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MICROPSECTRA OKSANAE SP. N., A NEW CRENOPHILOUS SPECIES INHABITING KARSTIC SPRINGS AND STREAMS IN SOUTH-EASTERN FRANCE (DIPTERA: CHIRONOMIDAE, TANYTARSINI)

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Abstract

Micropsectra oksanae sp. n. is described as male adult and pupal exuviae, based on associated pharate material collected in May 2005 from two pristine karstic streams (Verne and Valescure, altitude 300-400m) in south-eastern France. Its geographical distribution is currently restricted to the northern area of the Var Department (France). Remarks on the taxonomic position and ecology of the new species are given.

Key words: Diptera, Chironomidae, *Micropsectra oksane* sp. n., karstic springs and streams, south-eastern France, conservation.

Introduction

Data on the taxonomy, geographical distribution and ecology of the genus *Micropsectra* Kieffer, 1909 from the Palaearctic Region (Shilova, 1976; Reiss, 1969a, 1969b, 1971, 1982, 1983; Cranston *et al.*, 1989; Stur and Ekrem, 2006; Ekrem *et al.*, 2010; Giłka, 2009, 2011; Giłka and Jazdzewska, 2010; Sæther and Spies, 2013) show that about 45 species are currently known from Europe and neighbouring areas. In continental France, the genus *Micropsectra* is represented by 23 known valid species and 6-7 undescribed new taxa: *M. andalusiaca* Marcuzzi, 1950; *M. appendica* Stur and Ekrem, 2006; *M. apposita* (Walker, 1856); *M.* cf. *aristata* Pinder, 1976; *M. atrofasciata* (Kieffer, 1911); *M. attenuata* Reiss, 1969; *M. auvergnensis* Reiss, 1969; *M. chionophila* (Edwards, 1933); *M. junci* (Meigen, 1818); *M. lacustris* Säwedal, 1975; *M. lindrothi* Goeghebuer, 1931; *M. mendli* (Reiss, 1983); *M. nohedensis* (Moubayed and Langton, 1996); *M. notescens* (Walker, 1856); *M. oksanae* sp. n.; *M. pallidula* (Meigen, 1830); *M. radialis* Goetghebuer, 1939; *M. recurvata* Goetghebuer, 1928; *M. roseiventris* (Kieffer, 1909); *M. shrankelae* Stur and Ekrem, 2006; *M. sofiae* Stur and Ekrem, 2006; *M. styriaca* Reiss, 1969 and *M. uliginosa* (Reiss, 1969).

In this paper, *Micropsectra oksanae* sp. n. (= *M.* sp. 6 in Moubayed-Breil and Ashe, 2016) is described as male adult and pupal exuviae based on associated material collected in May 2005

from two pristine karstic springs and streams in south-eastern France (upper basin of both Verne and Valescure streams, Var Department, altitude 300-400m). A total of **768** species of Chironomidae, recently reported from continental France in Moubayed-Breil (2017), was updated to **780** valid species based on Moubayed-Breil and Ashe (2018) and Moubayed-Breil *et al.* (2018). Consequently, the description of *M. oksanae* sp. n. increases the total number to **820** taxa including **781** valid known species from this country. Remarks and discussion on the closest related *Micropsectra* species and comments on the ecology and geographical distribution of the new species are given.

Materials and methods

Morphological terminology and measurements follow Sæther (1980), Pinder and Reiss (1986) and Spies (1998) for the imagines; Sæther (1980), Anderson *et al*. (2013) and Langton (1991, 1994) for the pupal exuviae. For the male hypopygium feature "*Micropsectra*-seta" see Giłka and Jazdzewska (2010, Figs 8, 10).

Type material was preserved in 80-85% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid then washed in about 60% ethanol before mounting on slides. Part of the abdomen and the halter of the male adult are preserved in 85% ethanol for an eventual DNA analysis.

