Bulletin 170

Some Nearctic Podonominae, Diamesinae, and Orthocladiinae

(Diptera: Chironomidae)

Ole A. Sæther

Fisheries Research Board
of Canada
Ottawa 1969

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ABSTRACT

New descriptions and redescriptions including descriptions of the immatures of most of the species, new synonyms, new combinations, and new distribution records are given for 4 species of the Podonominae, 5 species of the Diamesinae, and 47 species of the Orthocladiinae. The morphological variation of acrostichal, dorsocentral, and squamal bristles, annular organs of wings, tibial combs and spurs, tarsal spurs, claws, pulvilli, and the hypopygial values and ratios are discussed. One new genus, *Psilometriocnemus*, is described and the subgenus *Parachaetocladius* of *Chaetocladius* is raised to generic status. Thirty-three new species are described: *Lasiodiamesa brusti*, *Diamesa fonticola*, *Diamesa spinacies*, *Cardiocladius albiplumus*, *Brillia retifinis*, *Trissocladius hamiltoni*, *Eukiefferiella paucunca*, *Eukiefferiella vitracies*, *Adactylocladius rowensis*, *Adactylocladius unicalcar*, *Orthocladius annectens*, *Orthocladius breviseta*, *Orthocladius manitobensis*, *Orthocladius wiensi*, *Syncricotopus fontinalis*, *Psectrocladius semicirculatus*, *Rheocricotopus eminellobus*, *Rheocricotopus kenorensis*, *Rheocricotopus pauciseta*, *Chaetocladius oliveri*, *Parachaetocladius hirtipectus*, *Limnophyes hamiltoni*, *Limnophyes immucronatus*, *Psilometriocnemus triannulatus*, *Parametriocnemus eoclivus*, *Parametriocnemus vespertinus*, *Paraphaenocladius nasthecus*, *Pseudorthocladius dumicaudus*, *Gymnometriocnemus marionensis*, *Heleniella curtistila*, *Heleniella hirta*, *Parakiefferiella torulata*, *and Pseudosmittia setavena*. Five new generic combinations are given: *Trissocladius domus* (Subl.) [*Orthocladius domus* (Subl.)]; *Trissocladius johannseni* (Subl.) [*Orthocladius johannseni* Subl.]; *Adactylocladius kibunensis* (Tok.) [*Spaniotoma* (*Orthocladius*) *kibunensis* (Tok.)]; *Parachaetocladius abnobeus* (Wülk.) [*Chaetocladius* (*Parachaetocladius*) *abnobeus* (Wülk.)]; and *Epoicocladius flavens* (Mall.) [*Smittia flavens* (Mall.)]. Three new synonyms are given: *Lasiodiamesa tenebrosa* (Coq.) [syn. *Lasiodiamesa nearctica* Brund.]; *Parametriocnemus lundbecki* [syn. *Parametriocnemus innocuus* (Curr.)]; and *Epoicocladius flavens* (Mall.) [syn. *Epoicocladius ephemerae* (Kieff.)]. Five genera are emended: *Cardiocladius*, *Trissocladius*, *Rheocricotopus*, *Heleniella*, and *Parakiefferiella*. The zoogeography and relationships of Nearctic and Palearctic genera and species of the Podonominae, Diamesinae, and Orthocladiinae are discussed.

INTRODUCTION

The North American chironomid fauna, especially the subfamilies Diamesinae and Orthocladiinae, is not well known. Furthermore, until the recent revisions and redescriptions by Sublette (1966a, b, 1967a, b), specimens of most of the previously described species could not be identified with any degree of certainty.

The present study was undertaken in order to add to our knowledge of the Nearctic fauna of Podonominae, Diamesinae, and Orthocladiinae. Descriptions of 33 new species representing 22 genera are presented along with new distribution records for an additional 18 species. The genus *Cricotopus* and the *Corynoneura* group are not included as they are currently under revision by Lic. M. Hirvenoja, Helsinki, and Dr D. Schlee, Stuttgart, respectively.[1]

Most of the material studied was collected in collaboration with Dr A. L. Hamilton during the summer of 1967. The remaining species originate from the Canadian National Collection in Ottawa and from the collection at the Freshwater Institute of the Fisheries Research Board of Canada in Winnipeg. Geographical areas represented include the Canadian provinces of Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, as well as the territory of Keewatin in the Northwest Territories and the State of New Hampshire in the United States. Holotypes, allotypes, and, if sufficient material is available, some paratypes will be deposited in the Canadian National Collection (CNC) in Ottawa. Any remaining paratypes will be retained at the collection of the Freshwater Institute in Winnipeg.

METHODOLOGY

All specimens selected for detailed examination were mounted on slides. The procedure used was adapted from one developed by Mr Leo Forster, Entomology Research Institute, Ottawa. The first step for adult bodies, pupae, larval heads, and some of the larval bodies was immersion for about 10 min in hot (near boiling) KOH. The next step in the procedure, and the first step for adult wings, larval and pupal exuviae, and some larval bodies was immersion in glacial acetic acid for at least 10 min. Then, all material was given successive treatments, each lasting not less than 10 min, in the following reagents: absolute alcohol, absolute alcohol layered over cedar wood oil, and, finally, cedar wood oil. The specimens were dissected in the cedar wood oil and mounted in Canada balsam. The advantages of studying specimens mounted on slides as opposed to pinned specimens are outlined by Schlee (1966). He stresses the point that pinned specimens shrink and do not retain their shape or body proportions so well as specimens mounted on slides. One illustration of the different antennal ratios obtainable on pinned and prepared specimens is the holotype

[1]After this manuscript was completed, Schlee's revision of the European species of the *Corynoneura* group appeared (Schlee, 1968).

of *Diamesa banana* Garr. Sublette (1967a, p. 294–296) examined the pinned holotype minus the hypopygium and one of the antennae. The antenna on the pinned specimen had an AR of 1.65. Subsequently the hypopygium and missing antenna were found on a slide prepared by Garrett at the time the specimen was pinned. The AR of this antenna was 1.26, a difference of 0.39 in the same specimen (see p. 21)!

The measurements and ratios used in this paper, with the exception of those outlined below, are described by Schlee (1966). The length of each segment of the antenna is measured as the distance from the apex of the sclerotized portion of the preceding segment to the apex of the sclerotized portion of the segment being measured (i.e., including the nonsclerotized part). The total length of the male is measured as the length of the thorax from the apex of the pronotum to the posterior end of the metanotum plus the length of the abdomen from the anteriomedian margin of the first tergite to the apex of the basistyle. Although most European authors have regarded the large, globular segment near the base of the antenna as the scapus and the usually suppressed segment basal of this merely as a base, the last-mentioned segment is homologous with the scapus and the globular segment with the pedicel (cf. Fittkau 1962, p. 16, footnote; Frommer, 1967, p. 5). In some females the scapus may be almost as large as the pedicel (Fig. 3A); in most males it is suppressed and indistinct. In the first case it should obviously be reckoned as a segment although most authors have considered the pedicel as the first segment of the antenna. Because of this it seems best to use the number of segments in the flagellum instead of using the number of segments in the antenna. The AR is then the length of the elongated segment, plus any segments distal to it divided by the combined length of the basal flagellar segments. With most of the species treated here the AR is the ratio of flagellar segments 13 (–15) to segments 1–12; however, in females of *Lasiodiamesa* it is flagellar segments 14 (–15) to segments 1–13. The palp always stands on a protuberance. Sometimes this projection is segmented, giving the impression of a fifth basal segment. However, it cannot be treated as such as in some species there is no indication of a segment, in others there is an incomplete division, and in only a few species is the division more or less complete. In this respect there is even variation within the species. Furthermore, in some species the palpal segments are more strongly sclerotized than the protuberance. Tokunaga (1939, p. 318–319) mentions that in *Adactylocladius kibunensis* (Tok.) comb.n. the palps are 5-segmented; in other species (see p. 53–60) the palps are 4-segmented. Tokunaga, however, has called the weakly segmented protuberance a palpal segment.[2] The terminology used for the thoracic sclerites and the thoracic chaetotaxy is illustrated in Fig. 1. The terms acrostichals and dorsocentrals are used instead of dorsomedians and dorsolaterals. The terminology of the wing venation (Fig. 2) in general follows the suggestions of Lindeberg (1964, 1966) for corrections of Tillyard's modification of the Comstock-Needham system excepting that M_4+Cu_1 is called Cu and M_4 is called M_{3+4} since the rudimentary vein M_3, as

[2]After completion of this manuscript discussions with Mr Dean Hansen, Department of Entomology, University of Minnesota, have convinced me that Tokunaga is right calling the palp 5-segmented. However, when the first segment is completely reduced the first obvious segment is in fact segment 2, although it is described as segment 1 in this paper.

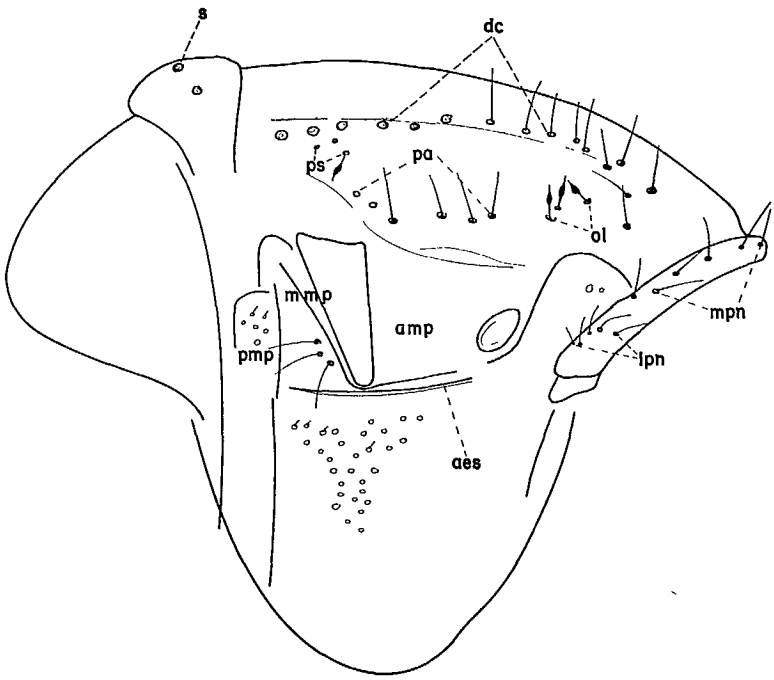

FIG. 1. *Limnophyes* sp. ♀. Thorax. *dc* = dorsocentrals, *mpn* = median pronotals, *lpn* = lateral pronotals, *ol* = orolaterals, *pa* = prealars, *ps* = prescutellars, *s* = scutellars, *amp* = anterior mesopleura, *mmp* = median mesopleura, *pmp* = posterior mesopleura, *aes* = anepisternal suture.

used by Lindeberg, may be merely a fold. In addition the forking of R is called Fr. The positions and numbers of sensory organs (Fig. 2) on or near the R veins is also used (see below). The bristle ratio (BR) should be regarded as a minimum value since many bristles, particularly the longer ones, have a tendency to fall off. In addition to the ratios mentioned by Schlee (1966) the hypopygium ratio

$$\left(\mathrm{HR} = \frac{\text{length of basistyle}}{\text{length of dististyle}}\right)$$

and the hypopygium value $\left(\mathrm{HV} = \frac{\text{length of male}}{\text{length of dististyle} \times 10}\right)$ (Sæther, 1967b, 1968) are used.

The terminology of the pupa follows Pagast (1947, p. 504–505) excepting that the covering case of scapus must be changed to covering case of pedicel. The pedes spurii A and B follows the classification of Zavřel (1942).

The terminology of the larval labrum follows Zavřel (1941a, b) (Fig. 7). The paralabial plates of the Orthocladiinae are situated more or less ventral to the labium and the hairs, which in previous descriptions were reported to be situated on the paralabial plates, actually are placed underneath the plates and lateral to the labium.

