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Leptoceridae (Trichoptera) of the People's Republic of China

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LEPTOCERIDAE (TRICHOPTERA) OF THE PEOPLE'S REPUBLIC OF CHINA[1]

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Abstract. The species of the long-horned caddisfly family Leptoceridae are reviewed for The People's Republic of China, bringing to 161 the number of leptocerid species (in 13 genera) known from this country. In this work, 67 new species are described, including three in the genus *Triplectides*, six in *Ceraclea*, seven in *Leptocerus*, ten in *Adicella*, three in *Triaenodes*, seventeen in *Oecetis*, fourteen in *Setodes*, five in *Trichosetodes* and two in *Mystacides*. The genus *Athripsodes* is reported here for the first time from China. Sixteen species known previously from only outside this country are now known from within it. *Oecetis lacustris martynovi* Yang and Morse is a NEW NAME for *Oe. lacustris orientalis* Martynov, 1935, and *Oe. testacea kumanskii* Yang and Morse is a NEW NAME for *Oe. testacea orientalis* Kumanski, 1991; both of which were preoccupied by *Oe. orientalis* Navás, 1921. *Oecetis lacustris martynovi* also is a NEW SYNONYM of *Oe. lacustris lacustris* (Pictet, 1834). *Parasetodes kiangsinicus* (Ulmer, 1932) is a NEW COMBINATION, transferred from *Leptocella*. An allotype male is designated for *Mystacides testaceus* Navás, 1931a. Descriptions, illustrations, and keys are provided for diagnosis of males of all species except two species *nomina dubia* (*Triaenodes fulvus* Navás, 1931, and *Tr. sericeus* Navás, 1935), for which only the females have been described, and one species *nomen dubium* (*Triplectides fulvescens* Navás, 1936), for which the description of the male is inadequate for diagnosis. *Triplectides magnus* Walker, 1852, is removed from the Chinese fauna. Descriptions of the immature stages are provided for each genus reviewed; descriptions are given of the females for 65 of the 112 species described in this work.

Keywords: caddisfly, new species, Oriental Region, Palearctic Region, revision

INTRODUCTION

This is the third in a series of major publications reviewing the Leptoceridae (Trichoptera) species of The People's Republic of China (PRC). The first (Yang and Morse, 1988) concerned the genus *Ceraclea* Stephens and the second (Yang and Morse, 1989) concerned the tribe Setodini Morse. A smaller work (Yang and Morse, 1997) provided descriptions of four additional leptocerid species. It is expected that reviews of this type will help to equip the Chinese people to use their

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variously pollution-intolerant aquatic insect species to assess and monitor the quality of surface water in their country. With this objective in mind, we expect to provide reviews of other major groups of Trichoptera in the future.

We continue to be impressed by the diversity of the Chinese aquatic insect fauna and by the likelihood that only a very small proportion of it is yet known. The 112 species of Leptoceridae reported here were captured in only 103 counties with a total of 156 collection sites. The 161 species of Leptoceridae reported for this entire series were taken at only 176 locations.

Yang and Morse (1988, 1997) listed 32 species of *Ceraclea* and (1989, 1997) 21 species of Setodini for the PRC. Besides these, the following 21 species of Leptoceridae have been reported previously from the PRC:

Adicella similis Ulmer, 1932
Ceraclea (*Athripsodina*) *disemeiensis* Yang, 1997 (in Yang, Wang, & Leng, 1997)
Leptocerus biwae (Tsuda, 1942b)
Leptocerus dicopennis (Huang, 1958)
Leptocerus pekingensis (Ulmer, 1932)
Mystacides elongatus Yamamoto and Ross, 1966
Mystacides testaceus Navás, 1931a
Oecetis complex Huang, 1957
Oecetis intima McLachlan, 1877
Oecetis lacustris (Pictet, 1834)
Oecetis laminata (Huang, 1957), NEW COMBINATION
Oecetis ochracea (Curtis, 1825)
Oecetis turbata Navás, 1933, now a synonym of *Setodes argentatus* Matsumura, 1906.
Parasetodes ussuriensis Martynov, 1935. [possibly a synonym of *Pa. maculatus* (Banks, 1911)]
Parasetodes kiangsinicus (Ulmer, 1932), NEW COMBINATION
Triaenodes dusrus Schmid, 1965
Triaenodes hoenei Schmid, 1959
Triaenodes fulvus Navás, 1931, NOMEN DUBIUM
Triaenodes sericeus Navás, 1935, NOMEN DUBIUM
Triaenodes sinicus (Ulmer, 1932)
Triplectides fulvescens Navás, 1936 , NOMEN DUBIUM
Triplectides magnus (Walker, 1852), REMOVE FROM CHINESE RECORDS
Triplectides medius (Navás, 1931)

Of these species, we have seen specimens of *Ceraclea disemeiensis*, *Leptocerus biwae*, *Lp. dicopennis*, *Mystacides elongatus*, *My. testaceus*, *Oecetis complex*, *Oe. lacustris*, *Oe. laminata*, and *Oe. ochracea*. The reports of Chinese populations of *Triplectides magnus* by Ulmer (1911, 1926, 1932), Martynov (1930), Navás (1923, 1931), Banks (1940), and Mosely (1942) probably are in error (Morse and Neboiss, 1981).

Three of these species have not been described sufficiently to permit diagnoses, such that we consider them *nomina dubia*, including *Triaenodes fulvus*, *Triaenodes sericeus*, and *Triplectides fulvescens*. *Parasetodes kiangsinicus* is transferred from *Leptocella* and *Oecetis laminata* is transferred from *Oecetodella*. *Parasetodes ussuriensis* may be a synonym of *Pa. maculatus*.

The genus *Athripsodes* is reported here for the first time from the PRC. We have seen specimens captured within the PRC of the following 16 species previously known from only the non-Chinese regions indicated:

Athripsodes ceracleoides Kumanski, 1991, Democratic-Popular Republic of Korea.
Parasetodes maculatus (Banks, 1911), Philippines, Sri Lanka, Sumatra, India, Myanmar.
Parasetodes respersellus (Rambur, 1842), Europe, Egypt, Uzbekistan, Russia (Amur Region), Japan.
Leptocerus moselyi (Martynov, 1935), Russia (Ussuri Region).
Leptocerus valvatus (Martynov, 1935), Russia (Ussuri and Amur Region), Japan.
Triaenodes pellectus Ulmer, 1908, Russia (Ussuri and Amur Region), Japan.
Triaenodes rufescens Martynov, 1935, Russia (Ussuri Region).
Triaenodes unanimis McLachlan, 1877, Northern Europe, Russia (Amur Region).
Oecetis biramosa Martynov, 1936, India, Sri Lanka.
Oecetis morii Tsuda, 1942b, Japan.
Oecetis nigropunctata Ulmer, 1908, Japan, Korea.
Oecetis tripunctata (Fabricius, 1793), Europe, Russia (Amur Region).
Oecetis antennata (Martynov, 1935), NEW COMBINATION, Russia (Amur Region).
Setodes alampata Schmid, 1987, India.
Mystacides dentatus Martynov, 1924b, South-central Russia.
Mystacides sibiricus Martynov, 1935, Russia (Siberia).

In this work we describe 67 new species in the following genera *Adicella* (10 species), *Ceraclea* (6), *Leptocerus* (7), *Mystacides* (2), *Oecetis* (17), *Setodes* (14), *Triaenodes* (3), *Trichosetodes* (5) and *Triplectides* (3). One species of *Oecetis* (*Pseudosetodes*) new to science is described herein by Dr. Y. Eric Chen.

Diagnoses for five of the species described herein appeared first in the key by Vshivkova et al. (1997), satisfying the technical availability requirements of the Third Edition of the International Code of Zoological Nomenclature (International Commission on Zoological Nomenclature, 1985) that were relevant at that time. These species (*Parasetodes aquilonius*, *Leptocerus colophallus*, *Oecetis bullata*, *Oecetis brachyura*, and *Mystacides absimilis*) were correctly credited to the present authors by Vshivkova et al. (1997) and hereafter are cited as having been made available in that work on that date. The complete descriptions of these five species are provided here to supplement the key of Vshivkova et al. (1997) and to provide phylogenetic notes and type data.

Together these records constitute a total of 161 species of Leptoceridae for the PRC.

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CHECKLIST OF CHINESE LEPTOCERIDAE

In this revision, the family-group classification of Leptoceridae proposed by Morse (1981) is followed.

TRIPLECTIDINAE Ulmer, 1906

Triplectidini Ulmer, 1906

Triplectides Kolenati, 1859

Triplectides australis Group, Morse and Neboiss, 1981:
Tp. acutobeccatus, NEW SPECIES, Figs. 80, 187.
Tp. deceptimagnus, NEW SPECIES, Figs. 81, 188.
**Tp. fulvescens* Navás, 1936 , NOMEN DUBIUM, Fig. 83.
**Tp. magnus* (Walker, 1852) reported from China probably in error (Morse and Neboiss, 1981), Figs. 7, 8, 9, 39.
**Tp. medius* (Navás, 1931), Fig. 84.
**Tp. legendrinus* (Navás, 1923), NOMEN DUBIUM

Tp. quadratus, NEW SPECIES, Figs. 59, 82, 189.

LEPTOCERINAE Leach, 1815

Athripsodini Morse and Wallace, 1976

Athripsodes Billberg, 1820

As. ceracleoides Kumanski, 1991; NEW CHINESE RECORD, Figs. 85, 190.

Ceraclea Stephens, 1829

Ceraclea (*C.*) *fulva* Group, Morse, 1975:
C. (*C.*) *alboguttata* (Hagen, 1860); Yang and Morse, 1988.
C. (*C.*) *elongata*, NEW SPECIES, Fig. 86.
C. (*C.*) *spinulicolis* Yang and Morse, 1988.

Ceraclea (*C.*) *nigonervosa* Group, Morse, 1975:
C. (*C.*) *sinensis* (Forsslund, 1935); Yang and Morse, 1988.
C. (*C.*) *superba* (Tsuda, 1942b); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *tarsipunctata* Group, Morse, 1975:
C. (*A.*) *major* (Huang, 1957); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *dissimilis* Group, Morse, 1975:
C. (*A.*) *indistincta* (Forsslund, 1935); Yang and Morse, 1988.
C. (*A.*) *lobulata* (Martynov, 1935); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *annulicornis* Group, Morse, 1975:
C. (*A.*) *ampliata*, NEW SPECIES, Figs. 87, 191.
C. (*A.*) *excisa* (Morton, 1904a); Yang and Morse, 1988.
C. (*A.*) *globosa* Yang and Morse, 1988.
C. (*A.*) *shuotsuensis* (Tsuda, 1942a); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *riparia* Group, Morse, 1975:
C. (*A.*) *celata*, NEW SPECIES, Figs. 88, 192.
C. (*A.*) *brachyacantha* Yang and Tian, 1987; Yang and Morse, 1988.
C. (*A.*) *forcipata* (Forsslund, 1935); Yang and Morse, 1988.
C. (*A.*) *grossa*, NEW SPECIES, Figs. 89, 193.
C. (*A.*) *hwangi* (Tian, 1981); Yang and Morse, 1988.
C. (*A.*) *interispina* Yang and Tian, 1987; Yang and Morse, 1988.
C. (*A.*) *nankingensis* (Huang, 1957); Yang and Morse, 1988.
C. (*A.*) *parakamonis*, NEW SPECIES, Figs. 90, 194.
C. (*A.*) *polyacantha* Yang and Tian, 1987; Yang and Morse, 1988.
C. (*A.*) *riparia* (Albarda, 1874), Yang and Morse, 1988.
C. (*A.*) *singularis*, NEW SPECIES, Figs. 91, 195.

C. (*A.*) *trifurca* Yang and Morse, 1988.
C. (*A.*) *yangi* (Mosely, 1942); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *marginata* Group, Morse, 1975:
C. (*A.*) *brachyclada* Yang and Morse, 1997.
C. (*A.*) *fooensis* (Mosely, 1942); Yang and Morse, 1988.
C. (*A.*) *lirata* Yang and Morse, 1988.
C. (*A.*) *semicircularis* Yang and Morse, 1997.
C. (*A.*) *vaciva* Yang and Morse, 1997.

Ceraclea (*Athripsodina*) *kolthoffi* Group, Morse, 1975:
C. (*A.*) *ensifera* (Martynov, 1935); Yang and Morse, 1988.
C. (*A.*) *kolthoffi* (Ulmer, 1932); Yang and Morse, 1988; Fig. 69.

Ceraclea (*Athripsodina*) *dingwuschanella* Group, Morse, 1975:
C. (*A.*) *acutipennis* Yang and Tian, 1989; Yang and Morse 1988.
C. (*A.*) *brachycera* Yang and Tian, 1989; Yang and Morse 1988.
C. (*A.*) *curva* Yang and Tian, 1989; Yang and Morse 1988.
C. (*A.*) *dingwuschanella* (Ulmer, 1932); Yang and Morse, 1988.

Ceraclea (*Athripsodina*) *ungulifera* Group, Morse, 1975:
C. (*A.*) *disemeiensis* Yang, 1997.
C. (*A.*) *emeiensis* Yang and Tian, 1989; Yang and Morse, 1988.

Ceraclea (*Athripsodina*) Incertae Sedis:
C. (*A.*) *signaticornis* (Ulmer, 1926); Yang and Morse, 1988.

Nectopsychini Morse, 1981

Parasetodes McLachlan, 1880

Parasetodes aquilonius Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, Figs. 92, 196.
Pa. kiangsinicus (Ulmer, 1932); NEW COMBINATION, Fig. 93.
Pa. maculatus (Banks, 1911); NEW CHINESE RECORD, Figs. 66, 94, 197.
Pa. respersellus (Rambur, 1842); NEW CHINESE RECORD, Figs. 95, 198.

Leptocerini Leach, 1815

Leptocerus Leach, 1815

Leptocerus mahawansa Group, Schmid, 1987:
Lp. senarius, NEW SPECIES, Figs. 96, 199.

Leptocerus atsou Group, Schmid, 1987:
Lp. valvatus (Martynov, 1935); NEW CHINESE RECORD, Figs. 97, 200.

Leptocerus ukchatara Group, Schmid, 1987:
Lp. cauliculus, NEW SPECIES, Fig. 98.
Lp. longicornis, NEW SPECIES, Fig. 99.

Leptocerus mahasena Group, Schmid, 1987:
Lp. bitaenianus, NEW SPECIES, Figs. 100, 201.
Lp. cirritus, NEW SPECIES, Figs. 101, 202.
Lp. clinatus, NEW SPECIES, Figs. 102, 203.
Lp. colophallus Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, Figs. 103, 204.
Lp. hamatus, NEW SPECIES, Figs. 104, 205.

Leptocerus species *Incertae Sedis*:
Lp. biwae (Tsuda, 1942b); Figs. 67, 105, 206.
Lp. dicopennis (Huang, 1958); Figs. 106, 207.
**Lp. pekingensis* (Ulmer, 1932) ; Fig. 208.

Triaenodini Morse, 1981

Adicella McLachlan, 1877

Adicella biramosa Group, NEW GROUP:
Ad. capitata, NEW SPECIES, Figs. 107, 209.
Ad. longiramosa, NEW SPECIES, Fig. 108.
Ad. mita, NEW SPECIES, Fig. 109.
Ad. tridigitata, NEW SPECIES, Figs. 62, 110.
Ad. triramosa, NEW SPECIES, Fig. 111.

Adicella filicornis Group, NEW GROUP:
Ad. longicornis, NEW SPECIES, Fig. 112.

Adicella oviformis Group, NEW GROUP:
Ad. acutangularis, NEW SPECIES, Fig. 113.
Ad. ellipsoidalis, NEW SPECIES, Fig. 114.
Ad. papillosa, NEW SPECIES, Fig. 115.
Ad. penicillaris, NEW SPECIES, Fig. 116.
**Ad. similis* Ulmer, 1932; Fig. 117.

Triaenodes McLachlan, 1865b

Triaenodes bilobatus, NEW SPECIES, Figs. 63, 118.
**Tn. dusrus* Schmid, 1965; Fig. 119.
Tn. foliformis, NEW SPECIES, Fig. 120, 210.
**Tn. hoenei* Schmid, 1959; Fig. 121.
Tn. pellectus Ulmer, 1908; NEW CHINESE RECORD, Figs. 61, 125, 215.
Tn. qinglingensis, NEW SPECIES, Fig. 122, 211.

Tn. rufescens Martynov, 1935; NEW CHINESE RECORD, Fig. 126.
**Tn. sinicus* Ulmer, 1932; Fig. 123.
Tn. unanimis McLachlan, 1877; NEW CHINESE RECORD, Figs. 60, 124, 212.
(*Triaenodes unanimis recta* Martynov, 1924a, may be a synonym of *Tn. unanimis.*)
(*Triaenodes yamamotoi* Tsuda, 1942b, may be a synonym of *Tn. unanimis.*)

Triaenodes Incertae Sedis:
**Tn. fulvus* Navás, 1931; NOMEN DUBIUM, Fig. 213.
**Tn. sericeus* Navás, 1935; NOMEN DUBIUM, Fig. 214.

Oecetini Silfvenius, 1905

Oecetis McLachlan, 1877

Oecetis (*Pseudosetodes*) *lais* Group Chen, 1993:
Oe. (*Ps.*) *minuscula*, NEW SPECIES, Figs. 127, 216.
Oe. (*Ps.*) *spatula* Chen, NEW SPECIES, Fig. 128.
Oe. (*Ps.*) *taenia*, NEW SPECIES, Figs. 129, 217.

Oecetis (*Oecetis*) *lacustris* Group Chen, 1993:
Oe. (*Ps.*) *lacustris* (Pictet, 1834), Figs. 130, 218.
Oe. (*Oe.*) *lacustris martynovi* NEW NAME and NEW SYNONYM.
Oe. (*Ps.*) *nigropunctata* Ulmer, 1908; NEW CHINESE RECORD, Figs. 131, 219.

Oecetis (*Oecetis*) *tripunctata* Group Chen, 1993:
Oe. (*Ps.*) *tripunctata* (Fabricius, 1793); NEW CHINESE RECORD, Figs. 132, 220.

Oecetis (*Oecetis*) *ochracea* Group Chen, 1993:
Oe. (*Oe.*) *bullata* Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, Figs. 133, 221.
Oe. (*Oe.*) *clavata*, NEW SPECIES, Figs. 134, 222.
Oe. (*Oe.*) *dilata*, NEW SPECIES, Figs. 135, 223.
Oe. (*Oe.*) *ochracea* (Curtis, 1825); Figs. 16, 17, 40, 47, 74, 136, 224.
Oe. (*Oe.*) *spinifera*, NEW SPECIES, Fig. 137.

Oecetis (*Oecetis*) *furva* Group Chen, 1993:
**Oe.* (*Oe.*) *intima* McLachlan, 1877; Figs. 138, 225.

Oecetis (*Pleurograpta*) *testacea* Group Chen, 1993:
Oe. (*Pl.*) *bellula*, NEW SPECIES, Figs. 139, 226.
Oe. (*Pl.*) *biramosa* Martynov, 1936; NEW CHINESE RECORD, Fig. 140.
Oe. (*Pl.*) *brachyura* Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, Fig. 141.
Oe. (*Pl.*) *caucula*, NEW SPECIES, Figs. 142, 227.
Oe. (*Pl.*) *complex* Huang, 1957, Figs. 143, 228.
Oe. (*Pl.*) *cyrtocercis*, NEW SPECIES, Figs. 144, 229.
Oe. (*Pl.*) *morii* Tsuda, 1942b; NEW CHINESE RECORD, Figs. 154, 236.

Oe. (*Pl.*) *paxilla*, NEW SPECIES, Figs. 145, 230.
Oe. (*Pl.*) *sicula*, NEW SPECIES, Figs. 146, 231.
Oe. (*Pl.*) *uniforma*, NEW SPECIES, Fig. 147.

Oecetis (*Pleurograpta*) *hamata* Group Chen, 1993:
Oe. (*Pl.*) *ancylocerca*, NEW SPECIES, Figs. 148, 232.
Oe. (*Pl.*) *antennata* Martynov, 1935, NEW COMBINATION, NEW CHINESE RECORD, Fig. 149.
Oe. (*Pl.*) *comalis*, NEW SPECIES, Figs. 150, 233.
Oe. (*Pl.*) *cornuata*, NEW SPECIES, Figs. 151, 234.
Oe. (*Pl.*) *laminata* Huang, 1957, NEW COMBINATION, Fig. 152.
Oe. (*Pl.*) *mirabilis*, NEW SPECIES, Figs. 153, 235.
Oe. (*Pl.*) *semissalis*, NEW SPECIES, Fig. 155.

**Oecetis* unidentified species Navás, 1933, Fig. 156.

Setodini Morse, 1981

Setodes Rambur, 1842

Setodes [Primitive Branch] *punctatus* Group, NEW GROUP:
St. chlorinus Yang and Morse, 1997.
St. diversus Yang and Morse, 1989.
St. punctatus (Fabricius, 1793); Yang and Morse, 1989.
St. species A, Yang and Morse, 1989.

Setodes [Primitive Branch] *argentiferus* Group, Schmid, 1987:
St. bispinus Yang and Morse, 1989; Fig. 237.
St. platecladus, NEW SPECIES, Figs. 157, 238.
St. trilobatus Yang and Morse, 1989.

Setodes [Primitive Branch] *apinchanga* Group, Schmid, 1987:
St. geminispinus, NEW SPECIES, Fig. 161.
St. spineus, NEW SPECIES, Fig. 158.

Setodes [Primitive Branch] *tejasvin* Group, Schmid, 1987:
St. alampata Schmid, 1987, NEW CHINESE RECORD, Figs. 159, 239.
St. carinatus Yang and Morse, 1989.
St. schmidi Yang and Morse, 1989.

Setodes [Primitive Branch] *hungaricus* Group, Schmid, 1987:
St. ancala Yang and Morse, 1989.

Setodes [Primitive Branch] species *Incertae Sedis*:
St. cheni, NEW SPECIES, Fig. 160.

Setodes [Derived Branch] Groups *Incertae Sedis*, *pulcher* Group, Schmid, 1987:
St. pulcher Martynov, 1910; Yang and Morse 1989; Fig. 76.

**St. pellucidulus* Schmid, 1987; Yang and Morse, 1989.
St. yunnanensis Yang and Morse, 1989.

Setodes [Derived Branch] Groups *Incertae Sedis*, species *Incertae Sedis*:
St. argentatus Matsumura, 1906; Yang and Morse, 1989; Fig. 240.

Setodes [Derived Branch] "White Species," *parisamchuddha* Group, Schmid, 1987:
St. hainanensis Yang and Morse, 1989.

Setodes [Derived Branch] "Curled Species," *aparimeya* Group, Schmid, 1987, *aethiopicus* Subgroup, Schmid, 1987:
St. distinctus Yang and Morse, 1989.
St. gyrosus, NEW SPECIES, Figs. 162, 241.
St. quadratus Yang and Morse, 1989.

Setodes [Derived Branch] "Curled Species," *aparimeya* Group, *manimekhala* Subgroup, Schmid, 1987:
St. brevicaudatus Yang and Morse, 1989.
St. longicaudatus Yang and Morse, 1989.
St. orthocladus, NEW SPECIES, Fig. 163.

Setodes [Derived Branch] "Curled Species," *aparimeya* Group, *tchaturdanta* Subgroup, Schmid, 1987:
St. scleroideus, NEW SPECIES, Figs. 78, 164, 242.
St. sypharus, NEW SPECIES, Figs. 165, 243.
St. varians, NEW SPECIES, Figs. 166, 244.

Setodes [Derived Branch] "Curled Species," *chandrakita* Group, Schmid, 1987:
St. lamellatus, NEW SPECIES, Fig. 167.
St. sinuatus, NEW SPECIES, Figs. 168, 245.

Setodes [Derived Branch] "Curled Species," *fluvialis* Group, Schmid, 1987:
St. fluvialis Kimmins, 1963b; Yang and Morse, 1989.

Setodes [Strange Species Branch], Schmid, 1987:
St. peniculus, NEW SPECIES, Figs. 169, 246.
St. reclinatus, NEW SPECIES, Figs. 170, 247.
St. tectorius, NEW SPECIES, Figs. 171, 248.
St. species B, Yang and Morse, 1989.

Trichosetodes Ulmer, 1915:

Trichosetodes atisudhara Group, Schmid, 1987:
Ts. insularis Schmid, 1987; Yang and Morse, 1989.
Ts. lasiophyllus Yang and Morse, 1989; Figs. 77, 79.

Trichosetodes polonorum Group, Schmid, 1987:
Ts. rhamphodes, NEW SPECIES, Fig. 173.

Ts. serratus, NEW SPECIES, Figs. 172, 249.

Trichosetodes atichayana Group, Schmid, 1987:
Ts. bicornis, NEW SPECIES, Figs. 175, 251.
Ts. falcatus, NEW SPECIES, Figs. 176, 252.
Ts. phylloideus, NEW SPECIES, Figs. 174, 250.

Mystacidini Burmeister, 1838

Mystacides Berthold, 1827

Mystacides longicornis Group Yamamoto and Ross, 1966:
My. sibiricus Martynov, 1935; NEW CHINESE RECORD, Figs. 18, 56, 177.

Mystacides testaceus Group, NEW GROUP:
My. absimilis Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, Figs. 178, 253.
My. testaceus Navás, 1931a; Figs. 75, 179, 254.

Mystacides azureus Group Yamamoto and Ross, 1966:
My. dentatus Martynov, 1924b; NEW CHINESE RECORD, Fig. 180.
My. elongatus Yamamoto and Ross, 1966; 1966; Figs. 181, 255.
My. pristinus, NEW SPECIES, Fig. 182.
My. superatus, NEW SPECIES, Figs. 183, 256.

* no specimens examined.

SPECIMENS EXAMINED

Specimens used in this research were collected by the authors and NAU/CU Caddisfly Team members (page 1) and by Prof. Tian Li-xin, Prof. Wang Shi-da, Prof. Chen Xiao-en, Wang Bei-xin, Du Yu-zhou, Zeng Tao, Leng Ke-ming, Gui Fu-rong, Zhou Chang-fa, Ma Yun, Wang Jian-guo, Hu Chun-ling, Xue Ying-gen, and or were obtained from the following:

Bei-jing Agricultural University (BAU)
Central (Hua-zhong) Agricultural University (CAU)
Nan-jing Normal University (NNU)
Nan-kai University (NKU)
Natural History Museum, United Kingdom (BMNH)
Northwest Agricultural University (NWAU)
Research Institute for Nature Management, The Netherlands (RIN)
United States Museum of Natural History (USNM)
Zhe-jiang Forest University (ZFU)
Zoological Institute, Academia Sinica, Bei-jing (ZIAS-B)
Zoological Institute, Academia Sinica, Shang-hai (ZIAS-S).

Types of new species described herein are deposited in the collections of the Department of Plant Protection, Nan-jing Agricultural University (NAU), Nan-jing, Jiang-su Province, People's Republic of China, and in the Clemson University Arthropod Collection (CUAC), Clemson University, Clemson, South Carolina, United States of America, unless otherwise stated.

LOCALITIES

Localities of specimens studied are in the eastern half of China, mostly in the southeastern quarter of the country (Fig. 1) as follows:

An-hui Province:

1. Dong-zhi Xian (N31.10, E117.00)
   Feng-shu-cun, Qiou-pu-qian-he, 11 km S.E. of Dong-zhi, 30 m elevation, 7 June 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
2. Jin Xian (N30.70, E118.35)
   2a. Song-cun, Ding-xi-he, 33 km E. of Jin Xian, 120 m elevation, 8 June 1990, Coll. John Morse and Sun Chang-hai.
   2b. Ding-xi-he, 31 km E. of Jin Xian, 120 m elevation, 8 June 1990, Coll. Yang Lian-fang.
3. Lang-xi Xian (N31.12, E119.18)
   Yao-cun, Yong-feng-he, 23 May 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
4. Qing-yang Xian (N30.60, E117.80)
   4a. Wu-xi, Jiu-hua-he, 26 June 1989, Coll. Sun Chang-hai and Yang Lian-fang.
   4b. Jiu-hua Shan, 400 m elevation, 20 June 1988, Coll. Sun Chang-hai and Tian Li-xin.
5. Su Xian (N33.60, E117.00)
   6 June 1973, Coll. Meng Xu-wu.
6. Wu-hu Shi (N31.23, E118.25)
   4-9 Aug. 1987, Coll. Li You-wen.
7. Xi Xian (N.29.90, E.118.45)
   7a. Feng-huang-cun, Feng-zi-he, 116 m elevation, 24 May 1990, Coll. Yang Lian-fang.
   7b. Yang-jia-tan, Feng-yuan-shui, 215 m elevation, 24 May 1990, Coll. John Morse and Sun Chang-hai.

Fu-jian Province:

8. Cong-an Shi (N.27.78, E.118.03)
   Cong-yang-xi, 29 km N. of Cong-an, 408 km marker, 29 May 1990, Coll. John Morse and Yang Lian-fang.
9. Fu-chou Shi (N.26.15, E. 119.30)
   15 May 1978, Coll. Zhao Xiu-fu
10. Jian-yang Xian (N.27.30, E.118.10)
    10a. 24 Oct. 1974, Coll. Li Fa-sheng.
    10b. 25 Oct. 1974, Coll. Yang Ji-kun.
    10c. Ma-sha-zhen, Wu-fu-xi, 28 km W. of Ma-sha, 300 m elevation, 1 June 1990. Coll. Yang Lian-fang.

10d. Same stream and date as 10c, 36 km W. of Ma-sha, 620 m elevation, Coll. John Morse and Sun Chang-hai.

11. Shao-wu Shi (N27.21, E117.27)
    11a. Da-zhu, 4 Aug. 1983, Coll. Li You-wen.
    11b. Nan-ban-qiao-cun, Jiao-xi, 40 km S.W. of Shao-wu, 420 m elevation, 2 June 1990, Coll. John Morse , Yang Lian-fang, and Sun Chang-hai.
12. Wu-yi Shan (N27.70, E117.70)
    12a. 15 June 1985, Coll. Li You-wen.
    12b. Jiu-qu-xi, 230 m elevation, 30 May 1990, Coll. John Morse, Liu, and Wang.
    12c. Miao-wan-cun, Jian-xi, 840 m elevation, 30 May 1990, Coll. Sun Chang-hai and Pan.
    12d. San-gang, 5-6 May 1986, Coll. Sun Chang-hai, Du Jian, and Zhang Shi-an.
    12e. San-gang, Jian-xi, 760 m elevation, 30 May 1990, Coll. Qi and Yang Lian-fang.
    12f. Tao-yuan-dong, 100 m from Jiou-qu, 235 m elevation, 31 May 1990, Coll. John Morse, Liu, and Wang.

Guang-dong Province:

13. "Cho-gahn" [possibly Shao-guan Shi] (N24.54, E113.33)
    1924; (in Navás' collection in Barcelona).
14. "Tai-yong" [possibly Da-yong] (N22.50, E113.25)
    5 Aug. 1936, Coll. L. Gressitt.
15. Mao-yang Xian, Hai-nan Island (N19.10, E109.70)
    19 April 1986, Coll. You Da-shou and Zhang Jun.
16. Wan-ning Xian, Hai-nan Island (N18.70, E110.20)
    Xing-long -wen-quan, 20 Dec. 1974, Coll. Li Fa-sheng.

Guang-xi Province:

17. Jin-xiu Xian (N24.1, E110.1)
    750 m elevation, 2-3 VI 1994, Coll. Zeng Tao.
18. Long-sheng Xian (N25.7, E110.0)
    18a. Hot Spring, 370 m elevation, 13 VI 1994, Coll. Zeng Tao.
    18b. Hua-ping, 680 m elevation, 8-11 VI 1994, Coll. Zeng Tao.
19. Long-zhou Xian (N22.3, E106.8)
    Long-gang, 26-27 V 1994, Coll. Zeng Tao.

Gui-zhou Province:

20. Chi-shui Xian (N28.5, E105.7)
    20a. Hu-shi, 300 m elevation, 11 June 1995, Coll. Sun Chang-hai and Wang Bei-xin.
    20b. Nan-zhu Forest Farm, Hu-shi, 460 m elevation, 9 June 1995, Coll. Sun Chang-hai and Wang Bei-xin.
    20c. Sha-luo Nature Reserve, 9 VIII 1994, Coll. Du Yu-zhou.
21. Fan-Jing Shan (N27.9, E108.6)
    21a. 21 VI 1994, Coll. Du Yu-zhou.
    21b. Hei-wan River, 530 m elevation, 3 June 1995, Coll. Sun Chang-hai and Wang

Bei-xin.

22. Feng-gang Xian (N27.9, E107.7)
    25 VI 1994, Coll. Du Yu-zhou.
23. Hua-xi Xian (N26.25, E106.40)
    1000 m elevation, 22-26 May 1981, Coll. Li Fa-sheng.
24. Li-bo Xian (N25.4, E107.8)
    24a. Da-qi-kong-chu, 6 VII 1994, Coll. Du Yu-zhou.
    24b. Xiao-qi-kong, 12-13 VII 1994, Coll. Du Yu-zhou.
25. Luo-dian Xian (N25.45, E106.70)
    500 m elevation, 2 June 1981, Coll. Li Fa-sheng.

He-bei Province:

26. Bei-jing Shi (N39.90, E116.40)
    Aug. 1929, Coll. Wu Jing-pu.
27. Chang-li Xian (N39.74, E119.13)
    15 June 1957, Coll. Zheng Le-yi.
28. Tian-jing Shi (N39.08, E117.12)
    21a. 6 July 1956, Coll. Zheng Le-yi.
    21b. June 1928, Coll. H. T. Feng.

He-nan Province:

29. Luan-chuan Xian (N33.7, E111.5)
    Long-yu-wan Forest Farm, 1000 m elevation, 10 VII 1996, Coll. Wang Bei-xin.
30. Song Xian (N34.1, E112.0)
    Bai-yun-shan. Forest Park, 1400 m elevation, 15-18 VII 1996 Coll. Wang Bei-xin.

Hei-long-jiang Province:

31. Jing-puo-hu (N 44.00, E129.00)
    2 Aug. 1987, Coll. Xue Yin-gen.
32. Jiu-san-nong-chang (N48.80, E125.30)
    1 Sept. 1963, Coll. unknown.
33. Qing'an Shi (N46.95, E127.50)
34. Wu-da-lian-chi Shi (N48.50, E125.60)
    7 Aug. 1987, Coll. Xue Yin-gen.

Hu-bei Province:

35. E-zhou Shi (N30.40, E114.85)
    16 Sept. 1964, Coll. LUO Xu-cai.
36. Han-chuan Xian (N30.60, E113.85)
    Diao-chuan-hu, 22.3 m elevation, 15 July 1990, Coll. John Morse, Yang Lian-fang, and Wang Shi-da.
37. Jin-shan Xian (N31.05, E113.10)

37a. 45 km N.W. of Yin-Cheng xian, up stream of Da-fu-shui, 80 m elevation, 17 July 1990, Coll. Yang Lian-fang and Wang Shi-da.

37b. 50 km N.W. of Yin-Cheng Xian, tribu. of Da-fu-shui, 90 m elevation, 17 July 1990, Coll. John Morse.

38. Ma-cheng Xian (N31.15, E115.02)

38a. Tong-jian-chong-he, 27 km N. of Ma-cheng, 150 m elevation, 12 July 1990, Coll. John Morse and Yang Lian-fang.

38b. Zheng-shui-he,15 km N.E. of Yin-cheng, 2 km S. of Gui-shan Tea Farm, 250 m elevation, 13 July 1990, Coll. Yang Lian-fang.

38c. Same locality and date as 27b, 1 km S. of Gui-shan Tea Farm, Coll. John Morse and Wang Shi-da.

39. Sheng-nong-jia (N31.80, E110.70)
21 June 1977, Coll. Zheng Le-yi.

40. Wu-han Shi (N30.50, E114.35)
Dong-hu, 11 July 1990, Coll. John Morse and Yang Lian-fang.

41. Yi-cheng Shi (N30.90, E113.55)
Da-fu-shui, Tian-dian dam, 40 m elevation, 16 July 1990, Coll. John Morse, Yang Lian-fang, and Wang Shi-da.

Hu-nan Province:

42. Sang-zhi Shi (N29.40, E110.2)
Tian-ping-shan, 8 June 1981, Coll. Tong Xin-wang.

Ji-ling Province:

43. Mei-he-kou Shi (N42.60, E125.60)
Hai-long-zhen, 23 July 1987, Coll. Xue Yin-gen.

Jiang-su Province:

44. Huai-yin Xian (N33.60, E119.00)
15 June 1974, Coll. Tian Li-xin.

45. Jin-hu Xian (N33,00, E119.00)
45a. 4 June 1985, Coll. Hu Chun-ling.
45b. 14 May 1987, Coll. Sun Chang-hai.
45c. 22 June 1987, Coll. Sun Chang-hai.

46. Nanjing Shi (N32.08, E118.80)
21 June 1990, Coll. Chu Xi-ping.

47. Shang-hai Shi (N31.13, E121.25)

48. Su-Zhou Shi (N31.30, E120.60)

49. Wei-shan-hu (N34.70, E117.20)
8-13 Aug. 1988, Coll. Sun Chang-hai.

50. Xin-hua Xian (N32.90, E119.80)
13 April 1987, Coll. Sun Chang-hai.

51. Yang- zhou Shi (N32.40, E119.40)
15 July 1981, Coll. Tian Li-xin.

52. Yi-xing Xian (N31.30, E119.80)
    Ming-ling-zhen, 3 June 1987, Coll. Sun Chang-hai.
53. Yun-tai Shan (N34.60, E119.30)
    2 July 1986, Coll. Yang Lian-fang.
54. "Zô-Sè" [possibly Zheng-ze Xian, 100 km S.E. of Shanghai] (N30.92, E120.49)
    14 June 1930, Coll. O. Piel.

Jiang-xi Province:

55. Bo-yang Xian (N29.00, E116.68)
    Mo-dao-shi-xiang, Chang-he, 30 m elevation, 6 June 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
56. Che-pan Zhen (N28.07, E118.05)
    80 km marker, 38 km N. of Cong-an Shi, 2 km within Jiang-xi Province, 550 m elevation, 29 May 1990 Coll. Sun Chang-hai.
57. Cong-yi Xian (N25.6, E114.3).
    57a. Shang-bao-nuan-shui, 440 m elevation, 26 July 1996, Coll. Leng Ke-ming.
    57b. Yang-ling, 400 m elevation, 25 July 1996, Coll. Leng Ke-ming
58. Gui-xi Xian (N28.30, E117.20)
    58a. Xi-qi-he, 10 km S. of Gui-xi, 30 m elevation, 4 June 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
    58b. Xi-qi-he, 59 km S.E. of Gui-xi, 210 m elevation, 5 June 1990, Coll. Yang Lian-fang.
    58c. Xi-qi-he, Lao-dong-qiao, 61 km S.E. of Gui-xi, 240 m elevation, 5 June 1990, Coll. John Morse and Sun Chang-hai.
59. "Hong-san" [possibly Heng-shan in S.E. Jiang-xi Province] (N 28.35, E116.60)
    22 June 1936, Coll. D. C. Gressitt.
60. Hui-chang Xian (N25.5, E115.7)
    Zhong-cun, 310 m elevation, 5 Aug. 1996, Coll. Leng Ke-ming.
61. Jiu-lian Shan (N24.6, E114.5)
    Xia-gong-tang, 21 July 1995, Coll. Wang Jian-guo.
62. "Kuling" [possibly Gu-ling] (N29.32, E115.59)
    1474 m elevation, 7 July 1935, Coll. Piel.
63. Nan-chang Shi (N28.6, E115.9)
    15 June 1995, Coll. Wang Jian-guo.
64. Rui-Jin Xian (N25.8, E116.0)
    64a. Ri-dong, Dong-zi-kou, 380 m elevation, 3 Aug. 1996, Coll. Leng Ke-ming.
    64b. Ba-ying, Mian-liao-kou, 310 m elevation, 4 Aug. 1996, Coll. Leng Ke-ming.
65. Tong-mu-guan (N27.85, E117.80)
    1 km N. of Tong-mu-guan, near the boundary between Fu-jian and Jiang-xi Provinces, 1150 m elevation, 31 May 1990, Coll. Yang Lian-fang and Sun Chang-hai.
66. Wu-ning Xian (N29.2, E115.0)
    Heng-lu-bai-yang, 160 m elevation, 18 July 1996, Coll. Leng Ke-ming.
67. Wu-yuan Xian (N29.15, E117.53)
    67a. 6 Aug. 1985, Coll. Liu Zu-yao and Zheng Jian-zhong.
    67b. Qin-hua-he, 57 km N. of Wu-yuan, 250 m elevation, 25 May 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
    67c. Ju-jin-cun, Yuan-tou-xi, 70 km N.W. of Wu-yuan, 280 m elevation, 26 May 1990, Coll. John Morse, Yang Lian-fang and Sun Chang-hai.

68. Yu-shan Xian (N28.69, E118.27)
San-qing-shan, Shuang-xi-he, 80 km S. of Yu-shan, 470 m elevation, 27-28 May 1990, Coll. John Morse, Yang Lian-fang, and Sun Chang-hai.
69. Zi-xi Zhen (N28.09, E117.80)
Dou-ba-he, 20 km N.E. of Zi-xi, 230 m elevation, 3 June 1990, Coll. Yang Lian-fang and Sun Chang-hai.

Liao-ning Province:

70. Shen-yang Shi (N41.50, E123.26)
9 Aug. 1955, Wang Li-xun.

Shaan-xi Province:

71. Qing-ling (N34.20, E106.80)
9 July 1973, 1400 m elevation, Coll. Zhou Yao and LU Zheng and Tian Zhu.

Si-chuan Province:

72. Cheng-du Shi (N30.70, E104.06)
3-5 July 1933, 1700 m elevation, Coll. D. C. Graham.
73. Du-jiang-yan Shi (N30.90, E103.40)
73a. 12 km W. of Guan-xian, Bai-sa-he, 790 m elevation, 19 June 1990, Coll. John Morse and Li You-wen.
73b. 6 km W. of Guan-xian, Bai-sa-he, 780 m elevation, 19 June 1990, Coll. Yang Lian-fang and Chen Xiao-en.
74. E-mei Shan (N29.36, E103.29)
74a. 13 May 1962, Coll. Huang Qi-ling.
74b. E-mei-he, 3 km W. of Jin-shui, 910 m elevation, 1 July 1990, Coll. Li You-wen and Chen Xiao-en.
74c. E-mei-he, 8 km W. of Jin-shui, 1080 m elevation, 1 July 1990, Coll. John Morse and Yang Lian-fang.
74d. Bao-xian-xi, 1 km S.W. of Lian-he-kou, 1000 m elevation, 2 July 1990, Coll. Yang Lian-fang and Chen Xiao-en.
74e. Yu-jia-he, Jie-tuo-qiao, 1000 m elevation, 2 July 1990, Coll. John Morse.
75. Feng-du Xian (N29.8, E107.7)
Shi-ping, 6 X 1994, 610 m elevation, Coll. Li Fa-sheng.

76. Jiang-jin Xian (N29.25, E106.30)
76a. Si-mian Shan, Da-hong-hai,1000 m elevation, 6 July 1990, Coll. Yang Lian-fang.
76b. Si-mian Shan, Dam of Da-hong-hai, 1000 m elevation, 6 July 1990, Coll. John Morse.
76c. Si-mian Shan, Fei-long-he, 800 m elevation, 7 July 1990, Coll. Yang Lian-fang.
76d. Si-mian Shan, Long-tan-hu, 900 m elevation, 7 July 1990, Coll. John Morse.
77. Jiang-you Xian (N31.75, E104.70)
Kang-shui-he (tributary of Fujiang), 2 km N.W.of Jiang-you, 600 m elevation, 28 June 1990, Coll. John Morse, Yang Lian-fang, Li You-wen, and Chen Xiao-en.

78. Jiou-zhai-gou (N33.18, E103.90)
    78a. Zheng-zhu-tan, 2440 m elevation, 26 June 1990, Coll. Yang Lian-fang and Li You-wen.
    78b. Shu-zheng-qun-hai, 2250 m elevation, 26 June 1990, Coll. John Morse.
    78c. Mouth of Jiou-zhai-gou, 2200 m elevation, 26 June 1990, Coll. Chen Xiao-en.
79. Lu-shan Xian (N30.1, E102.9)
    1020 m elevation, 19 VI 1996, Coll. Wang Bei-xin and Zhou Chang-fa.
80. Nan-ping Xian (N33.20, E104.22)
    80a. Bai-shui-jiang,14 km N.W. of Nan-ping, 1550 elevation, 25 June 1990, Coll. Yang Lian-fang and Chen Xiao-en.
    80b. Same river, elevation, and date, 11 km N.W. of Nan-ping, Coll. John Morse.
81. Ping-wu Xian (N32.50, E104.22)
    81a. Trib. of Fu-jiang, 17 km E. of Ping-wu,1050 m elevation, 27 June 1990, Coll. Yang Lian-fang and Li You-wen.
    81b. Same trib. and date,19 km E. of Ping-wu, 1090 m elevation, Coll. John Morse.
82. Qing-cheng Shan, Guan Xian (N31.00, E103.60)
    82a. 29 Aug. 1984, Coll. Li You-wen.
    82b. Wei-jiang-he, 32 km S.W. of Guan Xian, 930 m elevation, 20 June 1990, Coll. John Morse, Yang Lian-fang, Li You-wen, and Chen Xiao-en.
83. Wan Xian (N30.80,E108.40)
    Chang-jiang, 9 July 1990, Coll. John Morse and Yang Lian-fang.
84. Xin-jin Xian (N30.40, E103.80)
    84a. Yang-ma-he, 4 km N. of Xin-jin, 550 m elevation, 18 June 1990, Coll. John Morse and Li You-wen.
    84b. Same river, elevation, and date, 3 km N.of Xin-jin, Coll. Yang Lian-fang and Chen Xiao-en.

Yun-nan Province:

85. Geng-ma Xian (N23.45, E99.40)
    15 July 1990, Coll. Wang Long-wen.
86. Guang-nan Xian (N24.10, E105.10)
    Ba-bao-Zhen, Xiang-shui-he, 16 July 1990, Coll. Li You-wen.
87. Hekou Xian (N22.55, E104.00)
    87a. Nan-xi-he, 5 km N. of Nan-xi-he-zhen, 190 m elevation, 20 July 1990, Coll. Ke Xin.
    87b. Spring, 5 km N. of Nan-xi-he-zhen, 300 m elevation, 20 July 1990, Coll. Li You-wen.
88. Hui-ze Xian (N26.4, E103.3)
    88a. Fa-da-cun, Luo-bu-gu-zhen, 1880 m elevation, 1 Aug. 1997, Coll. Gui Fu-rong.
    88b. Xiao-long-tan, Luo-bu-gu-zhen, 1840 m elevation, 28 July. 1997, Coll. Gui Fu-rong.
89. Jin-ping Xian (N22.80, E103.30)
    89a. A-de-bo-xiang, Kun-he-cun, Kun-he,1450 m elevation, 19 July 1990, Coll. Li You-wen.
    89b. 10 km N. of A-de-bo-xiang, Kun-he, 1350 m elevation, 19 July 1990, Coll. Ke Xin.
90. Jing-hong Xian (N22.00, E100.80)
    20 April 1982, Coll. Wang Su-mei and Zhou Jing-ro.
91. Kai-yuan Xian (N23.70, E103.30)
    Nan-dong, 8 km E. of Kai-yuan, 1200 m elevation, 17 July 1990, Coll. Ke Xin.
92. Kun-ming Shi (N25.0, E102.7)

Song-hua-ba Reservoir, 1990 m elevation, 1 VI 1996, Coll. Morse and Yang.

93. Li-jiang Shi (N26.95, E100.20)
    93a. Hei-long-tan, 2400 m elevation, 28 V 1996, Coll. Morse and Yang.
    93b. Li-jiang, 1935, Coll. H. Höne.
94. Ma-li-po Xian (N23.15, E104.75)
    94a. Nan-wen-he-xiang, Nan-wen-he, 600 m elevation, 12 July 1990, Coll. Li You-wen and Ke Xin.
    94b. Nan-wen-he-xiang, Lao-jun-shan Forest, 1350 m elevation, 13 July 1990, Coll. Li You-wen and Ke Xin.
    94c. Nan-jiang-he, 8 km W. of Meng-dong-xiang, 1100 m elevation, 14 July 1990, Coll. Li You-wen and Ke Xin.
95. Meng-hai Xian (N21.92, E100.40)
    Xi-shuang-ban-na, 1160 m elevation, 27 May 1974, Coll. Zhou Yao and Yuan Feng.
96. Ping-bian Xian (N23.00, E103.75)
    96a. E. of Ping-bian, 1350 m elevation, 21 July 1990, Coll. Ke Xin.
    96b. Di-shui-ceng-xiang, Da-shen-gou Forest, 1200 m elevation, 21 July 1990, Coll. Li You-wen.
97. Wen-shan Xian (N23.55, E104.09)
    97a. San-jiao-tan, 5 km N. of Wen-shan, 1300 m elevation, 9 July 1990, Coll. Li You-wen and Ke Xin.
    97b. Lao-hui-long-xiang, 2 km E. of Bai-yi-zhai, 1650 m elevation, 10 July 1990, Coll. Ke Xin.
    97c. Ba-xin-xiang, Suo-zuo-di, Ta-pi-he, 1991 m elevation, 10 July 1990, Coll. Li You-wen.
98. Wu-ding Xian (N25.5, E102.3)
    Gao-qiao, 1908 m. elevation, 23 Aug. 1997 Coll. Gui Fu-rong.
99. Ying-jiang Xian (N24.60, E97.90)
    99a. 25 May 1983, Coll. Hu Chun-ling.
    99b. 27 May 1983, Coll. Tian Li-xin.
100. Yuan-yang Xian (N23.15, E102.75)
    E-zha-xiang, 10 km W. of Ha-ba-cun, 1000 m elevation, 24 July 1990, Coll. Ke Xin.

Zhe-jiang Province:

101. An-ji Xian (N30.6, E119.6)
    Long-wang Shan, 490-550 m elevation, 10 May 1996, Coll. Wu Hong.
102. Tian-mu Shan (N30.40, E119.50)
    28 June- 2 July 1986, Coll. Han Dong-liang.
103. Zhou Shan (N30.15, E122.25)

SYSTEMATIC TREATMENT

Complete bibliographies, including synonyms, of each species described before 1961 can be found in Fischer's *Trichopterorum Catalogus* (1965, 1966, 1972). Additional bibliographic data covering literature published during 1961-1970 are available from Nimmo's *Bibliographia Trichopterorum* (1996). We do not attempt to complete these bibliographies to the present except that all species described since 1960, as well as new synonyms and significant redescriptions, are included in synonymies. 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, if known, following the original description citation for each species.

In the descriptions, the terminology for wing venation follows that of Morse (1975). Terminology for genitalic structures follows that of Nielsen (1957) and Morse (1975) for males and of Nielsen (1980) for females, except as noted below. Abbreviations are indicated with the text and illustrations to designate the following structures:

Males:

ba.pl	= basal plate of the inferior appendages
bd	= basodorsal lobe of an inferior appendage
bv	= basoventral lobe of an inferior appendage
end	= endophallic membranes
har	= harpago of an inferior appendage
inf.app	= inferior appendage (paired)
IX	= abdominal segment IX
lo.pt.X	= lower part of tergum X (Triaenodini and Oecetini)
ma.ne	= negative manille (Schmid, 1987; posterior concavity of *Setodes* sternum IX without elevated margins)
ma.po	= positive manille (Schmid, 1987; posterior concavity of *Setodes* sternum IX with elevated lateral and posterior margins)
m.b.inf.app	= main body of an inferior appendage
me.rdg	= mesal ridge of an inferior appendage
papi	= semimembranous papillae of tergum IX
par	= paramere (paired)
phb	= phallobase
ph.do	= dorsal process of phallobase
phc	= phallicata
ph.sc	= phallotremal sclerite
ph.sh	= phallic shield
pr.app	= preanal appendage (paired; "superior appendage" of Nielsen, 1957)
rec.pr	= recurved, rod-like basal process of an inferior appendage (paired)
sap.do	= sub-apicodorsal lobe of an inferior appendage
scl.st	= sclerotized strip (often paired) of phallic shield
t	= tubule (Schmid, 1987; sclerotized ejaculatory duct of *Trichosetodes*, often exposed)
up.pt.X	= upper part of tergum X (Triaenodini and Oecetini)
X	= abdominal segment X

Females:

an.tb	= anal tube
d.br	= dorsal branch of spermathecal sclerite [some species of *Triaenodes*]
d.i.gon.IX	= dorsal internal part of gonopod IX (Nielsen, 1980)
d.pl	= dorsal plate of spermathecal sclerite (*Leptocerus*)
go.pl	= gonopod plate (e.gon.VIII and e.gon.IX of Nielsen, 1980)
i.gon.VIII	= internal part of gonopod VIII [Nielsen, 1980]

i.X	= internal part of abdominal segment X (Nielsen, 1980)
IX	= abdominal segment IX
IXa	= anterior, horizontal area of tergum IX (Nielsen, 1980)
IXb	= papilla (paired, low sclerotic bulge of tergum IX of Nielsen, 1980)
lam	= lamella (paired; IXd of Nielsen, 1980)
pr.app	= preanal appendage (paired; IXc of Nielsen, 1980)
pr. sp	= process of spermathecal sclerite (Nielsen, 1980)
p.v.l.IX	= posterior ventral lobe of pleuron IX.
s-b.p	= sensilla-bearing process (paired; *Triplectides*)
sp.sc	= spermathecal sclerite (Nielsen, 1980)
v.br	= ventral branch of spermathecal sclerite [some species of *Triaenodes*]
v.pl	= ventral plate of spermathecal sclerite (*Leptocerus*)

Wings:

longitudinal veins, anterior to posterior:

C	= costal vein
SC	= subcostal vein
R	= radial vein
S_1	= first sectoral vein
S_2	= second sectoral vein
S_3	= third sectoral vein
S_4 + MA or S_4 + M_1	= fourth sectoral vein and anterior median vein or fourth sectoral vein and first median vein
MA	= anterior median vein (M_1 + M_2)
M_1	= first median vein
M_2	= second median vein
MP	= posterior median vein (M_3 + M_4)
f.v.	= false vein (hindwing only)
Cu_1	= first cubital vein
Cu_2	= second cubital vein
P	= plical vein
E	= empusal vein
1A	= first anal vein
2A	= second anal vein
arculus	= anastomosis of P, E, 1A, and 2A near posterior margin
JB	= jugal bar

forks:

Fork 1	= fork of S_1 and S_2
Fork 2	= fork of S_3 and S_4
Fork 3	= fork of M_1 and M_2 (usually absent in Leptoceridae)
Fork 4	= fork of M_3 and M_4 (absent in Leptoceridae)
Fork 5	= fork of Cu_1 and Cu_2 (~~absent in Leptoceridae forewing~~; present in hindwing of Leptoceridae other than Triaenodini)

crossveins, anterior to posterior:

h	= humeral crossvein, connecting C with SC near base

sc-r	= subcostal-radial crossvein, connecting SC with R
r-s	= radial-sectoral crossvein, connecting R with S_{1+2}
s	= sectoral crossvein, connecting S_{1+2} with S_3
m	= median crossvein, connecting MA with MP (often absent in Leptoceridae due to partial fusion of longitudinal veins)
m-cu	= median-cubital crossvein, connecting MP with Cu_1 (in Leptoceridae present only in forewing)
anastomosis	= alignment of s, base of S_4, m, m-cu, and sometimes cu and arculus (also = "cord"; present only in forewing; involving other veins and crossveins in other Trichoptera families)
cu-p	= cubito-plical crossvein, connecting Cu2 with P near arculus (present only in forewing)
strut	= strut, connecting P with E near wing base

special cells, anterior to posterior:

stigmal	= cell behind SC and apicad of sc-r (also = "stigma"; usually with spongy and somewhat opaque texture; this texture often evident also in adjacent wing regions)
discoidal	= cell behind R_{1+2} and basad of s (also = "discal")
thyridial	= cell behind M and basad of m-cu

special landmark:

nygma	= opaque thickened spot in membrane of Fork 2

The phylogenetic philosophy and methods we usually use are those outlined by Morse and Holzenthal (1987) in which only monophyletic groups are given formal taxonomic status and in which monophyletic groups are recognized by their possession of one or more synapomorphies (uniquely shared characters). Exceptions are specifically noted with reasons for delaying implementation.

LEPTOCERIDAE Leach, 1815

Leptocerides Leach, 1815, p. 136 (as tribe).

Type genus: *Leptocerus* Leach, 1815.

SIGNIFICANCE: The family Leptoceridae is worldwide in distribution, occurring on all continents except Antarctica. Its immature stages live in a wide range of lotic and lentic habitats; many species are rather tolerant of organic pollution, others are apparently quite sensitive (Resh and Unzicker, 1975). In the PRC, the number of known species in this family (161 spp.) is the largest for any family among the Trichoptera. Often, among all aquatic insects, species of Leptoceridae are the most common ones occurring in particular locations. Therefore, the family has special significance for monitoring surface water quality in the PRC.

KEYS: The following keys for larvae, pupae, and adults of Leptoceridae subfamilies, tribes, and genera known from the PRC are modified from those of other authors. The reader should be careful with these keys since genera not yet known from the PRC are not included in it. Two Triplectidinae genera (both in Triplectidini) which are likely to be found in the PRC in the future, but which have not yet been reported here, include *Symphitoneuria* Ulmer, 1906 (Australia,

New Guinea, Philippines, Sulawesi, Sunda Islands; larva and pupa described by StClair, 1987; adult described by Ulmer, 1951; Mosely and Kimmins, 1953; and Morse, 1989), and *Symphitoneurina* Schmid, 1950 (New Guinea; larva and pupa unknown; adult described by Schmid, 1950). Four Leptocerinae genera likely to occur in the PRC, but not yet reported here, include *Erotesis* McLachlan, 1877 (Triaenodini; Europe, Japan; larva described by Hwang, 1930; Lepneva, 1966; and Wallace, 1981; adult described by Malicky, 1982, 1983), *Poecilopsyche* Schmid, 1968 (genus *incertae sedis*; India and Myanmar; larva and pupa not yet described; adult described by Schmid, 1968), *Tagalopsyche* Banks, 1913a (Mystacidini; Java, Philippines, Sumatra; larva and adult described by Ulmer, 1951, 1955), and *Ylodes* Milne, 1934 (Triaenodini; 17 spp. and subspp. in the Holarctic Region north of the PRC; larva, pupa and adult described by Manuel and Nimmo, 1984; larva and pupa described by Glover, 1996).

LARVAE: According to StClair (1987), larvae of Leptoceridae generally may be distinguished from those of other caddisfly families by the following combination of characters: (1) usually with long antennae on the front margin of the head (although less than 1/5 as long as anterior width of frontoclypeus in many species), (2) hind legs long, (3) each hind leg with two-segmented trochanter, (4) each hind leg with two-segmented femur (first segment very small and usually visible only anteriorly), (5) each hind tibia often two-segmented, and (6) usually with sclerite on each lateral hump of abdominal segment I, this sclerite with numerous very short setae anteriorly.

The following larval key for Chinese Leptoceridae genera is adapted from those of Ulmer (1955), Marlier (1962), Lepneva (1966), Wiggins (1977, 1996), Wallace (1981), Morse and Holzenthal (1984), StClair (1987), and Wiggins et al. (1994).

KEY TO GENERA OF CHINESE LEPTOCERIDAE LARVAE

1. Head of last instar larva with secondary cephalic ecdysial lines which surround eyes at least anteriorly and ventrally and extend to occipital foramen (Fig. 2); metanotum without sclerites or with only one pair of small sclerites at setal area 3 (Fig. 4) . . . . . Leptocerinae, 2

1'. Head without secondary cephalic ecdysial lines as above (Fig. 5); metanotum with at least two pair of sclerites: large pair at setal area 1, smaller pair at setal area 3 (Fig. 6); case a hollowed twig (Fig. 7), randomly arranged detritus (Fig. 8), stems, leaves, or snail shells (Fig. 9), or may use cases made by other caddisflies . . . . . Triplectidinae, *Triplectides*, p. 29.

2(1). Mesonotum with pair of dark, curved or straight bars on weakly sclerotized plates (Fig. 10); abdomen broad basally, tapering posteriorly (Fig. 3A), with gills usually in clusters of two or more branches . . . . . Athripsodini, 3

2'. Mesonotum without pair of dark bars (Fig. 11); abdomen more gradually tapered and with gills arranged in clusters or singly or absent 4

3(2). Ventral apotome of head triangular (Fig. 12); gills absent on abdominal segments IV-VIII; sand grain case without overhanging dorsal lip (Fig. 13) . . . . . *Athripsodes*, p. 40.

3'. Ventral apotome quadrangular or polygonal (Fig. 14); gills sometimes present on abdominal segments IV-VIII; case of later instars made of sand grains or secretion with overhanging dorsal lip (Fig. 15), sometimes including spicules and pieces of freshwater sponge (Fig. 3B) . . . . . *Ceraclea*, Yang and Morse (1988) and p. 41.

4(2'). Maxillary palpi extending far beyond anterior edge of labrum (Fig. 16); mandibles elongate and blade-like, with teeth, if present, on single cutting edge (Fig. 17) .

. . . . . Oecetini, *Oecetis*, p. 114.

4'. Maxillary palpi extending little, if any, beyond anterior edge of labrum (Fig. 18); mandibles short and wide, with dorsal and ventral cutting edges surrounding cavity (Fig. 19) 5

5(4'). Middle legs each with tarsal claw hooked, stout, and bifid, tarsus curved (Fig. 20); case of transparent silk, slender, smooth, straight or slightly curved, conical or almost cylindrical (Fig. 21) . . . . . Leptocerini, *Leptocerus*, p. 64.

5'. Middle legs each with tarsal claw slightly curved and slender, tarsus straight (Fig. 22) 6

6(5'). Ventral apotome of head short and triangular, not separating genae posteriorly (Fig. 23); gills in multibranched clusters; tibia of each hindleg without apparent subdivision (Fig. 24); case conical and straight, composed of flat quadrangular plant material joined edge to edge lengthwise, extremely slender . . . . . Nectopsychini, *Parasetodes*, p. 58.

6'. Ventral apotome of head in late instar long and rectangular, separating genae completely (Fig. 25); gills not in clusters or absent; tibia of each hindleg with or without apparent subdivision (Figs. 26, 27) 7

7(6'). Tibia of each hindleg apparently divided into two subsegments by pale transverse band (Fig. 26) 8

7'. Tibia of each hindleg without apparent subdivision (Fig. 27) 10

8(7). Anal prolegs each with sclerotized concave plate with marginal spines (Fig. 28) . . . . . Setodini, *Setodes* (in part), p. 151.

8'. Anal prolegs without spinous concave plates (Fig. 29) 9

9(8'). Hindlegs natatorial, each with two close-set fringes of long hairs (Figs. 30, 31; some species without natatorial hairs); case slender, of longitudinal plant pieces in spiral arrangement (Fig. 32) . . . . . Triaenodini (in part), *Triaenodes*, p. 97.

9'. Hindlegs not natatorial, without fringes of long hairs (Fig. 26); case irregular, made of plant and mineral materials, with twigs or conifer needles extending beyond ends (Fig. 33) . . . . . Mystacidini, *Mystacides*, p. 185.

10(7'). Hindlegs each with tibia much longer than femur (exclusive of basal subsegment) or tarsus (Fig. 34); head and pronotum reddish color; case of fine sand or little bits of mud in thickly wound secretion tube, smooth, strongly bent and conical (Fig. 35) . . . . . Triaenodini (in part), *Adicella*, p. 83.

10'. Hindlegs each with femur, tibia, and tarsus subequal in length (Fig. 27); head and thorax much lighter, often with dark spots . . . . . Setodini (in part), 11

11(10'). Head and pronotum yellowish with dark spots and specks (Fig. 36) or dark with light spots (Fig. 37); case of sand grains, more or less rough, conical, slightly bent (Fig. 38) . . . . . *Setodes* (in part), Yang and Morse (1989) and p. 151.

11'. Head and pronotum light amber colored, without dark spots and specks; case similar to that of *Setodes* . . . . . *Trichosetodes*, Yang and Morse (1989) and p. 177.

PUPAE: According to StClair (1987), pupae of Leptoceridae may be distinguished from those of other families of Trichoptera by the following combination of characters: (1) mandibles

each with two setae on outer margin; (2) abdominal segment I with rough-spined ridge posterolaterally; (3) one pair of anterior hookplates present dorsally on abdominal segments III to VI or III to VII, inclusively; (4) one pair of posterior hookplates present dorsally on abdominal segment V; (5) lateral line of setae present on abdominal segments III to VIII, inclusively, although possibly obvious only on VIII; (6) gills present on abdominal segments in similar arrangement as in larvae, although sometimes absent on I and II; (7) antennae coiled several times around abdominal segment IX and supported by clump of stout setae on each side dorsally; and (8) anal processes rod-like. The following pupal key for Chinese Leptoceridae genera is modified from those of Ulmer (1955), Marlier (1962), Lepneva (1966), Morse and Wallace (1976) and StClair (1987). Pupal cases and gill arrangements are very similar to those of larvae.

KEY TO GENERA OF CHINESE LEPTOCERIDAE PUPAE

1. Abdominal segment IX with one or two pairs of dorsolateral wart-like projections with pitted surfaces (Fig. 39) ..... Triplectidinae, *Triplectides*, p. 29.
1'. Abdominal segment IX without wart-like projections 2

2(1'). Labrum soft, not bordered by sclerotized carina, not notched, and without unusually long stiff pair of anterior bristles (Figs. 40, 45, 46, 49, 53); mandibles each with cutting edge variously toothed (Fig. 47) or serrated (Fig. 48) or smooth (Figs. 41, 42) 3
2'. Labrum hard, bordered by sclerotized carina, sometimes notched, with one or two pairs of long stiff bristles in middle of anterior edge and with somewhat similar ones laterally from them (Fig. 43, 55, 57); mandibles with uniformly short teeth (Fig. 44) 8

3(2). Two spurs on each foretibia ..... Athripsodini, 4
3'. One or no spurs on each foretibia 5

4(3). Labrum with small apical triangular projection (Fig. 49); gills absent on abdominal segments IV-VIII; apex of each caudal process complicated and ending abruptly without tapering (Figs. 50, 51) ..... *Athripsodes*, p. 40.
4'. Labrum without projection (Fig. 45); gills sometimes present on abdominal segments IV-VIII; apex of each caudal process tapered (Fig. 52) .... *Ceraclea*, Yang and Morse (1988) and p. 41.

5(3'). Mandibles slightly curved, each with smooth mesal edge, never projecting in middle (Fig. 42) ..... Nectopsychini, *Parasetodes*, p. 58.
5'. Mandibles each with distinct projection or larger teeth near middle of cutting edge (Fig. 47) 6

6(5'). Labrum as long as basal width or shorter, with few setae on surface (Fig. 46) .. .. Triaenodini, 7
6'. Labrum longer than basal width, with 30-40 setae on surface (Figs. 40, 53) ... . Oecetini, *Oecetis*, p. 114.

7(6). Anterior hookplates present of abdominal terga III-VII ..... *Adicella*, p. 83.
7'. Anterior hookplates present on abdominal terga III-VI ..... *Triaenodes*, p. 97.

8(2'). Anal rods broad basally, close together, then abruptly narrowed, rod-like, tapered (Fig. 54); labrum with two stiff anterior bristles relatively short, only half as long

as width of labrum (Fig. 55) ..... *Leptocerus*, p. 64.

8'. Anal rods not so broad nor so abruptly narrowed, but on the whole rod-like (Fig. 56); labrum with stiff anterior bristles about as long as labrum width (Fig. 43) 9

9 (8'). Antennae each with first segment long, cylindrical (similar to Fig. 79) .... Setodini (in part), *Trichosetodes*, Yang and Morse (1989) and p. 177.

9'. Antennae each with first segment conical (similar to Fig. 78) 10

10(9'). Labrum often with four long bristles close together in middle near anterior edge (as in Fig. 57); wing pads pointed (as in Fig. 58); gills absent .... Setodini (in part), *Setodes*, Yang and Morse (1989) and p. 151.

10'. Labrum with two long bristles close together in middle at anterior edge (Fig. 43); wingpads blunt; gills usually present ..... Mystacidini, *Mystacides*, p. 185.

ADULTS: Adults of Leptoceridae and other Trichoptera are much better known than are the immature stages, with at least one gender of the adults described for virtually all species. Adults of Leptoceridae may be distinguished from those of other families by the following characteristics: (1) Head without ocelli; (2) antennae very long and slender; (3) maxillary palpi each with five segments; (4) pronotum consisting of lateral pair of erect, plate-like warts separated by wide, mesal, excavated collar hidden by mesonotum in dorsal view; (5) mesonotum produced anteromesally, with pair of irregular sub-medial lines of setal spots, (6) mesoscutellum short, usually with pair of small scutellar warts, (7) mesothoracic tibiae each usually without preapical spurs, with a row of black spines along its length and with pair of apical spurs; (8) both forewings and hindwings with $\underline{S}_{3+4}$ usually seemingly unbranched (i.e., apical Fork 2 usually apparently absent), except that nygma (otherwise always appearing in Fork 2) present, indicating $\underline{S}_3$ separate from $\underline{S}_4$ (Betten, 1934; Morse 1975); and (9) females with pair of vertical, movable lamellae on either side of genital opening. Works by Ross (1944), Ulmer (1951), Marlier (1962), Wiggins (1996), Schmid (1980, 1998), Vshivkova et al. (1997) were useful for composing the following key.

KEY TO GENERA OF CHINESE LEPTOCERIDAE ADULTS

1. Hindwings each with discoidal cell closed (i.e., with crossvein $\underline{s}$ present) and with apparently three independent branches of $\underline{M}$ (Fig. 59) .... Triplectidinae, *Triplectides*, p. 29.

1'. Hindwings each with discoidal cell open (i.e., with crossvein $\underline{s}$ absent) and with apparently only one (Fig. 66) or two (Figs. 60, 62) independent branches of $\underline{M}$ ..... Leptocerinae, 2

2(1'). Hindwings each with apical Fork 5 (fork of $\underline{Cu}$) absent (Figs. 60, 62) .. Triaenodini, 3

2'. Hindwings each with apical Fork 5 present (Figs. 66-69) 4

3(2). Forewings each with thyridial cell and stem of $\underline{M}$ present; Fork 2 generally rectangular (Fig. 62) ..... *Adicella*, p. 83.

3'. Forewings each with thyridial cell and stem of $\underline{M}$ usually absent; Fork 2 generally triangular (Fig. 61) ..... *Triaenodes*, p. 97.

4(2'). Katepisternum of each mesopleuron truncate anterodorsally (Fig. 64) 5

4'. Katepisternum of each mesopleuron acute anterodorsally (Fig. 65) 8

5(4). Hindwings each with $\underline{M}$ apparently simple, unbranched (Fig. 66) .....

. . . . . Nectopsychini, *Parasetodes*, p. 58.

5'. Hindwings each with M branched (Figs. 67-69) 6

6(5'). Hindwings narrower than forewings, each hindwing with division of $\underline{S}_{1+2}$ from S_3 (normal first fork of S) at (Fig. 67) or beyond (Fig. 68) anastomosis [i.e., at or beyond Fork 2 (fork of $\underline{S}_3$ and $\underline{S}_4$)] . . . . . Leptocerini, *Leptocerus*, p. 64.

6'. Hindwings broader than forewings, each hindwing with origin of $\underline{S}_{1+2}$ well basad of anastomosis (Fig. 69) . . . . . Athripsodini, 7

7(6'). Vertex with midcranial suture (Fig. 70); maxillary palpi each with fourth segment completely sclerotized, similar in surface texture to first through third segments (Fig. 71); male abdominal segment X deeply divided to base on midline (Fig. 85B) . . . . . *Athripsodes*, p. 40.

7'. Vertex without midcranial suture (Fig. 72); maxillary palpi each with fourth segment incompletely sclerotized and pliable, at least apically, similar in surface texture to fifth segment (Fig. 73); male abdominal segment X without division on midline or with division much less than half length of segment, such that segment composed of odd number of principal longitudinal pieces (Figs. 86B, 87B) . . . . . *Ceraclea*, Yang and Morse (1988) and p. 41.

8(4'). Forewing with MP apparently arising from m-cu crossvein or from CuA, such that very straight MP and MA appear to be an unbranched M vein (Fig. 74) . . . . . Oecetini, *Oecetis*, p. 114.

8'. Forewing with MP obviously arising from M (Fig. 75) 9

9(8'). Forewing with C notched at stigma (Fig. 75); body and wings very dark brown or bluish black . . . . . Mystacidini, *Mystacides*, p. 185.

9'. Forewing without notch on costal margin (Figs. 76, 77); body and wings pale or somber shades of gold or brown, but never very dark, wings often lined or spotted with silver or brown . . . . . Setodini, 10

10(9'). Basal segment of each antenna in either sex rather stout basally, tapering to apex, without tuft of long hairs at apex in male (Fig. 78) . . . . . *Setodes*, Yang and Morse, 1989, and p. 151.

10'. Basal segment of each antenna in either sex slender, cylindrical, with tuft of long hairs at apex in male (Fig. 79) . . . . . *Trichosetodes*, Yang and Morse, 1989, and p. 177.

TRIPLECTIDINAE Ulmer, 1906

Triplectidinae Ulmer, 1906, p. 105.
Type genus: *Triplectides* Kolenati.

TAXONOMY: The subfamily was reviewed by Ulmer (1907a) and Mosely (1936a) for the world fauna. Reviews of species in particular geographic regions have been published by Mosely and Kimmins (1953 for Australia and New Zealand), Ulmer (1951, 1955 for the Sunda Islands), Neboiss (1977 for Tasmania, 1986 for the Southwest Pacific and Australian Region), Holzenthal (1986a, 1986b, 1988a for the Neotropical Region).

PHYLOGENY: Morse (1981) and Morse and Holzenthal (1987) presented the following synapomorphies as evidence of the monophyly of the subfamily: (1) male phallic parameres are absent; (2) the male phallicata is indistinct, possibly plate-like; and (3) each pupal mandible has a large mesal tooth. Morse (1981) and Morse and Holzenthal (1987) provided phylogenetic evidence for three tribes, including Grumichellini Morse, Hudsonemini Morse, and Triplectidini Ulmer.

DIAGNOSIS: Other characters diagnostic for larvae, pupae, and adults of species of this subfamily are mentioned in the keys above.

DISTRIBUTION: Extant species of Triplectidinae are known primarily in the Australasian Biogeographic Region, but are also well reported in the Neotropical, Oriental, and East Palearctic Regions. Two fossil species were reported in West Palearctic Baltic amber (Ulmer, 1912b).

Triplectidini Ulmer, 1906

Triplectidinae Ulmer, 1906, p. 105.

Type genus: *Triplectides* Kolenati, 1859.

PHYLOGENY: According to Morse (1981) and Morse and Holzenthal (1987), monophyly for this tribe is evidenced by the presence on each male inferior appendage of a basal lobe which is flexible on a narrow sclerotized strip. They indicated that the tribe includes the following nominal genus-groups: *Lectrides* Mosely, 1953; *Notanatolica* McLachlan, 1866; *Notoperata* Neboiss, 1977; *Pseudonema* McLachlan, 1862; *Symphitoneuria* Ulmer, 1906; *Symphitoneurina* Schmid, 1950; *Tetracentron* Brauer, 1865; *Tobikera* Matsumura, 1931; *Triplectides* Kolenati, 1859; *Triplectidina* Mosely, 1936a; and *Westriplectes* Neboiss, 1977. Of these, *Notoperata*, *Westriplectes*, and *Triplectides* may be paraphyletic (Morse and Holzenthal, 1987), with all of the other genus-groups having evolved from within *Triplectides*, although explicit evidence was not presented to support this assertion. Presentation of such evidence is outside the scope of this work, also.

LARVAE: Triplectidini larvae may be distinguished from those of the other two tribes by the following combination of characters (StClair, 1987; and Holzenthal, 1986b, 1988a, 1988b): (1) antennae often less than one-fifth as long as anterior margin of frontoclypeal apotome (longer in Hudsonemini, *Notoperata*, *Westriplectes*, and several species of *Triplectides*); (2) antennae situated behind base of mandibles on front margin of head capsule (nearly halfway between front margin of head and eyes in Grumichellini); (3) anterior margin of pronotum scalloped, at least near anterolateral corners (not scalloped in other two tribes); and (4) anteromesal sclerites (setal area 1 sclerites) of metanotum confined to anterior half of notum (nearly as long as notum in Grumichellini and involving also setal area 2).

PUPAE: Triplectidini pupae may be distinguished from those of Grumichellini and Hudsonemini by the following combination of characters (StClair, 1987): mandibles each with one tooth on mesal margin (no tooth in *Notoperata*, which has slender mandibles, long labral setae, and particularly dark stout head setae) and hookplates on abdominal terga III-VI only.

ADULTS: Triplectidini and Hudsonemini adults may be distinguished from those of Grumichellini by the following characters: (1) pre-pronotal sclerites present (Morse and Holzenthal, 1987, figs. 2 and 3); (2) anterolateral pronotal lobes broad (Morse and Holzenthal, 1987, fig. 3); (3) lateral pronotal warts present (Morse and Holzenthal, 1987, fig. 2); and (4) mesotibial preapical spurs present. Triplectidini adults may be distinguished from those of Hudsonemini by the following characters: (5) each male inferior appendage with a basal lobe which is flexible on a narrow sclerotized strip, and (6) with a harpago (Morse and Neboiss, 1982, fig. 71b).

DISTRIBUTION: As for the subfamily, extant species of Triplectidini are known primarily in the Australasian Biogeographic Region, but are also well reported in the Neotropical, Oriental, and East Palearctic Regions. Two fossil species were reported in West Palearctic Baltic amber (Ulmer, 1912b).

Triplectides Kolenati, 1859

Triplectides Kolenati, 1859, pp. 169, 247;
Type species: *Mystacides gracilis* Burmeister (selected by Mosely, 1936a).
Pseudonema McLachlan, 1862, p. 305 (synonym, Ulmer, 1905);
Type species: *Pseudonema obsoletum* McLachlan (monobasic).
Tetracentron Brauer, 1865, p. 418 (synonym, Ulmer, 1907a);
Type species: *Tetracentron sarothropus* Brauer (monobasic), a synonym of *Pseudonema obsoletum* McLachlan, 1862, according to Ulmer (1907a).
Loticana Mosely, 1936a, pp. 92, 121 (synonym of *Symphitoneuria*, Mosely and Kimmins, 1953);
Type species: *Leptocerus oppositus* Walker (original designation).
Notanatolica McLachlan, 1866, p. 256 (synonym, Mosely, 1936a);
Type species: *Leptocerus magnus* Walker (selected by Fischer, 1965).
Symphitoneuria Ulmer, 1906, p. 31 footnote (synonym, Morse and Holzenthal, 1987);
Type species: *Leptocerus exiguus* McLachlan (monobasic).
Tobikera Matsumura, 1931 (synonym, Tsuda, 1942b);
Type species: *Tobikera misakiana* Matsumura (monobasic).
Triplectidina Mosely, 1936a (synonym, Morse and Holzenthal, 1987);
Type species: *Triplectides oreolimnetes* TILLYARD (original designation).
Symphitoneurina Schmid, 1950 (synonym, Morse and Holzenthal, 1987);
Type species: *Symphitoneuria fulva* Navás (original designation).
Lectrides Mosely, 1953 (synonym, Morse and Holzenthal, 1987);
Type species: *Lectrides varians* Mosely (original designation).

PHYLOGENY: Evidence for the monophyly of *Triplectides sensu lato* (including *Lectrides*, *Notanatolica*, *Pseudonema*, *Symphitoneuria*, *Symphitoneurina*, *Tetracentron*, *Tobikera*, *Triplectides*, and *Triplectidina*) is the long forewing thyridial cell (Morse and Holzenthal, 1987). In their review of the *Triplectides* of Australia, Morse and Neboiss (1982) named ten species groups, but provided no explicit phylogenetic evidence for the monophyly of any of them. All five of the species now known from the PRC belong to their *Tp. australis* Group.

LARVAE: Larvae of *Triplectides sensu lato* may be distinguished from those of *Notoperata* and *Westriplectes* (the other two genera in this tribe according to Morse and Holzenthal, 1987) by the following combination of characters (StClair, 1987, and Holzenthal, 1988a): (1) hindlegs each with tibia usually divided about in the middle into two subsegments (not divided in *Notoperata* or in *Tp. varius* Kimmins, 1953), (2) antennae half as long as anterior margin of frontoclypeal apotome or shorter (longer in *Westriplectes*), and (3) metanotal setal area 2 with one long pair of setae and one very short pair (two pairs very short and inconspicuous in *Westriplectes*).

PUPAE: Pupae of *Triplectides sensu lato* species may be distinguished from those of other genera of Triplectidinae by (1) mandibles each with small to large mesal tooth (absent in all genera except *Westriplectes*); (2) labrum more or less rectangular or pentagonal with 16 to 18 setae (elongate with slight apical point and with more than 20 setae in *Westriplectes*); and (3) hookplates present on abdominal segments III through VI, inclusively (StClair, 1987).

ADULTS: Adults of *Triplectides sensu lato* species have the following characters by which they may be distinguished from adults of other Triplectidinae genera (Morse and Neboiss, 1982): (1) the male forewing discoidal cell is broadened apically (Figs. 2L, 2M, 3M, 4M), sometimes proximate to thyridial cell apically or throughout its length; (2) the s crossvein typically is concave apically; and (3) the thyridial cell is much longer than the discoidal cell, sometimes attenuated apically or throughout its length such that M and S_{3+4} together form a thick composite longitudinal vein. The female forewing discoidal cell sometimes also is broadened apically and with a concave s crossvein and a long thyridial cell, but they are never so strongly modified as in the male. (4) The male forewing has forks of S_1 and S_2, S_3 and S_4, and Cu_1 and Cu_2 (Forks I, II, and V *auctt.*), as evidenced by the appearance of the nygma in its typical position in the fork of S_3 and S_4. (5) The female forewing and (6) hindwings of both sexes have forks of S_1 and S_2, S_3 and S_4, M_1 and M_2, and Cu_1 and Cu_2 (Forks I, II, III, and V *auctt.*), except the fork of S_1 and S_2 (Fork I) is usually absent in hindwings of *Tp. voldus* and those of species of *Lectrides*, *Symphitoneuria*, and *Symphitoneurina*. This fork sometimes appears aberrantly in some species of *Notalina*. Males of *Symphitoneurina* also have the fork of M_1 and M_2 (Fork III) in the forewing. (7) Tibial spurs are 2, 2, 2 or 2, 2, 4 or 2, 4, 4 on the three legs of one side from foreleg to hindleg, respectively.

DISTRIBUTION: Extant species of *Triplectides* are known primarily in the Australasian Biogeographic Region, but are also well reported in the Neotropical, Oriental, and eastern Palearctic Regions. The type species and its apparent closest relatives occur exclusively in the Neotropical Region and are the only species of the genus occurring in that Region (Morse and Holzenthal, 1987).

HABITAT: Larvae of *Triplectides* "occur in a variety of water bodies from sphagnum bogs at high altitudes to temporary swamps in lowland areas" (StClair, 1987).

HABITS: Case of early instars made of plant material and may include mineral material, but late instars always use plant materials, often hollowing a twig or stem (StClair, 1987). Food various, including old and recently dead leaves of terrestrial and aquatic origin, wood, other insects (including one Australian species, *T. similis*, that eats adult insects by floating at the water surface), algae, and diatoms (Chessman, 1986; StClair, 1987).

Triplectides australis Group Morse and Neboiss, 1982

TAXONOMY: Mosely (1936a) considered *Notanatolica* to be a synonym of *Triplectides*. The type species of *Notanatolica* (*Leptocerus magnus* Walker, 1852) belongs to this Group according to Morse and Neboiss (1982). Furthermore, they indicated that "the species identified by various authors as *Tp. magnus* from Asia, New Zealand, and other locations outside southeastern Australia is probably some other species, possibly *Tp. australis*." However, StClair (1987) said that the larvae described by Ulmer (1955) as "*T. magnus*" is very different from that of *T. australis*, certainly a different species than *T. australis*. The discovery that all of the Chinese species belong to this Group suggests that it is a widespread and probably species-rich Group throughout eastern Asia, for which many different species historically have been called *Tp. magnus* in error.

PHYLOGENY: Ulmer (1955), Pendergrast and Cowley (1966), Cowley (1978), Neboiss (1957), and Morse and Neboiss (1982) discussed the fact that the species of the Group are ovoviviparous, with the females bearing living first instar larvae through the ventral membranes between sternum VIII and the gonopod plates. Morse and Neboiss (1982) suggested that this reproductive strategy may be responsible, at least in part, for the success of these species in temporary waterways in arid regions of Australia. The ovovivipary of the species of this group and the structural modifications of the females associated with this phenomenon, including (1) very reduced lamellae, (2) very large sensilla-bearing process on each Preanal appendage, and (3)

expanded and infolded pleural and sternal membranes behind abdominal segment VIII, suggest that the Group is monophyletic.

LARVAE: Descriptions have been published for larvae of species of this Group, including *Triplectides australis* Navás, 1934 (Korboot, 1963, and StClair, 1987); *Tp. cephalotes* Walker, 1852 (Cowley, 1978); *Tp. magnus* (StClair, 1987); *Tp. sp. (Ulmer, 1955, as Tp. "magnus,"* but probably not that species according to Morse and Neboiss [1982] and StClair [1987]); and *Tp. voldus* Mosely, 1953 (Korboot, 1964a, and StClair, 1987). Assorted details of the biologies and life histories of the following species have been published, with emphasis on the larval aspects: *Tp. australis* (Korboot, 1963, and StClair, 1987), *Tp. cephalotes* (Cowley, 1978), and *Tp. voldus* (Korboot, 1963). According to StClair (1987), "the *Australis* Group larvae share the character of having [1] the frontoclypeal apotome as wide behind the constriction as on the anterior margin. Although *Tp. australis* larvae may sometimes have the frontoclypeal apotome slightly wider behind the constriction, it is never broad behind the constriction as it is in the *Australicus* Group." In addition, (2) gills are composed of single filaments, (3) the mesonotum is paler than the pronotum, but not so strongly contrasting as to be hard to see, and (4) the anterolateral corners of the pronotum are strongly scalloped, but not much extended (StClair, 1987).

PUPAE: Pupae have been described for several species of this Group, including *Triplectides australis* (StClair, 1987), *Tp. magnus* (StClair, 1987), sp. (Ulmer, 1955, as "*Notanatolica magna*," but probably not this species according to Morse and Neboiss, 1982, and StClair, 1987), and *Tp. volda* (Korboot, 1964a, and StClair, 1987). Pupae of known species of the *Tp. australis* Group may be distinguished from those of other groups of *Triplectides* by the following combination of characters (StClair, 1987): (1) mandibles serrate (smooth in *Tp. similis* Group); (2) anterior hookplates of abdominal tergum III about same length as those of VI (those of III half as long as those of VI in *Tp. similis*, *Tp. proximus*, *Tp. elongatus*, and *Tp. truncatus* Groups); (3) abdominal segment IX with one short and four long setae on each side ventrolaterally near base of each anal process (three or four setae in this position in *Tp. similis*, *Tp. proximus*, *Tp. elongatus*, and *Tp. truncatus* Groups); and (4) anal processes short and thick and apically expanded with slight lateral twist or anal processes very long and slender with slightly recurved tip very short and fine (anal processes each short and thick but without apical expansion and twist in *Tp. australicus* Banks, 1939, anal processes each long and slender but with thicker recurved tip in *Tp. ciuskus* Mosely, 1953; StClair, 1987).

ADULTS: Adults within the *Tp. australis* Group may be diagnosed by the following characters (Morse and Neboiss, 1982): (1) the posterior apical angle of the discoidal cell in the forewing clearly is separated from the thyridial cell by a short base of vein $\underline{S}_4$ (Figs. 2L, 2M, 3M, 4M); (2) tibial spurs are 2, 2, 2; (3) the male tergum X lacks sharp dorsal or ventral carinae; (11) each male harpago usually has two or three teeth apically; (4)the male segment IX has a weakly sclerotized strip on each side, below which a broad lobe extends mesad to the phallus; (5) the female segment VIII has expansive posterior membranes laterally and especially ventrally that are invaginated into the abdomen and that are readily ruptured for extrusion of larvae; (6) the female preanal appendages each have a greatly enlarged and sometimes sclerotized sensilla-bearing process ventrally; (7) the female lamellae are shorter, less conspicuous and much less sclerotized than in other *Triplectides* species, often covered by the telescoped sternum VIII; (8) the female spermathecal sclerite is generally longitudinally rectangular.

DISTRIBUTION: Species of this Group occur in the Australasian, Oriental, and eastern Palearctic Biogeographic Regions; they are apparently the only members of the genus occurring in the Oriental and eastern Palearctic Regions.

HABITAT: Larvae occur in a wide variety of habitats from sphagnum bogs at high altitudes to temporary swamps in lowland areas (StClair, 1987).

FEEDING HABITS: Known larvae of species in this Group are primarily shredders detritivores, feeding on wood and dead leaves, and sometimes they are predatory (StClair, 1987).

Triplectides acutobeccatus, NEW SPECIES
Figs. 80, 187

DESCRIPTION: Head and thorax golden brown, vertex and palpi with pale yellowish brown setae, antennae golden brown with black annulations. Forewings fulvous with golden brown hairs; venation of male (Fig. 80F, 80Fa) with m-cu crossvein 1.5 times as long as free basal portion of S_4, fork of S_4+MA and MP sessile and with or without very short free vein M_{1+2} (MA) at anastomosis.

MALE GENITALIA (Fig. 80): Segment IX nearly rectangular in lateral view; tergum IX with anterior margin produced cephalad in broad rounded lobe and with posterior margin produced caudad at center to form triangle in dorsal view; lateral pieces short, in nearly semicircular lobes in lateral view. Tergum X broad and hood-like, slightly constricted at distal one-third, with apicomesal excision extending to two-fifths distance from apex. Apicodorsal lobe of each inferior appendage 1.3 to 1.4 times as long as its harpago; harpago hooked mesad at apex with ventral carina of each beak-like hook forming straight line in ventral view; mesal ridges of appendages divergent, rounded apically, each prominent and with broad excision between ridge and main body of appendage in ventral view. Phallus tube-like, strongly narrowed dorsally in its distal two-fifths, with narrowest portion about one-half as broad as widest portion, then dilated at apex in side view; ejaculatory duct visible in basal portion; phallotremal sclerite large, highly sclerotized, produced dorsally in pair of oval, transparent, vertical lobes.

FEMALE GENITALIA (Fig. 187): Tergum IX producing backward in large triangular process, pleural region extending laterad, forming pair of large, horizontal concavities. Preanal appendages (dorsal setose lobes, Morse and Neboiss, 1982) each 2.4 times as long as broad, gradually tapering to blunt apex; sensilla-bearing lobes sclerotized, compressed, truncated apically, each bearing row of stout apical setae. Lamellae large, semicircular. Gonopod plate transverse rectangular, with large triangular opening between lamellae and apical margin of plate. Spermathecal sclerite about 2.3 times as long as wide, slightly contracted at middle, with rounded apex.

LENGTH OF FOREWING: Male 13-13.5 mm, female 15.5-16.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 49 (NAU). Paratypes--1 male, 2 females, Loc. 49 (NAU); 1 male, Loc. 44 (NAU); 1 male, 2 females, Loc. 45a (NAU); 1 male, 2 females, Loc. 5 (CUAC); 2 males, Loc. 35 (CUAC).

ETYMOLOGY: Latin, "with beak-like process," referring to the shape of the male harpago.

DIAGNOSIS: In the *Triplectides australis* Group (Morse and Neboiss, 1982), this species appears closely related to the following species, but its male differs from it in having the apex of tergum X broadly rounded, each harpago very strong with a stout beak-like apex angled mesad, and mesal ridge of each inferior appendage forming a prominent, rounded lobe; its female differs from that of the following species by having relatively larger preanal appendages, sensilla-bearing processes, and lamellae.

DISTRIBUTION: Known from only the type localities in mideastern China.

Triplectides deceptimagnus, NEW SPECIES
Figs. 81, 188

DESCRIPTION: Head and thorax reddish brown with pale and brownish setae intermixed; palpi dark brown, densely covered with pale, brownish setae. Forewings hyaline

yellowish with brown setae, male forewings (Fig. 81Fa) with fork of $\underline{S_4}$+$\underline{MA}$ and $\underline{MP}$ stalked at base.

Male genitalia (Fig. 81): Abdominal segment IX (IX) narrow, with its depth about 4.5 times length of sternum; tergum obtuse angulate, about 2 times as long as sternum; pleural pieces acute triangular, strongly extending outwards. Tergum X (X) rounded laterally, tapering to bilobed apex, with apicomesal membranous region in dorsal and ventral views; in lateral view, tergum X with narrow apex. Subapicodorsal lobe (sap.do) of each inferior appendage somewhat clavate, harpago (har) with apex curved mesad and with one or two sub-apical teeth; mesal ridge (me.rdg) of appendage slightly contracted mesally at base with small excision between it and main body of appendage (m.b.inf.app); basoventral lobe (bv) of inferior appendage slender, distinctly petiolate. Phallus, parallel-sided tube in lateral view, apicoventral portion enlarged and forming pair of shallow lateral concavities sub-apically in dorsal view; basal half of ejaculatory duct obvious; phallotremal sclerite (ph.sc) very small, but its paired dorsal plates conspicuous.

Female genitalia (Fig: 188): Abdominal segment IX (IX) strongly depressed, with its width about twice its height; tergum broadly triangular; pair of pleural concavities partly hidden by tergum in dorsal view; in side view, longitudinal ridge across whole segment. Preanal appendages (sup.app) short, oval; sensilla-bearing lobes (s-b.p) very small, digitate. Lamellae (lam) small, semicircular. Spermathecal sclerite (sp.sc) sinuate laterally, parallel-sided in its anterior three-fourths, posterior quarter narrowing to blunt apex. Ventral opening between lamellae much smaller than in *Tp. acutobeccatus*.

LENGTH OF FOREWING: Male 13.2-13.8mm, female 14.6-14.8 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 99a (NAU). Paratypes--2 males, 5 females, Loc. 99a (NAU); 1 male, 1 female, Loc. 99a (CUAC); 1 male, Loc. 72 (NAU); 1 male, 1 female, Loc. 59 (NAU); 1 female, Loc. 14 (NAU).

ETYMOLOGY: Latin, "false magnus," with reference to the similarity of *Tp. magnus* and this new species.

DIAGNOSIS: In the general shape of the male harpago and the female spermathecal plate, this new species is very similar to *Tp. magnus*, but differs from it in the male by having tergum X rounded laterally and narrowing to a bilobed apex, the mesal ridge of each inferior appendage broadly rounded and more prominent, and the phallus with a pair of sub-apical, lateral concavities. It differs from *Tp. magnus* in the female by having the sensilla-bearing process small, digitate, more like that of *Tp. helvolus*, but differing from this latter species in its semicircular lamellae and its sensilla-bearing processes curved downward 90°.

DISTRIBUTION: Known from only the type localities in southeastern and southcentral China.

Triplectides fulvescens Navás, 1936, NOMEN DUBIUM
Fig. 83

Triplectides fulvescens Navás, 1936, p. 132, f. 90; holotype = male; type repository = Insect Collections, Institute of Zoology, Academia Sinica, Beijing; type locality = "Kuling" (possibly Gu-ling , Jiang-xi Province, Loc. 62.).

Navás' description and illustration (Fig. 83) for this species are not adequate for identification (translated from Latin):

> "Similar to *magna* Walker. More pale. Head fulvous, hairs fulvous, eyes black; palps fulvous, hairs mostly fuscous, dense, otherwise white; antennae white

fulvous, scape annulated with fuscous, primarily thick, fulvous. Thorax fulvous, with fulvous and white hairs. Abdomen fulvous-testaceous, with fulvous hairs, appendages (Fig. 83) fulvous; upper median surface longitudinally fuscous, obsolete in anterior third; process of last tergite [tergum X] elongate, apex attenuate, rounded; inferior appendages in dorsal view arcuate, base thick, apex attenuate. Legs fulvous white, hairs concolorous. Wings with reticulations, hair fringes mostly fulvous. Forewing narrow, apex sub-acute, with dense pubescence, to apex sub-fuscous; apical fork 1 longer than its stalk and discoidal cell. Length of body of male 8.3 mm, length of forewing 13 mm, length of hindwing 9.5 mm.

"Country. China: Kuling, 7.VII.1935. Piel collector."

Triplectides magnus (Walker, 1852)
Figs. 7, 8, 9, 39

Leptocerus magnus Walker, 1852, p. 73; holotype = male; type repository = The Natural History Museum, London; type locality = Tasmania ("Van Diemen's Land").

Notanatolica magna (Walker); Ulmer, 1911, Tai-wan; Ulmer, 1926, China (Guang-dung,Yun-nan); Navás, 1931, China (Shanghai); Ulmer, 1932, China (Su-zhou).

Triplectides magna (Walker); Mosely, 1942, China (Fu-zhou).

The revision of Morse and Neboiss (1982) indicated that the reports of *Triplectides magnus* from China and other parts of Asia probably are in error.

Triplectides legendrinus (Navás, 1923)

Notanatolica legendrina Navás, 1923, p. 50-51; holotype = male; type repository = Museum national d'Histoire naturelle, Paris ; type locality = "Haut Plateau Yunnanais, Distr. de Yunnan-Fou, 1850 a 2000 m., 35" lat. N., Dr. Legendre, 1905" China (Yunnan, perhaps near Kunming); Martynov, 1930, China (Guang-dung); Banks, 1940, China (Sichuan); synonym of *Triplectides magnus* according to Fischer, 1965.

Because of the probability that *Triplectides magnus* does not occur in China (Morse and Neboiss, 1982), *Triplectides legendrinus* probably is not a synonym of *T. magnus*; the type male of *T. legendrinus* needs to be studied in order to determine the modern species to which the name applies. Navás' description for *T. legendrinus* is not adequate for identification (translated from Latin):

"Head testaceous, clothed with dense white hairs; eyes dark red; palps dark, middle segments thick, with dense dark and white hairs; antennae two or more times as long as forewings, first segment inflated, testaceous, others ferrugenous, base near articulations white.

"Thorax dark ferrugenous, with grey hairs.

"Abdomen dark ferrugenous, posterior margins of segments pale, ferrugenous-fulvous; appendages fulvous; posterior margin of last tergite produced, convex; cerci cylindrical, inferior appendages one and a half times as long.

"Forewing with thick and short pubescence on the whole wing, dark, sprinkled with distinct small yellowish spots; dark reticulations nearly everywhere; apical fork 1 more than twice as long as its pedicel, 5 scarcely shorter than the first; discoidal cell much shorter than its pedicel.

"Hindwing membrane hyaline, with very light yellowish hue; pubescence yellowish, scattered, obscure apically; fringe yellowish, pale; apical fork 1 with small anterior branch, with posterior branch twice as long as its pedicel.

"Length of body of male 11.3 mm.
"Length of forewing 16.3 mm.
"Length of hindwing 12 mm.
"Length of antenna 39 mm."

Triplectides medius (Navás, 1931)
Fig. 84

Notanatolica media (Navás, 1931), p. 9 ; holotype = female; type repository = Navás Collection (now in Museo de Zoología, Barcelona, Spain); type locality = Cho-gahn (possibly Shao-guan Shi, Guangdong Province, Loc. 13, southern China.)
Triplectides media (Navás); Mosely, 1936a, p. 125.
Triplectides media (Navás); Schmid, 1950, p. 357-358, figs. 99-101.

We have not seen specimens of this species. Schmid (1950) considered this species a synonym of *Tp. gilolensis* (McLachlan). Schmid's (1950) drawings of the male genitalia of the holotype of *Tp. medius* are provided here (Fig. 84). According to his description (1950, translated from French):

"'upper penis cover' [tergum X] regularly shaped, narrowed and truncate apically; middle branch [harpago] of inferior appendages slightly arched and abruptly bent before apex; internal branch [mesal ridge] identical to that of *gilolensis*, lower branch [basoventral branch] long and broad, reaching base of middle branch."

Triplectides quadratus, NEW SPECIES
Figs. 59, 82, 189

DESCRIPTION: Specimens have been preserved in alcohol for more than 30 years, body color mostly faded. Head brown, thorax dark brown with few light brown setae. Male forewing (Fig. 82Fa) S_4+MA separating from MP at anastomosis, their fork nearly sessile, m-cu crossvein 2 times as long as free basal portion of S_4.

MALE GENITALIA (Fig. 82): General shape of segment IX resembling that of *Tp. deceptimagnus* except about half again as long and lateral pieces produced backward in sharp triangle. Tergum X shaped like that of *Tp. acutobeccatus*; apicomesal cleft visible in dorsal view; distal portion slightly contracted to a blunt apex in lateral view. Subapicodorsal lobe of each inferior appendage 1.7-1.8 times as long as harpago in ventral view; latter with short hooked apex curved mesad, its dorsal margin smoothly arched; mesal ridge of appendage nearly in right angle with main body. Tube-like phallus very similar to that of *Tp. acutobeccatus*, contracted in distal

half with apex enlarged, ejaculatory duct obvious, phallotremal sclerite large with pair of dorsal , vertical plates.

FEMALE GENITALIA (Fig. 189): From above, tergum IX produced backward in broad semicircular plate partly obscuring pair of lateral concavities. Preanal appendages each about 2.8 times as long as broad, and 1.7 times as long as its sensilla-bearing process; latter process compressed, truncate, apically with row of short, stout setae. Lamellae small, sub-triangular, ventral margin rounded in lateral view. Spermathecal sclerite nearly square in ventral view.

LENGTH OF FOREWING: Male 15 mm, female 15.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 74a (NAU). Paratypes--3 males, 3 females, Loc. 74a (NAU); 2 males, Loc. 36 (CUAC).

ETYMOLOGY: Latin, "square," with reference to the shape of female spermathecal plate and the shape of the mesal ridge of the male inferior appendage.

DIAGNOSIS: This species is very similar to *Tp. acutobeccatus* based on the female and male genitalia characters mentioned above, but differs from it in the male by having each lateral piece of segment IX projecting backward in a sharper angle and the apex of each harpago more smoothly arched; in the female, it differs by having the spermathecal sclerite nearly square.

DISTRIBUTION: Known from only the type localities in mideastern and midcentral China.

KEY TO ADULTS OF CHINESE *TRIPLECTIDES* SPECIES

(The female of *Tp. medius* Navás and adults of *Tp. fulvescens* Navás are unknown.)

1. Genitalia with inferior appendages (Fig. 80) and phallus (Fig. 80D) ..... males, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 187C) .... females, 5

2(1). Mesal ridge of each inferior appendage forming angle of about 90° with body of appendage (Fig. 84C) 3
2'. Mesal ridge of each inferior appendage forming prominent projection (Fig. 80C) ... 4

3(2). Each harpago at least twice as long as its basal width in ventral view (Fig. 84C) ..... *Tp. medius* Navás, p. 35.
3'. Each harpago no more than 1.5 times as long as its basal width (Fig. 82C) .... *Tp. quadratus*, n. sp., p. 35.

4(2'). Tergum IX nearly two times as long as sternum (Fig. 81A); harpago evenly arched and with one or two sub-apical teeth (Fig. 81C), phallus parallel-sided tube in lateral view (Fig. 81D), with paired shallow concavities sub-apically and phallotremal sclerite inconspicuous in dorsal view (Fig. 81Dd) .... *Tp. deceptimagnus*, n. sp., p. 33.
4'. Tergum IX with sternum slightly shorter than tergum (Fig. 80A); harpago angled and with acute apex lacking sub-apical teeth (Fig. 80C); distal half of phallus constricted in lateral view and phallotremal sclerite conspicuous (Fig. 80D) ..... *Tp. acutobeccatus*, n. sp., p. 32.

5(1'). Sensilla-bearing process of each preanal appendage straight, compressed, at least 2 times as long as wide, with apex truncate, bearing row of stout setae (Fig. 187A) 6
5'. Sensilla-bearing process of preanal appendage small digitate, depressed, with

narrow apex bearing few setae not in row (Fig. 188A) . . . . . .
. . . . . *Tp. deceptimagnus*, n. sp., p. 33.

6(5). Spermathecal sclerite at least 2 times as long as wide, lateral edges constricted in middle then enlarged to rounded posterior apex in ventral view (Fig. 187C) . . .
. . . . . *Tp. acutobeccatus*, n. sp., p. 32.

6'. Spermathecal sclerite nearly square (Fig. 189C) . . . . . *Tp. quadratus*, n. sp., p. 35.

LEPTOCERINAE Leach, 1815

TAXONOMY: Other than Triplectidinae, this is the only other subfamily recognized in Leptoceridae. Species of Leptocerinae have been reported in large numbers from all continents and biogeographic regions except Antarctica. No review of the world species of this large subfamily has been published since the 1800's. Ulmer (1907a), reviewed adults of the world genera. Other synopses have concerned genera and species of particular countries or continents.

Two genera of Leptocerinae other than those reported here from the PRC, but which are especially likely to be found in the PRC in the future, are *Poecilopsyche* Schmid described from India and Myanmar and *Ylodes* Milne from the Holarctic region. Schmid (1968) placed *Poecilopsyche* between *Athripsodes* and *Leptocerus*, but Morse (1981) was unable to position it more precisely in his phylogeny. Larvae and pupae of *Poecilopsyche* are unknown. The *Poecilopsyche* adult is distinctive by the following combination of characters (Schmid, 1968): both wings are narrow, with venation resembling that of *Setodes* except that in the hind wing Fork I is absent and the fork of S occurs basad of the s-m crossvein; the male inferior appendages each have a sub-apicodorsal lobe and a short harpago as in Triplectidini and *Ceraclea* species. *Ylodes* belongs in the Triaenodini according to Morse (1981), having been accorded full generic status by Manuel and Nimmo (1984). Larvae, pupae, and adults of *Ylodes* species apparently will run to *Triaenodes* in the keys above. According to Glover (1996), the larva may be distinguished from that of *Triaenodes* by the fact that the *Ylodes* larva has "most of head in dorsal view with light brown pigmentation, ending before occipital foramen; only small amount of cream ground color visible as a thin smooth crescent between anterior head pigmentation and occipital foramen." According to Manuel and Nimmo (1984), the pupa of *Ylodes* may be distinguished from that of *Triaenodes* by the presence of a heavily toothed median shoulder on the mandible and by a long and slender anal process without a short acute median shoulder. The male may be distinguished from that of *Triaenodes* by (1) the "intermediate appendages" [upper part of segment X] forming a single blunt membranous lobe; (2) lower part of segment X well developed; (3) inferior appendages simple oval to sub-oval, apically concave; (4) phallicata membranous and muscular; and (5) single dorsomedian paramere arising from phallotheca (Manuel and Nimmo, 1984). The female of *Ylodes* may be distinguished from that of *Triaenodes* by (1) the absence of a dorsal vaginal chamber, (2) the simplicity of the "vaginal apparatus" [spermathecal sclerite], and (3) the absence of a median keel on the "vulvular scale" [gonopod plate] (Manuel and Nimmo, 1984).

PHYLOGENY: Morse (1981) provided the following synapomorphies of adults as evidence for the monophyly of the subfamily: (1) absence of one branch of the M vein (Fork III) in each hindwing, (2) absence of the s crossvein in each hindwing, and (3) absence of preapical spurs on the midtibiae. Morse (1981) also published a phylogeny of the tribes of Leptocerinae.

DIAGNOSIS: Characters by which larvae, pupae, and adults of Leptocerinae may be distinguished from Triplectidinae are provided in the keys above.

Athripsodini Morse and Wallace, 1976

PHYLOGENY: According to Morse and Wallace (1976) and Morse (1981, 1984), monophyly for the tribe is evidenced by the following synapomorphies: (1) the larva is relatively short with a broad metathorax and (2) its mesonotum has dark sclerotized bars. This tribe and all other tribes in the subfamily are the sister group of Leptorussini as indicated by (1) the presence of homologous sclerotized strips from the male phallic shield articulating with corresponding sclerotized strips of sternum IX and (2) adult tibial spurs in a 2, 2, 2 arrangement on each fore- to hindtibia, respectively (Morse, 1975, 1981). Athripsodini is the sister group to all remaining tribes in the subfamily; these tribes are a monophyletic group as indicated by (1) absence of one branch of the female median vein (fork III) in each forewing and (2) tibial spurs in a 1, 2, 2 arrangement (Morse, 1981). The tribe Athripsodini includes sister genera *Athripsodes* and *Ceraclea* and sister genera *Axiocerina* and *Leptocerina* (Morse, 1984). *Homilia* and *Leptecho* and *Leptocerodes* appear to be allied with *Athripsodes*; their relationships will be discussed in a pending revision of that genus. Monophyly of *Athripsodes* and *Ceraclea* is suggested by the unique presence of a second, dorsal pair of phallic paramere spines in the male genitalia (Morse and Wallace, 1976). Monophyly of *Axiocerina* and *Leptocerina* is suggested by (1) the nearly sessile origin of the main fork of the median vein (M) in the forewing, arising at, or very near, the level of fork II (or r-m crossvein of other authors) and (2) the anteriorly recurved ventral phallic shield and phallobase of the male, its concave ventral face sliding over the basal plate (fused bases) of the inferior appendages (Morse, 1984).

LARVAE: Larvae of at least the following species of Athripsodini have been described:

Athripsodes

As. albifrons (L.)--Wallace (1981), Waringer and Graf (1997)

As. aterrimus (Stephens)--Lepneva (1966), Hickin (1946, 1967), Steinmann (1967), Wallace (1981), Waringer and Graf (1997)

As. bilineatus (L.)--Lepneva (1966), Hickin (1946, 1967), Steinmann (1967), Wallace (1981), Waringer and Graf (1997)

As. cinereus (Curtis)--Lepneva (1966), Steinmann (1967), Wallace (1981), Waringer and Graf (1997)

As. commutatus (ROSTOCK)--Wallace (1981), Waringer and Graf (1997)

As. interjectus (McLachlan)--Wallace (1981)

Ceraclea

Ceraclea (*Athripsodina*) *alagma* (Ross)--Resh (1976)

C. (*A.*) *ancylus* (Vorhies)--Resh (1976)

C. (*A.*) *annulicornis* (Stephens)--Lepneva (1966), Steinmann (1967), Resh (1976), Wallace (1981), Waringer and Graf (1997)

C. (*A.*) *arielles* (Denning)--Resh (1976)

C. (*A.*) *diluta* (Hagen)--Resh (1976)

C. (*A.*) *dissimilis* (Stephens)--Wallace (1981), Waringer and Graf (1997)

C. (*A.*) *excisa* (Morton)--Lepneva (1966), Resh (1976, from which *C. misca* is a distinct species)

C. (*A.*) *flava* (Banks)--Resh (1976)

C. (*A.*) *nepha* (Ross)--Resh (1976)

C. (*A.*) *tarsipunctata* (Vorhies)--Resh (1976)

Ceraclea (*C.*) *albimacula* (Rambur)--Lepneva (1966), Steinmann (1967), Wallace (1981), Waringer and Graf (1997, larva indistinguishable from that of *C. alboguttata*)

C. (*C.*) *alces* (Ross)--Resh (1976)
C. (*C.*) *cancellata* (Betten)--Resh (1976)
C. (*C.*) *enodis* Whitlock and Morse--Whitlock and Morse (1994)
C. (*C.*) *fulva* (Rambur)--Lepneva (1966), Steinmann (1967), Wallace (1981), Waringer and Graf (1997)
C. (*C.*) *maculata* (Banks)--Resh (1976)
C. (*C.*) *mentiea* (Walker)--Resh (1976)
C. (*C.*) *nigronervosa* (Retzius)--Resh (1976), Wallace (1981), Waringer and Graf (1997)
C. (*C.*) *punctata* (Banks)--Resh (1976)
C. (*C.*) *resurgens* (Walker)--Resh (1976)
C. (*C.*) *senilis* (Burmeister)--Lestage (1926), Lepneva (1966), Steinmann (1967), Waringer and Graf (1997)
C. (*C.*) *slossonae* (Banks)--Resh (1976)
C. (*C.*) *spongillovorax* (Resh)--Resh (1976)
C. (*C.*) *submacula* (Walker)--Resh (1976), Wallace (1981)
C. (*C.*) *transversa* (Hagen)--Resh (1976)

PUPAE: Pupae of at least the following species of Athripsodini have been described:

Athripsodes
As. aterrimus (Stephens)--Klapalek (1888), Thienemann (1905), Hickin (1949), Lepneva (1966), Steinmann (1967)
As. bilineatus (L.)--Steinmann (1967)
As. cinereus (Curtis)--Silfvenius (1905), Lepneva (1966), Steinmann (1967)
As. excisus (Morton)--Silfvenius (1905), Lepneva (1966)

Ceraclea
Ceraclea (*Athripsodina*) *annulicornis* (Stephens)--Lepneva (1966), Steinmann (1967)

Ceraclea (*C.*) *albimacula* (Rambur)--Lepneva (1966)
C. (*C.*) *enodis* Whitlock and Morse--Whitlock and Morse (1994)
C. (*C.*) *fulva* (Rambur)--Silfvenius (1905), Lepneva (1966), Steinmann (1967)
C. (*C.*) *senilis* (Burmeister)--Klapalek (1888), Thienemann (1905), Lestage (1926), Lepneva (1966), Steinmann (1967)

DIAGNOSIS: Characters by which larvae, pupae, and adults of Athripsodini and its genera may be distinguished from other Asian Leptocerinae tribes and their genera are provided in the keys above.

DISTRIBUTION: *Athripsodes* and *Ceraclea* are distributed in the Afrotropical, Holarctic, and Oriental biogeographic regions, *Axiocerina* and *Leptocerina* in the Afrotropical region, with *Axiocerina* confined to the Indian Ocean islands of Mauritius and Réunion.

Athripsodes Billberg, 1820

Athripsodes Billberg, 1820, p. 94;

Type species: *Phryganea albifrons* L. (subsequent selection of Milne, 1934).

Leptocerus, Hagen, 1860, not Leach, 1815, in part; *Athripsodes* Billberg, 1820, according to Milne (1934) and Kimmins (1949).

PHYLOGENY: According to Morse and Wallace (1976), monophyly for the genus is evidenced by the following synapomorphies: (1) the sub-apicodorsal lobe of each male inferior appendage is small and strongly sclerotized and (2) the larva and pupa lack gills on abdominal segments IV to VIII. A phylogenetic revision of the genus is being written (Morse, in preparation).

LARVAE: According to Morse and Wallace (1976), larvae of *Athripsodes* species have the head always longer than broad and parafrontal lines absent; the submental apotome is always triangular and separates the genae. Each of the pair of mesonotal bars in the final instar is short and straight. The reinforcing sclerites (lateral case-holding plates) of abdominal segment I are each strongly bent in the distal anterior part or are slightly forked or with a large clear space in the anterior half. Gills are present on no more than abdominal segments I-III. No posterolateral projections are evident on abdominal segment IX and a definite tergite is present. There is a single, strong, accessory claw above each main anal claw. The case is long, tapering, and slightly curved; its anterior dorsal lip never overlaps the ventral one, even in the earlier instars. Second instar larvae lack a row of long setae on the hind legs.

PUPAE: According to Morse and Wallace (1976), the pupae of *Athripsodes* species each have a triangular process or distinct bulge on the anterior median edge of the labrum. Gills are arranged as in the larvae. The apex of each of the pupal anal rods is complicated and ends abruptly without tapering. The pupal case has round or vertical elliptical anterior and posterior openings.

ADULTS: According to Morse and Wallace (1976), adults have an externally obvious midcranial sulcus; a completely sclerotized, inflexible, maxillary palp segment IV; a deeply divided male tergum X; and male inferior appendage sub-apicodorsal process short and heavily sclerotized.

DISTRIBUTION: *Athripsodes* species are known from the Afrotropical, Oriental, and Palearctic Biogeographic Regions.

HABITAT: Larvae of some species are specialists, others are generalists, in a wide range of lentic and lotic habitats (Lepneva, 1966; Hickin, 1967).

FEEDING HABITS: Larvae are collectors-gatherers on bottom substrates and plant feeders (Lepneva, 1966).

Athripsodes ceracleoides Kumanski, 1991
NEW CHINESE RECORD
Figs. 85, 190

Athripsodes ceracleoides Kumanski, 1991, p. 56, 57, f. 15-21; holotype = male; type deposition = National Natural History Museum, Sofia, Bulgaria; type locality = Te-dong River, Phyöngyang City, Phyöngyang-si Province, People's Democratic Republic of Korea.

This species, described by Kumanski from Korea, also has been captured in southeastern China in An-hui, Hu-bei, and Jiang-xi Provinces. We provide here descriptions and illustrations based on our material.

DESCRIPTION: Head and thorax fulvous, vertex with white hairs, face and palpi with fulvous hairs. Forewings hyaline with golden brown hairs. Abdomen creamy white with terga somewhat darkened.

MALE GENITALIA (Fig. 85): Segment IX narrowest dorsally, with pleural region deeply excised in middle. Preanal appendages elongate oval, about 1.5 times as long as mid-width. Tergite X deeply divided into 2, recurved, tapered branches, each with much shorter, slender, straight, setose projection arising dorsally from base. Each inferior appendage divided into 2 branches: ventral branch strongly depressed in sub-quadrate plate with truncate apex and small triangular process laterally at midlength in ventral view; dorsal process slender, slightly dilated and bent and with 4-5 very strong setae at middle. Phallus a simple tube, about 3 times as long as

average width, its apex semimembranous and enlarged apically; paramere spines and sclerotized phallicata absent.

FEMALE GENITALIA (Fig. 190): Tergum IX strongly protruded at posterior center in a highly compressed plate, with apical portion tapering to blunt apex in lateral view beyond rest of genitalia; in dorsal view appearing as long, narrow keel. Tergite X a small trapezoidal plate positioned almost in middle of genital apex, fused dorsally with long process of segment IX. Preanal appendages each small, setose lobe on either side of process IX. Lamellae about as long as wide in lateral view, each with rounded apex. Gonopod plates lightly sclerotized, divided mesally by narrow membranous area. Internal part of gonopod VIII + IX stout, digitate, partly exposed in ventral view, its ventral process with anterior end abruptly narrowed and then rounded apically.

DIAGNOSIS: By the striking resemblance of its genitalia, this species is obviously close to *Athripsodes tsudai* (Akagi, 1960) and *As. seikunis* (Kobayashi, 1987) from Japan. (Male genitalia of the latter species were illustrated and described upside down.) It is possible that *As. seikunis* is a synonym of *As. tsudai*, but the illustrations and descriptions are not adequate to reach this conclusion with confidence. The truncate, sub-quadrate apex of the ventral branch of each male inferior appendage of *As. ceracleoides*, as seen in ventral view, clearly differs from the projecting, tapered apex seen on each of those of *As. tsudai* and *As. seikunis*.

LENGTH OF FOREWING: Male 8.8-9.2 mm, female 8.0-8.4 mm.

IMMATURE STAGES: Unknown.

DISTRIBUTION: Previously known from Phyŏngyang City, DPR of Korea; now found in southeastern China.

MATERIAL STUDIED: 1 male, Loc. 6 (NAU); 1 male, Loc. 67a (NAU); 1 male, Loc. 41 (CUAC); 1 female, Loc. 41 (NAU).

Ceraclea Stephens, 1829

Ceraclea Stephens, 1829, p. 28.

Type species: *Phryganea nervosa* Fourcroy (monobasic), a synonym of *Ceraclea nigronervosa* (Retzius, 1783).

Leptocerus, Hagen, 1860, not Leach, 1815; synonym of *Athripsodes* Billberg, 1820, according to Milne (1934) and Kimmins (1949).

Athripsodes Billberg, 1820, in part; re-segregated by Morse and Wallace (1976).

The nomenclature, distribution, and phylogeny of this genus and its subgenera and species groups were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of these taxa.

HABITAT: Larvae of the various species each live in restricted types of habitats among a wide variety of lotic and lentic situations (Wiggins, 1977, 1996).

FEEDING HABITS: Larvae are mostly collectors-gatherers on bottom substrates (Wiggins, 1996), with a few species eating green plants (McGaha, 1952). Species of the *Ceraclea* (*C.*) *fulva* Group apparently are all obligate predators of freshwater sponges; a few other species are facultative sponge predators (Resh *et al.*, 1976).

Ceraclea (*Ceraclea*) Stephens, 1829

The nomenclature, distribution, and phylogeny of this subgenus and its species groups were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of these taxa.

Ceraclea (*C.*) *fulva* Group Morse, 1975

The nomenclature, distribution, and phylogeny of this species group were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of its species.

