KEYS FOR THE GENUS *CRICOTOPUS* adapted from "Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae)" by M. Hirvenoja

by

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in cooperation with

New York State Department of Environmental Conservation

and

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ABSTRACT

This publication presents the essence of Hirvenoja's (1973) keys and illustrations for adult males, adult females, pupae, and larvae for the genus *Cricotopus* in a format that is usable by itself. The applicability of the keys, which are based on European material, to the Nearctic fauna is discussed.

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INTRODUCTION

Members of the genus *Cricotopus* are a common and often abundant component of freshwater invertebrate communities. They occur in many habitats and under a wide range of water quality conditions. At present over 30 species have been described from the Nearctic region, but many additional species undoubtedly exist and await description. Taxonomic understanding of the North American fauna is poor, especially for the immature stages. LeSage and Harrison (1980b) described the adults, pupae, and larvae (where possible) of 11 species from a small Canadian stream and noted that a thorough revision of the Nearctic fauna is needed.

Hirvenoja (1973) revised the European species of *Cricotopus* and related genera and provided a wealth of information—including keys, descriptions, and illustrations, as well as taxonomic, morphological, and biological discussions—for some 70 species. This work will provide the foundation for revisions of the genus in other geographic regions and is a useful part of the literature base with which species determinations of field-collected specimens can be attempted. However, many applied biologists are unable to make full use of the keys and illustrations because the text is in German and because some of the couplets in the keys are rather lengthy and complex.

The purpose of this bulletin is to present Hirvenoja's superb illustrations and the essence of his keys in a form that is usable by itself. To this end we have not only translated the keys but have reorganized and simplified them as well. All information presented herein is taken from Hirvenoja and is restricted to the genus *Cricotopus*. The original work also included four smaller genera: *Acricotopus* (1 species), *Halocladius* (6 species), *Paracladius* (3 species), and *Paratrichocladius* (2 species).

After completing the literal translation, we organized the keys into four units: adult males, adult females, pupae, and larvae. We then simplified some of the couplets, sacrificing an understanding of phylogenetic relationships for usability. In particular the large, complex subgeneric couplets for adult males and pupae were eliminated. Instead, the various species groups of the subgenus *Cricotopus* were split off more or less individually in the early portions of these keys, after which the subgenus *Isocladius* was identified. The only change made in Hirvenoja's classification scheme (Table 1) was to recognize the subgenus *Nostococladius*, erected by Ashe and Murray (1980). The one affected species (*C. lygropis*) formerly was in the *lygropis*-group of the subgenus *Cricotopus*.

Although the subgenera are no longer separated in a single couplet, an attempt has been made to maintain the integrity of species-groups in the keys. This will help readers to understand the limits of species groups as established by Hirvenoja.

It was not possible to include Hirvenoja's lengthy morphological discussion, which explains the terminology used in his keys. Consequently the terminology was altered to conform with Saether (1980). The terms and abbreviations are listed in Table 2, and some figures have been labeled to help clarify the terminology.

Finally, figure numbers were added in the keys to help readers utilize the numerous and excellent illustrations. For each species the figure numbers are given after the species name in the keys and are listed in Table 1. Hirvenoja's original figure numbers have been retained and can be used as a type of index to his work. Hirvenoja interspersed the figures with the text, so that the descriptions, diagnoses, and biological information for a species are often located on the same or adjacent pages to the figures.

Adult, pupal, and larval diagnoses for *Cricotopus* are given by LeSage and Harrison (1980b). Generic keys for adult males are available in Brundin (1956, in German), Pinder (1978), and Oliver (1981). Saether (1977) provides a generic key for adult females. Larvae (L) and pupae (P) can be keyed, with varying success, in Beck (1976, L), Bryce and Hobart (1972, L), Chernovskii (1949, L), Cranston (1982, L), Hilsenhoff (1975, L), Mason (1973, L), Oliver et al. (1978, L), Pankratova (1977, L, P), Roback (1957, L, P), Simpson and Bode (1980, L), and Thienemann (1944, L, P; in German as *Eucricotopus* and *Trichocladius*). Keys for larvae, pupae, and adults of the Holarctic genera of Chironomidae are in preparation (Fittkau et al.) and will greatly facilitate the identification of chironomid specimens, including *Cricotopus*.

COMMENTS ON THE APPLICABILITY OF THE KEYS TO THE NEARCTIC FAUNA

The following keys contain different number of species because not all stages have been associated for all species. The key for adult males is complete, containing all 58 species listed in Table 1. Fewer species are included in the keys for adult females (54 species), pupae (40 species), and larvae (26 species).

Cricotopus is a large and taxonomically difficult genus. Among the problems encountered in attempting a specific identification is the extensive intraspecific variation, which can lead to overlapping diagnostic traits for closely related species. In adults this applies not only to numerical characters (such as the number of sensillae chaeticae and the values of AR, BR, BV, and LR) but also to qualitative characters (such as abdominal pigmentation, the arrangement of setae on abdominal tergites, and the shape of the male hypopygium). In adult males of *C. sylvestris*, for example, Hirvenoja (1973) found that the abdominal tergites may be uniformly pigmented or portions of tergites I, IV and V may have pale areas. Considerable variation can also occur in the immature stages. As an example, the frontal setae in the pupae of *C. triannulatus* and *C. curtus* usually are on the prefrons, but in some specimens they are on the frontal apotome. Even greater intraspecific variations are likely to be found as Nearctic material of Holarctic species is examined. Already LeSage and Harrison (1980b) have found that their adult specimens of *C. annulator* have a shorter wing length, a lower AR in males, and fewer sensillae chaeticae in the females than the European specimens.

Naturally, not all North American material will be identifiable to species and some will not correspond with any species group concepts. LeSage and Harrison (1980b) suggest that *C. politus* (Coq.) and *C. luciae* LeSage and Harrison should each be placed in its own species group.

The considerable number of Holarctic species renders Hirvenoja's work extremely valuable in helping to improve the taxonomic understanding of North American material. To date 24 of the 58 species have been reported as occurring in North America (Table 1); most of these probably occur in the northeastern United States. We have encountered 11 species representing six groups during our biomonitoring activities in New York State. The following comments on these species and groups supplement the taxonomic and distributional notes in Simpson and Bode (1980).

Cricotopus (Cricotopus) tremulus group

This group is comprised of many lotic species and is found in habitats ranging in size from small streams to large rivers. Various representatives occurred at 203 of our 225 sampling sites, but we have limited distributional data for individual species because the larvae are difficult to distinguish from one another. To date we have reared three species, *C. tristis*, *C. pulchripes*, and *C. triannulatus*, as well as some other species that do not fit any of Hirvenoja's descriptions. *Cricotopus exilis* Joh. is a junior synonym of *C. triannulatus* (LeSage and Harrison, 1980b). Six of Hirvenoja's nine species have already been recorded in North America (Table 1), and many additional species may exist. *C. infuscatus* and perhaps many other species in the *infuscatus*-group of Sublette and Sublette (1971) belong to the *tremulus*-group.

The larvae of some species closely resemble *Orthocladius* larvae and cannot be determined to genus without associated pupal or adult material. Generally speaking, larvae with setal tufts on the abdomen are *Cricotopus*, while larvae lacking these tufts could be either *Cricotopus* or *Orthocladius*.

The posterior portion of the pupal abdomen should be mounted carefully, since the location and size of the setae on segment VIII are important for group- and species-level identifications.

Cricotopus (Cricotopus) festivellus group

We have reared a species from the St. Lawrence River that fits the group characters as an adult but not in the pupal or larval stages. LeSage and Harrison (1980a) list *C. festivellus* as occurring in two Canadian streams.

Cricotopus (Cricotopus) bicinctus group

Both *C. bicinctus* and *C. vierriensis* occur in New York, and all stages can be determined fairly easily with Hirvenoja's keys. *C. bicinctus* is probably the most common species of *Cricotopus* in North America (LeSage and Harrison 1980a,b), and the larvae are found under a wide range of habitat types and water quality conditions. In New York State we have found it at 220 of 225 sampling sites, it is present in diverse, well-balanced macroinvertebrate communities and increases in abundance when stresses (such as heavy metals) eliminate more sensitive species. According to Hirvenoja (1973, p. 238) the larvae live primarily in flowing waters; but they are also often abundant in brackish waters, along with *C. sylvestris*, *C. triannulatus*, and some other common *Cricotopus* species. Due to its wide geographic distribution and the morphological variation in the adults, Oliver (1977) raised the possibility that *C. bicinctus* is actually a species complex.

Cricotopus vierriensis is much less common than *C. bicinctus*. We have found it in two small productive streams, and LeSage and Harrison (1980a) found it in one of the four streams they sampled. According to Hirvenoja (1973, p. 242) the larvae inhabit both standing and flowing waters and can tolerate waters with high salt concentrations.

Cricotopus (Cricotopus) trifascia group

The *trifascia*-group is very distinctive in all stages and can be determined easily by using Hirvenoja's keys. The larvae are rheophilous and occur in both clean and polluted waters. For example, LeSage and Harrison (1980a) reported *C. trifascia* to be the dominant species in a river with severe industrial, urban, and agricultural pollution. *Cricotopus ithacaensis* (Sublette, 1967) is a junior synonym of *C. trifascia* (LeSage and Harrison, 1980b). Of the two species assigned to this group, the immature stages of only one (*C. trifascia*) are known.

Cricotopus (Isocladius) sylvestris group

This large group contains 12 of the 22 species in the subgenus *Isocladius*. The larvae of this group are easily recognizable, being the only members of the subgenus with bifid premandibles. To date six species have been reported from North America, and we have reared three of these (Table 1). The most commonly occurring species is *C. sylvestris*, which we have reared from a wide range of habitats, including slowly moving, turbid canals, a large brackish estuary (Hudson River), and a large, swift-flowing river (St. Lawrence). According to Hirvenoja (1973, p. 283) the larvae inhabit standing and slowly flowing water and occur in brackish water to about 8 percent salinity. The species occurs principally in habitats rich in vegetation and plant remains, but it can also inhabit waters with very low concentrations of dissolved oxygen.

Cricotopus trifasciatus (small form) is much less common than *C. sylvestris*, and these two species often occur in the same samples. Hirvenoja (1973, p. 290) reviewed the literature and concluded that the larvae of *C. trifasciatus* (small form) feed on the leaves of several kinds of aquatic plants, including *Limnanthemum nymphoides*, *Polygonum amphibium*, *Potamogeton natans*, *Nuphar luteum*, and *Nymphaea* sp.

We have found *C. tricinctus* thus far at only one site in a small, productive stream. Hirvenoja (1973, p. 304) lists the larvae of this species as occurring in ponds, lakes, and slowly moving waters, where it mines the leaves of *Potamogeton natans* and certain other aquatic plants.

Cricotopus (Isocladius) intersectus group

All stages of the *intersectus*-group key out fairly well, but the pupa is most easily recognized due to the strong granulations on the dorsal portion of the thorax (Fig. 199_1). There is only one European species in this group (*C. intersectus*), and our material is considerably different, representing one (or more) different species. In New York State it occurs in large rivers and canals, including some areas subjected to severe organic and toxic waste loadings. In Europe *C. intersectus* is characteristic of eutrophic lakes, and the larvae can exist under an extremely wide range of dissolved oxygen concentrations.

Table 1. Classification scheme for European *Cricotopus* (after Hirvenoja, 1973)

	Nearctic records*			Stages known A♂	A♀	P	L	Figures
Cricotopus								
(*Cricotopus*)								
pilosellus-group								
villosus	a			X				72
pilosellus				X	X	X		73–75
pilidorsum				X	X	X		75
tibialis-group								
cumulatus				X	X			76–78
gelidus				X	X			83
lestralis				X	X			84
ephippium				X	X	X		79–82
tibialis	a		c	X	X	X	X	85–90
polaris	a			X	X	X		90–94
fuscus-group								
fuscus				X	X	X	X	95–101
algarum				X	X	X	X	96–97, 100–103
pirifer				X	X	X	X	95–97, 100–101, 104–105
magus-group								
magus				X	X	X		105–106
tremulus-group								
septentrionalis				X	X			107–108
pulchripes		b		X	X			109–110
tremulus	a			X	X	X	X	111–115
claripes				X	X			116
tristis	a	b		X	X	X		117
curtus		b		X	X	X	X	118–121
annulator	a		c	X	X	X	X	122–123
beckeri				X	X			124–125
triannulatus	a		c	X	X	X	X	126–127
cylindraceus-group								
cylindraceus	a			X	X	X	X	129–131
patens				X	X	X	X	130, 132–134
coronatus	a			X	X	X		130, 135
festivellus-group		b						
festivellus	a		c	X	X	X		130, 136–137
flavocinctus				X	X	X	X	138–139
albiforceps				X	X	X	X	140–141
bicinctus-group								
bicinctus	a	b	c	X	X	X	X	142–143
vierriensis	a	b	c	X	X	X	X	144–145
pallidipes				X	X			146
trifascia-group								
trifascia		b	c	X	X	X	X	147–150
similis				X	X			151
caducus-group								
guttatus				X				153
caducus				X	X	X		152, 154

(*Nostococladius*)								
lygropis				X	X			128
(*Isocladius*)								
dobrogicus-group								
dobrogicus				X	X			155–156
sylvestris-group								
ornatus	a			X	X	X	X	157–159
lactus				X	X	X	X	160–164
pilitarsis	a			X	X	X		165–167
pilicauda				X				168
relucens				X	X	X		169–170
sylvestris	a	b	c	X	X	X	X	171–176
glacialis	a			X	X			177
suspiciosus				X	X	X	X	178–180
trifasciatus, large form				X	X			181–182
trifasciatus, small form		b		X	X	X	X	183–186
speciosus				X	X			187–188
tricinctus	a	b		X	X	X	X	185, 189–191
reversus-group								
reversus				X	X	X	X	192–194
perniger				X	X	X		195
intersectus-group								
intersectus	a	b		X	X	X	X	196–200
laricomalis-group								
arcuatus				X	X	X		201–203
obtusus				X	X	X		204
laricomalis	a			X	X	X	X	205–207
obnixus-group								
reductus				X				212
obnixus	a			X	X	X	**	203, 208–211
brevipalpis-group								
brevipalpis				X	X	X	X	213–215

* a — listed as Holarctic by Hirvenoja
b — collected during New York State biomonitoring activities
c — reported by LeSage and Harrison (1980a, 1980b)

** C. *elegans* (? = *obnixus*)

Table 2. Terms and abbreviations used in keys (after Saether, 1980). Figure numbers indicate where corresponding structures are labeled.

ADULTS

Morphological terms

AnP	Anal point (Fig. 108, 116)
APa	Anterior prealar setae (Fig. 73)
APs	Antepronotal setae (see "MAps" below)
BS	Basal setae (Fig. 129, 135, 193, 205)
CD	Crista dorsalis (Fig. 86, 92, 137)
Dc	Dorsocentral setae (Fig. 76)
Gc	Gonocoxite (Fig. 86 (♂), 128 (♀))
Gs	Gonostylus (Fig. 86, 170)
H	Humeral setae (Fig. 155, 165)
IVo	Inferior volsella (Fig. 77, 86)
LS	Lateral setae (Fig. 96, 148, 151)
MAps	Median setae of antepronotum (Fig. 91, 155)
MaS	Marginal setae (Fig. 135, 193, 205)
MD_1	Anteromedian muscle marks (Fig. 83, 96)
MD_2	Posteromedian muscle marks (Fig. 96, 138)
MS	Median setae (Fig. 96, 138)
P_{1-3}	Legs (fore, middle and hind, respectively)
Pcs	Precpisternal setae (Fig. 73, 192)
PPa	Posterior prealar setae (Fig. 73, 76)
Pts	Paratergital setae (Fig. 76, 83, 96)
SCa	Seminal capsule (Fig. 154)
SCh	Sensillae chaeticae (Fig. 5)
Scts	Scutellar setae (Fig. 76, 196, 201)
SDu	Spermathecal duct (Fig. 140, 154)
SVo	Superior volsella (Fig. 86, 117, 177, 187, 202, 204, 208, 213)

Ratios

AR	Antennal ratio: ratio of length of apical elongated flagellomere plus any flagellomeres distal to it divided by combined length of the more basal flagellomeres.
BR	"Bristle ratio": ratio of longest seta of basal tarsomere divided by minimum width of the tarsomere measured one third from apex. (BR without subscript refers to front leg, BR_{1-3} are ratios of front, mid and hind legs.)
BV	"Beinverhältnisse": combined length of femur, tibia and basitarsus (=basal tarsomere) divided by combined length of tarsomeres 2–5. (BV without subscript refers to front legs; BV_{1-3} to front, mid and hind legs, respectively.)
LR	Leg ratio: ratio of basal tarsomere to tibia. (LR without subscript refers to front leg; LR_{1-3} refer to ratio of front, mid and hind legs, respectively.)

Table 2 (continued)

PUPAE

Morphological terms

AM	Anal macrosetae (Fig. 148)
D	D setae (Fig. 93, 97, 120, 157, 172, 174)
Dc	Dorsocentral setae (Fig. 87, 93)
FA	Frontal apotome (Fig. 79)
FS	Frontal setae (Fig. 79)
Hl	Hooklets (Fig. 169, 214)
L	L setae (Fig. 93, 97, 120, 157, 172, 174)
MD	Muscle marks (Fig. 137, 174, 195)
O	Oral setae (Fig. 174)
OF	Ocular field (Fig. 79)
Po	Postorbital setae (Fig. 79)
Prfr	Prefrons (Fig. 79)
PSB	Pedes spurii B (Fig. 117, 122, 142, 163, 199)
TH	Thoracic horn
V	V setae (Fig. 157, 172, 174)

LARVAE

Morphological terms

AP	Anterior parapod
ChB	Chaetulae basales (Fig. 191)
ChL	Chaetulae laterales (Fig. 191)
M	Mentum
PE	Pecten epipharyngis (Fig. 88, 176, 191)
Pm	Premandible (Fig. 88, 115)
PmB	Premandibular brush (Fig. 88, 115)
RO	Ring organ (Fig. 159)
Si	Seta interna (mandible) (Fig. 210)
SI	Seta anteriores (labrum) (Fig. 207, 210)

Ratio

AR	Antennal ratio: length of basal antennal segment divided by the combined length of the remaining segments. (This is the inverse of the antennal ratio used by Hirvenoja in the original work.)

LITERATURE CITED

Ashe, P. and D. A. Murray. 1980. *Nostococladius*, a new subgenus of *Cricotopus* (Diptera: Chironomidae), pp. 105–111. *In* Murray, D. A. (ed.) Chironomidae. Ecology, Systematics, Cytology and Physiology. Pergamon Press, New York.

Beck, W. M., Jr. 1976. Biology of the larval chironomids. Fla. St. Dept. Environ. Reg. Tech. Ser. 2(1): 1–58.

Brundin, L. 1956. Zur Systematik der Orthocladiinae (Dipt. Chironomidae). Rep. Inst. Freshwat. Res. Drottningholm *37*:5–185.

Bryce, D. and A. Hobart. 1972. The biology and identification of the larvae of the Chironomidae (Diptera). Entomol. Gaz. *23*:175–217.

Chernovskii, A. A. 1949. Identification of larvae of the midge family Tendipedidae (Opredelitel' lichinok komarov semeistva tendipedidae). English translation of Russian by E. Lees, Freshwater Biol. Assoc., K. E. Marshall (ed.). National Lending Library of Science and Technology, Boston Spa, Yorkshire, England (1961). 293 pp.

Cranston, P. S. 1982. A key to the larvae of the British Orthocladiinae (Chironomidae). Freshwater Biol. Assoc. Sci. Publ. No. 45. 152 pp.

Hilsenhoff, W. L. 1975. Aquatic insects of Wisconsin. Generic keys and notes on biology, ecology and distribution. Tech. Bull. No. 89, Dept. Nat. Resources, Madison, Wisconsin. 52 pp.

Hirvenoja, M. 1973. Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae). Ann. Zool. Fennici *10*: 1–363.

LeSage, L. and A. D. Harrison. 1980a. The biology of *Cricotopus* (Chironomidae: Orthocladiinae) in an algal-enriched stream: Part I. Normal biology. Arch. Hydrobiol./Suppl. 57 *4*:375–418.

LeSage, L. and A. D. Harrison. 1980b. Taxonomy of *Cricotopus* species (Diptera: Chironomidae) from Salem Creek, Ontario. Proc. Entomol. Soc. Ont. *111*:57–114.

Mason, W. T., Jr. 1973. An introduction to the identification of chironomid larvae. Div. Poll. Surv., Fed. Water Poll. Cont. Admin., Cincinnati, OH. 89 pp.

Oliver, D. R. 1977. *Bicinctus*-group of the genus *Cricotopus* van der Wulp (Diptera: Chironomidae) in the Nearctic with a description of a new species. J. Fish. Res. Bd. Can. *34*(1):98–104.

Oliver, D. R. 1981. Chironomidae, pp. 423–458. *In* McAlpine, J. F. et al., coordinators. Manual of Nearctic Diptera. Ag. Can. Monogr. 27. 674 pp.

Oliver, D. R., D. McClymont and M. E. Roussel. 1978. A key to some larvae of Chironomidae (Diptera) from the Mackenzie and Porcupine River Watersheds. Can. Fish. Mar. Serv. Tech. Rep. *791*:iv + 73 pp.

Pankratova, V. Ya. 1977. The family of chironomids or midges—Chironomidae [Keys to larvae and pupae]. (Opredelitel' presnovodnykh bespozvonochnykh evropeiskoi chasti SSSR. (Plankton i bentos.). Zool. Inst. Akad. Nauk (SSSR). English translation of Russian by P. Moorhouse, Freshwater Biol. Assoc., Westmorland, England. 63 pp.

Pinder, L. C. V. 1978. A key to the adult males of the British Chironomidae (Diptera), the non-biting midges. Vol. I. The Key. Freshwater Biol. Assoc. Sci. Publ. No. 37. 169 pp.

Roback, S. S. 1957. The immature tendipedids of the Philadelphia area. Monogr. Acad. Nat. Sci. Phila. 9:1–152 + 28 pl.

Saether, O. A. 1977. Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. Bull. Fish. Res. Bd. Can. *197*:1–209.

Saether, O. A. 1980. Glossary of chironomid morphology terminology (Diptera, Chironomidae). Entomol. Scand. Suppl. 14. 51 pp.

Simpson, K. W. and R. W. Bode. 1980. Common larvae of Chironomidae from New York State streams and rivers, with particular reference to the fauna of artificial substrates. Bull. N.Y.S. Museum *439*: 1–105.

Sublette, J. E. 1967. Type specimens of Chironomidae (Diptera) in the Cornell University collection. J. Kansas Entomol. Soc. *40*(4): 477–564.

Sublette, J. E. and M. F. Sublette. 1971. The Orthocladiinae (Chironomidae: Diptera) of California. I. The *Cricotopus infuscatus* group. Entomol. News *82*:85–102.

Thienemann, A. 1944. Bestimmungstabellen für die bis jetzt bekannten Larven und Puppen der Orthocladiinen (Diptera Chironomidae). Arch. Hydrobiol. *39*:551–664.

KEYS FOR *CRICOTOPUS*

Adult males (58 species)

1 Gonocoxite without inferior volsella (Fig. 147_3); abdominal tergites I and IV light (Subgenus *Cricotopus*, in part—*trifascia*-group) 2

Gonocoxite with inferior volsella (e.g. Fig. 77_3); pigmentation of abdominal tergites variable 3

2 Abdominal tergites III-IV each with 10–19 lateral setae (Fig. 148_1); AR 1.51–1.79; first tarsomere of P_3 with 27–39 sensillae chaeticae on its basal half . . . . . *trifascia* Edw. (Fig. 147, 148)

Abdominal tergites III-IV each with 3–7 lateral setae (Fig. 151_6); AR 1.04–1.25; first tarsomere of P_3 with 8–10 sensillae chaeticae on its basal 1/4–1/3. . . *similis* Goetgh. (Fig. 151)

3 Anterior prealar setae present, somewhat smaller than and merged with posterior prealar setae (Fig. 73_1) (Subgenus *Cricotopus*, in part—*pilosellus*-group) 4

Anterior prealar setae absent (e.g. Fig. 76_1) 6

4 BR (ratio of longest seta of a tarsomere divided by minimum width of same tarsomere) of third tarsomere of p_1 greater than 3.5 . . . . . *villosus* Hirv. (Fig. 72)

BR of this tarsomere less than 3.5 5

5 Precpisternal setae present (Fig. 73_1) . . . . . *pilosellus* Brund. (Fig. 73, 74)

Precpisternal setae absent . . . . . *pilidorsum* Hirv.

6 Setae on abdominal tergites and scutellum usually uniformly distributed and usually dense (Fig. $76_{1,5}$); numerous paratergital setae on most or all segments (Fig. 83_4); inferior volsella either bilobed or not distinctly longer than wide (Fig. 77_3, 80_3, 83_3) (Subgenus *Cricotopus*, in part—*tibialis*-group) 7

Setae on abdominal tergites (at least III and IV) usually reduced to groups or rows, not uniformly distributed; paratergital setae less numerous (e.g. Fig. 126_5) or absent; if setae on tergites III and IV uniformly distributed, inferior volsella simple and rounded apically (Fig. 156_7, 193_9) 12

7 Inferior volsella simple and about as long as wide (Fig. 77_3); BR of third tarsomere of p_1 about 4.6 (4.0–5.8) . . . . . *cumulatus* Hirv. (Fig. 76, 77)

Inferior volsella wider than long or more or less bilobed; BR usually much less 8

8 Inferior volsella wider than long, at most slightly bilobed 9

Inferior volsella distinctly bilobed 11

9 AR less than 1 . . . . . *ephippium* (Zett.) (Fig. 79, 80)

AR greater that 1 10

10 Setae not uniformly distributed over abdominal tergites, with bare areas evident in region of anteromedian muscle marks (MD_1) (Fig. 83_1) . . . . . *gelidus* (Kieff.) (Fig. 83)

Setae uniformly distributed over abdominal tergites . . . . . *lestralis* (Edw.) (Fig. 84)

11 Crista dorsalis pointed distally, otherwise relatively narrow (Fig. 92_3); apical tooth and distal setae of gonostylus remarkably long . . . . . *polaris* Kieff. (Fig. 91, 92, 94)

Crista dorsalis wide and often rounded apically, never distinctly pointed; apical tooth and distal setae of gonostylus of normal size (Fig. 86_3) . . . . . *tibialis* (Meig.) (Fig. 85–87, 89)

12 AR distinctly less than 1.0; tarsi of p_2 and p_3 strongly shortened (BV_2 greater than 4.5, BV_3 greater than 4.0); inferior volsella simple, rounded and somewhat teardrop-shaped (Fig. 153_2, 154_6) (Subgenus *Cricotopus*, in part—*caducus*-group) 13

AR normally greater than 1.0; when less than 1.0, tarsi not shortened (BV_2 less than 4.5, BV_3 less than 4.0) 14

13 Tibiae of p_2 and p_3 with two spurs; LR_1 0.56–0.62; LR_2 0.24–0.25; inferior volsella wider than in following species . . . . . *guttatus* Hirv. (Fig. 153)

Only one tibial spur on all legs (Fig. 152_1); LR_1 0.47–0.55; LR_2 0.32–0.38 . . . . . *caducus* Hirv. (Fig. 152, 154)

Adult males (continued)

14 Abdominal tergites III-IV each with a transverse row of basal setae (Fig. 129_4); longitudinal rows of median setae absent or indistinct; inferior volsella often bilobed (Fig. 129_3), if only weakly (Fig. 135_{11}), sensillae chaeticae present on first tarsomere of p_2 (Subgenus *Cricotopus*, in part) 15

Abdominal tergites III-IV each usually without a transverse row of basal setae (e.g. Fig. 137_1); if these present, inferior volsella simple and rounded apically and sensillae chaeticae absent on first tarsomere of p_2 18

15 Inferior volsella distinctly bilobed (Fig. 106_6); legs and abdominal tergites unicolorous; p_2 without sensillae chaeticae (*magus*-group) . . . . . *magus* Hirv. (Fig. 106)

Inferior volsella simple, conical and strongly curved posteriorly or weakly bilobed; if weakly bilobed, legs and/or tergites with pale markings, first tarsomeres of p_2 and p_3 with sensillae chaeticae (*cylindraceus*-group) 16

16 Tibiae without rings; first tarsomere of p_2 with 2–6 sensillae chaeticae on its basal fourth; that of p_3 with 2–5 sensillae chaeticae on its basal fifth . . . . . *coronatus* Hirv. (Fig. 135)

Tibiae with pale rings; tergite I sometimes pale 17

17 Abdominal tergites with relatively distinct pale bands (Fig. 129_1); first tarsomere of p_2 with 4–10 sensillae chaeticae, that of p_3 with 9–15 sensillae chaeticae on its basal third . . . . . *cylindraceus* (Kieff.) (Fig. 129)

Abdominal tergites unicolorous (Fig. 133_3); first tarsomere of p_2 with 1–5 sensillae chaeticae on its basal fifth, that of p_3 with 2–7 sensillae chaeticae . . . . . *patens* Hirv. (Fig. 130, 132, 133)

18 Median setae on tergites III-IV usually in a single longitudinal row (Fig. 138_1), rarely indistinctly double; inferior volsella weakly bilobed or simple (Fig. 137_7), often conical and strongly curved posteriorly; crista dorsalis distinct; fore tarsi dark, fore tibiae ringed; abdominal tergites with light markings; first tarsomeres of p_2 and p_3 with sensillae chaeticae (Subgenus *Cricotopus*, in part—*festivellus*-group) 19

Median setae on tergites III-IV usually either undifferentiated or in double longitudinal rows (e.g. Fig. 96_1); if these in a single row, inferior volsella simple and not strongly curved posteriorly and sensillae chaeticae absent on first tarsomere of p_2 (some *Isocladius*) or tergites I and IV pale (*Cricotopus* (*C.*) *vierriensis*—Fig. 144) 21

19 Abdominal tergites I, II and IV pale . . . . . *albiforceps* (Kieff.) (Fig. 140)

Pigmentation of abdominal tergites otherwise 20

20 Posterior fourth of tergite IV and anterior fourth of tergite V pale (Fig. 137_3); hypopygium as in Fig. 137_7 . . . . . *festivellus* (Kieff.) (Fig. 136, 137)

Tergites IV and V uniformly pigmented, tergite I pale; hypopygium as in Fig. 138_6 . . . . . *flavocinctus* (Kieff.) (Fig. 138)

21 Lateral setae arranged in one or two rows on posterolateral margins of tergites III-IV (Fig. 117_5) and superior volsella rounded (Fig. 117_9) or absent; legs and tergites often with light areas (Subgenus *Cricotopus*, in part) 22

Lateral setae usually arranged in several rows on posterolateral margins of tergites III-IV (Fig. 128_6, 158_1); if these in one or two rows, superior volsella distinctly humped (e.g. Fig. 202_8, 204_7) 33

22 Abdominal tergites either unicolorous or tergites I and IV pale; inferior volsella always simple and more or less curved posteriorly; median setae on tergites III-IV single or double (*bicinctus*-group) 23

Tergites I and II usually pale; when pigmentation otherwise, inferior volsella distincly bilobed (e.g. Fig. 126_{10}); inferior volsella usually bilobed, if simple either directed medially (Fig. 116_3), curved posteriorly (Fig. 112_5) or broadened apically (Fig. 108_6, 109_4); median setae on tergites III-IV always distinctly double (*tremulus*-group) 25

23 Abdominal tergites unicolorous (Fig. 146_2); crista dorsalis distinct . *pallidipes* Edw. (Fig. 146)

Abdominal tergites I and IV usually pale; crista dorsalis indistinct 24

Adult males (continued)

24 Concavity of gonocoxite between base of gonostylus and inferior volsella much longer than wide; apex of inferior volsella does not reach middle of this concavity (Fig. 142_7) ..... *bicinctus* (Meig.) (Fig. 142)

Concavity of gonocoxite rounded (Fig. 144_3); apex of inferior volsella reaches middle of this concavity ..... *vierriensis* Goetgh. (Fig. 144)

25 Fore tarsi with pale rings 26

Fore tarsi uniformly dark; inferior volsella more or less distinctly bilobed; basal lobe narrow and directed medially, distal lobe directed somewhat posteriorly 29

26 Only second tarsomere pale; inferior volsella very wide and truncate apically (Fig. 109_4); anal point usually absent ..... *pulchripes* Verr. (Fig. 109)

Second tarsomere of p_1 and at least basal half of third tarsomere pale 27

27 Inferior volsella wide and bluntly rounded (Fig. 108_6); anal point present ..... *septentrionalis* Hirv. (Fig. 107, 108)

Inferior volsella narrower, its basal lobe foot-shaped or straight and directed medially.... 28

28 Basal lobe of inferior volsella foot-shaped (Fig. 112_5), distal lobe somewhat distinct; anal point absent ..... *tremulus* (L.) (Fig. 111, 112)

Basal lobe straight, directed medially, distal lobe somewhat indistinct; anal point present (Fig. 116_3) ..... *claripes* Hirv. (Fig. 116)

29 Crista dorsalis narrow, pointed apically; small anal point present (Fig. 117_8) ..... *tristis* Hirv. (Fig. 117)

Crista dorsalis wider, not pointed apically; anal point absent 30

30 Abdominal tergites I and IV pale (Fig. 124_1) ..... *beckeri* Hirv. (Fig. 124)

Abdominal pigmentation otherwise 31

31 Abdominal tergites unicolorous (completely dark) or tergites I, IV and V pale (Fig. 126_1) ..... *triannulatus* (Macq.) (Fig. 126)

Abdominal pigmentation otherwise 32

32 Tergites I and II and posterior margins of next few tergites pale (Fig. 119_1); distal lobe of inferior volsella weak (Fig. 119_4) ..... *curtus* Hirv. (Fig. 118, 119)

All tergites with at least some pigmentation (Fig. 122_1); distal lobe of inferior volsella relatively well developed (Fig. 122_8) ..... *annulator* Goetgh. (Fig. 122)

33 Anal point present, inferior volsella simple and directed posteriorly (Fig. 128_3); legs and tergites uniformly pigmented (Fig. 128_1) (Subgenus *Nostococladius*) ..... ?*lygropis* Edw. (Fig. 128)

Anal point absent, inferior volsella simple or bilobed; pigmentation variable 34

34 Inferior volsella bilobed (Subgenus *Cricotopus*, in part—*fuscus*-group) 35

Inferior volsella simple (Subgenus *Isocladius*) 37

35 Anterior margin of basal lobe of inferior volsella and posterior margin of distal lobe divergent (Fig. 104_3) ..... *pirifer* Hirv. (Fig. 96, 100, 104)

Anterior margin of basal lobe of inferior volsella and posterior margin of distal lobe convergent or parallel (Fig. 98_3, 102_3) 36

36 LR_1 0.63–0.73 ($\bar{x}$ = 0.68) ..... *fuscus* (Kieff.) (Fig. 95, 96, 98, 100)

LR_1 0.68–0.72 ($\bar{x}$ = 0.70) ..... *algarum* (Kieff.) (Fig. 96, 100, 102)

37 Humeral setae and median antepronotal setae present (Fig. $155_{1,2}$) (*dobrogicus*-group) ..... *dobrogicus* Albu (Fig. 155, 156)

These setae absent 38

38 Transverse rows of basal and marginal setae absent (e.g. Fig. 189_6); median setae on tergites II-IV in a single longitudinal row, more or less separated from lateral setae; light markings usually present on legs and abdomen; small but distinct pulvillae present (*sylvestris*-group) 39

Transverse rows of basal and/or marginal setae usually distinct on all abdominal tergites (Fig. 205_1); legs and abdominal tergites sometimes unicolorous; small pulvillae present or absent 50

Adult males (continued)

39 Inferior volsella about 40 μm wide, truncate or broadly rounded apically (not strongly tapered apically) (Fig. 166_4, 168_2) 40

Inferior volsella distinctly narrower (measured at about its middle) and distinctly tapered apically (e.g. Fig. 172_6) 41

40 First tarsomere of p_3 with 27–39 sensillae chaeticae; BR of third tarsomere of p_1 2.9–3.7 ..... *pilitarsis* (Zett.) (Fig. 165, 166)

First tarsomere of p_3 with 5–6 sensillae chaeticae; BR of third tarsomere of p_1 1.3–2.3 ..... *pilicauda* Hirv. (Fig. 168)

41 Scutellar setae 2–3 μm thick; median setae on abdominal tergites less than 4 μm thick.. 42

Scutellar setae and median setae of abdominal tergites 4–5 μm thick 43

42 Gonostylus at most 4 times as long as wide and bent slightly, when directed anteriorly it reaches no further than middle of inferior volsella (Fig. 157_5); BR of third tarsomere of p_1 3.9–5.9 ..... *ornatus* (Meig.) (Fig. 157, 158)

Gonostylus more than 4 times as long as wide and fairly straight, when directed anteriorly it reaches completely over inferior volsella (Fig. 170_1); BR of third tarsomere of p_1 1.3–2.0 ..... *relucens* Hirv. (Fig. 169, 170)

43 16–36 lateral setae on tergites II–IV; AR greater than 2.0; dark, relatively wide stripes on all but first abdominal tergite (Fig. 160_1) or pigmentation similar to light form of *C. sylvestris* (Fig. 172_2) ..... *laetus* Hirv. (Fig. 160, 161)

Lateral setae less numerous and often smaller than median setae; if AR greater than 2, tergites I, IV and VII with large, pale areas 44

44 Abdominal tergites usually all dark (Fig. 172_1); when tergites I, IV and VII with pale areas, anterior ⅓ of tergite V also pale (Fig. 172_2) (the identification of the light forms of these species is often possible only with associated pupae or adult females) 45

Abdominal tergites I, VII (and sometimes IV) with large pale areas, other tergites dark.. 46

45 First tarsomere of p_3 with 15–30 sensillae chaeticae; abdominal tergites I–V entirely dark (Fig. 172_1) or tergites I, IV and V with pale areas (Fig. 172_2) ..... *sylvestris* (Fabr.) (Fig. 171, 172)

First tarsomere of p_3 with 9 sensillae chaeticae; abdomen very dark (Fig. 177_1) ..... *glacialis* Edw. (Fig. 177)

46 Abdominal tergite I and posterior ⅔ of tergite VII pale; thorax pale dorsally between vittae ..... *suspiciosus* Hirv. (Fig. 178)

Abdominal tergites I, IV and VII with pale areas; thorax pale or dark dorsally 47

47 Tergite IV usually entirely pale, occasionally with some pigmentation in region of posteromedian muscle marks (Fig. 181_1); area between vittae pale 48

If tergite IV not entirely pale, pigmentation darkest in anterior corners of tergite (Fig. 187_1); prescutellar area or entire area between vittae usually dark 49

48 First tarsomere of p_3 with 42–45 sensillae chaeticae; AR 1.92–2.04 ..... *trifasciatus* (Meig.) (large form) (Fig. 181, 182)

First tarsomere of p_3 with 9–17 sensillae chaeticae; AR 1.58–1.80 ..... *trifasciatus* (Meig.) (small form) (Fig. 183)

49 First tarsomere of p_3 with 47–70 sensillae chaeticae; pigmentation of tergites and structure of hypopygium as in Fig. 187 ..... *speciosus* Goetgh. (Fig. 187, 188)

First tarsomere of p_3 with 13–32 sensillae chaeticae; pigmentation of tergites and structure of hypopygium as in Fig. 189 ..... *tricinctus* (Meig.) (Fig. 189)

50 Transverse rows of basal and marginal setae present (Fig. 193_1, 195_1) on abdominal tergites III–IV; superior volsella and pulvillae absent (*reversus*-group) 51

Transverse rows of basal setae absent on abdominal tergites III and IV; simple longitudinal row of median setae usually distinct, but merges with lateral setae through transverse row of marginal setae 52

Adult males (continued)

51 Preepisternal setae present (Fig. 192_1) ..... *reversus* Hirv. (Fig. 192, 193)

Preepisternal setae absent ..... *perniger* (Zett.) (Fig. 192, 195)

52 Superior volsella absent; scutellum usually with dense setae, dorsocentral setae numerous (Fig. 196); tergites I and IV occasionally somewhat lightened (Fig. 198_2); pulvillae absent (*intersectus*-group) ..... *intersectus* (Staeg.) (Fig. 196–198)

Superior volsella more or less distinct; scutellar setae less numerous than in above species and usually in a single row (Fig. 201_3); dorsocentral setae less numerous; abdominal tergites all dark; small pulvillae sometimes present 53

53 Superior volsella produced into a definite hump (Fig. 177_4) (*laricomalis*-group) 54

Superior volsella rounded, flattened (e.g. Fig. 208_9) 56

54 Pulvillae absent; inner margin of gonocoxite between inferior volsella and gonostylus strongly curved (Fig. 202_{10}); first tarsomere of p_3 with 13–15 sensillae chaeticae ..... *arcuatus* Hirv. (Fig. 201, 202)

Small pulvillae present; inner margin of gonocoxite less strongly rounded (Fig. 205_{10}); tibiae usually ringed; number of sensillae chaeticae lower 55

55 Hypopygium usually pale distally; crista dorsalis fairly wide, rounded distally (Fig. 204_8); first tarsomere of p_3 with 8–12 sensillae chaeticae ..... *obtusus* Hirv. (Fig. 204)

Hypopygium dark; crista dorsalis dark, narrow, short and slightly bent (Fig. 205_{10}); first tarsomere of p_3 with 3–8 sensillae chaeticae ..... *laricomalis* Edw. (Fig. 201, 205)

56 Palps short; their length less than ½ width of head (*brevipalpis*-group) ..... *brevipalpis* Kieff. (Fig. 213, 214)

Palps long; their total length more than ½ width of head (*obnixus*-group) 57

57 Inferior volsella about 25 μm wide (Fig. 208_8) ..... *obnixus* (Walk.) (Fig. 208)

Inferior volsella about 40μm wide (Fig. 212_3) 58

58 Anal lobe of wing moderately projected; AR over 1 ..... sp. cfr. *obnixus* (Fig. 211)

Anal lobe of wing reduced; AR 0.76–0.78 ..... *reductus* Hirv. (Fig. 212)

Adult females (54 species)

1 Humeral setae and pulvillae absent 2

Humeral setae usually present (e.g. Fig. 165); when absent (one species) maxillary palps very short (less than ½ as long as maximum width of head) and small pulvillae present (Subgenus *Isocladius*) 35

2 Anterior prealar setae present, somewhat shorter than and merged with posterior prealar setae (Fig. 73_1) (Subgenus *Cricotopus*, in part-*pilosellus*-group) 3

Anterior prealar setae absent 4

3 Preepisternal setae present (Fig. 73_1) ..... *pilosellus* Brund. (Fig. 73–75)

Preepisternal setae absent ..... *pilidorsum* Hirv. (The female of *C. villosus* is unknown)

4 Setae on abdominal tergites III-IV and on scutellum usually dense and uniformly distributed; numerous paratergital setae on most abdominal segments (e.g. Fig. 76_2) (Subgenus *Cricotopus*, in part-*tibialis*-group) 5

Setae on abdominal tergites III and IV not uniformly distributed, some areas lacking setae (e.g. Fig. 96); paratergital setae less abundant or absent 10

5 131–208 dorsocentral setae present (Fig. 76_1) ..... *cumulatus* Hirv. (Fig. 76–78)

Number of dorsocentral setae much lower (e.g. Fig. $85_{1,3}$) 6

6 First tarsomere of p_1 with sensillae chaeticae situated on its basal half (rarely its basal 3/5); median antepronotal setae absent 7

This tarsomere with sensillae chaeticae situated on its basal ⅔ (rarely its basal 3/5); median antepronotal setae sometimes present 9

7 Setae of abdominal tergites somewhat reduced anteriorly (Fig. 83_4) ..... *gelidus* (Kieff.)(Fig. 83)

Setae of abdominal tergites uniformly distributed (Fig. 80_6) 8

8 Seminal capsules 150–210 μm long (Fig. 81_1); antenna with one preapical seta (Fig. 81_3) ..... *ephippium*(Zett.) (Fig. 79–81)

Seminal capsules 140–160 μm long (Fig. 84_4); antenna without preapical seta (Fig. 84_7) ..... *lestralis* (Edw.) (Fig. 84)

9 Median antepronotal setae present (Fig. 91_1) ..... *polaris* Kieff. (Fig. 91, 92)

These setae usually absent (when present, this species cannot be differentiated with certainty from previous one) ..... *tibialis* (Meig.) (Fig. 85–87)

10 Tarsi of p_2 and p_3 quite short (BV_{2-3} greater than 4.5); spermathecal ducts straight, seminal capsules elongate ovoid (Fig. 154_{10}) (Subgenus *Cricotopus*, in part-*caducus*-group) ..... *caducus* Hirv. (Fig. 152, 154)

Tarsi longer (BV_{2-3} less than 4.0); spermathecal ducts often strongly curved 11

11 Gonocoxite IX flat (Fig. 128_4); lateral setae on tergites III-IV in many rows (Fig. 128_7) (Subgenus *Nostococladius*) ..... *lygropis* Edw. (Fig. 128)

Gonocoxite IX somewhat swollen (e.g. Fig. 110) (Subgenus *Cricotopus*, in part) 12

12 Spermathecal ducts curved and/or convoluted, when seminal capsules small (less than 90 μm) abdominal tergites and/or legs with pale markings 13

Spermathecal ducts usually straight, if curved (*C. pallidipes*) seminal capsules very small (about 60 μm) and rounded and legs and abdominal tergites unicolorous (Fig. 146) 30

13 Median setae of each abdominal tergite in one row or only one seta between MD_2 (Fig. 138_2, 140_2); some tergites pale, tibiae ringed (*festivellus*-group) 14

Median setae on each abdominal tergite in double longitudinal row; when these rows incomplete, many setae between MD_2(Fig. 96_2) 16

14 Abdominal tergites I and II pale, tergite II at most with dark spots laterally(Fig. 140_4) ..... *albiforceps* (Kieff.) (Fig. 140)

Pigmentation pattern different 15

Adult females (continued)

15 Abdominal tergites I, V and VI usually mostly pale(Fig. 137_4); in dark individuals only tergite I and anterior part of V pale ..... *festivellus* (Kieff.) (Fig. 130, 136, 137)

Only tergite I pale (Fig. 138_4)..... *flavocinctus* (Kieff.) (Fig. 138)

16 Seminal capsules pear-shaped (e.g. Fig. 98_4); legs and tergites either entirely dark or tergites I and II somewhat lighter than others; lateral setae present, often in many rows (*fuscus*-group)..... 17

Seminal capsules oval or rounded; legs and tergites often with pale markings 19

17 Paratergital setae absent (Fig. 96_6); first tarsomere of p_2 and p_3 each with 16–23 sensillae chaeticae; LR_1 0.57–0.64 ..... *pirifer* Hirv. (Fig. 96, 104)

Paratergital setae present posteriorly on abdominal segments (Fig. $96_{2,4}$); first tarsomere of p_2 and p_3 usually with more than 20 (16–44) sensillae chaeticae each 18

18 LR_1 0.61–0.66 ..... *fuscus*(Kieff.) (Fig. 95, 96, 98)

LR_1 0.66–0.68 ..... *algarum* (Kieff.) (Fig. 96, 102)

19 Abdominal tergites all dark or tergite I and areas between other tergites somewhat lightened (Fig. 129_2); seminal capsules always oval (longer than wide); lateral setae of tergites usually farther from lateral and posterior margins of tergites III and IV (Fig. 129_8) (*cylindraceus*-group)..... 20

Usually two or three abdominal tergites pale; when all tergites dark, seminal capsules rounded and no longer than wide (Fig. 122_3); rows of lateral setae on tergites III and IV very close to lateral and posterior margins of tergites (e.g. Fig. 112_4) (*tremulus*-group)... 22

20 Anterior tarsi usually entirely dark, occasionally an indistinct ring on tibiae; first tarsomere of p_2 with 14–21 sensillae chaeticae, that of p_3 with 12–18 sensillae chaeticae .... *coronatus* Hirv. (Fig. 130, 135)

Anterior tibiae with a distinct white ring..... 21

21 First tarsomere of p_2 with 51–75 sensillae chaeticae, that of p_3 with 50–83 sensillae chaeticae ..... *cylindraceus* (Kieff.) (Fig. 129, 130)

First tarsomere of p_2 with 10–25 sensillae chaeticae, that of p_3 with 8–25 sensillae chaeticae ..... *patens* Hirv. (Fig. 132, 133)

22 Anterior tarsi ringed 23

Anterior tarsi uniformly dark..... 26

23 Only second tarsomere of p_1 pale ..... *pulchripes* Verr. (Fig. 109, 110)

Second tarsomere and at least basal half of third tarsomere of p_1 pale..... 24

24 Median antepronotal setae usually present; seminal capsules oval and without a neck-part (Fig. 108_5); LR_1 0.66–0.70 ..... *septentrionalis* Hirv. (Fig. 107, 108)

With another combination of characters; median antepronotal setae absent; LR_1 usually less 25

25 Seminal capsules round and with a short but distinct neck-part (Fig. 113_6)..... ..... *tremulus* (L.) (Fig. 111–113)

Seminal capsules oval and without a distinct neck-part (Fig. 116_9) .... *claripes* Hirv. (Fig. 116)

26 Tergite IV pale..... 27

Tergite IV dark 28

27 Abdominal tergites I and IV pale..... *beckeri* Hirv. (Fig. 124, 125)

Abdominal tergites I, IV and V with pale markings (Fig. 126_2) .... *triannulatus* (Macq.) (Fig. 126)

28 Seminal capsules oval; abdominal tergites I and II usually more or less pale .... *tristis* Hirv. (Fig. 117)

Seminal capsules rounded 29

Adult females (continued)

29 Abdominal tergites I and II usually entirely pale (Fig. 119_2), first tarsomere of p_2 with 11–27 sensillae chaeticae, first tarsomere of p_3 with 10–24 sensillae chaeticae ..... *curtus* Hirv. (Fig. 118–119)

All abdominal tergites dark or I or I and II pale; first tarsomere of p_2 with 8–14 sensillae chaeticae, that of p_3 with 8–13 ..... *annulator* Goetgh. (Fig. 122)

30 LR_1 0.45–0.57; legs and abdominal tergites uniformly colored; spermathecal ducts straight (*magus*-group) ..... *magus* Hirv. (Fig. 106)

LR_1 greater than 0.5 31

31 Abdominal tergites I and IV pale and tibiae ringed; seminal capsules usually over 100μm long, when as small as in following species group, fore edge of tergite II brighter pale than in those species (*trifascia*-group) 32

Abdominal tergites and legs uniformly colored, or abdominal tergites I and IV pale and tibiae ringed; seminal capsules small, no more than 80 μm long, rounded and with a short neck (*bicinctus*-group) 33

32 Seminal capsules over 100 μm (Fig. 147_6); first tarsomere of p_2 and p_3 with 40–50 sensillae chaeticae on basal half ..... *trifascia* Edw. (Fig. 147, 148)

Seminal capsules no more than 80 μm long (Fig. 151_7); first tarsomere of p_2 with 10–14 sensillae chaeticae on basal 2/5, and about same number on basal ¼-⅓ of first tarsomere of p_3 ..... *similis* Goetgh. (Fig. 151)

33 Spermathecal ducts curved (Fig. 146_9); abdominal tergites unicolorous (Fig. 146_3) ..... *pallidipes* Edw. (Fig. 146)

Spermathecal ducts straight; abdominal tergites I and IV pale 34

34 Setae on gonocoxite IX up to 60 μm long (Fig. 142_5), at least one seta longer than 20 μm. ..... *bicinctus* (Meig.) (Fig. 142)

Setae on gonocoxite IX about 20 μm long (Fig. 144_9) ..... *vierriensis* Goetgh. (Fig. 144)

35 Humeral setae absent (*brevipalpis*-group) ..... *brevipalpis* Kieff. (Fig. 213, 214)

Humeral setae present 36

36 Median antepronotal setae present; preepisternal setae absent (Fig. 155_2); antenna without preapical setae; abdominal tergites with relatively dense setae (Fig. 155_4) (*dobrogicus*-group) ..... *dobrogicus* Albu (Fig. 155, 156)

Median antepronotal setae usually absent; when present (one species) preepisternal setae present 37

37 Transverse rows of basal and marginal setae absent; median setae more or less separated from lateral setae (Fig. 158_2, 181_5); antenna without preapical setae (Fig. 158_5); pulvillae small, but distinct (*sylvestris*-group) 38

Transverse rows of basal and/or marginal setae present on abdominal tergites (e.g. Fig. 193_2); antenna usually with one preapical seta (Fig. 193_{10}); pulvillae present or absent 48

38 Scutellar setae less than 3 μm thick 39

Scutellar setae 4–5 μm thick 40

39 Seminal capsules oval (Fig. 158_6); first tarsomere of p_1 without sensillae chaeticae ..... *ornatus* (Meig.) (Fig. 157, 158)

Seminal capsules more elongate (Fig. 170_4); first tarsomere of p_1 with about 12 sensillae chaeticae ..... *relucens* Hirv. (Fig. 169, 170)

40 Lateral setae of abdominal tergites III and IV about ⅔ as long as median setae (e.g. Fig. 160_6) 41

Lateral setae of abdominal tergites III and IV distinctly shorter, about ⅓ as long as median setae 42

41 First tarsomere of p_3 with 47–74 sensillae chaeticae ..... *laetus* Hirv. (Fig. 160, 162)

First tarsomere of p_3 with 90–141 sensillae chaeticae ..... *pilitarsis* (Zett.) (Fig. 165–167)

Adult females (continued)

42 Abdominal tergite VIII somewhat pale, others very dark (Fig. 177_2); first tarsomere of p_2 and p_3 each with 31–32 sensillae chaeticae ..... *glacialis* Edw. (Fig. 177)

Pigmentation otherwise 43

43 Abdominal tergites I and VII almost entirely pale, others entirely dark (Fig. 178_2); area between vittae light; first tarsomere of p_2 with 50–63 sensillae chaeticae, that of p_3 with 52–70 sensillae chaeticae ..... *suspiciosus* Hirv. (Fig. 178, 179)

Pigmentation otherwise 44

44 Abdominal tergites IV and/or VII with some pigmentation, often in form of a dark transverse stripe, some of remaining tergites with some pale areas (Fig. 172_4); first tarsomere of p_2 with 32–55 sensillae chaeticae, that of p_3 with 34–53 sensillae chaeticae ..... *sylvestris* (Fabr.) (Fig. 171–173)

Abdominal tergites I, IV and VII almost entirely pale, others entirely dark 45

45 Area between vittae pale (e.g. Fig. 181_2); tergite IV entirely pale or pigmented near MD_2 (Fig. 183_2) 46

At least median area between vittae dark (e.g. Fig. 187_4); tergite IV pale or pigmented near anterior edge of tergite 47

46 First tarsomere of p_2 with 79–90 sensillae chaeticae, that of p_3 with 75–89 sensillae chaeticae ..... *trifasciatus* (Meig.) (large form) (Fig. 181, 182)

First tarsomere of p_2 with 31–45 sensillae chaeticae, that of p_3 with 31–45 sensillae chaeticae ..... *trifasciatus* (Meig.) (small form) (Fig. 183)

47 First tarsomere of p_2 with 123–126 sensillae chaeticae, that of p_3 with 124–125 sensillae chaeticae ..... *speciosus* Goetgh. (Fig. 187, 188)

First tarsomere of p_2 with 41–59 sensillae chaeticae, that of p_3 with 40–64 sensillae chaeticae ..... *tricinctus* (Meig.) (Fig. 189)

48 Transverse rows of both basal and marginal setae usually present on tergites III-IV (Fig. 193_2); when basal setae absent, median setae paired; antenna with one preapical seta, pulvillae absent (*reversus*-group) 49

Tergites III-IV without transverse rows of basal setae; median setae in one row 50

49 Preepisternal setae present; seminal capsules rounded and with a distinct neck-part (Fig. 193_{11}) ..... *reversus* Hirv. (Fig. 192, 193)

Preepisternal setae absent; seminal capsules oval, the neck-part less distinct (Fig. 195_{11}) ..... *perniger* (Zett.) (Fig. 192, 195)

50 Scutellar setae numerous, not arranged in a single row (Fig. 196_1); seminal capsules rounded, at least 80 μm long (Fig. 198_6); abdominal tergites unicolorous (Fig. 197_2) or tergites I and IV somewhat pale (Fig. 198_3); antenna with one preapical seta (*intersectus*-group) ..... *intersectus* (Staeg.) (Fig. 196–198)

Scutellar setae usually in a single row (e.g. Fig. 201_3); seminal capsules usually oval; when rounded no more than 60 μm in diameter (without the neck-part); abdominal tergites unicolorous; antenna with or without preapical seta 51

51 Seminal capsules small (50–60 μm) and rounded; spermathecal ducts straight (Fig. 209) (?*obnixus*-group) ..... *obnixus* (Walk.) (Fig. 208, 209)

Seminal capsules oval; spermathecal ducts curved or convoluted (*laricomalis*-group) 52

52 Gonocoxite IX somewhat longer than wide (Fig. 203_1); pulvillae absent ..... *arcuatus* Hirv. (Fig. 201–203)

Gonocoxite IX about as long as wide; small pulvillae present 53

53 Antenna without preapical seta (Fig. 204_{10}); seminal capsules 75–90 μm long (Fig. 204_{11}) ..... *obtusus* Hirv. (Fig. 204)

Antenna with preapical seta (Fig. 205_{12}); seminal capsules 110–114 μm long (Fig. 206) ..... *laricomalis* Edw. (Fig. 201, 205, 206)

Pupae (40 species)

1 Frontal setae on prefrons (anterior to middle of antennal bases—Fig. 79_3) (Subgenus *Cricotopus*, in part) 2

Frontal setae on frontal apotome or absent 15

2 Thoracic horn short, without spinules and distinctly rounded apically (Fig. 113_3) (*tremulus*-group, in part) . . . . . *tremulus* (L.) (Fig. 113, 114)

Thoracic horn with spinules or absent 3

3 D_4-seta of segment VIII displaced laterally, located close to L_4 and appearing as a fifth L-seta (e.g. Fig. 120_2); shagreen always separated into anterior and posterior fields and kidney- or crescent-shaped (*tremulus*-group, in part) 4

D_4-seta of segment VIII located somewhat medial from L-setae (Fig. 93_3, 97_{7-8}) 5

4 L_4 of segment VIII distinctly larger than other L-setae of that segment (Fig. 120_2) . . . . . *curtus* Hirv. (in part) (Fig. 120)

L_4 of segment VIII no larger than the other L-setae of that segment . . . . . *triannulatus* (Macq.) (in part) (Fig. 126)

5 L_4 of segment VIII equal to or longer than other L-setae of that segment (Fig. 87_8, 93_3); shagreen on abdominal tergites usually more or less separated into anterior and posterior fields; if widely separated, anterior field usually rectangular and never crescent-shaped (e.g. Fig. 87_6) 6

L_4 of segment VIII equal to or smaller than the other L-setae of that segment; shagreen usually widely separated into anterior and posterior fields, these usually crescent-shaped (e.g. Fig. 140_7); if fields united, a relatively large spinule-free area occurs near posteromedian muscle marks (MD_2) (Fig. 137_{11}) 9

6 Shagreen continuous, not interrupted (Fig. 75_{4-5}); pedes spurii B not strongly developed . . . . . *pilosellus*-group (Fig. 74, 75) (The pupae of two species in this group are known, *C. pilosellus* and *C. pilidorsum*, but no characters are known for distinguishing them from one another.)