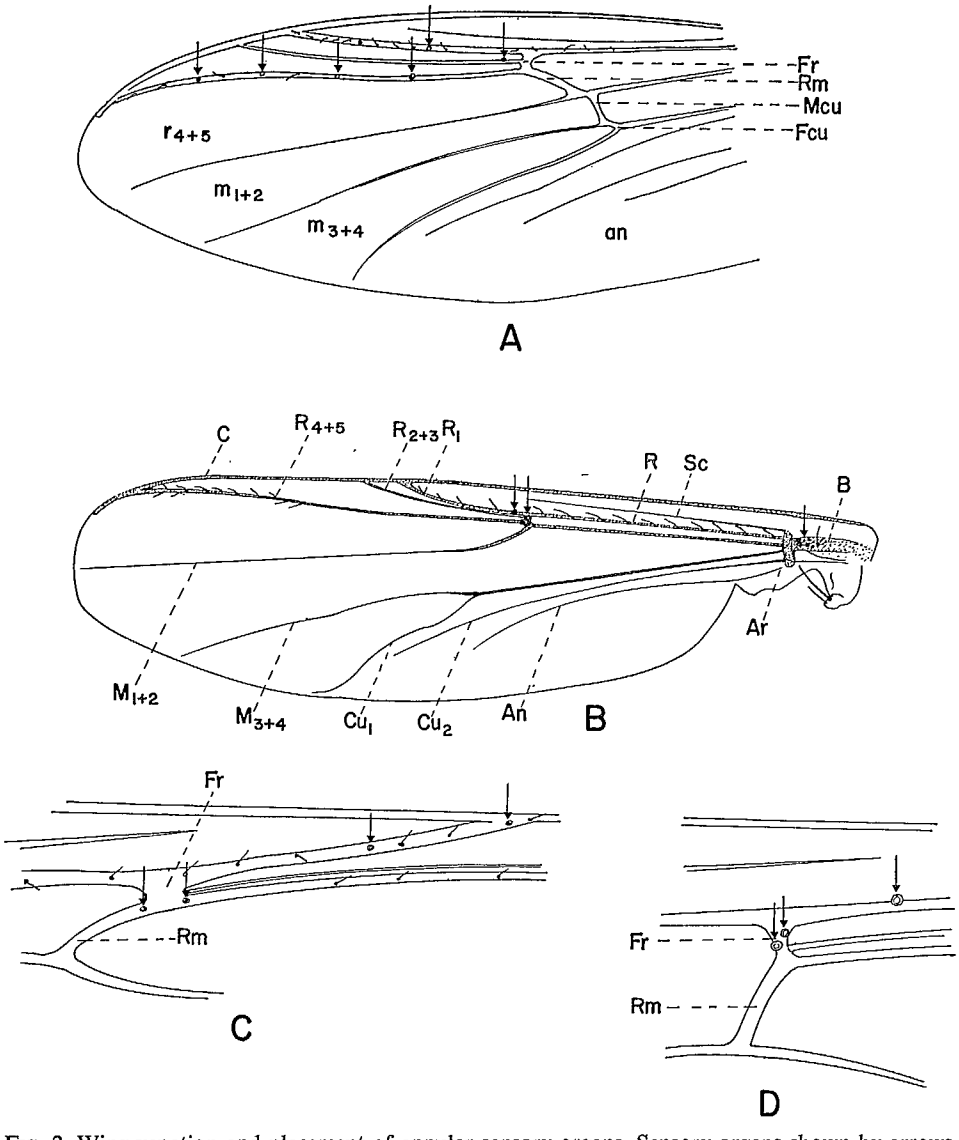

FIG. 2. Wing venation and placement of annular sensory organs. Sensory organs shown by arrows. (A) *Diamesa fonticola* sp.n. ♂; (B) *Limnophyes* sp. ♀; (C) *Paraclunio alaskensis* (Coq.) ♂; (D) *Psilometriocnemus triannulatus* gen.n., sp.n. ♂. *Ar* = arculus, *B* = basal vein, *Fr* = forking of R.

(In *Plecopteracoluthus downesi* Steff. [Steffan, 1965, p. 1340, fig. 17] the hairs are lateral to both the labium and the paralabial plates.)

The Orthocladiini and Metriocnemini are not treated as tribes in this paper as the division seems to be somewhat arbitrary and until a thorough phylogenetic study of the Orthocladiinae has been done it seems better to keep the two tribes together

in the tribe Orthocladiini. Future studies, however, will probably result in a division into several tribes, but along other boundaries than those used at present. Also the *Clunio* group should for the moment be placed within Orthocladiini since Strenzke (1960) and Brundin (1967, p. 435) mention that this group is an apparent sister group of the *Smittia* group.

In the following descriptions all measurements are in microns except where otherwise stated. A number in parentheses following the measurements gives the number of specimens measured (*n*). When sufficient material was available, initial measurements were made of total length, wing length, AR, and dorsocentrals in order to find the extremes. More extensive measurements were then carried out on a number of specimens taking care to include those specimens that appeared to be most extreme. If available, specimens from different localities were also measured. Even a small number should therefore give a relatively good expression of the variation.

NOTES ON MORPHOLOGICAL VARIATION

Thorax — The shape of the pronotum, especially the position of the pronotal lobes, is, in Brundin (1956a), regarded as one of the main characters for separating the different genera of Orthocladiinae. This seems to be a good separating character for most of the genera. However, *Trissocladius*, a genus that shows a number of trends towards reduction in other morphological features (cf. Sublette, 1967b, p. 495), has been shown to have either a rather broad and collarlike pronotum or a moderately developed pronotum. The lobes may be joined along a more or less broad suture with only a slight anterior notch; they may be in broad contact, but not along a suture; they may be in contact only near the mesonotal projection; or they may be completely separated. This emendation of the genus makes the separation of the imagines from the imagines of *Orthocladius* very difficult. The immature stages, however, are easily separated.

The number, position, and strength of acrostichals, dorsocentrals, and prealars seem to be of variable specific and generic taxonomic value. Of the 3 new species of *Rheocricotopus* described in this paper, 1 has very short and indistinct acrostichals, 1 has acrostichals of average length, and the 3rd species has acrostichals as strong as many members of the *Metriocnemus* group. In *Heterotrissocladius subpilosus* (Kieff) Edw. the variation of the number of acrostichals is very large from absent to about 8 (D. R. Oliver, personal communication). The dorsocentrals show a very large variation in some species; in others the variation seems small. In *Parametriocnemus lundbecki* (Joh.) the dorsocentrals may be in a single staggered row, in an irregular double row, or even partly in a triple row. The number varies from 10 to 21 bristles in the male. In some species the number of prealars may also be highly variable. For example in *Lasiodiamesa arietina* (Coq.) Subl. it varies from 11 to 20. Conversely, in other species the number is often relatively constant.

Wing — During the course of this investigation it became apparent that a reduced number of squamal bristles can occur in a number of Orthocladiinae other than those

mentioned by Brundin (1956a, p. 52). This was particularly true of *Rheocricotopus* where all 3 new species had a reduced number of squamal bristles.

Most, and probably all, chironomid wings have annular sensory organs on or near the radial veins. These annular organs are placed dorsally as well as ventrally on the wings. The annular organs on the radial veins, however, have been reported only for the species *Buchonomyia thienemanni* Fittk. (Fittkau, 1955) and *Lasiodiamesa bipectinata* Sæth. (Sæther, 1967b).[3] Similar annular organs are also present on the basal vein of all chironomids, where there usually are a few larger and many smaller organs. A detailed analysis of the wings of a large number of species indicates that the numbers and locations of sensory organs are quite consistent within broad taxonomic limits. *Diamesa* have 1–2 sensory organs near the base of R_{2+3}, 2–3 on R_1, and 3–6 on R_{4+5}, altogether 6–9 sensory organs (Fig. 2A); *Protanypus* and *Prodiamesa* have 3 sensory organs near the forking of R and on R_{2+3}; *Paraclunio* of the Telmatogetoninae have a total of 4 sensory organs on Rm, R_1, and R_{4+5} (Fig. 2C); the Podonominae have altogether 3–4 sensory organs near Rm, near the forking of R or proximally on R_{4+5}; probably all members of the tribes Macropelopiini, Tanypodini, and Coelotanypodini as well as the genus *Natarsia* of the tribe Pentaneurini have 3 sensory organs near the forking of R, on R_1, and sometimes on R_{2+3}; the new genus *Psilometriocnemus* of Orthocladiinae have 2 sensory organs at the forking of R and 1 basally on R_1 (Fig. 2D); the remaining Pentaneurini, the Orthocladiinae except *Psilometriocnemus*, and the Chronominae have 2 sensory organs (Fig. 2B), normally one at the forking of R and one at the base of R_1, although the second organ may be on R_{4+5}, near the apex of R, or on the wing membrane. In *Diamesa* the sensory organs are placed at regular intervals midway between bristles on the radial veins (Fig. 2A). This regular arrangement may indicate that the sensory organs and the bristles have a common origin, and that they may still have essentially the same functions.

Legs — The tibial combs seem to be nearly identical in all members of the treated subfamilies. In *Lasiodiamesa*, however, the comb is often double or triple and indistinct; there is also a small comb present on the front tibia (Fig. 4, 8), and a rudiment of a comb is represented by a sclerotized plate at the apex of the middle tibia. The number of spines in the tibial combs varies between individuals of the same species, but the variation is not enough to negate the use of this character as a taxonomic tool.

The tibial spurs in Orthocladiinae seem to be much more variable within a genus than mentioned by Brundin (1956a). In contrast to the generic diagnosis given by Brundin, the outer spur in *Cardiocladius albiplumus* sp.n. is less than half the length of the inner one. Similarly *Eukiefferiella paucunca* sp.n., *Rheocricotopus eminellobus* sp.n., *Heleniella curtistila* sp.n., *Heleniella hirta* sp.n., *Parametriocnemus lundbecki* (Joh.), and *Parametriocnemus vespertinus* sp.n., have the outer spur as long as or longer than half the length of the inner spur. Again Brundin's (1956a) generic diagnosis does

[3]Schlee (1968, p. 70–71) mentions that such annular organs ("sensillae campaniformis") are present in all chironomids.

not fit. There often seems to be a considerable variation within one genus. For example the very minute outer spur in *Heleniella dorieri* Ser.-Tos. (Serra-Tosio, 1967, fig. 5) is in marked contrast to that found in the 2 species of *Heleniella* treated in this paper. The presence or absence of tarsal spines ("Sohlenstachel," Fittkau, 1962, p. 26) seems to be of value as a generic character. The numbers are, however, individually variable within certain limits. In *Lasiodiamesa*, tarsal spines are not present; in *Diamesa*, there are spines not only at the apices of ta_1 and ta_2, but also in the middle of ta_1.

The tarsal claws of all Diamesinae and Orthocladiinae are very similar. They have 2–12 apical teeth in the males and are singly pointed in the females. At the base there are 2–8 longer hairs in the inner margin as well as some shorter hairs on both outer and inner margins. Only the longer hairs are referred to in the following descriptions. Small pulvilli are present at least in some members of a number of genera where they previously have been regarded as absent. Examples include *Trissocladius*, *Orthocladius*, *Eukiefferiella*, *Parametriocnemus*, *Paraphaenocladius*, *Heleniella*, and *Parakiefferiella*. In *Eukiefferiella vitracies* sp.n., they are indeed rather large and distinct.