Ceraclea (*C.*) *elongata*, NEW SPECIES
Fig. 86

DESCRIPTION: Body stout, head and thorax of male reddish brown, frons with white hairs, vertex with brown hairs. Forewings brown, covered densely with dark brown setae.

MALE GENITALIA (Fig. 86): Preanal appendages broad and truncate in dorsal view. Tergum X hood-like with distal half turned upward in 55° angle in lateral view; in dorsal view, apicodorsal half divided into 2 long, convergent, blunt, caudal lobes on either side of large mesal setose lobe about two-thirds as long as apicolateral lobes. Inferior appendages each with small, blunt basoventral lobe bearing same size setae as those on ventral margin of appendage; mesal ridge produced as broad plate extending from base to origin of harpago, with sinuate edge and with several short, fine setae on caudal surface; sub-apicodorsal lobe broad; harpago with sub-apicomesal process obtuse. Phallobase with short ventral apex, dorsal portion elongated, about 2 times as long as ventral portion in side view; 2 paramere spines short, strongly bent ventrad; phallotremal sclerite large.

LENGTH OF FOREWING: Male 9.0 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 4a (NAU).

Etymology: Latin, "elongated," with reference to the dorsally elongated phallobase of the male genitalia.

DIAGNOSIS: The male of this species somewhat resembles that of *C. spinulicolis* in the strongly upturned distal half of tergum X with its narrow rounded apex in side view and the absence of a stout seta on the caudal surface of the mesal ridge of each inferior appendage. However, *C. elongata* differs from it in (1) possessing a well-developed mesal setose lobe of tergum X; (2) the short, conical basoventral lobe of each inferior appendage without stout spines; and (3) the dorsally elongated phallobase with its dorsal margin about 2 times as long as its ventral margin.

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

PHYLOGENY: Besides the ten species listed by Yang and Morse (1988), the *C. fulva* Group includes *C. alabamae* Harris, 1989, from the United States of America, and this new species. Among the 12 species of the Group, *C. cama* Flint, 1965, is the only species retaining the plesiomorphic, long, ventral apex of the male phallobase (Morse, 1975). All species of the Group other than *C. cama* and *C. spinulicolis* Yang and Morse, 1988, have the following synapomorphies: a pronounced mesal projection between the apicolateral lobes of tergum X and a conspicuous basoventral projection on each inferior appendage. All other species of the Group except *C. cama*, *C. spinulicolis*, and this new species have the apicolateral lobes of tergum X broad and truncate, with a tuft of hairs on the apicoventral corner (Resh *et al.*, 1976; Yang and Morse,

1988). Thus, we infer that *C. cama* is the sister species to all others of the Group, that *C. spinulicolis* is the sister species to all others of the Group except *C. cama*, and that *C. elongata* is the sister species of the remaining members of the Group.

Ceraclea (*Athripsodina*) Kimmins, 1963b

The nomenclature, distribution, and phylogeny of this subgenus and its species groups were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of these taxa.

Ceraclea (*Athripsodina*) *annulicornis* Group Morse, 1975

The nomenclature, distribution, and phylogeny of this species group were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of its species.

Ceraclea (*Athripsodina*) *ampliata*, NEW SPECIES
Figs. 87, 191

DESCRIPTION: Head light yellowish with dark brown warts, thorax yellowish brown, middle portion of mesonotum forming dark mesal stripe. Frons with white hairs in middle, brown hairs on either sides; vertex with white and brown hairs intermixed. Forewing light brown with dark brown hairs. Abdomen creamy white except terga and sterna of segments II through V fulvous.

MALE GENITALIA (Fig. 87): Preanal appendages broad and sub-truncate, fused basally for short distance in dorsal view. Tergum X median portion slender, upturned, with apex slightly arched downward in lateral view and, in dorsal view, long, acute triangular process with short setae; lateral processes stout in lateral view, sinuate, extending far beyond tip of median portion, each bearing 2 droplet-shaped, apical spines which cross each other. Basoventral lobe of each inferior appendage short, triangular, with blunt apex, about half as long as main body of appendage; subapicodorsal lobe well developed and curved caudad; harpago small, very thin in lateral view, about half as long as dorsal lobe; mesal ridge produced in setose lobe at midlength of main body. Phallobase huge, about three-fourth times as tall as that of segment IX in side view; anterior end enlarged tremendously such that foramen positioned in ventral side at midlength; apical portion about one-quarter times as tall as the anterior portion, curved downward in lateral view and, in ventral view, excised apicoventrally; left paramere spine absent, right paramere spine short.

FEMALE GENITALIA (Fig. 191): Tergum IXa broadly triangular, IXb forming conspicuous mesal lobe fused with tergum X; tergum X flattened and positioned at lower level, a triangular lobe with blunt apex in dorsal view. Preanal appendages broad setose mounds, mostly fused with segment IX. Lamellae triangular in side view, especially setose on ventral surface. Gonopod plate with a few striae on side margins, convex along middle line with a pair of deep concavities beside it, apically bearing pair of broad digitate processes about 2 times as long as wide and one half as long as preanal appendage. Spermathecal sclerite sub-rhomboid, about 1.5 times as long as wide with anterior end extending to middle of segment VIII.

LENGTH OF FOREWING: Male 6.9 mm, female 5.8-6.6 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2a (NAU). Paratypes--13 females, Loc. 2a (NAU).

ETYMOLOGY: Latin, "enlarged," with reference to the extremely inflated male phallobase.

DIAGNOSIS: This species somewhat resembles the Holarctic species *C.* (*A.*) *annulicornis* (Stephens, 1836) in the short basoventral lobe of each inferior appendage, the very large anterior end of the phallobase, and the absence of the left paramere spine. However, it differs from this and all other species of the *C. annulicornis* Group in that the phallic guide is not obviously produced basally or excavated in the middle or projecting as conspicuously apically; the median portion of tergum X is longer, down-curved, acute-triangular in dorsal view, without lateral thickenings and with huge lateral processes longer than median portion, each bearing 2 stout apical spines; anterior end of phallobase even larger than in *C. annulicornis*, about three-fourths as tall as segment IX; female with pair of conspicuous concavities on gonopod plate..

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

PHYLOGENY: This species, *C. annulicornis*, *C. ruthae*, *C. shuotsuensis*, and *C. globosa* are a monophyletic group as indicated by a homologously enlarged and sub-spherical anterior end of the male phallobase. The three characters listed above by which this species resembles *C. annulicornis* are each shared uniquely with that species, suggesting that they are sister species. No further evidence is available by which the polytomy of the other lineages may be resolved (Yang and Morse, 1988).

Ceraclea (*Athripsodina*) *riparia* Group Morse, 1975

The nomenclature, distribution, and phylogeny of this species group were discussed by Morse (1975) and Yang and Morse (1988), along with diagnoses for adults, pupae, and larvae of its species.

Ceraclea (*Athripsodina*) *celata*, NEW SPECIES
Figs. 88, 192

DESCRIPTION: Head and thorax reddish brown, vertex and frons with mostly white setae, sides with brown and white setae intermixed. Forewing light yellowish brown with apical half (region beyond anastomosis) faint fulvous; hairs of forewings mostly rubbed, with traces of greyish brown hairs along edges and apical regions.

MALE GENITALIA (Fig. 88): Segment IX with ventral half about 2 times as long as dorsal half. Preanal appendages triangular and fused for about half their length. Tergum X triangular in dorsal view, its blunt apex extending beyond preanal appendages about 25%; lateral processes slender, hidden beneath middle portion of tergum X in dorsal view and extending not quite to its tip. Basoventral lobe of each inferior appendage nearly 2 times as broad as main body of appendage and nearly as long, with apex very compressed, curved mesad, and bilobed with each lobe bearing stout spine and with one or two smaller spines between them, these spines partly concealed in lateral and caudal views by lobes; main body of inferior appendage erect, with sub-apicodorsal lobe curved somewhat mesad and caudad; mesal ridge inconspicuous and bearing few setae. Phallobase broadest near middle, foramen located ventrally about one-third distance from anterior end; anterior portion about twice as broad as posterior portion; right apicoventral lobe slightly larger than left one; paramere spines arranged normally for this group.

FEMALE GENITALIA (Fig. 192): Tergum IXa short and broad, tergum IXb forming small median projection united with tergum X. Preanal appendages short, bearing fine setae. Tergum X small tongue-like lobe, half as long as preanal appendages in dorsal view. Lamellae triangular in side view, with dorsolateral surface concave and with venter setose. Gonopod plates

concave mesally, with few short striae on lateral edges; mesal posterior processes inconspicuous, lateral processes forming elliptical lobe; apicomesal processes of internal part of gonopod VIII (i.gon.VIII, Nielsen, 1980), semimembranous, longer and more slender than elliptical lobes of gonopod plates. A pair of rugose pockets submerged in segmacoria between gonopod plate and sternum VII. Spermathecal sclerite about 2 times as long as broad, nearly parallel-sided with anterior end narrowed and truncated.

LENGTH OF FOREWING: Male 6.3-7.0 mm, female 5.3-5.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 38b (NAU). Paratypes--17 males, 17 females, Loc. 38b (NAU); 5 males, 5 females, Loc. 38b (CUAC).

ETYMOLOGY: Latin, "concealed," with reference to the characteristically partly concealed apical spines of the inferior appendages.

DIAGNOSIS: The male of this species somewhat resembles that of *C.* (*A.*) *riparia* (Albarda) in the stout, basoventral lobe of each inferior appendage bearing 2 thick, apical spines. The male phallus resembles those of *C. modesta* (Banks), *C. forcipata* (Forsslund), and *C. flava* (Banks) in having the foramen positioned ventrally and that of *C. modesta* in lacking a sub-apical excavation. But differs from these and other *C. riparia* Group species as follows: basoventral lobe of each inferior appendage about 2 times as broad as its main body with very compressed bilobed apex bearing 2 thick spines whose bases are concealed by the lobes; mesal ridge of inferior appendage inconspicuous and bearing 3-4 thick, straight setae; segmacoria between sternum VII and gonopod plates of female with pair of rugose pockets.

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

PHYLOGENY: This species, *C. riparia*, *C. yangi* (Mosely, 1942), *C. brachyacantha* Yang and Tian, 1987; and *C. nankingensis* (Huang, 1957) compose a monophyletic lineage in the *C. riparia* Group as indicated by the homologous pair of dimples on tergum IX of the male. (These dimples are doubled on the left side of the holotype of this new species, but single on the right side.) Among these species, the males of only this new species and *C. riparia* have the apex of the basoventral lobe of each inferior appendage bilobed, suggesting that they are sister species. A trichotomy involving (1) this line of *C. riparia* + *celata*, (2) *C. yangi*, and (3) *C. nankingensis* + *brachyacantha* (Yang and Morse, 1988) remains unresolved.

Ceraclea (*Athripsodina*) *grossa*, NEW SPECIES
Figs. 89, 193

DESCRIPTION: Head and thorax consistently dark brown, vertex and frons with mostly white and dark brown setae intermixed, palpi with dark brown setae. Forewings yellowish brown, with dark brown setae.

MALE GENITALIA (Fig. 89): Segment IX with dorsal half forming moderately narrow band, basal half quadrate in lateral view. Preanal appendages each short, separate at base, diverging strongly from base to near middle then curved caudad. Tergum X about 2 times as long as preanal appendages, with lateral edges sinuately tapering to a blunt setose apex in dorsal view; dorsomesal region elevated and bare, defined by two longitudinal ridges; lateral process stout, only extending to the middle of main portion of tergum. Basoventral lobe of each preanal appendage huge, forming angle of about 90° with main body of appendage; broadest at base, about 3 times as broad as main body, with 2-4 stout setae on basomesal surface, then tapering to narrow apex curved mesad, bearing 4 stout spines in row, in ventral view; main body of inferior appendage curved about 45° caudad from just before its middle, mesal ridge slightly produced near base, setose; harpago as long as sub-apicodorsal lobe, strongly curved mesad. Phallobase conspicuously enlarged anteriorly such that phallic foramen positioned on ventral surface about one-third distance from anterior end;

phallobase broadest near middle, about 1.5 times as broad as anterior portion, 3.5 times as broad as posterior portion; apicoventral cleft very short; paramere spine single, three-quarters times as long as phallobase; short piece of dense brownish membrane (possibly vestigial right paramere spine) situated near base, parallel to long left spine.

FEMALE GENITALIA (Fig. 193): Tergum IXa very short, IXb a pair of large lobes. Preanal appendages short and broad in dorsal view. Tergum X very small, acute triangular lobe, only visible in dorsal view. Lamellae sub-rectangular pads covered with fine setae. Gonopod plates sclerotized and separated mesally, each slightly concave, with mesal and lateral edges raised, lateral edges with longitudinal striations; each plate with deep depression sub-mesally one-third distance from apex; apically, each plate with 2 apical projections, mesal one shorter and more blunt than elliptical lateral one. Spermathecal sclerite about 2.5 times as long as broad, narrowed in anterior and posterior ends, parallel-sided in its main portion.

LENGTH OF FOREWING: Male 6.7-7.8 mm, female 5.3-6.2 mm

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 76d (NAU). Paratypes--2 males, 4 females, Loc. 76c (NAU); 1 male, 1 female, Loc. 76c (CUAC).

ETYMOLOGY: Latin, "big, thick," with reference to the large, stout basoventral lobe of each male inferior appendage.

DIAGNOSIS: This species resembles the next two in that the males have (1) short lateral lobes of tergum X, (2) a massive basoventral lobe of each inferior appendage (3) bearing a row of stout apical spines and have (4) a single, very long, right phallic paramere spine with (5) a parallel, ventral, dark semimembranous or membranous vestige of the left paramere spine. Among these, this species most closely resembles *C.* (*A.*) *singularis* (1) in the shape of the inferior appendages and (2) in possessing the same number of spines on the apex of its basoventral lobe. It differs (1) in the much shorter lateral processes of tergum X, extending at most to the middle of segment X; (2) in the basal width of the basoventral lobe 3 times as broad as the main body of the appendage; and (3) the ventral apex of the phallobase with a shallow cleft.

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

PHYLOGENY: Within the *C. riparia* Group, this species and the next two species share uniquely the characters numbered 1, 2, 4, and 5 in the above Diagnosis; no synapomorphies have been detected to resolve the relationships among these three species. *Ceraclea kamonis* (Tsuda, 1942b) apparently also belongs in this complex, although the characters of tergum X and the phallus are yet unknown. These, along with *C. polyacantha* (Yang and Morse, 1988), have the following synapomorphies: (1) a row of 4-5 stout spines at the apex of the basoventral lobe of each inferior appendage (except *C. parakamonis* and *C. kamonis*), and (2) the anterior end of the phallobase long and "sagging" ventrad.

The synapomorphy mentioned by Yang and Morse (1988) for *C. polyacantha* + *interispina* Yang and Morse, 1988 ("tergum X is clavate in dorsal view") is not seen in the other species cited for this complex and thus may be a homoplasy. Therefore, the relationships of *C. interispina* are uncertain. In the male of *C. interispina* the stout spines in the middle of the basoventral lobe of each inferior appendage may an autapomorphy, not homologous with the more nearly apical spines of other *C. riparia* Group species. If true, then a close relationship with *C. nankingensis* (Huang, 1957) and *C. brachyacantha* Yang and Morse, 1988, seems reasonable because of the similarly long sternum IX and more abruptly short pleura IX, especially with *C. brachyacantha* for which tergum X is similarly angled dorsad from the base. However, no "dimples" have been detected in tergum IX of *C. interispina*.

Ceraclea (*Athripsodina*) *parakamonis*, NEW SPECIES
Figs. 90, 194

DESCRIPTION: Head and thorax reddish brown, frons with white hairs in the middle, brown hairs in lateral parts, vertex and palpi with white and brown hairs intermixed. Forewing light brown with dark brown setae.

MALE GENITALIA (Fig. 90): Short segment IX forming narrow band in dorsal half with longer, quadrate ventral half in lateral view. Preanal appendages about as long as broad, widely separated basally. Tergum X long, about 3 times as long as preanal appendages, generally parallel-sided, sinuate in lateral view, with rounded setose apex; dorsum with convex, bare mesal region defined by 2 longitudinal ridges, widely separated at base, converging near apex; lateral processes of tergum X slender and straight, about one half as long as middle portion and closely appressed with its sides. Basoventral lobe of each inferior appendage with massive base upright, distal half cylindrical, one half as broad as that of basal half, abruptly curved backward and downward with blunt apex bearing one apical and one sub-apical spines; in caudal view, its mesal edge produced in broad rounded lobe bearing several long, stout setae; main body of each inferior appendage with apical half curved mesocaudad, harpago longer than sub-apicodorsal lobe. Phallobase with anterior end enlarged such that phallic foramen positioned on ventral surface nearly one-third distance from anterior end, broadest at level of phallic foramen, about 4 times as broad as posterior portion, 2 times as broad as anterior portion; apicoventral cleft of phallobase shallow; sclerotized paramere spine single, slightly shorter than phallobase, vestigial paramere spine short, brownish, membranous.

FEMALE GENITALIA (Fig. 194): Segment IX broad transversely, at least 3 times as wide as its own length in ventral view. Tergum IXa and IXb conspicuous, lower portion of pleural region expanded laterally in sub-quadrate lobe in dorsal view. Preanal appendages semicircular. Tergum X forming mesal lobe at lower level than tergum IX and between preanal appendages, slightly smaller than either preanal appendage. Lamellae each with longitudinal ridge on outer surface; venter setose. Gonopod plates quadrate, each concave mesally with pair of oblique ridges anterolaterally, each apicomesally with 2 lobes with mesal one as long as and 2 times as broad as lateral one. Spermathecal sclerite long, elliptical, about 2.5 times as long as broad.

LENGTH OF FOREWING: Male 7.9-8.5 mm, female 6.0-6.6 mm

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 82b (NAU). Paratypes--20 males, 32 females, Loc. 82b (NAU); 10 males, 10 females, Loc. 82b (CUAC).

DIAGNOSIS: The male of this species is somewhat similar to that of *C.* (*A.*) *kamonis* in the general shape of the inferior appendages, but differs from it in the following ways: (1) tergum X sinuate with rounded apex extending far beyond the preanal appendages in lateral view (preanal appendages longer and tergum X shorter in *C. kamonis*), (2) the lateral process of tergum X well developed (none shown by Tsuda, 1942b, for *C. kamonis*), and (3) the apex of the basoventral lobe of each inferior appendage bears one apical and one sub-apical stout spines (one huge spine in *C. kamonis*).

DISTRIBUTION: Known from only the type locality southcentral China.

PHYLOGENY: *Ceraclea kamonis* is probably the sister species of *C. parakamonis*. Tsuda's illustration of the male genitalia for *C. kamonis* shows an upright, massive basoventral lobe of each inferior appendage with the distal half reduced in a cylindrical, curved process (perhaps a huge apical spine). This form of the basoventral lobe of the inferior appendage is unique among *Ceraclea* species. These two species together constitute one of the three unresolved lineages of the monophyletic complex that involves also *C. grossa* and *C. singularis*, as discussed for *C. grossa* above.

Ceraclea (*Athripsodina*) *singularis*, NEW SPECIES
Figs. 91, 195

DESCRIPTION: Head and thorax brown; vertex, frons and palpi with mostly brown setae, with some white setae intermixed. Forewing light brown with concolorous fine brown setae.

MALE GENITALIA (Fig. 91): Segment IX same shape as for *C.* (*A.*) *grossa*, narrow band in dorsal half and quadrate in ventral half in side view. Preanal appendages short lobes, each almost as long as wide, divided basally but not widely separated from each other. Tergum X about 2.5 times as long as preanal appendages, nearly parallel-sided with apical portion narrowing to prominent mesal lobe elevated above rest of tergum in lateral view; in dorsal view, bare mid-line region defined by 2 longitudinal ridges; lateral processes stout rods, three-fourths as long as main portion of tergum, each with apex bearing few setae. Each inferior appendage with basoventral lobe huge and straight, forming angle of 65° with main body of appendage; about 1.5 times as long as basal width and basally about 2 times as broad as main body of appendage; main body of appendage curved slightly caudad, its mesal ridge produced in two setose lobes near base; harpago about as long as sub-apicodorsal lobe, bearing two apical setae. Phallobase conspicuously enlarged anteriorly such that phallic foramen positioned on ventral surface near middle of phallus; broadest at level of phallic foramen, about twice as broad as posterior portion, 1.5 times as broad as anterior portion; apical ventral lobe without cleft; left paramere spine highly sclerotized, three-fourths times as long as phallobase, right spine semimembranous, one half as long as the left one.

FEMALE GENITALIA (Fig. 195): Tergum IXa distinctive, IXb inconspicuous. Preanal appendages broad, very short. Tergum X small rounded piece, one half as long as lamellae. Lamellae 2 times as long as wide, with blunt apex and with venter convex and setose. Gonopod plates well sclerotized, separated from midline where slightly elevated except in distal one-fourth portion; lateral edges with few striae; apically each gonopod plate produced in 2 lobes with mesal lobe slightly shorter, about 2 times as broad as lateral lobe. Spermathecal sclerite mushroom-like, very broad posteriorly, dorsally bearing a huge parallel-sided plate, extending to anterior region of segment VII.

LENGTH OF FOREWING: Male 7.3 mm, female 5.7 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81b (NAU). Paratypes--1 male, 1 female, Loc. 81b (NAU).

ETYMOLOGY: Latin, "single," with reference to the single distinctive paramere spine.

DIAGNOSIS: This species is very similar to *C. grossa* as mentioned for that species above, but differs in that (1) the apex of tergum X has a prominent apical elevation, (2) the basoventral lobe of each inferior appendage is relatively narrower basally and (3) not especially curved mesad apically, (4) the mesal ridge of the main body of the appendage is produced in 2 setose lobes near the base, and (5) the anterior end of the phallus is longer.

DISTRIBUTION: Known from only the type locality in northern Si-chuan Province, southcentral China.

PHYLOGENY: The sister-group relationship of this species with *C.* (*A.*) *grossa*, and with the sister lineage of *C. kamonis* + *parakamonis* was discussed with these species above.

REVISED KEY TO ADULTS OF CHINESE *CERACLEA* SPECIES

[Illustration numbers preceded by "Fig." may be found in this work, those illustration numbers preceded by "Y&M, 1988, fig." or "Y&M, 1997, fig." may be found in the works by Yang and Morse, 1988, or Yang and Morse, 1997, respectively.

Females of the following species remain unknown and are not keyed here:

C. (*C.*) *elongata*, NEW SPECIES,
C. (*C.*) *superba* (Tsuda);
C. (*A.*) *acutipennis* Yang and Tian,
C. (*A.*) *brachyacantha* Yang and Tian,
C. (*A.*) *brachycera* Yang and Tian,
C. (*A.*) *brachyclada* Yang and Morse,
C. (*A.*) *curva* Yang and Tian,
C. (*A.*) *disemeiensis* Yang,
C. (*A.*) *globosa* Yang and Morse,
C. (*A.*) *indistincta* (Forsslund),
C. (*A.*) *lirata* Yang and Morse,
C. (*A.*) *major* (Huang),
C. (*A.*) *emeiensis* Yang and Tian,
C. (*A.*) *polyacantha* Yang and Tian,
C. (*A.*) *semicircularis* Yang and Morse,
C. (*A.*) *signaticornis* (Ulmer),
C. (*A.*) *trifurca* Yang and Morse
C. (*A.*) *vaciva* Yang and Morse.]

1. Genitalia with inferior appendages and phallus (Y&M, 1988, figs. 2A, 2D) .. male, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Y&M, 1988, figs. 31A, 31D) ..... female, 40

2(1). Phallus with well-sclerotized phallicata (Y&M, 1988, fig 2D); phallobase entire apicoventrally (as in Fig. 85Dc) ..... Subgenus *Ceraclea*, 3
2'. Phallus without separate, well-sclerotized phallicata (Y&M, 1988, fig. 8D); phallobase usually with longitudinal cleft apicoventrally (Figs. 87C, 90Dv) ... . Subgenus *Athripsodina*, 7

3(2). Preanal appendages broad, fused basally for a short distance (Y&M, 1988, fig. 2B); tergum X upturned in middle (Y&M, 1988, fig. 2A); harpago with triangular, sub-apical projection (Y&M, 1988, fig. 2C) 4
3'. Preanal appendages small, separated basally (Y&M, 1988, fig. 4B); tergum X straight (Y&M, 1988, fig. 5A'); harpago without sub-apical projection (Y&M, 1988, fig. 4C) 6

4(3). Tergum X truncate apically, with pair of ear-like ridges laterally in middle (Y&M, 1988, fig. 3A); each inferior appendage with spine-bearing basoventral lobe (Y&M, 1988, fig. 3A) and strong spine on caudal face of mesal ridge (Y&M, 1988, fig. 3C) ..... C. *alboguttata* (Hagen), see Y&M, 1988.
4'. Tergum X rounded apically, without lateral ridges (Y&M, 1988, fig. 2A); each inferior appendage either without basoventral lobe (Y&M, 1988, fig. 2A) or lobe without apical spines (Fig. 86A); mesal ridge (me.rdg) of each inferior appendage without strong spine on caudal face (Fig. 86Ev) 5

5(4'). Each inferior appendage with basoventral lobe short, cone-like (Fig. 86A); dorsal margin of phallobase 2 times as long as ventral margin (Fig. 86D) .... C. *elongata*, n. sp., p. 42.

5'. Each inferior appendage with basoventral lobe not evident (Y&M, 1988, figs. 2A, 2C); dorsal margin of phallobase as long as ventral margin (Y&M, 1988, fig. 2D) ..... *C. spinulicolis* Yang and Morse, see Y&M, 1988.

6(3'). Tergum X no longer than preanal appendages, without spine-bearing lateral processes (Y&M, 1988, fig. 4A); each harpago longer than main body of its inferior appendage (not including sub-apicodorsal lobe, Y&M, 1988, figs. 4A, 4C); paramere spines longer than phallicata (Y&M, 1988, fig. 4D) .... *C. superba* (Tsuda), see Y&M, 1988.

6'. Tergum X twice as long as preanal appendages, with spine-bearing lateral processes (Y&M, 1988, figs. 5A', 5B); each harpago about half as long as main body of its inferior appendage (Y&M, 1988, fig. 5C); paramere spines shorter than phallicata (Y&M, 1988, fig. 5D) ..... *C. sinensis* (Forsslund), see Y&M, 1988.

7(2'). Lateral processes of tergum X small, finger-like, not reaching middle of main portion of tergum (Y&M, 1988, fig. 6A); basoventral lobe of each inferior appendage with row of 5-6 stout spines laterally (Y&M, 1988, fig. 6A); dorsal parameres present (Y&M, 1988, fig. 6D) ..... *C. major* (Huang), see Y&M, 1988.

7'. Lateral processes of tergum X absent (Y&M, 1988, figs. 21A, 22A) or reaching at least middle of main portion of tergum (Y&M, 1988, fig. 23A); basoventral lobe of each inferior appendage absent (Y&M, 1988, fig. 23A) or with all spines apical (Y&M, 1988, fig. 16C') or sub-apically on mesal surface (Y&M, 1988, fig. 12C'); only one or two paramere spines present, dorsal parameres absent (Fig. 86D; Y&M, 1988, figs. 7D, 9D, 12D, 29D) 8

8(7'). Main body of each inferior appendage inconspicuous (Y&M, 1988, fig. 21C) or absent (Y&M, 1988, fig. 22C), harpago absent 9

8'. Main body of inferior appendage at least as large as its basoventral lobe (Y&M, 1988, figs. 12A, 20A), harpago present 13

9(8). Main body of each inferior appendage slender, semimembranous and basoventral lobe with tapered apex in ventral view (Y&M, 1988, fig. 21C); phallus with two separate paramere spines (Y&M, 1988, fig. 21a) .... *C. lirata* Yang and Morse, see Y&M, 1988.

9' Main body of each inferior appendage absent (Y&M, 1988, fig. 22C) 10

10(9'). Paramere spines fused for only five-sixths of their length apically (Y&M 1997, fig. 3D); preanal appendages fused for one-third of their length from base (Y&M, 1997, fig. 3B) ..... *C. vaciva* (Y&M, 1997), see Y&M, 1997.

10'. Parameres completely fused into a single spine, preanal appendages separated from each other from their base (Y&M, 1988, figs. 21B, 29D) 11

11(10'). Basoventral lobe of each inferior appendage huge, strongly curved at mid distance in semicircle (Y&M, 1997, figs. 6A, 6A) .... *C. semicircularis* (Y&M, 1997), see Y&M, 1997.

11'. Basoventral lobe of each inferior appendage not strongly curved at mid distance in semicircle (Y&M, 1997, figs. 5A, 5C) 12

12(11'). Basoventral lobe of each inferior appendage short, only half as long as height of segment IX, constricted near middle with apex tapered (Y&M, 1997, figs. 5A,

5C) ..... *C. brachyclada* (Y&M, 1997), see Y&M, 1997.

12'. Basoventral lobe of each inferior appendage long, at least three-fourths as long as height of segment IX, with apex enlarged and recurved (Morse, 1975, figs. 97A, 97C; Y&M, 1988, figs. 22A, 22C) ..... *C. fooensis* (Mosely), see Y&M, 1988.

13(8'). Each inferior appendage with distinct basoventral lobe (Y&M, 1988, figs. 7A, 12A) 14

13'. Each inferior appendage without basoventral lobe (Y&M, 1988, figs. 23A, 24A) .. 33

14(13). Tergum X without slender lateral processes (Y&M, 1988, fig. 8D) 15

14'. Tergum X with slender lateral processes (Y&M, 1988, figs. 1A, 10A) 16

15(14). Preanal appendages rounded apically in dorsal view (Y&M, 1988, fig. 7B); mesal ridge of each inferior appendage sub-triangular (Y&M, 1988, fig. 7A); paramere spines 2/3 as long as phallobase (Y&M, 1988, fig. 7D) ..... *C. indistincta* (Forsslund), see Y&M, 1988.

15'. Preanal appendages nearly acute in dorsal view (Y&M, 1988, fig. 8D); mesal ridge hooked dorsad (Y&M, 1988, fig. 8C); paramere spines half as long as phallobase (Y&M, 1988, fig. 8D) ..... *C. lobulata* (Martynov), see Y&M, 1988.

16(14'). Preanal appendages at least as long as tergum X (Y&M, 1988, figs. 30A, 30B) ..... *C. signaticornis* (Ulmer), see Y&M, 1988.

16'. Preanal appendages no more than 2/3 as long as tergum X (Y&M, 1988, fig. 9A) 17

17(16'). Basoventral lobe of each inferior appendage without stout apical spines, although normal hairs often present (Fig. 87A; Y&M, 1988, fig. 9A); one paramere spine far anterior of other one and much smaller, seta-like (Y&M, 1988, fig. 9D, 12D), or anterior paramere spine absent (Fig. 87D) 18

17'. Basoventral lobe of each inferior appendage with stout apical spine (Y&M, 1988, figs. 16A, 16C') or spines (Figs. 88A, 88Ec; Y&M, 1988, figs. 12A, 12C'); paramere spines subequal and arranged end-to-end (Fig. 88D; Y&M, 1988, fig. 12D) or one paramere spine semimembranous (Fig. 89D) 21

18(17). Basoventral lobe of each inferior appendage broad basally, tapering to acute apex (Y&M, 1988, figs. 10A, 10C) ..... *C. shuotsuensis* (Tsuda), see Y&M, 1988.

18'. Basoventral lobe of each inferior appendage more slender basally, with blunt apex in lateral view (Fig. 87A; Y&M, 1988, figs. 9A, 11A) 19

19(18'). Basoventral lobe of each inferior appendage straight (Fig. 87A; Y&M, 1988, fig. 9A); phallic guide of inferior appendage without sinuous caudal ridge (Fig. 87Ec; Y&M, 1988, fig. 9A) 20

19'. Basoventral lobe of each inferior appendage bent caudad (Y&M, 1988, fig. 11A); phallic guide with sinuous caudal ridge (Y&M, 1988, figs. 11A, 11C) ..... *C. globosa* Yang and Morse, see Y&M, 1988.

20(19). Tergum X rounded with small apical cusp in dorsal view (Y&M, 1988, fig. 9B), its lateral processes small, without apical spines (Y&M, 1988, figs. 9A, 9B); phallic guide of each inferior appendage prominent (Y&M, 1988, fig. 9C); phallobase less than half as tall as segment IX in lateral view (Y&M, 1988, figs.

9A, 9D) ..... *C. excisa* (Morton), see Y&M, 1988.

20'. Tergum X acute-triangular in dorsal view (Fig. 87B), its lateral processes extending beyond its main portion and each bearing 2 stout apical spines (Figs. 87A, 87B); phallic guide of each inferior appendage vestigial, not prominent (Fig. 87Ec); phallobase huge, three-fourths as tall as segment IX in side view (Fig. 87A) ..... *C. ampliata*, n. sp., p. 43.

21(17'). Basoventral lobe of each inferior appendage with huge apical spine at least 2/3 as long as lobe, with slender spine sub-apically (Y&M, 1988, figs. 20A, 20C) ... . *C. forcipata* (Forsslund), see Y&M, 1988.

21'. Basoventral lobe of each inferior appendage with only short apical spine or spines no more than 1/4 as long as lobe, with or without sub-apical spine or spines (Y&M, 1988, figs. 14C, 16C) 22

22(21'). Basoventral lobe of each inferior appendage with 1, 2, or 3 stout spines on short median process (Y&M, 1988, fig. 13C) ..... ') ..... *C. interispina* Yang and Tian, see Y&M, 1988.

22'. Basoventral lobe of each inferior appendage without spine-bearing median process (Figs. 88Evp, 89Evp; Y&M, 1988, fig. 12C') 23

23(22'). Basoventral lobe of each inferior appendage with 4-5 stout apical and sub-apical spines (Fig. 89Evp; Y&M, 1988, fig. 12C') 24

23'. Basoventral lobe of each inferior appendage with no more than 3 apical and sub-apical spines (Fig. 90Evp; Y&M, 1988, figs. 14A, 14C) 26

24(23). Phallus with only one paramere spine fully sclerotized, the other semimembranous, below and parallel with the sclerotized spine (Figs. 89D) 25

24'. Phallus with both paramere spines fully sclerotized, aligned end-to-end (Y&M, 1988, fig. 12D) ..... *C. polyacantha* Yang and Morse, see Y&M, 1988.

25(24). Apex of basoventral lobe of each inferior appendage strongly curved mesad (Fig. 89Evp), mesal ridge of its main body produced in inconspicuous setose lobe (Fig. 89Ec) ..... *C. grossa* , n. sp., p. 46.

25'. Apex of basoventral lobe of each inferior appendage only slightly curved mesad (Fig. 91Evp), mesal ridge of main body produced in 2 setose lobes (Fig. 91Ec) ..... *C. singularis*, n. sp., p. 48.

26(23'). Basoventral lobe of each inferior appendage with basal half upright; distal half cylindrical, one-half as broad as basal portion, arched backward and downward in 145° angle (Fig. 90A); phallus with only one paramere spine fully sclerotized, the other semimembranous, below and parallel with the sclerotized spine (Fig. 90D) ..... *C. parakamonis*, n. sp., p. 47.

26'. Basoventral lobe of each inferior appendage directed more or less backward through its entire length, tapered to apex in lateral view (Fig. 88A); phallus with both paramere spines fully sclerotized, aligned end-to-end (Fig. 88D) or apparently single in retracted position (Y&M, 1988, fig. 17D) 27

27(26'). Lateral processes of tergum X upturned about 90°, each with stout apical spine (Y&M, 1988, fig. 1A) ..... *C. hwangi* (Tian), see Y&M, 1988.

27'. Lateral processes of tergum X straight, without stout apical spines (Fig. 88A;

Y&M, 1988, fig. 15A) 28

28(27'). Basoventral lobe of each inferior appendage with 1 or 2 apical spines, no sub-apical spine (Figs. 88A, 88Evp; Y&M, 1988, figs. 14A, 14C) 29

28'. Basoventral lobe of each inferior appendage with 2 apical spines, 1 sub-apical spine (Y&M, 1988, fig. 15C) ..... *C. yangi* (Mosely), see Y&M, 1988.

29(28). Basoventral lobe of each inferior appendage with 2 apical spines (Figs. 88A, 88Evp; Y&M, 1988, figs. 14A, 14C) 30

29'. Basoventral lobe of each inferior appendage with only 1 apical spine (Y&M, 1988, fig. 16C') 31

30(29). Basoventral lobe of each inferior appendage about as broad in lateral view as main body (dorsal branch) of appendage (Y&M, 1988, fig. 14A), with its apical spines fully exposed (Y&M, 1988, fig. 14C) ..... *C. riparia* (Albarda), see Y&M, 1988.

30'. Basoventral lobe of inferior appendage about twice as broad in lateral view as main body of appendage (Fig. 88A), with its stout apical spines hidden basally by flanges (Fig. 88Evp) ..... *C. celata*, n. sp., p. 44.

31(29'). Tergum X slender in apical 1/3 in dorsal view (Y&M, 1988, fig. 18B); its lateral processes upturned about 60°, reaching dorsal profile of tergum in lateral view (Y&M, 1988, fig. 18A) ..... *C. trifurca* Yang and Morse, see Y&M, 1988.

31'. Tergum X broad apically in dorsal view (Y&M, 1988, fig. 17B); its lateral processes nearly straight, parallel with lateral edges of tergum (Y&M, 1988, fig. 17A) 32

32(31'). Basoventral lobe of each inferior appendage with apical spine about 1/8 as long as lobe (Y&M, 1988, fig. 17C'); paramere spine apparently single in normal retracted position (Y&M, 1988, fig. 17D) .... *C. brachyacantha* Yang and Tian, p. see Y&M, 1988.

32'. Basoventral lobe of each inferior appendage with apical spine about 1/3 as long as lobe (Y&M, 1988, fig. 16C'); two paramere spines aligned end-to-end (Y&M, 1988, fig. 16D) ..... *C. nankingensis* (Huang), see Y&M, 1988.

33(13'). Tergum X with lateral processes (Y&M, 1988, fig. 23A) 34

33'. Tergum X without lateral processes (Y&M, 1988, fig. 27A') 37

34(33). Lateral processes of tergum X 1.5 times as long as preanal appendages, widely separated from tergum basally, upturned about 45° apically (Y&M, 1988, fig. 29A); tergum X abruptly narrower beyond preanal appendages (Y&M, 1988, fig. 29B) 35

34'. Lateral processes of tergum X no longer than preanal appendages, closely applied to tergum basally, thick and blunt and little if any upturned apically (Y&M, 1988, fig. 23A); tergum X narrowed only slightly apically in lateral view (Y&M, 1988, fig. 23A), with apex blunt and sub-parallel sided in dorsal view (Y&M, 1988, fig. 23B) 36

35(34). Lateral processes of tergum X recurved evenly, each with acute apex (Yang, Wang, and Leng, 1997, fig. 1A) .... *C. disemeiensis* Yang, see Yang, Wang, and Leng, 1997.

35'. Lateral processes of tergum X each straight through most of its length and with upturned apex blunt (Y&M, 1988, fig. 29A) ..... *C. emeiensis* Yang and Tian, see Y&M, 1988.

36(34'). Sternum IX completely divided longitudinally, its posterior ventral corners elongated, twice as long as rest of sternum (Y&M, 1988, fig. 23A); phallic guide of each inferior appendage long, saber-like (Y&M, 1988, fig. 23C), mesal ridge with small truncate projection ..... *C. ensifera* (Martynov), see Y&M, 1988.

36'. Sternum IX not divided and without long apical processes (Y&M, 1988, fig. 24A); phallic guide not saber-like, mesal ridge with dagger-like process (Y&M, 1988, fig. 24C) ..... *C. kolthoffi* (Ulmer), see Y&M, 1988.

37(33'). Preanal appendages finger-like, divergent (Y&M, 1988, fig. 26B); tergum X apex not cleft on meson ..... *C. curva* Yang and Tian, see Y&M, 1988.

37'. Preanal appendages triangular and parallel or convergent (Y&M, 1988, figs. 25B, 27B); tergum X apex cleft on meson 38

38(37'). Preanal appendages shorter than tergum X (Y&M, 1988, fig. 25A); tergum X with pair of dorsolateral finger-like processes (Y&M, 1988, fig. 25B) ..... *C. brachycera* Yang and Tian, see Y&M, 1988.

38'. Preanal appendages longer than tergum X (Y&M, 1988, fig. 28A); tergum X without pair of finger-like processes but with pair of thick recurved, apical sensilla-bearing pads (Y&M, 1988, fig. 27B') 39

39(38'). Mesal ridge of each inferior appendage with apical process falcate (Y&M, 1988, fig. 28C) ..... *C. acutipennis* Yang and Tian, see Y&M, 1988.

39'. Mesal ridge of each inferior appendage with apical process blunt and sub-triangular (Y&M, 1988, fig. 27C) ..... *C. dingwuschanella* (Ulmer), see Y&M, 1988.

40(1'). Lamellae semicircular in lateral view (Y&M, 1988, fig. 31A); gonopod plates with evident longitudinal striae laterally and each plate convex with single caudal projection (Y&M, 1988, fig. 31C) 41

40'. Lamellae semicircular (Y&M, 1988, fig. 35A) or elliptical (Y&M, 1988, fig. 40A) in lateral view, but if semicircular then gonopod plates without lateral striae (Y&M, 1988, fig. 35C); gonopod plates with or without lateral striae, but if with striae then each plate concave and with two caudal projections (Y&M, 1988, fig. 40C) 42

41(40). Lamellae without ventral striae (Y&M, 1988, figs. 31A, 31C) although faint striae may be present laterally (Y&M, 1988, figs. 31A, 31C); preanal appendages very short transverse ridges (Y&M, 1988, fig. 31B) ..... *C. spinulicolis* Yang and Morse, see Y&M, 1988.

41'. Lamellae with ventral striae (Y&M, 1988, figs. 32A, 32C); preanal appendages longer than tergum IX and semicircular in dorsal view (Y&M, 1988, fig. 32B) ..... *C. alboguttata* (Hagen), see Y&M, 1988.

42(40'). Tergum IX dorsal process truncate apically in dorsal view, with pair of small lateral protuberances (Y&M, 1988, fig. 42B) ..... *C. forcipata* (Forsslund), see Y&M, 1988.

42'. Tergum IX dorsal process rounded (Fig. 191B, Y&M, 1988, fig. 33B) or cleft (Fig.

193B, Y&M, 1988, fig. 44B) apically in dorsal view 43

43(42'). Spermathecal sclerite with long, sclerotized supporting ribbons extending anterad beyond sclerite (Y&M, 1988, figs. 35A, 35D) 44

43'. Spermathecal sclerite without ribbons anterior of sclerite (Figs. 191A, 191C; Y&M, 1988, figs. 33A, 33D) 45

44(43). Anterior supporting ribbons of spermathecal sclerite extending only to middle of abdominal segment VIII (Y&M, 1988, fig. 35A); gonopod plates each with dark pit apicomesally (Y&M, 1988, fig. 35C) ..... *C. excisa* (Morton), see Y&M, 1988.

44'. Anterior supporting ribbons of spermathecal sclerite extending to anterior end of segment VIII (Y&M, 1988, fig. 36A); gonopod plates without pits (Y&M, 1988, fig. 36C) ..... *C. shuotsuensis* (Tsuda), see Y&M, 1988.

45(43'). Gonopod plates each with transverse ridge near middle (Y&M, 1988, fig. 33C); spermathecal sclerite ovoid to pear-shaped, broadest near middle, rounded anteriorly in ventral view (Y&M, 1988, fig. 33D) ..... *C. sinensis* (Forsslund), see Y&M, 1988.

45'. Gonopod plates without ridges (Fig. 192C, Y&M, 1988, fig. 43C) or each with indentation (Fig. 191C) or longitudinal ridge (Fig. 193C; Y&M, 1988, figs. 45C, 46C); spermathecal sclerite angled laterally (Fig. 191C) or parallel-sided (Fig. 193C) or broadest posteriorly (Fig. 192C) and blunt (Fig. 191C) or truncate (Fig. 192C, Y&M, 1988, fig. 43D) or with small projection (Y&M, 1988, fig. 46D) anteriorly 46

46(45'). Gonopod plates each with depression (Figs. 191C, 193C) or without longitudinal ridge (Fig. 192C, Y&M, 1988, fig. 43C) 47

46'. Gonopod plates without depressions and each with longitudinal ridge from middle of sclerite to its posterior margin (Y&M, 1988, figs. 45C, 46C) 58

47(46). Each gonopod plate with one posterior process (Fig. 191C, Y&M, 1988, fig. 43C) . 48

47'. Each gonopod plate with two posterior processes, its lateral process sometimes partly hidden above mesal one (Y&M, 1988, fig. 34C) or with mesal process sometimes much smaller than lateral one (Fig. 192C, Y&M, 1988, fig. 37C) 49

48(47). Posterior process of each gonopod plate finger-like, 2 times as long as wide, with blunt apex (Fig. 191C) ..... *C. ampliata*, n. sp., p. 43.

48'. Posterior process of each gonopod plate triangular, its length no more than its basal width, with sub-acute apex (Y&M, 1988, figs. 34C, 43C) ..... *C. fooensis* (Mosely), see Y&M, 1988.

49(47'). Gonopod plates convex, their lateral posterior processes square, much shorter than and mostly hidden above large mesal processes (Y&M, 1988, fig. 34C) ..... *C. lobulata* (Martynov), see Y&M, 1988.

49'. Gonopod plates concave, their lateral posterior processes elliptical, longer than mesal processes and fully exposed (Fig. 192C, 194C; Y&M, 1988, fig. 37C) 50

50(49'). Sternum IX transverse-rectangular, at least 3 times as wide as its own length in ventral view, gonopod plates each with oblique ridge on anterolateral region (Fig. 194C) ..... *C. parakamonis*, n. sp., p. 47.

50'. Sternum IX no more than 2 times as wide as long (Fig. 192C, Y&M, 1988, fig. 38C), gonopod plates without oblique anterolateral ridges 51

51(50'). Abdominal segment IX pleural regions concave, with conspicuous lateral pockets above gonopod plates (Y&M, 1988, figs. 37A, 37C); spermathecal sclerite diamond-shaped (Y&M, 1988, fig. 37D) ..... *C. interispina* Yang and Tian, see Y&M, 1988.

51'. Abdominal segment IX pleural regions convex (Y&M, 1988, fig. 38A, 38C); spermathecal sclerite parallel-sided (Fig. 193C), triangular (Y&M, 1988, fig. 38C), elliptical (Y&M, 1988, fig. 39D), or with dorsal plate extending anterad (Fig. 195C) 52

52(51'). Spermathecal sclerite mushroom-like, bearing huge dorsal plate extending to anterior region of segment VII (Fig. 195C) ..... *C. singularis*, n. sp., p. 48.

52'. Spermathecal sclerite shaped otherwise, without dorsal plate extending anterad (Fig. 192C) 53

53(52'). Each gonopod plate with deep sub-mesal depression 2/3 distance to apex, pleural regions of segment IX with evident striations (Fig. 193C) ... *C. grossa* , n. sp., p. 45.

53'. Gonopod plates without deep depressions (Fig. 192C, Y&M, 1988, fig. 39C) 54

54(53'). Pair of rugose pockets ventrally in intersegmental membranes anterior of gonopod plates (Fig. 192C) ..... *C. celata* , n. sp., p. 44.

54'. Rugose pockets absent in intersegmental membranes (Y&M, 1988, fig. 38C) 55

55(54'). Gonopod plate mesal caudal projections rounded (Y&M, 1988, fig. 39C) ..... *C. yangi* (Mosely), see Y&M, 1988.

55'. Gonopod plate mesal caudal projections acute (Y&M, 1988, figs. 38C, 40C) 56

56(55'). Gonopod plates broadest in middle (Y&M, 1988, fig. 40C); spermathecal sclerite broadest in middle (Y&M, 1988, fig. 40D) ..... *C. nankingensis* (Huang), see Y&M, 1988.

56'. Gonopod plates broadest anteriorly (Y&M, 1988, fig. 41C); spermathecal sclerite broadest posteriorly (Y&M, 1988, figs. 38C, 39D) 57

57(56'). Lamellae triangular in lateral view, each with dorsal edge straight to rounded apex (Y&M, 1988, fig. 38A) ..... *C. riparia* (Albarda), see Y&M, 1988.

57'. Lamellae quadrilateral in lateral view, each parallel-sided basally with dorsal apex oblique (Y&M, 1988, fig. 41A) ..... *C. hwangi* (Tian), see Y&M, 1988.

58(46'). Abdominal segment IX pleural regions concave (Y&M, 1988, fig. 46A); gonopod plates convex between longitudinal ridges, with long and slender apicomesal projections (Y&M, 1988, fig. 46C) ... *C. dingwuschanella* (Ulmer), see Y&M, 1988.

58'. Abdominal segment IX pleural regions convex (Y&M, 1988, fig. 44A); gonopod plates concave between longitudinal ridges, with triangular (Y&M, 1988, fig. 45C) or inconspicuous (Y&M, 1988, fig. 44C) apicomesal projections 59

59(58'). Gonopod plate anterior margins projecting anteromesally into abdominal segment VIII and anterior ends of longitudinal ridges divergent (Y&M, 1988, fig. 44C) ..... *C. ensifera* (Martynov), see Y&M, 1988.

59'. Gonopod plate anterior margins projecting anterolaterally into abdominal segment VIII and anterior ends of longitudinal ridges convergent (Y&M, 1988, fig. 45D) ..... *C. kolthoffi* (Ulmer), see Y&M, 1988.

Nectopsychini Morse, 1981

Nectopsychini Morse, 1981, pp. 261, 262;
Type genus: *Nectopsyche* Müller, 1879.

PHYLOGENY: According to Morse (1981), this tribe includes only the sister genera *Nectopsyche* Müller, from the New World, and *Parasetodes* McLachlan, from the Old World. The tribe is the sister lineage to the branch that gave rise to *Brachysetodes* Schmid, *Poecilopsyche* Schmid, and Leptocerini + Triaenodini + Oecetini + Setodini + Mystacidini (Morse, 1981). Monophyly for the tribe is indicated by the homologous absence of the stems of the sector and median veins in the hindwing; monophyly for the other taxa listed above is indicated by their narrow hindwings (Morse, 1981).

LARVAE: Larvae of *Nectopsyche* were described by Müller (1879), Vorhies (1909, as *Leptocella uwarowii* Kolenati), Elkins (1936, as *Leptocella uwarowii*), Ross (1944, as *Leptocella* spp.), Wiggins (1977), Haddock (1977), and Daigle and Haddock (1981); those of *Parasetodes* by Marlier (1958, 1962). The larvae are natatorial, living in lakes, especially with thick vegetation, or in slower portions of rivers on the bottom or on plants. The ventral apotome of the head is triangular, relatively longer than in Athripsodini, and not separating the genae posteriorly in *Parasetodes*; gills usually are present on anterior abdominal segments; the tibia of each hindleg is without an apparent subdivision. The metanotal bars seen on Athripsodini larvae are absent in this tribe. The case is conical and straight, composed of mineral or plant material, and extremely slender.

PUPAE: Pupae of *Nectopsyche* were described by Ross (1944, as *Leptocella* sp.) and Haddock (1977); those of *Parasetodes* by Marlier (1958, 1962). The mandibles are slightly curved, never projecting in the middle, and without teeth or serrations; each foretibia has one spur; anal appendages are long and slender, slightly tapering from base to apex; anterior hook plates oval and occurring on abdominal terga III through VI, posterior hook plates on abdominal tergum V.

ADULTS: The adults of Nectopsychini are slender, delicate, generally colored very light shades of testaceous or yellow, with light colored hairs covering the wings and often with black or brown or silver patches of hairs in distinctive patterns among the lighter ones. Forewings are narrow with venation similar to that of male Athripsodini; hindwings are broad as in Athripsodini, but with the stems of the sectoral and median veins vestigial or absent. Tibial spurs are arranged 1, 2, 2 on the three tibia from front to hind tibia, respectively.

DISTRIBUTION: Reported from all biogeographic regions except the Australasian Region and Antarctica.

Parasetodes McLachlan, 1880

Parasetodes McLachlan, 1880, p. 66.
Type species: *Setodes respersellus* Rambur (monobasic).

PHYLOGENY: Monophyly for this genus is indicated by the branched condition of each male inferior appendage and the unbranched condition of the hindwing median vein. Monophyly for the sister genus *Nectopsyche* is indicated by the pair of unpigmented lines delimiting the

anterolateral corners of the larval pronotum and, in the adult male genitalia, by the relatively low position of tergum X and the presence of a conspicuous pair of external periphallic processes (Morse, 1975). Holzenthal (1995) provided seven synapomorphies for *Nectopsyche*.

LARVAE (Marlier 1958, 1962): The larva of *Parasetodes* is white with pale yellow integument; long, slender, cylindrical. The head has its large eyes situated in the anterior third. The frons is broad anteriorly, acute posteriorly, with a pair of conspicuous lateral notches. The antennae are very long, extending to the level of the apex of the labrum. The maxillae and their palps extend well beyond the labrum. As for *Nectopsyche*, the ventral apotome is sub-triangular, but the ventral apotome of *Parasetodes* differs from that of *Nectopsyche* in being closed posteriorly by the genae (Fig. 23). Thoracic sclerites are weakly sclerotized. (Larvae of *Parasetodes* have not been seen by us so that we cannot remark on the presence or absence of unpigmented lines delimiting the anterolateral corners of the pronotum as seen in *Nectopsyche*.) Metathoracic tibiae are not subdivided by any secondary annulations (Fig. 24). Abdominal gills occur on segments II through VI; gills occur singly, if at all, in *Nectopsyche*, but are mostly multibranched clusters in *Parasetodes*. The case is composed of flat quadrangular plant material joined edge to edge lengthwise.

PUPAE: Insufficient information is available to distinguish *Nectopsyche* and *Parasetodes* pupae. The illustration of the *Nectopsyche* pupal mandible given by Ross (1944) shows the lateral base with two hairs and its edge directed anteriorly, parallel with the body midline; that given for *Parasetodes* by Marlier (1962) does not show any hairs and its edge is angled conspicuously laterad (Fig. 42).

ADULTS: The median vein in each *Parasetodes* hindwing apparently lacks apical branches (Fig. 66); there are two apical median veins in each *Nectopsyche* hindwing. The male genitalia lack external periphallic processes (Fig. 92D) in *Parasetodes* species and each inferior appendage is deeply divided into two branches (Fig. 92A).

DISTRIBUTION: Species of this genus are known from the Afrotropical, Oriental, and Palearctic Biogeographic Regions.

HABITAT: Larvae live in lentic habitats rich in vegetation and humic material (Marlier, 1962).

FEEDING HABITS: Unknown.

Parasetodes aquilonius Yang and Morse, 1997
Figs. 92, 196

Parasetodes aquilonius Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, p. 177, 179, pl. 114 fig. 1-5, pl. 115 fig. 1-3.

DESCRIPTION: Specimens preserved in alcohol with hairs badly rubbed. Coloration of body and forewings (Fig. 92F) nearly identical with that of *Pa. maculatus* (Fig. 94F). Forewing anastomosis arranged in more nearly straight line (Fig. 92F) than in *Pa. maculatus* (Fig. 94F, in which anastomosis arched).

MALE GENITALIA (Fig. 92): Tergum X forming hood, broad at base then tapering to bifid apex; its mesal region membranous and high above rest of tergum to middle, lateral sclerotized regions each with edges parallel in lateral view to two-thirds distance from base then sharply descending to point. Inferior appendages each divided nearly to base into two branches; upper branch straight, longer than lower branch, with distal half dilated then abruptly constricted to short digitate apex bearing long terminating seta; lower branch gradually tapering and curving mesad to apex. Phallus with phallobase very short, paramere spines absent, phallicata trough-like, regularly downcurved, apically with pair of triangular lateral lobes in dorsal view, truncate in lateral view.

FEMALE GENITALIA (Fig. 196): Female genitalia very similar to those of *Pa. respersellus* (Rambur, 1842). Abdominal segment IX strongly produced at center of posterior margin (IXa); papillae processes (IXb) distinct; preanal appendages (IXc) fused with tergum X; lamellae (IXd) elongate and directed downward, visible in both dorsal and ventral views. Tergum X slender, straight, directed caudad. Gonopod plates fused into single, broad ventral band. Spermathecal sclerite with ventral process not distinctly protruding anteriorly.

LENGTH OF FOREWING: Male 10.5-11 mm, female 8.5-10 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 70 (NAU). Paratypes--CHINA: 1 male, Loc. 27 (NAU); 1 male, Loc. 32 (NAU); RUSSIA: 1 male 2 females, South Primorye, Dmitriyevka Vil., near Spassk Town, 4 Aug 1989, col. Levanidova (IBP); 1 female, South Primorye, Dmitriyevka Vil., 8 Aug 1989, Coll. Kholin (NAU); 1 male, 2 females, South Primorye, Khorol Vil., 24 Aug 1985, col. Makarchenko (CUAC);1 male, Khabarovsk Reg., Bira R. basin, Tyoploye Lake, 23 Sep 1959 (IBP); 1 male, South Primorye, "Kedrovaya Pad" Reserve, 1 Sep 1973, col. Levanidova (IBP); 2 males 2 females, South Primorye, Dmitriyevka village, near Spassk town, 2 July 1989, col. Lukyanchenko (CUAC).

ETYMOLOGY: Greek, "northern," with the reference to the present distribution of this species: Palearctic Region, northern China.

DIAGNOSIS: We were at first inclined to consider these examples as variations of *Pa. maculatus* or *Pa. kiangsinicus*, because of the similarities of the coloration of the forewings and the general resemblance of the male genitalia, but further examination from various examples has shown that the differences are consistently correlated, distinguishing this species from those two: (1) anastomosis of forewings more nearly straight; (2) sclerotized plates of male tergum X trapezoid in lateral view; (3) lower branch of each inferior appendage shorter than dorsal branch ; and (4) dorsal branch dilated in distal half, terminating in a short, digitate apex.

The female is distinguished from those of *Pa. maculatus* by (1) tergum X of the new species directed caudad rather than upward, (2) its base narrow and not hiding lamellae in dorsal view; (3) lamellae more slender in lateral view, almost three times as long as wide; and (4) spermathecal sclerite with ventral process not produced cephalad. It can possibly be distinguished from that of *Pa. respersellus* in that (1) the lamellae do not protrude as far away from the rest of the genitalia and (2) the gonopod plates are not divided at the mesal apex in this species. From both of those species, (1) abdominal segment IX (IXa) is more strongly produced caudally in the middle in lateral view and (2) the base of tergum X is much narrower in dorsal view in the *Pa. aquilonius* female.

DISTRIBUTION: Known from northern China and southeastern Russia.

PHYLOGENY: The females of this species and *Parasetodes respersellus* share long and slender lamellae and a caudally directed tergum X, suggesting that they may be sister species.

Parasetodes kiangsinicus (Ulmer, 1932)
Fig. 93

Leptocella kiangsinica Ulmer, 1932, p. 59, f. 29; holotype = male; type repository = Museum of Yen-ching (now Beijing University); type locality = Jiang-xi Province.

The existence of the holotype of this species is in doubt. We did not find this species in our collecting. However, for completeness, we provide Ulmer's (1932) original drawing (Fig. 93) and translate his description as follows (from German):

"The only male, conserved in alcohol, appears similar to *Leptocella bakeri* Banks [syn. of *maculatus*, Kimmins, 1963b; authors] as a result of the dark vein-spots decorating the forewing. The coloration seems to be almost completely as in this species. Thus: Head brownish gold, back pale, antennae whitish or goldish white, darker basally, the segments ringed dark; legs pale brownish gold, the tibiae and tarsi somewhat paler than the femora; forewing (in alcohol !) nearly colorless, with pale (goldish) hairs, the veins weakly browner, all crossveins and the branch points of the longitudinal veins spotted with dark brown; in the weakly indicated greyish brown oblique crossband, a silver-white haired spot on the upper border of the thyridial cell, before the anastomosis; hindwing nearly colorless, whitish, the veins and the marginal hairs white; the venation of both wings close to *Lp. bakeri*; in the forewing the first two crossveins of the anastomosis form a straight line situated nearly about its own length further basad; apical cells I and IV long stalked, each about as long as its stalk, cell IV and its stalk somewhat longer than cell I and its stalk. The genitalia of the male are very similar to those of *Lp. bakeri*; tergum X forms a long twisted triangular pointed plate; the preanal appendages are narrowly ribbon-like, at the end somewhat narrowed and rounded rod, shorter than tergum X; the phallus is slender, downwardly arched, at the end somewhat broadly truncate; the inferior appendage projecting as two slender branches; the ventral branch is more slender than the dorsal one, at the end sickle-shaped dorsally arched; the dorsal branch is more robust than the ventral one, slightly shorter, at the end brandished in S-shape; preanal appendages and ventral branch of the inferior appendages with long hair.

Body length: 7 mm; LENGTH OF FOREWING: 8 mm; wing span thus about 17 mm."

FEMALE AND IMMATURE STAGES: Female undescribed, immature stages unknown.

DISTRIBUTION: Only known from Jiang-xi Province in southeastern China.

MATERIAL EXAMINED: 13 males, 2 females Loc. 63 (NAU); 2 females, Loc. 57b (NAU).

We have specimens, but did not describe or illustrate them or place them phylogenetically. Why?

DIAGNOSIS: The differences of male genitalia between this species and *Pa. maculatus* are in having (1) the apical part of the lower branch of each inferior appendage sickle-shaped with its apical portion strongly arched upward and (2) the dorsal branch twisted in an S-shape.

PHYLOGENY: The sister species of *Pa. kiangsinicus* cannot be determined with the limited evidence available.

Parasetodes maculatus (Banks, 1911)
NEW CHINESE RECORD
Figs. 66, 94, 197

Leptocella maculata Banks, 1911, p. 104, pl. 6 fig. 6; holotype = male; type repository = possibly USNM; type locality = "Pusa, Bengal [India], July 30, on rice leaves."

Leptocella bakeri Banks, 1913a, p.177, pl. 9 fig. 15; Holotype = sex unknown; type repository = = unknown, possibly US National Museum of Natural History; Philippines; synonym according to Kimmins, 1963b, p. 288.

Leptocella bakeri Banks; Ulmer, 1915, pp. 56-57, figs. 28-29: Sri Lanka.

Parasetodes ussuriensis Martynov, 1935, pp. 207, 263-264, figs. 68-71; type repository = probably

Zoological Institute, St. Petersburg; type locality = Russia (Ussuri Region); possible synonym of Pa. *bakeri* according to Schmid, 1958, p. 124.

Parasetodes ussuriensis Martynov; Tsuda, 1941, p. 161: China ("Manchuria").

Leptocella bakeri Banks; Martynov, 1936, pp. 254, 301: India (Bengal, Bihar), Myanmar.

Leptocella bakeri Banks; Ulmer, 1951, p. 414, figs. 615-618: Sumatra, Philippines, Sri Lanka, India.

Leptocella bakeri Banks; Schmid, 1958, p. 124-125, pl. 22 figs. 12-14: Sri Lanka.

Parasetodes maculata (Banks); Kimmins, 1963b, p. 288: India, Sri Lanka, Myanmar, Malaya, Thailand.

DESCRIPTION: Head and thorax pale to deep yellow, sometimes yellowish brown; antennae pale yellow; frons and palps with traces of pale goldish hairs. Forewings yellowish; anastomosis, cross-veins and all forks of longitudinal veins shaded with dark brown spots; irregular faint grayish patches distributed in mid, distal, and posterior portions of the wing; distinctive silver-white spot, sub-rounded to nearly triangular, positioned on median vein about two-thirds distance from origin of thyridial cell (Fig. 94F).

MALE GENITALIA (Fig. 94): Our male specimens have genitalia almost identical with those figured by Schmid (1958) for *Pa. bakeri*. Segment IX short, a little longer ventrally than dorsally. Tergum X consisting of two vertical sclerites separated by membranous region in basal half, membranous region arching high above sclerites between slender preanal appendages, sclerites each acute and widely separated apically in dorsal view and tapering gradually to acute apex in lateral view. Inferior appendages each divided deeply into two branches: Lower branch as long as upper branch, slender ribbon-like, with apical portion produced in slender rod, terminated with few short setae, positioned somewhat laterally such that upper branch mostly visible in ventral view; upper branch with apex more sinuate than shown by Schmid, which might be a variable character. Phallus slender, regularly downcurved, pair of lateral ridges extending most of length of phallicata, constricted sub-apically and rounded apically in dorsal and lateral views (rather than diamond shaped in dorsal view and truncate in lateral view as in the following new species).

FEMALE GENITALIA (Fig. 197): Abdominal segment IX narrow, tergum IXa produced in triangular process, IXb inconspicuous. Preanal appendages each appearing as large triangular mound fused on either side of tergum X. Tergum X broad at base, tapering to narrow, truncated apex strongly turned upward; dorsal surface of apical region with mesal, longitudinal ridge. Spermathecal sclerite extending anteriorly to center of segment VIII, broader and sub-quadrate posteriorly, ventral process of sclerite about as tall as its length, conspicuously slanted forward.

The holotype and the two paratypes of *Pa. ussuriensis* are females. Martynov's (1935) description and illustrations of their distinctive genitalia suggest that they belong to this species.

MATERIAL EXAMINED: 1 male, Loc. 6; 28 females, Loc. 12b (NAU); 2 males, 1 female, Loc. 40 (NAU); 3 females, Loc. 2a (NAU); 1 female, Loc. 11b (NAU); 6 females, Loc. 58a (NAU); 4 males, 6 females, Loc. 24b (NAU); 1 male, 2 females, Loc. 24a (NAU).

DISTRIBUTION: Previously known from India (Bengal, Bihar), the Philippines, Sri Lanka, Sumatra, and Myanmar. Our collections extend its range to southeastern and southcentral China. If *Pa. ussuriensis* is a synonym, the distribution of the species also includes Russia (Ussuri Region) and northern China.

Parasetodes respersellus (Rambur, 1842)
NEW CHINESE RECORD
Figs. 95, 198

Setodes respersella Rambur, 1842, p. 515; holotype = missing (McLachlan, 1880; Ulmer, 1907b);

type repository = probably was once the Zoological Collection of the Baron Edmund de Selys Longchamps, National Museum of Natural Science in Brussels, Belgium; type locality = France (Paris)

Parasetodes respersella (Rambur); McLachlan, 1880, p.66, pl. 57 figs. 1-4; description and illustrations for male.

Parasetodes respersella (Rambur); Ulmer, 1905, p. 97; Egypt.

Parasetodes respersella (Rambur); Ulmer, 1907a, p. 137, pl. 18 fig. 170, wings of male.

Parasetodes respersella (Rambur); Ulmer, 1907b, p. 48; Japan.

Parasetodes respersella (Rambur); Martynov, 1914, pp. 413, 436; Uzbekistan (Amu-Darja River, Nukus).

Parasetodes respersella (Rambur); Martynov, 1935, p. 261-262, f. 64-67; descriptions and illustrations for female; Russia (Amur Region).

Parasetodes respercellus (Rambur); Fischer, 1966, pp. 62-63; misspelling.

Parasetodes respersella (Rambur); Malicky, 1983, p. 270; illustrations for male and female.

Our single female specimen from southern China geographically is partly congruent with *Pa. maculatus*, but the structure of the female genitalia is very different from Schmid's (1958) drawings of that species in the shape and orientation of both tergum X and the lamellae, and in the shape of the spermathecal sclerite. However, it agrees reasonably with Martynov's (1935) and Malicky's (1983) figures for the female of *Pa. respersellus*, such that, with the limited material available, we consider it to be that species.

DESCRIPTION: Coloration of body and wings same as all other species of this genus occurring in China, as described above.

MALE GENITALIA (Fig. 95): We have not seen males of this species. Regarding his male specimen from Far East Russia, Martynov (1935) said (in Russian), "Male genitalia are of normal form and similar to European and Turan [Turkestan] specimens." McLachlan (1880) described a French male specimen as follows:

> "In the male, the 9th dorsal segment is produced into a triangle, obtuse at the apex. Beneath either side of this are inserted the preanal appendages, which are elongate-oval, furnished with very long pale hairs. From between the preanal appendages proceeds an upper penis-cover, directed downward; it is broad at its base , and deeply concave, but the sides are elevated and thickened, gradually converging and ending in a point. From beneath this cover proceeds the penis, which is testaceous, long, sub-cylindrical, curved regularly downward if viewed laterally, its apex obtuse. Inferior appendages seated on rounded side-pieces of the 9th ventral segment; each consists of two up-directed branches, separated to the base, the inner or upper whitish and semi-transparent, the outer or lower slightly testaceous and opaque, with a small terminal joint, each (especially the lower) with very long pale hairs; viewed ventrally the lower branches are divergent."

FEMALE GENITALIA (Fig. 198): Tergum IXa and paired terga IXb conspicuous; preanal appendages fused with tergum X. Tergum X triangular in dorsal view with blunt, rounded apex, in lateral view parallel-sided with ventral margin straight, directed diagonally downward (Fig. 198A) or caudad (Malicky 1983). Lamellae sub-triangular and slender in lateral view, about two times as long as basal width with narrow apex directed downward; gonopod plates concave with short, longitudinal, apicomesal ridge; ventral process of spermathecal sclerite incomplete in our specimen, appearing bell-shaped, about twice as long as average width, broadest anteriorly with anterolateral corners produced in angles.

LENGTH OF FOREWING: Female 8.9 mm.
IMMATURE STAGES: Unknown.
MATERIAL EXAMINED: 1 female, Loc. 15 (NAU).
DISTRIBUTION: This species was recorded previously from throughout the southern Palearctic Region: France (Rambur, 1842; Berland and Mosely, 1937); Japan (Ulmer, 1907b); Turkestan (Martynov, 1914), Amur (Primorye Region, Martynov, 1935), and Egypt (Ulmer, 1905, 1931). If our identification is correct, this single female specimen is the first record of this species in the Oriental Region, south China.

KEY TO ADULTS OF CHINESE *PARASETODES* SPECIES

(The female of *Pa. kiangsinicus* still is unknown.)

1. Genitalia with inferior appendages and phallus (Fig. 92) ..... male, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 196) ..... female, 5

2(1). Lower branch of each inferior appendage shorter than upper branch (Fig. 92A) ..... *Pa. aquilonius* Yang and Morse, p. 59.
2'. Lower branch of each inferior appendage at least as long as upper branch (Fig. 93A) 3

3(2'). Upper branch of each inferior appendage strongly sinuate (Fig. 93A); phallus with truncate apex (Fig. 93A) ..... *Pa. kiangsinicus* (Ulmer), p. 60.
3'. Upper branch of each inferior appendage straight or slightly sinuate (Fig. 94A); phallus constricted sub-apically then enlarged to blunt apex (Fig. 94D) 4

4(3'). Tergum X downcurved with rounded membranous lobe dorsobasally (Fig. 94A) before deeply divided apex (Fig. 94B); phallus very long and downcurved, lower branch of each inferior appendage upcurved (Fig. 94A) ..... *Pa. maculatus* (Banks), p. 61.
4'. Tergum X directed caudad (Fig. 95A), with apex bifid in dorsal view (Fig. 95B); phallus much shorter and nearly horizontal (Fig. 95D) ..... *Pa. respersellus* (Rambur), p. 62.

5(1'). Tergum X straight and directed caudad in lateral view, lamellae each 2-3 times as long as basal width (Fig. 196A); spermathecal sclerite broadest anteriorly (Fig. 196C) 6
5'. Tergum X with apical one-third strongly curved upward in lateral view, lamellae each about as long as wide (Fig. 197A); spermathecal sclerite broadest posteriorly (Fig. 197C) ..... *Pa. maculatus* (Banks), p. 61.

6(5). Gonopod plates not divided on meson near apex (Fig. 196C); middle of tergum IX projecting caudad over papillae, hiding them in dorsal view (Fig. 196B) ... . *Pa. aquilonius* Yang and Morse, p. 59.
6'. Gonopod plates divided on meson (Fig. 198C); middle of tergum IX only slightly projecting, not hiding papillae in dorsal view (Fig. 198B) ..... *Pa. respersellus* (Rambur), p. 62.

Leptocerini Leach, 1815

Leptoceridae Leach, 1815, p. 136;
Type genus: *Leptocerus* Leach.

PHYLOGENY: As restricted by Morse (1981), this tribe includes only the genus *Leptocerus*. It is included in a monophyletic group with Triaenodini + Oecetini + Setodini + Mystacidini as evidenced by the homologous (1) absence of the harpago of each male inferior appendage and (2) absence of an adult midcranial sulcus (Morse, 1981). The sister lineage of Leptocerini (the other tribes just listed) is monophyletic as indicated by the homologously (1) constricted dorsal apex of the adult mesopleural katepisternum and (2) the fused condition of the male tergum X (Morse, 1981).

Leptocerus Leach, 1815

Leptocerus Leach, 1815, p. 136;
Type species: *Phryganea interrupta* Fabricius (monobasic).

PHYLOGENY: Species of *Leptocerus* constitute a monophyletic group as indicated by the following synapomorphies: (1) the larval mesothoracic tibiae and tarsi are thick, each with a row of seta-terminated teeth; (2) the larval mesothoracic claws are thick, curved, and with two apical points (Morse, 1981); (3) the larval case is entirely of silk; (4) the adult hindwing has the primary fork of S occurring beyond the origin of S_4 (r-m crossvein of authors). In the male genitalia, the following additional synapomorphies are inferred: (5) caudal pleura of segment IX with a pair of slender processes; (6) a deeply divided tergum X is expressed as a pair of long, slender processes. Furthermore, the groundplan of the male genitalia included conspicuous preanal appendages, an inferior appendage with a large basal dorsomesal lobe and a phallus with the primitive arrangement of phallobase (with phallic shield and sclerotized strips connecting or articulating with pleura IX), a pair of paramere spines arising from a membranous endotheca, and a sclerotized, tubular phallicata.

In poetic fashion, Schmid (1987) despaired of knowing the phylogeny of the species in this genus beyond the recognition of his ten Groups. ("A vrai dire, nous tenons quelques fils, mais ils sont si courts que l'on ne peut les nouer." To tell the truth, we hold some threads, but they are so short that one cannot tie them.) With the addition of new species described here from China, we are able to tie a few of the threads, but must await an opportunity to examine more of the species of the genus before the complete fabric may become evident. There are at least four principal lineages that evolved from the *Leptocerus* ancestor (Fig. 257).

In one clade, (7) the basal dorsomesal branch of each inferior appendage is especially long; (8) paramere spines are absent in species of the *Leptocerus mahawansa* Group (with [9] short tergum IX, Fig. 96A), *Lp. atidvaya* Group (with [10] a thick hair brush on the apex of each inferior appendage), and *Lp. sinuosus* Gibbs, 1973; (11) the right process of tergum X is absent in the *Leptocerus samnata* Group.

In a second clade, (12) the caudal edges of pleura IX are deeply and evenly concave and (13) the basal dorsomesal lobe of each inferior appendage is very broad and large (Fig. 97A) in the *Leptocerus atsou* Group (with [14] a compressed basal dorsomesal lobe of each inferior appendage and [15] preanal appendages fused basally), species placed by Schmid (1987) in the *Lp. ukchatara* Group (without evident synapomorphies except two species with tergum X processes absent), and *Lp. similis* McLachlan, 1875.

In a third clade, (16) the preanal appendages are fused in a single dorsal lobe. The two species of the *Leptocerus assimulans* Group species have (17) each pleuron IX process fused with its corresponding tergum X process beneath the fused preanal appendage lobe and the *Lp. speciosus* Group species have (18) the basal dorsomesal lobe of each inferior appendage very long and sub-rectangular.

In the fourth clade, (19) preanal appendages are fused with each other and with the bases of the pleura IX processes. In this last clade, *Leptocerus sadbhuta* Schmid, 1987, has only this synapomorphy. Synapomorphies among other species in this clade are as follows: (20) The paramere spines are fused basally (Figs. 105D, 106Dd) in *Lp. biwae* (Tsuda 1942b) and *Lp. dicopennis* (Huang, 1958), although they apparently do not share other synapomorphies. (21) The fusion apparently is complete in the remaining species, such that there is but one paramere spine (Fig. 100D) in species of the *Leptocerus mechakita* Group, the *Lp. mahasena* Group, the *Lp. atiraskrita* Group, and in the species *Lp. chiangmaiensis* Malicky, 1991, *Lp. datrayukta* Schmid, 1987, *Lp. lanzenbergeri* Malicky, 1991, and *Lp. sukhabaddha* Schmid, 1987, although no other synapomorphies are known by which to relate the species *Lp. chiangmaiensis*, *Lp. datrayukta*, and *Lp. lanzenbergeri* with each other or with the other lineages of this clade. (22) Pleura IX are deeply divided just below the preanal appendages + pleura IX processes and (23) the single paramere spine is a slender filament (Fig.101D) in species of the *Leptocerus atiraskrita* Group, the *Lp. mahasena* Group, the *Lp. mechakita* Group (with [24] tergum X asymmetrical and divided only apically), the *Lp. interruptus* Group (with [25] the paramere spine absent and [26] tergum X asymmetrical), and *Lp. sukhabaddha* Schmid, 1987. (27) Tergum X processes are virtually absent in species of the *Leptocerus mahasena* Group (with [28] very short phallicata) and species of the *Lp. atiraskrita* Group (with [29] huge pleura IX processes).

While these hypotheses do not account for many of Schmid's (1987) species *incertae sedis* ("espèces isolées ou peu connues"), at least the broad outlines of the phylogeny for the genus are thus comprehensible.

LARVA: Larvae of *Leptocerus* species were described by Vorhies (1909, as "*Setodes*"), Lloyd (1921, as "*Setodes*"), Betten (1934, as "*Setodes*"), Ross (1944), Ulmer (1955, as "*Setodes*"), Hickin (1943b, 1967), Lepneva (1966), Wiggins (1977, 1996), Wallace (1981), Wallace et al. (1990), and Waringer and Graf (1997). Larvae are distinguished from those of other Leptoceridae genera mostly by the thickened mesothoracic tibiae, each with a ventral row of seta-bearing teeth, by the thick mesothoracic claws, each strongly hooked and with two apical teeth (Fig. 20), and by the long metathoracic legs, each usually with a dense fringe of swimming hairs. In addition, the sclerotized head, pronotum, and mesonotum have dark spots. The ventral apotome of the head is sub-triangular. The abdomen lacks gills or has only two laterally at the anterior margin of the second segment, tergum IX lacks a sclerotized plate, the anal prolegs have large setae dorsally, and the anal claw has one to three dorsal accessory denticles. In life, they are generally bright green. The case is smooth, tapered, slightly curved, made entirely of silk (Fig. 21) or including a few fine mineral particles. According to Schmid (1987), the usual habitat is various sizes of rapidly flowing, sometimes turbid streams, with only a few species living among aquatic plants in lentic or very slowly moving lotic habitats.

PUPA: Pupae of *Leptocerus* species were described by Vorhies (1909, as "*Setodes*"), Ross (1944), and Ulmer (1955, as "*Setodes*"). Pupae are distinguished from those of other Leptoceridae genera by the relatively stout anal processes, each with a wide base (Fig. 54). Furthermore, the two stout setae on the distal edge of the labrum are only about half as long as the labrum is wide (Fig. 55). The mandibles are abruptly narrowed beyond the base, slender, sinuous, and with very fine mesal denticles. There are 0, 2, 2 spurs on each of the pro- , meso- , and metathoracic legs, respectively. In life, they are generally bright green.

ADULT: Schmid (1987) provided a recent, detailed discussion of adult *Leptocerus* morphology. The following combination of characters distinguishes adults of the genus from those

of other leptocerid genera: (1) the katepisternum of the mesopleuron is truncate anterodorsally (similar to Fig. 64) and (2) the body and forewing color is dark. In the wings (Figs. 67, 68), (3) the hindwings are narrower than the narrow forewings; (4) the bases of the hindwing sectoral (S) and median (M) veins are weak or absent; (5) the usual first division of the hindwing S vein occurs at or beyond the origin of Fork II.

DISTRIBUTION: Presently known from all Biogeographic Regions except the Neotropical Region and Antarctica.

HABITAT: Larvae swim above the bottom among plants in lentic or lotic depositional habitats (Lepneva, 1966; Wiggins, 1977).

FEEDING HABIT: Larvae eat fine particulate matter (Wiggins, 1996).

Leptocerus mahawansa Group Schmid, 1987

Schmid (1987) characterized this Group as follows (from French):

> "Species with one or two white marks on the forewing and with the posterior half of the wing always spangled with silver.
> "MALE GENITALIA: Segment IX massive laterally, weakly sclerotized ventrally and more or less shortened dorsally. Segment X absent or virtually so or entirely integrated in the dorsal surface of segment IX, which is indistinguishable except for its armature. Preanal appendages generally well visible, although scarcely projecting. There are two pairs of branches, one median and one lateral, differently developed. The lateral branches generally are in very long spines, simple or divided to their base and strongly sclerotized; they are inserted on what appears to be the upper apical angle of segment IX from which the seem to issue. The median branches generally are more slender, weakly sclerotized and terminating in a point sometimes recurved in a claw. Inferior appendages often triangular, armed with conical tubercles and strongly sclerotized; the basal dorsomedial branch of each is often recurved toward the base, of variable thickness and always much longer than the main part of the appendage. Phallic apparatus large, situated relatively high under the branches of segment X and slightly recurved toward the base; it is composed of two parts of subequal length and separated by a short membranous region; these are very probably the phallobase, the endotheca, and the phallicata. The first of the three of these parts exhibits some longitudinal, chitinous strengthening ridges."

Up to now, the Group has included at least seven species from India and Sri Lanka: *Leptocerus manichyana* Schmid, 1987; *Lp. prithudhara* Schmid, 1987; *Lp. ankuchagraha* Schmid, 1987; *Lp. bahuchaka* Schmid, 1987; and *Lp. sarchtika* Schmid, 1987, all from India; and *Lp. mahawansa* (Schmid, 1958), and *Lp. parakum* Chantaramongkol and Malicky, 1986, from Sri Lanka. The following species brings the number in the Group to eight.

Leptocerus senarius, NEW SPECIES
Figs. 96, 199

DESCRIPTION: Head and thorax dark brown, antennae with scape brown, other segments each pale yellow with black annulation. Abdomen with dorsum and ventrum light brown. Forewing color indeterminable in alcohol.

MALE GENITALIA (Fig. 96): Segment IX triangular in lateral view, with dorsal length very short, sternum rectangular in ventral view. Segment IX pleural processes divided to base, forming two pairs of very long and slender rods, acute apically, its uppermost pair of rods each with six to seven peg-like spines on slightly dilated apical quarter, its lowermost pair of rods without spines or setae. Preanal appendages reduced to small rounded setose patches at base of segment IX pleural processes. Tergum X represented by pair of slender rods arising among segment IX rods, all three pairs about equal in length and extending to apices of inferior appendages; tergum X pair with apices more twisted and bearing four to five setae apicodorsally. Inferior appendages each broadest in basal two-thirds and more or less parallel-sided in lateral and ventral views; apical one-third triangular with blunt apex with six to eight water-drop shaped spines; middle of mesal edge bearing few short, stout setae and papilla armed with stout apical spine; basal dorsomesal lobe 1.3 times as long as main part of appendage and extending beyond it to blunt apex, its dorsal and ventral mesal ridges with two rows of spines arranged on basal half of dorsomesal ridge and apical half of ventromesal ridge. Phallus generally tube-like, angled about 90° at endotheca, with phallobase rising obliquely upward from base, phallicata issuing obliquely downward, trough-like in distal two-thirds with apex blunt in lateral view, with small excision in ventral view.

FEMALE GENITALIA (Fig. 199): Tergum IX extending over tergum X and fused with it forming continuous plate extending slightly beyond apex of lamellae, with lateral edges constricted at the boundary between IX and X in dorsal view. Distal half of tergum IX hood-like, with mesal triangular portion bare, semimembranous, lateral portions setose. Anal tube visible beneath terga IX+X, with its apical portion free, semimembranous. Lamellae long, broad basally and bottle-shaped in lateral view, setose apically, each bearing two long setae sub-apically. Internal part of gonopod plate (i.gon.VIII) large, triangular, about three-fourths to four-fifths as long as lamellae in ventral view, posteriorly fused with spermathecal sclerite. Spermathecal sclerite with anterior half sub-rectangular, bearing pair of short, lateral arms and pair of long ventral arms, latter extending to anterior edge of segment VIII.

LENGTH OF FOREWING: Male 4.6-4.7 mm, female 4.0-4.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2b (NAU). Paratypes--2 females, Loc. 2b (NAU); 137 males, 185 females, Loc. 67c (NAU); 28 males, 15 females, Loc. 7b (CUAC).

ETYMOLOGY: Latin, "consisting of six," with reference to the 3 pairs of processes produced from terga IX+X.

DIAGNOSIS: Among species of this Group, the male genitalia of this species most closely resembles those of *Leptocerus bahuchaka* from Khasi Hills and Manipour and *Lp. sarchtika* from Manipour, especially *Lp. bahuchaka*. In all three species, pleura IX processes are divided to the base. The shape of each inferior appendage is very similar in *Lp. bahuchaka* and this species, each with a sub-apical papilla. However, this species is unique in that (1) the dorsal-most pleura IX processes are more slender, slightly dilated apically, and with 6-7 peg-like spines; (2) tergum X processes are each without a sub-apical constriction or fork; and (3) the basal dorsomesal lobe of each inferior appendage is smaller than for any other species of the Group.

DISTRIBUTION: Known from only the type localities southeastern China.

Leptocerus atsou Group Schmid, 1987

Schmid (1987) described this Group as follows (from French):

> "General coloration reddish to light brown, with the anterior wings uniformly light brown. Apicolateral border of [male] segment IX concave and generally with a spine dorsally. There is an unpaired, bifid structure dorsally, probably the

preanal appendages partially fused with each other, which bears two lower lateral branches that are paired, symmetrical, and little sclerotized, possibly the reduced and bifid segment X. Inferior appendages simple and longitudinally triangular: their basodorsal branches are larger than the appendages themselves and in lobes parallel with them.

Schmid (1987) included three Australasian species in the Group, *Leptocerus atsou* Schmid, 1987; *Lp. ousta* Schmid, 1987; and *Lp. souta* Mosely, 1953.. To these we add European *Leptocerus tineiformis* Curtis, 1834, and eastern Asian *Lp. valvatus* (Martynov, 1935).

PHYLOGENY: The most obvious synapomorphies by which the Group may be considered monophyletic include the following characters of the male genitalia: (1) the basal fusion of the preanal appendages, (2) the origin of the lobes of tergum X on the lower surface of those appendages, and (3) the compressed and oval basal dorsomesal branch of each inferior appendage. The sister lineage of the Group may be found among species of Schmid's (1987) *Leptocerus ukchatara* Group and *Leptocerus similis* (McLachlan, 1875) with all of which the species of this Group share a very large basal dorsomesal lobe of each inferior appendage and the deeply concave caudal edge of each pleuron IX in the male genitalia.

Leptocerus valvatus (Martynov, 1935)
NEW CHINESE RECORD
Figs. 97, 200

Setodes valvata Martynov, 1935, pp. 264-265, figs. 72-74; holotype = male; type repository = probably Zoological Institute, St. Petersburg; type locality = Usuri Region (eastern Russia).
Leptocerus valvata (Martynov, 1935), Fischer, 1966 , p.30.
Leptocerus valvata (Martynov, 1935), Schmid, 1987, p.139.

DESCRIPTION: Our specimens are in alcohol and are thus with less life-like coloration. Martynov's (1935) description is useful, however:

"Head black, clothed anteriorly with blackish and yellowish hairs, antennae more than twice as long as the whole body with wings; basal joint bulbous, yellow; in the basal third of antennae each joint brown, but whitish in its basal part; in the distal half, the thread becomes uniformly brownish. Thorax brown; anterior legs brownish, median and posterior also brownish, but clothed with pale yellow pubescense. Anterior wings brown, clothed with blackish hairs, but with several whitish markings of snow-white hairs, as follows: a whitish transverse stripe, beginning at the end of SC, a short stripe near the base, a variable stripe, beginning at the middle between them and several spots in the apical portion; fringe brown; venation as in *St. tineiformis* Curt. Abdomen brownish."

MALE GENITALIA (Fig. 97): Segment IX long, but with deep and broadly rounded lateral excisions; preanal appendages large, sub-triangular in dorsal view, fused basally. Segment X represented by two narrow slender processes, acute at their ends; two short pleura IX processes laterally from them bearing long hairs at ends. Inferior appendage large, subdivided into two lobes: lower lobe straight, thick and hairy; upper lobe narrow basally, broad apically, plate-like and oval from side, mesal surface bearing numerous tubercles with short setules. Phallicata thick, arched

downward; apex asymmetrical, with two lateral sinuate and tapering plates curved inwards and acute; paramere spines absent.

FEMALE GENITALIA (Fig. 200). Segment IX deeply divided laterally at point of insertion of lamellae; ventral gonopod plate broad and brown at base, extending into narrow and pale median process. Lamellae long and very broad, each with rounded apex in lateral view. Tergum IX almost completely united with preanal appendages and tergum X, forming long and thick dorsal plate; seen from above, this plate triangular in its distal part and with two to six long black bristles, length subequal with that of lamellae.

LENGTH OF FOREWING: Male 5.5-6.4 mm , female 5.5-6.1 mm.

IMMATURE STAGES: Unknown.

Material examined: 1 male, Loc. 28a (NAU); 2 males, 1 female, Loc. 45b (NAU); 2 males, 1 female, Loc. 45b (CUAC).

DIAGNOSIS: Martynov (1935) allied this species with *Leptocerus tineiformis* and *Lp. similis* (McLachlan, 1875), but with no specific characters mentioned. However, we suggest a new relationship of *Lp. valvatus* with the species of the *Lp. atsou* Group, and especially *Lp. ousta* by the following combination of characters: (1) tergum IX+X with a pair of long slender processes each ending in an acute darkened apex; inferior appendage short, with compressed basodorsal lobe of each appendage oval with pedicel at base; phallicata distinctively sclerotized trough. *Leptocerus valvatus* resembles *Lp. tineiformis* and *Lp. ousta* by the absence of male phallic paramere spines; pleura IX processes are absent in those species and very short in *Lp. valvatus*. *Leptocerus valvatus* is readily distinguished from these and other *Lp. atsou* Group species by the distinctively trough-like male phallicata with its apex divided into two sinuate, asymmetrical spines, crossing each other.

DISTRIBUTION: Previously recorded from the Usuri and Amur regions of eastern Russia and from Japan, it is now known from northeastern and southeastern China.

PHYLOGENY: This species shares the synapomorphies of the *Leptocerus atsou* Group, here expanded to include also at least *Lp. tineiformis* and *Lp. valvatus*. Among members of this Group, it appears most closely related to *Leptocerus ousta* and *Lp. tineiformis* as suggested by the shared absence of paramere spines and the reduced pleura IX processes (absent in the other two species).

Leptocerus ukchatara Group Schmid, 1987

Schmid (1987) described the Group as follows (from French):

> "Species with two white marks on the forewings and the posterior half of the wing spangled with silver.
>
> "Male genitalia forming a compact assemblage and without long branches or appendages. Segment IX well developed laterally, with its apical border semicircularly concave, membranous for a relatively long distance ventrally, very long dorsally and forming a median lobe dividing segment X into two parts. Segment X formed of two horizontal and convex lobes on which the preanal appendages are not distinguishable; unless these lobes are not themselves actually the enlarged preanal appendages and segment X; it is terminated, in two species, by two poorly sclerotized lobes and in two others by strongly sclerotized points which I have called horns rather than branches. Inferior appendages are not large; their dorsobasal branches are well developed, arched ventrad and surpassing the apices of the inferior appendages. Phallic apparatus composed of two parts: one vertical which is without doubt the phallotheca and a horizontal part which is probably the aedeagus proper: two species possess two rather

poorly developed lateral spines; their insertion in the phallotheca and the aedeagus show that they are reduced parameres; two other species have the aedeagus accompanied by two preapical spines which are surely secondary developments of the latter."

Schmid (1987) included four species in the Group: *Leptocerus agunachila* Schmid, 1987; *Lp. aprachasta* Schmid, 1987; *Lp. ukchatara* Schmid, 1987; and *Lp. vakrita* Schmid, 1987.

PHYLOGENY: Monophyly for the *Leptocerus ukchatara* Group may be inferred by the homologous long median production of tergum IX. Schmid (1987) inferred that the *Lp. ukchatara* Group may be relatively close to the *Lp. atsou* Group, as indicated by the following synapomorphies: (1) the elongate development of tergum IX, (2) the concavity of the apicolateral edge of segment IX, (3) the partial fusion of the preanal appendages, and (4) the large size of the basodorsal branch of each inferior appendage relative to that of the main body of the appendage.

Leptocerus cauliculus, NEW SPECIES
Fig. 98

DESCRIPTION: Head and thorax dark brown; vertex, frons and palpi covered with dark brown setae. Forewing brown with dark brown hairs.

MALE GENITALIA (Fig. 98): Segment IX very long dorsally and ventrally, lateral posterior margin deeply excised, forming typical C-shaped band in lateral view. Preanal appendages represented by elliptical setose patch on tergum IX at base of each of two long processes representing fused productions of segments IX and X (or of segment IX only with segment X absent); these long processes compressed, each tapering to setose, narrow end curved mesad and each with longitudinal ridge running from its base to near its apex in dorsal view; in lateral view with middle portion slightly dilated. Inferior appendages long, in ventral view basal third broad with mesal margins sinuate and setose, then tapering and divergent in middle third, then with apical third angled mesad and reduced to rod with acute apex and curved upward in lateral view; mesal basodorsal process of each inferior appendage produced upward in oblique stalk with dorsal end enlarged in broad lobe about 3 times as long as tall, with posterior end obtuse and anterior end reduced in narrow finger about one-fifth as broad as middle height of lobe. Phallobase small globe, phallicata fused with phallobase, cylindrical in basal one-fourth, remainder trough-like, curved slightly downward and sinuately narrowing to acute apex in lateral view; midventral surface with wrinkled region. One pair of paramere spines stout, arched over phallicata with apices hooked downward, fused with phallobase and each other basally.

LENGTH OF FOREWING: Male 4.8 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 69 (NAU).

ETYMOLOGY: Latin, "stem," with reference to the stalked basodorsal process of each inferior appendage.

DIAGNOSIS: This species belongs to the *Leptocerus ukchatara* Group as indicated by C-shaped form of segment IX with a conspicuous posterior production of tergum IX. In both this species and the following species, the pair of segment IX + X processes are especially long, the inferior appendages are slender and acute apically, the mesal basodorsal branches of the inferior appendages are conspicuously stalked, and the paramere spines are fused with each other basally. However, it differs from that species in that (1) the processes of terga IX + X have hooked apices rather than spines; (2) the distal portions of the inferior appendages are strongly angled in ventral view; and (3) the mesal basodorsal lobe of each inferior appendage is positioned high above the main body of the appendage.

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

PHYLOGENY: This species shares the synapomorphies of the *Leptocerus utchatara* Group and shares with the following species the homologously long processes of segments IX + X, the long and tapering inferior appendages, the stalked condition of the mesal basodorsal process of each inferior appendage, and the basally fused paramere spines, suggesting that they are sister species.

Leptocerus longicornis, NEW SPECIES
Fig. 99

DESCRIPTION: Head and thorax dark brown, antennae pale yellowish with black annulations. Forewing very narrow, brown with traces of dark brown hairs.

MALE GENITALIA (Fig. 99): Segment IX very long dorsally and ventrally, lateral posterior margin deeply excised, forming typical C-shaped band in lateral view. Preanal appendages completely fused with terga IX + X, represented as pair of setose concavities. Tergum X fused with IX in pair of stout, sinuate and highly sclerotized processes extending nearly as far as tip of inferior appendages, each with apex produced in long dorsal spine and with short ventral spine bearing few setae. Inferior appendages long blade-like, broad at base, each gradually narrowing to acute apex with apical one-third curved evenly dorsad about 90°; mesal basodorsal process of each inferior appendage produced in huge lobe, about 3 times as long as tall, three-fourths as long as inferior appendage, with circular excision sub-basodorsally, in lateral view, forming short basal stem and anterior triangular projection on process. Phallobase tube-like, with distal two-thirds trough-shaped and with anterior end twice as broad as posterior end, sinuately narrowing to shallow apex in lateral view, ventrally with wrinkled region at one-third distance from apex. One pair of paramere spines about half as long as phallus, evenly tapered and slightly curved, fused basally with each other and with phallobase.

LENGTH OF FOREWING: Male 5.3 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2b (NAU).

ETYMOLOGY: Latin, "long horn," with reference to the long, sclerotized tergum X in male specimens.

DIAGNOSIS: This species is a member of *Leptocerus ukchatara* Group by the synapomorphies mentioned in the diagnosis of *Lp. cauliculus*. It mostly resembles *Lp. cauliculus* in the long blade-like inferior appendages, with mesal basodorsal process of each appendage a large lobe with an obvious basal stem in side view, but differs from it in: (1) terga IX + X processes each with apex armed with two stout spines; (2) mesal basodorsal process of each inferior appendage huge, with shorter basal stem, lying closely against main body of appendage; and (3) paramere spines nearly straight, half as long as phallus, arising from middle of dorsum of phallus, with acute apices.

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

PHYLOGENY: This species shares the synapomorphies of the *Leptocerus utchatara* Group and shares with *Lp. cauliculus* the synapomorphies cited above, suggesting that they are sister species.

Leptocerus mahasena Group Schmid, 1987

According to Schmid (1987), this group comprises *Leptocerus akhunta* Schmid, 1987; *Lp. anuradha* (Schmid, 1958); *Lp. argentoniger* (Ulmer, 1915); *Lp. chatadalaja* Schmid, 1987; *Lp.*

kchapavarna Schmid, 1987; *Lp. mahasena* (Schmid, 1958); *Lp. sakantaka* Schmid, 1987; *Lp. samchita* Schmid, 1987; *Lp. sudhara* Schmid, 1987; *Lp. sukhabaddha* Schmid, 1987; and *Lp. tursiops* Malicky, 1979. To these we add *Lp. moselyi* (Martynov, 1935), from the Amur Region of Russia. The Group is characterized in the adults by the "*argentoniger*" coloration of the forewings, and in the males by the virtual absence of segment X, the large size of pleura IX processes fused with preanal appendages, the fused condition of the preanal appendages with each other, the large size of the main part of each inferior appendage, and the small size of the phallicata. Among these characters, the large size of the main part of each inferior appendage and the small size of the phallicata are inferred as specializations, presumably synapomorphies demonstrating the monophyly of the Group. Schmid (1987) thought that the Group is the most primitive of the genus, but our interpretation is that it is among the more recently evolved lineages of our fourth clade and the sister lineage of the *Lp. atiraskrita* Group. Immature stages are unknown for species of this Group.

Leptocerus bitaenianus, NEW SPECIES
Figs. 100, 201

DESCRIPTION: Head and thorax of dry specimens fuscous with fuscous hairs. Forewing hyaline, densely clothed with blackish brown hairs, not longitudinally bipartite; two narrow bluish-white-haired crossbands one-third distance and two-thirds distance from base; apical portion with irregular spots of whitish hair; this pattern differing from general patterns described by Schmid (1987) for which whitish marks, when present, confined to anterior edge. (Our specimens, now in alcohol, do not show any color pattern.)

MALE GENITALIA (Fig. 100): Segment IX long ventrally, caudal margin oblique, deeply incised beneath pleura IX processes, dorsum forming narrow transverse band; apical margin of venter excavated and with pair of longitudinal ridges curved mesad and nearly meeting in middle of segment; pleura IX processes symmetrical, 1.5 times as long as sternum IX, each deeply divided into two branches with apices curved mesad and dorsad and appearing to cross each other in lateral view. Preanal appendages fused with each other and with bases of pleura IX processes, appearing as indefinite setose mounds on each side of base of tergum. Segment X represented as sharp spine at apex of mesal ridge between preanal appendages. Inferior appendages about as long as pleura IX processes, each with ventral margin evenly curved upward, with dorsal margin slightly dilated at middle, then tapering to slender apex; mesal basodorsal process of each inferior appendage slender, slightly sinuate, one half as long as main appendage, its mesal edge produced in broad lobe bearing row of stout setae. Phallus short, tube-like, one half as long as inferior appendages, with apex curved downward; paramere spine (dorsal filament of Schmid, 1987) 1.7-1.8 times as long as phallus, sinuately extending beyond apices of pleura IX processes.

FEMALE GENITALIA (Fig. 201): Terga IX and X fused, forming bare sub-triangular hood fused with compressed, setose, preanal appendages. Lamellae nearly 1.5 times as long as wide in lateral view, with apex slightly indented dorsally. Gonopod plate large, semicircular, bearing fine setae. Spermathecal sclerite huge, anterior end of ventral process of sclerite divided into two triangular points, its ventral ridge weakly sclerotized, two-third as long as ventral process; dorsal process moderately sclerotized, about twice as long as ventral process, extending to segment VII.

LENGTH OF FOREWING: Male 5 mm; female 4.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 16 (NAU). Paratypes--2 males, Loc. 16 (NAU); 1 male, 1 female, Loc. 16a (NAU); 5 males, 10 females, Loc. 58a (NAU); 5 males, 9 females, Loc. 58a (CUAC).

ETYMOLOGY: Greek, "two stripes," with reference to the two bluish-white cross-bands on each forewing.

DIAGNOSIS: This species appears closest to *Lp. kchapavarna* Schmid, 1987, from India (Mysore), in the shape of tergum X and the inferior appendages, but differs from it in that pleura IX processes are relatively shorter and each is divided into two, rather than three branches; mesal basodorsal process of each inferior appendage are more slender and sinuate; the paramere spine is more twisted; and the phallicata is of the same diameter throughout its length.

DISTRIBUTION: Known from only the type localities in southern China.

PHYLOGENY: This species is probably a lineage of a monophyletic group that includes at least *Lp. kchapavarna* and *Lp. sukhabaddha* Schmid, as indicated by the following uniquely shared synapomorphies: (1) the undivided remnant of segment X and (2) the deeply divided pleura IX processes.

Leptocerus cirritus, NEW SPECIES
Figs. 101, 202

DESCRIPTION: Head and thorax dark brown, hairs on head mostly rubbed, palpi with traces of brown setae. Forewings brown, covered with dark brown setae. Abdomen pale yellow with dorsum and ventrum light brown.

MALE GENITALIA (Fig. 101): Segment IX deeply excavated posterolaterally, such that ventral half sub-rectangular in lateral view and dorsal half short, forming transverse band; pleura IX processes very long and divided into two pairs of rods: pair of well-sclerotized dorsolateral rods with left rod extending to tip of inferior appendages, asymmetrically much longer than right one, both originating sub-dorsally and directed laterad, then evenly curved caudad, converging to enclose heart-shaped region in dorsal view; ventromesal pair symmetrical, semimembranous, shorter and thinner than dorsolateral pair, arising from ventral apex of fused preanal appendages.. Preanal appendages fused with each other and forming elevated setose patch beyond origins of dorsolateral pleura IX processes and above and between ventromesal processes. Inferior appendages foliaceous, each with mesal ridge together with its basal plate produced upward in broad sclerotized lobe with apicomesal surface bearing many thick, dark spines, lobes of opposing appendages with spines locked together to form a heart-shaped basal hole through which phallus moves. Phallus short, sinuate tube; phallobase apparently fused with phallicata, basal half about 1.5 times as broad as apical half; single paramere spine ("dorsal filament" of Schmid, 1987) relatively straight, arising dorsally near middle, and extending well beyond it, about as long as phallus.

FEMALE GENITALIA (Fig. 202): Segment IX highly sclerotized. Tergum IX fused with X forming large shield, its basal half produced laterad in triangular lobes with apices curved downward; apical half rectangular with each lateral end rounded and bearing few long setae, apicomesal portion elevated; in lateral view, tergum thick with apex obliquely truncate. Anal tube extending to level of anterior edge of segment IX. Lamellae constricted in basal third into narrow stalk; bare hooked triangular process arising from this stalk on dorsolateral surface and directed caudad, with surface of stalk caudad of process covered with fine hairs; rest of lamellae nearly square in lateral view, forming thick, vertical pads. Gonopod plate wide and foliaceous; laterally bearing large, patch of short hairs on each side; apical margin wrinkled laterally, strongly produced at center in fusiform lobe. Spermathecal sclerite rocket-shaped, about 3 times as long as average width in ventral view..

LENGTH OF FOREWING: Male 5.1 mm, female 4.6-4.7 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 58a (NAU). Paratypes--2 females, Loc. 58a (NAU).

ETYMOLOGY: Latin, "having fine filament," with reference to the presence of both the fine processes of terga IX+X and the dorsal filament of the phallus.

DIAGNOSIS: Male pleura IX processes are asymmetrical and deeply divided, like those of *Leptocerus kchapavarna* and *Lp. sukhabaddha*. However, the origins of those branches are much more remote basally, the asymmetrical lateral processes form the outline of a "heart" in dorsal view, and the mesal pair are fine, semimembranous filaments arising from the ventral apex of the fused preanal appendages. Also, the mesal basodorsal process of each inferior appendage is more nearly upright in a tall, broad piece that ends posteriorly in a papillate process. The female genitalia are distinguished by laterally enlarged terga IX+X; lamellae each with a narrow basal stem from which is produced laterad a hooked triangular process; and a gonopod plate bearing a fine setose patch on each side.

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

PHYLOGENY: Like the preceding species, this species appears to be a close relative of *Leptocerus kchapavarna* and *Lp. sukhabaddha* because of the asymmetrical, deeply divided pleura IX processes.

Leptocerus clinatus, NEW SPECIES
Figs. 102, 203

DESCRIPTION: Head, palpi, and thorax brown; forewing light brown, covered with yellowish brown setae; under surface of hindwings each with yellowish brown setae arising in middle along S and M veins, distal half of anal regions darkened somewhat, and dark brown setae arising from apical half distance of Cu_2, as well as from hind margin of anal field, with longest hairs about four-fifths as long as wing (Fig. 102H).

MALE GENITALIA (Fig. 102): Segment IX strongly slanted caudad in lateral view, with anterior margin of tergum level with posterior margin of sternum; pleura IX processes extending as far as tips of inferior appendages, each with apex produced in two spines, with dorsal spine straight, ventral spine curved. Preanal appendages represented by patches of setae at bases of pleura IX processes. Sclerotized tergum X virtually absent. Inferior appendages long, cucumber-shaped in lateral view, bearing thick, long black setae ventrally; in ventral view, each dilated in middle of mesal edge, strongly constricted sub-apically, then slightly enlarged, with rounded apex produced mesad in beak-like spine; mesal basodorsal lobe slightly produced at one-fourth distance from base, setose; long, slender process arising from dorsal edge of inferior appendage near mesal basodorsal lobe with its base curved forward and outward anteriorly then stretching backward to apices of inferior appendages and pleura IX processes. Phallus sinuate tube with phallicata and phallobase fused, strongly constricted near base, then enlarged to cylindrical region, distal half of phallus shallow trough-like with narrow apex curved downward, bottom of the trough semimembranous with large, phallotremal sclerite, with its acute apex projecting as sub-apicoventral spine in lateral view; dorsal filament (paramere spine)of phallus about as long as phallus.

FEMALE GENITALIA (Fig. 203): Terga IX and X fused with each other and preanal appendages, produced backward in long sub-rectangular hood, with bare triangular region defined by sharp ridges, setose apicolaterally beyond ridges. Pleural and ventral portions of segment IX mostly separated from tergum. Lamellae long elliptical lobes each with ventral margin covered by conspicuous rugose pad. Gonopod plate foliaceous, basal three-fourths broad with pair of large laterobasal concavities and pair of longitudinal sub-mesal ridges, apical portion narrowing to blunt apex nearly as long as lamellae. Dorsal internal part of gonopod IX semimembranous with distal

half deviating from segment X. Internal part of gonopod VIII (i.gon.VIII) stretching far beyond anterior margin of gonopod plate in slender, mesal process, three times as long as wide in lateral view. Spermathecal sclerite 1.5 times as long as wide; broad, slightly excavated at anterior end; with two pairs of anterior dorsal processes each with apex curved outward in ventral view; ventral ridge high, about half as long as main body of sclerite.

LENGTH OF FOREWING: Male 5.8 mm, female 5.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 67c (NAU). Paratype--1 female, Loc. 67c (NAU).

ETYMOLOGY: Greek, "sloped," with reference to the slanted lateral view of segment IX.

DIAGNOSIS: This member of the *Leptocerus mahasena* Group may be distinguished by the following characters: (1) segment IX strongly slanted backward; (2) inferior appendages slender cucumber-shaped in lateral view each with extremely long, recurved basodorsal process; (3) mesal basodorsal process of each inferior appendage only slightly produced, bearing fine setae; (4) phallus with a tiny, black apicoventral spine.

DISTRIBUTION: Known from only the type locality southeastern China.

PHYLOGENY: Among species of the *Leptocerus mahasena* Group, this species is most closely related to *Lp. sudhara*, as indicated by the homologously backward slanted segment IX.

Leptocerus colophallus Yang and Morse, 1997
Figs. 103, 204

Leptocerus colophallus Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, p. 179, pl. 116 fig. 6-10, pl. 117 fig. 5-7.

DESCRIPTION: Head and thorax dark brown, vertex covered with long dark brown hairs, frons and palpi covered with yellowish brown hairs. Forewings faint fuscous with traces of blackish hairs, apical margins with few white haired small spots.

MALE GENITALIA (Fig. 103): Segment IX triangular in lateral view, broadest ventrally; deeply excised posteriorly below the pleura IX processes; pleura IX processes pair of long, asymmetrical branches, left branch with very broad basal half in dorsal view, with distal half reduced to long rod, bearing two small dorsomesal spines at middle and short sub-apicoventral spine; right branch slender, as long as left branch with long sub-apicodorsal spine and three tiny apical spines. Segment X processes represented by asymmetrical pair of dorsomesal stubs. Inferior appendages very narrow, straight, about twice as long as sternum IX, bearing dense long setae, each dilated in middle with dorsal edge serrated; in ventral view dilated region about twice as broad as apical width; mesal basodorsal process short triangular, one-third as long as main body; with inner surface armed with 4-5 black teeth. Phallus very short, about as long as dorsal process of each inferior appendage; phallobase clearly distinguished from remainder of phallus; paramere spines absent; phallicata trough-like.

FEMALE GENITALIA (Fig. 204): Terga IX + X + preanal appendages forming broad plate, much shorter than lamellae, apex sinuately truncated, basally with pair of small oval maculae in dorsal view. Ventral part of anal tube "a median longitudinal projection" on lower side of "dorsal plate" (Martynov 1935), slightly sclerotized. Lamellae each constricted in middle, acute apically, and with broad flap on basoventral margin. Gonopod plate separated from pleura laterally by deep excisions, sub-triangular in ventral view with convex basolateral margins. Apex of internal part of gonopod VIII slender, projecting far beyond gonopod plate. Spermathecal sclerite broad

and truncate anteriorly, with pair of anterior sclerotized bars extending to anterior margin of segment VIII, each with apex curved abruptly ventrad.

LENGTH OF FOREWING: Male 5.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 12d (NAU). Paratypes--1 male, Russia, Amur River basin, Kur River, Novopokrovka vil., 20 July 1953, Levanidova col. (IBP). 1 female, Russia, Ussuri River basin, Khor River, 3-6 July 1950, Levanidova col. (IBP).

ETYMOLOGY: Greek, "short penis," with reference to the very short phallus.

DIAGNOSIS: This species is very similar to *Leptocerus moselyi* (Martynov, 1935) and somewhat similar to *Lp. tursiops* Malicky, 1979. From *Lp. tursiops*, the males of *Lp. moselyi* and this species differ by having the right pleuron IX process more slender than the left one, by the more slender inferior appendages, and by the absence of a paramere spine. From *Lp. moselyi*, this species differs in that the spines of left pleuron IX process are not similar in shape, size, and position; the right segment X process is a stub and not a broad hook; and the inferior appendages do not each have such a conspicuous dilation in the middle.

DISTRIBUTION: Known from only the type localities in southeastern China and the Ussuri Region of eastern Russia.

PHYLOGENY: The three species *Leptocerus tursiops*, *Lp. moselyi*, and this species, share the following synapomorphies, suggesting that they are a monophyletic group: (1) asymmetrical pleura IX processes, (2) very short segment X processes, and (3) a short mesal basodorsal process on each inferior appendage. Therefore, both *Lp. moselyi* and this new species are added to the *Lp. mahasena* Group. *Leptocerus moselyi* and *Lp. colophallus* are sister species in that the diagnostic characters distinguishing them from *Lp. tursiops* are all uniquely shared synapomorphies.

Leptocerus hamatus, NEW SPECIES
Figs. 104, 205

DESCRIPTION: Body in alcohol generally dark brown. Forewings densely covered with dark brown hairs, speckled with white and very dark hairs at apical regions, with white spot at end of each longitudinal vein. Abdomen light brown.

MALE GENITALIA (Fig. 104): Segment IX longest ventrally; dorsum IX narrow, forming mesal V-shaped excavation; fused terga IX + X + preanal appendages produced from center of excavation, about 1.5 times as long as sternum IX, their basal third narrow, middle third hood-like and three times as broad as base, apical third forming pair of slender, sinuous, acute projections each bearing four setae; pleura IX processes deeply divided, each forming two long, sinuate processes on either side of V-shaped excavation, with dorsomesal processes more slender and directed caudoventrad, lower-lateral processes stouter and directed caudodorsad. Inferior appendages oblong in lateral view, broadly sub-rectangular in ventral view, each armed with stout spines on apicomesal edge; "mesal basodorsal lobe" arising apicodorsally in long, curved branch hooked mesad, its mesal edge with several basal chalazae. Phallus forming shallow trough dilated in middle, constricted sub-apically, its apex slightly enlarged with apicolateral corners produced outward in sharp spines and with another two acute spines arising sub-apicolaterally; dorsal filament (paramere spine) very fine, three-fourths as long as phallus, arising from its base.

FEMALE GENITALIA (Fig. 205): Terga IX +X broad at base, 1.2 times as long as its basal width, with small shoulders basally in dorsal view, slightly excised apicomesally, mostly bare, semimembranous on meson, setose laterally. In lateral view, semimembranous anal tube with apical half free from tergum X, tapering to acute apex, sinuate in lateral view. Lamellae rectangular, 1.5 times as long as tall each with apicodorsal corner produced in acute spine, inner

surface forming setose pad. Gonopod plates forming single transverse rectangular plate with pair of pair of large, transverse pockets apicolaterally. Internal part of gonopod VIII (d. i.gon.VIII, Schmid, 1987) tongue-like, extending as far as tips of lamellae with its lower surface forming a pair of elliptical concavities. Spermathecal sclerite triangular, 1.5 times as long as its anterior width, ventrally bearing long semimembranous process (v.pl.) extending to anterior margin of segment VIII.

LENGTH OF FOREWING: Male 5.2-5.5 mm, female 5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 23 (NAU). Paratypes--2 males, 3 females, Loc. 23 (NAU); 1 male, Loc. 67a (NAU); 1 male, 1 female, Loc. 2b (CUAC).

ETYMOLOGY: Latin, "hook like," with reference to the apicodorsal structures of the inferior appendages.

DIAGNOSIS: The male of this member of the *Leptocerus mahasena* Group has terga IX + X + preanal appendages produced in six branches, like some species in the *Lp. mahawansa* Group. From this and all other species in either Groups, it is unique in the male genitalia by the following characters: (1) terga IX + X + preanal appendages basally with a narrow stem in dorsal view; (2) "mesal basodorsal lobe" of each inferior appendage displaced apicodorsally, long, slender, and hooked mesad; (3) apex of phallus enlarged and developed in two pairs of spines. In the female genitalia it is distinctive in the following characters: (1) internal part of gonopod plate distinctively protruded, with its apicoventral surface bearing paired elliptical concavities and (2) the spermathecal sclerite ventrally bearing a long semimembranous anterior plate.

DISTRIBUTION: Known from the type localities in southeastern China.

PHYLOGENY: With the assumption that the acute processes of the mesal projection from the V-shaped excavation are the synapomorphies of pleura IX processes seen in other *Leptocerus mahasena* Group species, the long slender rods on either side of the excavation must be viewed as novel structures. This is based on the presence of long setae on the acute processes, suggesting the location of the preanal appendages morphologically above the deep division of pleura IX, characteristic of the *Lp. mahasena* Group and its close relatives. Males of *Lp. sakantaka* Schmid, *Lp. argentoniger* Ulmer, and *Lp. akhunta* Schmid, like that of this species, have the main body of each inferior appendage short and truncated, such that the large mesal basodorsal lobe is displaced apicodorsally. More evidence is needed to ascertain with which of these species *Lp. hamatus* is most closely related.

Leptocerus species *Incertae Sedis*

The following species belong to our fourth clade, but their relationships with each other or with species groups named by Schmid (1987) is yet undetermined beyond what we discussed on page 65.

Leptocerus biwae (Tsuda, 1942b)
Figs. 67, 105, 206

Setodes biwae Tsuda, 1942b, pp. 300-301, fig. 53-54; holotype not selected; type repository unknown; type locality = Japan (Honshu). Mori and Matutani, 1953, mating.

Leptocerus biwae (Tsuda); Schmid, 1987, p. 128, Pl. XXVII, fig. 12, description and illustration of male.

Body color apparently similar to that of other species in this genus, generally dark brown. Forewing mostly covered with dark brown hairs with few greyish to white hair spots in middle of wing, as predicted by Schmid (1987). Tsuda's figure 53 is of a forewing of a species of *Setodes* (Schmid, 1987).

MALE GENITALIA (Fig. 105): Segment IX with dorsal two-thirds slanted backward, each process of tergum IX + X very fine and bearing ventral spine at one-third distance from base of process. Inferior appendages about 3.5 times as long as wide in lateral view with dorsal edge strongly serrated in middle; in ventral view, extremely narrowed in apical one-seventh with mesal basodorsal branch produced in sub-quadrate lobe not curved upward. Phallobase distinct, separated from paramere plate and from phallicata by membranous regions; phallicata shaped as peculiar sclerotized trough, shallow in anterior half, its apex enlarged with each apicolateral end produced in triangular process and with apicoventral margin protruded downward, pair of small, dorsal lobes at middle; paramere appears as basodorsal plate with distal half divided into two tapering spines, not extensile; broad membranous area between paramere plate and phallicata.

FEMALE GENITALIA (Fig. 206): Highly sclerotized, brown. Tergum IX fused with tergum X, forming long hood with distal half gradually narrowing to sub-truncate apex in dorsal view, in lateral view with dorsal and ventral margins more or less parallel and with obliquely truncated apex; dorsal surface consisting of large, triangular, semimembranous region from base of tergum IX to tip of tergum X, defined laterally by pair of oblique ridges; apicolateral portion (preanal appendages) setose. Lamellae sub-rectangular, 2.5 times as long as average width, slightly narrowed in basal half with venter of apex forming setose pads. Gonopod plate broad, 1.5 times as broad as long with each posterolateral end rounded, mesal lobe triangular, 1.5 times as long as its basal width, projecting posteriorly between lamellae to about four-fifths their length. Spermathecal sclerite sub-triangular, 1.5 times as long as its anterior end.

LENGTH OF FOREWING: Male 6.1-7.0 mm; female 5.8-6.9 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 7 males, 11 females, Loc. 45a, (NAU); 5 males, 5 females, Loc. 45a, (CUAC).

DIAGNOSIS: This species has the largest body size of any other *Leptocerus* species occurring in China. The male bears some resemblance to *Lp. dicopennis* in the phallus with a dorsal paramere plate. The very peculiar structure of the phallicata as described above is found only in this species. This species may be a synonym of *Lp. pekingensis* (Ulmer, 1932), as noted below.

DISTRIBUTION: Previously known from Japan and northeastern China (Loc. 28b), this species is now known also from southeastern China at Loc. 45a.

PHYLOGENY: The species *Leptocerus biwae* and *Lp. dicopennis* (Huang, 1958) have paramere spines fused into a basodorsal plate. We infer that this is an intermediate condition in a transformation series toward a single paramere spine in *Leptocerus*. The two species do not seem to have other synapomorphies by which they may be hypothesized as sister species; at the same time, we have not discovered synapomorphies by which either of them may be hypothesized as a sister lineage of other single-paramere lineages.

Leptocerus dicopennis (Huang, 1958)
Figs. 106, 207

Setodes dicopennis Huang, 1958, pp. 281-282, figs. 13-16. holotype = male; type repository = Nan-jing Agricultural University; type locality = Nan-jing, Jiang-su Province, Loc. 46.
Leptocerus dicopennis (Huang, 1958); Schmid, 1987, p. 139.

