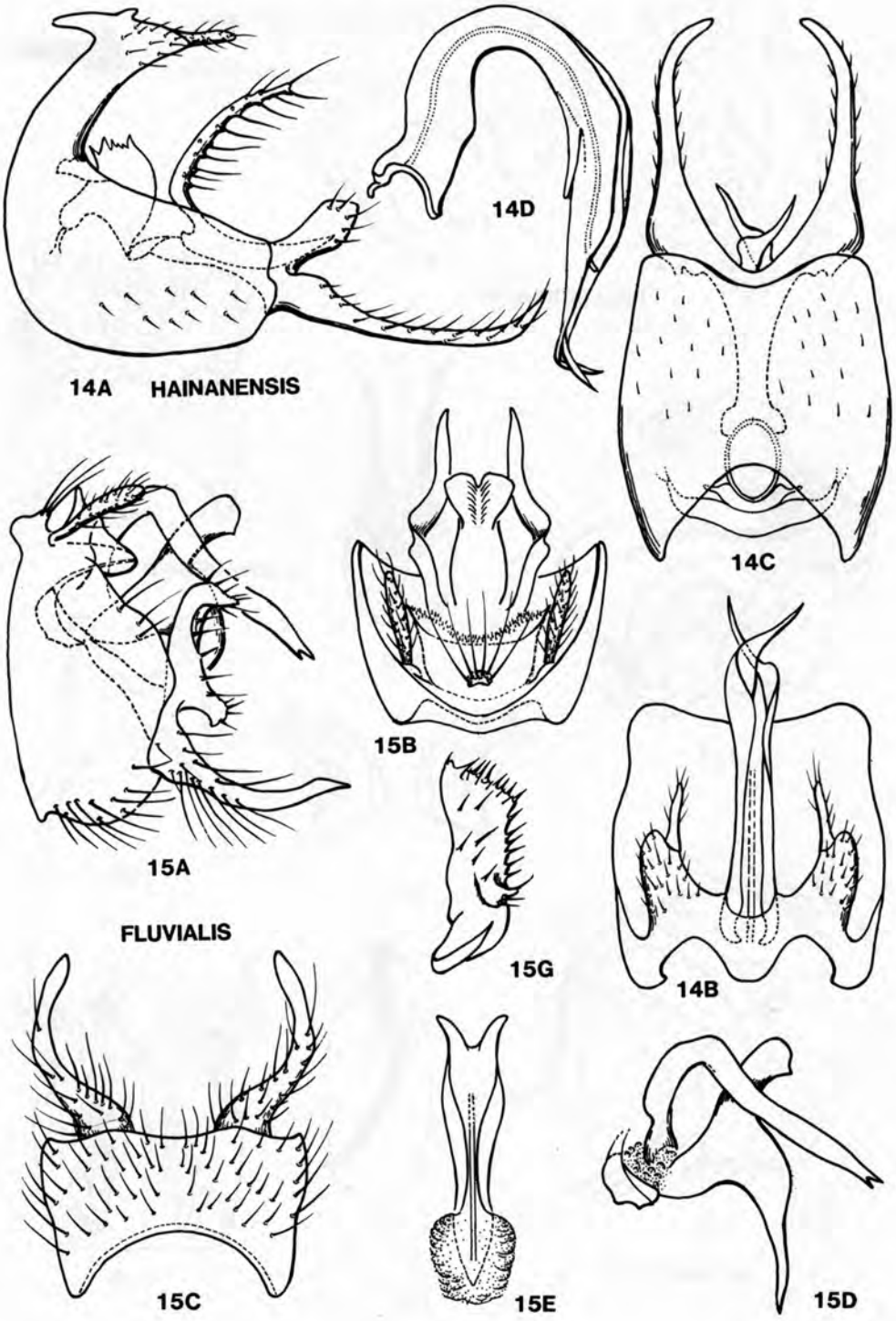
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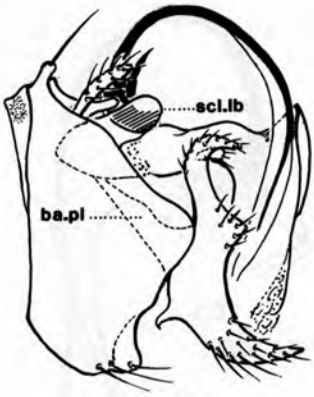

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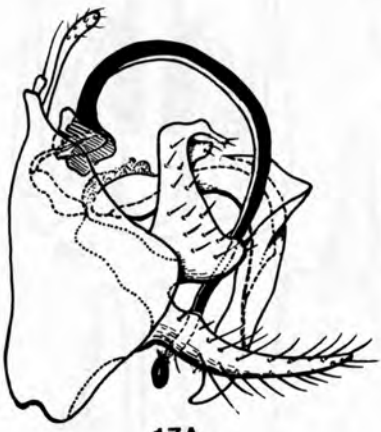

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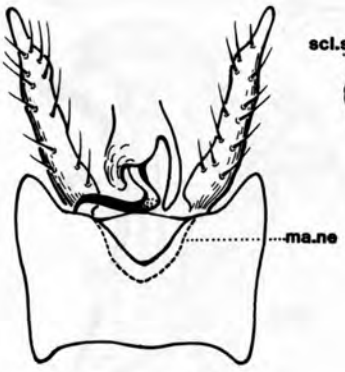