Abdomen — Within limits, HV and HR seem to be of generic as well as specific value. Enlarged hypopygia are usually characteristic of species that are adapted to such specialized sexual behaviour as copulation on the ground (Wülker, 1959b, p. 61; Brundin, 1967, p. 186; Sæther, 1968, p. 472). In some cases a number of species representing several intermediate stages between what is regarded as the "typical" and the most aberrant morphological variants are present (Wülker, 1959b, p. 63; Sæther, 1968, p. 472–473). A low HV indicates an aberrant species, but not necessarily an apomorphic species. Interesting in this respect is the group consisting of the species *Diamesa hygropetrica* (Kieff.), *Diamesa permacer* Walk., *Diamesa davisi* Edw., *Diamesa alpina* Tok., and *Diamesa spinacies* sp.n. *Diamesa alpina* Tok. and *D. davisi* are aberrant species with HV's probably about 1.5 and 0.72, respectively. In contrast *D. hygropetrica* and *D. spinacies* have HV's of probably about 3 and 3.36, respectively. No other *Diamesa* excepting *Diamesa astyla*, an aberrant Japanese species lacking a true dististyle, have values this high (Sæther, 1968, table 3). *Diamesa hygropetrica* and *D. spinacies* are probably also among the more plesiomorphic species of the genus. It may therefore well be that a high HV in some cases indicates a plesiomorphic position within a genus. The knowledge of the HV and HR is at present too incomplete to indicate anything similar in other genera. In *Orthocladius* s. str. the 4 new species described have an HV of 3.13–3.64, not more than the maximum variation within a single species. This seems to indicate a small variation within normal members of a genus. The lowest recorded value for HV was found in *D. davisi* (0.72) (Sæther, 1968, p. 444), the highest in *Heleniella curtistila* sp.n. (ca. 5.2). *Heleniella curtistila* also has the highest HR (2.90); *Diamesa thienemanni* [syn. *Diamesa semireducta* Sæth. according to Serra-Tosio (personal communication)] and *Eukiefferiella saanensis* Wülk., both somewhat aberrant species, have the lowest HR (1.32). The HV seems to be partly related to size as the smaller species often have a high value. This will of course obscure the interpretation of this ratio, but nevertheless, when used in conjunction with other characters, it may be of some value in phylogenetic studies.

SUBFAMILY PODONOMINAE

Genus *Parochlus* End.

Parochlus kiefferi (Garr.) Brund.

Tanypus tibialis Staeger, 1845: 354 (Preoccupied by *T. tibialis* Say 1823: 151).
Tanypus tibialis Staeg., Lundbeck 1898: 294.
Tanypus tibialis Staeg., Henriksen & Lundbeck 1918: 593.
Paratanypus kiefferi Garrett, 1925: 8.
Podonomus peregrinus Edwards 1929: 296.
Podonomus peregrinus Edw., Edwards 1933: 88.
Podonomus (*Paratanypus*) *kiefferi* (Garr.), Johannsen 1934: 346.
Podonomus peregrinus Edw., Edwards 1935: 469.
Podonomus peregrinus Edw., Goetghebuer 1936: 23.
Podonomus (*Paratanypus*) *kiefferi* (Garr.), Edwards 1937: 101, pro parte.
Podonomus "sp. cfr. *steineni*" Thienemann in Edwards & Thienemann 1938: 156 (pupa).
Podonomus kiefferi (Garr.), Goetghebuer 1939b: 3.
Podonomus kiefferi (Garr.), Thienemann 1939: 161 (larva).
Podonomus kiefferi (Garr.), Lenz 1939: 7 (pupa), 15 (larva).
Tanypus tibialis Staeg., Henriksen 1939: 69.
Podonomus kiefferi (Garr.), Chernovskii 1949: 151.
Podonomus (*Paratanypus*) *kiefferi* (Garr.), Coe 1950: 134.
Podonomus kiefferi (Garr.), Roback 1966: 130.
Podonomus peregrinus Edw., Fittkau, Schlee & Reiss 1967: 348.
Parochlus kiefferi (Garr.), Brundin 1967: 147.
Podonomus kiefferi (Garr.), Sublette 1967a: 292.
Parochlus kiefferi (Garr.), Brund., Sæther 1967b: 241.
nec *Podonomus peregrinus* Edw., Edwards 1931: 256.
nec *Podonomus kiefferi* (Garr.), Wirth 1952: 34.
nec *Podonomus kiefferi* (Garr.), Freeman 1961: 631.

The previous lists of synonyms in Roback (1966), Sublette (1967a), Brundin (1967), and Sæther (1967b) are incomplete. Apparently the differences between *Podonomus kiefferi* (Garr.) and *Podonomus peregrinus* Edw. mentioned by Sublette (1967a, p. 294) are due to variation and erroneous descriptions (cf. Brundin, 1967, p. 147–148, fig. 81, 82, 92, 96, 97; Sæther, 1967b, fig. 8–14).

SPECIMENS EXAMINED
1 pupa, 3 larvae, small stream, Mt. St. Hilaire, Que., R. Mackay.

DISTRIBUTION
Finland, Sweden, Norway, Scotland, England, Germany, Austria, Greenland, Que., Ont., B.C., Maine, New York, Colorado, Washington, and California (Brundin, 1967, p. 148; Sæther, 1967b, p. 235).

Genus *Lasiodiamesa* Kieff.

Lasiodiamesa arietina (Coq.) Subl.

Tanypus arietinus Coquillet, 1908: 144.
Podonomus arietinus (Coq.), Johannsen 1934: 346.

Podonomus arietinus (Coq.), Johannsen 1952: 13.
Lasiodiamesa arietinus (Coq.), Sublette 1966b: 580.

The species is characterized by having 15 segments in the male and female flagella, a low AR (0.64–0.75), a short wing length, parameres S-shaped, anal point ending in 2 diverging spines, 2 comparatively slender, lamellar, lancet-shaped setae ventrally near apex, 6 bristles in 2 transversal rows on anal point and 7–8 bristles on each side of base, and dististyle with the basal portion prolonged into a well-marked conical "heel," apical portion short, tapering, and ending in a short lamellar point carrying a small, subterminal seta. Thoracic horn of pupa parallel-sided, setal scars close together. Other characters of pupa and larva of general generic type.

MALE ($n = 1$)

Length 3.0 mm. Wing length 1.65 mm. Coloration as in other species.

Antenna — Flagellum apparently with 15 segments, 2 apical divisions incomplete (Fig. 3B). First

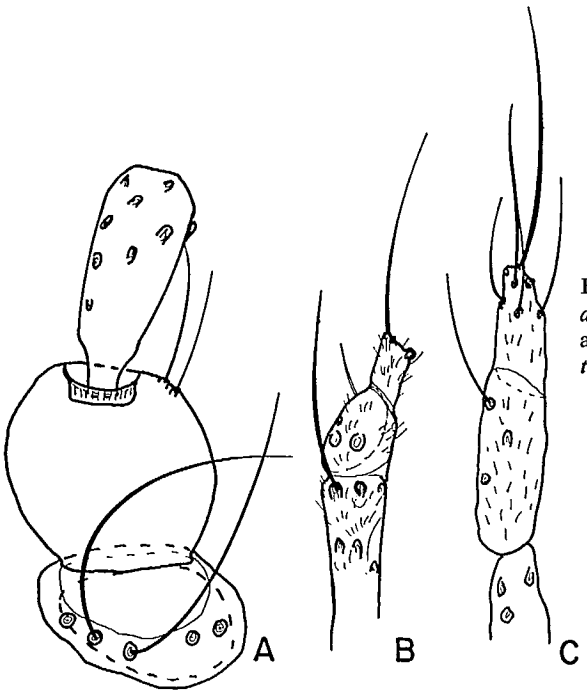

FIG. 3. *Lasiodiamesa* antennae: (A) *L. arietina* (Coq.) Subl. ♀. Scapus, pedicel, and basal flagellar segment; (B) *L. arietina* (Coq.) Subl. ♂. Tip of antenna; (C) *L. brusti* sp.n. ♀. Tip of antenna.

segment with 1 hair whorl, segments 2–12 with 3 hair whorls, segment 13 with about 30 hair whorls, segment 14 without hair whorl, and segment 15 with a hair whorl near apex. Pedicel without hairs. Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{103}{113}$; flagellar segments: $\frac{57}{32}$, $\frac{36}{30}$, $\frac{37}{27}$, $\frac{36}{26}$, $\frac{40}{24}$, $\frac{41}{24}$, $\frac{43}{24}$, $\frac{44}{23}$, $\frac{44}{19}$, $\frac{44}{19}$, $\frac{50}{17}$, $\frac{50}{17}$, $\frac{339}{23}$, $\frac{30}{21}$, $\frac{23}{11}$. AR = 0.75.

Head — Vertex bristles 24, uniserial except medially where they are double, i.e., about as in *Lasiodiamesa bipectinata* (Sæth., 1967b, fig. 1), longest bristle about 70. Clypeus with 8 bristles. Dorsal projection of eyes 3–4 ommatids in width. Palp with sensory pit on second segment as in *Lasiodiamesa*

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brusti sp.n.; segments 1–4 with 5, 12, 20, and 20 bristles, respectively; palp proportions 45, 74, 77, 131.

Thorax — Pronotum with 5 bristles, lobes small, but larger than in *L. bipectinata* Sæth. (Sæther, 1967b, fig. 1). Acrostichals about 33 in a double row, diverging in prescutellar area; dorsocentrals 16 uniserial, prealars 11, postalars 2. Scutellum with 9 strong, uniserial scutellars and 16 weaker bristles in front, between, and slightly posterior to the stronger ones.

Wing — VR = 0.94. Wing membranes and veins with microtrichia 4–8 long and macrotrichia 25–90 long. Sensory organs 1 on Fr, 1 proximally on R_{4+5}, and 1 distally on R_1, C with triserial macrotrichia; R_1 dorsally with 65 uni-biserial macrotrichia, ventrally with 28; R_{4+5} dorsally with 55 uniserial macrotrichia, 40 uniserial ventrally; M_{1+2} proximal to Rm without dorsal macrotrichia, about 14 ventrally; M_{1+2} distal to Rm with altogether about 60 macrotrichia; Cu dorsally with 17, ventrally bare; M_{3+4} 30; Cu_1 about 20; An with about 30 dorsally, ventrally without macrotrichia. Squama with 6 bristles.

Halteres — With microtrichia and macrotrichia 15–30 long on distal half.

Legs — Bristles mostly uniformly dispersed. Spur on front tibia 54 long. Front tibia with a small comb of 10 spines (Fig. 4C). Spurs on middle tibia 47 and 50 long. Apex of middle tibia with a small, triangular sclerotized plate. Spurs on hind tibia 50 and 61 (Fig. 4A). Width of apex of hind tibia 59. Comb of hind tibia double, apical row with 6 spines 45–54 long and proximal row with 3 spines 30–38 long. Claw (Fig. 4B) of hind leg 43 long, with 6 teeth near base, and 4 blunt, apical teeth. ta_5 with the usual basal enlargement.

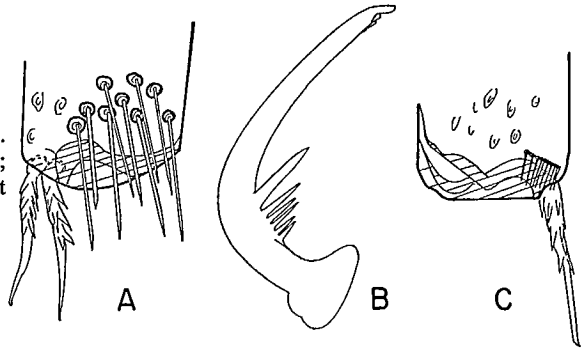

FIG. 4. *Lasiodiamesa arietina* (Coq.) Subl. ♂. (A) Comb and spurs of hind tibia; (B) Claw; (C) Comb and spur of front tibia.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	943	1006	721[a]	297[a]	191[a]	130[a]	94[a]	0.72[a]	3.75[a]	2.70[a]	2.91[a]
p_2	975	903	–	–	–	–	–	–	–	–	–
p_3	1080	1100	823	348	236	139	97	0.75	3.66	2.65	2.36

[a]Probably front leg, but may also belong to middle leg as all front and middle legs are broken between ti and ta_1.

Abdomen — Tergites with uniformly distributed bristles, the longest about 100.

Hypopygium (Fig. 5) — Anal point about 20 long, without distinct dorsal heels, but ending in 2 short diverging spines; 2 comparatively slender, lamellar, lancet-shaped setae ventrally near apex; 6 bristles in 2 transverse rows on anal point; 7–8 bristles on each side of base of anal point. Basistyle with about 8 strong bristles at distalmedian corner, the longest 30. Longest bristle of basistyle about 130 long, dorsal appendage twisted so that the ventral surface with about 40 weak bristles is dorsal. Dististyle with the basal portion prolonged into a well-marked conical "heel," apical portion short, tapering, and ending in a short lamellar point carrying a small, subterminal seta. HR = 1.63; HV = 2.97.