DESCRIPTION: Huang (1958) did not mention the color pattern of the forewing for his new species, but based on our specimens, we add the following: Body dark brown with dark brown hair, forewing bipartite, covered with greyish silver hairs posteriorly, but fuscous haired from anterior margin to the basal two-thirds of thyridial cell and to distal one-third of $\underline{R}_3$ cell; no white marks evident.

MALE GENITALIA (Fig. 106): Segment IX longest ventrally, without projections beneath preanal appendages. Tergum X forming pair of slender processes, with acute apices gradually divergent. Preanal appendages small, distinctive setose lobes. Inferior appendages semi-rounded lobes, each with circular apical excision; inner surface of larger upper lobe bearing dozen short, stout spines; basomesal process broadly triangular in ventral view, about as long as upper lobe, curved upward. Phallobase separated from parameres and phallicata by membranes, phallicata long, shallow trough extending beyond tip of inferior appendages, paramere plate three-fourths as long as that of phallicata, about three times as long as its own width in dorsal view, slightly enlarged near the middle with apex curved downward.

FEMALE GENITALIA (Fig. 207): Sclerotized brown. Segment IX with pleural region deeply excised to narrow vertical strip, terga IX+X forming hood with apical margin produced at center. Preanal appendages represented as pair of setose lobes arising from lateral ends of hood at slightly lower level. Lamellae long-oval, each with long base (possibly part of pleural IX), with dorsomesal longitudinal ridge in dorsal view. Gonopod plate sub-rhomboid, with apicomesal process (internal part of gonopod plate) small, triangular rather than slender as in *Leptocerus valvatus*. Spermathecal sclerite with basal half parallel-sided, ventral process about half as long as sclerite.

LENGTH OF FOREWING: Male 5.5-6.0 mm, female 4.4 mm.

MATERIAL EXAMINED: 11 males, 3 females, Loc. 45c (NAU); 2 males, 1 female, Loc. 46 (CUAC).

DIAGNOSIS: Schmid (1987) placed this species among his species *incertae sedis* ("espèces isolées ou peu connues"). With the additional information of male genitalia from Malicky (1983), we agree with Huang (1958) that this species resembles *Leptocerus tineiformis* in the shape of tergum X, preanal appendages, and inferior appendages, especially in the phallus with a dorsal plate separated from the phallicata, but differs from it in: (1) sternum IX longest region of segment, (2) processes of tergum X without sub-apical spines, (3) inferior appendages sub-rounded without a long base, and (4) paramere plate three-fourths as long as phallicata and as long as the processes of tergum X.

DISTRIBUTION: Known from southeastern China.

PHYLOGENY: The relationships of this species with *Leptocerus biwae* and other *Leptocerus* species were discussed above.

Leptocerus pekingensis (Ulmer, 1932)
Fig. 208

Setodes pekingensis Ulmer, 1932, p. 60; holotype = female; type repository = Deutsches Entomologischen Institute; type locality = Beijing (Loc. 26).
Leptocerus pekingensis (Ulmer, 1933); Schmid, 1987, p.139.

Ulmer (1932) established this species based on female specimens. According to his drawing for the FEMALE GENITALIA (Fig. 208): Terga IX + X long, terminating in rounded apex with narrow median cleft, base of tergum with a large triangular area (possibly semimembranous); triangular apicomesal process of gonopod plate (i.gon.VIII, Schmid, 1987) of modest size, neither so broad as in *Leptocerus dicopennis* nor so narrow as in *Lp. valvatus*, similar

to that in *Lp. biwae*. It is likely that *Lp. pekingensis* actually is the female of *Lp. biwae* (over which it has priority).

KEY TO ADULTS OF CHINESE *LEPTOCERUS* SPECIES

(The females of *Lp. cauliculus* and *Lp. longicornis* are yet unknown, the male of *Lp. pekingensis* is yet unknown, and the female of *Lp. pekingensis* is insufficiently described to key here.)

1. Genitalia with inferior appendage and phallus (Fig. 96A) ..... male, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 199) ..... female, 12

2 (1). Phallus with single dorsal filament (Figs. 100D, 101D, 102D) 3
2'. Phallus with two (Fig. 98D) or no (Figs. 97D, 103D) paramere spines, without single dorsal filament 6

3(2). Segment IX strongly slanted caudad dorsally, not deeply excavated dorsolaterally (Fig. 102A) ..... *Lp. clinatus*, n. sp., p. 74.
3'. Segment IX very long ventrally, posterior dorsolateral margin deeply excavated (Figs. 100A, 101A) 4

4(3'). Mesal basodorsal branch of each inferior appendage evidently arising above its main body (Figs. 100A, 101A) and bearing thick spines on its mesal surface (Figs. 100C, 101C); phallus tubular with truncate apex in lateral view (Figs. 100D, 101D) 5
4'. Mesal basodorsal lobe of each inferior appendage not arising above its main body (Fig. 104A) and with only fine setae on its mesal surface (Fig. 104C), phallus trough-like, slender, tapering to narrower, spinous apex in lateral view (Fig. 104D) ..... *Lp. hamatus*, n. sp., p. 77.

5(4). Tergum IX + X symmetrical, with two stout branches, each divided into two acute spines (Figs. 100A, B); dorsal filament of phallus stout with twisted apex, 2 times as long as phallus (Fig. 100D); mesal basodorsal lobe of each inferior appendage slender (Fig. 100A) ..... *Lp. bitaenianus*, n. sp., p. 72.
5'. Tergum IX + X asymmetrical, forming two pairs of processes of which dorsal pair curved in heart shape and left process much longer than right process, mesal pair very thin, semimembranous (Figs. 101A, B); dorsal filament of phallus straight, about as long as phallus (Fig. 101D); mesal basodorsal lobe semicircular in lateral view (Fig. 101A) ..... *Lp. cirritus*, n. sp., p. 73.

6(2'). Paramere spines absent from phallus (Figs. 97D, 103D) 7
6'. Paramere spines (Figs. 98D, 99D) or plate (Figs. 105D, 106Dd) present 9

7(6). Tergum IX + X with two main branches asymmetrical and with many spiny projections (Figs. 103A, B); mesal basodorsal branch of each inferior appendage acute triangular, one-third times as long as main body of appendage (Figs. 103A, 103Evp); phallus short, straight tube (Fig. 103D) ..... *Lp. colophallus* Yang and Morse, p. 75.
7'. Tergum IX + X with more than two branches, symmetrical (Figs. 96A, B; 97A, B); mesal basodorsal branches of inferior appendages as long as or longer than

appendages (Figs. 96A, 97A); phallus curved or not tubular (Figs. 96A; 97D, Dd) . . 8

8(7'). Tergum IX + X consisting of six long processes (Figs. 96A, B); mesal basodorsal branch of each inferior appendage slender, longer than its main body, and without pedicel base (Fig. 96A); phallicata without apical spines (Fig. 96A) . . . . . *Lp. senarius*, n. sp., p. 67.

8'. Tergum IX + X consisting of pair of long processes and pair of short processes in addition to preanal appendages (Figs. 97A, B); mesal basodorsal branch of each inferior appendage large, oval with pedicel base (Fig. 97A); phallicata divided apically into two spines (Fig. 97D') . . . . . *Lp. valvatus* Martynov, p. 68.

9(6'). Phallicata fused with phallobase, paramere spines slender and fused dorsally with phallus (Figs. 98D, 99D) 10

9'. Phallicata separated from phallobase by membranes, paramere spines fused with each other in dorsal plate (Figs. 105D, 106D') 11

10(9). Processes of terga IX + X each with bifid apex (Figs. 99A, B); inferior appendages each with huge mesal basodorsal process not stalked, anteriorly with short triangular projection (Fig. 99A); paramere spines arising from middle dorsum of phallus (Fig. 99D) . . . . . *Lp. longicornis*, n. sp., p. 71.

10'. Processes of tergum IX + X not forked at apices (Figs. 98A, B); inferior appendages each with huge mesal basodorsal process stalked, anteriorly with long slender projection (Fig. 98A); paramere spines arising near base of phallus (Fig. 98D) . . . . . *Lp. cauliculus* , n. sp., p. 70.

11(9'). Paramere "plate" broad in dorsal view, three-fourths as long as phallicata (Fig. 106D'); inferior appendages short, each with mesal basodorsal lobe prominent, sub-rounded and bearing thick mesal spines (Fig. 106A, B); terga IX + X process without spines (Figs. 106A, B) . . . . . *Lp. dicopennis* Huang, p. 79.

11'. Paramere "plate" about one-half as long as phallicata, weakly sclerotized, with distal half divided, phallicata produced in pair of lobes on its dorsal edges at middle (Fig. 105D); inferior appendages long, each with mesal basodorsal lobe scarcely visible in lateral view (Fig. 105A) and with only fine hairs mesally (Fig. 105C); each process of terga IX + X bearing sub-basal spine (Figs. 105A, B) . . . . . *Lp. biwae* Tsuda, p. 78.

12(1'). Tergum IX strongly produced laterad in triangular processes (Fig. 202B); lateral regions of gonopod plate and bases of lamellae with patches of short, dense setae and each lamella with prominent basal hook (Figs. 202A, C) . . . . . *Lp. cirritus*, n. sp., p. 73.

12'. Tergum IX not strongly produced laterad (Fig. 203B); gonopod plate and bases of lamellae with only scattered long setae and lamellae without basal hooks (Figs. 203A, C) 13

13(12'). Lamellae each with basoventral edge produced in setose hook and excavation (Fig. 204A) . . . . . *Lp. colophallus* Yang and Morse, p. 75.

13'. Lamellae without hook and excavation on basoventral edge (Fig. 205A) 14

14(13'). Ventral part of anal tube semimembranous, with distal half separate from terga IX + X (Fig. 205A) 15

14'. Ventral part of anal tube fully sclerotized, forming closed canal with terga IX + X (Fig. 201A) 17

15(14). Lamellae rectangular, each with apicodorsal corner produced in sharp spine (Fig. 205A); internal part of gonopod plate VIII as long as lamellae and gonopod plate with pair of transverse, elliptical, concavities (Fig. 205C) ..... *Lp. hamatus*, n. sp., p. 77.

15'. Lamellae rounded apically (Fig. 199A); internal part of gonopod VIII shorter and gonopod plate without concavities (Fig. 199C) 16

16(15'). Gonopod plate with a pair of laterobasal concavities and two sub-mesal longitudinal ridges (Fig. 203C); exposed internal part of gonopod plate VIII slender with blunt apex, three times as long as wide (Fig. 203C) ..... *Lp. clinatus*, n. sp., p. 74.

16'. Gonopod plate without concavities and ridges (Fig. 199C); exposed internal part of gonopod VIII broadly triangular with acute apex, twice as long as wide (Fig. 199C) ..... *Lp. senarius*, n. sp., p. 67.

17(14'). Spermathecal sclerite long, spindle-shaped, with ventral process excavated at anterior end and with dorsal plate extending to segment VII (Fig. 201C) ..... *Lp. bitaenianus*, n. sp., p. 72.

17'. Spermathecal sclerite triangular and without excavation or extension (Fig. 200C) . 18

18(17'). Spermathecal sclerite without short, anterolateral processes (Fig. 207C); exposed internal part of gonopod VIII small, triangular, not longer than its width (Fig. 207C) ..... *Lp. dicopennis* Huang, p. 79.

18'. Spermathecal sclerite with pair of anterolateral processes (Figs. 200C, 206C); exposed internal part of gonopod VIII at least twice as long as its average width (Figs. 200C, 206C) 19

19(18'). Terga IX + X strongly tapering in distal half to narrow apex in dorsal view (Fig. 200B); exposed internal part of gonopod VIII slender, more than three times as long as average width (Fig. 200C) ..... *Lp. valvatus* Martynov, p. 68.

19'. Terga IX + X evenly tapered and with blunt apex in dorsal view (Fig. 206B); exposed internal part of gonopod plate broadly triangular, about twice as long as its average width (Fig. 206C) ..... *Lp. biwae* Tsuda, p. 78.

Triaenodini and Oecetini

Yang and Morse (1993) presented evidence that Triaenodini and Oecetini are sister lineages. This is in contradiction to the inference of Morse (1981) that the Oecetini are the sister lineage of Setodini + Mystacidini. The evidence for this revised opinion is (1) that male sternal IX and phallic sclerotized strips now have been observed in at least some species of *Oecetis* (Oecetini) and (2) that a divided tergum X (seen in all Triaenodini and some Oecetini) is a uniquely shared condition of Triaenodini and Oecetini. The "divided tergum X" of the male genitalia refers to separation of this structure into a lower part and an upper part. The lower part is usually composed of one piece or is variously excised apicomesally into two pieces. The upper part is composed of one to three processes arising from the dorsal base of the lower part.

Triaenodini Morse, 1981

Triaenodini Morse, 1981, pp. 261-262;
Type genus = *Triaenodes* McLachlan.

According to Morse (1981) and Yang and Morse (1993), monophyly for this tribe is evidenced by (1) the absence of branches of the hindwing cubital vein (Fork 5 absent; Fig. 116H; Marlier, 1962, figs. 89A and 89B) and (2) the trifid condition of the upper part of tergum X of the male genitalia (e.g., Fig. 110B; vs. only a single upper part of tergum X in Oecetini, e.g., Figs. 127A, B). According to them, the tribe includes the following genus-groups: *Adicella*, *Allosetodes*, *Erotesis*, *Triaenodella*, *Triaenodes* and *Ylodes*. Arguments for a phylogeny of these taxa were presented by Yang and Morse (1993), Neboiss and Wells (1997), and Andersen and Holzenthal (1999). Although *Erotesis* (four species) is known from the East and West Palearctic Regions and *Ylodes* (17 species, Manuel and Nimmo, 1984) is known from all the Holarctic Regions, neither genus has been reported from China and thus will not be discussed here in detail. The Oriental genus *Allosetodes* Banks, 1931, was synonymized with *Triaenodes* by Andersen and Holzenthal (1999).

Adicella McLachlan, 1877

Adicella McLachlan, 1877, pp. 294, 326, 327;
Type species: *Setodes reducta* McLachlan (selected by Kimmins, 1950).

PHYLOGENY: Yang and Morse (1993) provided characters demonstrating the monophyly of *Adicella*: (1) the lateral regions of the lower part of tergum X are tall, hood-like, especially tall apically, their ventral margins embracing the phallus, and (2) the phallicata is spoon-like, with a pair of apicodorsal lobes arising from the phallotremal sclerite. Yang and Morse (1993) also suggested that monophyletic *Erotesis* is its sister lineage because the two genera share uniquely a wide and long ventral lip of the phallic shield resting on the basal plate of the inferior appendages. Neboiss and Wells (1997), on the other hand, considered *Erotesis* the sister lineage of *Triaenodes* (and presumably *Ylodes*, not treated by them) on the basis of short and rounded preanal appendages.

Schmid (1994b, 1994c) described 46 new species of *Adicella* from India (more than doubling the number of species in the genus), grouping them according to general diagnostic characters. Because many of these characters are not synapomorphic, we include the following Chinese species in his Groups only selectively. With the addition of so many new species in recent years, the genus deserves a careful assessment of its phylogeny in order to clarify its natural groups.

LARVAE: The larva of *Adicella filicornis* (Pictet, 1834) was described by Morton (1904b), Ulmer (1909), Lestage (1921), Lepneva (1966), Hickin (1967), Steinmann (1967), and Wallace (1981). That of *Adicella reducta* (McLachlan) was described by Wallace (1981) and that of *Ad. contorta* Marlier was described by Marlier (1956, 1962). Barnard (1940) described the case of *Adicella monacha* Barnard, 1940, and indicated that the larva was similar to that of *Ad. filicornis*. The more salient features include a head that is reddish-orange or banded and spotted with reddish-orange, with asymmetrical mandibles having two cutting edges, and with a rectangular ventral apotome; legs without swimming hairs, hind tibiae undivided and much longer than their respective femora or tarsi; sclerite on each lateral hump of abdominal segment I with broad, straight, and dark posterior bar; gills single.

CASES: Larval cases are either strongly curved, composed of sand grains coated with secretion *or* straight, made in a spiral of cut plant material such as roots or square pieces of leaves

or made of plant materials in a manner that results in the case being more or less square in cross section.

PUPAE: The pupa of *Adicella filicornis* was described by Morton (1904b), Lestage (1921), Lepneva (1966), and Steinmann (1967) and that of *Ad. contorta* by Marlier (1956, 1962). The labrum is soft, without a bordering carina or pairs of extremely long hairs in the middle, it is about as long as broad and with a conspicuous apical projection. Mandibles each have a hooked apex and serrations especially large on a moderate prominence mesally, deeply concave laterally with two short basolateral setae. Apical spurs on the fore-, mid-, and hind tibiae are 1, 2, 2, respectively. Paired hook plates anteriorly on abdominal terga III-VII each have two to three hooks, paired hook plates posteriorly on abdominal tergum V each have 10-12 hooks. Anal rods are long, slender, with about seven small spinules and about four fine setae on the apical third.

ADULTS: Yang and Morse (1993) and Andersen and Holzenthal (1999) clarified means for distinguishing the adults of *Adicella* from those of *Triaenodes*, in light of the unreliability of the presence or absence of a stem for the forewing M vein (Kimmins, 1963a). Specifically, (1) the fork of forewing $\underline{S}_{3+4}$ is sub-rectangular in *Adicella* and *Erotesis*, usually sub-triangular in *Triaenodes* and *Ylodes*; (2) the lower part of tergum X is tall in *Adicella* and *Erotesis*, especially apically, and nearly surrounds the phallus in *Adicella*, but is much more shallow and apically covers only the dorsum of the phallus in *Triaenodes* and the other Triaenodini genera.

Adicella and *Erotesis* have the stem of M present in each forewing; the stem of M is missing in the forewing of *Ylodes* species and most *Triaenodes* species.

Adicella is very similar to *Erotesis*, but is distinguishable from it by structures of the male genitalia in which *Adicella* has the following diagnostic characters: (1) Tergum IX not divided longitudinally on the meson (divided in *Erotesis*); (2) upper part of tergum X consisting of one, two, or three slender processes (no obvious processes in *Erotesis*); (3) lower part of tergum X without pair of lateral setose mounds (mounds present in *Erotesis*); (4) phallicata spoon-like with a pair of apicodorsal lobes arising from the phallotremal sclerite (tubular and without lobes in *Erotesis*).

CLASSIFICATION: The species groups discussed below are generally those recognized by Schmid (1994b, 1994c). Synapomorphic and diagnostic characters are provided in the discussions along with lists of the species we consider to be included in each.

Because of their possession of all the *Erotesis* synapomorphies cited by Yang and Morse (1993) and none of the *Adicella* synapomorphies, we suggest that *Adicella melanella melanella* (McLachlan, 1884) and *Adicella melanella marocana* (Botosaneanu, 1989) be transferred back to the original genus *Erotesis*.

DISTRIBUTION: The 93 species of *Adicella* are distributed only in the Palearctic, Oriental and Afrotropical Regions. We found ten new species of *Adicella* from southeastern China. Together with *Adicella similis* Ulmer, described originally from China, there are now eleven known Chinese species of this genus.

HABITAT: Rivers, canals, streams, and flowing marshes among dense vegetation to small running bodies of water such as trickling springs, brooks, slowly flowing bogs, often among moss and bryophytes (Lepneva, 1966; Hickin, 1967), especially on roots (Wallace et al., 1990).

FEEDING HABITS: Unknown.

Adicella biramosa Group Kimmins, 1963b

Kimmins (1963b) described the *Adicella biramosa* Group to include four Indian species known to him that had the male inferior appendage divided into two conspicuous branches. Schmid (1994c) added three Indian and a Pakistani species to the Group, characterizing it by the possession of two pairs of dorsomedian lobes on tergum X and a strong dorsal branch on each inferior

appendage. With the new species described below, the Group now includes the following 13 species, all occurring in the Oriental Region, of which four species are found in southeastern China, the others being restricted to India and Pakistan and Andamen Island:

Ad. alcyo Schmid, 1994c, India
Ad. biramosa Martynov, 1936, India
Ad. capitata, NEW SPECIES, China
Ad. dharasena Schmid, 1961, Pakistan
Ad. dhruvasena Schmid, 1961, Pakistan
Ad. dirce Schmid, 1994c, India
Ad. longiramosa, NEW SPECIES, China
Ad. mita, NEW SPECIES, China
Ad. narendraya Schmid, 1961, Pakistan
Ad. niobe Schmid, 1994c, India
Ad. starmuehlneri Malicky, 1979, Andamen Island
Ad. tridigitata, NEW SPECIES, China
Ad. triramosa, NEW SPECIES, China

The immature stages are unknown for species of this Group. The females of only *Adicella starmuehlneri* (Malicky, 1979), *Ad. biramosa* (Schmid, 1958), and *Ad. capitata* are now known. In these three species, female tergum X + preanal appendages is long and hood-like and bears a pair of lobes basolaterally that are covered with dense setae; the gonopod plate is rugose with lateral concavities. These characters seem to be unique among the species of *Adicella* for which the females are known, suggesting that they may be additional synapomorphies supporting the monophyly of the Group.

Adicella capitata, NEW SPECIES
Figs. 107, 209

DESCRIPTION: Head and thorax yellowish brown, abdomen light greyish above, creamy white beneath, hairs on palpi and wings mostly rubbed in alcohol. Forewings hyaline faint yellowish brown with traces of concolorous hairs, hindwing fringes brown.

MALE GENITALIA (Fig. 107): Pleura IX with upper pleural regions compressed posteriorly, leaving elevated triangular dorsum, with apical edge produced at center in small triangular process with pair of papillae just beneath it; pleural region rectangular, with posterior margins sinuate. Preanal appendages short, oval. Lower part of tergum X forming tall hood, at much lower level than tergum IX; separated into pair of vertical lobes apically that are connected by membranes dorsally in basal half; ventral region of each side of hood sclerotized and extended ventromesad to embrace phallus, such that its edges almost meeting each other at mid line in ventral view; upper part of tergum X represented by only two lateral processes (middle process absent), straight, slightly longer than preanal appendages, bearing papillae with setae apically. Inferior appendages each appearing bifid in lateral view, mesal basodorsal branch well developed, longer than ventral branch (main body), sinuately directed backward and inward with each apex enlarged in capitate head, setose; in ventral view, mesal basodorsal branch evenly curved mesad, with short setose lobe just below the head (possibly rudimentary apical process of ventral branch); ventral branch slightly depressed, in ventral view broad basally and arched mesad at distal third, ending in blunt apex, mesal surface densely covered with short, spine-like setae. Phallobase evenly tube-like, bent about 100°; paramere spines absent; phallicata about three-fourths as long as phallobase

and completely retracted within it when at rest, phallotremal sclerite thin, small, U-shaped, with large dorsal lobes.

FEMALE GENITALIA (Fig. 209): Segment IX short, its dorsum produced apically in long triangular lobe and fused with tergum X and preanal appendages, forming broad elongate plate extending beyond lamellae, with apical ventrolateral edges curled inward, apex truncate; basal ventrolateral edges excavated, setting off distinctive basal setose lobe on each side. Lamellae quadrate, vertical lobes, each with outer surface bearing two semimembranous ridges; dorsal ridge acute and much smaller than ventral one; ventral ridge with dense fine setae. Gonopod plate broad, rugose, with lateral regions partly set off, enlarged in quadrate shape, each bearing two concavities and one small lobe. Exposed internal part of gonopod plate (i.gon.VIII), slender, twice as long as wide. Spermathecal sclerite oval, 1.3 times as long as wide.

LENGTH OF FOREWING: Male 7.3 mm, female 7.0 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 94a (NAU). Paratypes--10 males, 8 females, Loc. 94a (NAU); 23 males, 14 females, Loc. 92 (NAU); 24 males, 28 females, Loc. 93a (NAU); 8 males, 8 females, Loc. 98 (NAU); 1 male, 2 females, Loc. 88a (NAU); 1 female, Loc. 88b (NAU)

ETYMOLOGY: Latin, "head like," with reference to the shape of the mesal basodorsal branch of each inferior appendage.

DIAGNOSIS: Because one branch of each male inferior appendage is small and curled mesad, there appear to be only two branches in lateral view, thus resembling males of *Adicella biramosa* and most other species of the Group. The male also resembles that of *Ad. biramosa* in the absence of the middle process of the upper part of tergum X (also *Ad. dhruvasena*), the digitate lateral processes of the upper part of tergum X, the mesal basodorsal branch of each inferior appendage with a broad base and apex curved mesad. It differs from *Adicella biramosa* and other species in the Group, however, in the long and well differentiated ventral apex of the lower part of tergum X and in the capitate apex of the mesal basodorsal branch of each inferior appendage. The female resembles those of *Adicella biramosa* and *Ad. starmuehlneri* in the rugose gonopod plate with lateral concavities and the long, hood-like tergum X + preanal appendages. However, in those species the hood-like tergum X + preanal appendages are relatively shorter, extending only as far as the tips of the lamellae, and they lack the semimembranous ridges on the sides of the lamellae.

PHYLOGENY: The divided basodorsal process of each inferior appendage of this species, *Adicella tridigitata*, and *Ad. triramosa* is unique in this Group, suggesting that the three species constitute a monophyletic group in a yet-unresolved trichotomy.

DISTRIBUTION: Known from only Yunnan Province, southcentral China.

Adicella longiramosa, NEW SPECIES
Fig. 108

DESCRIPTION: Head and thorax yellowish brown, abdomen creamy white, palpi and forewings with yellowish brown hairs, hindwing fringes brown.

MALE GENITALIA (Fig. 108): Segment IX short rectangular, sub-apical margin of dorsum scarcely produced on meson, with pair of papillae apically; pleural posterior margins sinuate, only slightly expended outward; sternum 1.5 times as long as tergum. Upper part of tergum X trifid, each process very short, papilliform, setose, with mesal one almost erect and lateral two angled somewhat, both with truncate apex in lateral view; lower part of tergum X tall, hood-like, composed of two large vertical lobes fused dorsobasally and with ventral margins slightly incurved. Preanal appendages water-drop shaped. Inferior appendages each bifid, ventral (main) branch short, thumb-like, acute apically; in caudal view, very broad at base with apical third curved inward; mesal basodorsal branch slender, upright, twice as long as ventral branch, with blunt apex bearing

few stout setae and curved slightly inward. Phallobase slender, curved tube with membranous depression dorsobasally, pair of carinae laterally, each above corresponding concavity; phallicata tubular, sinuate, about as long as phallobase, moderately sclerotized; phallotremal sclerite distinctively U-shaped, its dorsal lobes semimembranous.

LENGTH OF FOREWING: Male 6.6 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 58a (NAU).

ETYMOLOGY: Latin, "long branch," with reference to the long mesal basodorsal branch of each inferior appendage.

DIAGNOSIS: The male of this species somewhat resembles *Adicella starmuehlneri* in the general shape of the genitalia. However, in this species: (1) sternum IX is relatively longer, (2) the middle process of the upper part of tergum X is much shorter and stouter, and (3) the ventral (main) branch of each inferior appendage is much more slender in both lateral and ventral views.

PHYLOGENY: The short ventral (main) branch of each inferior appendage and the relatively long mesal basodorsal branch of this species and *Adicella starmuehlneri* is a synapomorphy suggesting that these two are sister species.

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

and Far East Russia
Arefina & Morse, 2001

Adicella mita, NEW SPECIES
Fig. 109

DESCRIPTION: Head and thorax light yellowish brown, hairs mostly rubbed in alcohol, forewings like other species of this genus with dark brown hairs, veins ciliate.

MALE GENITALIA (Fig. 109): Segment IX short rectangular, dorsum produced backward at center in triangular lobe with rounded apex, dorsal papillae not apparent, pleural regions expanded outward posteriorly, with posterior margins sinuate. Preanal appendages short oval, 1.4 times as long as wide. Upper part of tergum X tridigitate, much longer than preanal appendages, with lateral processes slightly dilated sub-apically and longer than mesal one; lower part of tergum X forming large hood deeply excised apicodorsally into two vertical pieces, each with broad apex in lateral view. Inferior appendages mitten-like, each with broad main body (= ventral branch) slanted dorsocaudad 45°, roughly twice as long as wide in side view, in caudal view with apical third produced as narrow hook arched inward to blunt apex bearing few thick setae, basal two-thirds with mesal ridge bearing few short setae; mesal basodorsal process clavate, three-fifths as long as main body with apex bent slightly inward. Phallobase even tube, with distal half bent downward in 90°, basal half bearing paired lateral ridges above concavities; phallicata moderately sclerotized; phallotremal sclerite thin, large, U-shaped, its dorsal lobes large, semimembranous.

LENGTH OF FOREWING: Male 6.2 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 67b (NAU). Paratype--1 male, Loc. 67b (NAU); 1 male, 1 female, Loc. 18a (NAU); 1 male, Loc. 101 (NAU).

ETYMOLOGY: Latin, "mitten," with reference to the shape of the inferior appendage of the male genitalia in lateral view.

DIAGNOSIS: This primitive species in the *Adicella biramosa* Group differs from its other species by (1) the three processes of the upper part of tergum X (only two processes in *Adicella capitata* and *Ad. biramosa*, four processes [middle process subdivided] in *Ad. dharasena* and *Ad. narendraya*) that are (2) longer than for the other species, about two-thirds as long as lower part of tergum X; the mesal basodorsal branch of each inferior appendage is (3) clavate (unlike all other species in the Group), (4) shorter than the main body (unlike *Adicella longiramosa* and *Ad.*

starmuehlneri), and (5) forms an acute angle with the main body of the appendage (erect in *Adicella biramosa*, *Ad. dhruvasena*, *Ad. dharasena*, *Ad. narendraya*, *Ad. longiramosa*, and *Ad. starmuehlneri*); and (6) the apical process of the main body of each inferior appendage is distinct (unlike that of those same immediately preceding species) and (7) not associated with the mesal basodorsal branch (unlike *Adicella capitata*, *Ad. tridigitata*, and *Ad. triramosa*).

PHYLOGENY: *Adicella mita* lacks apparent synapomorphies with other species of this Group, suggesting that it may be primitive in the Group.

DISTRIBUTION: Known from southeastern China.

Adicella tridigitata, NEW SPECIES
Figs. 62, 110

DESCRIPTION: Body fuscous, head and palpi densely clothed with dark brown setae. Anterior wings hyaline pale fuscous with dark brown hairs.

MALE GENITALIA (Fig. 110): Segment IX rectangular in lateral view with posterior margins typically sinuate and produced outward, dorsum with posterior triangular projection and pair of distinctive papillae just beneath it. Preanal appendages short, nearly as long as broad, somewhat truncate at ends. Upper part of tergum X tridigitate, ciliated apically, arising from basal membranous region joining halves of lower part of tergum X, with median process at higher level and slightly longer than other two. Lower part of tergum X deeply divided into two spoon-like, tall, vertical lobes extending ventrally to about middle of pleura IX, each lobe with longitudinal ridge in middle. Inferior appendages each with three prominent branches: uppermost branch (presumably the originally mesal basodorsal branch) digitate, slightly bent mesad at apex, with few sub-apical setae; middle branch (presumably the originally apical projection of the main body of the appendage) arising from the caudal base of the uppermost branch, strongly curled mesad, with few apical setae; lower branch (presumably the originally ventral and mesal ridge of the main body) acute in lateral view, concave dorsally, with conspicuous lateral carina, in ventral view broadly parallel-sided and curved slightly mesad with sub-apical hook and obliquely truncate apex, setose along its entire ventral surface. Phallobase tube-like abruptly curved backward from near base, with pair of arched ridges on each side of basal region; paramere spines slender, moderately sclerotized; phallicata moderately sclerotized shallow trough with distinctive dorsal lobes of phallotremal sclerite.

LENGTH OF FOREWING: Male 5.5 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 52 (NAU). Paratypes--2 males, Loc. 52 (NAU); 2 males, Loc. 12d (CUAC).

ETYMOLOGY: Latin, "with three fingers," with reference to the structure of the upper part of tergum X and also the shape of each inferior appendage.

DIAGNOSIS: The male of this species most closely resembles that of *Adicella triramosa* in the three long branches of each inferior appendage. However, unlike it: (1) the pleural regions of segment IX are conspicuously flared outward posteriorly, (2) each of the lobes of the lower part of tergum X has a longitudinal ridge laterally, (3) the ventral branch of each inferior appendage in ventral view has a small sub-apical hook and an obliquely truncate apex, (4) the middle branch of each inferior appendage is fused with the mesal basodorsal branch basally, and (5) the phallus has two short paramere spines. *Adicella capitata* shares characters #2 and #4 above with *Ad. tridigitata*, but the middle branch of each inferior appendage is much shorter in *Ad. capitata* and the phallus of *Ad. capitata* lacks lateral carinae on the phallobase and lacks paramere spines.

PHYLOGENY: Diagnostic characters #2 and #4 above are unique for *Adicella tridigitata* and *Ad. capitata*. The very long middle branch of each inferior appendage is unique for *Ad.*

tridigitata and *Ad. triramosa*. Therefore, one or the other of these sets of apparent synapomorphies is presumably homoplasious. Pending the discovery of additional characters by which to provide a convincing choice, the three species must be left in an unresolved trichotomy.

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

Adicella triramosa, NEW SPECIES
Fig. 111

DESCRIPTION: Body color fuscous, similar to that of *Adicella tridigitata*; hairs on palpi and forewings yellowish brown.

MALE GENITALIA (Fig. 111): Segment IX rectangular, with posterior margins of pleural regions sinuate but not obviously extended outward, apical edge of dorsum slightly produced at center, papillae very tiny. Preanal appendages short oval. Upper part of tergum X tridigitate, ciliated at apex with middle process much longer and higher than other two; lower part of tergum X hood-like with its dorsum flat basally, then angled ventrad in lateral view, basal half semimembranous on the meson, with apical half broadly excised into two straight pieces without longitudinal lateral carinae, ventral edges slightly incurved. Mesal basodorsal branch of each inferior appendage setose throughout its length, strongly slanted backward, closely appressed to the middle branch (= apical process of ventral branch); middle branch as long as, and thinner than, mesal basodorsal branch in lateral view, but broader in dorsal view, with apex narrowing to tiny fork; ventral branch not quite as long as other branches, shallowly concave dorsally with weak lateral ridge and acute apex in side view, in ventral view slender banana-shaped, four times as long as wide, slightly curved mesad, with blunt apex, bearing approximately two rows of short spines on mesal edge. Phallus shaped as for other species in this genus, paramere spines absent.

LENGTH OF FOREWING: Male 6.0 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 56 (NAU).

ETYMOLOGY: Latin, "three branches," with reference to the three-branched upper part of tergum X and the shape of each inferior appendage.

DIAGNOSIS: Male genitalia are very similar to those of *Adicella tridigitata*. However, *Ad. triramosa* differs from it in the following details: (1) the lower part of tergum X of *Ad. triramosa* has its apex obliquely truncate in side view, (2) the middle branch of each inferior appendage does not arise from the base of the mesal basodorsal branch, (3) the branches of each inferior appendage are directed more strongly caudad and are more closely appressed to each other, and (4) the ventral branch of each inferior appendage is banana-shaped in ventral view.

PHYLOGENY: This species is one of the lineages in a trichotomy with *Adicella capitata* and *Ad. tridigitata*, as explained for the phylogeny of *Ad. tridigitata* above.

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

Adicella danae Group Schmid, 1994c

According to Schmid (1994c), this Group consists of those species for which the preanal appendages are large, [the lower part of] tergum X appears in lateral view as an isosceles triangle, the two lobes of [the upper part of] tergum X are long and slender [except absent in *Ad. clio*], and the inferior appendages are long and slim. To these characters we add that the phallobase is usually (except in *Ad. clio*) produced apically in a lobe that may be divided into two strongly sclerotized processes. The females of *Adicella filicornis*, *Ad. josephinae*, *Ad. meridionalis*, *Ad. reducta* have been described (Malicky, 1983; Gonzalez et al., 1989). In the females of these species the preanal

appendages are large, independent, oval flaps and the lamellae are divided into two lobes apically. The larvae of *Adicella filicornis* and *Ad. reducta* have been described (Wallace, 1981). Too few larvae are known to ascertain Group characteristics in the larval stages. The species are distributed in the Oriental and West Palearctic Biogeographic Regions, with only one species known from China. The nine species we recognize for this Group include the following:

Ad. clio Schmid, 1994c; India,
Ad. danae Schmid, 1994c; India
Ad. filicornis (F.J. Pictet, 1834), *Mystacide*; Europe
Ad. fulva Kimmins, 1963b, India
Ad. josephinae Gonzalez and Otero, 1980; Spain
Ad. longicornis, NEW SPECIES; China (Fu-jian)
Ad. meridionalis Morton, 1906; Spain
Ad. phryne Schmid, 1994c ; India
Ad. reducta (McLachlan, 1865b), *Setodes*; Europe

Adicella longicornis, NEW SPECIES
Fig. 112

DESCRIPTION: Head and thorax testaceous, abdomen creamy white, hairs mostly rubbed in alcohol. Forewing with traces of yellowish brown setae.

MALE GENITALIA (Fig. 112): Segment IX sub-triangular in lateral view, with sternum IX more than twice as long as its tergum and having triangular projection beneath inferior appendages, posterior margin of pleura IX sinuate; dorsum IX produced backward at its center and fused with upper part of tergum X. Preanal appendages oval. Upper part of tergum X comprised of three processes: long, highly sclerotized, middle process strongly compressed and bearing many papillae with setae ventrally; pair of short, truncate lateral processes each bearing short setae apically. Lower part of tergum X modified into pair of long, slender, sclerotized processes, each with apex hooked upward, basolaterally with setose lobe. Inferior appendages each composed of single branch, broad basally in lateral view, in ventral view arched mesad, apex and mesal margin bearing stout setae, with small lobe produced in middle of mesal margin. Phallobase highly sclerotized, broad tube, 2.2 times as long as wide, its apicoventral edge produced backward in elongate lobe bearing two teeth at each corner; phallic shield both with pair of lateral sclerotized strips articulating with sternum IX strips and with broad median strip articulating with basal plate of inferior appendages. Paramere spines each long, slender, rod-like, terminating in tiny tooth apically beyond whorl of fine setae. Phallicata with only lateroventral margins sclerotized, appearing as pair of slender bars, phallotremal sclerite very small, its dorsal lobes weakly semimembranous.

LENGTH OF FOREWING: Male 5.1 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 11b (NAU).

ETYMOLOGY: Latin, "long horn," with references to the long, sclerotized mesal process of tergum X.

DIAGNOSIS: This species somewhat resembles *Adicella phryne*, *Ad. fulva*, and *Ad. meridionalis* within the *Adicella danae* Group in the presence of a broad, setose basolateral lobe on each half of the lower part of tergum X and the very reduced mesal ridge of each inferior appendage. It differs from *Adicella phryne* and *Ad. fulva* in possessing a median process on the upper part of tergum X (absent in *Ad. phryne* and *Ad. fulva*). It differs from *Adicella meridionalis* in the longer median process of the upper part of tergum X, extending in this species to the apices

of the lower part of tergum X. It differs from all of these species and all other *Adicella* species in (1) the unusually slender halves of the lower part of tergum X, (2) each inferior appendage with a broader base in lateral view and a small lobe in the middle of the mesal margin (= remnant of the mesal ridge), (3) the broad phallus with an apical lobe bearing two teeth at each corner, and (4) the paramere spines rod-like, each bearing a tiny spine at its apex beyond a sub-apical whorl of setae.

PHYLOGENY: Within the *Adicella danae* Group, *Ad. longicornis* is one of four species having a unique setose basolateral lobe on each half of the lower part of tergum X. Among these, only *Adicella longicornis* and *Ad. meridionalis* have the median process of the upper part of tergum X compressed, suggesting that they are sister species.

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

Adicella maculata Group Schmid, 1994c

According to Schmid (1994c), males of the *Adicella maculata* Group have preanal appendages of average size, [the lower part of] tergum X has its lower apical angle extended caudad, [the upper part of tergum X consists of] three median dorsal lobes of small size, and the inferior appendages are not slender and their mesal surface is spinose. To these characters we add that the apicodorsal process of each inferior appendage is usually prominent and broad and the spinose mesal ridge of each inferior appendage is thick and broad. These are weak hypotheses; several species of the Group could belong to other Groups, especially the *Adicella danae* Group. Like males of the *Adicella danae*, *Ad. pulcherrima*, and *Ad. syriaca* Groups, the mesal basodorsal branch of each inferior appendage is absent. The females of *Adicella maculata* and *Ad. trifida* were described by Kimmins (1963b); their preanal appendages are not as large as those of the *Adicella danae* Group, the lamellae of *Ad. trifida* are oval without apical lobes, while those of *Ad. maculata* have the upper lobe larger than the ventral lobe. Larvae of no species of this Group have been described. We include the following ten species in this Group:

Ad. acte Schmid, 1994c; India
Ad. acutangularis, NEW SPECIES; China (Yunnan)
Ad. dryas Schmid, 1994c, India
Ad. eurynoe Schmid, 1994c, India
Ad. maculata Kimmins, 1963b; India
Ad. oviformis Ulmer, 1951; Java
Ad. similis Ulmer, 1932; China (Beijing)
Ad. thais Schmid, 1994c, India
Ad. thalie Schmid, 1994c, India
Ad. trifida Kimmins, 1963b, Myanmar

Adicella acutangularis, NEW SPECIES
Fig. 113

DESCRIPTION: Vertex and thorax brown, head and palpi covered with brown hairs. Forewings covered with brown hairs. Abdomen pale, each segment with brown dorsum, creamy white ventrum.

MALE GENITALIA (Fig. 113): Segment IX short, apical margin of dorsum produced backward in broad triangular lobe, beneath which papillae small but visible. Preanal appendages water-drop shaped, 1.5 times as long as wide. Upper part of tergum X tridigitate, with mesal process as long as preanal appendages, longer and at a little higher level than lateral processes.

Lower part of tergum X large, hood-like, with ventral edges below middle of segment IX, these margins especially well-sclerotized and each with apical end produced backward in acute, horn-like process; in dorsal view, excision between "horns" broad, semicircular. Inferior appendages slender, broadest basally in lateral view; in caudal view each appendage arched mesad, with mesal ridge narrow, ending in small triangular corner near middle. Phallobase short tube, three times as long as wide, with mid-dorsal depression, paramere spines absent, phallicata with distinctive sclerotization on ventrolateral edges, phallotremal sclerite large, crescentiform in dorsal view, its dorsal lobes weakly semimembranous.

LENGTH OF FOREWING: Male 5.11 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 87b (NAU).

ETYMOLOGY: Latin, "with an acute angle," with reference to the apicoventral projection of the lower part of tergum X.

DIAGNOSIS: The male of this species resembles that of *Adicella trifida* Kimmins in the general shape of segment IX and the inferior appendages, but differs from it in the median process of the upper part of tergum X longer than the lateral processes in *Ad. acutangularis* and from all other *Adicella* species in that each half of the lower part of tergum X has the apex of its ventral margins produced in an acute horn.

PHYLOGENY: On each inferior appendage of males of *Adicella acutangularis*, *Ad. acte*, and *Ad. trifida*, the narrow mesal ridge terminates in a square corner, suggesting that these may be sister species.

DISTRIBUTION: Known from only the type locality in midsouthern China.

Adicella similis Ulmer, 1932
(Fig. 117)

Adicella similis Ulmer, 1932: 62-63, f 34-35; holotype = male, type locality = China (Beijing), type repository = unknown.

Reported from northern China, this is the most northern species of *Adicella* so far reported in East Asia and the only species of the genus known from the East Palearctic Region. We have not seen specimens of this species and the original description and illustrations are not adequate for diagnosis.

Adicella pulcherrima Group, Schmid, 1994b

Schmid (1994b) included eight species in this Group: *Ad. pulcherrima* Ulmer, 1951 (Schmid questioning whether this is only one species); *Ad. castanea* Kimmins, 1963b; and *Ad. longicerca* (Kimmins, 1963b); along with five new species from India. According to Schmid (1994b), the Group may be described as follows (translated from French):

> "Coloration of the forewings is a little less dull than those of other *Adicella*, with the anastomosis emphasized by light, and some indistinct yellowish marks in the posterior and apical parts of the wing. There are two additional formations in the hairs, present in both sexes. In the forewings, the jugal lobe bears a cushion of dense and short erect hairs. In the middle of its length, the postcostal border is provided with a short, comb-like row of very long hairs, of equal length and directed posterad (Ulmer, 1951, pl. XXII, fig. 678). Furthermore, and only in the

male, the jugal lobe of the hindwings bears a strong brush of very long and very fine blackish hairs. According to the position of the wing, this brush can be developed into a very broad aerial fan, reminiscent of those that certain *Trichosetodes* bear on their scape (Schmid, 1987, pl. XIX, fig. 3).

"Male Genitalia: Segment IX very short and with its apicolateral border more or less concave posteriorly. Preanal appendices in very long and slender rod, sub-cylindrical, horizontal, and arched mesad. Segment X valves composed of a small upper lobe, more or less spiney, and a large smooth lower lobe, horizontal and broadly oval. Inferior appendages small, in a sub-vertical position, more or less lobed and always partly spicuous. Phallic apparatus with the phallotheca slightly arched, the parameres present and relatively well developed and the aedeagus [phallicata] short and massive.

"The Group is distributed in tropical Asia. In India it is localized in the mountains of the northern part of the country. The species present the same ecological characters as the other *Adicella*: they inhabit medium and small streams that are more or less turbulent in the lower and middle altitudes, between 250 and 2950 m altitude and are captured by net as well as at the light."

We include the following twelve species in this Group:

Ad. castanea Kimmins, 1963b; India
Ad. ellipsoidalis, NEW SPECIES: China (Jiang-xi)
Ad. euphrosyne Schmid, 1994b; India
Ad. euryale Schmid, 1994b; India
Ad. eurynome Schmid, 1994b; India
Ad. eurypyle Schmid, 1994b: India
Ad. eurysthene Schmid, 1994b; India
Ad. longicerca (Kimmins, 1963b), *Triaenodes*; Myanmar
Ad. nigropunctata Ulmer, 1930; Sumatra
Ad. papillosa, NEW SPECIES; China (Jiang-xi)
Ad. penicillaris, NEW SPECIES; China (Jiang-xi)
Ad. pulcherrima Ulmer, 1906; Java, Sumatra

Adicella ellipsoidalis, NEW SPECIES
Fig. 114

DESCRIPTION: Head and thorax fulvous, abdomen pale fuscus above, milk-yellow beneath; hairs on head and palpi yellowish; antennae along dorsomesal edges of scape, pedicel, and basal half of first flagellum segment covered with dense row of hairs (Fig. 114J). Forewings hyaline with traces of yellowish brown hairs, hindwing fringes brown.

MALE GENITALIA (Fig. 114): Segment IX slightly longer ventrally, pleural regions not flared outward, tergum produced posteriorly at center in triangular lobe with pair of papillae just beneath it. Preanal appendages sub-triangular with mesal edges straight in dorsal view. Upper part of tergum X bifid, slightly longer than preanal appendages, fused and broadened at base, each with outer basal margin having small, irregular, seta-bearing chalazae. Lower part of tergum X hood-like, divided into two vertical shallow plates each with inner surface concave, accommodating phallus. Inferior appendages short, elliptical, each about 2.5 times as long as wide (almost as broad as pleuron IX), without branches, with posteroventral surface bearing long setae; in caudal view crescentic, with obvious constriction at one-third distance from apex, mesal ridge thick and broad

and evenly covered with short, spine-like setae. Phallobase short tube bent 90°, with a pair of lateral ridges at bend; paramere spines absent; phallicata shallow, moderately sclerotized, phallotremal sclerite inconspicuous, with distinctively sclerotized dorsal lobes instead.

LENGTH OF FOREWING: Male 6.6 mm.

FEMALE AND IMMATURE STAGES: Female undescribed, immature stages unknown.

TYPE MATERIAL: Holotype MALE, Loc. 68 (NAU). Paratypes--1 male, Loc. 68 (NAU); 1 male, Loc. 56 (CUAC); 6 males, 2 females, Loc. 29 (NAU).

ETYMOLOGY: Greek, "elliptical," with reference to the shape of each inferior appendage of the male genitalia.

DIAGNOSIS: The male of this species has only two processes in the upper part of tergum X, in this respect resembling *Adicella euphrosyne*, *Ad. euryale*, *Ad. eurynome*, *Ad. eurypyle*, *Ad. eurysthene*, and *Ad. papillosa* in this Group, *Ad. oviformis* and *Ad. similis* in the *Ad. maculata* Group, *Ad. fulva* in the *Ad. danae* Group, and several species in the *Ad. biramosa* and *Ad. syriaca* Groups. It differs from these in (1) the peculiar row of hairs on the antennae, (2) the more slender processes of the upper part of tergum X, and (3) the lack of strong sclerotization or an apical projection on the ventral edge of each half of the lower part of tergum X.

PHYLOGENY: Although the the general appearance of the male of this species resembles especially that of *Ad. eurypyle*, there are no conspicuous synapomorphies to indicate that this is its sister species.

DISTRIBUTION: Known from the type localities in southeastern and mideastern China.

Adicella papillosa, NEW SPECIES
Fig. 115

DESCRIPTION: Head and thorax yellowish brown, abdomen pale yellow, hairs rubbed in alcohol, with traces of yellowish brown hairs on forewings, hindwing fringes brownish.

MALE GENITALIA (Fig. 115): Segment IX rectangular, pleural region slightly flared laterad but posterior margins not sinuate in lateral view; from dorsal view apical margin produced backward at center in rounded process, papillae absent. Upper part of tergum X forming broad plate with its distal two-thirds bifid, each process with apex sub-truncate, having several seta-bearing papillae; lower part of tergum X large, hood-like with distal two-thirds divided into two vertical plates each with ventrolateral region moderately sclerotized and extending mesad beneath phallus, with narrow apex turned upward in lateral view. Inferior appendages each single, upright, without branches, parallel-sided with anterodorsal end arched anterodorsad and produced in truncated apex in lateral view; in caudal view with mesal surface bearing 3-4 rows of short spines, constricted sub-apically, with apicomesal end protruded in small lobe. Phallobase slender tube curved 90°, with a pair of lateral ridges near base, paramere spines absent, phallicata distinctive shallow trough, phallotremal sclerite U-shaped in dorsal view, normal size for this genus, with paired dorsal lobes well defined.

LENGTH OF FOREWING: Male 6.6 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 67c (NAU). Paratype: 1 male, 64a (NAU).

ETYMOLOGY: Latin, "many nipples," with reference to the papillae on the pair of processes of the upper part of tergum X.

DIAGNOSIS: The male of this species resembles that of *Adicella evadne* Schmid 1995 from India, but it can be distinguished by the following diagnostic characters: (1) The upper part of tergum X is broad and plate-like, with its distal two-thirds narrowly bifid, each process with a sub-truncate apex and having several seta-bearing papillae. (2) The lower part of tergum X has the ventrolateral region darker, moderately sclerotized and with narrow apex turned upward in lateral

view. (3) The inferior appendages in lateral view are nearly three times as long as wide. It also looks like those of the species listed in the diagnosis of *Adicella ellipsoidalis*, having only a bifid upper part of tergum X, but it differs from these in (4) the possession of seta-bearing papillae on the upper part of tergum X, (5) each half of the lower part of tergum X with its ventral margin nearly embracing the phallus, and (6) each inferior appendage erect and with a truncate dorsal apex and a setose lobe on the apicocaudal corner.

PHYLOGENY: As for *Adicella ellipsoidalis*, the relationships of this species within the *Ad. pulcherrima* Group remain unresolved.

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

Adicella penicillaris, NEW SPECIES
Fig. 116

DESCRIPTION: Head and thorax fuscous, abdomen creamy white. Forewing covered with yellowish brown hairs, hindwings with black, thick hair-brushes, two-thirds as long as hindwing, arising from axillary regions (Fig. 116H).

MALE GENITALIA (Fig. 116): Segment IX broadest ventrally, tergum with mesal triangular projection with united papillae at apex. Preanal appendages large oval, twice as long as wide in dorsal view. Middle process of dorsal part of tergum X three-fourths as long as lower part of tergum X, with many seta-bearing papillae laterally near middle, lateral processes absent; lower part of tergum X large, hood-like, deeply excised apicomesally into two vertical plates, each with dorsal-most portion semimembranous and with ventral region strongly sclerotized all the way from base to tip with acute dorsolateral projection. Inferior appendages each single, unbranched, upright, about 2.5 times as long as wide with both ventral and dorsal ends rounded in lateral view; in caudal view mesal surface with approximately four rows of short stout spines, obviously constricted about two-thirds distance from base. Phallobase very short, about twice as long as broad; paramere spines short, semimembranous, only visible when phallicata exposed; phallicata only sclerotized in apical region, phallotremal sclerite large, U-shaped, its vertical dorsal lobes not distinctive.

LENGTH OF FOREWING: Male 6.2 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 67b (NAU).

ETYMOLOGY: Latin, "brush," with reference to the long-haired brush arising from the axillary region of the hindwing.

DIAGNOSIS: Apparently this is the only species of the *Adicella pulcherrima* Group for which the male has only one process of the upper part of tergum X, intermediate in this respect between *Ad. maculata*, for which the median process is long and the lateral processes are short, and *Ad. euphrosyne*, for which there is only a transverse shelf with a row of chalazae. Three species of the *Adicella danae* Group and several species of the *Ad. syriaca* Group also have this character. Among these, this is the only species (1) with obtuse triangular ventromesal projections near the middle of the ventral edges of the halves of the lower part to tergum X (best seen in ventral view), (2) with a triangular apicolateral projection on each half of the lower part of tergum X, and (3) with such a short phallus.

PHYLOGENY: The upper part of tergum X of this species uniquely resembles that of *Ad. maculata*, possibly representing an intermediate step in a transformation series to the condition seen in *Ad. euphrosyne*.

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

KEY TO MALES OF CHINESE *ADICELLA* SPECIES

(The females of *Adicella* and the male of *Ad. similis* are insufficiently known to key.)

1. Genitalia with inferior appendages and phallus (Fig. 107) ..... male, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 209) female, not keyed.

2(1). Inferior appendages each with mesal basodorsal branch (Fig. 107A) 3
2'. Inferior appendage without basodorsal branches (Fig.112A) 7

3(2). Basodorsal branch of each inferior appendage clavate, ventral branch mitten-like, with apical processes far away from basodorsal processes (Fig. 109A) ..... *Adicella mita*, n. sp., p. 88.
3'. Basodorsal branch of each inferior appendage foliaceous (Fig. 107A) or digitate (Fig. 108A), accompanied by one (Fig. 108A) or two (Fig. 110A) additional processes that are slender and not mitten-shaped in lateral view 4

4(3'). Each inferior appendage with only two branches or basodorsal branch without posteromesal lobe (Figs. 108A, C, E) ..... *Adicella longiramosa*, n. sp., p. 87.
4'. Each inferior appendage with three branches (Figs. 110A, 111A) or basodorsal branch with posteromesal lobe (Figs. 107A, C) 5

5(4'). Apical process (middle branch) of each inferior appendage closely appressed (Fig. 111A) or basally fused (Fig. 110A) with basodorsal branch 6
5'. Apical process of each inferior appendage completely fused with basodorsal branch, appearing as small lobe on posteromesal edge of basodorsal branch (Figs. 107A, C) ..... *Adicella capitata*, n. sp., p. 85.

6(5). Ventral branch of each inferior appendage banana-shaped in ventral view (Fig. 111C), its apical process appressed to dorsal branch but not arising from it (Fig. 111A) ..... *Adicella triramosa*, n. sp., p. 89.
6'. Ventral branch of each inferior appendage obliquely truncate in ventral view and with sub-apicomesal hook (Fig. 110C), its apical process fused basally with dorsal branch (Fig. 110A) ..... *Adicella tridigitata*, n. sp., p. 88.

7(2'). Sternum IX produced in middle in triangular process (Fig. 112C); paramere spines rod-like, each bearing sub-apical whorl of setae and tiny spine apically (Fig. 112De) ..... *Adicella longicornis*, n. sp., p. 91.
7'. Sternum IX not produced in middle (Fig. 113C); paramere spines absent (Fig. 113De) or vestigial (Fig. 116D) 8

8(7'). Three slender dorsal processes of tergum X present (upper part of tergum X tridigitate, Fig. 113B); apicoventral end of each lower part of tergum X sclerotized and produced in acute horn (Fig. 113A, B, C) ... *Adicella acutangularis*, n. sp., p. 92.
8'. One (Fig. 116B) or two (Figs. 114B, 115B) dorsal processes of tergum X present, each with lateral, seta-bearing chalazae 9

9(8'). One dorsal process of tergum X present (Fig. 116B) ..... *Adicella penicillaris*, n. sp., p. 96.
9'. Two dorsal processes of tergum X present (Figs. 114B, 115B) 10

10(9'). Dorsal processes of tergum X slender, digitate (Figs. 114A, B); inferior appendages elliptical, each with rounded apex (Fig. 114A) . . . . . *Adicella ellipsoidalis*, n. sp., p. 94.

10'. Dorsal processes of tergum X broad plates (Fig. 115B); inferior appendages obliquely truncate apically and with posteromesal, spinose lobe (Figs. 115A, E) . . . . . *Adicella papillosa*, n. sp., p. 95.

Triaenodes McLachlan, 1865b

Triaena McLachlan, 1865a, p. 34 (preoccupied).

Triaenodes McLachlan, 1865b, p. 110; type species: *Leptocerus bicolor* Curtis (selected by Ross, 1944).

Allosetodes Banks, 1931, p. 421; type species: *Allosetodes plutonis* Banks (monobasic); synonym of *Triaenodes* according to Andersen and Holzenthal, 1999.

Triaenodella Mosely, 1932a, p. 297; type species: *Triaenodella chelifera* Mosely (original designation); synonym of *Triaenodes* according to Ross, 1944; subgenus of *Triaenodes* according to Yang and Morse, 1993.

Austrotriaena Yang and Morse, 1993; type species: *Triaenodes trifida* Kimmins (original designation); as subgenus.

PHYLOGENY: The relationships of species groups that have been included in *Triaenodes* were reviewed by Manuel and Nimmo (1984) and Yang and Morse (1993). According to Yang and Morse (1993), the genus is a monophyletic group as indicated by the following synapomorphies: (1) the male antennal scapes each have a hairy scent organ, covered with a long flap (organ or flap lost independently in a few lineages); (2) the basal plate of the inferior appendages is very short and does not articulate with the ventral lip of the phallic shield; (3) the paramere spines are absent; and (4) the phallicata is either absent or fused with the phallobase. Yang and Morse (1993) also recognized three subgenera within *Triaenodes*. Their findings were challenged by Neboiss and Wells (1997) and Andersen and Holzenthal (1999). Forty-four more species were recently described from Australia (Neboiss and Wells, 1998). Pending the completion of descriptions of additional large numbers of species from Africa and South America (Andersen and Holzenthal, 1999) and a re-assessment of the world fauna, we refrain from implementing a subgeneric classification here.

LARVAE: Larvae have been described for the following species:

Triaenodes aba Milne--Ross, 1944; Glover, 1996.

Triaenodes baris Ross--Glover, 1996.

Triaenodes bernaysae Korboot--Korboot, 1964b.

Triaenodes bicolor Curtis--Reaumur, 1737; Hagen, 1864 (as *Mystacides auripilis* Bremi); Klapalek, 1888; Struck, 1903; Ulmer, 1903a, 1904; Thienemann, 1905; Silfvenius, 1905; Ulmer, 1909; Lestage, 1921; Lepneva, 1940; Hickin, 1942, 1967; Lepneva, 1966; Steinmann, 1967; Wallace, 1981; Waringer and Graf, 1997.

Triaenodes cumberlandensis ETNIER and WAY--Glover, 1996.

Triaenodes difformis Mosely--Marlier, 1956.

Triaenodes flavescens Banks--Vorhies, 1909; Glover, 1996.

Triaenodes florida Ross--Glover, 1996.

Triaenodes furcella--Glover, 1996.

Triaenodes helo Milne--Glover, 1996.

Triaenodes ignitus (Walker)--Glover, 1996.
Triaenodes injustus (Hagen)--Ross, 1944; Glover, 1996.
Triaenodes marginatus Sibley--Sibley, 1926; Ross, 1944; Glover, 1996.
Triaenodes melaca Ross--Glover, 1996.
Triaenodes nox Ross--Glover, 1996.
Triaenodes ochraceus (Betten and Mosely)--Glover, 1996.
Triaenodes perna Ross--Glover, 1996.
Triaenodes taenia Ross--Manuel and Braatz, 1984; Glover, 1996.
Triaenodes tardus Milne--Ross, 1944; Manuel and Braatz, 1984; Glover, 1996.
Triaenodes voldus Mosely--StClair, 1987.

These may be distinguished from larvae of other Leptoceridae genera by the following combination of characters (see especially Glover 1996): (1) Head with secondary cephalic ecdysial lines surrounding the eyes anteriorly and ventrally and extending to the occipital foramen (*vs.* Triplectidinae); (2) head lacking small amount of cream ground color visible as a thin, smooth crescent posterodorsally (vs. *Ylodes* species, which have this color); (3) ventral apotome of head long and rectangular (*vs.* Athripsodini, Nectopsychini, Leptocerini, and Oecetini); (4) maxillary palpi extending little beyond anterior edge of labrum (*vs.* Oecetini); (5) mandibles short and wide, with dorsal and ventral edges surrounding mesal cavity (*vs.* Oecetini); (6) mandibles strongly asymmetrical (*vs.* other genera of Leptoceridae except *Ylodes*); (7) mesonotum without pair of dark bars (*vs.* Athripsodini); (8) middle legs each with tarsal claw slightly curved and slender, tarsus straight (*vs.* Leptocerini); (9) metanotum usually without sa3 sclerites (vs. usually present in Triplectidinae, Mystacidini, Nectopsychini, and Setodini); (10) tibia of each hind leg with pale transverse band giving appearance of a subdivision (*vs.* other genera except *Triplectides* and genera of Mystacidini and Setodini); (11) hind legs usually natatorial, each with two close-set fringes of long hairs (*vs.* other genera except most *Ylodes* and some *Oecetis* and *Nectopsyche* species, which have such hairs); (12) abdomen only slightly, gradually tapered from base to apex (*vs.* Athripsodini); (13) abdominal gills single and not in clusters (vs. Athripsodini and few *Triplectides*); (14) anal prolegs without spinous concave plates (*vs. Setodes*).

CASE: Slender, tapered, with longitudinally oriented pieces of green plants, root tips, or detritus arranged in a dextral or sinistral spiral.

PUPAE: The pupa of *Triaenodes bicolor* Curtis was described by Lestage (1921) and Steinmann (1967) and that of *Triaenodes voldus* Mosely by StClair (1987). Glover (1996) described the pupae of *Triaenodes aba*, *Tn. flavescens*, *Tn. florida*, *Tn. helo*, *Tn. ignitus*, *Tn. injustus*, *Tn. melaca*, *Tn. nox*, *Tn. ochraceus*, *Tn. perna*, and *Tn. tardus*. Characters by which pupae of Chinese *Triaenodes* pupae may be distinguished from those of other Leptoceridae genera are provided in the key above.

ADULTS: Means for distinguishing adults of *Triaenodes* species from those of *Adicella* and *Erotesis* species were discussed by Yang and Morse (1993) and summarized above in the discussion of *Adicella* adults. According to Yang and Morse (1993), most of the species of this genus have a scent organ with a hair pencil and often a sclerotized covering flap. It is absent in all other Triaenodini species, and, apparently secondarily, at least in *Triaenodes bicolor*, *Tn. aba* Milne, *Tn. nox* Ross, and *Triaenodes lanceolata* Kimmins. The fork of forewing $\underline{S}_{3+4}$ is sub-triangular in *Triaenodes* and *Ylodes* and sub-rectangular in *Adicella* and *Erotesis*. According to Manuel and Nimmo (1984) and Yang and Morse (1993), *Triaenodes* adult males are distinguishable from those of *Ylodes* by the following characters: (1) male antennal scapes each usually have a hairy scent organ, usually covered by a long sclerotized flap (absent in *Ylodes* species and other Trichoptera); (2) the basal plate of the inferior appendages does not articulate with the phallobase (articulating in other Triaenodini species); (3) the apices of the pair of long, recurved processes arising on the basal plate are usually fully visible in lateral view (tips hidden

in *Ylodes* species); (4) the phallobase is longer than tall (very short in *Ylodes* species); (5) paramere spines are absent (single paramere spine arising from dorsomesal apex of the phallobase in *Ylodes* species); and (6) the phallicata is absent or fused with the phallobase (distinct in species of *Ylodes* and other Triaenodini).

CLASSIFICATION: The use of genus-group names that have been synonymized with *Triaenodes* were reviewed by Manuel and Nimmo (1984) and Yang and Morse (1993). The genus is in serious need of a world revision to elucidate the relationships and classification of its many species. Manuel (pers. comm.) is revising the North American species.

HABITAT: Larvae generally swim or climb above the bottom among plants in lentic or lotic depositional habitats.

FEEDING HABITS: Larvae usually eat green plants, including submerged roots of riparian vegetation (Berg, 1949; McGaha, 1952; Tindall, 1960; Glover, 1996). At least one species, *Triaenodes bicolor*, has been reported as a pest of rice (Moretti, 1942).

Triaenodes bilobatus, NEW SPECIES
Figs. 63, 118

DESCRIPTION: Head, thorax and legs testaceous, covered with same color setae; basal segments of antennae each about 1.5 times as long as head, with "scent-organ" on inner side; forewings hyaline, yellowish.

MALE GENITALIA (Fig. 118): Segment IX somewhat broader both dorsally and ventrally, posterior pleural margins each with deep oblique excision filled with membrane; from above apical margin strongly produced at center with paired conspicuous papillae just beneath it; venter of segment IX trapezoidal with lateral margins sinuate in ventral view. Preanal appendages triangular, very broad at base in lateral view (sometimes in dorsal view). Median process of upper part of tergum X absent, its lateral processes represented by two ciliate, dorsal lobes placed laterally near apices of halves of lower part of tergum X; lower part of tergum X hood-like, deep at base, somewhat like species in *Adicella* but with apical excision shallow and with fused basal portion not membranous. Inferior appendages elongate, depressed, each with recurved basal plate process stout, curved 180°, slightly longer than main body of appendage; in ventral view main body of each appendage with broad, bulbous base gradually narrowing to blunt apex, mesal ridge and apex sparsely covered with short, spine-like setae. Phallus with only phallobase conspicuous, trough-like, slightly longer than inferior appendages, with weak longitudinal ridge on each side and with apicodorsal ends dentate; ejaculatory duct lying in middle of trough.

FEMALE GENITALIA (as for Fig. 211): Almost identical with the female of *Triaenodes qinglingensis*, we can associate them only by corresponding localities of the males.

LENGTH OF FOREWING: Male 6.1-7 mm; female 5.6-6.7 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 9 (NAU). Paratypes--9 males, 21 females, Loc. 2a (NAU); 2 males, 3 females, Loc. 11b (CUAC).

ETYMOLOGY: Latin, "bilobed," with reference to the appearance of tergum X.

DIAGNOSIS: The male of this species resembles that of *Triaenodes ochreelus* McLachlan, 1877, and *Tn. unanimis* (McLachlan) in the general shape of each inferior appendage, with relatively short recurved processes of the basal plate and with no apparent basodorsal branch of the appendage. We have not seen specimens of *Tn. sinicus* Ulmer, 1932, but the original illustrations suggest that it also is similar to these species. *Triaenodes bilobatus* differs from all these, however, in the relatively shorter and stouter recurved processes of the basal plate and especially in the bilobed condition of the upper part of tergum X, with the lobes closely applied to the length of the lower part of the tergum, such that they are not immediately obvious. *Triaenodes*

sinicus may have a similar condition of tergum X, but the main body of each inferior appendage is bent strongly dorsad.

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

Triaenodes dusrus Schmid, 1965
Fig. 119

Triaenodes dusrus Schmid, 1965; p. 147, figs. 7-8; holotype = male; type repository = Alexander Koenig Museum in Bonn; type locality = Li-Kiang (now Li-jiang, Yunnan Province, Loc. 93b.)

DESCRIPTION: We have not seen specimens of this species. According to Schmid (1965, translated from French):

> "Body light reddish yellow and covered with light yellow pilosity. Remaining pilosity of anterior wings gold. Venation: in anterior wings, fork 1 as long as its stalk; false discoidal cell very large. Level with origin of that cell and in middle of its width, sub-radial cell in both anterior wings showing short segment of longitudinal vein not attached to any other vein.
>
> "MALE GENITALIA [Fig. 119]: Segment IX well developed ventrally, showing longitudinal median carina. Preanal appendages relatively small, oval-triangular. Dorsal lobe of segment X [median process of upper part of tergum X] twice as long as preanal appendages, clearly visible in profile and distinctly situated above lower part of segment X. Lower part of segment X of similar form to that of [*Triaenodes*] *hoenei*, appearing very obliquely truncate basally in lateral view. Inferior appendages small, of complex form and terminated in three lobes; one external, relatively obtuse, hairy on its lateral surface; one internal, separated from the external lobe by wide rounded space and bearing row of spines on its median edge; and one middle lobe, smaller than the other two, more slender and originating anteriorly in the space separating the other two. Dorsal branches of inferior appendages [recurved processes of basal plate] and phallus similar to those of [*Tn.*] *hoenei*."
>
> LENGTH OF FOREWING: Male about 8 mm ["Wingspan of male: 18 mm"]
>
> FEMALE AND IMMATURE STAGES: Unknown.

DIAGNOSIS: Like those of *Triaenodes bicolor*; *Tn. darfuricus* Mosely, 1936b; *Tn. tanzanica* Olah, 1986; *Tn. wambana* Mosely, 1939; and similar species; the male of *Tn. dusrus* has an erect basodorsal branch on the main body of each short inferior appendage in addition to the recurved processes of the basal plate. It differs from the first species in that the preanal appendages of this species are only half as long as the lower part of tergum X (1.5 times as long in *Tn. bicornis*). From the other three species it differs in the fused condition of the lower part of tergum X (divided in long slender spines in those species). It differs from all of these by the fact that the upper part of tergum X is present as a single median process (missing in all of the above species). It also resembles *Tn. hoenei*, but the median process of the upper part of tergum X is only as long as the preanal appendages in that species and the basodorsal branch of each inferior appendage is represented only by a setose bump.

DISTRIBUTION: Known from only the type locality in southern China.

Triaenodes foliformis, NEW SPECIES
Figs. 120, 210

DESCRIPTION: Head and thorax yellowish brown, hairs on vertex and palpi yellowish brown to brown; scape of each male antenna stout, about twice as long as first flagellar segment, bearing large tuft of long fine hairs covered by long, thin plate; forewing ochraceus, densely covered with brown hairs.

MALE GENITALIA (Fig. 120): Dorsum of segment IX forming triangular hood; pleural regions semisclerotized with deep excisions ventrally, segregating sternum into two parts, with posterior part projecting caudad, sub-quadrate in ventral view. Preanal appendages large, foliaceous, 3 times as long as wide. Upper part of tergum X with conspicuous median process straight, clavate, similar to that of *Tn. unanimis*; with pair of vestigial lateral processes basally; lower part of tergum X constricted sub-basally with large, rounded apex extending well beyond median process of upper part of tergum X, slightly exceeding inferior appendages. Inferior appendages foliaceous, in lateral view sub-oval with acute apex, about 1.4 times as long as width; recurved processes of basal plate about three times as long as appendages, with basal third directed forward then remainder arched backward; dorsolateral surface of each inferior appendage concave, this concavity defined by lateral ridge and dorsomesal ridge, bare except with two long setae arising from chalazae near base; in ventral view main body of appendage semicircular, with inner margins relatively straight, bearing approximately three rows of short setae. Phallus slender, parallel-sided trough, six times as long as wide, 2.5 times as long as inferior appendages, with pair of lateral ridges near middle for engaging recurved processes of basal plate; ejaculatory duct arched dorsad sub-apically.

FEMALE GENITALIA (Fig. 210): Tergum IX_a broadly incised and elevated in obtuse process, tergum IX_b represented by pair of large lobes well-separated from each other. Preanal appendages represented as broad setose mounds fused with tergum X. Segment X forming longitudinally short, vertically tall anal tube with its bottom semimembranous. Lamellae rounded, spoon-like, concave mesally. Gonopod plate with basal arched ridge and high mesal ridge produced apically in acute spine, lateral regions deeply concave in basal half; U-shaped internal part of gonopods VIII + IX mostly exposed. Spermathecal sclerite elongate elliptical, with its ventral process about three-fourths as long as sclerite.

LENGTH OF FOREWING: Male 6.9 mm, female 7.3 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 76d (NAU).

ETYMOLOGY: Latin, "leaf-like," with reference to the shape of the inferior appendages.

DIAGNOSIS: The male of this species is somewhat similar to that of *Triaenodes unanimis* in the form of the median process of the upper part of tergum X and in inferior appendages each not divided into apical lobes and without a basodorsal branch but with a dorsolateral concavity. It differs from that species, however, in the tongue-like appearance of the lower part of tergum X in dorsal view and in the fact that the lateral ridge of each inferior appendage extends to the apex of the appendage.

DISTRIBUTION: Known from only the type locality in southern China.

Triaenodes hoenei Schmid, 1959
Fig. 121

Triaenodes hoenei Schmid, 1959; pp. 328-329, figs. 10-12; holotype = male; type repository = Zoological Museum of the Humboldt-University of Berlin; type locality = "Li-kiang" (Li-jiang, Yun-nan Province, Loc. 93).

DESCRIPTION: We have not seen specimens of this species. According to Schmid (1959, translated from French):

> "Dorsum of body reddish, with dense beige pilosity, also covering palps. Face and sides reddish yellow. Tarsi covered with yellowish silver scaley hairs. Abdomen brown, relatively dark. Anterior wings with dense pilosity uniformly light reddish brown. False discoidal cell remarkably large, fork 1 shorter than its stalk.
> "MALE GENITALIA [Fig. 121]: Segment IX relatively long ventrally, dorsally high, short, but not oblique; recessed angle separating these two parts very acute, prolonged far toward the base and including basolateral parts of segment X. Preanal appendages relatively large; broad basally, abruptly narrowed in middle and bearing remarkably long hairs. Median process [of upper part] of segment X simple and as long as preanal appendages; in dorsal view appearing slender in basal half and circularly rounded apically. Segment X rather obtusely oval and slightly longer than preanal appendages. Inferior appendages small and of complex form; in lateral view, lower branch [main body of each appendage] showing upper basal prominence and terminating in two poorly developed lobes; in ventral view, appearing obtuse with apex excised; resulting apicomesal lobe bearing short thick hairs; apicolateral lobe more slender and armed with two or three short spines [apically]; partly hidden triangular lobe found in apical excision. Upper branch of inferior appendage [each recurved process of basal plate] not very large, parallel with phallus, slightly shorter than phallus, apex rounded with few small hairs. Phallus of medium size, nearly horizontal, slightly arched basally, not very sclerotized, but with ejaculatory duct clearly visible."

LENGTH OF FOREWING: Male about 14 mm ["wingspan 29-30 mm"].
FEMALE: Undescribed.
IMMATURE STAGES: Unknown.
DIAGNOSIS: The male of this species appears most nearly like that of *Triaenodes indicus* Martynov, 1936, but differs from it in the shorter and more-clavate median process of the upper part of tergum X (longer than the lower part of tergum X and parallel-sided in *Tn. indicus*), the longer and basally broader preanal appendages (less than half as long as the lower part of tergum X and slender in *Tn. indicus*), the vestigial basodorsal branch of each inferior appendage represented by a small hump (small slender process in *Tn. indicus*), and the apicolateral lobe of each inferior appendage only as long as the apicomesal process (much longer in *Tn. indicus*). Schmid (1965) commented on the similarity to *Tn. dusrus*, from which it differs by characters mentioned above.
DISTRIBUTION: Known from only the type locality in southern China.

Triaenodes qinglingensis, NEW SPECIES
Figs. 122, 211

DESCRIPTION: Head and thorax reddish brown, legs testaceous, basal segment of male antennae very long, each with "scent-organ" situated on inner side; forewings ochraceus with brownish hairs.
MALE GENITALIA (Fig. 122): Segment IX dorsally forming triangular hood, pleural region deeply excised, mostly dividing sternum from rest of segment; sternum large, sub-triangular in lateral view, about 1.5 times as long as tergum, sub-quadrate in ventral view. Preanal appendages

large foliaceous, 4 times as long as average width; median process of upper part of tergum X straight, clavate, bearing short setae, basal third narrowed, apex dilated and extending beyond lower part of tergum X. Lower part of tergum X entire, broad basally, strongly constricted at middle in dorsal view, with blunt apex, appearing very acute in lateral view. Inferior appendages oblong; recurved processes of basal plate each stout, projecting anterodorsad in basal third then arched backward with apex directed down beyond tip of main body of appendage; in ventral view, each main body slightly dilated basally, constricted near middle, with outer margins longer than inner margins, forming obliquely truncate apex bearing dense, spine-like setae, mesal region of appendage sparsely covered with short setae. Phallobase slender, trough-like, nearly twice as long as main body of inferior appendages, with its ventral surface deeply concave such that two lateral edges appearing as high ridges, ejaculatory duct elevated at apex.

FEMALE GENITALIA (Fig. 211): Segment IX rectangular in side view, IXa single and slightly protruding, IXb paired and prominent. Preanal appendages oval, setose mounds fused with tergum X, poorly defined. Tergum X forming short anal tube. Lamellae large, spoon-like. Gonopod plate sclerotized with high, mesal ridge dividing plate into two lateral regions; each lateral region concave and with two transverse ridges defining three areas: apical area rounded-sub-triangular lobe, middle and basal areas each sub-rectangular, apical and middle areas with rugose surfaces; in lateral view, mesal ridge with two dentate-sinuations. Internal gonopod plate U-shaped, with only apices of its two arms exposed. Spermathecal sclerite with anterior half narrowing to parallel-sided process, posterior half nearly right rhomboidal, ventral process of sclerite less than half as long as sclerite.

LENGTH OF FOREWING: Male 6.8-7.5 mm, female 6.0-6.2 mm.

TYPE MATERIAL: Holotype MALE, Loc. 71 (NAU). Paratypes--4 males, 45 females, Loc. 11b (NAU); 1 male, 6 females, Loc. 10c (NAU); 3 males, 1 female, Loc. 67c (CUAC); 1 male, 3 females, Loc. 58c (NAU); 1 male, Loc. 58a; 1 male, Loc. 56 (CUAC); 1 male, 1 female, Loc. 76c (NAU); 1 male, 4 females, Loc. 66 (NAU); 1 male, 1 female, Loc. 57b (NAU); 1 male Loc. 29 (NAU).

ETYMOLOGY: Chinese, "Qing-ling Mountains" (pronounced "ching-ling," giving equal emphasis to each syllable), with reference to the type locality, which is supposed to be part of the boundary between the Oriental Region and the Palearctic Region within China (Zhang and Zhao, 1978).

DIAGNOSIS: The male of this species very closely resembles *Tn. unanimis*, but differs from it in the following characters: (1) the median process of the upper part of tergum X has the distal clavate portion parallel-sided and extending beyond the apex of the lower part of tergum X; (2) the lower part of tergum X has an acute apex in lateral view; (3) the base of each inferior appendage is not so strongly angled in ventral view; and (4) the apex of each inferior appendage is broader and distinctly obliquely truncate.

DISTRIBUTION: Known from the type localities in southeastern, southcentral and mideastern China.

Triaenodes sinicus Ulmer, 1932
Fig. 123

Triaenodes sinica Ulmer, 1932; p. 61, figs. 32-33; holotype = male; type repository = Yen-ching University (now Beijing University); type locality = Soochow (now Su-zhou, Jiang-su Province, Loc. 48).

DESCRIPTION: We have not seen specimens of this species. Ulmer (1932) provided the following description (translated from German):

"Colors faded [in alcohol], hair abraded. Head dirty olive-brown, in life probably clear green; base of antenna (these broken), palps and legs colored similar to head; only somewhat more clear; first antennal segment near base on posterior surface with hair pencil, about half as long as segment, itself as long as head. Wings entirely colorless, transparent, without discernible hair, veins obvious, appearing olive-brown over white background, in transmitted light most veins, especially in hindwing, virtually clear or whitish. In forewing veins of anastomosis forming straight line, discoidal cell large, about three times as long as its stalk, somewhat narrower than following cell; fork 1 stalked, about as long as its stalk, following four apical cells sessile and all of similar length, third cell acute (simulating fork 2), remaining cells closed by straight base; apical cell 4 narrower than apical cell 2 and 5, the rest very similar width. In hindwing, somewhat broader than forewing, fork 1 with long stalk, longer than in forewing; apical cells 2 and 4 broad, ending diagonally and extending basally parallel; apical cell 3 (simulating fork 2) acute and shorter than neighboring cells.

"MALE GENITALIA [Fig. 123]: Tergite IX strongly produced, extended in triangle to process, best seen in dorsal view; preanal appendages narrowly oval, their outer edge excised before apex, so that apex appearing somewhat constricted; tergite X cleft in two thick, straight, parallel rods, apically rounded in dorsal view and somewhat narrowed in lateral view; pair of slender, sclerotized, apically setose rods further ventrad, closely over thick phallus; inferior appendages large, in dorsal view visible beneath preanal appendages as foliaceous plates, gradually tapered apically to blunt point, inner edge convex, outer edge sinuous before concave apex; in lateral view inferior appendage situated on prominent last sternite, excised between inferior appendages on hind edge (ventral view); in lateral view inferior appendages more or less parallel-sided, bent upward, cut out from outer surface with longitudinal carina, on bent inner edge.

"Body length: 6 mm; length of forewings: 8 mm; wingspan thus about 17 mm.

"Material: 2 males, C 37, Soo-chow, C.F. Wu collector, one in Yen-ching University Museum; one in my collection."

FEMALE AND IMMATURE STAGES: Unknown.

DIAGNOSIS: The male's "slender, sclerotized, apically setose rods" are apparently the recurved processes of the basal plate. The shape of the main body of each inferior appendage, without a basodorsal branch, resembles that of *Triaenodes ochreelus*, *Tn. unanimis*, and their relatives. Like *Tn. bilobatus*, a dorsal part of tergum X is not immediately obvious. However, *Tn. sinicus* differs from these in the strongly bent inferior appendages. We assume that the "tergite X cleft in two thick, straight, parallel rods, apically rounded in dorsal view and somewhat narrowed in lateral view" refers to the lower part of tergum X; the presence and the structure of the upper part of tergum X are not indicated in Ulmer's description or illustration.

DISTRIBUTION: Known from only the type locality in Jiang-su Province.

Triaenodes unanimis McLachlan, 1877
NEW CHINESE RECORD
Figs. 60, 124, 212

Triaenodes unanimis McLachlan, 1877; p. 324-325, figs. 1-4; holotype not designated; syntype

repositories = Helsingfors Museum and The Natural History Museum, London; type localities = Finland and Oesel Island.

Triaenodes unanimis form *recta*, Martynov, 1924a; type repository = probably Zoological Institute, St. Petersburg; type locality = Amur. Possibly a synonym of *Tn. unanimis*.

Triaenodes yamamotoi Tsuda, 1942b; type repository = Zoological Institute of the Imperial University of Kyoto, but reportedly now lost (K. TANIDA, personal communication); type locality = Japan. Possibly a synonym of *Tn. unanimis*.

This species had been widely recorded in Europe and in the Amur region of eastern Russia and divided into subspecies by Martynov (1924a, 1935). The male genitalia of our examples from southeastern China generally agree with those of Martynov's drawing for his *Tn. unanimis recta*. The only character he supplied for distinguishing *Triaenodes unanimis recta* from *Tn. unanimis unanimis* was: "straight upper process of the 10th segment." A comparison of his figures with Malicky's (1983) figures of *Tn. unanimis unanimis* based on a European specimen as well as our examples from different localities in China shows no consistent differences in tergite X, such that we tentatively name our Chinese examples as *Tn. unanimis unanimis* and provisionally consider Martynov's subspecies as a synonym of the nominate subspecies.

Tsuda's drawing for his *Triaenodes yamamotoi* from Japan also shows similarity with *Tn. unanimis*. The long processes of the inferior appendages were apparently overlooked, such that it is possible that *Triaenodes yamamotoi* is a synonym of *Tn. unanimis*.

DESCRIPTION: Head and thorax yellowish brown with yellowish brown hairs. Forewings straw yellow with golden yellow hair. Antennae of male specimens each with long scape and typical scent-organ as for other *Triaenodes* species found in China; scent-organ hairs dark brown.

MALE GENITALIA (Fig. 124): Segment IX moderately long dorsally, long ventrally, short laterally, especially below preanal appendages; tergum with curved, transverse groove; sternum mostly separated from pleura by vertical excisions, sternum pentagonal in lateral view, rectangular in ventral view. Preanal appendages oval, each with slender, tapering apex. Upper part of tergum X with median process slender in basal half, oval apically; lower part of tergum X undivided, blunt in lateral view. Inferior appendages with recurved processes of basal plate each directed anterodorsad in basal third, then angled caudad, its blunt apex with few short hairs; main body of each appendage with diagonal lateral carina and rounded apex in lateral view, without basodorsal branch, in ventral view with right angle laterally in middle, mesal edge sinuous and bearing many stout spines, blunt apically. Phallus curved, trough-like in apical two-thirds, with prominent longitudinal, lateral flanges.

FEMALE GENITALIA (Fig. 212): Segment IX, preanal appendages, and lamellae similar to those of *Triaenodes qinglingensis*. Gonopod plate divided in halves by high mesal longitudinal ridge; these halves not rugose, their middle transverse ridges indistinct; apical margin of plate with mesal V-shaped cleft. Spermathecal sclerite short, laterally deeply excised near middle, its anterior portion with lateral edges protruding in quadrate lobes, ventral process as long as anterior part of sclerite.

LENGTH OF FOREWING: Male 8-9 mm, female 7.3-8.2 mm.

MATERIAL EXAMINED: 13 males, 1 female, Loc. 45a (NAU); 8 males, 6 females, Loc. 37b (CUAC); 1 male, 1 female, Loc. 41 (NAU).

DIAGNOSIS: This species is closely related to *Triaenodes qinglingensis*, but in the male genitalia the mesal process of the upper part of tergum X has a relatively short fusiform apex; the recurved processes of the basal plate end just on the top corners of the inferior appendages, and, in ventral view, the inferior appendages each have the lateral edge strongly produced near the middle and the apex is nearly acute.

DISTRIBUTION: Previously known from Europe and Russia, this species now is found in southeastern China.

Triaenodes fulvus Navás, 1931, NOMEN DUBIUM
Fig. 213

Triaenodes fulva Navás, 1931, pp. 9-10, fig. 17; holotype = female; type repository = Institute of Zoology, Academia Sinica; type locality = Zô-Sè [possibly Zheng-ze Xian, 100 km S.E. of Shanghai at Loc. 54]
Triaenodes fulva Navás; C.F. Wu, 1937, p. 1293. Zhe-jiang.

Navás' (1931) description and illustration (Fig. 213) of the female of *Triaenodes fulvus* are insufficient to identify the species with confidence (translated from Latin):

> "Body completely fulvous, with white fulvous hairs. Head with fuscous eyes; palps white fulvous; antennae both with scape fulvous, shorter than head, remainder white fulvous, apex with narrow fuscous annulations. Abdomen ventrally pale. Legs white fulvous. Wings iridescent, membrane colored light fulvous, reticulation fulvous, pubescence fine, in forewing near veins partly fuscous. Forewing apical fork 1 long, anterior branch as long as its stalk, posterior branch longer; discoidal cell twice as long as its stalk; anastomosis crossveins forming straight line, posterior discoidal cell white. Hindwing (Fig. 213) paler, pubescence completely pale; apical fork 1 posterior branch twice as long as anterior branch, half as long as its stalk. Length of body of female 7.1 mm, length of forewing 9.7 mm, length of hindwing 7.5 mm.
> "Country. China: Zô-Sè, 21.IV.1930, O. Piel coll. Mus. Heude."
>
> The male and immature stages of this species remain unknown.

Triaenodes sericeus (Navás, 1935), NOMEN DUBIUM
Fig. 214

Triaenodes sericea Navás, 1935, pp. 100-101, fig. 64; holotype = female; type repository = Institute of Zoology, Academia Sinica; type locality = Zô-Sè [possibly Zheng-ze Xian, 100 km S.E. of Shanghai at Loc. 54].
Triaenodes sericea Navás; C.F. Wu, 1937, p. 1293; Schmid, 1950, p. 377, fig. 135; brief description and lateral view of female genitalia.

Navás' (1935) description and illustration and Schmid's (1950) description and illustration (Fig. 214) are insufficient to identify the species with confidence (Schmid, 1950, translated from French):

> "The holotype female, from Zô-Sè (Savio) 4-VII-1933, is found in the Navás collection. General color of body yellowish red, slightly darker on dorsal surface. Antennae yellow, not annulated. Scape, as long as head, covered with gold pilosity. Legs yellow, very light. Wings reddish, uniform, strongly pubescent. Genitalia of the female (Fig. 214). Wingspan: 13 mm."

The male and immature stages of this species remain unknown.

Triaenodes pellectus Ulmer, 1908
NEW CHINESE RECORD
Figs. 61, 125, 215

Triaenodes pellecta Ulmer, 1908, pp. 344-345, figs. 1-3; holotype = female (as a "male"); type repository = Ulmer's collection, Hamburg, Germany; type locality = Japan.

Triaenodes pellecta Ulmer; Martynov, 1935, pp. 207, 237, figs. 34-35, brief description and illustrations for the so-called "male," Russia (Amur region).

Triaenodes pellecta Ulmer; Tsuda, 1942b, p. 295, as "male" reported from Japan again.

Triaenodella gracillima Martynov, 1935; pp. 243-247, figs. 41-45; holotype = male; type repository = probably Zoological Institute, St. Petersburg; type localities = river Bikin and river Daubiche, Russia (South Ussuri region); synonym of *Tn. pellectus* according to Uenishi (1993) and Yang and Morse (1993) and Schmid (1994a).

Triaenodella gracillima Martynov; Tsuda, 1942b, pp. 303-304, figs. 58; one male found in Japan (Honshu).

DESCRIPTION: Head and thorax yellowish, palpi covered with mixed yellowish and brownish hairs; antennae long, yellow, segments with blackish annulations in their basal parts; scape longer than head in both male and female, thick in male, with broad basal projection on its inner side, projection bearing large tufts of long thin hairs, anteriorly these tufts covered with two triangular, thin, pale plates. Mesonotum with two short, brown stripes anteriorly at sub-mesal margin, center of notum dark brown. Forewings of males and females each with apical posterior margin characteristically excised, forming relatively acute apex (Fig. 61), most of wing with faint irregular fuscus cloud (more clear in female), clothed with yellowish brown hairs; some blackish spots arranged at middle of apical cells, at base of discoidal cell, behind Cu_1 and near arculus; venation as in *Triaenodes rufescens* Martynov. Posterior wings pale, with pale yellow hairs. Abdomen completely pale yellow in male; in female, yellowish above, sternites I-IV completely darkened, sternites V and VI each darkened laterally, creamy yellow in center.

MALE GENITALIA (Fig. 125): Sternum VIII slightly longer than tergum VIII. Segment IX short dorsally and laterally, in lateral view appearing as narrow sinuous ribbon mostly telescoped within segment VIII; much longer, setose, trough-like, projecting caudad ventrally, with phallus arising near middle of projection and inferior appendages arising at apex, with narrow apical incision on meson. Preanal appendages very slender, hairy, extending beyond inferior appendages. Upper part of segment X forming two very long, compressed processes originating between preanal appendages, somewhat arcuate in lateral view, each with attenuated apex divided into two spines far beyond all other appendages; pair of short, bare, asymmetrical digitate processes variously present or absent basally; lower part of tergum X short and roof-shaped, deeply and narrowly excised at its apex, directed ventrocaudad in phallocrypt membranes. Inferior appendages with main body quadrate in lateral view, basal plate and its recurved processes absent, each with basodorsal process short and stout, bearing ventral hairy lobe near middle, apex long and slender; in ventral view, apicomesal corner of each appendage produced upward with mesal surface covered densely with stout setae, apicolateral corner excised. Sternum IX with triangular strips in plane of phallocrypt articulating with narrow phallic shield (Fig. 125B'); phallus compressed and broad basally in lateral view, tapering to slender apex, initially directed dorsocaudad, then arched ventrocaudad to apex.

FEMALE GENITALIA (Fig. 215): The generally ornate appearance of the female genitalia of this species certainly makes the animal look like a male, complete with all the usual

appendages. It is only with good optics and detailed examination that one is able to detect a true gonopod plate, internal spermathecal sclerite, and membranous spermatheca and bursa copulatrix. Therefore, it is understandable that three noted authorities in Trichoptera systematics misidentified the gender of the female of this species. Segments VIII and IX distinctly separated by long, telescoping, membranous constriction. Segment IX with dorsum and pleural region heavily synsclerotized in slanted hood, dorsum with spine (IXa) arched high over genitalia and extending to apices of lamellae, compressed, in lateral view broad basally and tapering to very acute apex, in dorsal view slender and nearly parallel-sided to acute apex; pair of small bumps (IXb) near midline, semimembranous, varying from small papillae to digitate processes. Preanal appendages (IXc) heavily sclerotized, horn-like, about 3 times as long as average width, bearing long setae. Tergum X displaced ventrad to middle of genitalia, forming short, sclerotized anal tube, apical margin enlarged and curved backward dorsally, with apicolateral margins produced in semicircular lobes in lateral view. Lamellae each thick, horizontal mass, with ventrolateral portion nearly horizontal, dorsomesal portion smaller, nearly vertical; in ventral view sub-rectangular, about twice as long as broad, rounded, setose apically. Gonopod plate with high longitudinal, mesal ridge with apex acute in ventral view and digitate in lateral view; concavity on either side of ridge each with large, sub-mesal process acute in ventral view and curved and digitate in lateral view, semicircular excision at lateral base of this process; internal part of gonopod VIII + IX semimembranous, visible laterad of process, sub-quadrate in ventral view, triangular in lateral view. Spermathecal sclerite sub-rhomboid, broad posteriorly, tapering to apex bearing small sub-rectangular plate; with two pairs of water-drop, dark patches in ventral view.

LENGTH OF FOREWING: Male 8.0 mm, female 8.2 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, 2 females, Loc. 76c (NAU); 1 female, Loc. 76d (NAU); 1 female, Loc. 7b (CUAC); 2 males, 7 females, Loc. 63 (NAU); 1 male, Loc. 61 (NAU); 1 female, Loc. 24a (NAU); 3 females, Loc. 21b (NAU).

DIAGNOSIS: This species belongs to a group including at least *Triaenodes lurideolus* Mey, 1990; *Tn. transversarius* Mey, 1990; and *Tn. semigraphatus* Mey, 1990, all from the Philippines; *Tn. ornatus* (Ulmer, 1915), from Sri Lanka; and *Tn. laami* Dakki, 1981, from Morocco; all of which have very long, paired, symmetrical processes of the upper part of male tergum X. Furthermore, at least *Tn. ornatus* and *Tn. laami* also have the posterior apex of each male and female forewing slightly excised. *Triaenodes pellectus* males, however, have the processes of the upper part of tergum X straighter than in *Tn. transversarius* and *Tn. semigraphatus* and the basodorsal branch of each inferior appendage much more slender than in any of these. A ventral view of the female genitalia of *Tn. ornatus* was provided by Schmid (1958), in which the various appendages do not appear to project nearly as conspicuously as in *Tn. pellectus*.

DISTRIBUTION: Previously known from Japan and the Russian south Ussuri area of the East Palearctic Region, this species now is also found in southeastern and southcentral Oriental China.

Triaenodes rufescens Martynov, 1935
NEW CHINESE RECORD
Fig. 126

Triaenodes rufescens Martynov, 1935, pp. 239-240, figs. 38-40; holotype = male; type repository = probably Zoological Institute, St. Petersburg; type locality = South Ussuri region of Russia.

DESCRIPTION: According to Martynov (1935): "Head brownish, clothed with yellow hairs; antennae pale yellow; basal joint longer than the head, yellow; 2nd joint of the palpi maxillaris the longest 3rd, 4th and 5th gradually shorter. Legs yellow; spurs 1.2.2. Membrane of anterior wings brownish, with dense golden-rufous pubescence; a brown dot in each apical cell; similar dot may be discerned in the dorsal part of wing; fringe brown; apical border of wing also brownish, interrupted at the ends of veins; discoidal cell broad, shorter than the apical portion of wing. Hind wings brownish; fringe yellowish. Thorax and abdomen brownish."

MALE GENITALIA (Fig. 126): Dorsal part of segment IX very short, ventral part extremely long; tergum IX forming pair of sub-median tubercles posteriorly; sternum broadly excised posteriorly. Preanal appendages slender, extending to apex of sternum IX. Upper part of tergum X with slender median process two-thirds as long as preanal appendages (Fig. 126B) to subequal with them (Martynov, 1935, fig. 39), accompanied by pair of basal papillae (probably vestiges of lateral processes of upper part of tergum X); lower part of tergum X asymmetrical with right side very long, evenly arching over phallus in lateral view, sinuous in dorsal view, left side very short, sub-triangular. Inferior appendages without basal plate and recurved processes; basodorsal branch itself divided into two processes of which upper process slender and bifid (Fig. 126A) or capitate (Fig. 126El and Martynov, 1935, fig. 38) with few apical setae and lower process digitate and downcurved beneath main body of appendage, basally swollen and with large ventral tooth; main body of appendage with slender apicolateral process and with broad apicomesal lobe constricted to varying degrees on mesal edge from broadly and shallowly constricted (Martynov, 1935, fig. 40) to narrowly and deeply constricted (Fig. 126C) and varying from steeply obliquely truncate (Martynov, 1935, fig. 40) to broadly rounded (Fig. 126C) with dense short stout spines at apex in ventral view. Phallus supported by sclerotized strips of sternum IX from beside bases of inferior appendages; highly asymmetrical, with profuse membranes and sclerotized strips of right side arching over and across otherwise trough-like left apex.

LENGTH OF FOREWING: Male 7.1-8 mm, possible female 7.7- 8.7 mm.

FEMALE: Undescribed.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, Loc. 23 (NAU); 2 males, 2 females, Loc. 74a (NAU); 16 females, Loc. 20c (NAU).

DIAGNOSIS: We agree with Martynov (1935) that this species is closely related to *Tn. differmis* (Mosely, 1932b) from Africa in the following male characters: (1) Lower part of tergum X asymmetrical and (2) basodorsal branch of inferior appendages divided into two slender processes. It differs from that species, however, in that (1) the left process of the lower part of tergum X is a very short lobe and (2) the lower process of the basodorsal branch of each inferior appendage is swollen in the basal half and bears a stout ventral tooth.

DISTRIBUTION: Previously known in the southern Ussuri area of Russia (East Palearctic Region), this species is now also found in southern China (Oriental Region).

KEY TO ADULTS OF CHINESE *TRIAENODES* SPECIES

(The females of *Tn. bilobatus*, *Tn. dusrus*, *Tn. hoenei*, *Tn. sinicus*, and *Tn. rufescens* are yet unknown; those of *Tn. fulvus* and *Tn. sericeus* are insufficiently described to key here; the males of *Tn. fulvus* and *Tn. sericeus* are yet unknown.)

1. Segment VIII and IX not separated by extensive membranous constriction (Fig. 210A) 2

1'. Segment VIII and IX separated by extensive membranous constriction (Figs. 215A, B) ..... female *Triaenodes pellectus*, Ulmer, p. 107.

2(1). Genitalia with inferior appendages and phallus (Fig. 118) ..... male, 3
2'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 210) ..... female, 11

3(2). Preanal appendages broad, triangular or oval, no longer than sternum IX (Fig. 120A); inferior appendages with basal plate and recurved processes, each with basodorsal branch present (Fig. 119A) or absent (Fig. 120A) 4
3'. Preanal appendages slender, at least as long as sternum IX (Fig. 126A); inferior appendages without basal plate or its recurved processes, each with basodorsal branch present (Fig. 126A) 10

4(3'). Lateral processes of upper part of tergum X displaced apically (Fig. 118A) .... *Tn. bilobatus*, n. sp., p. 100.
4'. Lateral processes of upper part of tergum X arising from base of tergum (Fig. 125B) 5

5(4'). Tergum X deeply divided into two symmetrical processes (Fig. 123B) .... *Tn. sinicus* Ulmer, p. 104.
5'. Tergum X upper and lower parts each single, undivided (Fig. 120A, B) 6

6(5'). Inferior appendages each with apex excised into two lobes in ventral view (Fig. 119Ev, 121C) 7
6'. Inferior appendages each with apex not excised into two lobes (Fig. 120C) 8

7(6). Inferior appendages each with short, digitate, basodorsal process (Figs. 119A, Ev) ..... *Tn. dusrus* Schmid, p. 100.
7'. Inferior appendages without digitate basodorsal processes (Figs. 121A, C) .... *Tn. hoenei* Schmid, p. 102.

8(6'). Inferior appendages leaf-like, sub-oval with apex in lateral view (Fig. 120A); lower part of tergum X four times as broad as upper part of tergum X in dorsal view (Fig. 120B) ..... *Tn. foliformis*, n. sp., p. 101.
8'. Inferior appendages rectangular in lateral view (Figs. 122A, 124A); lower part of tergum X only slightly broader than upper part of tergum X in dorsal view (Figs. 122B, 124B) 9

9(8'). Inferior appendages each with lateral edge angled about 80° near middle and with acute setose apex in ventral view (Fig. 124C); median process of upper part of tergum X with fusiform head (Fig. 124B) ..... *Tn. unanimis* McLachlan, p. 105.
9'. Inferior appendages each with lateral edge angled about 30° near middle and each with obtuse, setose apex in ventral view (Fig. 122C); median process of upper part of tergum X with long, parallel-sided, clavate head (Fig. 122B) .... *Tn. qinglingensis*, n. sp., p. 103.

10(3). Lower part of tergum X forming two symmetrical long and thick processes with apex divided into two sharp spines (Figs. 125A, B); main body of inferior appendages quadrate in lateral and ventral views (Figs. 125A, C) .... male *Tn. pellectus* Ulmer, p. 107.
10'. Lower part of tergum X asymmetrical, consisting of long, sinuate right process and very short, triangular left lobe at its base (Figs. 126A, B); main body of inferior appendages not quadrate, each with lateral margin bearing digitate process (Figs.

126A, C, El) ..... *Tn. rufescens* Martynov, p. 109.

11(2'). Gonopod plate with basal transversely arched ridge and with mesal ridge produced apically in an acute spine (Fig. 210C) ..... *Triaenodes foliformis*, n. sp., p. 101.

11'. Gonopod plate without transversely arched ridge, mesal ridge not produced apically, but with apicomesal excision (Figs. 211C, 212C) 12

12(11'). Gonopod plate rugose with two pairs of transverse ridges (Fig. 211C) .... *Tn. qinglingensis*, n. sp., p. 103.

12'. Gonopod plate not rugose, with only one curved, transverse ridge near apex (Fig. 212C) ..... *Tn. unanimis* McLachlan, p. 105.

Oecetini Morse, 1981

LARVAE: Larvae of at least the following species of Oecetini (*Oecetis*) have been described:

Oecetis arizonica Denning--Floyd (1995).
Oe. avara (Banks)--Ross (1944); Floyd (1995).
Oe. cinerascens (Hagen)--Betten (1934); Ross (1944); Floyd (1995).
Oe. disjuncta (Banks)--Floyd (1995).
Oe. eddlestoni Ross--Ross (1944); Floyd (1995).
Oe. furva (Rambur)--Klapalek (1893); Ulmer (1903a, 1909); Thienemann (1905); Silfvenius (1905); Lestage (1921); Lepneva (1940, 1966); Hickin (1967); Steinmann (1967); Wallace (1981); Waringer and Graf (1997).
Oe. georgia Ross--Floyd (1995).
Oe. immobilis (Hagen)--Floyd (1995).
Oe. inconspicua (Walker)--Ross (1944); Floyd (1995, seven very different forms of this "species").
Oe. intima McLachlan--Lepneva (1966).
Oe. lacustris (Pictet)--Klapalek (1893); Struck (1903); Ulmer (1903a, 1909); Silfvenius (1905); Lestage (1921); Lepneva (1940, 1966); Hickin (1967); Steinmann (1967); Wallace (1981); Waringer and Graf (1997).
Oe. laustra Mosely--StClair (1987).
Oe. modesta (Barnard), *Potamoryza* (Chen, personal communication)--Barnard (1934).
Oe. morsei BUENO-SORIA--Floyd (1995)
Oe. nigropunctata Ulmer--Kuwayama (1928, 1929, 1934).
Oe. nocturna Ross--Floyd (1995).
Oe. notata (Rambur)--Wallace (1981); Waringer and Graf (1997).
Oe. ochracea (Curtis)--Klapalek (1893); Ulmer (1903a, 1909); Silfvenius (1905); Lestage (1921); Lepneva (1940, 1966); Ross (1944); Hickin (1967); Steinmann (1967); Wallace (1981); Floyd (1995); Waringer and Graf (1997).
Oe. osteni Milne--Floyd (1995).
Oe. parva (Banks)--Floyd (1995).
Oe. persimilis (Banks)--Floyd (1995).
Oe. porteri Ross--Floyd (1995).
Oe. singularis (Ulmer), *Oecetodella* (Chen, personal communication)--Ulmer (1955).
Oe. sphyra Ross--Floyd (1995).
Oe. struckii (Klapalek), *Paroecetis* --Struck (1903); Ulmer (1903a, 1909); Lestage (1921);

Wiberg-Larsen and Waringer (1998).
Oe. testacea (Curtis)--Wallace (1981); Waringer and Graf (1997).

Larvae of *Oecetis* may be distinguished from those of other Leptoceridae genera by (1) the predatory mandibles with a single cutting edge from which arise several teeth, (2) the elongated maxillary palps, (3) the small ventral apotome, and (3) the setose labrum.

PUPAE: Pupae of at least the following species of Oecetini (*Oecetis*) have been described:

Oe. furva (Rambur)--Lepneva (1966); Steinmann (1967).
Oe. inconspicua (Walker)--Ross (1944).
Oe. lacustris (Pictet)--Lepneva (1966); Steinmann (1967).
Oe. laustra Mosely--StClair (1987).
Oe. modesta (Barnard), *Potamoryza* (Chen, personal communication)--Barnard (1934).
Oe. ochracea (Curtis)--Lepneva (1966); Steinmann (1967).
Oe. singularis (Ulmer), *Oecetodella* (Chen, personal communication)--Ulmer (1955).

Pupae of *Oecetis* may be distinguished from those of other Leptoceridae genera by the following characters: (1) labrum soft and not bordered by a sclerotized carina, longer than broad, with a conspicuous apical projection and not notched, and with 30-40 setae on its surface but without an unusually long and stiff pair of anterior bristles; (2) mandibles each with a distinct projection and larger teeth near the middle of the cutting edge; (3) foretibiae each with one or no spurs; and (4) anterior hookplates on abdominal segment VII (as well as abdominal segments III-VI).

ADULTS: Adults of *Oecetis* may be distinguished from those of other Leptoceridae genera by the following combination of characters: (1) katepisternum of each mesopleuron acute anterodorsally; (2) forewing with apical cell $\underline{S}_3$ (Fork 2) rectangular, with $\underline{MP}$ originating at a right angle to $\underline{MA}$ then angled again 90° toward apex, apparently arising from $\underline{m\text{-}cu}$ crossvein or from $\underline{Cu}_1$ such that the very straight base of $\underline{M}$ and $\underline{S}_4 + \underline{MA}$ appear to be an unbranched $\underline{M}$ vein; and (3) hindwings each with the discoidal cell open, apparently with only two branches of $\underline{M}$ (apical Forks 1 and 5 present in both fore- and hindwings in both sexes and Fork 2 present in forewings of both sexes).

PHYLOGENY: The Oecetini and Triaenodini probably are sister lineages as indicated by Yang and Morse (1993) and discussed above for Triaenodini. The Oecetini are monophyletic as indicated by the following synapomorphies: (1) larvae are predatory and mouthparts are modified to accommodate this feeding habit (*e.g.*, mandibles have a single cutting edge with several teeth and maxillary palps are elongated); (2) the larval ventral apotome is small; (3) the larval labrum has many setae; (4) the pupa has anterior hookplates on abdominal segment VII (in addition to III to VI, as in other genera); and (5) the adult forewing $\underline{MP}_{3+4}$ vein is displaced posteriorly in association with the $\underline{CuA}_{1+2}$ vein (Betten, 1934). A phylogeny of the world species of Oecetini is in preparation by Chen (1993 and personal communication), such that phylogenetic inferences will not be made here other than to place species in subgenera and species groups for diagnostic purposes.

CLASSIFICATION: According to Chen (1993 and personal communication), all Oecetini species belong to four subgenera in the genus *Oecetis*. His forthcoming revision will redefine the subgenera and describe the species groups to which the following species belong.

HABITATS: Oecetini species are bottom dwellers in both lentic (littoral) and lotic waters of all sizes, mainly stagnant and slowly running, occasionally faster streams. Some species occur in brackish water.

FEEDING HABITS: Generally predaceous. At least one Japanese species of *Oecetis* has been reported feeding on rice plants (Kuwayama, 1928, 1929, 19343; Balduf, 1939).

Oecetis McLachlan, 1877

Oecetis McLachlan, 1877,
Type species: *Leptocerus ochraceus* Curtis (selected by Ross, 1944).

Because all world species of Oecetini belong to the genus *Oecetis* (Chen, 1993 and personal communication), the above remarks regarding the tribe apply equally here.

Oecetis (*Pseudosetodes*) Ulmer, 1905

Pseudosetodes Ulmer, 1905, as a genus,
Type species: *Pseudosetodes punctipennis* Ulmer, 1905 (monobasic).

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (1993 and personal communication).

Oecetis (*Pseudosetodes*) *lais* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (1993 and personal communication).

Oecetis (*Pseudosetodes*) *minuscula*, NEW SPECIES
Figs. 127, 216

DESCRIPTION: Body yellowish brown. Forewings hyaline, light fulvous, with apical cells long and narrow; first two apparent crossveins of anastomosis (s crossvein and base of S_4 vein) connected in oblique line, third apparent crossvein (base of MP vein) much nearer wing base than other two apparent crossveins. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 127): Segment IX with apicodorsal margin slightly convex in middle, dorsolateral processes arising beneath preanal appendages and just above middle regions of pleura IX, broad at base, each tapering to acute apex. Dorsal part of tergum X represented by single mesal process, slightly downcurved in lateral view, elongate and elliptical in dorsal view; lower part of tergum X semimembranous, appearing as two lobes beneath dorsal part, longer than upper part of tergum X, each bearing one seta apically. Inferior appendages slender, each about four times as long as basal width and with apex upturned in lateral view, basodorsal lobe prominent, somewhat mesal, and arising on basal third of appendage, extending inwards then upwards such that visible in both lateral and ventral views. Phallus slender, trough-shaped, bulbous basally, apical third slightly dilated with apex abruptly curved downward and tapering to point in characteristic pickax shape in lateral view; paramere spines absent.

FEMALE GENITALIA (Fig. 216): Segment IX very short, dorsum longest with broadly triangular median dorsal process (IXa) and pair of tiny papillae (IXb), segment tapering laterally. Preanal appendages semicircular, fused with segment IX. Tergum X short fused with anal tube in dorsal view, quadrate in lateral view, subanal plate (i.d.gon.IX, Nielson, 1980) well developed and slightly notched apicomesally. Lamellae sub-circular in lateral view, each with outer surface concave, ventrally expanded outward in broad setose pad. Gonopod plate large, pale, anteriorly bounded by pair of sclerotized concavities basally, each with light reticulation at bottom; distal end broadly rounded, shallowly and broadly concave sub-apically, with pair of conspicuous sub-

triangular dark rugose areas laterally; spermathecal sclerite sub-elliptical, about 1.5 times as long as broad.

LENGTH OF FOREWING: Male 3.5-3.6 mm, female 3.6-4.0 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 12a (NAU); Paratypes--1 male, 13 females, Loc. 2a (NAU).

ETYMOLOGY: Latin, "very small," with reference to the very small body size.

DIAGNOSIS: The male genitalia of this species most closely resemble those of *Oecetis terraesanctae* Botosaneanu and Gasith, 1971, from the Middle East; *Oe. kathia* Mosely, 1939, and *Oe. portalensis* Mosely, 1939, from central Africa; and *Oe. acuta* Ulmer, 1931, and *Oe. modesta* (Barnard, 1934) from South Africa in the long pleura IX, slender and upcurved inferior appendages, and pickax phallus. It differs from these in the much smaller basodorsal branch of each inferior appendage, which arises more nearly mesally in this species than in these others; also, the bend of the phallus is broader in lateral view and occurs about two-thirds of the distance from the base of the phallus.

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

Oecetis (Pseudosetodes) spatula Chen, NEW SPECIES
Fig. 128

Oecetis spatula Chen, 1990, pp. 122-124, figs. A-77, 78, 79; NOMEN NUDUM.
Oecetis spatula Chen, 1993, pp. 44, 57, 376, fig. 7.41 (as *Oe. "spatura"*); NOMEN NUDUM.

Chen's Master of Science thesis (1990) did not contain a claim that it was issued for permanent scientific record. Furthermore, since only 15 photocopies of the thesis were prepared when he completed his degree and it was not published in any other form, it can be argued that 15 copies are not sufficiently "numerous" to qualify the work as "published" in the sense of the 3rd edition of the International Code of Zoological Nomenclature (ICZN, 1985, Article 8[a][3]), then in force. More importantly, it did not "employ ink on paper in conventional printing" and it neither contained a statement by the author "in words in the work itself . . . that any new name or nomenclatural act within it is intended for permanent, public, scientific record" nor that it was "produced in an edition containing simultaneously obtainable copies" (ICZN, 1985, Article 8[d]). Chen (1993) revised the description for his doctoral dissertation, but again, with a disclaimer, did not make the dissertation "published" nor the name "available" in the sense of the Code. Therefore, we deem the work to be yet unpublished and the name a nomen nudum until now. Chen's (1993) description was as follows:

"DESCRIPTION: Head and body in alcohol reddish brown; vertex and frons with sparse brown setae. Forewings uniformly light brown with dense brown setae, without color pattern.

"MALE GENITALIA: Pleura IX narrow dorsally, gradually broader ventrally, dorsolateral processes very long and slightly curved ventrad, foliaceous, about as long as inferior appendages. Preanal appendages short, oval, about twice as long as wide in lateral view. Upper part of tergum X rod-like, about twice as long as preanal appendages. Lower part of tergum X below this process acute. Inferior appendages scoop-shaped, rectangular and about three times as long as wide in ventral view, each with broad ridge in 90 degree angle mid-dorsally. Phallus about as long as inferior appendages, curved ventrad, without paramere spines.

"FEMALE GENITALIA: Segment IX narrow, broadest laterally, mid-dorsal line with shallow transverse groove. Preanal appendages short and broad, partly fused with upper part of tergum X. Segment X concave mesally, slightly longer than preanal appendages. Lamellae long

and broad, generally oval in lateral view, concave laterally and mesally, with dorsal ridge. Gonopod plate trapezoidal, with transverse grooves laterally between it and segment VII. Spermathecal sclerite bulb-shaped, with central median processus about half as long as sclerite.

"LENGTH OF FOREWING: Male 5.0-5.2 mm; female 4.8-5.0 mm.

"IMMATURE STAGES: Unknown.

"TYPE MATERIAL: Holotype MALE (Taiwan Museum of Natural History): 'Tai-wan, Tai-pei Co., Nai-sung Creek (25.1° N, 121.6° E), 2-VII-1988, Y. Eric Chen.'

"ETYMOLOGY: Latin, 'a broad blade for stirring liquids' or 'a small spade,' referring to the shape of the inferior appendages."

Based on our male specimen, we describe and illustrate this species as follows:

DESCRIPTION: Head and thorax yellowish brown, palpi with brown setae. Forewings uniformly light brown, marked with fuscus at crossveins and fork points. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 128): Segment IX longest one-quarter distance from venter in lateral view, shortest dorsally with conspicuous paired papillae; pleura IX processes arising from near middle of pleural regions, extending to apices of inferior appendages and median process of upper part of tergum X, each process with acute apex slightly downcurved. Preanal appendages oval, half as long as pleura IX processes. Mesal process of upper part of tergum X rod-like with apex dilated in lateral view, slender and parallel-sided in dorsal view, as long as pleura IX processes and inferior appendages and twice as long as preanal appendage; lower part of tergum X arising between pleura IX processes, semimembranous, deeply excised apically, leaving two slender processes, shorter than upper part of tergum X, each with apex bearing few setae. Inferior appendages scoop-like, rectangular; basodorsal branch triangular, blunt apically in lateral view; in ventral view, appendages about 3 times as long as wide, each with rounded apex curved inward and with dorsal end hooked mesad. Phallus simple tube, about as long as inferior appendages, gently downcurved , membranous dorsally in apical third, ventrally with deep, longitudinal concavity on each side bounded by wrinkle in lateral view; paramere spines absent.

LENGTH OF FOREWING: Male 4.9 mm.

FEMALE: Description unpublished (Chen, 1990).

MATERIAL EXAMINED: One male from Loc. 96a (NAU).

DIAGNOSIS: Males of this species, *Oecetis lais* (Hagen), *Oe. sumanasara* Schmid, *Oe. ornata* Kimmins, *Oe. eburnea* Schmid, and the following new species *Oe. taenia* differ from other species of this Group by their broadly rectangular inferior appendages. *Oecetis spatula* and *Oe. taenia* apical hook on each inferior appendage is smaller than in those species, however; *Oe. lais*, *Oe. sumanasara*, and *Oe. eburnea* all lack a basodorsal branch in lateral view, this branch is broader in *Oe. ornata* and longer in *Oe. taenia* than in this species. Pleura IX processes are more slender in *Oecetis taenia* than in this species, and especially so in *Oe. lais*, *Oe. sumanasara*, and *Oe. eburnea*, and much shorter in *Oe. ornata*.

DISTRIBUTION: Known from Taiwan (Chen, 1990) and southcentral China.

Oecetis (*Pseudosetodes*) *taenia*, NEW SPECIES
Figs. 129, 217

DESCRIPTION: Body in alcohol pale yellow brown, hairs on palpi and antennal scape brown. Forewing uniformly covered with brown hairs; apical cells slender, discoidal cell slightly longer than thyridial cell; fringes dark brown in forewings, light brown in hindwing. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 129): Segment IX narrow dorsally, broadest sub-ventrally; pleura IX processes arising from unusually high position on pleural regions, each appearing narrow

and parallel-sided in dorsal and lateral views; directed downward about 45° with tip extending slightly beyond apices of inferior appendages. Preanal appendages depressed, oval in dorsal view, about 2.2 times as long as wide. Median process of upper part of tergum X rod-like, setose apically, 1.5 times as long as preanal appendages; lower part of tergum X represented by pair of semimembranous, slender processes, each bearing one apical setae. Inferior appendages broadly rectangular, each with apex obliquely truncate in lateral view; basodorsal branch thumb-like, setose; in ventral view, appendages broadest at one-fourth distance from base, rounded and incurved apically, each with mesal ridge produced in long, narrow lobe covered with setae. Phallobase trough-like, membranous dorsally in apical half, with pair of weak lateral ridges; in lateral view globular at base, constricted near basal third, slightly enlarged in middle, then tapering to narrow apex curved downward, apical portion only about one-third as broad as middle portion; paramere spines absent.

FEMALE GENITALIA (Fig. 217): Segment IX short, tergum produced in mesal obtuse process (IXa), IXb not conspicuous. Preanal appendages oval in lateral view, mostly fused with segment IX and X. Tergum X appearing as compressed anal tube with longitudinal lateral ridges. Lamellae broad and thick, with dorsal and apical and ventral margins expanded in broad band, ventrally pad-like, upper lateral surface concave. Gonopod plate large, constricted near distal third before obtusely triangular apex; deep excisions also present between pleura IX and plate. Spermathecal sclerite rhomboid, more acute at posterior end.

LENGTH OF FOREWING: Male 4.7-4.9 mm; female 4.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 76d (NAU); Paratype--1 female same data as holotype (NAU); 1 male Loc. 12c (NAU).

ETYMOLOGY: Latin, "band," with reference to the distinctive shape of the male pleura IX processes.

DIAGNOSIS: Among the similar species listed in the diagnosis of *Oecetis spatula* Chen, the male of this species most closely resembles that of *Oe. spatula*, especially in the broadly rectangular inferior appendages with its basodorsal branch present and in the broader pleura IX processes. It differs from that species, however, in the parallel-sided pleura IX processes arising more nearly dorsally, the thumb-like basodorsal branch of each inferior appendage half as long as the main body of the appendage; and the more slender phallobase with its apical portion only about one-third as broad as its middle portion.

DISTRIBUTION: Known from only the type localities in southern China.

Oecetis (*Oe.*) McLachlan, 1877

Oecetis McLachlan, 1877,

Type species: *Leptocerus ochraceus* Curtis (selected by Ross, 1944).