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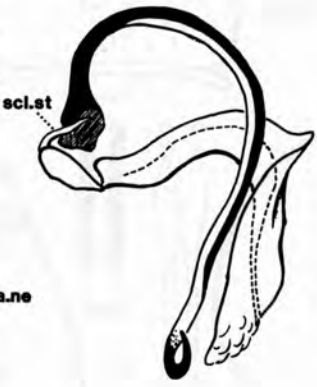

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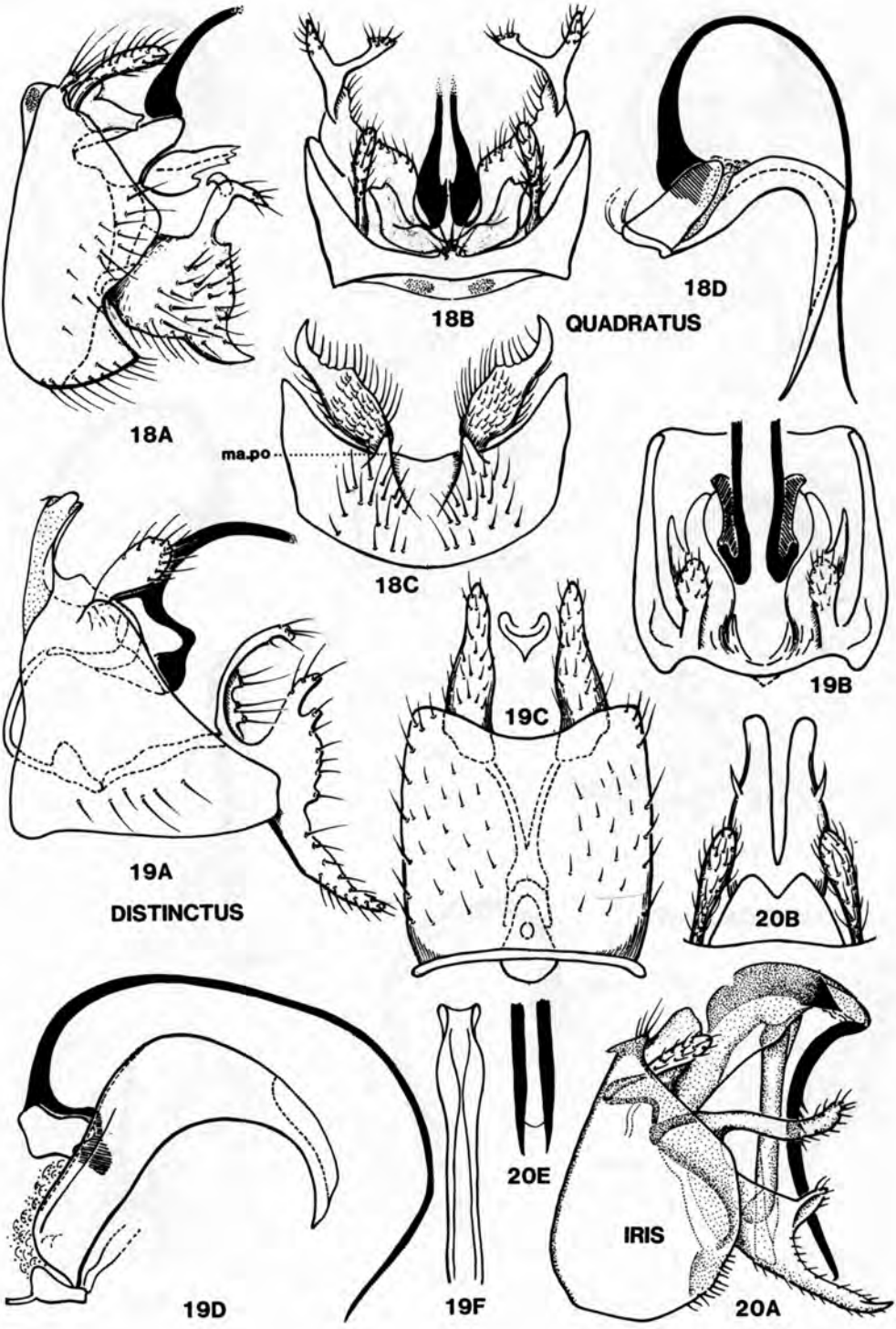
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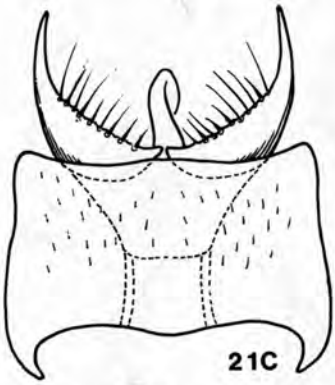

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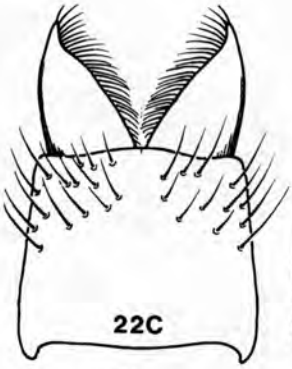