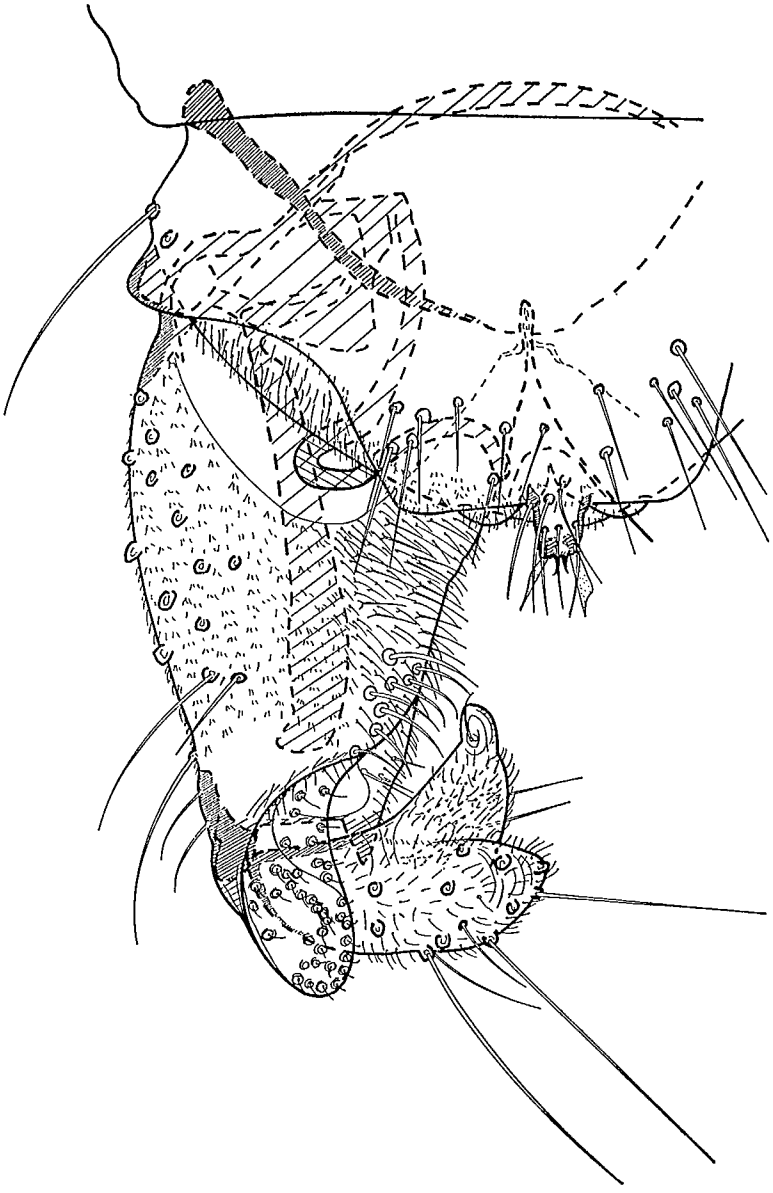

FIG. 5. *Lasiodiamesa arietina* (Coq.) Subl. ♂. Hypopygium.

FEMALE ($n = 1$)

Length 2.4 mm. Wing length 1.71 mm.

Antenna — Scapus with 5–6 uniserial, strong bristles; pedicel with 3 apical bristles; flagellum probably with 15 segments, but separation between segments 14 and 15 not clearly visible in this specimen.

Scapus $\frac{\text{length}}{\text{width}}$: $\frac{40}{63}$; pedicel $\frac{\text{length}}{\text{width}}$: $\frac{56}{59}$; and $\frac{\text{length}}{\text{width}}$ of flagellar segments 1–13 and 14 plus 15 combined: $\frac{72}{29}$, $\frac{61}{26}$, $\frac{64}{23}$, $\frac{73}{21}$, $\frac{67}{19}$, $\frac{73}{19}$, $\frac{63}{16}$, $\frac{73}{16}$, $\frac{69}{14}$, $\frac{70}{11}$, $\frac{73}{13}$, $\frac{70}{14}$, $\frac{69}{16}$, $\frac{92}{21}$. AR = 0.09.

Head — Vertex with 26 uni-biserial bristles. Clypeus with 15 bristles. Palp lengths: 52, 56, 68, 126.

Thorax — Dorsocentrals about 30 including about 10 orolaterals not present in the male; prealars 14, postalars 2. Scutellum with 8 strong, uniserial bristles, and about 14 weaker in front and between the stronger ones.

Wing — VR = 0.89. Sensory organs placed as in the male.

Legs — Spur on front tibia 54 long. Spurs on middle tibia 41 and 52 long. Spurs on hind tibia 50 and 61 long. Width of apex of hind tibia 59. Hind tibial comb with 6 spines in apical row, 5 in basal row. Claw of hind leg 38 long, with 5 basal teeth. Empodium 44 long.
Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	941	995	684	284	221	149	122	0.69	3.21	2.52	3.00
p_2	963	995	657	288	207	140	113	0.66	3.50	2.98	2.78
p_3	1040	1058	833	387	248	162	117	0.79	3.38	2.83	2.40

PUPA (n = 2)

Length 3.9–4.1 mm.

Cephalothorax — Thoracic horn even more parallel-sided than in *Lasiodiamesa armata* Brund. (Brundin, 1967, p. 325, fig. 462); length 182(♂)–212(♀); maximum width 52(♀)–55(♂); apical and basal width nearly identical, only a few microns smaller than the maximum width. The three bristles in front of horn subequal 24–26 in length. Distance from horn to posterior bristle 36, from posterior to median bristle 47, from median to anterior bristle 12. Length of anterior pair of frontal bristles 49–57.

Abdomen — Length of bristles on segment V: L_1 = 32–39, L_2 = 79–89, L_3 = ca. 28, L_4 = ca. 43, D_1 = 32–33, D_2 = D_3 = D_4 = 89–97, D_5 = 61–69. D_4 on VIII 40–43 long. Lateral bristles on anal segment 322–329 long. Anal lobes 432(♂) and 472(♀) long, width 62(♂) and 54(♀); i.e., each lobe 7.0 times as long as wide in the male specimen, 8.7 times as long as wide in the female specimen. Anterior lateral seta of anal lobe 300–320 long, located 72 from base of anal lobe. Posterior dorsal seta 80 long, located 214–230 from apex of anal lobe. Setal scars close together, located 80 from apex.

LARVA

Length of fourth instar 5.4–7.4 mm (47), of third instar 4.8–5.0 mm (3). Head capsule length 0.37–0.46 mm, mean 0.43 mm (47) in fourth instar; 0.32–0.33 mm (3) in third instar. Coloration as in *L. brusti* sp.n.

Head — Antenna (Fig. 6A) with 5 segments. Basal segment 20–26 (5) wide, 20 wide in third instar (Fig. 6B), with indications of faint apical annulation. Length of antennal segments (n = 5): 130–140, mean 136; 32–33; 39–41; 2; 6. Same in third instar (n = 1): 97, 24, 32, 2, 6. AR = 1.68–1.72, in third instar 1.53. Distance from base to annular organ 37–49 (5), 34 (1) in third instar; to basal bristle 41–52 (5), 39 (1) in third instar; to distal bristle 82–89 (5), 61 (1) in third instar. Basal segment with 2 short, pointed styles, about 8 long, at apex, and 2 longer blades, the inner dark, the outer hyaline and much thicker, both 75–77 (5) long, 49 (1) in third instar. Second segment with apical style having 2 segments, basal one 2 (5) long, distal one 39–41 long. Third antennal segment with a nonannulated apical portion. Labrum and epipharyngeal area will appear from Fig. 7. Maxilla and maxillary palp as in *L. brusti* (Fig. 10B). Mandible as in *L. brusti* (Fig. 10A), 131–140 (5) long, 108 (1) in third instar, with 20–24 (5) bristles in inner brush. Labium as in *L. brusti* (Fig. 10E).

Abdomen — Procerci 418–455 (5) long, 351 (1) in third instar; 42–43 (3) wide, 47 (1) in third instar; coloration as in other species of the genus. A small bristle standing on the dark side in a white ring 0.84–0.86 (6) from base, 0.80 (1) in third instar. Procerci each with 15 apical bristles, 288–360 (5)

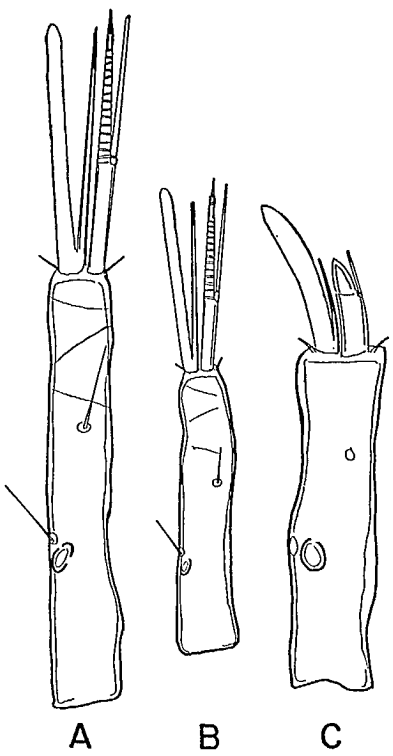

FIG. 6. *Lasiodiamesa*, larval antennae. (A) *L. arietina* (Coq.) Subl., fourth instar; (B) *L. arietina* (Coq.) Subl., third instar; (C) *L. brusti* sp.n. abnormal antenna, fourth instar.

long, 279 (1) in third instar. Anal tubules 378–450 (5) long, 268 (1) in third instar. Posterior prolegs 306–333 (5) long, 293 (1) in third instar.

SPECIMENS EXAMINED

Male and female with pupal exuviae, 12 larvae, Mer Bleue, Ont., 9.VI.1967, L. Haig-Smillie and R. Macdonald; 46 larvae, Mer Bleue, Ont., 23.V.1967, L. Haig-Smillie, R. Macdonald, and D. R. Oliver; 1 third instar larva, pool near Fortune Lake, Gatineau Park, Que., 15.V.1967, D. R. Oliver.

DISTRIBUTION

New York, Que., Ont. New to Canada.