Description

***Micropsectra oksanae* Moubayed-Breil and Ashe, sp. n.**

(= *M.* sp. 6 in Moubayed-Breil and Ashe, 2016)

Material examined

Holotype. **France**, karstic spring, upper basin of Verne stream, Var Department, altitude 400m, 24 May 2005, 1 male pharate adult, leg. J. Moubayed-Breil. Environmental data of spring: calcareous water, conductivity about 430µS/cm; temperature 8-12°C.

Paratypes (all leg. J. Moubayed-Breil). 1 male adult + 1 male pupal exuviae, same locality and data as for holotype; 2 pupal exuviae (1 male + 1 female), Valescure karstic springs and rivulets, upper basin of the Réal Collobrier River, Var Department, south-eastern France; 43° 26' 0" North, 6° 47' 0" East.

The Holotype (on 1 slide) is deposited in the collections of the National Museum of Ireland – Natural History, Merrion Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection.

Diagnostic characters

The most closely related *Micropsectra* species to *M. oksanae* sp. n. belong to the *atrofasciata*-group but also to the *attenuata*-group based on various characters of both the male adult and pupal exuviae including: the shape of tergite IX and anal point (dorsal and lateral view); absence of a digitus; the distribution pattern of armament on tergites III-V of the pupa. However, the new species can be separated from other members of the genus *Micropsectra* primarily by the following characters of the male adult and pupal exuviae.

Male adult. Anal lobe of wing weakly projecting, squamal area densely covered with dark proclinate microtrichia (directed forwards). Tergite IX sub-rectangular with a nearly straight posterior margin, the presence of a distinct projecting hump located medially (clearly visible in lateral view), anal tergite bands posteriorly separated and abruptly terminated well before base of anal point. Anal point drop-like with bifid apex. Superior volsella triangular, longitudinally projecting, wide at base and gradually tapered distally to a pointed apex, setiger area with 7-8 setae located laterally close to the outer margin, inner margin bare, median area markedly wrinkled, digitus absent. Stem of median volsella uniformly linear, reaching distal third of inferior volsella, with both normal and lanceolate setae apically. Inferior volsella reaching beyond half-length of gonostylus, with a distinct transverse protrusion medially and a well developed setiferous ventral lobe bearing 5 long setae.

Pupal exuviae. Frontal apotome weakly wrinkled, frontal tubercles well developed and typically cylindrical. Thoracic horn distinctly swollen in its proximal half. Thorax with two granulose areas located anteriorly and posteriorly close to the thoracic suture; thoracic mound well developed, consisting of a broad sub-triangular expansion projecting laterally at a right angle. All pleurae bare. Tergite II almost entirely covered with chagrin and short spines except for one postero-median oval patch, Pedes spurii B present, hook row ¾ as long as segment width. Tergite III with a pair of inwardly curved spine patches becoming gradually longer posteriorly and separated by a bare oval median area. Armament of tergites IV-V quite similar but less conspicuous on V, consisting of two fused pairs of bands located on anterio- and postero-median areas, anterior one sub-oval to sub-triangular and extended transversally, wider laterally, composed of short inwardly bent spines becoming gradually longer laterally, second band a reverse L-shape on the left side, composed of long and dense spines anteriorly becoming shorter posteriorly. Lateral setae present on segments I-IV (2, 2, 2, 1); lateral taeniae present on segments II-VIII (1, 1, 2, 3, 4, 4, 5). Comb of segment VIII weakly paddle-like in shape, composed of 4-5 strong teeth including one much larger located medially. Anal lobe with 2 dorsal taeniae placed posteriorly, fringe with 22-24 taeniae.

Etymology

The new species is named '*oksanae*' after our colleague Dr Oksana V. Orel (Institute of Biology and Soil Sciences; Vladivostok, Russia) who is actively contributing to our knowledge of the subfamily Chironominae in the Russian Far East.

Male adult

(n = 2; Figs 1-2, 5, 7-11)

A large sized *Micropsectra* species. Total length 4.95-5.00mm. Wing length 3.25mm. TL/WL 1.54. Colouration brown to dark brown with contrasting light brown to dark brown scutal thoracic strips. Head, legs and abdominal segments brownish, anal segment contrasting brown to dark brown.