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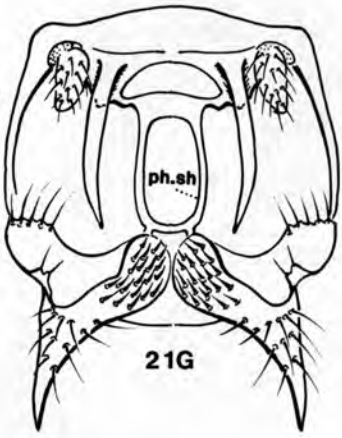

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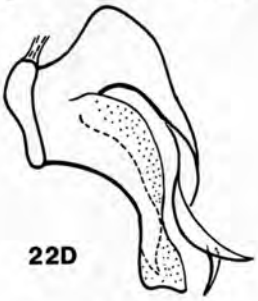

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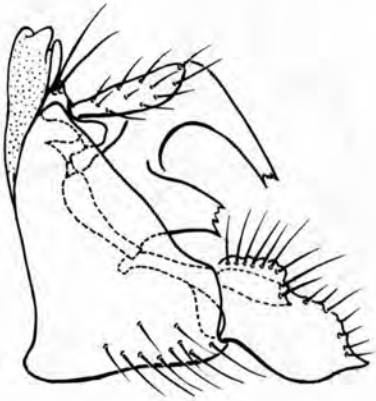
22H

22D'

22B



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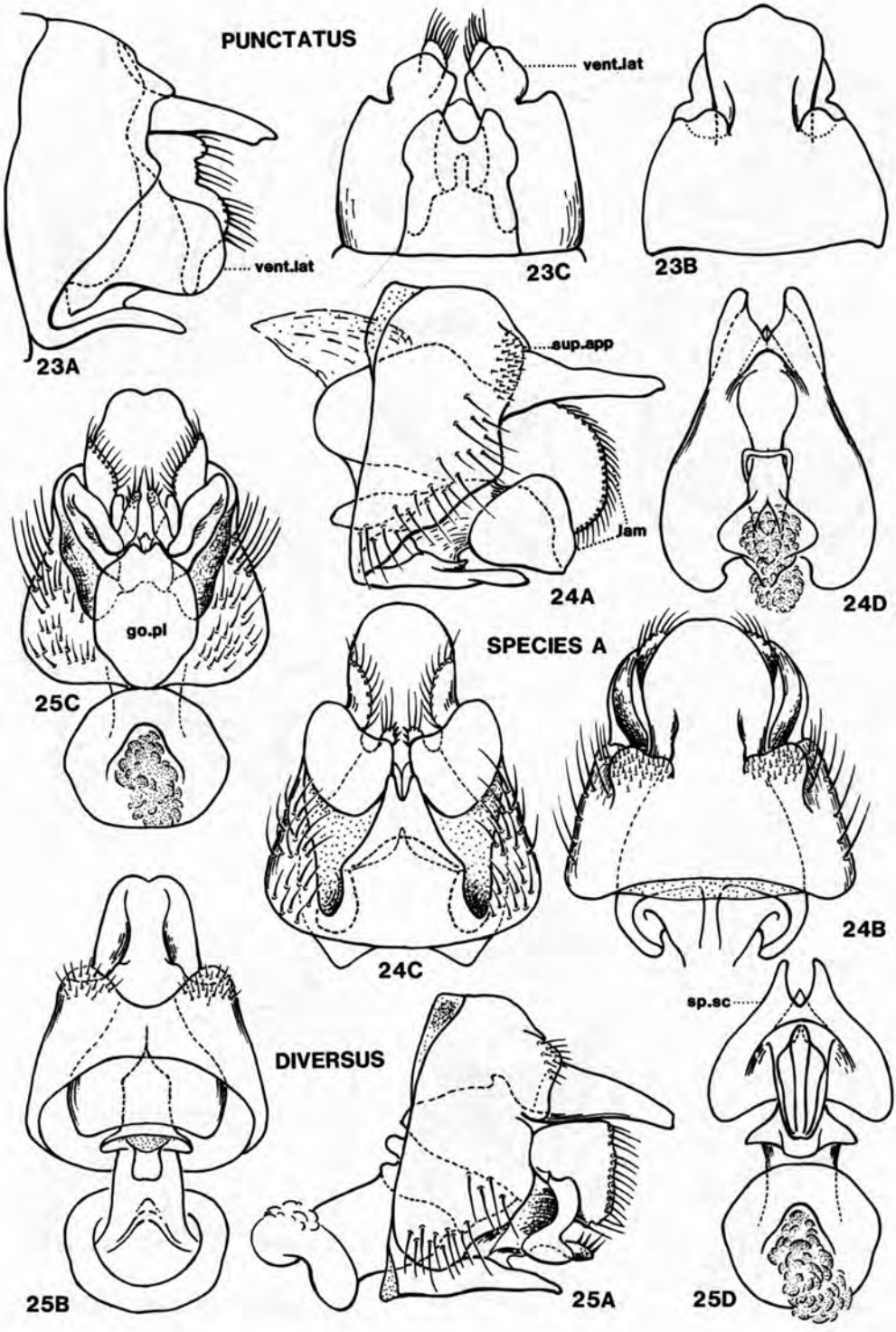
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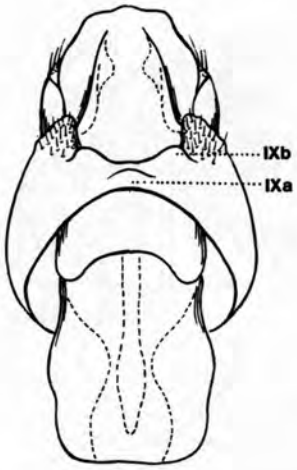