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (1993 and personal communication).

Oecetis (*Oecetis*) *lacustris* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (1993 and personal communication).

Oecetis (*Oecetis*) *lacustris* (Pictet, 1834)
Figs. 130, 218

Mystacide lacustris Pictet, 1834; p. 171-172, pl. 13, fig. 7; type gender unknown; type repository = presumably the Museum of Natural History in Geneva, but no specimens of this species were cited in that collection by Botosaneanu and Schmid (1973); type locality = Switzerland.
Oecetis lacustris (Pictet); McLachlan, 1877.
Oecetis lacustris (Pictet); Martynov, 1907, Manchuria.
Oecetis lacustris (Pictet); Martynov, 1914, China.
Oecetis lacustris (Pictet); Berland and Mosely, 1936, China.
Oecetis lacustris forma *orientalis* Martynov, 1935 (preoccupied by Navás, 1921); type locality = probably Zoological Institute, St. Petersburg; Mosely, 1942, China (Fuzhou, Loc. 9.).
***Oecetis lacustris martynovi* Yang and Morse, NEW NAME** (replacement for *Oe. lacustris orientalis* Martynov) and **NEW SYNONYM** of *Oecetis lacustris* (Pictet).
[A complete synonymy for this species, with collection records published through 1960 from throughout Europe and eastern Asia, was provided by Fischer, 1966 and 1972]

DESCRIPTION: Forewings greyish yellow with darker markings on the anastomosis and various spots elsewhere. We agree with Kumanski (1991) that the arrangement of the forewing anastomosis is highly variable, at least for this species and the following species *Oecetis nigropunctata* Ulmer. For example, from one collection in Sichuan Province (Loc. 76d), of 73 specimens, 34% had an arrangement generally like Fig. 130Fa-1, 45% like Fig. 130Fa-2, and 21% like Fig. 130Fa-3. Several specimens also had different arrangements on forewings from opposite sides of the same specimen. The same situation also was observed in other large collections of this species. Tibial spurs 0-2-2 (Malicky, 1983) or 1-2-2 (at least some of our specimens). The considerable variation observed in our specimens seems to include that discussed by Martynov (1935) for his subspecies.

MALE GENITALIA (Fig. 130): Shape of inferior appendages and phallus slightly variable from different localities as shown in figures; however, genitalia consistently possessing following distinctive characters also seen in European specimens: (1) phallus elliptical, twice as long as wide, apicoventral apex stout, broad at base, curved straight downward; in dorsal view pear-like with left basal lobe larger than right lobe, filling no more than half of genital capsule in this view; foramen positioned posteriorly; (2) inferior appendages with distal half stout in ventral view, digitate, very slightly tapering to blunt apex.

FEMALE GENITALIA (Fig. 218): Malicky (1983) provided illustrations of the female of this species. To these, we add a description and details of the spermathecal sclerite as follows:

Segment IX narrow sclerotized ring, tergum produced in both anterior and posterior center, projecting over bases of preanal appendages, strongly constricted laterally so that pleural regions in lateral view sinuate, acrotergite area large. Preanal appendages short, oval, appressed on tergum X. Tergum X forming short anal tube, just extending slightly beyond preanal appendages and lamellae. Lamellae small, contiguous apicomesally when at rest, each with setose ventral edge curved outward and blunt basally in ventral view. Gonopod plate elliptical, delineated by very distinctive dark stripe continuous with lamellae and short flanges of pleura IX, nearly meeting at right angle anteriorly. Spermathecal sclerite diamond-shaped, with prominent 90° angles laterally and with anterior end bearing two small sub-apical triangular projections.

LENGTH OF FOREWING: Male 7-7.3 mm, female 6.4-6.9 mm. [Pictet's (1834) measurements of the type specimen, "length with the wings closed: 3 lines," or 6.5 mm, and "length of antennae: 5 lines," or 10.5 mm, suggest that the type possibly is or was a female.]

LARVA: Resembling that of *Oecetis ochracea* (Curtis) (Figs. 16, 17). Distinguished by Lepneva (1966) and Wallace (1981) with the following characters: (1) foretrochantin with numerous setae (about 16; one long seta in *Oe. ochracea*) and (2) tergum IX tergite with only 12 primary setae (6 long, 6 short; more than 12 setae, up to 40 setae in *Oe. ochracea*, mostly long).

PUPA: Resembling that of *Oecetis ochracea* (Figs. 40, 47). Distinguished by Lepneva (1966) with the following characters: (1) anterior margin of labrum with shorter median process than *Oe. ochracea*, (2) fore- and midtibiae with fewer setae, (3) foretibiae without apical spurs (one on each foretibia of *Oe. ochracea*), and (4) dorsal antenna-catching processes of tergum IX each with three or four setae (nine to twelve in *Oe. ochracea*).

HABITAT: "Small, eutrophic lakes, littoral and sublittoral; on solid bottom of sand and detritus or silt; sometimes among plants; in creeks or mouths of slow rivers; small floodplain water bodies, ponds" (Lepneva, 1966).

MATERIAL EXAMINED: 4 males, 3 females, Loc. 1 (NAU); 2 males, Loc. 11b (NAU); 1 female, Loc. 34 (NAU); 2 males, 2 females, Loc. 43 (NAU); 10 males, 23 females, Loc. 76c (CUAC); 47 males, 26 females, Loc. 76d (NAU); 1 male, 2 females, Loc. 83 (NAU); 3 males, 1 female, Loc. 84a (NAU); 3 males, 3 females, Loc. 85 (NAU); 1 male, 2 females, Loc. 89b (NAU); 49 males, 97 females Loc. 94c (NAU); 1 male, 1 female, Loc. 95 (NAU); 5 females, Loc. 96a (NAU); 3 males, 6 females, Loc. 96b (NAU); 5 males, 8 females, Loc. 97a (CUAC); 15 females, Loc. 100 (NAU); 7 males, 5 females, Loc. 17 (NAU); 6 males, 10 females, Loc. 20b (NAU) and the following specimens loaned from the U.S. National Museum of Natural History: France, 25 July 1986, 1 male; Netherlands, Loosdrecht, 4 July 1937, 1 male; west Tenchelling, 30 June 1957, 1 female.

DISTRIBUTION: This species has been widely recorded previously in the Holarctic Region, including China, and once specifically in Oriental China (Fou-zhou). We examined a large number of specimens from 18 localities in 8 provinces of eastern and central Palearctic and Oriental China.

Oecetis (*Oecetis*) *nigropunctata* Ulmer, 1908
NEW CHINESE RECORD
Figs. 131, 219

Oecetis nigropunctata Ulmer, 1908; p. 345-346, fig. 4-7; type gender = not indicated; type repository = Ulmer's collection, Hamburg; type localities = Kanagawa and Utsubusa, Japan.

Oecetis pallidipunctata Martynov, 1935; pp. 207, 249-253, figs. 47-50; type repository = probably Zoological Institute, St. Petersburg; synonym according to Kumanski, 1991.

Oecetis hamochiensis Kobayashi, 1984; p. 12, figs. 33-38; holotype, male; type repository = Kanagawa Prefectural Museum; possible synonym.

DESCRIPTION: Body color, wing pattern, and general form of genitalia strikingly similar to those of *Oecetis lacustris* (such that initially we considered the two species synonyms). Anastomosis of forewings arranged also variously in three types as in *Oe. lacustris*; *e.g.*, one collection of 51 specimens from An-hui Province (Loc. 2a), with 35.3% resembling Fig. 130Fa-1, 39.2% like Fig. 130Fa-2, and 25.5% like Fig. 130Fa-3; also like *Oe. lacustris*, some individuals with different arrangements in their left and right forewings. By examining a specimen from Japan and our large collection, we found distinctive characters that could easily distinguish this species from *Oe. lacustris*. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 131): General form of segment IX, tergum X, and inferior appendages identical with those of *Oecetis lacustris* except: (1) distal half of inferior appendages

more slender and with narrow acute apex in ventral view; (2) phallus huge in dorsal view, its basal end nearly filling genital capsule, with right basal lobe much larger than left one (left larger than right in *Oe. lacustris*); in lateral view, its basodorsal end enlarged cephalad to or into segment VIII so that foramen positioned ventrally; in ventral view, exposed apical portion of phallus left of apical lip and membranes twice as broad as right side (Fig. 131C; about equal in *Oe. lacustris*).

FEMALE GENITALIA (Fig. 219): Segment IX narrow sclerotized ring, tergum produce at center of both anterior and posterior margin, acrotergite area very broad, dorsal half of pleural region strongly constricted in lateral view, such that posterior margin sinuous. Preanal appendages semicircular, fused with tergum X. Tergum X forming short anal tube protruding just beyond preanal appendages. Lamellae small, contiguous mesally when at rest, each with ventral edge curved outward in narrow pad in ventral view. Gonopod plate delineated by distinctive darker stripes similar to those of *Oecetis lacustris*, sometimes widest enclosed space more nearly basad (widest in middle in *Oe. lacustris*). Spermathecal sclerite somewhat parallel-sided in ventral view, lateral corners near anterior end (rather than in middle as in *Oe. lacustris*) and broadly rounded anterior end without triangular projections.

LENGTH OF FOREWING: Male 7.2-7.7 mm, female 7.4-7.7 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 10 males, 41 females, Loc. 2a (NAU); 3 males, 16 females, Loc. 10d (NAU); 2 males, 14 females, Loc. 11b NAU); 1 female, Loc. 12b (NAU); 1 male, 7 females, Loc. 21a (NAU); 2 males, 15 females, Loc. 20c (NAU); 1 male, Loc. 28a (NAU); 3 males; 1 male, Loc. 39 (NAU); 16 females, Loc. 55 (NAU); 2 males, 6 females, Loc. 56 (NAU); 8 females, Loc. 58c (NAU); 1 male, 1 female, Loc. 65 (CUAC).

DIAGNOSIS: Distinguishing characters are listed above for males and females. Illustrations of the male genitalia of *Oecetis hamochiensis* Kobayashi (1984) from Japan, with the huge phallus and the acute apices of the inferior appendages in ventral view, suggest that it is a synonym of *Oe. nigropunctata*. However, the diamond-shaped spermathecal sclerite of the female he illustrated suggests that Kobayashi had a mixed type series.

DISTRIBUTION: Previously found only in Japan and Korea, this species now is known also in southeastern and southcental China.

Oecetis (*Oecetis*) *tripunctata* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (1993 and personal communication).

Oecetis (*Oecetis*) *tripunctata* (Fabricius, 1793)
NEW CHINESE RECORD
Figs. 132, 220

Phryganea tripunctata Fabricius, 1793; p.81; type gender = unknown; type repository = unknown; type locality = Saxony (Halle), Germany.

Setodes punctatella Rambur, 1842, p. 516; type gender = unknown; type repository = Institut royal des Sciences naturelles de Belgique (Ulmer, 1907b); synonym according to McLachlan, 1877. type locality = ?

Oecetis alexanderi Kumanski, 1976, in Kumanski and Malicky, 1976, pp. 118-120, figs. 10, 11; holotype gender = male; type repository = Collection of Kumanski; synonym according to Malicky, 1983. type locality = ?

DESCRIPTION: Head, thorax, scape, and pedicel reddish brown, appendages otherwise testaceous. Forewings rubbed in alcohol, membrane hyaline except with fuscous coloration in wide costal cell, radial cell and near the base of fork 1 and with especially conspicuous dark markings at each fork of longitudinal veins, along anastomosis, at arculus, and at apical tips of all longitudinal veins. Tibial spurs 1, 2, 2.

MALE GENITALIA (Fig. 132): Segment IX nearly as long dorsally as ventrally, broadly rounded posteriorly on dorsal meson, broadly excavated posteriorly on ventral meson, sinuous posterolaterally. Preanal appendages very broad in lateral view and completely fused with each other dorsally, incorporating upper part of tergum X. Lower part of tergum X fused with preanal appendages and extending caudad only slightly beyond them. Inferior appendages slender, each with basal corner and sinuous dorsal margin in lateral view and with mesal ridge barely visible in basal two-thirds; each tapering and sinuous to blunt, slightly incurved apex in ventral view again with mesal ridge barely visible in basal two-thirds. Phallus small, about twice as long as tall in lateral view, with prominent apicoventral lip and single paramere spine.

FEMALE GENITALIA (Fig. 220): Segment IX short, broadly rounded posterodorsally, sinuous laterally. Preanal appendages setose, broad in lateral view and completely fused with each other dorsally. Tergum X fused with preanal appendages and extending caudad only slightly beyond them. Lamellae semicircular, with outcurved, setose, ventral pads. Gonopod plate defined by brown stripes continuous with flanges of pleura IX, stripes not meeting anteriorly, with open space about as far as half length of one stripe. Spermathecal sclerite and internal part of gonopod plate pentagonal, acute and exposed posteriorly, blunt anteriorly.

LENGTH OF FOREWING: Male 7.5-7.9 mm, female 5.3-6.3 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, Loc. 2a (NAU); 6 males, 6 females, Loc. 3 (NAU); 1 male, 1 female, Loc. 10d (NAU); 1 male, Loc. 10c (NAU); 106 females, Loc. 11b (NAU); 1 male, 7 females Loc. 12a (NAU); 3 males 42 females, Loc. 12b (NAU); 1 male, 3 females, Loc. 58a (NAU); 35 males, 92 females, Loc. 58c (NAU); 15 males, 20 females, Loc. 58c (CUAC); 1 male, 1 female, Loc. 81a (NAU); 3 males, 2 females, Loc. 99b (NAU); 1 male, 4 females, Loc. 24b (NAU).

DIAGNOSIS: A large number of species show remarkable similarity with *Oecetis tripunctata*. Indeed, a major revision is seriously needed to sort synonyms from valid species in this complex. The following species all have the male preanal appendages fused with each other and have tergum X and the inferior appendages shaped similarly. In this list, we indicate characters by which *Oe. tripunctata* appears to differ from each species. All characters pertain to males unless otherwise stated.

Similar species:	Characters of *Oecetis tripunctata*:
Oe. aequatoricalis Marlier, 1958 (Zaire)	- basodorsal branch of each inferior appendage much less pronounced.
Oe. albopunctata (Lestage, 1919b) (Zaire)	- basoventral corner of each inferior appendage produced.
Oe. angulata Kimmins, 1963b (India)	- forewings spotted; inferior appendages narrower basally.
Oe. angustipennis (Martynov, 1936) (India)	- forewings spotted.
Oe. brunnescens (Ulmer, 1923) (Sudan)	- forewings spotted.
Oe. buitenzorgensis Ulmer, 1951 (Java)	- preanal appendages much shorter.
Oe. gradata (Ulmer, 1923b) (Sudan)	- basoventral corner of each inferior appendage produced.
Oe. lucipetens (Barnard, 1940)(S. Africa)	- base of each inferior appendage narrower.

Oe. maculipennis (Ulmer, 1922) (Sudan)	- apex of each inferior appendage not as long, straighter.
Oe. mahadeva (Banks, 1913b) (India)	- female forewings spotted; lamellae semicircular.
Oe. indivisa (Martynov, 1936) (India)	- preanal appendages and tergum X not incised apically.
Oe. nervisquamosa (Schmid, 1958) (Sri Lanka)	- inferior appendages tapered to apex in ventral view.
Oe. ocellata Jacquemart, 1959 (Zaire)	- inferior appendages not abruptly narrowed in ventral view.
Oe. ovampoensis Barnard, 1934 (S. Africa)	- female forewings with fuscous areas anteriorly.
Oe. punctatissima Schmid, 1958 (Sri Lanka)	- inferior appendages not as abruptly narrowed in lateral view; female with preanal appendages fused.
Oe. rectangula Kimmins, 1963b (India)	- inferior appendages narrower basally.
Oe. sibayiensis Scott, 1968 (South Africa)	- inferior appendages narrower basally.
Oe. simplex Marlier, 1956 (Zaire)	- tergum X longer than preanal appendages.
Oe. sinuata Kimmins, 1963b (Myanmar)	- phallus smaller.
Oe. striata (Kimmins, 1956) (Uganda)	- preanal appendages and tergum X not incised apically; ventrocaudal edge of each inferior appendage straight in lateral view.
Oe. tenuis Martynov, 1936 (India)	- forewings spotted.

DISTRIBUTION: Previously known in Europe and the Amur region of Russia (Martynov, 1935), this species is here reported for the first time from the Oriental Region in southeastern and southcentral China.

Oecetis (*Oe.*) *ochracea* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (personal communication).

Oecetis (*Oe.*) *bullata* Yang and Morse, 1997
Figs. 133, 221

Oecetis (*Oecetis*) *bullata* Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, p. 188, 191, pl. 123 fig. 16-19, pl. 127 fig. 5-7.

DESCRIPTION: Head and thorax fulvous with fulvous hairs. Forewings hyaline with sparse fulvous pubescence, marginal fringes not very long, forks and anastomosis shaded with pale fuscous. Abdomen pale fulvous. Forewing anasatomosis broken, first crossvein (s) distal by slightly more than its own length from other two veins, which are close together. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 133): Apicodorsal margin of segment IX produced strongly in triangular lobe, each pleuron produced in broad and blunt triangle, and sternum with widely rounded caudal lip. Upper part of tergum X vestigial; lower part of tergum X about half as long as preanal appendages and with its apex oblique in lateral view, tapering and rounded in dorsal view. Preanal appendages oval. Inferior appendages about twice as long as pleura IX; each narrow basally, broadened basoventrally in rectangular lobe, basodorsal lobe rounded with long setae;

distal two-thirds of appendage slender in lateral view; in ventral view each appendage with basoventral portion produced in truncate mesal lobe with semicircular excision just beyond it and with distal portion incurved and slightly clavate. Phallus huge and globular, almost completely filling genitalia chamber, its apicoventral end projecting downward in narrow, sharp beak; one weakly sclerotized paramere spine sinuate in lateral view.

FEMALE GENITALIA (Fig. 221): Segment IX narrow, apicodorsal margin produced strongly in triangular lobe, ventral half of this segment projecting forward to anterior margin of segment VIII; in ventral view with pair of pockets positioned just beneath and beside lamellae. Preanal appendages broad, oval. Tergum X broad, semicircular in dorsal view, with floor of anal tube as long as tergum. Gonopod plate lyre-shaped, bounded laterally with sinuate ridges, distal end tapering to narrow acute tip. Spermathecal sclerite small, sub-oval, 1.2 times as long as wide, with anterior end narrowed, truncate.

LENGTH OF FOREWING: Male 6.3 mm, female 6 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 6 (NAU). Paratypes--5 females, same data as holotype (NAU).

ETYMOLOGY: Latin, "huge penis," with reference to the distinctively large phallus.

DIAGNOSIS: This species somewhat resembles *Oecetis kambaitensis* Kimmins, 1963b; *Oe. assamensis* Kimmins, 1963b; and *Oe. ochracea* in the general appearance of the male inferior appendages. It differs from *Oe. kambaitensis* in having the lower part of male tergum X obliquely truncate in lateral view and with a pointed apex from above, the distal part of the inferior appendages are not so incurved from ventral view; it differs from *Oe. assamensis* in having long oval preanal appendages, with tergum X about one and a half times as long as preanal appendages; differs from *Oe. ochracea* in having a much longer distal portion of the inferior appendages; and it differs from all of them in having a distinctive huge, globular phallus.

DISTRIBUTION: Known from only the type series collected in southeastern China.

Oecetis (*Oe.*) *clavata*, NEW SPECIES
Figs. 134, 222

DESCRIPTION: Body pale yellow, thorax yellow brown above, palpi covered with golden brown setae, antennae with first segment of flagellum slightly arched near base. Forewings light testaceous, covered with long brown setae; forks and anastomosis faintly shaded with fuscous; anastomosis broken, with first crossvein (s, closing discoidal cell) distad by slightly more than its own length from the second "crossvein" (actually basal part of $\underline{S_4}$), third "crossvein" (actually basal part of MP) slightly oblique and distal about half of its own length from second "crossvein." Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 134): Segment IX only slightly produced at center of its dorsal apical margin, paired papillae tiny but distinctive; pleura with large, blunt, triangular side pieces positioned somewhat above midline; sternum with transverse band of setae in middle, with wide transparent region present caudad of it. Preanal appendages oval, partly fused with tergum X. Upper part of tergum X not evident; lower part of tergum X short, broadly triangular, slightly excised sub-apically. Inferior appendages slender, convergent in ventral view; in lateral view each with basoventral lobe triangular, basodorsal lobe rounded and setose, distal portion slender, nearly straight; in ventral view each with basoventral lobe triangular, widely separated from slightly clavate and apically rounded distal portion. Phallus large, sub-globose, asymmetrical with left side enlarged and projecting anteriorly, displacing foramen to right; ventral apex projecting downward in sinuate tongue; phallic shield strips distinctive, semicircular; paramere single, sinuate, with base positioned on right side and apex directed to left apical end of the phallus.

FEMALE GENITALIA (Fig. 222): Segment IX short, tergum with tiny pair of caudal, membranous papillae, lower lateral portion slightly broadened and produced outward, forming pair of lateroventral pockets above lateral edges of gonopod plate; tergum X forming conspicuous, sclerotized anal tube, slightly longer than lamellae, divided into upper and lower lips, with semicircular preanal appendages arising basolaterally. Lamellae short, three times as tall as long, parallel-sided in lateral view, each with ventral margin produced in narrow, setose pad in ventral view. Gonopod plate broad, with transparent region sub-circular and distinguishable anteriorly by grey, setose area of segment VIII. Spermathecal sclerite about as long as broad, simple bulb shape, slightly constricted anteriorly, bearing lampshade-like structure posteriorly with small mesal process.

LENGTH OF FOREWING: Male 7.0-8.0 mm, female 6.7-8.1 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 74e (NAU). Paratypes--1 male, 3 females, same data as holotype (NAU); 3 males, 25 females, Loc. 82b (NAU); 2 males, 4 females, Loc. 74c (CUAC).

ETYMOLOGY: Latin, "club like," with reference to the clavate shape of the male inferior appendages.

DIAGNOSIS: This species mostly resembles *Oecetis ochracea*. However, the inferior appendages of the male genitalia each have the distal slender portion slightly longer than the broad basal part, the ventromesal process of each inferior appendage is more nearly in a right angle, and the phallus has the left anterior lobe strongly enlarged; the female lamellae are much taller but short, giving an elongate shape in lateral view, rather than oval as in *Oe. ochracea*.

DISTRIBUTION: Known from only the type series of localities in southcentral China.

Oecetis (*Oe.*) *dilata*, NEW SPECIES
Figs. 135, 223

DESCRIPTION: Body yellowish brown, frons and palpi with pale hairs, male antennae with first segment of flagellum arched near base. Forewings light brown, with only sparse fulvous pubescence, each with large colorless areas around anastomosis; faint, fuscous clouding over all forks, anastomosis and at apex of each longitudinal vein; crossvein s (closing discoidal cell) distad by about 1.5 times its own length from other two crossveins (which are very close to each other). Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 135): Tergum IX moderately produced in rounded, triangular lobe with tiny papillae; caudal side pieces in middle of pleura IX large, blunt, triangular; ventral apical margin in broad, slightly rounded lobe, bare and transparent. Preanal appendages oval, fused with tergum X. Upper part of tergum X not evident; lower part of tergum X short, trilobed with two basolateral lobes almost same size as preanal appendages and appressed just beneath them, mesal lobe tongue-like. Basal two-thirds of each inferior appendage broad in lateral view, basoventral lobe protruded in small right triangle, prominent basodorsal edge convex and with short setae; rest of appendage digitate; in ventral view, basoventral lobe broadly quadrate with clavate distal portion not obviously curved inward. Phallus asymmetrical, foramen obviously positioned on left anterior end; phallic shield rudiment appearing as left ventral ridge basally; generally rectangular in lateral view, apical portion forming shallow trough curved downward with right sub-apical margin more protruded backward; single paramere spine, positioned with base from left side sinuately directed to apical right side.

FEMALE GENITALIA (Fig. 223): Segment IX short, slightly sinuate in lateral view, about one-fifth as long as tall; tergum with tiny membranous papillae present; lower portion of pleural regions produced both outward and backward, each forming lateral pocket with sternum

VIII and ventral pocket above gonopod plate. Preanal appendages large, semicircular, close to each other. Tergum X short, pad-like, retracted beneath preanal appendages. Lamellae short, more than twice as tall as long, each with ventral end forming small, waterdrop-shaped setose pad. Gonopod plate broad, with bare, transparent area nearly quadrate, apical margin produced in obtuse angle. Spermathecal sclerite nearly equilateral triangle with rounded corners, ventral process about half as long as sclerite.

LENGTH OF FOREWING: Male 5.8-6.2 mm, female 5.3-5.9 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2a (NAU). Paratypes--23 males, same data as holotype (NAU); 32 females, same data as holotype (CUAC); 27 males, 52 females, Loc. 76c (NAU); 10 males , 13 females, Loc. 58c (CUAC); 1 male, Loc. 67b (CUAC); 10 males, 14 females, Loc. 11b (NAU); 1 male, 1 female, Loc. 12c (NAU); 2 males, 5 females, Loc. 12b (NAU); 15 males, 9 females Loc. 20a (NAU); 10 males, 3 females, Loc. 21b (NAU).

ETYMOLOGY: Latin, "enlarge," with reference to the distinctive basodorsal enlargement of each of the male inferior appendages.

DIAGNOSIS: Distinguishing them from those of all other species of the *Oe.* (*Oe.*) *ochracea* Group, the male genitalia of this species have the lateral pieces of IX large and triangular, positioned in the middle of the pleural region; tergum X appears trilobed, with the lateral lobes formed by the preanal appendages; and the inferior appendages each protrude distinctively on its dorsolateral edge near the middle. The female genitalia of this species have a conspicuous, lateroventral pocket on each side, distinguishing this species from all others in the *Oe.* (*Oe.*) *ochracea* Group.

DISTRIBUTION: Known from only the localities of the type series in southeastern and southcentral China.

Oecetis (*Oe.*) *ochracea* (Curtis, 1825)
Figs. 16, 17, 40, 47, 74, 136, 224

Leptocerus ochraceus Curtis, 1825, pl. 57; holotype male; type repository = ISNB; type locality = Britain.

Oecetis ochracea (Curtis), McLachlan, 1877, p. 330-331, pl. 36, fig. 1-5.

Oecetis ochracea (Curtis), Martynov, 1910, p. 379: China ("Changai," possibly Loc. 47).

Oecetis ochracea (Curtis), Martynov, 1914, pp. 329, 339; China (W. South Ching-ang, possibly now Qing'an Shi, Hei-long-jiang Province, at Loc. 33.)

DESCRIPTION: Head and body reddish brown; forewings hyaline, light tawny yellow with only faintly pale fuscous spot at arculus. Abdomen tawny yellow above, paler beneath. Second "crossvein" (base of $\underline{S_4}$) oblique, slightly separated from distad first crossvein (s), but aligned with third crossvein (base of MP). Tibial spurs 1, 2, 2 (Malicky, 1983); our specimen without forelegs.

MALE GENITALIA (Fig. 136): Tergum IX produced in center as moderate triangular lobe, with pair of papillae just beneath it, side pieces of segment IX large, acute, triangular. From above, preanal appendages oval, nearly proximate. Tergum X slightly elevated along longitudinal midline with apex truncate in lateral view, incised in dorsal view. In lateral view, each inferior appendage with basodorsal edge protruding in large, blunt lobe; basoventral edge projecting in sharp triangular lobe thumb-like in ventral view; distal portion stout, digitate, evenly curved inward and upward. Phallus long elliptical, 1.7 times as long as broad in lateral view, apicoventral end produced downward in sharp beak-like process in lateral view, half as long as phallus; in dorsal

view, peach-like, slightly asymmetrical; one weakly sclerotized paramere originating on right and proceeding to left apex.

FEMALE GENITALIA (Fig. 224, redrawn from the work of Malicky, 1983): In illustrations of Ross (1944) and Malicky (1983), segment IX narrow, sinuous in lateral view, its tergum projecting over small papillae, ventral edges of its pleura flared outward above edges of gonopod plate. Preanal appendages moderately developed, semicircular. Segment X slightly longer than preanal appendages, truncate in lateral view. Lamellae elliptical in lateral view, apicoventrally with slightly sinuous margin and prominence. Gonopod plate with broad, sinuous lateral flanges, featureless or with faint transverse suture medially, light or dark anteriorly on sternum VIII. Spermathecal sclerite nearly round in ventral view.

LENGTH OF FOREWING: Male 11.5 mm, (female presumably about 10.5 mm, according to McLachlan, 1877).

LARVA: Described by Klapalek (1893); Ulmer (1903a, 1909); Silfvenius (1905); Lestage (1921); Lepneva (1940, 1966); Ross (1944); Hickin (1967); Steinmann (1967); Wallace (1981), Floyd (1995); and Waringer and Graf (1997).

PUPA: Described by Lepneva (1966) and Steinmann (1967).

MATERIAL EXAMINED: 1 male, Loc. 32 (NAU).

DIAGNOSIS: Our single specimen shows slight variation from figures for *Oecetis ochracea* given by Ross (1944) and Malicky (1983) in that the lower part of tergum X is broader in our specimen, with its apex truncate in lateral view and incised in dorsal view; the basoventral process of each inferior appendage is longer and more nearly finger-like in both lateral and ventral views. However, the general shape of the male genitalia, especially of the phallus, is very similar. This species can easily be recognized by the large body size. The small, narrow, basoventral lobe arising near the middle of each inferior appendage in ventral view and the peach-like phallus, only slightly asymmetrical in dorsal view, distinguish it from closely related *Oecetis clavata* and all other species of this Group. The female gonopod plate is darkly bordered laterally by two lobes of nearly equal size on each side.

DISTRIBUTION: Previously known from throughout the Holarctic Region, the species now is reported in northern China, Hei-long-jiang Province.

preoccupied by Gibon and Randriamasimanana, 1998, in R.&G. Revue fr Ent (NS) 20

Oecetis (*Oe.*) *spinifera*, NEW SPECIES
Fig. 137

DESCRIPTION: Specimen much rubbed in alcohol, body pale testaceous, palpi covered with pale brown hairs. Forewings hyaline, with sparse, fulvous hairs. Crossvein closing the discoidal cell (s) distad by slightly more than its own length from the other two crossveins which are close together. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 137): Segment IX short dorsally, abruptly lengthened below preanal appendages, longest ventrally, about 2.2 times as long as tall; tergum IX in dorsal view with apical margin produced in center, papillae fused into one small process; each pleuron quadrate below preanal appendage in lateral view, broader and with irregular posterior margin at level of inferior appendage, apicoventral margin of IX projecting in a broad, rounded lobe, lightly sclerotized. Preanal appendages oval, closely appressed, but with only mesal margins fused to tergum X. Tergum X (not including apical spines) 2.6 times as long as tergum IX, with V-shaped excision and with dense, long, thick setae apically. Inferior appendages each with very short, broad base; basoventral lobe produced in right triangle in lateral view, obtuse in ventral view; basodorsal region slightly broadened; remainder of appendage very slender, sinuate in lateral view, evenly incurved in ventral view. Phallus broad and rounded dorsally in basal half, then narrowing and gently downcurved to trough shaped apex; relatively longer than any species within this Group, 3.5

times as long as its mid width in lateral view, in dorsal view strongly asymmetrical with left side much larger than right side; single curved paramere spine thick, its base positioned at left basal side with apex directed to right apical side of phallus.

LENGTH OF FOREWING: Male 6.1 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 7b (NAU); Paratype: 1 male, Loc. 101 (NAU).

ETYMOLOGY: Latin, "with thorns," with reference to the apex of tergum X bearing thorn-like spines in the male genitalia.

DIAGNOSIS: The male of this species resembles those of others in *Oe.* (*Oe.*) *ochracea* Group in: (1) lateral pieces of segment IX large sub-triangular; (2) inferior appendages each with its basoventral part produced ventromesad in a small lobe which are visible in lateral view and the apical part abruptly reduced in a slender process curved inward, resembling especially the inferior appendages of *Oe.* (*Oe.*) *assamensis*. However, tergum X is long and broad in this species, with its apex deeply excised and bearing dense, thorn-like setae, and the phallus is relatively longer in lateral view, distinguishing the species from all the others.

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

Oecetis (*Oe.*) *furva* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (personal communication).

Oecetis (*Oe.*) *intima* McLachlan, 1877
Figs. 138, 225

Oecetis intima McLachlan, 1877, p.330-332, PI. 36, fig. 1-3; type gender = male; type repository = BMNH; type locality = Krasnovodsk, Turkmeniya (Kimmins, 1957b).

Oecetis intima McLachlan, Martynov, 1910; China (Changai) [Shang-hai in Jiang-su Province at Loc. 47 or possibly Qing'an Shi, Hei-long-jiang Province at Loc. 33].

This species reportedly occurs in the Palearctic region including China. So far, we have not seen Chinese specimens.

McLachlan (1877) described the species as follows:

> "Very similar to *ochracea*, but perhaps slightly smaller. The pubescence of the anterior-wings may be termed yellowish-grey rather than ochraceus, but there is little difference; the anastomosis in these wings is decidedly different, inasmuch as the nervule closing the discoidal cell is placed much nearer the apex than the two below it, which are nearly in an oblique line.
>
> "The anal parts are very similar. In the male the principal difference is in the inferior appendages, which, viewed ventrally, have no (or scarcely any) basal dilatation, are widely divergent almost from the base.
>
> "Length of body, 8 mm. Expanse, male 23-24 mm."

Spurs 1,2,2 (Malicky, 1983).

MALE GENITALIA (Fig. 138, from the work of Malicky, 1983): Segment IX short, longest laterally slightly below middle in lateral view. Preanal appendages elliptical, diverging from base. Tergum X divided into two lobes in lateral view, tapering to shallowly and broadly excised apex in dorsal view. Inferior appendages each with basoventral lobe poorly expressed, rounded in ventral view, not visible in lateral view; basodorsal lobe very large, nearly as long as remainder of appendage and much broader in lateral view; remainder upturned and tapered to blunt apex. Phallus short, with prominent apicoventral lip.

FEMALE GENITALIA (Fig. 225, from the work of Malicky 1983): Segment IX short, tergum triangular in dorsal view, overarching bases of preanal appendages, posterior margin of pleura nearly straight, their ventral edges flared outward above sides of gonopod plate. Preanal appendages semicircular. Tergum X truncate in lateral view, broadly rounded in dorsal view. Lamellae about twice as tall as long, with apicoventral margin sinuate and prominent. Gonopod plate with broad lateral flanges rounded posteriorly, slightly sinuate anteriorly. Shape of spermathecal sclerite not shown.

LARVA: Described in detail by Lepneva (1966).

DIAGNOSIS: The male of this species closely resembles that of *Oecetis furva* (Rambur), but is distinguishable from it by the 1,2,2 spur formula and less strongly recurved phallus in *Oe. intima*. The male genitalia of these two are distinguishable from those of other species in the *Oe.* (*Oe.*) *furva* Group in the bilobed appearance of tergum X in lateral view and the much larger basodorsal lobe and much reduced basoventral lobe of each inferior appendage. The female of this species closely resembles that of *Oe. ochracea* (Curtis), but the lateral flanges of the gonopod plate are less sinuous anteriorly, such that there is little or no evidence of an anterior pair of lobes.

DISTRIBUTION: Known from southeastern Europe and central Asia to China.

Oecetis (*Pleurograpta*) Wallengren, 1891

Pleurograpta Wallengren, 1891,

Type species: *Mystacida notata* Rambur (selected by Fischer, 1966).

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (personal communication).

Oecetis (*Pleurograpta*) *testacea* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (personal communication).

Oecetis (*Pleurograpta*) *bellula*, NEW SPECIES
Figs. 139, 226

DESCRIPTION: Head, thorax and abdomen pale yellow, hairs on head and palpi pale goldenish. Forewings covered with golden yellow to brown hairs, pale yellow at basal one fifth and apical portion beyond anastomosis, each with large fuliginous patch from the level of anterior end to anastomosis, then gradually bleached to apex; costal margin, s, posterior margin, and arculus achromatic; anastomosis with s distad more than its own length from bases of S_4 and MP, these two apparent crossveins arranged in straight line perpendicular with wing axis. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 139): Terga VI, VII, and VIII each with pair of thick honeycomb reticulation areas. Segment IX with at least basal half retracted into VIII, anterior margin semicircular in lateral view, broadest ventrally, obliquely incised laterally, forming pair of long, sclerotized lobes pressed on top of phallus; pleural regions slanting dorsomesally such that cross-section of segment IX triangular. Preanal appendages extending beyond posterior margin of IX, clavate, very slender in basal half. Upper part of tergum X rod-like, sinuous in lateral view; lower part of tergum X pair of vestigial semimembranous strips much lower than dorsal one, each deeply divided into two slender filaments. Inferior appendages stout, conical basally, each with its basodorsal margin produced in three setose processes: distad process horn-like and compressed and broad at base and tapering to acute apex, basal process short and stubby, third process curved and digitate and arising from dorsomesal edge of basal process; distal half of appendages produced in stout rod, very dark in color, curved upward and slightly backward in 100-130° angle (variable). Phallus short tube-like, slightly constricted near base, with ventral part produced in long, shallow trough; short acute spine and long rod with hooked apex arising from its left basal side; two paramere lobes long, broad, considerably enlarged distally, each then abruptly narrowed to acute spine-like apex, right one completely sclerotized and fused with phallobase, left one partly membranous; apex of ejaculatory duct also sclerotized and extending free from endophallic membranes.

FEMALE GENITALIA (Fig. 226) Tergum IXa triangular, IXb inconspicuous, lateroventral region of segment IX produced in a pair of rugose sacs and stout lobes, each with surface densely covered with tiny setae. Preanal appendages small, appressed basomesally on tergum X. Tergum X sub-rectangular, fused with the enlarged subanal plate (d.i.gon.IX) forming a tube-like structure surrounding anus. Lamellae small, slender basally, lower apical angle produced in pair of rounded pads in ventral view. Gonopod plate highly sclerotized, lateral edges expanded in flanges with pair of tiny digitate processes at anterolateral corners. Spermathecal sclerite triangular apically, positioned near apex of gonopod plate, dorsal process sub-trapezoidal and bearing semimembranous projection extending to center of segment VII.

LENGTH OF FOREWING: Male 6.3-7.3 mm, female 6.9 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 68 (NAU). Paratypes--2 males, 1 female, same data as holotype (NAU); 11 males, Loc. 58c (NAU); 1 male, Loc. 67b (CUAC); 1 male, Loc. 56 (NAU); 1 male, Loc. 10c (CUAC).

ETYMOLOGY: Latin, "pretty," with reference to the beautiful color of the forewings.

DIAGNOSIS: This species resembles *Oecetis* (*Pleurograpta*) *complex* and *Oe. tsudai* Fischer, 1970, but the male differs from that of each of them in that: (1) the basodorsal projection of each inferior appendage is trifid; (2) the phallobase has a short spine and a long hooked rod arising from the left side near the base; and (3) two parameres are each broadly dilated near its dark acute apex.

DISTRIBUTION: Known from only the localities of the type series in southeastern China.

Oecetis (*Pleurograpta*) *biramosa* Martynov, 1936
NEW CHINESE RECORD
Fig. 140

Oecetis biramosa Martynov, 1936; pp. 269-270, figs. 35-36; holotype male; type repository = Indian Museum; type locality = India, Orissa, Balighai, near Puri, 16-20.viii.11 [16-20 August 1911], Coll. N. ANNANDALE and F. H. GRAVELY (in alcohol).

Oecetis biramosa, Schmid, 1958; pp. 140-141, Pl. 26, figs. 7-8; description and illustration for female.

Our single male specimen in alcohol is very much denuded. According to Martynov (1936): "Head yellow, antennae yellow with narrow black annulations, thorax brownish, legs pale yellow. Anterior wings pale greyish yellow; . . . ; first and second crossveins [s and base of S_4] of anastomosis forming an oblique line,. . . third crossvein [base of MP] not oblique, and situated before the second vein . . . ." Tibial spurs 0-2-2.

The wing venation and genitalia of a male from southeastern China appear to agree reasonably with Martynov's (1936) description and figures, with a few variations. The following detailed description is based on our specimen:

MALE GENITALIA (Fig. 140): Terga VI, VII, and VIII with thick honeycomb reticulations, tergum VIII greatly enlarged, but not divided, covering most of segment IX; segment IX longest ventrally, shortest dorsally, with sinuous posterior margins. Preanal appendages long, clavate, three-fourths as long as inferior appendages. Upper part of tergum X slender and slightly shorter than preanal appendages, lower part of tergum X forming pair of broad semimembranous lobes with rounded apices and bearing few short setae. Inferior appendages each bifid, with ventral branch longer than that figured by Martynov, at least 2.5 times as long as basodorsal branch; in ventral view, two lower branches parallel with each other and with only distal third curved inward (rather than whole branch curved in semicircle as in Martynov's figure.) Phallus trough-like, 2.5 times as long as the height of base, with dorsal margins sinuately tapering to narrow apex in lateral view; two paramere spines almost identical, about two-thirds as long as phallus.

FEMALE GENITALIA: Not observed by us, but see the description and illustration by Schmid (1958, from French):

> "Female genitalia relatively prominent; segment X obtuse, with dorsal part bracketed by valves [lamellae] which are tall and truncate apically. Sternite VIII and base of sternite IX with numerous visible carinae forming several concavities. Vaginal apparatus large and complex."

LENGTH OF FOREWING: Male 6.5 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, Loc. 51 (NAU).

DIAGNOSIS: Martynov (1936) considered this species to be closely related to *Oecetis* (*Pleurograpta*) *scutata* Ulmer, 1930, since tergum VIII of both species is not divided. We suggest that *Oe. reticulata* Kimmins, 1957a; *Oe. asmada* Malicky, 1979; and the following new species *Oe. cyrtocercis* may be somewhat more closely related to this species. However, the simple dorsobasal branch of each male inferior appendage is much more developed and curved parallel to the ventral branch in lateral view and there are two long paramere spines with identical size in the phallus which can help distinguish it from these allies.

DISTRIBUTION: This species previously was reported from India and Sri Lanka; it now is found also in southeastern China.

Oecetis (*Pleurograpta*) *brachyura* Yang and Morse, 1997
Fig. 141

Oecetis (*Pleurograpta*) *brachyura* Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, p. 191, pl. 125 fig. 6-9.

DESCRIPTION: Head and thorax yellowish brown. Forewings hyaline, faint yellowish; forks of veins and anastomosis lightly shaded with fuscous, veins covered with plumose hairs, each with s crossvein distal about its own length from bases of S_4 and MP, these latter veins arranged

in transverse straight line; apex of forewing somewhat rounded; hindwing fringes fuscous. Abdomen fuscous above, yellowish beneath. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 141): Terga VII and VIII reticulated in very thin layer, each divided into two parts by median line (similar to Fig. 145B). Segment IX with dorsum short; pleural regions abruptly elongated, each with its apicodorsal corner of posterior lateral margins not or only slightly produced in tiny spine, not curved inward; sternum slightly longer than pleural regions. Preanal appendages foliaceous, each with at least half of its basolateral margin fused with segment IX. Upper part of tergum X slender digitate, slightly dilated at apex in lateral view; lower part of tergum X forming pair of semimembranous processes, slightly shorter than upper part, each bearing fine seta on tip. Inferior appendages short and stout in side view, each with basodorsal lobe broad and long, leaving semicircular excision on apicodorsal angle; in ventral view, stout, each with apex curved mesad in right angle and abruptly narrowing to point. Phallobase tube-like in basal half, distal half trough-like, slightly sinuate; paramere spines consisting of one long spine and four short spines.

FEMALE AND IMMATURE STAGES: Unknown.

LENGTH OF FOREWING: Male 8.0 mm.

TYPE MATERIAL: Holotype MALE, Loc. 23 (NAU). Paratypes--3 males collected with holotype (NAU); 1 male collected with holotype (CUAC).

ETYMOLOGY: Latin, "short tail," with references to the short preanal appendages.

DIAGNOSIS: The male of this species most closely resembles those of *Oecetis* (*Pleurograpta*) *villosa* Kimmins, 1963b, and the new species *Oe. paxilla* described below, but differs from them in that the apicomesal corner of each preanal appendage is not so obviously produced and the apicodorsal corners of pleura IX are not each projecting in a large black spine with many tiny spines on it.

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

also — Russia (Primorye Region)

Oecetis (*Pleurograpta*) *caucula*, NEW SPECIES
Figs. 142, 227

DESCRIPTION: Head and thorax yellowish brown; vertex, frons, and palpi with long brown setae. Wings with golden brown hairs, forewings faint yellowish with small fuscous spot on each fork, crossvein, and longitudinal vein apex; anastomosis arranged almost in oblique line, with s crossvein slightly distal from bases of $\underline{S_4}$ and MP, or each of them slightly distal from next one; hindwing fringes golden brown. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 142): Tergum VII normal except with pair of thin reticulate patches near posterior margin. Tergum VIII completely covered with thick honeycomb plate 1.3 times as long as broad. Segment IX nearly two-thirds as long as tall, longest near middle, tapering on both anterior and posterior margins to short dorsum, pleura each with large lateral piece defined by distinctive notch sub-dorsally. Preanal appendages strongly capitate. Upper part of tergum X long and slender, extending beyond apices of inferior appendages with distal portion downcurved; lower part of tergum X semimembranous, divided in two lobes, with each apex rounded and bearing few setae. Inferior appendages small, digitate, about 3.5 times as long as wide in lateral view; in ventral view, each with basal half quadrate, distal half widely excised apicomesally to short dilated process with acute apex hooked inward. Phallus tube-like, about 2 times as long as wide, each apicolateral margin with triangular excision dividing apex into lobes with ventral lobe much longer than dorsal lobe and its apex slightly downcurved in lateral view; one extremely large paramere spine arising from deep sclerotized cup with 20-30 short, stout spines set irregularly at bottom of cup; phallotremal sclerite large, U-shape, highly sclerotized.

FEMALE GENITALIA (Fig. 227): Segment IX short, tergum with dorsal median process (IXa) in acute triangle, paired papillae conspicuous, pleural regions long near middle, each forming posterior triangle above lateroventral pocket. Preanal appendages fused with tergum X, latter forming short anal tube, obliquely truncate in side view, with its bottom, the subanal plate (d.i.gon.IX), enlarged and excised mesally. Lamellae sub-rounded, each with ventral margin curved inward. Gonopod plate short, produced backward in broad pentagonal process, with its lateral shoulders at mesal end of each pocket and its rounded apical center strongly projecting between lamellae. Spermathecal sclerite sub-rectangular, about 1.7 times as long as wide, dorsal process of sclerite asymmetrical with its right lobe highly sclerotized and bearing thick mass of membranes, left lobe much smaller and completely membranous.

LENGTH OF FOREWING: Male 5.9-6.5 mm, female 6.0-6.6 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 4b (NAU). Paratypes--3 males, same data as holotype (NAU); 2 males, 7 females, Loc. 67c (NAU); 3 males, Loc. 67b (NAU); 4 males, Loc. 2a (CUAC); 2 females, Loc. 7 (CUAC); 2 males, Loc. 38b (NAU); 6 males, Loc. 21b (NAU).

ETYMOLOGY: Latin, "cup," with reference to the large cup-shaped base of the male paramere spine.

DIAGNOSIS: Among members of this Group, this species is distinguished from all others by the following characters: (1) male tergum VII bearing only a pair of thin reticulate patches near the posterior margin; (2) male inferior appendages short, without evident basodorsal branch; (3) single male paramere spine extremely stout, bearing a huge cup basally with many short spines set at the bottom of the cup; and (4) female with dorsal process of spermathecal sclerite asymmetrical.

DISTRIBUTION: Known from only the type series localities in southeastern and southcentral China.

Oecetis (*Pleurograpta*) *complex* Huang, 1957
Figs. 143, 228

Oecetis complex Huang, 1957; p. 391-392, figs. 83-86. holotype = male; type repository = reportedly at NAU , but specimen missing; type locality = Shou-wu, Fu-jian Province (Loc. 11). NEOTYPE established below.

DESCRIPTION: Body yellowish brown. Forewings with large fulvous patch in middle of wing, from basal one-fifth extending to anasatomosis then gradually bleached to apex, as in *Oecetis bellula*; anastomosis with s cross vein distal of bases of $\underline{S_4}$ and MP at least 1.5 times its own length, latter two vein segments arranged in almost transverse line. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 143): Huang's (1957) description of the male genitalia is not especially diagnostic. To it we add the following: Terga VI, VII, and VIII with paired honeycomb reticulations. Segment IX broadest ventrally, anterior margin semicircular in lateral view, deeply and narrowly incised laterally, forming pair of long, sclerotized lobes pressed on top of phallus; tergum IX highly elevated as slender bar for retracting and supporting genitalia within segment VIII. Preanal appendages clavate, very long, such that middle of each appendage level with apex of sternum IX. Upper part of tergum X slender, slightly longer than preanal appendages and with apex slightly capitate; lower part of tergum X forming pair of thin, semimembranous strips nearly as long as preanal appendages and each with apex bearing apical seta. Inferior appendages as long as sternum IX; conical basally, each with broad, hairy, basodorsal lobe arising from near midlength of appendage; distal third reduced to cylindrical process and distal fourth bare, curved upright 90° or more; in ventral view, each basodorsal lobe with broadly semicircular excision at distal edge, forming small setose triangular lump near its base. Phallus asymmetrical, generally tube-like,

paramere spines apparently fused with phallobase, left paramere with large membranous pad subapically and small dark apical spine, right paramere spine more simple and tapering to acute curved apex, phallicata forming sclerotized trough fused with phallobase, sclerotized ejaculatory duct projecting beyond endophallic membranes, acute apically, with fine spine immediately adjacent to it.

FEMALE GENITALIA (Fig. 228): Tergum IX forming conspicuous triangular region high above rest of segment, sternum elongate and projecting anteriorly. Preanal appendages fused with tergum X, appearing as oval setose bump on either side. Tergum X forming short anal tube with bottom extremely enlarged in pair of broad lobes. Lamellae triangular, each with base slender and ventral ends produced in rounded pads. Gonopod plate very long, dark brown, fully sclerotized, with pair of shallow pockets above large horn-like, basolateral processes, pair of small triangular processes at about midlength of side margins, with remainder of plate tapering to rounded apex in ventral view; in lateral view apical half only about half as thick as basal half. Spermathecal sclerite with basal part broad, roughly hexagonal, and with triangular anterolateral processes; apical two-thirds more slender and triangular.

LENGTH OF FOREWING: Male 5.6-6.6 mm, female 5.9-6.3 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Neotype MALE, Loc. 2a (NAU).

OTHER MATERIAL EXAMINED: 3 males, 4 females, Loc. 2a (NAU); 2 males, 1 female, Loc. 8 (NAU); 5 males, Loc. 58c (NAU); 1 male, Loc. 58a (NAU); 1 female, Loc. 67c (NAU); 2 males, 1 female, Loc. 76c (NAU); 4 males, 1 female, Loc. 76d (CUAC); 1 female, Loc. 11b (NAU); 1 male, Loc. 12b (NAU).

DIAGNOSIS: We agree with Huang (1957) that this species most closely resembles *Oecetis yukii* Tsuda, 1942b. However, since Tsuda's figures for *Oe. yukii* are not especially diagnostic, we can say only that the male differs from it at least in that the apical fourth of each inferior appendage is curved upright in this species, where more than one-third of the appendage is strongly curved forward in *Oe. yukii.*

DISTRIBUTION: Known from southeastern and southcentral China.

Oecetis (*Pleurograpta*) *cyrtocercis,* NEW SPECIES
Figs. 144, 229

DESCRIPTION: Head and thorax brownish; forewings hyaline, faint yellowish brown, marked with fuscous at forks and along anastomosis, with some extra dark spots at middle of Sc and near apex of each vein; anastomosis with s crossvein distal slightly less than its own length from bases of S_4 and MP, themselves arranged in almost transverse line, longitudinal veins ciliate; hindwings with fringes dark brown. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 144): Terga VII and VIII completely reticulated, tergum VIII elongated and extended to level with apex of sternum IX. Segment IX very short dorsally, forming narrow transverse band between preanal appendages; much longer immediately below preanal appendages, sub-rectangular. Preanal appendages each slender, setose, with blunt apex, apical third abruptly curved mesad and ventrad. Upper part of tergum X simple, straight rod; lower part of tergum X broad, semimembranous, much longer than upper part of tergum X, deeply excised apicomesally. Inferior appendages each with two main branches, lower branch slender, sinuate, with blunt basoventral bump and acute apex in lateral view, in ventral view curved in semicircle beyond basolateral hook and mesal shoulder; basodorsal branch with setose basolateral flange, serrate basomesal ridge, acute sub-apicocaudal horn, and blunt setose apex. Phallus generally tube-like, apicoventral margin projecting backward and slightly downward, about as long as basal half. Primitive left paramere composed of one sclerotized stout spine and one semimembranous lobe

with sclerotized acute tip; primitive right paramere composed of two thin sclerotized spines and one semimembranous lobe with sclerotized tip.

FEMALE GENITALIA (Fig. 229): Sternum VIII with pair of deep concavities sub-apicolaterally, followed posteriorly by pair of shallow, rugose depressions. Tergum IX protruded at center in small triangular lobe (IXa) with rounded apex, lateroventral regions of IX above gonopod plate each with deep concavity as long as both depressions on each side of sternum VIII combined. Preanal appendages fused with tergum X. Tergum X, short, obliquely truncate in side view, with the subanal plate extending slightly beyond dorsum and excised mesally. Lamellae short, slender basally, apex oval, about half as long as tall. Gonopod plate highly sclerotized, quadrate, with apical end abruptly constricted into short, broad, truncate lobe. Spermathecal sclerite sub-rectangular, rounded anteriorly, nearly truncate posteriorly, with small triangular apex; four irregular sclerites suspended in membranes above spermathecal sclerite.

LENGTH OF FOREWING: Male 5.6-6.8 mm, female 5.5-6.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 12d (NAU). Paratypes--2 males, same data as holotype (NAU); 3 males, 2 females, Loc. 11b (CUAC); 28 males, 6 females, Loc. 76c (NAU); 1 male, Loc. 2a (NAU); 1 female, Loc. 67c (CUAC); 1 male, 3 females, Loc. 22 (NAU); 1 male, 1 female, Loc. 18a (NAU); 2 males, 7 females, Loc. 63 (NAU); 1 male. Loc. 61 (NAU).

ETYMOLOGY: Greek, "curved rod," with reference to the shape of the preanal appendages.

DIAGNOSIS: The male genitalia of this species are very similar to those of *Oecetis purusamedha* Schmid, 1995, from Indian. They differ from those of the latter, however, in: (1) the basodorsal branch of inferior appendage has a setose basolateral flange which, viewed from beneath, appears as a basolateral hook, (2) the sub-apicocaudal process of the dorsal branch of each inferior appendage is acute and horn like, and (3) the phallus has two primitive parameres sclerotized only at their apices.

DISTRIBUTION: Known from only the type series localities in southeastern and southcentral China.

Oecetis (*Pleurograpta*) *paxilla*, NEW SPECIES
Figs. 145, 230

DESCRIPTION: Color and wing pattern are identical with those of *Oecetis brachyura*. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 145): Terga VII and VIII reticulated in same way as *Oecetis brachyura*. Segment IX with dorsum very short, forming narrow, vertical, transverse band, immediately below preanal appendages much broader and sub-rectangular, its posterior apicodorsal corner produced in acute sclerotized peg with basal cluster of small spines. Preanal appendages short and broad, each with apicomesal corner produced in digitate projection, densely covered with tiny setae. Upper part of tergum X sclerotized, dilated at apex in lateral view and with pair of very fine grooves on upper surface causing apex to appear slightly tripartite in dorsal view; lower part of tergum X forming pair of semimembranous strips, shorter than upper part, each bearing apical seta. Inferior appendages short and stout, each with semicircular excision on apicodorsal end in lateral view; in ventral view appendages broad at base, curved inward, each gradually narrowing to acute apex. Phallobase tube-like in basal half with curved ridges on each side, distal half trough-like, sinuate, tapering to narrow, asymmetrical apex; three or four paramere spines, only one of which extremely long.

FEMALE GENITALIA (Fig. 230): Sternum VIII with pair of deep, setose pockets above anterolateral edges of gonopod plate. Tergum IX broad, semimembranous, its apicodorsal margin

produced at center in triangular lobe (IXa), with tiny membranous papillae (IXb) present below it; pleural regions more sclerotized, divided laterally by membranes of pleura VIII, and strongly produced ventrolaterally, forming pair of flanges just above gonopod plate. Preanal appendages represented by pair of setose patches on tergum X. Tergum X short and sclerotized, fused with lateral regions of segment IX, and, ventrally, fused with subanal plate (i.d.gon.IX), the latter deeply excised apicomesally in dorsal view. Lamellae small, each with lower sub-apical angle produced in blunt lobe curved mesad. Gonopod plate sub-circular; apical margin slightly produced at center, lateral edges expanded in broad flanges. Spermathecal sclerite with main body pear-shaped in ventral view, ventrally bearing pair of short, dark strips arched in right angle, dorsally bearing pair of long, sclerotized ribbons twice as long as sclerite.

LENGTH OF FOREWING: Male 8.0-8.5 mm, Female 7.7-8.9 mm.

TYPE MATERIAL: Holotype MALE, Loc. 76c (NAU). Paratypes--10 males, 22 females, same data as holotype (NAU); 7 males, 2 females, Loc. 76d (CUAC); 1 male, Loc. 98 (NAU).

ETYMOLOGY: Latin, "peg" or "small stake," with reference to the special structure produced on either side of male segment IX.

DIAGNOSIS: The male genitalia of this species most closely resemble those of *Oecetis villosa* Kimmins, 1963b. However, the apicodorsal corners of pleura IX are each produced in a single stake with a cluster of smaller spines at its base rather than with an area of dense, acute serrations; also the excision at the apex of each inferior appendage is deeper and more circular.

DISTRIBUTION: Known from only the type series localities in southcentral China.

Oecetis (*Pleurograpta*) *sicula*, NEW SPECIES
Figs. 146, 231

DESCRIPTION: Head and thorax reddish brown, abdominal sterna pale yellow, terga II to V fuscus, terga VI and VII with golden honeycomb-like reticulation, reticulation on each tergum divided into two parts by longitudinal fuscus ridge on meson. Wings in alcohol with traces of light golden brown hairs; forewings faintly greyish, each with transparent patch around anastomosis region; anastomosis arched and with faint, fuscous clouding over crossveins; dark brown spots on forks, apices of longitudinal veins, and arculus. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 146): Tergum VIII forming golden honeycomb-like shield, not divided mesally, about 1.5 times as long as broad, covering genitalia dorsally. Segment IX very short dorsally; pleural regions abruptly 5 times longer, each with dorsal part above excision forming stout dagger-like spine pressed mesad against phallus; sternum nearly as long as pleura. Preanal appendages slender, curved outward, capitate. Upper part of tergum X single, rod-like, lower part of tergum X composed of pair of flat, semimembranous lobes, dilated apically in dorsal view, each slightly produced sub-apically in tiny mesal process. Inferior appendages each trifid in lateral view, upper branch broad basally, narrowing to capitate apex curved slightly mesad; middle branch short, triangular; lower branch only half as long as dorsal branch, tapering to acute apex. Phallus highly sclerotized, slightly curved downward, generally parallel-sided in lateral view, asymmetrical: left side with semicircular excision in sub-apicodorsal edge and with apex truncate in lateral view; right apex without sclerotization; two main paramere spines: one stout, with sclerotized basal cup also supporting more than two dozen fine spines; another spine very thin, about one third as long as stout one, on long slender membranous lobe; phallotremal sclerite large, highly sclerotized and U-shaped.

FEMALE GENITALIA (Fig. 231): Segment IX with IXa conspicuous, IXb composed of one semimembranous process; ventral half of pleural regions of IX produced outward, each forming large posterior pocket with inner surface rugose. Preanal appendages shorter than tergum X, fused with it dorsolaterally, together with it surrounding shallow indentation. Tergum X deeply

and narrowly excised apically. Lamellae small, semicircular, each with ventral triangular projection. Gonopod plate broad, mostly transparent, with apical end constricted laterally before rugose pockets of pleura IX; internal part of gonopod VIII (i.gon.VIII) well developed with broadly truncate apex extending beyond posterior apex of gonopod plate. Spermathecal sclerite generally triangular, but complex, in ventral view with ventral ridge of spermathecal process four-fifths as long as sclerite, ventrally with dark, elliptical, transverse structure; anteroventral margin rounded, bearing pair of ear-like lateral projections.

LENGTH OF FOREWING: Male 4.6-5.0 mm, female 4.5-4.9 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2a (NAU). Paratypes--1 male same data as holotype (NAU); 43 males, 10 females, Loc. 12b (NAU); 10 males, 3 females, Loc. 12b (CUAC); 2 males, Loc. 10d (NAU); 1 male, Loc. 67c (NAU).

ETYMOLOGY: Latin, "a dagger," with reference to the dorsal dagger-like projection of pleura IX in the male genitalia.

DIAGNOSIS: This species is most similar to *Oecetis testacea testacea* (Curtis, 1834); Oe. *testacea kumanskii* Yang and Morse, NEW NAME; *Oe. fahieni* Schmid, *Oe. lingua* Schmid, and *Oe. tsudai* Fischer but the male differs from those of these species in (1) the well-developed lower part of tergum X, (2) the rounded capitate apex of the upper branch of each inferior appendage, (3) the triangular middle branch of each inferior appendage (also in *Oe. asmada*), and (4) the truncate left apex of the phallus.

Since its identity is unknown, the name *Oecetis orientalis* Navás, 1921, from "Tongking" (Vietnam), is a NOMEN DUBIUM. Nevertheless, Navás' name is an available name. Therefore, the species *Oecetis orientalis* Tsuda, 1942b, is a homonym (Fischer, 1966) that was renamed *Oecetis tsudai* Fischer, 1970. Because of the "coordinate status" of names in the species group, the subspecies *Oecetis testacea orientalis* Kumanski, 1991, also is a homonym that should be renamed. Therefore, we rename this subspecies ***Oecetis testacea kumanskii* Yang and Morse, NEW NAME.**

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

Oecetis (*Pleurograpta*) *uniforma*, NEW SPECIES
Fig. 147

DESCRIPTION: Head and thorax pale yellow. Antennae with first segment of flagellum only 1.5 times as long as second segment, neither arched nor with fine silky hairs. Forewing hyaline faintly yellowish, without fuscous shading except anastomosis (in straight line) and arculus brownish, hairs on wings long, brownish, hindwing fringes fuscous. Abdomen fuscous above, pale yellow beneath; terga VII and VIII with thin reticulation. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 147): Segment IX broad ventrally, dorsal third short, abruptly excised posteriorly to narrow transverse band, anterior margin of pleura IX strongly produced forward; posterodorsal corner produced in sinuous spine curved posteromesad to acute apex; in dorsal view, tergum IX strongly produced caudad. Upper part of tergum X produced in slender, bare rod with acute apex, its base fused with tergum IX; lower part of tergum X completely membranous, appearing in two lobes each bearing weak seta apically. Preanal appendages huge, narrower at base, nearly parallel-sided in apical two-thirds, apically rounded in lateral view, obliquely truncate in dorsal view, extending well beyond posterior margin of segment IX, slightly beyond lower part of tergum X, and nearly to apex of upper part of tergum X. Inferior appendages simple, bifid, mitten-like in lateral view; basodorsal branch thumb-like with rounded apex; main body triangular with acute ventral apex, in ventral view main body narrower than in side view, slightly sinuate with mesal margins more nearly approximate basally and diverging apically.

Phallus asymmetrical apically, basal half large, globular, foramen positioned at anterior center, apical half shallow, trough-like; in dorsal view, right edge of phallobase produced in two lobes, one in large lobe with acute tip just beyond posterior end of segment IX, other in small sub-rounded lobe protruded at one-third distance from apex; paramere spines consisting of one stout, arched spine and three slender, straight spines.

LENGTH OF FOREWING: Male 6.1 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 86 (NAU).

ETYMOLOGY: Latin, "simple, even" with reference to the simple, nearly parallel-sided preanal appendages.

DIAGNOSIS: Among males of this Group, that of *Oe. uniforma* has long preanal appendages and hooked apicodorsal processes of pleura IX which distinguish it from all other species in this Group.

DISTRIBUTION: Known from only the type locality in south central China.

Oecetis (*Pleurograpta*) *morii* Tsuda, 1942b
NEW CHINESE RECORD
Figs. 154, 236

Oecetis morii Tsuda, 1942b, pp. 298-299, fig. 50a-b; holotype not selected; type repository = originally Zoological Institute, Kyoto Imperial University; now represented only by wing preparations in University of Osaka Prefecture, under the care of Dr. K. TANIDA, labeled as "*Setodes morii* male n. sp., Otsu" (T. NOZAKI, personal communication); type locality = Japan (Honshu).

This species, previously known only by a male from Japan, now is known from China. The female is associated and described here for the first time. Tibial spurs 1-2-2 (Tsuda, 1942b) or 0-2-2 (some of our specimens).

DESCRIPTION: Vertex brown; thorax brown above, pale yellow on pleura and sternum. Palpi and wings covered with long fulvous hairs, plumose hairs on veins. Forewings hyaline, faint yellowish, very lightly shaded with small brown spots on forks, anastomosis only slightly darker than other veins, with s crossvein and transverse base of MA vein arranged in line, slanting to base, transverse base of MP vein upright, slightly basal of other two. Abdomen fulvous above, pale yellow beneath.

MALE GENITALIA (Fig. 154): Segment IX dorsal third with broadly rounded excision posteriorly in lateral view, leaving narrow dorsal band produced in small rounded triangle at meson. Preanal appendages long, each dilated at middle then narrowing to tip, about four times as long as its mid-width. Upper part of tergum X composed of slender, dorsomesal rod with apex dilated and extending to apices of inferior appendages; lower part of tergum X consisting of pair of divergent, semimembranous, lateral processes. Inferior appendages large, vertical plates, in lateral view each broad, parallel-sided in basal half, tapering in apical half to narrow tip, dorsal edge with thin triangular projection at midlength; in ventral view proximate basally, distal half with rounded mesal excision with apices hooked and curved inwards. Phallus strongly asymmetrical, phallobase with left piece well developed, basal half broad, distal half narrowed, abruptly constricted sub-apically before distinctive capitate apex; its right piece small, basodorsal lobe with acute, spine-like apex; three long paramere spines essentially identical.

FEMALE GENITALIA (Fig. 236): Tergum IXa broadly produced at apicomesal margin, paired papillae IXb membranous; pleural regions extremely expanded laterally in pair of quadrate wings and with pair of smaller side lobes anteriorly just below them. Preanal appendages fused

with tergum X, forming tube surrounding caudal socket, slightly longer than tall in lateral view. Lamellae forming vertical lobes, sub-rectangular in lateral view with ventral margins curved inwards, pad-like, each two times as long as broad in ventral view. Gonopod plate large, transparent, its anterior margin defined by sclerotized brown area, broad, transverse, kidney-shaped with paired setose areas. Spermathecal sclerite with pair of lateral excisions, ventral process of sclerite positioned at its anterior end, one half as long as its body.

LENGTH OF FOREWING: Male 6.1-6.4 mm; female 5.9-6.4 mm.

MATERIAL EXAMINED: 1 male, 3 females, Loc. 36 (NAU); 1 male, 1 female, Loc. 36 (CUAC).

DIAGNOSIS: The male of this species somewhat resembles that of *Oe. semissalis* (Fig. 155Dd) in the right lateral piece of the phallobase produced in a stout spine, multiple paramere spines (at least three), and lack of honeycomb reticulation on terga VII and VIII. However, the much longer preanal appendages in side view, the larger inferior appendages, the capitate apex of the phallobase, and three identical paramere spines in this species easily distinguish it from *Oe. semissalis*.

DISTRIBUTION: Previously known only in Japan, this species is now known in Hu-bei Province, mideastern China.

Oecetis (*Pleurograpta*) *hamata* Group Chen, 1993

Phylogenetic inferences and a diagnosis for adults are in preparation by Chen (personal communication).

Oecetis (*Pleurograpta*) *ancylocerca*, NEW SPECIES
Figs. 148, 232

DESCRIPTION: Body yellowish brown, male antennae each with scape long, cylindrical, first flagellum segment distinctively elongated, bearing dense tuft of long, dark grey pencil hairs, this segment at least two times as long as scape and equal to combined length of next seven flagellum segments. Forewings of both sexes yellowish hyaline, anastomosis almost connected in arched line and very dark, several rounded brownish spots arranged like those in *Oecetis singularis*. Abdomen yellowish. Tibial spurs 0-2-2.

MALE GENITALIA (Fig. 148): Segment IX excised abruptly in posterodorsal half, forming narrow transverse band with its dorsal center produced backward in rounded triangle and with pair of conspicuous papillae just beneath it. Preanal appendages huge, highly sclerotized, horn-like, curved evenly about 130° in lateral view and tapering evenly from broad base to acute apex, originating at bottom of excision of segment IX. Upper part of tergum X single, clavate process with apex setose, sub-deltoid in lateral view. Inferior appendages very short, slightly bifid with upper portion highly expressed, digitate in side view, blunt and almost truncate in caudoventral view, lower portion produced mesad and thus scarcely visible in lateral view. Phallus large, globular in basal two-thirds, narrowing to slender neck at apical third, apex abruptly curved downward; three unequal paramere spines.

FEMALE GENITALIA (Fig. 232): Abdominal segments VII and VIII fused with IX, their original distinctions evident as two transverse grooves dorsally, tergum IX elevated and strongly produced at its posterior center. Preanal appendages oval. Tergum X short dorsally, nearly as long as lamellae ventrally, with deep caudal depression in middle. Lamellae small, each with vertical ridge laterally near apex, this ridge appearing lobe-like in ventral view. Subgenital plate large, composed of sterna VII and VIII and gonopod plate, with rhomboid semisclerotized area in center;

two pairs of distinctive pockets posterolaterally near bases of lamellae. Spermathecal sclerite small, rectangular, longer than broad, with truncate anterior end.

LENGTH OF FOREWING: Male 7.5 mm, Female 6.5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 90 (NAU). Paratypes--1 male, 3 females, collected with holotype (NAU).

ETYMOLOGY: Greek, "bent tail," with reference to the huge, horn-like preanal appendages of the male genitalia.

DIAGNOSIS: The male of this species most closely resembles those of *Oecetis singularis* Ulmer, 1930, from Sumatra and the new species *Oe. cornuata* below in their huge preanal appendages. It differs from the males of both of these species in that these preanal appendages each taper evenly to an acute downcurved apex and in that the inferior appendages are much smaller in *Oe. ancylocerca,* each with an upright digitate dorsal branch and with a very short ventral branch directed mesad.

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

Oecetis (*Pleurograpta*) *antennata* (Martynov, 1935), NEW COMBINATION, NEW CHINESE RECORD

Fig. 149

Oecetodella antennata Martynov, 1935, p. 257-258, figs. 59-63; holotype male, type repository = probably Zoological Institute, St. Petersburg; type locality = Russia, Amur Region, Bikin River an the mouth of the Bejzuche River, near Bikin.

DESCRIPTION: Head and thorax yellowish brown, hairs on head and palpi golden brown, male antennae with basal five flagellum segments heavily covered with golden brown hairs, first flagellum segment as long as scape. Forewing resembling others in subgenus *Pleurograpta*, anastomosis forming one arcuate line with small dark brown spot appearing on each fork, at each cross vein, and at apices of branches of longitudinal veins. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 149): Our single specimen from northeastern China has genitalia almost identical with those figured by Martynov (1935).

According to Martynov (1935): "9th segment very broad at sides and beneath, its tergite narrow, but forming tongue-shaped projection backwards. Preanal appendages longer than the median process of the ninth tergite, hairy, slender at base. 10th segment [= upper part of tergum X] forming a long process, acute at its end. Pedes genitales [= inferior appendages] asymmetrical, the left appendage forming three, the right only two branches, inner branch lacking. Seen from side, each appendage is composed of a horizontal long branch and of a vertical shorter and slender process, arising upwards from its base, left branch bears internally a second short process . . . Penis [= phallus] composite and forms beneath a separate elongated plate, covering it from beneath; there are two straight and long titillators [= paramere spines] and one shorter and slender appendage . . . .

"Length 4 to 4.6 mm."

To this we added the following:

Phallus asymmetrical, cylindrical basal third continued as sclerotization only on right half, this half produced in long plate with dorsal margin arched, slightly sinuate at apex, and ventral margin sinuately curved ventrad; four paramere spines: two long, relatively straight spines; one short, curved spine; and one tiny spine which Martynov did not mention in his description.

LENGTH OF FOREWING: Male 6.1 mm.

FEMALE AND IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: One male at Loc. 34 (NAU).

DIAGNOSIS: The male genitalia of this species resemble those of *Oe. belihuloya* Malicky, 1973; *Oe. malighawa* Schmid, 1958; and *Oe. scutulata* Martynov, 1936, in the short preanal appendages, the general shape of the inferior appendages, and the asymmetrical and multispinous phallus. However, the asymmetrical inferior appendages and the fourth paramere spine of the phallus differentiate this species from these other three and from other species of *Oecetis*.

DISTRIBUTION: Previously known from only Amur, eastern Russia, now found in Heilong-jiang Province, northeastern China.

Oecetis (*Pleurograpta*) *comalis*, NEW SPECIES
Figs. 150, 233

DESCRIPTION: Head and thorax testaceous, vertex and palpi with fuscous hairs darker in male than in female. Male antennae with form of *Oecetis antennata*: each with first flagellum segment stout, moderately elongated, about as long as scape and as long as combined length of next four segments, each of which as long as broad (Fig. 150J). These five basal flagellum segments bearing on their outer surface dense pencil of silky, fuscous hairs at least three times as long as first segment; inner surface of pedicel and first basal flagellum segment densely clothed with short, fulvous hairs. Forewings hyaline, faintly yellow; clearly marked with fuscous at forks of veins, on veins of anastomosis, and at apices of longitudinal veins; anastomosis with s crossvein distal less than its own length from transverse base of $\underline{S}_4$, transverse bases of $\underline{S}_4$ and MP nearly aligned, transverse base of MP oblique. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 150): Dorsal third of segment IX abruptly excised posteriorly, forming narrow transverse band anteriorly, center of its apical margin only slightly produced; lower portion of segment large, sub-quadrate in lateral view. Preanal appendages slender, clavate, five to six times as long as broad. Upper part of tergum X produced in median digitate projection, setose and highly sclerotized, reaching almost to tip of inferior appendages; lower part of tergum X forming pair of semimembranous projections much shorter than upper part, bearing short setae apically and sub-apically. Inferior appendages each generally bifid: lower branch short, shelf-like, appearing as broad triangular lobe in ventral view; dorsal branch stout in basal half and slender apically, each with triangular lateral carina, serrate longitudinal mesal carina, and dorsal lobe triangular in lateral view and rounded in dorsal view with few apical setae. Phallus highly sclerotized, broad, and asymmetrical tube, divided into two apicolateral lobes: left lobe small and rounded; right lobe large, curved downward and tapering to blunt triangular apex; phallotremal sclerite large, trough-like, semisclerotized; two short paramere spines, one with sclerotized cup at its base.

FEMALE GENITALIA (Fig. 233): Tergum IX projecting caudad, pair of membranous papillae conspicuous; pleural regions of segment IX each broadly produced backward in semicircular lobe; anterior pleural margins strongly produced outward forming pair of shallow troughs on each side of segment. Preanal appendages broad, fused laterally with caudal projections of pleura IX. Tergum X longest ventrally with deep caudal pocket. Lamellae small, oval lobes. Gonopod plate highly sclerotized, sub-triangular, with apicomesal excision. Spermathecal sclerite dark brown, with trough-like apex visible in lateral view above gonopod plate, dorsal projection tongue-like, constricted laterally near middle, extending to middle of segment VIII.

LENGTH OF FOREWING: Male 7.1-7.5 mm, Female 7.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81b (NAU). Paratypes--1 female, same data as holotype (NAU); 1 male, Loc. 42 (NAU).

ETYMOLOGY: Latin, "with hairs," with reference to the specialized hairy antennae.

DIAGNOSIS: The male of this species somewhat resembles that of the new species *Oecetis mirabilis*, below, with their inferior appendages each bearing a lateral ridge and the phallus of each species with a large, trough-like phallotremal sclerite. However, it differs from that of *Oe. mirabilis* in that the lower part of tergum X is apparent in this species, the inferior appendages are more slender and with an evident basoventral process, and the phallus is relatively shorter and broader.

DISTRIBUTION: Known from only the type localities in southcentral China.

Oecetis (*Pleurograpta*) *cornuata*, NEW SPECIES
Figs. 151, 234

DESCRIPTION: Head and thorax testaceous, antennae of the male resembling those of *Oe. antennata* in form, but without hairs (Fig. 151J). Forewings hyaline, faint yellow, clearly marked with fuscous at the forks of the veins, on the veins of the anastomosis, and at the apices of the longitudinal veins; anastomosis with s crossvein distal about its own length from other two veins and with transverse bases of $\underline{S}_4$ and MP connected in slightly zigzag, oblique line. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 151): Segment IX anterior margin slanted posterodorsad, abruptly excised posteriorly in dorsal half, leaving narrow transverse anterodorsal band. Preanal appendages huge, highly sclerotized, mostly parallel-sided, each abruptly narrowed to acute dorsal apex with sub-apical process on its ventral edge one-fourth distance from apex. Upper part of tergum X single mesal digitate projection; lower part of tergum X not evident. Inferior appendages as long as tall, trifid: dorsal branch setose, capitate in lateral view, slender and concave basally, projecting mesad as vertical plate in distal half; middle branch setose, slender, tapered; ventral branch setose, produced horizontally as transverse shelf broad in ventral view. Phallobase broad, tubular, about three times as long as average width; globular basally, its left side divided sinuously from one-third distance from base to enlarged, trumpet-like posterior opening with ventral end curved downward; single paramere spine very stout and depressed, arising from huge cup-like sclerotized base; additionally, semimembranous lobe (possibly second paramere spine) beside dark paramere spine; phallotremal sclerite developed as small trough, semisclerotized.

FEMALE GENITALIA (Fig. 234): Segment IX longest dorsally, tergum IX strongly protruded mesally (IXa), nearly reaching as far as tips of preanal appendages; pair of digitate processes (IXb) projecting beneath it; preanal appendages sclerotized, at least two times as long as their average width; tergum X nearly rectangular in lateral and dorsal views, longer ventrally, with apex of ventral edge notched in dorsal view. Lamellae small, oval in lateral view, more strongly sclerotized dorsally and apically. Gonopod plate sclerotized and strongly concave ventrally, broad at base, slightly narrowing to broad apex with shallow notch at its center. Spermathecal sclerite short, mostly rectangular; dorsal process of spermathecal sclerite semimembranous.

LENGTH OF FOREWING: Male 6.2-6.9 mm, female 5.6-6.8 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 11b (NAU). Paratypes--8 males, 12 females, same data as holotype (NAU); 4 males, 1 female, Loc. 2a (CUAC); 1 male, Loc. 12b (NAU); 2 males, 2 females, Loc. 17 (NAU).

ETYMOLOGY: Latin, "horn-like," with reference to the huge, sclerotized preanal appendages.

DIAGNOSIS: Adults of this species exhibit all of the characters of this Group mentioned for the previous species, but differs from other species within the Group in that its male preanal appendages are parallel-sided and each has a ventral, sub-apical projection; its male inferior

appendages each have a conspicuous basodorsal precess; its phallobase has a broad apex with a constriction before the apex; and the single paramere is blade-like and accompanied by a semimembranous projection.

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

Oecetis (*Pleurograpta*) *laminata* Huang, 1957,
NEW COMBINATION
Fig. 152

Oecetodella laminata Huang, 1957; p. 392-393, fig. 87-91; holotype = male; type repository = NAU; type locality = Shao-wu, Fu-jian Province at Loc. 11.

DESCRIPTION: Body and wing pattern agreeing with those of other species of this Group, male antennae like those of *Oe. antennata*. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 152): General appearance of segments IX and X and of inferior appendages agreeing well with description and illustrations by Huang. Phallus asymmetrical, tubular in basal quarter, remainder of phallus sclerotized only on right side as long curved plate with blunt apex, its ventral edge with excision near base. Two paramere spines stout with one spine at least twice as long as other; phallotremal sclerite large, U-shaped.

LENGTH OF FOREWING: Male 6.3 mm.

FEMALE AND IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 4 males, Loc. 10a (NAU); 1 male, Loc. 58a (CUAC).

DIAGNOSIS: This species is very similar to *Oecetis antennata*, but the inferior appendages of this species are consistently symmetrical and the phallus has only two paramere spines.

DISTRIBUTION: This species is known from three localities in southeastern China.

Oecetis (*Pleurograpta*) *mirabilis*, NEW SPECIES
Figs. 153, 235

DESCRIPTION: Body testaceous, male antennae bearing thick pencil of hairs on basal four flagellum segments, flagellum obviously twisted between first segment and next three segments. Forewings hyaline, faint yellowish, clearly marked with fuscous at forks of veins, on veins of anastomosis, and apices of longitudinal veins; s crossvein distal less than its own length from other two anastomosis veins, these two arranged in oblique line. Abdomen fuscous dorsally, pale yellow ventrally. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 153): Dorsal half of segment IX excised posteriorly, forming narrow transverse arch anteriorly, apical margin of tergum produced mesally in small rounded lobe; lower part of segment IX large, sub-trapezoidal and rotated counterclockwise in lateral view. Preanal appendages long, slightly clavate. Upper part of tergum X single, mesal process, digitate, reaching slightly beyond preanal appendages. Lower part of tergum X not apparent. Inferior appendages short and stout, each with longitudinal ridge on lateral surface dividing appendage into dorsal and ventral parts in lateral view, dorsal part with basodorsal process apex very broad and truncate, apical process slightly broadened apically and obliquely truncate, these processes separated by deep circular excision; shelf-like ventral part stout in ventral view with serrate apex. Phallobase long and slender, positioned dorsally, consisting of two asymmetrical processes apicodorsally (ph.do.): long, slender, well-sclerotized, blade-like process on left side serrate on its left edge and with its apex dilated, and basal semimembranous strip on right side about half as long

as blade; paramere spine single, stout, half as long as dorsal blade; phallicata completely membranous with a huge, trough-like phallotremal sclerite.

FEMALE GENITALIA (Fig. 235): Segment IX clearly distinguished by carina from preanal appendages and segment X; IXa conspicuous and triangular in dorsal view, paired papillae of IXb tiny, mostly hidden beneath IXa in dorsal view; side pieces about one-third as tall as segment, truncate; ventral margins produced outward and fused with gonopod plate. Preanal appendages low setose ridges. Segment X with caudal socket, obliquely truncate in lateral view, ventral margin with U-shaped excision in dorsal view. Lamellae small, each with apicoventral end strongly produced ventrad. Gonopod plate enlarged, in ventral view sub-triangular with rounded corners, surface concave. Spermathecal sclerite retracted to segment VIII, ventral process of sclerite not evident (possibly hidden by membranes), pair of sub-quadrate plates submerged in membranes with dorsal semimembranous strips extending to anterior margin of segment VII.

LENGTH OF FOREWING: Male 7.2-7.7 mm; female 7.3-7.6 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 82a (NAU). Paratypes--1 male, 8 females, Loc. 82b (NAU).

ETYMOLOGY: Latin, "strange," with reference to the very peculiar structure of the phallus.

DIAGNOSIS: This species belongs to the group of species near *Oe. penicillata* Kimmins, 1963b, the male somewhat resembling that of *Oe. penicillata* in the distinctive form of the phallus as described above, but differs from it by *Oe. mirabilis* having tergum X single, digitate; inferior appendages stout, bifid dorsally; the paramere spine extremely long; and the phallotremal sclerite highly sclerotized, trough-like.

DISTRIBUTION: Known from only the type localities in southcentral China.

Oecetis (*Pleurograpta*) *semissalis*, NEW SPECIES
Fig. 155

DESCRIPTION: Head and thorax pale yellow brown; antennal pedicel with anterior surface produced in angle, first segment of flagellum about 3 times as long as second segment, obviously arched at basal half (Fig. 155J); forewings faintly brownish, dark brown spots over all forks, anastomosis, and apices of each longitudinal vein, anastomosis basically in arched line. Tibial spurs 1-2-2.

MALE GENITALIA (Fig. 155): Segment IX broadest ventrally, with dorsal anterior margin broadly excised to narrow transverse posterodorsal band, side pieces of segment IX long anteriorly, not obviously produced posteriorly; apicodorsal margin at conjunction between tergum and pleural regions produced in small triangular projection where dorsal portion of phallic shield is attached. Preanal appendages stub-like, slightly constricted at base, each with obliquely truncate apex. Upper part of tergum X stout, with fine setae before acute apex; lower part of tergum X in pair of broad, semimembranous lobes slightly shorter than upper part of tergum X. Inferior appendages basically bifid, each with main body sub-rectangular in lateral view, 2 times as long as broad, with apex blunt in lateral and ventral views; basodorsal branch upright, with three lobes: small triangular process arising from its base and directed laterad and with single apical seta; strongly compressed lobe in middle of hind margin, broad in lateral view and enlarged mesad; and distal lobe acute, more setose, directed dorsad then mesad. Phallus asymmetrical, generally parallel-sided in lateral view; base globular in dorsal view with right side and most of apicoventral portion sclerotized, forming right wall and incomplete ventral trough; right wall produced near midlength in a stout spine directed caudolaterad, apex excised such that dorsal hook separated from ventral half-trough; left side of phallus membranous; phallotremal sclerite dark, V-shaped; four

paramere spines with largest flat, arched, positioned basally, with intermediate-sized spine straight, positioned apically, and with the remaining two spines tiny, submerged in exposed endophallic membranous.

LENGTH OF FOREWING: Male 5.6 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 10d (NAU).

ETYMOLOGY: Latin, "of a half," with reference to the sclerotization of the male phallobase.

DIAGNOSIS: The male of this species resembles that of *Oecetis antennata*, but the lower part of tergum X is evident in this species, and the sclerotization of the basodorsal branch of each inferior appendage and the right side of the phallus are much more complex than in that species. It is distinguished from those of all other members of this Group by the lack of a long hair pencil on the basal segment of each flagellum.

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

Oecetis unidentified species Navás, 1933
Fig. 156

"*Oecetis turbata*" Navás, 1933; pp. 20-21, fig. 35, in part.

NOT:

Oecetis turbata Navás, 1933; pp. 20-21; holotype = male; type repository = Navás Collection, Municipal Institute of Natural Sciences, Barcelona; type locality = Chusan (Zhou-shan), Zhe-jiang Province at Loc. 103.

Setodes turbata (Navás), Schmid, 1950, pp. 382, 384-385, figs. 143-145, holotype male described.

The figure that Navás provided for the wings of his *Oecetis turbata* (Fig. 156) suggests that he was indeed examining a specimen of *Oecetis*. However, the holotype, described by Schmid (1950), clearly is a species of *Setodes*. Therefore, Navás apparently illustrated some specimen in the type series other than the holotype and misidentified the holotype as belonging to the same species. The first author (LFY) examined a paratype in the Institute of Zoology, Academia Sinica, and determined that it is certainly of a species of *Oecetis*, possibly *Oe. lacustris*, but she was not allowed to dissect the specimen. Paratype specimens of the species in the Institute need to be examined in more detail to discover the identity of the *Oecetis* species Navás illustrated.

KEY TO ADULTS OF CHINESE *OECETIS* SPECIES

(Females of *Oecetis antennata*, *Oe. biramosa*, *Oe. brachyura*, *Oe. laminata*, *Oe. semissalis*, *Oe. spinifera*, and *Oe. uniforma* are yet unknown.)

1. Genitalia with inferior appendages and phallus (Fig. 127) ..... (male), 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 216) .... (female), 30

2(1). Antennae each with its basal flagellar segment very long (Figs. 148J, 155J), usually covered with dense tuft of golden brown hairs arising from short pedicel and subsequent basal flagellar segments (Fig. 150J) ..... [*Oecetis* (*Pleurograpta*) *hamata* Group], 3
2'. Antennae with basal flagellar segments not unusually long 9

3(2). First flagellar segment twice as long as scape (Fig. 148J); preanal appendages huge, variously horn-like (Figs. 148A, 151A) 4

3'. First flagellar segment as long as scape (Fig. 150J); preanal appendages clavate (Fig. 149A) 5

4 (3). Preanal appendages broad at base, each narrowing to acute tip (Fig. 148A) .... *Oe.* (*Pl.*) *ancylocerca*, n. sp., p. 138.

4'. Preanal appendages each parallel-sided in basal third-fourths, then abruptly excised ventrally to acute apex (Fig. 151A) ..... *Oe.* (*Pl.*) *cornuata*, n. sp., p. 141.

5(3'). Preanal appendages each about 1.5 times as long as broad (Fig. 155A); phallus with sharp spine near middle of right side projecting at 45° angle (Fig. 155Dd) ..... *Oe.* (*Pl.*) *semissalis*, n. sp., p. 143.

5'. Preanal appendages each at least 4 times as long as broad (Figs. 151A, 152A); phallus without sharp spine projecting from near middle 6

6(5'). Basoventral lobe of each inferior appendage broadly triangular in ventral view (Fig. 151C) 7

6'. Basoventral lobe of each inferior appendage long, acute in ventral view (Figs. 149C, 152C) 8

7(6). Main body of each inferior appendage short, roughly as long as broad (153A); phallus extremely long and slender and with one huge paramere spine (Fig. 153D) ..... *Oe.* (*Pl.*) *mirabilis*, n. sp., p. 142.

7'. Main body of each inferior appendage roughly 4 times as long as its average width (Fig. 150A); phallus broad tube, 3 times as long as broad and with two small paramere spines (Fig. 150D) ..... *Oe.* (*Pl.*) *comalis*, n. sp., p. 140.

8(6'). Inferior appendages symmetrical (Fig. 152C); two paramere spines (Fig. 152D) ..... *Oe.* (*Pl.*) *laminata* Huang, p. 142.

8'. Inferior appendages asymmetrical (Fig. 149C); four paramere spines (Fig. 149D) ..... *Oe.* (*Pl.*) *antennata* (Martynov), p. 139.

9(2'). Paramere spines absent (Fig. 128D) ..... [*Oe.* (*Pseudosetodes*) *lais* Group)], 10

9'. One or more paramere spines present (Figs. 130D, 139D) 12

10(9). Inferior appendages slender, each more than 4 times as long as its base (Fig. 127A); apex of phallus abruptly curved downward and tapering to point (Fig. 127A) ..... *Oe.* (*Ps.*) *minuscula*, n. sp., p. 114.

10'. Inferior appendages broad, each at most 2.5 times as long as its base (Fig. 128A); apex of phallus gradually curved and tapering to blunt tip (Fig. 128D) 11

11(10'). Pleura IX processes parallel-sided (Figs. 129A, 129B); basodorsal projection of each inferior appendage at least one half as long as main body of appendage, thumb-like (Fig. 129A) ..... *Oe.* (*Ps.*) *taenia*, n. sp., p. 116.

11'. Pleura IX processes broad basally and tapered to acute apex in lateral view (Fig. 128A), clavate in dorsal view (Fig. 128B); basodorsal projection of each inferior appendage shorter, triangular (Fig. 128A) ..... *Oe.* (*Ps.*) *spatula* Chen, n. sp., p. 115.

12(9'). Tergum X roof-like, not divided into upper and lower parts (Figs. 130A, 130B) ... 13

12'. Tergum X divided into upper and lower parts, upper part rod-like and lower part forming pair of semimembranous processes (Fig. 140B) ..... [*Oe.* (*Pleurograpta*) *testacea* Group], 21

13(12). Inferior appendages with bases closely approximate for one-third to one-half their length (Fig. 130C-4) ..... [*Oe.* (*Oecetis*) *lacustris* Group], 14

13'. Inferior appendages not so closely approximate basally (Fig. 132C) 15

14(13). Phallus huge, with basal end almost as broad as segment IX (Fig. 131B) ..... *Oe.* (*Oe.*) *nigropunctata* Ulmer, p. 119.

14'. Phallus not as broad (Fig. 130B-4) ..... *Oe.* (*Oe.*) *lacustris* (Pictet), p. 118.

15(13'). Preanal appendages about as long as broad and fused with each other and tergum X, nearly covering tergum X (Figs. 132A, 132B); inferior appendages each about 3 times as long as basal width in ventral view (Fig. 132C) ..... [*Oe.* (*Oecetis*) *tripunctata* Group], *Oe.* (*Oe.*) *tripunctata* (Fabricius), p. 120.

15'. Preanal appendages about 2 times as long as wide, not fused with each other (although sometimes fused with tergum X), not covering tergum X (Figs. 133A, 133B) 16

16(15'). Sternum IX with pit in apical projection between bases of inferior appendages (Fig. 138 C) ..... *Oe.* (*Oe.*) *intima* McLachlan, p. 127.

16'. Sternum IX without pit-bearing projection between inferior appendages (Fig. 139C) ..... [*Oe.* (*Oe.*) *ochracea* Group], 17

17(16'). Tergum X long and broad, with apex deeply excised and bearing dense, thorn-like setae (Fig. 137B) ..... *Oe.* (*Oe.*) *spinifera*, n. sp., p. 126.

17'. Tergum X not as large, not excised, without thorn-like setae (Fig. 133B) 18

18(17'). Phallus huge, globular, at least half as deep as segment IX in lateral view (Fig. 133A) ..... *Oe.* (*Oe.*) *bullata* Yang and Morse, p. 122.

18'. Phallus generally rectangular, less half as deep as that of IX in lateral view (Fig. 134A) 19

19(18'). Phallus with left anterior lobe strongly enlarged (Figs. 134D, 134Dd, 134Dr); basal plate of inferior appendages broad (Fig. 134C) ..... *Oe.* (*Oe.*) *clavata*, n. sp., p. 123.

19'. Phallus with lobes of anterior end not as strongly enlarged (Figs. 135D, 135Dd, 135Dr); basal plate of inferior appendages not so well developed (Fig. 135C) 20

20(19'). Tergum X triangular, apically blunt in dorsal view (Fig. 135B); mesal lobe of each inferior appendage quadrate in ventral view (Fig. 135C) ..... *Oe.* (*Oe.*) *dilata*, n. sp., p. 124.

20'. Tergum X quadrate and truncate or apically incised in dorsal view (Fig. 136B); mesal lobe of each inferior appendage acute in ventral view (Fig. 136C) ..... *Oe.* (*Oe.*) *ochracea* (Curtis), p. 125.

21(12'). At least tergum VIII with reticulation (Fig. 139A') 22

21'. No abdominal terga with reticulation ..... *Oe.* (*Pl.*) *morii* Tsuda, p. 137.

22(21). Tergum VIII with thick, honeycomb-like reticulation (Fig. 139A') 23
22'. Tergum VIII with thin, simple reticulation (Fig. 141A) 28

23(22). Inferior appendages simple and short, about half as long as segment IX (Figs. 142A, 142C); phallus with huge paramere spine arising from deep sclerotized cup surrounded by several tiny spines (Fig. 142A) ..... *Oe.* (*Pl.*) *caucula*, n. sp., p. 131.
23'. Inferior appendages each with one or more basodorsal processes, longer (Fig. 139A); phallus with three or more paramere spines of more nearly equal size (Fig. 139D) 24

24(23'). Tergum VIII reticulation divided mesally; inferior appendages each with apical third to apical half curved dorsad (Fig. 139A); each forewing with middle portion shaded with large fuliginous patch 25
24'. Tergum VIII reticulation not divided; inferior appendages each without upturned apex (Fig. 144A); forewings without large fuliginous areas 26

25(24). Basodorsal projection of each inferior appendage trifid (Fig. 139A) ..... *Oe.* (*Pl.*) *bellula*, n. sp., p. 128.
25'. Basodorsal projection of each inferior appendage simple (Fig. 143A) ..... *Oe.* (*Pl.*) *complex* Huang, p. 132.

26(24'). Basodorsal projection of each inferior appendage capitate, twice as long as main body (Fig. 146A) ..... *Oe.* (*Pl.*) *sicula*, n. sp., p. 135.
26'. Basodorsal projection of each inferior appendage shorter than main body (Fig. 140A) 27

27(26'). Preanal appendages each slender, with apical third curved mesad and ventrad (Figs. 144A, 144B); basodorsal process of each inferior appendage bifid (Fig. 144A) ..... *Oe.* (*Pl.*) *cyrtocercis*, n. sp., p. 133.
27'. Preanal appendages clavate, straight (Figs. 140A, 140B); basodorsal process of each inferior appendage thumb-like (Fig. 140A) ..... *Oe.* (*Pl.*) *biramosa* Martynov, p. 129.

28(22'). Inferior appendages each with small, digitate basodorsal process (Fig. 147A); apicodorsal ends of pleura IX each produced in large hook (Fig. 147A) ..... *Oe.* (*Pl.*) *uniforma*, n. sp., p. 136.
28'. Inferior appendages each with very broad basal process and with semicircular apex (Fig. 141A); apicodorsal ends of pleura IX each with smaller spiny stake (Fig. 145A) or without process (Fig. 141A) 29

29(28'). Preanal appendages each with setose, digitate process (Fig. 145B); apicodorsal ends of pleura IX produced in spiny stake (Fig. 145A) ..... *Oe.* (*Pl.*) *paxilla*, n. sp., p. 134.
29'. Preanal appendages with only tiny triangular apicomesal projection (Fig. 141B); pleura IX without processes (Fig. 141A) ..... *Oe.* (*Pl.*) *brachyura* Yang and Morse, p. 130.

30(1'). Dorsal branch of spermathecal sclerite asymmetrical, with right lobe larger and more sclerotized (Figs. 227B, 227C) ..... *Oe.* (*Pl.*) *caucula*, n. sp., p. 131.

30'. Dorsal branch of spermathecal sclerite symmetrical (Figs. 216C, 217C) 31

31(30'). Preanal appendages tall (Fig. 220A) or long (Fig. 236A) in lateral view, fused with each other and with tergum X (Figs.. 220B, 236B); segment X short, scarcely projecting beyond preanal appendages, with ventral edge much shorter than dorsal edge (Fig. 220A) or segment X not evident (Fig. 236A) 32

31'. Preanal appendages not as tall or as long (Figs. 216A, 219A), not so thoroughly fused with each other and tergum X (Figs. 216B, 219B); segment X usually longer, extending well beyond preanal appendages, with ventral edge at least as long as dorsal edge (Figs.216A, 228A, 230B) 33

32(31). Preanal appendages taller than long (Fig. 220A); segment X distinctive beyond preanal appendages (Fig. 220A) ..... [*Oe.* (*Oe.*) *tripunctata* Group], *Oe.* (*Oe.*) *tripunctata* (Fabricius), p. 120.

32'. Preanal appendages longer than tall (Fig. 236A); segment X not distinct (Fig. 236A) ... [*Oe.* (*Pleurograpta*) *testacea* Group, in part], *Oe.* (*Pl.*) *morii* Tsuda, p. 137.

33(31'). Gonopod plate with two pairs of rugose patches, posterior pair more rugose than anterior pair (Fig. 216C) ..... [*Oe.* (*Pseudosetodes*) *lais* Group, in part], *Oe.* (*Ps.*) *minuscula*, n. sp., p. 114.

33'. Gonopod plate without two pairs of rugose patches 34

34(33'). Lateral surface of each lamella with carina paralleling dorsal and apical edges, ventral edge turned outward, forming large setose pad (Fig 217A) ..... [*Oe.* (*Pseudosetodes*) *lais* Group, in part], *Oe.* (*Ps.*) *taenia*, n. sp., p. 116.

34'. Lateral surface of each lamella without carina (Fig. 218A) or carina differently shaped (Fig. 232A), ventral edge not forming such large pad (Fig. 221A) 35

35'. Segment X with ventral edge no longer than dorsal edge (Figs. 219A, 221A); posterolateral edges of gonopod plate usually defined by dark, narrow ridges (Figs. 219C, 221C) 36

35(34'). Segment X with ventral edge clearly longer than dorsal edge (Fig. 228A); posterolateral edges of gonopod plate defined by ridges (Figs. 228C, 234C) or by pockets (Figs. 229C, 233C), but these not dark, usually not narrow ..... *Oe.* (*Pleurograpta*), major part, 42

36(35'). Gonopod plate delineated anteriorly by distinctively darkened stripes (Fig. 218C) ..... [*Oe.* (*Oecetis*) *lacustris* Group], 37

36'. Gonopod plate defined anteriorly at most by vague light brown lines (Fig. 222C) ..... *Oecetis* (*Oe.*) species, 38

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38(36'). Lateral edges of gonopod plate defined by long carinae reaching nearly to anterior margin of segment VIII (Figs. 221A, 221C) ..... *Oe.* (*Oe.*) *bullata* Yang and Morse, p. 122.

38'. Lateral edges of gonopod plate not extending as far anteriorly (Figs. 224A, 224C) . 39

39(38'). Segment X forked in lateral view (Fig. 222A) ..... Oe. (*Oe.*) *clavata*, n. sp., p. 123.
39'. Segment X not forked (Fig. 223A) 40

40(39'). Pleura IX with upward directed pocket on each side near ventral edge (Fig. 223A) ..... *Oe.* (*Oe.*) *dilata*, n. sp., p. 124.
40'. Pleura IX without pockets (Fig. 225A) 41

41(40'). Posterolateral carinae of gonopod plate each with two convex lobes (Fig. 224C) ..... *Oe.* (*Oe.*) *ochracea* (Curtis), p. 125.
41'. Posterolateral carinae of gonopod plate each with one convex lobe (Fig. 225C) ..... *Oe.* (*Oe.*) *furva* Group, *Oe.* (*Oe.*) *intima* McLachlan, p. 127.

42(35). Gonopod plate with pair of anterolateral, horn-like processes (Figs. 226A, 226C, 228A, 228C); ventral pads of lamellae circular in ventral view (Figs. 226A, 228C) 43
42'. Gonopod plate without horn-like processes (Figs. 229A, 229C); ventral pads of lamellae not circular (Fig. 230C) 44

43(42). Horn-like processes of gonopod plate huge, with additional pair of small, triangular processes in ventral view (Fig. 228C) ..... *Oe.* (*Pl.*) *complex* Huang, p. 132.

43'. Horn-like processes of gonopod plate small, with additional pair of setose humps on either side of plate in ventral view (Fig. 226C) ..... *Oe.* (*Pl.*) *bellula*, n. sp., p. 128.

44(42'). Gonopod plate highly sclerotized, bearing at least one pair of pockets anterolaterally (Fig. 230C) 45
44'. Gonopod plate mostly transparent, without anterolateral pockets (Fig. 233C), although posterolateral pockets may be present (Figs. 231C, 232C) 46

45(44). Gonopod plate apically truncate and bearing two pairs of anterolateral pockets (Fig. 229C) ..... *Oe.* (*Pl.*) *cyrtocercis*, n. sp., p. 133.
45'. Gonopod plate apically produced and bearing one pair of anterolateral, setose pockets (Fig. 230C) ..... *Oe.* (*Pl.*) *paxilla*, n. sp., p. 134.

46(44'). Pleura IX with one (Fig. 231A) or two (Fig. 232A) pockets ventrally, above posterolateral edges of gonopod plate 47
46'. Pleura IX outcurved above full length of gonopod plate, without ventral pockets (Fig. 233C) 48

47(46). Ventral pleura IX forming pair of rugose pockets (Fig. 231A); lamellae semicircular in lateral view (Fig. 231A) ..... *Oe.* (*Pl.*) *sicula*, n. sp., p. 135.
47'. Ventral pleura IX forming two pairs of smooth-walled pockets (Fig. 232C); lamellae quadrate in lateral view (Fig. 232A) ..... *Oe.* (*Pl.*) *ancylocerca*, n. sp., p. 138.

48(46'). Posterior margins of pleura IX each produced caudad in broad lobe (Fig. 233A) .. 49
48'. Posterior margins of pleura IX not produced (Fig. 234A) ..... *Oe.* (*Pl.*) *cornuata*, n. sp., p. 141.

49(48). Gonopod plate sub-triangular, broad anteriorly (Fig. 233C); pleura IX curved laterad anteriorly (Fig. 233C) ..... *Oe.* (*Pl.*) *comalis*, n. sp., p. 140.

49'. Gonopod plate more nearly diamond-shaped, broadest in middle (Fig. 235C); pleura IX not outcurved (Fig. 235C) ..... *Oe.* (*Pl.*) *mirabilis*, n. sp., p. 142.

Setodini Morse, 1981

According to Morse (1981) and Schmid (1987), this tribe includes the genera *Hemileptocerus*, *Setodes*, *Sericodes*, and *Trichosetodes*. *Episetodes* is a synonym of *Setodes* (Schmid, 1958). Monophyly for the tribe is indicated by the homologous apical position of the fork of RP in each hindwing, beyond the branch of MA, in the adults (Morse, 1981). A homoplasious example of this character is seen in the hindwings of some *Leptocerus* species, adding to the confusion of these genera which persisted for many years (e.g., Fischer, 1966, pp. 43-49). Possibly, another synapomorphy of Setodini and a useful diagnostic character for Setodini larvae is the double row of strong spines on either side of the anus which, in some *Setodes* species evolved to a spinous plate.

LARVA and PUPA: Larvae and pupae are known only for the genera *Setodes* and *Trichosetodes*. Larvae are distinguished from those of other Leptoceridae by the presence of two rows of strong posteriorly directed spines on each anal proleg (*Trichosetodes* and some *Setodes*) or the anal region surrounded by tooth-edged plates (remaining *Setodes*) (Ulmer, 1955; Wiggins, 1977, 1996; Wallace, 1981). Pupae of Setodini and Mystacidini and Leptocerini are distinguished from those of other Leptoceridae by the hard labrum, margined with a sclerotized ridge, having one or two pairs of long, stiff bristles close together near the middle of the anterior edge and at least one notch on that edge, and by the uniformly small-toothed mandibles (Ulmer, 1955). From Leptocerini pupae, Setodini pupae are distinguished by the narrower and more widely separated bases of the caudal appendages, generally like little rods, and by the longer bristles on the labrum, nearly as long as the labrum is wide (Ulmer, 1955). From Mystacidini pupae, Setodini pupae are distinguished by the absence of foretibial spurs (*Tagalopsyche* species have one spur on each foretibia), presence of either one (some *Trichosetodes* species) or two pairs of long bristles on the labrum (only one pair in *Mystacides* species), and the absence of gills (usually present in *Mystacides* species).

PHYLOGENY: According to Morse (1981), the Setodini are the sister lineage of Mystacidini, as indicated by the presence of a single phallic shield sclerotized strip extending in the phallocrypt from the apicoventral edge of the phallic shield to the basal plate of the inferior appendages (Schmid, 1987). A synapomorphic character of Setodini includes the apical displacement of the fork of Rs in each hindwing, beyond the apparent crossvein of the nygmal cell (base of $\underline{S}_4$ at base of cell $\underline{S}_3$) (Morse, 1981).

Setodes Rambur, 1842

LARVAE: Larvae of at least the following species of *Setodes* have been described:

Setodes arenatus Holzenthal--Nations (1994);
Setodes argentatus Matsumura--Kuwayama (1928, 1929, 1934);
Setodes argentipunctellus (McLachlan)--Siltala (1907), Ulmer (1909), Hickin (1943c, 1946, 1952), Wallace (1981), Wallace *et al.* (1990), Waringer and Graf (1997);
Setodes dixiensis Holzenthal--Nations (1994);
Setodes epicampes (EDWARDS)--Nations (1994);
Setodes guttatus (Banks)--Nations 1994);

Setodes hungaricus Ulmer--Botosaneanu (1959);
Setodes incertus (Walker)--Merrill and Wiggins (1971), Wiggins (1977, 1996), Nations (1994);
Setodes oligius (Ross)--Nations (1994);
Setodes oxapius (Ross)--Nations (1994);
Setodes punctatus (Fabricius)--Kolenati (1859, as *St. hiera*), Wallace (1981), Wallace *et al.* (1990), Waringer and Graf (1997);
Setodes stehri (Ross)--Merrill and Wiggins (1971, as *Setodes* sp.), Nations (1994);
Setodes tineiformis (Curtis)--Steinmann (1967).

Larvae of *Setodes* build cases that are open at both ends and without apparent differences between anterior and posterior ends. This behavior apparently is correlated with the ability of larvae to reverse their positions in their cases and with the highly armored posterior end of the larva, suitable for repelling intruders attacking from the rear (Merrill and Wiggins, 1971; Wiggins, 1996). Larvae of *Setodes* have been distinguished from those of *Trichosetodes* by the yellowish head and pronotum with dark points and spots or dark head with or without light spots (*vs.* clear amber-colored head without marks in *Trichosetodes*) (Ulmer, 1955; Merrill and Wiggins, 1971; Nations, 1994).

PUPAE: Pupae of at least the following species of *Setodes* have been described:

Setodes argentipunctellus (McLachlan)--Ulmer (1903b, 1909)
Setodes hungaricus Ulmer--Botosaneanu (1959)
Setodes incertus (Walker)--Merrill and Wiggins (1971)
Setodes tineiformis (Curtis)--Ulmer (1955), Steinmann (1967)

Pupae of *Setodes* have been distinguished from those of *Trichosetodes* by the normal length and bulbous shape of each antennal scape of the male (long in *Trichosetodes*) (Ulmer, 1955).

ADULTS: Adults may be distinguished from those of *Hemileptocerus* and *Sericodes* by the *Setodes* forewing discoidal cell more than three times as long as broad and by the fork of M in each forewing far beyond the anastomosis (with a long "stalk"). *Setodes* adults may be distinguished from those of *Trichosetodes* by the stout, tapering scape of each antenna without a tuft of long hairs.

HABITATS: Larvae have been found on stony shores of lakes and sandy bottoms of fast-flowing portions of large rivers (Wallace *et al.*, 1990) where they are burrowers (Merrill and Wiggins, 1971; Wiggins, 1996).

FEEDING HABITS: Larval gut contents have included vascular plant fragments and arthropod sclerites and larvae in captivity fed readily on enchytraeid worms (Merrill and Wiggins, 1971; Wiggins, 1996). At least one species has been reported as injurious to rice (Balduf, 1939; Moretti, 1942).

CLASSIFICATION: The classification followed here is that of Schmid (1987; also used by Yang and Morse, 1989). We use Schmid's classification even though his *Setodes* is paraphyletic and some of his branches lack synapomorphies. We accept this classification for now because a badly needed, phylogeneticly based world revision is outside the scope of this study.

Setodes Primitive Branch, Schmid, 1987

Setodes apinchanga Group, Schmid, 1987

Setodes geminispinus, NEW SPECIES
Fig. 161

DESCRIPTION: Specimens teneral and rubbed in alcohol. Body pale, yellowish white, forewings almost achromatic, covered with golden hairs scattered with small dark spots; hindwing fringes pale yellow.

MALE GENITALIA (Fig. 161): Segment IX longest ventrally, obliquely incised to short tergum forming transverse anterodorsal band fused with preanal appendages and tergum X. Preanal appendages and tergum X composing broad, roof-like, hairy plate with apical one-third divided into two broad, divergent lobes, each with apex truncate; this plate covering rounded remainder of tergum X. Lower branch of each inferior appendage as long as sternum IX, broad basal half with thumb-like middle branch arising from dorsal edge near base; in ventral view, lower branch slender, its distal half abruptly curved mesad; upper branch ("lobe tendinique" of Schmid, 1987) divided into two processes: slender, setose, sinuate, lateral process directed caudad and stout, erect, setose mesal process three times as long as broad and with rounded apex. Phallobase shallow plate, phallicata trough-like, arched 90° at middle, with basal half slender and tubular, dorsal edges expanded in broad lobes for two-thirds length, and apical third abruptly reduced in pair of narrow valves; two broad paramere spines, each forked at middle and bearing tiny spine on dorsal edge of each branch near apex.

LENGTH OF FOREWING: Male 5.3 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 10d (NAU). Paratype--1 male, same data as holotype (NAU).

ETYMOLOGY: Latin, "double spines," with reference to the deeply forked paramere spines.

DIAGNOSIS: Like those in other species of the *St. apinchanga* Group, the male genitalia of this new species have segment IX arched posterad in its upper part and short dorsally, segment X is robust, inferior appendages are not fused with each other and each has a slender upper branch and strong lower branch, the phallicata forms a large arch and the paramere spines are strong. Among the described species of the Group, the male genitalia of this new species most closely resemble those of *St. apinchanga* Schmid, 1987, in that the preanal appendages are fully integrated into segment X and the middle branch of each inferior appendage is positioned on the top of the lower branch. They differ from the genitalia of that species and those of others in the Group especially by the deeply divided paramere spines.

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

PHYLOGENY: The posterior position of the middle branch of each inferior appendage is uniquely shared in this Group by this species and *St. apinchanga*, suggesting that they are sister species.

Setodes spineus, NEW SPECIES
Fig. 158

DESCRIPTION: Vertex and thorax dark brown with white and brown hairs intermixed, frons yellowish white, antennae covered with white hairs, palpal hairs brownish. Wings hyaline

slightly tinged with brown, forewings not very acute at apex, with small golden maculae scattered on dark brown background; fringes of wings dark brown.

MALE GENITALIA (Fig.158): Dark brown, highly sclerotized. Segment IX longest ventrally, dorsum strongly produced at apical center. Preanal appendages small, triangular. Tergum X arcuate, thorny, deeply excised apicolaterally in lateral view. Inferior appendages short and tall, roughly parallelogram-shaped in lateral view, each with ventral edge excised at midlength and with a slender apicoventral process; each mesal surface bearing sub-triangular process near dorsocaudal margin, broad truncate process near base, and setose semicircular lobe just beneath it. Phallobase hemispherical; phallicata slender, shallow, trough-like, with basal two-thirds protruded in high mesal ridge, distal half arched downward, abruptly constricted at apical third then dilated at apex in lateral view. Each paramere spine completely divided into two long spines arranged with longer spine above shorter one, apex of each curved downward.

LENGTH OF FOREWING: Male 6.3 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 78c (NAU).

ETYMOLOGY: Latin, "thorn-like," with reference to the thorny shape of tergum X.

DIAGNOSIS: The male of this species most nearly resembles that of *Setodes pandara* Schmid, 1987, from India, but differs from it in that this new species has: (1) lateral arms of tergum X much longer than mesal portion (much shorter in *St. pandara*, these are stout in *St. spineus*, with dorsocaudal edges serrate); (2) a phallicata with a less-pronounced mesal ridge and with its apex more-dilated; and (3) each paramere spine completely divided.

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

PHYLOGENY: This species possibly is the sister species of *St. pandara* as indicated by the following synapomorphies: (1) similarly parallelogram-shaped inferior appendages; (2) each inferior appendage bearing three medial processes; and (3) phallicata with a high mesal ridge.

Setodes argentiferus Group, Schmid, 1987

Setodes bispinus Yang and Morse, 1989
Fig. 237

Setodes bispinus Yang and Morse, 1989; holotype = male; type repository = Nanjing Agricultural University Insect Museum; type locality = Jiang-xi Province, Gui-xi-xian at Loc. 58.

The female of this species was collected for the first time about 120 km south of the male type locality.

DESCRIPTION: Body stout, yellowish brown; wings hyaline, light tawny yellow, most hairs rubbed in alcohol, but with traces of golden brown and dark brown hairs.

FEMALE GENITALIA (Fig. 237): Segment IX broad, about twice as tall as long in lateral view; terga IX + X with longitudinal, mesal concavity; pleura IX deeply concave ventrally between gonopod plates and lamellae. Tergum X large semicircular plate with basal third constricted in dorsal view, forming pair of basolateral excisions. Lamellae long, sub-rectangular, each with dorsal apex rounded and turned upward, with two longitudinal ridges laterally; ventral portion curved inward, broadly rectangular in ventral view, with apicomesal end produced in rounded setose lobe above triangular, bare, more nearly mesal lobe. Gonopod plates broad, together about twice as wide as long, each with apical margin produced in large triangular lobe. Spermathecal sclerite anteriorly bearing highly sclerotized purse-shaped projection; internal part of gonopod VIII rod-like, extending far beyond gonopod plate.

LENGTH OF FOREWING: Male 6.9 mm, female 6.8 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, 1 female, Loc. 58a, (NAU); 1 male, 2 females, Loc. 18b (NAU); 1 male, Loc. 19 (NAU); 1 male, Loc. 22; 1 male, Loc. 24b (NAU).

DISTRIBUTION: Known from southeastern and southcentral China.

PHYLOGENY: This species belongs to the *Setodes argentiferus* Group of Schmid (1987) as indicated by Yang and Morse (1989) for synapomorphies of the male genitalia. We now add the following synapomorphies of the female genitalia for the Group based on the species *Setodes trilobatus* Yang and Morse, 1989; *St. platecladus*, new species; and this species: (1) Lamellae with dorsal and ventral edges sub-parallel, each with a sub-ventral longitudinal ridge, (2) gonopod plate slightly broadened basally with apical margin bilobed, (3) lateral regions of segment IX deeply concave between the gonopod plates and the bases of the lamellae. The male of this species shares with *St. argentiguttatus* Schmid an upper branch of each inferior appendage divided into multiple processes, a unique character for the Group, suggesting a sister-group relationship between them.

Setodes platecladus, NEW SPECIES
Figs. 157, 238

DESCRIPTION: Body stout, tawny yellow. Wings rubbed in alcohol with only traces of golden hairs and several fuscous spots along anterior margins and displayed in some of the apical cells; hindwings with pale tawny yellow fringes.

MALE GENITALIA (Fig. 157): Segment IX produced caudally both dorsally and ventrally. Tergum X fused with tergum IX forming elongated hood with rounded apex turned upward. Preanal appendages completely fused with tergum X, appearing as pair of oval setose mounds. Inferior appendages trifurcate, each with lower branch crescentiform, about as long as sternum IX; middle branch foliaceous with rounded apex in lateral view, its apicomesal corner produced in triangular projection; upper branch ("lobe tendinique" of Schmid 1987) setose, almost 2 times as long as mesal branch, its caudoventral surface sinuate. Phallobase semicircular in lateral view; phallicata stout, evenly curved about 160°; constricted throughout basal third; distal half composed of three pieces: ventromedian lobe and pair of dorsolateral lobes, latter with dorsal edges slightly produced mesad in thin plates; apex of ejaculatory tube lying in chamber above plates; paramere spines each with short branch near middle and with apex bent laterad.

FEMALE GENITALIA (Fig. 238): Tergum IXa and IXb forming conspicuous ridge with three small lobes over tergum X. Preanal appendages prominent, triangular. Tergum X large, hood-like, with rounded apex in dorsal view; truncate in lateral view. Pleura IX slightly produced ventrally, each with deep excision between it and gonopod plate. Lamellae broad, half as long as tall; each with posterior margin oblique, serrate, and strongly produced at ventral corner at end of conspicuous, lateral ridge; ventral portion beneath ridge produced ventromesad in broad lobe with mesal edge bearing several stout setae. Gonopod plate strongly convex, with apical margin enlarged and slightly but broadly excised at center. Spermathecal sclerite generally fusiform with its ventromesal ridge high, strongly sclerotized and three-fourths as long as sclerite in ventral view, each dorsolateral edge of spermathecal sclerite projecting dorsad in pair of vertical plates almost as tall as tergum X in lateral view.

LENGTH OF FOREWING: Male 6.0-6.6 mm, female 6.2-6.9 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 82b (NAU). Paratypes--43 males, 36 females, same data as holotype (NAU); 10 males, 10 females, same data as holotype (CUAC); 2 males, Loc. 79 (NAU).

ETYMOLOGY: Greek, "broad branch," with reference to the uniquely broadened middle branch of each inferior appendage.

DIAGNOSIS: The female of this species closely resembles that of *Setodes trilobatus*, but differs from it by possession of: (1) a truncate apex of tergum X in side view, (2) lamellae with distal margins more oblique, and (3) a fusiform spermathecal sclerite. Male genitalia more closely resemble those of *Setodes bispinus* in the divided paramere spines and elongated tergum X; however, the apex of tergum X is upturned in this species, the mesal branch of each inferior appendage is foliaceous, and the distal half of the phallicata consists by three long, flattened lobes, bearing above them a conspicuously sclerotized ejaculatory tube.

DISTRIBUTION: This species is known from only the type locality in southcentral China.

PHYLOGENY: Four species of this Group have the upper lobe ("lobe tendinique" of Schmid, 1987) of each male inferior appendage divided into two processes (*Setodes argentiferus* McLachlan, 1871; *St. venustus* Ulmer, 1951 [Probably there are at least two different species in the type series of *St. venustus*]; *St. argentiguttatus* Schmid, 1987; and *St. bispinus*, this upper lobe further subdivided in the latter two species), a homologous condition suggesting their monophyly . Of the three remaining species, *St. trilobatus* and this new species share a rather elongate mesal branch of each inferior appendage, suggesting a sister-group relationship between them. They share with *St. argentivarius* Kimmins, 1963b, an undivided male tergum X.