Head. Eyes bare; hairs densely present on the inner margin of eyes (proximal, median and distal parts); frontal margin slightly gaping medially; coronal triangle distinct; frontal tubercles absent. Temporal setae 12 including 9 inner and 3 outer verticals. Clypeus sub-rectangular with about 35-37 setae in 8 rows. Palp 5-segmented (segments 4 and 5 lost); length (in µm) of segments 1 to 3: 85, 85, 105; palpomere 3 with 5-6 sensilla clavata and several sensilla coeloconica (about 5). Antenna 13-segmented, 1490µm long, ultimate flagellomere 970µm long, weakly clubbed (nearly linear) and bearing 1 distinct apical seta; antennal groove reaching segment 3; AR 1.87.

Thorax. Lobes of antepronotum widely separated; antepronotals with 4-5 lateral antepronotals, median antepronotals absent; acrostichals 8-9 in 1 row; dorsocentrals 14-15 in 1-2 rows; prealars 4-5. Scutellum with about 22 setae located in 2 rows. *Wing*. Brachiolum with 2 setae; all veins and cells well covered with setae; anal lobe weakly projecting, squamal area (Figs 1-2) densely covered with spine-like blackish proclinate microtrichia (directed forwards); squama bare. *Legs*. Tarsomere ta_1 of PI slightly longer than tibia. Length (in µm) of tibial spurs: PI, 20; PII, 30 and 20; PIII, 45 and 25. Tibial combs of PII and PIII well developed with about 17 smooth and sub-equal teeth (20-25µm long). Length (µm) and proportions of legs PI-PIII as in Table 1.

TABLE I. *Micropsectra oksanae* sp. n. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs.

P	fe	Ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
PI	1450	1160	1320	835	660	420	225	1.14	1.84	1.98	3.00
PII	1785	1745	725	570	425	290	215	0.41	3.71	4.87	2.70
PIII	1740	1310	715	530	425	330	185	0.55	2.56	4.27	2.30

Hypopygium (Figs 7-8) as illustrated in dorsal (Fig. 7) and ventral view (Fig. 8, without anal point and tergite IX). Tergite IX 270µm maximum width at base (between the lateral teeth), sub-rectangular, broad in both basal and distal parts with a nearly straight posterior margin; anal tergite bands (ATB) widely open basally, converging posteriorly but separated and abruptly terminated well before base of anal point, not reaching crests of anal point; projecting elevated hump (tubercle) present on median area (clearly visible in lateral view, Fig. 5), bearing 4 dorsal setae below its apical part as in Fig. 7; teeth present on median part of lateral margin. Anal point (Figs 5, lateral; 7, dorsal; 10 ventral) 65µm long, maximum width 75-80µm at base and 25µm in median part, drop-like with bifid apex, with 12-14 setae including 4-5 placed laterally and 8-9 on ventral side. Sternapodeme broadly rectangular, 115-120µm long and 80-85µm wide, slightly swollen latero-medially, lateral horn-like projections present basally; inner branch linear; outer branch smaller, projecting upwards and turns over distally to join the median part of the sternapodeme; phallapodeme nearly S-like in shape, linearly elongated, bifurcate in median part. Superior volsella (Figs 7, 9) about 90µm long, 53-55µm maximum width, sub-triangular, longitudinally directed, wide at base and gradually tapered distally to apex, setiger area (SA) with 7-8 setae located laterally close to the outer margin, inner margin bare, longer setae on inner margin absent; inner median area markedly wrinkled dorsally; digitus absent; *Micropsectra*-seta placed on a distinct rounded tubercle. Median volsella (Fig. 8) 120-125µm long, 15µm maximum width, stem uniformly linear, nearly S-like, reaching distal third of inferior volsella; lamellar setae (Figs 8, 11) typically subulate (lanceolate), parallel-sided proximally, broadened medially with curved setae-like apices. Inferior volsella (Figs 7, dorsal; 8, ventral) about 190µm long, 25µm maximum width, wider at base and distal part, reaching beyond half length of gonostylus, slightly bent inwards distally, presence of a distinct transversal protrusion medially, setiferous ventral lobe well developed and bearing 5 long setae. Gonocoxite 150µm long, with 8-9 setae. Gonostylus (Figs 7-8) 190µm long and about 40µm maximum width, broadly shaped, moderately swollen medially, tapering in its distal half to a pointed apex; median and distal inner margin bearing 1-2 rows of 8-10 fine long setae. HR 0.79.