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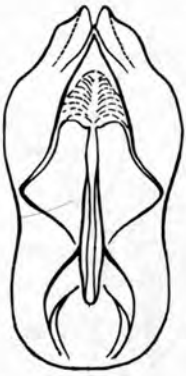

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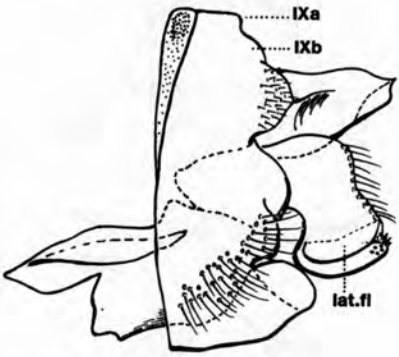

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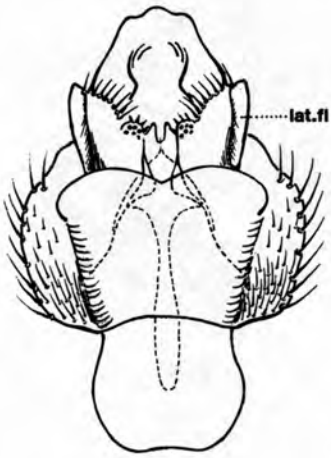

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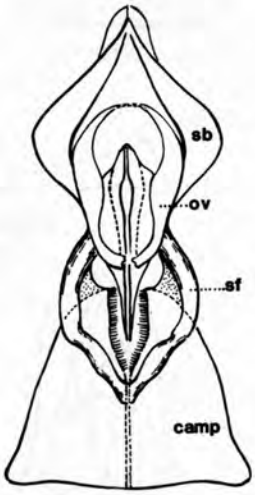

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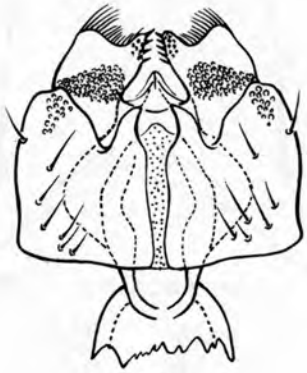

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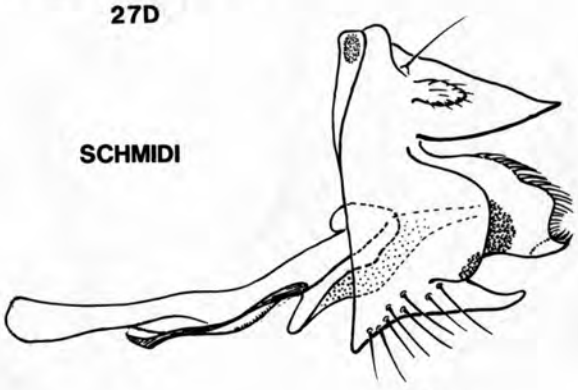
SCHMIDI



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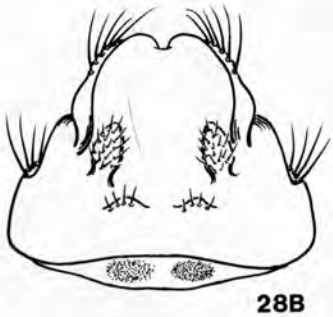

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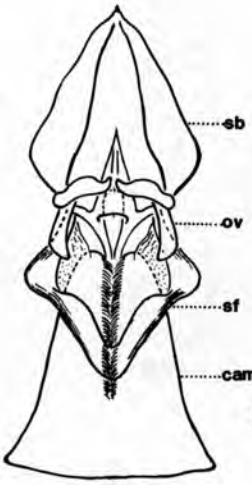

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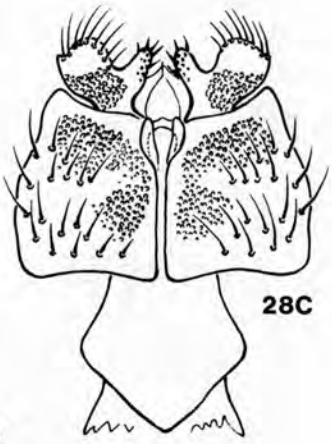

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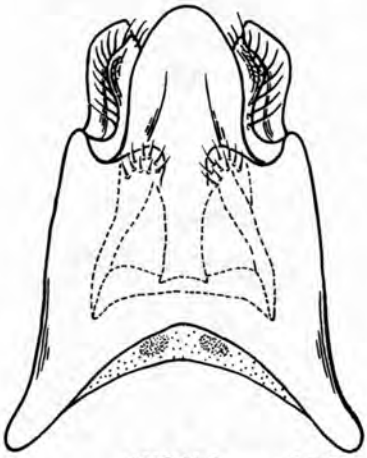

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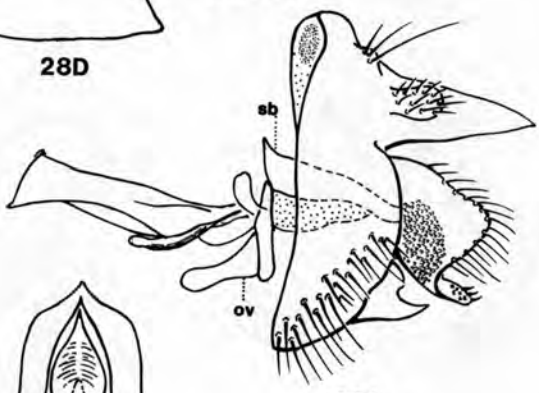