REMARKS

There are several incongruities between the male described herein and the lectotype (labeled holotype according to Sublette in a personal communication) redescribed by Sublette (1966b, p. 580–582). The drawing of the hypopygium of the lectotype seems to indicate an anal point with 4 apical, lamellar setae and 3 bristles on the anal point. Sublette reported that the claw had only 1 basal tooth, the spurs of hind tibiae were of equal length, there were about 20 prealars, and the wing length was 2.18–2.32 mm. Sublette (personal communication) has reexamined his paralectotypes and mentions that the differences in claws and in the lengths of the tibial spurs are due to observational error, i.e., the paralectotypes have claws with 6 basal teeth and the spurs of the hind tibiae are in a ratio of 5:6 in accordance with the specimen described herein. The illustration by Sublette (1966b, fig. 1) did not show the total

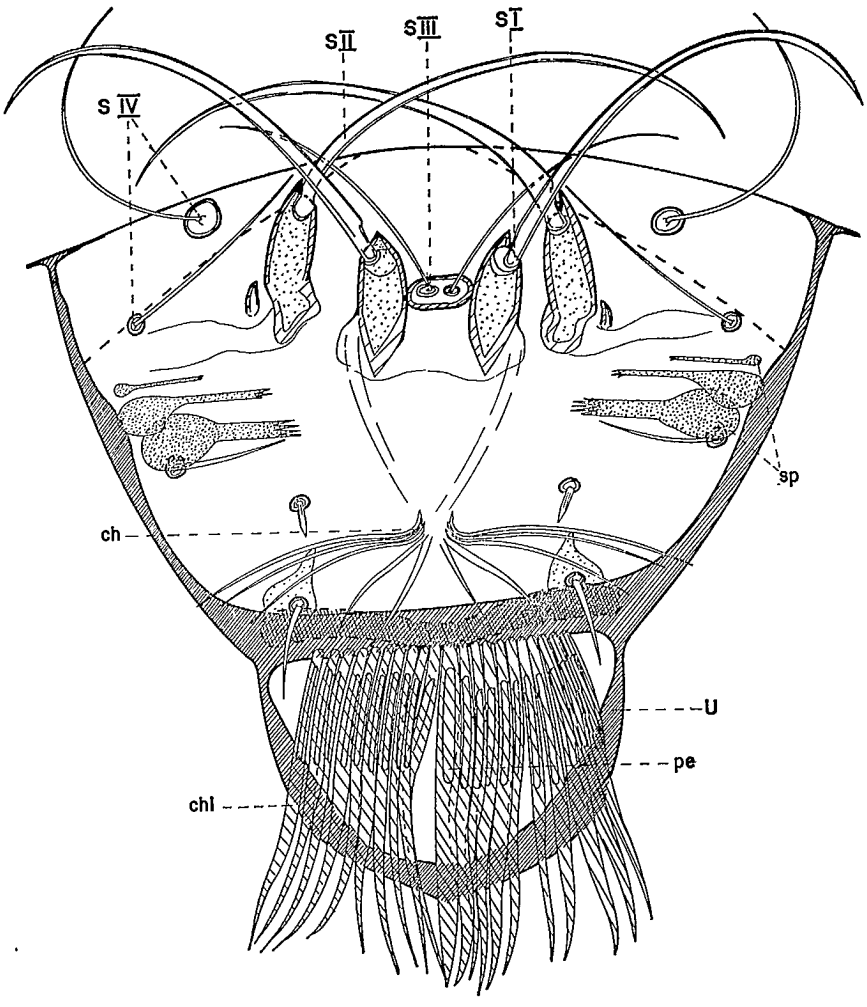

FIG. 7. *Lasiodiamesa arietina* (Coq.) Subl. Larva. Labrum and epipharyngeal area. *S IV* = bisensillum, *sp* = spinulae, *ch* = chaetae, *chl* = chaetulae laterales, *pe* = epipharyngeal comb, *U* = ungula.

number of bristles on the anal point since 3 were at the margin of the anal point. One paralectotype reexamined by Sublette indicates 2 apical lamellae, 2 apical spines, and 6 setae on the anal point proper as in the specimen described herein. In 1 of the paralectotypes, Sublette (personal communication) found only 11 prealar bristles, i.e., a variation of 11–20 prealar bristles has been shown. He also found by reexamination that the total wing range is 2.00–2.32 mm. Thus the measurement of 1.65 mm for the specimen described herein is not so far off considering that it was made from the arculus.

The wing length of *L. arietina* is less than in all other known species of *Lasio-*

diamesa (Brundin, 1967, p. 316; Sublette, 1966b, p. 581, 583, 584, 1967a, p. 292; Sæther, 1967b, p. 235), except *L. brusti* sp.n. The AR is also less than in any other *Lasiodiamesa*. The bristles on antenna, thorax, and wings are less numerous than in *L. bipectinata* and *L. brusti*. Only 3 sensory organs could be found on the wings; there are 4 in *L. bipectinata* and *L. brusti*.

The pupa differs from other members of the genus, except *L. armata*, by the parallel-sided or nearly parallel-sided thoracic horn.

The larvae of *Lasiodiamesa sphagnicola* and *L. brusti* seem to have the apical bristle of basal antennal segment closer to the apex than those of *L. arietina*. *Lasiodiamesa sphagnicola* has 17 bristles in inner brush of mandible (Thienemann, 1937a, p. 74); *L. brusti* has 26–30; and *L. arietina* 20–24. The procerci of *L. arietina* have 15 long bristles at apex as opposed to about 13 in *L. sphagnicola* and 11 in *L. brusti*.

Lasiodiamesa brusti sp.n.

The species is characterized by having 15 segments in the male and female flagella, an AR of 0.91–1.18, a wing length of 1.82–2.30 mm, squama with 7–10 bristles, parameres L-shaped, anal point ending in 4 dorsally curved points, with 4 broad leaf-shaped setae ventrally near apex, 4–6 bristles on anal point and 7–12 bristles on each side of base, and dististyle with a small rounded protuberance on outer contour. The pupa and the larva are very similar to those of other species in the genus.

MALE

Length 3.1–3.7 mm, mean 3.36 mm (5). Wing length 1.82–2.30 mm, mean 2.06 mm (6). Coloration as in other species of the genus.

Antenna — Flagellum apparently with 15 segments, two apical divisions incomplete, similar to *L. arietina* (Coq.) Subl. (Fig. 3B). First segment with 1 irregular hair whorl, segments 2–12 each with 2 or 2–3 irregular hair whorls, segment 13 with 38–48 (6) irregular, indistinct hair whorls, segment 14 without hair whorl, and segment 15 with a hair whorl near apex. Pedicel without hairs.

Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{121}{131}$ (6). Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{60}{31}$, $\frac{43}{29}$, $\frac{43}{28}$, $\frac{41}{27}$, $\frac{40}{26}$, $\frac{38}{25}$, $\frac{38}{25}$, $\frac{40}{24}$, $\frac{41}{23}$, $\frac{39}{21}$, $\frac{41}{20}$, $\frac{44}{20}$, $\frac{479}{19}$, $\frac{36}{22}$, $\frac{15}{11}$ (6). AR = 0.91–1.18, mean 1.05 (6).

Head — Vertex bristles 19–24 (5) uniserial to biserial, longest bristle 70–80 (5). Clypeus with 6–10 (6) bristles, longest bristle 105–120 (3). Palp with a small sensory organ (6 in diam) about 0.83 from base of segment 2; segments 1–4 with 10–11, 13–17, 15–20, and 23–28 bristles, longest bristle 65–82 (6); palp proportions 68–74, 61–77, 81–97, 140–173 (6).

Thorax — Pronotum with 5–7 (6) bristles; lobes small, but larger than in *L. arietina* (Coq.) Subl. and much larger than in *L. bipectinata* Sæth. (Sæther, 1967b, fig. 7). Acrostichals about 40–48 in a double row, diverging in prescutellar area, about as in *L. bipectinata* (Sæther, 1967b, fig. 3); dorsocentrals 14–17 (5) including 3–4 bristles that may be regarded as orolaterals; prealars 9–12 (5); postalars 2 (6). Scutellum with 8–10 (6) strong uniserial bristles and about 5 weaker bristles in front of and between the stronger ones.

Wing — VR = 0.90–0.96, mean 0.94 (6). Wing membrane and veins with microtrichia 4–8 long and macrotrichia 25–90 long. Sensory organs 2 on membrane distal of Fr and 1 on proximal half of R_{4+5}, or 1 on Fr and 2 proximally on R_{4+5}. In addition 1 sensory organ is always present distally on R_1. C with 42–47 (3) triserial macrotrichia distal to junction of R_{4+5}; R_1 dorsally with 65 uni-biserial

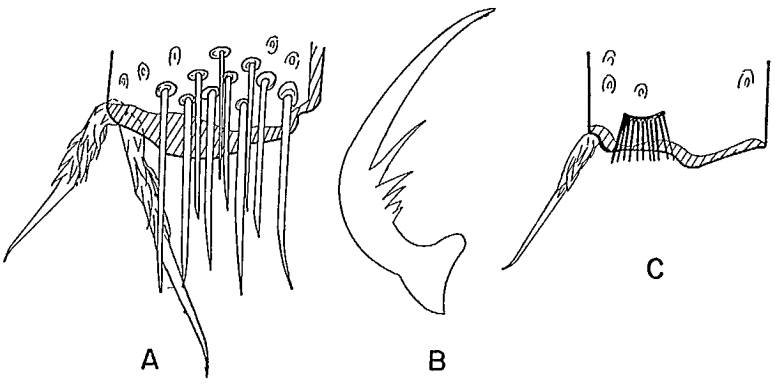

FIG. 8. *Lasiodiamesa brusti* sp.n. ♂. (A) Comb and spur of hind tibia; (B) Claw; (C) Comb and spur of front tibia.

macrotrichia, ventrally with about 30, R_{4+5} dorsally with 58–68 (3) uni-biserial macrotrichia, about 50 uniserial ventrally; M_{1+2} proximal of Rm without dorsal macrotrichia, 22 (2) ventrally, distal of Rm with altogether 87–90 (2) macrotrichia; Rm with 2 (3) dorsal macrotrichia; Cu dorsally with 18–20 (2), ventrally bare; M_{3+4} 40–50 (2); Cu_1 30–32 (2); An with 33 dorsally, ventrally without macrotrichia. Squama with 7–10 bristles.

Halteres — With microtrichia and macrotrichia 20–40 long on distal half.

Legs — Bristles mostly uniformly dispersed. Spur on front tibia 55–65 (6) long. Front tibia with a small comb of 11 spines about 22 long (Fig. 8C). Spurs on middle tibia 41–54 (6) and 45–56 (6) long. Apex of middle tibia with a small, triangular, sclerotized plate. Spurs on hind tibia 45–59 (6) and 59–79 (6) long. Width of apex of hind tibia 55–72 (6). Comb of hind tibia (Fig. 8A) double, apical row with 5 spines 46–62 (3) long and proximal row with 4–6 spines 40–53 (3) long. Claw (Fig. 8B) of hind leg about 50 long, with 5 (5) teeth near base, and 4 blunt apical teeth. Empodium 45–50 long. ta_5 with the usual basal enlargement (Edwards, 1937, fig. 19C, 20C).

Lengths (means) and proportions (ranges and means) of legs (n = 6):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	959	1005	829	344	251	144	102	0.76–0.89, 0.83	3.27–3.49, 3.34	2.22–2.56, 2.39	2.67–5.22
p_2	981	1005	797	320	207	129	98	0.73–0.84, 0.79	3.58–3.88, 3.71	2.35–2.72, 2.50	3.50–4.44
p_3	1033	1082	908	434	263	146	93	0.80–0.87, 0.84	3.17–3.33, 3.25	2.23–2.43, 2.33	1.78–5.00

Abdomen — Tergites with uniformly distributed bristles, the longest 260.

Hypopygium (Fig. 9)—Anal point about 45–59 (6) long, with dorsal keels ending in 4 dorsally curved points; 4 broad, leaf-shaped setae, 17–20 long, ventrally near apex; 4–6 (3) bristles, 3–4 in an apical row, 1–2 just proximal of these; 7–12 (4) bristles on each side of base of anal point. Basistyle with 14–16 strong bristles in distalmedian half, the longest 40–45. Longest bristle of basistyle reaching 150–160; dorsal appendage ventrally with about 16 bristles 20–30 in length. Dististyle with longitudinal axis somewhat curved, with a small rounded protuberance on outer contour, apical point variable (Fig. 9A–C), but never a dark terminal spine as in *L. bipectinata* Sæth. (Sæther, 1967b, fig. 6). HR = 1.88–2.18, mean 2.03 (6); HV = 2.84–3.51, mean 3.25 (5).

FEMALE (n = 5, when not otherwise stated)

Length 2.7–3.0 mm, mean 2.8 mm (5). Wing length 2.06–2.45 mm, mean 2.19 mm (4).

Antenna — Scapus with 6–7 uniserial, strong bristles; pedicel with 5–6 (3) bristles; flagellum with 15 segments, separation between segments 14 and 15 not complete.