Pupal exuviae

(n = 2 male exuviae; Figs 13-18)

Pupal exuviae of *Micropsectra oksanae* sp. n. resemble those of the *atrofasciata*-group. Total length 5.00-5.10mm. General colouration brown to dark brown; frontal apotome and thorax brownish; abdominal segments brownish except for segment VIII and anal segment which are dark brown, muscles marks blackish and distinct on segments I-VIII, genital sac brownish. Cephalothorax including frontal apotome weakly wrinkled, scutal hump weak; thorax with

granulations restricted to two small areas located on anterio-median and median part close to the thoracic suture.

Cephalothorax. As in Figs 13-16 including frontal apotome (Fig. 13), side view of thorax (Fig. 14), thoracic horn (Fig. 15) and thoracic mound (Fig. 16). Frontal apotome (Fig. 13), frontal tubercules 60µm long and 50µm at maximum width and typically cylindrical, frontal setae 145-155µm long. Thorax (Fig. 14) with 1 median antepronotal seta 140µm long and 1 lateral antepronotal seta 125µm long; precorneal setae respectively 130, 105 and 115µm long; dorsocentrals Dc_1-Dc_2 sub-equal (about 100µm long), Dc_3-Dc_4 sub-equal (about 120µ long), distance between Dc_2 and Dc_3 225µm; thoracic horn (Fig. 15) about 400µm long, distinctly swollen in its proximal part, narrowed distally, with numerous long setae located mostly along the ventral margin.

Abdomen (Fig. 17). All pleurae bare. Tergite I bare. Tergite II almost covered by points and small spines except for one postero-median oval patch; posterior transverse row of hooks on tergite II occupying about 45% of tergite width, composed of about 130 hooklets in a single row; Pedes spurii B obvious but weak. Armament on tergites III-V as in Fig. 17. Tergites III-V with a pair of longitudinal bands on either side of mid-line, each with long spines: continuous on tergites III-IV shorter, sparse and less spinulated on tergite V. Pairs of long spines on tergites III-V becoming gradually shorter and less extensive: 22-24 long spines (tergite III); 37-40 on IV, 5-7 on V, 3-4 on VI. Lateral setae on segments I-IV: 1, 2, 2, 1; lateral taeniae on segments II-VIII: II-III (1), IV (2), V (3), VI-VII (4), VIII (5). Postero-lateral comb of segment VIII (Fig. 18) 60µm long, about 35µm maximum width, paddle-like in shape, consists of 4-5 rows of unequal straight teeth, longest tooth 40µm long, placed medially. Anal lobe 250µm long, 350-360µm maximum width, bearing 2 long dorsal setae located on posterio-median part; fringe with 26-27 taeniae in a single row. Genital sac about 300µm long, overreaching tip of anal lobe by 100-110µm.

Larva

Unknown.

Taxonomic remarks

Based on some comparative taxonomic data from the literature (Reiss, 1969a, 1969b, 1974; Stur and Ekrem, 2006; Anderson *et al*., 2013, Table 2; Giłka, 2011, Giłka and Jazdzewska, 2010), as well on some unusual morphological characters found in the male adult and pupal exuviae of *Micropsectra oksanae* sp. n., this new species keys between the *attenuata*-group and the *atrofasciata*-group. Nevertheless, based on a similar chaetotaxy of the anal lobe of the wing, the absence of a digitus and the shape of the median volsella, *M. oksanae* sp. n. can be tentatively placed near to *M. auvergnensis* and *M. roseiventris*. However, the following

distinguishing characters will easily separate *M. oksanae* sp. n. from other members of the genus *Micropsectra* including members of the *atrofasicata*-group, especially *M. auvergnensis* and *M. roseiventris*.