Shagreen usually distinctly separated into anterior and posterior fields; if shagreen uninterrupted, dorsal region of thorax with faintly spined wrinkles (Fig. 82) (*tibialis*-group) . . . 7

7 Dorsal region of thorax with faintly spined wrinkles (Fig. 82); accessory tubercle of antennal sheath (near pedicel) nearly as long as wide (similar to Fig. 130_3) . . . . . *ephippium* (Zett.) (Fig. 79, 81, 82)

Dorsal region of thorax smooth; accessory tubercle of antennal sheath barely discernible . 8

8 Dc_2 near Dc_1 (Fig. 93_1); anterior field of shagreen scarcely extends anterolaterally from anteromedian muscle marks (MD_1) (Fig. 93_4) . . . . . *polaris* Kieff. (Fig. 93)

Dc_2 near Dc_3 and Dc_4 (Fig. 87_9); anterior field of shagreen usually extends anterolaterally from MD_1 (Fig. 87_6) . . . . . *tibialis* (Meig.) (Fig. 87, 90)

9 Pedes spurii B well developed on abdominal segments II and III; shagreen always separated into anterior and posterior fields (*cylindraceus*-group) 10

Pedes spurii B usually only well developed on segment II; if also on segment III, shagreen not separated into anterior and posterior fields (Fig. 137_{11}) 12

10 Exuviae entirely pale; no accessory tubercle on antennal sheath; abdominal segment VII with 3–4 L-setae . . . . . *coronatus* Hirv. (Fig. 135)

Exuviae either moderately pigmented or a few abdominal segments very dark; abdominal segment VII with 3 L-setae 11

11 All abdominal segments moderately dark; accessory tubercle of antennal sheaths well developed (Fig. 130_3) . . . . . *cylindraceus* (Kieff.) (Fig. 130)

Tergites II–V very dark (Fig. 133_7); accessory tubercle on antennal sheaths barely discernible . . . . . *patens* Hirv. (Fig. 133)

12 Thoracic horn absent and anterior fields of shagreen crescent-shaped and not extending to anterolateral edges of tergites (Fig. 154_7) (*caducus*-group) . . . . . *caducus* Hirv. (Fig. 154)

Thoracic horn usually present; if absent, anterior fields of shagreen extend over MD_1 to edges of tergites (Fig. 138_{11}) (*festivellus*-group) 13

Pupae (continued)

13 Thoracic horn absent ..... *flavocinctus* (Kieff.) (Fig. 138)

Thoracic horn present 14

14 Shagreen distinctly separated into anterior and posterior fields ..... *albiforceps* (Kieff.) (Fig. 140)

Shagreen not distinctly separated into anterior and posterior fields, spinule-free area usually present near MD_2 (Fig. 137_{11}) ..... *festivellus* (Kieff.) (Fig. 136, 137)

15 Most mesal of 3 anal macrosetae (on each side) distinctly shorter than other 2 setae (Fig. 148_4); tergites VII–VIII with strong shagreen (Subgenus *Cricotopus*, in part—*trifascia*-group) ..... *trifascia* Edw. (Fig. 147, 148)

Anal macrosetae all about equally long; no strong shagreen on tergites VII–VIII (except *C. brevipalpis*—Fig. 214) 16

16 Frontal setae, pedes spurii B and thoracic horns absent (Subgenus *Cricotopus*, in part—*magus*-group) ..... *magus* Hirv. (Fig. 106)

One or more of the above structures present 17

17 D_4-seta of segment VIII displaced laterally, inserted close to L_4 and appearing as a fifth L-seta (e.g. Fig. 120_2); anterior fields of shagreen always separate from posterior fields and kidney- or cresent-shaped (Subgenus *Cricotopus*, in part—*tremulus*-group, in part) 18

D_4-seta of segment VIII located somewhat medial from L-setae (Fig. 93_3, 97_{7-8}) 21

18 Frontal setae absent 19

Frontal setae present 20

19 Pedes spurii B present on abdominal segments II and III (Fig. 117_{12}) ..... *tristis* Hirv. (Fig. 117)

Pedes spurii B present only on segment II (Fig. 122_{12}) ..... *annulator* Goetgh. (Fig. 122)

20 L_4 of segment VIII distinctly larger than other L-setae of that segment (Fig. 120_2) ..... *curtus* Hirv. (in part) (Fig. 120)

L_4 of segment VIII no larger than other L-setae ... *triannulatus* (Macq.) (in part) (Fig. 126)

21 Anterior and posterior fields of shagreen widely separated from one another (Subgenus *Cricotopus*, in part) 22

Shagreen of abdominal tergites usually not divided into anterior and posterior fields; when divided, anterior field extends anterolaterally over MD_1 to anterior corner of tergite (Fig. 195_7, 199_2) (Subgenus *Isocladius*) 26

22 Pedes spurii B present on abdominal segments II and III; thoracic horn present; L_4 of segment VIII not larger than the other L-setae of that segment (*bicinctus*-group) 23

Pedes spurii B present on segement II but not on segment III; L_4-seta of segment VIII somewhat larger than other L-setae (*fuscus*-group) 24

23 Thoracic horn 15–20 μm wide (Fig. 142_{11}) ..... *bicinctus* (Meig.) (Fig. 142)

Thoracic horn 45–50 μm wide (Fig. 144_{10}) ..... *vierriensis* Goetgh. (Fig. 144)

24 Three L-setae on each side of abdominal segment VIII; shagreen on tergite V not separated into anterior and posterior fields (Fig. 97_1) ..... *pirifer* Hirv. (Fig. 97)

Four L-setae on each side of segment VIII: shagreen separated into anterior and posterior fields on segment V (Fig. 97_{2-3}) 25

25 Thoracic horn present (Fig. 97_5) ..... *fuscus* (Kieff.) (Fig. 97)

Thoracic horn absent ..... *algarum* (Kieff.) (Fig. 97)

26 Tergites VII and VIII with strong shagreen (Fig. 214_4) or row of hooklets on conjunctive II/III interrupted medially (*brevipalpis*-group) ..... *brevipalpis* Kieff. (Fig. 213, 214)

Tergites VII and VIII with at most weak shagreen; transverse row of hooklets on conjunctive II/III uninterrupted 27

27 Shagreen on tergites II-V more or less uniformly distributed (Fig. 175_{1-2}); D_3-seta located somewhat medial of line between D_2 and D_4 (Fig. 174) (*sylvestris*-group) 28

Shagreen on tergites III-V reduced laterally and sometimes separated into anterior and posterior fields (e.g. Fig. 195_7); D_3-seta inserted close to the line between D_2 and D_4 35

Pupae (continued)

28 Thoracic horn dark, 20–55 μm wide, 340–360 μm long and covered with very small spinules (Fig. 158_4) ..... *ornatus* (Meig.) (Fig. 157, 158)

Thoracic horn usually smaller and lacking spinules, at most weakly darkened 29

29 Frontal setae 3–5 μm thick 30

Frontal setae 2–3 μm thick 31

30 Pedes spurii B present on abdominal segment II; thoracic horn 220–330 μm long, colorless or uniformly lightly pigmented; at most 3 L-setae on segment VII ..... *sylvestris* (Fabr.) (Fig. 172, 174, 175)

Pedes spurii B absent; thoracic horn 100–230 μm long, often somewhat swollen basally and occasionally somewhat pigmented and wrinkled (Fig. 184_2); 4 L-setae often present on segment VII ..... *trifasciatus* (Meig.) (small form) (Fig. 184, 185)

31 Pedes spurii B present on segment II (Fig. 163); thoracic horn 250–380 μm long (Fig. 160_3) ..... *laetus* Hirv. (Fig. 160, 163)

Pedes spurii B absent; thoracic horn usually shorter 32

32 Length of exuviae 4.0–5.0 mm; frontal setae 2–3 μm thick; 3 L-setae on abdominal segment VII ..... *tricinctus* (Meig.) (Fig. 185, 190)

Length of exuviae 5.0–6.5 mm 33

33 150–200 hooklets on conjunctive II/III ..... *relucens* Hirv. (Fig. 169, 170)

100–140 hooklets on conjunctive II/III 34

34 Frontal setae about 2.0 μm thick ..... *pilitarsis* (Zett.) (Fig. 167)

Frontal setae 2.5–3.0 μm thick ..... *suspiciosus* Hirv. (Fig. 179)

35 Thoracic horn lacking spinules and blunt or rounded apically 36

Thoracic horn with spinules; if these are weak, the horn is pointed apically 39

36 Pedes spurii B absent; thoracic horn quill-shaped (Fig. 208_5) (?*obnixus*-group) ..... *obnixus* (Walk.) (Fig. 208)

Pedes spurii B present on abdominal segment II (*laricomalis*-group) 37

37 Thoracic horn rounded apically and often strongly constricted basally (Fig. 205_5) ..... *laricomalis* Edw. (Fig. 205)

Thoracic horn blunt apically and trimmed with minute hair-like spinules (Fig. 202_5, 204_5) 38

38 Suture margin very weakly granulated and wrinkled ..... *arcuatus* Hirv. (Fig. 202)

Suture margin smooth (distinction from previous species questionable; additional material may yield some differences in size of thoracic horn) ..... *obtusus* Hirv. (Fig. 204)

39 Pedes spurii B present on segment II and sometimes granulated; also present but very weak on segment III; thoracic region wide and strongly granulated dorsally (Fig. 199) (*intersectus*-group) ..... *intersectus* (Staeg.) (Fig. 199)

Pedes spurii B present only on segement II; thoracic region narrow dorsally and relatively weakly granulated (*reversus*-group) 40

40 Thoracic horn with distinct spinules and more than 150 μm long (Fig. 193_5) ..... *reversus* Hirv. (Fig. 193)

Spinules on thoracic horn barely distinguishable, horn much shorter (Fig. 195_5) ..... *perniger* (Zett.) (Fig. 195)

Larvae (26 spp.)

1 Pecten epipharyngis composed of three nearly equal-sized scales (e.g. Fig. 88_3) (Subgenus *Cricotopus*) 2

Pecten epipharyngis a single conical scale, often with a notch on each side (the lateral scales are reduced and fused with the median scale) (e.g. Fig. 176_3) (Subgenus *Isocladius*) . . . 16

2 Median tooth of mentum at most 2½ times as wide as a first lateral tooth, often much narrower; premandibles simple or bifid 3

Median tooth of mentum 3 or more times as wide as a first lateral tooth; premandibles simple 10

3 Premandibles simple (*tremulus*-group) 4

Premandibles bifid 7

4 Premandibular brush present, although small (Fig. 115_5); abdominal setae simple, thick and long . . . . . *tremulus* (L.) (Fig. 115)

Premandibular brush absent; several abdominal segments with setal tufts 5

5 Antennal ratio 1.3–1.5 . . . . . *annulator* Goetgh. (Fig. 123)

Antennal ratio 1.5–1.8 6

6 Outer mandibular margin nearly smooth (Fig. 121_4) . . . . . *curtus* Hirv. (Fig. 121)

Outer mandibular margin crenulate (Fig. 127_5) . . . . . *triannulatus* (Macq.) (Fig. 127)

7 Premandibular brush present, composed of small spiny appendages (Fig. 88_3); setal tufts present on abdominal segments I–VIII (*tibialis*-group) . . . . . *tibialis* (Meig.) (Fig. 88)

Premandibular brush absent; abdominal segments I–VI with setal tufts or occasionally strong simple setae (*fuscus*-group) 8

8 Median tooth of mentum 1.2–1.4 times as wide as a first lateral tooth (Fig. 99_5) . . . . . *fuscus* (Kieff.) (Fig. 99)

Median tooth of mentum 1.5–1.7 times as wide as a first lateral tooth 9

9 Setal tufts each with 5–12 setae (rarely 2) . . . . . *algarum* (Kieff.) (Fig. 103)

L_4 usually a 2–4 branched seta (rarely a small setal tuft) (Fig. 105_{11}) . . . . . *pirifer* Hirv. (Fig. 105)

10 First and second lateral teeth of mentum small and partially fused with median tooth (Fig. 149_1) (*trifascia*-group) . . . . . *trifascia* Edw. (Fig. 149, 150)

First and second lateral teeth of mentum not partially fused with median tooth 11

11 Inner margin of mandible serrated (Fig. 143_5) (*bicinctus*-group, in part) . . . . . *bicinctus* (Meig.) (Fig. 143)

Inner margin of mandible smooth 12

12 Galea with only a few distally pinnate lamellae (Fig. 145_{11}) (*bicinctus*-group, in part) . . . . . *vierriensis* Goetgh. (Fig. 145)

Galea with many distally pinnate lamellae (e.g. FIg. 139_{12}) 13

13 Lateral teeth of mentum all about equally large 14

Second lateral teeth of mentum distinctly smaller than third lateral teeth (Fig. 134_{4-5}) . . . 15

14 Antennal ratio 2.4 (*cylindraceus*-group, in part) . . . . . *cylindraceus* (Kieff.) (Fig. 131)

Antennal ratio about 1.5 (*festivellus*-group, in part) . . . . . *albiforceps* (Kieff.) (Fig. 141)

15 Galea with at most two rows of distally pinnate lamellae (Fig. 134_{13}) (*cylindraceus*-group, in part) . . . . . *patens* Hirv. (Fig. 134)

Galea with three rows of distally pinnate lamellae (Fig. 139_{12}) (*festivellus*-group, in part) . . . . . *flavocinctus* (Kieff.) (Fig. 139)

16 Premandibles bifid (*sylvestris*-group) 17

Premandibles simple 22

17 Abdominal segments I–VII with setal tufts 18

Abdominal segments I–VI with setal tufts, segment VII with at most a double seta 19

Larvae (continued)

18 Both sense pits of basal antennal segment near ring organ (Fig. 159_2) ..... *ornatus* (Meig.) (Fig. 159)

One sense pit near ring organ, other near middle of basal antennal segment (Fig. 164_2) ..... *laetus* Hirv. (Fig. 164)

19 Apical tooth of small claws of anterior parapods not strikingly larger than subapical teeth (Fig. 176_{11}) ..... *sylvestris* (Fabr.) (Fig. 176)

Apical tooth of these claws much larger than subapical teeth (Fig. 191_{11}) 20

20 Antennal ratio of mature larvae 1.4–1.7 ..... *tricinctus* (Meig.) (Fig. 191)

Antennal ratio of mature larvae 1.7–2.0 21

21 Antenna about 6 times as long as wide (Fig. 180_3) ..... *suspiciosus* Hirv. (Fig. 180)

Antenna 5.0–5.5 times a long as wide (Fig. 186_2) ..... *trifasciatus* (Meig.) (Small form) (Fig. 186)

22 SI simple (Fig. 210_4) 23

SI bifid (e.g. Fig. 207_3) 24

23 Antenna more than twice as long as wide; seta interna of mandible present (Fig. 210) ..... *elegans* Joh. (Fig. 210)*

Antenna no longer than wide (Fig. 215_8); seta interna of mandible absent (Fig. 215_6) (*brevipalpis*-group) ..... *brevipalpis* Kieff. (Fig. 215)

24 Setal tufts of abdomen each composed of about 10 setae, the longest seta about twice as long as corresponding abdominal segment (?*laricomalis*-group) ..... *laricomalis* Edw. (Fig. 207)

Setal tufts each about as long as corresponding abdominal segment 25

25 Setal tufts on abdominal segments I–VII each composed of 20–50 setae (Fig. 194_7) (?*reversus*-group) ..... *reversus* Hirv. (Fig. 194)

Setal tufts on segments I–VI each composed of 20–30 setae (Fig. 200_7); tuft on segment VII either absent or composed of fewer than 10 setae (*intersectus*-group) ..... *intersectus* (Staeg.) (Fig. 200)

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* This species belongs to the *obnixus*-group and probably is synonymous with *C. obnixus* (Walk.).

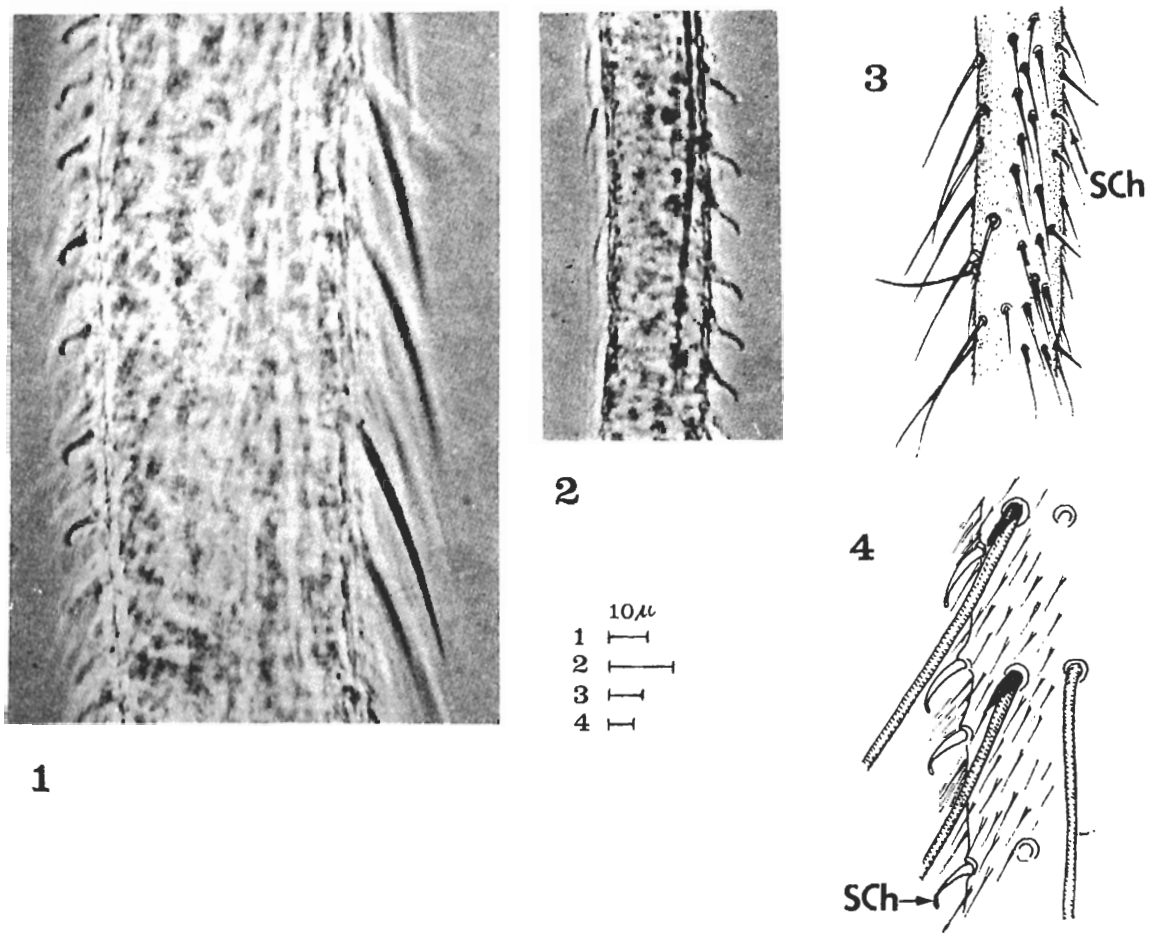


Figure 5. *Paracladius conversus* (Walk.) ♂ basitarsis of p_3 in phase contrast, sensillae chaeticae on left (1); *Cricotopus caducus* Hirv. ♀, basitarsis of p_1 in phase contrast, sensillae chaeticae on right (2); *Cricotopus sylvestris* (Fabr.) ♂, basitarsis of p_3 (3); same of *P. conversus* (4). SCh sensilla chaetica.

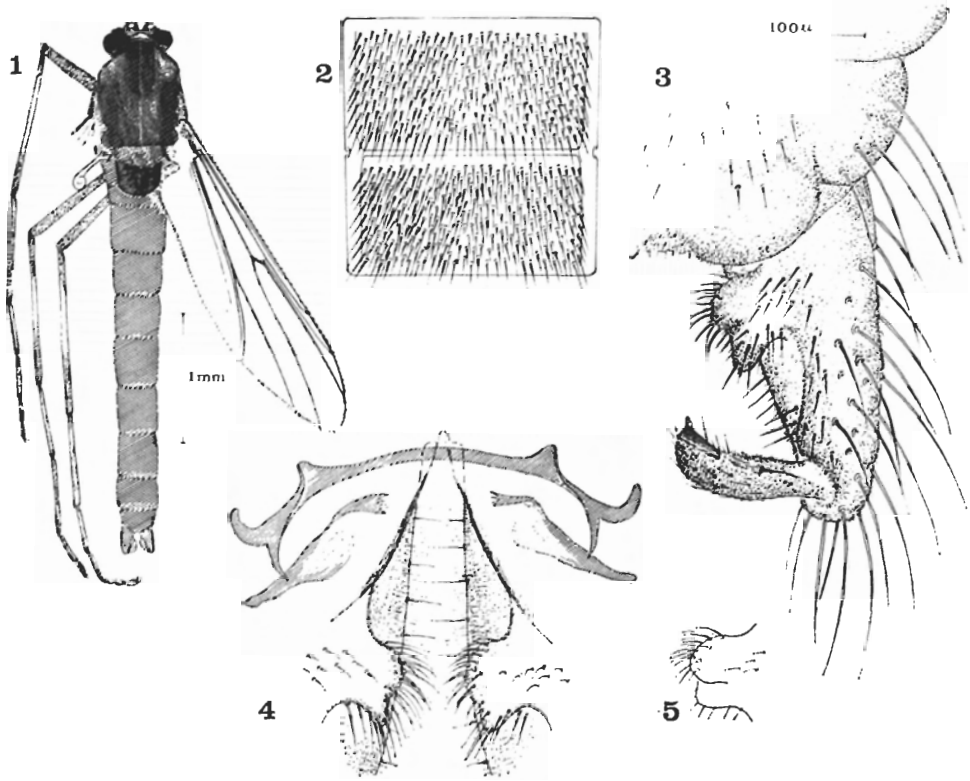


Figure 72. *Cricotopus* (*C.*) *villosus* Hirv., adult. ♂ (1); chaetotaxy scheme for abdominal tergites III and IV of ♂ (2); hypopygium of ♂ (3); aedeagal lobe and phallapodeme of hypopygium (4); inferior volsella with example from Spitzbergen (5). Scale of drawings 3=4–5.

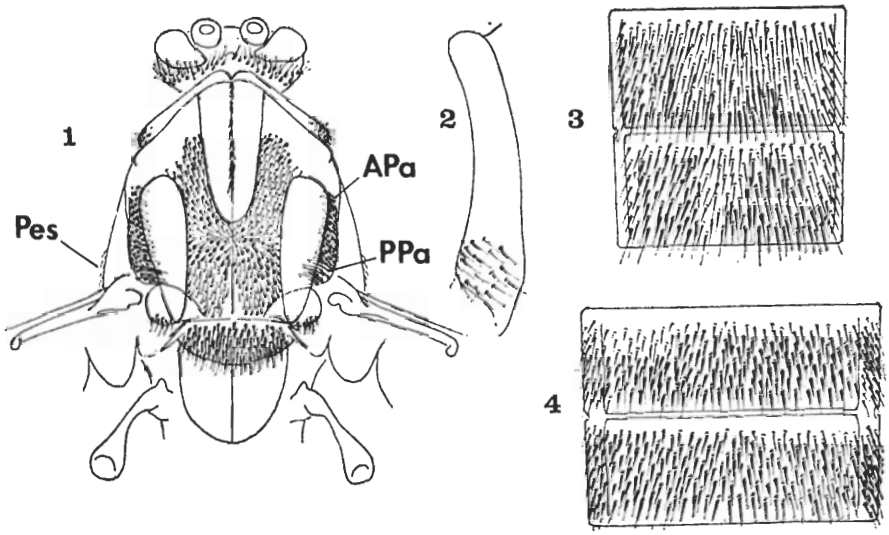


Figure 73. *Cricotopus* (*C.*) *pilosellus* Brund., adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum, lateral (2); chaetotaxy scheme for abdominal tergites III and IV of ♂ (3); same (and Pts) of ♀ (4).—APa anterior prealars, Pes preepisternal setae, PPa posterior prealars.

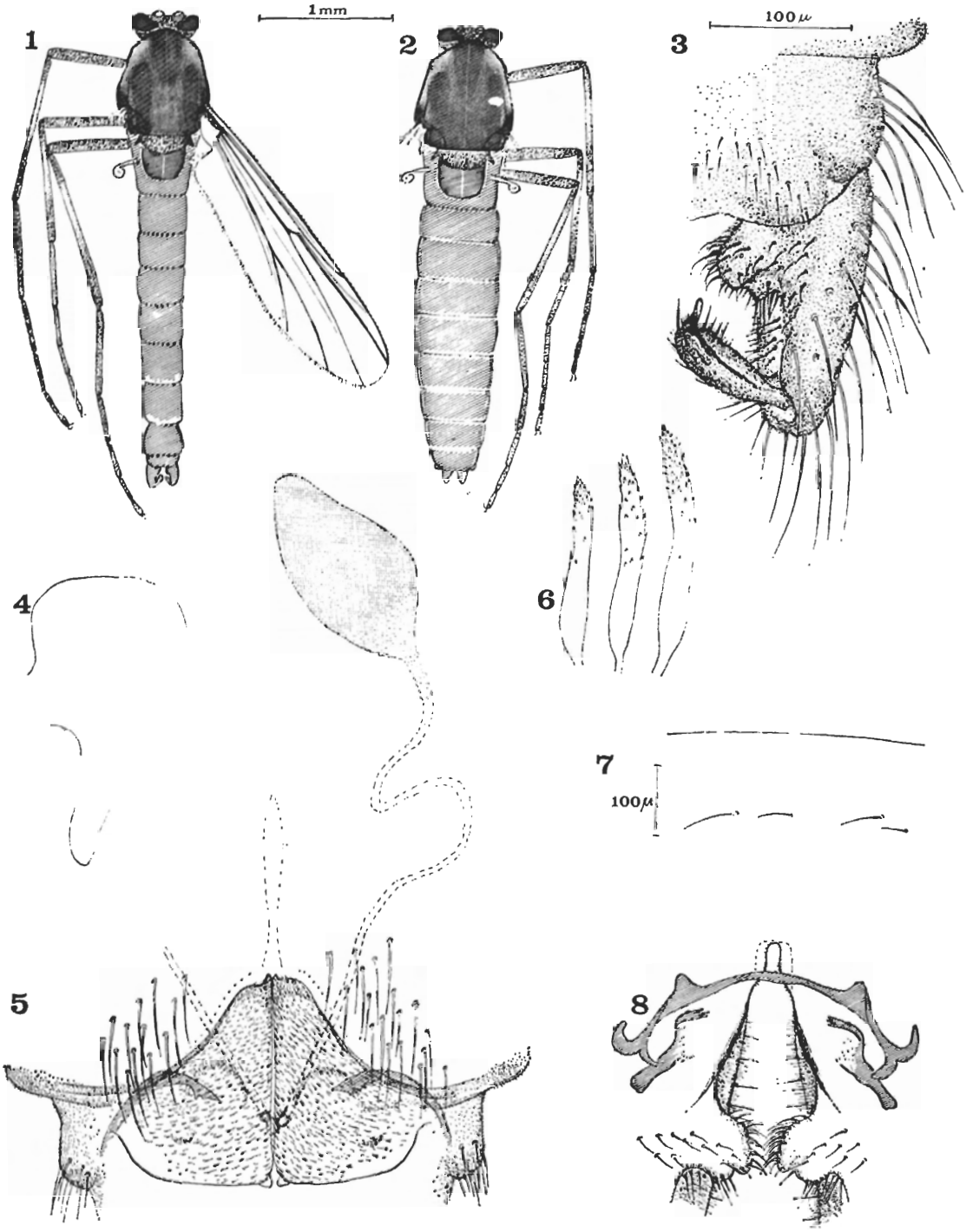


Figure 74. *Cricotopus* (*C.*) *pilosellus* Brund., adult, pupa. ♂ (1); ♀ (2); hypopygium of ♂ (3); cercus (4); spermatheca and outer genitalia of ♀ (5); thoracic horn of pupa (6); arrangement and size relationship of Dc setae of pupa (7); aedeagal lobe and phallapodeme of hypopygium of ♂ (8). Scale of drawings 1=2; 3=4–6, 8.

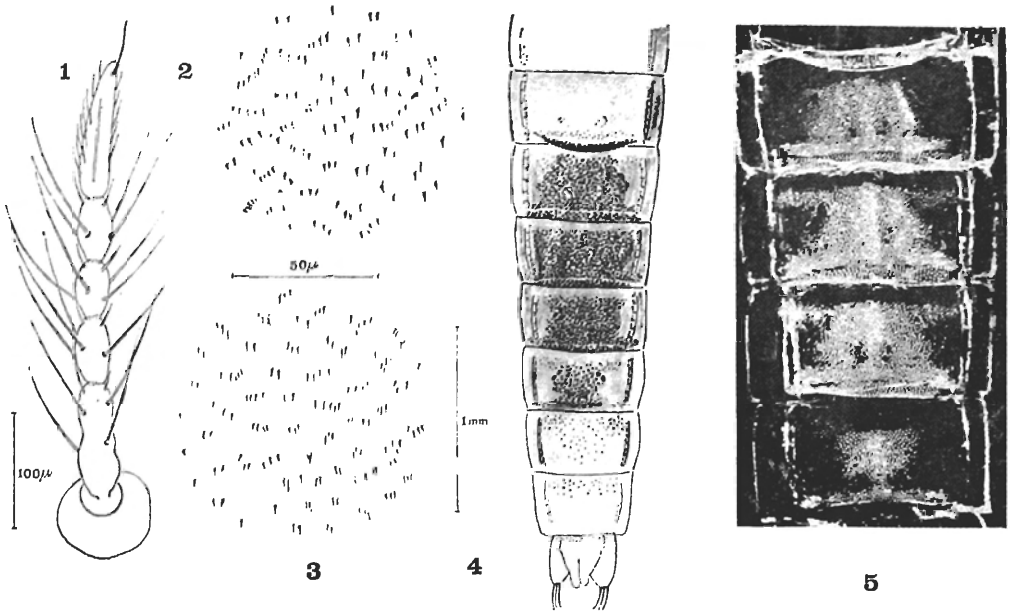


Figure 75. *Cricotopus* (*C.*) *pilosellus* Brund., adult, pupa. Antenna of ♀ (1); spinules of anterior edge of abdominal sternite III (2); shagreen and pigmentation of abdominal segments of pupa (4); shagreen of segments III-VI, dark field photography (5). *Cricotopus* (*C.*) *pilidorsum* Hirv. spinules of anterior edge of abdominal sternite III (3).

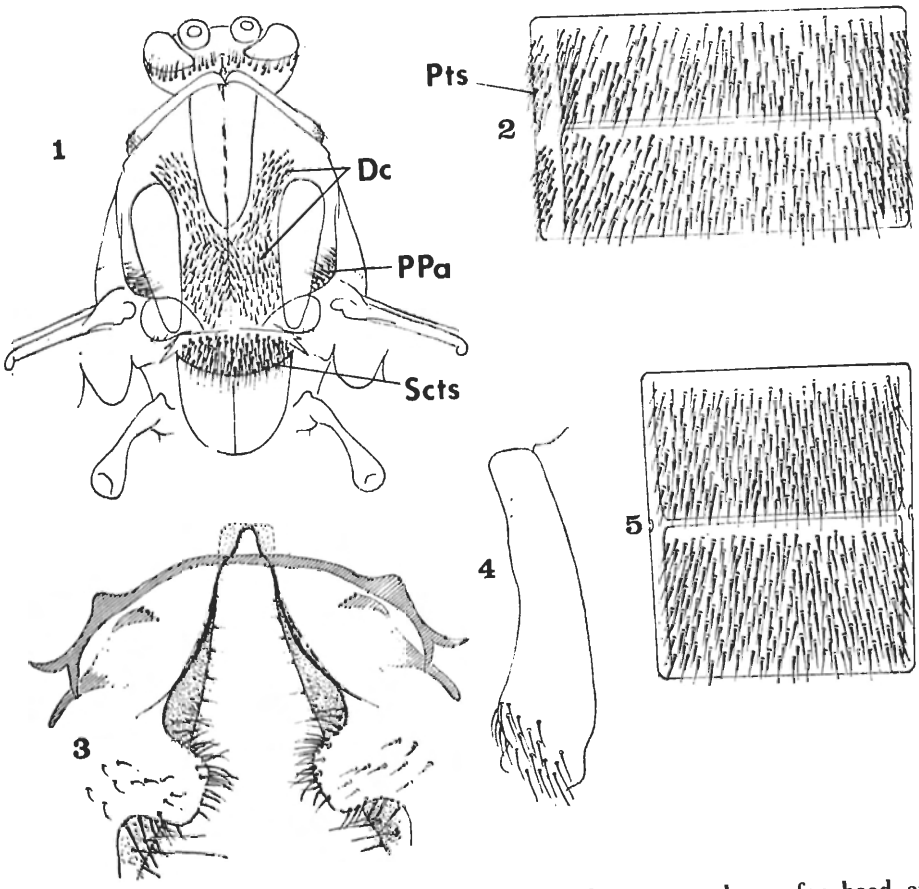


Figure 76. *Cricotopus* (*C.*) *cumulatus* Hirv., adult. Chaetotaxy scheme for head and thorax, dorsal of ♀ (1); same for abdominal tergites III and IV (as well as Pts) of ♀ (2); aedeagal lobe and phallapodeme of hypopygium of ♂ (3); antepronotum, lateral (4); chaetotaxy scheme for abdominal tergites III and IV of ♂ (5). — Dc dorsocentrals, PPa posterior prealars, Pts paratergital setae, Scts scutellar setae.

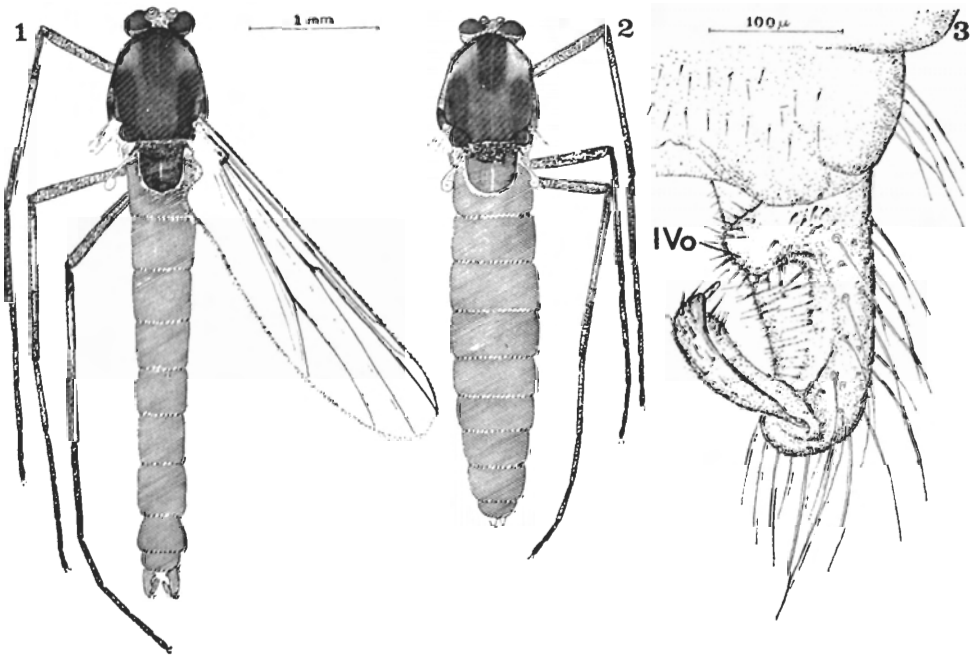


Figure 77. *Cricotopus* (*C.*) *cumulatus* Hirv., adult. ♂ (1); ♀ (2); hypopygium of ♂ (3).— IVo inferior volsella.

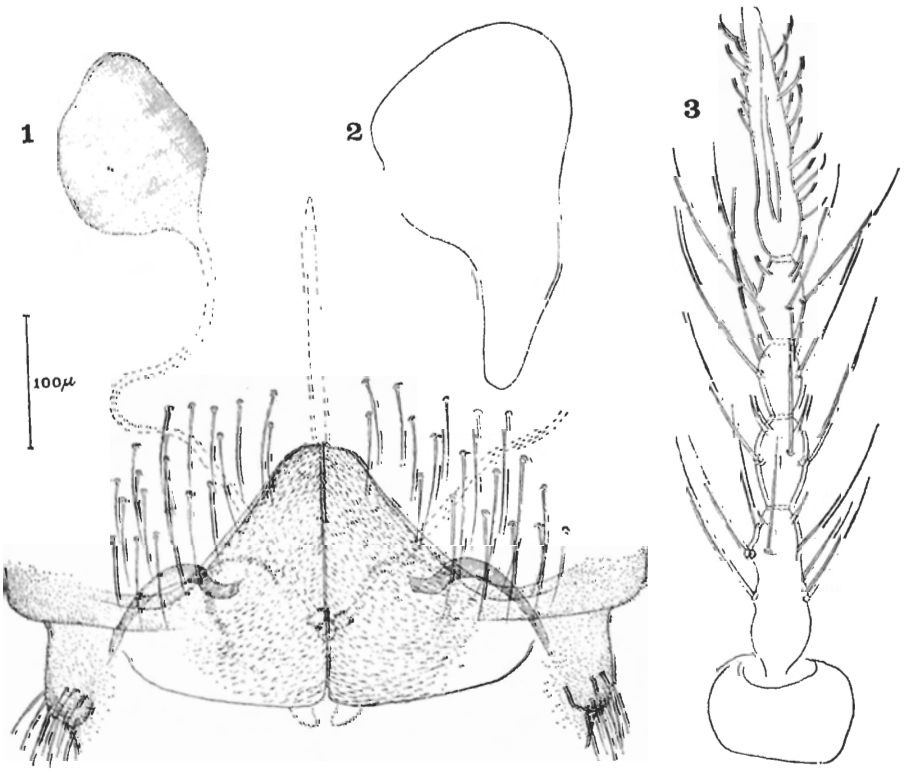


Figure 78. *Cricotopus* (*C.*) *cumulatus* Hirv., adult ♀. Spermatheca and outer genitalia (1); cercus (2); antenna (3).

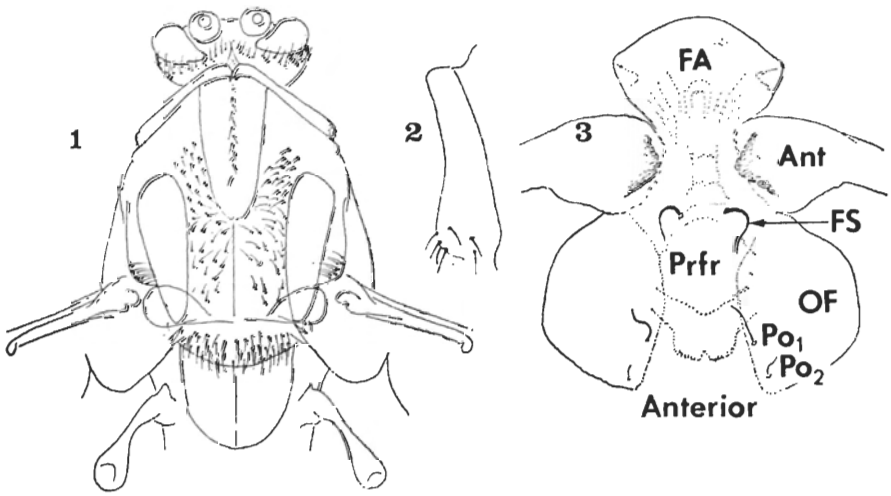


Figure 79. *Cricotopus* (*C.*) *ephippium* (Zett.). Chaetotaxy scheme for head and thorax of adult, dorsal (1); antepronotum, lateral (2); head region of pupal exuvium (3).—Ant proximal part of antennal sheath (hump in region of pedicel punctuate), FS frontal setae, FA frontal apotome, OF ocular field, Po_{1-2} postorbitals, Prfr prefrons.

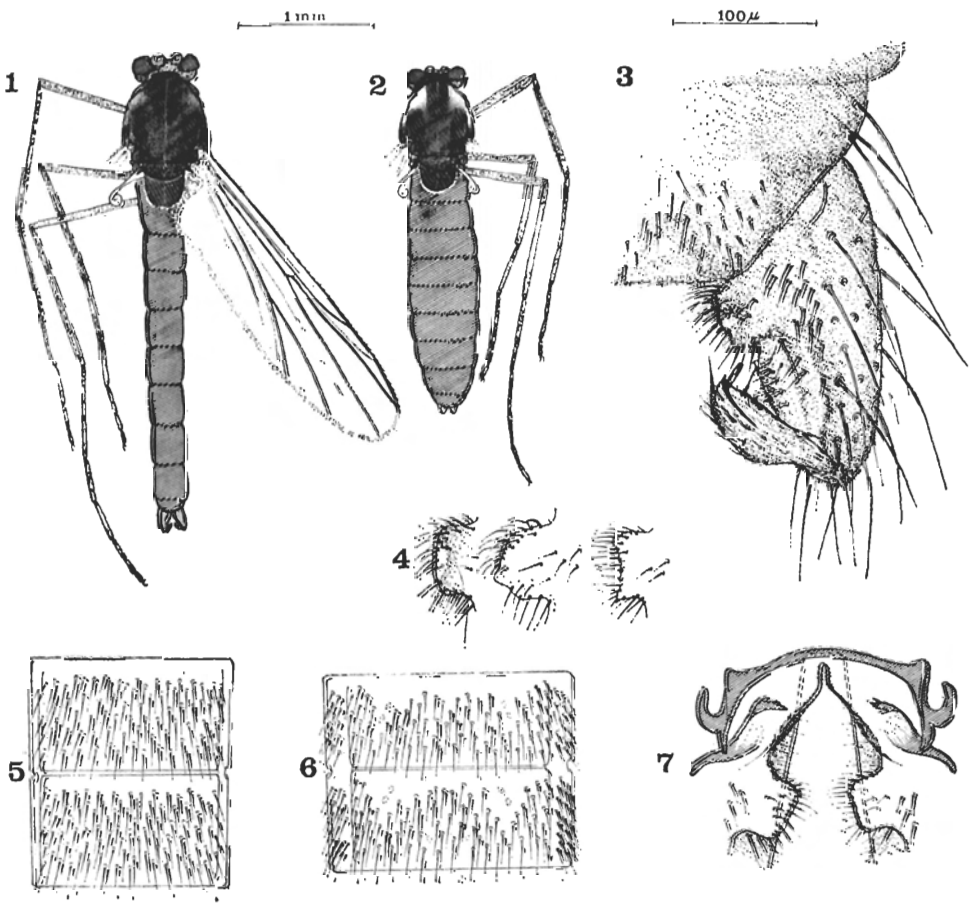


Figure 80. *Cricotopus* (*C.*) *ephippium* (Zett.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); variation of inferior volsella (4); chaetotaxy scheme for abdominal tergites III and IV of ♂ (5); same of ♀ (with Pts) (6); aedeagal lobe and phallapodeme of hypopygium (7).

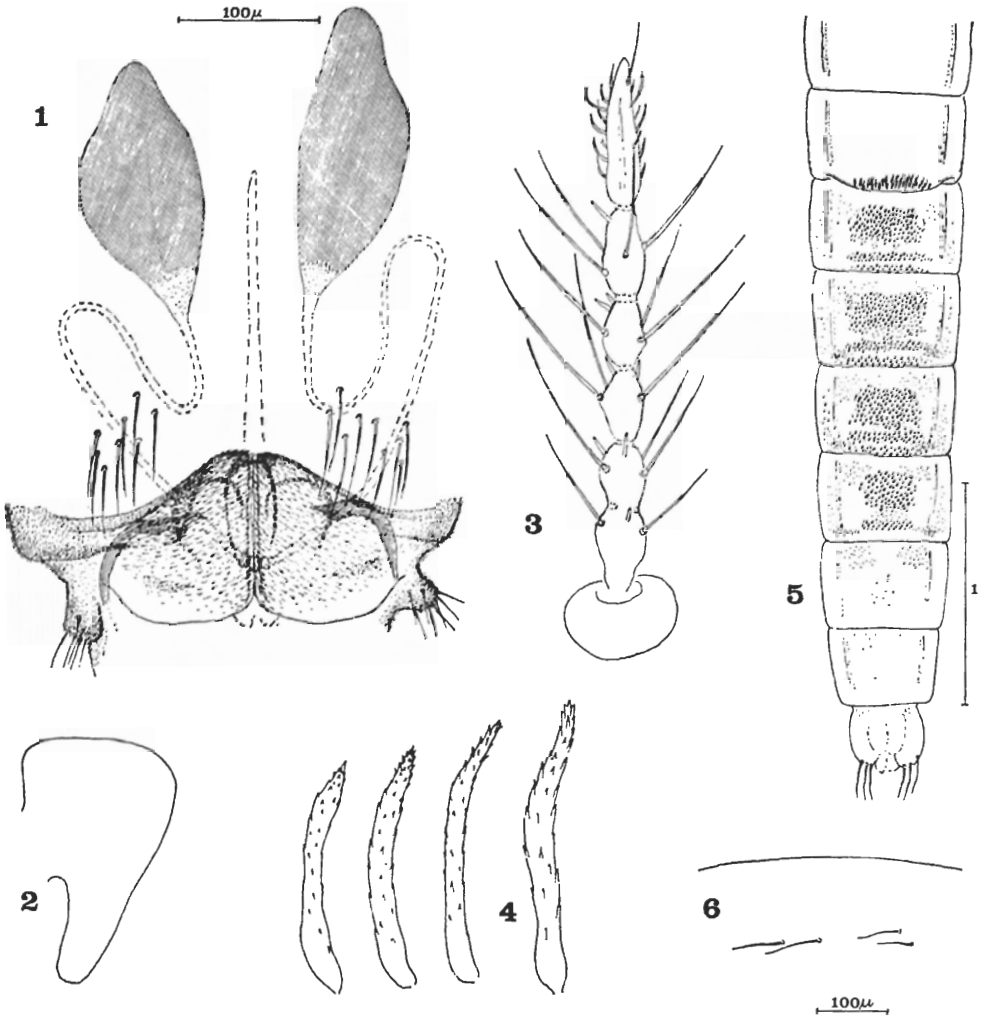


Figure 81. *Cricotopus* (*C.*) *ephippium* (Zett.), adult, pupa. Spermathecae and outer genitalia (1); cereus (2); antenna of ♀ (3); thoracic horn (4); shagreen of abdominal segments of pupa (5); size relationship and arrangement of Dc setae of pupal exuvium (6). Scale of drawings 1=2–4.

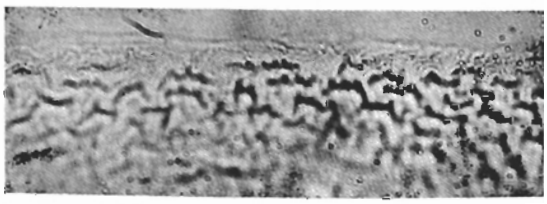


Figure 82. *Cricotopus* (*C.*) *ephippium* (Zett.), pupa. Margin of pronotal suture.

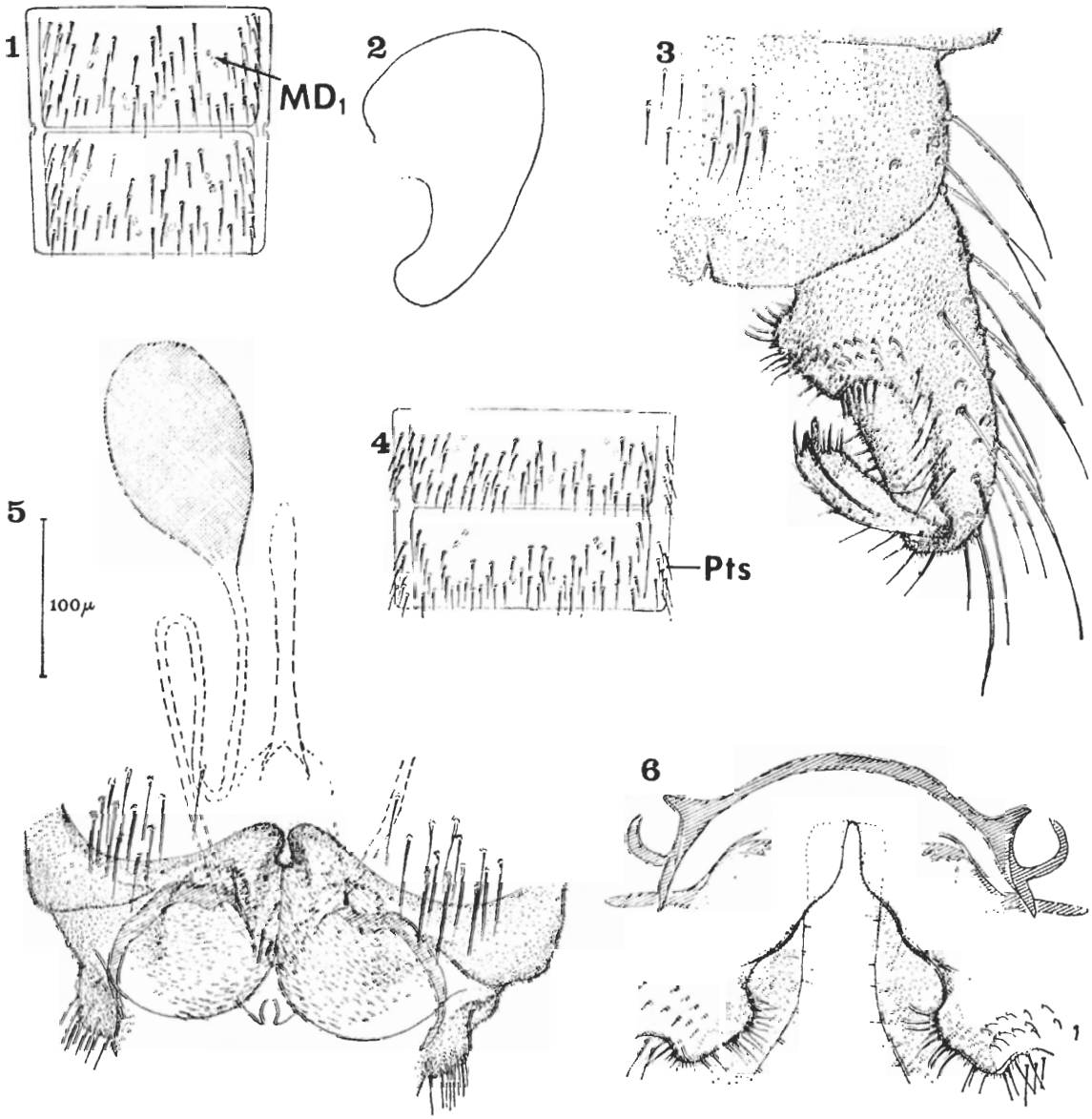


Figure 83. *Cricotopus* (*C.*) *gelidus* (Kieff.), adult. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); cercus of ♀ (2); hypopygium of ♂ (3); chaetotaxy scheme for abdominal tergites III and IV (with Pts) of ♀ (4); spermatheca and outer genitalia of ♀ (5); aedeagal lobe and phallapodeme of hypopygium (6). Scale of drawings 2=3, 5, 6.—MD_1 anterolateral muscle marks, Pts paratergital setae.

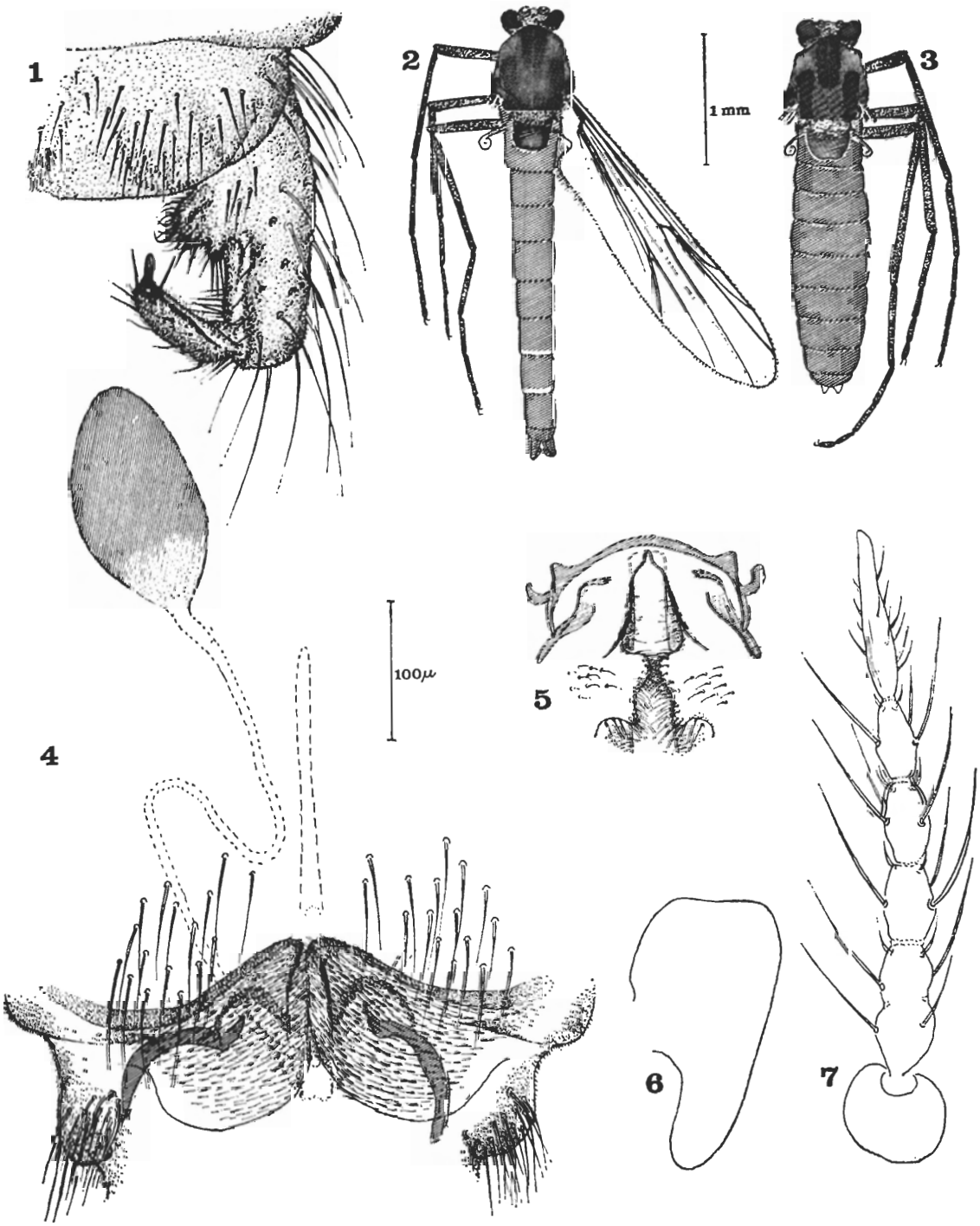


Figure 84. *Cricotopus* (*C.*) *lestralis* (Edw.), adult. Hypopygium of ♂ (1); ♂ (2); ♀ (3); spermatheca and outer genitalia of ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); cercus of ♀ (6); antenna of ♀ (7). Scale of drawings 1=4–7; 2=3.

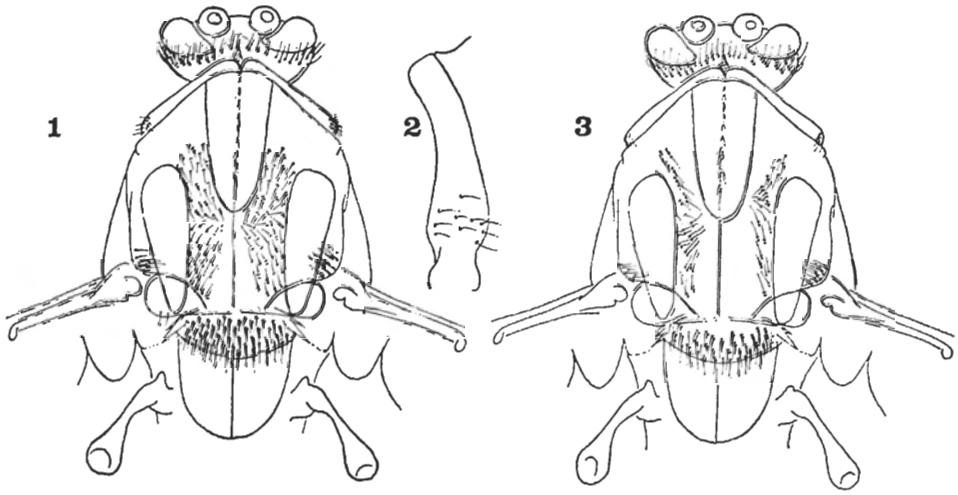


Figure 85. Chaetotaxy scheme for head and thorax, dorsal (1) and antepronotum, lateral (2) of *Cricotopus* (*C.*) *tibialis* (Meig.); chaetotaxy scheme for head and thorax of a population from Canada, "*C.* cfr. *tibialis*" (Meig.), see p. 161 (3).

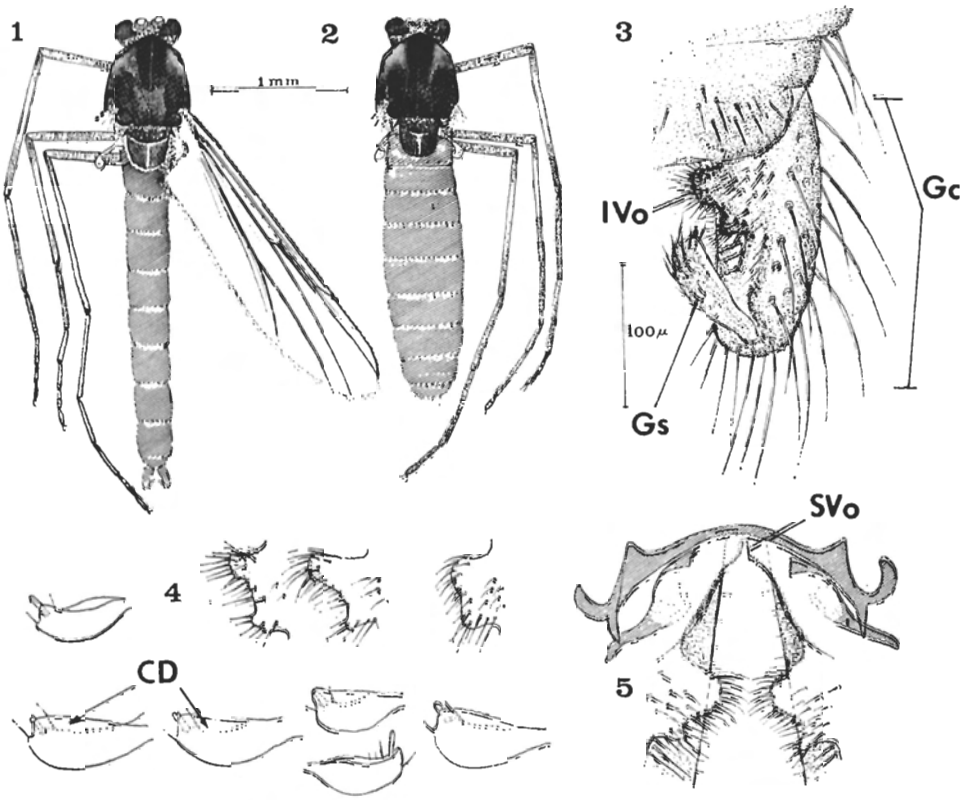


Figure 86. *Cricotopus* (*C.*) *tibialis* (Meig.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); variation in inferior volsella and gonostylus (partly produced by preparation) (4); aedeagal lobe and phallapodeme of hypopygium (5).—CD crista dorsalis, Gc gonocoxite, Gs gonostylus, IVo inferior volsella, SVo superior volsella.

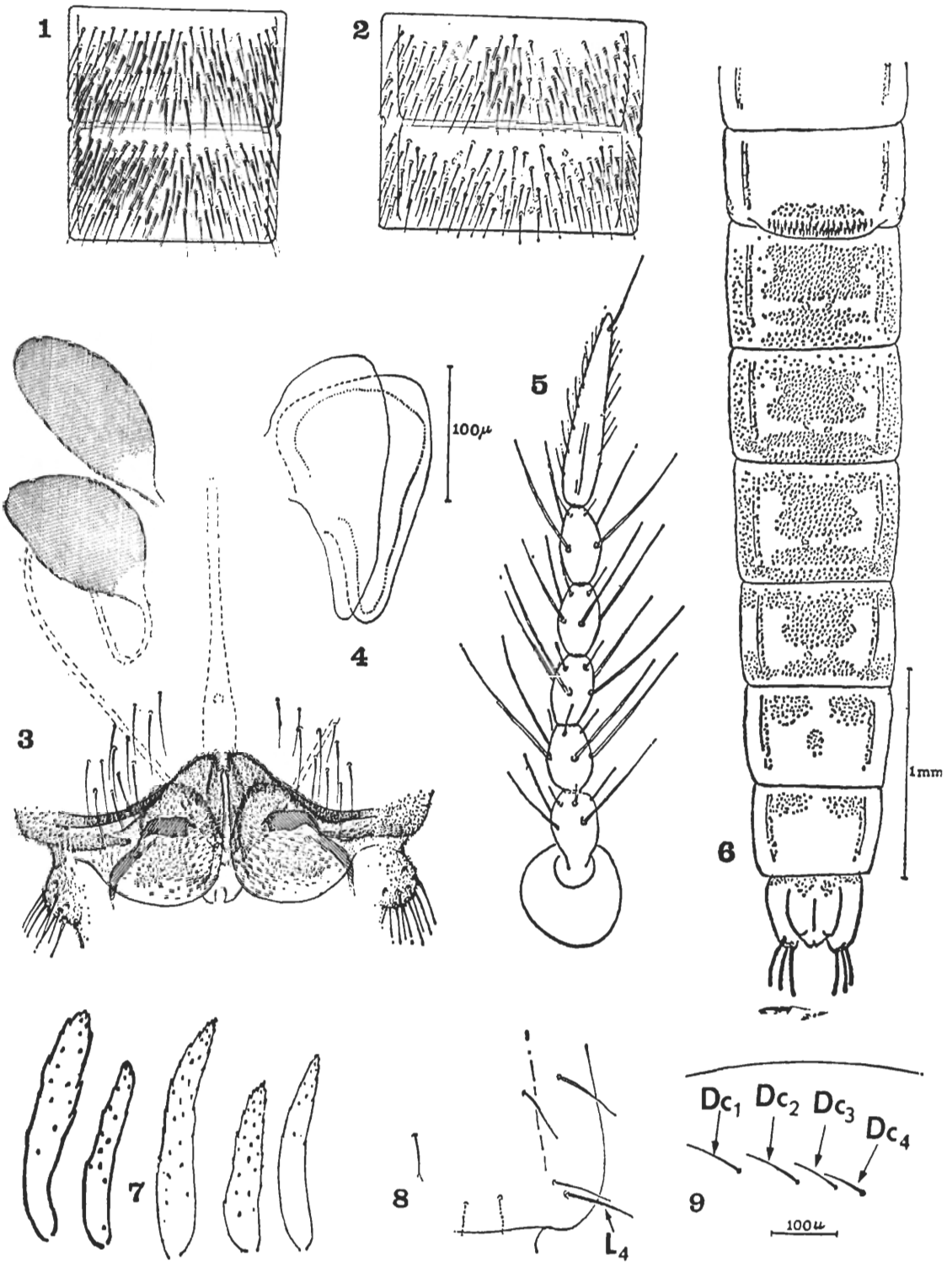


Figure 87. *Cricotopus* (*C.*) *tibialis* (Meig.), adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same (with Pts) of ♀ (2); spermathecae and outer genitalia (3); variation in cerci (4); antenna of ♀ (5); shagreen of abdominal tergites (6); variation in thoracic horn (left from Spitzbergen, right from Germany) (7); anal angle of abdominal segment VIII of pupa (8); size relationship and arrangement of Dc setae of pupa. (9). Scale of drawings 3=4–7; 8=9.