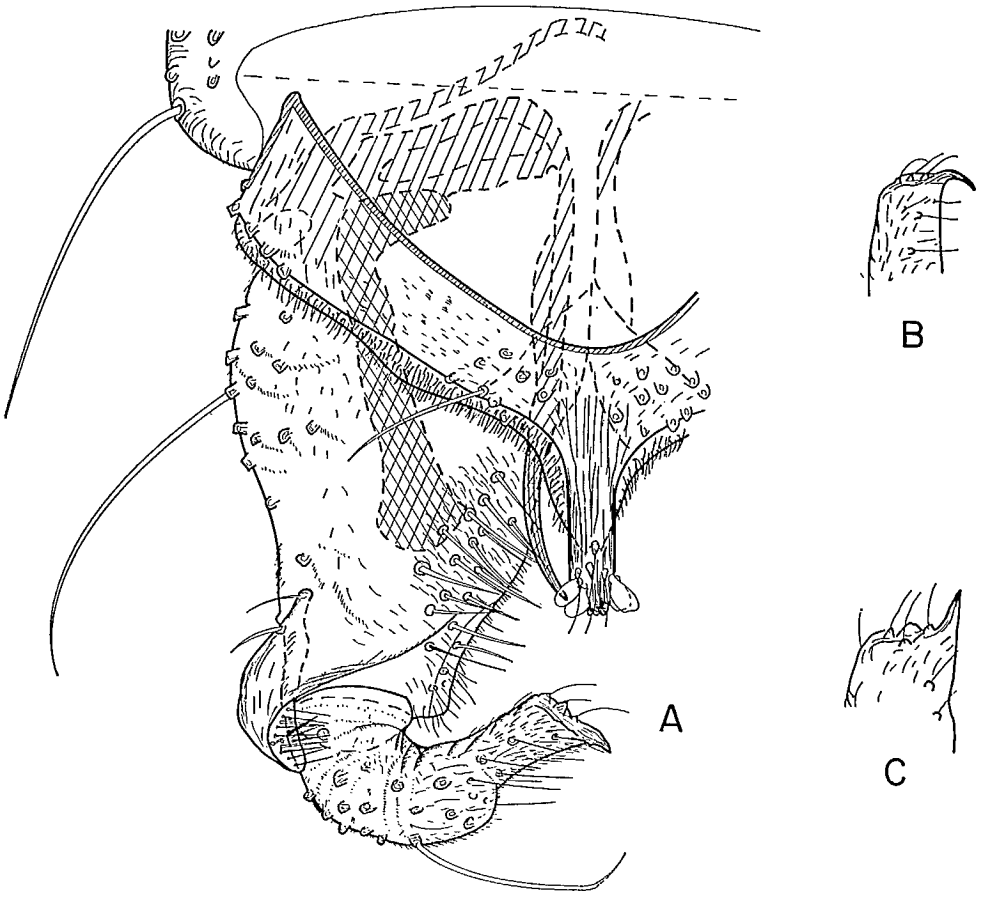

FIG. 9. *Lasiodiamesa brnsti* sp.n. ♂. (A) Hypopygium; (B) and (C) Variation in apex of dististyle.

Mean $\frac{\text{length}}{\text{width}}$ of scapus: $\frac{45}{77}$ (3); of pedicel: $\frac{69}{68}$ and of flagellar segments: $\frac{71}{28}$, $\frac{66}{27}$, $\frac{74}{24}$, $\frac{78}{22}$, $\frac{81}{21}$, $\frac{89}{20}$, $\frac{87}{18}$, $\frac{86}{17}$, $\frac{89}{16}$, $\frac{91}{13}$, $\frac{96}{13}$, $\frac{90}{15}$, $\frac{89}{16}$, $\frac{72}{22}$, $\frac{39}{18}$. AR = 0.08–0.11, mean 0.09.

Head — Vertex with 23–26 (3) uni-biserial bristles. Clypeus with 14–18 bristles. Palp lengths: 68–83, 65–74, 81–89, 144–158.

Thorax — Pronotum with 7–10 (4) bristles. Acrostichals about 55–60; dorsocentrals 12–14; orolaterals 13–17; prealars 15–18; postalars 2. Scutellum with 9 strong bristles, and 8–10 weaker ones.

Wing — VR = 0.88–0.93, mean 0.91. Sensory organs 1 on distal half of R_1, R_{4+5}, and Fr with a total of 3. Rm with 4–6 bristles. Squama with 10–11 bristles.

Legs — Spur on front tibia 56–59 long. Spurs on middle tibia 38–50 and 54–59 long. Spurs on hind tibia 50–65 and 68–80 long. Width of apex of hind tibia 59–72. Hind tibial comb with 11–13 spines in 2 or 3 irregular rows, apical row with 5–7, middle row with 4–6, and basal row with 0–3. Claw of hind leg 38–42 (3) long, with 5 basal teeth. Empodium about 45 long.

Lengths (means) and proportions (ranges and means) of legs ($n = 3$ on ta of p_2, $n = 4$ on ta of p_3):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	948	1049	834	359	252	147	110	0.76–0.85, 0.79	3.13–3.59, 3.26	2.21–2.51, 2.40	1.78–2.42
p_2	961	1033	830	365	236	140	108	0.74–0.87, 0.81	3.15–3.47, 3.33	2.27–2.57, 2.40	2.55–3.82
p_3	1008	1142	948	428	257	152	108	0.78–0.90, 0.84	3.14–3.42, 3.29	2.07–2.47, 2.26	1.42–2.76

PUPA

Length 4.0–5.5 mm ($n = 11$)

Cephalothorax — Thoracic horn more or less parallel-sided on apical ¾, then gradually constricted; length 198–248, mean 217 (13); maximum width (at apex) 68–88, mean 74 (13); width ½ from base 56–76 (13); minimum width 30–42 (13) about 10 from base, proximal width slightly larger. The 3 bristles in front of thoracic horn subequal 30 — 65 (8) in length. Distance from horn to posterior bristle 25–35, mean 30 (7), from posterior to median bristle 47–65, mean 56 (11), from median to anterior bristle 5–12, mean 9 (11), from anterior to posterior bristle 43–73, mean 61 (8). Length of anterior pair of frontal bristles 41–69, mean 55 (7).

Abdomen — Length of bristles on segment V ($n = 9$–12): $L_1 = 39$–53, $L_2 = 118$–171, $L_3 = 39$–57, $L_4 = 79$–150, $D_1 = 36$–55, $D_2 = 112$–167, $D_3 = 47$–120, $D_4 = 57$–112, $D_5 = 39$–79. D_4 on VIII 34–53 long, mean 48 (12). Lateral bristles on anal segment 246–332 (10) long. Anal lobes 495–547 long, mean 515 (10), width 51–69 (10); i.e., each lobe about 8 times as long as wide. Anterior lateral seta of anal lobe 258–303 long, mean 262 (8) located 77–124, mean 99 (10), from base of anal lobe. Posterior dorsal seta 99–132 long, mean 111 (5), located 151–234, mean 210 (10), from apex of anal lobe. Distance between setal scars measured along median line of anal lobe 0–12 (8), setal scars located 56–83 (7) from apex.

LARVA

Length 5.3–5.5 mm (2). Head capsule length 0.46–0.52 mm, mean 0.50 mm (18). Coloration greyish-blue, integuments greyish-white, and head dark brown.

Head — Antenna as in *L. arietina* (Coq.) Subl. (Fig. 6A) with 5 segments. Thienemann (1937a, p. 70–74) mentions 4 segments, but has probably overlooked the very short fourth segment. Basal segment brownish, 26–28 wide, with faint indication of apical annulation (even more faint than in *L. arietina*). Length of antennal segments ($n = 10$): 130–148, mean 136; 35–39; 37–44; 2–3; 4–7. AR = 1.52–1.74, mean 1.62. Distance from base to annular organ 34–55, mean 43 (13), to basal bristle 45–77, mean 54 (14), to apical bristle 81–106, mean 89 (13). (Thienemann did not observe any bristles on basal segment, but they are probably lost in his specimens.) Basal segment with 2 short, pointed styles, 8–13 (6) long, at apex, and 2 longer blades, the inner dark, the outer hyaline and much thicker, both 75–81 (10) long. Second segment with apical style having 2 segments, basal one 3 (7) long, distal one 38–41 long. Third antennal segment with a non annulated apical portion as in *L. arietina* (Fig. 6A). One specimen had 1 normal antenna and 1 abnormal antenna with only 3 segments (Fig. 6C). Lengths of antennal segments 1–3: 112, 20, 12. Basal segment 28 wide. Distance from base to annular organ 40, to basal bristle 44, to apical bristle 73. Thick blade of basal segment reaching 54 in length, thin blade 35. Apical style of second segment 14. All segments of the abnormal antenna are shorter than in the normal antenna. Accordingly the abnormal antenna is not merely an antenna where the last segments are broken off. If the basal segment had been broken off, the antenna must have been partly regenerated, which also seems unlikely. Labrum and epipharyngeal area about as in *L. arietina* (Fig. 7), but the spinulae (Fig. 10C) differs somewhat, the base of left and right chaetae groups are separated by a greater distance (ca. 10), and an epipharyngeal comb with 5 spines is distinguishable; in *L. arietina* the teeth of the epipharyngeal comb are not distinct from the chaetulae laterales. The chaetulae basales could not be distinguished in *L. brusti* and *L. arietina*. Maxilla and maxillary palp as in Fig. 10B. Mandible (Fig. 10A) 149–178 long, mean 164 (14), with 26–30 bristles in inner brush. Labium (Fig. 10E) with 15 pairs of lateral teeth. Eyespot as in Fig. 10D.

Abdomen — Two spiracular rings on segment 11 as in other *Lasiodiamesa* (Brundin, 1967, p. 318). Procerci 540–603 (5) long, 45 (2) wide, brownish-black on posterior side, pale on anterior side. A small

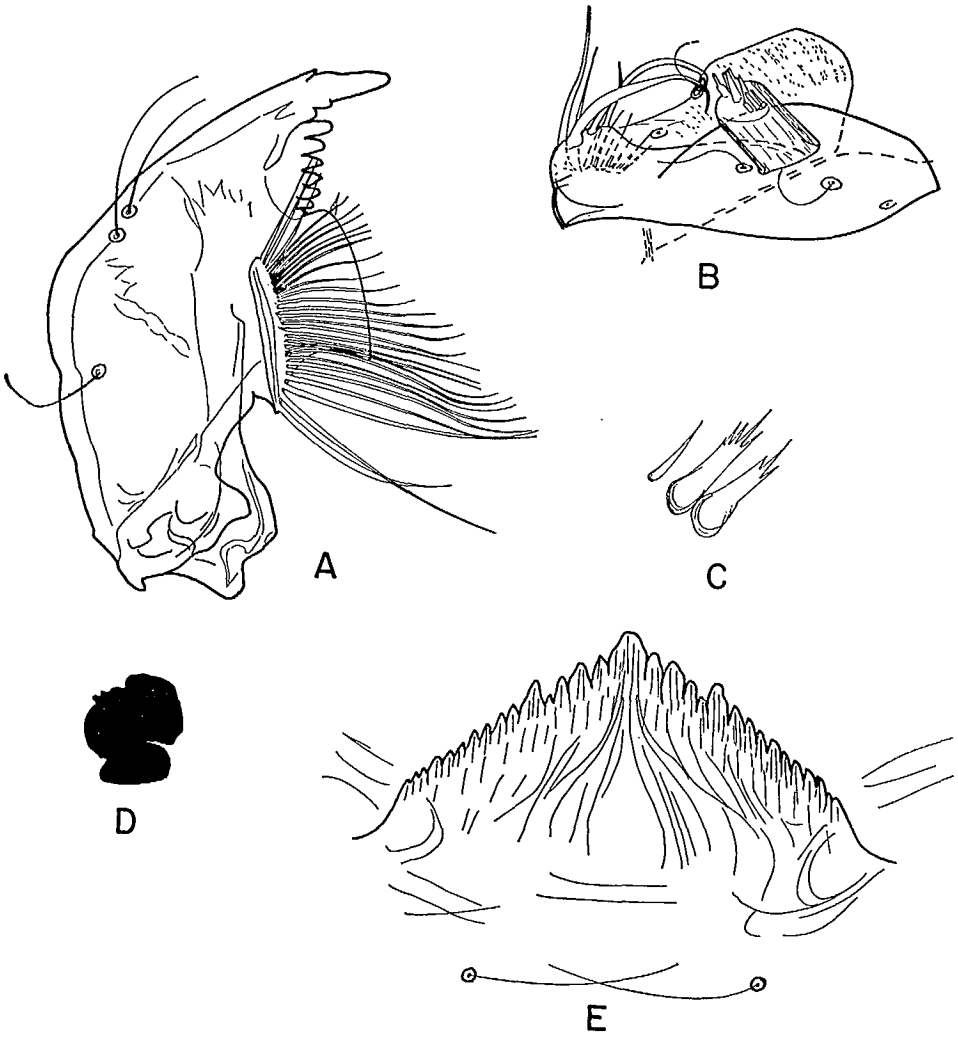

FIG. 10. *Lasiodiamesa brusti* sp.n. Larva. (A) Mandible; (B) Maxilla and maxillary palpus; (C) Spinulae; (D) Eye-spot; (E) Labium.

bristle standing on the dark side in a white ring 0.69–0.80 (6) from base. Procerci each with 11 apical bristles, 252–306 (6) long. Anterior anal tubules 482–585 (2) long, posterior anal tubules 441–531 (2) long. Posterior prolegs 387–401 (2) long.