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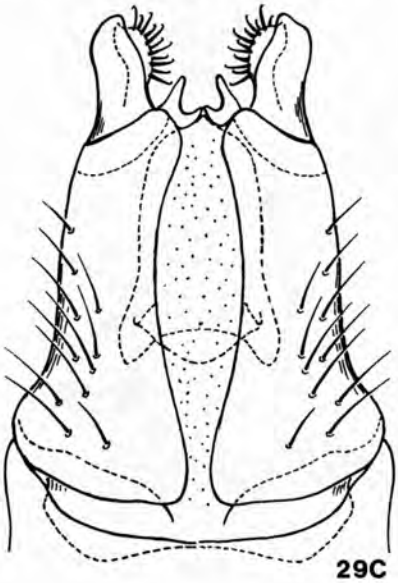

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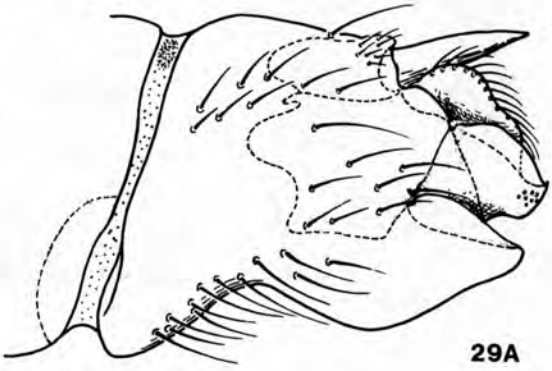

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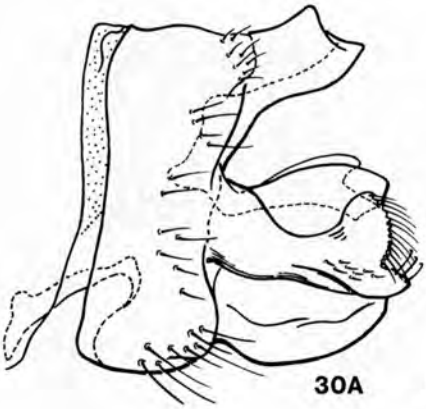
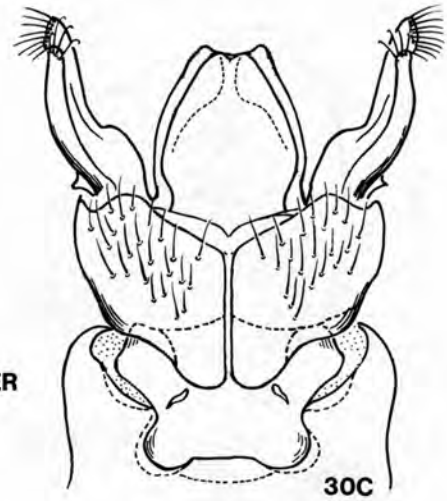


30A

PULCHER



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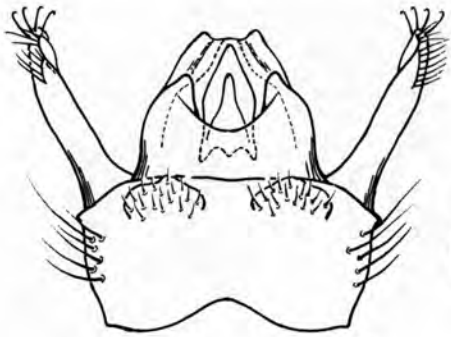

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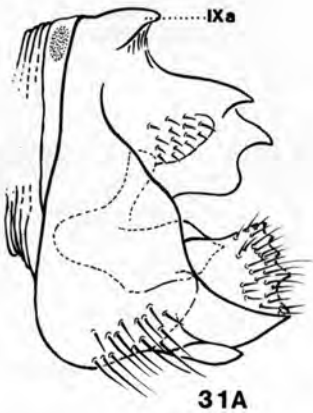

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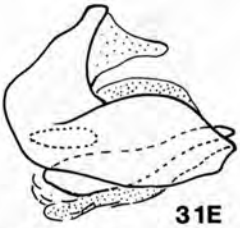

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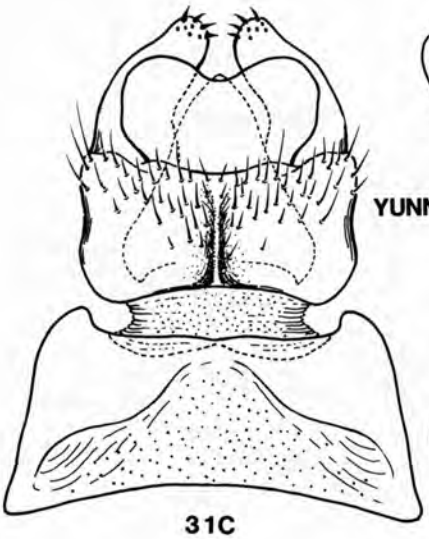