Setodes tejasvin Group, Schmid, 1987

Setodes alampata Schmid, 1987
NEW CHINESE RECORD
Figs. 159, 239

DESCRIPTION: Specimen much diluted in alcohol. Body pale yellowish, wings nearly white, venation concolorous, fringes of hindwing pale brown in male.

MALE GENITALIA (Fig. 159): Male genitalia of our specimen almost identical with those figured by Schmid (1987). However, in our specimen, tergum X noticeably shorter and ventromesal setose projection of each inferior appendage not so clearly visible in lateral view.

FEMALE GENITALIA (Fig. 239): Female genitalia described here for first time. Pleural regions of segment IX each produced in broadly rounded triangular lobe near middle, its apex excised sub-ventrally in transverse pocket. Tergum X fused with tergum IX in large plate, semicircular in dorsal view, slightly excised apicomesally. Lamellae each divided into two lobes: dorsal lobe broad with setal fringe; ventral lobe nearly covered with dense, tiny setae, conspicuously constricted one-third distance from base in ventral view, then expanding horizontally with dorsal surface concave, its apex bearing three short, stout setae. Spermathecal sclerite with sub-rhomboid shape, anteriorly forming large rectangular plate extending to anterior end of segment VIII.

LENGTH OF FOREWING: Male 4.4 mm, female 4.4 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: 1 male, 1 female, Loc. 87b (NAU).

DIAGNOSIS: The genitalia of our male specimen from Yun-nan Province, southcentral China, are very similar to those illustrated for *Setodes alampata* Schmid, 1987, from Khasi Hills (India). Despite some differences, we are reluctant to describe our specimens as a new species. Although the ventral branch of each male inferior appendage is very short, the male genitalia of this species otherwise resemble those of species of the *Setodes tejasvin* Group (Schmid, 1987). This species is distinguished from other species within the *St. tejasvin* Group by the following diagnostic characters: MALE GENITALIA: (1) segment IX nearly same length throughout, although somewhat produced apicoventrally; (2) ventral branch of each inferior appendage very reduced,

forming transverse basomesal ridge that is sub-rectangular in ventral view; and (3) phallus without paramere spines. FEMALE GENITALIA: Lamellae each obviously divided into two lobes, lower lobe abruptly constricted laterally one-third distance from base.

DISTRIBUTION: Previously known from India, now found in southcentral China.

PHYLOGENY: This species was placed by Schmid (1987) in his "Primitive Branch, Isolated Species." We consider it here to be most closely related to *St. kadrava* Schmid, 1987, and *St. tejasvin* Schmid, 1987, in the *St. tejasvin* Group based on the following synapomorphies in the male genitalia: (1) preanal appendages fused with tergum X in long strips, forming a pair of high, longitudinal ridges; (2) tergum X a deep hood, with its apex truncate in lateral view; and (3) inferior appendages each composed of two branches, the dorsal one with a sub-apicoventral ridge mesally. The large posterior expansion on each side of segment IX at the level of the inferior appendages in Schmid's two species suggest that they are each other's closest relatives, leaving *St. alampata* as their sister lineage by the three synapomorphies listed above.

Setodes Primitive Branch Species Incertae Sedis
("Primitive Branch, Isolated Species" Schmid, 1987)

Setodes cheni, NEW SPECIES
Fig. 160

Setodes perpendicularis Chen, 1990: 128-131, fig. A-84; not "published" in the meaning of the International Code of Zoological Nomenclature (1985), *nomen nudum*.

DESCRIPTION: Specimens in alcohol are pale yellow; thorax pale, tawny yellow; forewings hyaline, slightly smokey, with brown hairs; hindwing fringes light brown.

MALE GENITALIA (Fig. 160): Segment IX rather short and fused with segment X dorsally. Setose preanal appendages long, elliptical, fused with tergum X. Tergum X rectangular in lateral view, with apex deeply and broadly incised in dorsal view. Inferior appendages each with two branches: lower branch slender, crescentiform, twice as long as upper branch, bearing two papillae on mesal surface; upper branch digitate, erect. Phallobase small, phallic shield broad, bowl-like; phallicata slender and tubular in basal half, bent about 90° at midlength, distal half trough-like, apex slightly expanded laterad in small ridges; phallotremal sclerite huge, about half as long as phallicata; paramere spines slender, symmetrical, almost reaching tip of phallicata.

Some variations present in mainland Chinese specimens relative to Chen's (1990): (1) pleural region of segment IX slightly more strongly produced in obtuse angles at one-third distance from ventral midline in side view rather than at mid distance in Chen's specimen, (2) tergum X with lateral bare regions produced far beyond preanal appendages (this region terminating at blunt point with preanal appendages in Chen's specimen); and (3) upper branches of inferior appendages variable in width among our specimens and Chen's.

LENGTH OF FOREWING: Male 5.04 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 10d (NAU). Paratypes--5 males, same data as holotype (NAU); 3 males, same data as holotype (CUAC).

ETYMOLOGY: We take pleasure in naming this species in honor of our colleague Dr. Y. Eric Chen, who discovered this species in Taiwan.

DIAGNOSIS: The male of this species most closely resembles that of *St. abhirakta* Schmid, 1987, from Thailand, but differs from it in that this new species has: (1) its phallicata with distal half curved downward in right angle, (2) paramere spines very slender, (3) phallotremal

sclerite huge, (4) dorsal branch of each inferior appendage erect, and (5) papillary processes of inferior appendages much smaller.

DISTRIBUTION: Known from the type locality in southeastern China and from Taiwan (Chen, 1990).

PHYLOGENY: Chen (1990) considered this species as most closely resembling *St. kadrava* of the *St. tejasvin* Group. However, we place *St. cheni* in Primitive Branch Incertae Sedis as probably the sister species of *Setodes abhirakta* Schmid, 1987, based on the following synapomorphy: inferior appendages each with two papillae on the mesal surface of its lower branch, each papilla bearing a long seta apically. These two sister species share with *Setodes puchkaraja* Schmid, 1987, the following synapomorphies: (1) inferior appendages crescentiform, without mesal processes and (2) phallicata with truncate apex. We infer, therefore, that these three species constitute a monophyletic group.

Setodes [Derived Branch] Groups *Incertae Sedis*, Schmid, 1987

Species Incertae Sedis
("Isolated species," Schmid, 1987)

Setodes argentatus Matsumura, 1906
Fig. 240

Setodes argentatus Matsumura, 1906: 24 (in Hydropsychidae); holotype gender and holotype repository unknown, type locality = Japan; Li, 1951; Yang and Morse, 1989.

Setodes appendiculatus Martynov, 1933, type repository = probably Zoological Institute, St. Petersburg; synonym according to Kumanski, 1991.

Oecetis turbata Navás, 1933: 20-21, fig. 35, holotype = male (Schmid, 1950); holotype repository = Navás Collection (Schmid, 1950), Barcelona, type locality = "Chu-san"; synonym according to Schmid, 1987; Yang and Morse, 1989. [See also *Oecetis* unidentified species, page 143 above.]

Setodes uenoi Tsuda, 1942a: 234-235, 300, fig. 19, 20a-c, 21a-c, holotype gender = presumably male, holotype repository = presumably Nara Women's University, Japan, type locality = Kei-zan-chin, North Korea; synonym according to Schmid, 1987; Yang and Morse, 1989.

The male of this species previously was known from Japan, Democratic-Popular Republic of Korea (DPRK), and northeastern China. In his investigation of the Leptoceridae of DPRK, Kumanski (1991) discovered the female of the species and concluded that it is the same as *St. appendiculatus* Martynov, which was established only on a female. According to our Chinese material, we come to the same conclusion. We provided a description and figures of the male in our previous revision (1989).

DESCRIPTION: Vertex and thorax brown, mesoscutum dark brown, frons and abdomen pale yellow; forewings with golden brown background hairs, with longitudinal silver stripes along basal two-thirds of veins, apical one-third displaying 10-12 short elliptical silver stripes, all stripes bordered with dark hairs.

FEMALE GENITALIA (Fig. 240): Segment IX with posterior pleural margins each slightly produced in rounded lobe; gonopod plate convex and forming median longitudinal ridge, apical margin strongly produced at center in triangular lobe, with deep excisions on each side of lobe. Tergum X pale, very long and very narrow horizontal plate, slightly enlarged and round at base, a little longer than lamellae, apex rounded in dorsal view. Lamellae broad, leaf-like, with

rounded apices widely divergent from each other; each lamella with conspicuous longitudinal, lateral ridge, with its basoventral portion produced mesad in small, setose lobe, with apicoventral end bearing few short setae and two stout, long setae. Spermathecal sclerite forming broad, oval, highly sclerotized plate with rounded depression on its center.

LENGTH OF FOREWING: Male 6.8 mm, female 6.6 mm.

IMMATURE STAGES: Unknown.

MATERIAL EXAMINED: Loc. 76c. 1 male, 3 females (NAU); 1 male, 1 female, same data (CUAC); 1 male, 1 female, Loc. 20a (NAU); 1 female, Loc. 60 (NAU).

DISTRIBUTION: Previously known from Japan, North Korea and northeastern China, now found in southeastern and southcentral China.

Setodes Curled Species, Schmid, 1987

Setodes fluvialis Group, Schmid, 1987

Setodes gyrosus, NEW SPECIES
Figs. 162, 241

DESCRIPTION: Specimens in alcohol much denuded. Body slender, uniformly pale yellow except abdomen creamy white; forewings hyaline yellow-brown tinged with traces of golden brown hairs.

MALE GENITALIA (Fig. 162): Pleura IX broad, square in lateral view; sternum IX without manille (posterior concavity of *Setodes* sternum IX, Schmid 1987, see Fig. 163c); tergum IX very short and fused with tergum X, forming transversely sinuous band, set above phallobase, with middle portion highly elevated and protruded in truncate process and with two lateral arms at lower level supporting recurved parameres; lightly sclerotized, semicircular plate (possibly part of tergum IX) anterior of sinuous band, submerged in membranes of segment VIII, with seta-bearing papilla arising from its center. Preanal appendages clavate, about five times as long as broad. Inferior appendages crescent-shaped, each basically two branched: basodorsal branch divided at apex forming two apical lobes crossing each other, lateral lobe directed dorsad and mesal lobe directed backward and subdivided apically; ventral branch concave dorsally, gradually tapering to narrow apex in lateral view. Phallobase positioned immediately beneath tergum X within upper half of segment IX; phallicata with anterior arm directed dorsad and posterior arm five times as long as anterior arm, forming slender trough, curved 170°, and extending downward below inferior appendages. Paramere spines evenly slender, overarching curved phallicata with basal one-fifth recurved cephalad.

FEMALE GENITALIA (Fig. 241): Pleura IX each with acute posteroventral corner, excised longitudinally sub-ventrally then recurved posteriorly in long triangular lobe with its base about twice as broad as blunt apex in ventral view; hereafter, we refer to this paired structure as the posterior ventral lobe of each pleuron IX (p.v.l.IX). Preanal appendages depressed, setose, three times as long as wide. Tergum X broadly triangular with blunt apex in dorsal view; narrow and acute in lateral view, extending just beyond lamellae. Lamellae broad basally, apicoventral ends produced ventrad and curved mesad in small, triangular lobes bearing several small stout setae. Gonopod plate convex mesally, gradually tapering to apex with pair of small triangular apical projections. Spermathecal sclerite very narrow in anterior two-thirds, bearing lightly sclerotized plate extending to middle of segment VIII; slender apex of internal part of gonopod VIII projecting caudad beyond gonopod plate.

LENGTH OF FOREWING: Male 4.2-4.6 mm, female 3.8-4.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 94b (NAU). Paratypes--5 males, 10 females, same data as holotype (NAU); 2 males, 2 females, same data as holotype (CUAC); 1 male, Loc. 91 (NAU).

ETYMOLOGY: Greek, "circle," with reference to the overarching shape of the paramere spines.

DIAGNOSIS: As in the other two species of the *Setodes fluvialis* Group, the male of this new species has no manille on sternum IX, tergum X is shaped as a "stop" or support for the paramere spines, and it has a large and 2-lobed upper branch and a long and slender lower branch of each inferior appendage. However, it differs from these by the more nearly square lateral appearance of segment IX, the transversely sinuous shape of tergum X in dorsal view, the shorter upper branch and stouter lower branch of each inferior appendage, the much more slender anterior arm and much more slender and elongate posterior arm of the phallicata, and the much more slender and elongate and recurved paramere spines. This is the first time a female of the Group has been described.

DISTRIBUTION: Known from only the type series localities in southcentral China.

PHYLOGENY: This species is placed in the *Setodes fluvialis* Group with reservation because of the several significant differences noted in the diagnosis above. Nevertheless, the presence of a unique anterior arm of the phallicata and the lack of characters that would place it in other species groups presently recognized convince us that it belongs here. It probably is the sister lineage to the other two species in the Group, *St. fluvialis* and *St. gangaja* Schmid, 1987, whose monophyly is apparent by the stouter anterior arm of the phallicata and the stouter paramere spines.

Setodes aparimeya Group, Schmid, 1987

Setodes manimekhala Subgroup, Schmid, 1987

Setodes orthocladus, NEW SPECIES
Fig. 163

DESCRIPTION: Body pale yellow, forewings hyaline with light yellow brown tinge, most hairs rubbed in alcohol, but membranes with hyaline streaks ringed with few dark brown hairs and scattered silvery hairs suggesting that wings originally had silvery streaks.

MALE GENITALIA (Fig. 163): Posterior margin of segment IX obliquely excised on its dorsal half to narrow tergum bearing 4 long setae on single short papilla; sternum enlarged in broad lobe near anterior margin in lateral view, posteriorly with shallow and broadly concave negative manille (ma.ne, without raised borders, Schmid 1987). Preanal appendages slender, clavate. Segment X short, transversely arched band embracing base of phallus. Inferior appendages each with dorsal branch slender, upright, its apex curved backward and divided into two processes, with mesal one broad, sub-truncate at apex in dorsal view, lateral process slender and acute; ventral branch shorter than dorsal one, directed caudad, rod-like, with blunt apex in ventral view; middle branch present as small triangular process at base of dorsal branch. Phallobase large sclerotized plate curved in U shape; phallicata generally parallel-sided, strongly curved downward about 150° at one-third length, left dorsal edge produced in broad flange as guide for paramere spine, pair of oval sclerotized lobes (dorsal lobes of phallotremal sclerite) at two-thirds length, where endophallic membranes evaginated; right paramere spine vestigial, stub-like, left spine slender, arching high above genitalia then downward, ending before apex of phallicata; additional short, stout spine located apically.

LENGTH OF FOREWING: Male 4.3-4.7 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2a (NAU). Paratypes--2 males, same data as holotype (NAU); 1 male, Loc. 10d (CUAC).

ETYMOLOGY: Greek, "straight branch," with reference to the straight, ventral branch of each inferior appendage, especially when viewed ventrally.

DIAGNOSIS: Like those of *Setodes brevicaudatus* and *St. longicaudatus*, the male of this species has an atrophied right paramere spine. The middle process of each inferior appendage is small like that of *St. brevicaudatus*, but unlike this new species and all others in the Subgroup, sternum IX of *St. brevicaudatus* has a positive manille (ma.po, Schmid 1987) and without a broad lobe near the anterior margin. This new species is distinctive in that no other species of the Subgroup has such a slender upper branch of each inferior appendage or such a straight-sided lower branch in ventral view, and no other species in the Subgroup has a stout spine at the apex of the phallicata. Also, the apex of the long, left paramere spine is not conspicuously foliaceous.

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

PHYLOGENY: This species has the male synapomorphies of the *Setodes manimekhala* Subgroup cited by Schmid (1987; see also Yang and Morse 1989). It is tempting to suggest that the atrophied right paramere spine is a synapomorphy providing evidence for the monophyly of *St. brevicaudatus*, *St. longicaudatus*, and this new species. Alternatively, the fact that the left paramere spine is not foliaceous in this species suggests that it may be the sister species of a lineage with a foliaceous spine that includes all other species in the Subgroup. A third possibility is that the broad lobe of sternum IX is a synapomorphy for a monophyletic group including all species in the Subgroup except *St. brevicaudatus*. Perhaps a resolution of these alternatives will become evident with characters of other life history forms when these become known.

Setodes aparimeya Group, Schmid, 1987 (continued)

Setodes tridanta Subgroup, Schmid, 1987

Setodes scleroideus, NEW SPECIES
Figs. 78, 164, 242

DESCRIPTION: Head and body light yellow, forewings rather rubbed in alcohol, with traces of six or seven silver stripes bordered by dark hairs.

MALE GENITALIA (Fig. 164): Segment IX longest laterally with pleural lobes protruded in broad rounded lobes; dorsum short, forming transverse narrow band with long, median, digitate process bearing 3-4 setae apically, pair of small papillae on either side of process; sternum with deep, semicircular positive manille. Preanal appendages slender, clavate extending to posterior edges of pleura IX. Tergum X rectangular, with apical margin recurved dorsad and cephalad as a "stop" or guide for the phallicata and paramere spines, laterally extending downward to embrace phallobase partly. Inferior appendages crescentiform, each with serrate posterior margins and stout triangular process positioned one-third distance from dorsal end. Phallobase broad plate; phallicata shallow, trough-like, downcurved 160° at one-fourth distance from base, ventrally with transverse striations at middle, phallotremal sclerite highly sclerotized, huge, U-shaped, exposed dorsally at middle. Pair of slender paramere spines symmetrical, overarching genitalia.

FEMALE GENITALIA (Fig. 242): Segment IX slightly arched, concave posteriorly in lateral view, with parallel-side anterior and posterior margins; posterior ventral lobe of each pleuron IX (p.v.l.IX). projecting posteriorly in pair of horizontal lobes, widely divergent in ventral view. Preanal appendages digitate, reaching three-fourths of lamellae. Tergum X long plate, extending far beyond rest of genitalia with apex deeply and narrowly excised in dorsal view, with pair of sub-

mesal ridges extending from base to near tip of each subdivided apex. Lamellae somewhat trapezoid, broadest at distal three-fourths, apicoventral corner incurved in small semicircular process bearing several stout setae. Gonopod plate broad basally, tapering to rounded apex, with large, triangular, membranous and slightly concave region in its center. Spermathecal sclerite very large, triangular, its anterior end rounded, with long rectangular processes on either side, nearly 4 times as long as broad, and much broader than posterior ventral lobe of pleuron IX in ventral view; internal part of gonopod VIII with sharp apex projecting posterad beyond gonopod plate.

LENGTH OF FOREWING: Male 4.5-5.1 mm, female 4-5 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 74e (NAU). Paratypes--3 males, 3 females, same data as holotype (NAU)); 66 males, 37 females, Loc. 11b (NAU); 10 males, 10 females, Loc. 11b (CUAC); 5 males, Loc. 58c (NAU).

ETYMOLOGY: Latin, "hard," with reference to the male genitalia with their huge sclerotized phallotremal sclerite.

DIAGNOSIS: Within this Subgroup, the male genitalia of this new species and the next species differ from those of all other species in having a conspicuous phallotremal sclerite and a positive manille. The inferior appendage of this species is much more slender than that of the next species. The female genitalia differ from those of the following two species (the only females of the Subgroup that have been described) by the combination of a deeply and narrowly notched tergum X in dorsal view and the shorter and more widely spaced ventral edges of pleura IX in ventral view.

DISTRIBUTION: Known from only the type series from southern China.

PHYLOGENY: Within this Subgroup, the male of this species apparently shares uniquely with those of *St. tridanta* Schmid, 1987; *St. satichaya* Schmid, 1987; and the following species an angled lower branch of each inferior appendage. This new species and the next share uniquely a highly sclerotized phallotremal sclerite, implying a sister-group relationship. Resolution of their trichotomy relative to *St. tridanta* and *St. satichaya* may be possible with the discovery of other life history forms.

Setodes sypharus, NEW SPECIES
Figs. 165, 243

DISTRIBUTION: Head and thorax pale yellow; antennae pale, with brown annulations; forewings rubbed in alcohol, yellowish smoky, covered with golden brown hairs and traces of few silver stripes bordered by dark hairs.

MALE GENITALIA (Fig. 165): Segment IX short dorsally with mesal process semisclerotized and nearly half as long as preanal appendages, pair of small papillae on either side; posterior margins of pleura long, semiquadrate; sternum with positive manille, bordered on each side by thin narrow triangular ridge. Preanal appendages clavate, reaching nearly as far as posterior margins of pleura IX. Tergum X large rectangular plate in dorsal view, with apical margin curved upward and lateral portions expanded downward. Inferior appendages roughly quadrate, each with posteroventral corner produced in stout ventral branch, apicodorsal end produced in long, blunt middle branch with setose upper branch half as long and closely anterior to it. Phallobase cylindrical; phallicata slender, trough-like, with distal two-thirds recurved 140° ventrad and anterad, dorsal margins near base each strongly produced in obtuse triangle, transverse grooves ventrally near middle. Paramere spines symmetrical, stout and globular basally with remainder slender, broadly overarching other genitalia. Phallotremal sclerite highly sclerotized with its apical portions not clearly delineate from endophallic membranous.

FEMALE GENITALIA (Fig. 243): Segment IX arched and concave posteriorly, parallel-sided in lateral view, posterior ventral lobe of each pleuron IX long and broad, extending to the mid-distance of lamellae. Tergum X long, broad plate, slightly constricted at base, distal half tapering to apex deeply and narrowly excised to two-fifth distance from tip; pair of longitudinal ridges extending from base to divided tips in dorsal view; in lateral view slightly upturned with apex extending to just beyond lamellae. Lamellae each elongated rhomboid with setose projection at two-thirds length of ventral edge and bearing dozen small, stout setae. Gonopod plate abruptly constricted near apex; mesal triangular area concave and lightly sclerotized. Spermathecal sclerite with triangular outline, its anterior end blunt, with paired convex processes narrower than ventral lobes of pleura IX in ventral view.

LENGTH OF FOREWING: Male 5.1-6.2 mm, female 5.1-6.0 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81b (NAU). Paratypes--4 males, 3 females, same data as holotype (NAU); 5 males, 6 females, Loc. 81a (CUAC).

ETYMOLOGY: Greek, "wrinkled skin," with reference to the male phallicata with transverse grooves ventrally near the middle.

DIAGNOSIS: Within this Subgroup, the male of this new species resembles *St. scleroideus* in the highly sclerotized phallotremal sclerite and positive manille, but differs from it in: (1) the quadrate inferior appendages; (2) the obtuse basodorsal angles of the phallicata; and (3) the apical edges of the phallotremal sclerite not distinctly separated from the endophallic membranous.

DISTRIBUTION: Known from only the type localities in southcentral China.

PHYLOGENY: By the highly sclerotized phallotremal sclerite, this species apparently has a sister-group relationship with *St. scleroideus*, as discussed with that species above.

Setodes aparimeya Group, Schmid, 1987

Setodes tchaturdanta Subgroup, Schmid, 1987

Setodes varians, NEW SPECIES
Figs. 166, 244

DESCRIPTION: Head pale yellow, flagella of antennae pale with brownish annulations; thorax pale testaceous, forewings pale fuscous, covered with golden yellow hairs, each forewing in its apical portion with 5-6 short elliptical silver streaks bordered by black hairs, fringes golden yellow; hindwing fringes brown.

MALE GENITALIA (Fig. 166): Segment IX short dorsally, median process of tergum IX clavate, two-third as long as preanal appendages, with two distinctive triangular processes on either side; posterior margins of pleura broadly rounded; sternum with negative manille. Preanal appendages digitate. Tergum X transverse rectangular plate with apical margin turned upward, lateral regions embracing part of phallobase. Inferior appendages vertical with basodorsal and basoventral ends both projecting caudad, each appendage with posterior margin produced in four branches: two lower branches nearly fused, together 3 times as thick as middle branch and half as long as dorsal branch; broad middle branch close to slender dorsal branch; dorsal branch with sinuous dorsal margin, acute apically. Phallobase short, cylindrical; phallicata shallow trough, broadly curved downward about 140° with transverse ventral "wrinkles" at middle; endophallic membranes compressed, falciform, clearly separated from phallicata at distal half; paramere spines symmetrical, stout basally, slender and very gradually tapering beyond base, broadly overarching other genitalia; phallotremal sclerite small, crescentiform, not heavily sclerotized.

FEMALE GENITALIA (Fig. 244): Segment IX longest dorsally, posterior margins of pleura broadly concave; posteroventral lobes of pleura IX extending beyond middle of lamellae. Preanal appendages long, almost reaching apices of lamellae. Tergum X sinuate in lateral view, extending far beyond other genitalia; in dorsal view, distal one-third abruptly constricted, submedian longitudinal ridges only distinctive at distal half. Lamellae narrow basally, each with apicoventral corner produced in small, triangular lobe with several stout setae. Gonopod plate tapered from middle to blunt, rounded apex; median triangular area large, lightly sclerotized. Internal part of gonopod VIII produced in slender process projecting posterad and dorsad 45°, with apex surpassing gonopod plate in ventral view. Spermathecal sclerite broad anteriorly, with pair of convex processes on either side of ventral process about twice as long as broad, each slightly broader than ventral lobe of pleura IX in ventral view.

LENGTH OF FOREWING: Male 4.2-4.5 mm, female 4.3-4.7 mm.

TYPE MATERIAL: Holotype MALE, Loc. 67c (NAU). Paratypes--1 male, 2 females, same data as holotype (NAU); 11 males, Loc. 67b (NAU); 3 males, 4 females, Loc. 58a (NAU); 12 males, 3 females, Loc. 7b (CUAC); 9 males, 1 females, Loc. 2a (NAU).

ETYMOLOGY: Latin, "changing," with reference to the abundant variation and diversity of shape of the inferior appendages within this Subgroup.

DIAGNOSIS: Within this Subgroup, the male of this species resembles *St. tarpaka* Gordon and Schmid, 1987 (in Schmid, 1987), in the shape of the inferior appendages (each with an erect and sinuous upper branch, broad middle branch, and lower branches close together), but this new species has (1) the lower branches of each inferior appendage even closer together (almost fused) and (2) no flanges on the median carina of the phallicata.

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

PHYLOGENY: The uniquely sinuous dorsal edge of the upper branch of each male inferior appendage suggests that *St. tarpaka* and this new species are sister lineages.

Setodes chandrakita Group, Schmid, 1987

Setodes lamellatus, NEW SPECIES
Fig. 167

DESCRIPTION: Body slender, pale yellow; antennae pale with narrow brownish annulations; forewings almost achromatic, covered with golden hairs with several narrow silver stripes bordered by black hairs; hindwing fringes pale grey.

MALE GENITALIA (Fig. 167): Segment IX obliquely excised in its dorsal half from rounded pleural angle; dorsomesal process of tergum broad, about 2.5 times as long as wide, highly depressed; sternum without manille. Preanal appendages clavate, extending beyond segment X. Tergum X large, transverse plate; median portion highly elevated, apex sinuous and protruded at center; laterally with pair of lobes almost completely fused with median portion along pair of furrows, with slight excisions at ends of furrows; each lateral lobe with concave, semitransparent patch below its preanal appendage. Inferior appendages simple, thin, foliaceous, concave dorsally, each broad basally, gradually tapering from middle in ventral view to slender acute apex, with mesal margin produced in small triangular process near apex; basodorsal part of appendage irregularly thickened and setose, without upper branches. Phallobase shallow plate; phallicata highly sclerotized, almost parallel-sided and evenly curved downward about 90°, apical fourth forming pair of stout sub-dorsal spines above ventromesal lobe. Paramere spines absent.

LENGTH OF FOREWING: Male 5.1 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81a (NAU).

ETYMOLOGY: Latin, "like a thin plate," with reference to the broad, leaf-like inferior appendages of the male genitalia.

DIAGNOSIS: This species belongs to the *Setodes chandrakita* Group as indicated by the distinctively broad and depressed median process of tergum IX and the deeply furrowed tergum X variously excised apically. Among these, only this species and the next one have the apex of the phallicata divided into two acute sub-dorsal spines and a ventromesal lobe. It differs from the next species by having: (1) long and foliaceous inferior appendages without upper branches and (2) the phallicata evenly curved, with its ventromesal lobe stout, digitate, only one-third as long as sub-dorsal spines.

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

PHYLOGENY: The diagnostic character of the phallicata mentioned for this species and the next one is unique in this Group, implying that the two are sister species. They share with *St. chandrakita* Schmid, 1987; *St. uddharcha* Schmid, 1987; and *St. parilaghu* Schmid, 1987, the absence of paramere spines, indicating that these five species are a monophyletic group.

Setodes sinuatus, NEW SPECIES
Figs. 168, 245

DESCRIPTION: Body slender, pale yellow; antennae pale with narrow brownish annulations; forewings pale yellow, covered with golden hairs with several long thin silver stripes bordered by black hairs; hindwing fringes pale in both male and female.

MALE GENITALIA (Fig. 168): Segment IX obliquely excised dorsally in the same manner as for *St. lamellatus* except posterior angle abrupt, not rounded; median projection of tergum broad, about 2.5 times as broad as wide and highly depressed. Preanal appendages stout, clavate, not quite reaching tip of tergum X. Tergum X large, transverse plate, obviously divided into three parts by furrows, each furrow ending at apical margin at deep excision; transparent patch located at base of each lateral lobe. Inferior appendages typically crescentiform with posterior margins broadly concave, each with ventral and dorsal branches both tapering to acute tip; in ventral view, broad at base, each with stout triangular projection near middle of mesal edge. Phallobase small, semicircular; phallicata trough-like, mostly sclerotized, slender and with slight elevation at basal third, enlarged at middle third, with rest divided sub-dorsally into two sinuate, spine-like lobes and one ventromesal trough, rectangular, achromatic in lateral view. Paramere spines absent.

FEMALE GENITALIA (Fig. 245): Segment IX sub-quadrate, about two-thirds as long as tall in lateral view; ventral portion of pleura IX recurved laterally then projecting both anteriorly and posteriorly, forming pair of broad posterior ventral lobes and basal transverse rhomboid plate. Preanal appendages broad, compressed, 2.5 times as long as wide, rounded at apices. Tergum X triangular, with prominent longitudinal median ridge from base to middle, broad at base in dorsal view, in lateral view its distal half abruptly narrowing to acute apex extending far beyond lamellae. Lamellae each strongly constricted basally above slender strip from pleuron IX, broadly rounded apically, with small ventral lobe bearing dozen short setae. Gonopod plate semi-oval. Spermathecal sclerite cone-shaped, anteriorly bearing pair of short curved bands.

LENGTH OF FOREWING: Male 4.9-5.1 mm; female 4.5-4.9 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81b (NAU). Paratypes--11 males, 7 females, same data as holotype (NAU); 16 males, 27 females, Loc. 81a (NAU); 10 males, 10 females, Loc. 81a (CUAC).

ETYMOLOGY: Latin, "bending," with reference to the sinuate, sub-dorsal, spine-like lobes of the phallicata.

DIAGNOSIS: As we discussed above, this species most closely resembles *St. lamellatus*. However, male tergum X is more obviously trilobed apically in *St. sinuatus*, the inferior appendages are typically crescentiform, and the phallicata is expanded at the middle, with the ventromesal lobe produced in a long trough, about two-thirds as long as the sub-dorsal spine-like lobes.

DISTRIBUTION: Known from only the type localities in southcentral China.

PHYLOGENY: The sister lineages of this species and rationale for their inference are provided with the discussion of *St. lamellatus* above.

Setodes Strange Species Branch, Schmid, 1987

Setodes iris Hagen, 1858

Setodes iris Hagen, 1858, page 486.

We have not seen specimens of this species. A complete review of this species was provided by Yang and Morse (1989), indicating the likelihood that it is not a species of the Chinese fauna, despite the record of Li (1951). Furthermore, we are impressed with the great difference between the females of this Branch newly described below and the paratype female of *St. iris* described by Schmid (1958; see Yang and Morse, 1989). Schmid's (1958) female more nearly resembles those of the *St. aparimeya* Group, suggesting that the female paratype and the male described by Ulmer (1915) and Schmid (1958, 1987) are not the same species.

Setodes peniculus, NEW SPECIES
Figs. 169, 246

DESCRIPTION: Body stout, pale yellow; antennae pale with very light, narrow brownish annulations; forewings yellowish smoky, evenly covered with dark brown hairs. Female with body color lighter than that of male, wings pale yellow. Hindwing fringes dark brown in male and pale yellow in female.

MALE GENITALIA (Fig. 169): Tergum IX short; posterior pleural margins sinuate; sternum produced posteriorly at center in long process longer than preanal appendages and half as long as inferior appendages, broad at base, with concave sides, tapering to narrow bifid apex. Tergum IX fused with tergum X and together forming elongate plate, sub-rectangular and twice as long as base in both dorsal and lateral views, with apex narrowly excised at center one-sixth its length, large setose mass on each basal corner of tergum X. Preanal appendages fused with tergum X as pair of setose mounds not clearly delineated. Inferior appendages each somewhat broad at basal half, ventral edge abruptly incised at serrate corner in middle, distal half reduced to long slender arm slightly bifid and downturned apically; basodorsal surface of appendage with long setae bent caudad near their middle; long, stout, acute mesal projection sub-basally; stout ventromesal triangular projection near middle. Phallobase somewhat funnel-shaped; phallic shield large, hemispherical; phallicata simple, trough-like, evenly arched about 80°, with distal half slightly dilated in lateral view. Paramere spines slender, symmetrical, each with its base curled in spiral and fused exteriorly with phallobase.

FEMALE GENITALIA (Fig. 246): Segment VIII small, sclerotized and retracted into anterior part of segment IX. Segment IX huge, highly sclerotized, 1.5 times as long as its middle height in lateral view, twice as long as its middle width in dorsal view, broad at base with distal half tapered to two-thirds basal height in lateral view; in dorsal view, with pair of depressions near apical margin. Tergum X broad lobe, with basal half parallel-sided, distal half tapering to blunt

apex narrowly excised at center one-third its length; basolaterally with pair of concavities; subapical surface with slight reticulation. Preanal appendages not evident. Lamellae stout at base, each strongly constricted in narrow handle at middle one-third, with apical portion enlarged in triangular lobe and with apicoventral end produced in semicircular process bearing two dozen long stout setae; dorsal surface of lamella concave. Gonopod plate highly sclerotized and produced in large chamber, rhomboid anteriorly, lateral edges deeply incised at three-fourths length, distal fourth triangular, internal part of sternum VIII visible apically as rounded lobe with small triangular apex. Spermathecal sclerite with main body bell-shaped in ventral view, with anteroventral projection long, extending to middle of segment IX.

LENGTH OF FOREWING: Male 6.2-6.6 mm; female 6.6 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 38b (NAU). Paratypes--2 males, same data as holotype (NAU); 2 males, same data as holotype (CUAC); 1 female, Loc. 38c (NAU).

ETYMOLOGY: Latin, "tuft," with reference to the tuft of stout setae on the basomesal corner of each inferior appendage beneath male tergum X.

DIAGNOSIS: The male of this species closely resembles that of the next two new species by (1) the elongate and bifid sternum IX and (2) the large rounded setose patch at each basolateral angle of tergum X and that of the next species by having (3) the basodorsal edge of each inferior appendage with long setae curved caudad at their middle. The male of *St. peniculus* differs from those of the next two species by having the combination of a serrate ventral corner at the middle of each inferior appendage, two stout projections on its mesal surface, and a bifid apex. The females of no other "Strange Species" have been described before now. The female genitalia of this species differ from those of the next two species by the much longer segment IX in *St. peniculus* and the narrower and shallower excision at the apex of tergum X.

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

PHYLOGENY: This species and the following two new species comprise a monophyletic group as indicated by the pair of setose patches of male tergum X discussed in the diagnosis that are uniquely shared in *Setodes* by these species. *Setodes peniculus* and the next species share uniquely the third numbered character of the diagnosis, indicating that these two are sister species. The relationship of these three species with other "Strange Species" is not obvious at present.

Setodes reclinatus, NEW SPECIES
Figs. 170, 247

DESCRIPTION: Body stout, pale yellow; antennae pale, with very narrow brownish annulations; forewings yellowish smoky, covered with reddish brown hairs; females with body and wings pale yellowish, lighter than male. Hindwings with fringes long, dark brown in male, pale in female.

MALE GENITALIA (Fig. 170): Tergum IX short; pleura abruptly shorter above middle, each pleuron with prominent right angle; sternum with prominent bulge near anterior margin, very long posteriorly on meson extending beyond tergum X and nearly to apices of inferior appendages, this process broad basally with concave sides tapering to slightly broadened and bifid apex in ventral view; in lateral view with dorsal edge produced in acute angle near middle. Tergum IX fused with tergum X, together elongated backward in large plate, broad at basal half with pair of crescentiform setose areas possibly representing preanal appendages fused with tergum, distal half abruptly reduced in pair of triangular lobes narrowly separated in dorsal view, laterally produced in pair of narrow setose flanges, each slightly curved upward at its distal edge. Inferior appendages each with distal portion produced in two branches: dorsal branch twice as long as ventral one, with its apical half slightly curved inward in ventral view; ventral branch stout, triangular; basodorsal

plate convex, covered densely with extremely long setae which arise upright then abruptly curve backward just beneath tergum X. Phallobase broadly semicircular in lateral view, with broad and shallow dorsal excisions sub-mesally near anterior end, foramen set anteriorly; phallic shield large, hemispherical; phallicata slender, trough-like, about twice as long as inferior appendages, arched downward and backward about 90° near middle, slightly dilated at middle with distal third narrowing to blunt apex in lateral view. Paramere spines slender, symmetrical, with their basal ends curved in spiral and fused exteriorly with phallobase.

FEMALE GENITALIA (Fig. 247): Segment IX rectangular in lateral view, about twice as tall as long, dorsum with pair of setose depressions. Preanal appendages oval setose mounds located on either side of the base of tergum X, the latter broad, sub-quadrate with wide excision apicomesally half as long as tergum. Lamellae about 3.5 times as long as average width, with middle slightly constricted, apicoventral end produced in broad lobe curved inward, bearing dozen long stout setae. Gonopod plate highly sclerotized and forming open genital chamber shaped like water chestnut, as long as wide in ventral view, lateral margins produced in pair of ventrolateral flanges and pair of sub-apicolateral flanges. Spermathecal sclerite anteriorly bearing huge rounded triangular process with its anterior end reaching to posterior margin of segment VII.

LENGTH OF FOREWING: Male 6.2-6.5 mm; female 6.9-7.3 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 81a (NAU). Paratypes--6 females, same data as holotype (NAU); 1 male, 1 female, same data as holotype (CUAC).

ETYMOLOGY: Latin, "bent back," with reference to the recurved hairs on the dorsal basomesal plate of each inferior appendage.

DIAGNOSIS: This species is somewhat similar to *St. peniculus* as we discussed for that species but it differs from it in the following autapomorphies: in the male, (1) pair of setose masses in the "armpits" of tergum X each in long stripe and less developed than in *St. peniculus* and (2) apicoventral branch of inferior appendage produced in stout spine half as long as dorsal branch; in the female, (3) gonopod chamber produced in two pair of lateral flanges near apex and (4) spermathecal sclerite bearing a huge triangular plate anteriorly.

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

PHYLOGENY: This species is a sister species of *St. peniculus* as indicated for that species above. Together they comprise a monophyletic group with the next species as explained in the phylogeny discussion for *St. peniculus*.

Setodes tectorius, NEW SPECIES
Figs. 171, 248

DESCRIPTION: Body stout, yellowish brown; antennae pale, with very narrow brownish annulations; forewings yellowish smoky, covered with golden brown hairs. Female with body and wings pale yellow, lighter than male. Hindwing fringes dark brown in male, pale yellow in female.

MALE GENITALIA (Fig. 171): Segment IX very long dorsally, shortest sub-dorsally; pleura long ventrally, each with rounded posterior margin; sternum without bulge or manille, extended posteriorly to level with apices of inferior appendages, this process broad basally, its sides concave and tapering to slightly widened and bifid apex. Tergum IX extending caudad to level with apices of inferior appendages and apex of sternum IX process and fused with tergum X, forming large, thick roof with truncata apex in lateral view; in dorsal view broad, about 1.2 times as long as wide, lateral edges produced in pair of flanges at midlength, with distal half gradually tapering to slightly bilobed apex; dense patch of stout setae basolaterally under tergum X. Preanal appendages appearing as pair of setose, oval mounds on upper lateral base of tergum X. Inferior appendages short, each 1.5 times as long as its average width, apically produced in three short and

stout processes: (1) ventral setose lobe, (2) dorsal hooked lobe bearing small process at base, and (3) mesolateral process bearing two stout, dark teeth apically; also with small triangular basolateral flange on each appendage. Phallobase semicircular; phallic shield large, hemispherical in lateral view; phallicata slender, cylindrical at its basal half, then bent downward in middle, distal half trough-like, slightly dilated, mesal ridge produced along midline, with endophallic membranes opened on top of ridge. Paramere spines slender, symmetrical, with their bases curved in spiral and exteriorly fused with phallobase, distal half of each spine gradually slightly dilated.

FEMALE GENITALIA (Fig. 248): Segment IX generally parallel-sided in dorsal and lateral views, dorsum with pair of sub-circular setose depressions near apical margin. Tergum X about 1.3 times as broad as long in dorsal view, with apex broadly excised at center about half its length. Lamellae nearly 1.5 times as long as segment IX, barbell-shaped, strongly constricted at middle, with apex enlarged in broad lobe about 4 times as tall as middle height, apicoventral lobes blunt, each bearing two dozen long, stout setae apically. Gonopod plate highly sclerotized, forming open chamber, lung-like in lateral view, apicolateral edges produced outward in pair of broad flanges. Spermathecal sclerite with barbell-shape in ventral view, bearing long, ventral projection with its end extending to middle of segment VIII.

LENGTH OF FOREWING: Male 5.5-6.0 mm; female 5.7-6.3 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 58c (NAU). Paratypes--4 males, 3 females same data as holotype (NAU); 68 males, 50 females, Loc. 11b (NAU); 10 males, 10 females, Loc. 11b (CUAC); 1 male, Loc. 12b (NAU).

ETYMOLOGY: Latin, "roof, covering," with reference to the large roof-shaped tergum X.

DIAGNOSIS: As we discussed for the previous two species, this species shares with *St. peniculus* and *St. reclinatus* a large setose mass at the "armpits" of tergum X in the male genitalia and the spermathecal sclerite anteroventrally bears a long process in the female genitalia. It differs from these in that the male of this species: (1) lacks a long dorsal branch and long basal hairs on each inferior appendage; (2) tergum IX+X is very broad, as broad as long, with its apex only slightly excised at the center; and (3) the phallicata is produced mesally in a longitudinal ridge. The female differs from those of the other two species in: (1) the relatively short segment IX (relatively half as long as in *St. peniculus*), (2) the relatively deep and wide excision of tergum X, (3) the highly constricted middle region of the lamellae (much more constricted than in *St. reclinatus*), and (4) the very deep chamber of the gonopod plate.

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

PHYLOGENY: This species appears to be a sister lineage of the two preceding species as indicated in the phylogeny discussion of *St. peniculus*.

Setodes species B Yang and Morse, 1989

Setodes species B Yang and Morse, 1989, pp. 23-24.

We described this female from a single unassociated specimen and placed it in the *Setodes pulcher* Group (Yang and Morse, 1989). However, now that we have been able to describe the females of the above three species of the "Strange Species" Branch (Schmid, 1987), it is apparent that this is probably a species of this Branch and a species for which the male remains unknown.

REVISED KEY TO ADULTS OF CHINESE *SETODES* SPECIES

[adapted from the key by Yang and Morse, 1989 (Y&M, 1989), which must be consulted for illustrations of many characters; females of *Setodes cheni*, *St. distinctus*, *St. geminispinus*, *St. lamellatus*, *St. orthocladus*, *St. pellucidulus*, *St. peniculus*, *St. spineus*, and *St. varians* remain unknown]

1. Genitalia with inferior appendages and phallus (Fig. 157) ..... males, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 237) ..... females, 35

2(1). Posterior margin of sternum IX strongly produced posterad at center in long process with bilobed apex (Fig. 169C); setose mass present at each ventral basolateral corner of tergum X (Fig. 169A); paramere spines each with basal spiral (Fig. 169D) 3
2'. Posterior margin of sternum IX not produced at center (Fig. 157C); tergum X without ventral setose mass (Fig. 157A); paramere spines without basal spirals (Fig. 157D) 5

3(2). Setose mass at each basolateral corner of tergum X large, rounded (Fig. 169A); inferior appendages each with apicoventral lobe small (Fig. 169A) or apicodorsal and ventral lobes subequal (Fig. 171A) 4
3'. Setose areas in long strips (Fig. 170A); inferior appendages each with apicoventral branch nearly half as long as dorsal branch (Fig. 170A) .. *St. reclinatus*, n. sp., p. 167.

4(3). Inferior appendages each with apicodorsal branch at least as long as its stout basal portion and with brush of bent setae arising basodorsally (Fig. 169A) ..... *St. peniculus*, n. sp., p. 166.
4'. Inferior appendages stubby, twice as long as broad, generally with three short apical processes, and without brush of basodorsal setae (Fig. 171A) ..... *St. tectorius*, n. sp., p. 168.

5(2'). Abdominal tergum IX long, sub-dorsal distance from anterior margin to base of preanal appendages longer than pleura or sternum (Y&M, 1989, fig. 10A) 6
5'. Abdominal segment IX longest ventrally (Fig. 157A) or laterally (Fig. 160A) 8

6(5). Tergum X with median tongue-like process (Y&M, 1989, figs. 10A, 10B) .... *St. pulcher* Martynov, see Y&M, 1989.
6'. Tergum X truncate or notched in dorsal view (Y&M, 1989, fig. 12B) 7

7(6'). Phallicata strongly compressed (Y&M, 1989, figs. 12C, 12D), semi-lunar in lateral view (Y&M, 1989, fig. 12A) ..... *St. yunnanensis* Yang and Morse, see Y&M, 1989.
7'. Phallicata broad dorsally, more or less parallel-sided in lateral view (Y&M, 1989, fig. 11D) ..... *St. pellucidulus* Schmid, see Y&M, 1989.

8(5'). Basoventral lobe of each inferior appendage more than three times as long as sternum IX on midline, constricted and angled 45° upward at middle (Y&M, 1989, figs. 9A, 9C) ..... *St. ancala* Yang and Morse, see Y&M, 1989.
8'. Basoventral lobe of each inferior appendage no more than twice as long as sternum IX, not constricted at middle, and usually only gradually curved upward (Fig. 160A) 9

9(8'). Preanal appendages long, setose strips fused with tergum X and forming pair of high, setose, sub-dorsal ridges (Fig. 159B) 10

9'. Preanal appendages fused with tergum X (Fig. 157A) or not (Fig. 158A), but not forming pair of sub-dorsal ridges 13

10(9). Phallicata falciform, its apicodorsal margin serrate with short setae 11

10'. Phallicata not falciform, its apicodorsal margin not serrated 12

11(10). Inferior appendages each with upper branch truncate and serrate apically, lower branch nearly straight and directed caudad (Y&M, 1989, fig. 7A) ..... *St. schmidi* Yang and Morse, see Y&M, 1989.

11'. Inferior appendages each with upper branch sub-triangular, not serrate apically, lower branch initially directed ventrad, then curved caudad (Y&M, 1989, fig. 8A) ..... *St. carinatus* Yang and Morse, see Y&M, 1989.

12(10'). Phallus with paramere spines present (Figs. 160D, 160Dc); lower branch of each inferior appendage slender, twice as long as sternum IX (Fig. 160A) ..... *St. cheni*, n. sp., p. 156.

12'. Phallus with paramere spines absent (Fig. 159D); lower branch of each inferior appendage apparently completely suppressed (Fig. 159A) ..... *St. alampata* Schmid, p. 155.

13(9'). Abdominal segment X not apparent in dorsal or lateral views (Figs. 161A, 161C) or appearing as pair of processes, each projecting from apex of its respective preanal appendage (Y&M, 1989, figs. 14A, 14B) 14

13'. Abdominal segment X long (Fig. 157A) or short (Figs. 163A, 163B), but always apparent as a single sclerite 15

14(13). Tergum X appearing as pair of digitate processes, each projecting from apex of its respective preanal appendage (Y&M, 1989, figs. 14A, 14B); paramere spines absent (Y&M, 1989, fig. 14D) .... *St. hainanensis* Yang and Morse, see Y&M, 1989.

14'. Tergum X pair of broad lobes beneath large, divergent, setose preanal appendages (Figs. 161A, 161B); paramere spines stout, each with distal half divided into two branches (Fig. 161D) ..... *St. geminispinus*, n. sp., p. 152.

15(13'). Abdominal segment X very long, with distal two-thirds reduced to sinuate spine and its apex exceeding other genitalic structures (Y&M, 1989, figs. 13A, 13B, 13E) ..... *St. argentatus* Matsumura, see Y&M, 1989 and p. 157.

15'. Abdominal segment X not slender (Figs. 159A, 171A) or not exceeding other genitalic structures (Figs. 157A, 158A) 16

16(15'). Abdominal segment X prominent, not reduced to transverse band (Figs. 157A, 158A); preanal appendages oval or sub-triangular (Fig. 158A) or fused with segment X (Fig. 157A) 17

16'. Abdominal segment X highly reduced to transverse U or V-shaped band immediately above phallobase (Fig. 163B); preanal appendages slender, clavate (Fig. 163A) 23

17(16). Abdominal segment X much more than twice as long as preanal appendages (Fig. 157A); inferior appendages each with long, slender basal process (Fig. 157A); one pair of paramere spines present, each either unforked (Figs. 160D, 160Dc) or forked (Fig. 157D) or spines absent (Fig. 159D) 18

17'. Abdominal segment X slightly longer than preanal appendages, composed of dorsomesal lobe and two acute lateral arms (Figs. 158A, 158B); inferior appendages each roughly parallelogram-shaped with basal process absent (Fig. 158A); phallus with two pairs of paramere spines (Figs. 158D, 158Dd) ..... *St. spineus*, n. sp., p. 153.

18 (17). Phallus with paramere spines absent (Yang and Morse, 1997, fig. 7D); mesal branch of each inferior appendage rectangular (Yang and Morse, 1997, figs. 7A) ..... *St. chlorinus* Yang and Morse, see Y&M, 1997

18' Phallus with paramere spines present (Fig. 157D); mesal branch of each inferior appendage rounded (Fig. 157A), multi-branched (Y&M, 1989, figs. 3A, 6A), digitate (Y&M, 1989, fig. 5A), or capitate (Y&M, 1989, fig. 4A) 19

19(18). Phallus with paramere spines deeply divided (Figs. 157D, 157Dc) 20

19'. Phallus with paramere spines undivided (Figs. 160D, 160Dc) 21

20(19). Inferior appendages each with median process in single lobe at least twice as broad as either of the others (Fig. 157A); phallicata blunt apically and directed ventrad, without midventral spine (Fig. 157D) ..... *St. platecladus*, n. sp., p. 154.

20'. Inferior appendages each with median process in 3-5 small lobes (Y&M, 1989, fig. 6A); phallicata with midventral spine and curled dorsad at apex (Y&M, 1989, fig. 6D) ..... *St. bispinus* Yang and Morse, see Y&M, 1989 and p. 152.

21(19'). Abdominal segment X with pair of lateral , sub-apical lobes (Y&M, 1989, figs. 5A, 5B); inferior appendages each with median process single, digitate, and basoventral lobe about twice as broad as others (Y&M, 1989, fig. 5A) ..... *St. trilobatus* Yang and Morse, see Y&M, 1989.

21'. Abdominal segment X without pair of lateral sub-apical lobes (Y&M, 1989, figs. 3A, 3B, 4A, 4B); inferior appendages each with median process truncate at apex and basoventral lobe not as broad (Y&M, 1989, figs. 3A, 4A) 22

22(21'). Abdominal segment X rounded apically in lateral and dorsal views (Y&M, 1989, figs. 3A, 3B) ..... *St. punctatus* (Fabricius), see Y&M, 1989.

22'. Abdominal segment X divided apicomesally (Y&M, 1989, fig. 4B) ..... *St. diversus* Yang and Morse, see Y&M, 1989.

23(16'). Phallicata consisting of straight vertical piece suspended beneath high, arching basal portion of phallus (Y&M, 1989, fig. 20A); pair of curved, serrate, paramere spines as long as phallicata and suspended caudad of it (Y&M, 1989, fig. 20A) ..... *St. iris* Hagen, see Y&M, 1989 and p. 165.

23'. Basal portion of phallus not high and arching and phallicata and paramere spines not suspended vertically from it (Fig. 163D) 24

24(23'). Paramere spines stout, abruptly angled ventrocaudad, bifid apically (Y&M, 1989, fig. 15D) ..... *St. fluvialis* Kimmins, see Y&M, 1989.

24'. Paramere spines slender, gradually curled ventrad (Fig. 163D), sometimes with

right spine reduced (Fig. 163B) 25

25(24'). Right paramere spine reduced (Fig. 163B) 26
25'. Paramere spines symmetrically developed (Fig. 164B) 28

26(25). Phallicata with additional short, stout spine near apex and phallotremal sclerite with pair of distinctive dorsal lobes (Fig. 163D) ..... *St. orthocladus*, n. sp., p. 160.
26'. Phallus without short apical spine and phallotremal sclerite without such conspicuous dorsal lobes (Y&M, 1989, fig. 17D) 27

27(26'). Inferior appendages each with basoventral lobe about as long as sternum IX, middle lobe short and triangular .... *St. brevicaudatus* Yang and Morse, see Y&M, 1989.
27'. Inferior appendages each with basoventral lobe about 1.5 times as long as sternum IX, middle lobe broad and rounded apically .... *St. longicaudatus* Yang and Morse, see Y&M, 1989.

28(25'). Segment IX longest ventrally (Fig. 167A) and sternum IX without apicomedian concavity (= manille) (Fig. 167C) 29
28'. Segment IX longest laterally (Fig. 165A), sternum IX with manille (Fig. 165C) ... 32

29(28). Tergum IX with stout, depressed median process (Figs. 167A, 167B); paramere spines absent (Fig. 167A) 30
29'. Tergum IX without distinctive median process (Y&M, 1989, fig. 19A) or process not depressed (Figs. 162A, 162B); paramere spines present (Fig. 162D) 31

30(29). Tergum X sinuate in dorsal view, with lateral lobes weakly divided apically from mesal lobe (Fig. 167B); inferior appendages without dorsal branches (Fig. 167A); phallicata with ventromesal lobe short, thumb-like (Fig. 167A) .... *St. lamellatus*, n. sp., p. 164.
30'. Tergum X with apical margin trilobed, with lateral lobes divided from mesal lobe by deep triangular excisions (Fig. 168B); inferior appendages each with dorsal branch (Fig. 168A); phallicata with ventromesal lobe enlarged in long rectangular process in lateral view (Fig. 168D) ..... *St. sinuatus*, n. sp., p. 164.

31(29'). Pleura IX obliquely shortened dorsally, tergum IX short transverse band without papilla and with acrotergite IX highly elevated (Y&M, 1989, figs. 19A, 19B); inferior appendages each with broad middle branch distinctively separated from basoventral branch (Y&M, 1989, fig. 19A) .... *St. distinctus* Yang and Morse, see Y&M, 1989.
31'. Pleura IX each with prominent posterior angle, abruptly shorter dorsally, tergum IX longer with seta-bearing papilla and with acrotergite IX not highly elevated (Figs. 162A, 162B); inferior appendages without middle branches (Fig. 162A) . ..... *St. gyrosus*, n. sp., p. 158.

32(28'). Inferior appendages generally quadrate, each with posterior ventral corner produced as stout, acute process (Fig. 165A) 33
32'. Inferior appendages crescentiform, each with posterior ventral corner produced as blunt process (Fig. 164A) 34

33(32). Apicodorsal corner of each inferior appendage produced as erect digitate projection with bifid apex (Y&M, 1989, fig. 18A); phallicata with acute apex and phallotremal sclerite not conspicuous (Y&M, 1989, fig. 18D) . . . . . *St. quadratus* Yang and Morse, see Y&M, 1989.

33'. Apicodorsal corner of each inferior appendage produced as two broad lobes separated from basoventral lobe (Fig. 165A); phallicata with blunt apex, phallotremal sclerite highly sclerotized (Fig. 165D) . . . . . *St. sypharus*, n. sp., p. 162.

34(32'). Inferior appendages each with apicodorsal lobe broad and arched caudad, apicoventral lobe triangular (Fig. 164A); phallotremal sclerite large, highly sclerotized (Fig. 164D) . . . . . *St. scleroideus*, n. sp., p. 161.

34'. Inferior appendages each with apicodorsal lobe slender and sinuous, apicoventral lobe quadrate, nearly subdivided into two processes (Figs. 166A, 166C); phallotremal sclerite not shaped in pair of large, sclerotized plates (Fig. 166D) . . . . . *St. varians*, n. sp., p. 163.

35(1'). Abdominal segment IX without pair of longitudinal sclerotized strips suspended ventrally, although single suspended plate or pair of differently shaped ventral posterior projections may be present (Figs. 247A, 247C) 36

35' Abdominal segment IX with pair of longitudinal sclerotized strips suspended ventrally, recurved laterally, and projecting posteriorly (Figs. 241A, 241C) 51

36(35). Lamellae long, each with middle portion reduced as slender stalk (Fig. 248A); gonopod plate forming sclerotized chamber, positioned posteriorly below and between lamellae (Fig. 248A) 37

36'. Lamellae generally broad lobes (Fig. 237A), or each slender with narrow apex (Y&M, 1989, fig. 34A); gonopod plate not forming a sclerotized chamber (Fig. 237A) 40

37(36). Chamber of gonopod plate oval, with ventrolateral edges not projecting outward in distinctive flanges (Y&M, 1989, fig. 30C); pocket present between sterna VIII and IX with large trapezoidal sclerotized plate (Y&M, 1989, fig. 30C) . . . . . *St. pulcher* Martynov, see Y&M, 1989.

37'. Chamber of gonopod plate not oval in ventral view, with ventrolateral edges projecting outward in broad flanges (Fig. 246C); without large, trapezoidal plate and pocket between sterna VIII and IX (Fig. 246C) 38

38(37'). Chamber of gonopod plate about as long as broad in ventral view and with two flanges on each side (Fig. 247C); spermathecal sclerite bearing huge, rounded triangular plate anteriorly (Fig. 247C) . . . . . *St. reclinatus*, n. sp., p. 167.

38'. Chamber of gonopod plate broader than long and with one flange on each side (Fig. 246C); spermathecal sclerite with anterior projection barbell-like (Fig. 246C) 39

39(38'). Segment VIII small, retracted into IX, segment IX 1.5 times as long as deep in lateral view, with anterior portion distinctively enlarged (Fig. 246A); chamber of gonopod plate with lateral corners of flanges more nearly acute (Fig. 246C) . . . . . *St. peniculus*, n. sp., p. 166.

39'. Segment VIII and IX normal (Fig. 248A); chamber of gonopod plate with lateral corners of flanges broadly rounded (Fig. 248C) . . . . . *St. tectorius*, n. sp., p. 168.

40(36'). Segments VIII and IX distinctly separated by membranous constriction (Y&M, 1989, fig. 31C); gonopod plate transverse, nearly as broad as segment IX, apically bilobed, posterior of fused and setose pleura IX (Y&M, 1989, fig. 31C) .... *St. yunnanensis* Yang and Morse, see Y&M, 1989.

40'. Segments VIII and IX not separated by deep membranous constriction (Fig. 239C); gonopod plate longer than broad (Fig. 245C) or segment IX pleura not fused and setose anterior of gonopod plate (Fig. 238C) 41

41(40'). Lamellae, sometimes together with segment IX, with reticulate surface sculpturing (Y&M, 1989, fig. 28C; Fig. 239A) 42

41'. Lamellae and segment IX without surface sculpture (Fig. 237A) 45

42(41). Lamellae narrow, clavate in lateral view (Y&M, 1989, fig. 34A); spermathecal sclerite broad with sinuate lateral margins (Y&M, 1989, fig. 34D) .... *St. fluvialis* Kimmins, see Y&M, 1989.

42'. Lamellae broad, more or less triangular in lateral view with distinctive reticulate surface sculpturing (Fig. 239A); spermathecal sclerite not as broad (Fig. 239C) or lateral margins not sinuate (Y&M, 1989, fig. 27D) 43

43(42'). Segment IX posteroventrally with pair of acute projections set off from rest of segment laterally (Y&M, 1989, fig. 27C) or with pair of small, laterally recurved projections (Y&M, 1989, fig. 28C); lamellae each with ventral projection small (Y&M, 1989, fig. 27A) and not constricted basally (Y&M, 1989, fig. 27C) 44

43'. Segment IX posteroventrally without acute projections set off from rest of segment laterally (Fig. 239C); lamellae each bifid (Fig. 239A), with large ventral portion deeply constricted at one-third distance from base in ventral view (Fig. 239C) ..... *St. alampata* Schmid, p. 155.

44(43). Segment IX posteroventrally with pair of acute projections strongly set off from rest of segment laterally in ventral view (Y&M, 1989, fig. 27C); spermathecal sclerite with ovoid structure (ov) flat in lateral view (Y&M, 1989, fig. 27A) and supporting flanges (sf) of campanulate structure (camp) ovoid in ventral view (Y&M, 1989, fig. 27D) ..... *St. schmidi* Yang and Morse, see Y&M, 1989.

44'. Segment IX posteroventrally with pair of small, laterally recurved projections not conspicuously set off from rest of segment laterally in ventral view (Y&M, 1989, fig. 28C); spermathecal sclerite with middle ring-like structure rhomboid in ventral view (Y&M, 1989, fig. 28D) ..... *St. carinatus* Yang and Morse, see Y&M, 1989.

45(41'). Segment IX more than three times as long as lamellae (Y&M, 1989, fig. 29A) ..... *St. ancala* Yang and Morse, see Y&M, 1989.

45'. Segment IX at most two times as long as lamellae (Y&M, 1989, fig. 25A) 46

46(45'). Gonopod plate with apex produced in two large, separated, triangular lobes (Fig. 237C); lamellae with apicodorsal apices rounded in lateral view and turned upward (Fig. 237A) ..... *St. bispinus* Yang and Morse, see Y&M, 1989 and p. 153.

46'. Gonopod plate with apex in two small triangular projections (Y&M, 1989, fig. 23C), enlarged and broadly bilobed (Fig. 238C), or in single triangle (Fig. 240C); lamellae not rounded (Fig. 238A) or not upturned apicodorsally (Fig. 240A) 47

47(46'). Setose pleura IX fused ventrally with each other and with posterior triangular gonopod plate (Fig. 240C); tergum X very slender in dorsal view (Fig. 240B) . . . . . *St. argentatus* Matsumura, see Y&M, 1989 and p. 157.

47'. Setose pleura IX not fused, separated by gonopod plate (Fig. 238C); tergum X nearly as broad as long (Fig. 238B) 48

48(47'). Lamellae each often with lateral flange (Y&M, 1989, fig. 26A, "lat.fl"), but this flange never recurved dorsad; gonopod plate as broad as long and broadly bilobed (Fig. 238C) 49

48'. Lamellae each with ventrolateral lobe recurved dorsad (Y&M, 1989, fig. 23A, "vent.lat"); gonopod plate longer than broad and ending in two small triangular projections (Y&M, 1989, fig. 23C) 50

49(48). Spermathecal sclerite longest ventrally in lateral view (Fig. 238A) . . . . . *St. platecladus*, n. sp., p. 154.

49'. Spermathecal sclerite longest dorsally in lateral view (Y&M, 1989, fig. 26A) . . . . . *St. trilobatus* Yang and Morse, see Y&M, 1989.

50(48'). Gonopod plate more or less quadrate, with apical portion slightly broadened and divided into two triangular lobes (Y&M, 1989, fig. 23C) . . . . . *St. punctatus* (Fabricius), see Y&M, 1989.

50'. Gonopod plate pentagonal, narrow posteriorly (Y&M, 1989, fig. 24C) . . . . . *St. diversus* Yang and Morse, see Y&M, 1989.

51(35'). Recurved ventral edges of pleura IX pair of longitudinal sclerotized strips in ventral view, less than three times as long as wide, each with obliquely truncated apex (Fig. 245C) 52

51'. Recurved ventral edges of pleura IX in ventral view more than three times as long as wide, with rounded apices (Fig. 242C) 53

52(51). Lamellae each with slender sclerotized strip arising from its base; tergum X 1.5 times as long as lamellae (Fig. F245A) . . . . . *St. sinuatus*, n. sp., p. 164.

52'. Lamellae without strip arising from its base; tergum X as long as lamellae (Schmid, 1958, plate 24, fig 1). . . . . *St. iris* Hagen, see Y&M, 1989 and p. 165.

53(51'). Pleural IX with posterior margins evenly concave in lateral view (Fig. 241A) 54

53'. Pleural IX with posterior margins convex or angled in lateral view (Y&M, 1989, fig. 37A) 57

54(53). Gonopod plate with semimembranous triangular region anteriorly, without apicomesal excision (Fig. 242C); recurved ventral edges of pleura IX fused basally for short distance (Fig. 242C) 55

54'. Gonopod plate without semimembranous triangular region, with small apicomesal excision (Fig. 241C); recurved ventral edges of pleura IX separate basally (Fig. 241C) . . . . . *St. gyrosus*, n. sp., p. 158.

55(54). Tergum X much longer than lamellae (Fig. 242A); lamellae as long as, or slightly longer than broad (Fig. 242A) 56

55'. Tergum X nearly as long as or slightly longer than lamellae (Fig. 243A); lamellae nearly twice as long as broad (Fig. 243A) . . . . . *St. sypharus*, n. sp., p. 162.

56(55). Tergum X with apical margin produced at center, forming a long, median lobe (Fig. 244B); lamellae each with apex truncate in lateral view (Fig. 244A) .... *St. varians*, n. sp., p. 163.

56'. Tergum X excised apically at center (Fig. 242B); lamellae each with obtuse apex in lateral view (Fig. 242A) ..... *St. scleroideus*, n. sp., p. 161.

57(53'). Pleura IX each with deep diagonal groove posterolaterally at base of each lamella, bounded anteriorly by narrow flange as tall as lamella, densely setose, with pair of rugose regions anteroventrally (Y&M 1989, fig. 37A) .... *St. quadratus* Yang and Morse, see Y&M, 1989.

57'. Segment IX with groove inconspicuous and not setose, without rugose area (Y&M, 1989, fig. 35A) 58

58(57'). Recurved ventral edges of pleura IX ("posterior ventral processes of segment IX") not extending to apices of lamellae and apical projections of gonopod plate each divided into short setose mesal lobe and broad and rounded lateral lobe (Y&M, 1997, figs. 8E, 8G) ..... purportedly *St. chlorinus* Yang and Morse, see Y&M, 1997.

58'. Recurved ventral edges of pleura IX extending to apices of lamellae (Y&M, 1989, figs. 35A, 36A) and apical projections of gonopod plate undivided, bare, acute (Y&M, 1989, figs. 35C, 36C, 36D) 59

59(58'). Spermathecal sclerite with sclerotized ribbons extending to anterior margin of segment VIII (Y&M, 1989, fig. 36A); tergum X much shorter than lamellae, with pair of broadly rounded lobes in dorsal view (Y&M, 1989, fig. 36B); segment IX in lateral view with ventral pair of flanges (between lamellae and recurved lateral margins of pleura IX) as long as broad (Y&M, 1989, fig. 36A) .... *St. longicaudatus* Yang and Morse, see Y&M, 1989.

59' Spermathecal sclerite with sclerotized ribbons extending to anterior one-third of segment VII (Y&M, 1989, fig. 35A); tergum X as long as lamellae, with apex produced in pair of triangular lobes in dorsal view (Y&M, 1989, fig. 35B); segment IX in lateral view with pair of very short flanges below lamellae and above recurved lateral margins of pleura IX (Y&M, 1989, fig. 35A) .... *St. brevicaudatus* Yang and Morse, see Y&M, 1989.

Trichosetodes Ulmer, 1915

Trichosetodes Ulmer, 1915, pp. 65-66;

The genus *Trichosetodes* includes 36 species, predominantly Oriental and tropical African in distribution with only *Ts. polonorum* Botosaneanu, 1970, and *Ts. japonicus* Tsuda, 1942b, distributed north of the tropics in Korea and Japan, respectively, in the East Palearctic Region.

Larvae of the following species of *Trichosetodes* have been described: *Trichosetodes imperfectus* Ulmer, 1951 (by Ulmer, 1955), and *Trichosetodes japonicus* (by Akagi, 1957). Pupae of the following species of *Trichosetodes* have been described: *Trichosetodes handschini* Ulmer, 1951; *Trichosetodes imperfectus*, and *Trichosetodes thienemanni* Ulmer, 1951 (all by Ulmer, 1955). Marlier (1962) provided an excellent summary of the larvae and pupae of the Asian *Trichosetodes* species. Schmid (1987) thoroughly characterized the adults of *Trichosetodes*. The highlights of these works regarding larvae, pupae, and adults of *Trichosetodes* were provided by Yang and Morse (1989).

Marlier (1962) described the biology of Asian species as follows (from French):

> The larvae of *Trichosetodes* are rheophilic, at least the known species; the case is made of grains of sand; it is conical but truncate, weakly curved and rugose. For pupation, the larva attaches its case at the anterior end on some stable object and then closes the two openings with membrane, the anterior opening of one central circular hole, the other of one dorsal transverse slit. It can also attach a larger pebble at each end. The *Trichosetodes* of Indonesia are inhabitants of small streams."

PHYLOGENY: Fifty-one synapomorphies so far have been recognized by us for inferring the phylogeny of this genus worldwide. These will be published in a separate work. Our species groups are similar to those of Schmid (1987), but there are some differences in their species composition. Schmid did not infer a phylogeny for his species groups nor for the species within them.

CLASSIFICATION: Chinese species of *Trichosetodes* are now known from the following Species Groups. These Groups have been refined slightly from those outlined by Schmid (1987):

Trichosetodes atisudhara Group, Schmid, 1987

Ts. atisudhara Schmid, 1987; Indian, Oriental Region.
Ts. atisukchma Schmid, 1987; Indian, Oriental Region.
Ts. insularis Schmid, 1987; China, Oriental Region.
Ts. lasiophyllus Yang and Morse, 1989; China, Oriental Region.
Ts. triangularis Kimmins, 1962; S. Africa, Afrotropical Region.

Trichosetodes polonorum Group, Schmid, 1987

Ts. atidhanin Schmid, 1987; Sikkim, Oriental Region.
Ts. handschini Ulmer, 1951; Java, Oriental Region.
Ts. imperfectus Ulmer, 1951; Sumatra, Oriental Region.
Ts. japonicus Tsuda, 1942b; Japan, East Palearctic Region.
Ts. polonorum Botosaneanu, 1970; Korea, East Palearctic Region.
Ts. rhamphodes, NEW SPECIES; China, Oriental Region.
Ts. serratus, NEW SPECIES; China, Oriental Region.
Ts. thienemanni Ulmer, 1951; Sumatra, Oriental Region.

Trichosetodes atichayana Group, Schmid, 1987

Ts. atibhadrata Schmid, 1987; India, Oriental Region.
Ts. atichayana Schmid, 1987; India, Oriental Region.
Ts. atiharin Schmid, 1987; Bombay, Oriental Region.
Ts. atiramaniya Schmid, 1987; India, Oriental Region.
Ts. atirupa Schmid, 1987; India, Oriental Region.
Ts. atisykha Schmid, 1958; Sri Lanka, Oriental Region.
Ts. bicornis, NEW SPECIES; China, Oriental Region.
Ts. falcatus, NEW SPECIES; China, Oriental Region.
Ts. phylloideus, NEW SPECIES; China, Oriental Region.

Trichosetodes polonorum Group, Schmid, 1987

Trichosetodes serratus, NEW SPECIES
Figs. 172, 249

DESCRIPTION: Body yellowish brown with traces of hairs on head and wings which suggest typical body color; silvery lines present on basal segments of antennae, thorax and forewings; on each antenna, first flagellar segment about 1.4-1.5 times as long as second segment, bearing golden scopulae near base (Fig. 172J).

MALE GENITALIA (Fig. 172): Segment IX with dorsal third excised posteriorly to narrow transverse tergum; anteropleural margins produced forward in broad lobes; posterior margin of sternum IX produced in pair of short triangular processes. Preanal appendages stout, clavate. Tergum X produced in pair of long, asymmetrical spines, extending nearly to apices of inferior appendages, with right spine shorter, more slender, finely serrate ventrally on basal half; left spine longer, larger, highly compressed, roughly serrated on basal three-fourths of ventral edge and forked apically. Inferior appendages each generally composed of bare, stout ventral body broad basally, gradually tapering to acute apex; two setose projections dorsobasally with one produced from dorsobasal edge, slightly depressed, directed mesad and caudad, other projection arising from distal part of basal plate, upright, with distal half abruptly reduced to slender process curved mesad. Phallobase very compressed, rectangular in anteroventral view; phallicata completely fused with phallobase, slightly constricted sub-basally, with rest of phallicata strongly compressed and curved downward; middle portion of phallicata with ventromesal ridge finely serrate and with dorsal margins each produced in small lobe; distal half of phallicata divided into two branches, with dorsal branch simple, slender spine, ventral branch twice as broad as dorsal branch and longer, with apex slightly twisted and bearing upturned, sub-apical tooth; ejaculatory duct (t) sclerotized and prominent from middle of phallicata.

FEMALE GENITALIA (Fig. 249): Tergum IX fused with X, IXa and IXb inconspicuous; pleural regions swollen, ventrally each produced in setose lobe, broad at base, tapering to slightly serrate, blunt apex. Tergum X sub-quadrate, only about one-third as broad as tergum IX in dorsal view. Lamellae elliptical in lateral view, nearly rectangular in ventral view; with each apicoventral end produced in small triangular lobe bearing few stout setae. Gonopod plate sclerotized, gradually tapering to apex slightly excised at center, with its anterior base constricted and retracted into segment VIII, forming pair of large transverse pockets in ventral view; in lateral view, ventral edge of gonopod plate sinuate. Spermathecal sclerite with fusiform ventral profile, bearing small, dark, butterfly-shaped plate in ventral view; dorsally bearing huge hood with anterior margin truncate in lateral view, in dorsal view about three-fourths as broad as segment VIII, its anterodorsal edge with deep triangular excision.

LENGTH OF FOREWING: Male 4.7-4.9 mm, female 4.2-4.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 38a (NAU). Paratypes--6 males, 10 females, same data as holotype (NAU); 4 males, 6 females, same data as holotype (CUAC).

ETYMOLOGY: Latin, "saw-like," with reference to the shape of tergum X in lateral view.

DIAGNOSIS: This species is distinguished from all others in the *Trichosetodes polonorum* Group by following characters: (1) first segment of the male flagellum has basal warts bearing dense golden setae at least half as long as the segment; (2) the phallicata has a dorsal bump; (3) both processes of tergum X are serrate ventrally, the left process also forked into two slender branches.

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

PHYLOGENY: This species is most closely related to *Trichosetodes atidhanin* Schmid, 1987, as indicated by the following synapomorphies: left process of tergum X (1) forked and (2) serrate ventrally. These two species are a sister lineage to two others in a trichotomy of this *Ts. polonorum* Group.

Trichosetodes rhamphodes, NEW SPECIES
Fig. 173

DESCRIPTION: Head tawny, probably with pair of narrow lines of silvery hairs running back from antennae, first segment of each flagellum basically of the *Trichosetodes atibadhrata* form (Schmid, 1987, pl. XIX, fig. 2), about 1.6-1.7 times as long as second segment. Thorax fuscous above with pair of silver streaks bordered with fine dark flat hairs; hindwing fringes dark brown.

MALE GENITALIA (Fig. 173): Segment IX very long; dorsal third of segment IX deeply excised to short tergum IX, forming narrow transverse dorsal band; anteropleural edges of segment IX produced cephalad in broad lobes in lateral view; posteroventral margin of sternum IX broadly excised, with pair of triangular processes produced sub-mesally in ventral view. Tergum X produced in pair of sinuate spines, almost identical in shape, both directed upward but in different angles. Inferior appendages each with main body stout basally, tapering to acute apex, dorsobasal edge with long, tapering, setose process having its inner surface concave and with its distal half curved inward; in ventral view, inferior appendages constricted at midlength and strongly curved mesad two-thirds distance from bases. Phallobase completely sclerotized and fused with phallicata; phallicata abruptly reduced in curved tube from near base, with its basal third directed dorsocaudad 45° degrees, then arched ventrocaudad in right angle (45° from body axis), longitudinal opening on right, apical fourth of phallicata divided into two long acute lobes with left lobe broader than right one, left one bearing small tooth sub-apicodorsally; ejaculatory tube sclerotized, clearly visible in slit on right side of phallus.

LENGTH OF FOREWING: Male 5.2-5.5 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 76d (NAU). Paratypes--1 male, same data as holotype (NAU); 1 male, same data as holotype (CUAC); 1 male, Loc. 20c (NAU); 5 males, 1 females, Loc. 20a, (NAU).

ETYMOLOGY: Greek, "beak like," with reference to the shape of the inferior appendages in ventral view.

DIAGNOSIS: Within the *Trichosetodes polonorum* Group, this species most closely resembles its sister species from Indonesia, *Ts. imperfectus*, *Ts. handschini*, and *Ts. thienemanni*, by the slender, strongly incurved apices of the inferior appendages. It differs from them and all others in the genus, however, by the following combination of characters : (1) the tergum X arms are sinuate, directed upward; (2) the inferior appendages have the distal third not visible in lateral view; and (3) each inferior appendage has only one dorsobasal projection.

DISTRIBUTION: Known from only the type locality in southeastern and southcentral China.

PHYLOGENY: This species of the *Trichosetodes polonorum* Group is a member of the monophyletic group for which the male inferior appendages are curved mesad. Within that group, it is a member of the monophyletic group with teeth near the apices of the phallic lobes, including *Ts. handschini* and *Ts. thienemanni*. Those latter two species are the sister lineage of this new species, their monophyly indicated by sternum IX lacking apicomesal processes and one pair of basal plate processes short, broad apically.

Trichosetodes atichayana Group, Schmid, 1987

Trichosetodes bicornis, NEW SPECIES
Figs. 175, 251

DESCRIPTION: Specimens denuded in alcohol, general color tawny yellow; antennae each with pedicel typically elongated, cylindrical, slightly twisted between scape and first segment of flagellum, latter bearing prominent oval brown setose patch basally as in *Ts. atibadhrata* (Schmid, 1987, pl. XIX, fig. 2). Mesonotum pale tawny above with pair of parallel longitudinal pale lines, lateral regions dark brown. Forewings mostly covered with golden brown hairs, but membranes with hyaline streaks and scattered silvery and dark hairs suggesting that wings originally had silvery streaks; hindwing fringes dark brown.

MALE GENITALIA (Fig. 175): Segment IX very long; dorsal one-third of segment IX excised horizontally to transverse anterodorsal band; anterolateral margins produced forward in rounded lobes. Tergum X giving rise to two pairs of asymmetrical, acute spines, each with mesal spine longer and extending to apices of inferior appendages. Preanal appendages short, clavate, upright. Inferior appendages quadrate basally in lateral view, each with apicodorsal end produced in long, stout projection, distal half tapering to acute point, curving slightly mesad then caudad; apicoventral end produced in small sharp spine directed backward; two erect digitate processes arising from each half of basal plate, with one close to phallus, other near base of inferior appendage. Phallobase broad and completely fused with much narrower phallicata; phallicata generally tube-like, strongly arched downward, with longitudinal cleft on left side, its distal one-fourth divided into two slender rods crossing each other; ejaculatory duct sclerotized with apex exposed above phallicata.

FEMALE GENITALIA (Fig. 251): Segment IX dorsally fused with tergum X, with pair of seta-bearing lumps located laterally from preanal appendages; pleura IX reduced in pair of setose lobes separated from dorsum by two longitudinal furrows. Preanal appendages small triangular lobes, covered with tiny setae. Tergum X semicircular, much shorter than lamellae. Lamellae elliptical, each with apicoventral end produced in small, triangular process mesally, bearing several short, stout setae. Gonopod plate plump, broad at base; basal half with lateral edges produced outward in pair of large flanges; distal half narrowing to bilobed apex, with apicomesal portion produced in pair of flanges water-drop shaped in ventral view. Spermathecal sclerite carrying huge dorsal plate, enlarged and extending downward at anterior apex, about twice as long as broad, with pair of pits in dorsal and lateral views near anterior end.

LENGTH OF FOREWING: Male 4.7-4.8 mm, female 4.2-4.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 2a (NAU). Paratypes--104 males, 70 females, same data as holotype (NAU); 20 males, 13 females, same data as holotype (CUAC).

ETYMOLOGY: Latin, "double horn," with reference to the sclerotized and branched tergum X in the male genitalia.

DIAGNOSIS: Among males of the *Trichosetodes atichayana* Group, the male of this species is the only one with prominent asymmetrical branches of tergum X, these each being forked. It also has an extra basodorsal lobe of each inferior appendage, like that of *Ts. falcatus*, n. sp., below. The female also resembles the female of *Ts. falcatus* in the pair of lip-like processes apicomesally on the gonopod plate, surrounding a clear region, but this species has an extra pair of setose bumps on tergum IX and the lamellae are narrower in lateral view; internally there is a very large dorsal sclerotized plate evident in this species.

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

PHYLOGENY: This species probably is a member of the *Trichosetodes atichayana* Group, as evidenced by the basally erect male phallus and the pair of foliaceous processes apically

on the phallus. However, in all other species of the Group, tergum X is greatly reduced, suggesting that *Ts. bicornis* is the sister species of the rest of the Group.

Trichosetodes phylloideus, NEW SPECIES
Figs. 174, 250

DESCRIPTION: Specimens in alcohol much denuded, generally yellow brown, antennae of the *Trichosetodes atibadhrata* form (Schmid, 1987, pl. XIX, fig. 2); palpi with traces of golden brown hairs; mesonotum with lateral regions dark brown, tawny yellow between wart lines; forewings pale fuscous with traces of white and silver longitudinal streaks bordered by black hairs; hindwing fringes golden brown.

MALE GENITALIA (Fig. 174): Segment IX long ventrally, dorsal fourth (lateral view) excised such that dorsal edges of pleura horizontal, tergum very short and forming narrow transverse anterior band, acrotergite long and elevated far above rest of genitalia; in dorsal view, with 4 long setae evenly distributed on dorsum between preanal appendages; anterolateral margins of IX produced forward in rounded lobes. Tergum X fused with segment IX and having lateral arms reduced to pair of small bumps protruded from apical margin beneath preanal appendages. Preanal appendages clavate, not quite half as long as segment IX. Inferior appendages broadly foliaceous, with distal half upturned and incurved and with inner surface of dorsal regions setose; dorsobasal process of each appendage long, stout basally, tapering to acute apex in lateral view; in ventral view, sub-apicoventral margin of main body of inferior appendage produced in broad lobe. Phallobase broad and short in lateral view, fused with phallicata imperceptibly; phallicata distinctively constricted near base, with distal two-thirds divided into two foliaceous lobes, one above other: with upper lobe sinuate, angled to right side then to left side, bearing sub-apical process on its right side; lower lobe slender with acute apex sinuately directed caudad; sclerotized ejaculatory duct deviating from lower lobe one-third length of phallus.

FEMALE GENITALIA (Fig. 250): Segment IX dorsally fused with X, IXa conspicuous; apicoventral corner of pleura IX produced in pair of sub-rectangular lobes, setose, with apical margins serrate. Preanal appendages reduced to small triangular lobes located distantly on the either side of the segment. Tergum X semicircular in dorsal view. Lamellae broad at base, each with rounded apex; apicoventral end produced in large, triangular lobe curved mesad, bearing dozen stout setae. Gonopod plate bare, swollen, nearly circular, slightly broadly notched apicomesally in ventral view. Spermathecal sclerite bell-shaped, dorsally bearing highly sclerotized hood with apicodorsal margin excised in deep U-shape in dorsal view and with apicoventral margin excised in semicircle in ventral view; apex of internal part of gonopod VIII protruding slightly beyond posterior margin of gonopod plate.

LENGTH OF FOREWING: Male 4.2-4.5 mm; female 3.9-4.2 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 7b (NAU). Paratypes--2 males, 2 females, same data as holotype (NAU); 2 males, 1 female, same data as holotype (CUAC).

ETYMOLOGY: Greek, "leaf like," with reference to the shape of the male inferior appendages.

DIAGNOSIS: Among males of the *Trichosetodes atichayana* Group, the male of this species most closely resembles *Ts. atharin* Schmid, 1987, in the exposed position of tergum X in lateral view and in the shapes of segment IX and the phallus. It differs from this and all other species of the Group, however, in : (1) the basal plate of the inferior appendages is short, with its basal process clearly arising from the outer surface of the appendage; (2) the inferior appendages are simple and foliaceous; (3) the phallobase is anchored low in the genital capsule, about one-fourth of the height from sternum IX; and (4) the phallicata has the apices of its foliaceous lobes

directed downward. No females of the Group have been described previously; the female of this species has the most distinctive development of lobe IXa and the most extensive internal dorsal sclerotization of any species in the genus described so far.

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

PHYLOGENY: Like those of other species of the *Trichosetodes atichayana* Group, the male of this species has an erect basal portion of the phallus, the apical processes of the phallus are long and foliaceous, and tergum X is greatly reduced (as for all species other than *Ts. bicornis*, n. sp.). All other species of the Group have the phallus arising high in the genital chamber, suggesting that this is their sister species.

Trichosetodes falcatus, NEW SPECIES
Figs. 176, 252

DESCRIPTION: Body yellow, pair of narrow lines of white hairs running from dorsal surface of pedicel back to head; male antennae of *Ts. atibadhrata* form (Schmid, 1987, pl. XIX, fig. 2), each with terminal tuft of fine hairs on long, basal segment, prominent oval bump with short golden setae on base of first flagellum (Fig. 176J); palpi tawny, with sparse brown hairs; mesonotum tawny above, with pair of pale longitudinal lines, bearing traces of white hairs, lateral region dark brown. Forewings pale fuscous, with traces of silvery streaks and bordered by black hairs; hindwing fringes golden brown.

MALE GENITALIA (Fig. 176): Segment IX long, greatly excised posterodorsally to short tergum forming narrow transverse anterior band with two tiny papillae, each bearing 1-2 setae; acrotergite elevated far above rest of genitalia; anterior margin broadly and deeply excised at ventral half in lateral view, posterior apicoventral margin produced in pair of small triangular projections with shallow concavity between them. Preanal appendages clavate, about two-thirds as long as segment IX. Tergum X short, transverse plate with apical margin slightly produced in two triangular processes. Inferior appendages foliaceous, each with three acute apical projections, basodorsal portion densely covered with setae; upper apical angle produced in tapering finger turned upward with its dorsal edge finely serrate and curved mesad; upper basal margin protruded in a broad triangular projection with acute apex; apicoventral end produced in short acute projection asymmetrical in these inferior appendages in ventral view; basodorsal process stout, waterdrop-shaped; slender digitate process arising on basal plate with apex curved caudad. Phallobase short and broad, fused dorsally with phallicata; phallicata more slender than phallobase in lateral view, long, generally falcate, with basal one-fifth erect then gradually and broadly curved downward with longitudinal opening on its left side; distal one-fourth divided into two pieces which cross each other, each process with angled, acute apex, right piece more spiraled than left one; basal half of ventral edge of phallicata bearing fine teeth; ejaculatory duct sclerotized, with apex projecting beyond phallicata.

FEMALE GENITALIA (Fig. 252): Segment IX fused dorsally with tergum X; IXa and IXb present as three identical small bumps arranged as triangle in dorsal view; apicoventral corners of pleura IX each produced in setose, oblique lobe, laterally embracing gonopod plate. Tergum X semicircular, almost as long as lamellae. Lamellae broad rounded lobes; apicoventral ends each produced in small, triangular process curved mesad, bearing several stout setae apically. Gonopod plate plump, enlarged and forming pair of lateral concavities at basal half; distal half tapering to blunt apex with apicomesal portion produced in pair of lip-like lobes surrounding transparent area. Spermathecal sclerite with triangular outline, ventrally bearing pair of long, helical structures extending forward to anterior edge of segment VIII and with pair of ear-like flaps on either side of spermathecal process.

LENGTH OF FOREWING: Male 4.2-4.6 mm; female 3.8-4.2 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 58c (NAU). Paratypes--11 males, 3 females same data as holotype (NAU); 28 males, 2 females, Loc. 12b (NAU); 5 males, 2 females, Loc. 10c (CUAC); 6 males, 1 female, Loc. 10d (CUAC); 45 males, 83 females, Loc. 11b (NAU); 1 male, Loc. 57a,; 4 males, 1 female, Loc. 64b; 2 males, Loc. 60 (NAU).

ETYMOLOGY: Latin, "falcate," with reference to the peculiar shape of the male phallicata.

DIAGNOSIS: Among males of the *Trichosetodes atichayana* Group, the male of this species most closely resembles *Ts. atiramaniya* Schmid, 1987, in the foliaceous inferior appendages with acute apical projections. Like that of *Ts. bicornis*, n. sp., above, the male has an extra basodorsal process on each inferior appendage. However, it differs from these and all other species in the Group by having three acute apical projections on each inferior appendage and serrations on the ventral edge of the phallus. The female has only a rudimentary dorsal sclerite internally and the spermathecal sclerite has a pair of long, helical structures not seen in other species.

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

PHYLOGENY: As for males of all species in the *Ts. atichayana* Group except *Ts. bicornis* and *Ts. phylloideus*, the male phallus of this species originates high in the genital capsule, suggesting that these species are a monophyletic group. The male of *Ts. falcatus* does not share with these other species either such slender processes of the basal plate or strong posterior productions of sternum IX. For lack of other evidence, we must leave this species in an unresolved trichotomy with the two lineages that have these apparent synapomorphies.

REVISED KEY TO ADULTS OF CHINESE *TRICHOSETODES* SPECIES

[adapted from the key by Yang and Morse, 1989 (Y&M, 1989); that work must be consulted for illustrations of many characters; the female of *Trichosetodes rhamphodes* is yet unknown.]

1. Genitalia with inferior appendages and phallus (Fig. 172) ..... male, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 249) ..... female, 8

2(1). Phallus with dorsal branch short, erect, blunt apically (Y&M, 1989, fig. 21H) . ..... *Ts. insularis* Schmid, see Y&M, 1989.
2'. Phallus without dorsal branch (Figs. 173D, 173Dr) or dorsal branch long and slender (Fig. 172D) abruptly constricted sub-basally (Fig. 172D) 3

3(2). Abdominal segment X inconspicuous, its branches much shorter than preanal appendages (Figs. 174A, 174B) 4
3'. Abdominal segment X branches conspicuous, sometimes forked or serrate (Fig. 172A) 6

4(3). Apex of each inferior appendage with three acute projections, its base with two erect, setose lobes (Fig. 176A) ..... *Ts. falcatus*, n. sp., p. 182.
4'. Apex of each inferior appendage with one acute projection, its base with one (Fig. 174A) or no (Y&M, 1989, fig. 22A) apparent lobe 5

5(4'). Base of each inferior appendage with long, upright lobe (Fig. 174A) .... *Ts. phylloideus*, n. sp., p. 181.
5'. Base of each inferior appendage with setose ridge, but no long upright lobe (Y&M,

1989, fig. 22A) ..... *Ts. lasiophyllus* Yang and Morse, see Y&M, 1989.

6(3'). Branches of tergum X slender, without forks or serrations (Figs. 173A, 173B) . ..... *Ts. rhamphodes*, n. sp., p. 179.

6'. One or both branches of tergum X forked or with serrations (Figs. 172A, 174A) ... 7

7(6'). Both branches of tergum X forked near base, without ventral serrations (Figs. 175A, 175B) ..... *Ts. bicornis* n. sp., p. 180.

7'. Left branch of tergum X forked near apex, both branches with ventral serrations (Figs. 172A, 172B) ..... *Ts. serratus*, n. sp., p. 178.

8(1'). Gonopod plate without apicomesal excision (Y&M, 1989, fig. 40C); spermathecal sclerite dorsally bearing short, acute process in ventral view (Y&M, 1989, fig. 40D) 9

8'. Gonopod plate with shallow (Fig. 250C) or conspicuous (Fig. 249C) apicomesal excision; spermathecal sclerite bearing large plate dorsally (Figs. 249A, 249B, 249C) or ventrally (Figs. 252A, 252C) 10

9(8). Tergum X acute in lateral view (Y&M, 1989, fig. 39A); setose ventrolateral carinae of pleura IX larger, covering one-fourth of gonopod plate ventrally (Y&M, 1989, fig. 39C) ..... *Ts. insularis* Schmid, see Y&M, 1989.

9'. Tergum X rounded in lateral view (Y&M, 1989, fig. 40A); setose ventrolateral carinae of pleura IX smaller, covering only edges of gonopod plate ventrally (Y&M, 1989, fig. 40C) ..... *Ts. lasiophyllus* Yang and Morse, see Y&M, 1989.

10(8'). Gonopod plate with pair of lips located apicomesally surrounding clear region (Fig. 251C) 11

10'. Gonopod plate without lips or clear area (Fig. 249C) 12

11(10). Large dorsal sclerotized hood internally (Fig. 251A); spermathecal sclerite without pair of spiral structures (Fig. 251C) ..... *Ts. bicornis*, n. sp., p. 180.

11'. Dorsal sclerotized hood inconspicuous (Fig. 252A); spermathecal sclerite ventrally with pair of long spiral structures (Fig. 252C) ..... *Ts. falcatus*, n. sp., p. 182.

12(10'). Tergum X quadrate, one-third as broad as segment IX in dorsal view (Fig. 249B); gonopod plate not strongly constricted basolaterally (Fig. 249C); spermathecal sclerite with small, butterfly-shaped plate ventrally (Fig. 249C) ..... *Ts. serratus*, n. sp., p. 178.

12'. Tergum X semicircular, two-thirds as broad as segment IX (Fig. 250B); gonopod plate strongly constricted basolaterally (Fig. 250C); spermathecal sclerite without butterfly-shaped plate (Fig. 250C) ..... *Ts. phylloideus*, n. sp., p. 181.

Mystacidini Burmeister, 1838

According to Morse (1981), monophyly for this tribe is evidenced by the produced apex of sternum IX of the male genitalia (Kimmins, 1963a, Figs. 82, 84; 1963b, Figs. 56, 58). The tribe includes the two genera *Mystacides* Berthold and *Tagalopsyche* Banks (Morse, 1981). *Tagalopsyche* is known from only four species from Ethiopia, India, Java, the Philippines, and

Sumatra (Banks, 1913a; Ulmer, 1951; Kimmins, 1963a, 1963b). *Mystacides* is known from 19 species from the Holarctic and Oriental Biogeographic Regions.

LARVA: Larvae of at least eight species of Mystacidini have been described, including the seven mentioned below for the genus *Mystacides* and one species of *Tagalopsyche*: *Tagalopsyche sisyroides* Banks (Ulmer, 1955). Larvae of Mystacidini may be distinguished from those of other tribes and genera of Leptocerinae in that the hind tibia are divided into two apparent segments (as in *Setodes*, *Triaenodes*, and *Ylodes*) but these legs are not natatorial (with rows of long hairs for swimming, as for most *Leptocerus*, *Triaenodes*, and *Ylodes*).

PUPA: Pupae of at least 11 species of Mystacidini have been described, including the ten mentioned below for the genus *Mystacides* and one species of *Tagalopsyche*: *Tagalopsyche sisyroides* Banks (Ulmer, 1955). Pupae of Mystacidini and Setodini may be distinguished from those of other tribes and genera of Leptocerinae in that the sclerotized labrum, with a marginal ridge, bears two pairs of bristles sub-medially that are about as long as the labrum is wide (Ulmer, 1955). No single character is known in the pupae that will distinguish all species of these two tribes from those of all other tribes.

ADULT: Adults of the tribe may be distinguished by the following suite of characters: Wings without the peculiarities of other tribes and genera; forewings apparently with Forks I and V, Fork V rather short (originating near end of thyridial cell), thyridial cell longer than discoidal cell; hindwings apparently with Forks I and V, Fork V long (originating near middle of wing). Male genitalia with sternum IX projecting caudad in a rectangular process for which the corners often are elongate. Female genitalia with pair of long, slender preanal appendages and lamellae with slender basal stalk.

Mystacides Berthold, 1827

Mystacides Berthold, 1827: 437. Type species: *Phryganea nigra* L. (monobasic) (Fischer, 1966, not *Phryganea longicornis* L., designation of Ross, 1944).

The genus was reviewed by Yamamoto and Wiggins (1964) for North American species and by Yamamoto and Ross (1966) for world species. The species mentioned by these authors occur mostly in the Holarctic Region, with a few species recorded from the Oriental Region south to Malaya (Ross and Yamamoto, 1966). Two species previously were reported in China, including *Mystacides elongatus* Yamamoto and Ross, 1966, and *My. testaceus*. We now have additional Chinese specimens of these species and Chinese specimens of *Mystacides dentatus* Martynov, 1924a, *My. sibiricus* Martynov, 1935, and three new species, bringing to seven the number of Chinese species of *Mystacides*. Motschulsky (1850) reported *Mystacides azureus* L., 1761, from the Amur Region of Siberia, but it has not yet been found in China. Also, *My. bifidus* Martynov, 1924b, and *My. bifidus* forma *dexter* Martynov, 1924b, reported from the Amur Region and Minousinsk, respectively, of Russia, but not yet reported from China, may be synonyms of *My. sepulchralis* (Walker, 1852); this must be determined by examination of large series from the Asian and North American populations, respectively. Furthermore, our experiences with Chinese species of this genus reveal that size is variable among populations and within populations at different times of year and that teneral forms often appear in large numbers in collections, without their corresponding non-teneral forms; consequently, we suspect that European *My. concolor* Burmeister, 1839, *My. leucoptera* McLachlan, 1884, and *My. monochroa* McLachlan, 1880, are merely teneral forms of *My. longicornis*.

Fischer (1965, Preface, page iii) gave reasons for considering the genus-group name *Mystacides* to be of feminine gender, referring to the feminine use of the name by Latreille (1825). However, the International Code of Zoological Nomenclature (International Commission of

Zoological Nomenclature, 1999, 30.1.4.4.) specifies that a genus-group name ending in "*-ides* is to be treated as masculine unless its author, when establishing the name, stated that it had another gender or treated it as such by combining it with an adjectival species-group name in another gender form." Berthold (1827), who first made the name *Mystacides* available, spelled the name of the only included species in the form "*Phryganea nigra*." In the absence of a clear use of the species epithet in feminine form in combination with the name *Mystacides*, we must use masculine gender for adjectival epithets in compliance with the Code.

LARVA: Descriptions with illustrations have been published for larvae of the following *Mystacides* species:

Mystacides alafimbriatus Hill-Griffin--Hill-Griffin (1912), Yamamoto and Wiggins (1964);
My. azureus (L.)--Ulmer (1903a, 1909); Struck (1903); Silfvenius (1905); Ulmer 1909); Esben-Petersen (1916); Lestage (1919a, 1921); Hwang (1927a, 1927b); Lepneva (1928, 1940, 1966); Krawany (1935); MacDonald (1950); Hickin (1952, 1967); Steinmann (1967); Wallace (1981); Moretti (1983); Waringer and Graf (1997);
My. dentatus Martynov--Lepneva (1966);
My. sibiricus Martynov--Lepneva (1966);
My. longicornis (L.)--Klapalek (1888); Ulmer (1903a, 1909); Struck (1903); Thienemann (1905); Silfvenius (1905); Esben-Petersen (1916); Lestage, (1921); Lepneva (1928, 1932, 1940; 1966); Hickin (1953, 1967); Steinmann (1967); Wallace (1981); Moretti (1983); and Waringer and Graf (1997);
My. niger (L.)--Klapalek (1893), Ulmer (1903a, 1909, 1927), Struck (1903), Esben-Petersen (1916); Lestage (1921); Hickin (1943a, 1946, 1949, 1967); Redeke (1948); Lepneva (1966); Steinmann (1967); Wallace (1981); and Waringer and Graf (1997);
My. sepulchralis (Walker)--Krafka (1915, 1923); Lloyd (1921); Betten (1934); Ross (1944); Yamamoto and Wiggins (1964); and Wiggins (1977, 1996).
My. spp.--Ulmer (1955), Lepneva (1966)

Larvae of *Mystacides* may be distinguished from those of other Leptoceridae genera by characteristics in the key. The subdivision of the hind tarsus serves to distinguish larvae of the genus from those of *Tagalopsyche* (Ulmer, 1955).

CASE: Descriptions and illustrations of the larval case are provided in many of the works cited above. It is straight or slightly curved, consisting of sand grains, usually with added detritus such as twigs or conifer leaves which often extend well beyond the anterior and posterior ends (Lepneva, 1966; Wiggins, 1977, 1996; Wallace, 1981). The case of sister genus *Tagalopsyche*, on the other hand, resembles that of *Triaenodes* (Ulmer, 1955).

PUPA: Descriptions with illustrations have been published for pupae of at least the following species:

Mystacides alafimbriatus--Hill-Griffin (1912);
My. azureus--Silfvenius (1905), Siltala (1907), Ulmer (1909), Lestage (1921), Hickin (1949), Lepneva (1966); Steinmann (1967);
My. longicornis--Klapalek (1888), Thienemann (1904), Silfvenius (1905), Ulmer (1909), Lestage (1921), Lepneva (1966), Steinmann (1967);
My. niger--Ulmer (1909), Lestage (1921), Lepneva (1966), Steinmann (1967);
My. sepulchralis--Betten (1934), Ross (1944), Yamamoto and Wiggins (1964).

Pupae of *Mystacides* may be distinguished from those of other Leptoceridae genera by characteristics in the key. The tibial spurs are 0-2-2, rather than 1-2-2 as in most *Tagalopsyche* species and two long bristles on the leading edge of the labrum are close together, without two intervening pairs of short hairs (Ulmer, 1955).

ADULT (Ulmer, 1951; Yamamoto and Wiggins, 1964; Schmid, 1980, 1998): In addition to the characteristics mentioned in the key, adults of *Mystacides* have the following characteristics which distinguish them from those of *Tagalopsyche*: (1) The tibial spurs are 0-2-2, rather than 1-2-2, (2) the forewing has a notch on the costal margin before the apex, (3) the forewing fork of $\underline{S}_1$ and $\underline{S}_2$ (Fork I) is sessile, (4) the forewing discoidal cell is about one-third the length of the wing, (5) the forewing anastomosis is oblique, (6) in the insect at rest, the forewing apex is deflected mesad along the anastomosis, (7) the hindwing costal margin is abruptly angled before the apex, and (8) the dorsal base of the male phallus bears a high, compressed flange from its phallic shield.

HABITAT: Larvae are found in shallow lentic and lotic depositional habitats among rooted plants or on sand or silt and detritus (Lepneva, 1966; Wiggins, 1996).

Mystacides longicornis Group, Yamamoto and Ross, 1966

This Group includes four species, *My. interjectus*, *My. niger*, *My. longicornis*, and *My. sibiricus*, of which only *My. sibiricus* Martynov occurs in China. *Mystacides niger* and *My. longicornis* have been reported both from the West Palearctic Region and from the East Palearctic Region north of China (McLachlan, 1877; Martynov, 1910; Matsumura, 1911--*My. niger*; McLachlan, 1884; Martynov, 1924b, 1935; Tsuda, 1942b; Lepneva, 1949a, 1950; Mey and Dulmaa, 1985--*My. longicornis*).

Mystacides sibiricus Martynov, 1935
Figs. 18, 56, 177

Mystacides sibiricus Martynov, 1935: 207, 232-235, figs. 28-30; type = male; type repository = Zoological Institute, St. Petersburg; type locality = Lake Ivan near Chita, southcentral Russia; synonym of *Mystacides interjectus* (Banks, 1914) according to Yamamoto and Ross, 1966, but not according to Wiggins and Parker, 1997.

DESCRIPTION: According to Martynov (1935), "body black, clothed with golden-yellow hairs; antennae pale-yellow, with brown annulations; distal part uniformly brown. Legs brownish, but also clothed with short yellow pubescence; spurs blackish. Anterior wings black, clothed with golden-yellow hairs, with some interruptions; transverse black stripe placed at the middle of wing, separate black spots situated in the distal portion; indistinct blackish stripe, partly clothed with yellow hairs, is placed also in the basal part, nearer to the hind margin." The colors of our specimen, in alcohol, are not so obvious.

MALE GENITALIA (Fig. 177): Our illustrations of the male genitalia of this Chinese specimen (Fig. 177) agree well with those of Martynov (1935) and Wiggins & Parker (1997). To these, we add the following observations: (1) in dorsal view, tergum X broad and laterally angled at one-third distance from base, gradually narrower to apex with pair of apical projections about one-fifth as long as tergum X; (2) dorsal portion of each inferior appendage directed caudad, parallel with ventral lobe, but without acute projection apically; (3) apicomesal lobe of dorsal portion of each inferior appendage large, semicircular in ventral view; (4) ventral lobe of each inferior appendage narrower than dorsal portion, as long as apical projection from sternum IX, this

projection being parallel-sided and apically truncate in ventral view; (5) phallus consisting of curved tube enclosing bases of parameres and obsolete phallicata.

FEMALE GENITALIA: No Chinese specimens of females for this species are available for study. Mey and Dulmaa (1985) illustrated the female of *My. sibiricus* (as *My. interjecta*) along with those of *My. longicornis* and *My. bifidus*. Yamamoto & Wiggins (1964) illustrated *My. interjectus* (as *My. longicornis*). The three known females of the *My. longicornis* Group differ from those of other *Mystacides* species in having the apicodorsal edge of each lamella broadly incised, concave in lateral view. The apex of the lamella is more slender in *My. sibiricus* and *My. longicornis* than in *My. interjectus*; it is longer in *My. sibiricus* than in either of the other two species and directed more nearly ventrad.

LARVA: The larva of this species was described by Lepneva (1966). Lepneva (1966) distinguished the larvae of the *My. longicornis* Group (from those of other *Mystacides* species) by the presence of a "characteristic, H-shaped black pattern formed by dorsal stripes and band in posterior part of frontoclypeus; first pair of dots in anterior part of frontoclypeus large or covered by a wide, black, transverse stripe; dots of 3rd pair indistinct, small, or absent; gills present." According to her, larvae of *My. sibiricus* differ from those of *My. longicornis* and *My. niger* by having "dorsal and lateral stripes narrow, ground color predominant" rather than stripes of H-shaped pattern wide, occupying most of the dorsal surface as in the other two species of the Group. In this respect, the larva of the North American *My. interjectus* (Banks) (Denning, 1937; Ross, 1944; Yamamoto and Wiggins, 1964) more closely resembles those of *My. longicornis* and *My. niger* of Lepneva (1966). This difference confirms the opinion of Wiggins & Parker (1997) that Asian *My. sibiricus* is a distinct species from North American *My. interjectus*. Lepneva's specimens were found in lakes and calm parts of rivers.

PUPA: The pupa of *My. sibiricus* is unknown. The pupa of *My. longicornis* was described by Lepneva (1966). It is indistinguishable from that of *My. interjectus* (described by Denning, 1937), both of which have gills present and the anal rods hooked apically. The pupa of *My. sibiricus* probably is similar to these.

DIAGNOSIS: Wiggins & Parker (1997) distinguished *Mystacides interjectus* from *My. sibiricus* and *My. longicornis* as follows: "In *M. interjectus* . . .the concave ventral face of the inferior appendage is conspicuously narrowed in caudal aspect; in *M. longicornis* and *M. sibiricus*, the concave ventral face is wide, and rather uniformly so throughout. Moreover, the phallotheca in *M. longicornis* and *M. sibiricus* terminates apically in a pair of stout sclerotized hooks; these hooks are scarcely developed in *M. interjectus*."

According to Martynov (1935), the male of *My. sibiricus* differs from that of its sister species, *My. longicornis*, by broader lateral regions of tergum X in lateral and dorsal views, with division into two separate distal processes taking place nearer end of tergum; each inferior appendage with its ventral lobe not triangular, but truncate, apically and not as broad basally; each inferior appendage with its apicomesal lobe, in ventral view, very broad but more evenly rounded on the mesal margin, posterior margin not excised. Our specimen resembles Martynov's (1935) description and illustrations of *My. sibiricus* in all these diagnostic characters except that it resembles *My. longicornis* with respect to the shape of the apicomesal lobe of each inferior appendage; however, we have found this character to vary, especially with the angle by which it is viewed, and therefore do not consider it reliable. Note that Malicky's (1983) illustration for *My. longicornis* more nearly resembles Martynov's (1935) illustration for *My. sibiricus* for this character. Wiggins & Parker (1997) deferred a decision about whether *Mystacides sibiricus* Martynov and *My. longicornis* Linnaeus are distinct species pending "examination of specimens over a wide geographic range in Eurasia." Nevertheless, we tentatively accept that most of Martynov's diagnostic characters are adequate to distinguish males of *My. sibiricus* from those of *My. longicornis* and that the differences depicted by Mey and Dulmaa (1985) for females of these

species are diagnostic. Note that Uenishi (1993) reported an undescribed species resembling *My. longicornis* in Japan; this could be the same species as we describe here.

MATERIAL EXAMINED: 1 male, Loc. 34 (NAU).

DISTRIBUTION: *Mystacides sibiricus* has been reported from various locations in eastern Asia north of China (Martynov, 1935; Mey and Dulmaa 1980, 1985; Wiggins and Parker, 1997). This is the first time that this species has been reported from China (Hei-long-jiang Province).

Mystacides testaceus Group, NEW GROUP

This Group includes two species, both of which occur in China.

Mystacides absimilis Yang and Morse, 1997
Figs. 178, 253

Mystacides absimilis Yang and Morse, 1997, in Vshivkova, Morse, and Yang, 1997, p. 200, 202, pl. 133 fig. 8-12, pl. 136 fig. 4-6.

ADULTS: (Specimens in alcohol) vertex and ventral portion of thorax fusco-piceous, occiput and thoracic nota reddish-brown; antennae pale yellow with brown annulations, palpi with dense black pubescence. Wings fusco-piceous with metallic sheen. Teneral adults pale whitish yellow, thorax yellowish-brown, pale in the middle, palpi and wings white, sparsely covered with dark hairs.

MALE GENITALIA (Fig. 178): Segment IX short dorsally, long ventrally, with sternal apical process undivided, almost as long as rest of sternum, in lateral view with its base narrow then parallel-sided for most of its length to blunt apex, in ventral view narrowest in middle and truncate apically. Preanal appendages slender, curved somewhat dorsad, slightly longer than tergum X. Tergum X symmetrical, broadened in middle in lateral and dorsal views, apical quarter divided into pair of sclerotized processes connected and covered by membranes, subanal plate in phallocrypt beneath tergum. Inferior appendages each with two posterior projections and dorsomesal lobe: upper posterior projection larger, triangular, directed caudad beyond apex of lower one; lower posterior projection smaller, tooth-like, projected dorsomesad, scarcely visible from lateral view, positioned more than half the distance from the base; dorsomesal lobe broad, extending full width of dorsal portion of appendage, semicircular in dorsal view. Phallus with phallic shield having pair of ventrolateral strips articulating with basal plate of inferior appendages and having median compressed anterodorsal plate; phallobase open and membranous dorsally beyond phallic shield, narrow sub-basally, middle third strongly expanded dorsolaterad in lateral and dorsal views, black ventral sub-apical spine projecting slightly beyond apex, apex truncate in dorsal view; pair of black paramere spines each evenly tapered to sinuous apex, evenly arched over phallus, nearly as long as phallobase; phallicata not evident.

FEMALE GENITALIA (Fig. 253): Segments IX + X long dorsally, shortest at sclerotized pocket near ventropleural region; lobes IXa not evident; lobes IXb with few short inconspicuous setae on pair of small mounds. Preanal appendages long and slender and setose; lamellae very long and tall, longer than segments IX + X, narrowest basally, ventral apex with setose lip broadly projecting mesad; gonopod plates fused into single sclerite about half as long as wide, very wide and concave anteriorly, with narrow apex extending to three-fourths of lamellae, far beyond apex of lobes IXb. Spermathecal sclerite shaped as pair of human lungs, with pair of elliptical structures between it and gonopod plates, visible in ventral view.

LENGTH OF FOREWING: male 7.3 mm, female 7.4 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 76b (NAU). Paratypes--6 males, 16 females, same data as holotype (NAU); 4 males, 4 females, same data as holotype (CUAC).

ETYMOLOGY: Latin, "not alike," emphasizing the differences between this species and *My. testaceus*.

DIAGNOSIS: This species resembles *My. testaceus* in the reddish-brown color of the dorsum of the head and thorax in both males and females and in details of the male genitalia. The male of the species is unlike that of *My. testaceus* in that sternum IX and its apical process are relatively longer, the lower posterior projection of each inferior appendage is less conspicuous in lateral view and is positioned beyond the middle of the appendage, the black ventral sub-apical spine of the phallobase is longer, positioned more nearly apically, and thus extends slightly beyond the apex of the phallobase, and the paramere spines are more evenly curved and tapered to the apex.

Females of the *Mystacides testaceus* Group have a distinct projection on the apicoventral portion of each lamella. The presumed female of *My. absimilis* is unlike that of *My. testaceus* in the broad tergum X with shallow apicomesal excision and the presence of setose mounds (IXb), and the much longer fused gonopod plates, extending beyond lobes IXb and to three-quarters of the lamellae.

DISTRIBUTION: Known from only the type locality in southeastern Sichuan Province.

Mystacides testaceus Navás, 1931
Figs. 75, 179, 254

Mystacides testacea Navás, 1931: 8, fig. 16; holotype gender = female; type deposition = Heude Museum [now in the insect collections of the Institute of Zoology, Academia Sinica); type locality = "Zô-Sè," near Shang-hai, Jiang-su Province at Loc. 54.

ADULTS: According to Navás (1931a, from Latin), "head testaceous, vertex completely fuscous, with testaceous hairs; eyes fuscous; palps black, with dense black hairs; antennae fuscous, with base of segments silver (mostly missing). Thorax testaceous, bright, *sublaevis* [meaning of "*sublaevis*" is unknown]. Abdomen fuscous, with fuscous hairs; with upper cerci of the male long and broad, with ventral margins concave, upper margin beyond middle angled, apex acute below. Legs fuscous, with fuscous hairs, middle tarsi with white rings. Apex of wing elliptical, with veins, pubescence, and fringe fuscous. Forewing membrane colored fuscous, pubescence strongly iridescent blue, discoidal cell long, longer than its pedicel; apical fork 1 short, much shorter than discoidal cell, fork 5 broad, scarcely longer than fork 1. Hindwing membrane colored lighter fuscous, more distinct in apical third, veins well visible; apical fork 1 short, more than three times shorter than its pedicel, fork 5 broad, penetrating slightly basad of the division of the radial sector." [translated by Dr. R.R. McGregor, Clemson University]

The caption for Navás' (1931a) fig. 16 reads (from Latin), "*Mystacides testacea* Nav. ♂ Hind wing. Mus. Heude."

Contrary to his description and figure caption, Navás' (1931a) holotype is actually a female. Consequently, the following is the first description of the male of the species. To help stabilize the nomenclature of the species in the genus, currently based mostly on male genitalia, we also designate a male allotype below.

MALE GENITALIA (Fig. 179): Segment IX short dorsally, longest ventrally, sternum about half as long as segment is tall; apical process of sternum IX single, setose, about two-thirds as long as remainder of sternum, its basal stalk about half as wide as apex, distally rounded and slightly incised in ventral view, blunt in lateral view. Preanal appendages slender, slightly longer than tergum X. Tergum X symmetrical, broadened in middle in lateral and dorsal views, apical

third divided into pair of sclerotized processes connected and covered by membranes, subanal plate in phallocrypt beneath tergum. Inferior appendages each with two posterior projections and dorsomesal lobe: upper posterior projection about same size as lower one, triangular, directed caudad to about level of apex of lower one; lower posterior projection tooth-like, projected dorsomesad, clearly visible from lateral view, positioned about one-third of distance from base; dorsomesal lobe broad, extending full width of dorsal portion of appendage, semicircular in dorsal view. Phallus with phallic shield having pair of ventrolateral strips articulating with basal plate of inferior appendages and having median compressed anterodorsal plate; phallobase open and membranous dorsally beyond phallic shield, narrow sub-basally, middle third strongly expanded dorsolaterad in lateral and dorsal views, then constricted in dorsal view before expanded and rounded apex, short black ventral spine situated about two-thirds distance from base; pair of black paramere spines each abruptly tapered near sinuous apex, nearly straight basally then curved from about middle, ending well before apex of phallobase; phallicata not evident.

FEMALE GENITALIA (Fig. 254): Segments IX + X long dorsally, shortest at sclerotized pocket near ventropleural region; region IXa not differentiated; lobes IXb bare, tiny; pair of sub-apical flanges present below IXb in dorsal view. Preanal appendages long, slender and setose. Lamellae long and tall, narrowest basally, ventral apex with slender setose projection directed ventromesad; gonopod plates fused into single sclerite about half as long as wide, very wide and narrowly incised anteromedially, with apex extending merely to middle of lamellae and to same level of lobes IXb. Spermathecal sclerite lung-shaped, with pair of waterdrop-shaped structures between sclerite and gonopod plates, visible in ventral view.

LENGTH OF FOREWING: male 7.7 mm, female 7.2 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: ALLOTYPE, MALE, Loc. 50 (NAU), about 225 km northwest of the holotype locality.

ADDITIONAL MATERIAL EXAMINED: 62 males, 33 females, same data as allotype; 2 males, 2 females, same data as neotype (CUAC); 5 males, 4 females, Loc. 3 (NAU); 1 female, Loc. 7 (NAU); 8 males, Loc. 45b (NAU); 3 males, 2 females, Loc. 46 (NAU).

DIAGNOSIS: This species resembles *My. absimilis* in the reddish-brown color of the dorsum of the head and thorax in both males and females and in details of the male genitalia. The male of the species is unlike that of *My. absimilis* in that sternum IX and its apical process are relatively shorter, the lower posterior projection of each inferior appendage is more conspicuous in lateral view and is positioned only about one-third distance from the base of the appendage; the black ventral sub-apical spine of the phallobase is shorter, positioned closer to the middle of the phallobase, and thus extending far short of the apex of the phallobase; and the paramere spines are more abruptly curved and tapered, not reaching the apex of the phallobase.

The female of the species is unlike that of *My. absimilis* in the bare, papilla-like lobes IXb; the presence of paired small, ventral sub-apical flanges; and the much shorter fused gonopod plates, not extending to the apices of lobes IXb and only to the middle of the lamellae.

DISTRIBUTION: Known from several locations in Jiang-su Province and An-hui Province in southeastern China.

Mystacides sepulchralis Group, Yamamoto and Ross, 1966

This Group includes North American *Mystacides alafimbriatus* (Fig. 184D), *My. sepulchralis* (Fig. 186D, 186Dd), and possibly also Asian *My. bifidus* (Fig. 185D) and *My. bifidus dexter*, if these latter two are not synonyms of *My. sepulchralis*. Among these, *My. sepulchralis* (and/or *My. bifidus* and/or *My. bifidus dexter*), presently reported from Siberia, may eventually be found in China.

Mystacides azureus Group, Yamamoto and Ross, 1966

Within this Group of eight Oriental and Palearctic species, only *My. dentatus*, *My. elongatus*, *My. pristinus*, and *My. superatus* occur in China, the others occurring either north (*My. azureus*), west (*My. indicus* and *My. khasicus*), or south (*My. sandersoni*) of China.

Mystacides dentatus Martynov, 1924b
Fig. 180

Mystacides dentata Martynov, 1924b: 65, 70, 75, 82, 89-92, figs. 3a-b; holotype = male; type repository = probably Zoological Institute, St. Petersburg; type locality = Lake Tiberkul, Minoussinsk.

Mystacides dentata forma *brevispinata* Martynov, 1924b: 89.

Mystacides dentata Martynov; Lepneva (1949a, 1966), Kimmins (1963b), Yamamoto and Ross (1966).

ADULTS: According to Martynov (1924b), "antennae pale yellowish-brown with broad white annulations in the basal half; basal joint dark yellowish; palpi clothed with blackish hairs. Coxae dark brown, femora and tibiae pale brownish with whitish hairs; intermediate tarsi white, brown at the tips of the joints; anterior and posterior tarsi brown, the bases of the joints whitish; abdomen fuscous. Anterior wings as in *My. azureus*, but somewhat brown or fuscous with steel-blue reflection; posterior wings smokey grey; fringes dark grey."