TYPE MATERIAL

Holotype with larval and pupal exuviae, male, rock pools in granite crevices, Baker Lake, District of Keewatin, N.W.T., 18.VII.1967, L. Brust (CNC No. 9971). Allotype, female with larval and pupal exuviae, same data as holotype. Paratype, 10 males with larval and pupal exuviae, 7 females with larval and pupal exuviae, 4 pupae, 1 larva, same data as holotype.

REMARKS

This species is obviously closely related to *L. sphagnicola* (Kieff.) Edw., *Lasiodiamesa rawsoni* Brund., and *L. bipectinata* Sæth. From these it differs in the small wing length, the anal point, and the shape of the dististyle. It differs also, at least from *L. bipectinata*, by apparently having 15 segments in both the male and the female antenna. The longitudinal axis of the dististyle is more curved than in *L. rawsoni* (Brundin, 1967, fig. 452), less than in *L. sphagnicola* (Brundin, 1967, fig. 451) and *L. bipectinata* (Sæther, 1967b, fig. 6). From *L. bipectinata* it differs also in several other details such as the chaetotaxy of thorax and wings, the VR (0.99 in *L. bipectinata*), the sensory organs on the wing (*L. bipectinata* has 4 organs at base of R_{4+5}), the bristles of squama (only 3–4 in *L. bipectinata*), the claws, which have 3 longer and 5–7 smaller teeth near the base in *L. bipectinata*, the shorter leg segments in *L. brusti*, and the HV and HR. The pupa shows the general characteristics of the genus (Thienemann, 1937a, p. 68–70; 1938, p. 156–157; Lenz, 1939, p. 8–9; Brundin, 1967, p. 317–318). There is a considerable variation in the length between the setal scars, but it is never so great as in the specimens of *Lasiodiamesa tenebrosa* (Coq.) (syn. *Lasiodiamesa nearctica* Brund. syn.n.) drawn by Brundin (1967, fig. 459). The pupa can be separated from *L. arietina* (Coq.) Subl. and *L. tenebrosa* by means of the thoracic horn. It seems to differ from the other *Lasiodiamesa* by having a short anterior lateral seta of the anal lobe only 0.48–0.56 times as long as the anal lobe and normally a little shorter than the lateral bristles of IX; in other species this bristle is ¾ the length of the anal lobe. The larval labrum is mainly in accordance with Zavřel (1941a, fig. 1), but the chaetae groups are more widely separated in *L. sphagnicola*, the chaetae and the bisensillar pairs are much shorter in *L. sphagnicola*, and the premandibular seta and rudimentary premandible is more median in *L. brusti*. Thienemann (1937a, p. 74) mentions that a normal inner brush is not present in *L. sphagnicola*, but is replaced by 17 backward directed bristlelike spines. This description is probably given from a specimen where the inner brush has been dislocated as the inner brush is normal in both the species described here. *Lasiodiamesa arietina*, however, has only 20–24 bristles, as opposed to 26–30 bristles in the inner brush of *L. brusti*. Thienemann also found only 12 pairs of lateral teeth on the labium, but *L. brusti* and *L. arietina* both have 15 lateral teeth. The 3 last teeth are small and inconspicuous and could quite easily be overlooked.

Lasiodiamesa tenebrosa (Coq.)

Tanypus tenebrosus Coquillet, 1905: 66.
Podonomus tenebrosus (Coq.), Johannsen 1934: 346.
Lasiodiamesa tenebrosa (Coq.), Johannsen 1952: 12.
Lasiodiamesa tenebrosa (Coq.), Sublette 1966b: 583.
Lasiodiamesa nearctica Brundin 1967: 326, syn.n.

Although the species is not present in the collections examined, it has been included here to give the new synonym.

DISTRIBUTION

New Hampshire, Northwest Territories (Sublette, 1966b, p. 583; Brundin, 1967, p. 326).

SUBFAMILY DIAMESINAE

Genus *Diamesa* (Meig.) Pag.

Diamesa banana Garr.

Diamesa banana Garrett, 1925: 6.
Diamesa banana Garr., Roback 1957a: 6.
Diamesa banana Garr., Sublette & Sublette 1965: 151.
Diamesa banana Garr., Sublette 1967a: 294.
nec *Diamesa heteropus* (Coq.), synonymie in Sublette (1967a, p. 294) in error.

This species is closely related to the European *Diamesa hamaticornis* Kieff. (Pagast, 1947, fig. 49–50). It differs by means of the higher antennal ratio, the absence of long hairs on basal lobe of basistyle, and perhaps in the shape of distal lobe of basistyle. There are at least 3 additional species in North America with the typical long, medioventral hairs on the basistyle.

MALE ($n = 1$)

Length 4.8 mm. Wing length 3.12 mm.

Antenna — Flagellum with longest bristle about 670 long. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{90}{50}$, $\frac{23}{45}$, $\frac{32}{43}$, $\frac{36}{36}$, $\frac{36}{32}$, $\frac{36}{29}$, $\frac{41}{27}$, $\frac{41}{27}$, $\frac{41}{25}$, $\frac{45}{23}$, $\frac{50}{23}$, $\frac{54}{23}$, $\frac{644}{34}$. Same in holotype: $\frac{83}{45}$, $\frac{23}{43}$, $\frac{25}{41}$, $\frac{36}{36}$, $\frac{34}{34}$, $\frac{36}{32}$, $\frac{36}{27}$, $\frac{41}{27}$, $\frac{41}{23}$, $\frac{41}{20}$, $\frac{41}{20}$, $\frac{45}{20}$, $\frac{594}{36}$. AR = 1.23, in holotype 1.26. Sublette mentions an AR of 1.65 in the same specimen. He has, however, measured the other antenna attached to the pinned body. This is a good example of the great differences between measurements made on prepared specimens as opposed to measurements on pinned specimens.

Head — Clypeus with 17 bristles, longest bristle 110. Palp lengths: 97, 135, 133, 176.

Thorax — Pronotum with 12 bristles. Dorsocentrals 8, prealars 4. Scutellum with about 25 scutellars.

Wing — VR = 0.94. Bristles on veins 12–30 long, R and R_1 with 11 bristles each, R_{4+5} with 12 bristles. Squama with 50 bristles. Sensory organs 2–3 on R_1, R_{2+3} with 1–2 basally, and R_{4+5} with 4. Mcu 84 long, Rm 240 long, and free end of costa 84 long.

Legs — Spur on front tibia 72 long. Spurs on middle tibia 50 and 61 long. Spurs on hind tibia 52 and 81 long. Width of apex of hind tibia 77. Comb with 16 spines 44–70 long. Tarsal spines 30–41 long, longest on p_3, ta_1 and ta_2 on all legs with 2 apical spines, ta_1 of p_2 with 8 additional spines, ta_2 of p_2 with 1, ta_1 of p_3 with 14, and ta_2 of p_3 with 7 additional spines. Claw of hind leg 55 long, with 8 apical teeth.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1224	1661	1224	574	338	–	–	0.74	–	2.36	2.93
p_2	1332	1404	711	378	230	99	122	0.51	4.16	3.85	2.00
p_3	1557	1755	1139	599	324	108	126	0.65	3.85	2.91	2.53

Hypopygium (Fig. 11) — Anal point about 130 long, about 110 long in the holotype, with about 5 weak bristles on each side. Basistyle with 15 long, medioventral bristles, the longest about 160 long. Dististyle with an apical spine, 11 long. HR = 1.45 (1.53 in holotype); HV = 2.55.

Other characters in accordance with Sublette (1967a, p. 294).

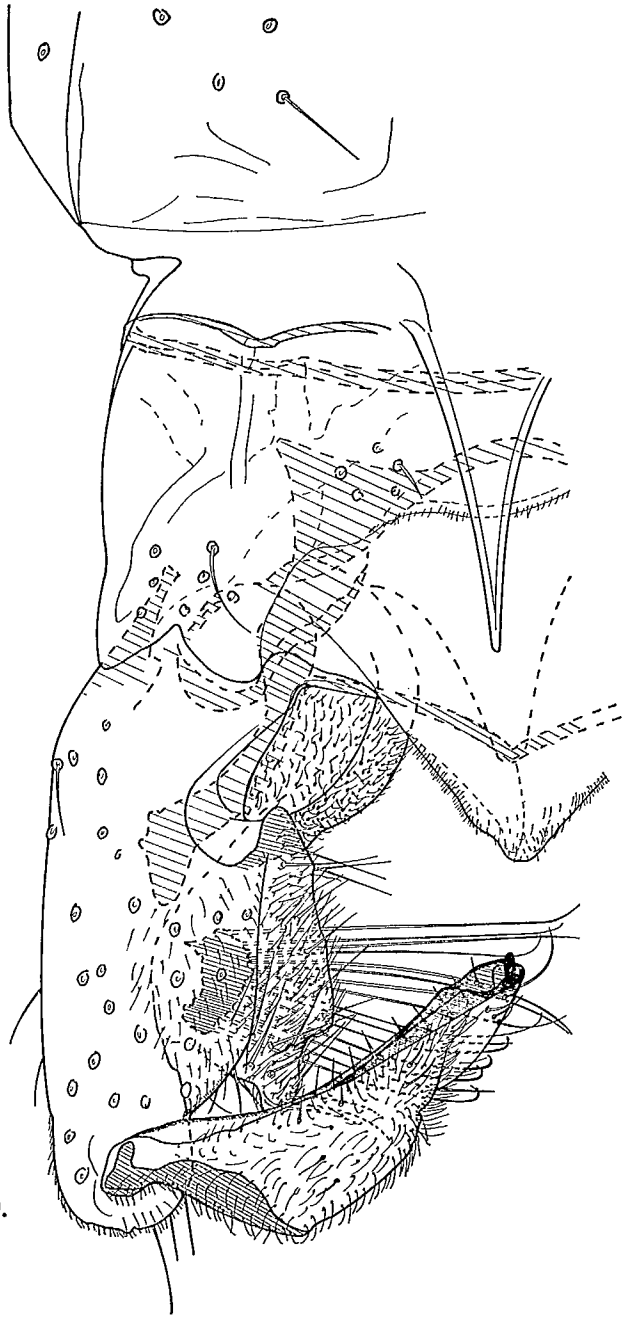

FIG. 11. *Diamesa banana* Garr. ♂. Hypopygium.

FEMALE ($n = 1$)

Two females of *Diamesa* were collected together with the male. One of them had hairy eyes and probably belongs to *D. banana*.

Length 4.0 mm. Wing length 3.00 mm.

Antenna — Length of flagellar segments: 43, 29, 27, 25, 29, 23, 32. AR = 0.47.

Head — Palp lengths: 82, 133, ca. 120, 225.

Thorax — Dorsocentrals 11, prealars 9. Scutellum with 27 bristles.

Wing — VR = 0.87. R with 13 bristles, R_1 and R_{4+5} with 15 bristles each. Squama with 50 bristles. Sensory organs on R_1 3, on R_{2+3} 2, and on R_{4+5} 4. Mcu 90 long, Rm 250 long, and free end of costa 84 long.