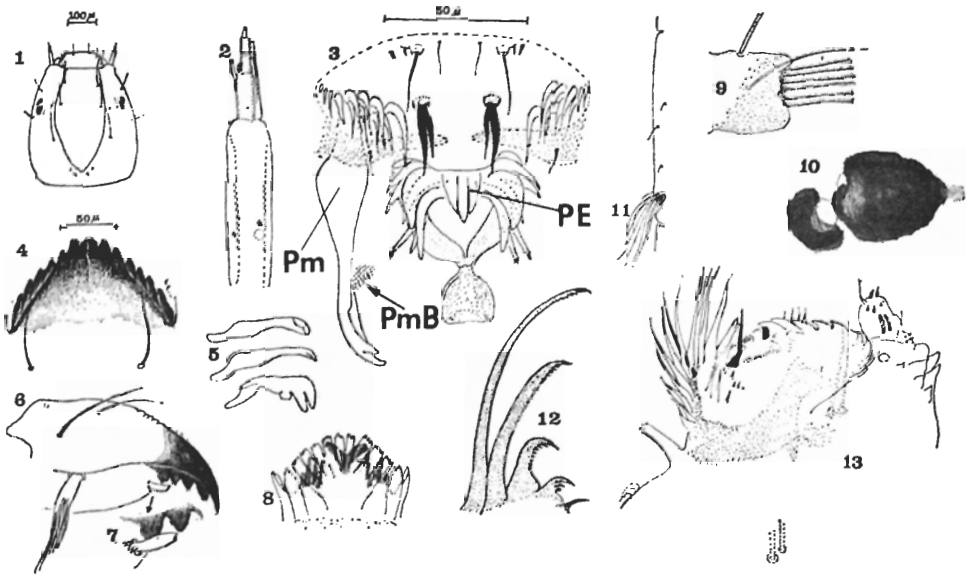


Figure 88. *Cricotopus* (*C.*) *tibialis* (Meig.), larva. Head, dorsal (1); antenna (2); palatal surface of labrum and premandible (with marks of premandibular brushes) (3); mentum (4); premandible (5); mandible (6); SSd of mandible (7); prementum (8); procercus (9); eyespots (10); L setae of abdominal segment III (11); claws of anterior parapods (12); maxilla (13). Scale of drawings 1=11; 2=3, 7–10, 12–13; 4=5–6.—PE pecten epipharyngis, Pm premandible, PmB premandibular brush.

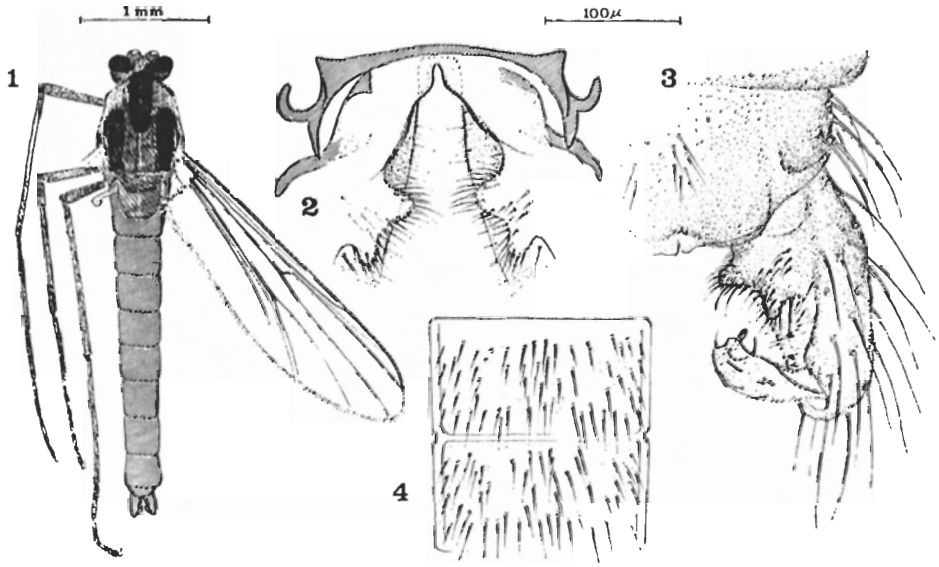


Figure 89. "*Cricotopus* cfr. *tibialis* (Meig.)", adult. ♂ (1); aedeagal lobe and phallapodeme of hypopygium (2); hypopygium (3); chaetotaxy scheme for abdominal tergites III and IV of ♂ (4).

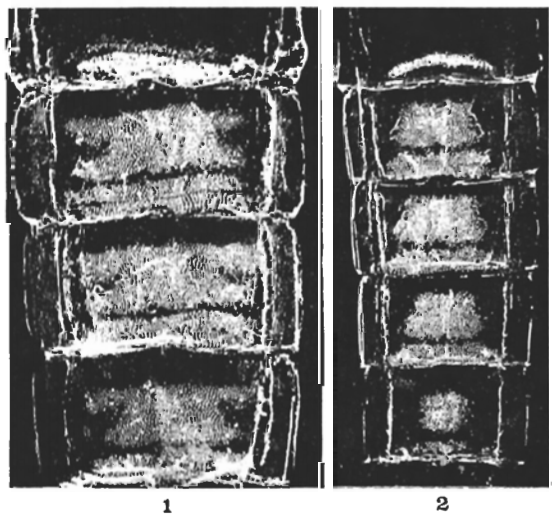


Figure 90. Shagreen of abdominal segments II–V of the pupal exuviae of *Cricotopus* (*C.*) *tibialis* (Meig.) (1) and of segments II–VI of *C.* (*C.*) *polaris* Kieff. (2). (Dark field photography).

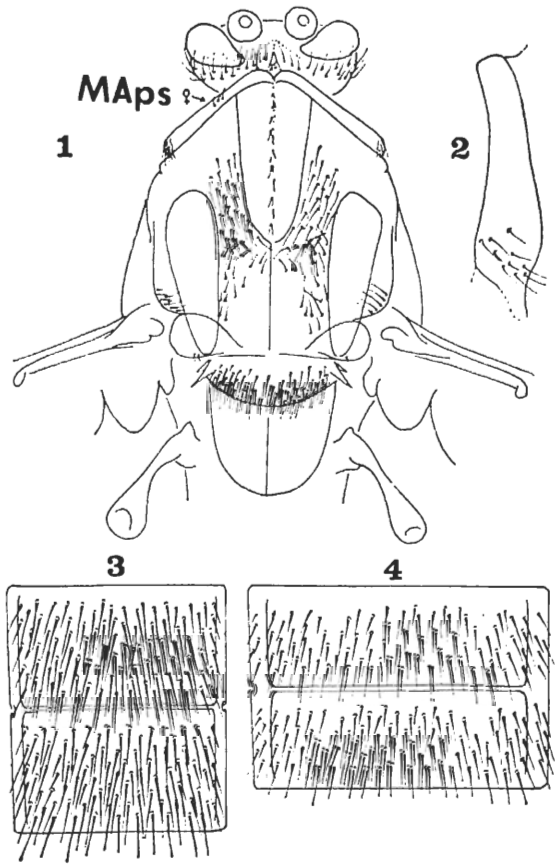


Figure 91. *Cricotopus* (*C.*) *polaris* Kieff. (Sompiojarvi), adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum of ♂, lateral (2); setation scheme for abdominal tergites III and IV of ♂ (3); same of ♀ (with Pts) (4).—MAps median setae of antepronotum.

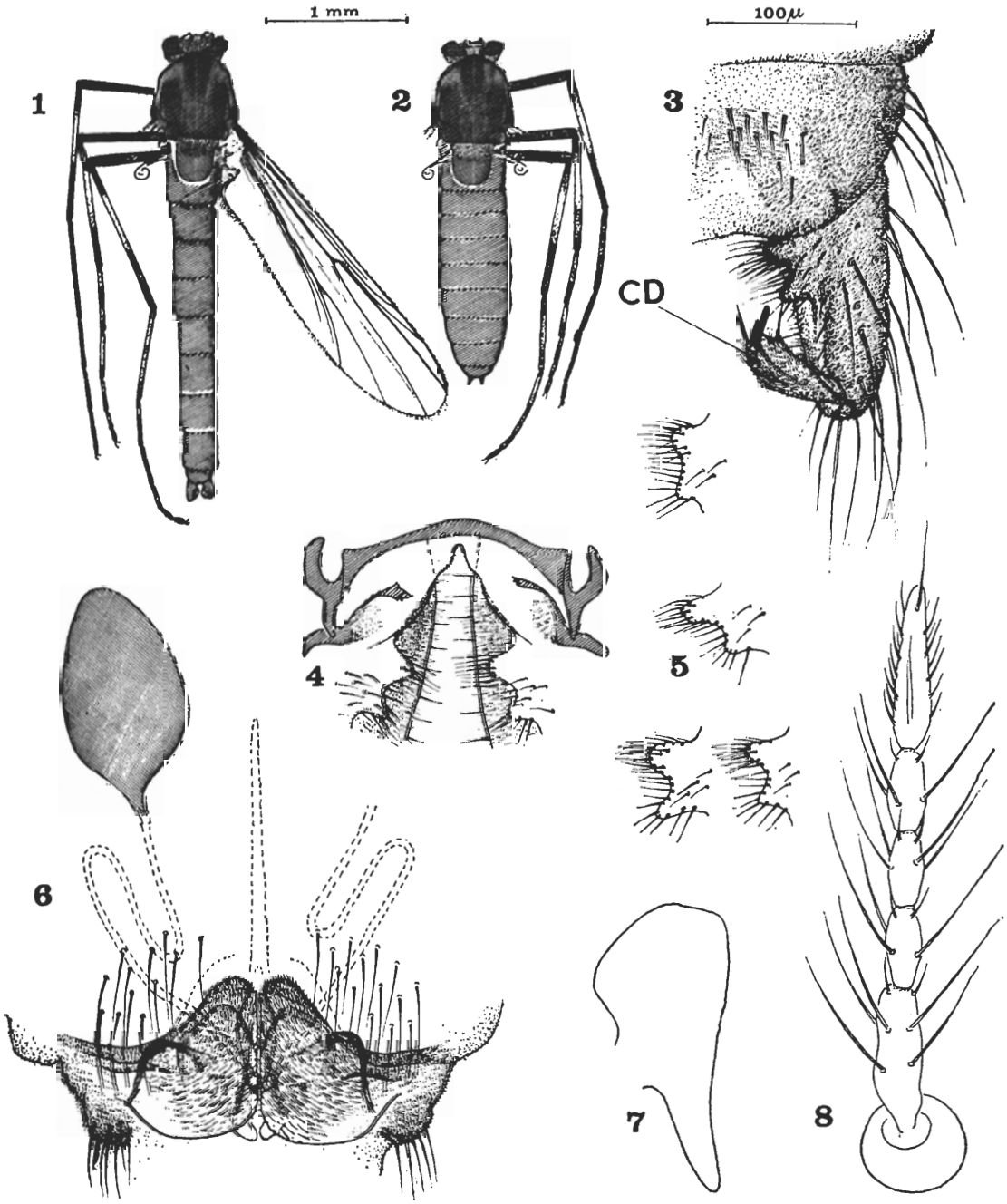


Figure 92. *Cricotopus* (*C.*) *polaris* Kieff., (Sompiojarvi), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); aedeagal lobe and phallapodeme of hypopygium (4); variation in inferior volsella (partly caused through preparation) (5); spermatheca and outer genitalia (6); cercus of ♀ (7); antenna of ♀ (8). Scale of drawings 1=2; 3=4–8.—CD crista dorsalis

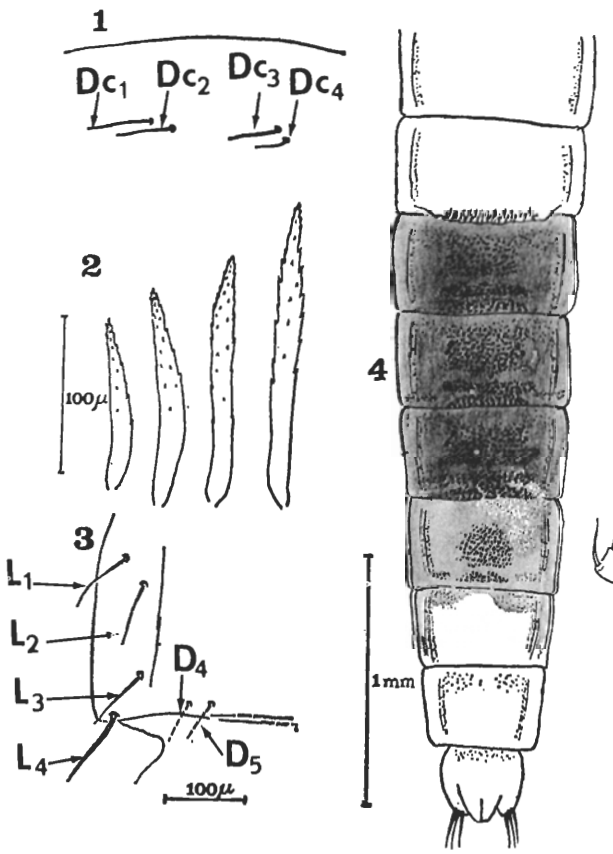


Figure 93. *Cricotopus* (*C.*) *polaris* Kieff. (Sompiojarvi), pupa. Size relationship and arrangement of Dc setae (1); variation of thoracic horn (2); anal angle of abdominal segment VIII (Scale = drawing 1) (3); shagreen and pigmentation of abdominal segments (4).

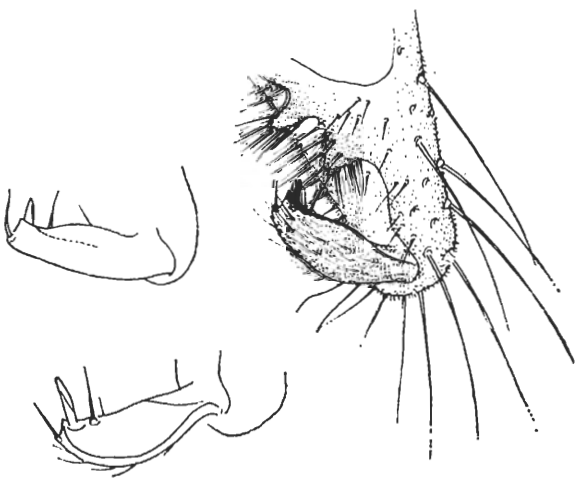


Figure 94. *Cricotopus* (*C.*) *polaris* Kieff., adult from Utsjoki, Finnish-Lappland. Gonocoxite, apical, and variation of gonostylus from a different view.

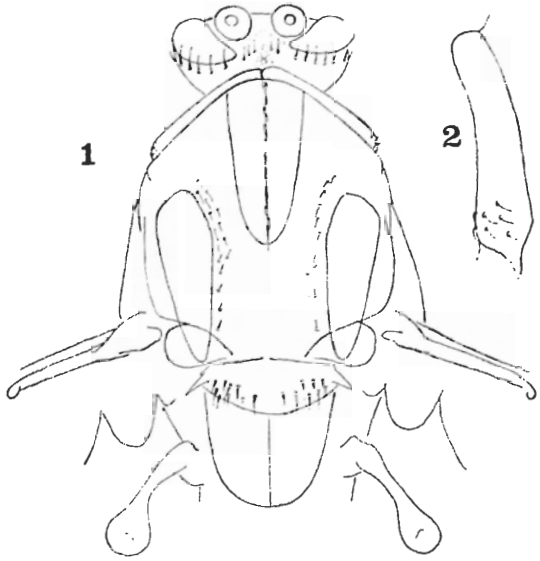


Figure 95. *Cricotopus* (*C.*) *fuscus* (Kieff.), chaetotaxy scheme for head and thorax of adult, dorsal (1); *C.* (*C.*) *pirifer* Hirv., antepronotum of adult, lateral (2).

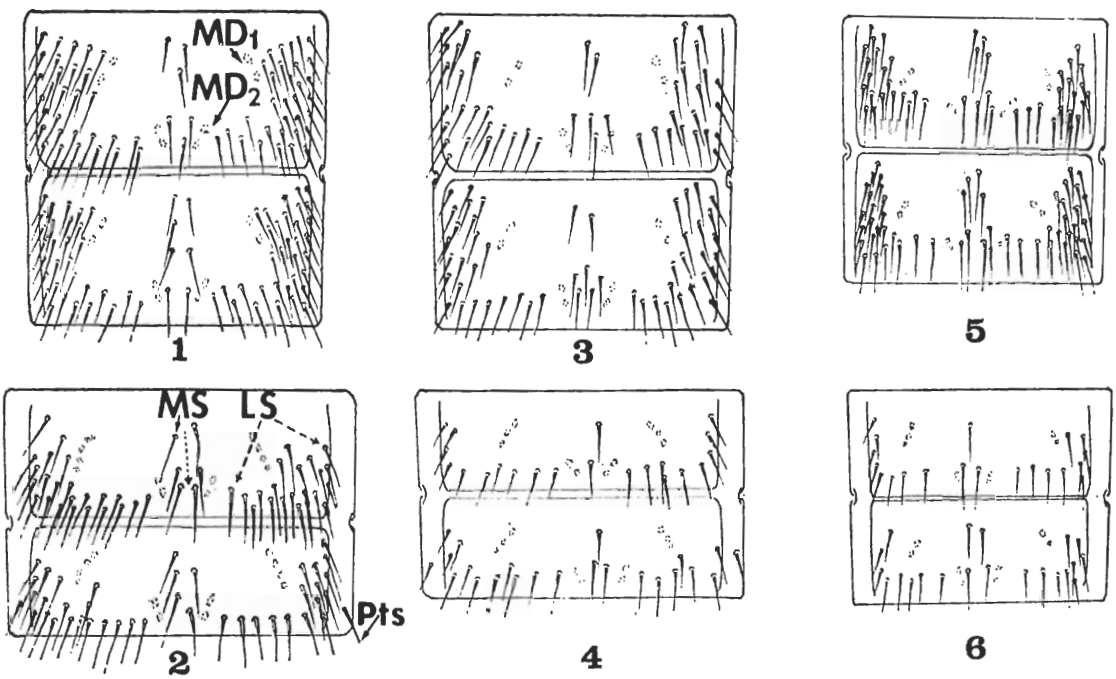


Figure 96. Chaetotaxy scheme for abdominal segments III and IV, dorsal, of the adults of the *fuscus*-group. *Cricotopus* (*C.*) *fuscus* (Kieff.) ♂ (1); same; ♀ (2); *C.* (*C.*) *algarum* (Kieff.) ♂ (3); same, ♀ (4); *C.* (*C.*) *pirifer* ♂ (5); same, ♀ (6). MD_{1-2} muscle marks, LS lateral setae, MS median setae, Pts paratergital setae.

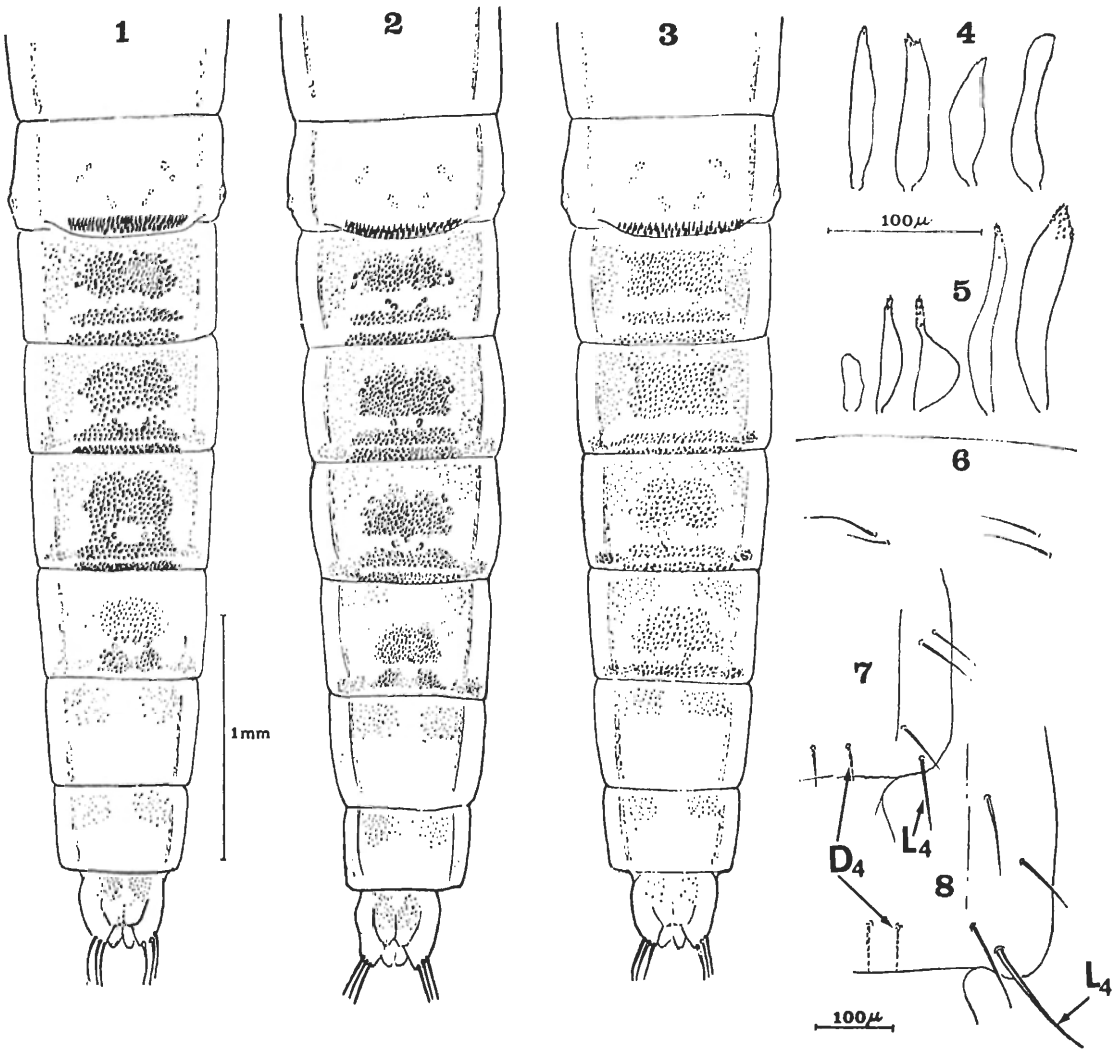


Figure 97. Shagreen of abdominal tergites of pupal exuviae of *Cricotopus* (*C.*) *pirifer* Hirv. (1); *C.* (*C.*) *fuscus* (Kieff.) (2); *C.* (*C.*) *algarum* (Kieff.) (3); variation in thoracic horn of pupa of *pirifer* (4);and *fuscus* (5); size relationship and arrangement of Dc_{1-4} of pupa of *pirifer* (6); setae on anal angle of segment VIII of *pirifer* (7); and *fuscus* (8). Scale of drawings 1=2–3; 4=5; 6=7–8.

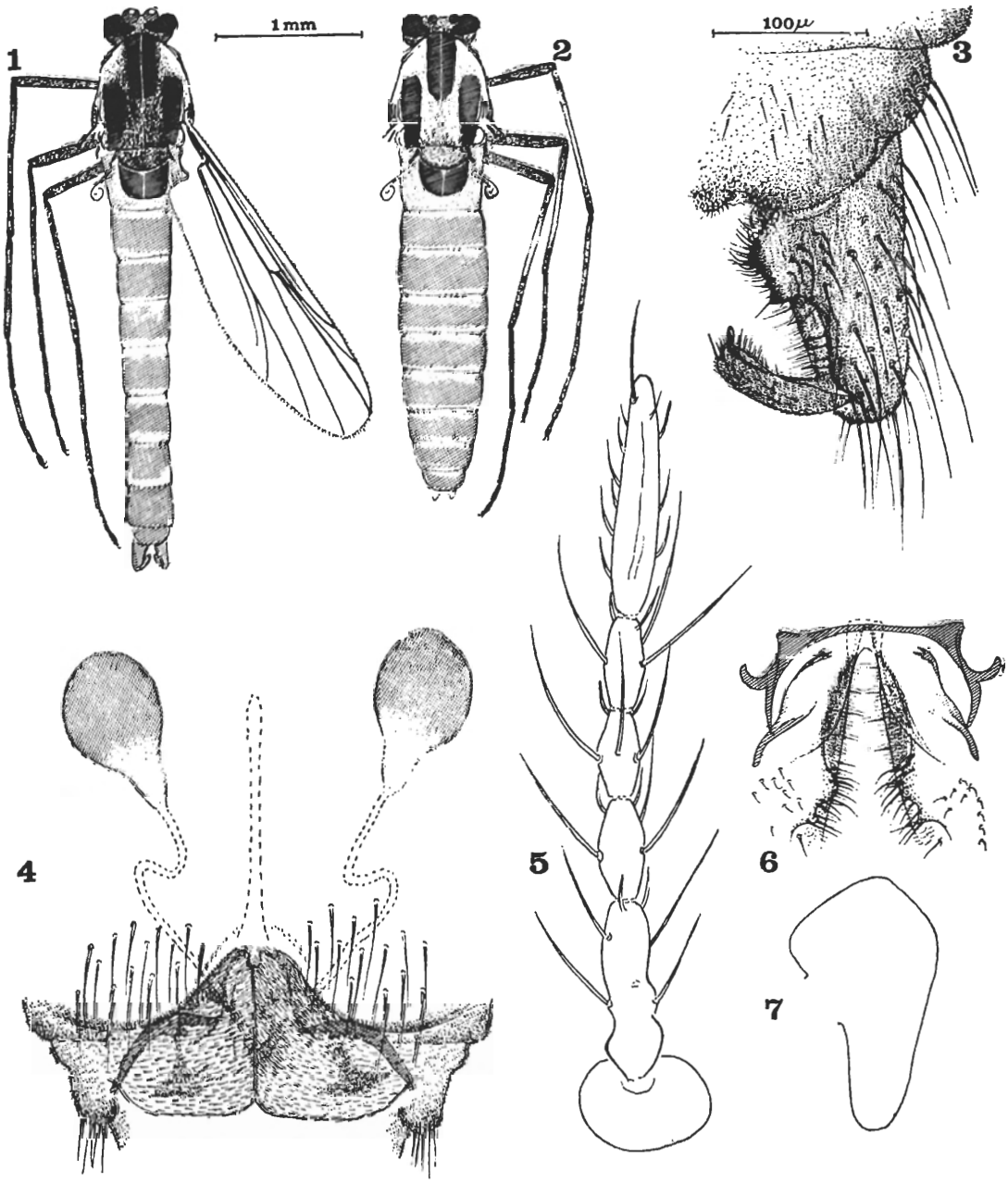


Figure 98. *Cricotopus* (*C.*) *fuscus* (Kieff.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); spermathecae and outer genitalia (4); antenna of ♀ (5); aedeagal lobe and phallapodeme of hypopygium of ♂ (6); cercus of ♀ (7). Scale of drawings 1=2, 3=4–7.

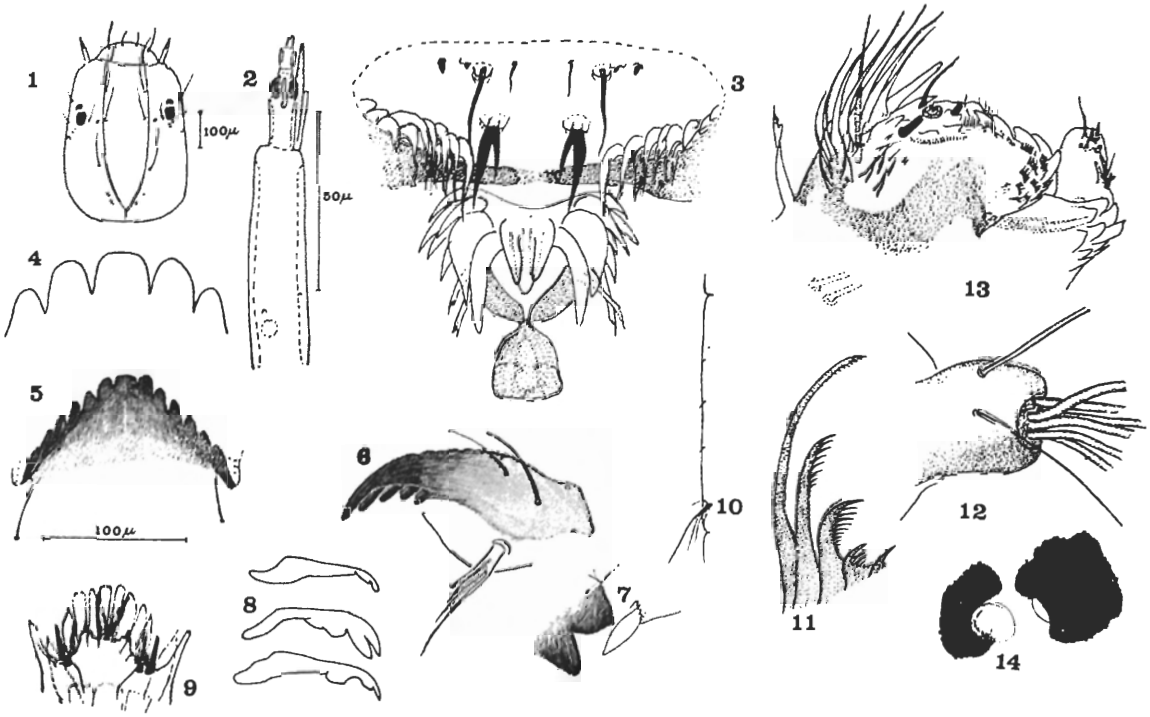


Figure 99. *Cricotopus* (*C.*) *fuscus* (Kieff.), larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); median tooth and first two lateral teeth of mentum (4); mentum (5); mandible (6); SSd of mandible (7); premandible (8); prementum (9); L setae of abdominal segment IV (10); claws of anterior parapods (11); procercus (12); maxilla (13); eyespots (14). Scale of drawings 1=10; 2=3–4, 7, 9, 11–14; 5=6, 8.

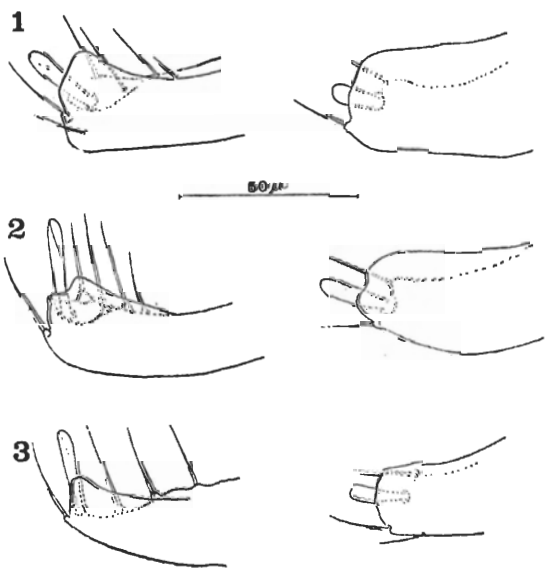


Figure 100. Distal end of gonostylus. *Cricotopus* (*C.*) *fuscus* (Kieff.) (1); *C.* (*C.*) *algarum* (Kieff.) (2); *C.* (*C.*) *pirifer* Hirv. (3).

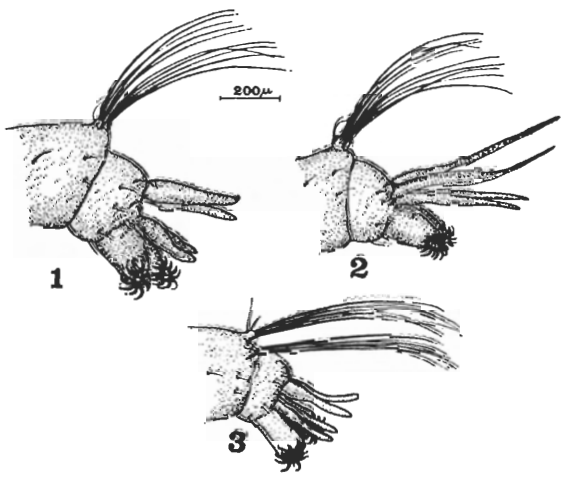


Figure 101. Posterior end of larvae. *Cricotopus* (*C.*) *fuscus* (Kieff.) (1); *C.* (*C.*) *algarum* (Kieff.) (2); *C.* (*C.*) *pirifer* Hirv. (3).

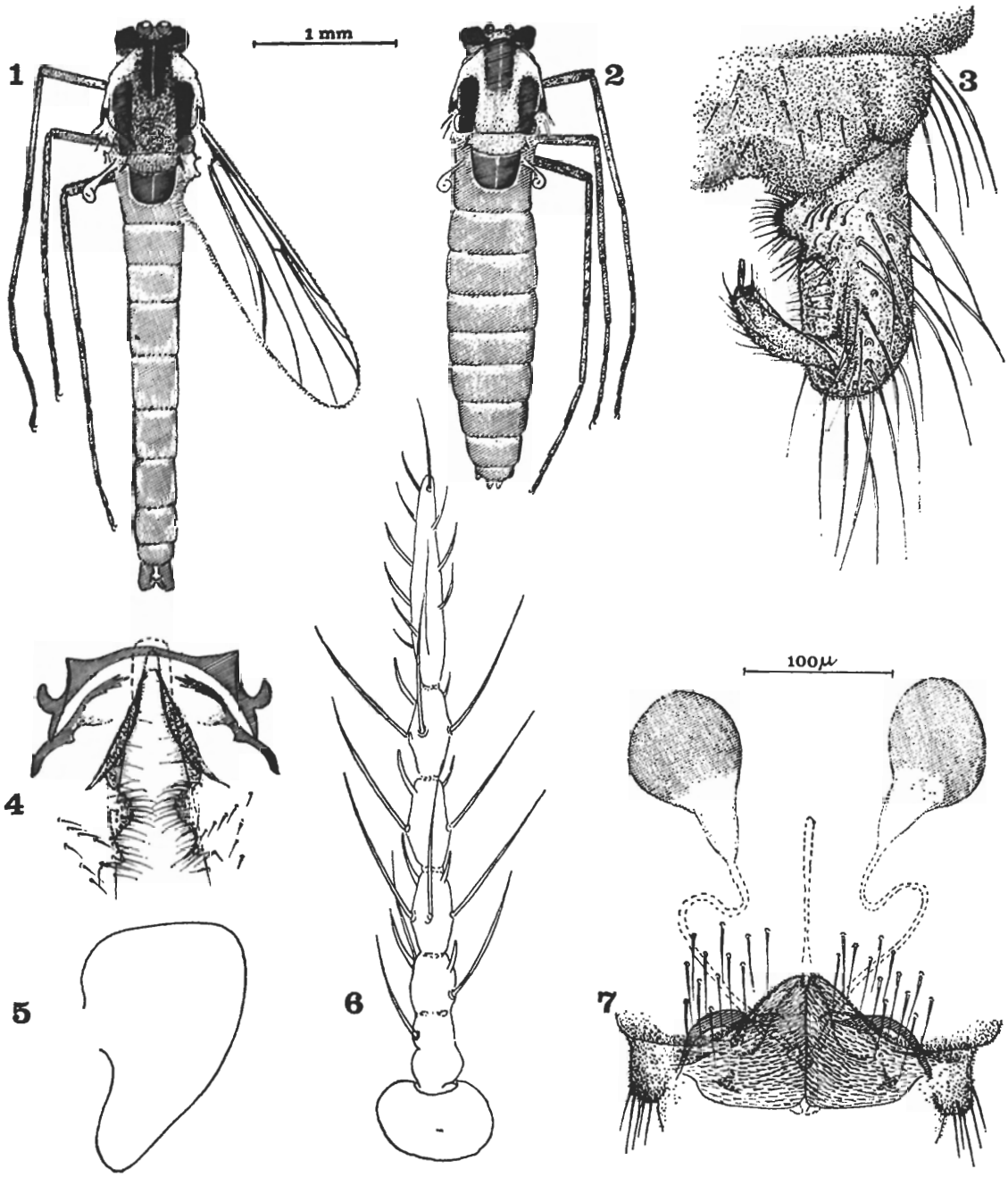


Figure 102. *Cricotopus* (*C.*) *algarum* (Kieff.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); aedeagal lobe and phallapodeme of hypopygium (4); cercus (5); antenna (6); spermathecae and outer genitalia of ♀ (7). Scale of drawings 1=2; 3=4–7.

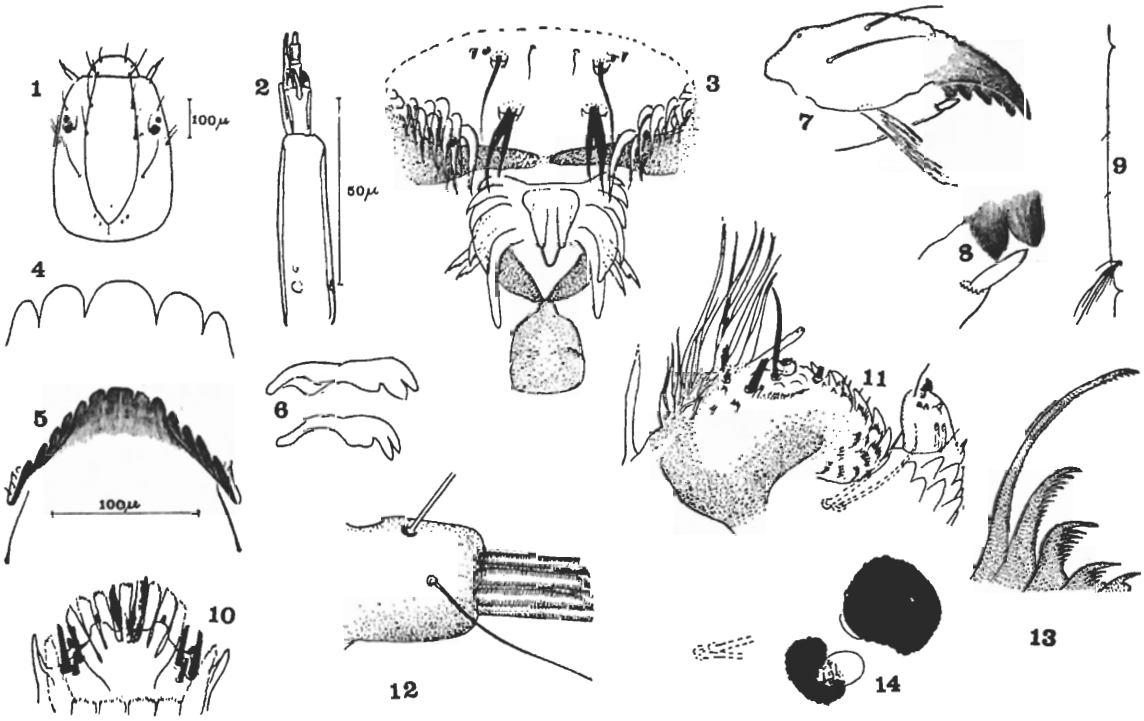


Figure 103. *Cricotopus* (*C.*) *algarum* (Kieff.), larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); median tooth and first two lateral teeth of mentum (4); mentum (5); premandible (6); mandible (7); SSd of mandible (8); L setae of abdominal segment IV (9); prementum (10); maxilla (11); procercus (12); claws of anterior parapods (13); eyespots (14). Scale of drawings 1=9; 2=3–4, 8, 10–14; 5=6–7.

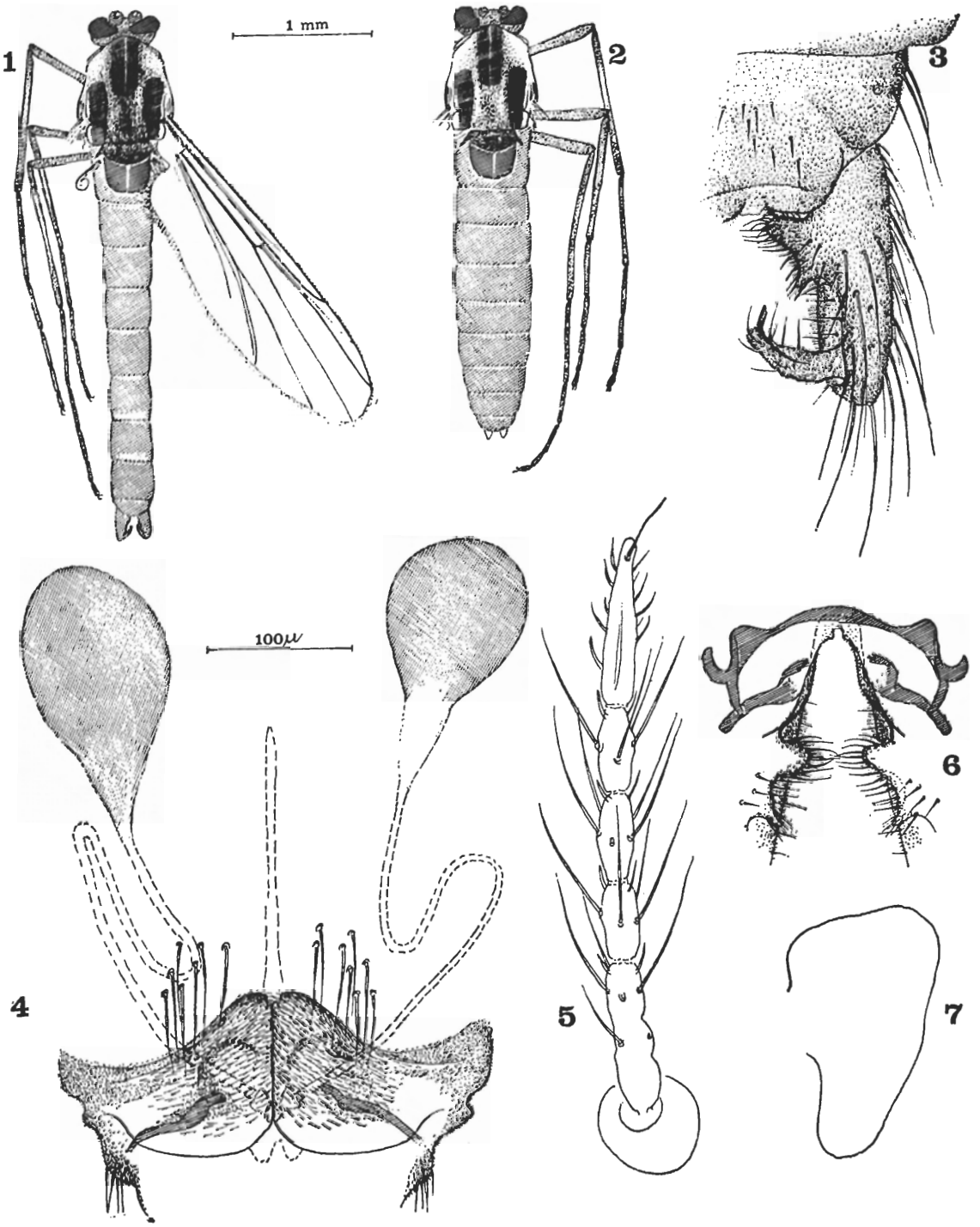


Figure 104. *Cricotopus* (*C.*) *pirifer* Hirv., adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); spermathecae and outer genitalia of ♀ (4); antenna of ♀ (5); aedeagal lobe and phallapodeme of hypopygium of ♂ (6); cercus of ♀ (7). Scale of drawings 1=2; 3=4–7.

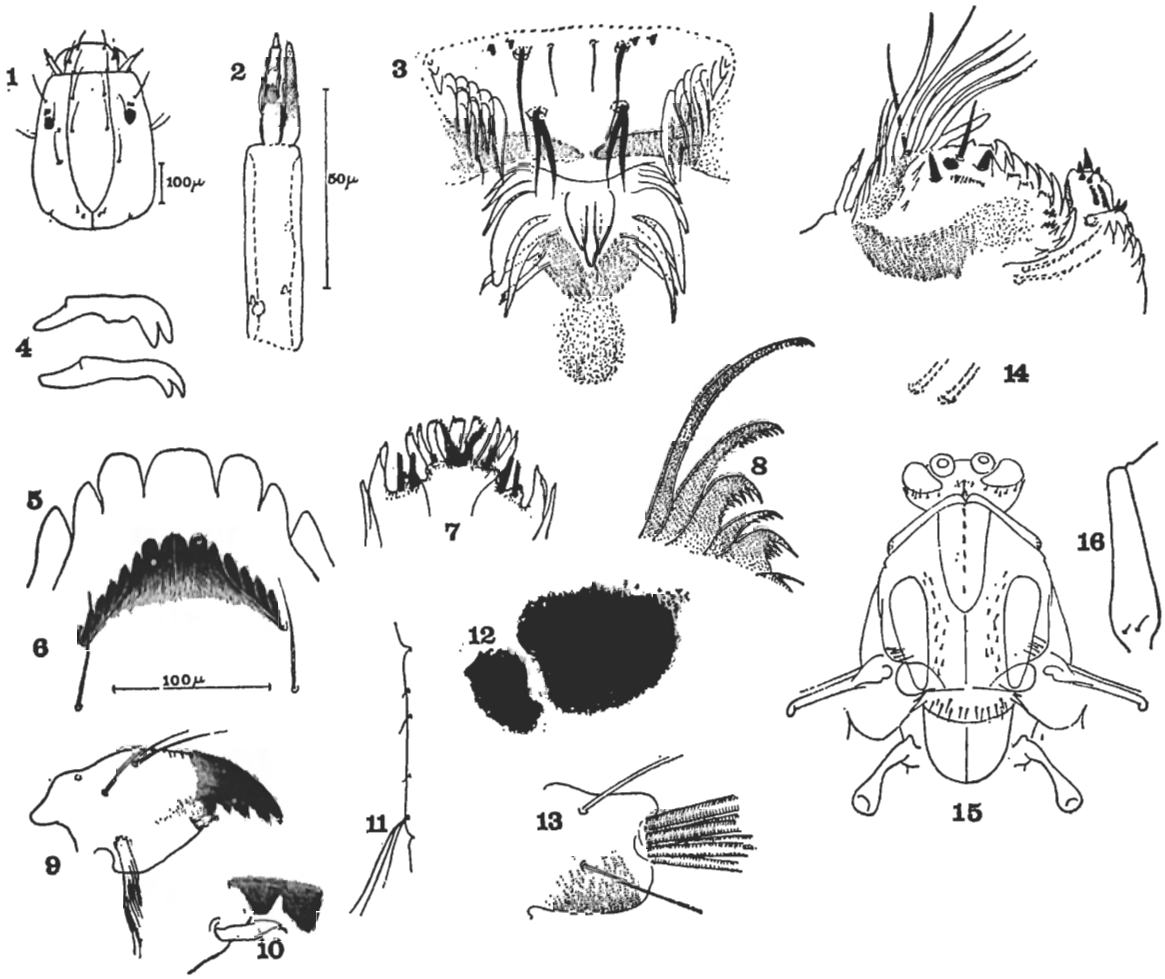


Figure 105. *Cricotopus* (*C.*) *pirifer* Hirv., larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); premandible (4); median tooth and first three lateral teeth of mentum (5); mentum (6); prementum (7); claws of anterior parapods (8); mandible (9); SSd of mandible (10); L setae of abdominal segment IV (11); eyespots (12); procercus (13); maxilla (14). Chaetotaxy of head and thorax, dorsal (15) and antepronotum, lateral (16) of adult of *Cricotopus* (*C.*) *magus* Hirv. Scale of drawings 1=11; 2=3, 5, 7, 8, 10, 12–14; 4=6, 9; 15 and 16 schematic freehand sketch.

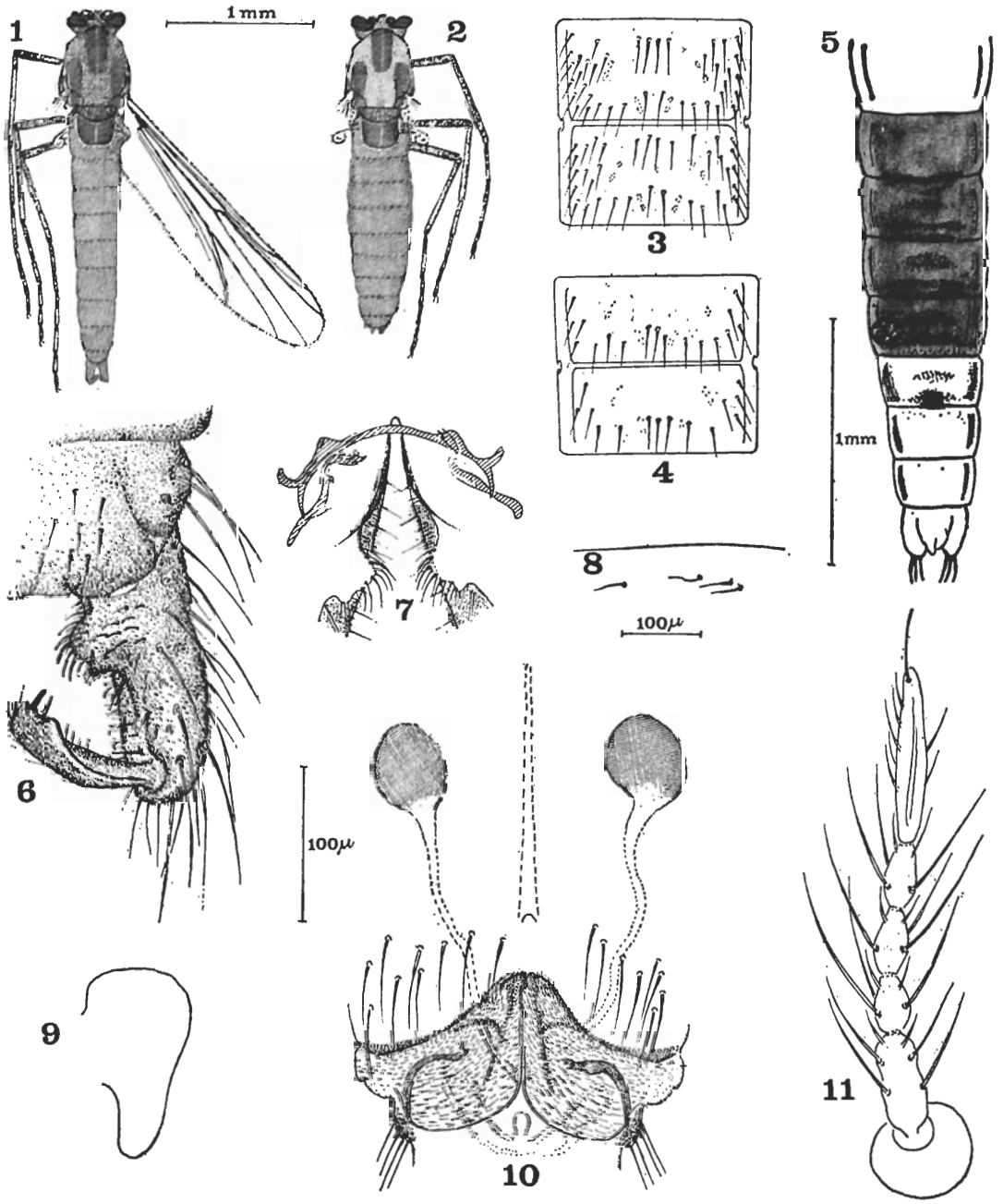


Figure 106. *Cricotopus* (*C.*) *magus* Hirv., adult and pupa. ♂ (1); ♀ (2); chaetotaxy scheme for abdominal tergites III and IV of ♂ (3) and ♀ (4); abdominal segments of pupal exuvium (5); hypopygium of ♂ (6); aedeagal lobe and phallapodeme of hypopygium (7); size relationship and arrangement of Dc setae of pupa (8); cercus (9); spermathecae and outer genitalia (10); antenna of ♀ (11). Scale of drawings 1=2; 6=7, 9–11.

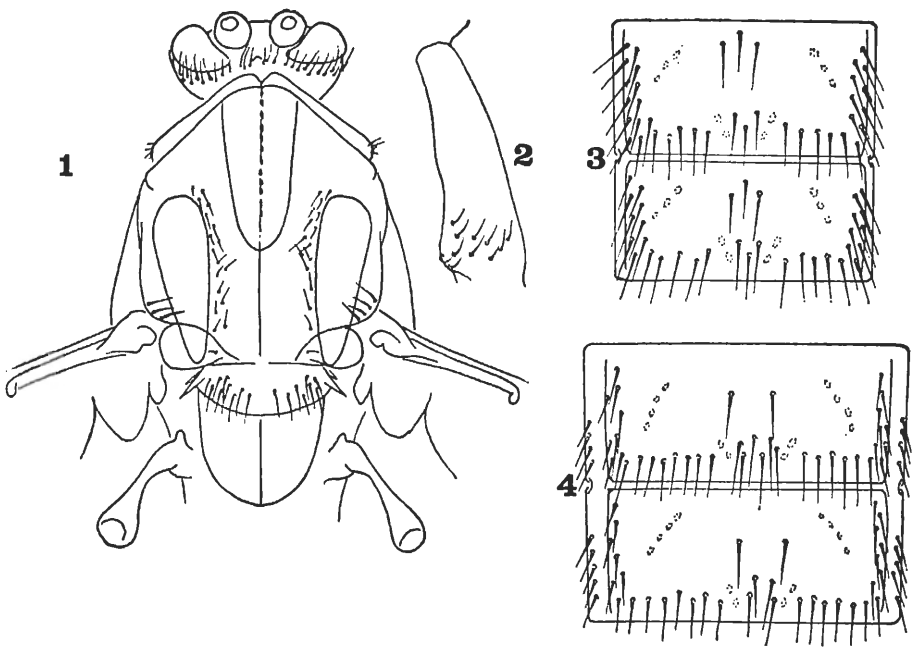


Figure 107. *Cricotopus* (*C.*) *septentrionalis* Hirv., adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum of ♂, lateral (2); chaetotaxy scheme for abdominal tergites III and IV of ♂ (3); same (with Pts) of ♀ (4).

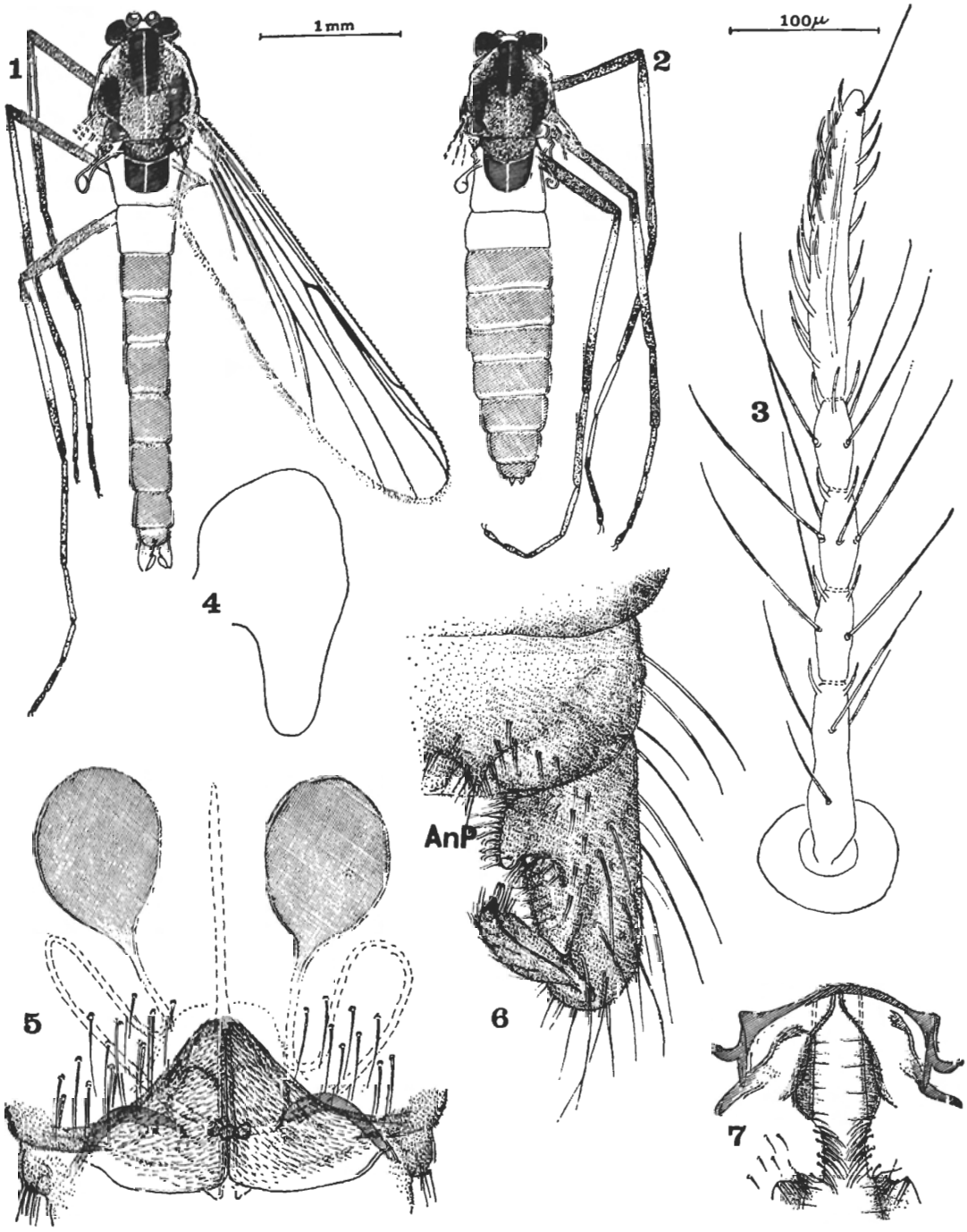


Figure 108. *Cricotopus* (*C.*) *septentrionalis* Hirv., adult. ♂ (1); ♀ (2); antenna (3); cercus (4); spermathecae and outer genitalia of ♀ (5); hypopygium of ♂ (6); aedeagal lobe and phallapodeme of hypopygium (7). Scale of drawings 1=2; 3=4–7.—AnP anal point.