MALE GENITALIA (Fig. 180): Segment IX short dorsally, long ventrally, apical process of sternum with short, wide base and with longer, slender, arms widely diverging basally, gradually curved slightly mesad, rounded apically. Preanal appendages very long and slender. Tergum X terminating in two spines: sinuous left spine about 1.5 times as long as right spine and crossing beneath it. Inferior appendages each with long dorsomesal lobe directed dorsad and concave on anterior surface and with three caudal projections: apicodorsal projection and middle projection widely separated on opposite ends of caudal carina, ventromesal projection close to middle projection in lateral view. Phallus without evident paramere spines or phallicata, apicoventral lip of phallobase straight-sided and rounded apically in dorsal view, narrow in lateral view and with pair of sharp sub-apicoventral flanges.

LENGTH OF FOREWING: male 7.1 mm.

LARVA: According to Lepneva (1949b, 1966), the fully grown larva is 8-9 mm,

> "main color of head light yellow; dots distinct, pinkish brown; stripes and spots absent or indistinct, in contrast to *My. azureus*. Anterior pair of the six dots on frontoclypeus large, with a dark transverse connection, even in dark specimens; second pair smaller than first; pale third pair indistinct; the group in posterior part formed by a row of four dots and 3 fused dots anterior to them; lateral dots smaller than median dots, sometimes absent. Dorsal stripes narrow, pinkish anteriorly, represented posteriorly by three large, distinct, brownish dots along frontal sutures; two rows of similar dots on each side on light background along coronal suture; lateral stripes replaced by three rows of distinct dots; ventral surface with six small dots on each side near occipital foramen. Gula brownish. Pronotum and mesonotum whitish, lighter than head. Pronotum with an indistinct, white stripe separating anterior angle; posterior margin grayish, narrow laterally, reddish brown. Median and lateral stripes of mesonotum

indistinct, pale grayish. Dots and setae as in *My. azureus*. Legs as in *My. azureus*; distal spots of hind tibia and tarsus reddish brown, larger than in *My. azureus*. Gills absent. Tergite of segment IX with a pinkish brown area; setae situated at whitish margin, as in *My. azureus*. Anal legs as in *My. azureus*, area 'b' with distinct, pinkish brown, dorsal dots."

CASE:
"Straight, slightly tapering posteriorly, made of small, usually flat, pieces of detritus and sand grains, often with platelets of mica, with large pieces of detritus, small rods, or conifer needles projecting at both ends."

FEMALE AND PUPAL STAGES: Unknown.

DIAGNOSIS: The male of this species resembles those of *My. elongatus* and *My. sandersoni* very closely in the general shape of the inferior appendages and the phallus. However, in this species, (1) the apical process of sternum IX is shaped much differently in our specimen, with a shorter and wider base and more slender lateral arms more widely divergent basally then curving slightly mesad to blunt apices (However, Martynov's crude drawing suggests that his specimen more nearly resembles *My. elongatus* and *My. sandersoni* in this character.), (2) the right process of tergum X is generally much shorter than the left process (Martynov's *My. dentatus brevispinatus* has the left spine about as short as the right one, but never is it as short as in *My. sandersoni*.), (3) the relative distance between apicodorsal and middle projections of each inferior appendage is greater than in *My. elongatus*, and (4) the apicoventral lip of the phallobase is straight-sided and rounded apically in dorsal view, rather than constricted sub-apically as in *My. elongatus* (Fig. 181Dd).

Lepneva (1966) characterized larvae of the *My. azureus* Group as having a head pattern primarily of dots, without a black H-shaped pattern of stripes and band in posterior part of frontoclypeus. She further distinguished *My. dentatus* from *My. azureus* and an unknown species in the Group by the fact that in *My. dentatus* the head pattern consists of dots only, without dark areas, and these dots are small, but distinct, and of a pinkish color.

MATERIAL EXAMINED: 1 male, Loc. 31 (NAU).

DISTRIBUTION: Previously reported from Minoussinsk and the Altai Mountains of southcentral Russia by Martynov (1924b) and Lepneva (1949a, 1966) and from northern Myanmar by Kimmins (1963b), we report it here for the first time from China (Hei-long-jiang Province).

Mystacides elongatus Yamamoto and Ross, 1966
Figs. 181, 255

Mystacides elongata Yamamoto and Ross, 1966: 630-632, figs. 3A-E; holotype = male; type repository = Harvard Museum of Comparative Zoology; type locality = Taiyong, East Guangdong, Guangzhou Province, China (Loc. 14)

ADULTS: According to Yamamoto and Ross (1966), this species and *My. sandersoni* have "dorsum of head, thorax, and abdomen dark brown; frontal area of head, mouthparts and antennae straw colored; legs and wings brownish yellow."

MALE GENITALIA (Fig. 181): Segment IX short dorsally, long ventrally, apical process of sternum with short, wide base and with lateral arms each about half as wide as base, diverging at right angle from base, straight, slightly tapering to blunt apex. Preanal appendages very long and slender. Tergum X terminating in two spines: left spine about as long as sinuous right spine and crossing beneath it (Fig. 181B; crossing over it in Yamamoto and Ross' specimen), or form of

spines reversed in mirror image in other specimens. Inferior appendages each with long dorsomesal lobe directed dorsad and concave on anterior surface and with three caudal projections: apicodorsal projection and middle projection variously moderately separated on opposite ends of caudal carina, ventromesal projection variably close to middle projection in lateral view. Phallus without evident paramere spines or phallicata, apicoventral lip of phallobase abruptly constricted and rounded apically in dorsal view, narrow in lateral view and with pair of sharp sub-apicoventral flanges.

FEMALE GENITALIA (Fig. 255): Segments IX + X longest dorsally; lobes IXa not evident; lobes IXb projecting slightly beyond midlength of preanal appendages, apex with pair of rounded lobes separated by shallow rounded excision in dorsal view; preanal appendages (lobes IXc) slender, setose, less than half as long as lamellae; lamellae (IXd) very long, each with elliptical apical half twice as broad as basal half, mesal surface and distal margin with short fine setae, dorsal margin slightly inflated in lateral view, apicoventral edge thickened, concave laterally, convex mesally. Gonopod plates proximate apicomesally. Spermathecal sclerite triangular; sclerites associated with spermathecal sclerite projecting caudally beyond gonopod plates to middle of lamellae, apically with two pairs of lateral lobes and acute mesal triangular projection.

LENGTH OF FOREWING: Male 6.6 mm, female 6.6 mm.

IMMATURE STAGES: Unknown.

DIAGNOSIS: The male of this species resembles those of *My. dentatus* and *My. sandersoni* very closely in the general shape of the inferior appendages and the phallus. However, in this species, (1) the apical process of sternum IX is shaped more nearly like that of *My. sandersoni* than that of *My. dentatus*; i.e., the apical process of sternum IX has a short, wide base and lateral arms each about half as wide as the base, diverging at a right angle from each other at the base, straight, each tapering to a blunt apex. (2) The right and left processes of tergum X are about the same length (Fig. 181B). (3) The relative distance between apicodorsal and middle projections of each inferior appendage is not as great as in *My. dentatus* and *My. sandersoni*. (4) The apicoventral lip of the phallobase is abruptly constricted sub-apically in dorsal view although there are some variations of this character.

The known females of the *Mystacides azureus* Group have lamellae that are very long, more nearly rounded apically in lateral view, rather than boot-shaped, and especially concave on the lower lateral surface. The female of *My. elongatus* differs from that of *My. superatus* primarily by the narrower apex of the gonopod plates and narrower sclerites associated with the spermathecal sclerite.

MATERIAL EXAMINED: 1 female, Loc. 10c (NAU); 1 male, 1 female, Loc. 11b (NAU); 1 male, 3 females, Loc. 23 (NAU); 1 male, 3 females, Loc. 25 (NAU); 3 males, Loc. 53 (CUAC); 6 males, 5 females, Loc. 58c (NAU); 1 male, 4 females, Loc. 67b (CUAC); 1 male, 1 female, Loc. 68 (NAU); 10 males, 19 females, Loc. 76c (NAU); 3 males, 2 females, Loc. 77 (CUAC); 1 male, Loc. 78b (NAU); 2 males, 1 female, Loc. 86 (NAU); 1 male, Loc. 88b (NAU); 3 males, Loc. 102 (NAU).

DISTRIBUTION: Previously known from only the type locality in Guang-dong Province. We now know it also from Fu-jian, Gui-zhou, Jiang-su, Jiang-xi, Si-chuan, Yun-nan, and Zhe-jiang Provinces.

Mystacides pristinus, NEW SPECIES
Fig. 182

ADULTS: Head and thorax black, antennae pale yellow with brown annulations, palpi with dense black hairs, forewings fusco-piceous with metallic sheen; body and wing covered with dark brown hairs.

MALE GENITALIA (Fig. 182): Segment IX short dorsally, long ventrally, apical process of sternum with short wide base and very short, rudimentary arms. Preanal appendages only half as long as those of other species, slightly dilated at middle. Tergum X with basal half broad and hood-like, distal half divided into four asymmetrical pieces: each lateral process short and broad and right lateral process hooked mesad, mesal processes twice as long as lateral processes and forming pair of stout, sinuate spines of about equal length except right mesal process slightly shorter and with slightly more pronounced mesal bulge near middle. Inferior appendages each with dorsal margin rounded in lateral view, not forming distinct angle apicodorsally, with two acute caudal projections, both short and close to each other, more or less pointed at each other; dorsomesal lobe long, directed dorsad, less then one-third as broad as inferior appendage in lateral view. Phallus broad, cylindrical, with apical portion abruptly reduced to shallow trough recurved ventrad and cephalad, with pair of acute sub-apicoventral flanges and with 2-3 small spines along ventromesal line at two-thirds distance from base; without evident paramere spines or phallicata.

LENGTH OF FOREWING: Male 6.2 mm.

FEMALE AND IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 37b (NAU).

ETYMOLOGY: Latin, "primitive," with reference to the primitive ventral process of sternum IX, division of tergum X, and ventral structure of phallus.

DIAGNOSIS: The male of this species is distinguished from those of others of the *My. azureus* Group in that tergum X has two well developed lateral processes in addition to two long mesal processes, the phallus has both median ventral spines and sub-apicolateral spines, and the posterior process of sternum IX is very short.

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

Mystacides superatus, NEW SPECIES
Figs. 183, 256

ADULTS: Vertex and thorax dark brown, antennae pale yellow brown, with brown annulations, palpi with dense dark brown hairs. Wings fuscus with very weak metallic sheen. Body and wings covered with hairs same color as sclerites.

MALE GENITALIA (Fig. 183): Segment IX short dorsally, posterior margin obliquely extended ventrad to long sternum; sternal apical process large, Y-shaped, slightly longer than rest of sternum, with each arm truncate apically and about as broad as short pedicel. Preanal appendages especially long, slender, and straight. Tergum X with distal half produced in pair of asymmetrical spines, evenly slender in dorsal view, with one spine two times as long as shorter spine and curved evenly over or beneath it. Inferior appendages each with posterodorsal projection extremely elongated, broad at base, tapering to acute apex extending almost as far as to apex of sternal process; lower projection stout at base with acute point reaching to midlength of dorsal projection; dorsomesal lobe moderately long, directed dorsad, less then one-third as broad as inferior appendage in lateral view. Phallus cylindrical at basal half with distal half trough-like; apicoventral lip of phallobase narrow in lateral view, abruptly constricted in ventral view and with pair of sharp sub-apicoventral flanges each with its base arising clearly sub-apically.

FEMALE GENITALIA (Fig. 256): Segment IX longest ventrally. Preanal appendages slender, straight. Tergum IX+X trapezoidal; subanal plate (d.i.gon.IX, Nielsen, 1980) with bilobed apex, projecting beyond tergum X. Lamellae each three times as long as middle width, with dorsal edge sub-parallel to the ventral edge in lateral view; in ventral view, each apicoventral end broadly protruded but not forming distinctive triangular lobe. Gonopod plate nearly square, apical margin broadly trilobed with pair of sub-apicoventral flanges laterally. Spermathecal sclerite triangular, with pair of sclerotized semicircular structures on each side.

LENGTH OF FOREWING: Male 8.3 mm, female 7.0 mm.

IMMATURE STAGES: Unknown.

TYPE MATERIAL: Holotype MALE, Loc. 73b (NAU). Paratypes--2 males, 3 females, same data as holotype (NAU); 5 males, 4 females, Loc. 78b (NAU); 2 males, 2 females, Loc. 78b (CUAC); 8 males, 3 females, Loc. 30 (NAU).

ETYMOLOGY: Latin, "above," with reference to the extraordinarily long posterior projection of each inferior appendage in the male genitalia.

DIAGNOSIS: This species closely resembles *Mystacides indicus* and *My. khasicus* from India, but differs from them in that (1) the dorsal projection of each inferior appendage is three times as long as its basal width and (2) the apicoventral process of each inferior appendage is as long as the width of the appendage in lateral view.

DISTRIBUTION: Known from only the type localities in southcentral and mideastern China.

KEY TO ADULTS OF CHINESE *MYSTACIDES* SPECIES

(Females of *Mystacides dentatus* and *My. pristinus* remain unknown.)

1. Genitalia with inferior appendages and phallus (Fig. 177) ..... males, 2
1'. Genitalia with lamellae and internal spermathecal sclerite (Fig. 253) ..... females, 8

2(1). Tergum X symmetrical (Fig. 177B); apicomesal lobe of each inferior appendage as broad as appendage (Figs. 178A, 178B, 178Ec); posterior process of sternum IX truncate (Fig. 178C) or with small mesal excision (Fig. 179C) 3
2'. Tergum X asymmetrical (Fig. 180B); apicomesal lobe of each inferior appendage slender (Fig. 185El), parallel-sided, posterior process of sternum IX deeply forked (Fig. 180C) 5

3(2). Thorax reddish brown; apex of tergum X covered with membranes and without obviously free apical lobes (Fig. 178B); phallus with dark ventromedian spine (Fig. 178D) 4
3'. Thorax black; apex of tergum X with a pair of short free spines (Fig. 177B); phallus without ventral spines (Fig. 177D) ..... *Mystacides sibiricus* Martynov, p. 188.

4(3). Ventral spine of phallus arising sub-apically (Fig. 178D); paramere spines evenly tapering to tips (Fig. 178D) ..... *Mystacides absimilis* Yang and Morse, p. 190.
4'. Ventral spine of phallus arising at mid distance (Fig. 179D); apices of paramere spines, beak-shaped (Fig. 179D) ..... *Mystacides testaceus* Navás, p. 191.

5(2'). Tergum X divided into four pieces (Fig. 182B); phallus with both apical flanges and ventromedian spines (Fig. 182D) ..... *Mystacides pristinus*, n. sp., p. 195.
5'. Tergum X divided into two pieces (Fig. 180B); phallus with ventromesal spines vestigial or absent (Fig. 180D) 6

6(5'). Apicodorsal process on posterior margin of each inferior appendage extending caudad almost to end of posterior process of sternum IX (Fig. 183A) ..... *Mystacides superatus*, n. sp.. p. 196.
6'. Apicodorsal process on posterior margin of each inferior appendage much shorter than sternum IX process, about as long as apicoventral process of appendage (Fig.

180A) 7

7(6'). Distance between two dorsal points on posterior margin of each inferior appendage three-fourths as long as appendage in lateral view (Fig. 180A); phallus not constricted sub-apically from dorsal view (Fig. 180Dd) .....
..... *Mystacides dentatus* Martynov, p. 193.

7'. Distance between two dorsal points on posterior margin of each inferior appendage half as long as appendage in lateral view (Fig. 181A); phallus constricted sub-apically in dorsal view (Fig. 181Dd) .....
..... *Mystacides elongatus* Yamamoto and Ross, p. 194.

8(1'). Lamellae each with ventral apex broadly rounded (Figs. 255A, 256A) 9

8'. Lamellae each with ventral apex acute (Figs. 253A, 254A) 11

9(8). Lamellae each with subapicodorsal edge concave (Mey and Dulmaa, 1985, fig. 18A) ..... *Mystacides sibiricus* Martynov, p. 188.

9'. Lamellae each with subapicodorsal edge convex (Figs. 255A, 256A) 10

10(9'). Distal portion of gonopod plate forming pair of sub-triangular sclerotized, brown plates (Fig. 255C); apical margin with pair of narrow finger-like projections (Fig. 255C) ..... *Mystacides elongatus* Yamamoto and Ross, p. 194.

10'. Gonopod plate nearly square, with pair of posterior pockets (Fig. 256C); apical margin produced dorsally in short, broad trilobed process (Fig. 256C) .....
..... *Mystacides superatus*, n. sp., p. 196.

11(8'). Lamellae each with apicoventral end produced in broadly rounded lobe in ventral view (Fig. 253C); spermathecal sclerite longer than wide(Fig. 253C) .....
..... *Mystacides absimilis* Yang and Morse, p. 190.

11'. Lamellae each with apicoventral end produced in small, triangular process in ventral view (Fig. 254C); spermathecal sclerite with its length subequal to its width (Fig. 254C) ..... *Mystacides testaceus* Navás, p. 191.

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EXPLANATION OF FIGURES

Fig. 1. Map of collection sites in China, with Chang-jiang (Yang-tze) and Huang (Yellow) Rivers indicated. The sites are named in the text beginning on page 11.

Figs. 2-38: Larval structures.

Fig. 2. Head of *Athripsodes cinereus* Curtis, right lateral view; redrawn from Wallace, 1981, fig. 16.

Fig. 3. *Ceraclea* (*C.*) *alboguttata* (Hagen), dorsal view (A), case with larva, ventral view; redrawn from Tsuda, 1954, fig. 1.

Fig. 4. Mesonotum and metanotum of *Triaenodes volda* Mosely, dorsal view; redrawn from StClair, 1994, fig. 22G.

Fig. 5. Head of *Triplectides australis* Morse and Neboiss, right lateral view; redrawn from StClair, 1990, fig. 2.35A.

Fig. 6. Mesonotum and metanotum of *Triplectides australis* Morse and Neboiss, dorsal view; redrawn from StClair, 1994, fig. 17G.

Fig. 7. Case of *Triplectides magnus* Walker, lateral view; redrawn from Ulmer, 1955, fig. 282.

Fig. 8. Case of *Triplectides magnus* Walker, lateral view; redrawn from Ulmer, 1955, fig. 284.

Fig. 9. Case of *Triplectides magnus* Walker, lateral view; redrawn from Ulmer, 1955, fig. 285.

Fig. 10. Mesonotum of *Athripsodes cinereus* Curtis, dorsal view; redrawn from Lepneva, 1966, fig. 712B.

Fig. 11. Mesonotum of *Mystacides sibiricus* Martynov, dorsal view; redrawn from Lepneva, 1966, fig. 769.

Fig. 12. Ventral apodeme of *Athripsodes cinereus* Curtis, ventral view; redrawn from Lepneva, 1966, fig. 711B.

Fig. 13. Case of *Athripsodes bilineatus* Linnaeus, lateral view; Hickin, 1968, fig. 801.

Fig. 14. Ventral apodeme of *Ceraclea* (*A.*) *excisa* (Morton), ventral view; redrawn from Lepneva, 1966, fig. 718C.

Fig. 15. Case of *Ceraclea* (*A.*) *excisa* (Morton), lateral view; redrawn from Lepneva, 1966, fig. 723.

Fig. 16. Head of *Oecetis ochracea* Curtis, front view; redrawn from Wallace, 1981, fig. 27.

Fig. 17. Right mandible of *Oecetis ochracea* Curtis, dorsal view; redrawn from Lepneva, 1966, fig. 800B.

Fig. 18. Maxillary palpi of *Mystacides interjectus* (Banks), ventral view; redrawn from Yamamoto and Wiggins, 1964, fig. 7.

Fig. 19. Left mandible of *Ceraclea excisa*, ventral view; redrawn from Resh, 1976, fig. 43 (as *C. misca*).

Fig. 20. Mesothoracic leg of *Leptocerus* sp.; redrawn from Ulmer, 1955, fig. 147.

Fig. 21. Case of *Leptocerus tineiformis* Curtis; redrawn from Lepneva, 1966, fig. 795.

Fig. 22. Mesothoracic leg of *Setodes incertus* Walker; redrawn from Merrill & Wiggins, 1971, fig. 2b.

Fig. 23. Ventral apodeme of *Parasetodes tumbanus* Marlier, ventral view; redrawn from Marlier, 1962, fig. 91.

Fig. 24. Metathoracic leg of *Parasetodes tumbanus* Marlier; redrawn from Marlier, 1958, fig. 1D.

Fig. 25. Ventral apodeme of *Mystacides sibiricus* Martynov, ventral view; redrawn from Lepneva, 1966, fig. 768B.

Fig. 26. Metathoracic leg, tibia, tarsus and claw of *Mystacides longicornis* Linnaeus, posterior view; redrawn from Lepneva, 1966, fig. 760.

Fig. 27. Metathoracic leg of *Trichosetodes imperfectus* Ulmer; redrawn from Ulmer, 1955, fig. 117.

Setodes incertus (Walker)

Fig. 28. Posterior end of *Triaenodes tardus* Milne, ventral view; redrawn from Morse and Holzenthal, 1996, fig. 18.108. Triaenodes tardus Milne

Fig. 29. Posterior end of *Nectopsyche* sp., ventral view; redrawn from Morse and Holzenthal, 1996, fig. 18.109.

Fig. 30. Metathoracic leg of *Triaenodes bicolor* Curtis, posterior view; redrawn from Wallace, 1981, fig. 116.

Fig. 31. Cross section of the tibia of metathoracic leg of *Triaenodes bicolor* Curtis; redrawn from Wallace, 1981, fig. 118.

Fig. 32. Case of *Ylodes conspersus* Rambur; redrawn from Wallace, 1981, fig. 135.

Fig. 33. Case of *Mystacides sibiricus* Martynov, lateral view; redrawn from Lepneva, 1966, fig. 771.

Fig. 34. Metathoracic leg of *Adicella contorta* Marlier; redrawn from Marlier, 1962, fig. 94B.

Fig. 35. Case of *Adicella filicornis* Mosely, lateral view; redrawn from Wallace, 1981, fig. 133.

Fig. 36. Head and thorax of *Setodes incertus* Walker, dorsal view; redrawn from Merrill and Wiggins, 1971, fig. 1.

Fig. 37. Head and thorax of *Setodes stehri* Ross, dorsal view; redrawn from Merrill and Wiggins, 1971, fig. 12.

Fig. 38. Case of *Setodes argentipunctellus* McLachlan, lateral view; redrawn from Wallace, 1981, fig. 134.

Figs. 39-58: Pupal structures.

Fig. 39. Warts of segmental IX of *Triplectides magnus* Walker, lateral view; redrawn from StClair, 1987, fig. 3.16C.

Fig. 40. Labrum of *Oecetis ochracea* Curtis, dorsal view; redrawn from Lepneva, 1966, fig. 805A.

Fig. 41. Left mandible of *Ceraclea* (*A.*) *excisa* (Morton), ventral view; redrawn from Lepneva, 1966, fig. 724.

Fig. 42. Mandible of *Parasetodes tumbana* Marlier; redrawn from Marlier, 1962, fig. 100H.

Fig. 43. Labrum of *Mystacides longicornis* Linnaeus, ventral view; redrawn from Lepneva, 1966, fig. 763A.

Fig. 44. Right mandible of *Mystacides longicornis* Linnaeus, ventral view; redrawn from Lepneva, 1966, fig. 763B.

Fig. 45. Labrum of *Ceraclea* (*A.*) *annulicornis* (Stephens), dorsal view; redrawn from Lepneva, 1966, fig. 730A.

Fig. 46. Labrum of *Triaenodes conspersus* Rambur, dorsal view; redrawn from Lepneva, 1966, fig. 781A.

Fig. 47. Left mandible of *Oecetis ochracea* Curtis, ventral view; redrawn from Lepneva, 1966, fig. 805B.

Fig. 48. Right mandible of *Athripsodes cinereus* Curtis, ventral view; redrawn from Silfvenius, 1905, fig. 15e.

Fig. 49. Labrum of *Athripsodes cinereus* Curtis, dorsal view; redrawn from Silfvenius, 1905, fig. 15d.

Fig. 50. Anal rod of female *Athripsodes cinereus* Curtis, lateral view; redrawn from Silfvenius, 1905, fig. 15f.

Fig. 51. Anal rod of male *Athripsodes cinereus* Curtis, dorsal view; redrawn from Silfvenius, 1905, fig. 15g.

Fig. 52. Anal rod of male *Ceraclea* (*A.*) *excisa* (Morton), dorsal view; redrawn from Lepneva, 1966, fig. 726.

Fig. 53. Labrum of *Oecetis singularis* Ulmer, dorsal view; redrawn from Ulmer, 1955, fig. 141.

Fig. 54. Anal rods of *Leptocerus tineiformis* Curtis, dorsal view; redrawn from Ulmer, 1955, fig. 151.

Fig. 55. Labrum of *Leptocerus neavei* Mosely, dorsal view; redrawn from Marlier, 1962, fig. 100F.
Fig. 56. Abdominal hook plates and anal rods of *Mystacides interjectus* (Banks), dorsal view; redrawn from Yamamoto and Wiggins, 1964, fig. 9.
Fig. 57. Labrum and mandible of *Trichosetodes handschini* Ulmer, ventral view; redrawn from Ulmer, 1955, fig. 127.
Fig. 58. Wing of *Trichosetodes imperfectus* Ulmer; redrawn from Ulmer, 1955, fig. 123.

Figs. 59-79. Adult structures.
Fig. 59. Fore- and hindwings of *Triplectides quadratus*, n. sp.
Fig. 60. Fore- and hindwings of *Triaenodes unanimis* McLachlan.
Fig. 61. Forewing of *Triaenodes pellectus* Ulmer.
Fig. 62. Fore- and hindwings of *Adicella tridigitata*, n. sp.
Fig. 63. Basal segment of right antenna of *Triaenodes bilobatus*, n. sp., mesal view.
Fig. 64. Left mesopleuron of *Ceraclea* (*A.*) *tarsipunctata* (Vorhies); redrawn from Ross, 1944, fig. 741.
Fig. 65. Left mesopleuron of *Mystacides sepulchralis* (Walker); redrawn from Ross, 1944, fig. 739.
Fig. 66. Fore and hindwings of *Parasetodes maculatus* (Banks).
Fig. 67. Fore and hindwings of *Leptocerus biwae* (Tsuda).
Fig. 68. Fore and hindwings of *Leptocerus sakantaka* Schmid; redrawn from Schmid, 1987, fig. 80.
Fig. 69. Fore and hindwings of *Ceraclea* (*A.*) *kolthoffi* (Ulmer).
Fig. 70. Vertex of head of *Athripsodes aterrimus* Stephens; redrawn from Morse, 1975, fig. 21.
Fig. 71. Maxillary palp of *Athripsodes cinereus* Curtis; redrawn from Morse, 1975, fig. 23.
Fig. 72. Vertex of *Ceraclea* (*C.*) *transversa* (Hagen); redrawn from Morse, 1975, fig. 22.
Fig. 73. Maxillary palp of *Ceraclea* (*A.*) *tarsipunctata* (Vorhies); redrawn from Morse, 1975, fig. 24.
Fig. 74. Fore and hindwings of *Oecetis ochracea* Curtis.
Fig. 75. Fore and hindwings of *Mystacides testaceus* Navás.
Fig. 76. Fore and hindwings of *Setodes pulcher* Martynov.
Fig. 77. Fore and hindwings of *Trichosetodes lasiophyllus* Yang and Morse.
Fig. 78. Basal antenna of *Setodes scleroideus* n. sp., left lateral view of left antenna.
Fig. 79. Base of left antenna of *Trichosetodes lasiophyllus* Yang & Morse, left lateral view.

Figs. 80-186. Male genitalia, wings, and antennae:
A = left lateral view of genitalia.
A' = left lateral view of genitalia showing tergum VIII.
B = dorsal view of genitalia.
B' = dorsal view of genitalia, omitting preanal appendages and upper process of tergum X.
C = ventral view of genitalia.
Cc = caudal view of apex of phallus.
D = left lateral view of phallus.
Dd = dorsal view of phallus.
De = expanded lateral view of phallus.
Dr = right lateral view of phallus.
Dv = ventral view of phallus.
Ec = caudal view of left inferior appendage.
El = lateral view of left inferior appendage.
Er = lateral view of right inferior appendage.

Ev = ventral view of inferior appendage.
Evp = ventral view of basoventral process of inferior appendage.
F = forewing.
Fa = anastomosis of forewing.
Gd = dorsal view of segment X.
Gl = lateral view of segment X.
H = hindwing.
J = base of antenna.
The following figures were redrawn from the sources indicated:
Fig. 83 from Navás, 1936, fig. 90;
Fig. 84 from Schmid, 1950, figs. 99-101;
Fig. 93 from Ulmer, 1932, fig. 29;
Fig. 119 from Schmid, 1965, figs. 7-8;
Fig. 121 from Schmid, 1959, figs. 10-12;
Fig. 123 from Ulmer, 1932, figs. 32-33.

Figs. 187-256. Female genitalia and hindwing:
A = left lateral view of female genitalia.
B = dorsal view of female genitalia.
C = ventral view of female genitalia.
D = ventral view of spermathecal sclerite.
E = left lateral view of genital chamber as seen through wall of segment IX.
H = hindwing.
The following figures were redrawn from the sources indicated:
Fig. 213 from Navás, 1931, fig. 17;
Fig. 214 from Schmid, 1950, fig. 135.

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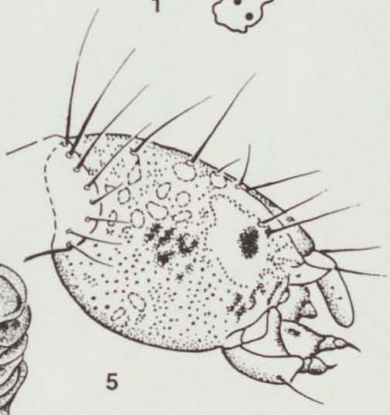

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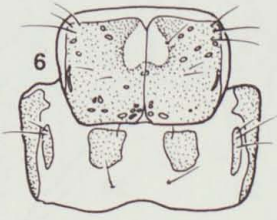

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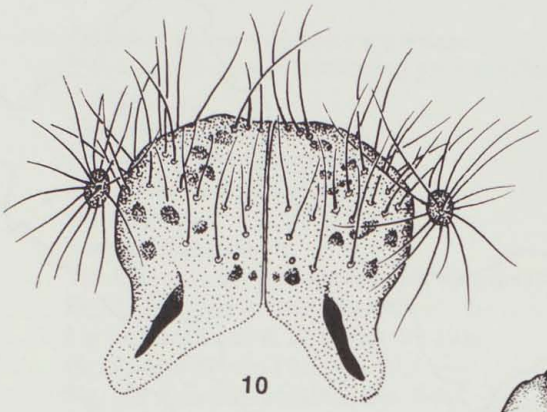

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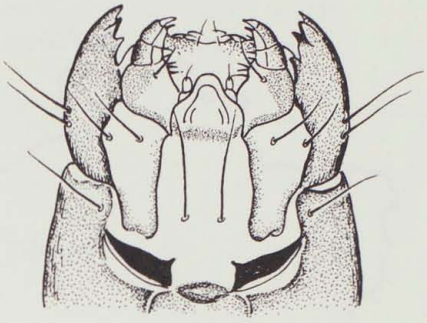

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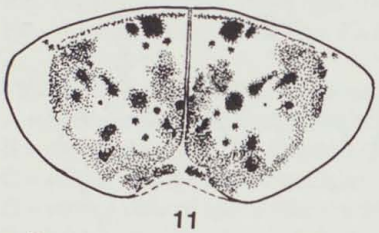

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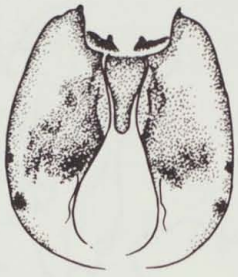

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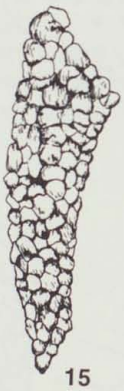

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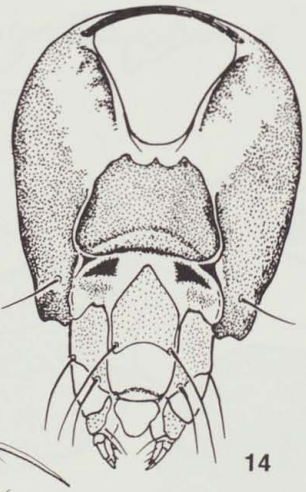

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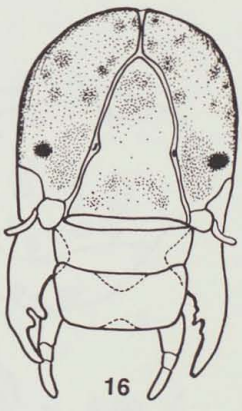

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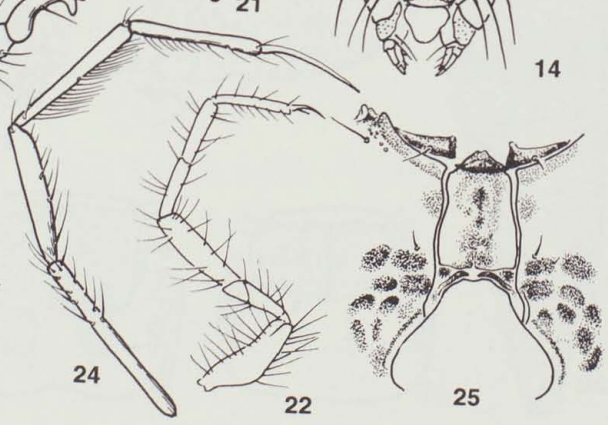

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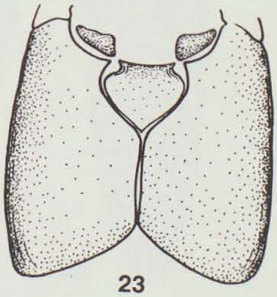

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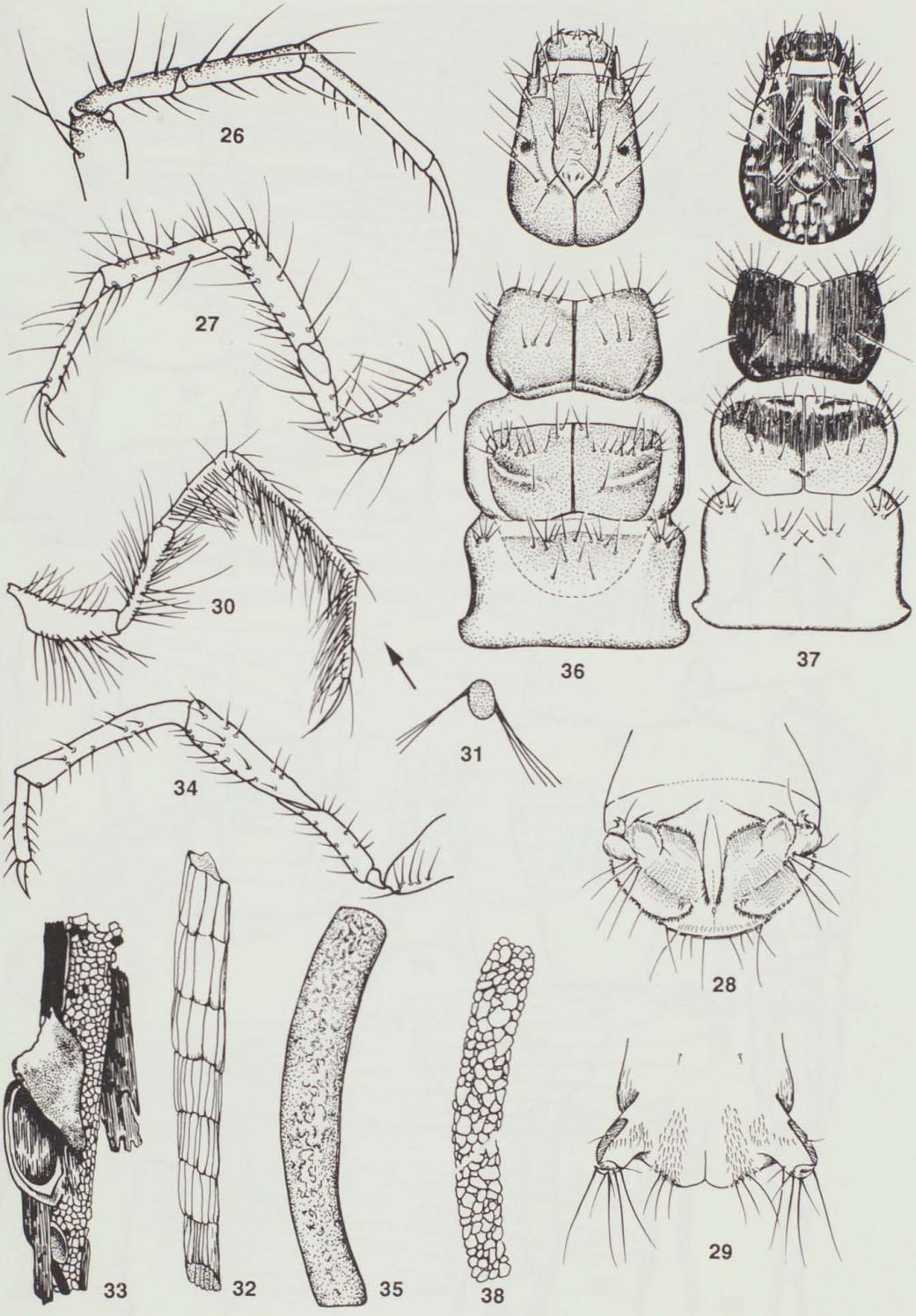
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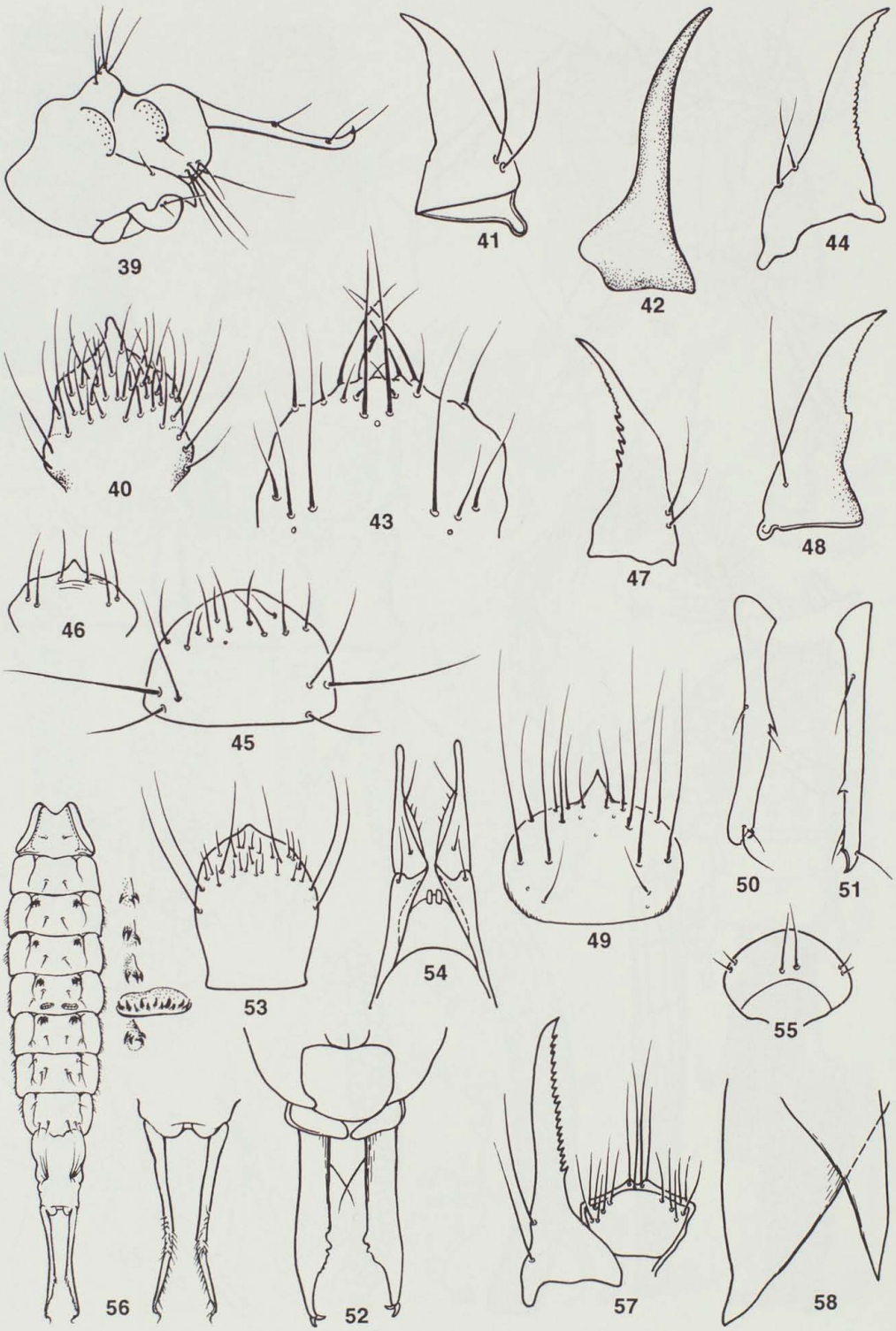
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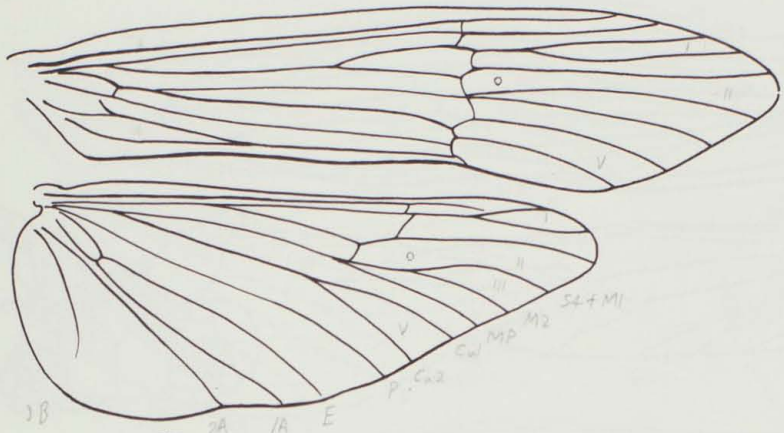

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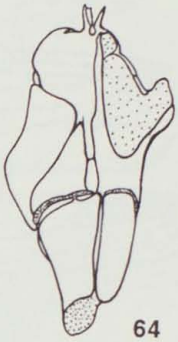

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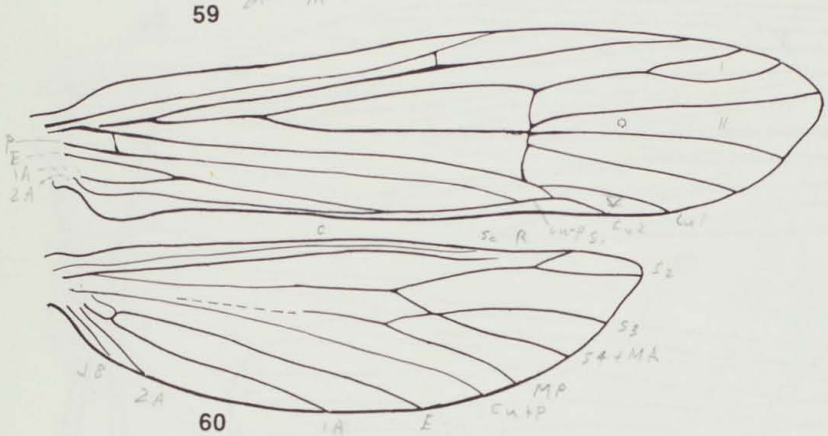

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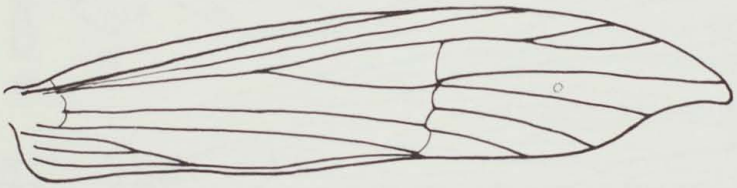

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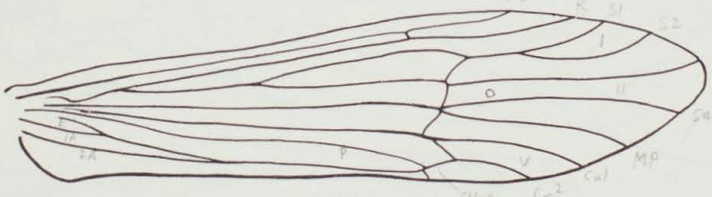

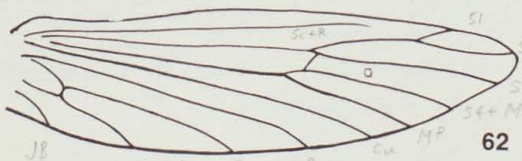

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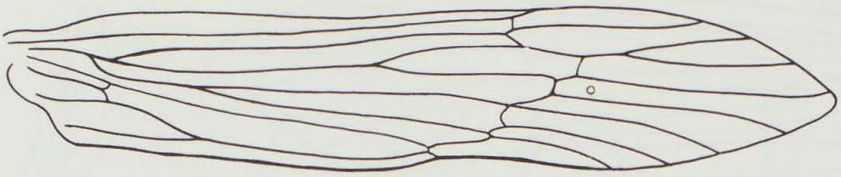

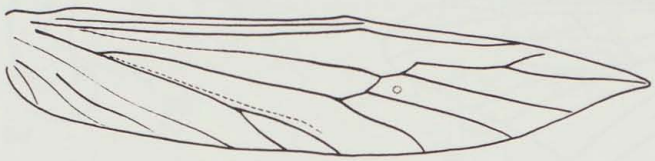

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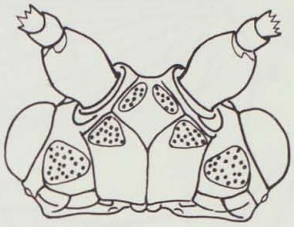

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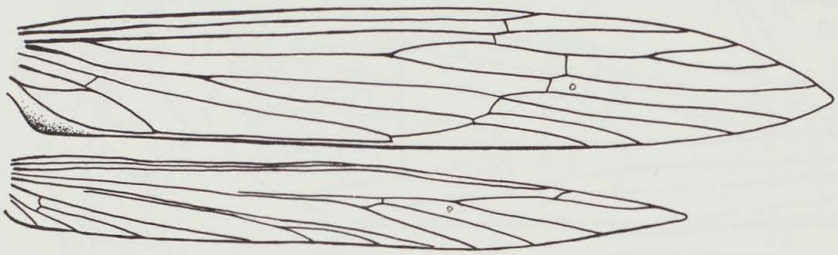

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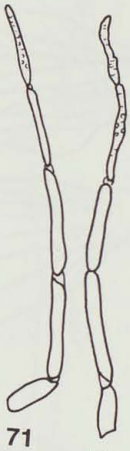

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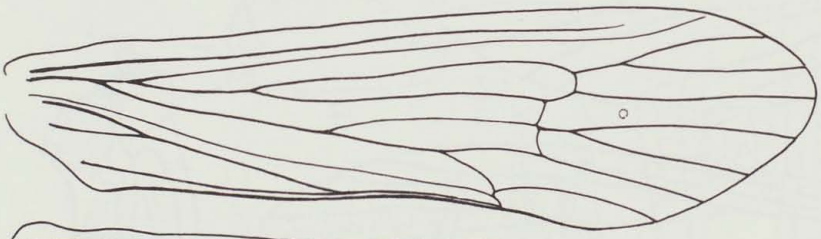

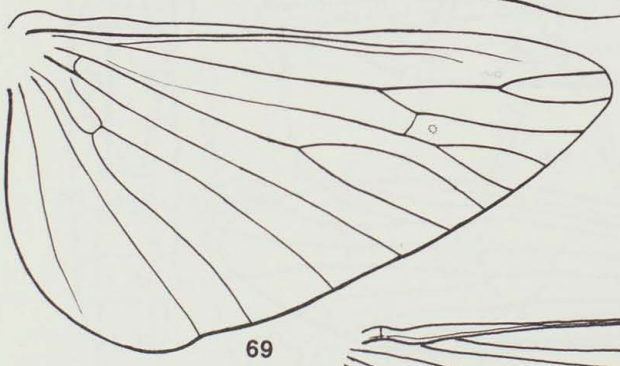

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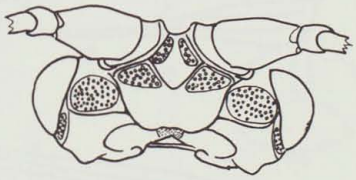

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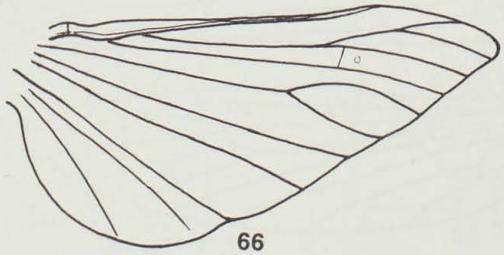

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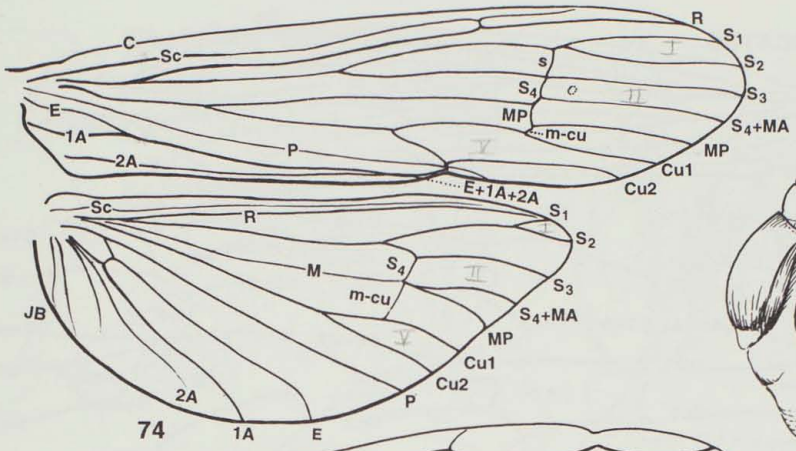

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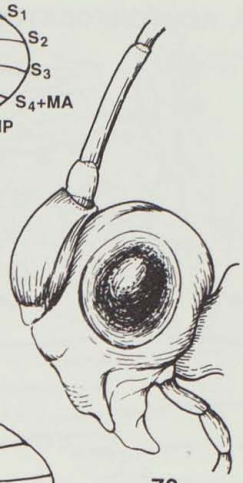

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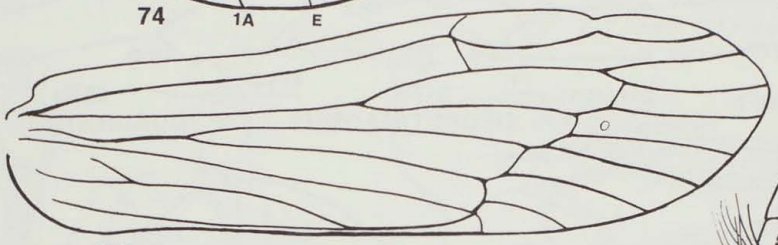

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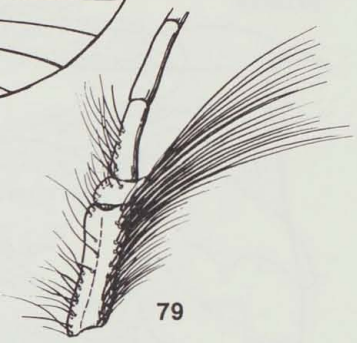

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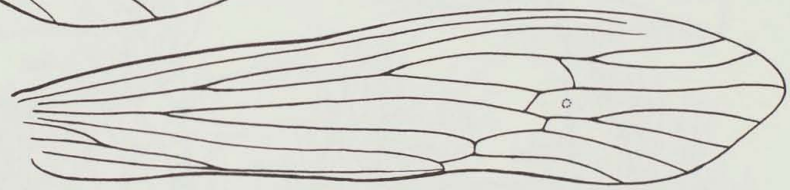

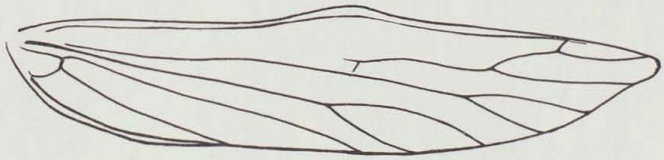

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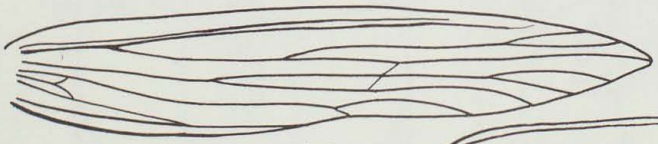

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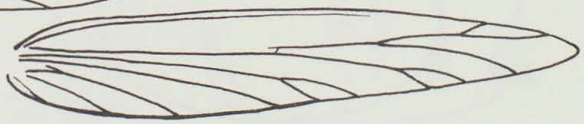

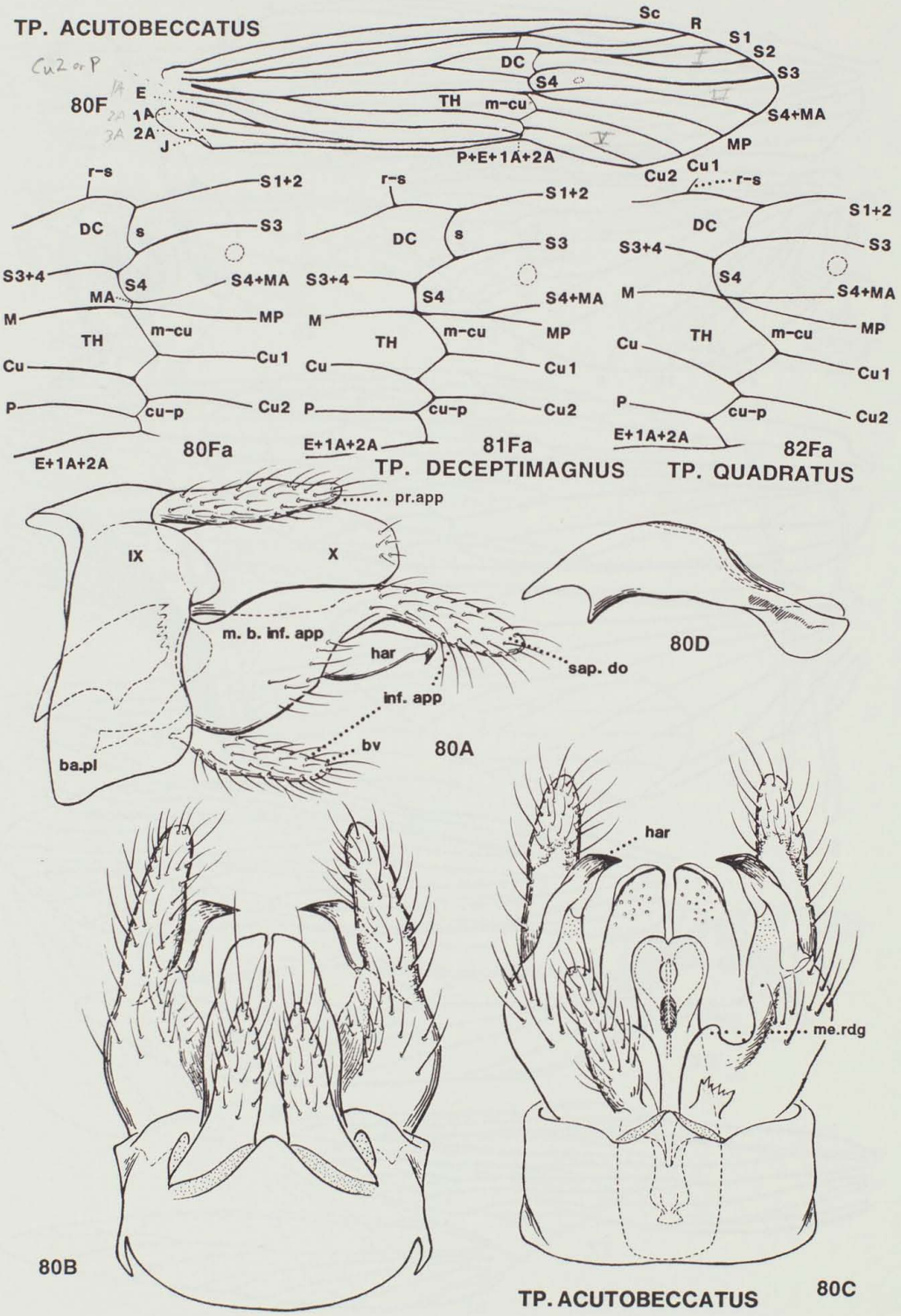
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S4
MA
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Cu
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cu-p
E+1A+2A
80Fa
81Fa
82Fa
TP. DECEPTIMAGNUS
TP. QUADRATUS
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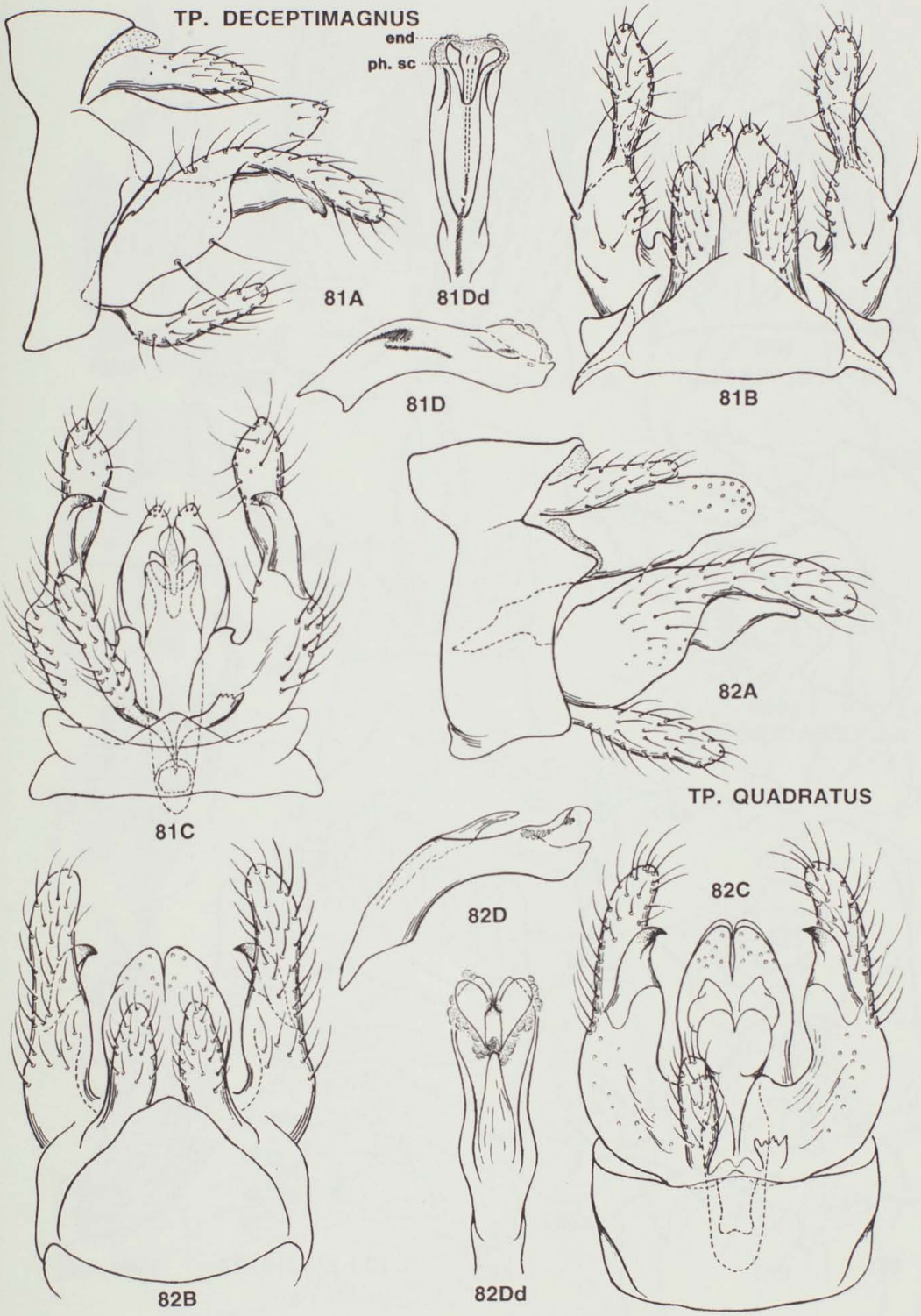
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ph. sc
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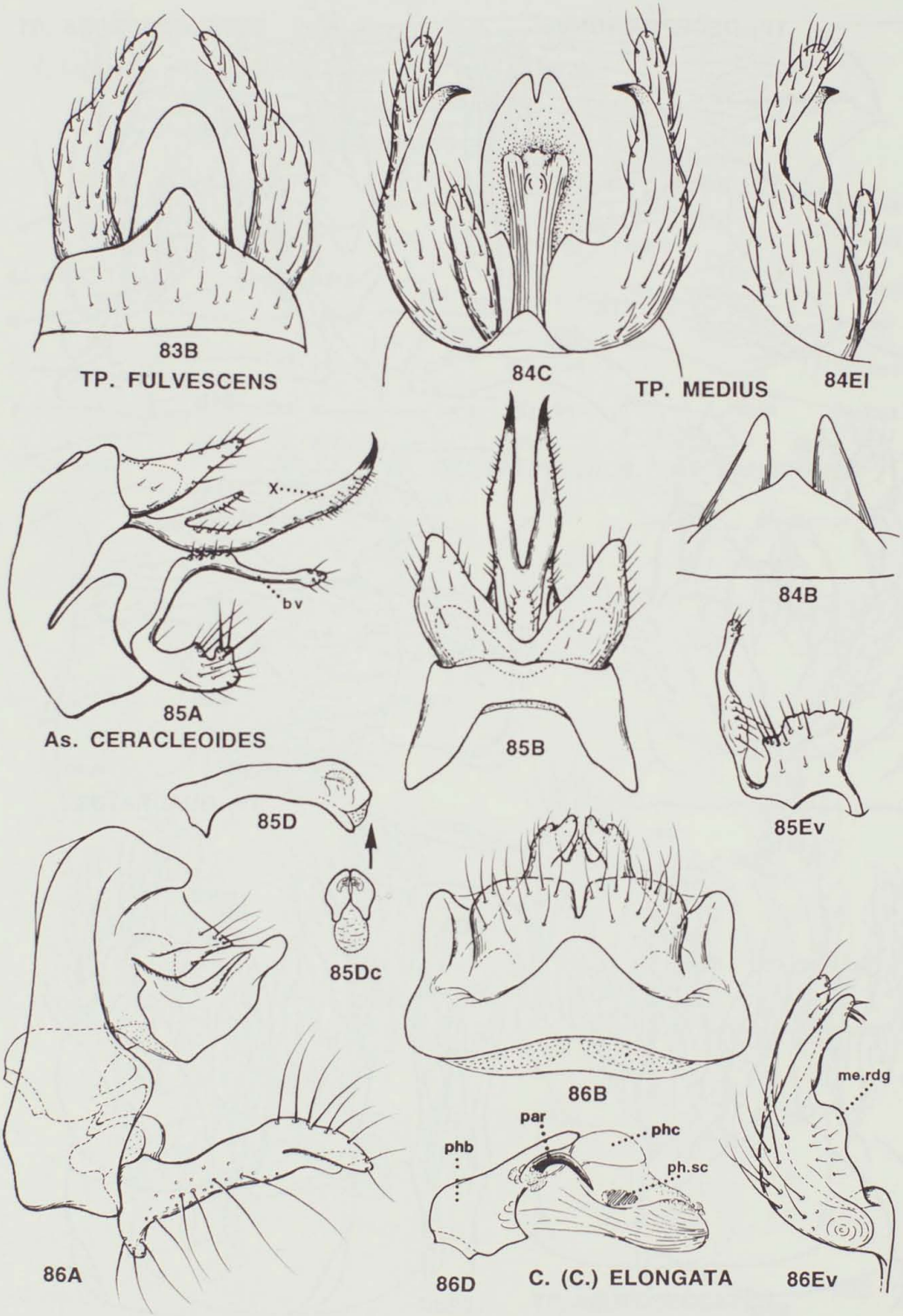
82Dd


83B
TP. FULVESCENS
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TP. MEDIUS
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X
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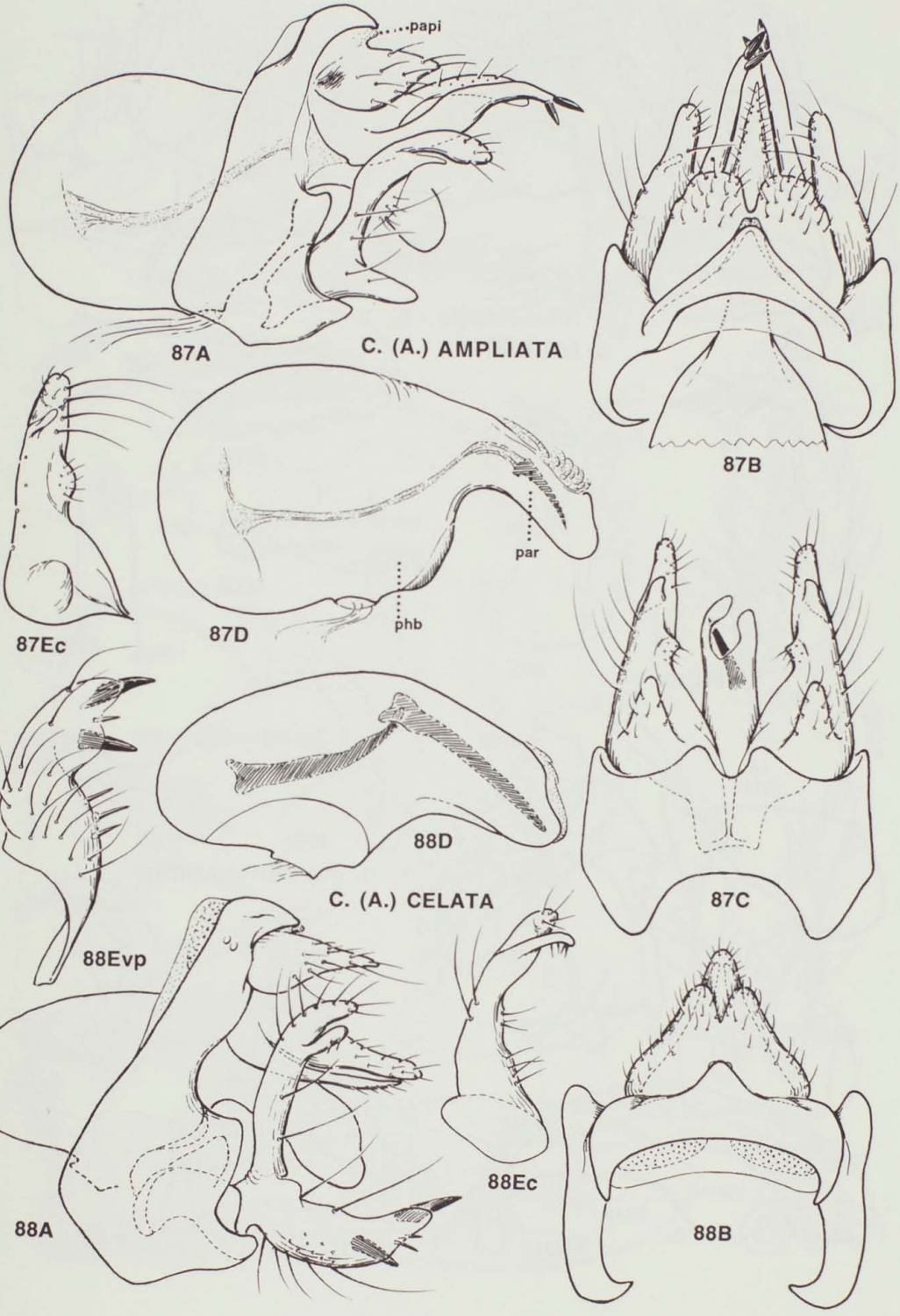
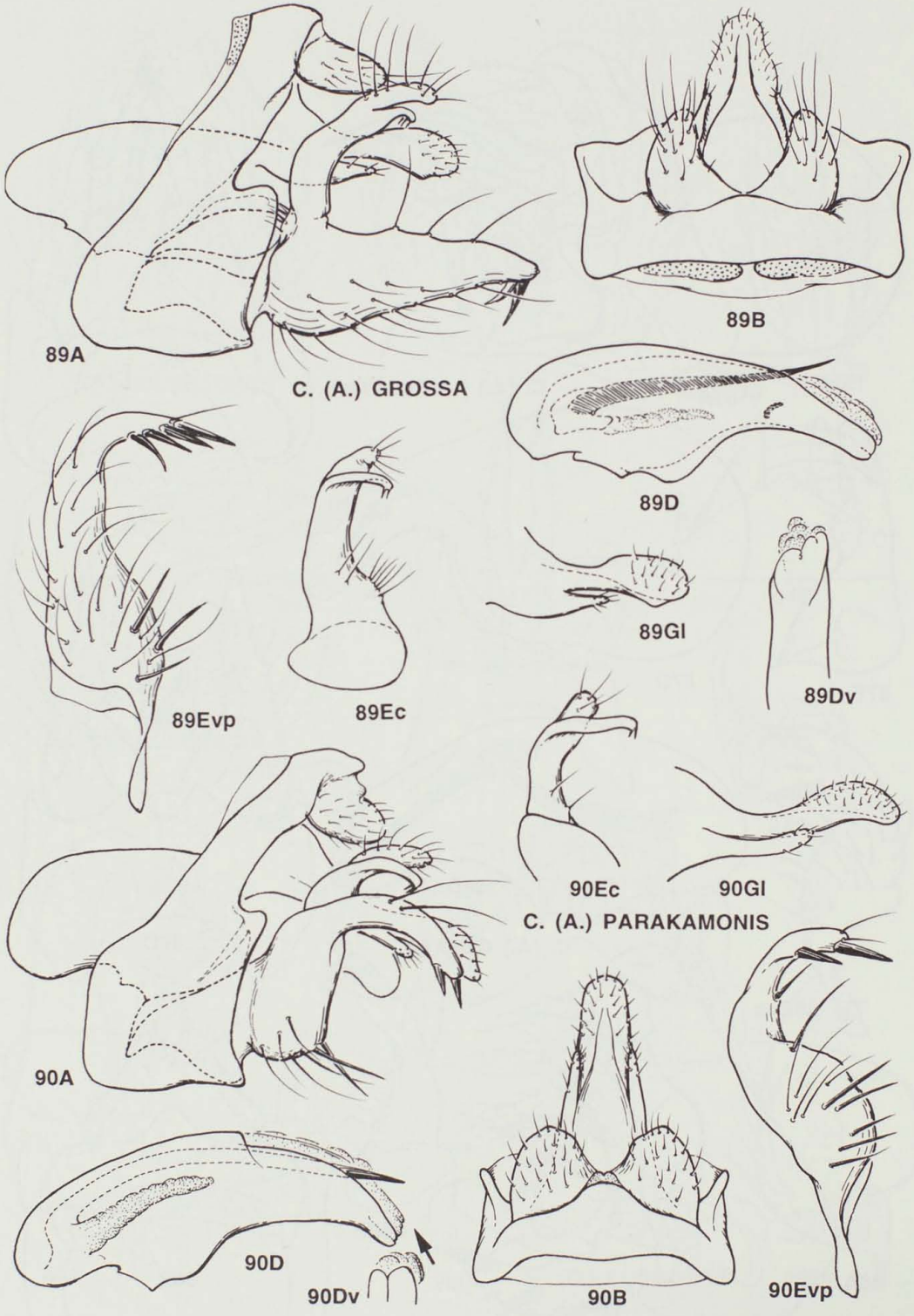
As. CERACLEOIDES
85B
85Ev
85D
85Dc
86B
me.rdg
par
phc
phb
ph.sc
86A
86D
C. (C.) ELONGATA
86Ev


papi
87A
C. (A.) AMPLIATA
87B
87Ec
87D
par
phb
87C
88D
C. (A.) CELATA
88Evp
88A
88Ec
88B


89A
89B
C. (A.) GROSSA
89D
89GI
89Dv
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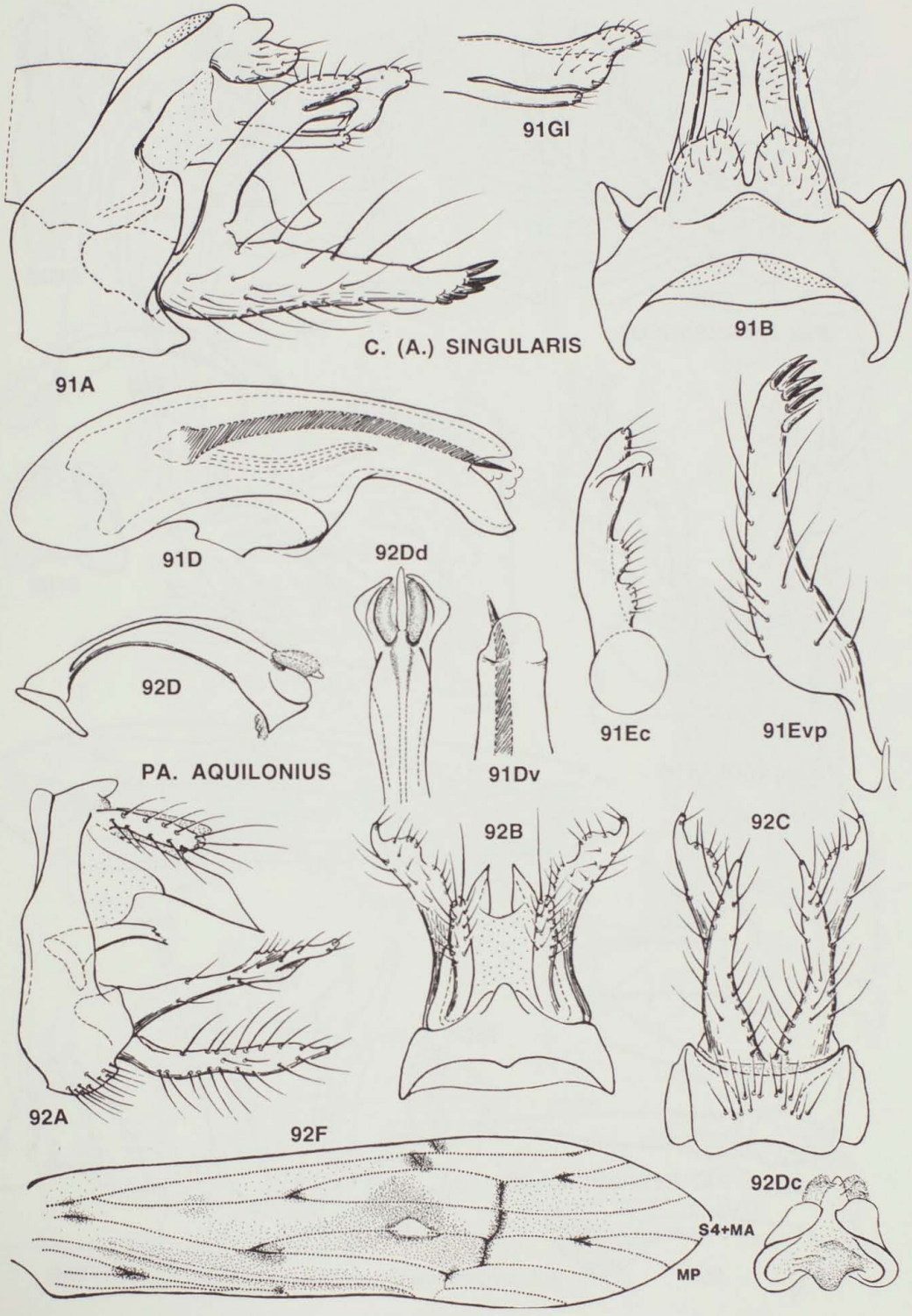
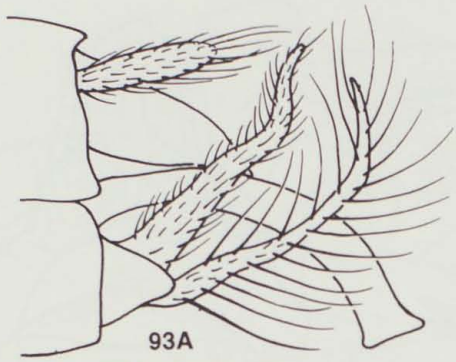
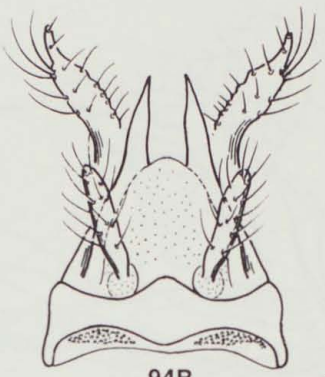
89Ec
90Ec
90GI
C. (A.) PARAKAMONIS
90A
90D
90Dv
90B
90Evp


91Gl
91B
C. (A.) SINGULARIS
91A
91D
92Dd
91Ec
91Evp
92D
91Dv
PA. AQUILONIUS
92B
92C
92A
92F
92Dc
S4+MA
MP



93A

PA. KIANGSINICUS



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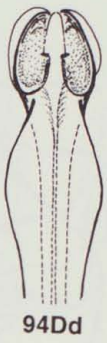

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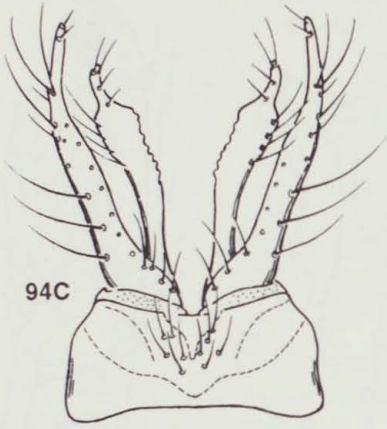

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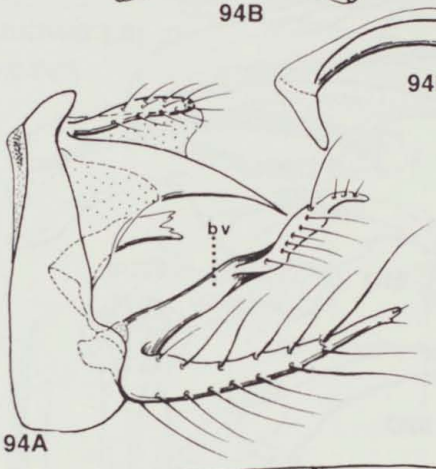

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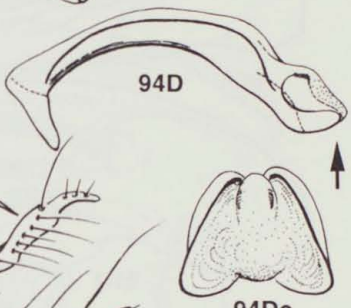
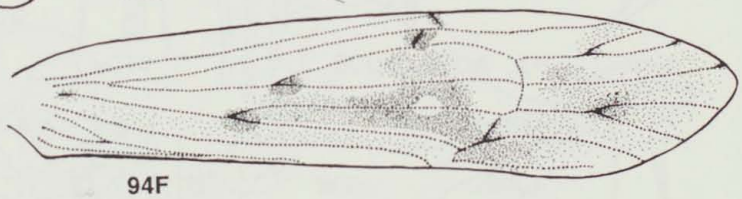
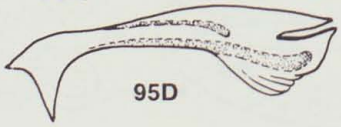


PA. MACULATUS

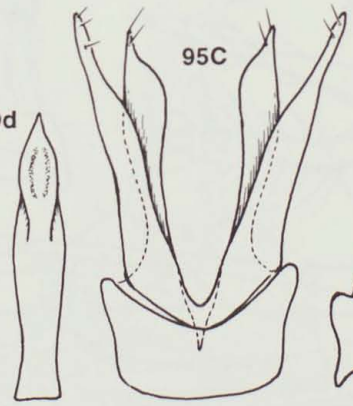


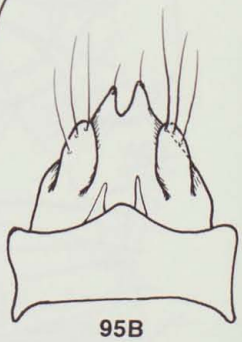
94F

95A PA. RESPERSELLUS



95D

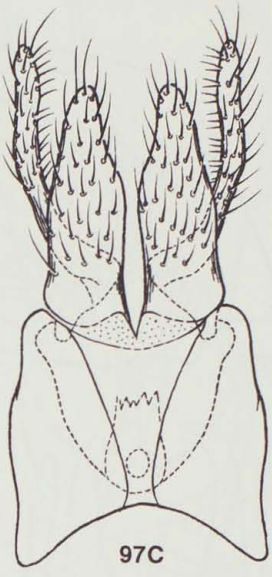




95B

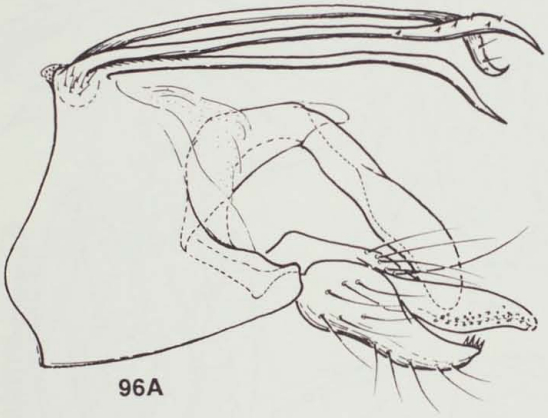
96B

96C



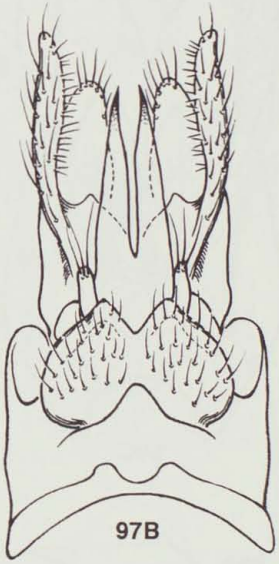
97C

LP. SENARIUS

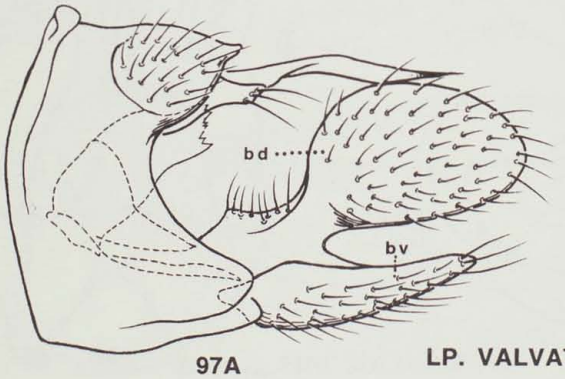


96A

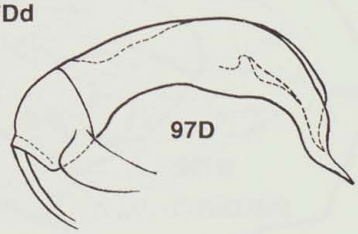
97Dd



97B

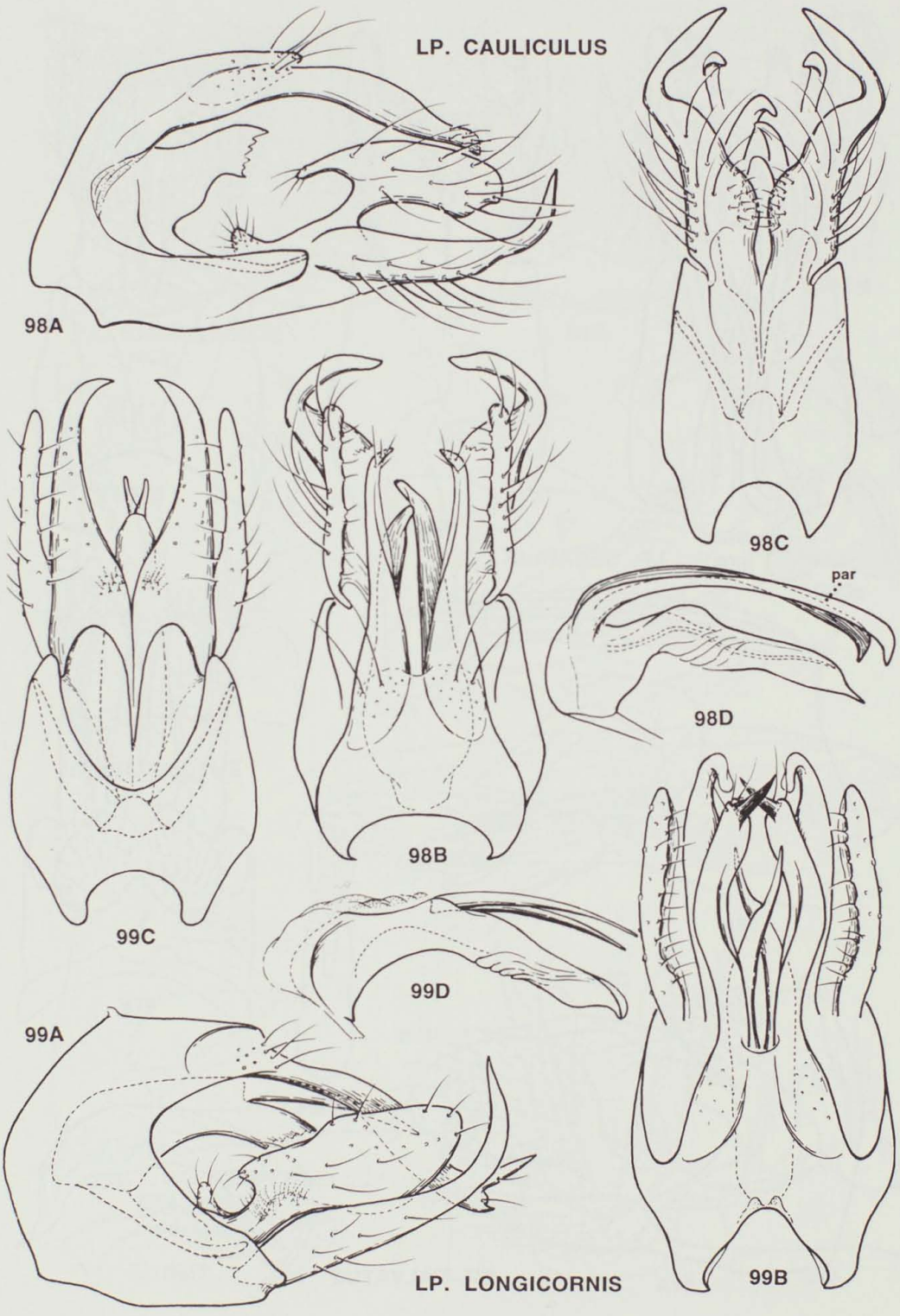


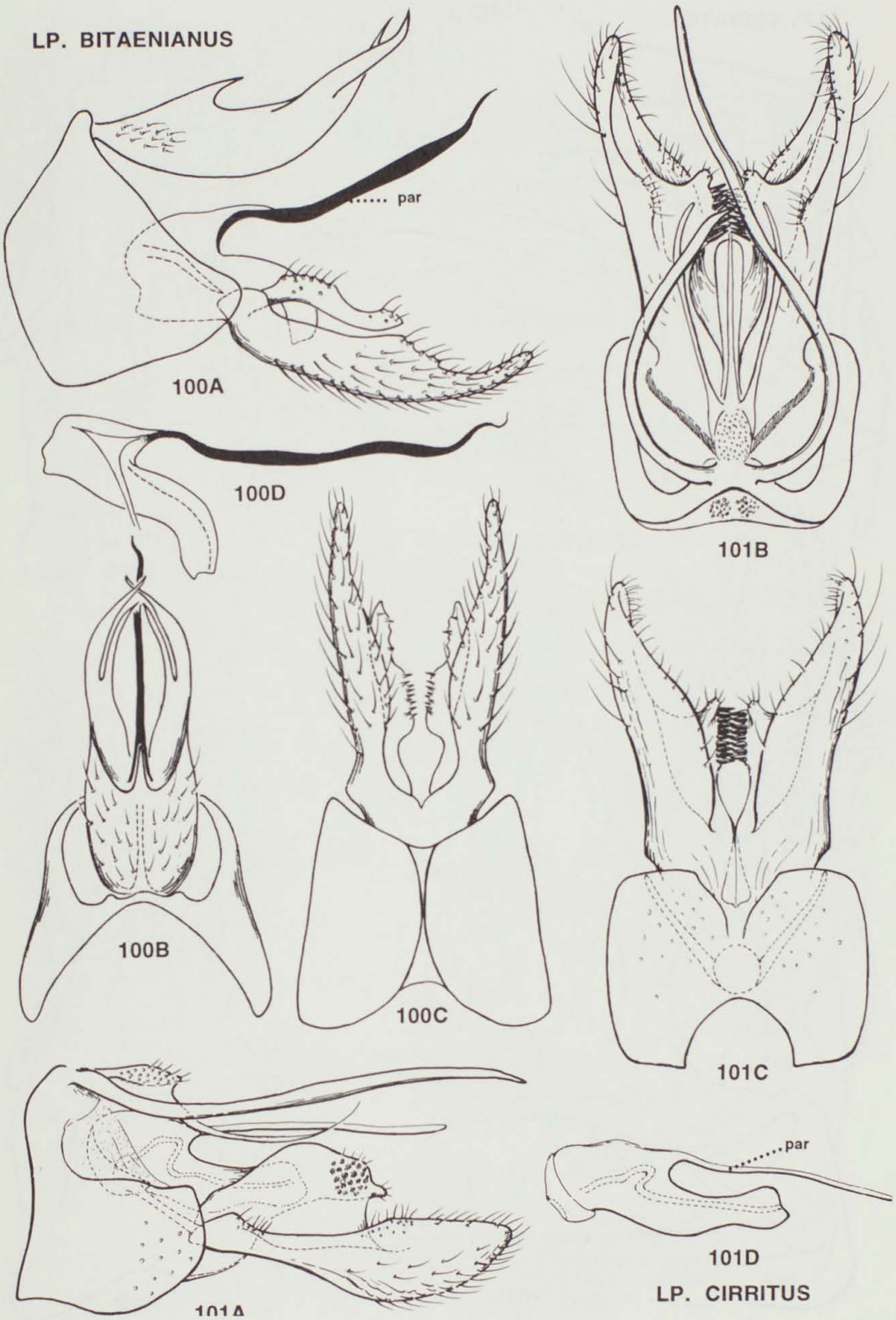
97A

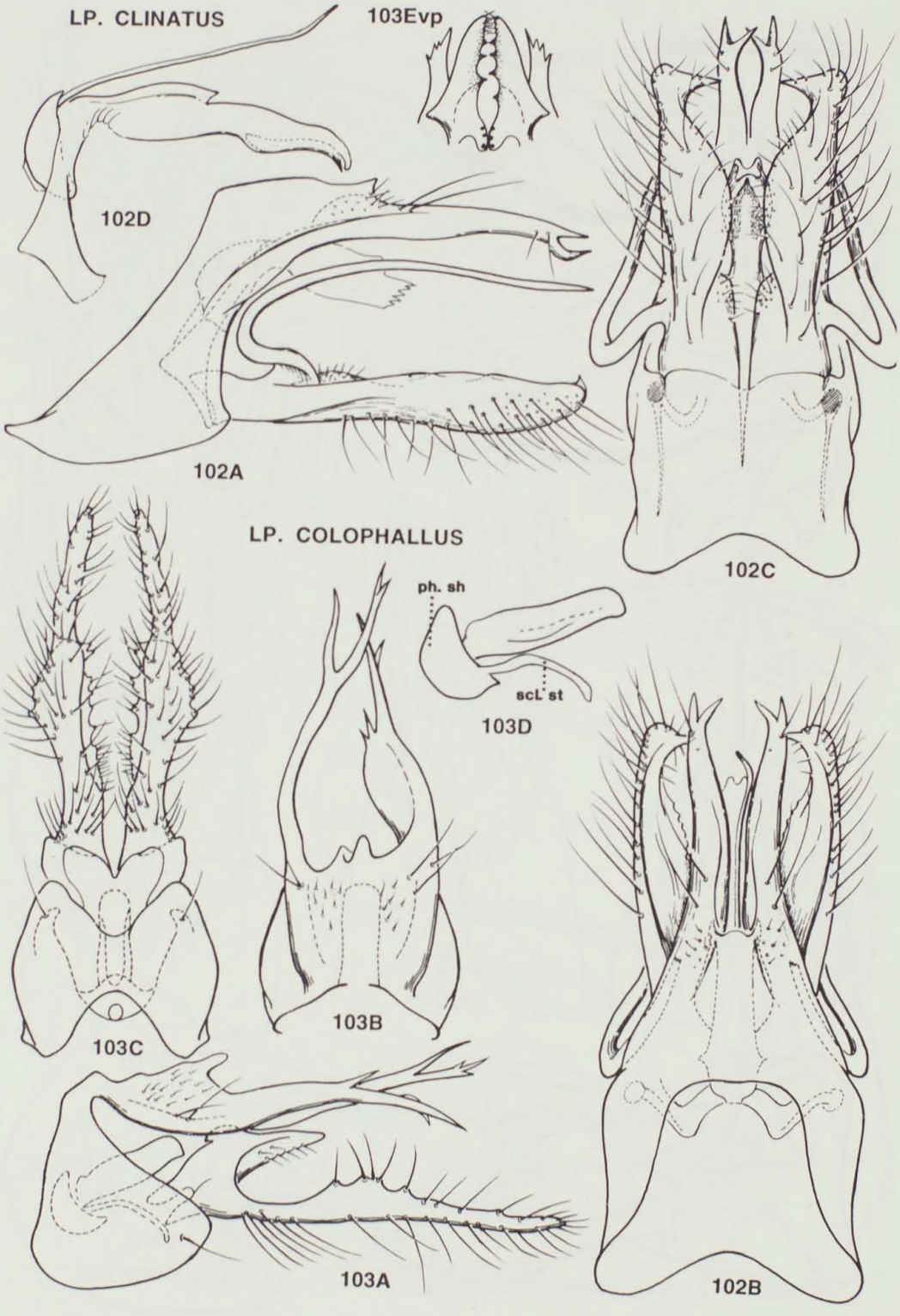


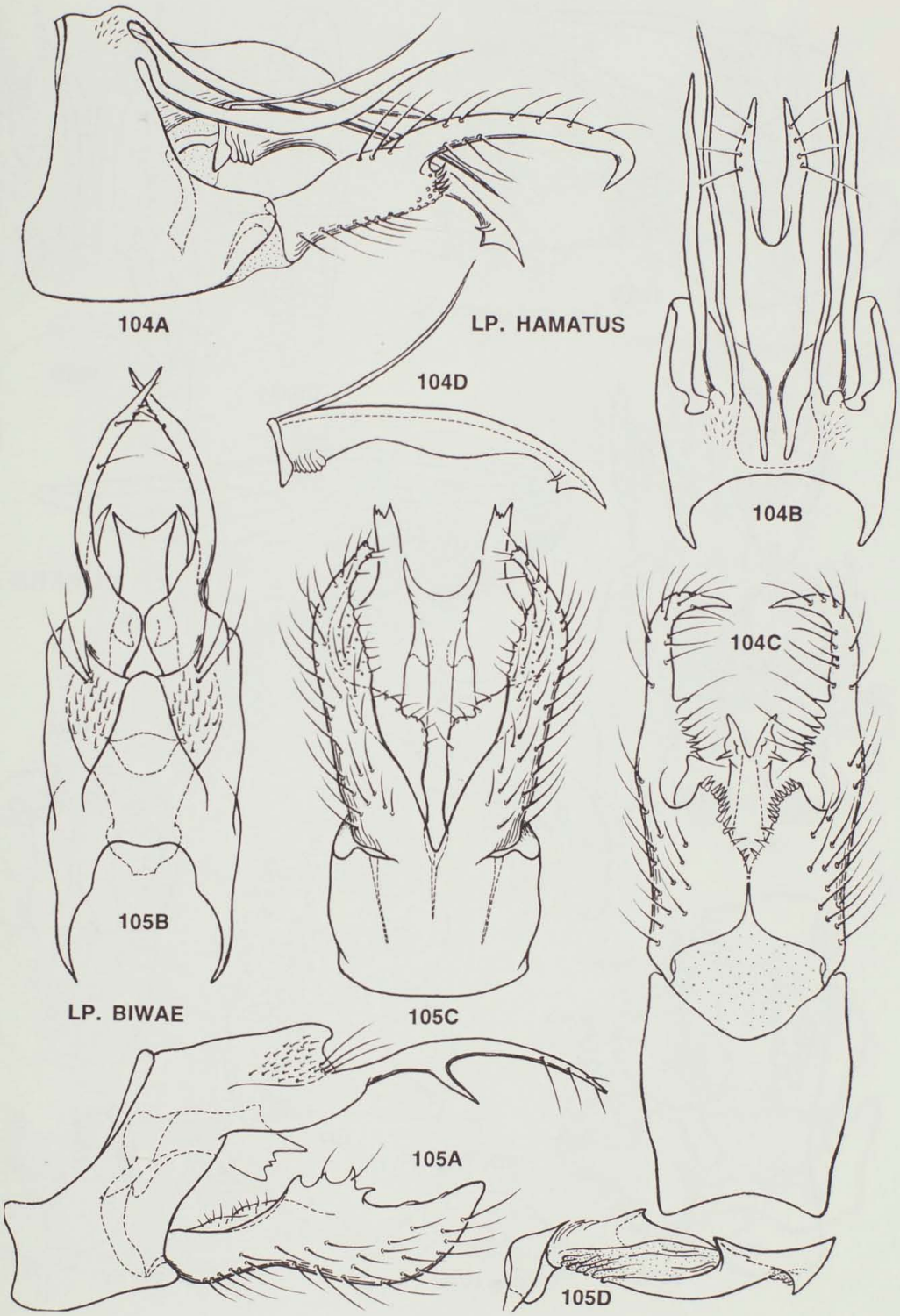
97D

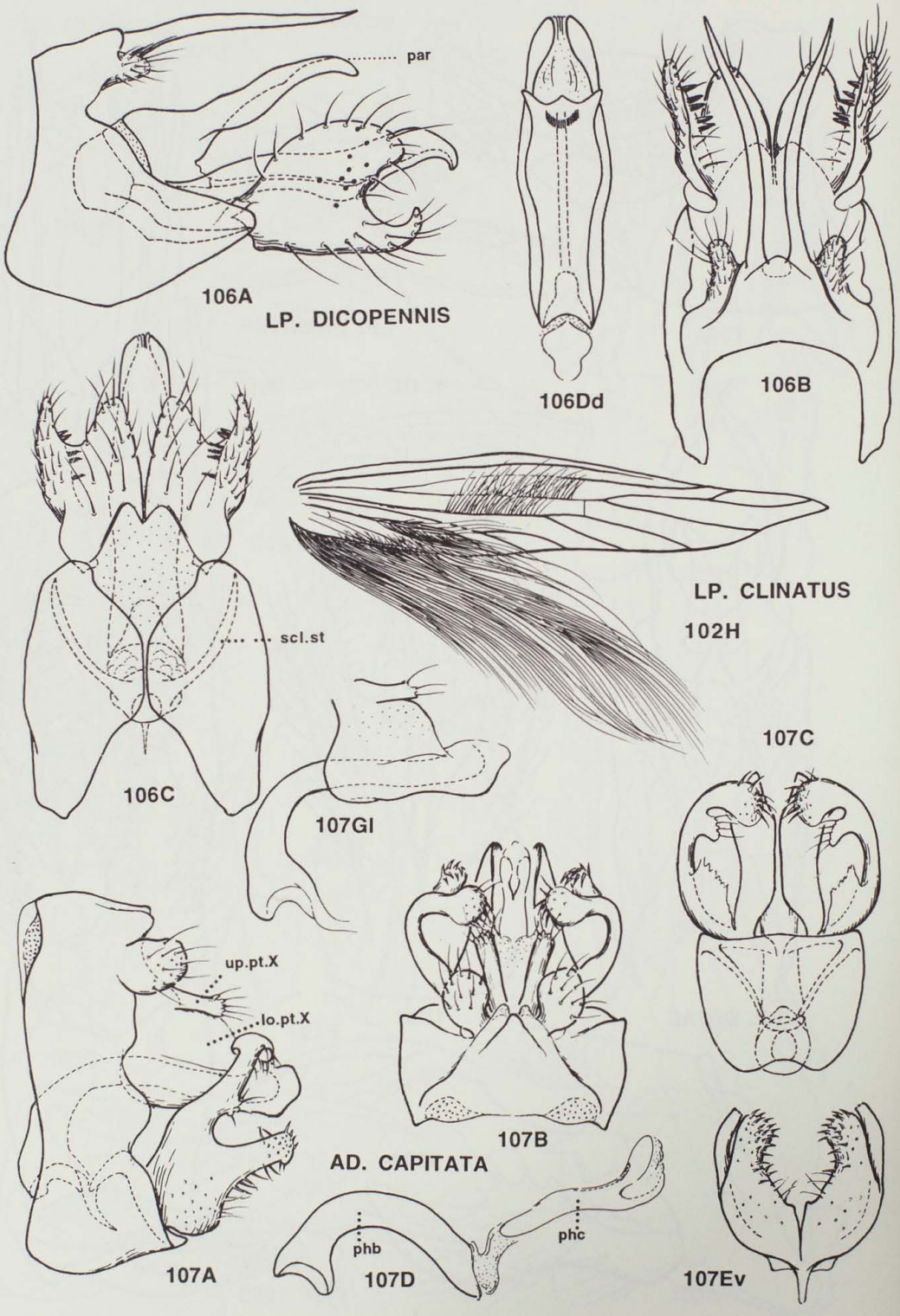
LP. VALVATUS

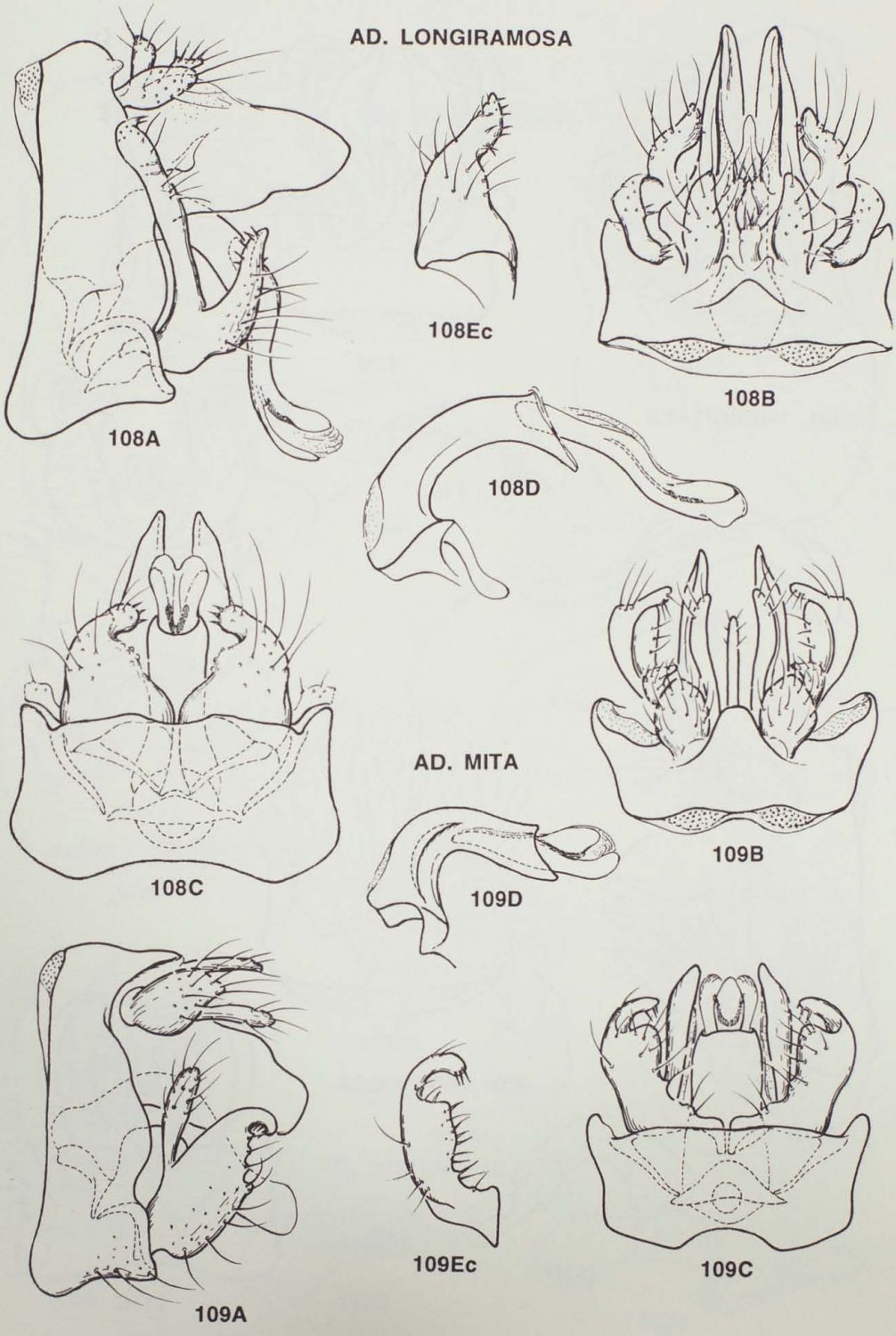

LP. CAULICULUS
98A
98C
par
98D
98B
99C
99D
99A
LP. LONGICORNIS
99B


LP. BITAENIANUS
par
100A
100D
100B
100C
101B
101C
101A
par
101D
LP. CIRRITUS

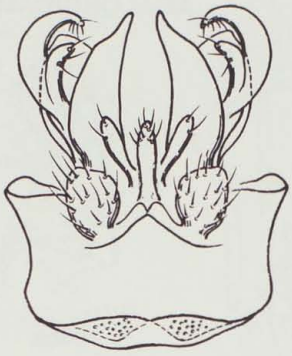

LP. CLINATUS
103Evp
102D
102A
102C
LP. COLOPHALLUS
ph. sh
scL st
103D
103C
103B
103A
102B


104A
LP. HAMATUS
104D
104B
104C
105B
LP. BIWAE
105C
105A
105D

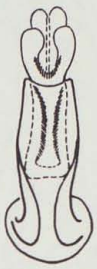

par
106A
LP. DICOPENNIS
106Dd
106B
LP. CLINATUS
102H
scl.st
106C
107GI
107C
up.pt.X
lo.pt.X
107B
AD. CAPITATA
phb
phc
107D
107A
107Ev


AD. LONGIRAMOSA
108A
108Ec
108B
108D
108C
AD. MITA
109B
109D
109A
109Ec
109C

110A

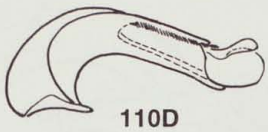


110B

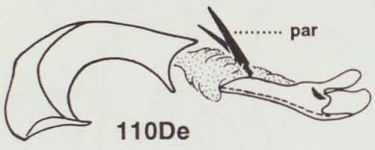


110Dd

AD. TRIDIGITATA



110D



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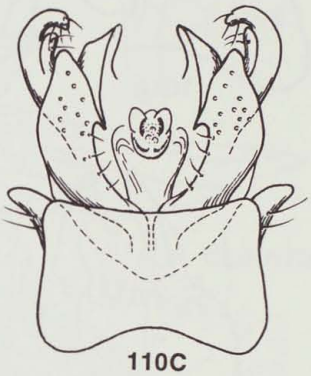
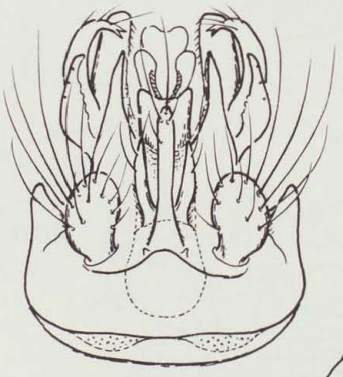


110C

111A



111B

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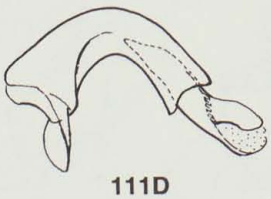
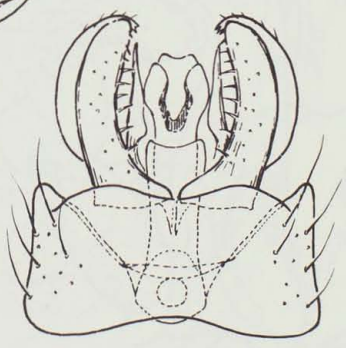


111D



111C

112A

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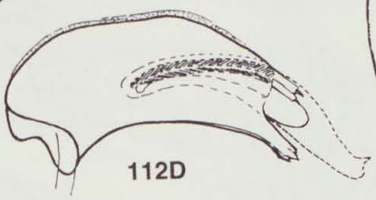
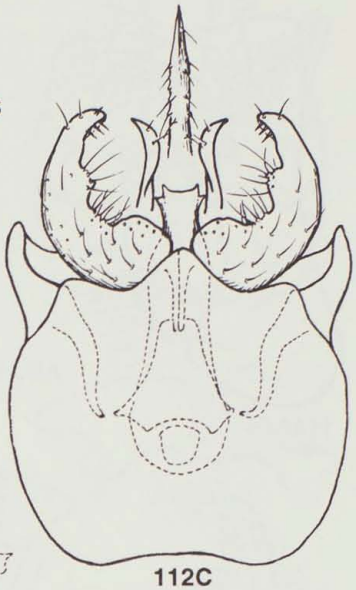
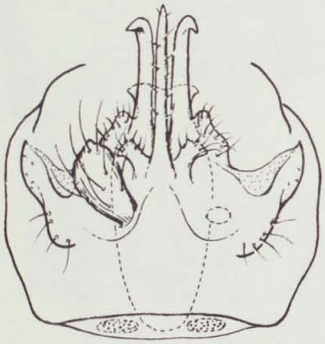


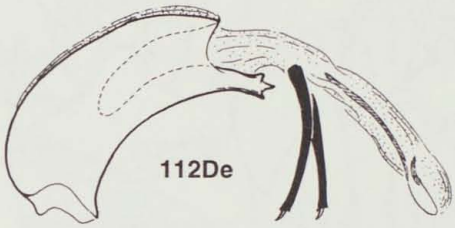
112D



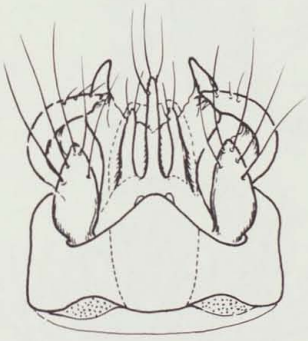
112C



112B



112De



113B

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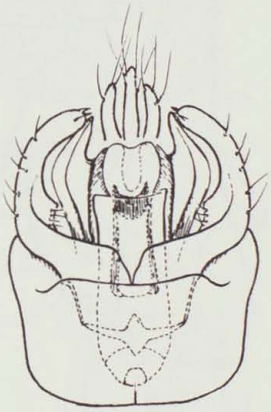
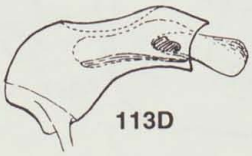


113C

113A



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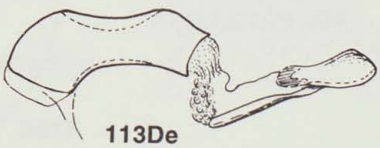

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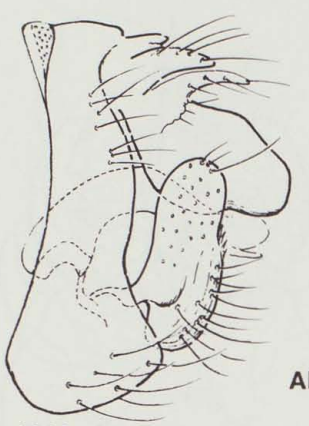
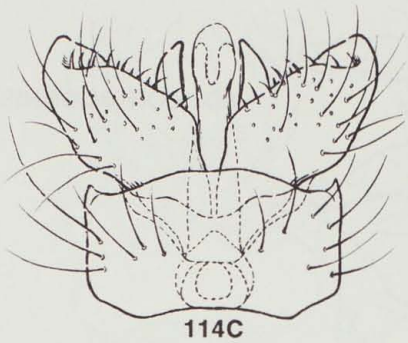
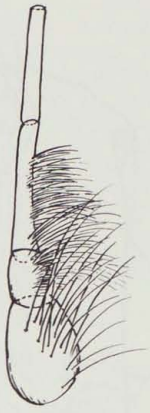


114A

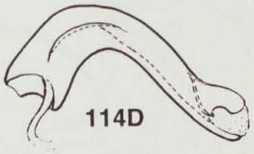


114C

AD. ELLIPSOIDALIS

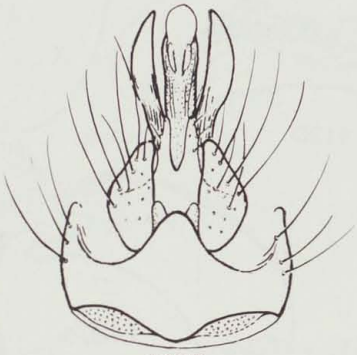


114J

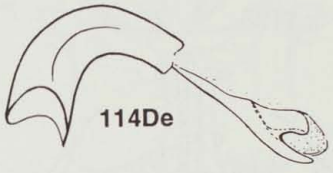


114D

114Ec



114B



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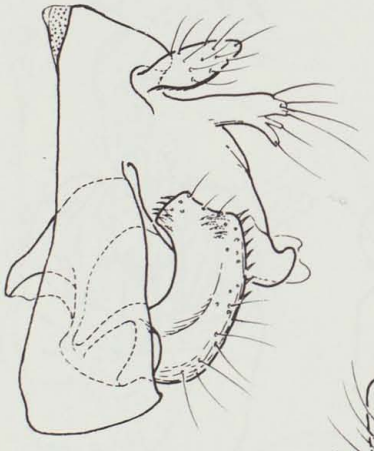
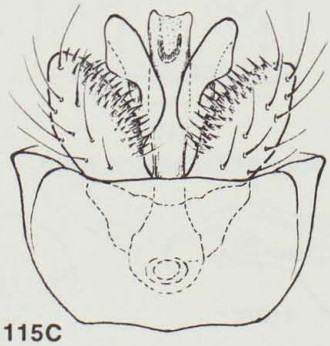