Male adult. Dorsal triangular hump on tergite IX of *M. oksanae* sp. n. without setae (Figs 5, 7), while it bears setae in *M. roseiventris* (Fig. 6); anal point drop-like dorsally with bifid apex as in *M. roseiventris* (Reiss, 1974, Fig. 5) except for the dorso-apical part of the crest (Figs 5-6, lateral), which is distinctly rounded apically in *M. oksanae* sp. n. (Fig. 5) but markedly pointed apically in *M. roseiventris* (Fig. 6); superior volsella (Figs 7, 9) of *M. oksanae* sp. n. sub-triangular, longitudinally elongated, with unusual distribution pattern of setae on setiger area, differently figured in the *atrofasciata*-group, *M. auvergnensis* (Reiss, 1969a, Fig. 11), *M. roseiventris* (Reiss, 1974, Fig. 5); lamellar setae of median volsella of *M. oksanae* sp. n. subulate, terminating in a long curved tail-like apex (Fig. 11), while it is spoon-like in *M. auvergnensis* (Reiss, 1969a, Fig. 11) or flattened and uniformly tapered apically in *M. roseiventris* (Fig. 12; Giłka, 2011, Fig. 183; Langton and Pinder, 2007, Fig. 103A).

Pupal exuviae. Cephalothorax. Frontal tubercles (Fig. 13) well developed with typical cylindrical shape in *M. oksanae* sp. n. is differently figured and weakly developed in the *atrofasciata*-group; thorax (Fig. 14) with two granulose areas located anteriorly and posteriorly close to the thoracic suture; thoracic mound (Fig. 16) L-like and well developed. All pleurae bare in *M. oksanae* sp. n. while shagreen is present on pleurae III-V in *M. roseiventris* and on pleurae II-VI in *M. auvergnensis*; armament on tergites III-VI belongs to the *atrofasciata*-type with sparsely distributed spines on tergite V; lateral taeniae present on segments II-VIII (1, 1, 2, 3, 4, 45) of *M. oksanae* sp. n. are differently distributed in *M. auvergnensis* and *M. roseiventris* (respectively 0, 0, 2, 3, 4, 4, 5 and 1-2, 1-2, 2-3, 4, 4, 5); comb of segment VIII paddle-like in shape (Fig. 18) and composed of 4-5 strong teeth in *M. oksanae* sp. n. while is semi-circular with 8-12 unequal crowded teeth in *M. roseiventris* (Fig. 19).

Ecology and geographical distribution

Material consisting of male adults, male pharate adults and pupal exuviae of *Micropsectra oksanae* sp. n. was collected in the upper basin of two pristine karstic streams. Habitats where the examined material was sampled consist of shady stretches of cold mountain helocrenes and streams with small waterfalls and sandy to gravely substrata, which deserve greater consideration and preservation. Bryocolous, hygropetric and madicolous habitats represent the most common and possibly favoured aquatic areas for larval populations. *M. oksanae* sp. n. belongs to the crenobiontic and rhithrobiontic community of species investigated by Lindegaard (1995). Emergence was recorded in May. *Micropsectra oksanae* sp. n. currently is only known to occur in two lowland streams located in south-eastern France (Var Department). Its geographical distribution may be restricted to the eastern part of the continental Tyrrhenian

Province as extensive collecting in this hot spot area of high endemism has not resulted in additional specimens being found. The continental Tyrrhenian Province extends from southern Spain to north-western areas of Italy.