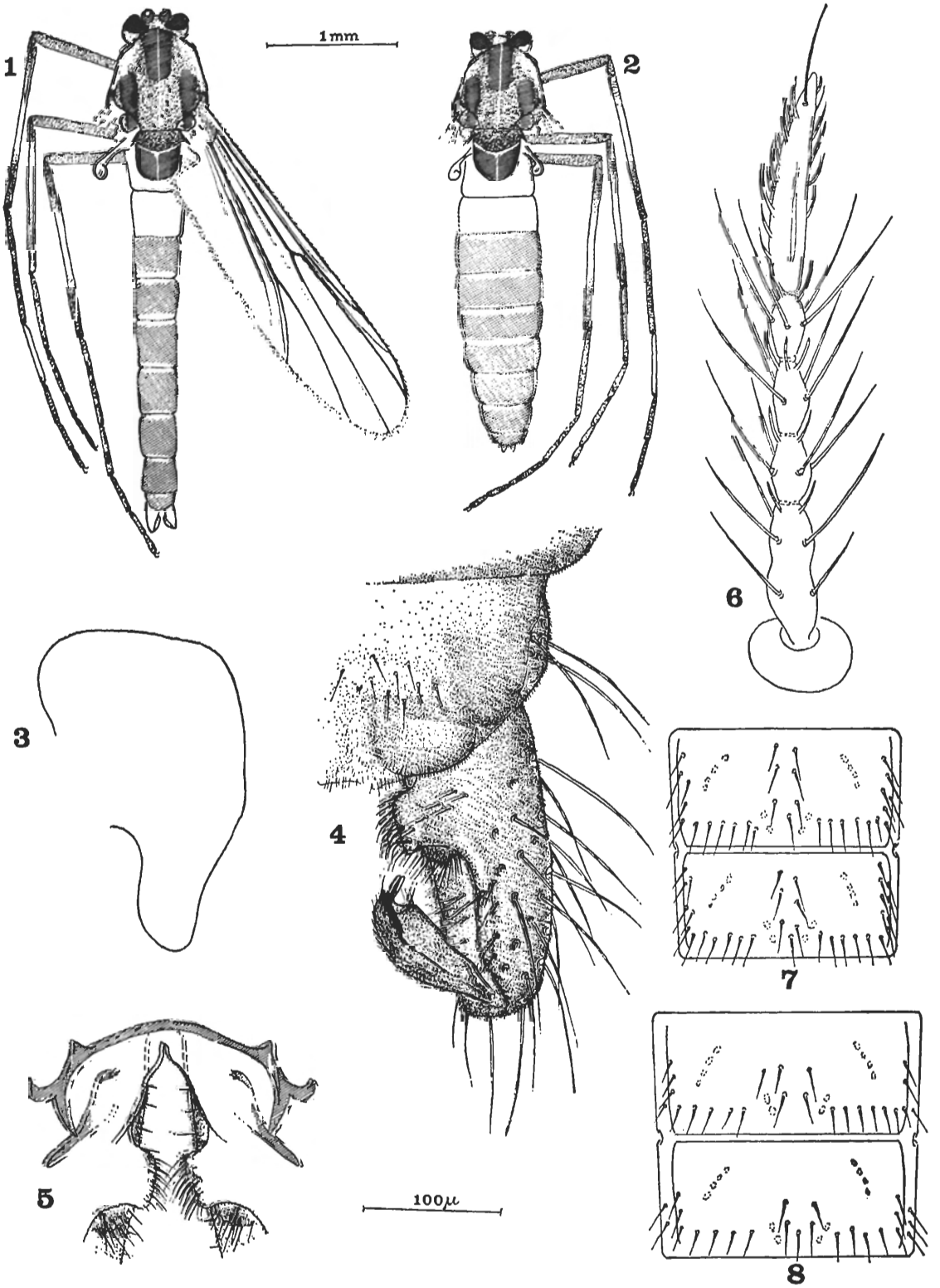


Figure 109. *Cricotopus* (*C.*) *pulchripes* Verr., adult. ♂ (1); ♀ (2); cercus of ♀ (3); hypopygium of ♂ (4); aedeagal lobe and phallapodeme of hypopygium (5); antenna of ♀ (6); chaetotaxy scheme for abdominal tergites III and IV of ♂ (7); same (with Pts) of ♀ (8). Scale of drawings 1=2; 3=4–6; 7 and 8 are freehand sketches.

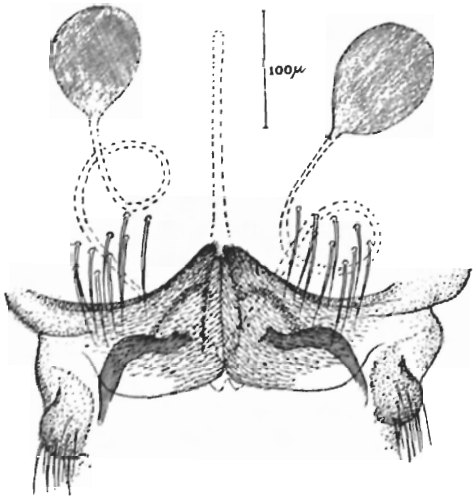


Figure 110. *Cricotopus* (*C.*) *pulchripes* Verr. Spermathecae and outer genitalia of ♀.

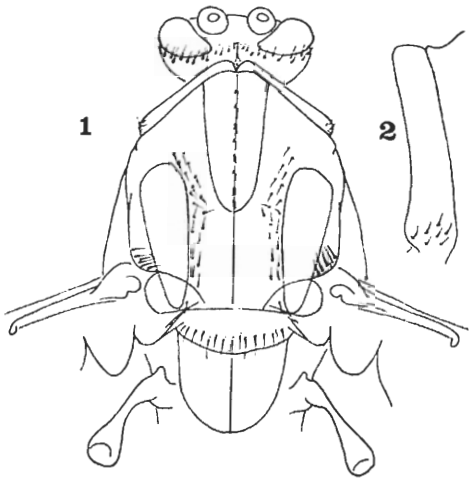


Figure 111. *Cricotopus* (*C.*) *tremulus* (L.), adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum, lateral (2).

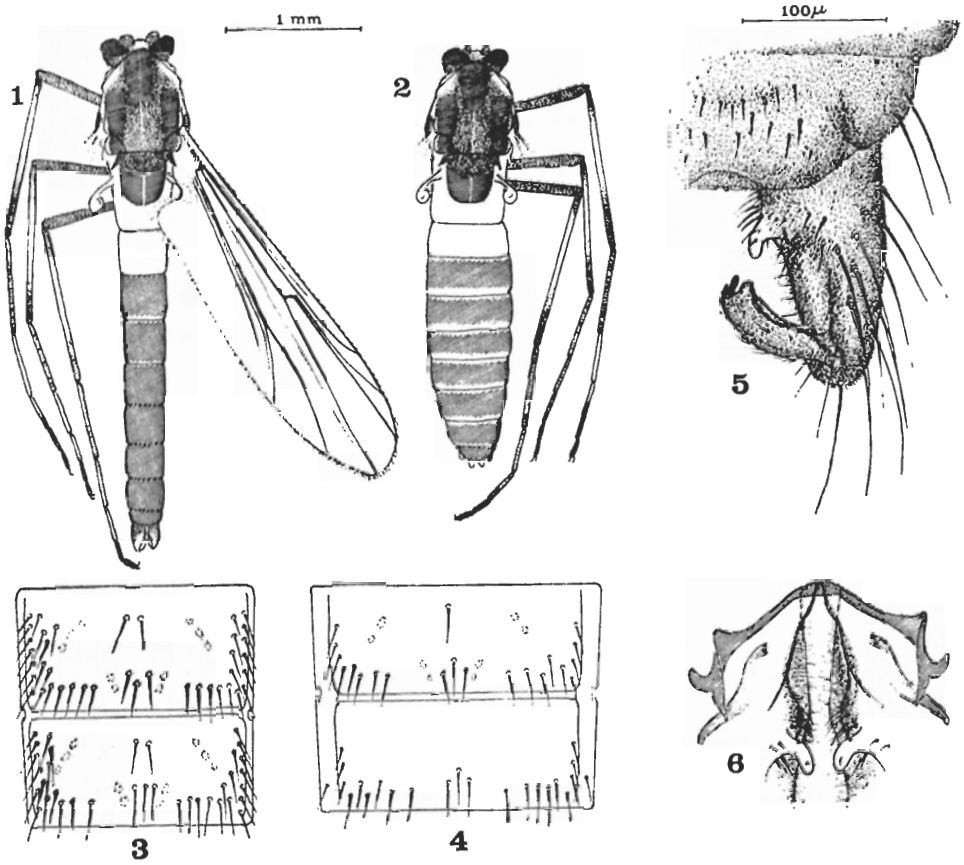


Figure 112. *Cricotopus* (*C.*) *tremulus* (L.), adult. ♂ (1); ♀ (2); chaetotaxy scheme for abdominal tergites III and IV of ♂ (3); same (with Pts) of ♀ (4); hypopygium of ♂ (5); aedeagal lobe and phallapodeme of hypopygium (6). Scale of drawings 1=2; 5=6.

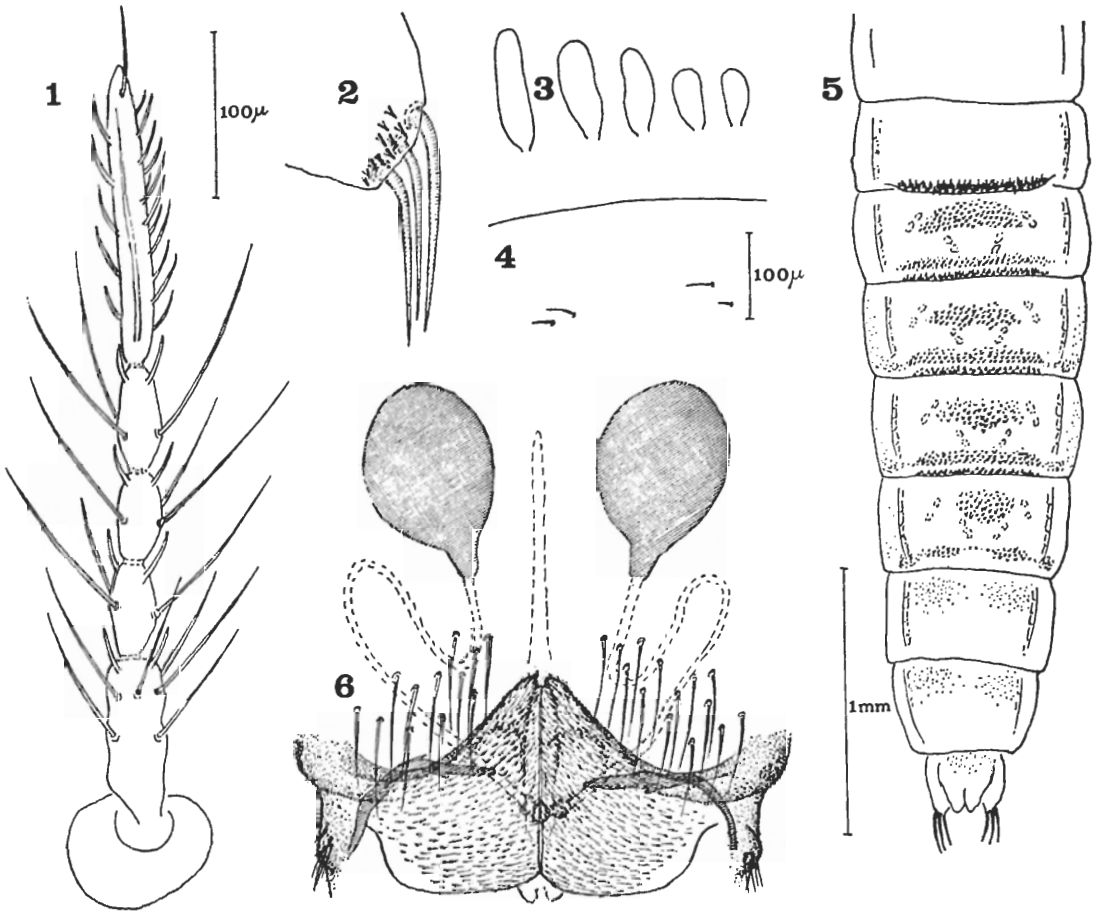


Figure 113. *Cricotopus* (*C.*) *tremulus* (L.), adult, pupa. Antenna of ♀ (1); distal end of paratergite of segment IX of a pupa from the Fulda, Germany (anal macrosetae and possibly rudiments of fringe of anal lobe) (2); thoracic horn (3); size relationship and arrangement of Dc setae of pupa (4); shagreen of abdominal segments of pupa (5); spermathecae and outer genitalia of ♀ (6).

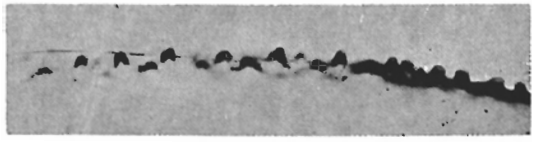


Figure 114. *Cricotopus* (*C.*) *tremulus* (L.). Margin of pronotal suture of pupal exuvium.

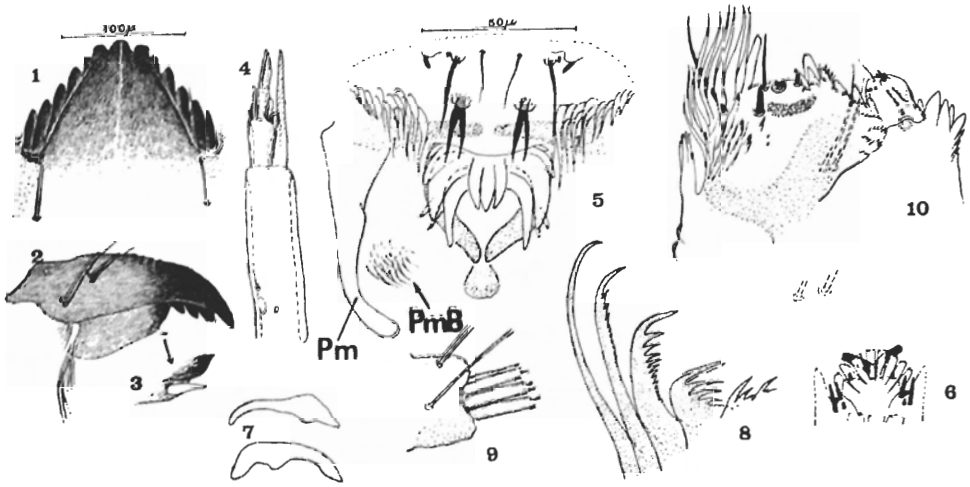


Figure 115. *Cricotopus* (*C.*) *tremulus* (L.), larva. Mentum (1); mandible (2); SSd of mandible (3); antenna (4); palatal surface of labrum and premandible (with premandibular brush) (5); prementum (6); premandible (7); claws of anterior parapods (8); procercus (9); maxilla (10). Scale of drawings 1=2, 7; 3=4–6, 8–10.—Pm premandible, PmB premandibular brush.

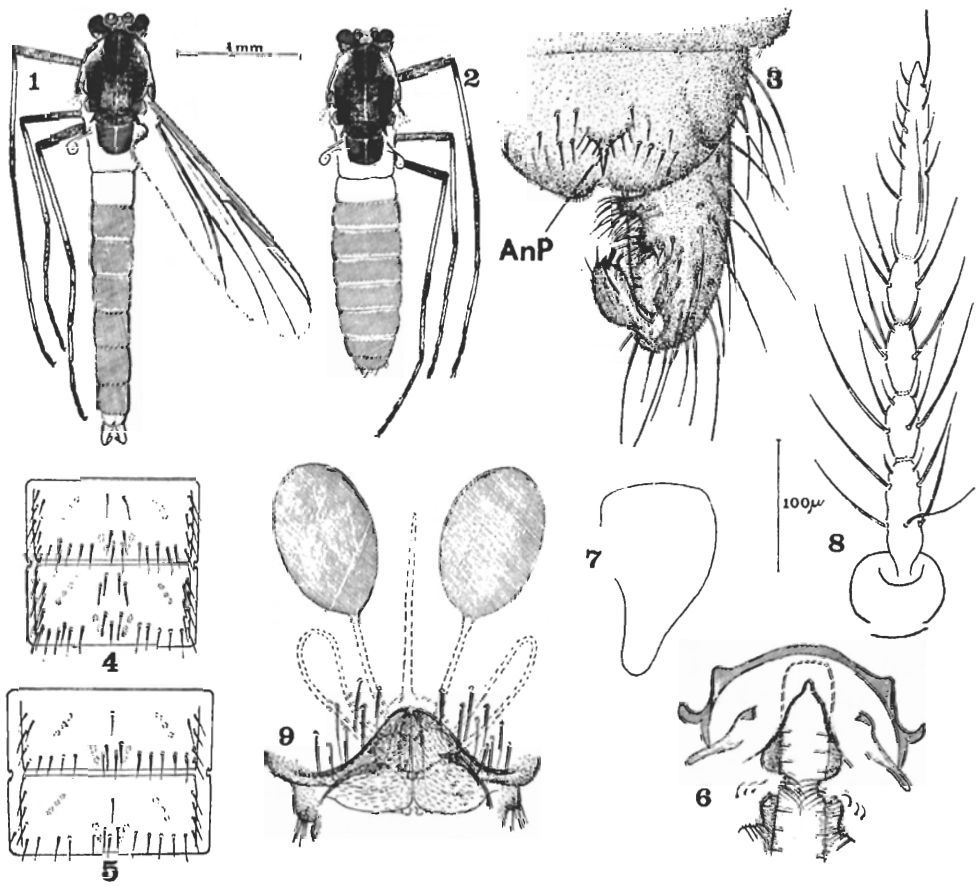


Figure 116. *Cricotopus* (*C.*) *claripes* Hirv., adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); chaetotaxy scheme for abdominal tergites III and IV of ♂ (4); same (with Pts) of ♀ (5); aedeagal lobe and phallapodeme of hypopygium (6); cercus (7); antenna (8); outer genitalia of ♂ (9). Scale of drawings 1=2; 3=6–9.—AnP anal point.

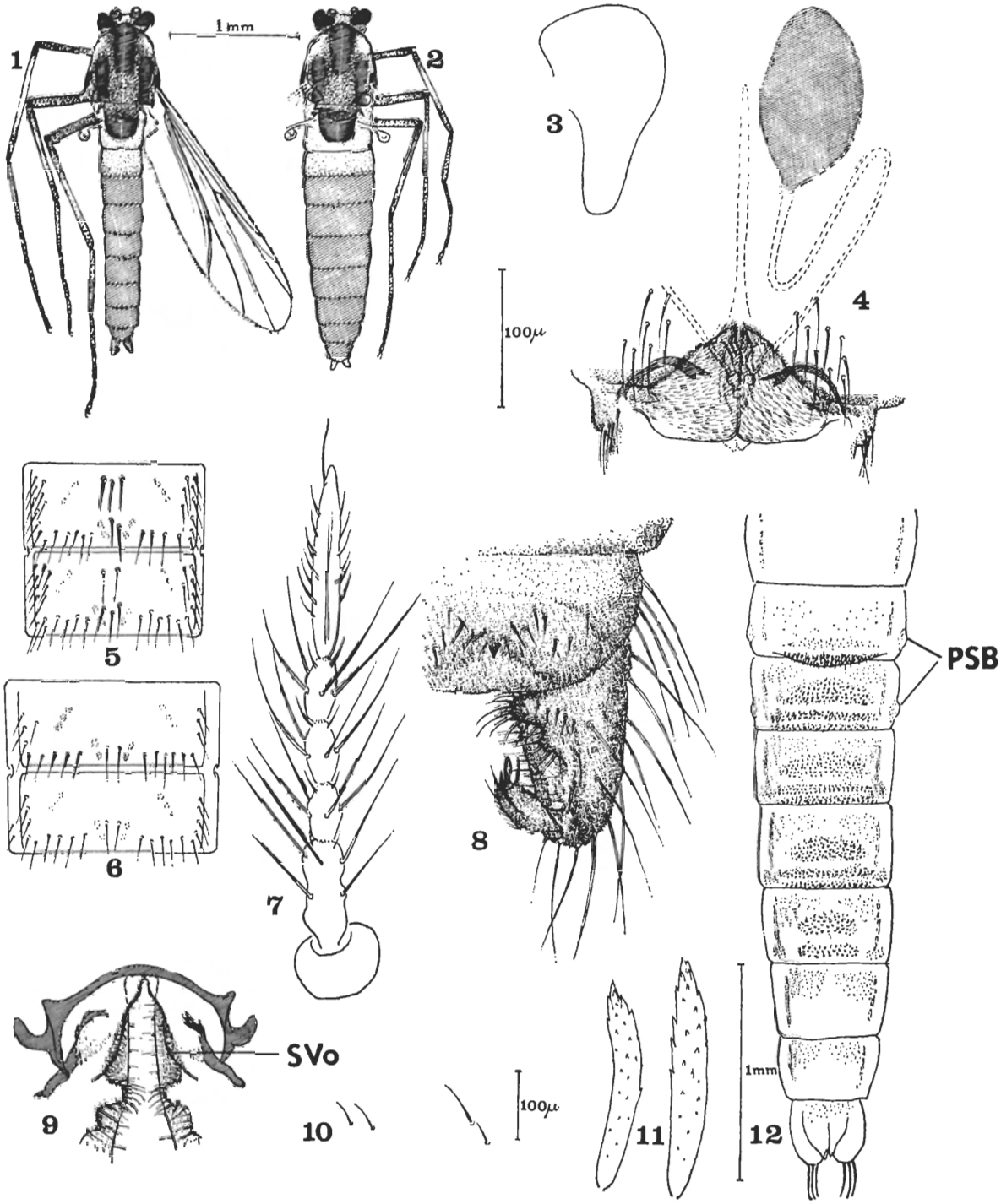


Figure 117. *Cricotopus* (*C.*) *tristis* Hirv., adult, pupa. ♂ (1); ♀ (2); cercus (3); spermatheca and outer genitalia of ♀ (4); chaetotaxy scheme for abdominal tergites III and IV of ♂ (5); same (with Pts) of ♀ (6); antenna of ♀ (7); hypopygium of ♂ (8); aedeagal lobe and phallapodeme of hypopygium (9); arrangement and size relationship of Dc_{1-4} (10); thoracic horn of pupa (11); abdominal tergites of pupa (12). Scale of drawings 1=2; 3=4, 7–9, 11.—PSB pedes spurii B, SVo superior volsella.

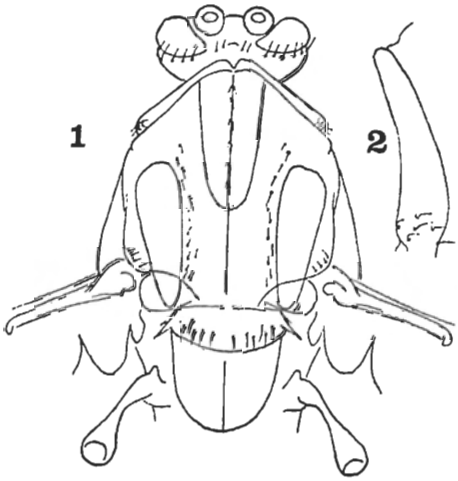


Figure 118. *Cricotopus* (*C.*) *curtus* Hirv., adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum, lateral (2).

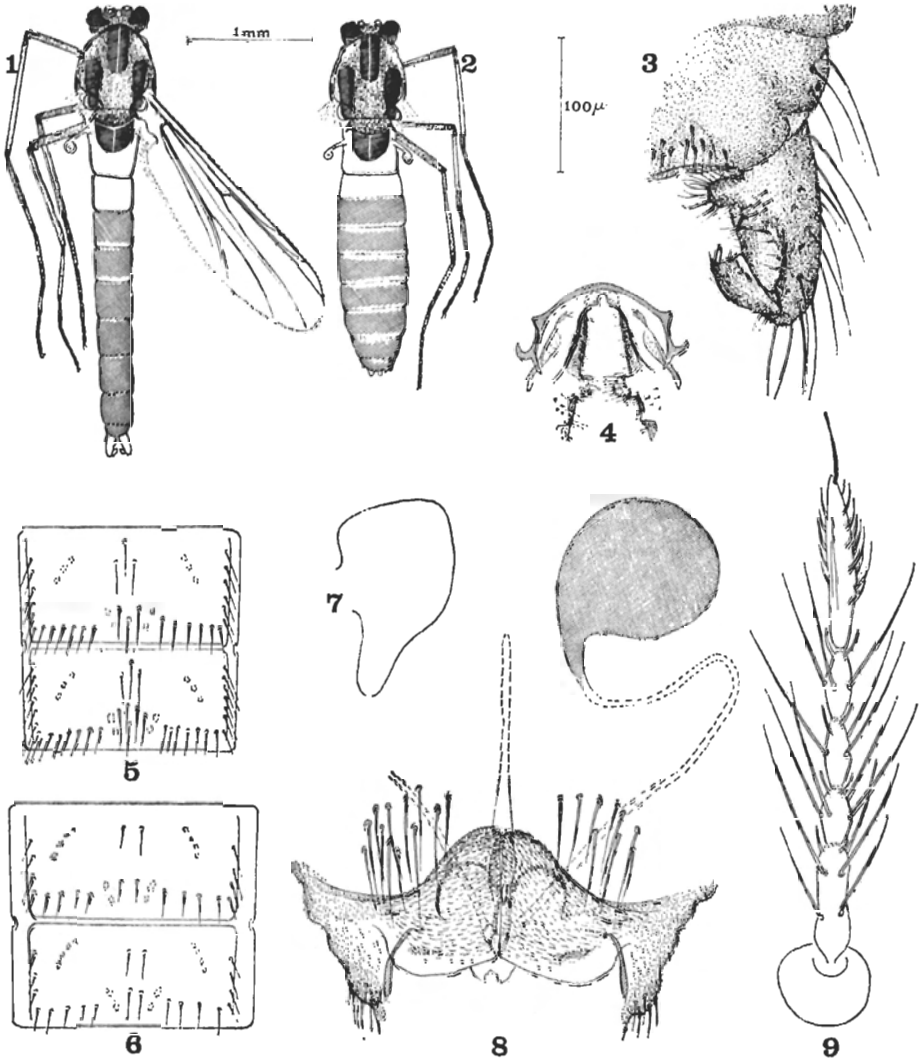


Figure 119. *Cricotopus* (*C.*) *curtus* Hirv., adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); aedeagal lobe and phallapodeme of hypopygium (4); chaetotaxy scheme for abdominal tergites III and IV of ♂ (5); same of ♀ (6); cercus (7); spermatheca and outer genitalia of ♀ (8); antenna of ♀ (9). Scale of drawings 1=2; 3=4, 7–9.

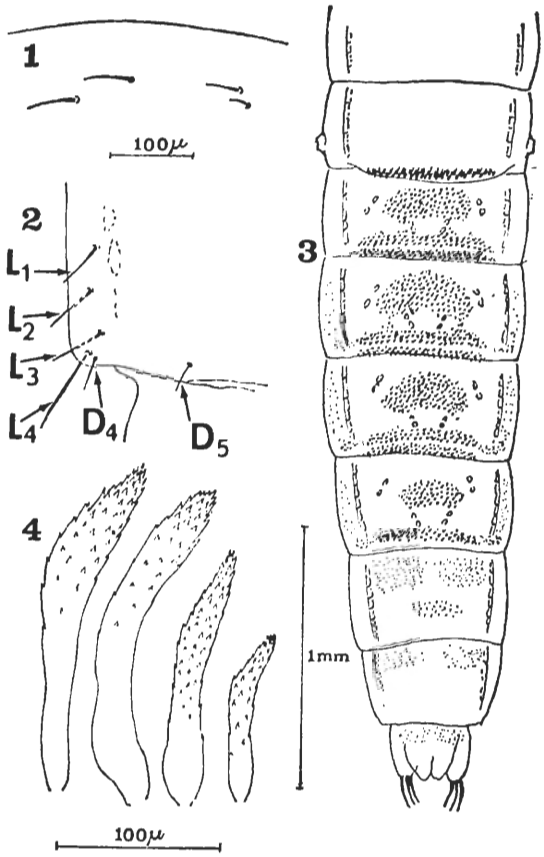


Figure 120. *Cricotopus* (*C.*) *curtus* Hirv., pupa. Arrangement and size relationship of Dc setae (1); setae on anal angle of segment VIII (2); shagreen of abdominal segments (3); thoracic horn (4).

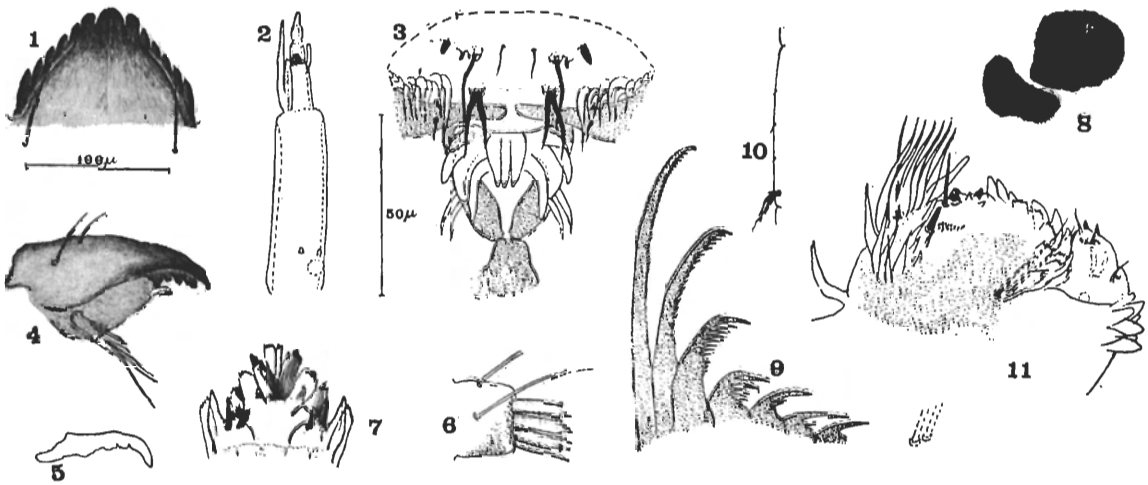


Figure 121. *Cricotopus* (*C.*) *curtus* Hirv., larva. Mentum (1); antenna (2); palatal surface of labrum (3); mandible (4); premandible (5); procercus (6); prementum (7); eyespots (8); claws of anterior parapods (9); L setae of abdominal segment IV (10); maxilla (11). Scale of drawings 1=4–5; 2=3, 6–9, 11; 10=1–2 of Figure 123.

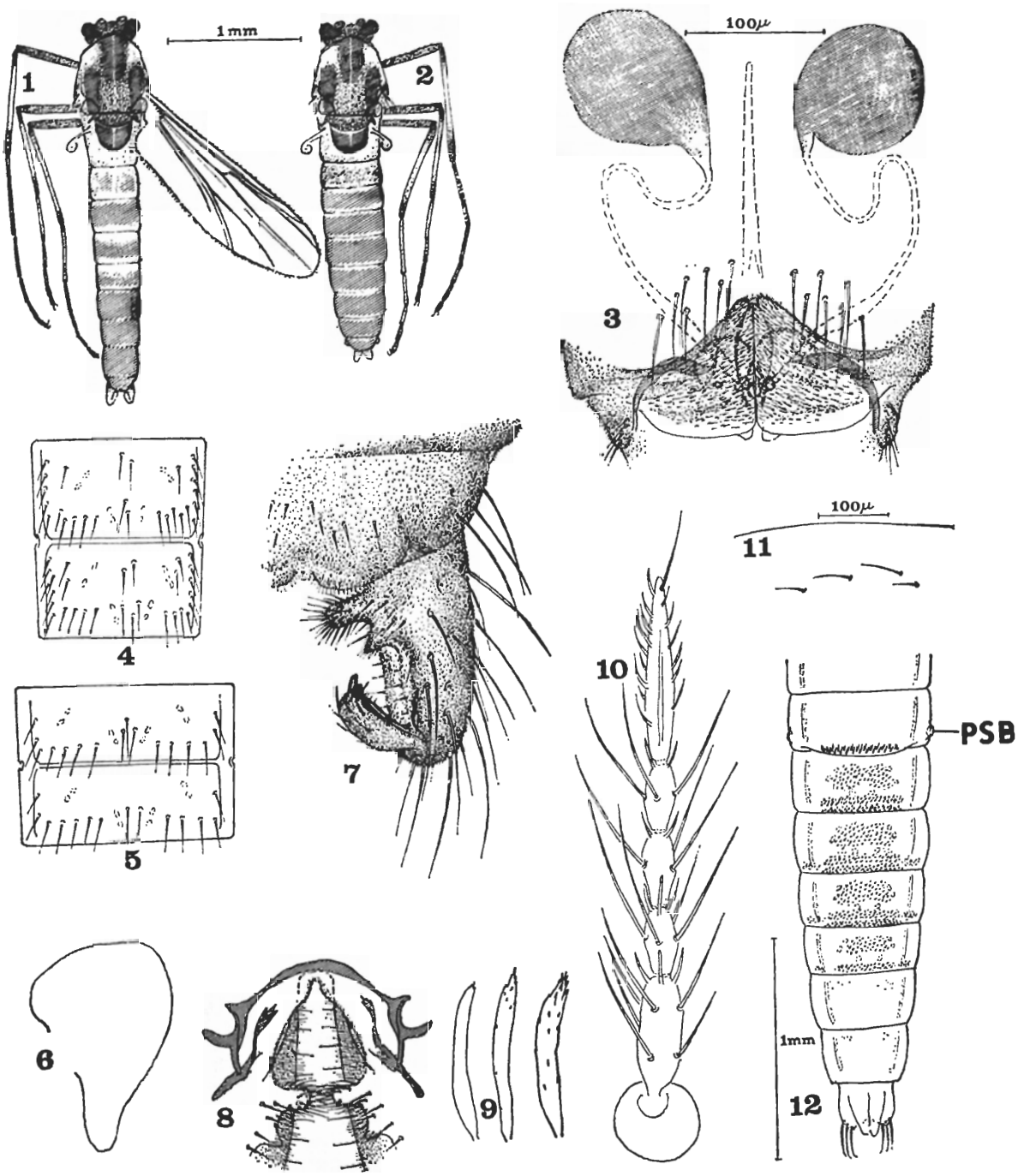


Figure 122. *Cricotopus* (*C.*) *annulator* Goetgh., adult, pupa. ♂ (1); ♀ (2); spermathecae and outer genitalia of ♀ (3); chaetotaxy scheme of abdominal tergites III and IV of ♂ (4); same of ♀ (5); cercus of ♀ (6); hypopygium of ♂ (7); aedeagal lobe and phallapodeme of hypopygium (8); thoracic horn of pupa (9); antenna of ♀ (10); size relationship and arrangement of Dc setae of pupa (11); shagreen of abdominal segments of pupa (12). Scale of drawings 1=2; 3=6–10.—PSB pedes spurii B.

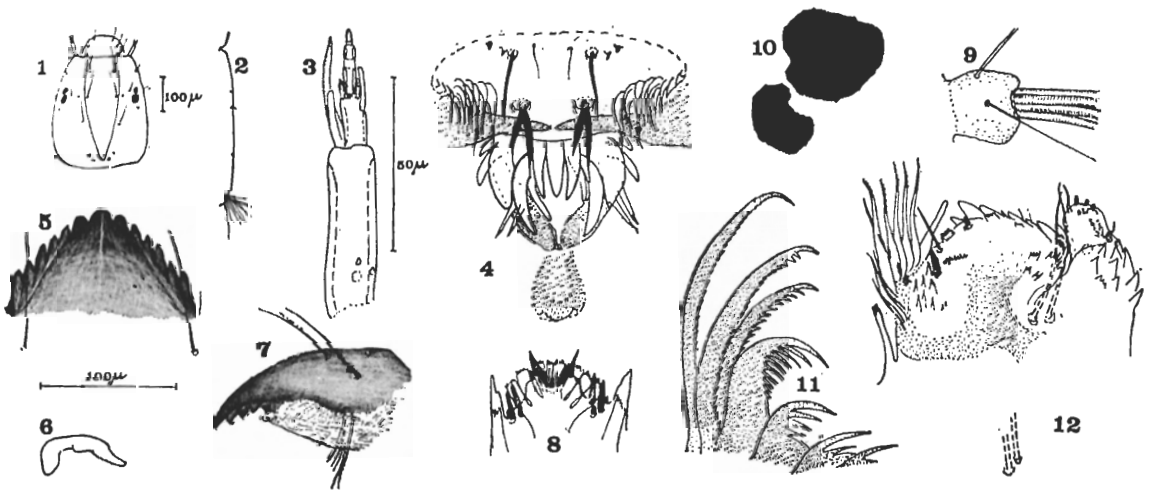


Figure 123. *Cricotopus* (*C.*) ?*annulator* Goetgh., larva from the *bituberculatus*-material of Thienemann. Head, dorsal (1); L setae of abdominal segment IV (2); antenna (3); palatal surface of labrum (4); mentum (5); premandible (6); mandible(7); prementum (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=2; 3=4, 8–12; 5=6–7.

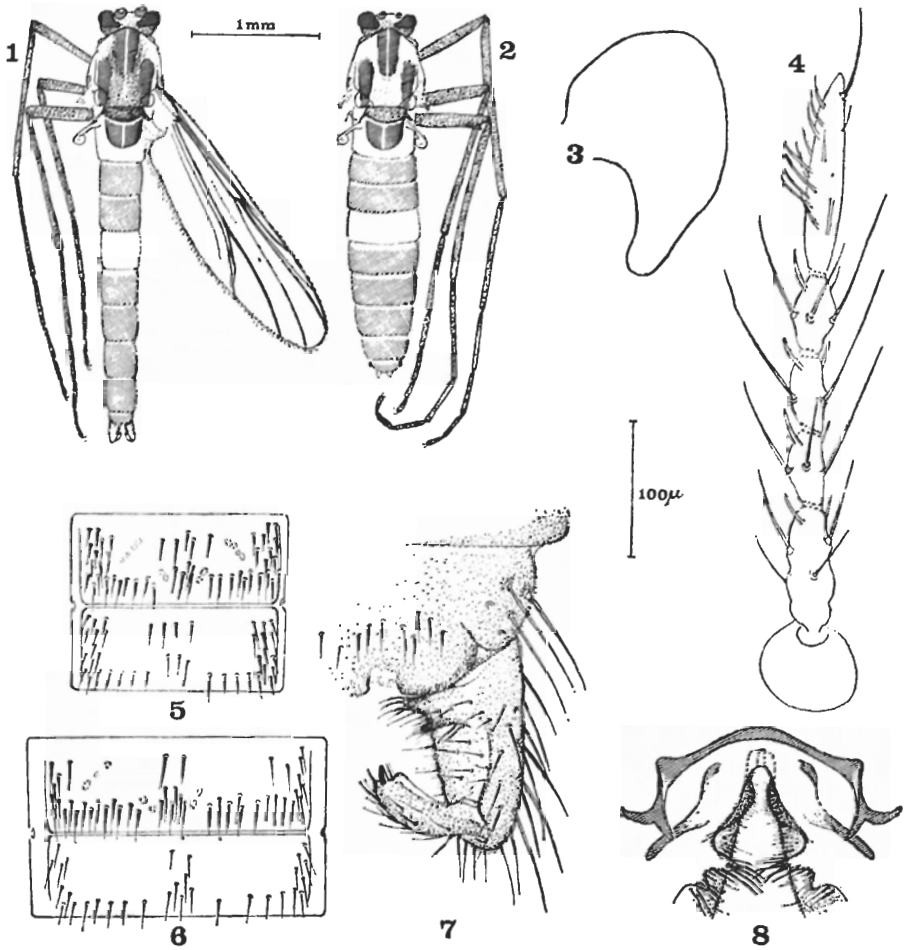


Figure 124. *Cricotopus* (*C.*) *beckeri* Hirv., adult. ♂ (1); ♀ (2); cercus of ♀ (3); antenna of ♀ (4); chaetotaxy scheme for abdominal segments III and IV of ♂ (5); same of ♀ (6); hypopygium of ♂ (7); aedeagal lobe and phallapodeme of hypopygium (8). Scale of drawings 1=2; 3=4, 7–8.

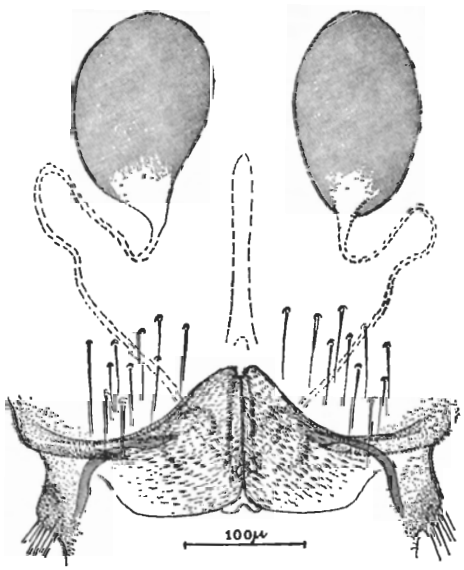


Figure 125. *Cricotopus* (*C.*) *beckeri* Hirv., spermathecae and outer genitalia of ♀.

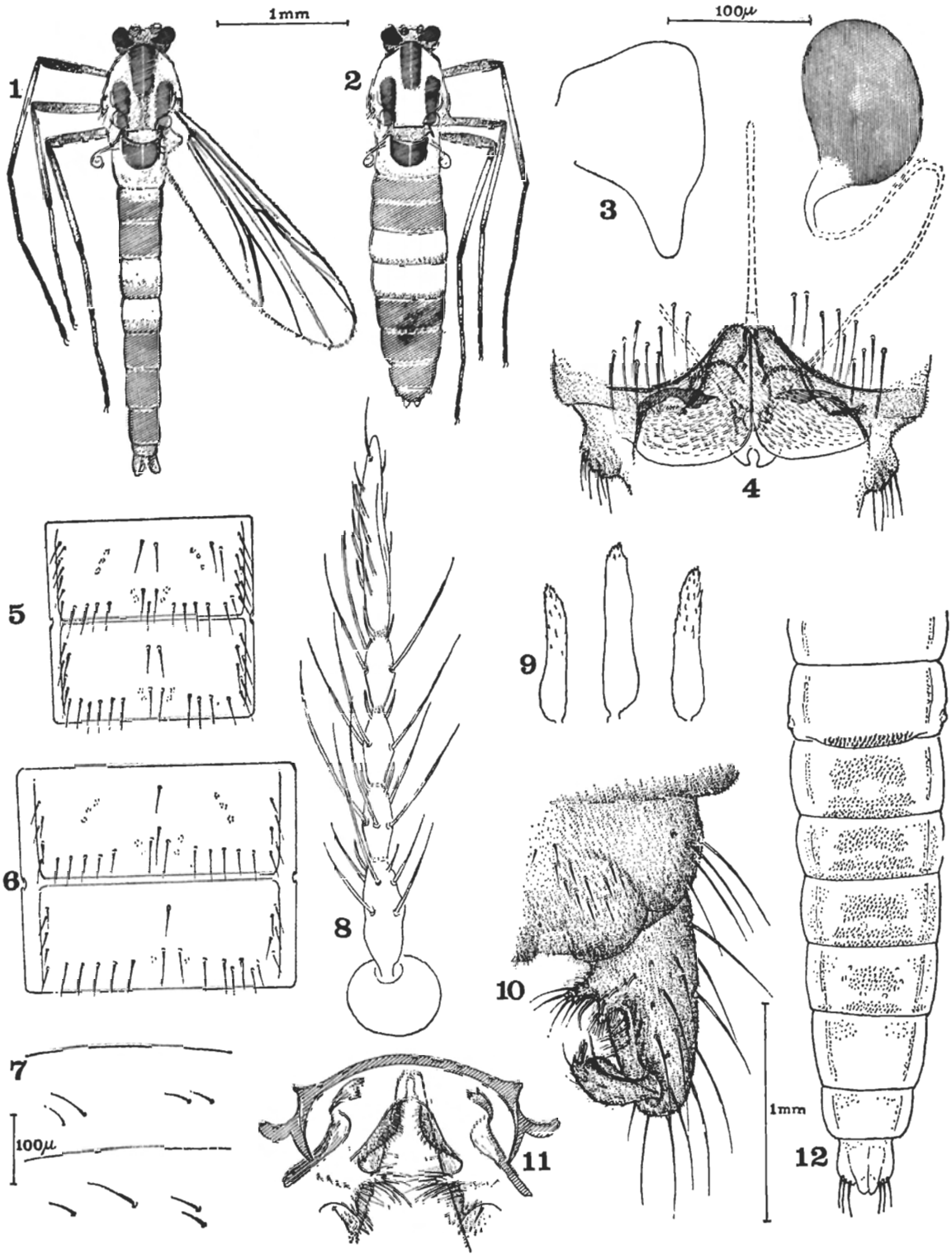


Figure 126. *Cricotopus* (*C.*) *triannulatus* (Macq.), adult, pupa. ♂ (1); ♀ (2); cercus of ♀ (3); spermatheca and outer genitalia of ♀ (4); chaetotaxy scheme for abdominal segments III and IV of ♂ (5); same of ♀ (6); variation in arrangement and size relationship of Dc setae of pupa (7); antenna of ♀ (8); thoracic horn of pupa (9); hypopygium of ♂ (10); aedeagal lobe and phallapodeme of hypopygium (11); shagreen of abdominal tergites of pupa (12). Scale of drawings 1=2; 3=4, 8–11.

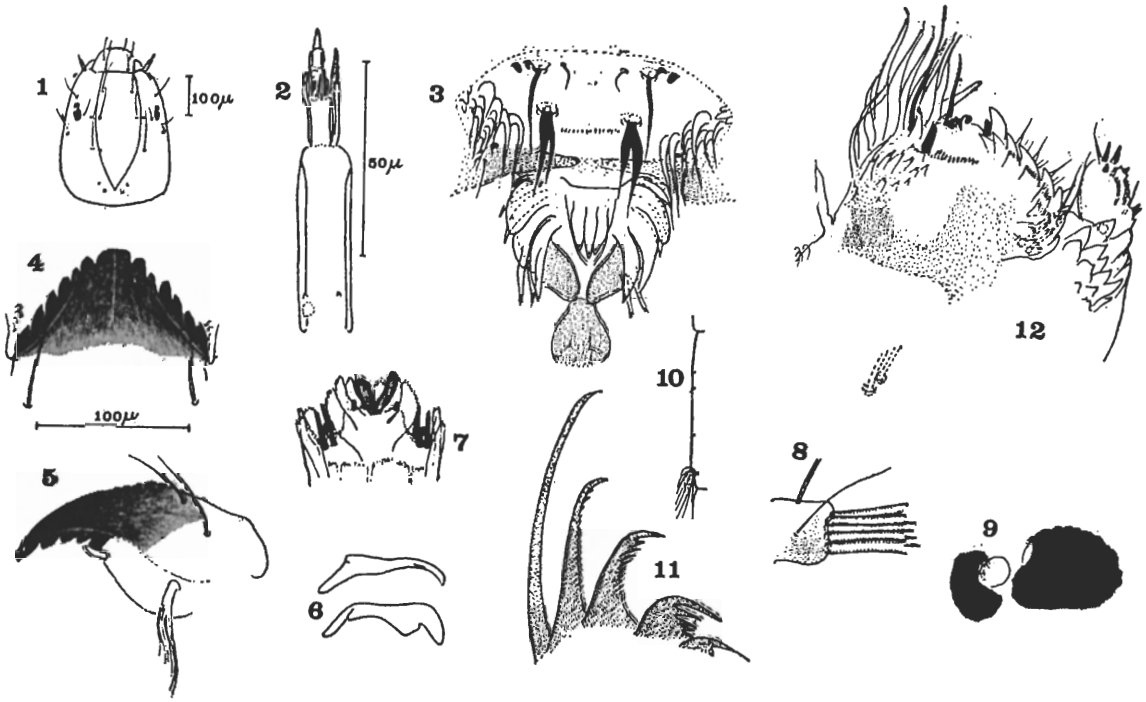


Figure 127. *Cricotopus* (*C.*) *triannulatus* (Macq.), larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); premandible (6); prementum (7); procercus (8); eyespots (9); L setae of abdominal segment III (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=10; 2=3, 7–9, 11–12; 4=5–6.

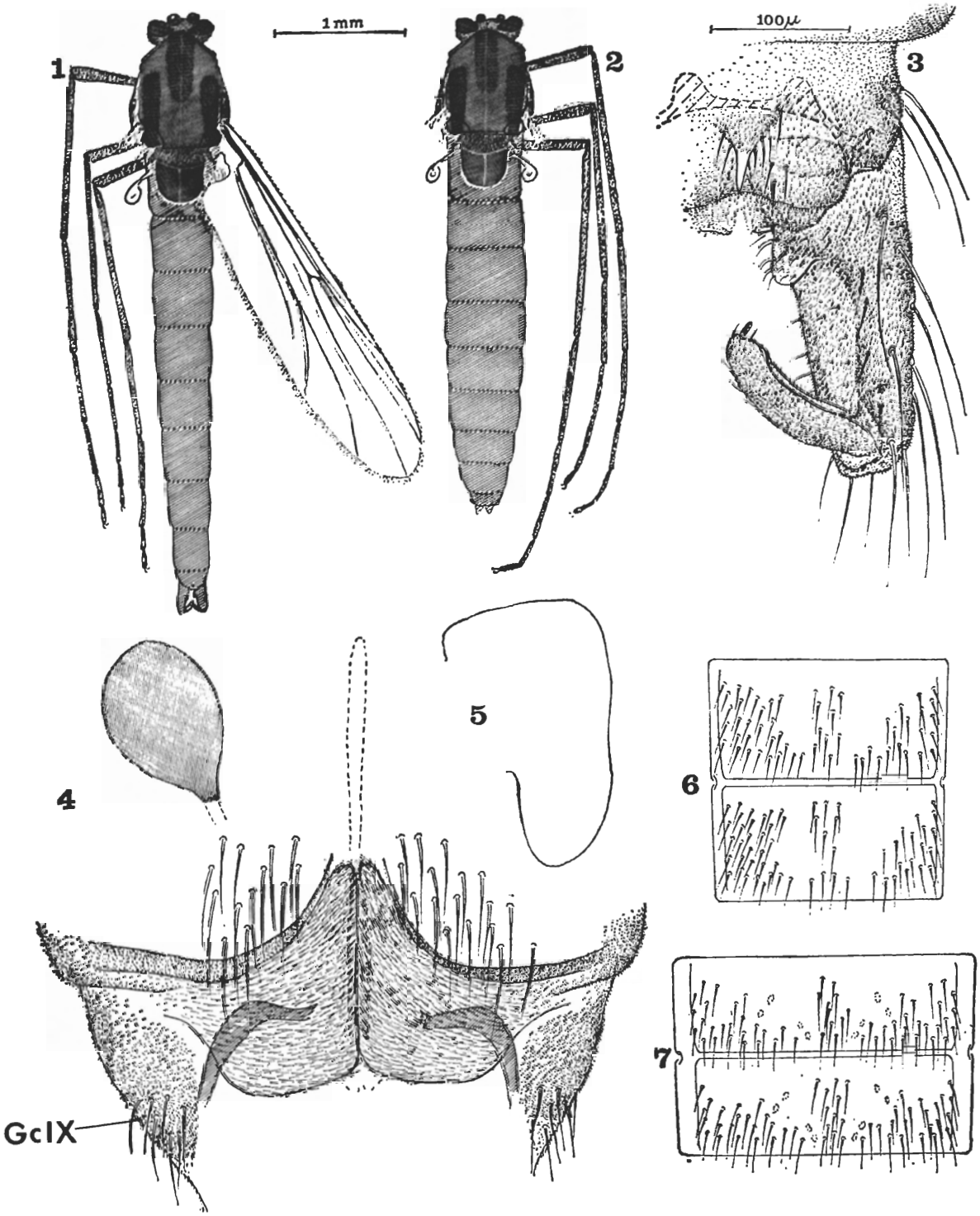


Figure 128. *Cricotopus (Nostococladius) lygropis* Edw., adult (Holotype ♀; placement of ♂ not certain). ♂ (1); ♀ (2); hypopygium of ♂ (3); spermatheca and outer genitalia of ♀ (4); cercus of ♀ (5); chaetotaxy for abdominal tergites III and IV of ♂ (6); same of ♀ (7). Scale of drawings 1=2; 3=4–5.—Gc IX gonocoxite IX.

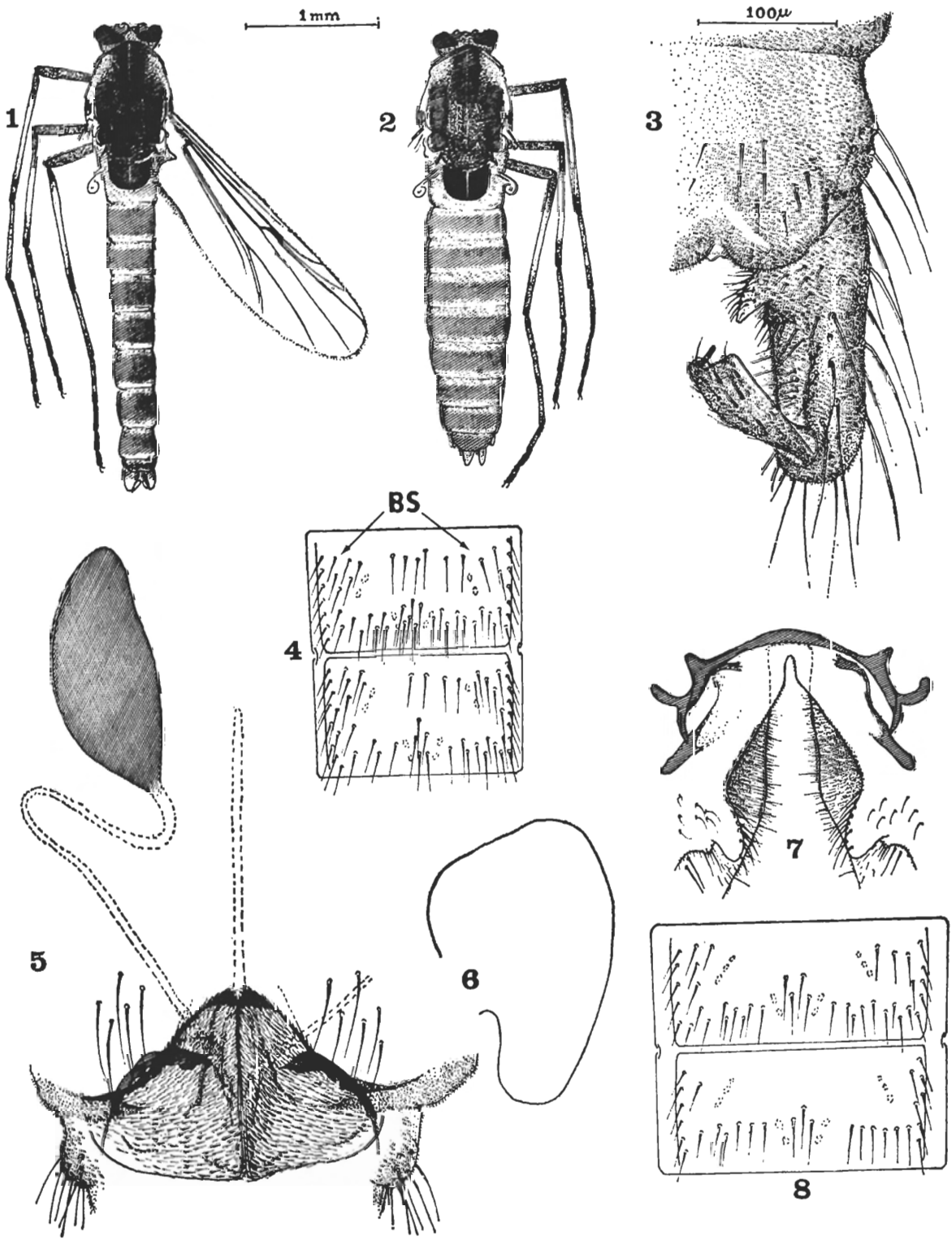


Figure 129. *Cricotopus* (*C.*) *cylindraceus* (Kieff.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); chaetotaxy scheme for abdominal tergites III and IV of ♂ (4); spermatheca and outer genitalia of ♀ (5); cercus of ♀ (6); aedeagal lobe and phallapodeme of hypopygium (7);chaetotaxy scheme for abdominal tergites III and IV of ♀ (8). Scale of drawings 1=2; 3=5–7.—BS basal setae.

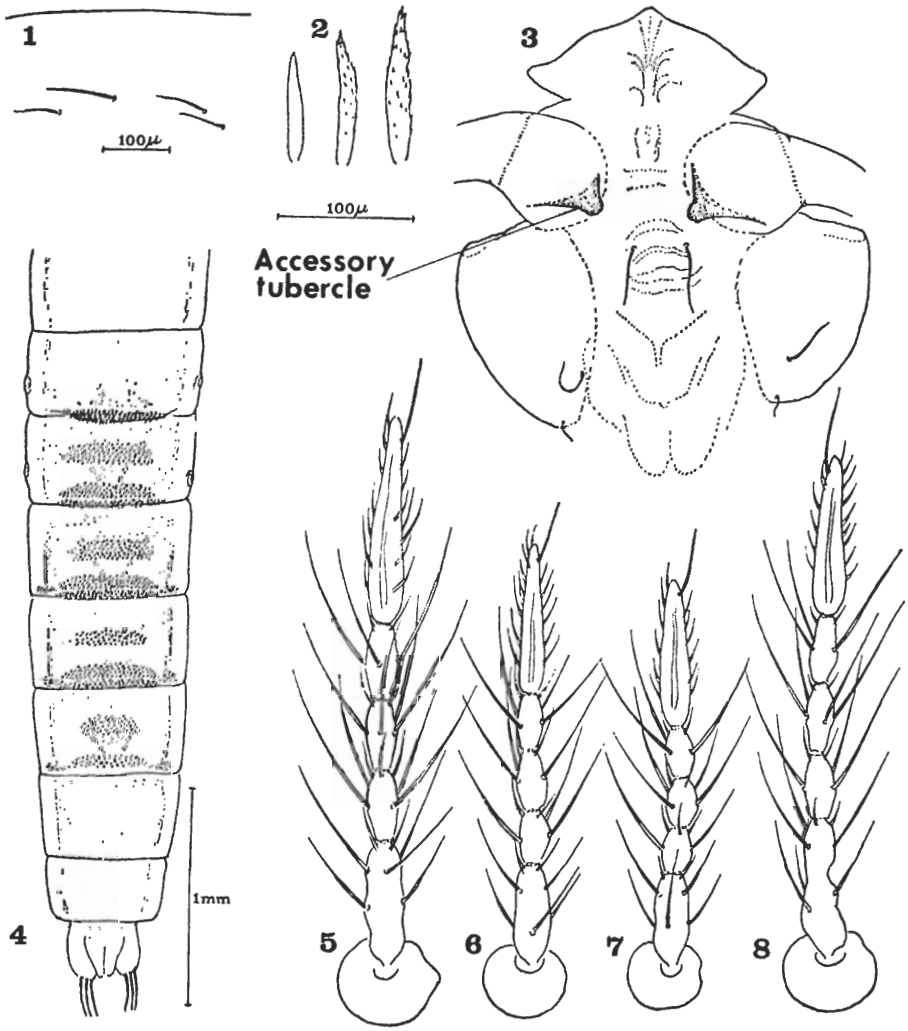


Figure 130. *Cricotopus* (*C.*) *cylindraceus* (Kieff.), adult, pupa. Size relationship and arrangement of De setae (1); thoracic horn (2); region of head seen from front, above, frontal apotome, laterally antennal bases and ocular field (3); abdominal segments of pupa (4); antenna of ♀ (5). Antenna of ♀ of *C.* (*C.*) *coronatus* Hirv. (6); same of *C.* (*C.*) *patens* Hirv. (7); same of *C.* (*C.*) *festivellus* (Kieff.) (8). Scale of drawings 1=3; 2=5–8.

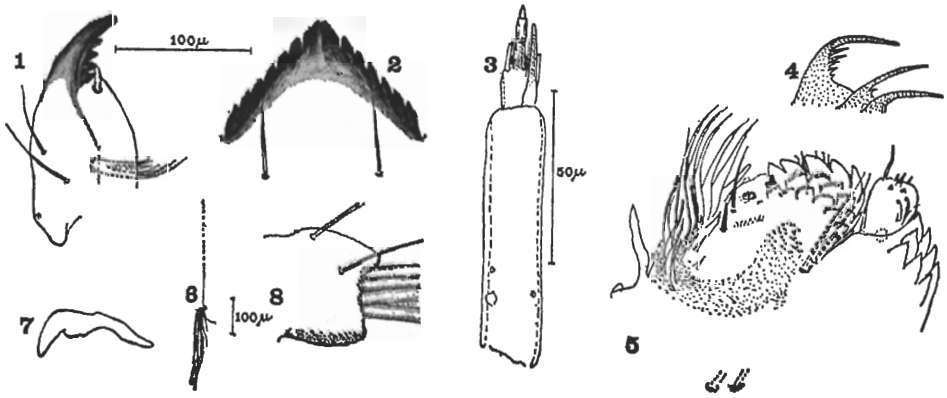


Figure 131. *Cricotopus* (*C.*) *cylindraceus* (Kieff.), larva. Mandible (1); mentum (2); antenna (3); some of the smaller claws of anterior parapods (4); maxilla (5); L_4 of abdominal segment ?IV (6); premandible (7); procercus (8). Scale of drawings 1=2, 7; 3=4–5, 8.

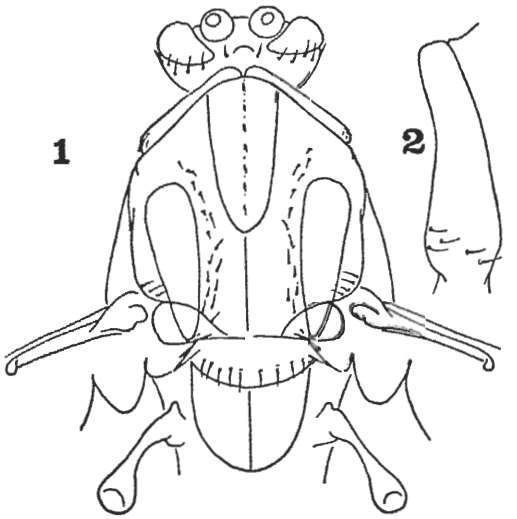


Figure 132. *Cricotopus* (*C.*) *patens* Hirv., adult. Chaetotaxy scheme of head and thorax, dorsal (1); antepronotum, lateral (2).