115A

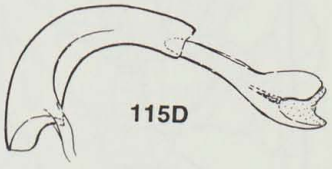
AD. PAPILLOSA

115Ec

115B



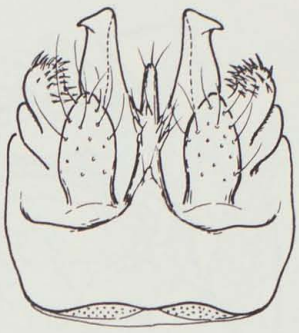
115C



115D

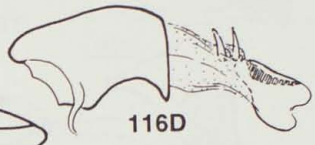
116A

116C

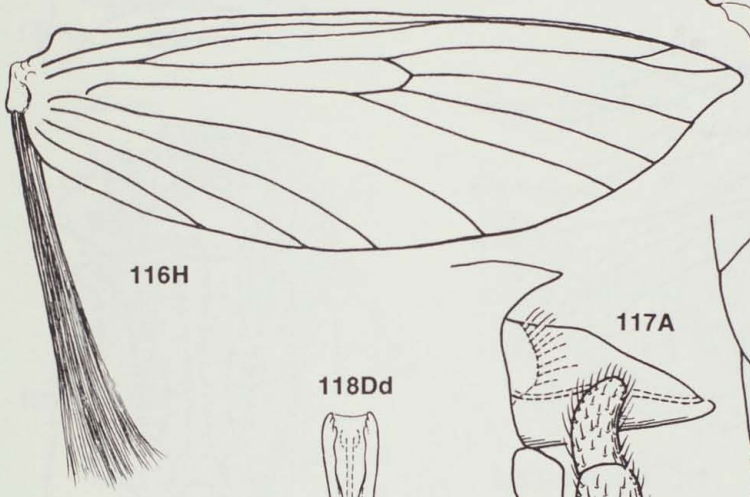


116B

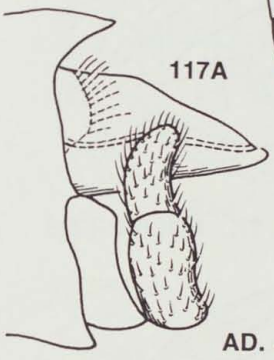
AD. PENICILLARIS



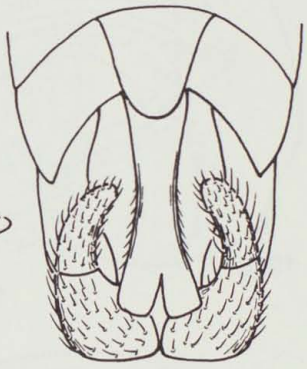
116D



116H



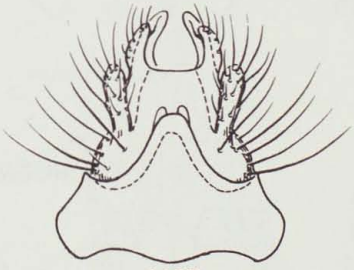
117A



AD. SIMILIS 117Cc

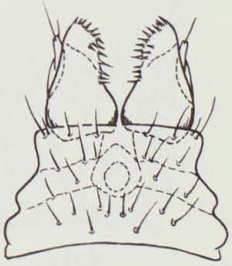
118Dd

118A



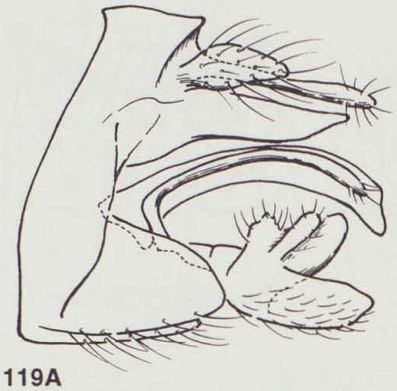
118B

118C



118D

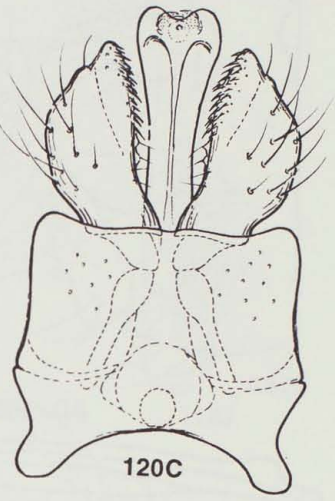
TN. BILOBATUS



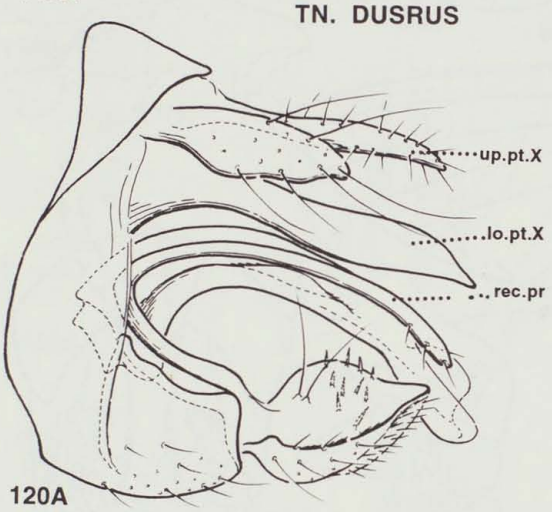
119A

119Ev

TN. DUSRUS

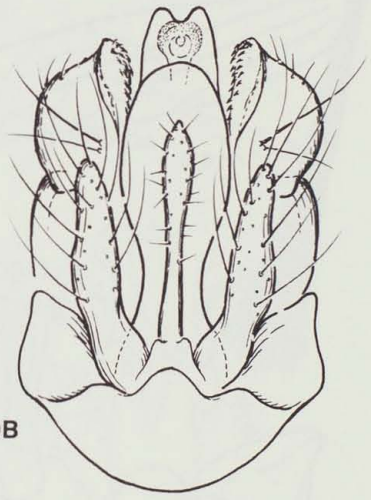


120C

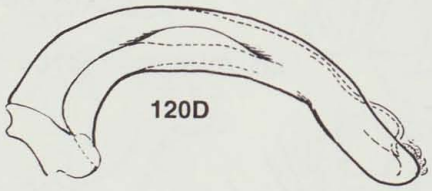


120A

TN. FOLIFORMIS



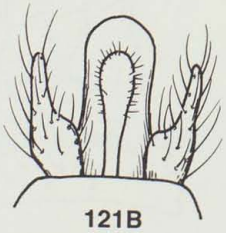
120B



120D

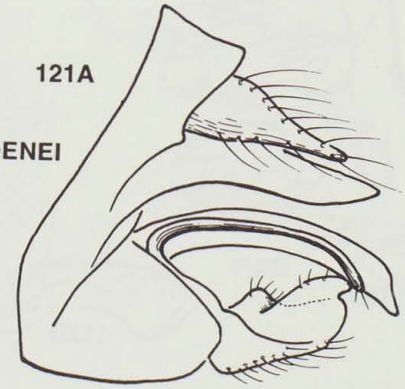
121A

TN. HOENEI



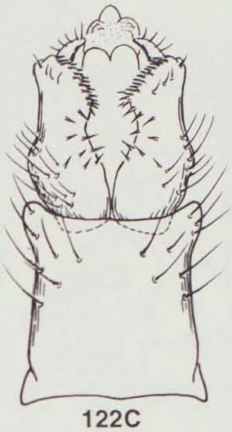
121B

121C



TN. QINGLINGENSIS

122A

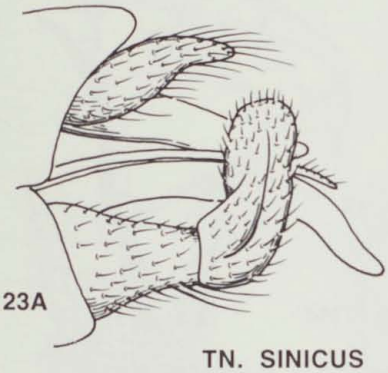


122C

122B

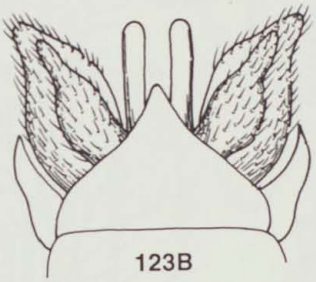
122D

122Dd

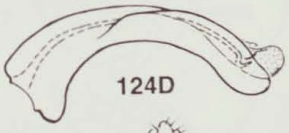


123A

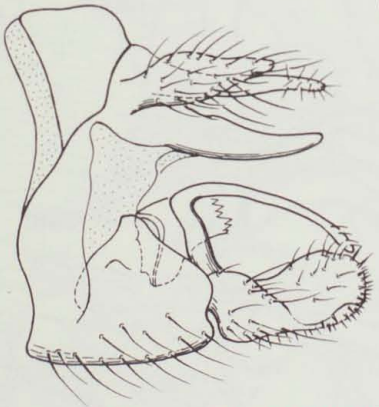
TN. SINICUS



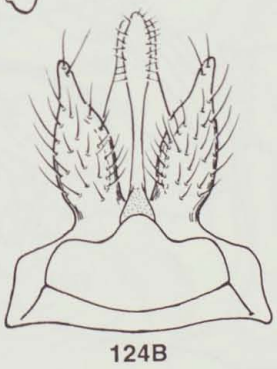
123B



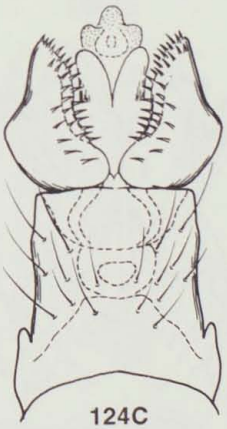
124D



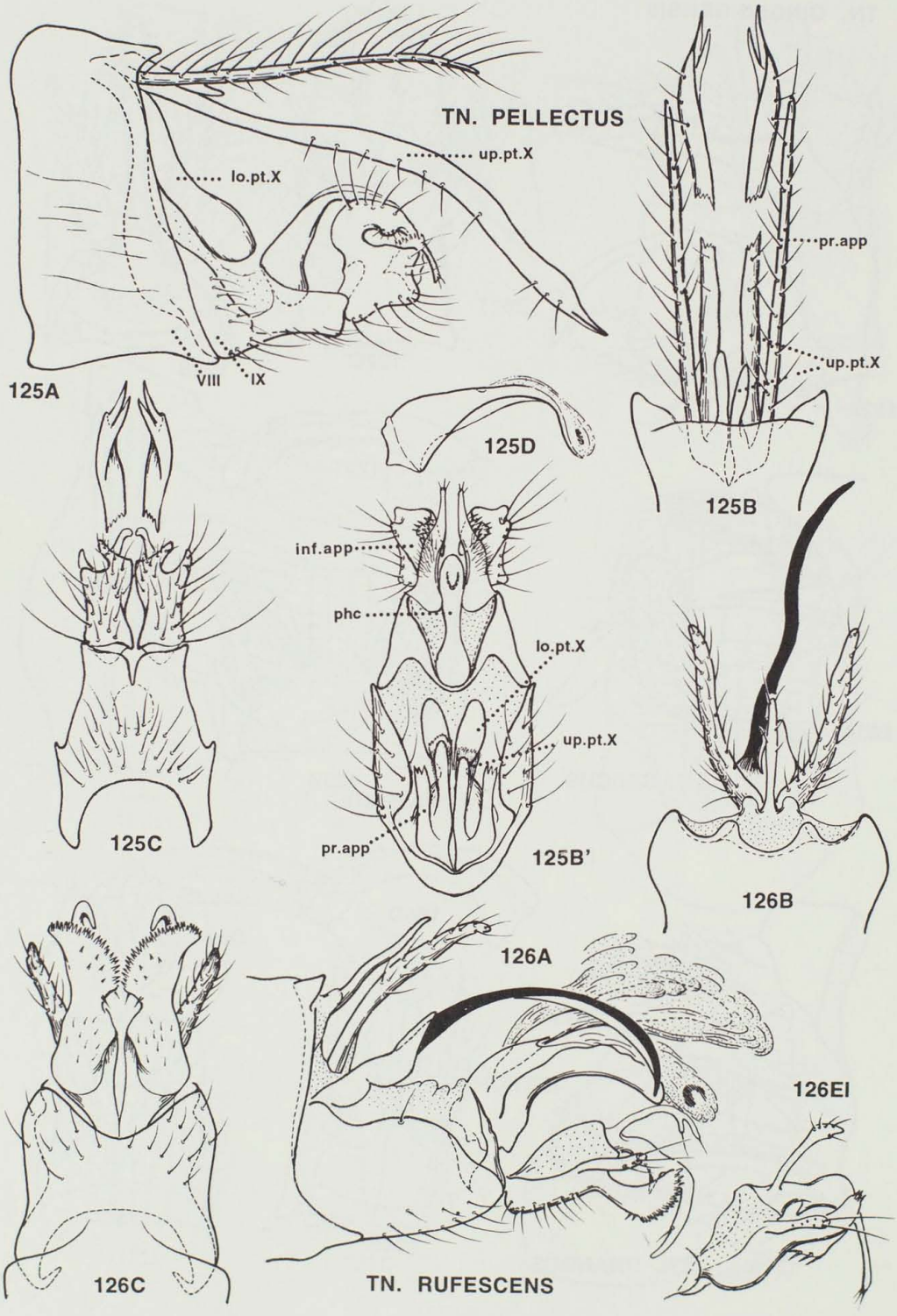
124A TN. UNANIMIS

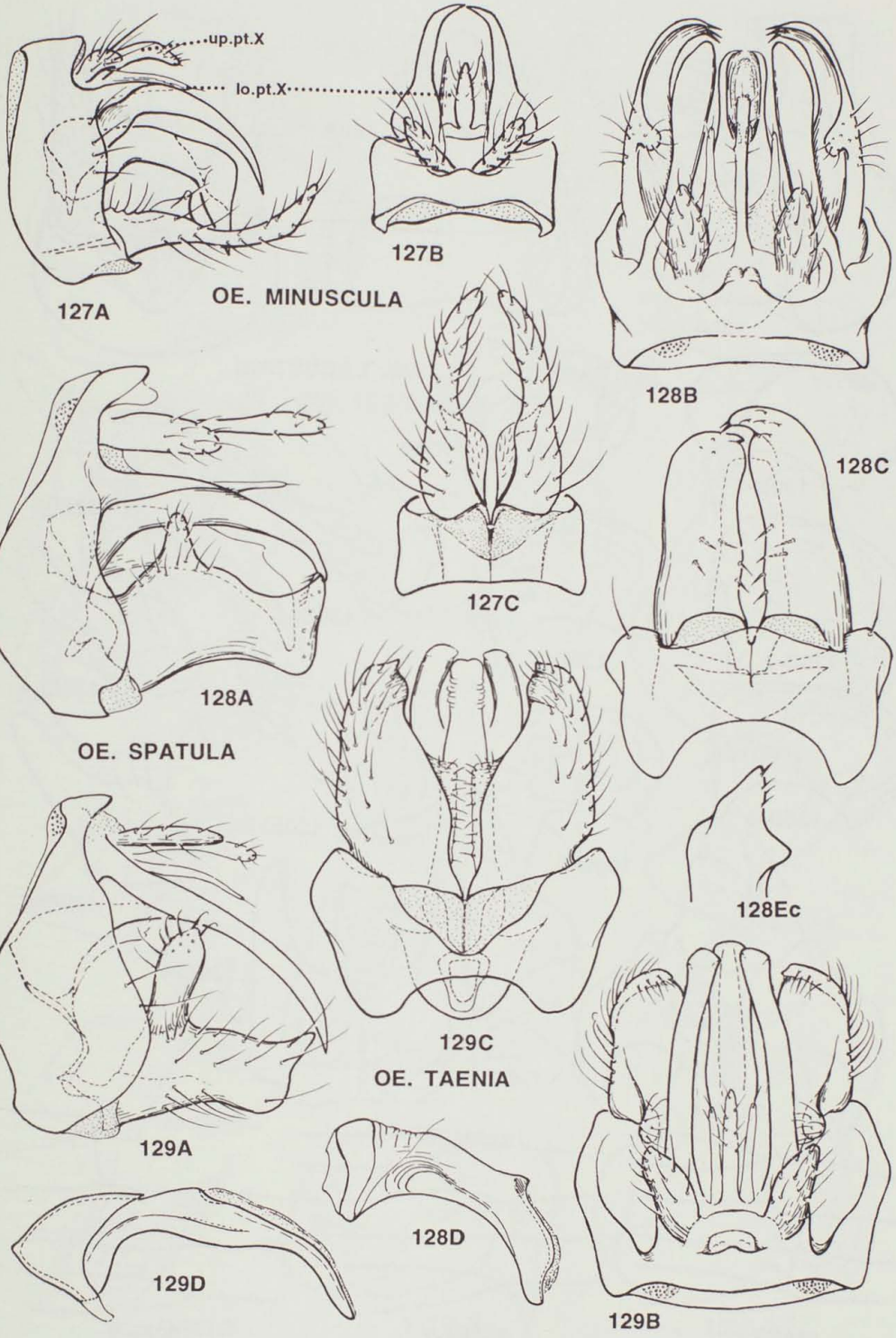


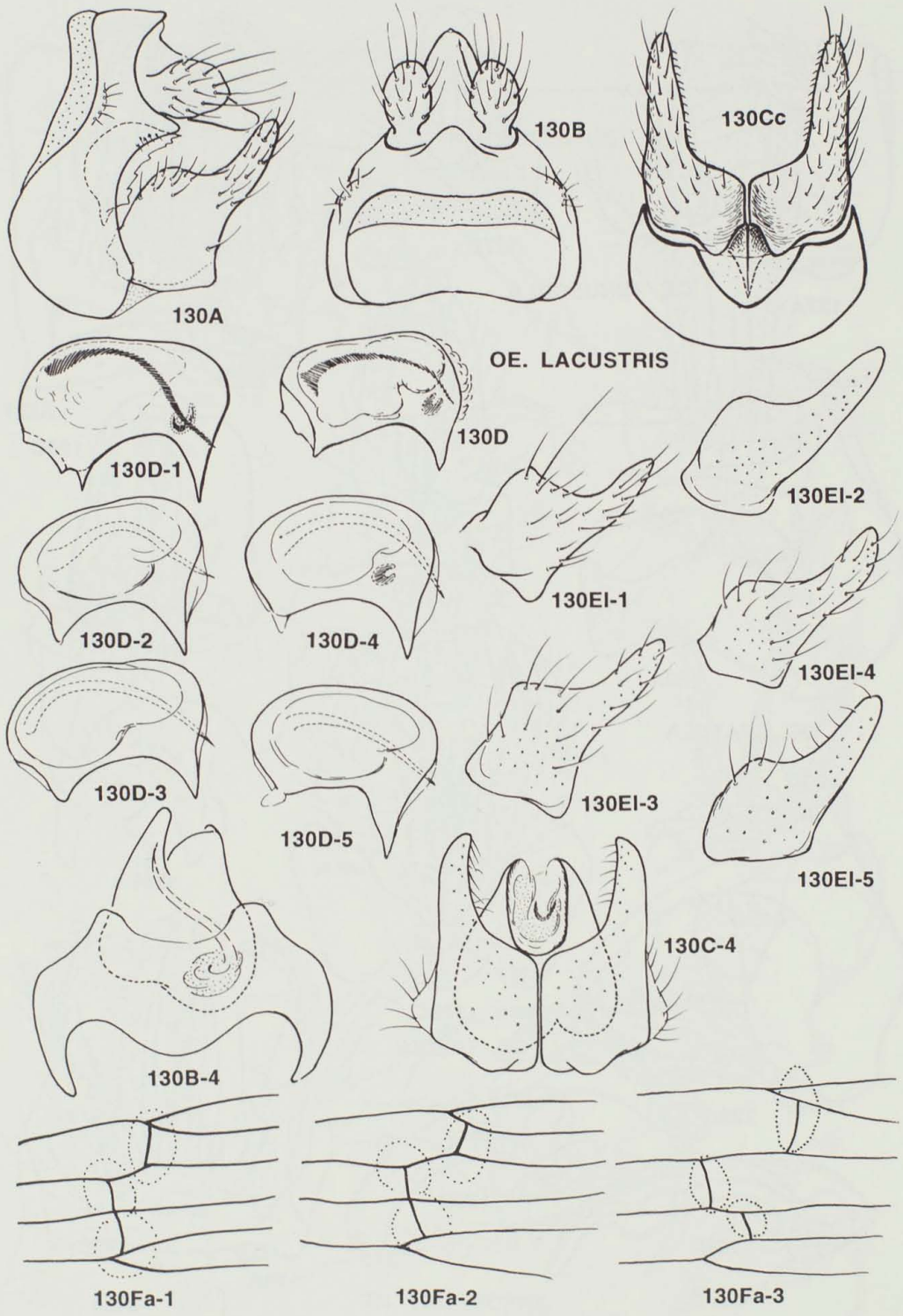
124B

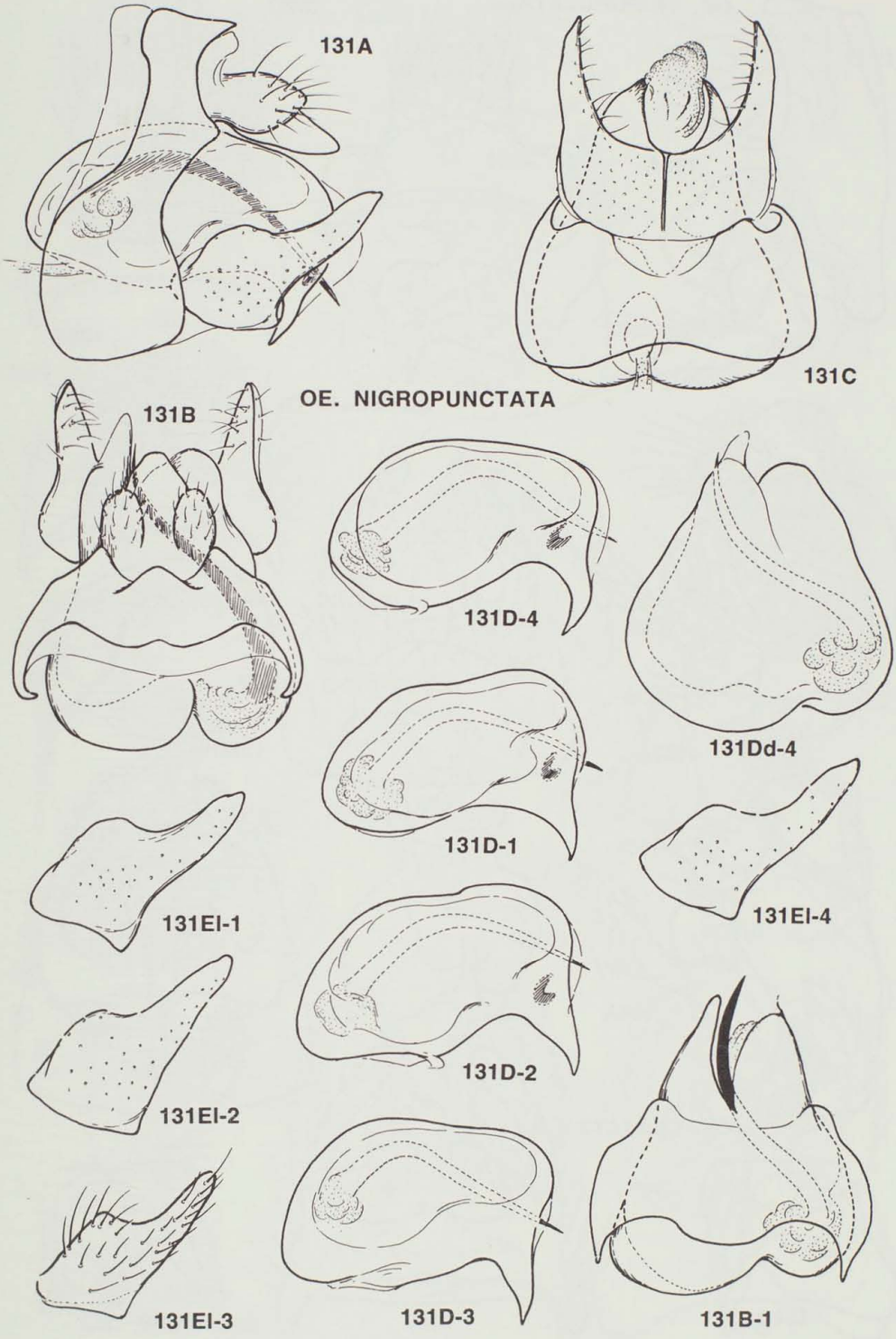


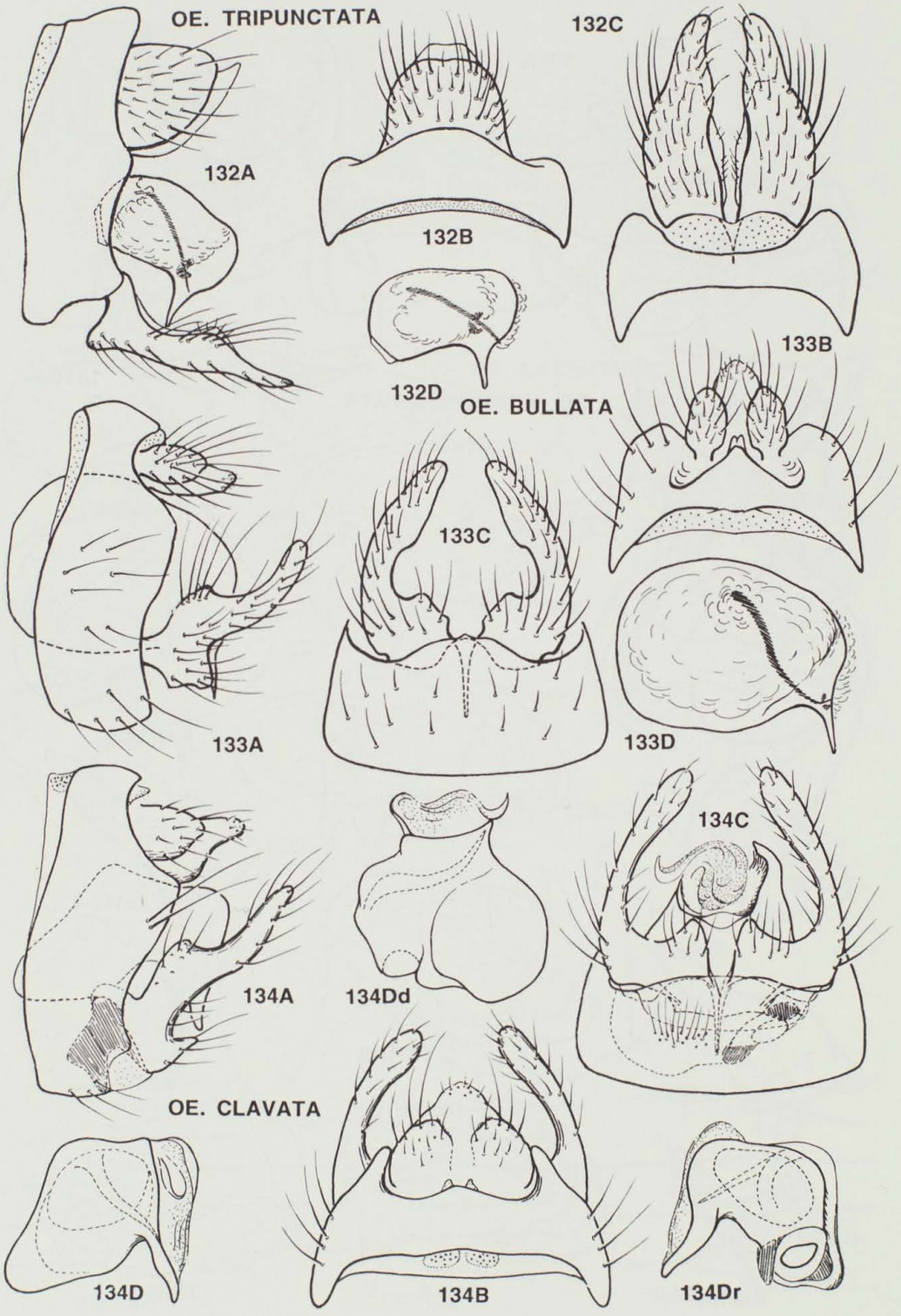
124C

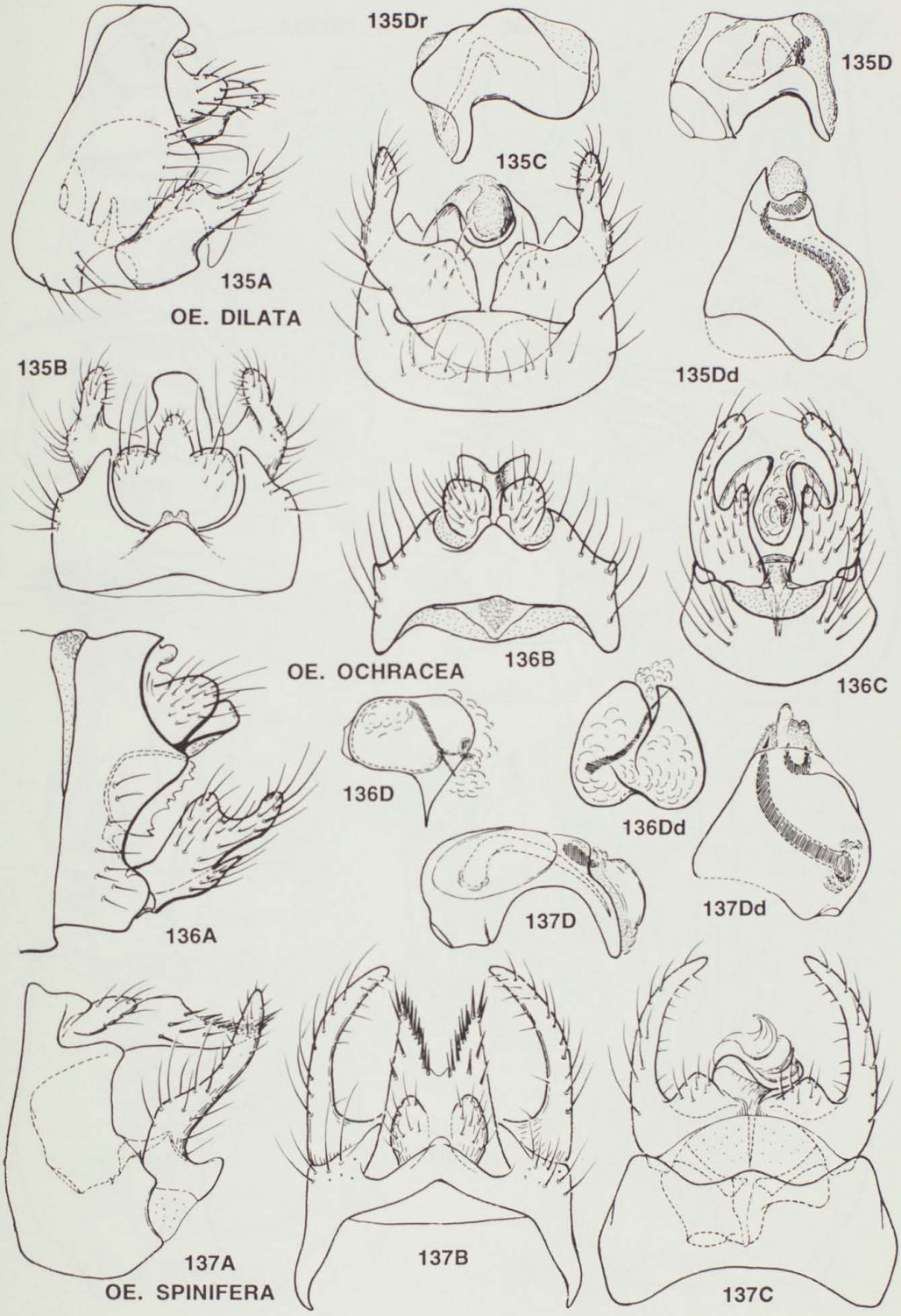

TN. PELLECTUS
up.pt.X
lo.pt.X
VIII
IX
125A
125D
pr.app
up.pt.X
125B
inf.app
phc
lo.pt.X
up.pt.X
pr.app
125B'
125C
126B
126A
126EI
126C
TN. RUFESCENS

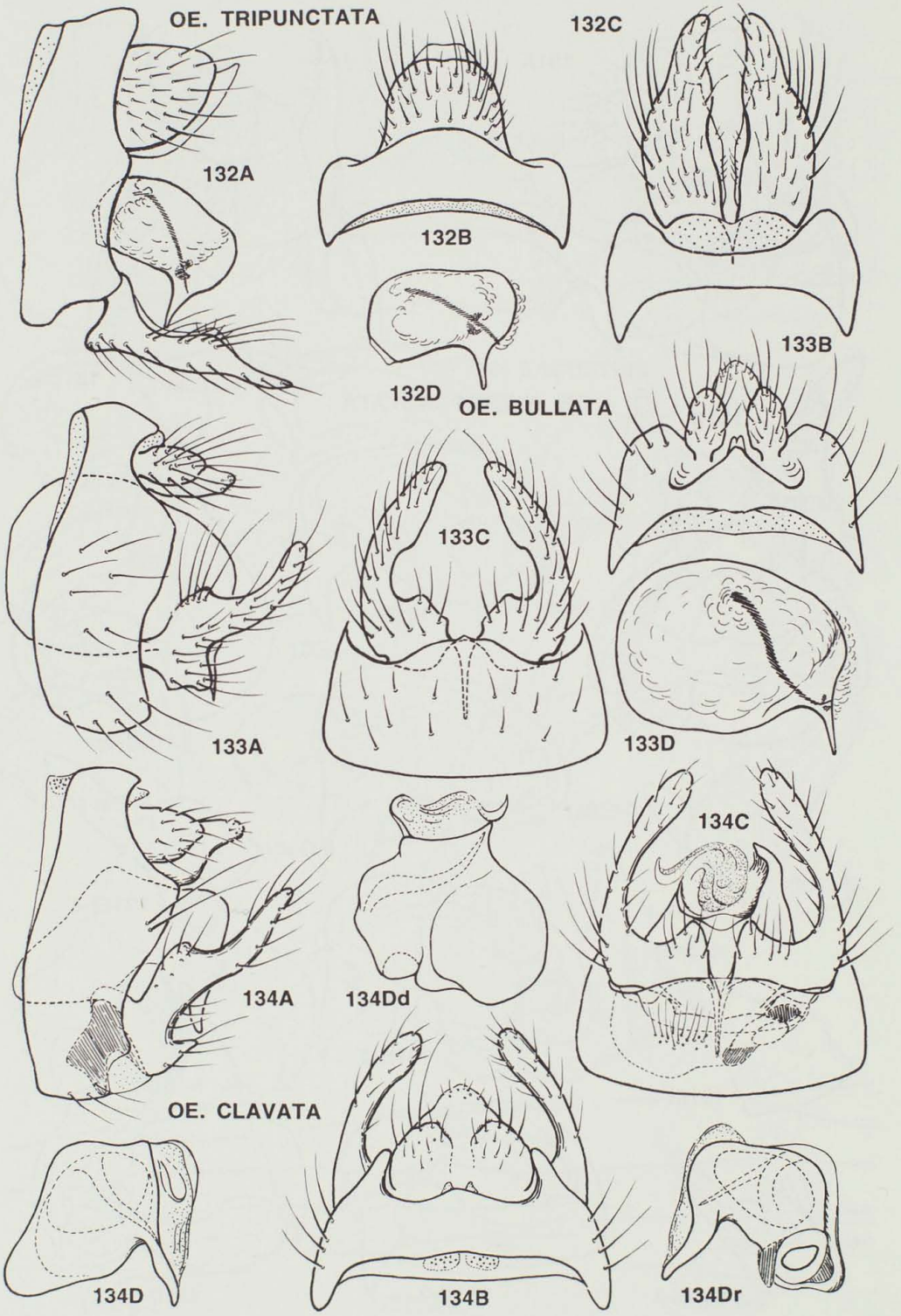

up.pt.X
lo.pt.X
127A
127B
OE. MINUSCULA
128B
127C
128C
128A
OE. SPATULA
128Ec
129C
OE. TAENIA
129A
128D
129D
129B

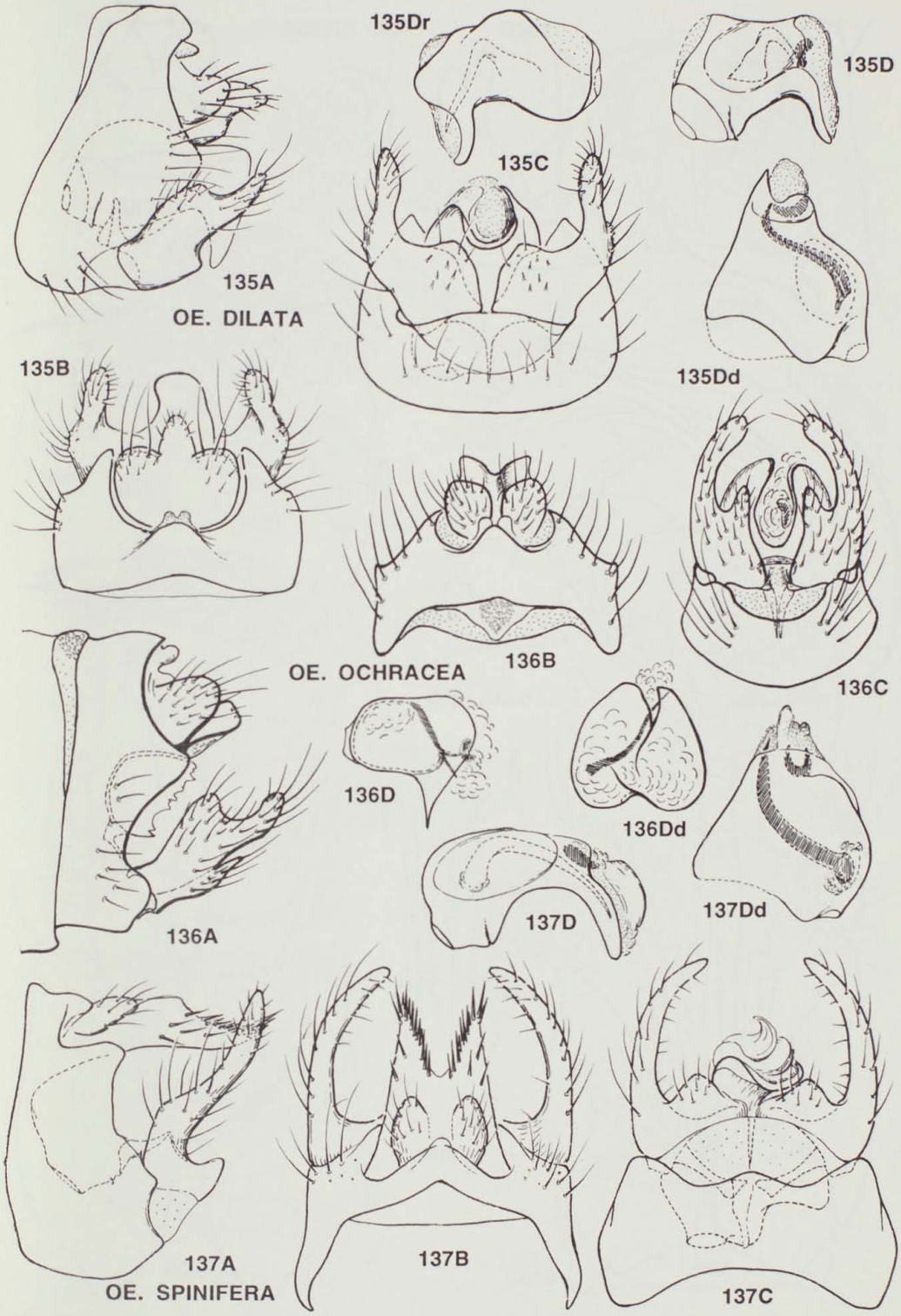

130A
130B
130Cc
OE. LACUSTRIS
130D
130D-1
130D-2
130D-3
130D-4
130D-5
130EI-1
130EI-2
130EI-3
130EI-4
130EI-5
130C-4
130B-4
130Fa-1
130Fa-2
130Fa-3

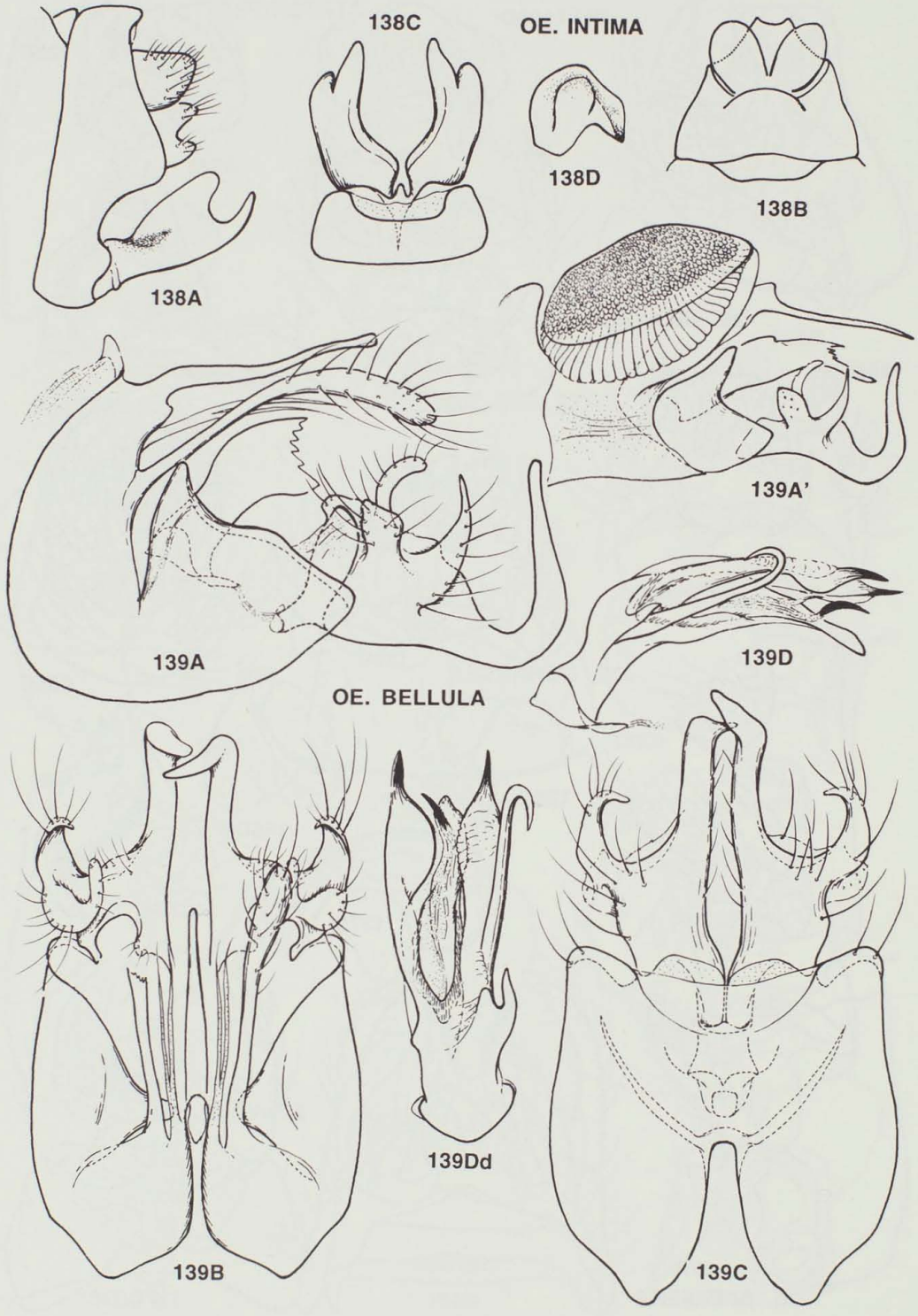

131A
131C
OE. NIGROPUNCTATA
131B
131D-4
131Dd-4
131D-1
131El-1
131El-4
131D-2
131El-2
131El-3
131D-3
131B-1

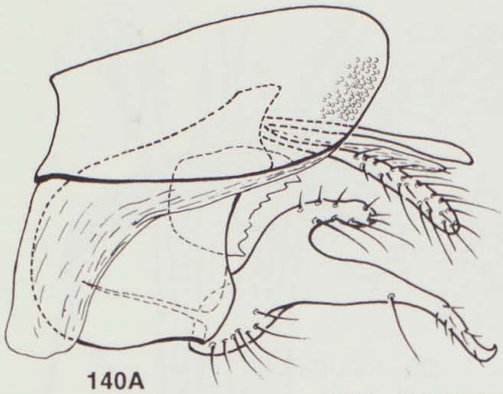

OE. TRIPUNCTATA
132A
132B
132C
132D
133B
OE. BULLATA
133C
133A
133D
134C
134A
134Dd
OE. CLAVATA
134D
134B
134Dr


135Dr
135D
135C
135A
OE. DILATA
135B
135Dd
136B
OE. OCHRACEA
136C
136A
136D
136Dd
137D
137Dd
137A
OE. SPINIFERA
137B
137C


OE. TRIPUNCTATA
132A
132B
132C
132D
133B
OE. BULLATA
133C
133A
133D
134A
134Dd
134C
OE. CLAVATA
134D
134B
134Dr

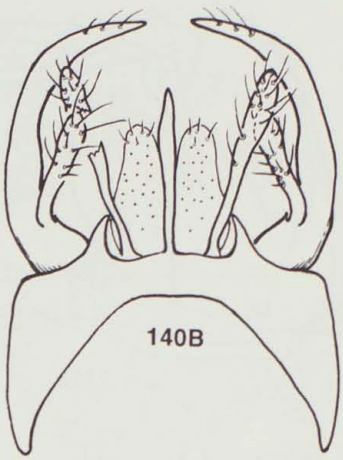

135Dr
135D
135C
135A
OE. DILATA
135B
135Dd
136B
OE. OCHRACEA
136C
136D
136Dd
136A
137D
137Dd
137A
OE. SPINIFERA
137B
137C


138C
OE. INTIMA
138D
138B
138A
139A'
139A
139D
OE. BELLULA
139Dd
139B
139C

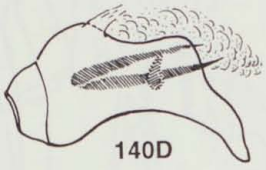


140A

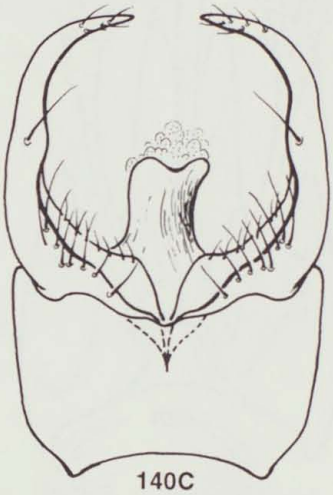
OE. BIRAMOSA



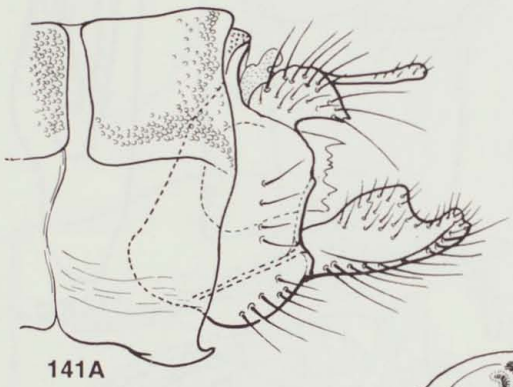
140B



140D

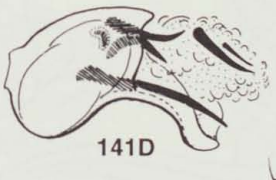


140C



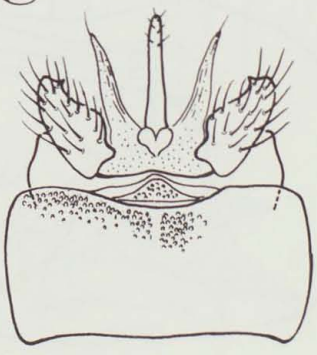
141A

OE. BRACHYURA



141D

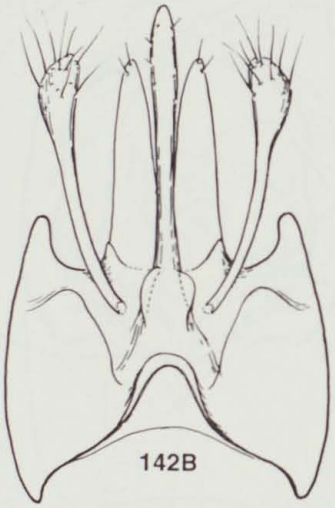
141C



141B

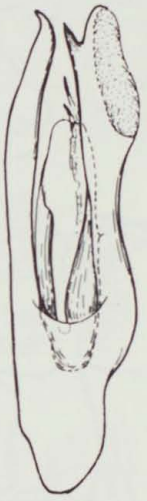
142A

OE. CAUCULA

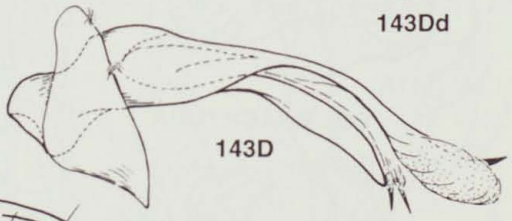


142B

142C



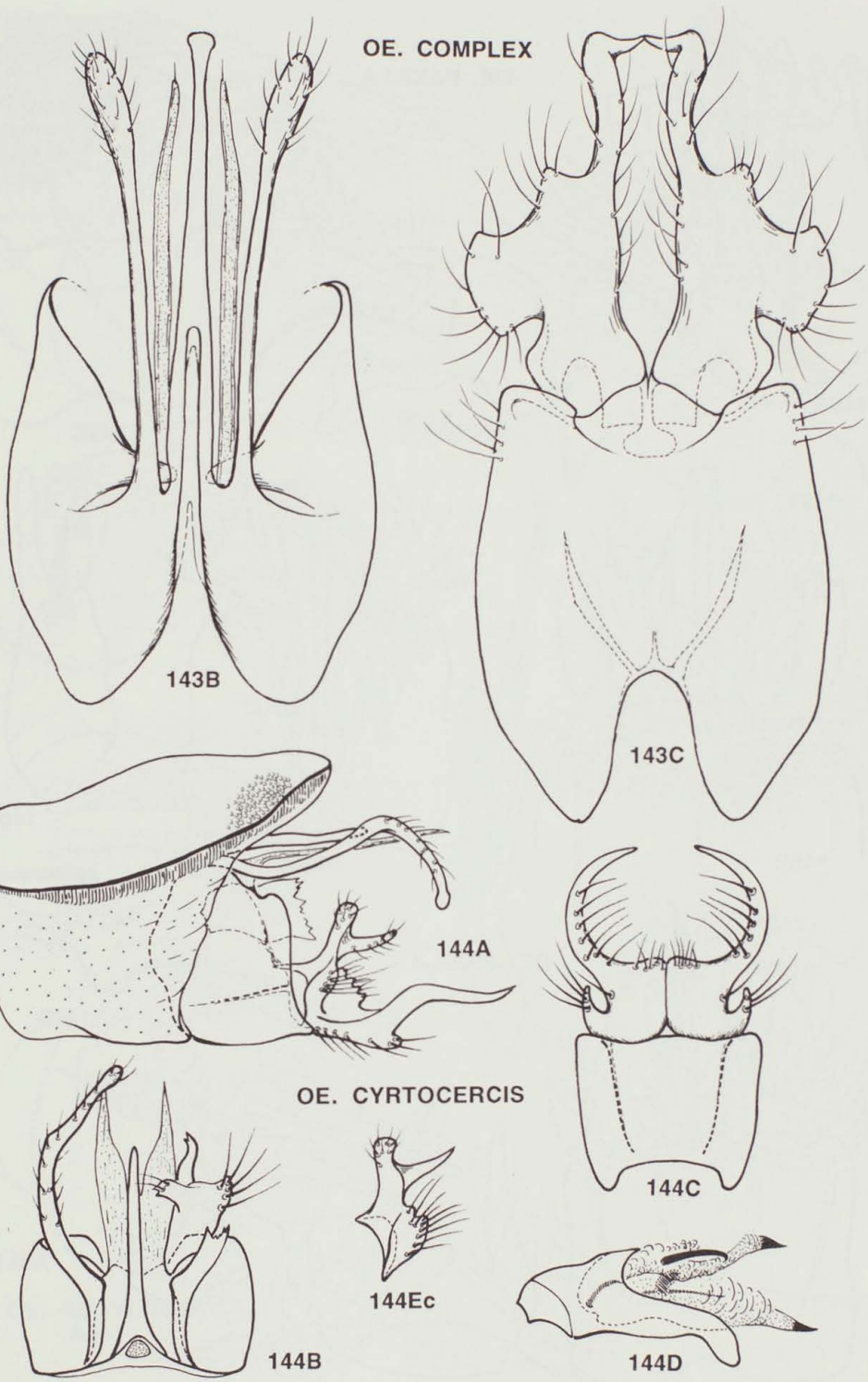
143Dd

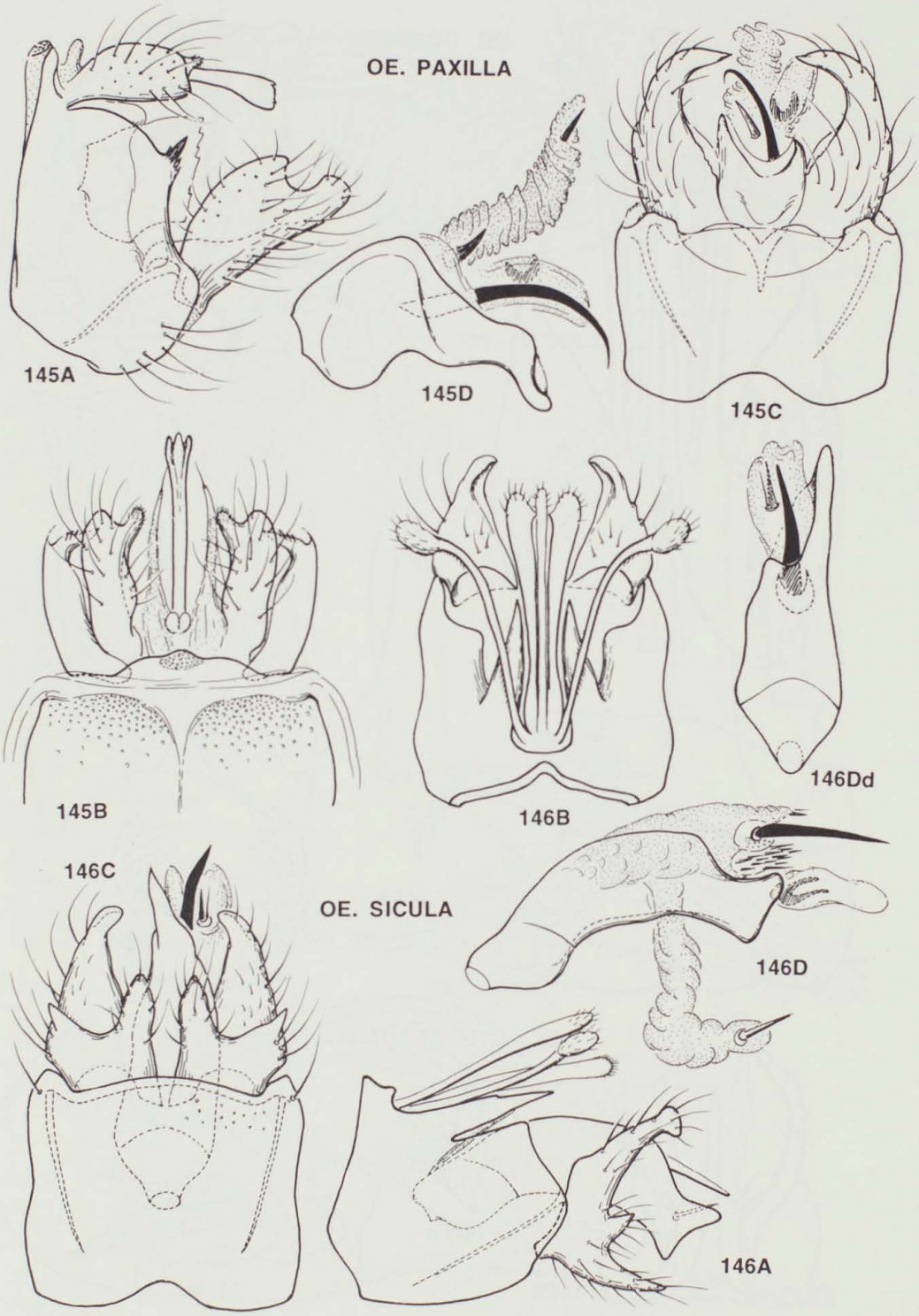


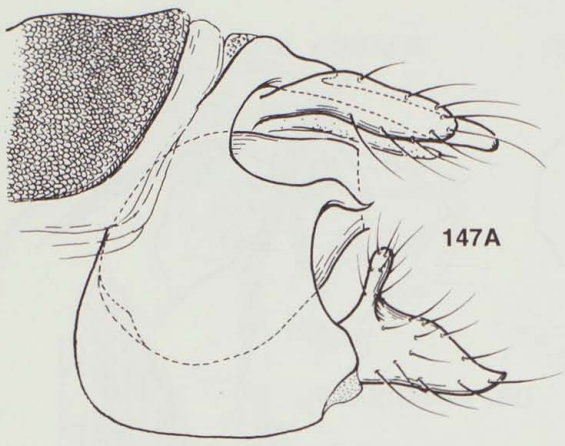
143D

143A

OE. COMPLEX


OE. COMPLEX
143B
143C
144A
OE. CYRTOCERCIS
144Ec
144C
144B
144D

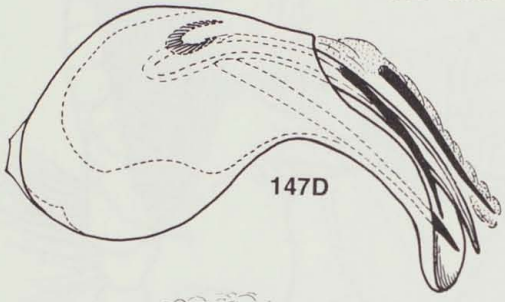

OE. PAXILLA
145A
145D
145C
145B
146B
146Dd
146C
OE. SICULA
146D
146A



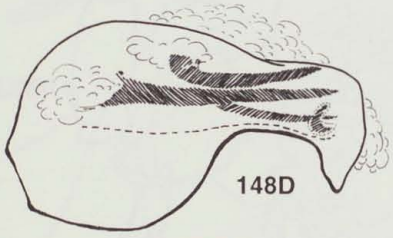
147A

OE. UNIFORMA

147B

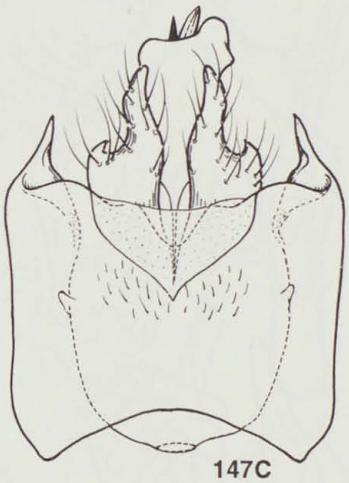


147D

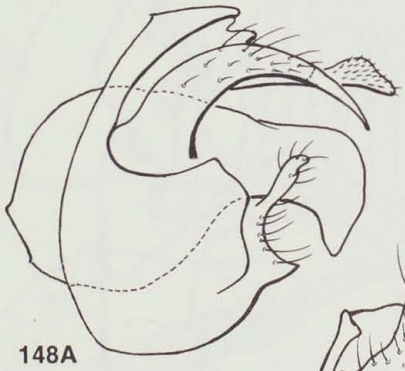


148D

148J

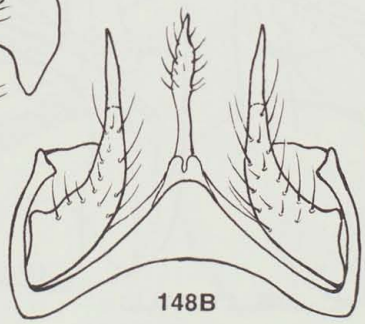


147C

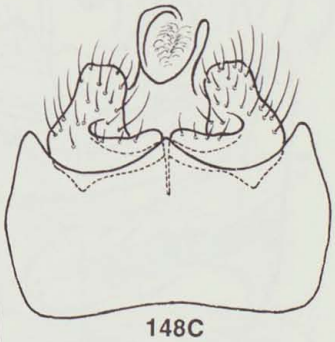


148A

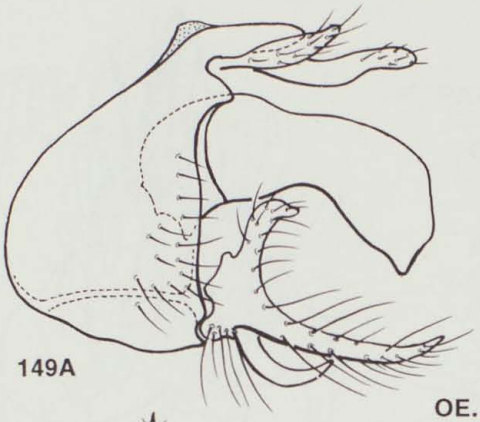
OE. ANCYLOCERCA



148B



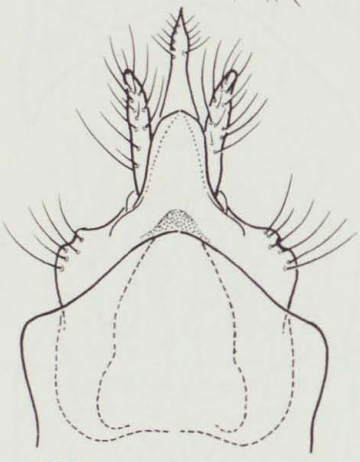
148C



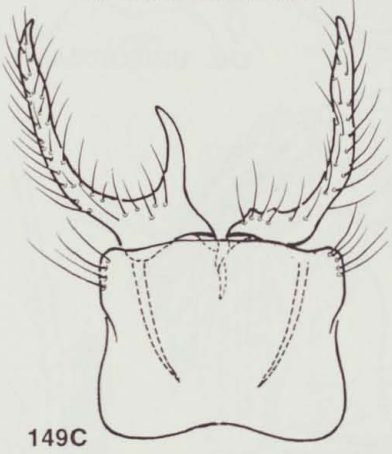
149A

149D

OE. ANTENNATA

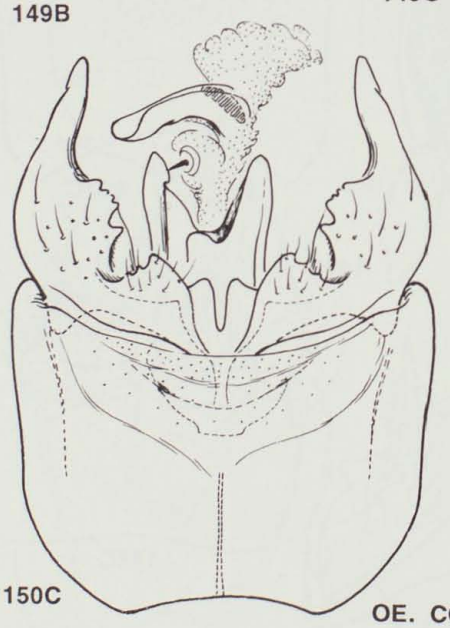


149B

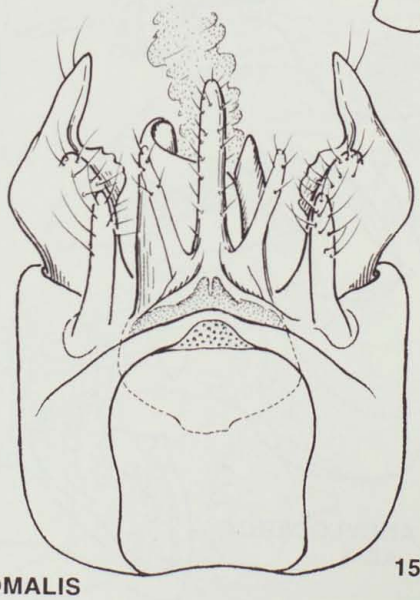


149C

150J

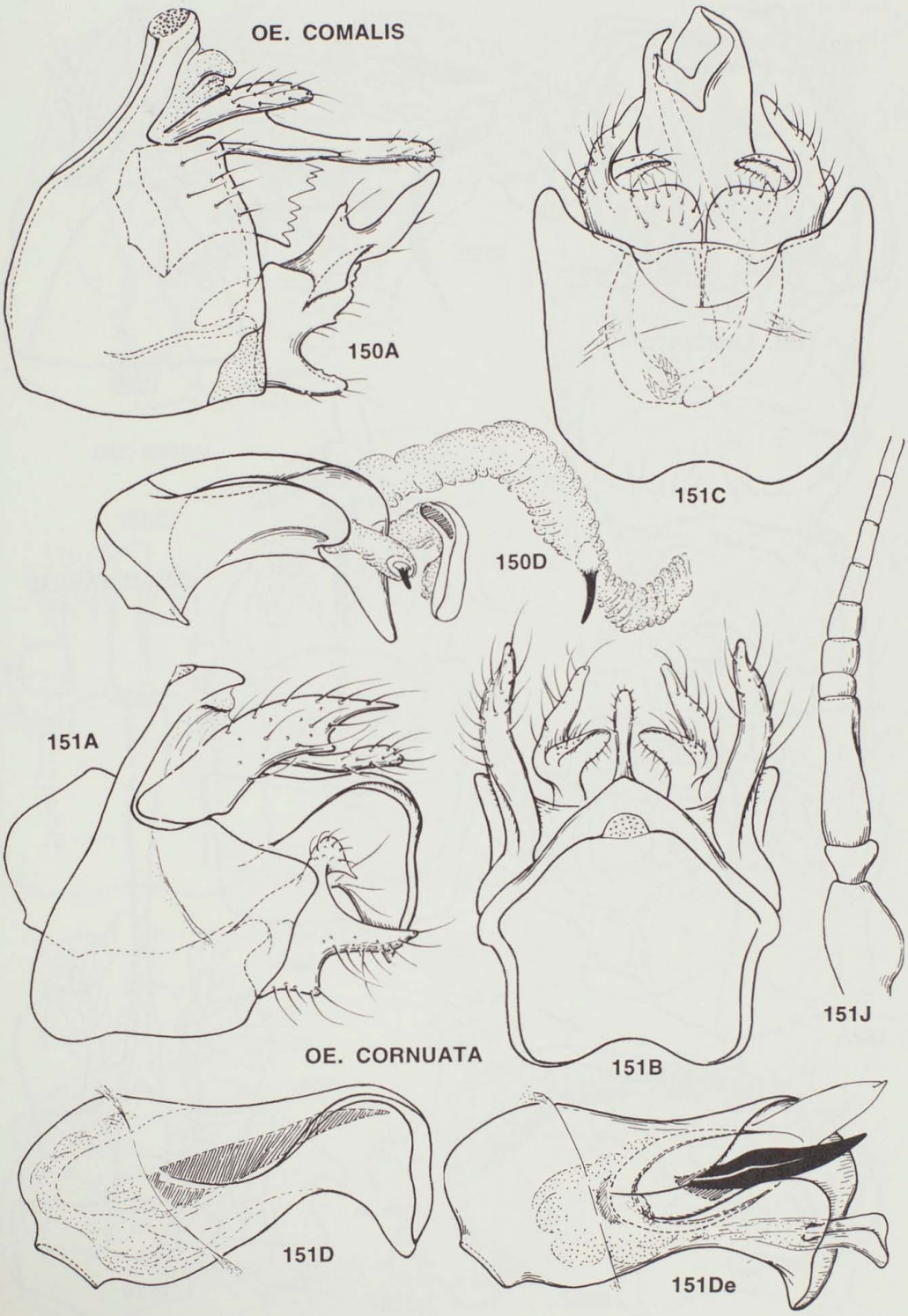


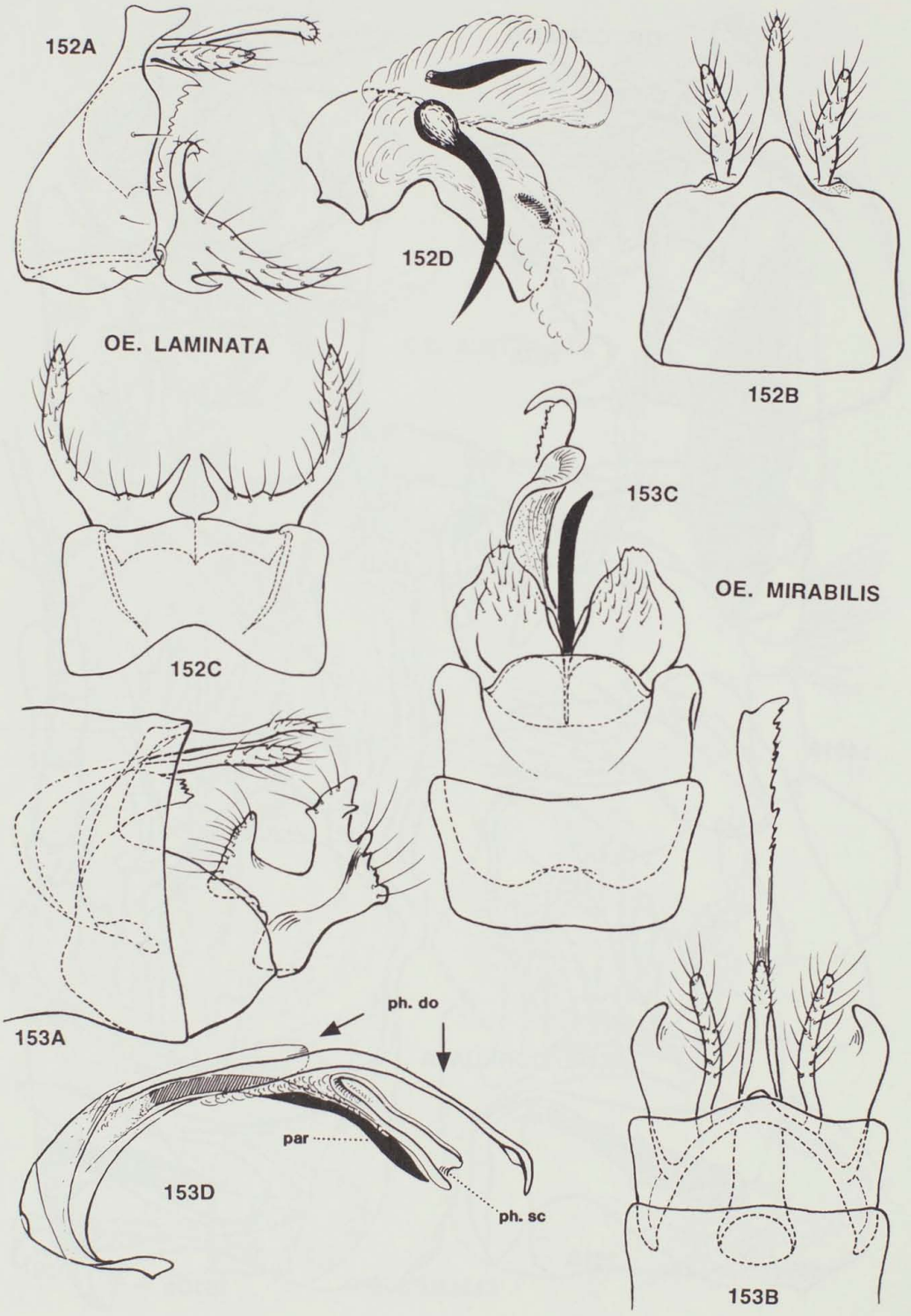
150C

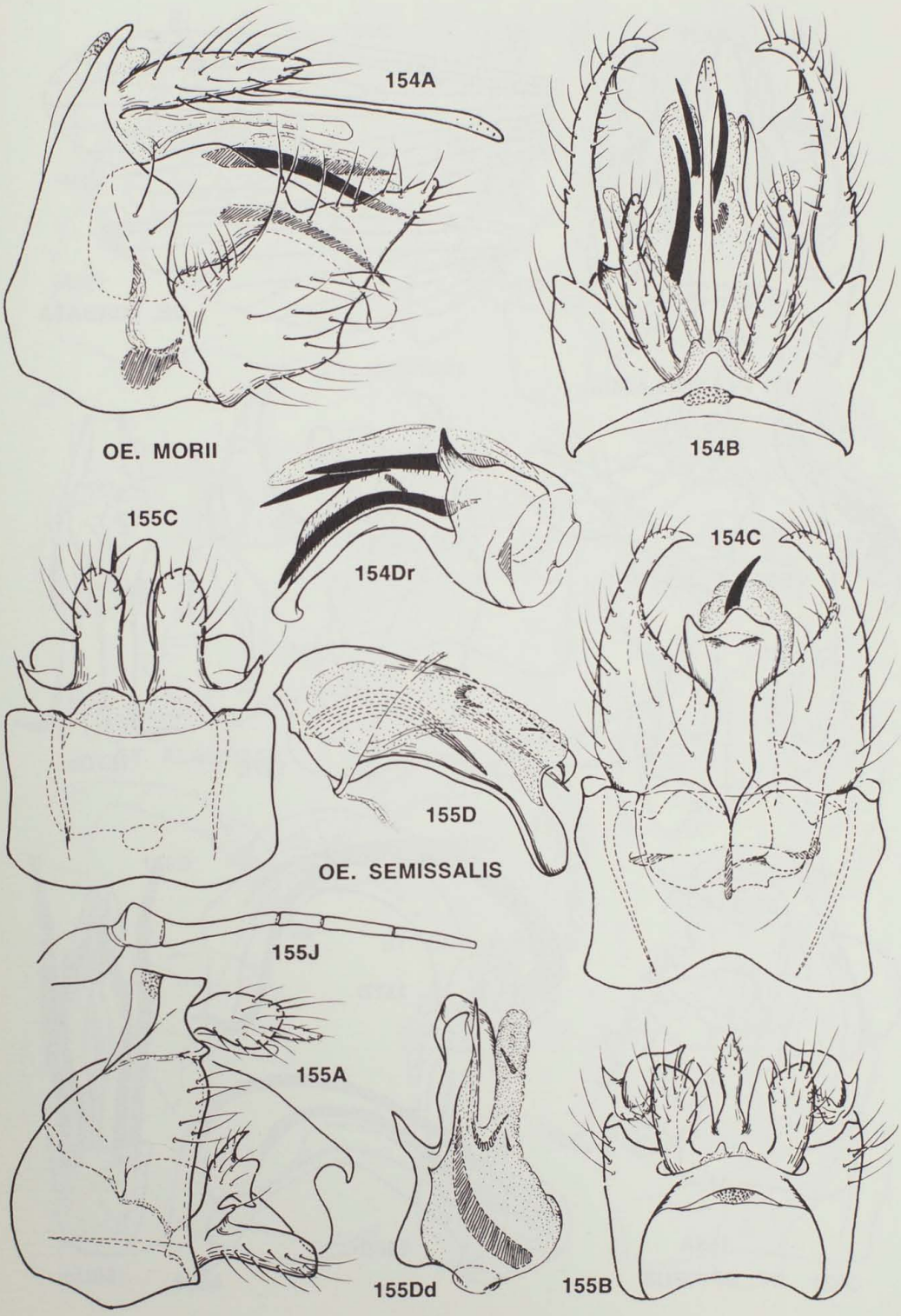


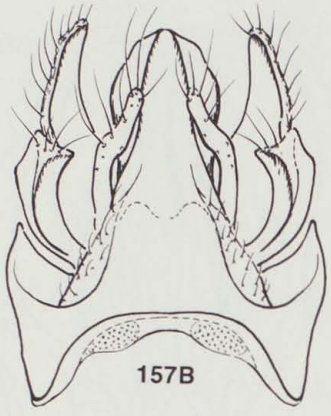
150B

OE. COMALIS


OE. COMALIS
150A
151C
150D
151A
151J
OE. CORNUATA
151B
151D
151De

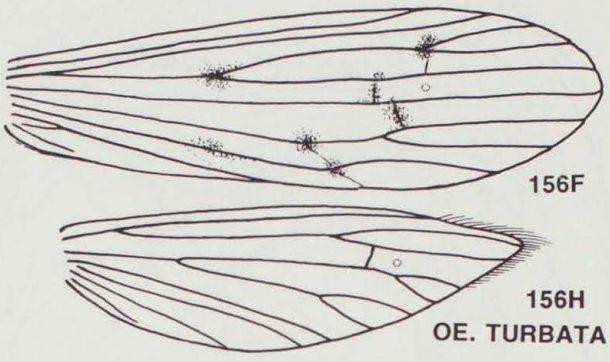

152A
152D
152B
OE. LAMINATA
152C
153C
OE. MIRABILIS
153A
ph. do
par
153D
ph. sc
153B


154A
154B
OE. MORII
154Dr
155C
154C
155D
OE. SEMISSALIS
155J
155A
155Dd
155B



157B

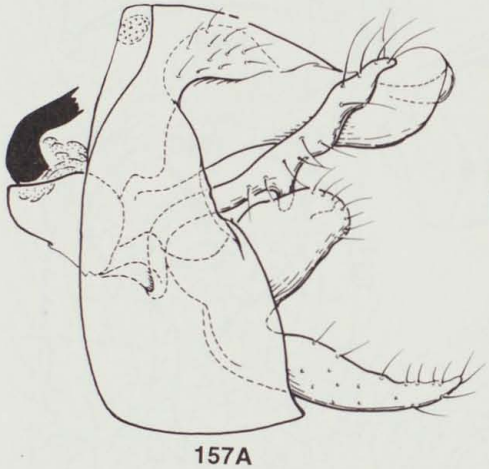
ST. PLATECLADUS



156F

156H

OE. TURBATA



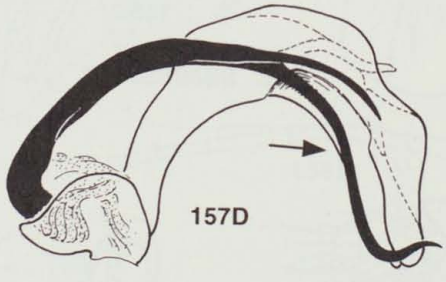
157A

157C

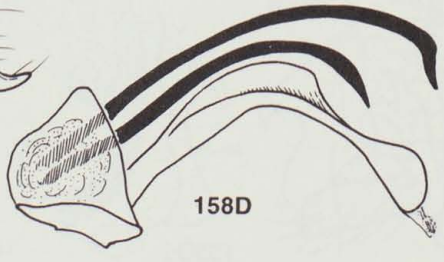
157Dc

158A

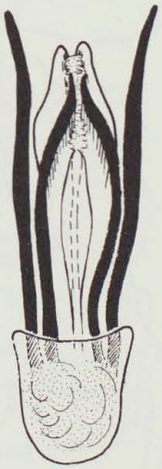
ST. SPINEUS



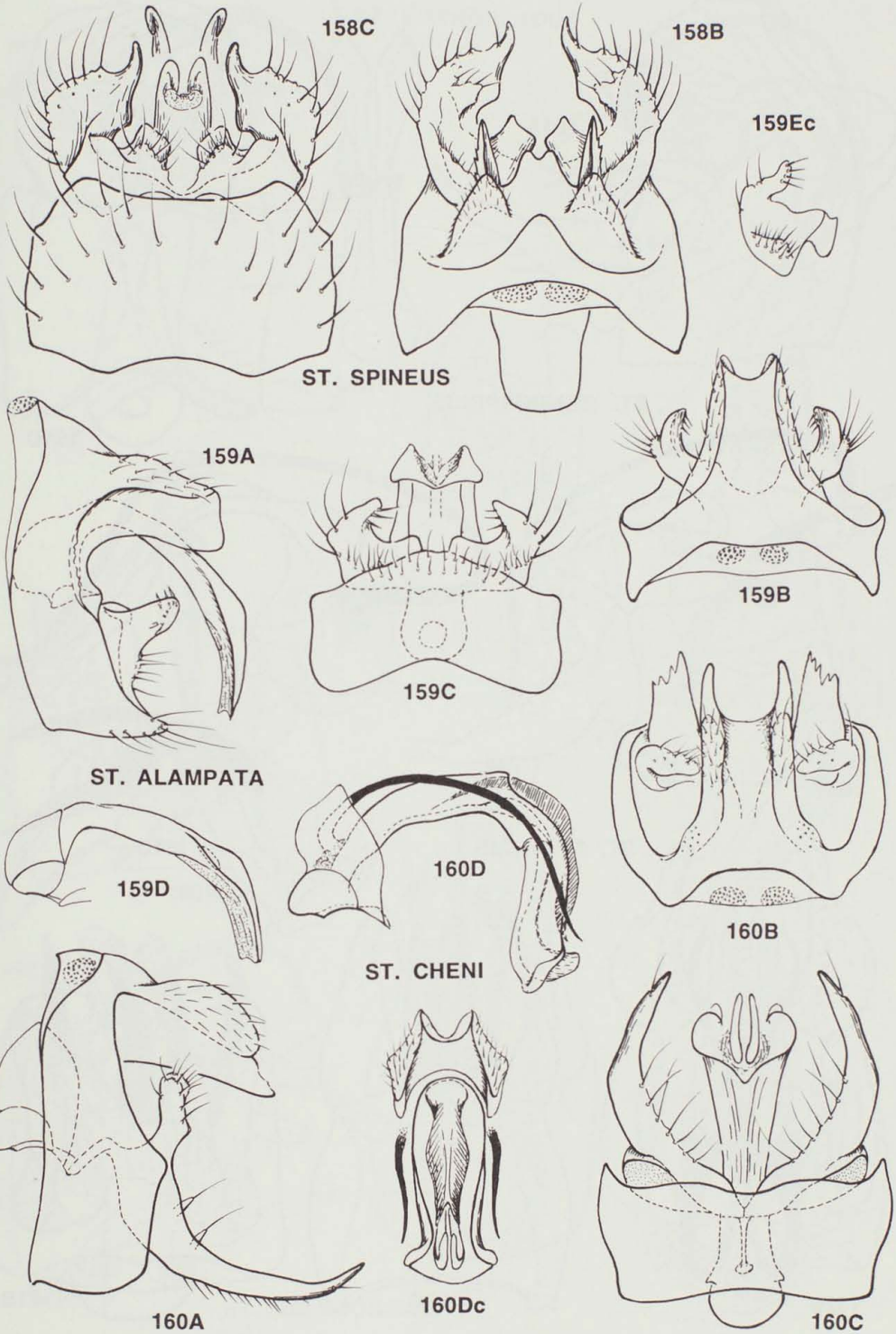
157D

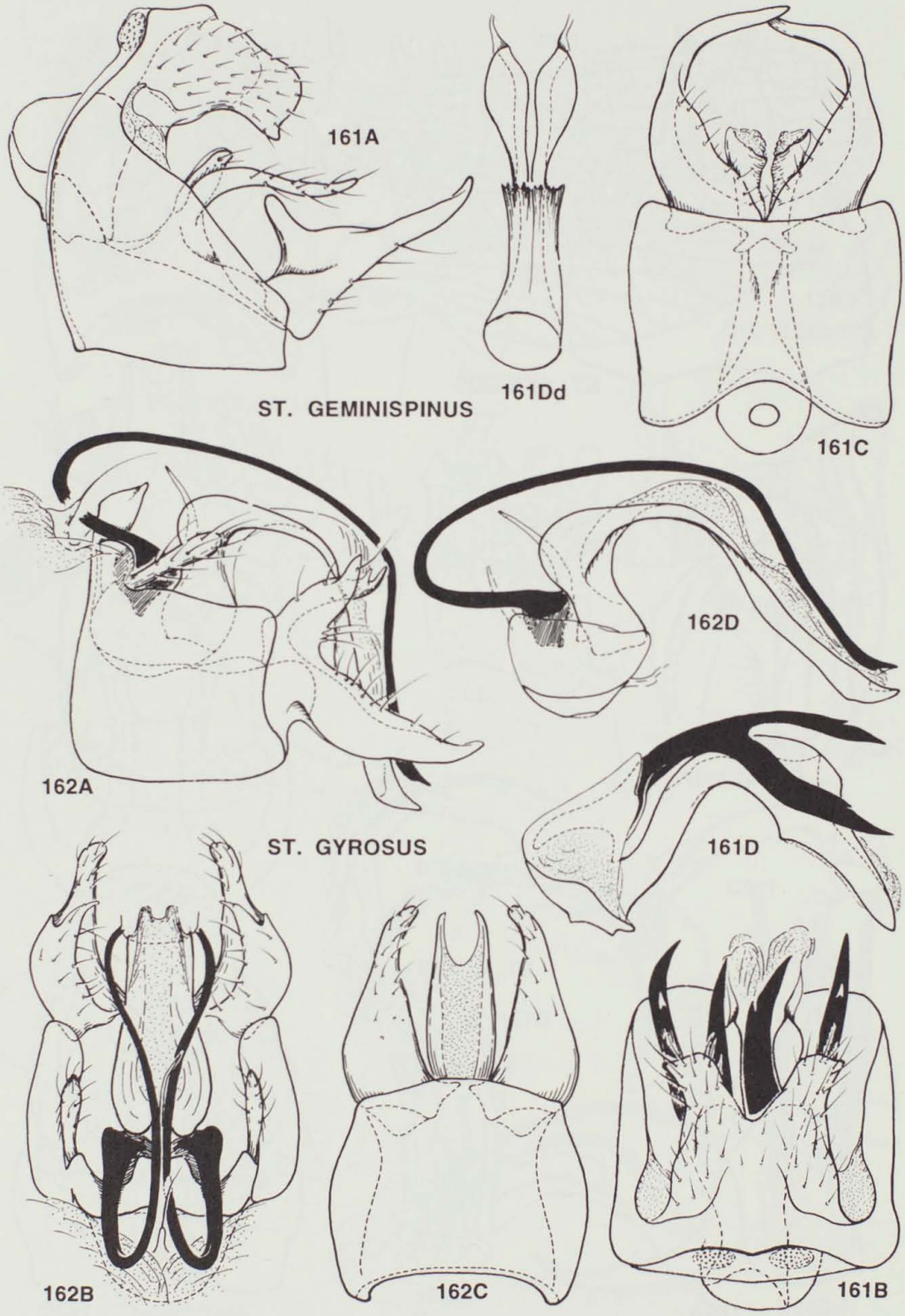


158D



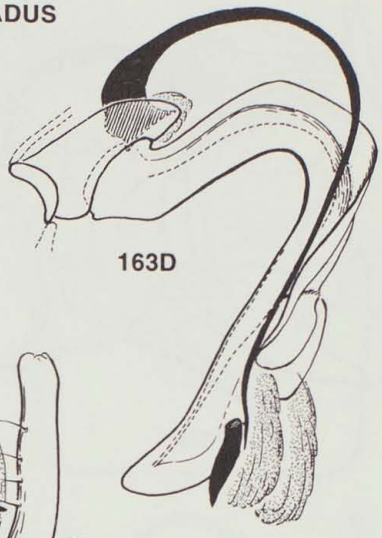
158Dd


158C
158B
159Ec
ST. SPINEUS
159A
159C
159B
ST. ALAMPATA
159D
160D
160B
ST. CHENI
160A
160Dc
160C

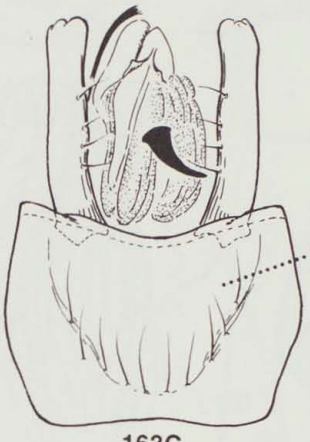

161A
161Dd
161C
ST. GEMINISPINUS
162D
162A
ST. GYROSUS
161D
162B
162C
161B

ST. ORTHOCLADUS

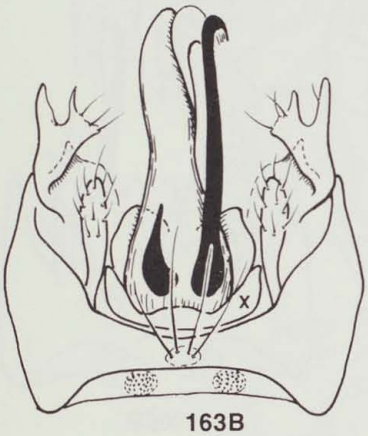
163A



163D

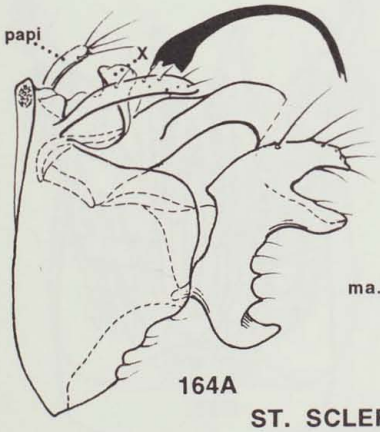


163C

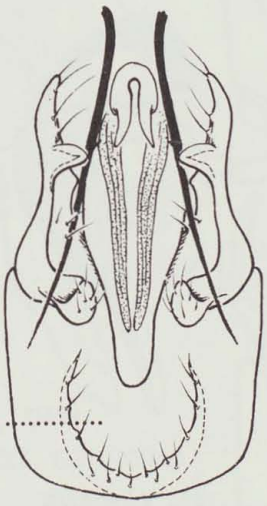


163B

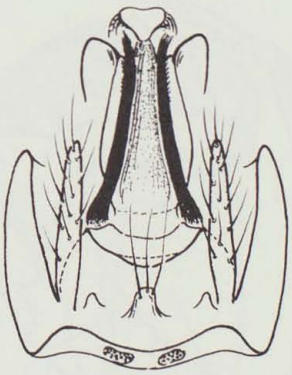
164D



164A

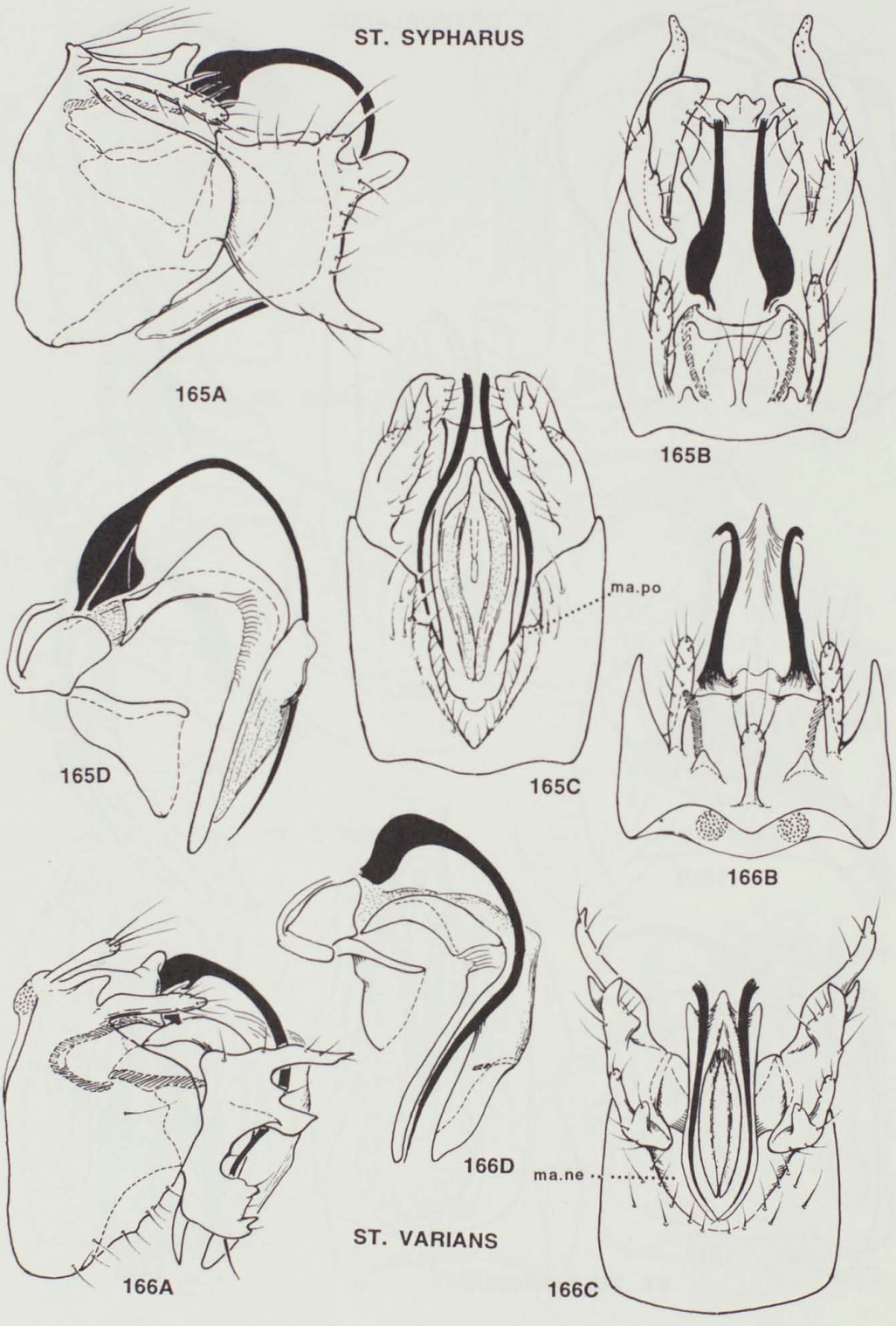


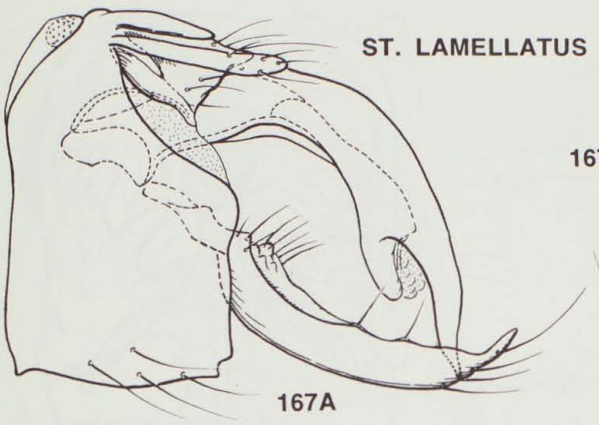
164C



164B

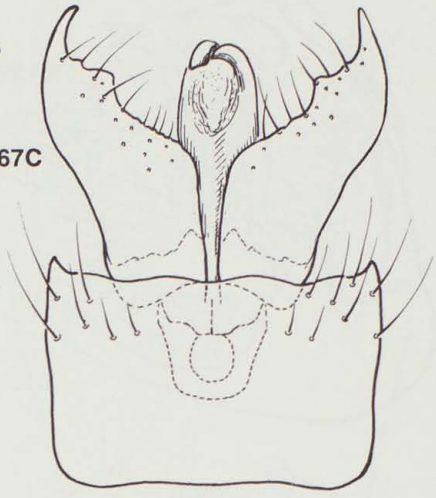
ST. SCLEROIDEUS


ST. SYPHARUS
165A
165B
ma.po
165C
165D
166B
166D
ma.ne
ST. VARIANS
166A
166C

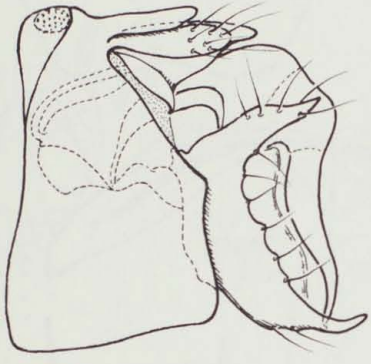


ST. LAMELLATUS

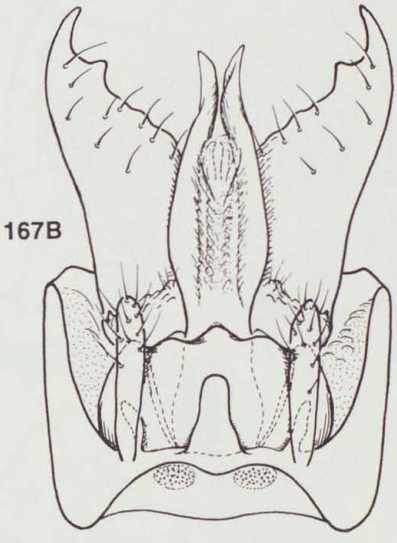
167A



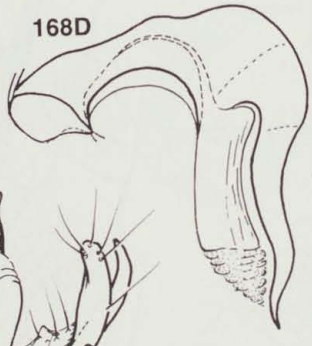
167C



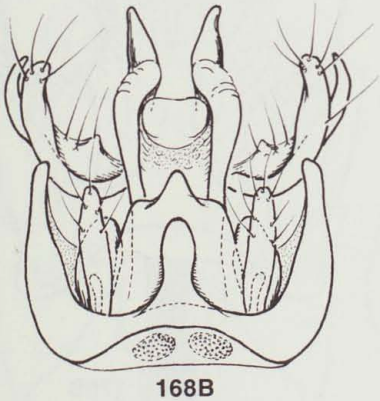
168A



167B

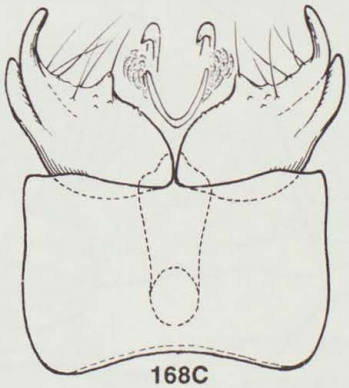


168D

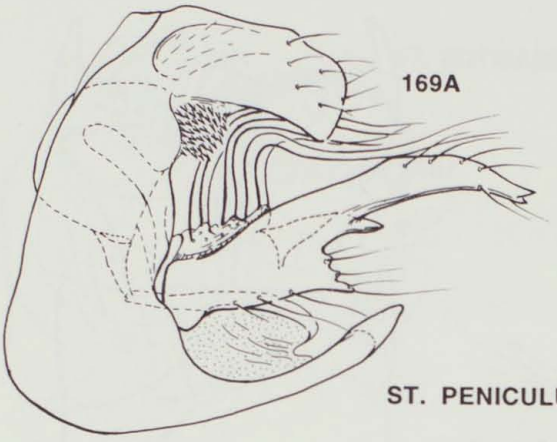


168B

ST. SINUATUS

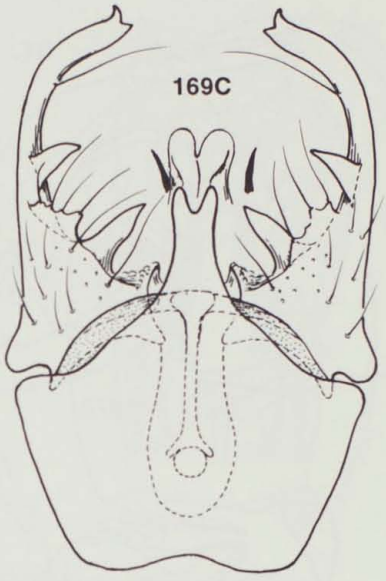


168C

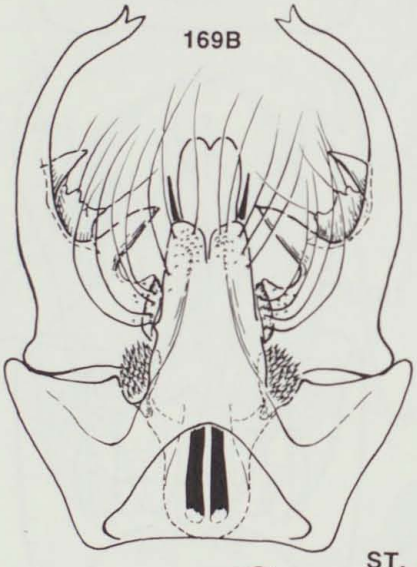


169A

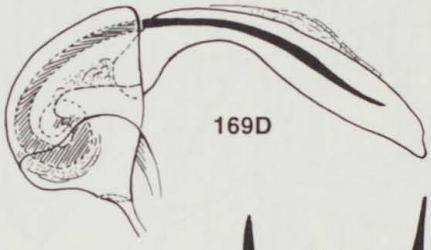
ST. PENICULUS



169C

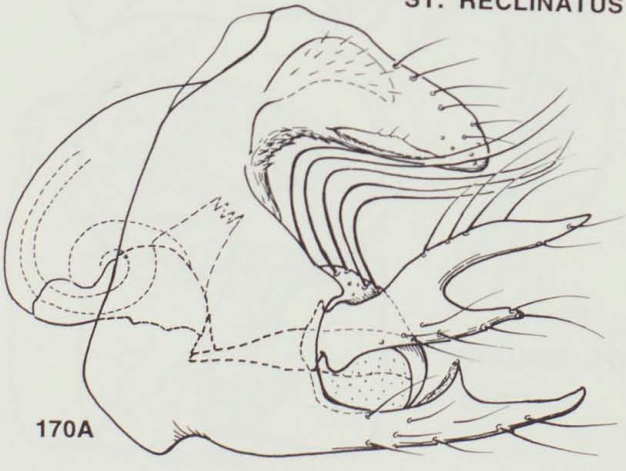


169B



169D

ST. RECLINATUS

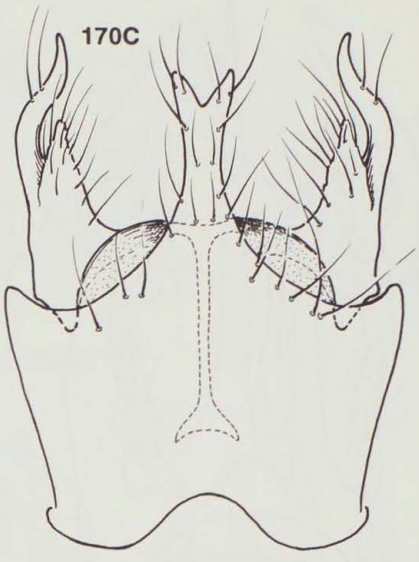


170A

170B

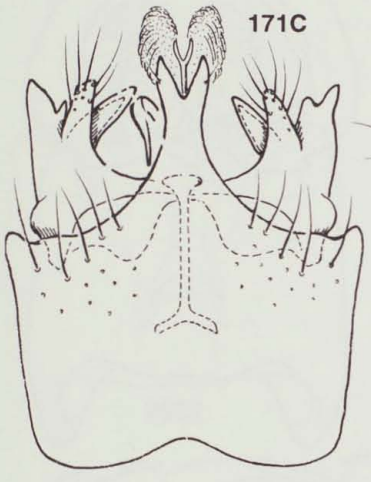
171A

ST. TECTORIUS



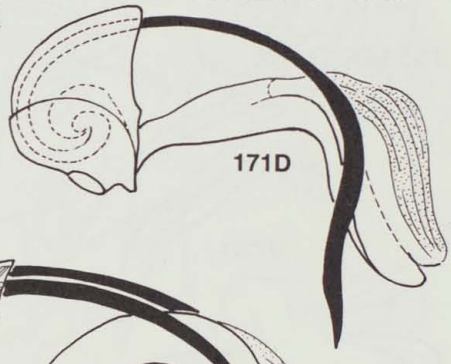
170C

ST. RECLINATUS

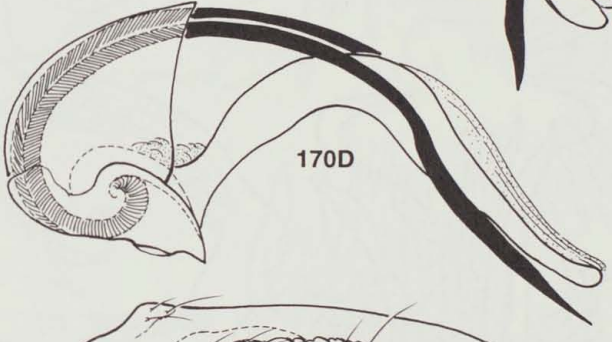


171C

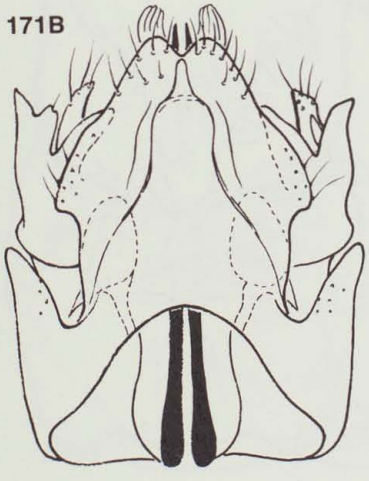
172J



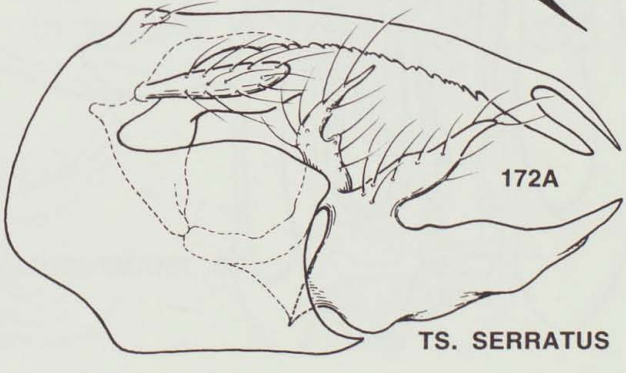
171D



170D

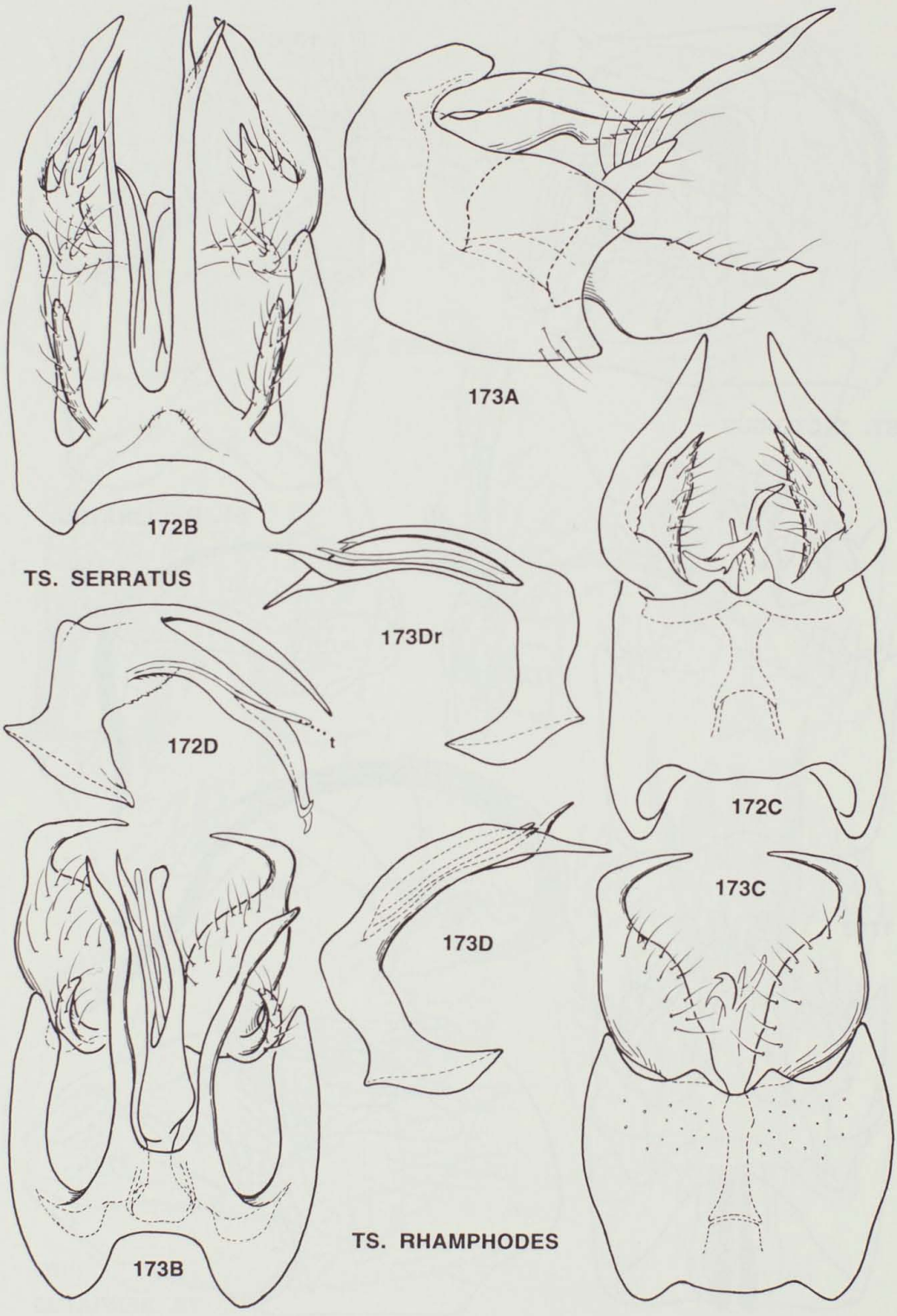


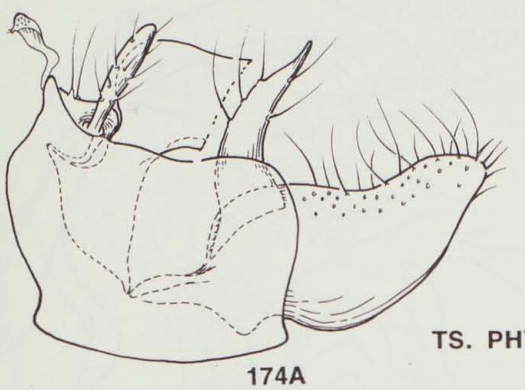
171B



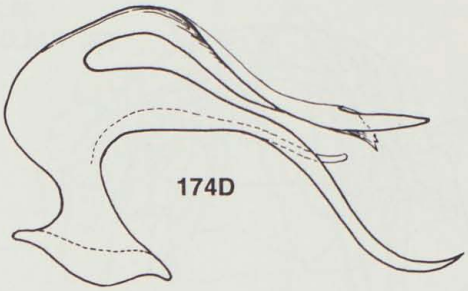
172A

TS. SERRATUS


172B
TS. SERRATUS
173A
172C
173Dr
172D
t
173C
173D
173B
TS. RHAMPHODES



174A

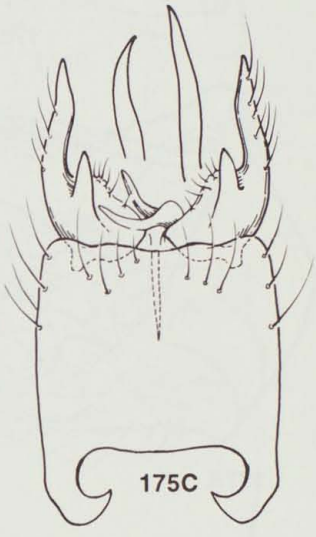


174D

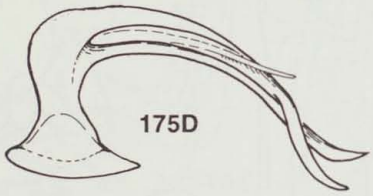
TS. PHYLLOIDEUS

174C

174B

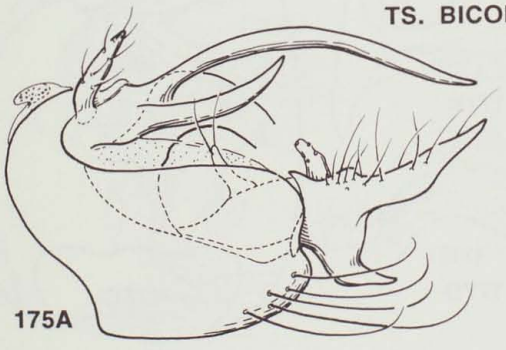


175C

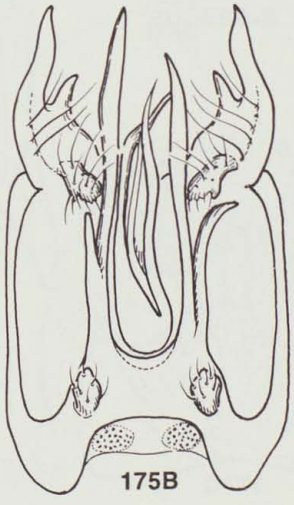


175D

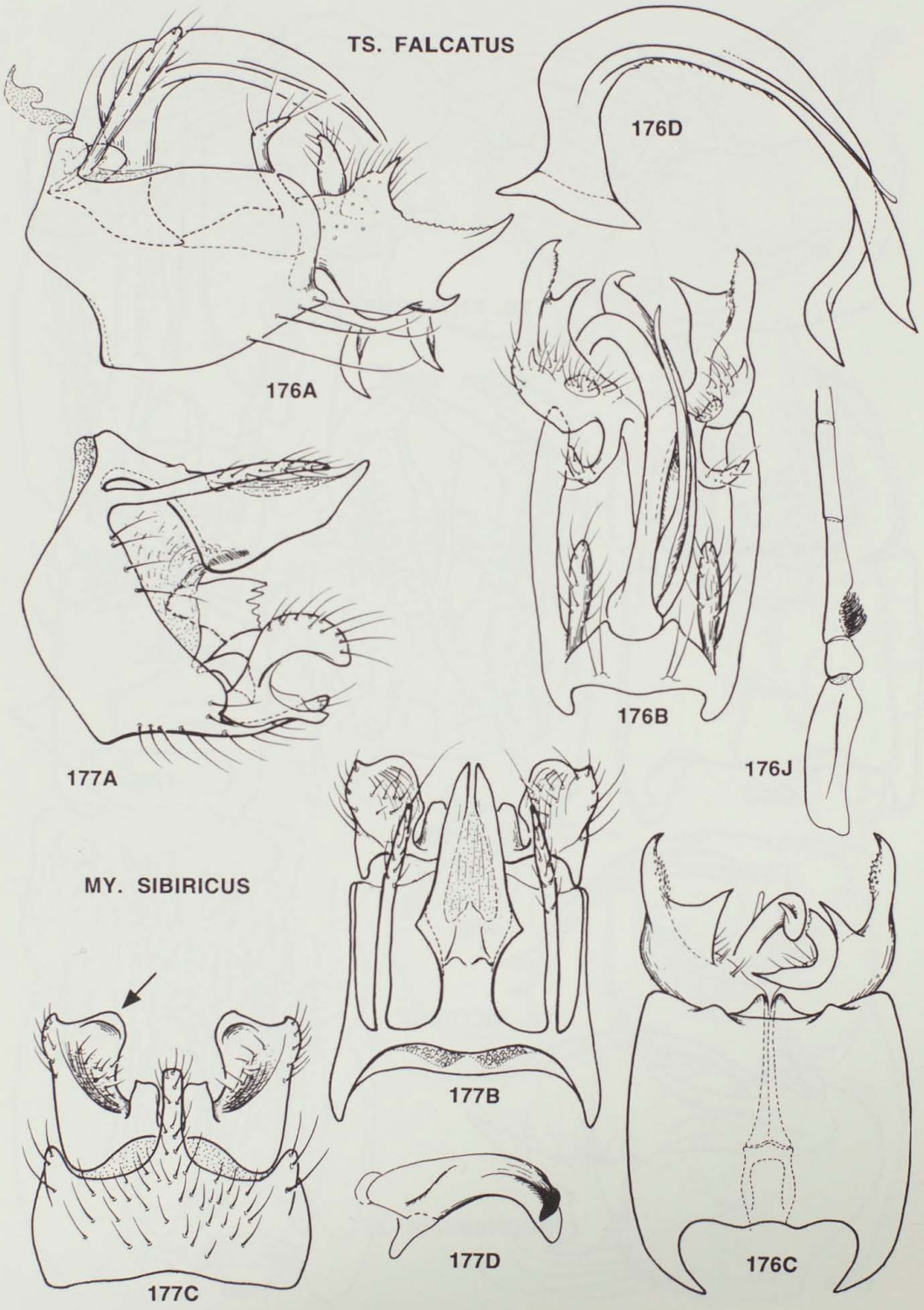
TS. BICORNIS

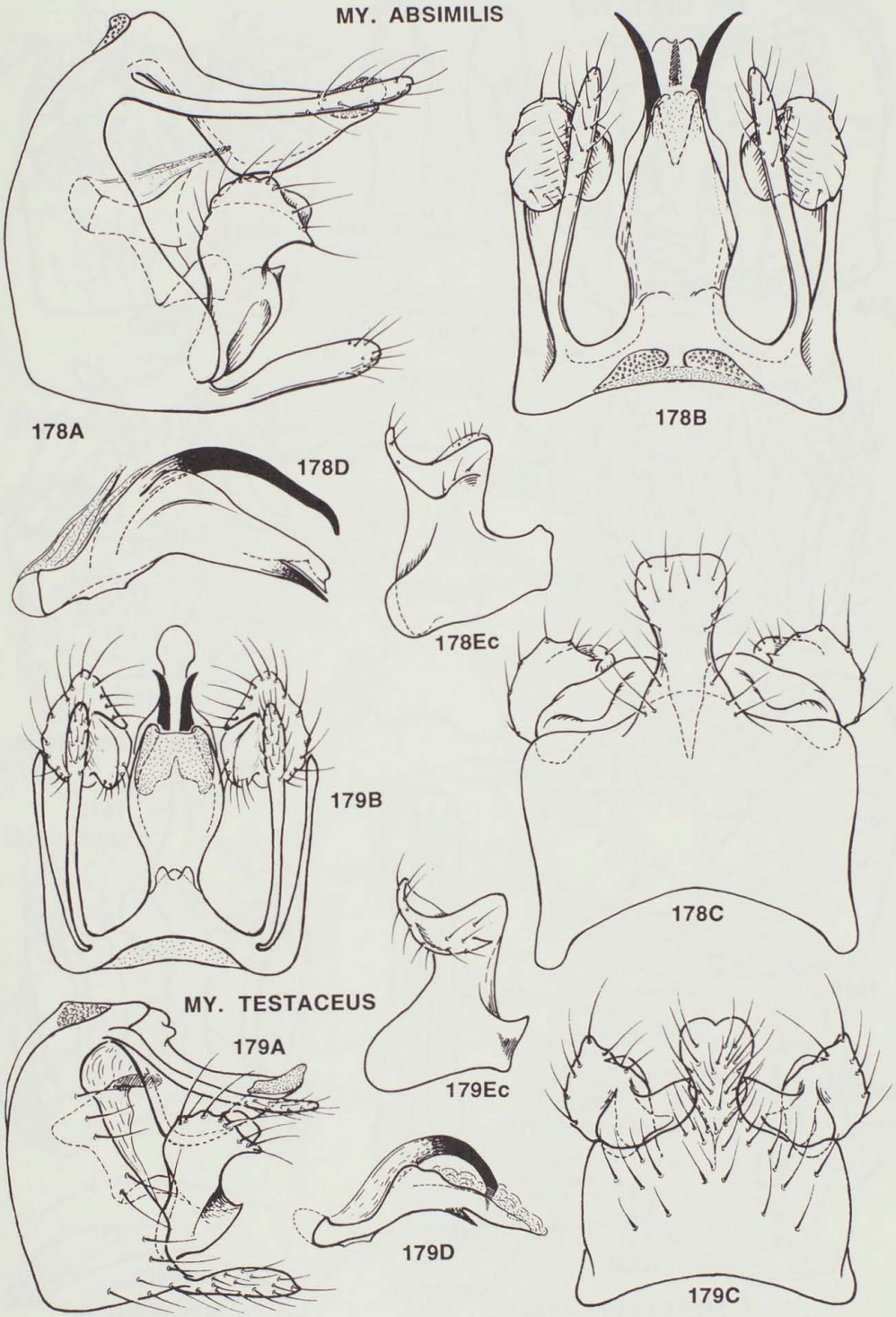


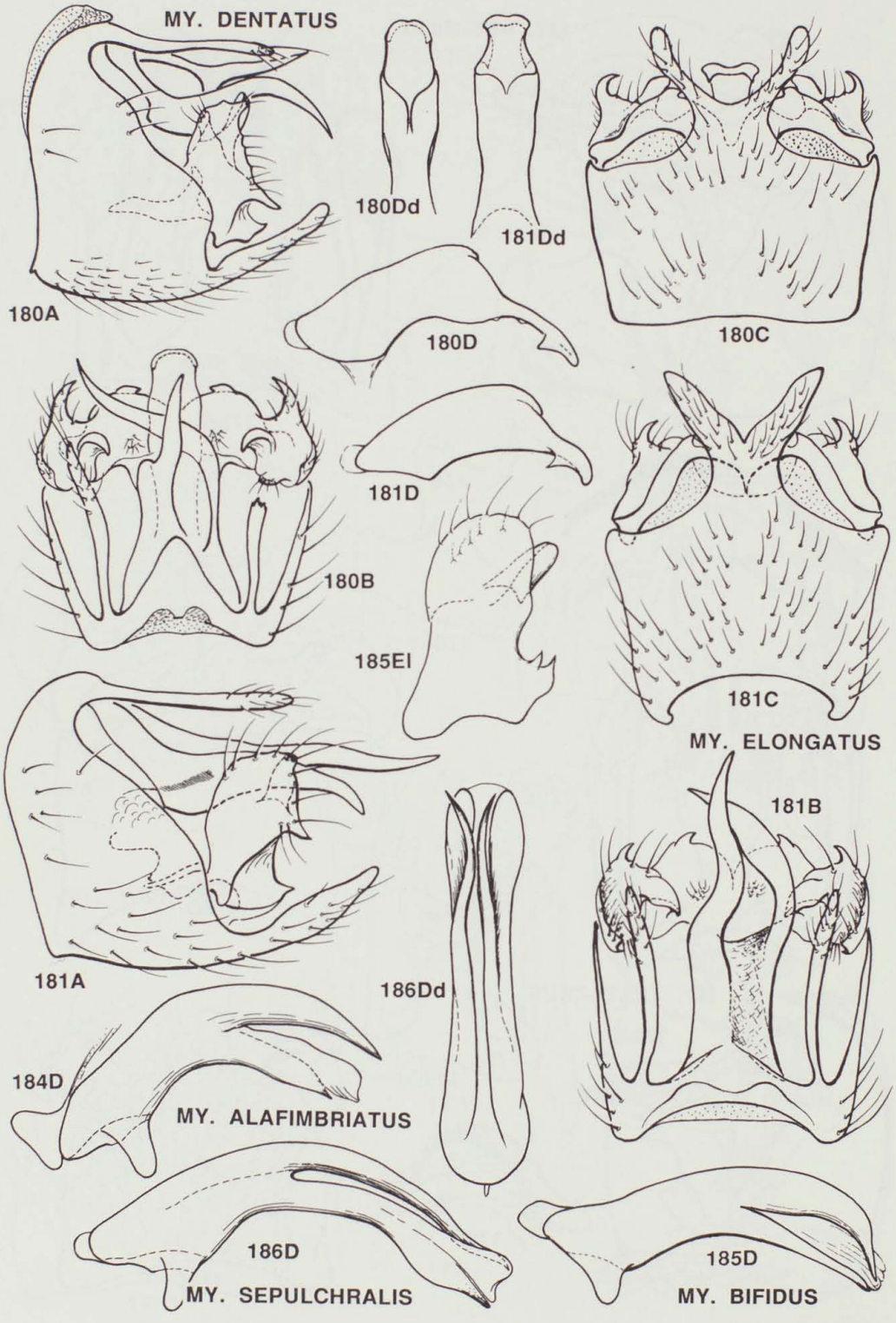
175A

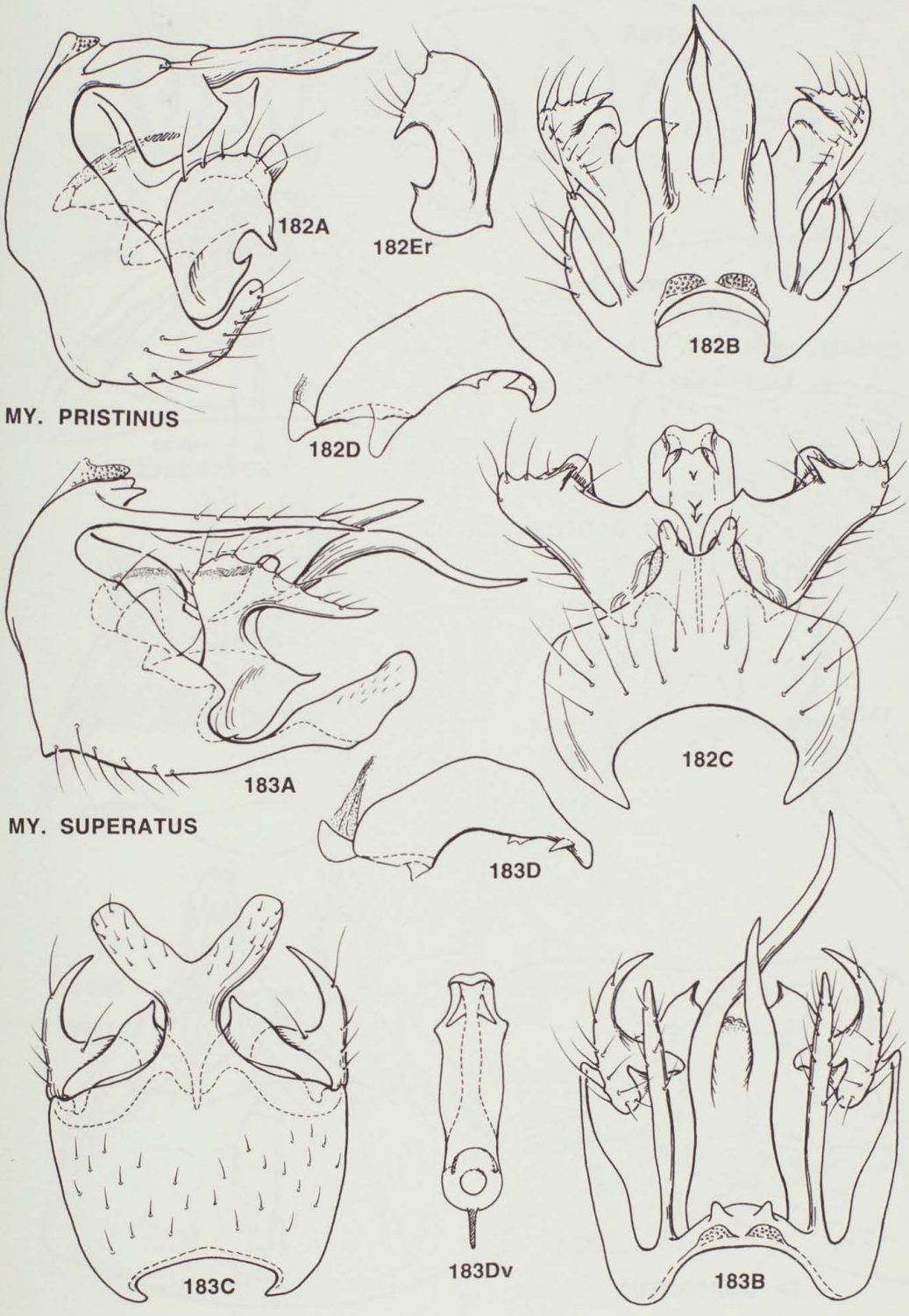


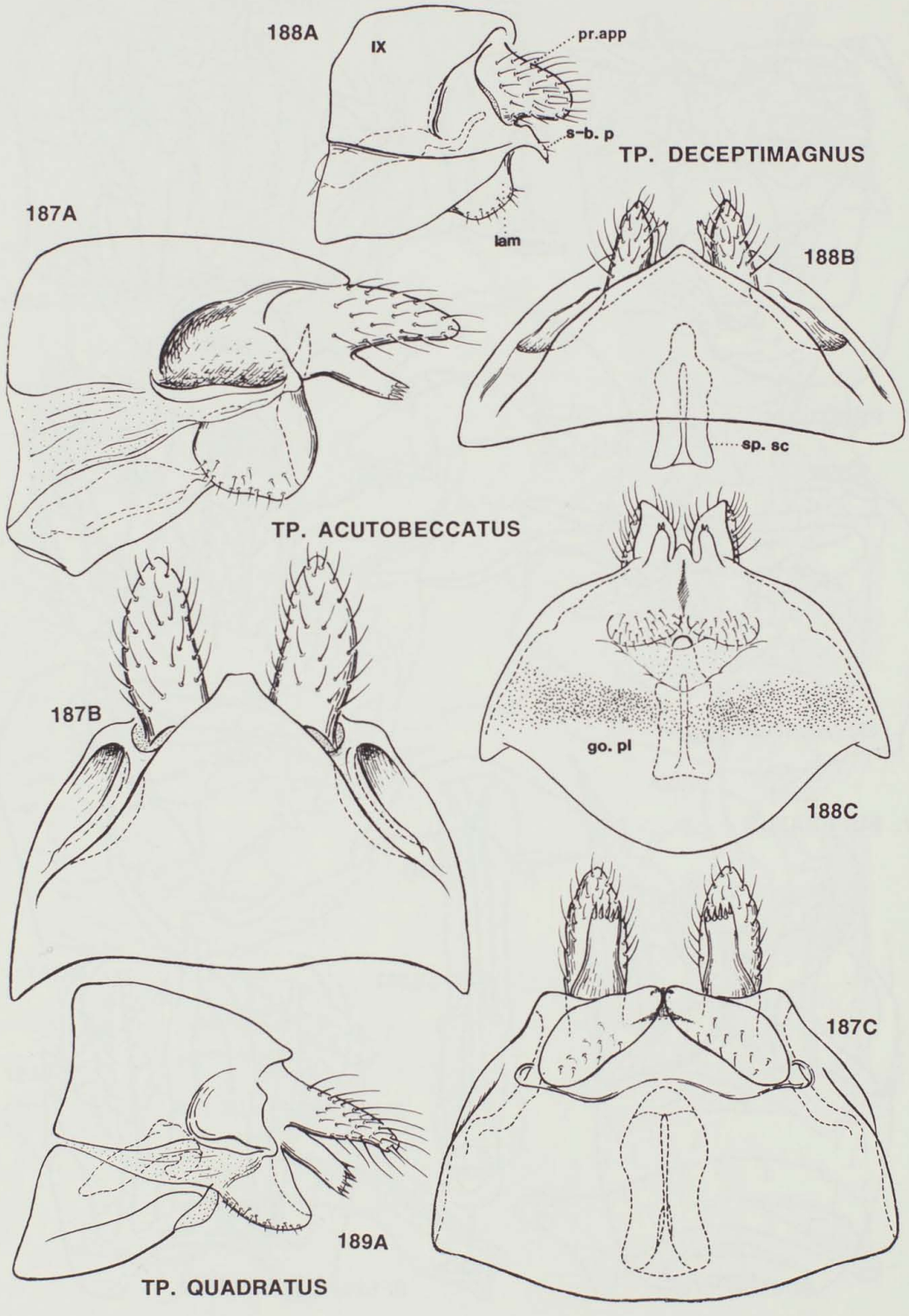
175B

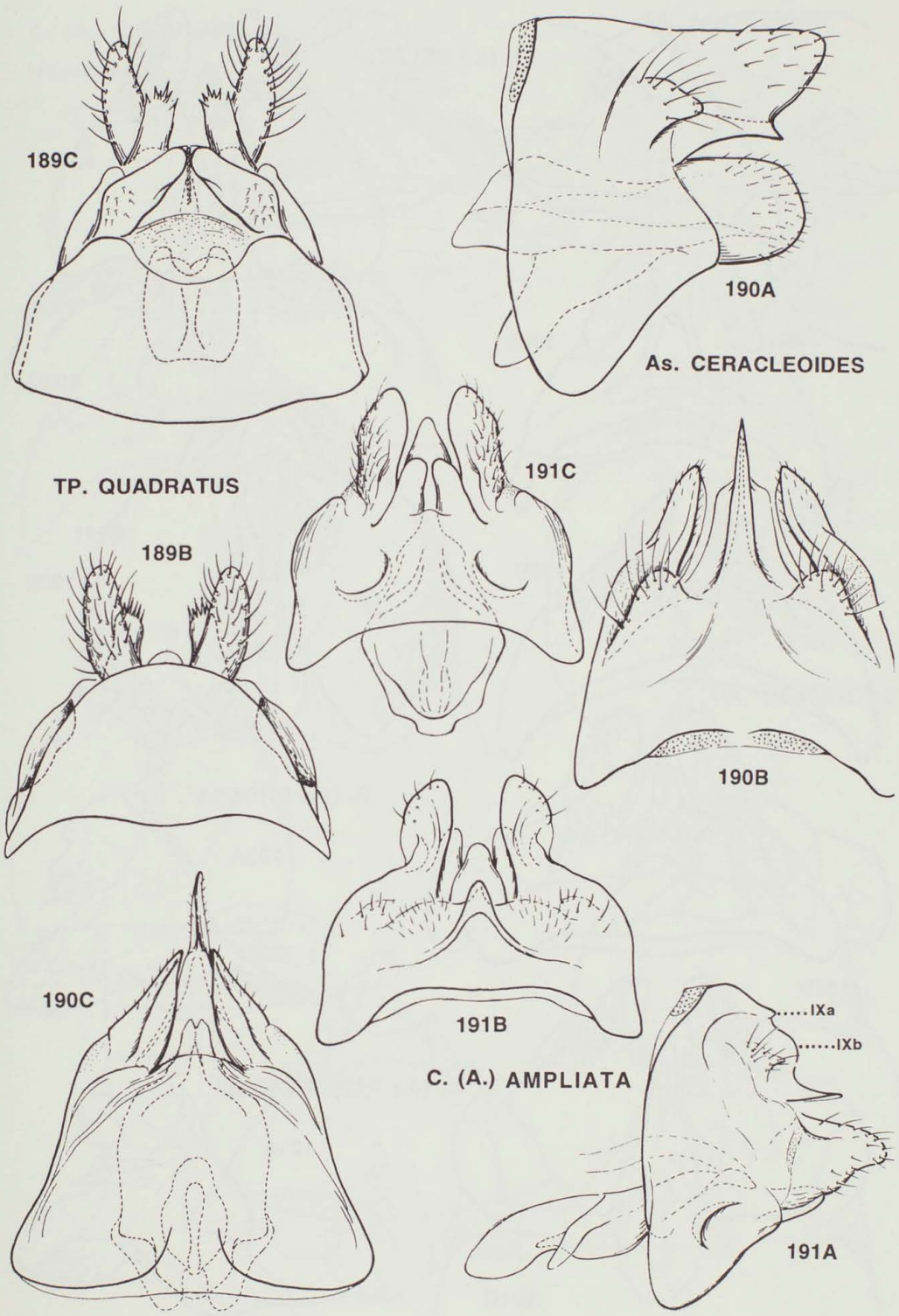

TS. FALCATUS
176D
176A
176B
176J
177A
MY. SIBIRICUS
177B
177C
177D
176C

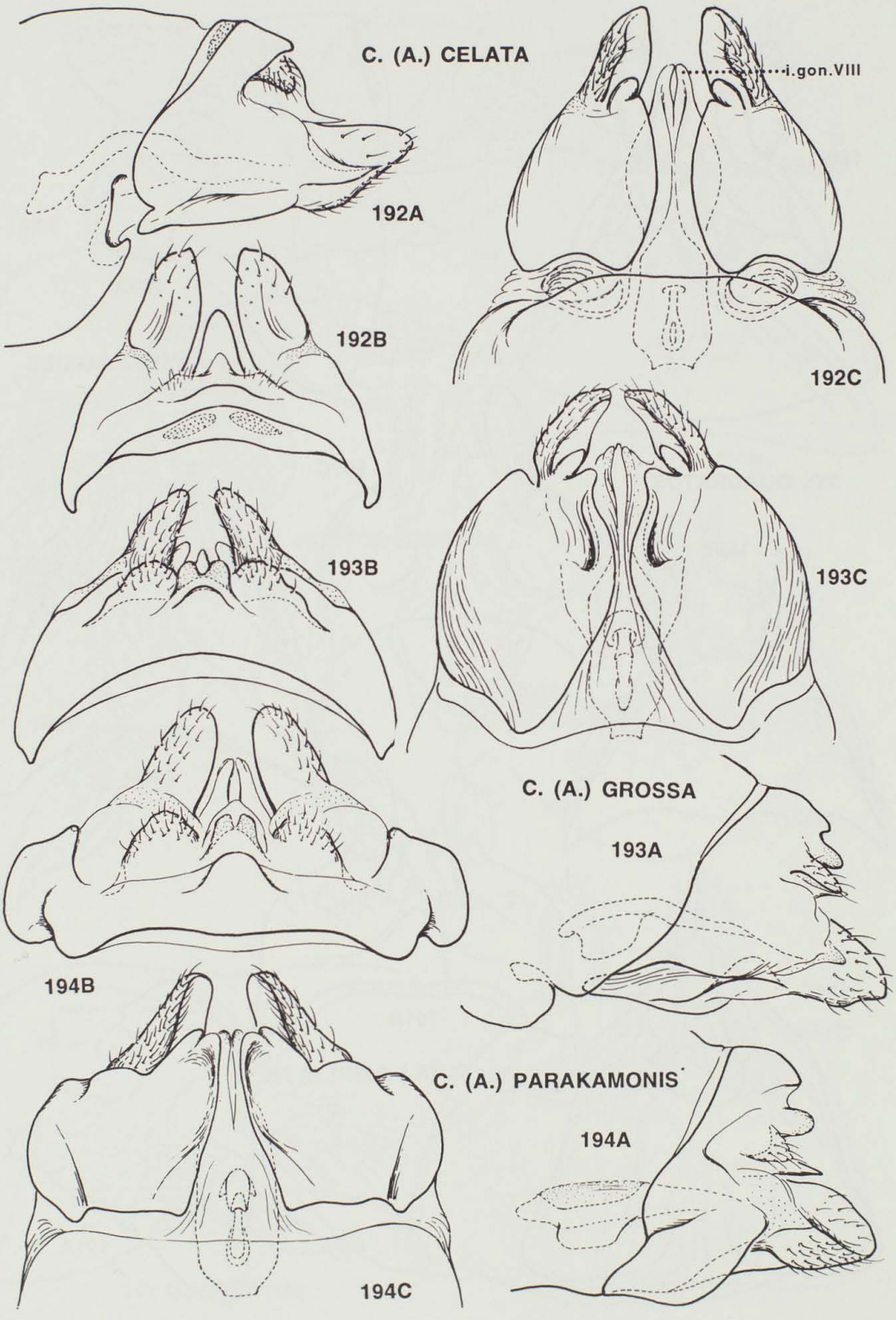

MY. ABSIMILIS
178A
178B
178D
178Ec
179B
178C
MY. TESTACEUS
179A
179Ec
179D
179C

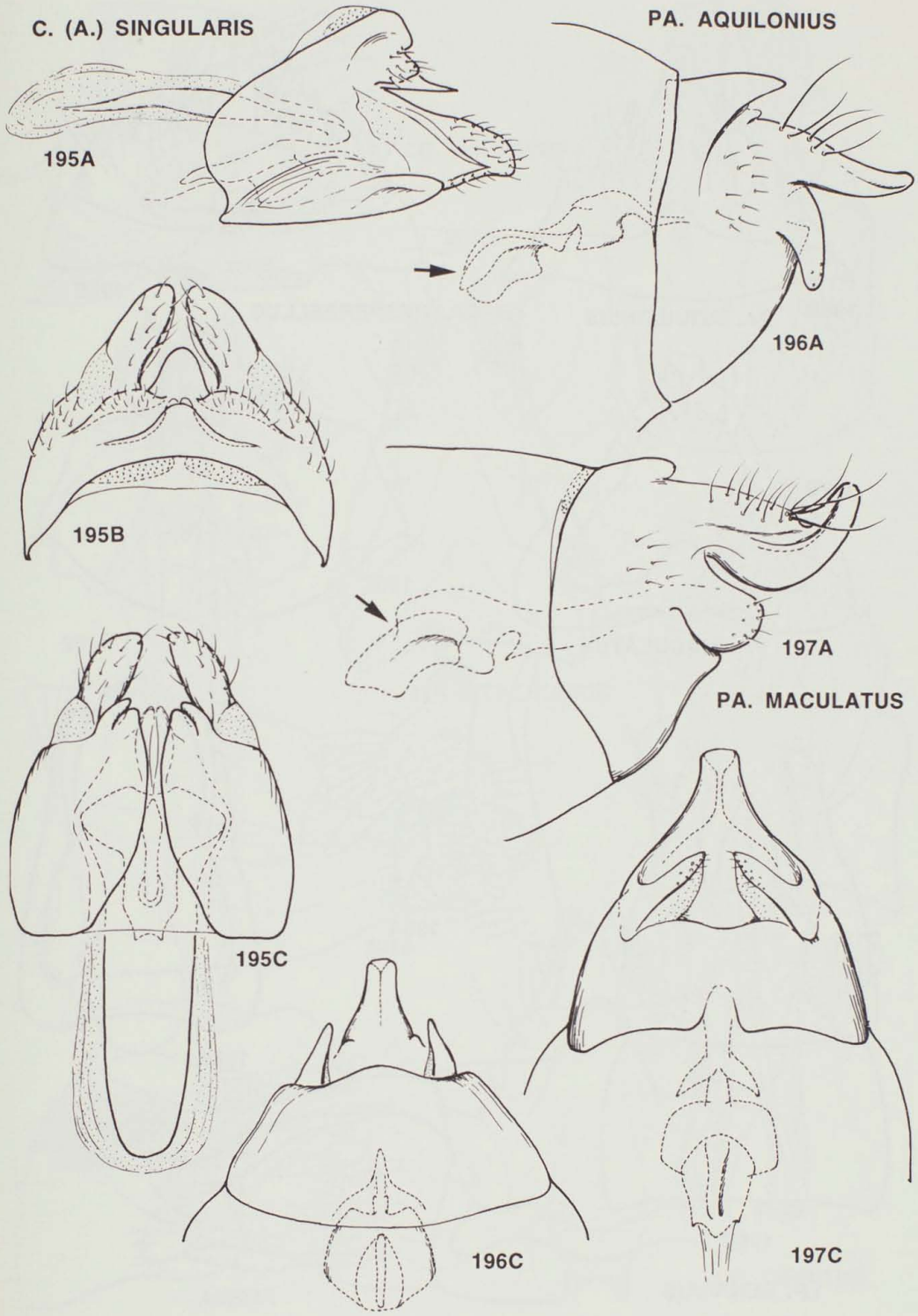

MY. DENTATUS
180Dd
181Dd
180A
180D
180C
180B
181D
185EI
181C
MY. ELONGATUS
181B
181A
186Dd
184D
MY. ALAFIMBRIATUS
186D
MY. SEPULCHRALIS
185D
MY. BIFIDUS