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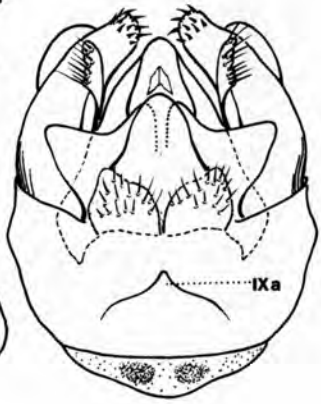
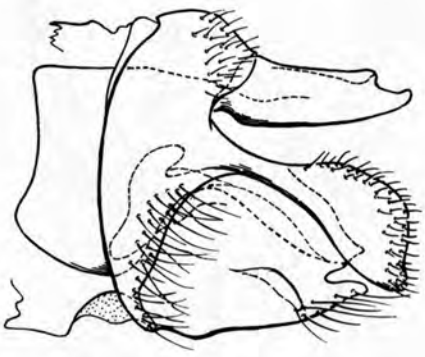


31B



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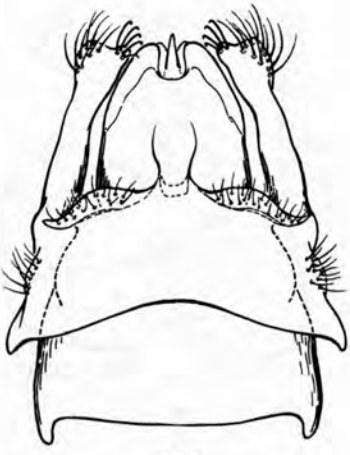
SPECIES B



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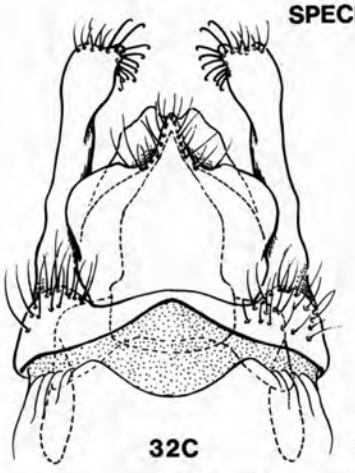

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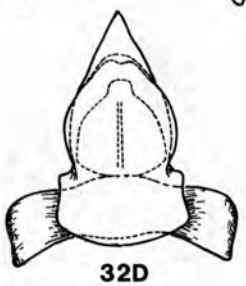

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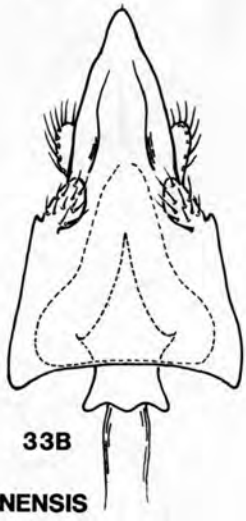

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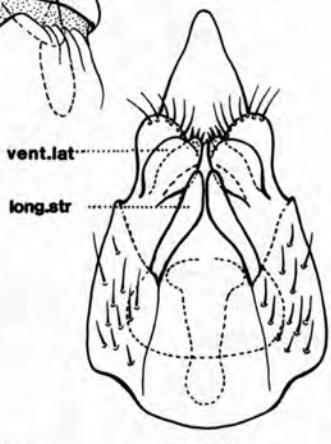

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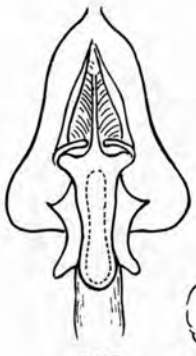

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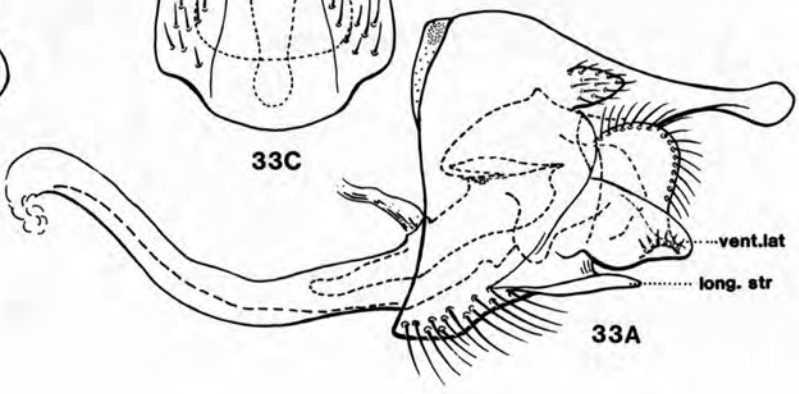