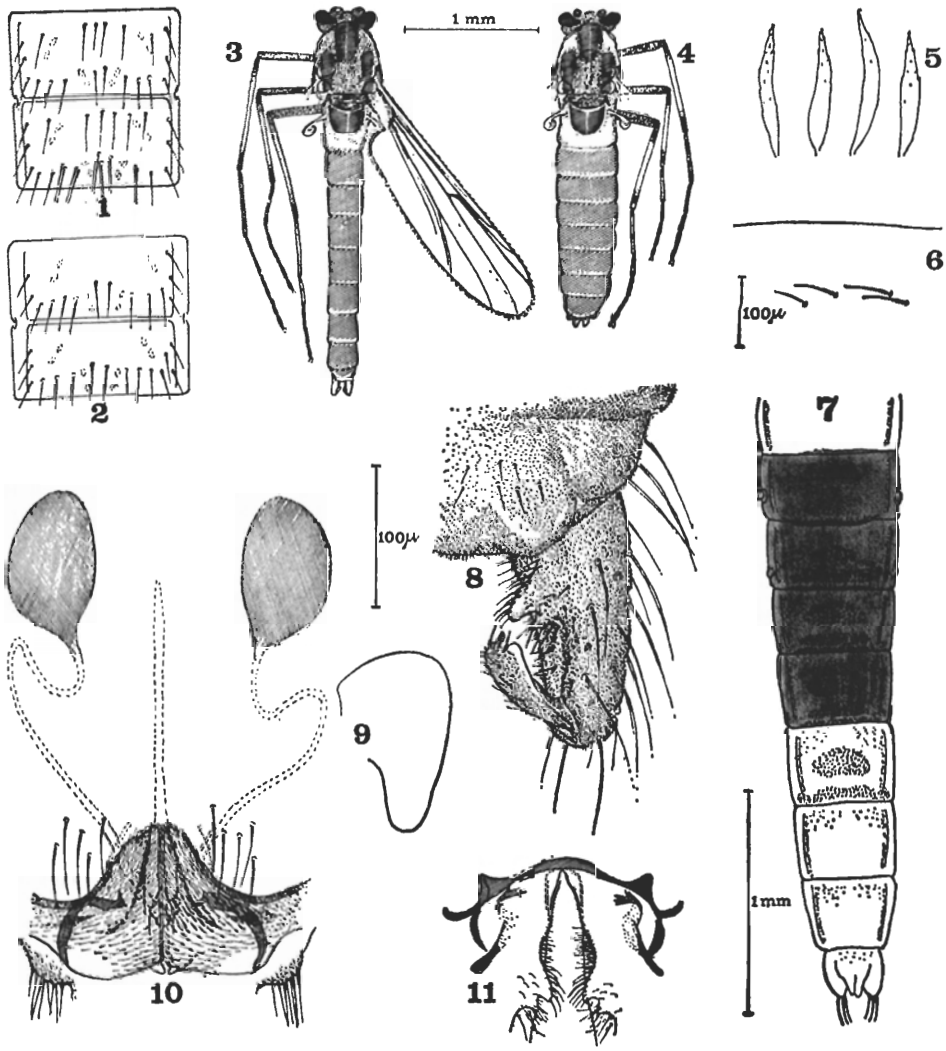


Figure 133. *Cricotopus* (*C.*) *patens* Hirv., adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); abdominal segments of pupa (7); hypopygium of ♂ (8); cercus of ♀ (9); spermathecae and outer genitalia of ♀ (10); aedeagal lobe and phallapodeme of hypopygium (11). Scale of drawings 3=4; 5=8–11.

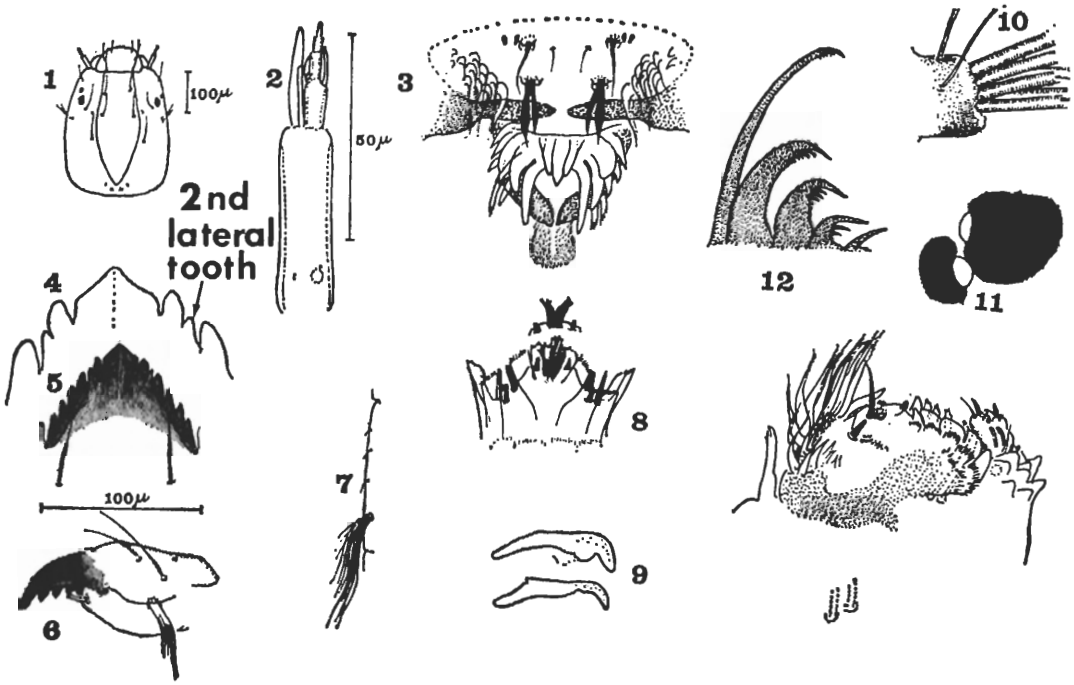


Figure 134. *Cricotopus* (*C.*) *patens* Hirv., larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); median tooth and first three lateral teeth of mentum (4); mentum (5); mandible (6); L setae of abdominal segment IV (7); prementum (ligula drawn above, separated) (8); premandible (9); procercus (10); eyespots (11); claws of anterior parapods (12); maxilla (13). Scale of drawings 1=7; 2=3–4, 8, 10–13; 5=6, 9.

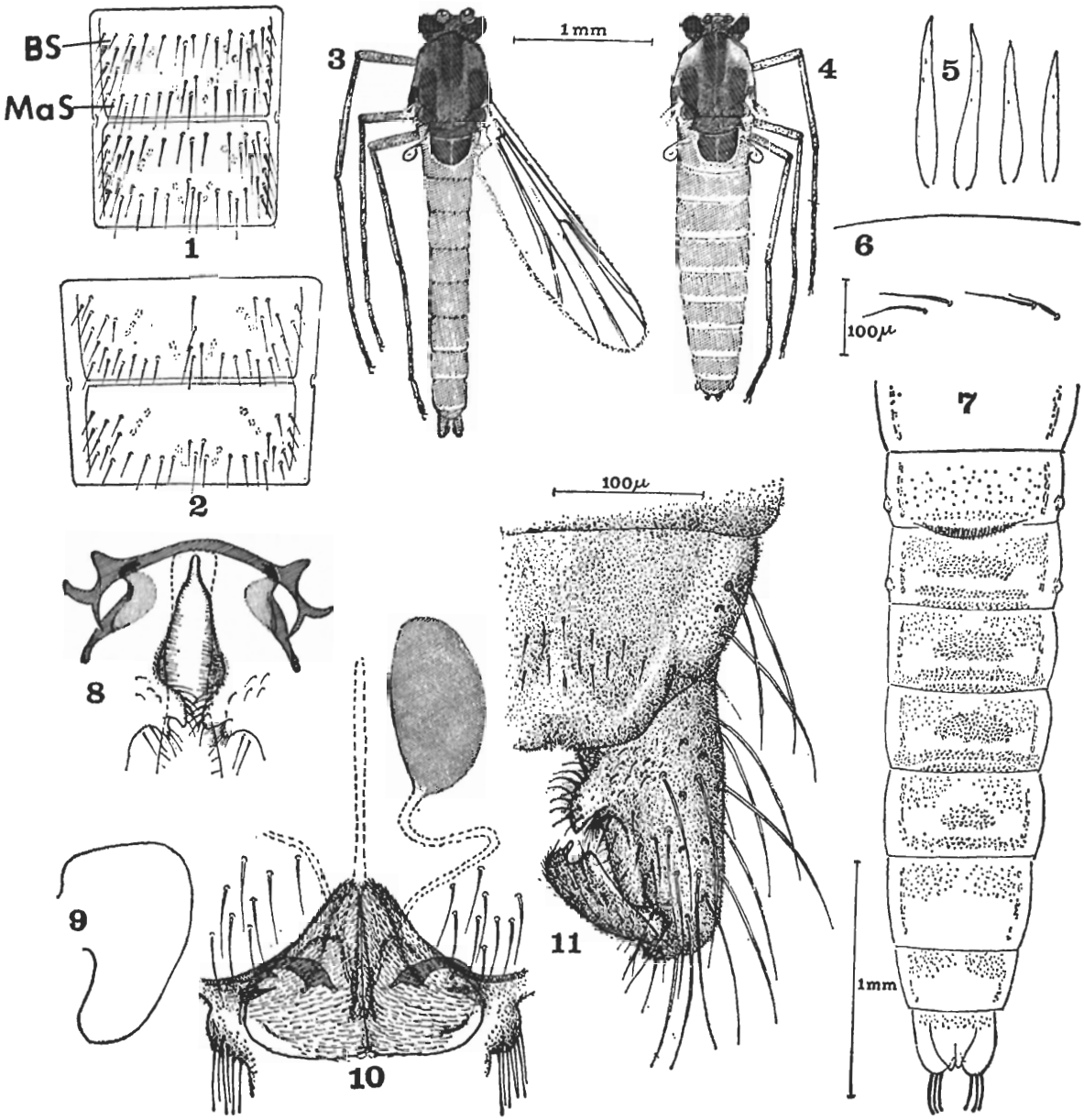


Figure 135. *Cricotopus* (*C.*) *coronatus* Hirv., adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); abdominal segments of pupa (7); aedeagal lobe and phallapodeme of hypopygium (8); cercus of ♀ (9); spermatheca and outer genitalia of ♀ (10); hypopygium of ♂ (11). Scale of drawings 3=4; 5=8–11. BS transverse row of basal setae, MaS transverse row of marginal setae.

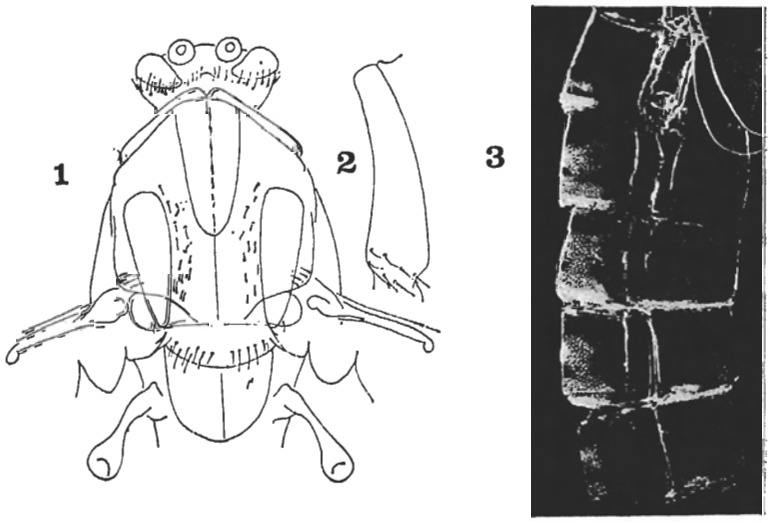


Figure 136. *Cricotopus* (*C.*) *festivellus* (Kieff.). Chaetotaxy scheme for head and thorax, dorsal (1); and antepronotum, lateral (2) of adult; abdominal segments II–VI of pupal exuvium, lateral (dark field photography) (3).

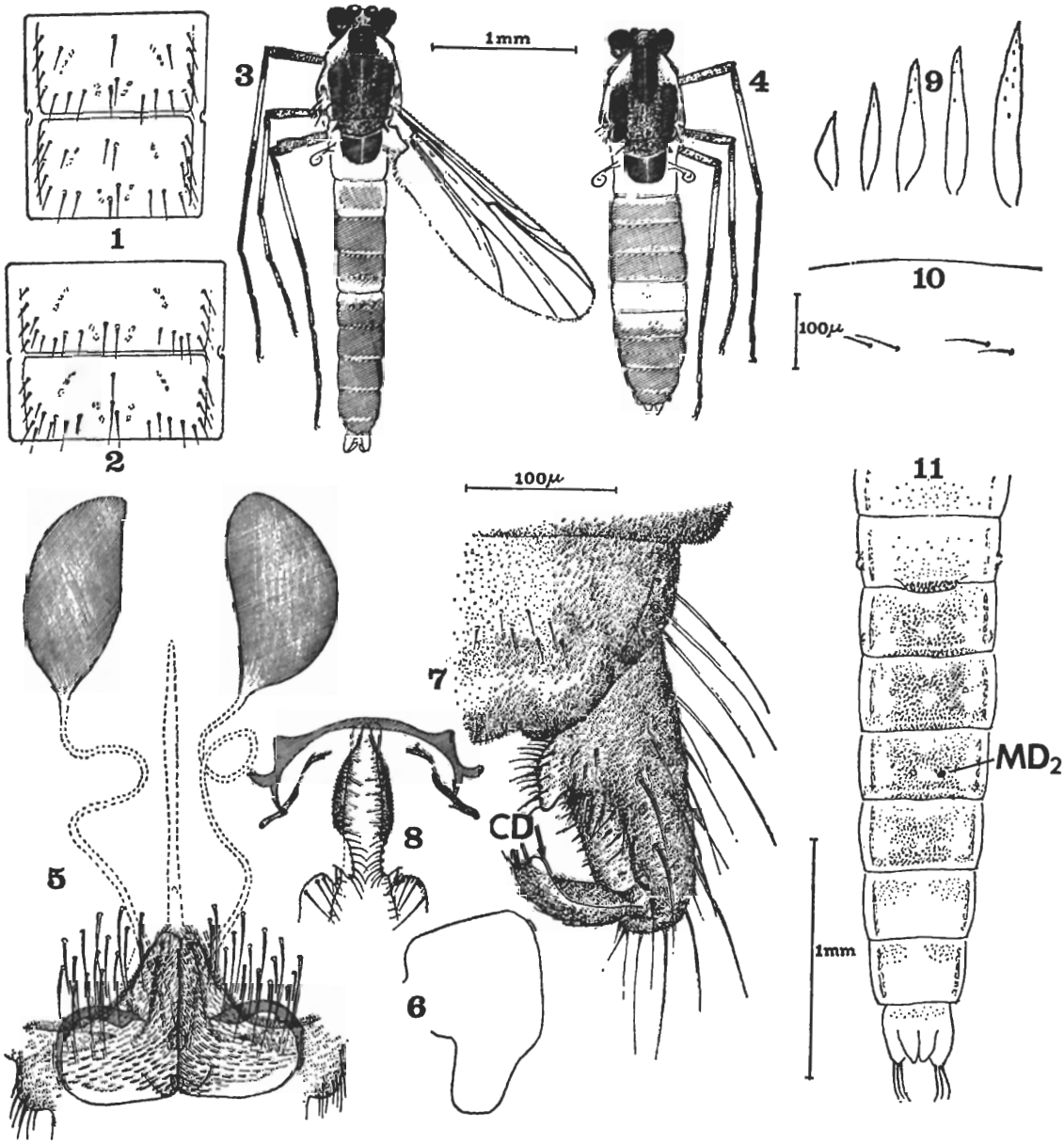


Figure 137. *Cricotopus* (*C.*) *festivellus* (Kieff.), adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); spermathecae and outer genitalia of ♀ (5); cercus of ♀ (6); hypopygium of ♂ (7); aedeagal lobe and phallapodeme of hypopygium (8); variation in thoracic horn (9); size relationship and arrangement of the Dc setae of pupa (10); abdominal segments of pupa (11). Scale of drawings 3=4; 5=6–9. CD crista dorsalis, MD_2 posteromedian muscle marks.

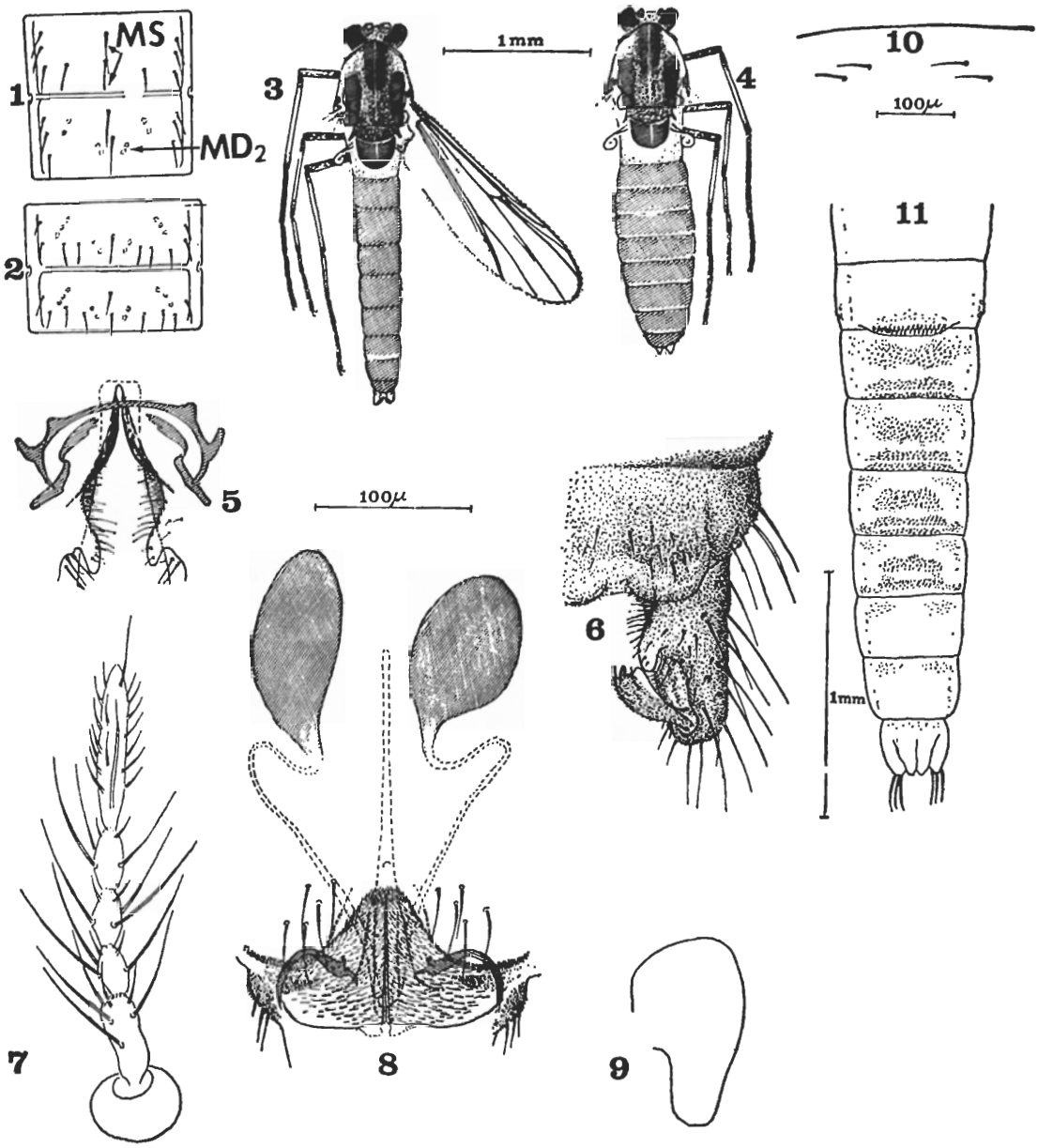


Figure 138. *Cricotopus* (*C.*) *flavocinctus* (Kieff.), adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); hypopygium (6); antenna (7); spermathecae and outer genitalia of ♀ (8); cercus of ♀ (9); size relationship and arrangement of Dc setae of pupa (10); abdominal tergites of pupa (11). Scale of drawings 3=4; 5=6–9.—MD_2 posteromedian muscle marks, MS median setae.

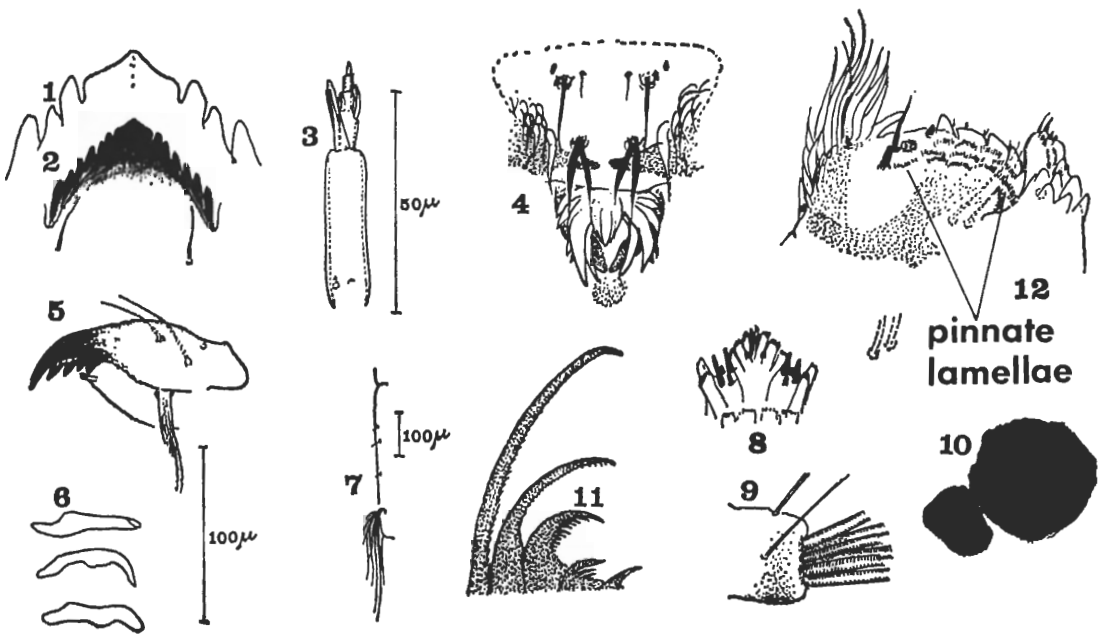


Figure 139. *Cricotopus* (*C.*) *flavocinctus* (Kieff.), larva. Median tooth and first three lateral teeth of mentum (1); mentum (2); antenna (3); palatal surface of labrum (4); mandible (5); premandible (6); L setae of abdominal segment IV (7); prementum (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=3–4, 8–12; 2=5–6.

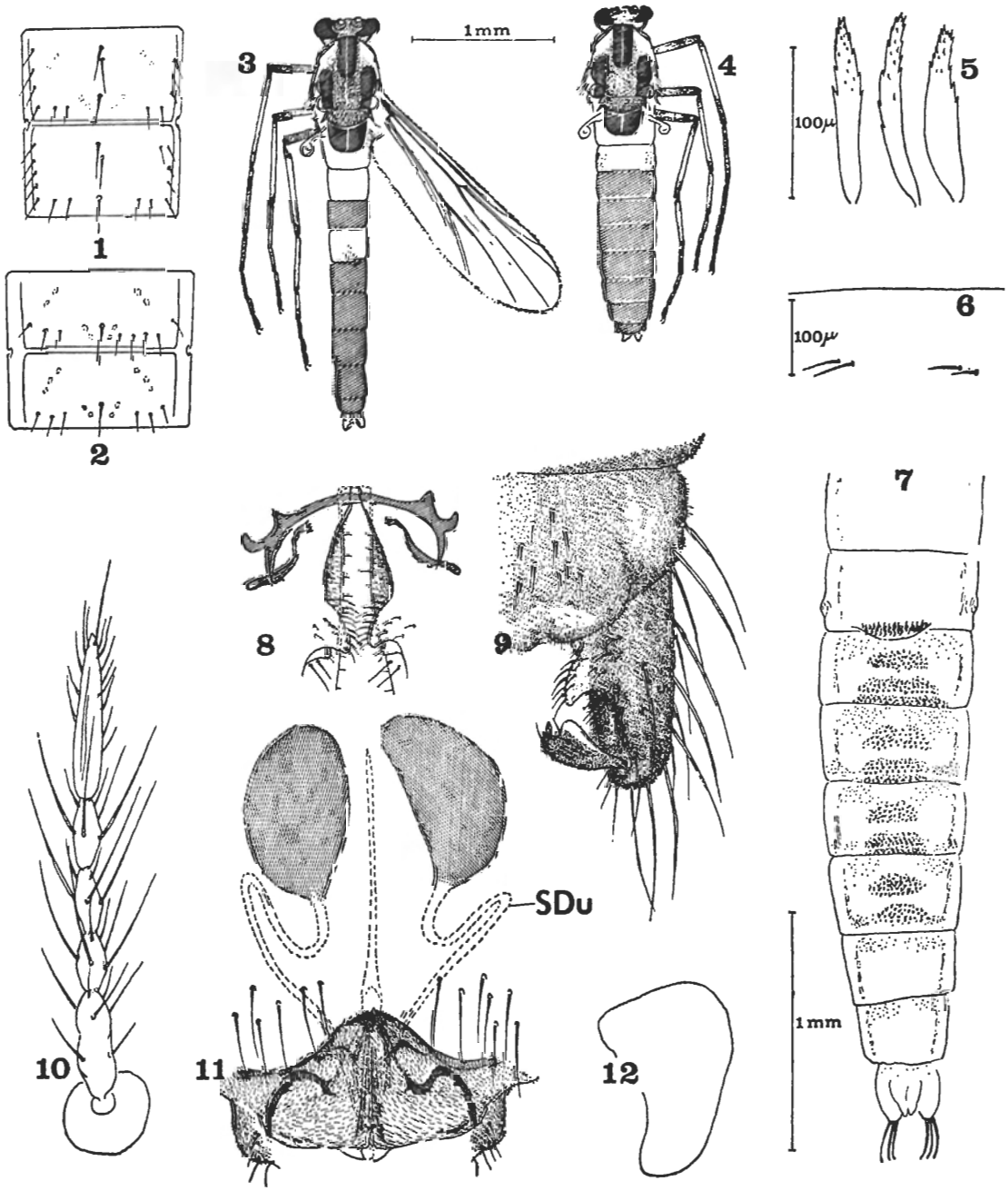


Figure 140. *Cricotopus* (*C.*) *albiforceps* (Kieff.), adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); abdominal segments of pupa (7); aedeagal lobe and phallapodeme of hypopygium (8); hypopygium (9); antenna (10); spermathecae and outer genitalia of ♀ (11); cercus of ♀ (12). Scale of drawings 3=4; 5=8–12. – SDu spermathecal duct.

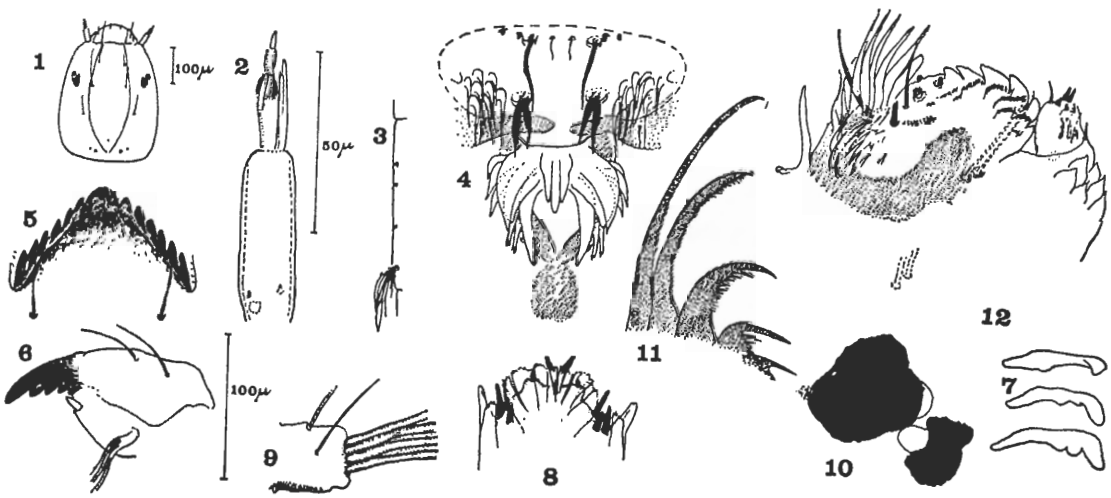


Figure 141. *Cricotopus (C.) albiforceps* (Kieff.), larva. Head, dorsal (1); antenna (2); L setae of abdominal segment IV (3); palatal surface of labrum (4); mentum (5); mandible (6); premandible (7); prementum (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=3; 2=4, 8–12; 5=6–7.

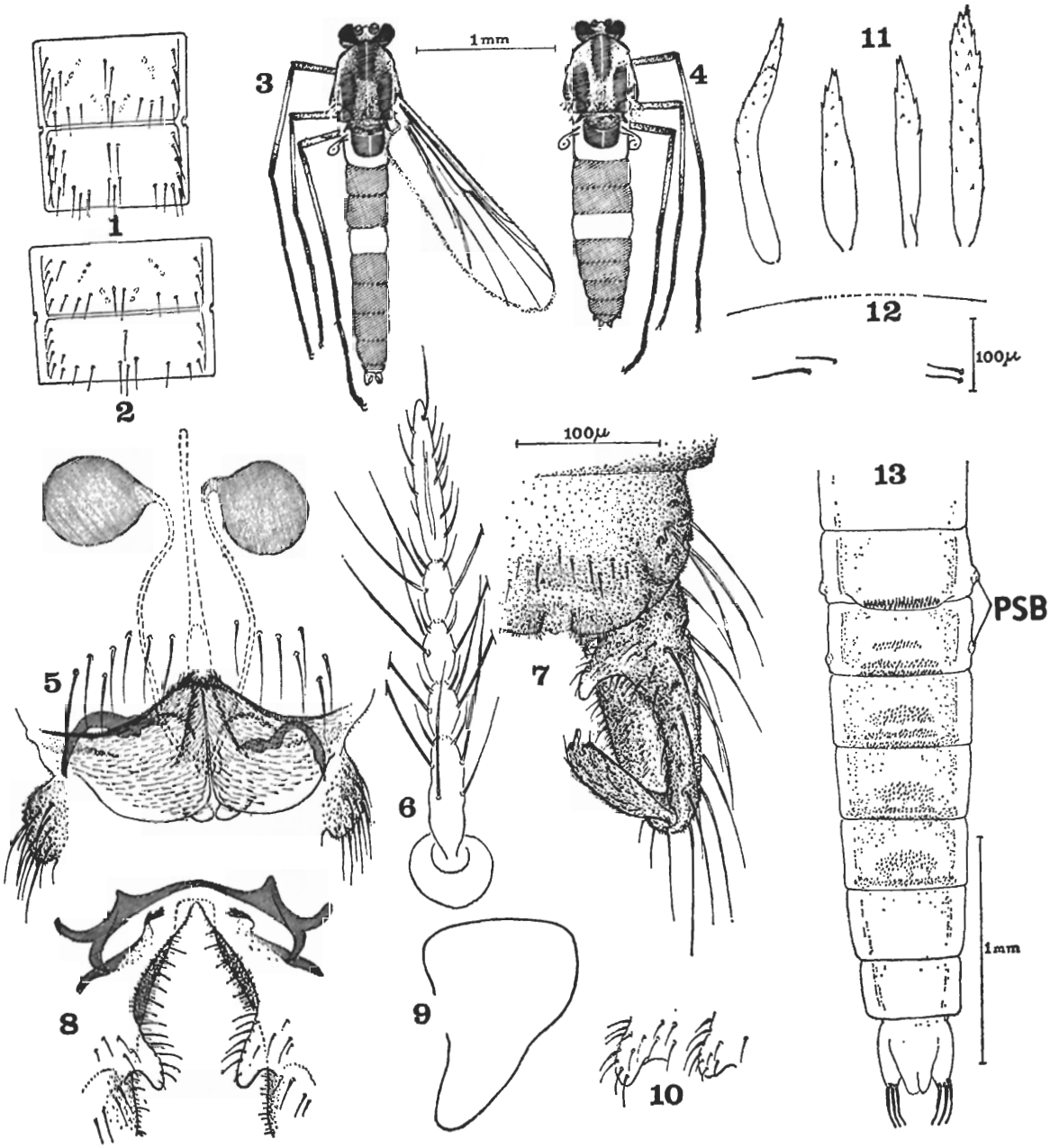


Figure 142. *Cricotopus (C.) bicinctus* (Meig.), adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); spermathecae and outer genitalia of ♀ (5); antenna of ♀ (6); hypopygium of ♂ (7); aedeagal lobe and phallapodeme of hypopygium (8); cercus of ♀ (9); inferior volsella of a population from Mutenianjoki, Finnish-Lappland (10); variation in thoracic horn (populations from Mutenianjoki, left, Tammisaari in the middle, and Tvärminne, right) (11); size relationship and arrangement of Dc setae of pupa (12); shagreen of abdominal segments (pigmentation about as in Figure 57 or 169) of pupa (13). Scale of drawings 3=4; 5=8–11.—PSB pedes spurii B.

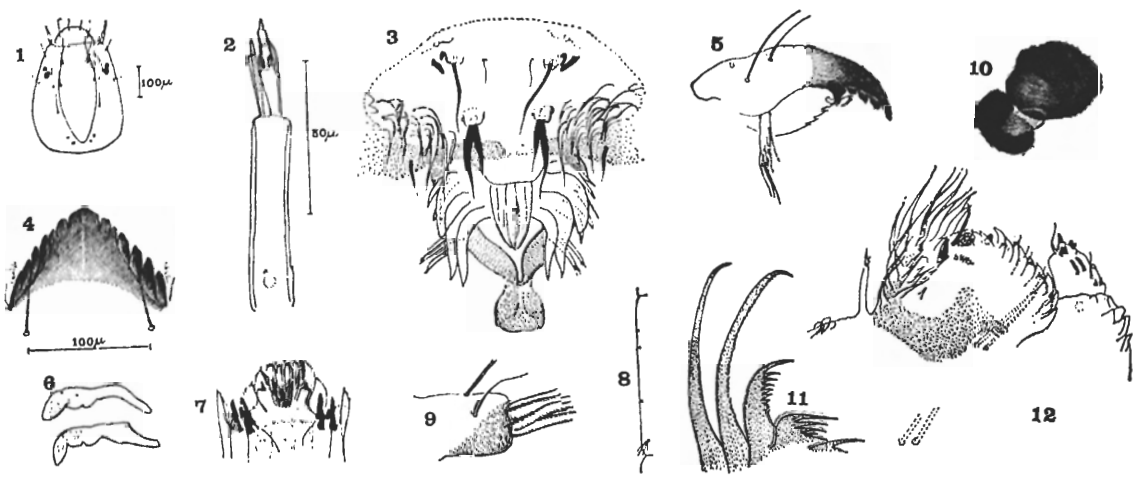


Figure 143. *Cricotopus (C.) bicinctus* (Meig.), larva. Head, dorsal, (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); premandible (6); prementum (7); L setae of abdominal segment V (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=8; 2=3, 7, 9–12; 4=5–6.

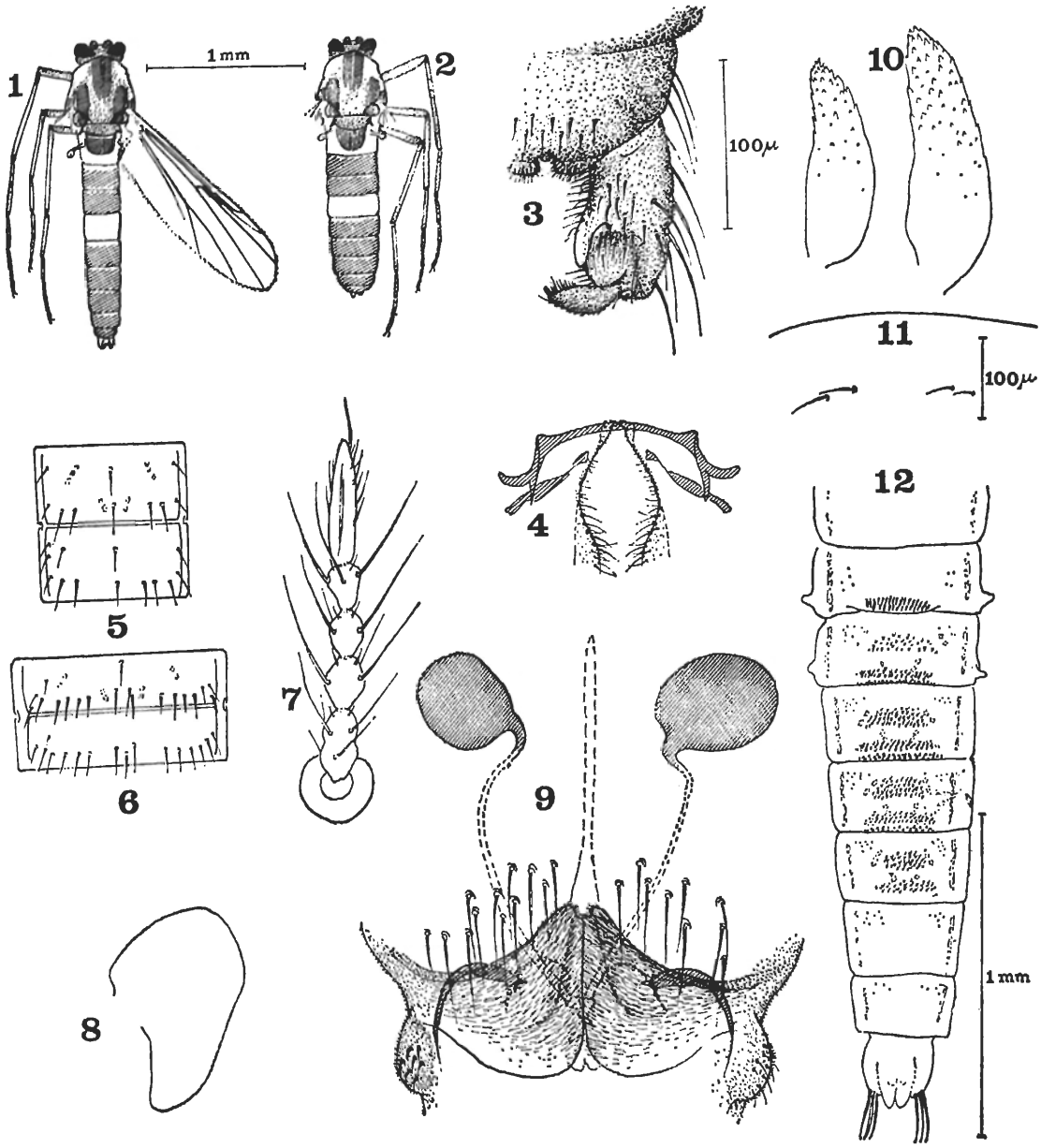


Figure 144. *Cricotopus (C.) vierriensis* Goetgh., adult, pupa. ♂ (1); ♀ (2); hypopygium (3); aedeagal lobe and phallapodeme of hypopygium (4); chaetotaxy scheme for abdominal tergites III and IV of ♂ (5); same of ♀ (6); antenna (7); cercus of ♀ (8); spermathecae and outer genitalia of ♀ (9); thoracic horn (10); size relationship and arrangement of Dc setae of pupa (11); abdominal segments of pupa (12). Scale of drawings 1=2; 3=4, 7–10.

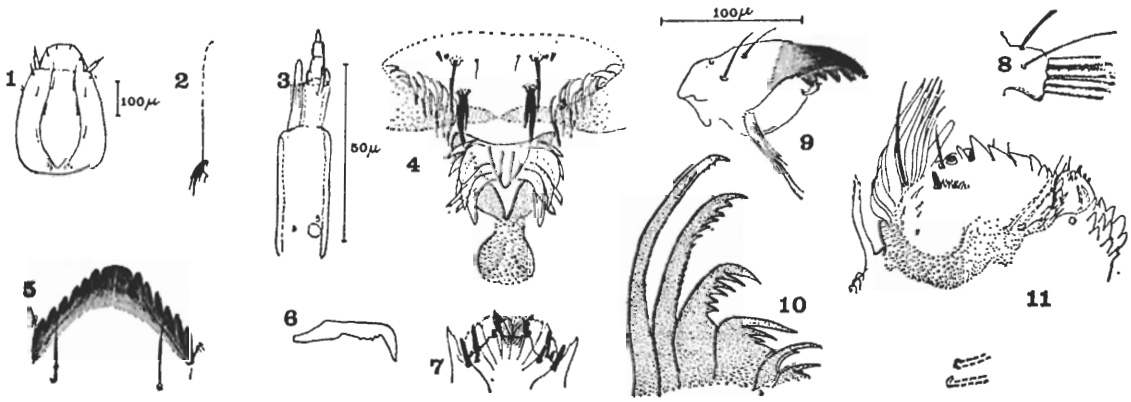


Figure 145. *Cricotopus (C.) vierriensis* Goetgh., larva. Head, dorsal (1); L_4 from one of the middle abdominal segments (2); antenna (3); palatal surface of labrum (4); mentum (5); premandible (6); prementum (7); procercus (8); mandible (9); claws of anterior parapods (10); maxilla (11). Scale of drawings 1=2; 3=4, 7–8, 10–11; 5=6, 9.

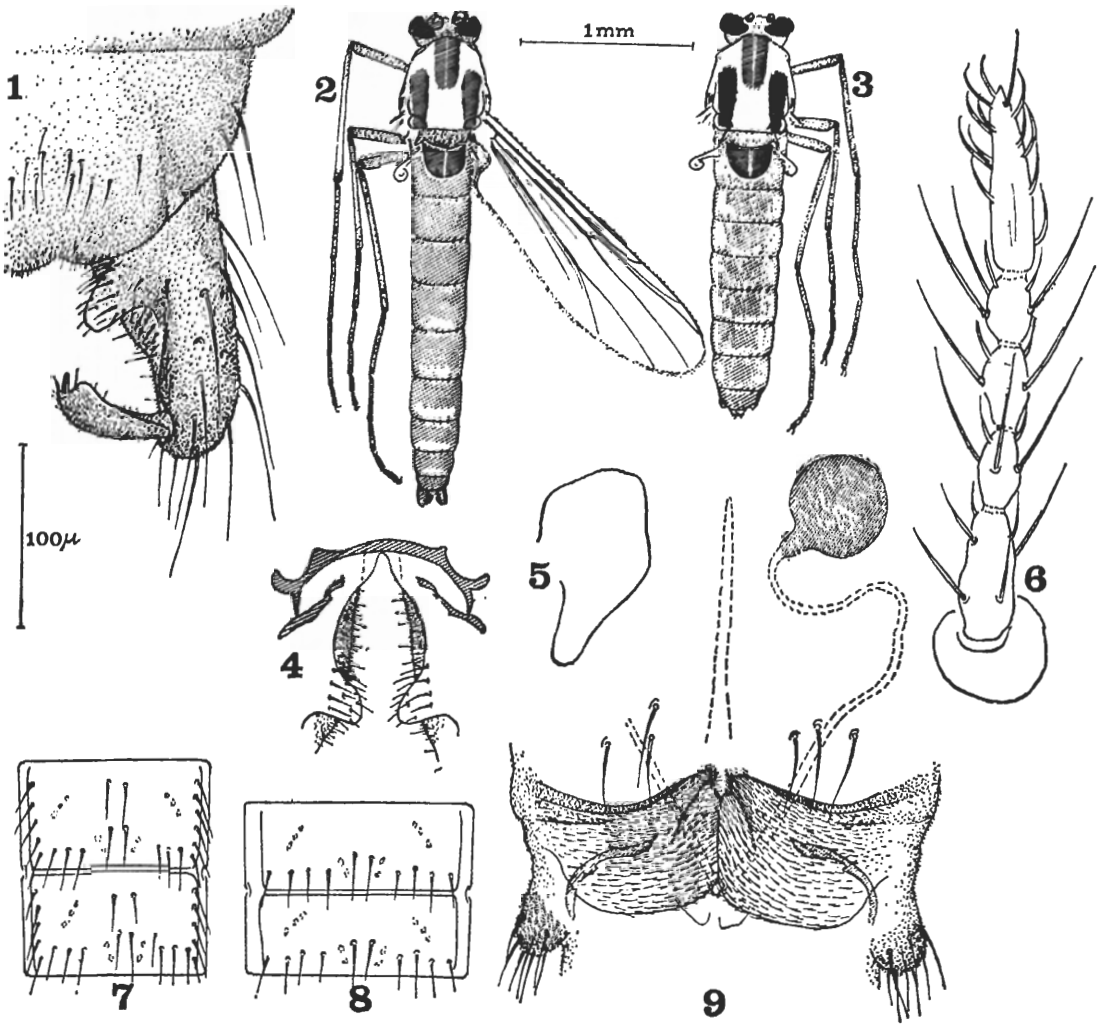


Figure 146. *Cricotopus (C.) pallidipes* Edw., adult. Hypopygium of ♂ (1); ♂ (2); ♀ (3); aedeagal lobe and phallapodeme of hypopygium (4); cercus of ♀ (5); antenna of ♀ (6); chaetotaxy scheme for abdominal tergites III and IV of ♂ (7); same of ♀ (8); spermathecae and outer genitalia of ♀ (9); Scale of drawings 1=4–6, 9; 2=3.

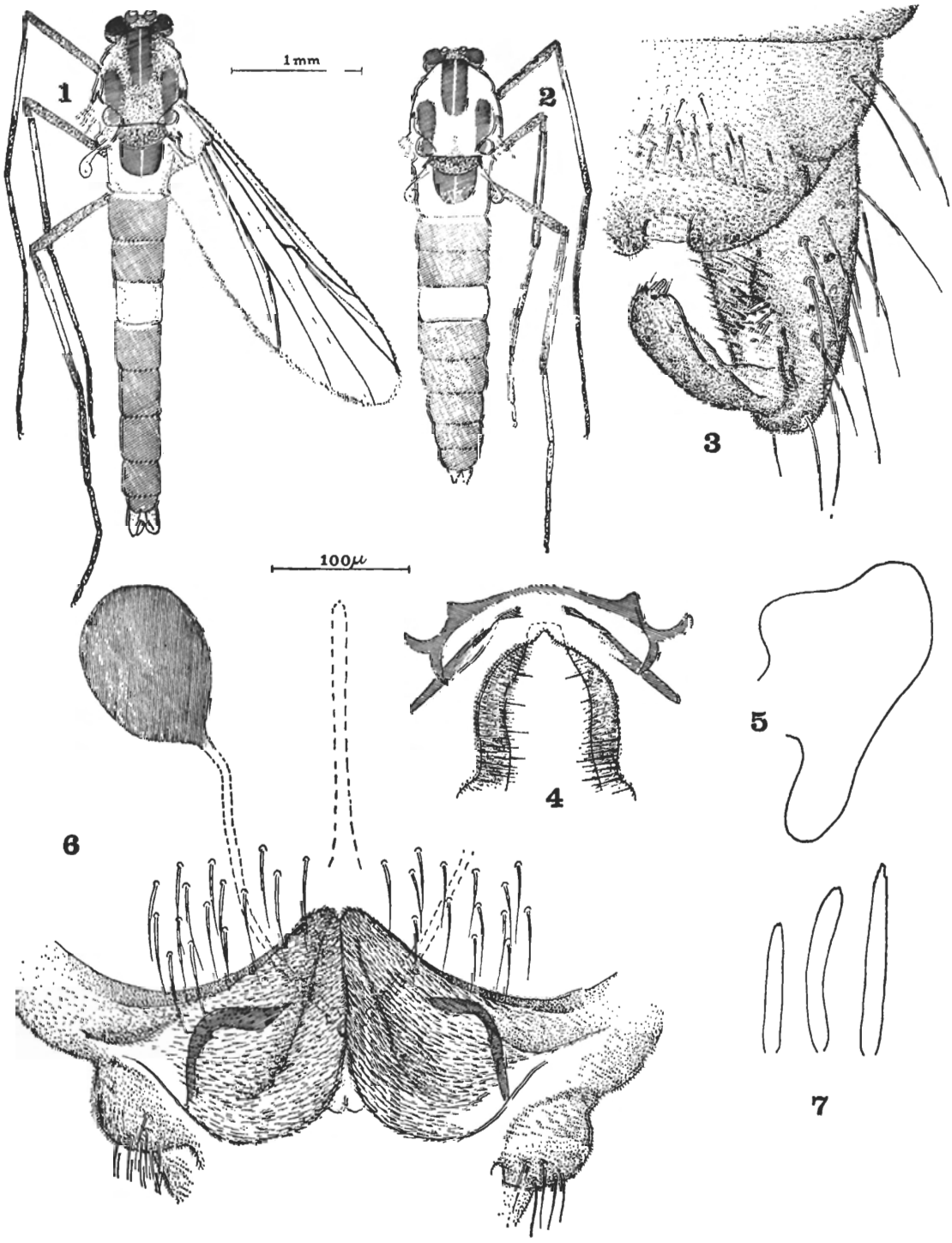


Figure 147. *Cricotopus (C.) trifascia* Edw., adult, pupa. ♂ (1); ♀ (2); hypopygium (3); aedeagal lobe and phallapodeme of hypopygium (4), cercus of ♀ (5); spermatheca and outer genitalia of ♀ (6); thoracic horn of pupa (7). Scale of drawings 1=2; 3=4–7.

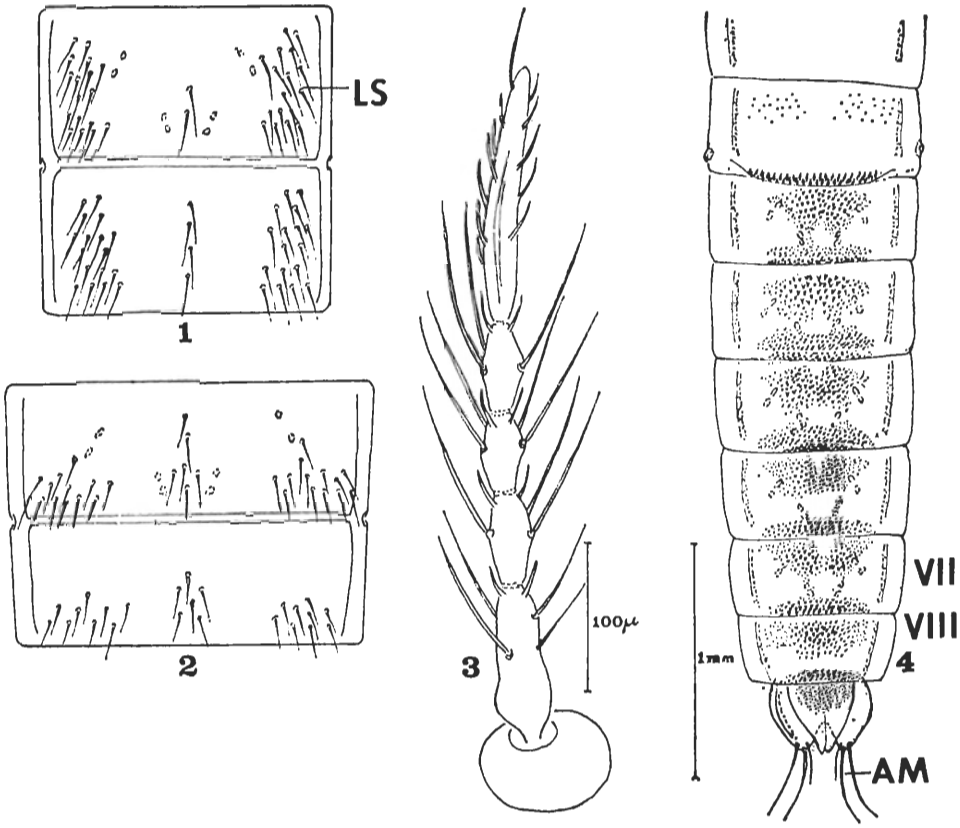


Figure 148. *Cricotopus (C.) trifascia* Edw., adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); antenna of ♀ (3); shagreen of abdominal tergites of pupa (4).—AM anal macrosetae, LS lateral setae.

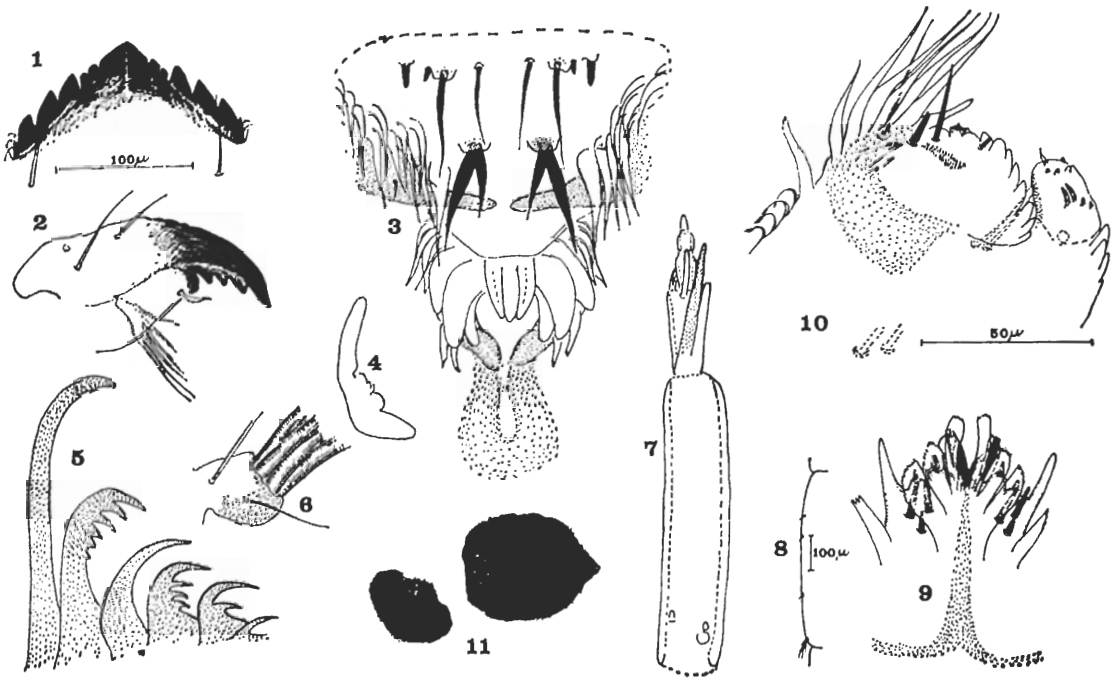


Figure 149. *Cricotopus (C.) trifascia* Edw., larva. Mentum (1); mandible (2); palatal surface of labrum (3); premandible (4); claws of anterior parapods (5); procercus (6); antenna (7); L setae of abdominal segment IV (8); prementum (9); maxilla (10); eyespots (11). Scale of drawings 1=2, 4; 3=5–7, 9–11.

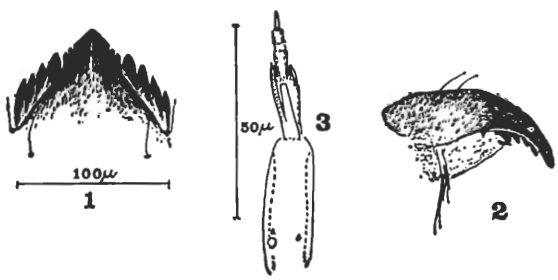


Figure 150. *Cricotopus (C.) trifascia* Edw., ? early instar larva: mentum (1); mandible (2); antenna (3). Scale of drawings 1=2.

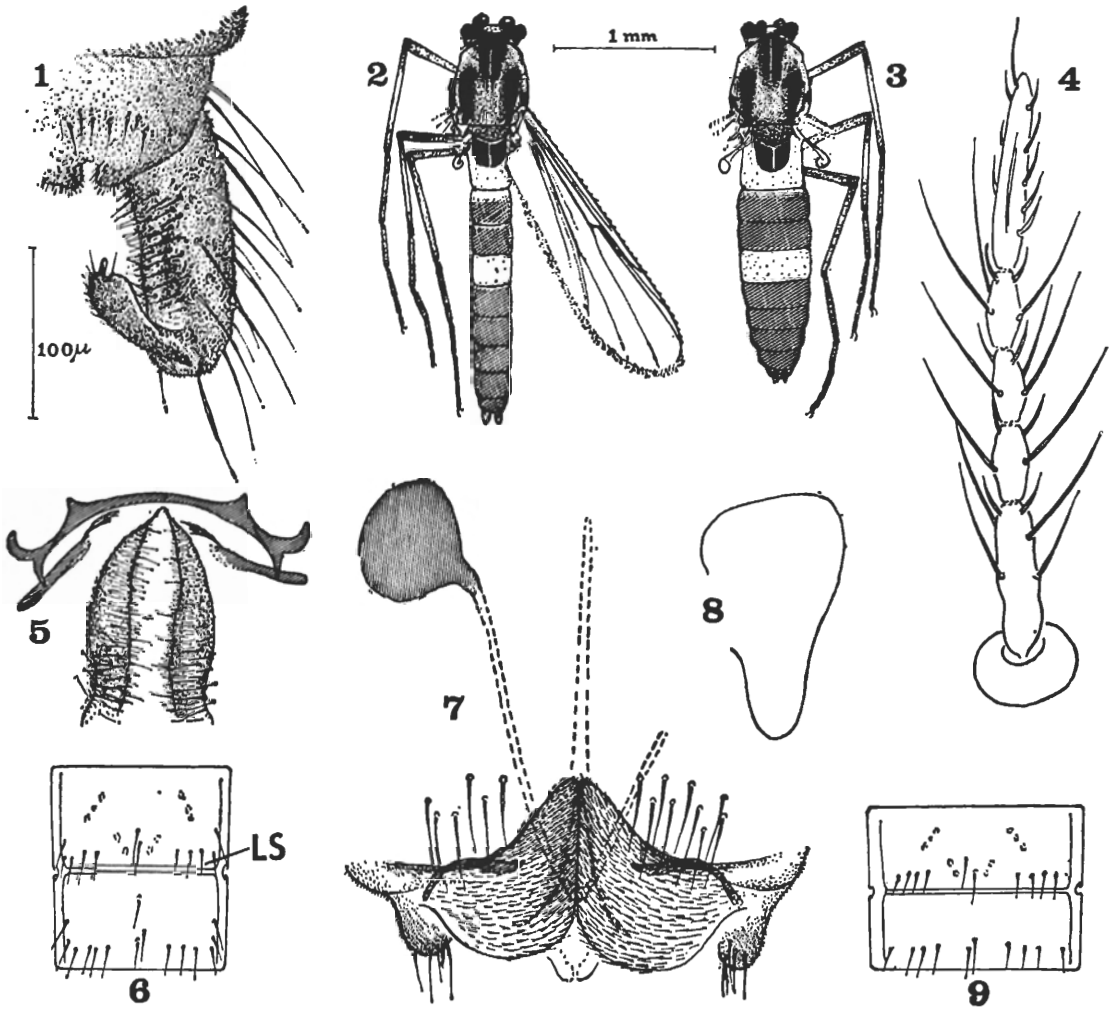


Figure 151. *Cricotopus (C.) similis* Goetgh., adult. Hypopygium of ♂ (1); ♂ (2); ♀ (3); antenna of ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); chaetotaxy scheme for abdominal tergites III and IV of ♂ (6); spermatheca and outer genitalia of ♀ (7); cercus of ♀ (8); chaetotaxy of abdominal tergites III and IV of ♀ (9). Scale of drawings 1=4, 5, 7, 8; 2=3.—LS lateral setae.

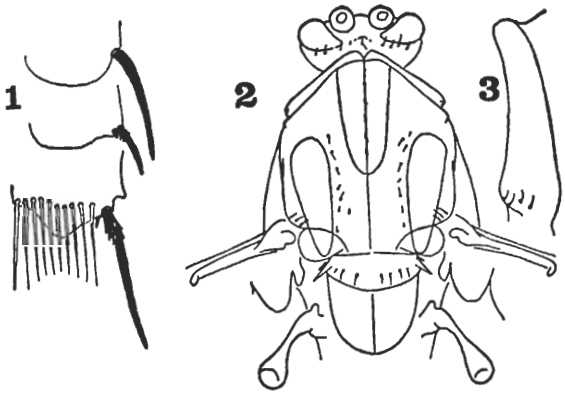


Figure 152. *Cricotopus (C.) caducus* Hirv., adult. Tibial spurs of P_1, P_2 and with tibial comb of P_3 (1); chaetotaxy scheme for head and thorax, dorsal (2); antepronotum, lateral (3).