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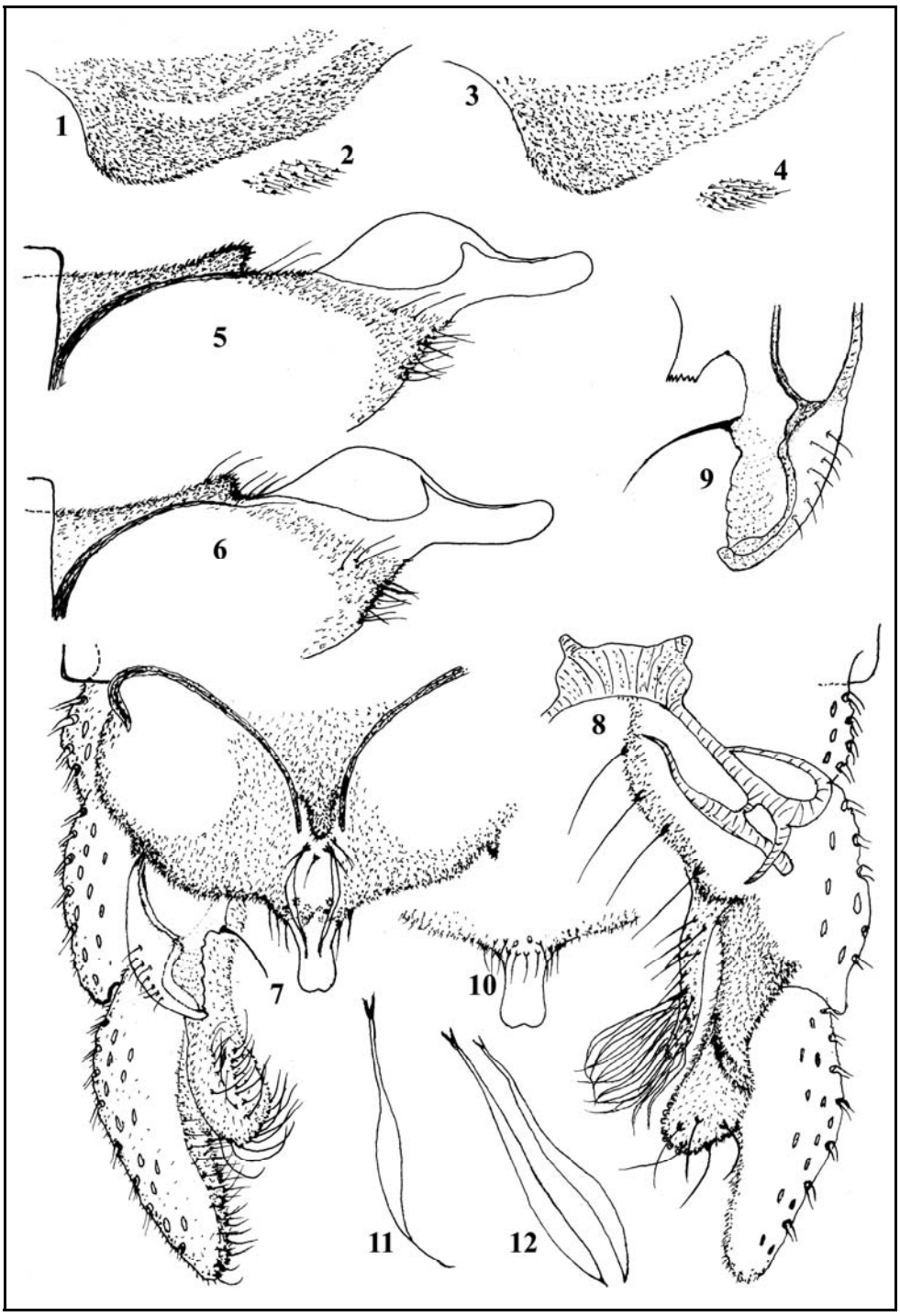
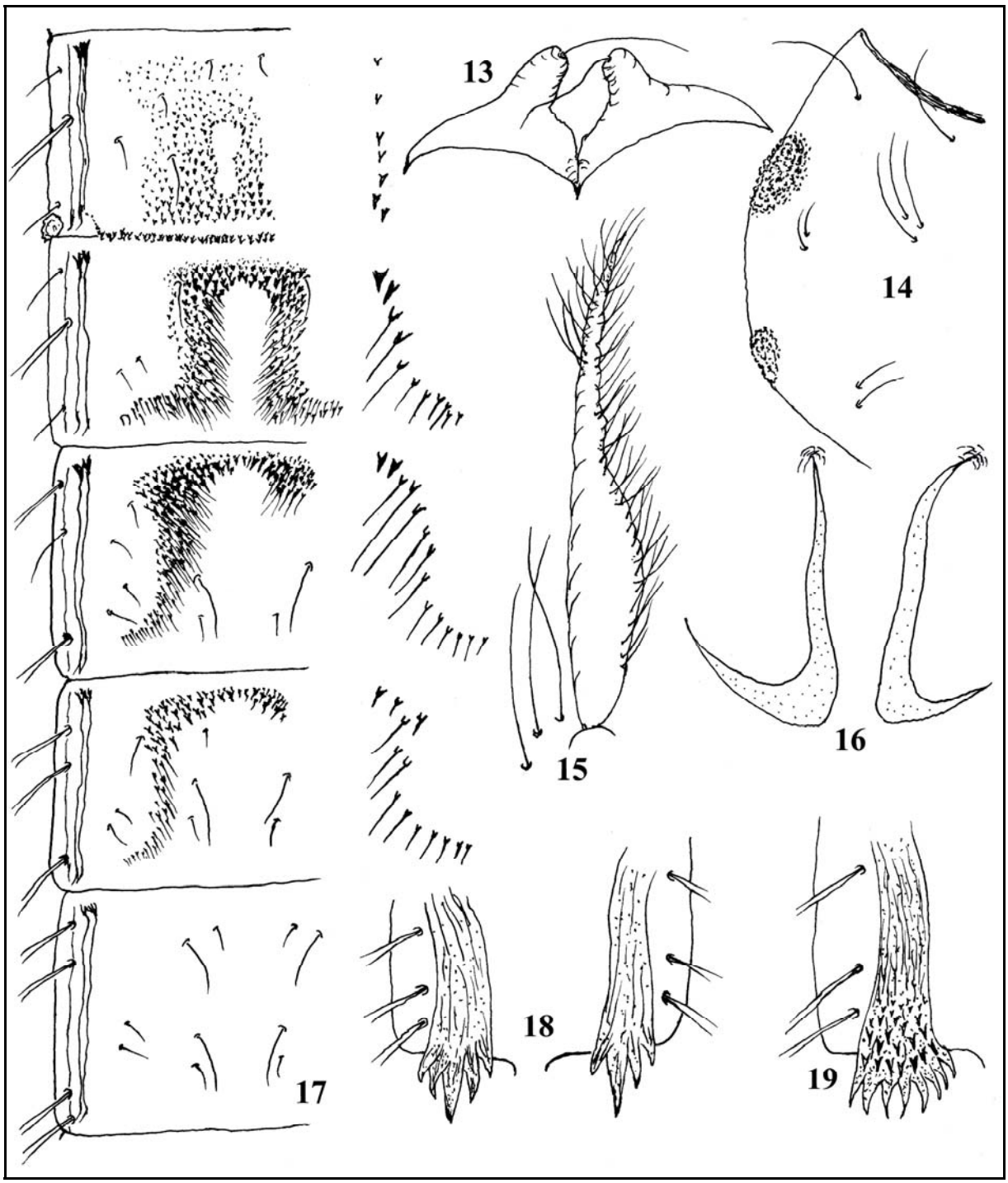


FIGURES 1-12. Male adult of *Micropsectra* spp. Squamal area with details of microtrichia of: (1-2) *M. oksanae* sp. n., (3-4) *M. roseiventris*. Tergite IX and anal point (lateral) of: (5) *M. oksanae* sp. n.; (6) *M. roseiventris*. *M. oksanae* sp. n.: (7-8) hypopygium in dorsal (7) and ventral view (8, without tergite IX and anal point); (9) superior volsella; (10) anal point, ventral. Differentiated setae of median volsella of: (11) *M. oksanae* sp. n., (12) *M. roseiventris*.



FIGURES 13-19. Pupal exuviae of *Micropsectra oksanae* sp. n. (13) frontal apotome; (14) thorax; (15) thoracic horn; (16) thoracic mound; (17) abdominal segments II-VI (dorsal), with details of armament on tergites. Posterio-lateral comb of segment VIII of: (18) *M. oksanae* sp. n., two aspects; (19) *M. roseiventris*.