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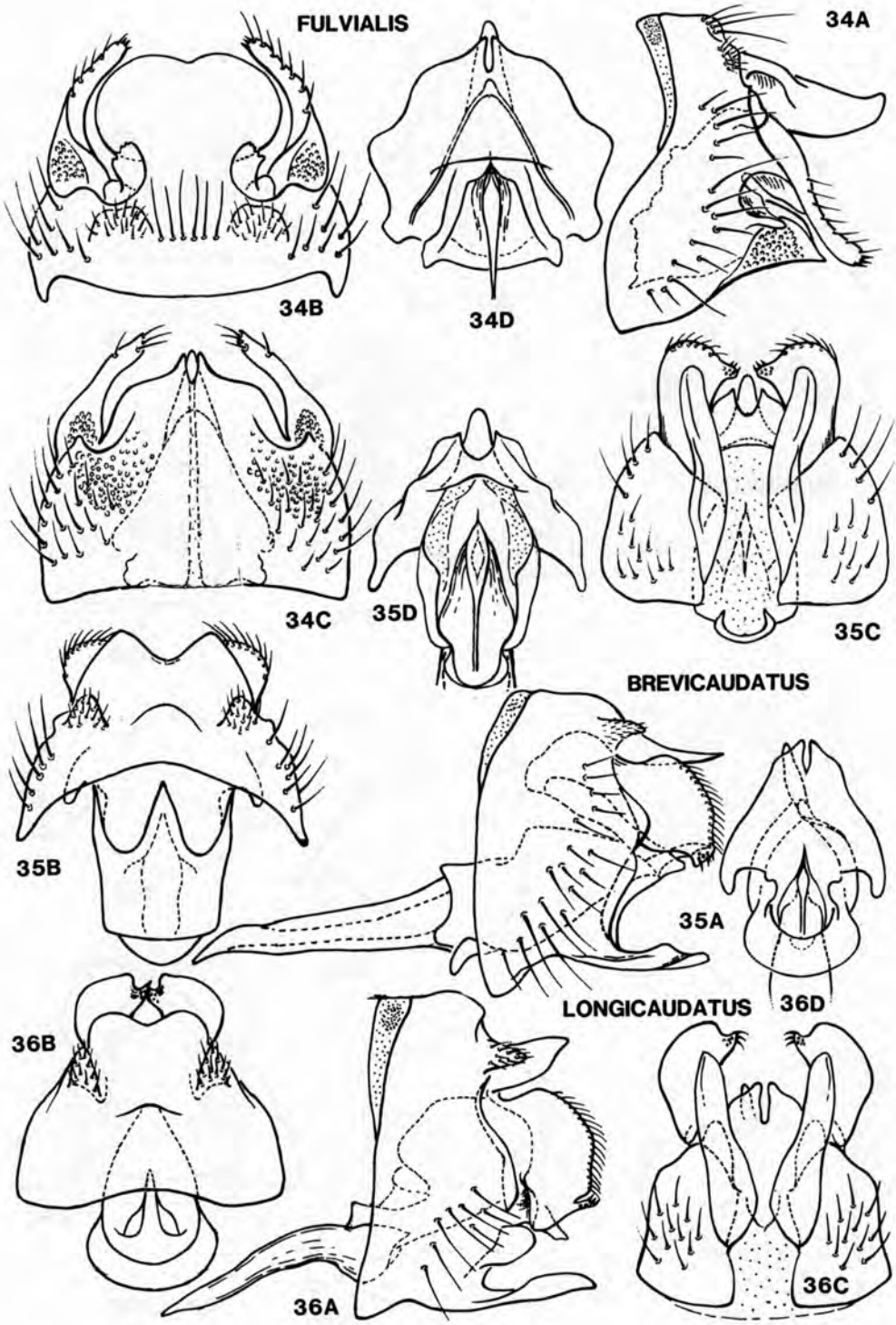
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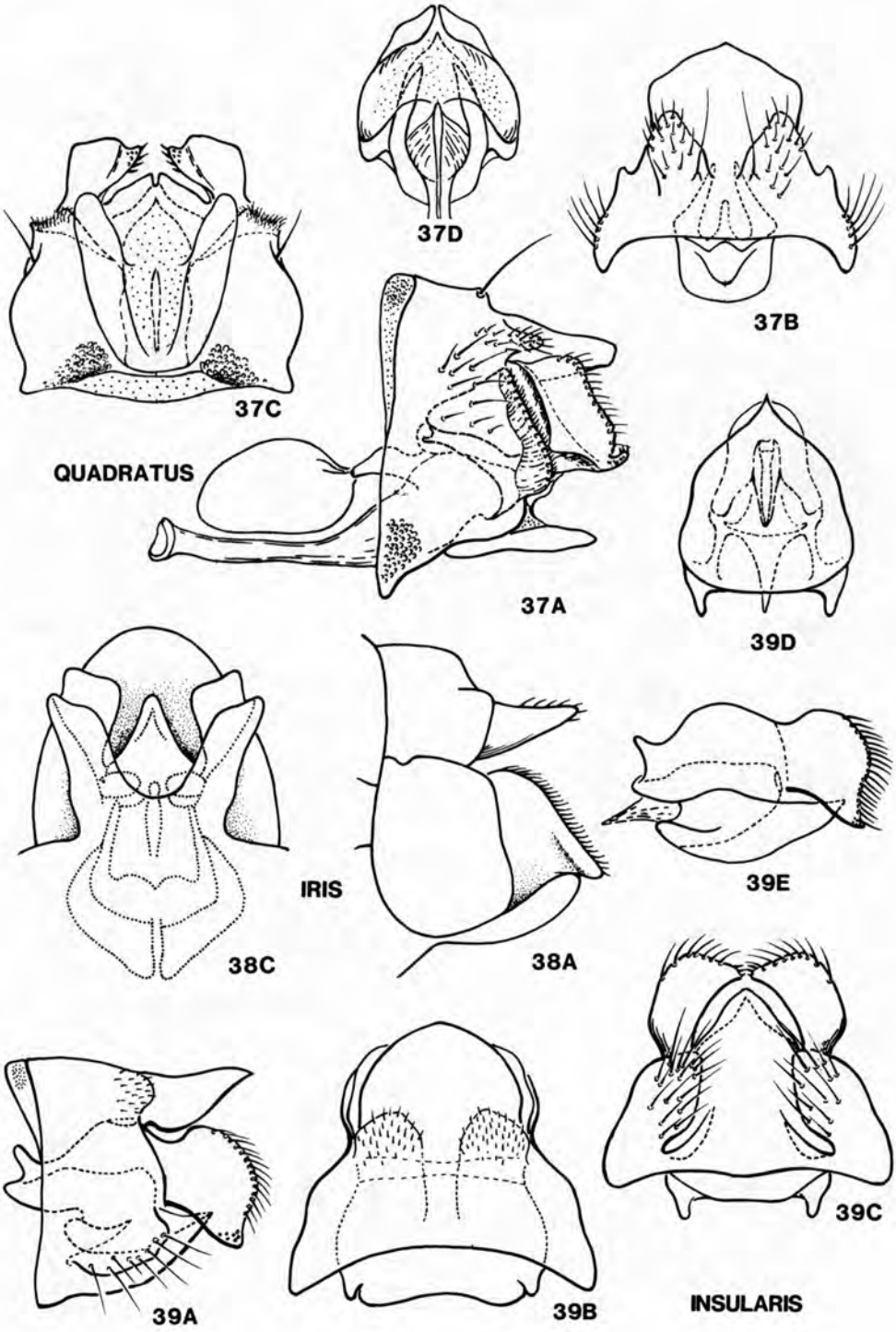