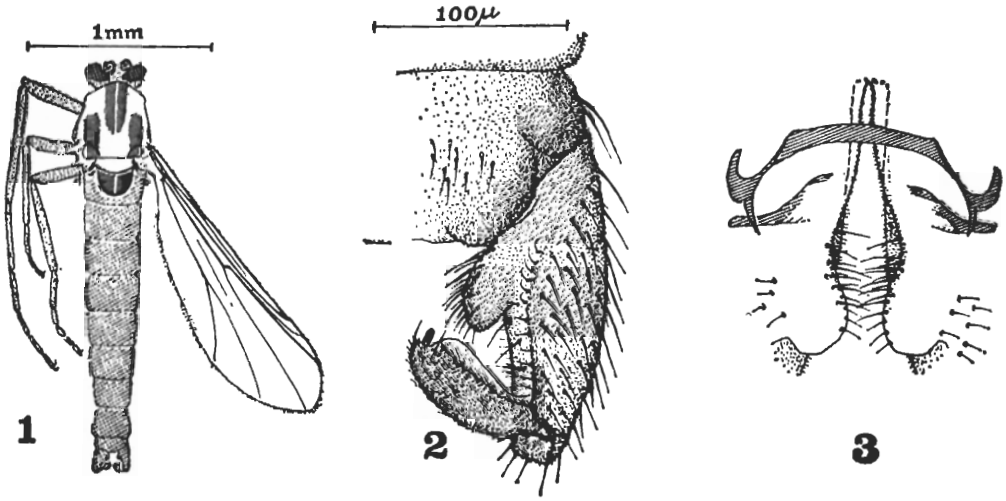


Figure 153. *Cricotopus (C.) guttatus* Hirv., adult. ♂ (1); hypopygium (2); aedeagal lobe and phallapodeme of hypopygium (3).

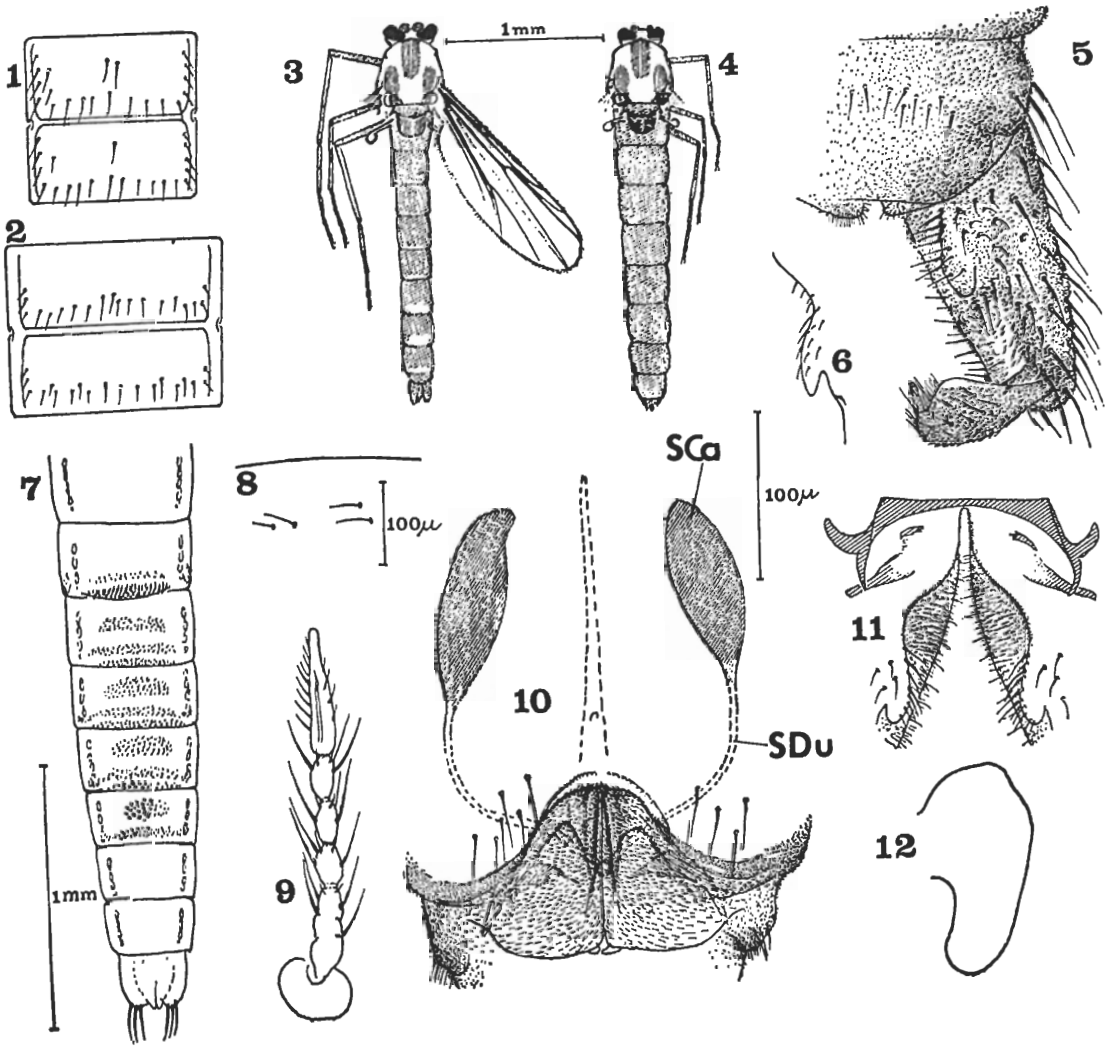


Figure 154. *Cricotopus (C.) caducus* Hirv., adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); hypopygium of ♂ (5); inferior volsella, more lateral than drawing 5 (6); abdominal segments (pigmentation as in Figure 106) of pupa (7); size relationship and arrangement of Dc setae of pupa (8); antenna of ♀ (9); spermathecae and outer genitalia of ♀ (10); aedeagal lobe and phallapodeme of hypopygium of ♂ (11); cercus of ♀ (12). Scale of drawings 3=4; 5=6, 9–12. — SCa seminal capsule, SDu spermathecal duct.

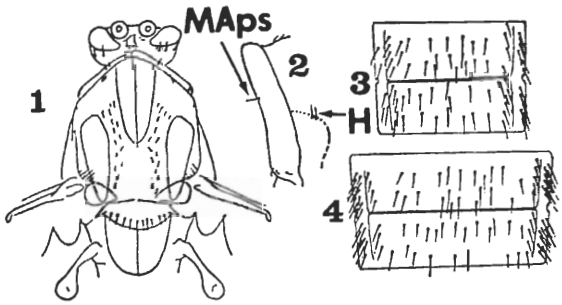


Figure 155. *Cricotopus (Isocladius) dobrogicus* Albu, adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum, lateral (2); chaetotaxy for abdominal tergites III and IV of ♂ (3); same of ♀ (4).—H humeral setae, MAps median setae of antepronotum.

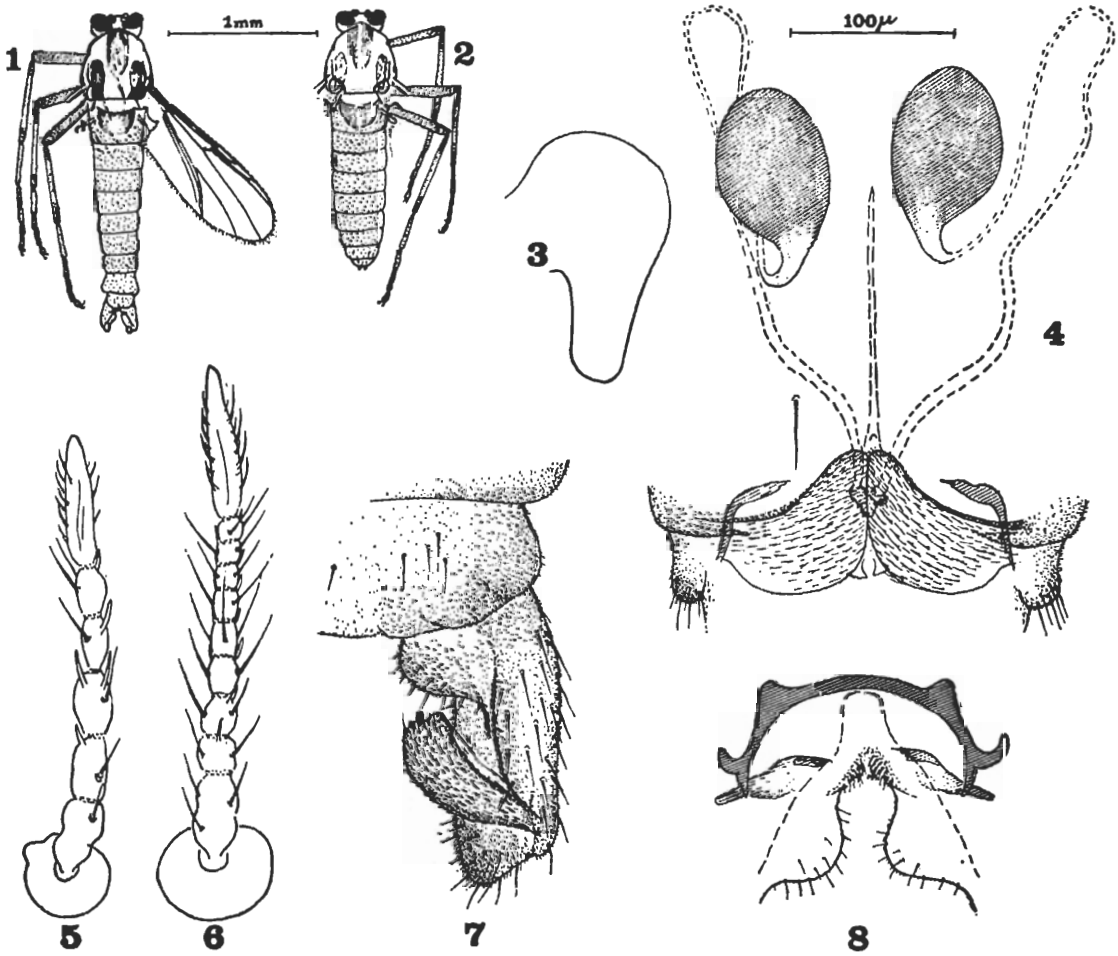


Figure 156. *Cricotopus (Isocladius) dobrogicus* Albu, adult. ♂ (1); ♀ (2); cercus of ♀ (3); spermathecae and outer genitalia of ♀ (4); antenna of ♀ (5); same of ♂ (6); hypopygium (7); aedeagal lobe and phallapodeme of hypopygium (8). Scale of drawings 1=2; 3=4–8.

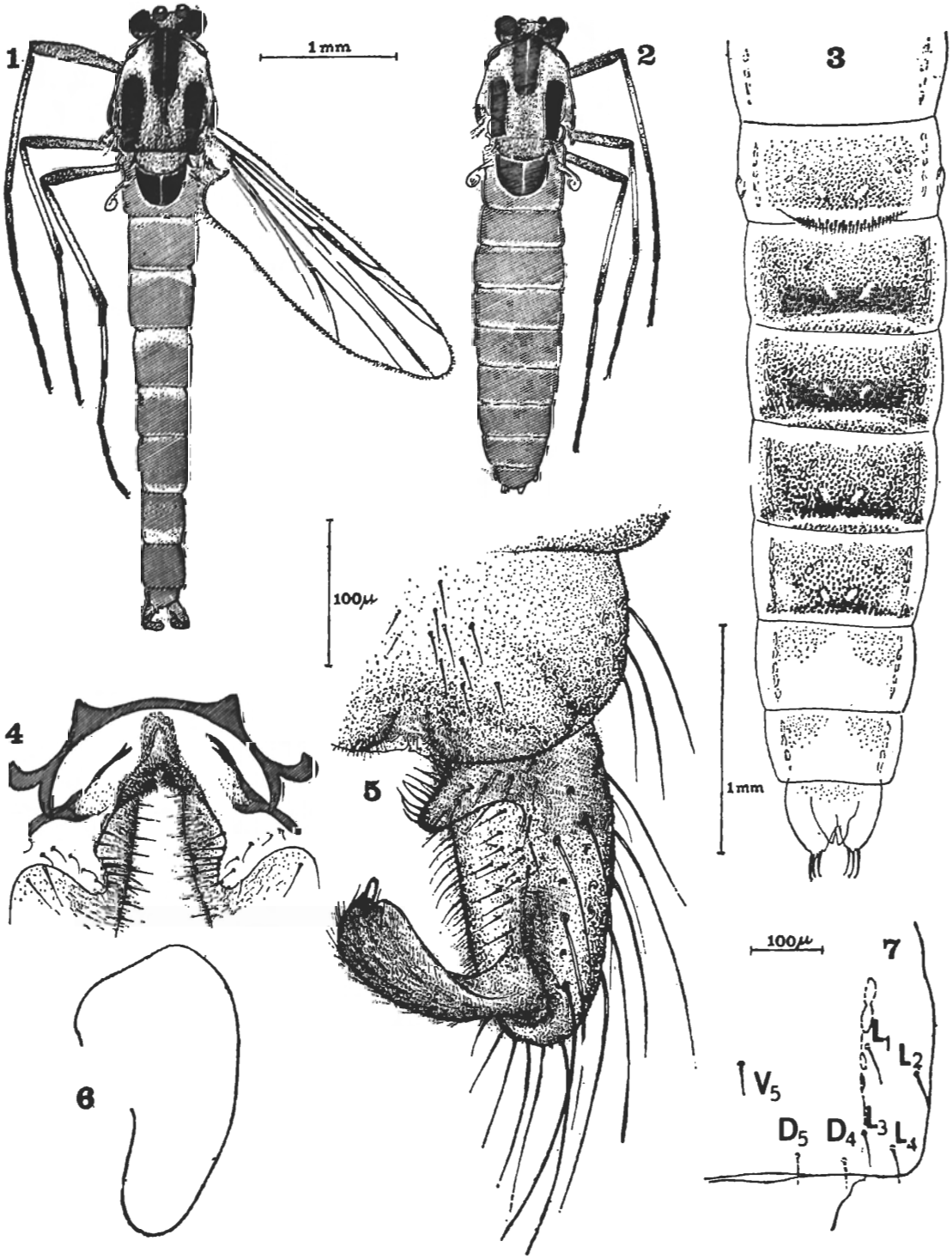


Figure 157. *Cricotopus (Isocladius) ornatus* (Meig.), adult, pupa. ♂ (1); ♀ (2); abdominal segments of pupa (3); aedeagal lobe and phallapodeme of hypopygium (4); hypopygium (5); cercus of ♀ (6); setae (left half) of segment VIII of pupa (7). Scale of drawings 1=2; 4=5–6. D_{1-5} D setae, L_{1-4} lateral setae, V_5 ventral seta 5.

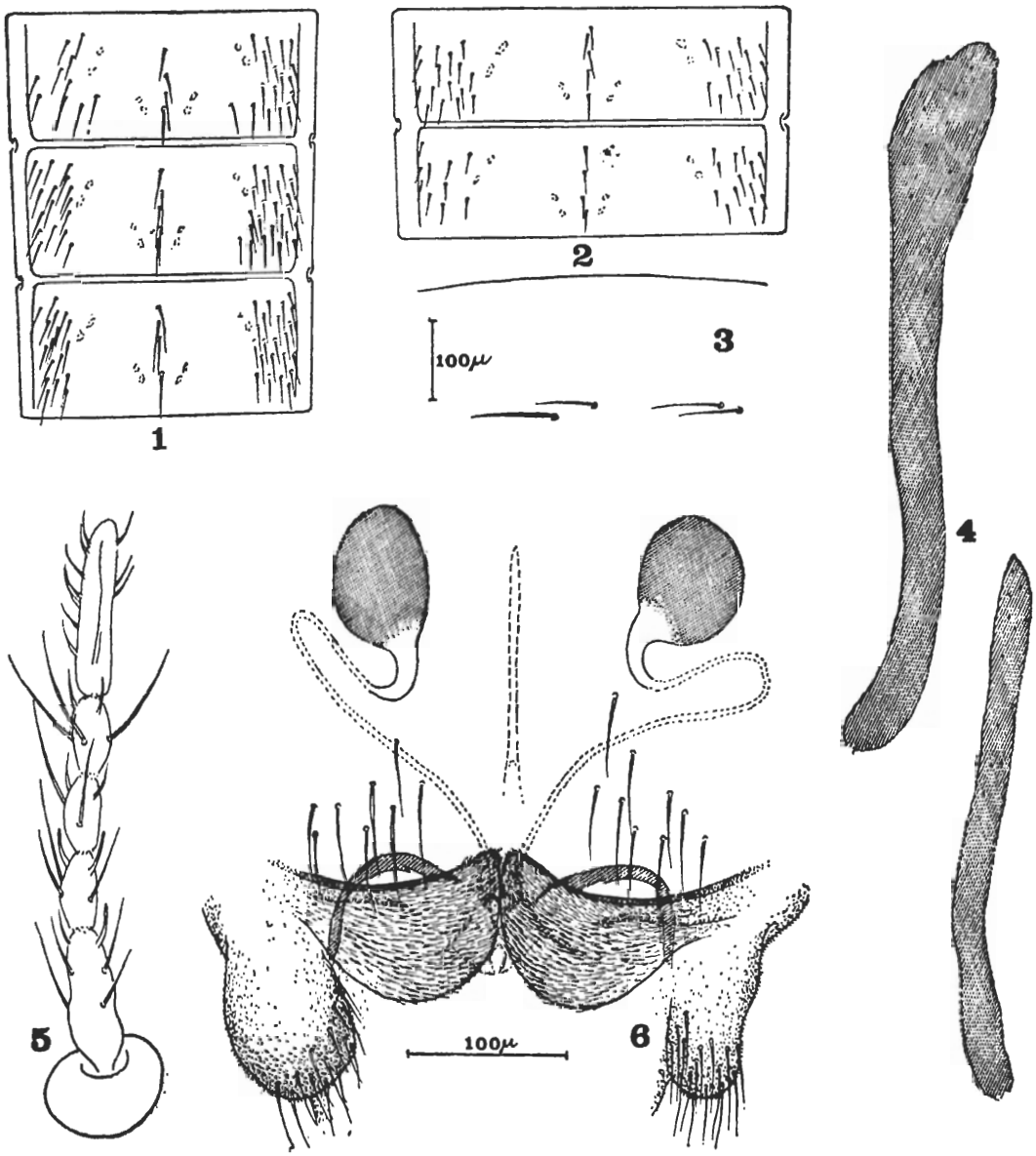


Figure 158. *Cricotopus (Isocladius) ornatus* (Meig.), adult, pupa. Chaetotaxy scheme for abdominal tergites II–IV of ♂ (1); same for III–IV of ♀ (2); size relationship and arrangement of Dc setae of pupa (3); thoracic horn of pupa (4); antenna of ♀ (5); spermathecae and outer genitalia of ♀ (6). Scale of drawings 4=5–6.

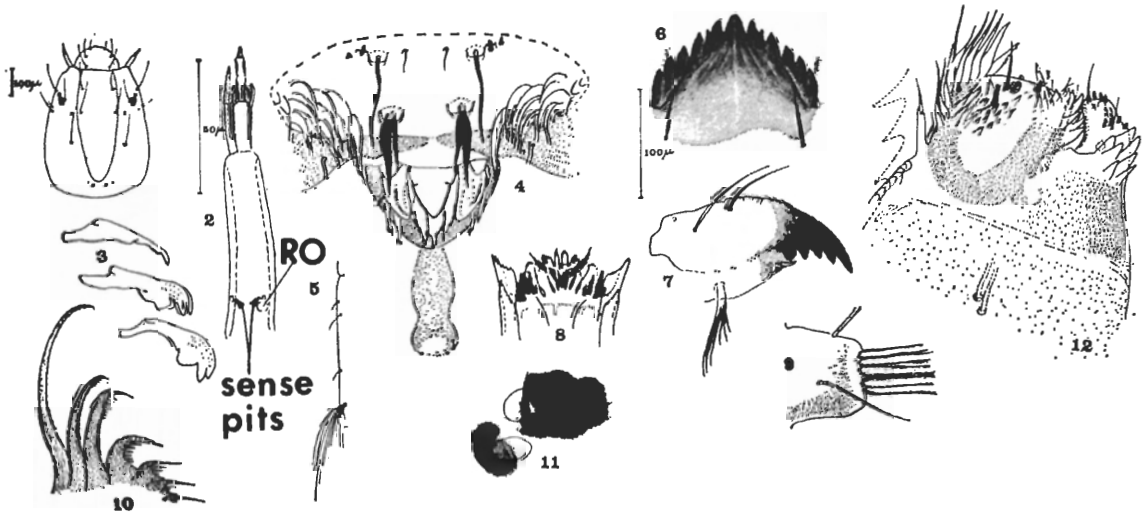


Figure 159. *Cricotopus (Isocladius) ornatus* (Meig.), larva. Head, dorsal (1); antenna (2); variation in premandible caused by different views (3); palatal surface of labrum (4); L setae of abdominal segment IV (5); mentum (6); mandible (7); prementum (8); procercus (9); claws of anterior parapods (10); eyespots (11); maxilla (12). Scale of drawings 1=5; 2=4, 8–12; 3= 6–7.—RO ring organ.

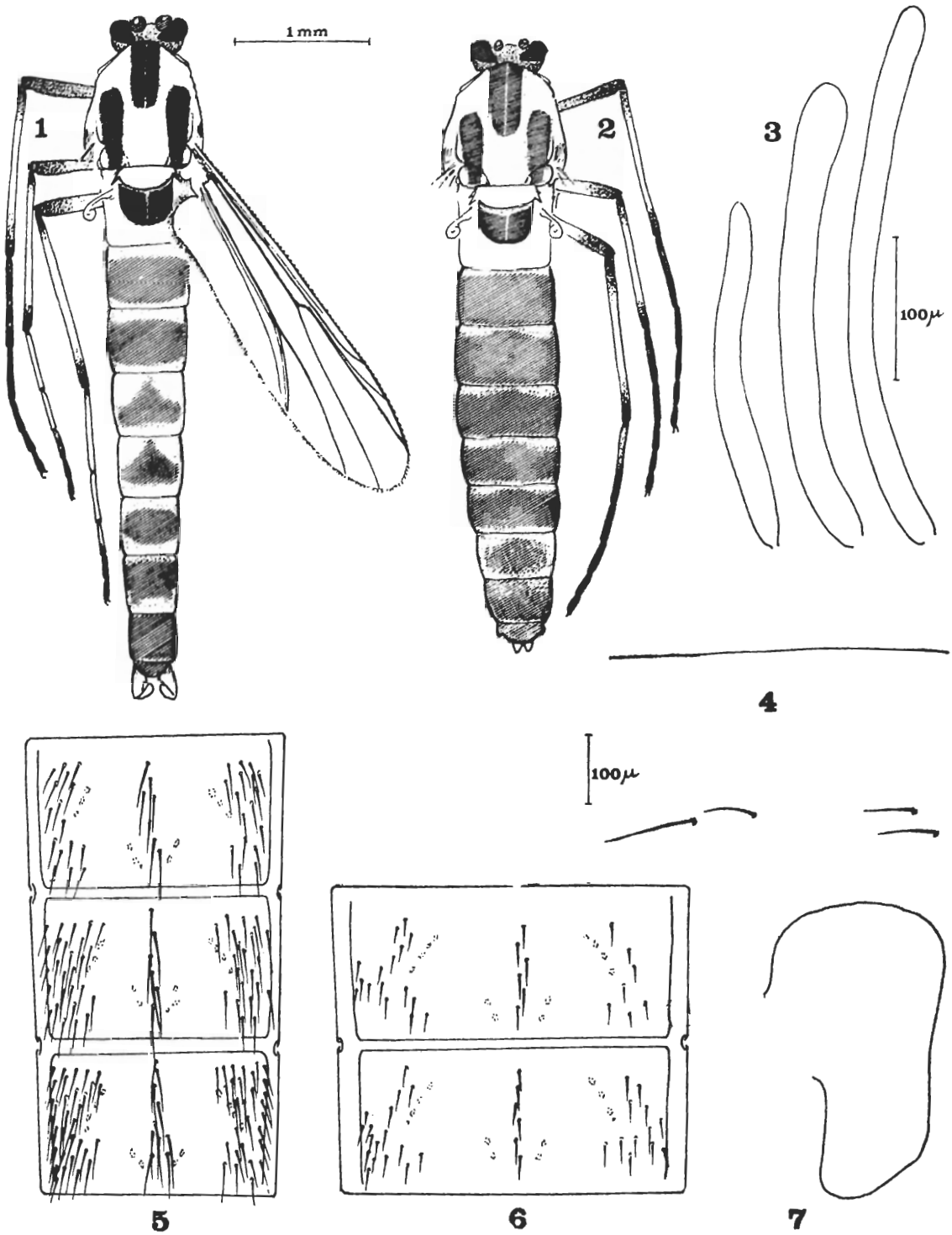


Figure 160. *Cricotopus (Isocladius) laetus* Hirv., adult, pupa. ♂ (1); ♀ (2); thoracic horn of pupa (3); arrangement and size relationship of Dc setae of pupa (4); chaetotaxy scheme for abdominal tergites II–IV of ♂ (5); same for III–IV of ♀ (6); cercus of ♀ (7). Scale of drawings 1=2; 3=7.

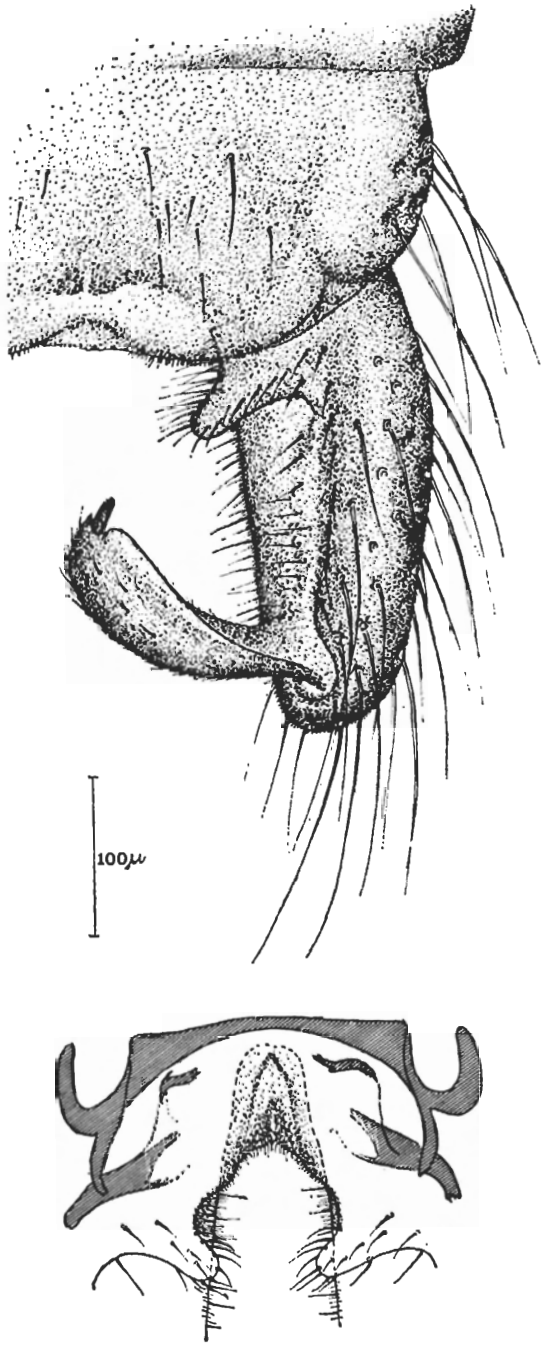
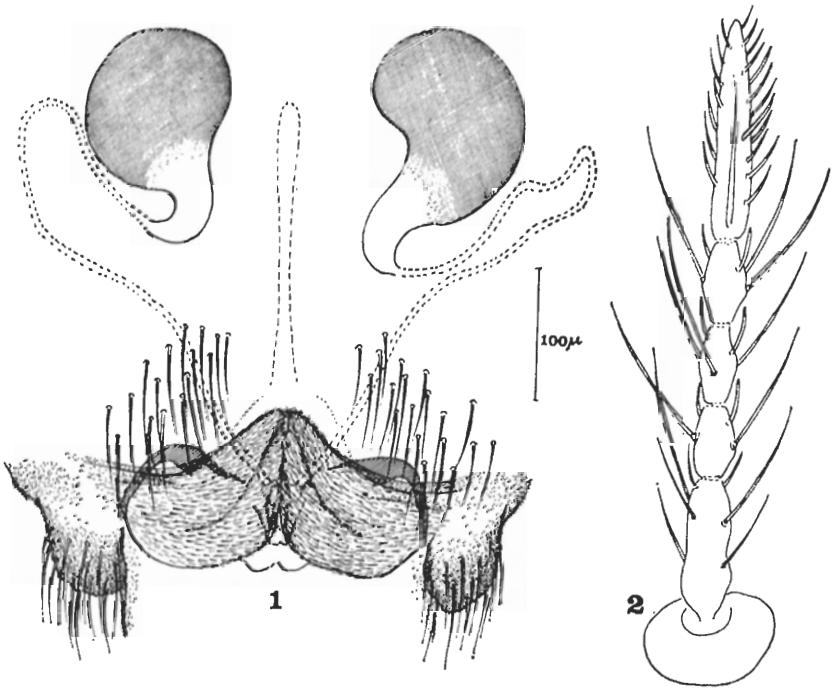


Figure 161. ***Cricotopus (Isocladius) laetus*** **Hirv., hypopygium and (below) aedeagal lobe and phallapodeme of hypopygium of ♂.**

Figure 162. *Cricotopus (Isocladius) laetus* Hirv., spermathecae and outer genitalia of ♀ (1); antenna of ♀ (2).



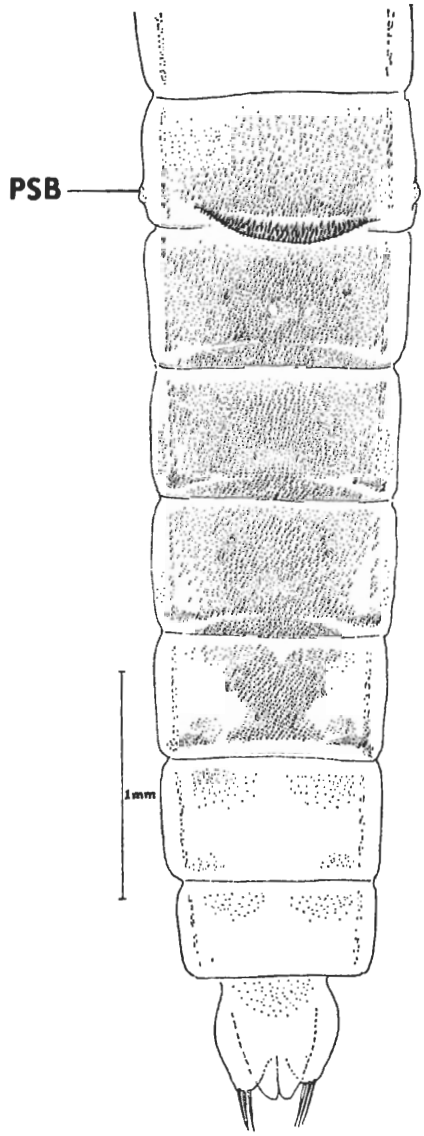


Figure 163. *Cricotopus (Isocladius) laetus* Hirv., shagreen of abdominal segments of pupa.—PSB pedes spurii B.

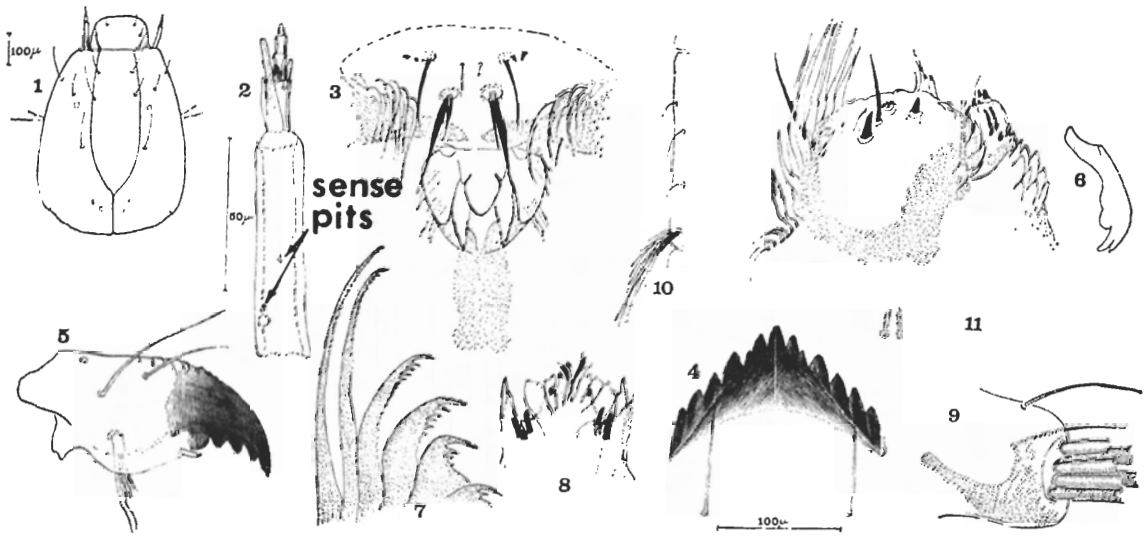


Figure 164. *Cricotopus (Isocladius) laetus* Hirv., larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); premandible (6); claws of anterior parapods (7); prementum (8); procercus (9); L setae of abdominal segment IV (10); maxilla (11). Scale of drawings 1=10; 2=3, 7–9, 11; 4=5–6.

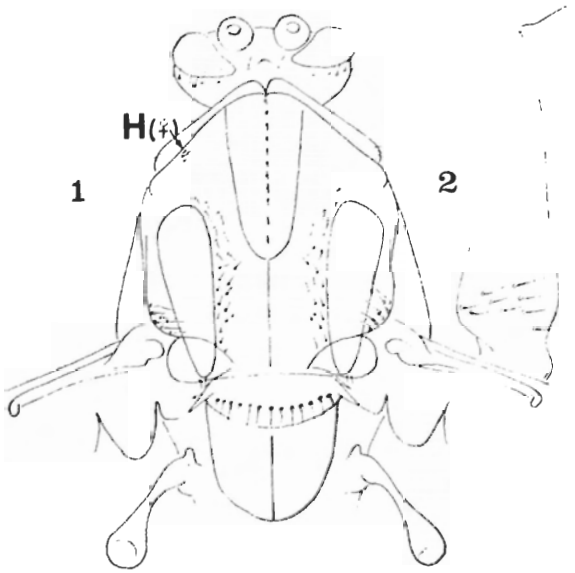


Figure 165. *Cricotopus (Isocladius) pilitarsis* (Zett.), adult. Chaetotaxy scheme for head and thorax, dorsal (1); same for antepronotum, lateral (2).—H humeral setae.

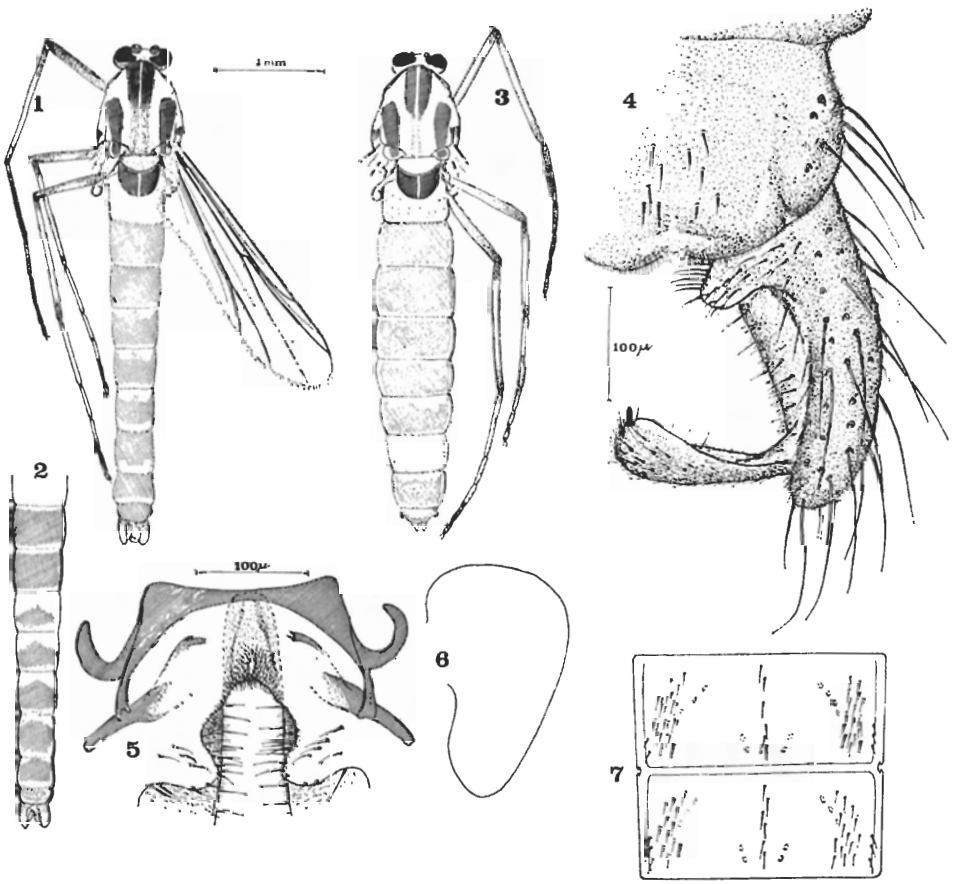


Figure 166. *Cricotopus (Isocladius) pilitarsis* (Zett.), adult. ♂ (1); pigmentation of abdominal tergites of some middle European, light specimens (2); ♀ (3); hypopygium (4); aedeagal lobe and phallapodeme of hypopygium (5); cercus of ♀ (6); chaetotaxy scheme for abdominal tergites III and IV of ♀ (7). Scale of drawings 1=2–3; 4=5–6.

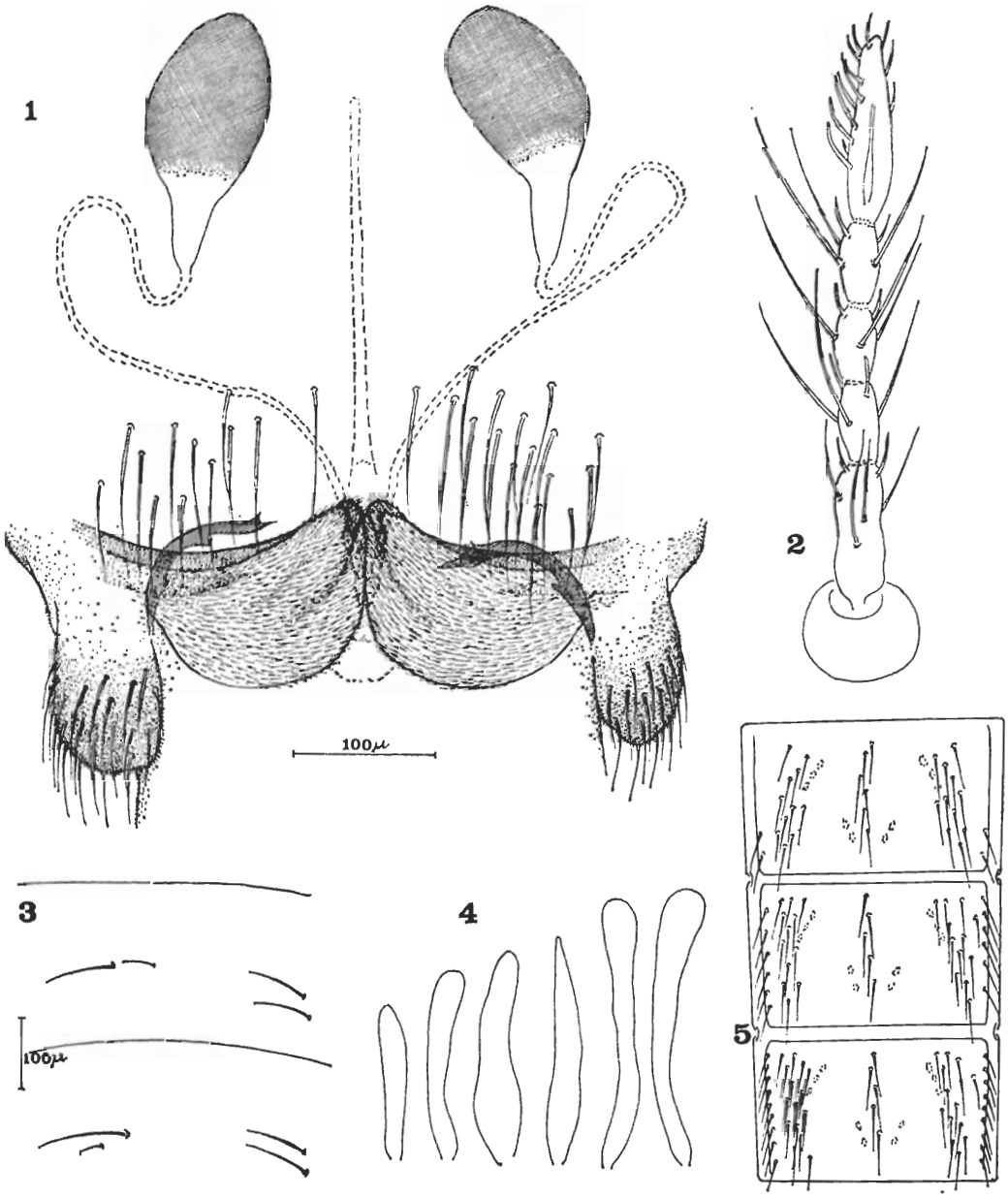


Figure 167. *Cricotopus (Isocladius) pilitarsis* (Zett.), adult, pupa. Spermathecae and outer genitalia of ♀ (1); antenna of ♀ (2); variation in arrangement and size relationship of Dc setae of pupa (3); thoracic horn of pupa (4); chaetotaxy scheme for abdominal tergites II–IV of ♂ (5). Scale of drawings 1=2, 4.

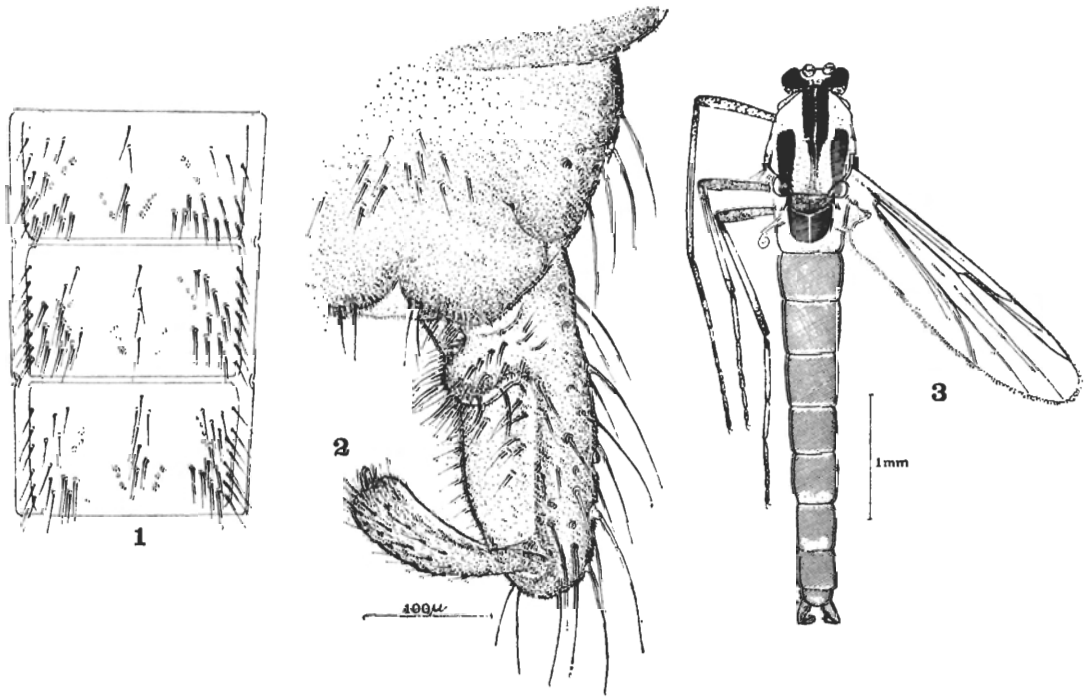


Figure 168. *Cricotopus (Isocladius) pilicauda* Hirv., ♂ . Chaetotaxy scheme of abdominal tergites II–IV(1); hypopygium (2); ♂ (3).

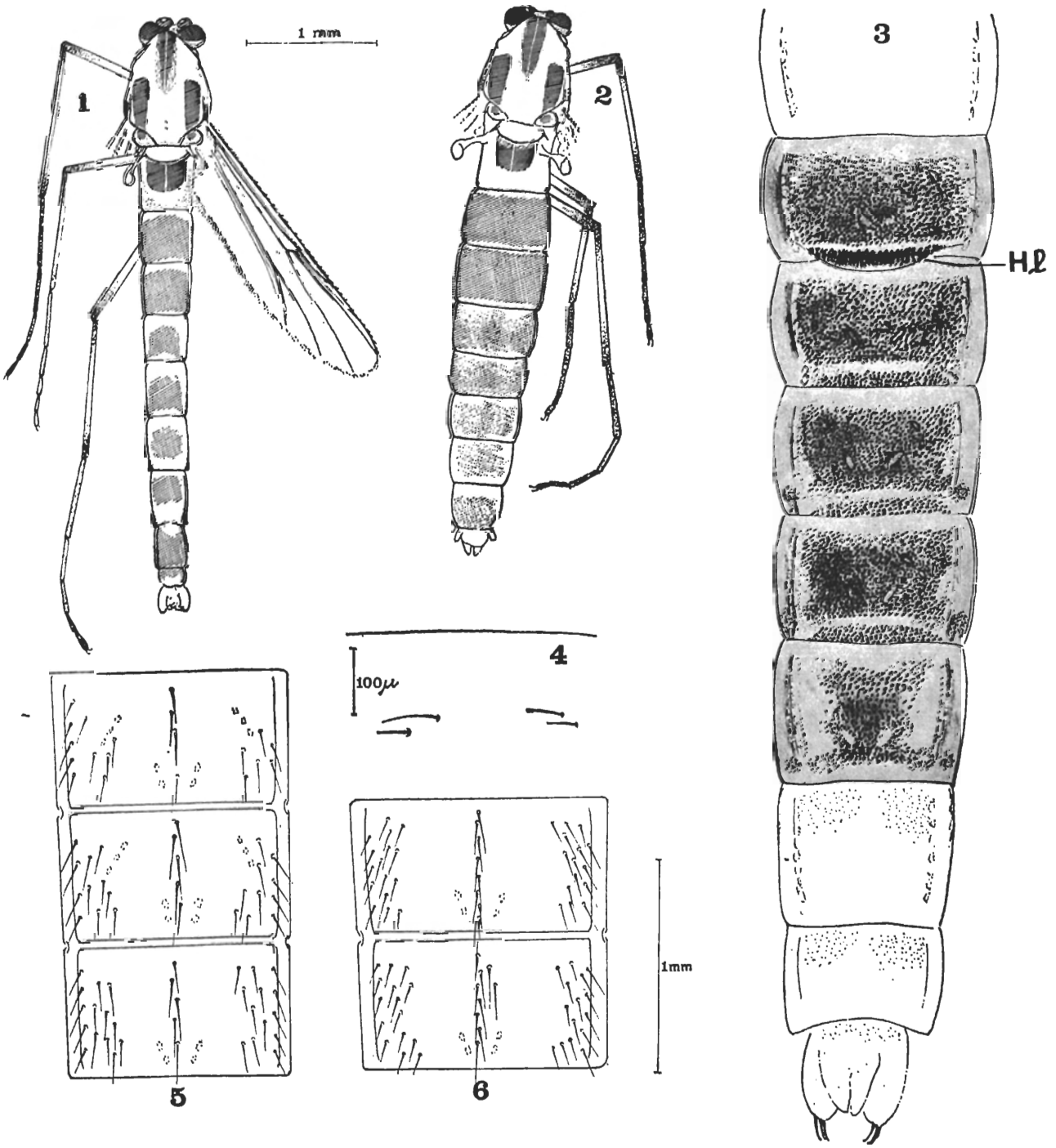


Figure 169. *Cricotopus (Isocladius) relucens* Hirv., adult, pupa. ♂ (1); ♀ (2); pigmentation and shagreen of abdominal tergites of pupa (3); size relationship and arrangement of Dc setae of pupa (4); chaetotaxy scheme for abdominal tergites II–IV of ♂ (5); same for III–IV of ♀ (6).—Hl hooklets.

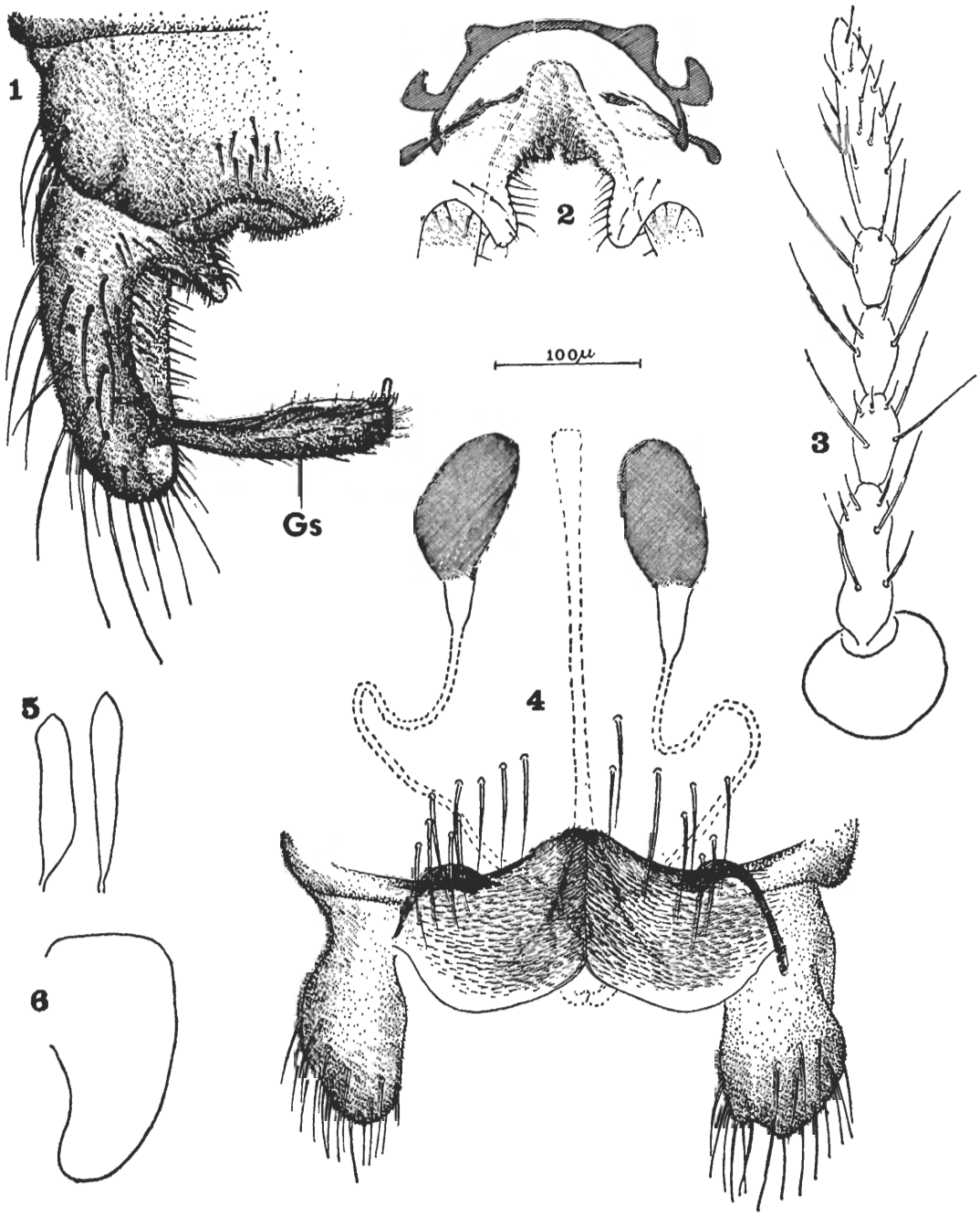


Figure 170. *Cricotopus (Isocladius) relucens* Hirv., adult, pupa. Hypopygium (1); aedeagal lobe and phallapodeme of hypopygium (2); antenna of ♀ (3); spermathecae and outer genitalia of ♀ (4); thoracic horn of pupa (5); cercus of ♀ (6). Scale of drawings 1=2–6.—Gs gonostylus.

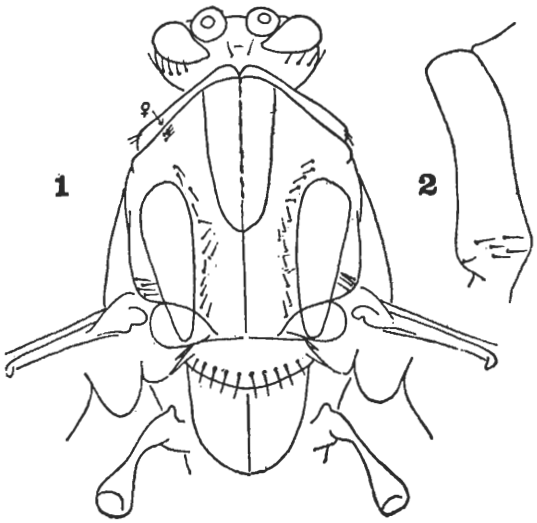


Figure 171. *Cricotopus (Isocladius) sylvestris* (Fabr.), adult. Chaetotaxy scheme for head and thorax, dorsal (1); antepronotum, lateral (2).

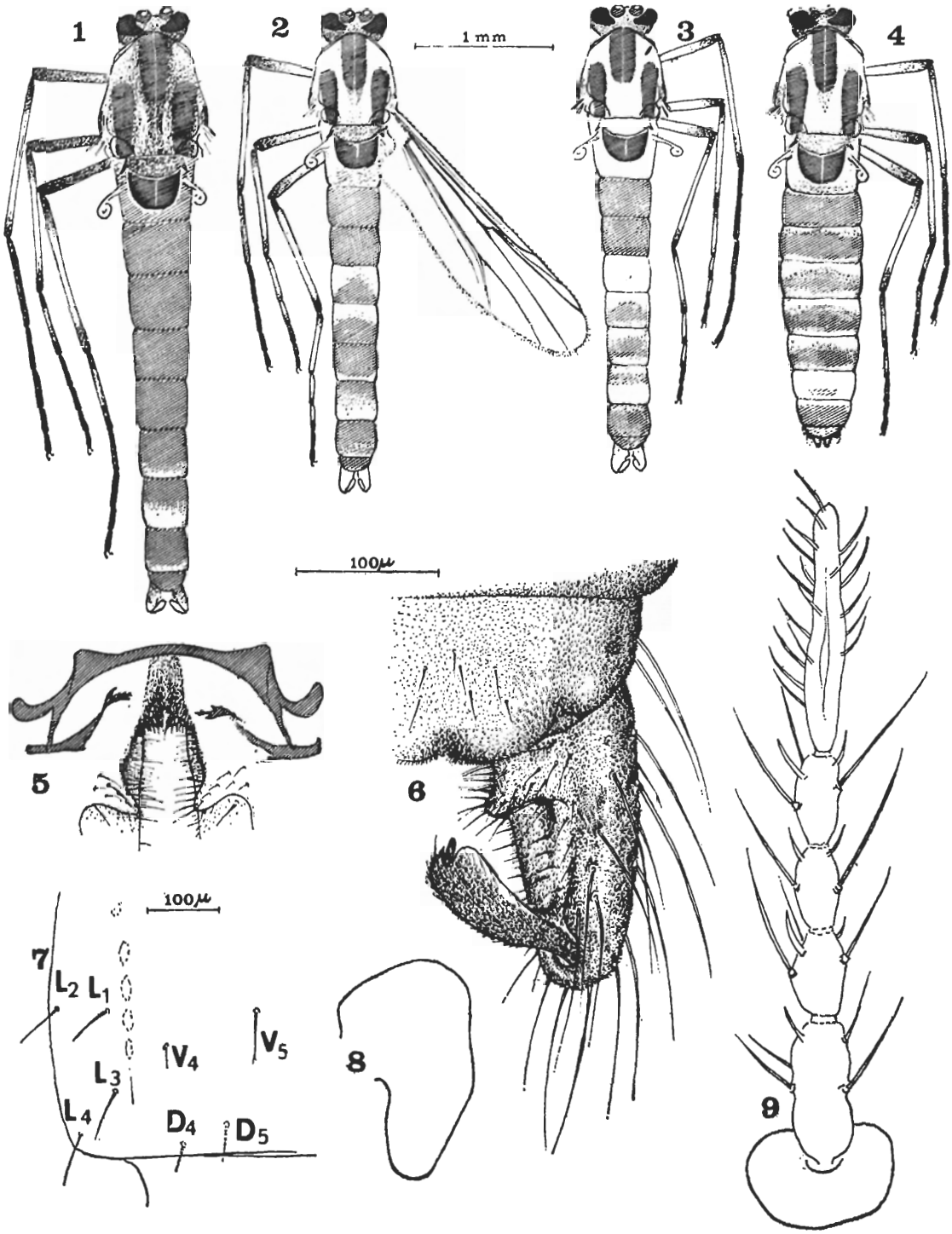


Figure 172. *Cricotopus (Isocladius) sylvestris* (Fabr.), adult and pupa. Large (Sompiojärvi) (1), "normal" (2), and weak (3) pigmentation of ♂ "normal", pigmentation of ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); hypopygium (6); setae of anal angle of abdominal segment VIII, ventral, of pupa (7); cercus of ♀ (8); antenna of ♀ (9). Scale of drawings 1=2–4; 5=6, 8–9. D_{1-5} D setae, L_{1-4} lateral setae, V_5 ventral seta 5.

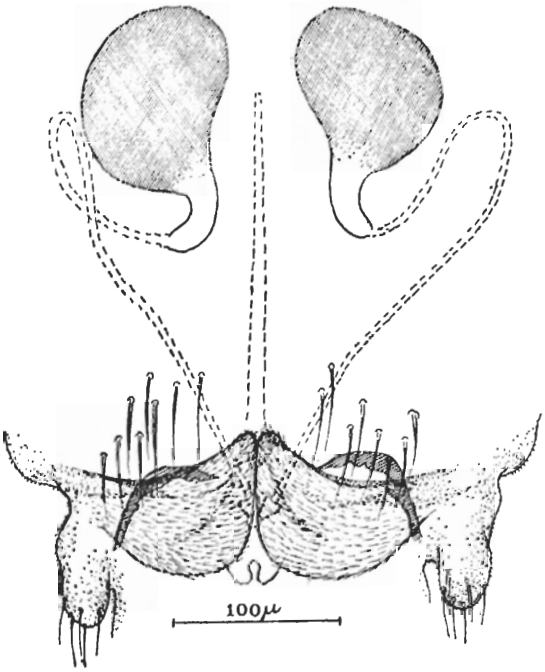


Figure 173. *Cricotopus (Isocladius) sylvestris* (Fabr.), spermathecae and outer genitalia of ♀.

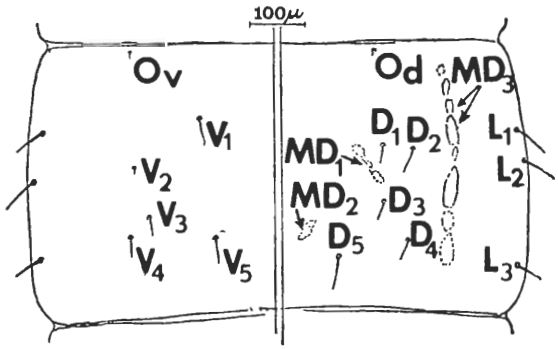


Figure 174. *Cricotopus (Isocladius) sylvestris* (Fabr.), chaetotaxy for abdominal segment IV of pupa. —MD_{1-3} muscle marks, dorsal, O_d dorsal and O_v ventral O setae, V_{1-5} ventral setae, L_{1-3} lateral setae, D_{1-5} dorsal setae.