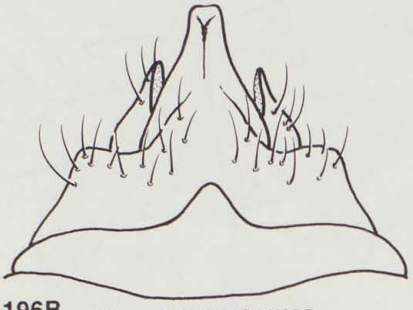

182A
182Er
182B
MY. PRISTINUS
182D
183A
182C
MY. SUPERATUS
183D
183C
183Dv
183B


188A
IX
pr.app
s–b. p
lam
TP. DECEPTIMAGNUS
187A
188B
sp. sc
TP. ACUTOBECCATUS
187B
go. pl
188C
187C
189A
TP. QUADRATUS

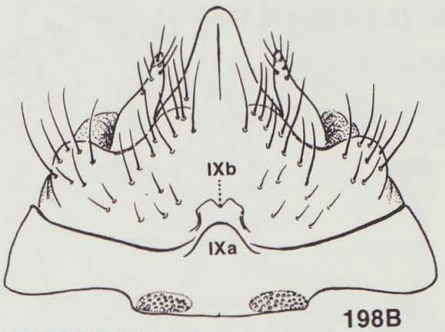

189C
190A
As. CERACLEOIDES
TP. QUADRATUS
191C
189B
190B
190C
191B
C. (A.) AMPLIATA
IXa
IXb
191A


C. (A.) CELATA
i.gon.VIII
192A
192B
192C
193B
193C
C. (A.) GROSSA
193A
194B
C. (A.) PARAKAMONIS
194A
194C

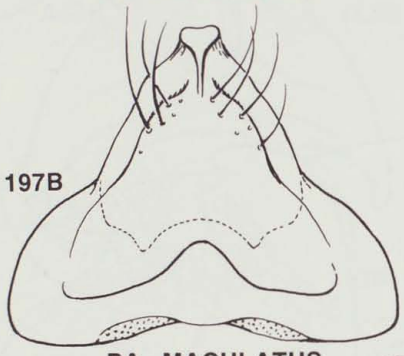

C. (A.) SINGULARIS
195A
195B
195C
PA. AQUILONIUS
196A
196C
PA. MACULATUS
197A
197C



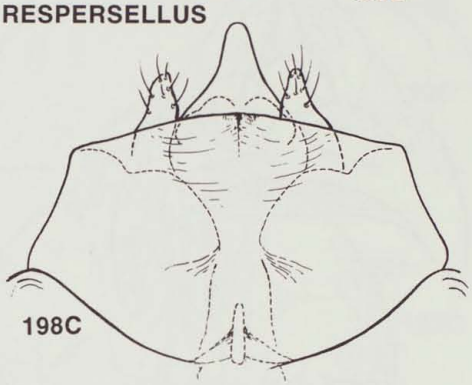
196B PA. AQUILONIUS



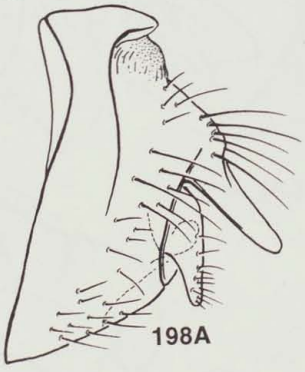
198B PA. RESPERSELLUS



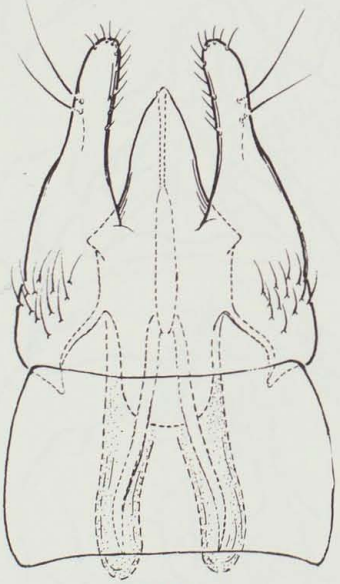
197B PA. MACULATUS



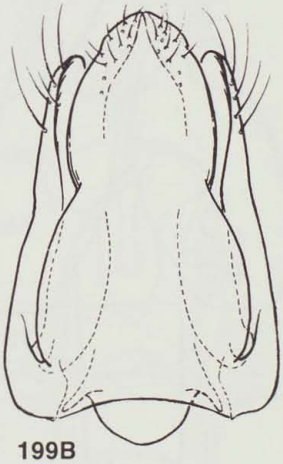
198C



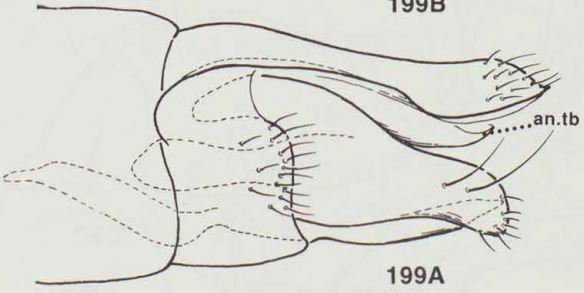
198A



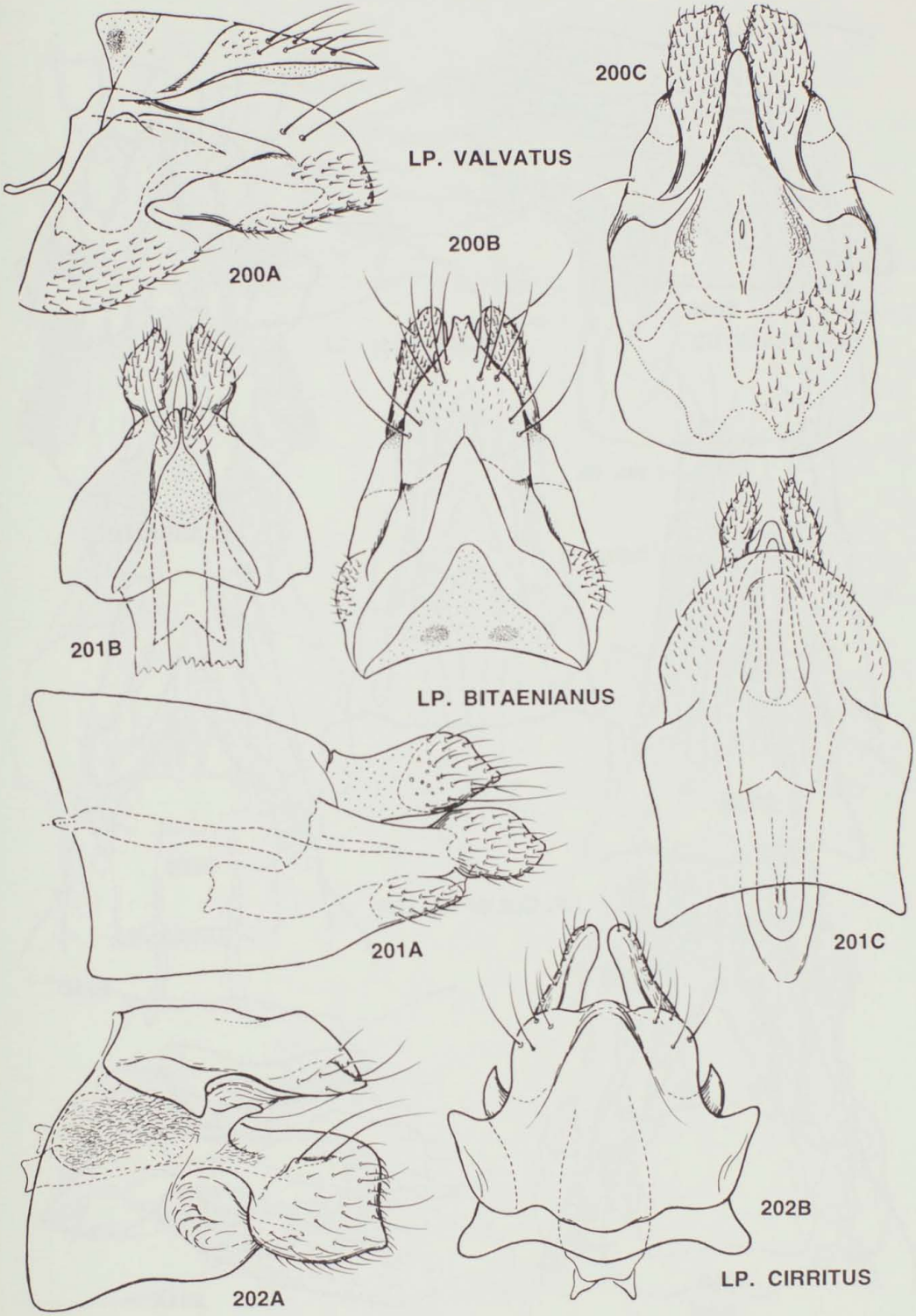
199C LP. SENARIUS

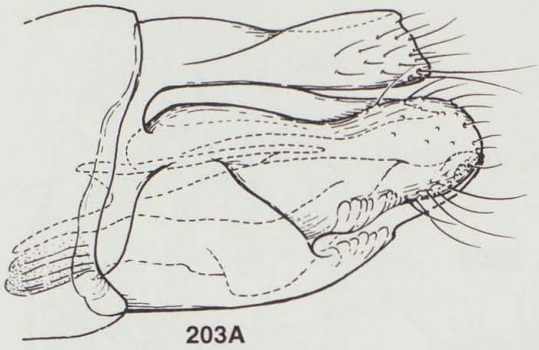


199B



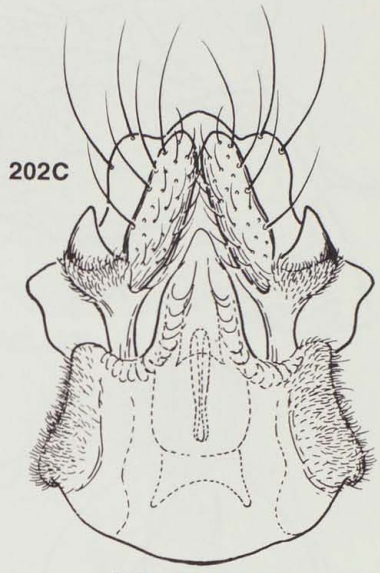
199A


LP. VALVATUS
200A
200B
200C
LP. BITAENIANUS
201B
201A
201C
202A
202B
LP. CIRRITUS



203A

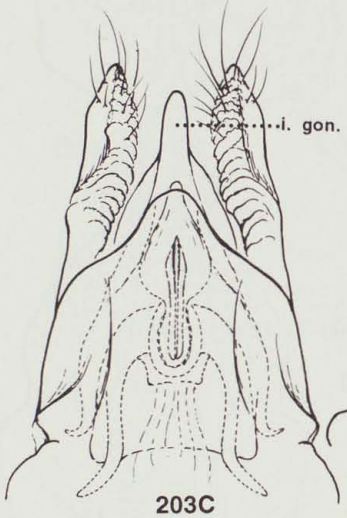
LP. CLINATUS



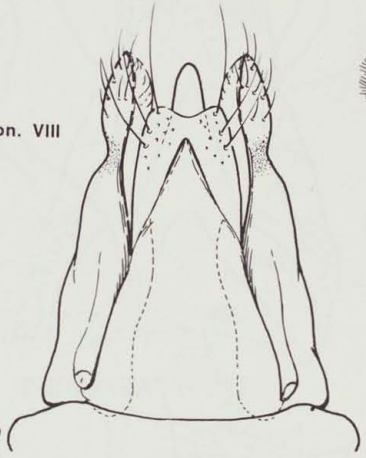
202C

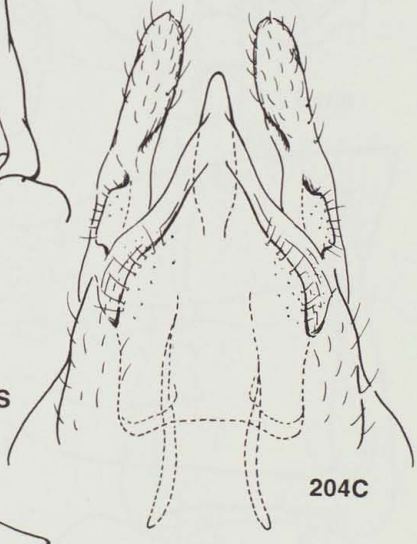
LP. CIRRITUS

203B



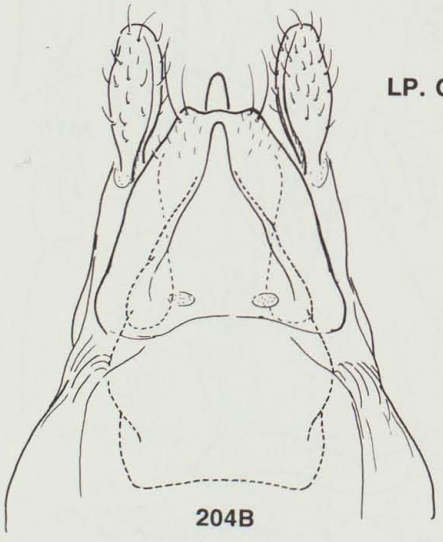
203C



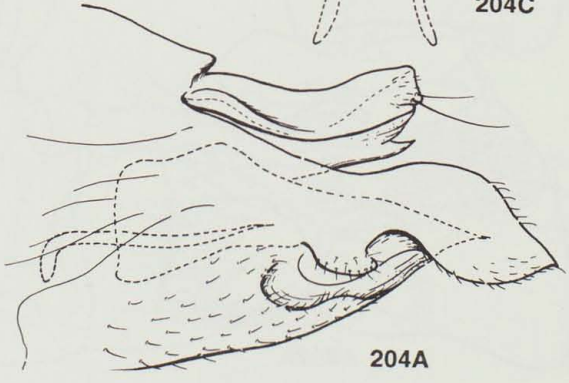


LP. COLOPHALLUS

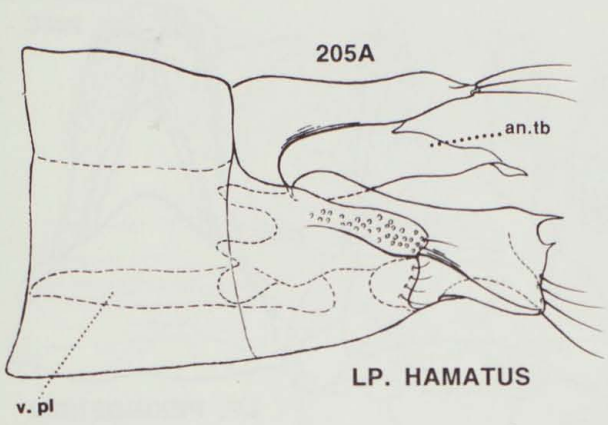
204C



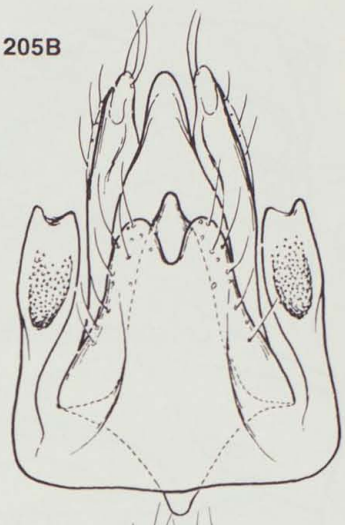
204B

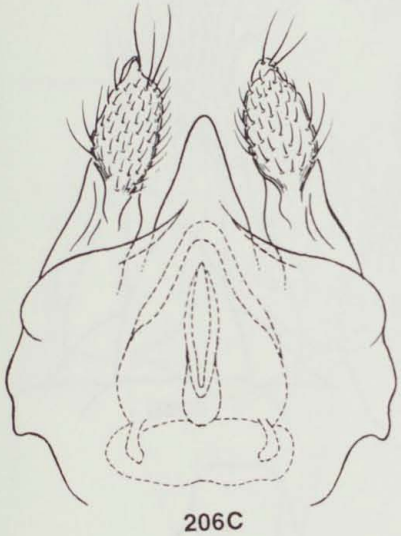


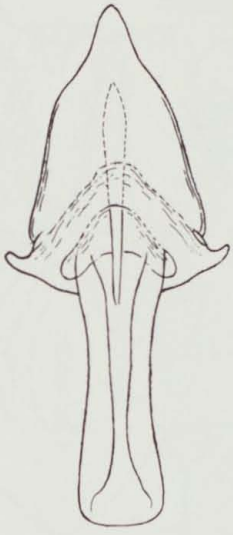
204A

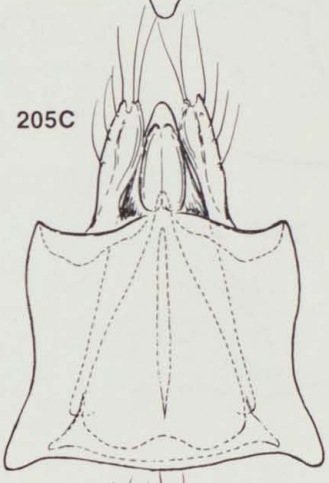


LP. HAMATUS

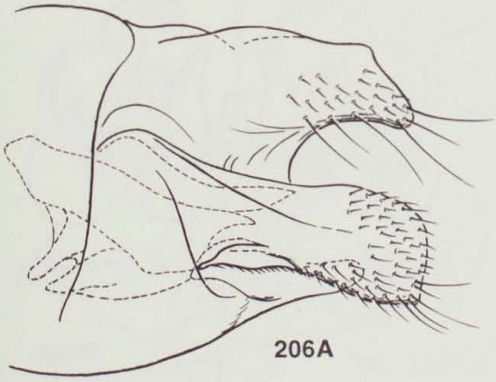


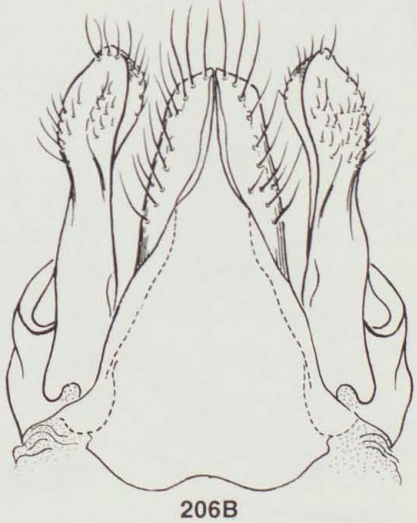


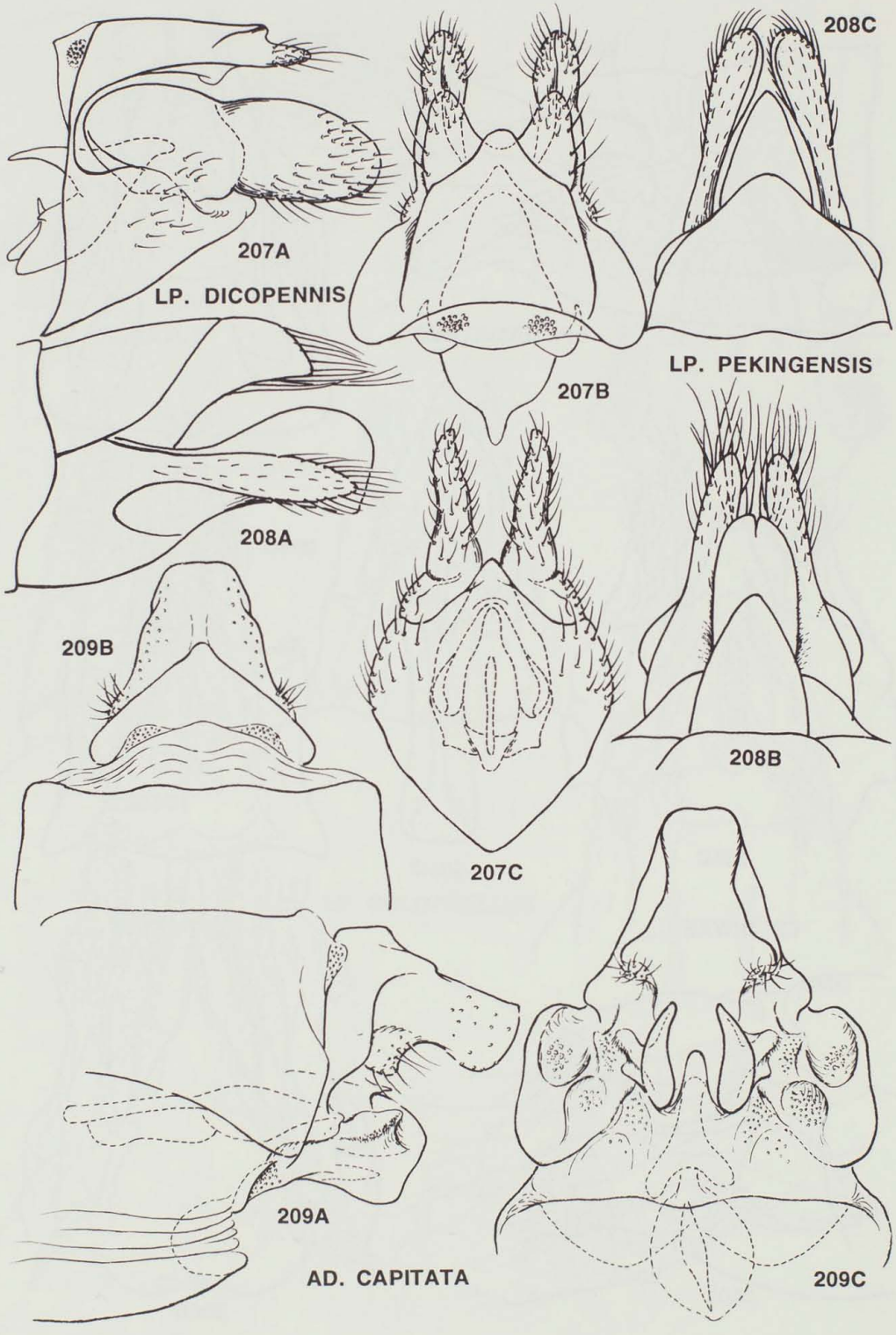


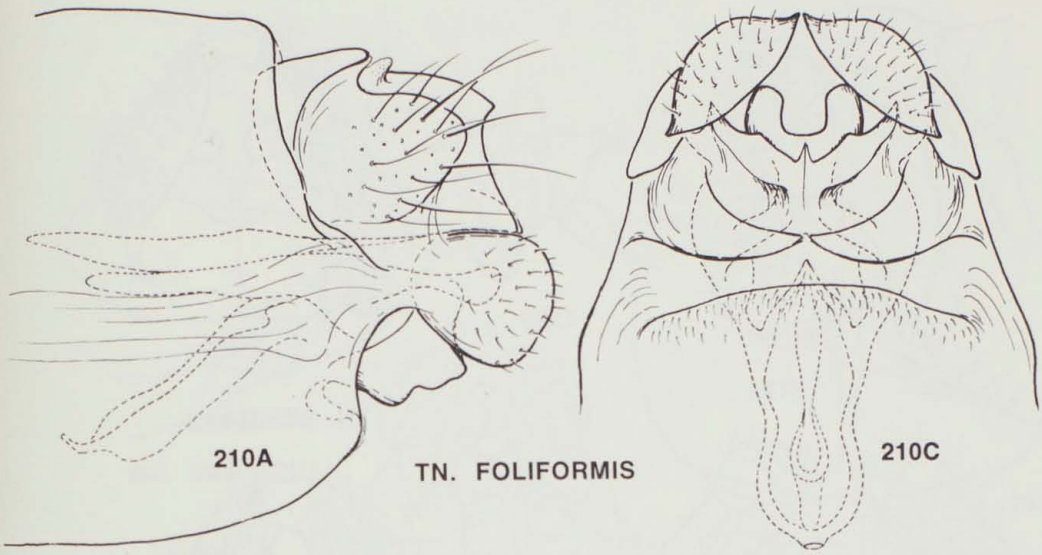


LP. BIWAE

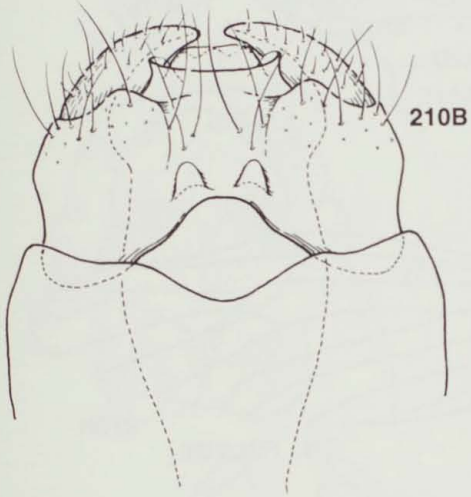


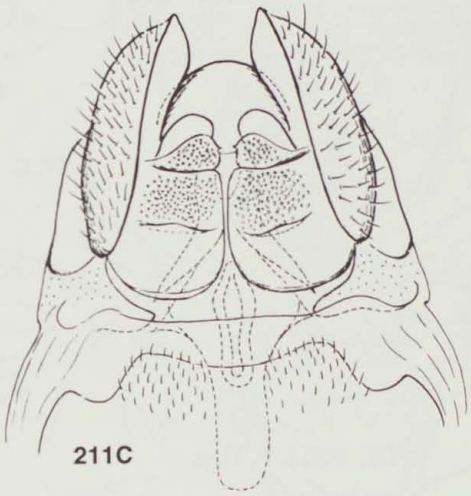


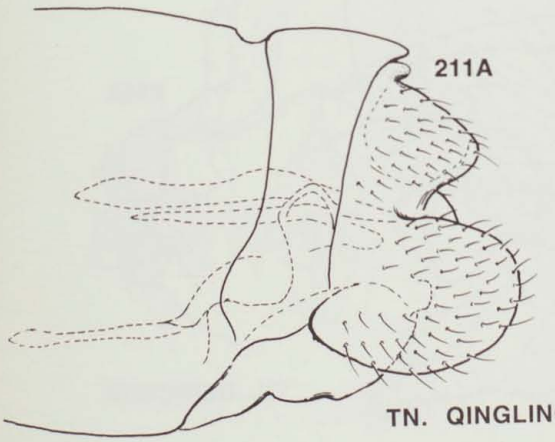

208C
207A
LP. DICOPENNIS
LP. PEKINGENSIS
207B
208A
209B
208B
207C
209A
AD. CAPITATA
209C

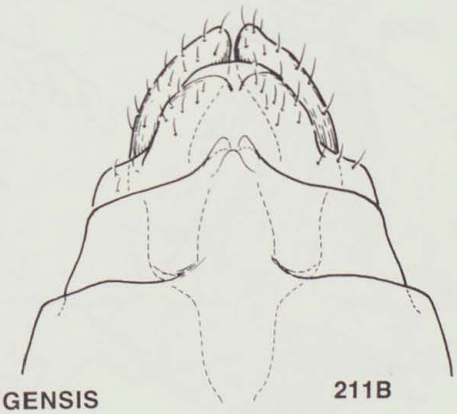


TN. FOLIFORMIS

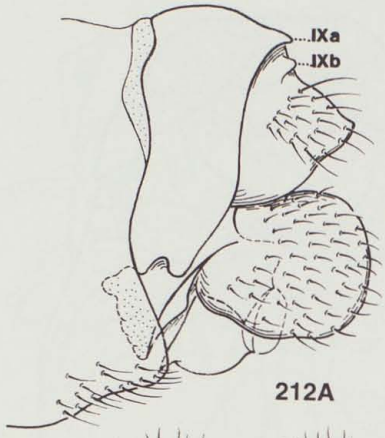




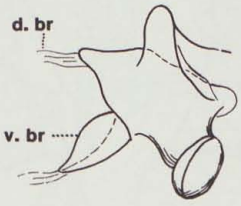




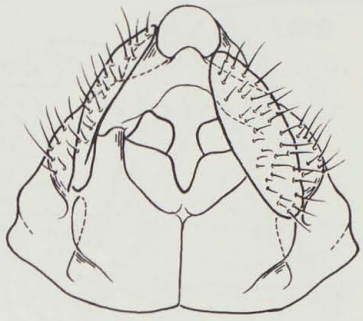
TN. QINGLINGENSIS



212A

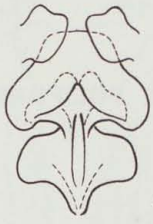


212E

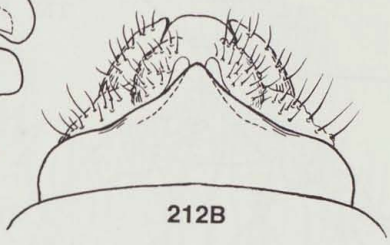


212C

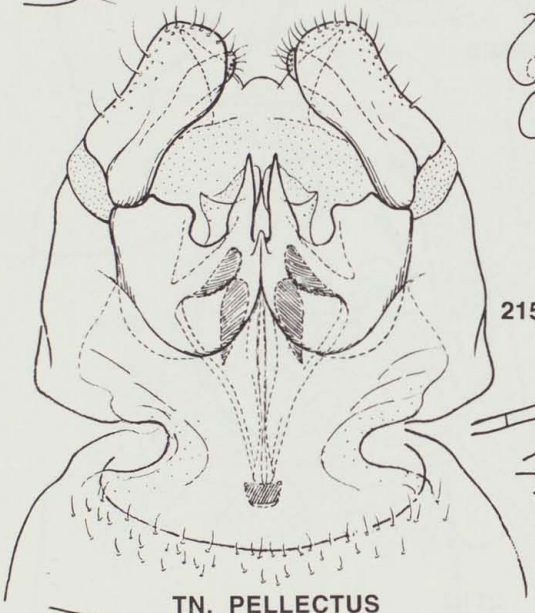
TN. UNANIMIS



212D



212B

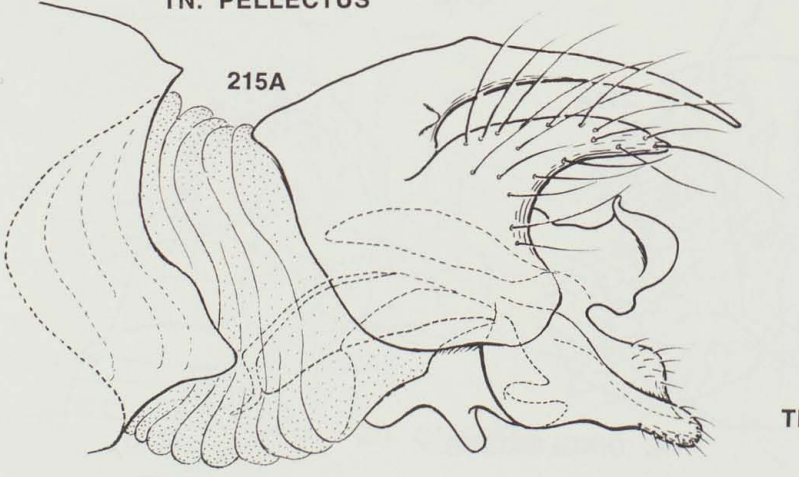


215C

TN. PELLECTUS

213H

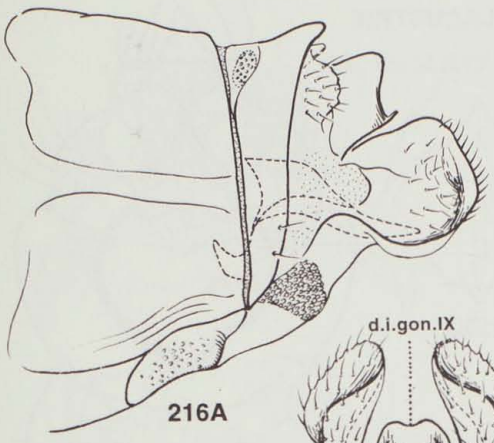
TN. FULVUS



215A

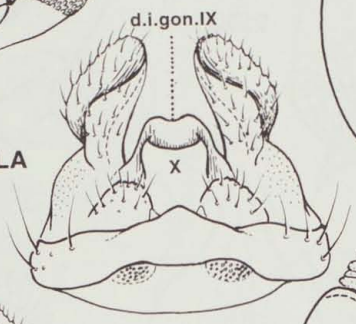
214A

TN. SERICEUS

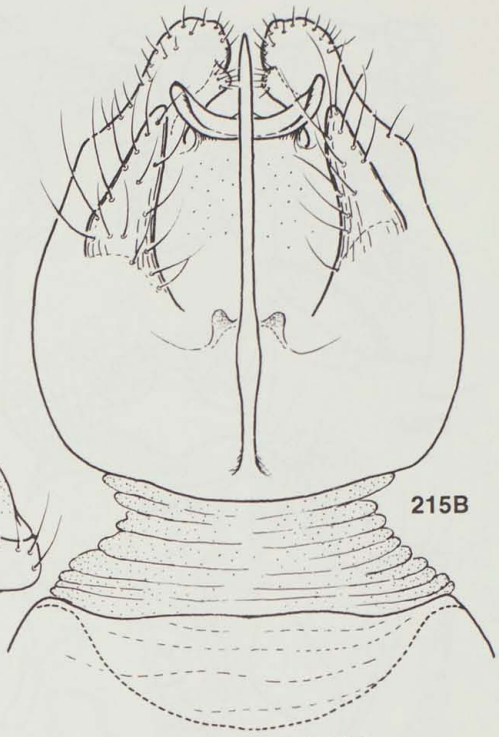


216A

OE. MINUSCULA

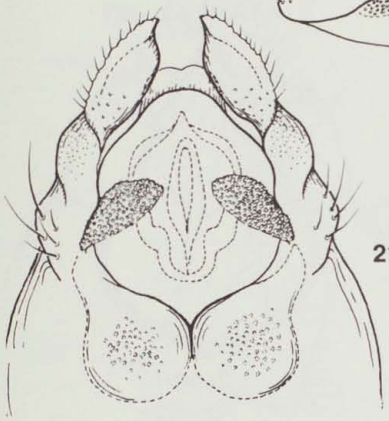


216B

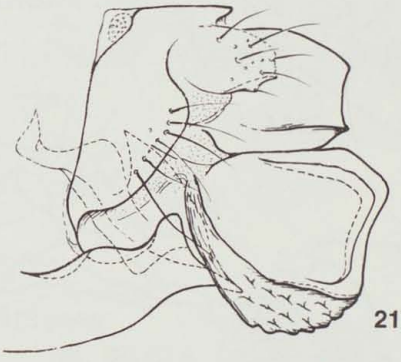


215B

TN. PELLECTUS

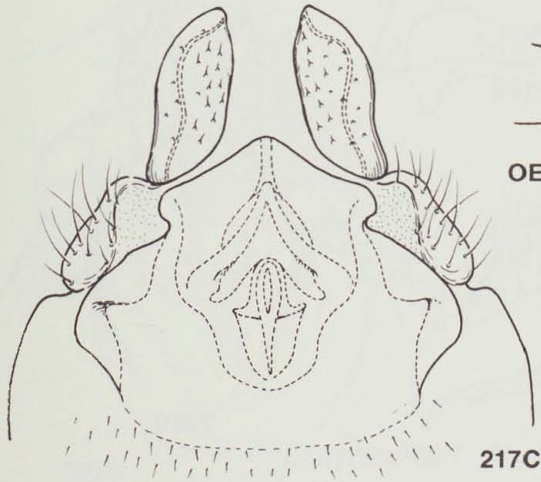


216C

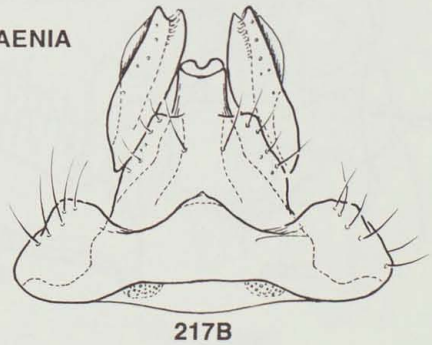


217A

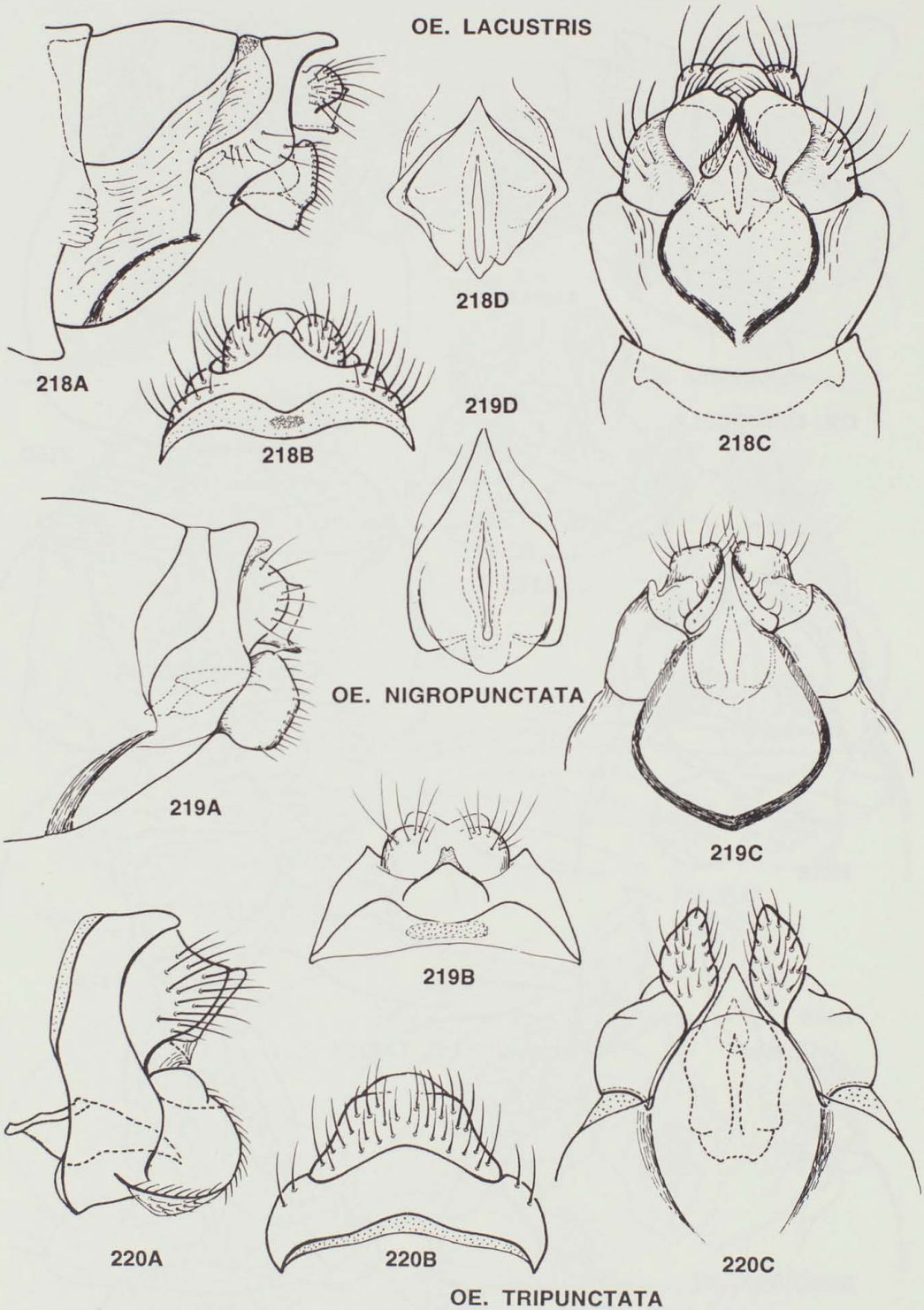
OE. TAENIA

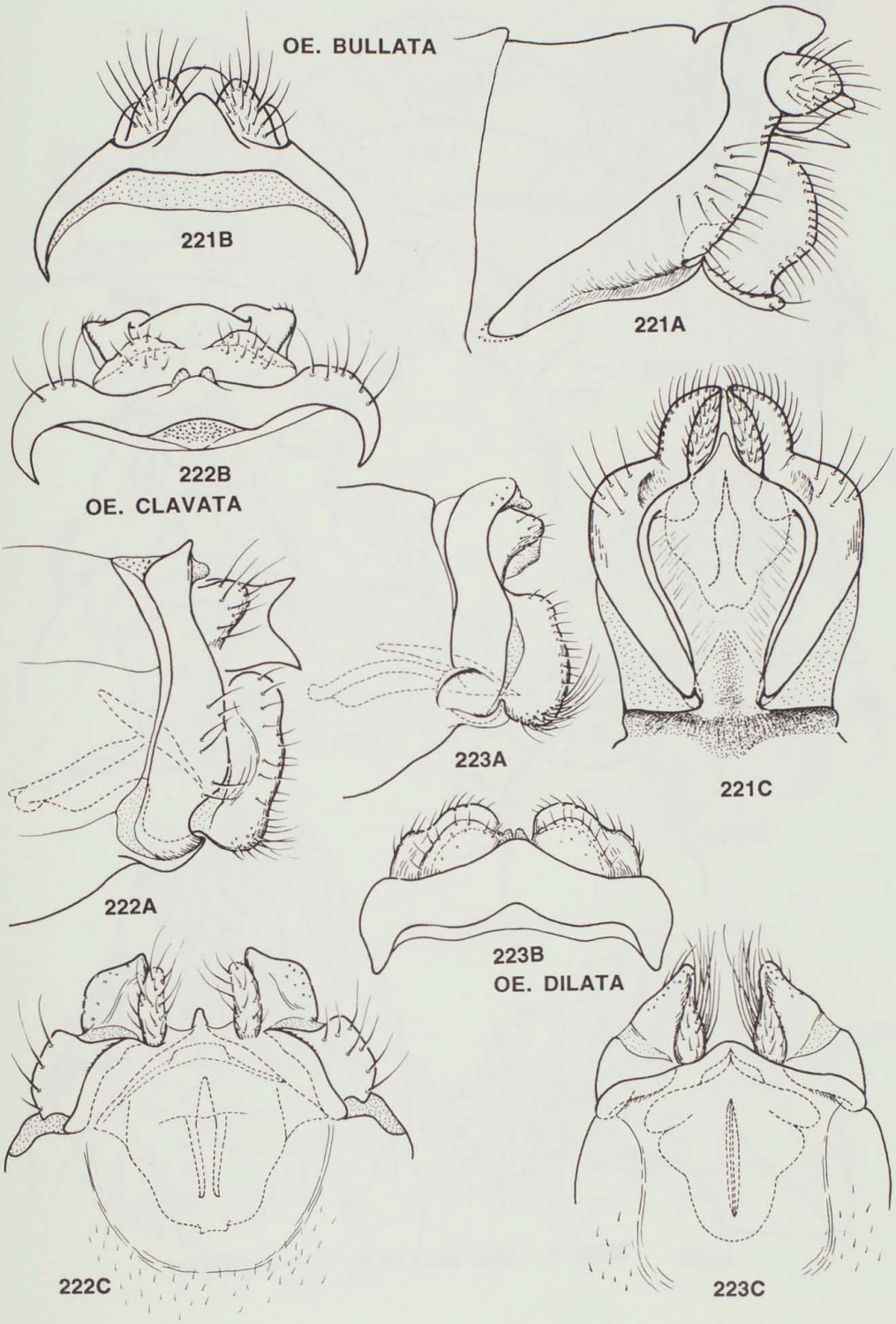


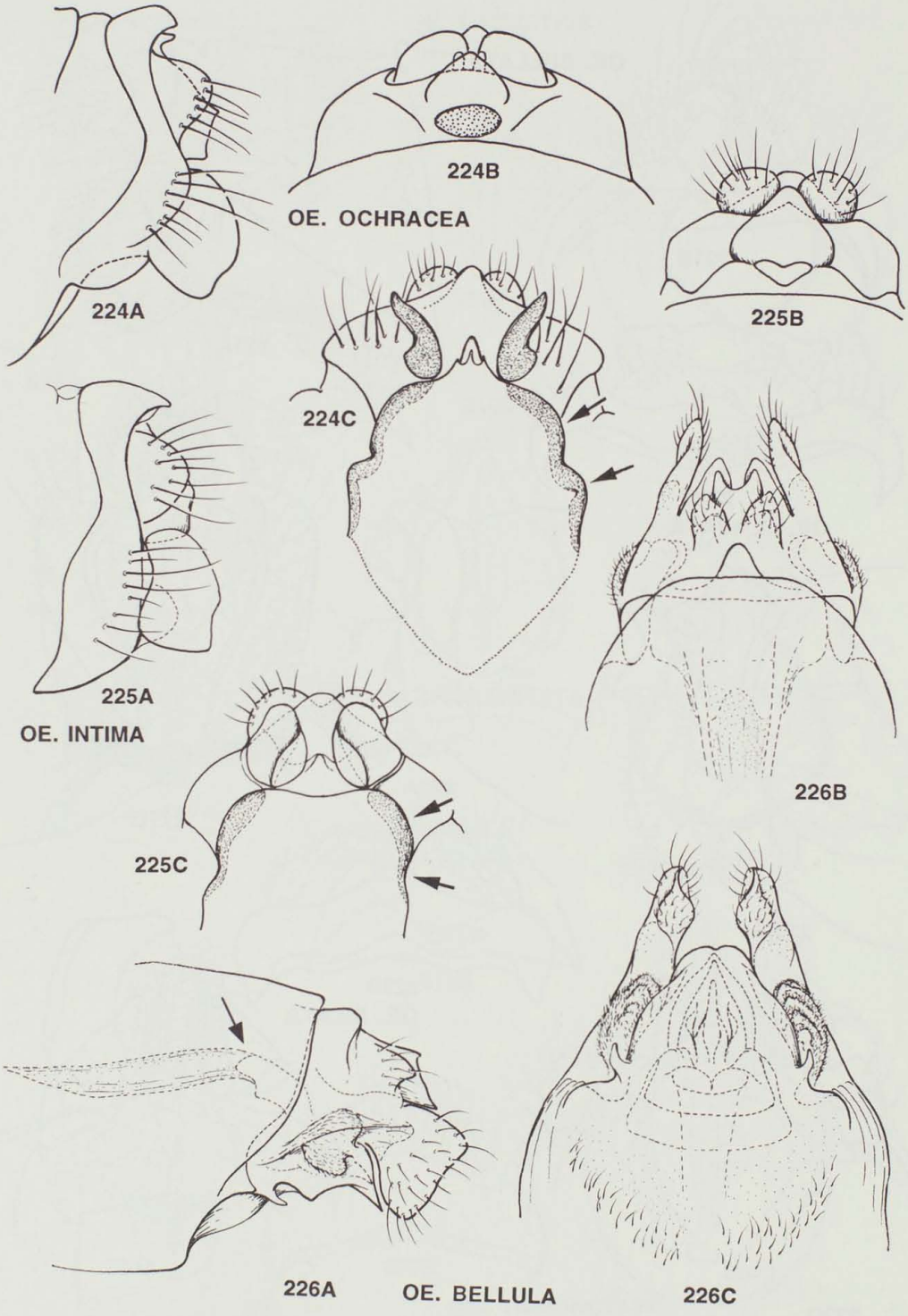
217C

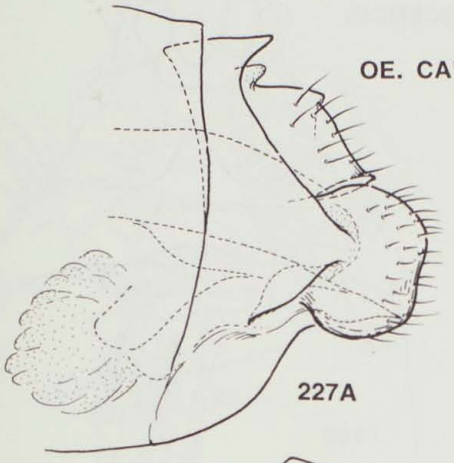


217B


OE. LACUSTRIS
218A
218B
218D
218C
219D
OE. NIGROPUNCTATA
219A
219B
219C
220A
220B
220C
OE. TRIPUNCTATA

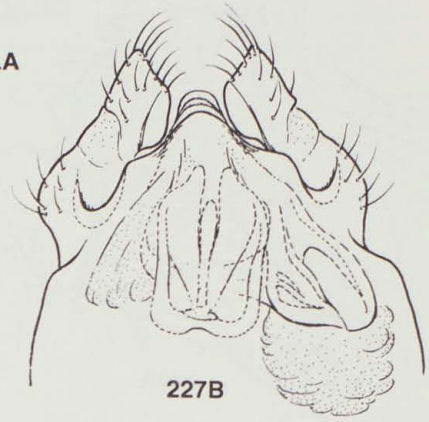

OE. BULLATA
221B
221A
222B
OE. CLAVATA
223A
221C
222A
223B
OE. DILATA
222C
223C


224A
224B
OE. OCHRACEA
225B
224C
225A
OE. INTIMA
226B
225C
226A
OE. BELLULA
226C

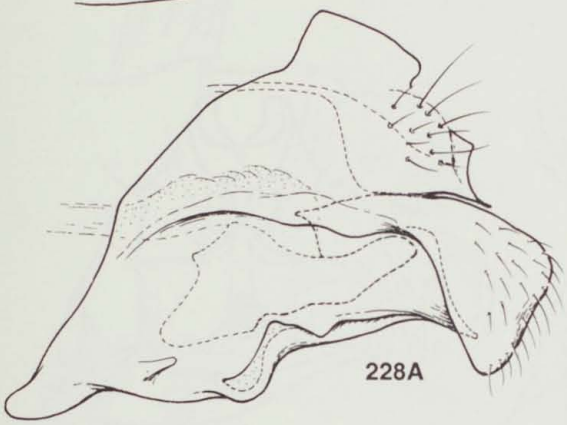


OE. CAUCULA

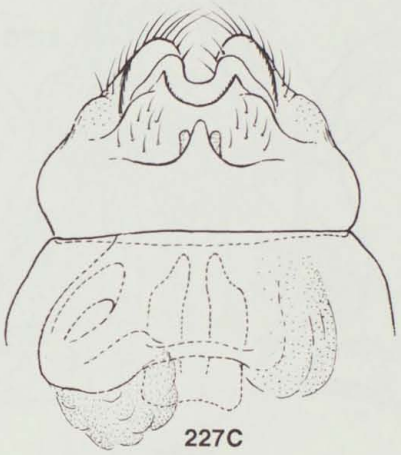
227A



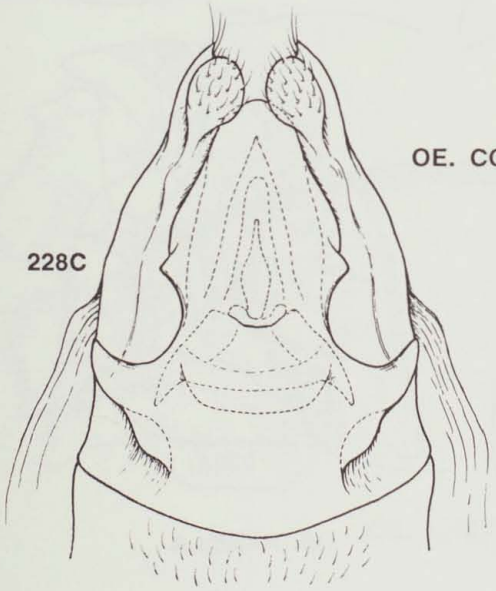
227B



228A

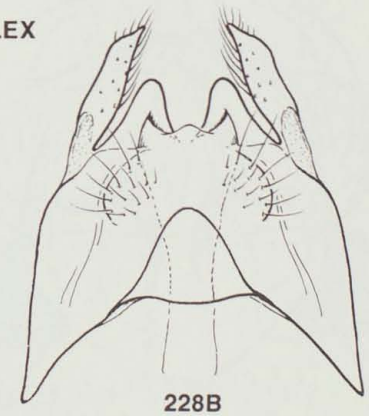


227C

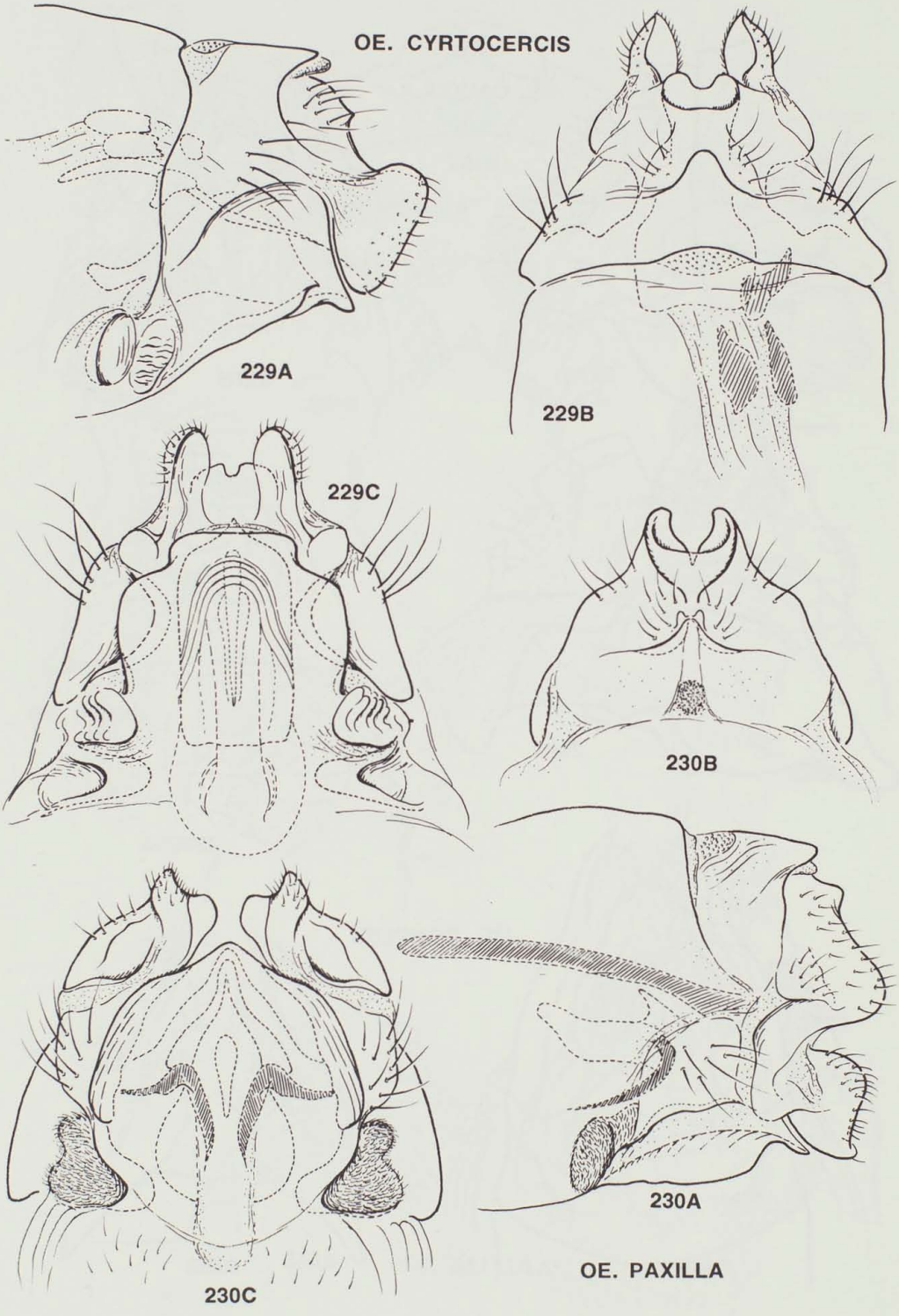


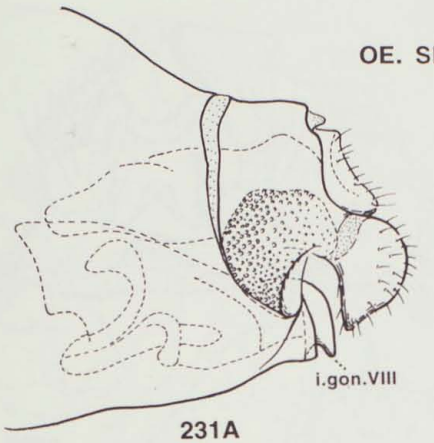
228C

OE. COMPLEX

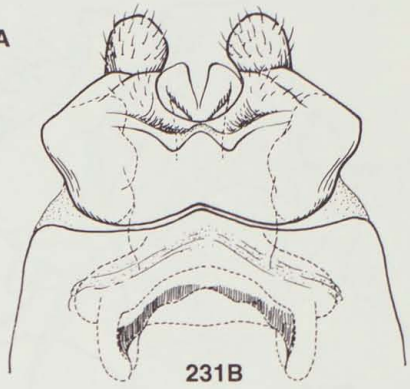


228B

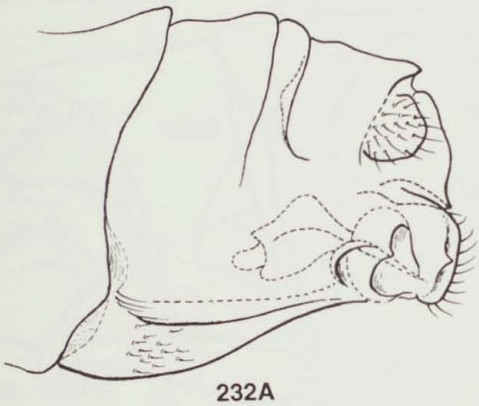

OE. CYRTOCERCIS
229A
229B
229C
230B
230A
230C
OE. PAXILLA



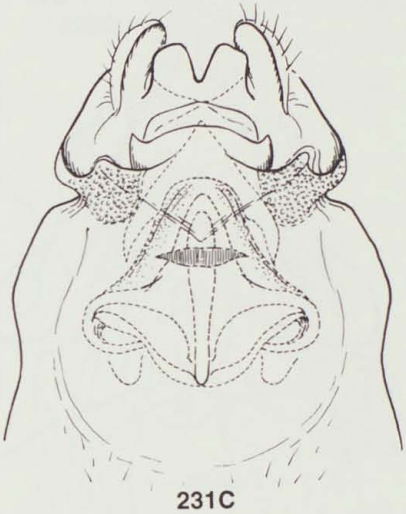
231A



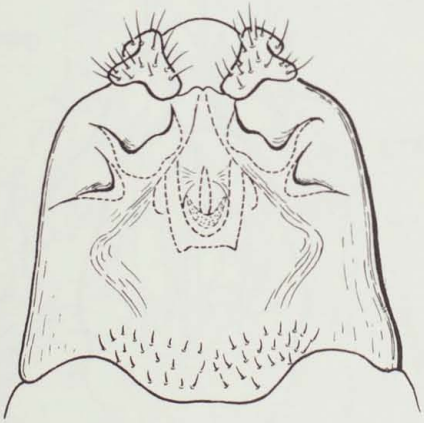
231B



232A

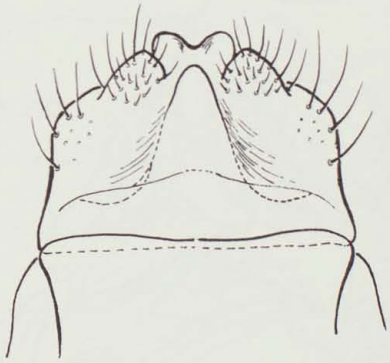


231C

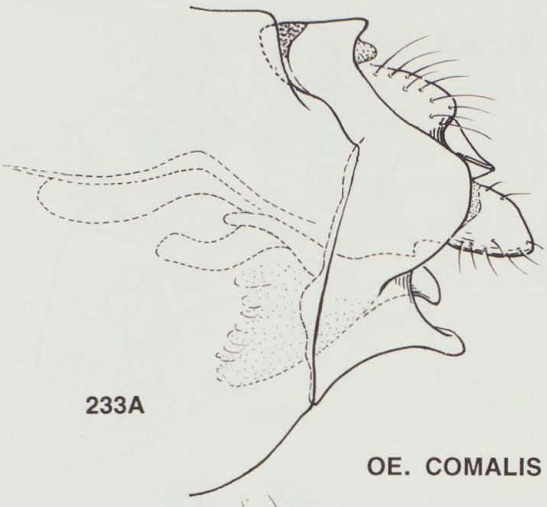


232C

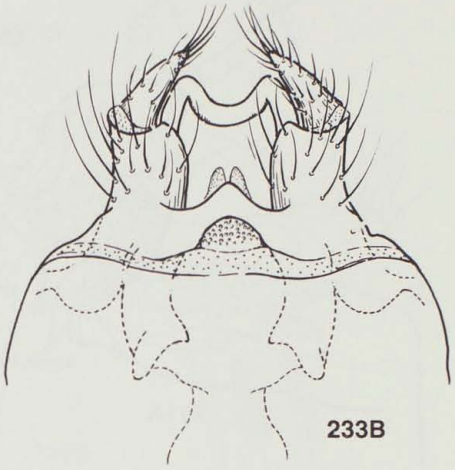
OE. ANCYLOCERCA



232B

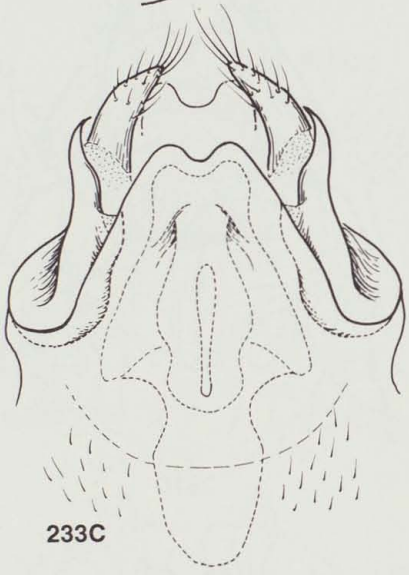


233A

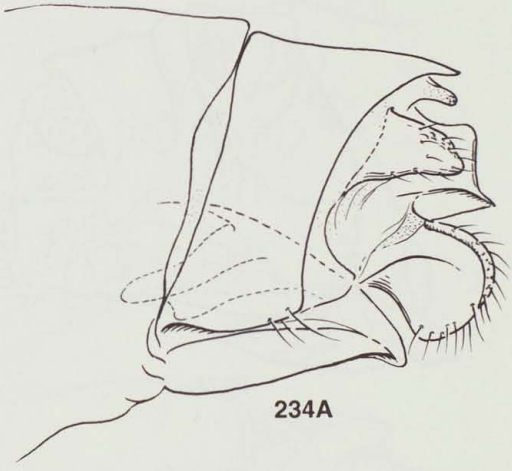


233B

OE. COMALIS

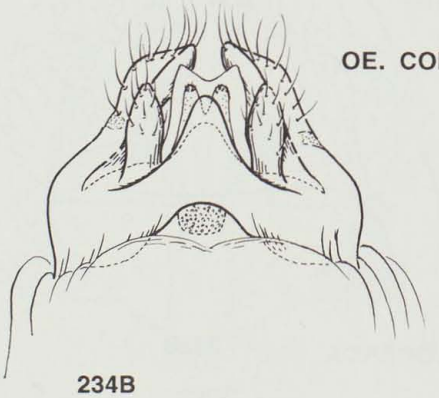


233C

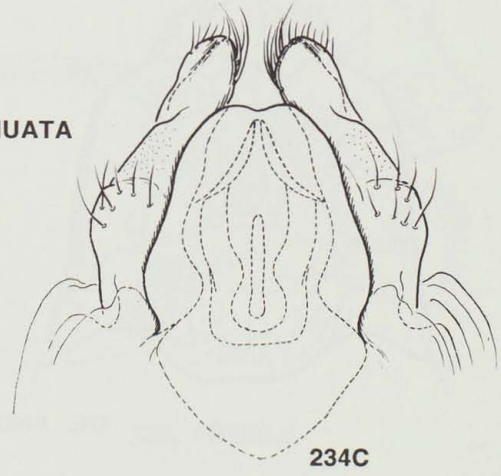


234A

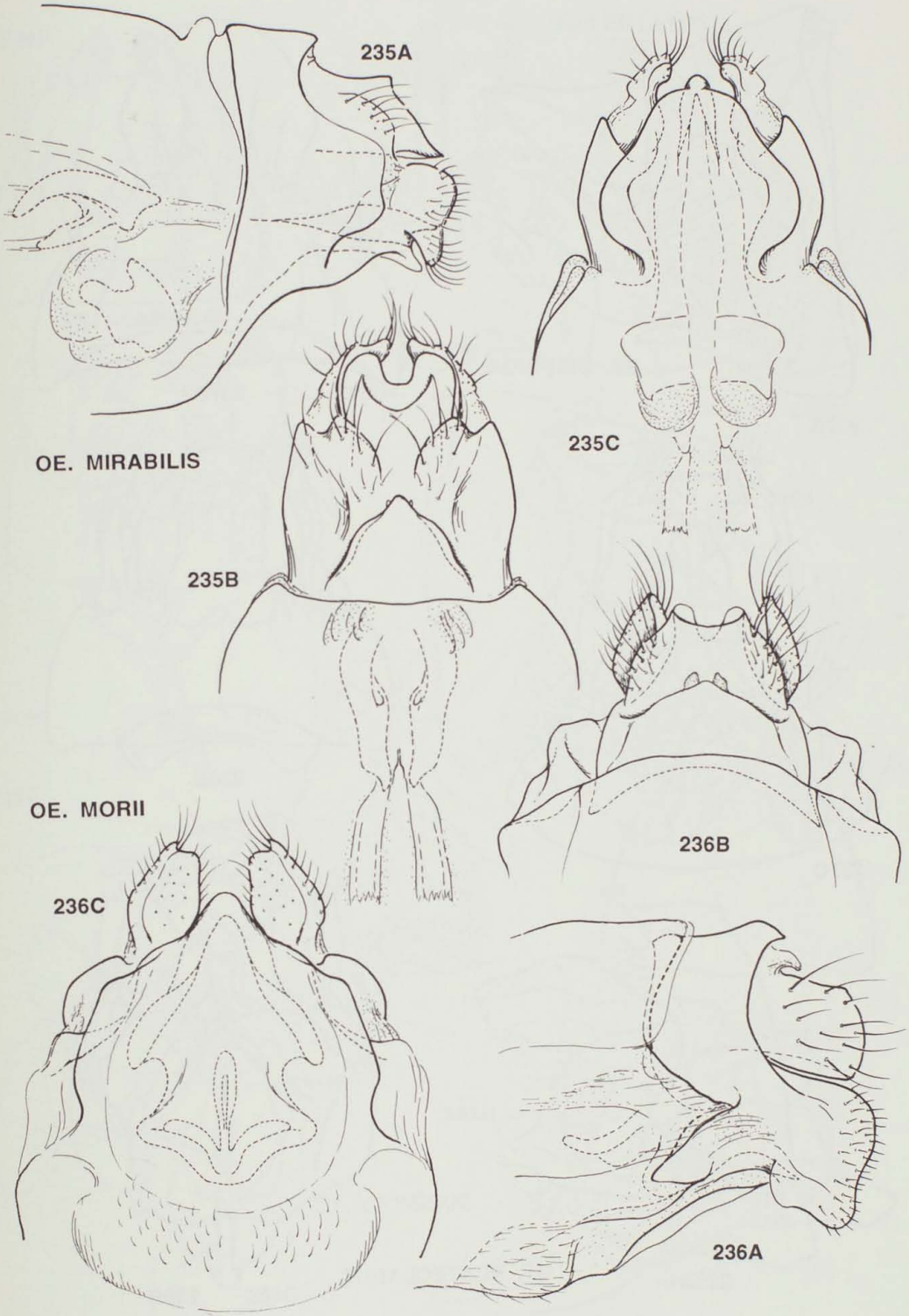
OE. CORNUATA

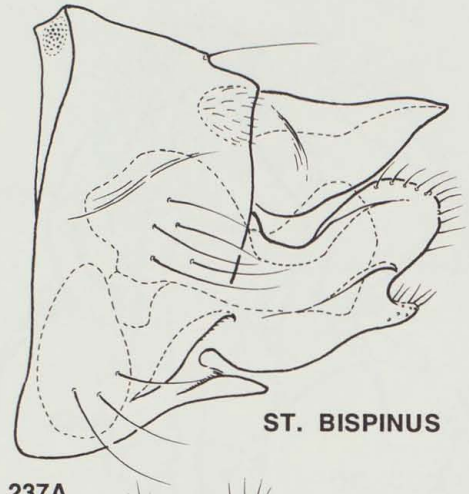


234B



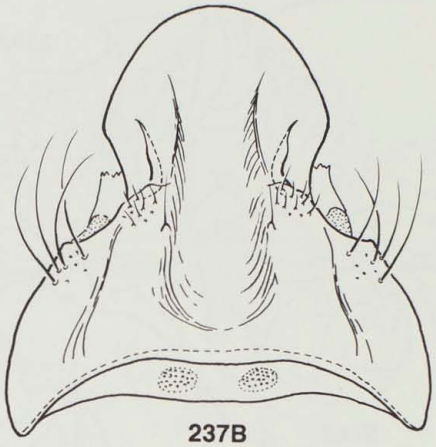
234C


235A
OE. MIRABILIS
235B
235C
OE. MORII
236C
236B
236A

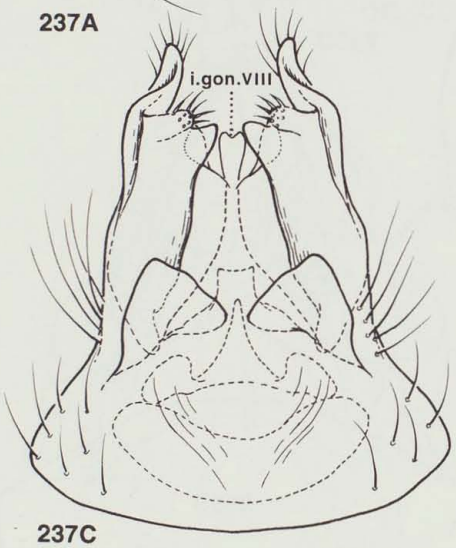


ST. BISPINUS

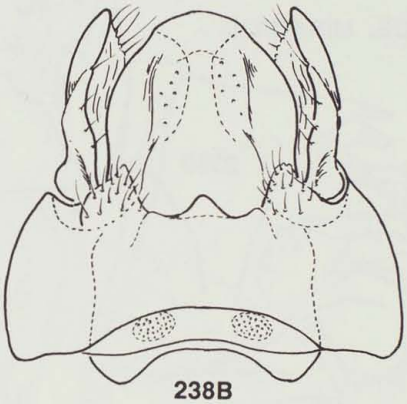
237A



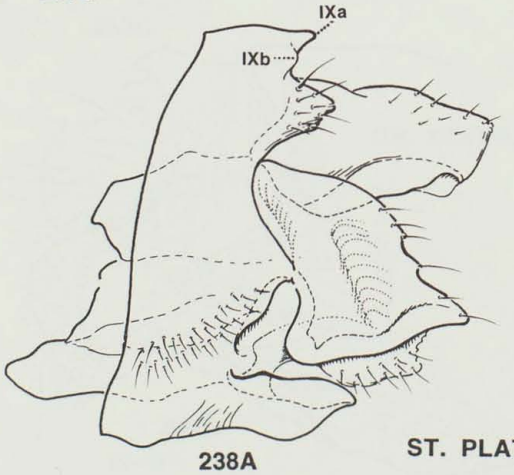
237B



237C

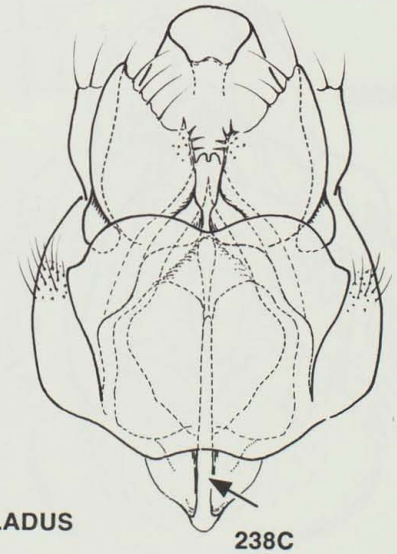


238B



238A

ST. PLATECLADUS



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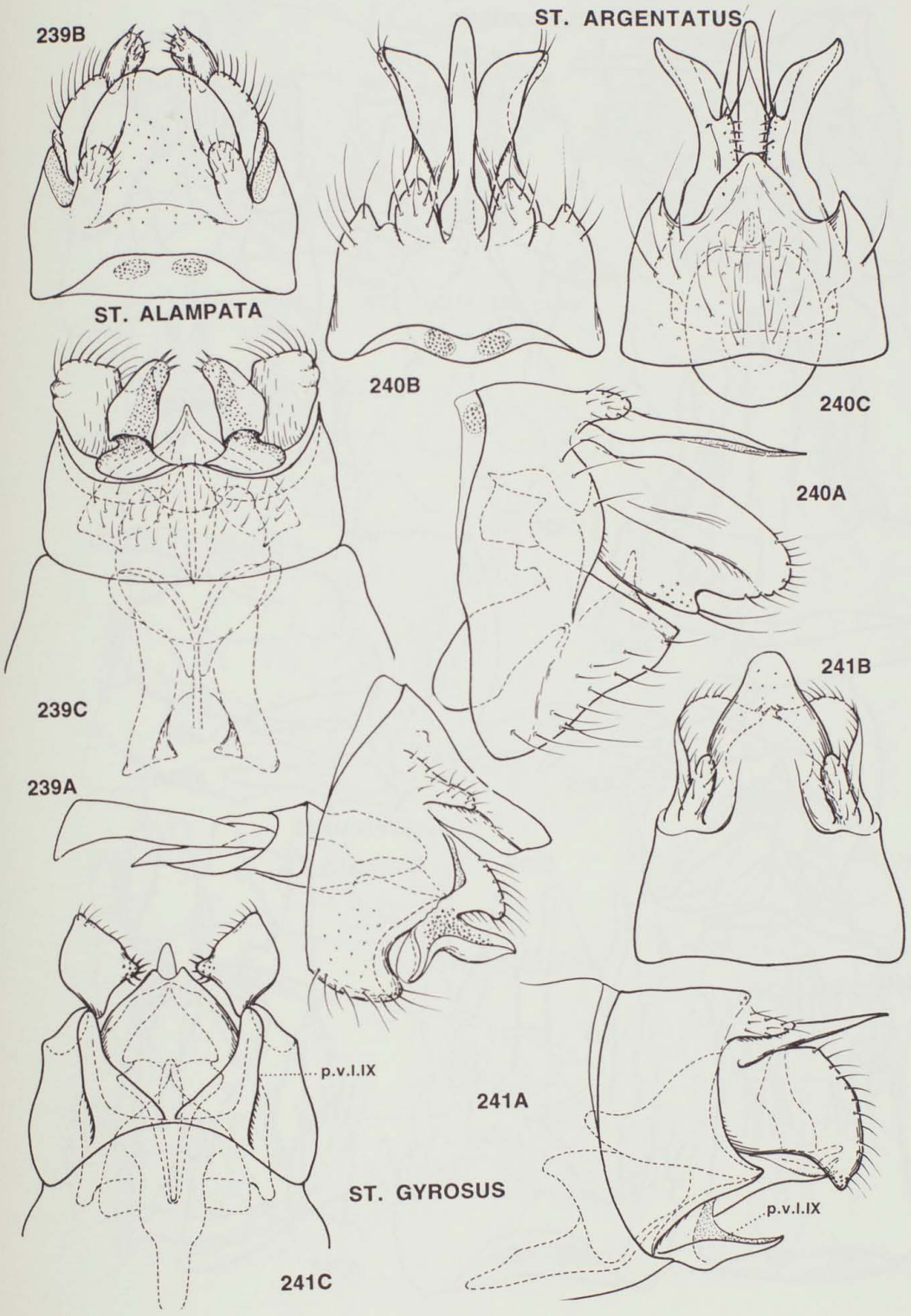
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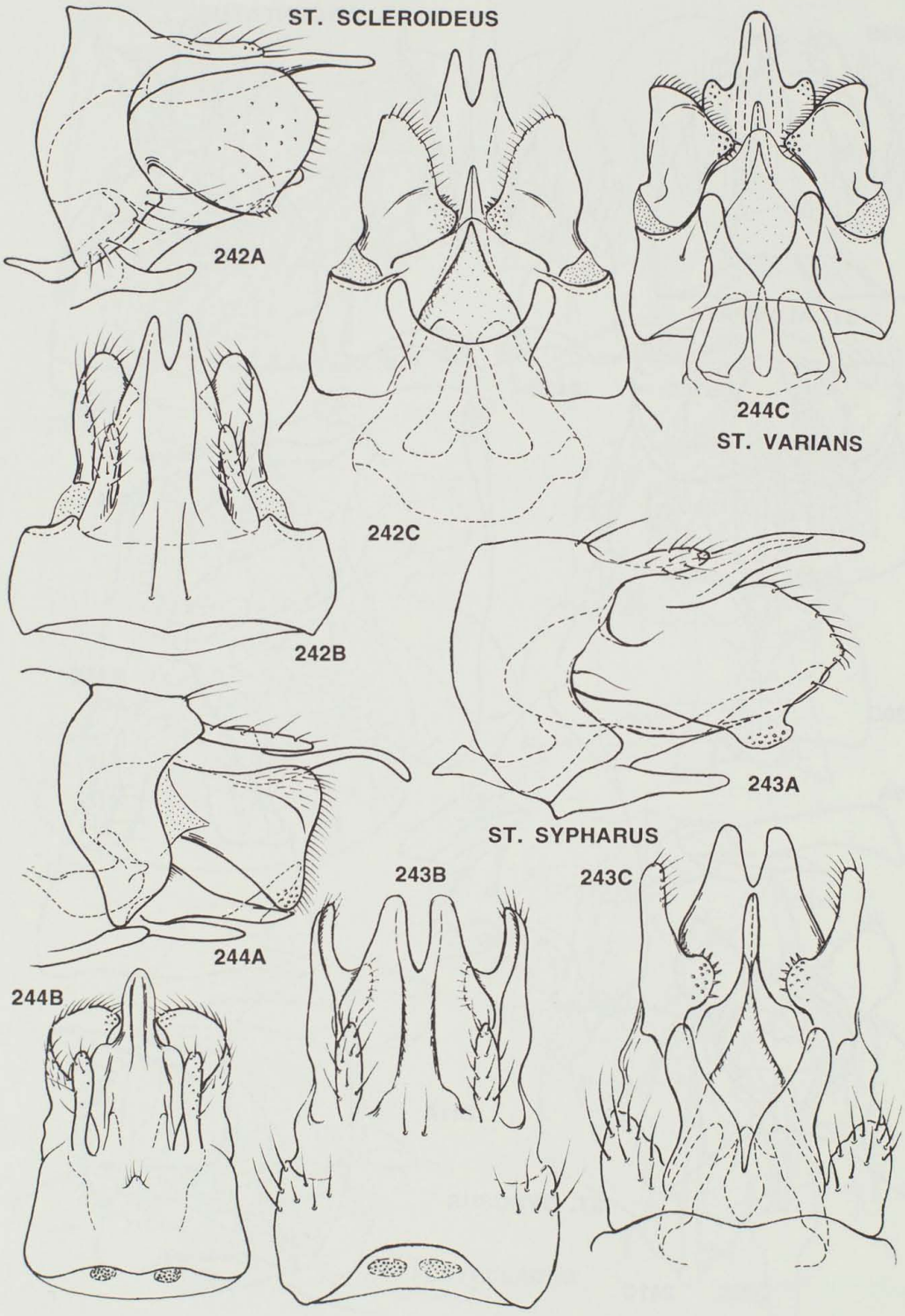
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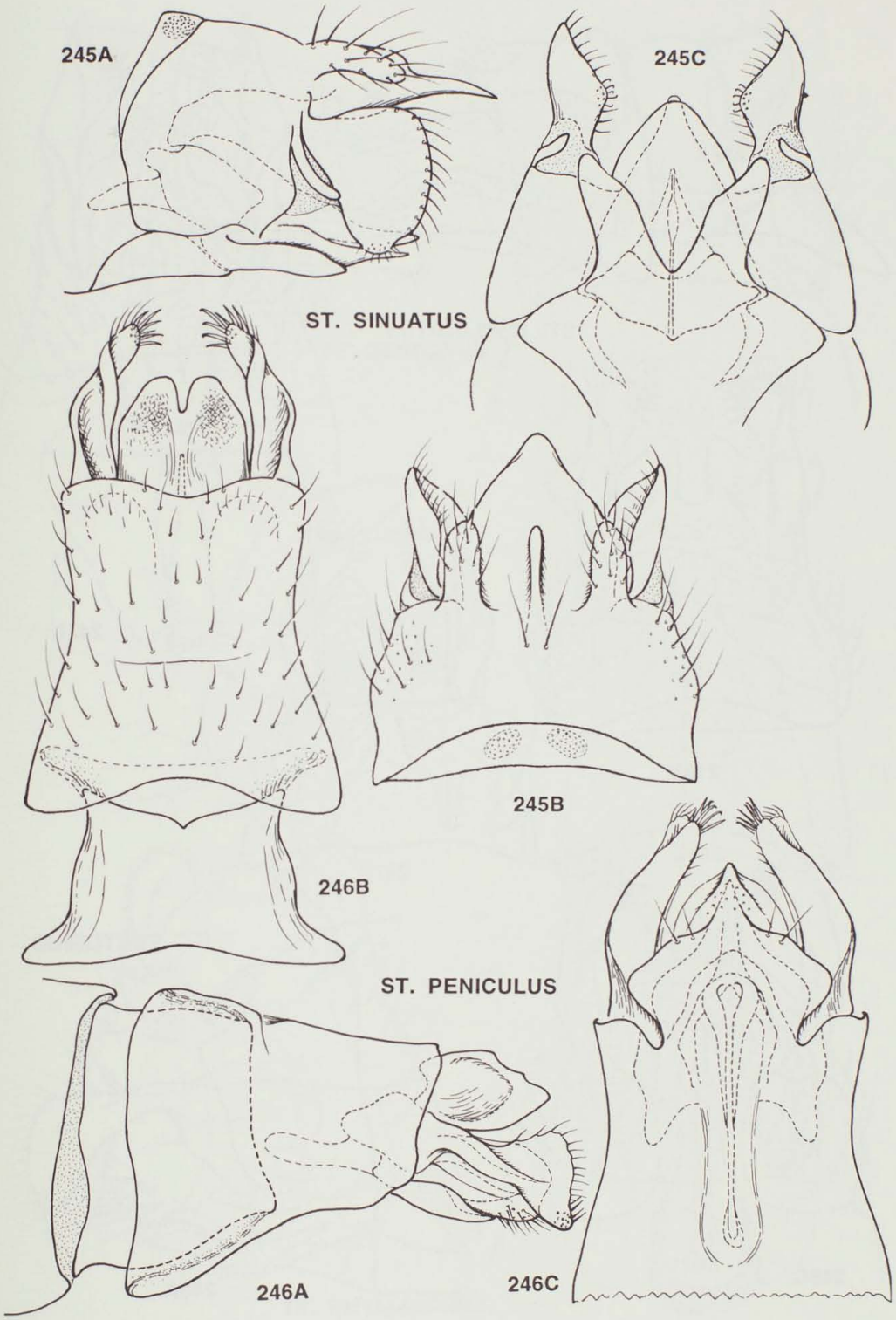
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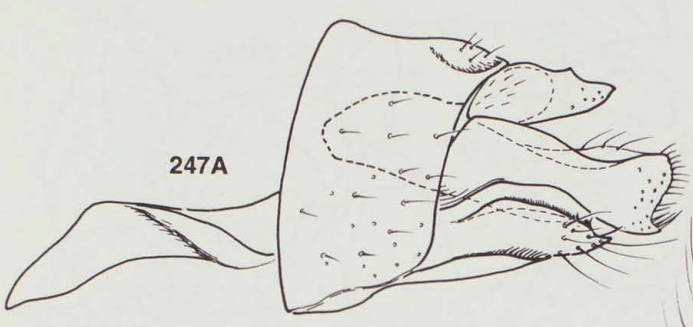

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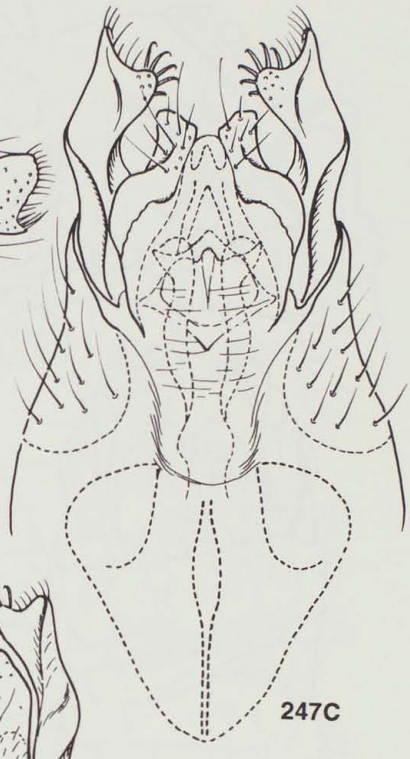

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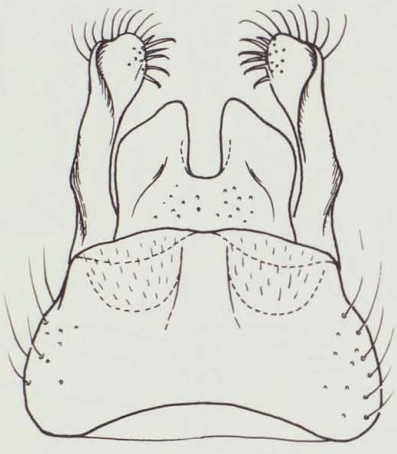

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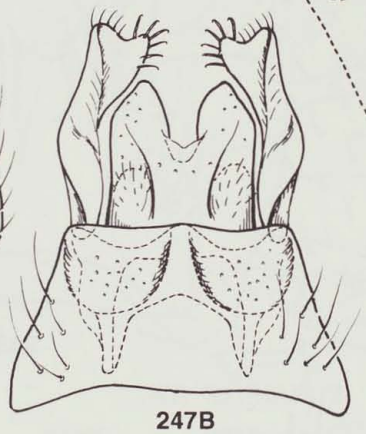

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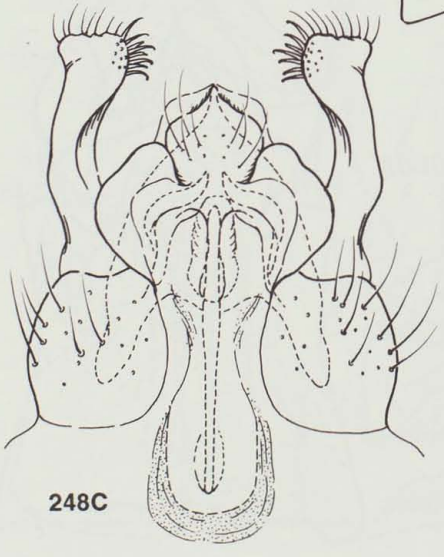

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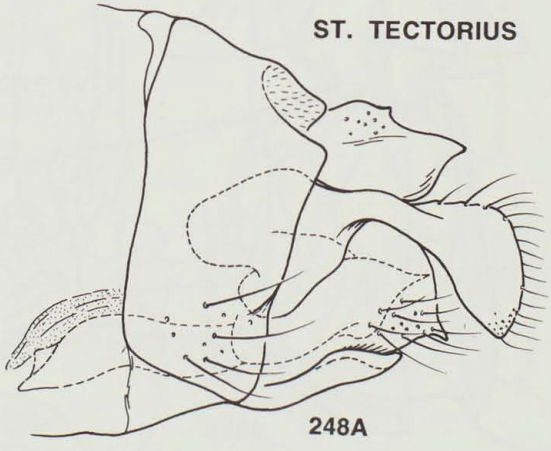

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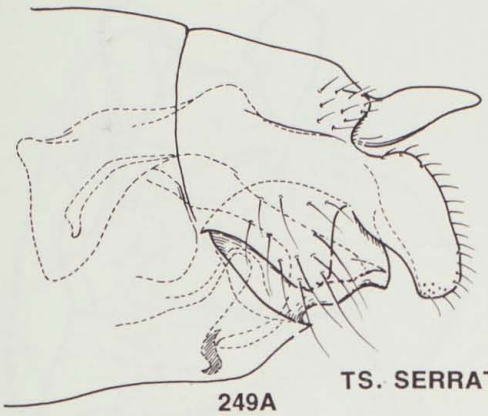

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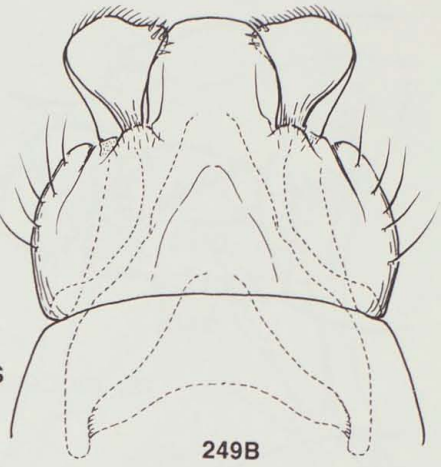

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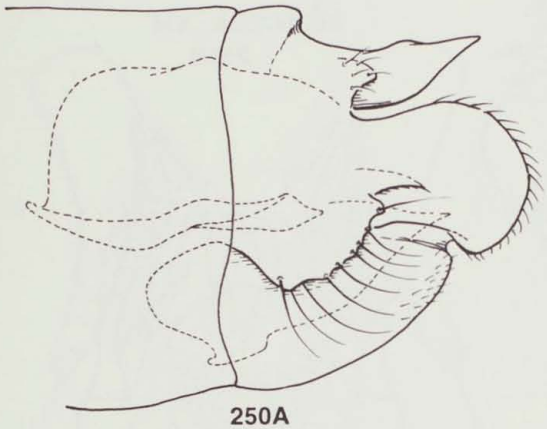

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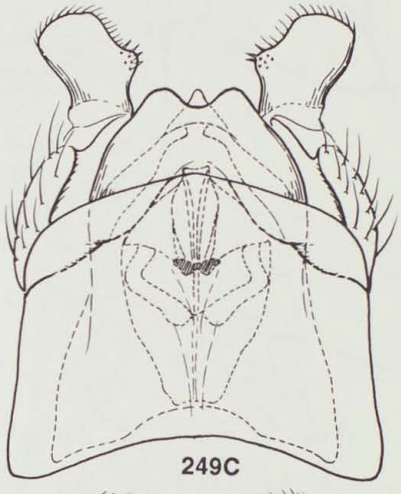

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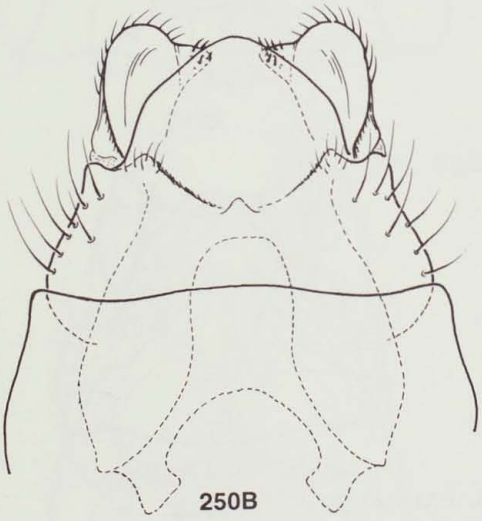

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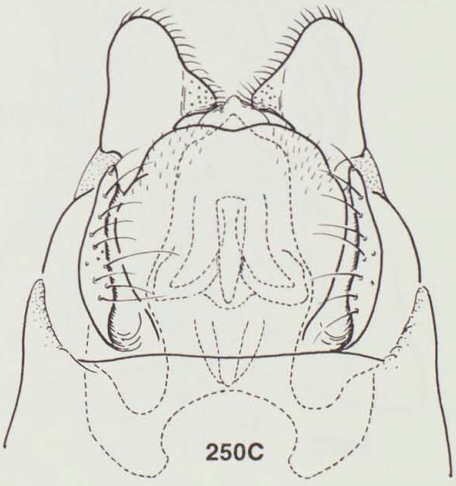

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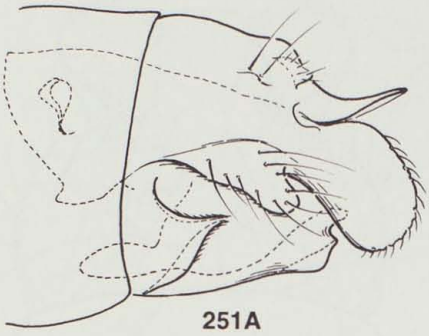

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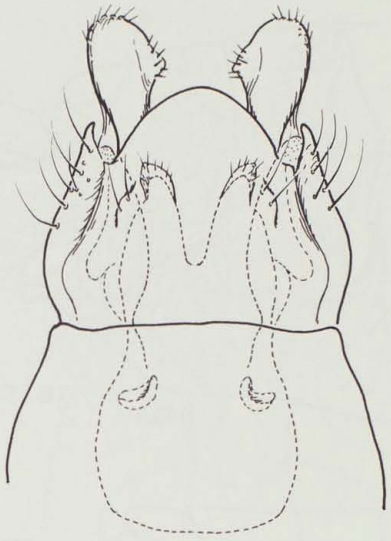

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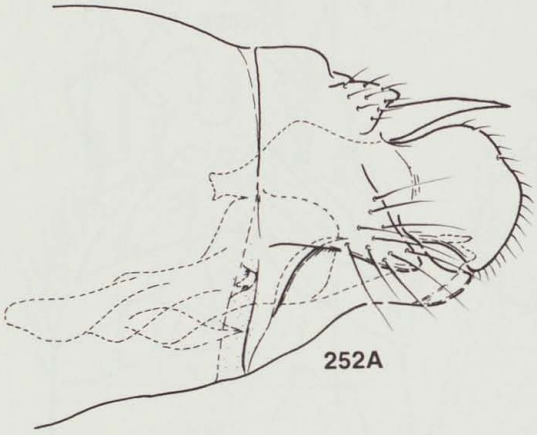

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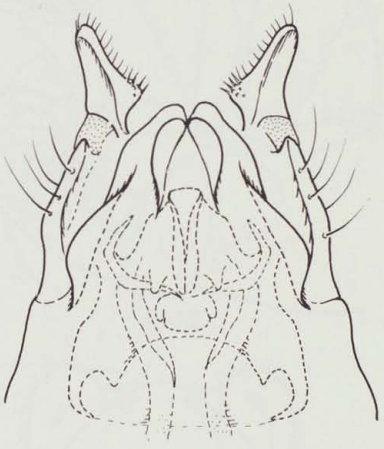

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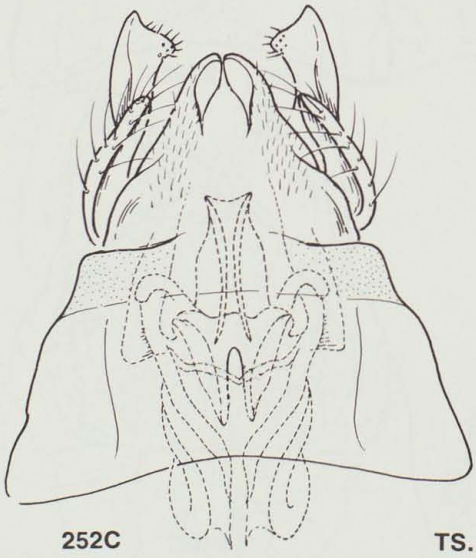

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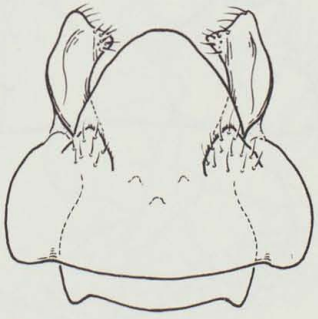

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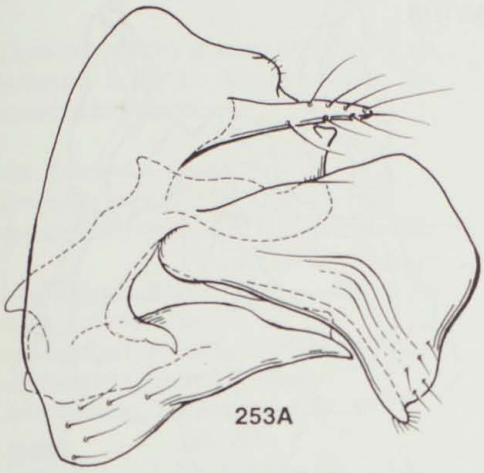

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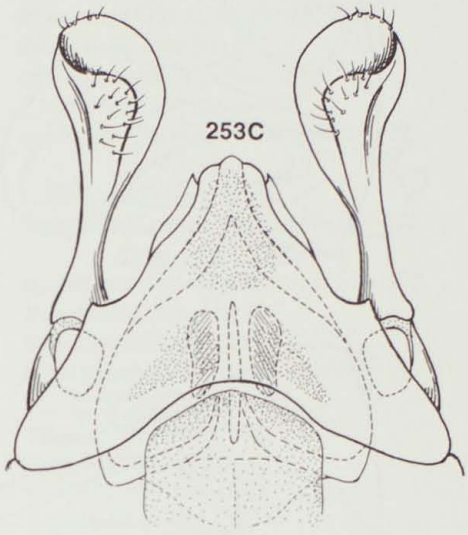

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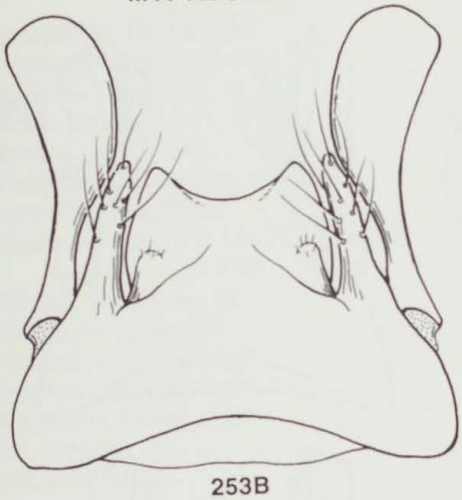

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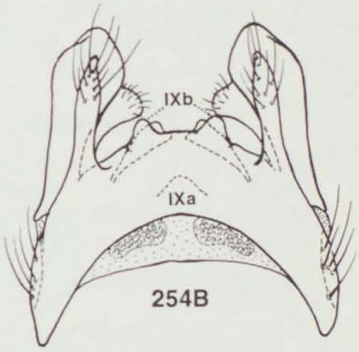

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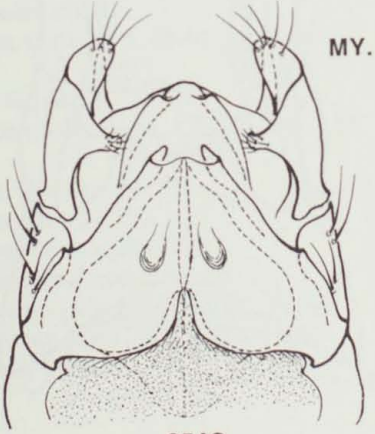

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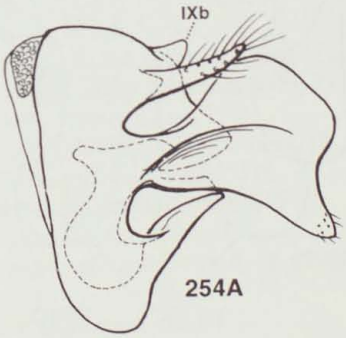

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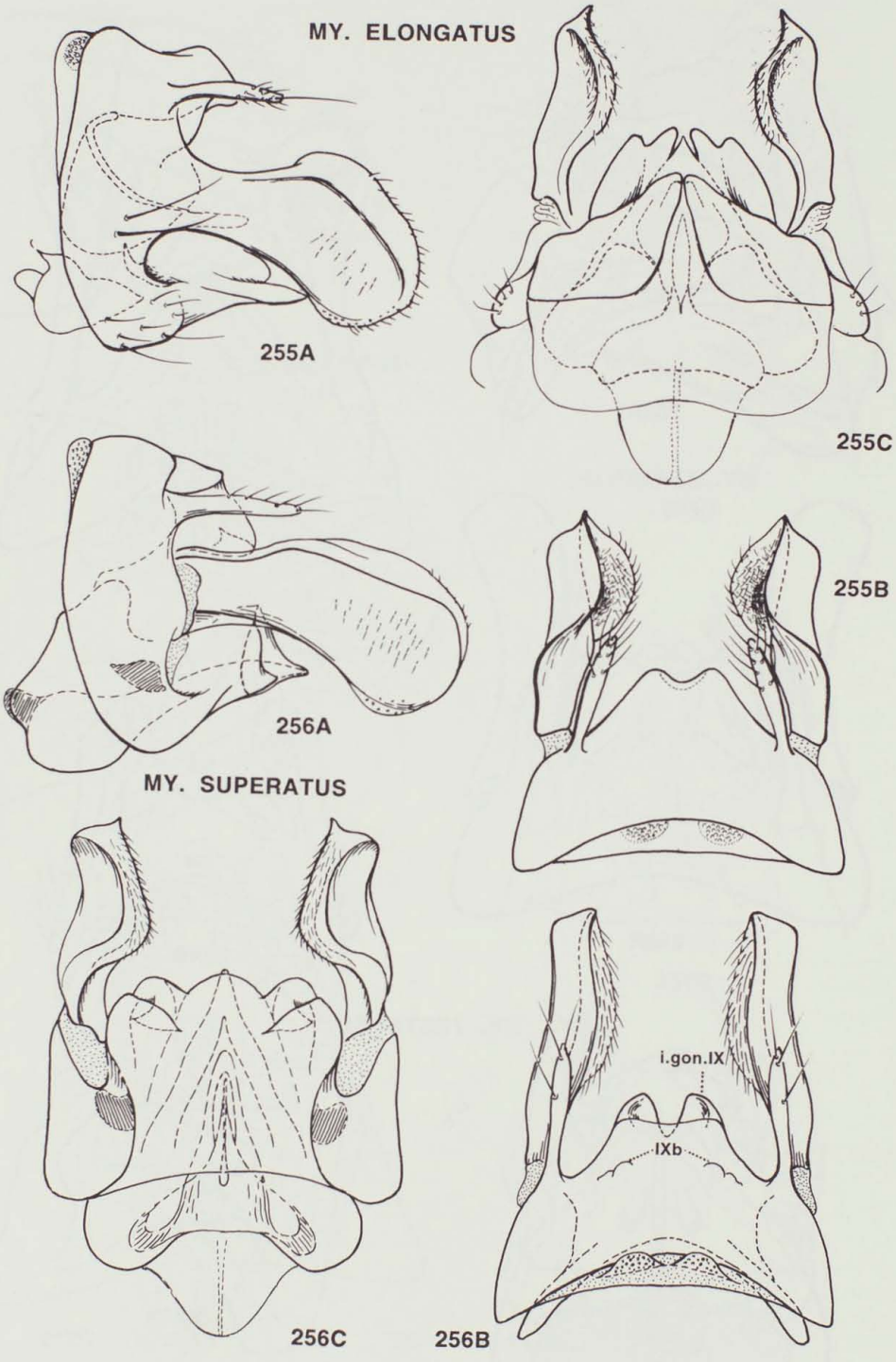
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