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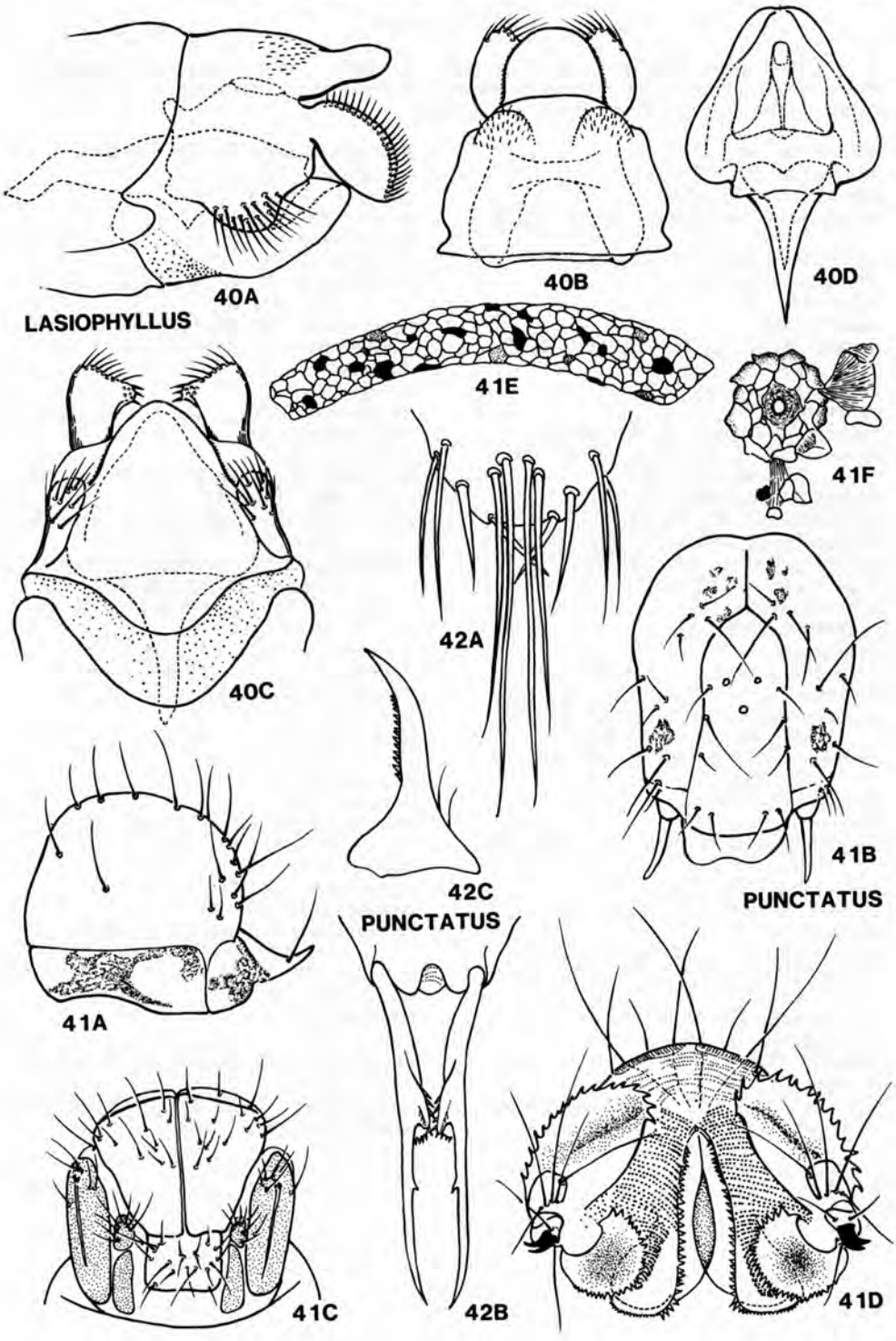
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