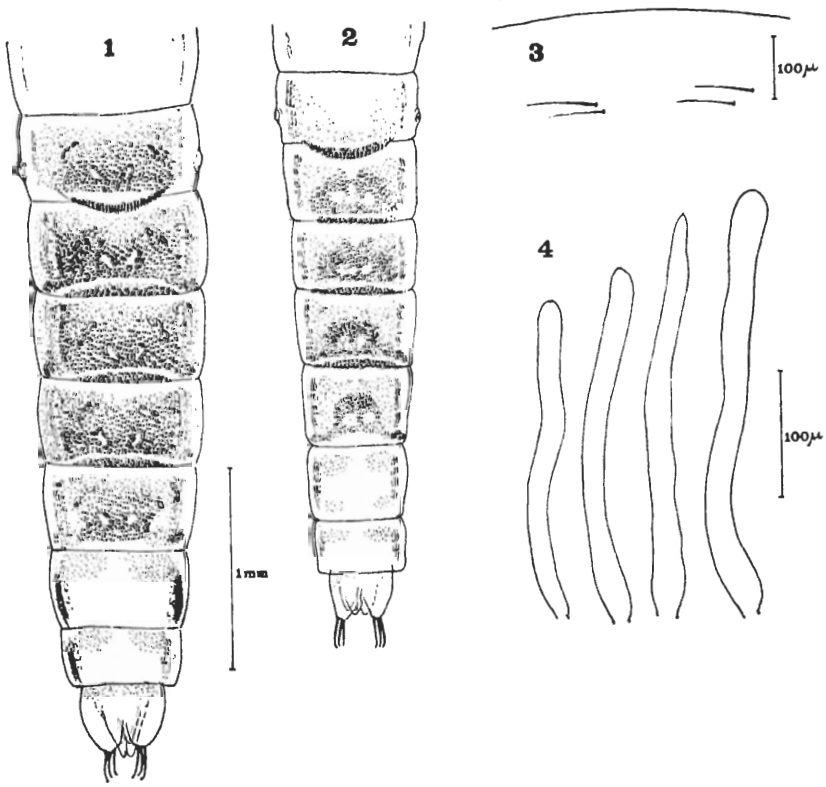


Figure 175. *Cricotopus (Isocladius) sylvestris* (Fabr.), pupa. Abdominal segments from collections in spring (1) and in summer (2) from some small ponds in Riihimäki, Südfinnland; size relationship and arrangement of Dc setae (3); variation in thoracic horn (4).

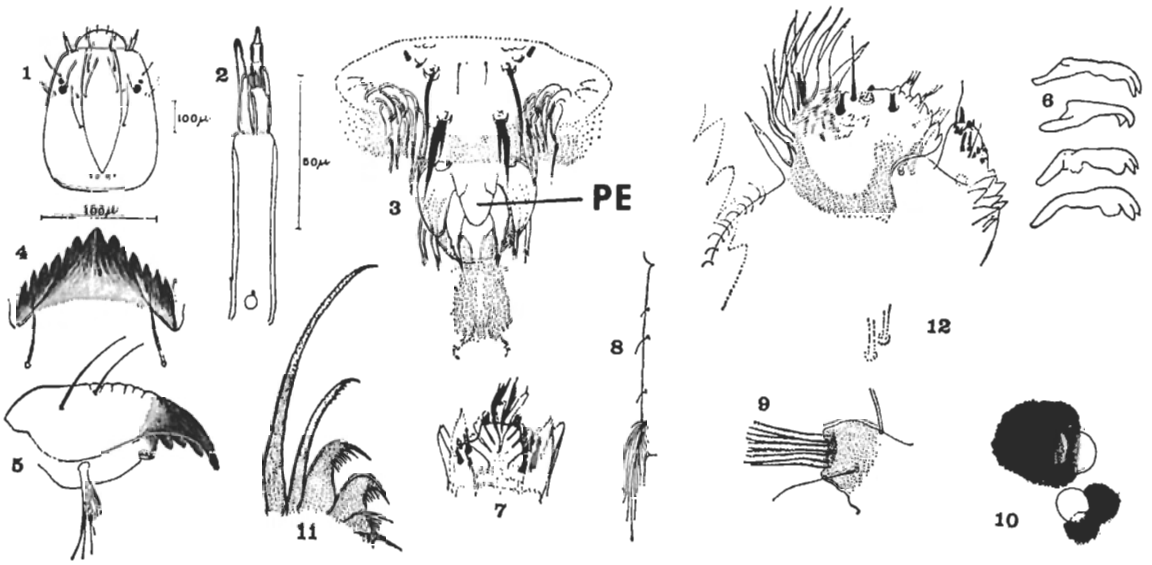


Figure 176. *Cricotopus (Isocladius) sylvestris* (Fabr.),larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); variation in premandible by different views (6); prementum (7); L setae of abdominal segment IV (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=8; 2=3, 7–12; 4=5–6. PE pecten epipharyngis.

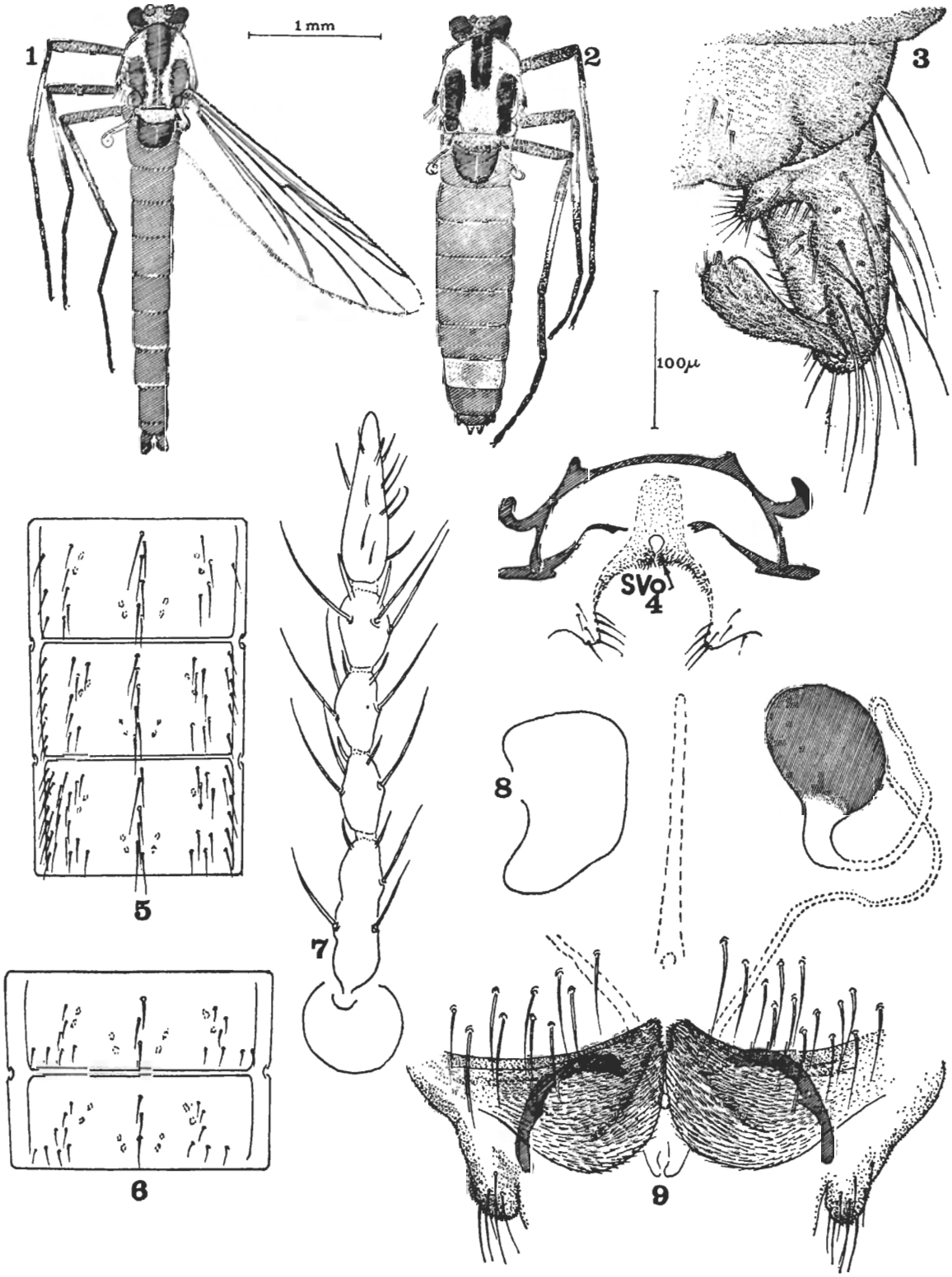


Figure 177. *Cricotopus (Isocladius) glacialis* Edw., adult. ♂ (1); ♀ (2); hypopygium (3); aedeagal lobe and phallapodeme of hypopygium (4); chaetotaxy scheme for abdominal tergites II–IV of ♂ (5); chaetotaxy of tergites III–IV of ♀ (6); antenna (7); cercus of ♀ (8); spermatheca and outer genitalia of ♀ (9). Scale of drawings 1=2; 3=4, 7–9. —SVo superior volsella.

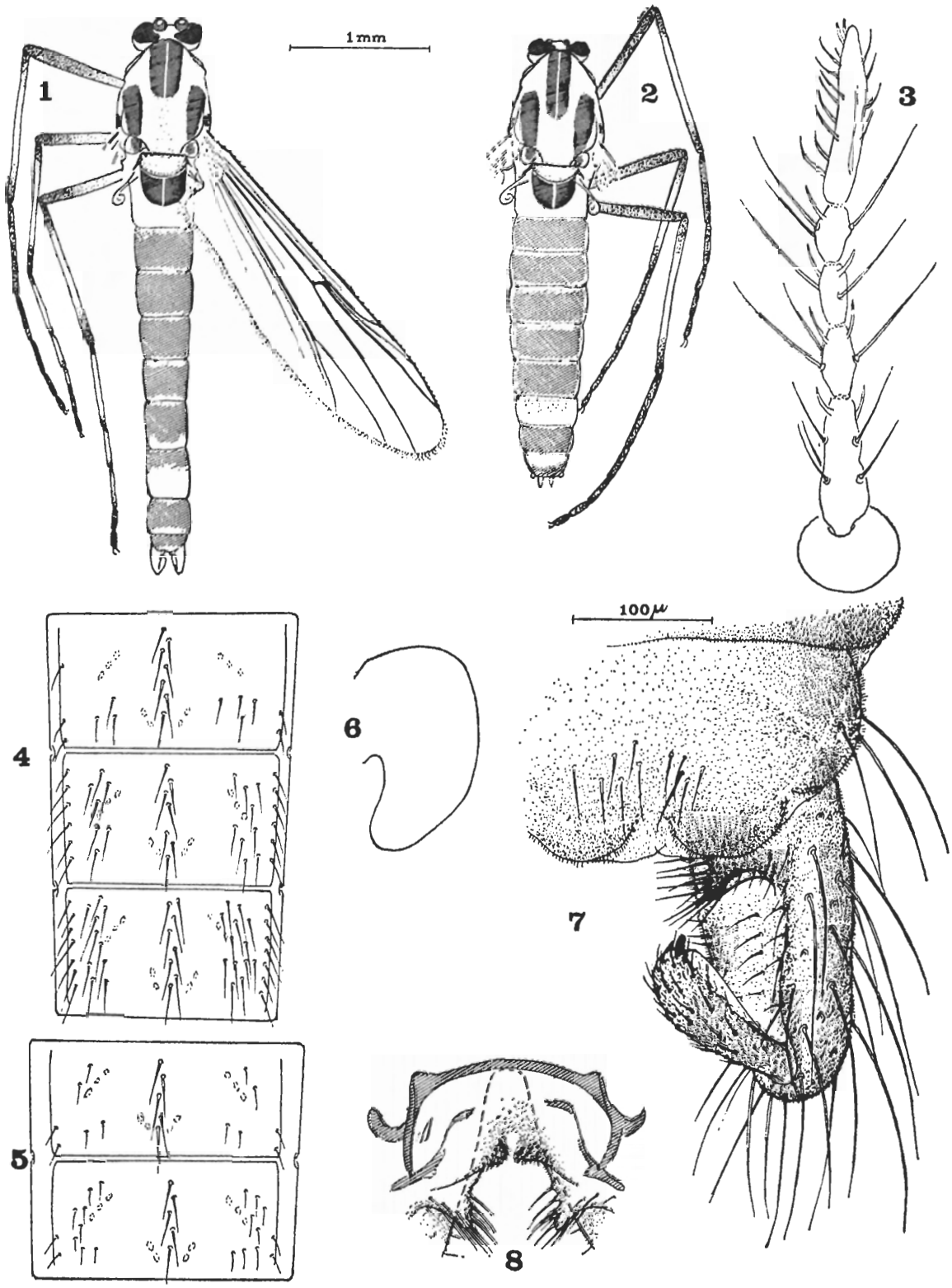


Figure 178. *Cricotopus (Isocladius) suspiciosus* Hirv., adult. ♂ (1); ♀ (2); antenna of ♀ (3); chaetotaxy scheme for abdominal tergites II–IV of ♂ (4); same for III–IV of ♀ (5); cercus of ♀ (6); hypopygium (7); aedeagal lobe and phallapodeme of hypopygium (8). Scale of drawings 1=2; 3=6–8.

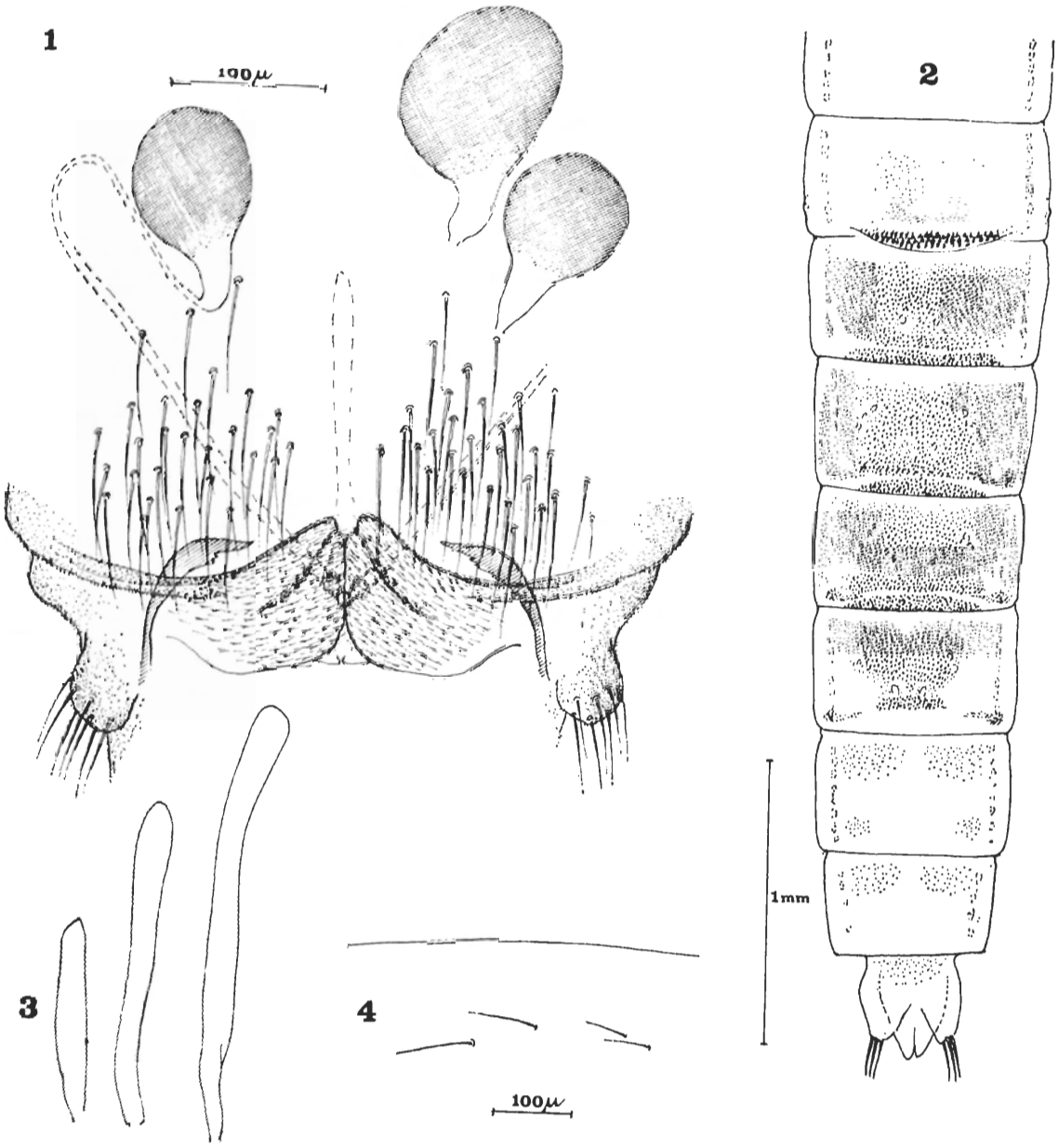


Figure 179. *Cricotopus (Isocladius) suspiciosus* Hirv., adult, pupa. Variation in spermatheca and outer genitalia of ♀ (1); shagreen (pigmentation refer to Figure 169) of abdominal segments (2); variation in thoracic horn (3); size relationship and arrangement of Dc setae of pupa (4). Scale of drawings 1=3.

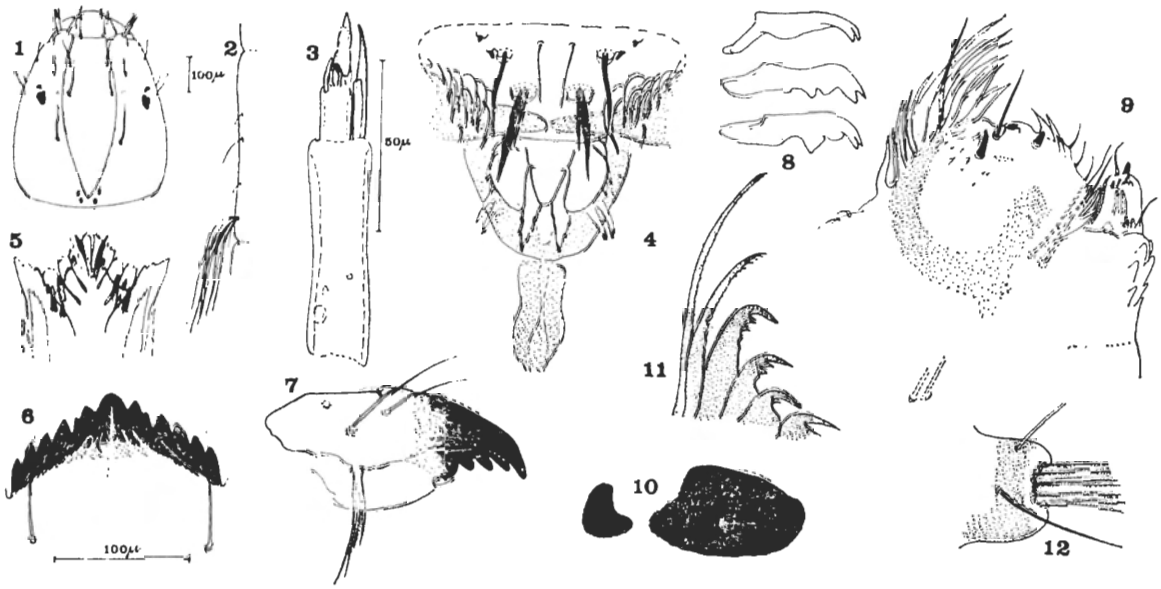


Figure 180. *Cricotopus (Isocladius) suspiciosus* Hirv., larva. Head, dorsal (1); L setae of abdominal segment IV (2); antenna (3): palatal surface of labrum (4); prementum (5); mentum (6); mandible (7); variation in premandible caused by different views (8); maxilla (9); eyespots (10); claws of anterior parapods (11); procercus (12). Scale of drawings 1=2; 3=4–5, 9–12; 6=7–8.

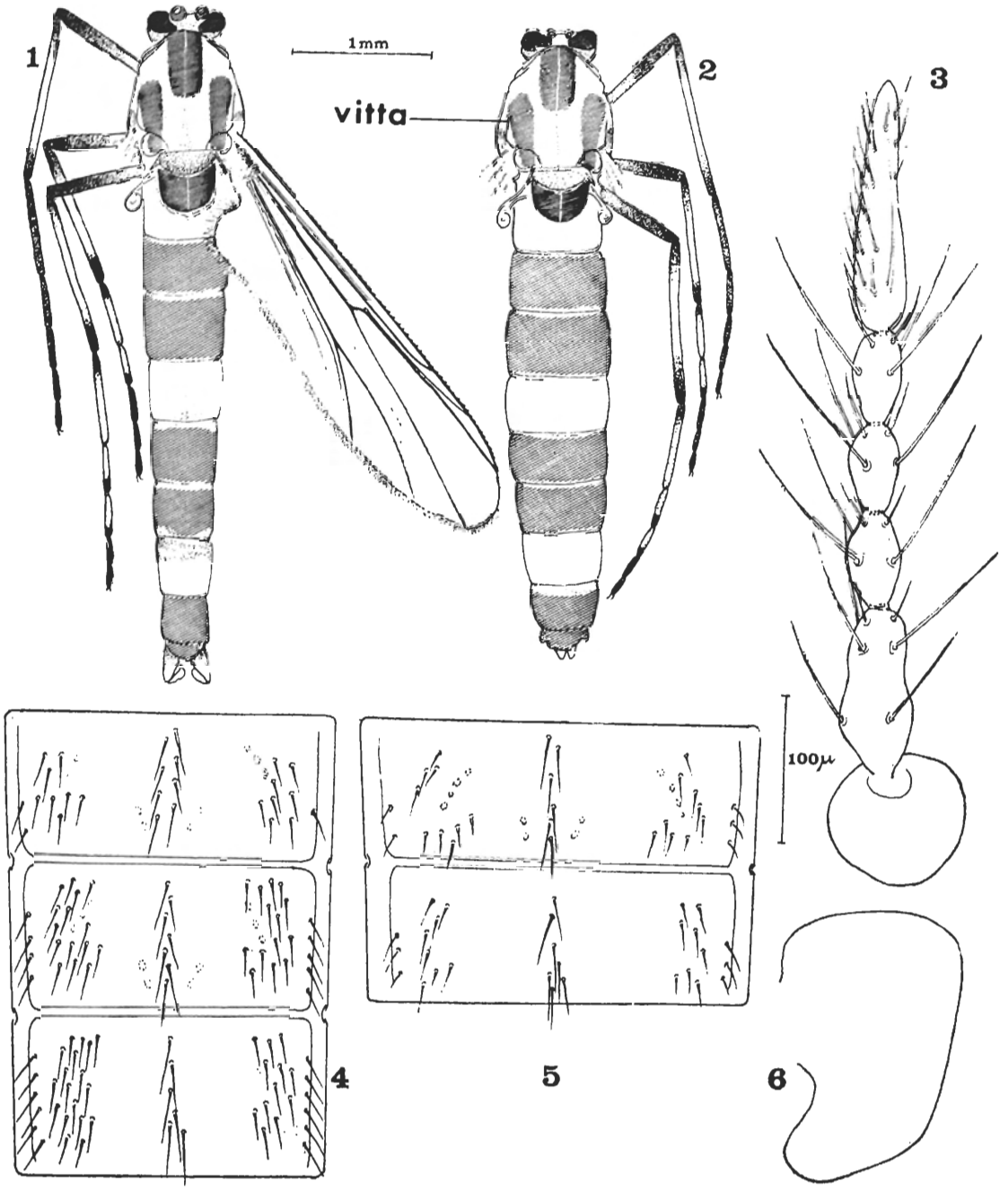


Figure 181. *Cricotopus (Isocladius) trifasciatus* (Meig.), "large form," adult. ♂ (1); ♀ (2); antenna of ♀ (3); chaetotaxy scheme for abdominal tergites II–IV of ♂ (4); same for III–IV of ♀ (5); cercus of ♀ (6). Scale of drawings 1=2; 3=6.

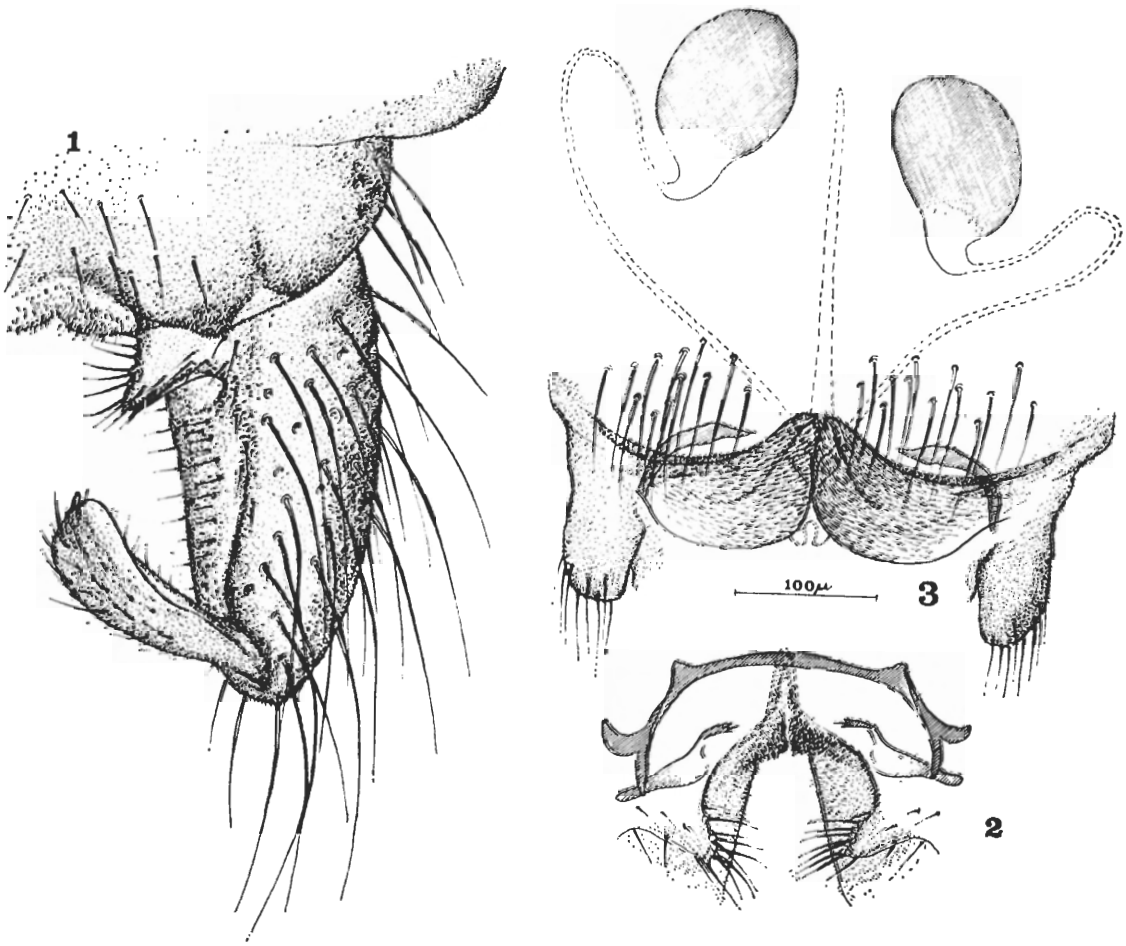


Figure 182. *Cricotopus (Isocladius) trifasciatus* (Meig.), "large form," adult. Hypopygium of ♂ (1); aedeagal lobe and phallapodeme of hypopygium (2); spermathecae and outer genitalia of ♀ (3).

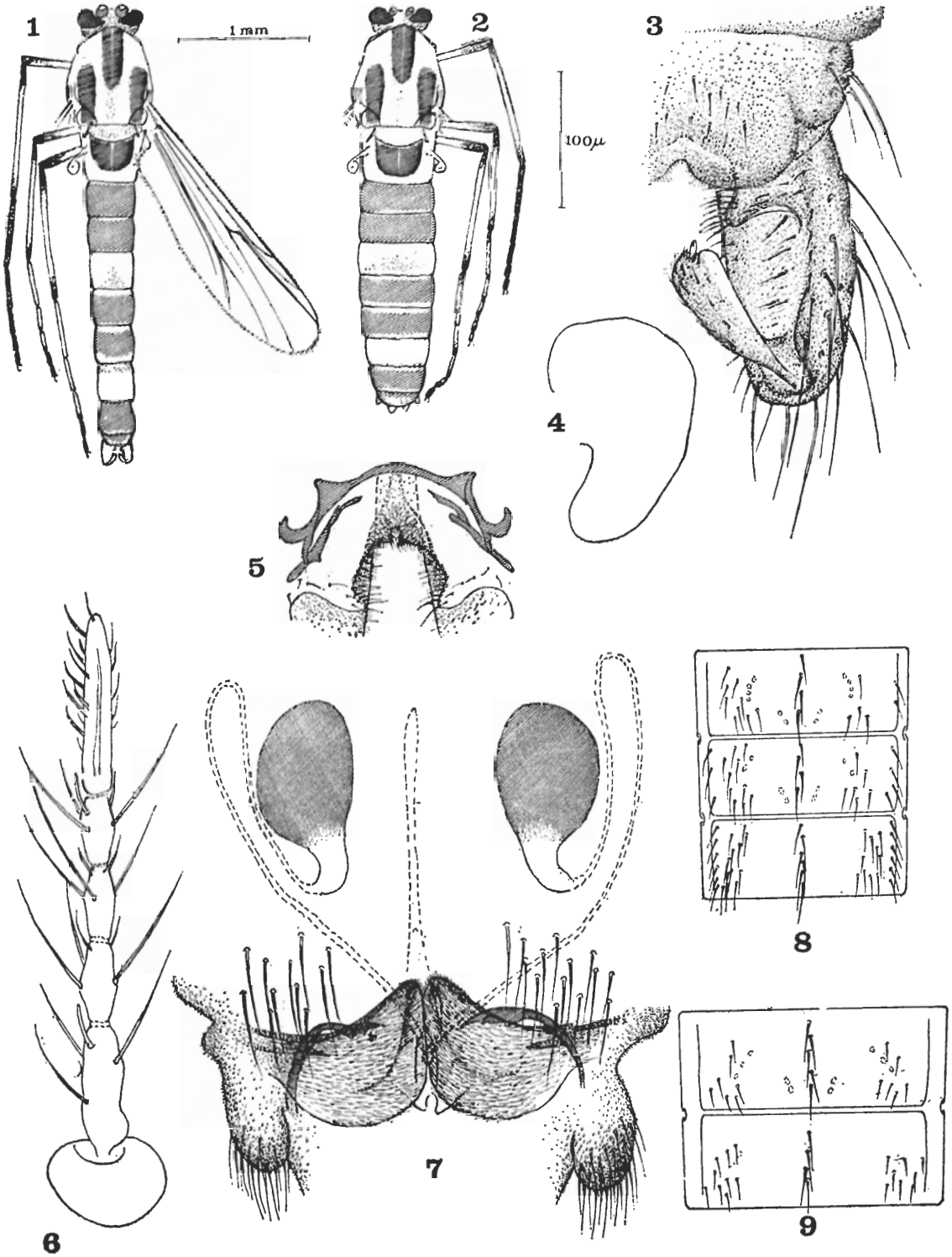


Figure 183. *Cricotopus (Isocladius) trifasciatus* (Meig.), "small form," adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); cercus of ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); antenna of ♀ (6); spermathecae and outer genitalia of ♀ (7); chaetotaxy scheme for abdominal tergites II–IV of ♂ (8); same for III–IV of ♀ (9). Scale of drawings 1=2; 3=4–7.

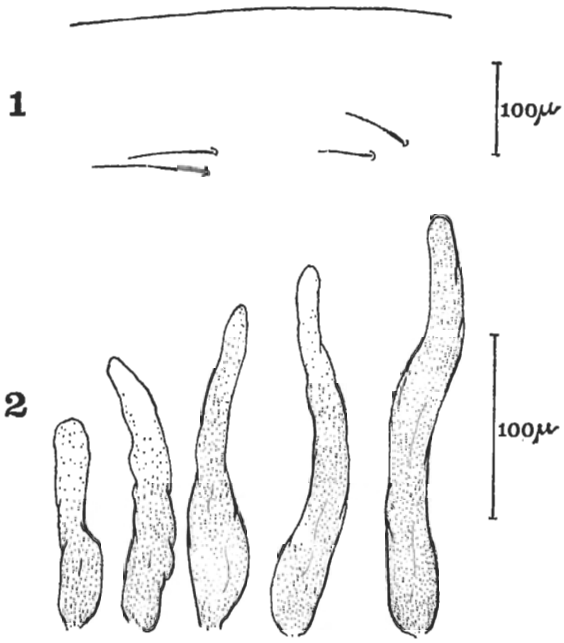


Figure 184. *Cricotopus (Isocladius) trifasciatus* (Meig.), "small form," pupa. Size relationship and arrangement of Dc setae (1); variation in thoracic horn. (2).

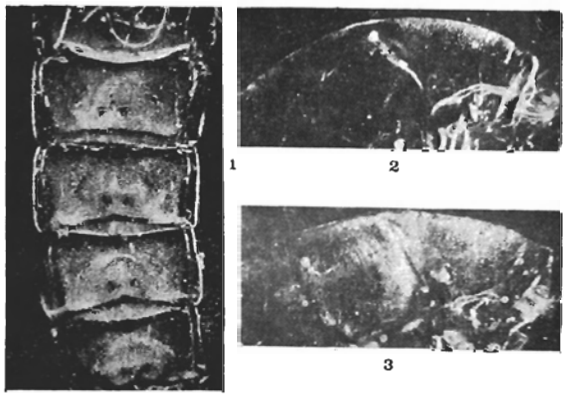


Figure 185. Shagreen of abdominal tergites (1) of *Cricotopus (Isocladius) trifasciatus* (Meig.), "small form," suture margin (thoracic region) of the same species (3) and (2) of *C. (I.) tricinctus* (Meig.). (Dark field photography).

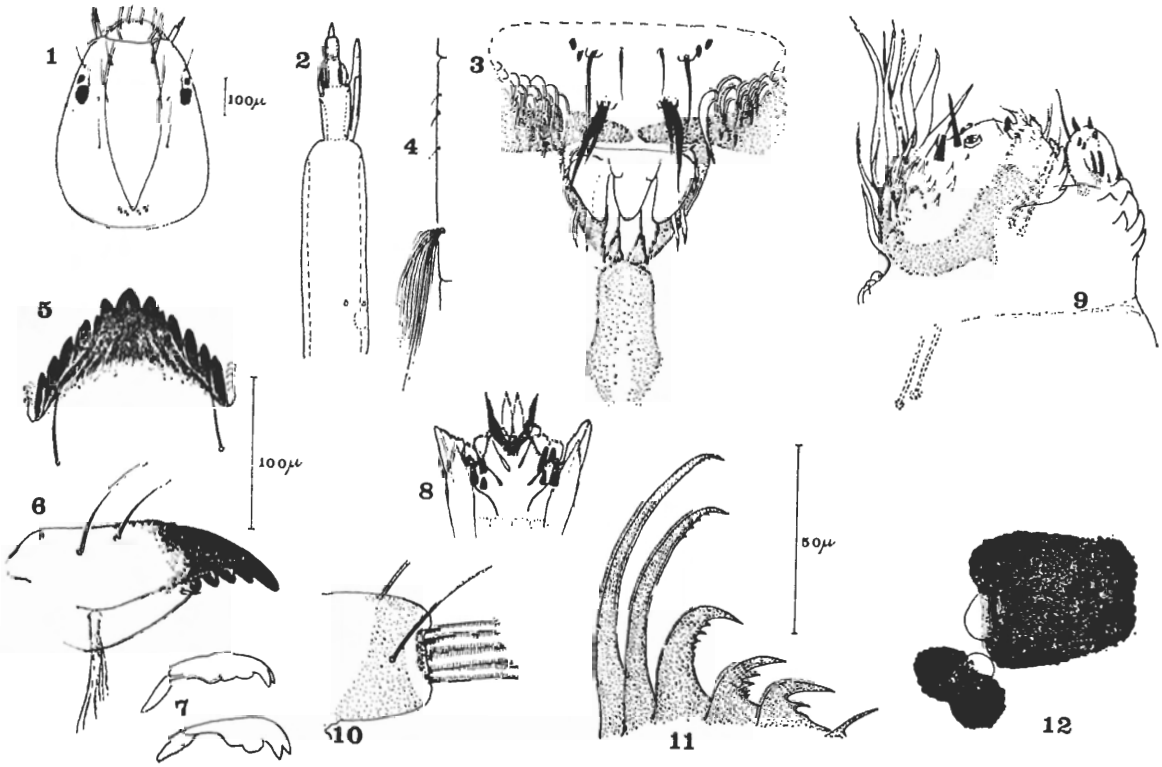


Figure 186. *Cricotopus (Isocladius) trifasciatus* (Meig.), "small form," larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); L setae of abdominal segment IV (4); mentum (5); mandible (6); premandible (7); prementum (8); maxilla (9); procercus (10); claws of anterior parapods (11); eyespots (12). Scale of drawings 1=4; 2=3, 8–12; 5=6–7.

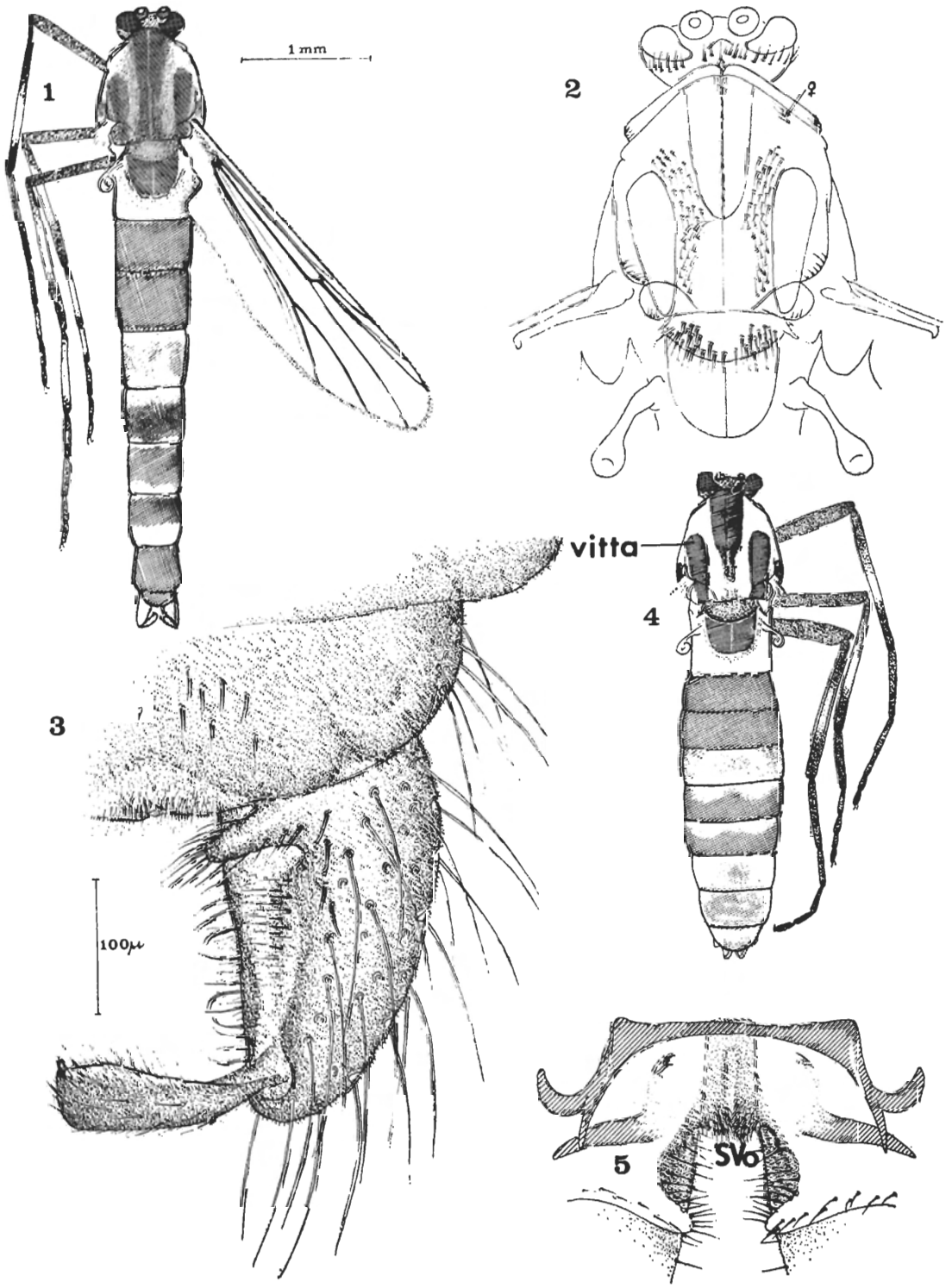


Figure 187. *Cricotopus (Isocladius) speciosus* Goetgh., adult. ♂ (1); chaetotaxy scheme for head and thorax, dorsal (2); hypopygium of ♂ (3); ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5). Scale of drawings 1=4; 3=5.—SVo superior volsella.

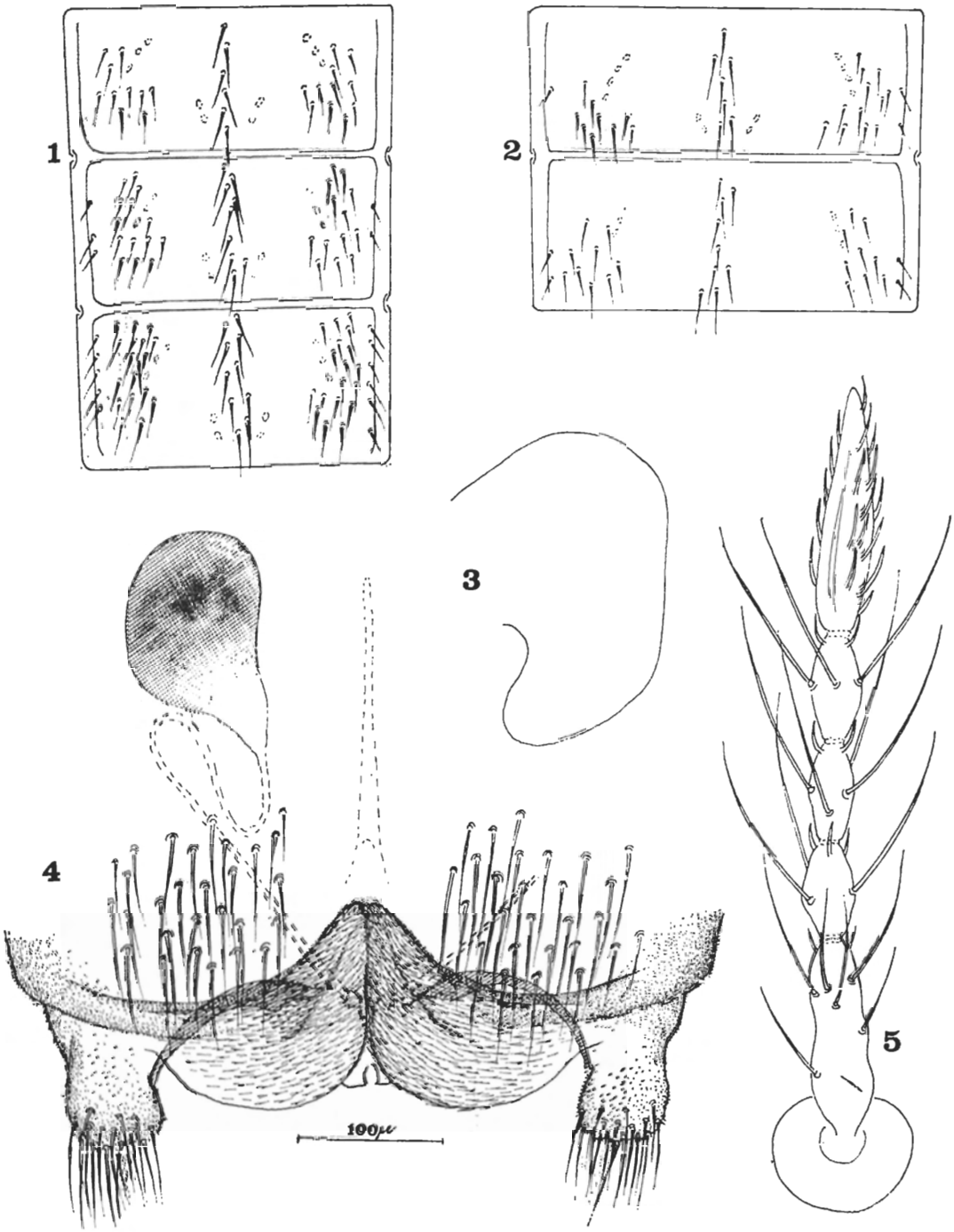


Figure 188. *Cricotopus (Isocladius) speciosus* Goetgh., adult. Chaetotaxy scheme for abdominal tergites II–IV of ♂ (1); same for III–IV of ♀ (2); cercus (3); spermatheca and outer genitalia of ♀ (4); antenna of ♀ (5). Scale of drawings 3=4–5.

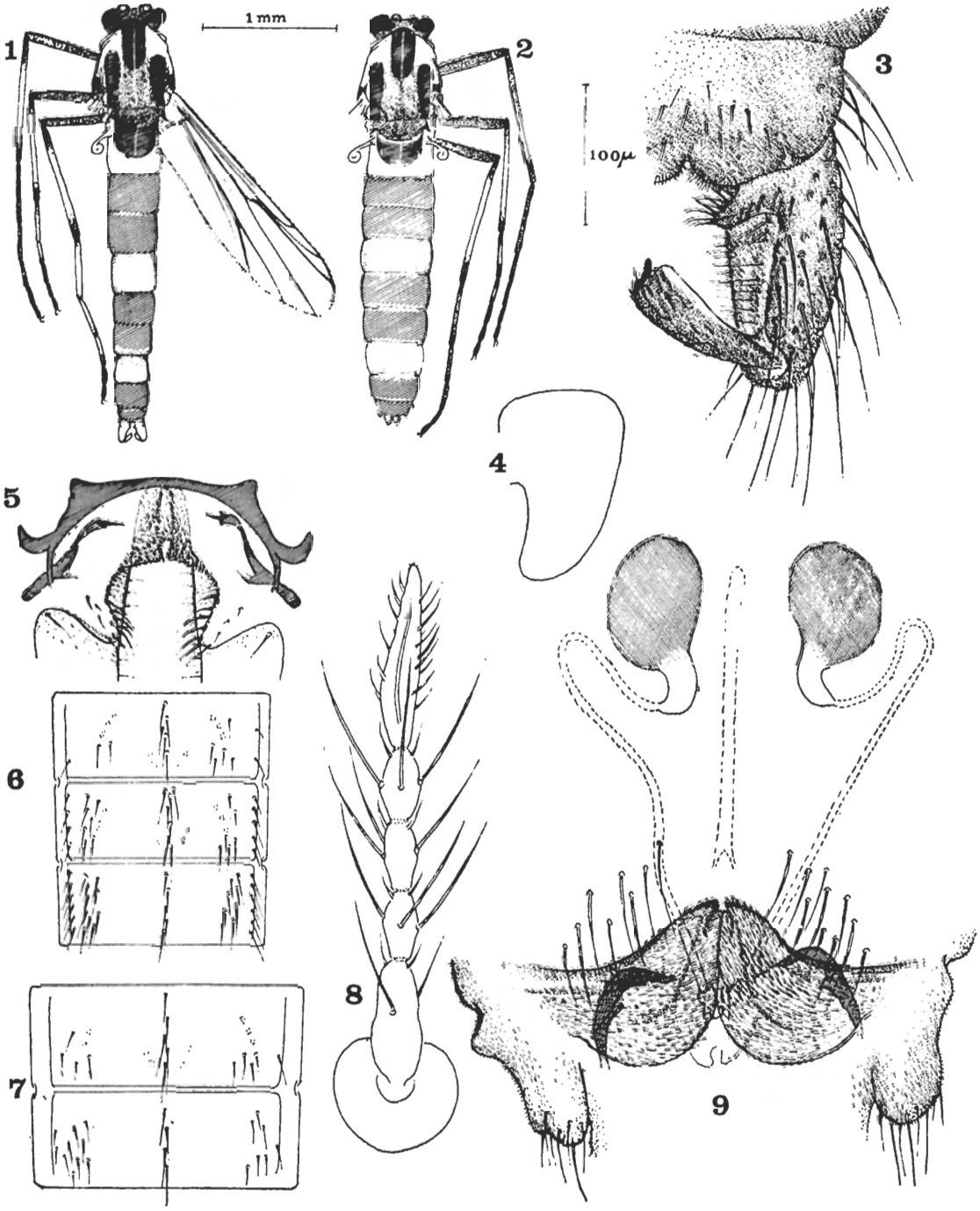


Figure 189. *Cricotopus (Isocladius) tricinctus* (Meig.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3); cercus of ♀ (4); aedeagal lobe and phallapodeme of hypopygium (5); chaetotaxy scheme for abdominal tergites II–IV of ♂ (6); same for III–IV of ♀ (7); antenna (8); spermathecae and outer genitalia of ♀ (9). Scale of drawings 1=2; 3=4–5, 8–9.

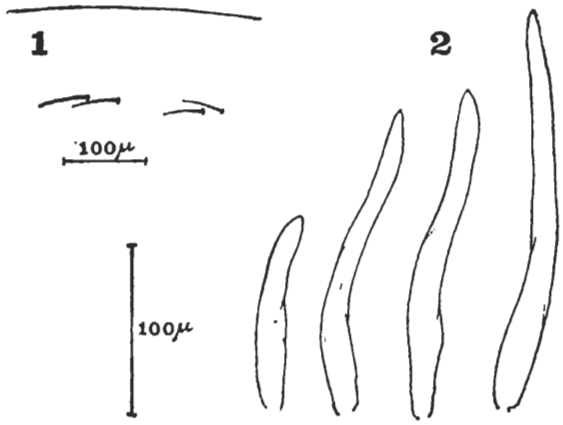


Figure 190. *Cricotopus (Isocladius) tricinctus* (Meig.), pupa. Size relationship and arrangement of Dc setae (1); thoracic horn (2).

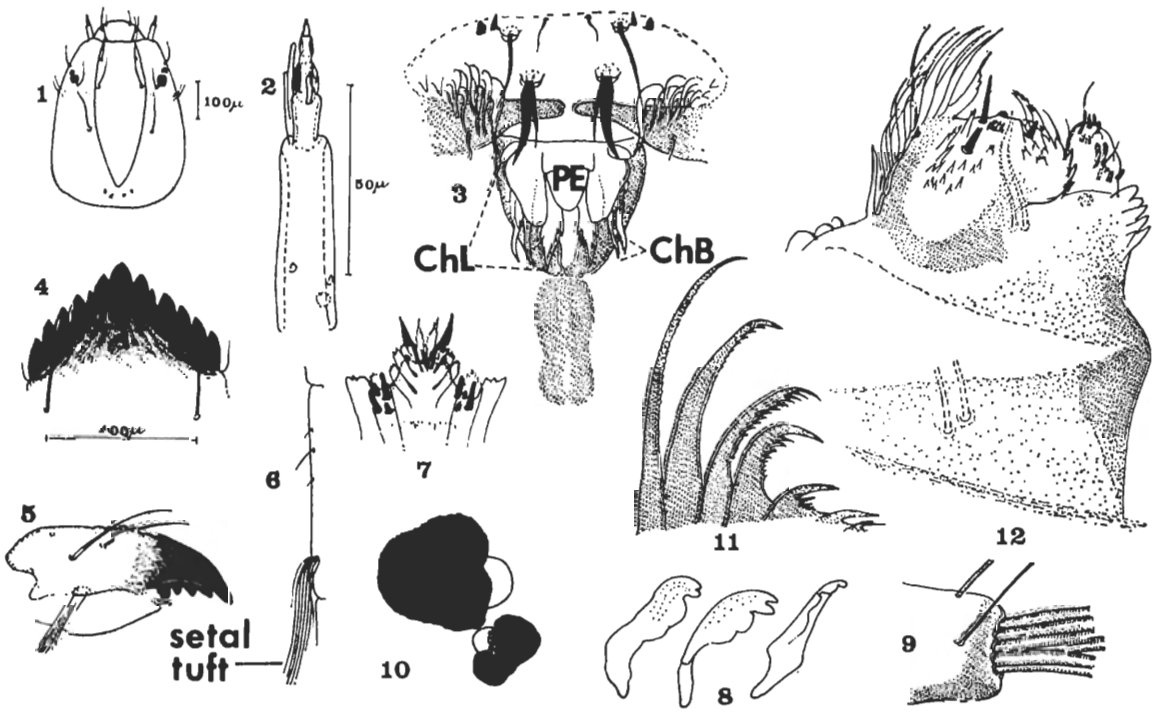


Figure 191. *Cricotopus (Isocladius) tricinctus* (Meig.), larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); L setae of abdominal segment IV (6); prementum (7); variation in premandible by different views (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=6; 2=3, 7, 9–12; 4=5, 8.—ChB chaetulae basales, ChL chaetulae laterales, PE pecten epipharyngis.

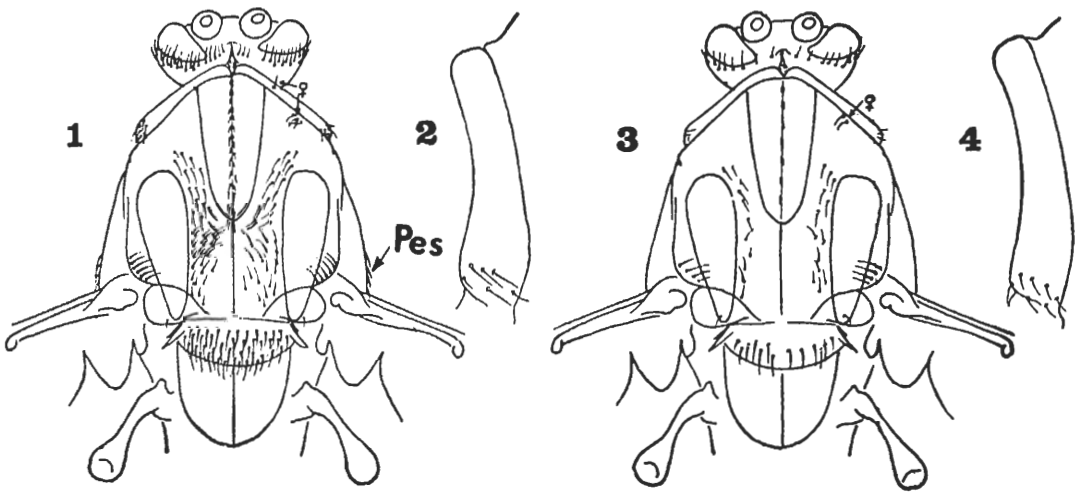


Figure 192. *Cricotopus (Isocladius) reversus* Hirv., (1–2) and *C.* (*I.*) *perniger* (Zett.) (3–4). Chaetotaxy scheme for head and thorax, dorsal and antepronotum.—Pes preepisternal setae.

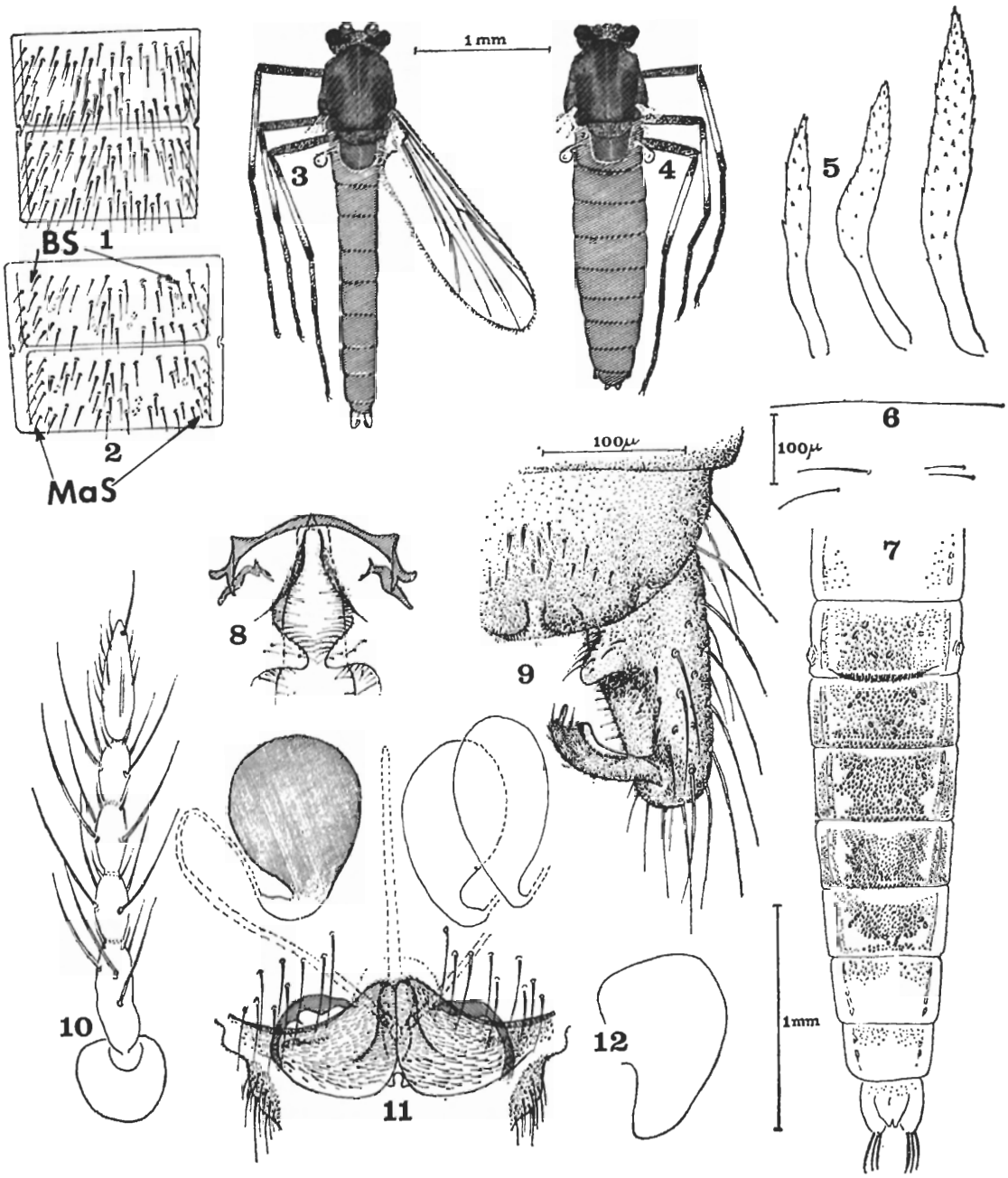


Figure 193. *Cricotopus (Isocladius) reversus* Hirv., adult, pupa. Chaetotaxy scheme for abdominal tergites III and IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); shagreen of abdominal segments of pupa (7); aedeagal lobe and phallapodeme of hypopygium (8); hypopygium (9); antenna (10); variation in spermathecae and outer genitalia of ♀ (11); cercus of ♀ (12). Scale of drawings 3=4; 5=8–12. —BS basal setae, MaS marginal setae.

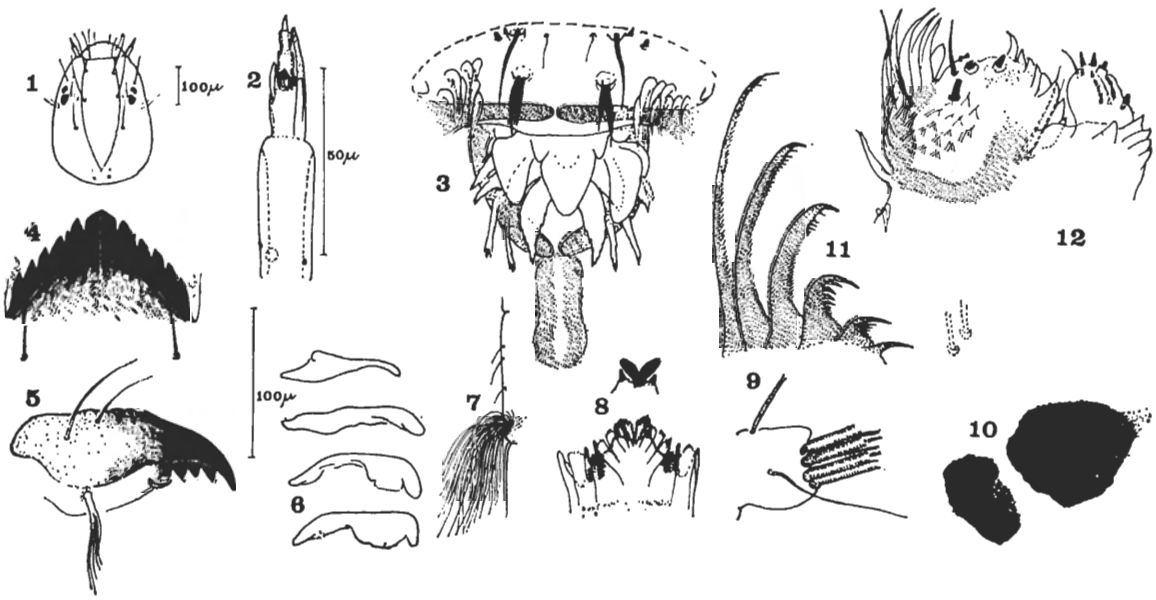


Figure 194. *Cricotopus (Isocladius) reversus* Hirv., larva. Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); variation in premandible with different views (6); L setae of abdominal segment V (7); prementum (above, apical part with appendage L and apical sensillae basiconicae) (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=7; 2=3, 8–12; 4=5–6.

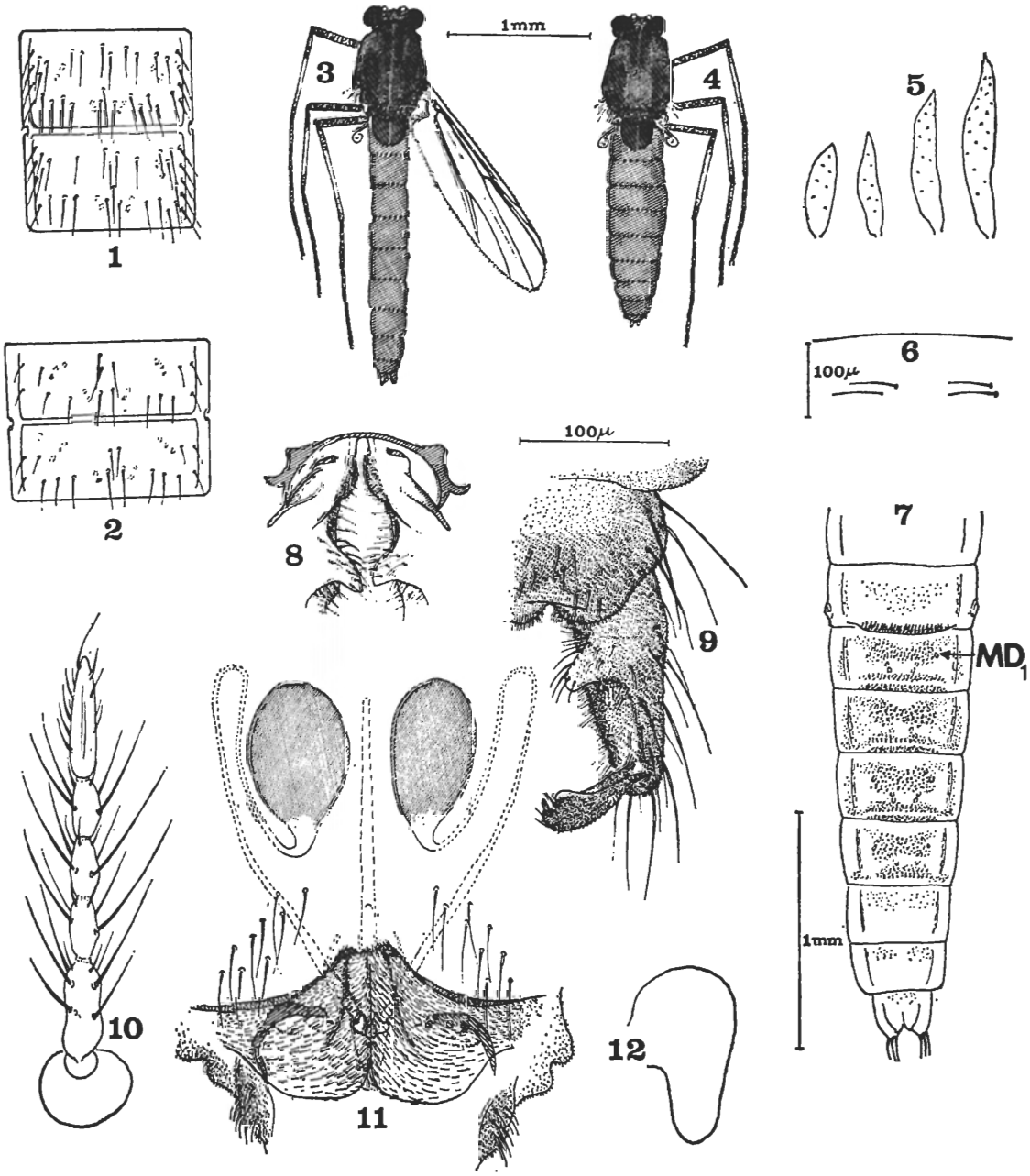


Figure 195. *Cricotopus (Isocladius) perniger* (Zett.), adult, pupa. Chaetotaxy scheme for abdominal tergites III–IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); shagreen of abdominal segments of pupa (7); aedeagal lobe and phallapodeme of hypopygium (8); hypopygium (9); antenna (10); spermathecae and outer genitalia of ♀ (11); cercus of ♀ (12). Scale of drawings 3=4; 5=8–12. —MD_1 anteromedian muscle marks.

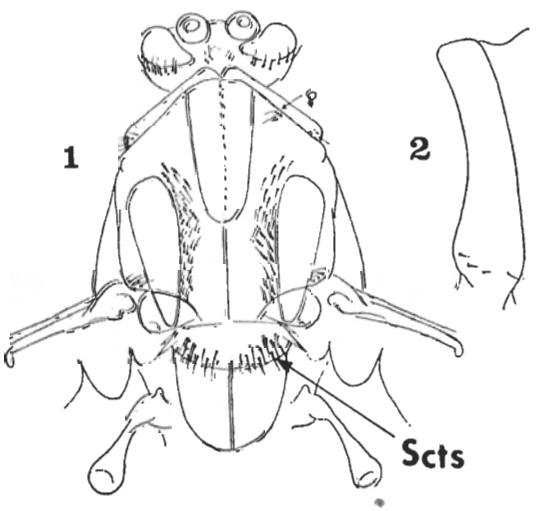


Figure 196. *Cricotopus (Isocladius) intersectus* (Staeg.), adult. Chaetotaxy scheme for head and thorax, dorsal (1); anteprono tum, lateral (2).—Scts scutellar setae.

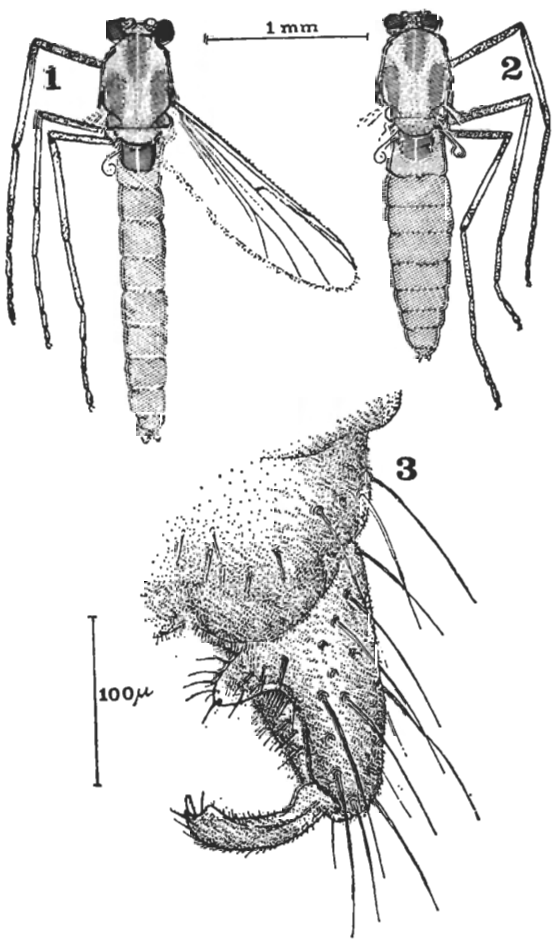


Figure 197. *Cricotopus (Isocladius) intersectus* (Staeg.), adult. ♂ (1); ♀ (2); hypopygium of ♂ (3). Dark, proportionately smaller animals, which among others are similar to the type specimens.

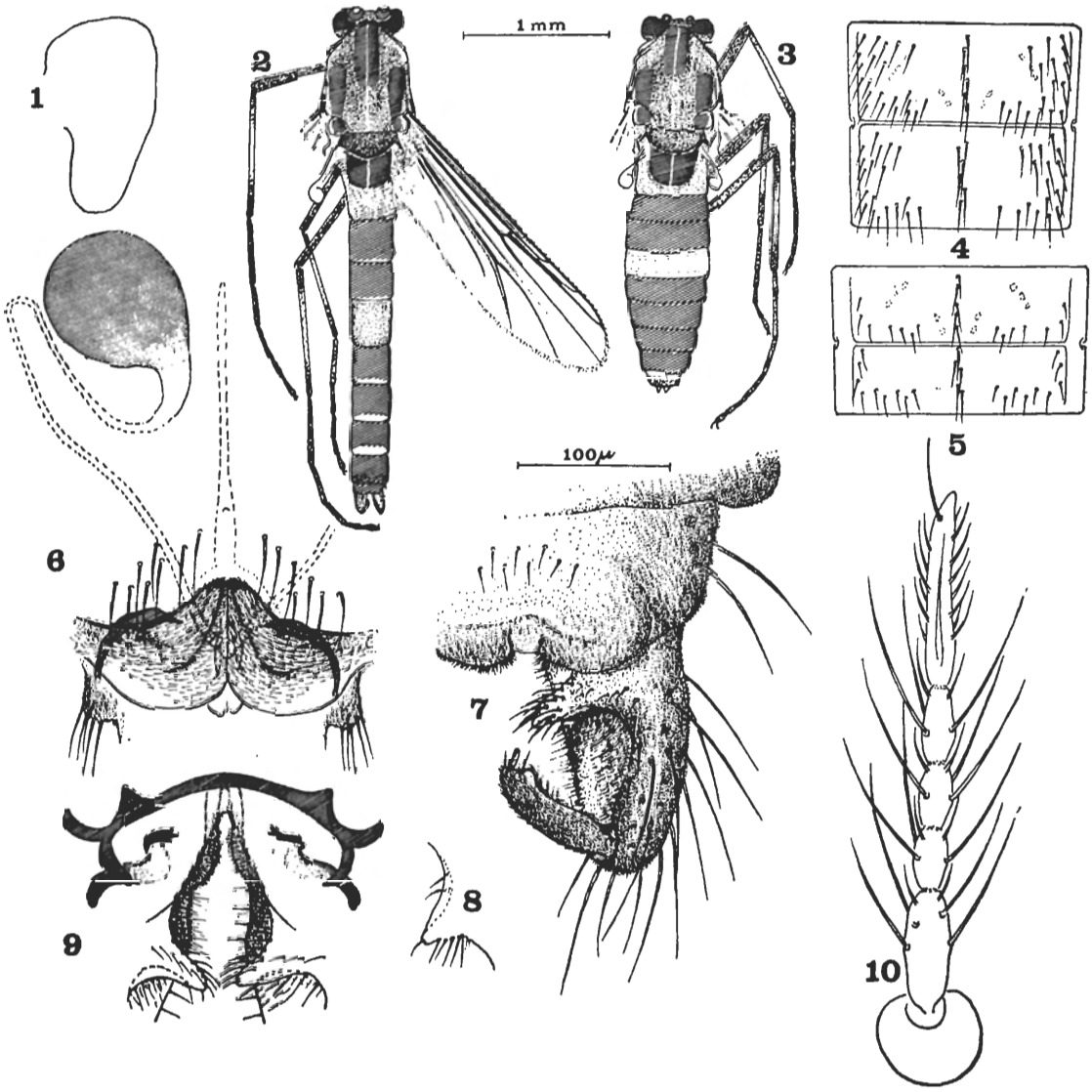


Figure 198. *Cricotopus (Isocladius) intersectus* (Staeg.), adult (most drawn after animals from Lake Sompiojärvi, Finnish-Lappland). Cercus of ♀ (1); ♂ (2); ♀ (3); chaetotaxy scheme for abdominal tergites III–IV of ♂ (4); same of ♀ (5); spermatheca and outer genitalia of ♀ (6); hypopygium (7); example of variation in inferior volsella (Fulda, Germany) (8); aedegal lobe and phallapodeme of hypopygium of ♂ (9); antenna of ♀ (10); Scale of drawings 1=6–10; 2=3.

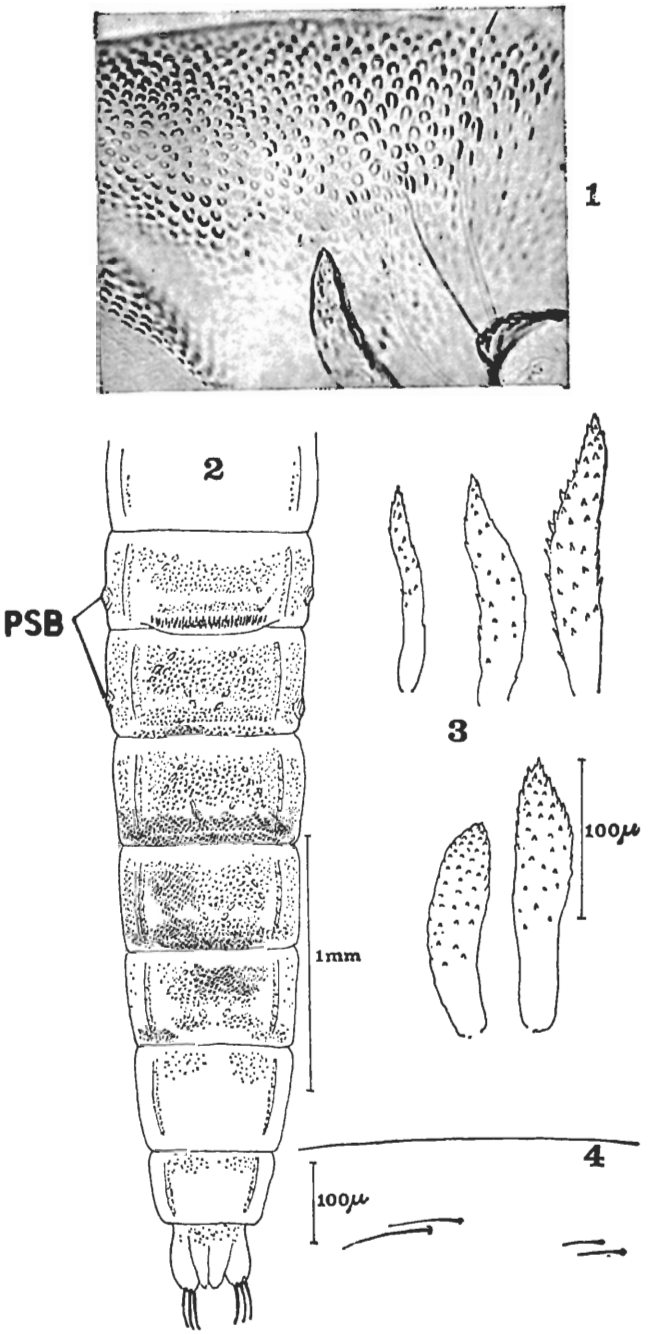


Figure 199. *Cricotopus (Isocladius) intersectus* (Staeg.), pupa. Thoracic region, dorsal ("granular") (1); shagreen of abdominal segments (2); variation in thoracic horn (above left from Riihimäki, in middle Espoobrackish water—and right, Sompiojärvi, Sodankylä, all from Finland; below, example from Lake Constance region, Germany) (3); size relationship and arrangement of Dc setae (4).—PSB pedes spurii B.

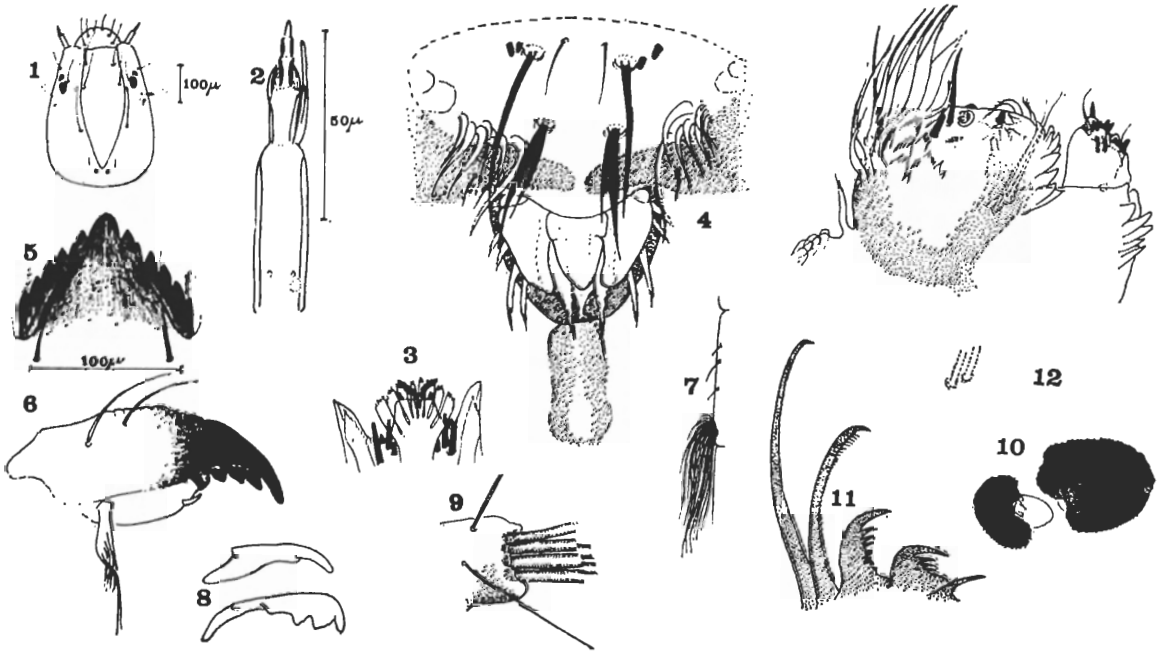


Figure 200. *Cricotopus (Isocladius) intersectus* (Staeg.), larva. Head, dorsal (1); antenna (2); prementum (3); palatal surface of labrum (4); mentum (5); mandible (6); L setae of abdominal segment V (7); variation in premandible with different views (8); procercus (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=7; 2=3–4, 9–12; 5=6, 8.

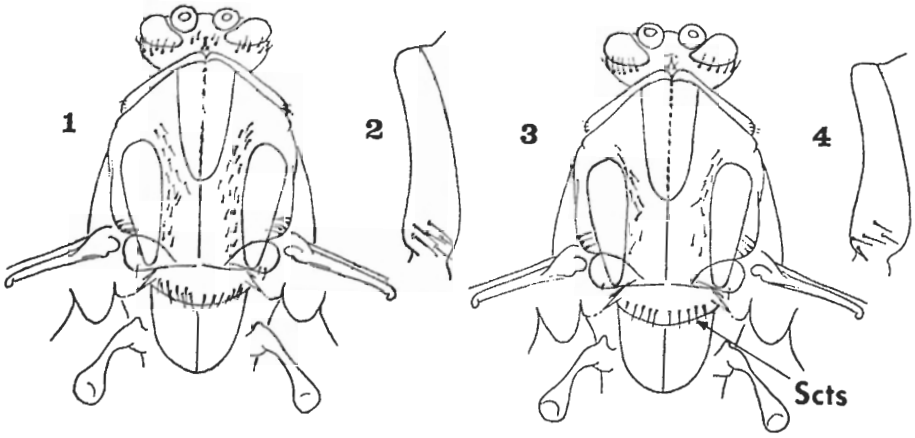


Figure 201. *Cricotopus (Isocladius) arcuatus* Hirv., (1–2) and *C. (I.) laricomalis* Edw. (3–4). Chaetotaxy of head and thorax of ♂ dorsal and antepronotum, lateral.—Scts scutellar setae.

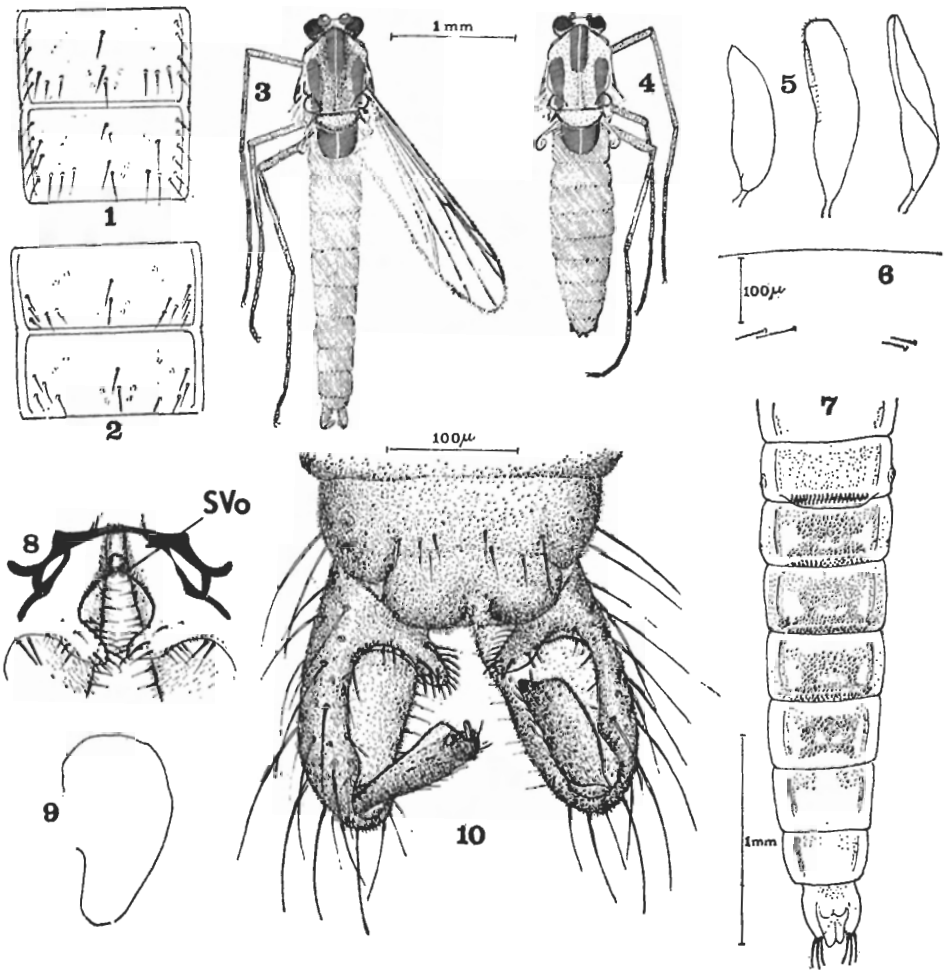


Figure 202. *Cricotopus (Isocladius) arcuatus* Hirv., adult, pupa. Chaetotaxy scheme for abdominal tergites III–IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); shagreen of abdominal tergites of pupa (7); aedeagal lobe and phallapodeme of hypopygium (8); cercus of ♀ (9); hypopygium (10). Scale of drawings 3=4; 5=8–10.—SVo superior volsella.

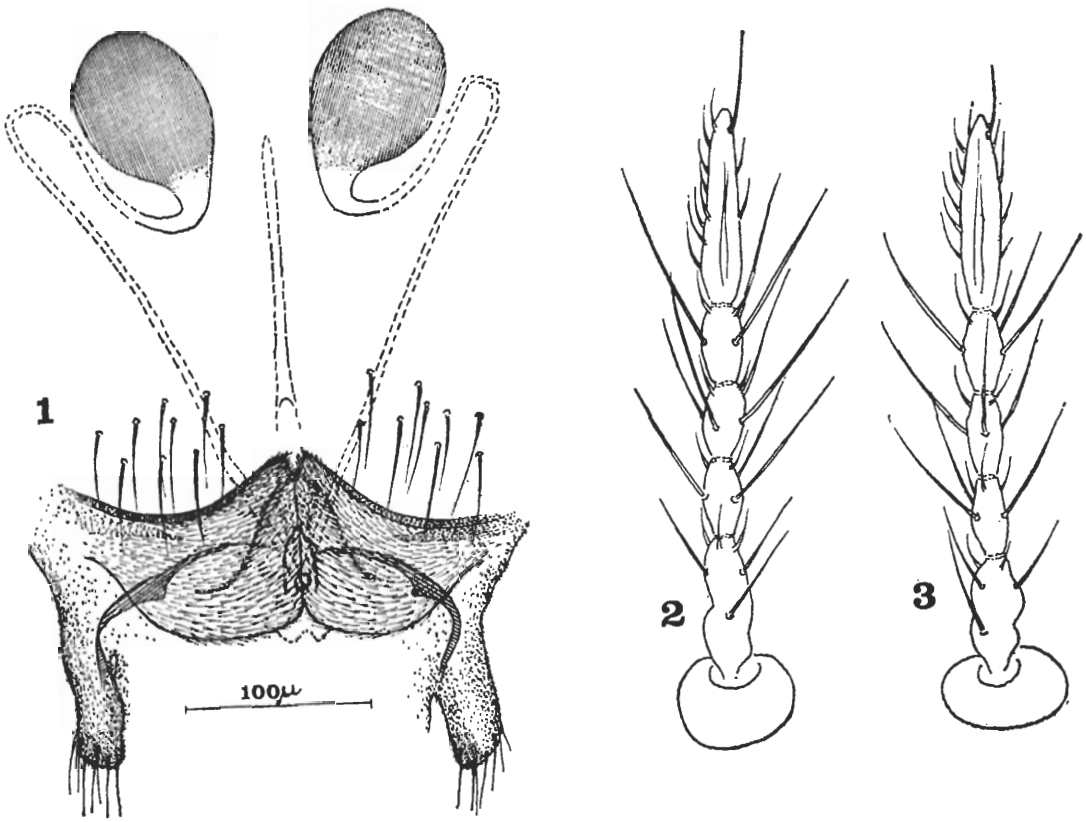


Figure 203. Spermathecae and outer genitalia (1) and antenna (2) of ♀ of *Cricotopus (Isocladius) arcuatus* Hirv.; antenna of ♀ of *C. (I.) obnixus* (Walk.) (3).

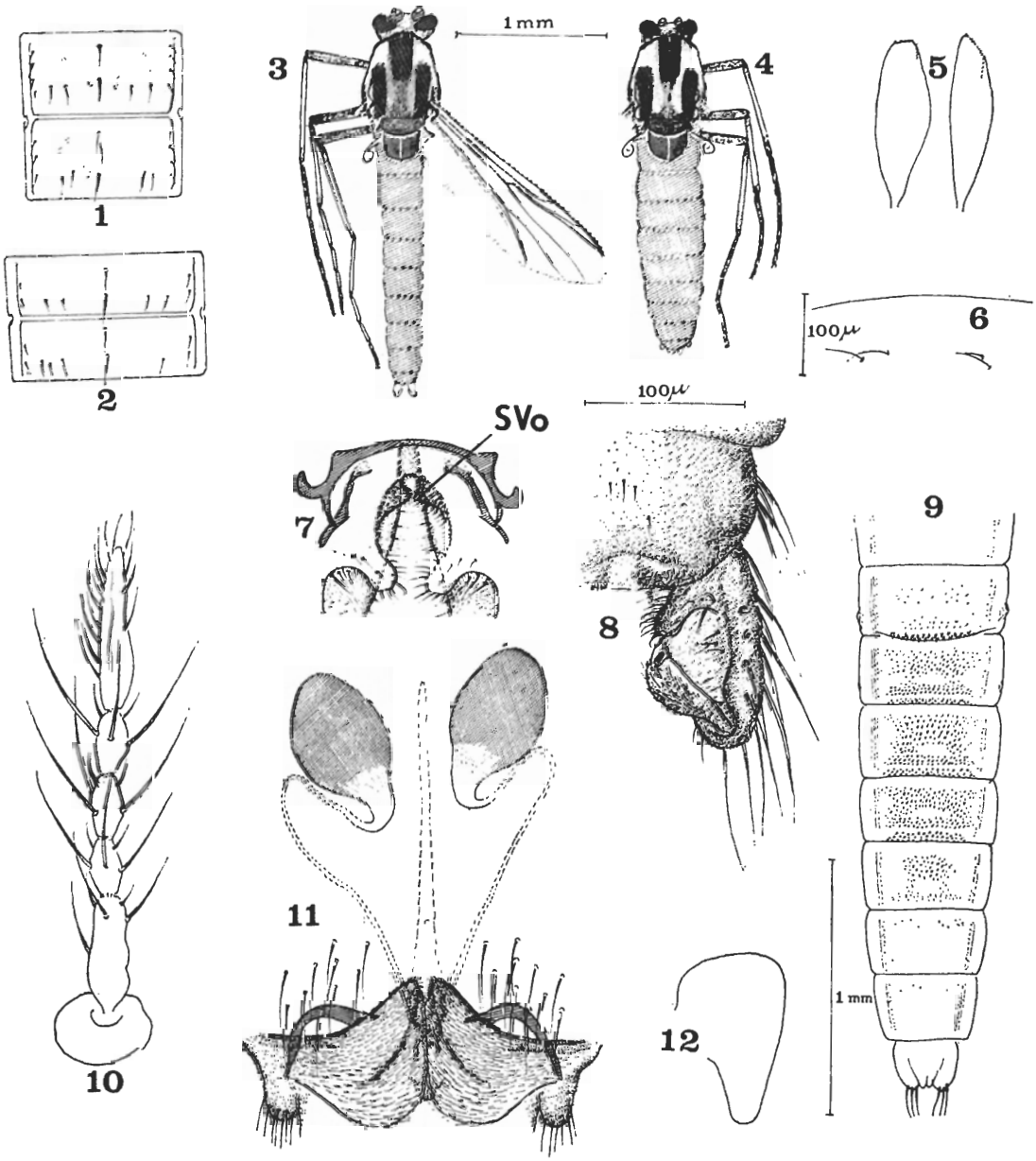


Figure 204. ***Cricotopus (Isocladius) obtusus*** **Hirv., adult, pupa. Chaetotaxy scheme for abdominal segments III–IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horn (5); size relationship and arrangement of Dc setae of pupa (6); aedeagal lobe and phallapodeme of hypopygium (7); hypopygium (8); shagreen of abdominal segments of pupa (9); antenna (10); spermathecae and outer genitalia of ♀ (11); cercus of ♀ (12). Scale of drawings 3=4; 5=7–8, 10–12.—SVo superior volsella.**

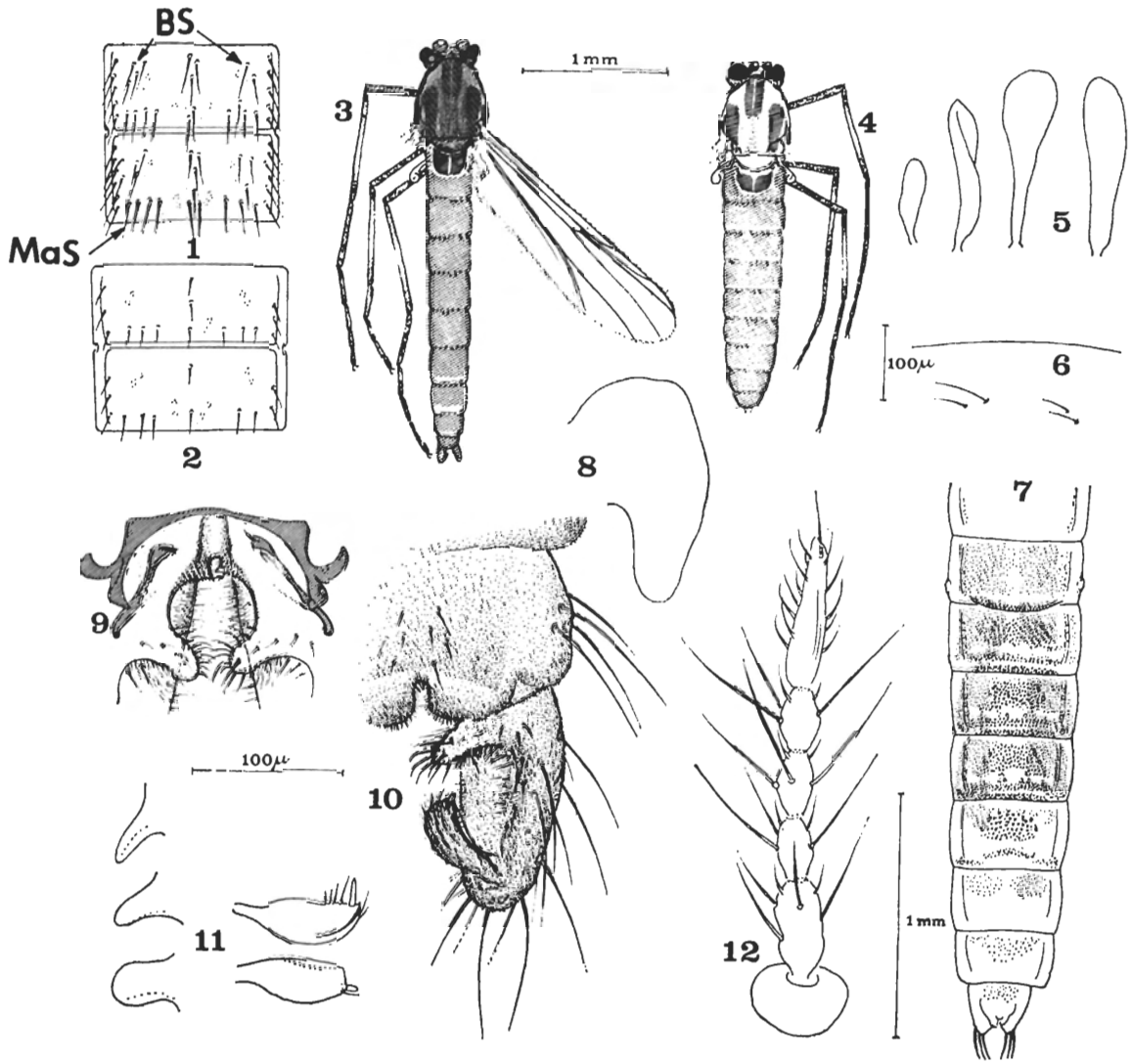


Figure 205. *Cricotopus (Isocladius) laricomalis* Edw., adult, pupa. Chaetotaxy scheme for abdominal tergites III–IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horns (5); size relationship and arrangement of Dc setae of pupa (6); shagreen of abdominal tergites of pupa (7); cercus of ♀ (8); aedeagal lobe and phallapodeme of hypopygium (9); hypopygium (10); variation of inferior volsella (left) and stylus of ♂ (11); antenna of ♀ (12). Scale of drawings 3=4; 5=8–12.—BS basal setae, MaS marginal setae.

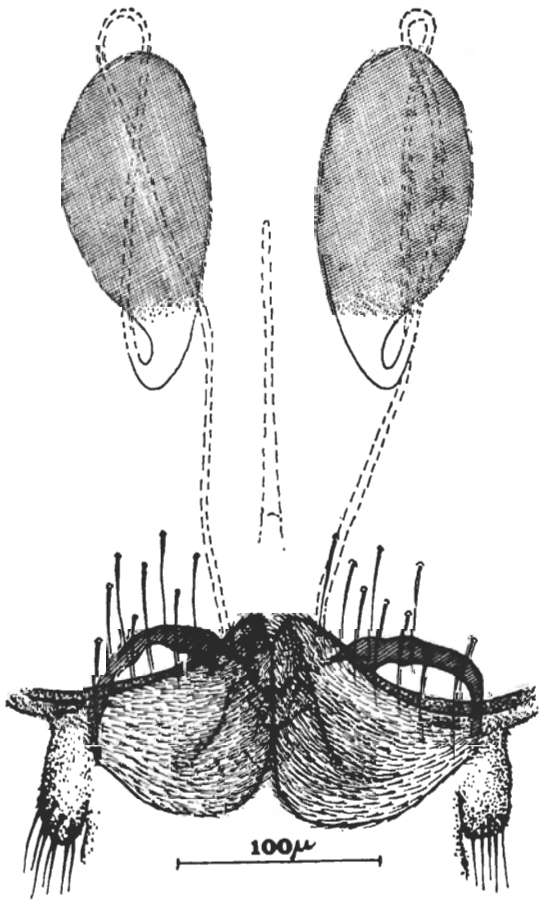


Figure 206. ***Cricotopus (Isocladius) laricomalis*** **Edw., spermathecae and outer genitalia of ♀.**

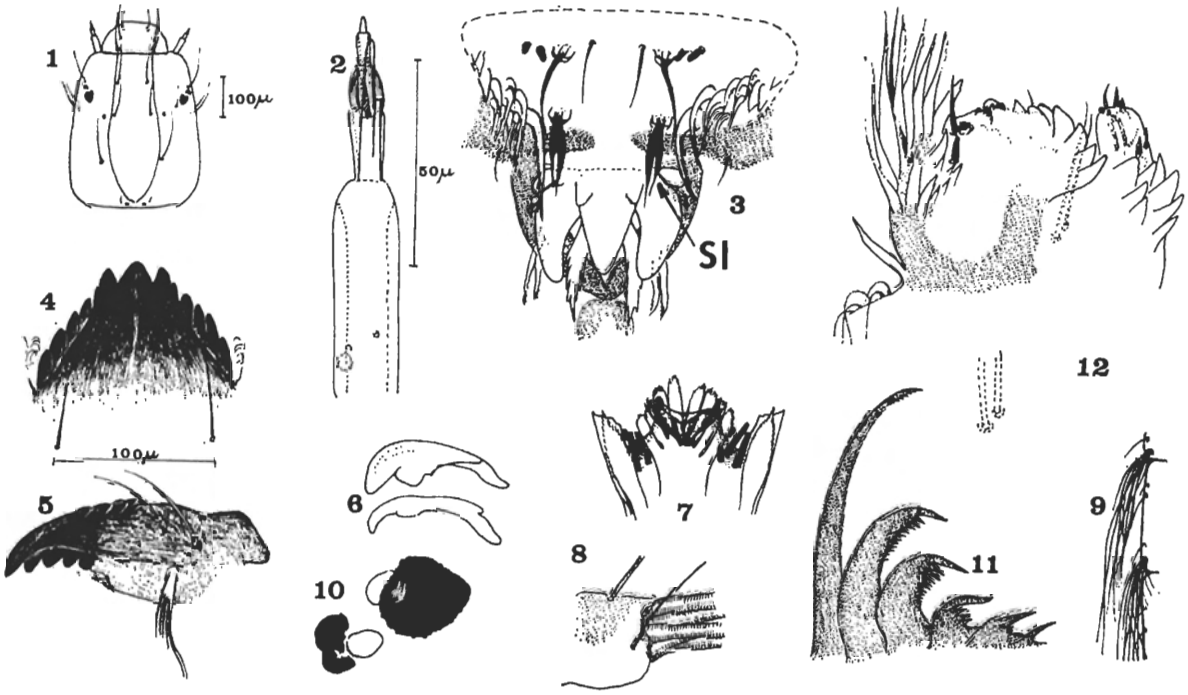


Figure 207. *Cricotopus (Isocladius) laricomalis* Edw., Head, dorsal (1); antenna (2); palatal surface of labrum (3); mentum (4); mandible (5); variation in premandible with different views (6); prementum (7); procercus (8); L setae of abdominal segment IV (9); eyespots (10); claws of anterior parapods (11); maxilla (12). Scale of drawings 1=9; 2=3, 7–8, 10–12; 4=5–6.—SI seta anteriores.

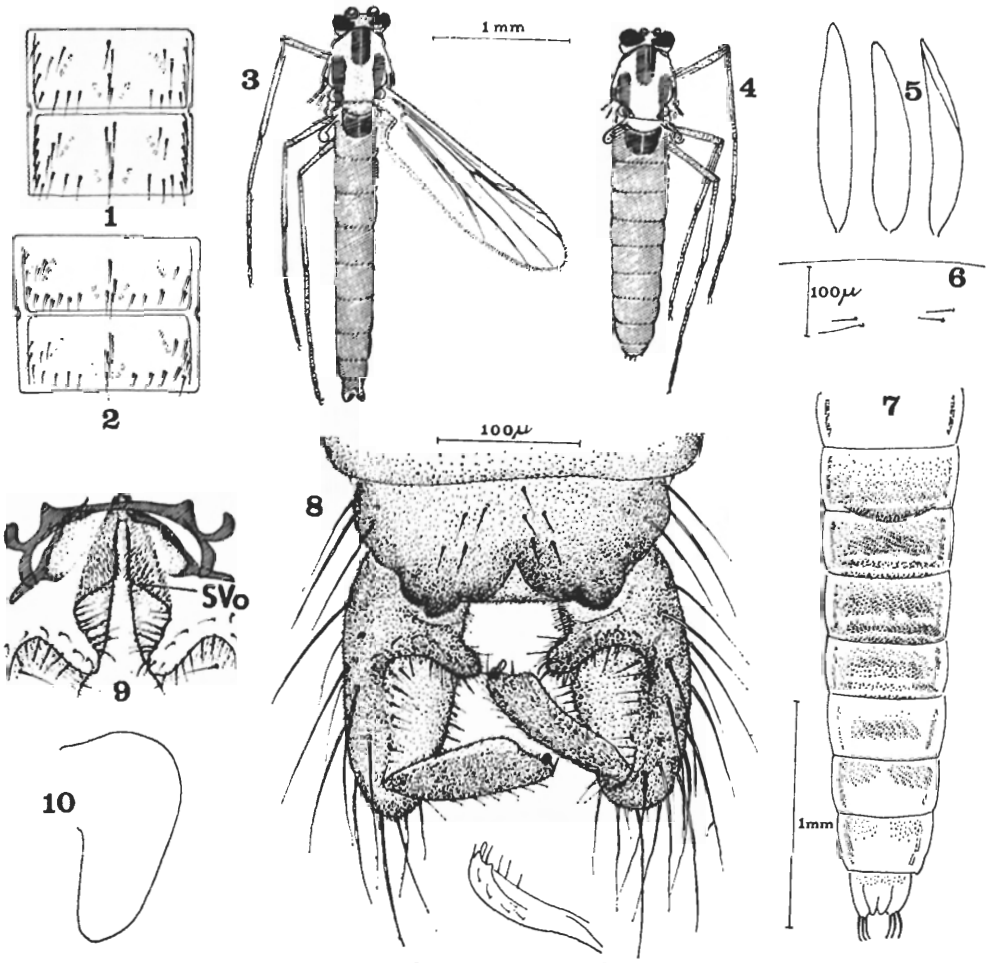


Figure 208. *Cricotopus (Isocladius) obnixus* (Walk.), adult, pupa. Chaetotaxy scheme for abdominal tergites III–IV of ♂ (1); same of ♀ (2); ♂ (3); ♀ (4); variation in thoracic horn (5); arrangement and size relationship of Dc setae of pupa (6); shagreen (in the illustration is an uncommon specimen, anterior and posterior spinule fields often are more confluent) of abdominal tergites of pupa (7); hypopygium (below, stylus with different view) (8); aedeagal lobe and phallapodeme of hypopygium (9); cercus of ♀ (10). Scale of drawings 3=4; 5=8–10.—SVo superior volsella.

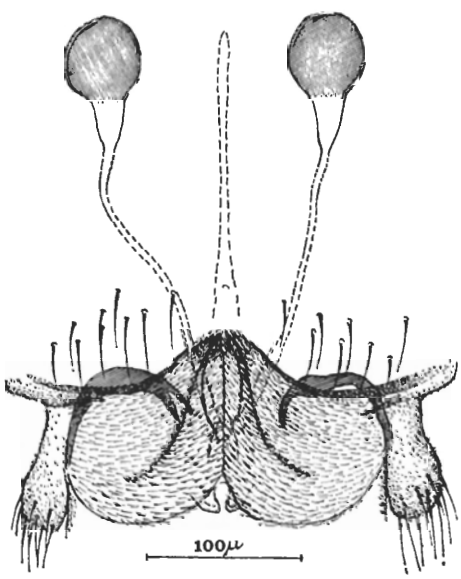


Figure 209. *Cricotopus (Isocladius) obnixus* (Walk.), spermathecae and outer genitalia of ♀.

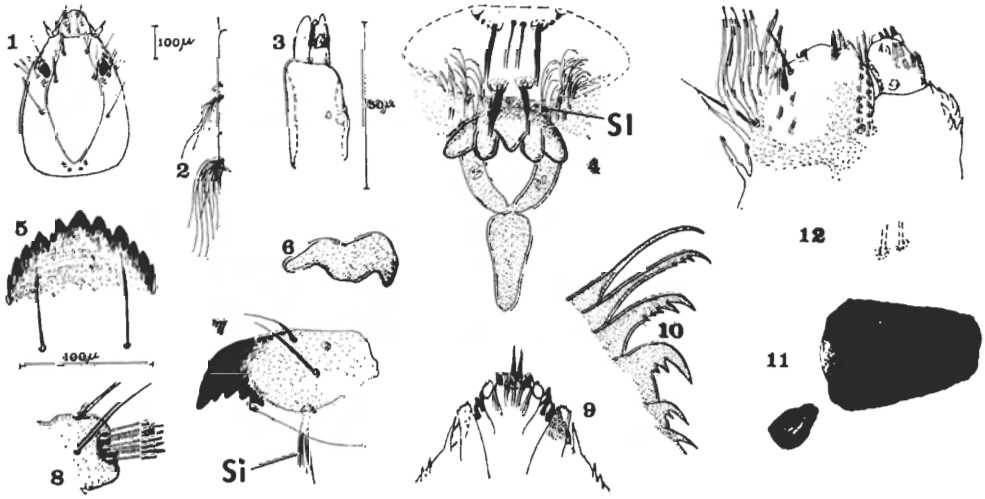


Figure 210. *Cricotopus (Isocladius) elegans* Joh. [? *obnixus* (Walk.)], larva. Head, dorsal (1); L setae of abdominal segment V (2); antenna (3); palatal surface of labrum (4); mentum (5); premandible (6); mandible (7); procercus (8); prementum (9); claws of anterior parapods (10); eyespots (11); maxilla (12). Scale of drawings 1=2; 3=4, 8–12; 5=6–7.—S_i seta interna, SI seta anteriores.

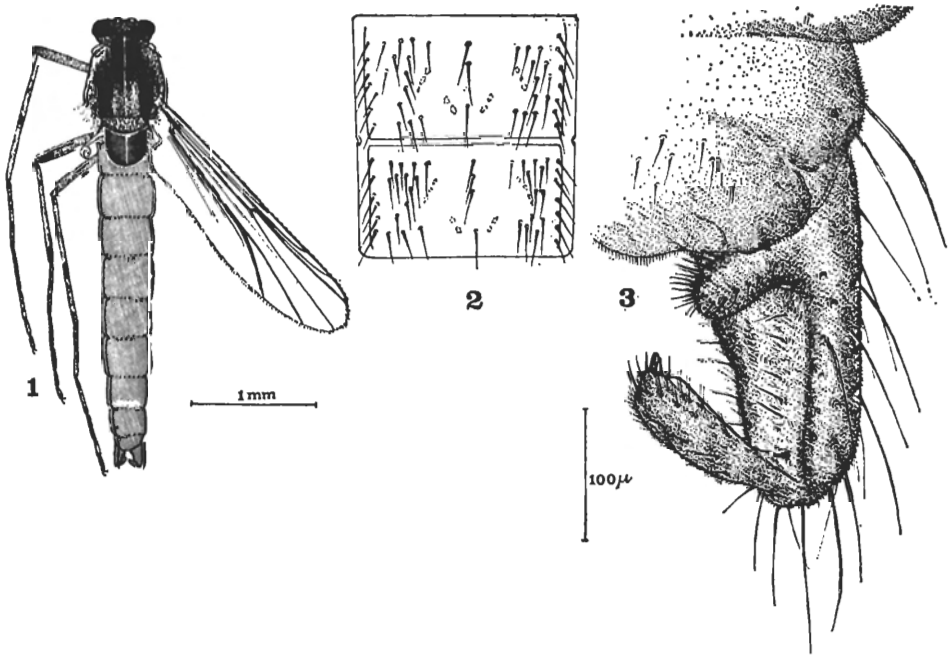


Figure 211. *Cricotopus (Isocladius)* sp., cfr. *obnixus* (Walk.). ♂ (1); chaetotaxy scheme for abdominal tergites III–IV of ♂ (2); hypopygium of ♂ (3).

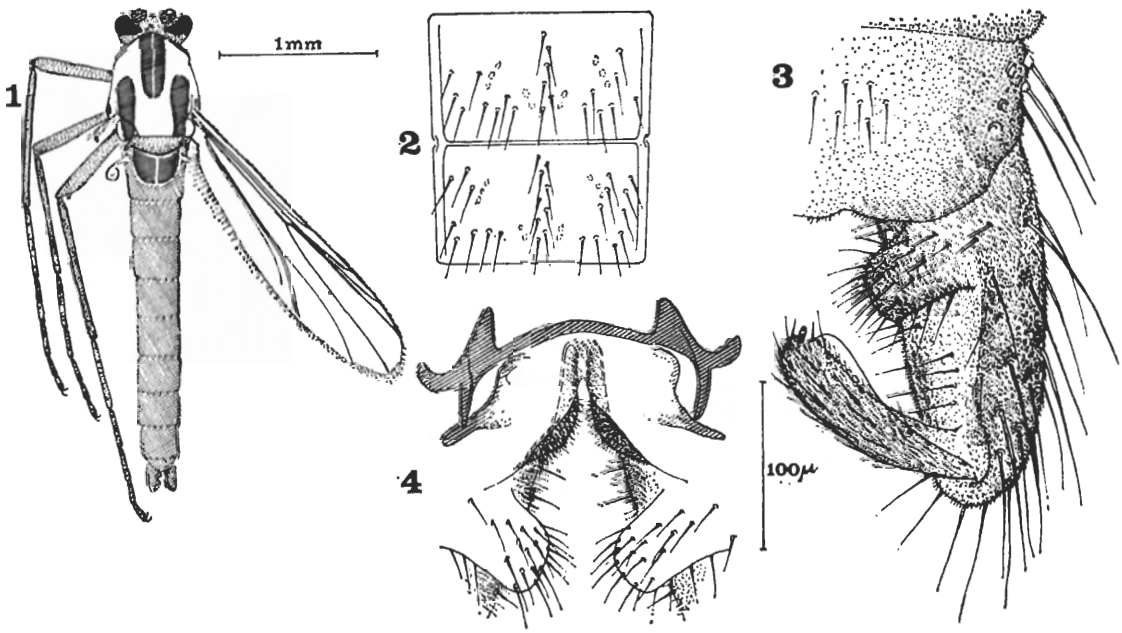


Figure 212. *Cricotopus (Isocladius) reductus* Hirv., ♂ (1); chaetotaxy scheme for abdominal tergites III–IV of ♂ (2); hypopygium (3); aedeagal lobe and phallapodeme of hypopygium (4).

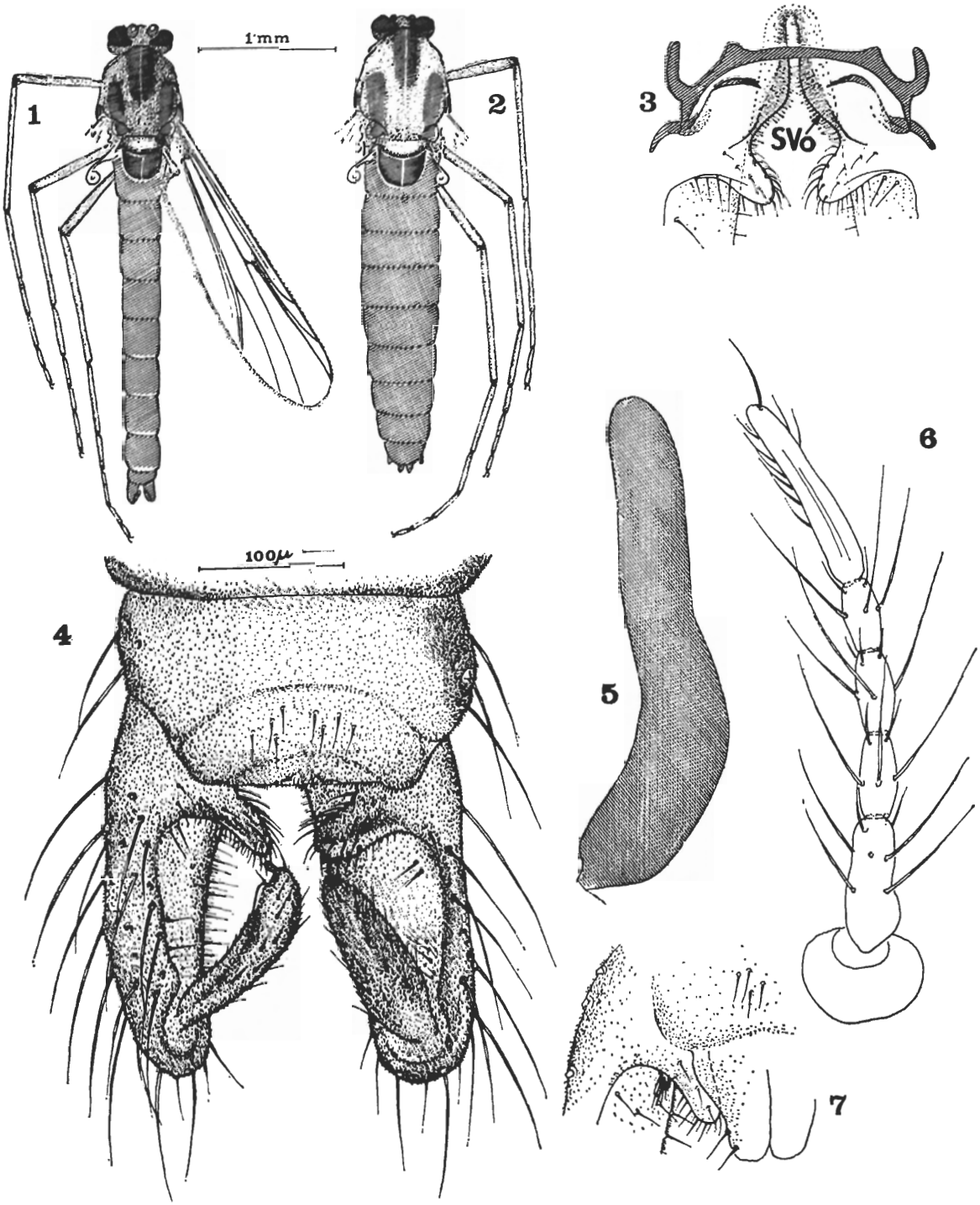


Figure 213. *Cricotopus (Isocladius) brevipalpis* Kieff., adult, pupa. ♂ (1); ♀ (2); aedeagal lobe and phallapodeme of hypopygium (3); hypopygium (4); thoracic horn of pupa (5); antenna of ♀ (6); deviated hypopygium of ♂ with indication of appendage 2 under inferior volsella and with two setae on proctiger (7). Scale of drawings 1=2; 3=4–7.—SVo superior volsella.

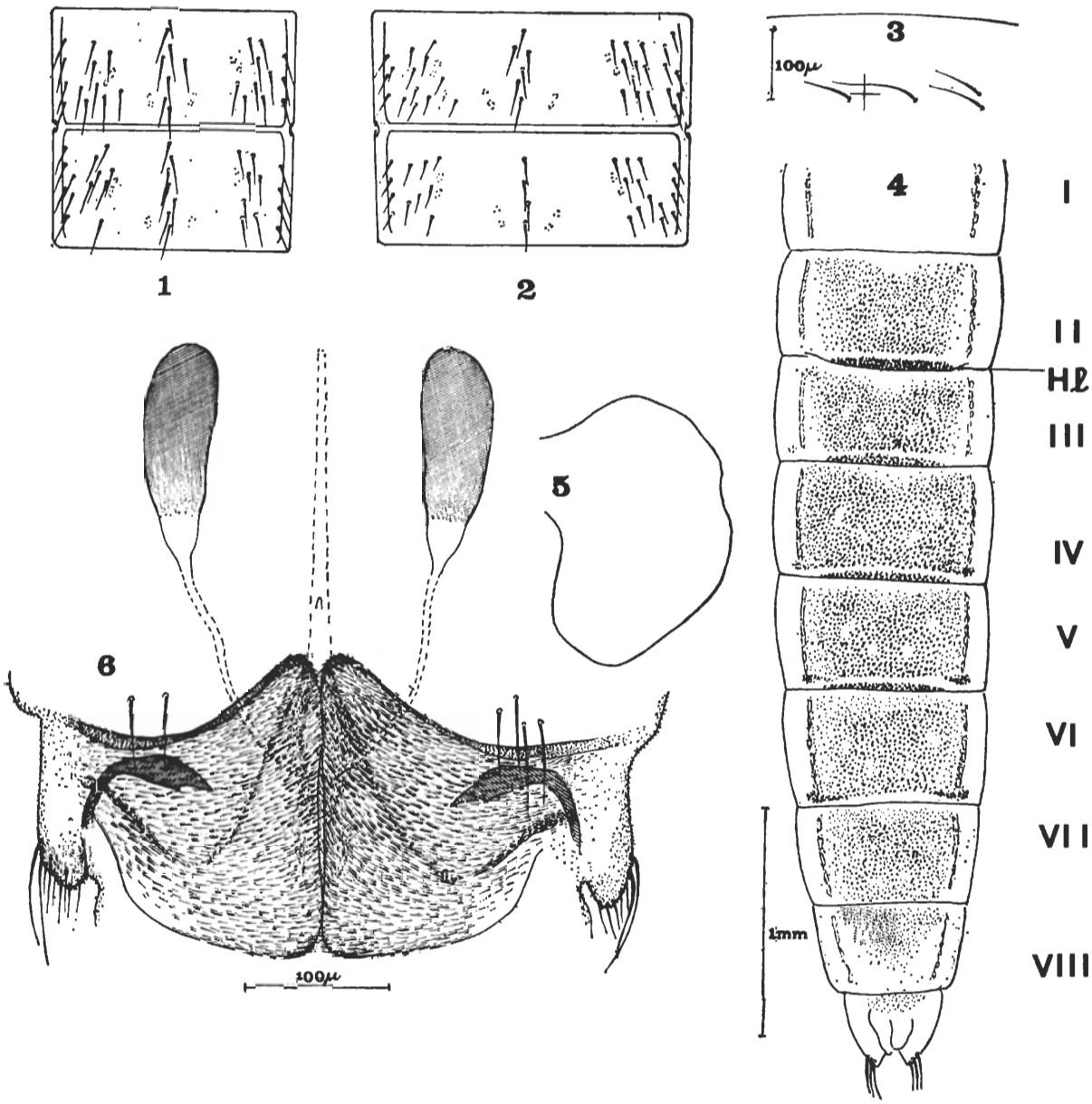


Figure 214. *Cricotopus (Isocladius) brevipalpis* Kieff., adult, pupa. Chaetotaxy scheme for abdominal tergites III–IV of ♂ (1); same of ♀ (2); size relationship and arrangement of Dc setae of pupa (3); shagreen of abdominal segments of pupa (4); cercus of ♀ (5); spermathecae and outer genitalia of ♀ (6). Scale of drawings 5=6.—Hl hooklets.

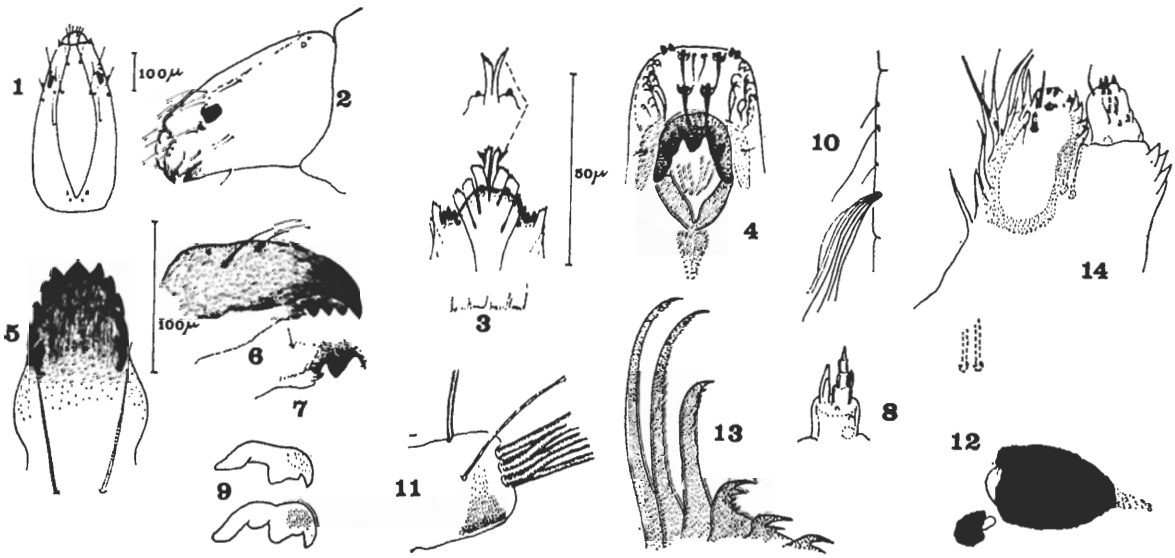


Figure 215. *Cricotopus (Isocladius) brevipalpis* Kieff., larva. Head, dorsal (1); head, lateral (2); prementum (above, appendage L) (3); palatal surface of labrum (4); mentum (5); mandible (6); region of last free tooth and SSd of mandible enlarged (7); antenna (8); premandible (9); L setae of abdominal segment IV (10); procercus (11); eyespots (12); claws of anterior parapods (13); maxilla (14). Scale of drawings 1=2–10; 3=4, 7, 8, 11–14; 5=6, 9.

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