Legs — Spur on front tibia 43 long. Spurs on middle tibia 45 and 54 long. Spurs on hind tibia 43 and 81 long. Width of apex of hind tibia 86. Comb with 16 spines 44–67 long. Tarsal spines 2 at apex of all ta_1 and ta_2, ta_1 of p_2 with 11 additional spines, ta_2 of p_2 with 4, ta_1 of p_3 with 16, and ta_2 of p_3 with 7 additional spines.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1161	1413	981	446	288	99	–	0.69	–	2.62	1.86
p_2	1202	1296	594	306	185	99	113	0.46	4.40	4.21	1.87
p_3	1319	1544	977	482	261	104	131	0.63	3.93	2.93	2.40

SPECIMENS EXAMINED

Lectotype, hypopygium and antenna slide (Garrett slide No. 5141), Cranbrook, B.C., 12.VIII., C.B.D. Garrett (CNC type No. 7915). 1 male, 1 female, at lighted windows, Waterton Lakes Townsite, Alta., 20.VIII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION:

B.C., Alta.

REMARKS

Roback (1957a, text fig. 1) reproduces Garrett's manuscript illustration of the male genitalia. Sublette (1967a, p. 296) mentions that *D. banana* has many features of the genitalia in common with *Diamesa heteropus* (Coq.) redescribed by Sublette (1966b, p. 585, fig. 4) and synonymizes the 2 species. Sublette, however, did not see the hypopygium of the holotype (Sublette, 1967a, p. 295). The most obvious feature in Garrett's manuscript illustration of *D. banana* is the group of long bristles in the middle of the basistyle, a feature apparently not developed in *D. heteropus*. *Diamesa banana* also lacks the sclerotized and darkened mesial margins of the basistyle that are present in *D. heteropus* (Sublette, 1966b, p. 586). Accordingly Sublette's synonym is in error.[4] *Diamesa onteona* Rob. (Roback, 1957a, p. 6–7) may be identical with *D. banana;* however, as Roback mentions, the arrangement of hair tufts on the basistyle seems to differ. Roback also mentions that the dististyle of *D. onteona* differs from that of *D. banana;* however, the dististyle of Garrett's type specimen of *D. banana* is essentially identical to that of *D. onteona* as illustrated by Roback.

[4]Hansen (personal communication) has, however, specimens of *D. banana* determined by Sublette as *D. heteropus*.

97967—3

Diamesa fonticola sp.n.

The species is characterized by a relatively high AR of about 1.25, naked eyes,[5] heart-shaped ta_4, no anal point, about 17 median bristles on tergite IX, large basal lobe of the basistyle attached over its whole length, and the dististyle, which is curved, broadest at base and with an apical tooth in addition to the spine. The pupa has only 2 hairs in front of the thoracic horn, rudimentary thorns on tergite II, normal thorns on tergites III–VIII, thorns on sternites III–VIII similar to thorns on tergites, shagreenation on tergites II–IX, and L_2 is usually situated midway between L_1 and L_3.

MALE ($n = 1$)

Length 5.0 mm. Wing length 2.71 mm. Thorax brownish-black; scutellum, legs, and abdomen brownish. Bristles on thorax and abdomen each arising in a light colored circular spot.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{122}{161}$. Flagellum longest bristle about 800. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{83}{54}$, $\frac{23}{50}$, $\frac{27}{47}$, $\frac{25}{47}$, $\frac{29}{45}$, $\frac{29}{43}$, $\frac{32}{43}$, $\frac{34}{45}$, $\frac{36}{45}$, $\frac{41}{41}$, $\frac{41}{43}$, $\frac{43}{45}$, $\frac{551}{38}$. AR = 1.25.

Head — Vertex with 36 bristles, the longest 100. Clypeus with 12 bristles, the longest 94. Palp lengths: 113, 151, 151, 194.

Thorax — Pronotum with 7 bristles. Dorsocentrals 9–11 uniserial, prealars 4 strong and 5 weak. Scutellum with 23 biserial bristles.

Wing — VR = 0.88. Basal vein with 2–3 bristles, R with 13–15, R_1 with 10–11, and R_{4+5} with 5 bristles. Squama with 33–36 bristles. Sensory organs 2 on R_1, 1 basal on R_{2+3}, and 3–4 on R_{4+5}. Free end of costa about 100 long.

Halteres — Knob with 4 bristles, stem with 6 bristles.

Legs — Spur on front tibia 90 long. Spurs on middle tibia 63 and 72 long. Spurs on hind tibia 54 and 99 long. Width of apex of hind tibia 90. Comb with 18 spines 39–77 long. ta_1 and ta_2 of all legs with 2 tarsal spines 40–46 long, ta_1 of p_2 with 10 additional spines, ta_2 of p_2 with 1, ta_1 of p_3 with 13, and ta_2 of p_3 with 7 additional spines. ta_4 heart-shaped on all legs. Claw of hind leg 58 long, with 12 apical teeth and 6 hairs at base, the longest 23.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1076	1418	945	450	288	117	149	0.67	3.42	2.64	2.50
p_2	1764	1314	657	351	243	113	149	0.50	4.36	4.68	2.40
p_3	1458	1638	1044	554	315	108	158	0.64	3.65	2.97	2.35

Abdomen — Tergites with uniformly distributed bristles, the longest 240 long.

Hypopygium (Fig. 12) — No anal point. Tergite IX with 17 bristles on median part. Basistyle with a basal lobe attached throughout its whole length. Dististyle curved in normal position (Fig. 12A), broad at base, narrowing apically in more ventral view (Fig. 12B), and with an apical tooth in addition to the apical spine 16 long (Fig. 12C). HR = 1.82; HV = 2.49.

FEMALE ($n = 1$, tentatively associated)

Wing length 3.49 mm. Coloration as in the male.

Antenna — Pedicel 74 long, with 6 bristles, the longest 90. Length of flagellar segments: 103, 54, 63, 59, 54, 52, 130. AR = 0.33.

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[5]The term "naked" eyes is used in the sense that no hairs are longer than the height of an ommatid. Also eyes that are minutely pubescent as in this and the following species are accordingly regarded as "naked."

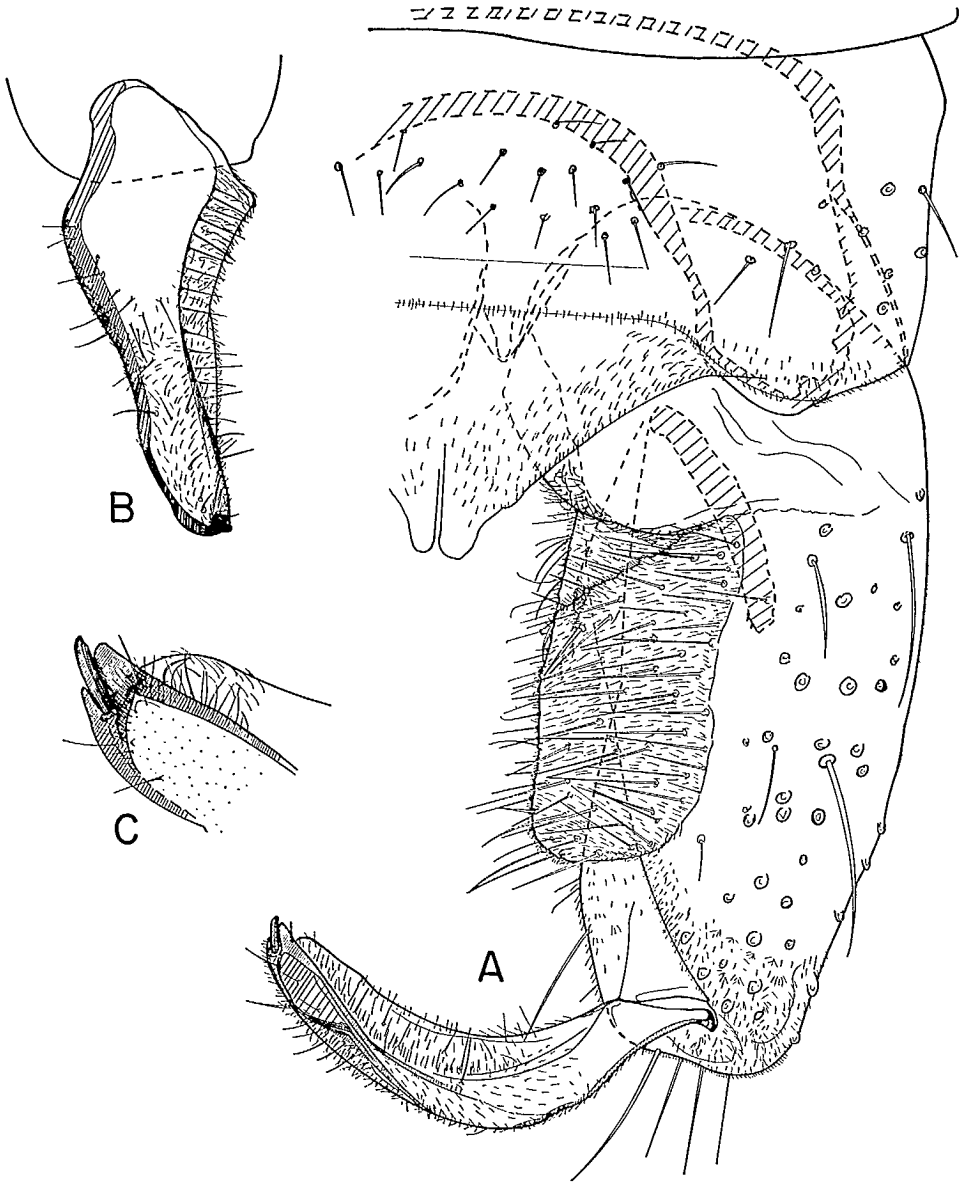

FIG. 12. *Diamesa fonticola* sp.n. ♂. (A) Hypopygium; (B) Dististyle in ventral view; (C) Apex of dististyle.

Head — Vertex with about 61 bristles, the longest 115. Clypeus with 24 bristles, the longest about 75. Palp lengths: 83, 164, 167, 221.

Thorax — Pronotum with 12 bristles. Dorsocentrals 20 uniserial, prealars 10 of which 5 are stronger. Scutellum with 48 bi-triserial bristles.

97967—3½

Wing — VR = 0.92. Basal vein with 4 bristles, R with 22–25, R_1 with 21, and R_{4+5} with 22 bristles. Squama with 43 bristles. Sensory organs 2 on R_1, 1 basal on R_{2+3}, and 5–6 on R_{4+5}. Free end of costa about 130 long.

Halteres — Knob with 4 bristles. Stem with 7 bristles.

Legs — Spur on front tibia 88 long. Spurs on middle tibia 77 and 79 long. Spurs on hind tibia 70 and 104 long. Width of apex of hind tibia 124. Comb with 23 spines 48–110 long. Tarsal spines 40–50 long, 3 apical spines on ta_1 of p_2, 2 apical spines on ta_1 of p_2 and of p_3, ta_1 of p_2 with 13 additional spines, ta_2 of p_2 with 6, ta_1 of p_3 with 20, and ta_2 of p_3 with 8 additional tarsal spines. Claw of hind leg 62 long, with 7 hairs at base, the longest 27.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1193	1665	1022	482	315	135	167	0.61	3.53	2.80	2.00
p_2	1566	1548	702	387	266	122	153	0.45	4.11	4.44	1.64
p_3	1665	1899	1071	621	365	135	167	0.56	3.60	3.33	1.38

PUPA ($n = 1$)

Length 6.6 mm. Exuvia subfuscous.

Cephalothorax — Thoracic horn lost. Only 2 bristles in front of horn, the anterior bristle 110 long, located about 35 from posterior bristle. Posterior bristle about 70 long, located about 90 from attachment point of thoracic horn. Frontal bristles 132 long. Covering case of pedicel without tubercles. Thorax rugulose with polygonic markings.

Abdomen — Shagreenation not present on segment I. Tergite II with sparse median shagreenation, tergite III–IX with slightly stronger shagreenation (Fig. 13A). Sternite II with extensive but faint group shagreenation, sternite III with less extensive but stronger group shagreenation anteriorly and medially, sternite IV without shagreenation, V with a few isolated paramedian spinules, VI with a few paramedian spinules, VII and VIII with more extensive paramedian and lateral shagreenation, sternite IX without shagreenation. The spinules on the tergites and on sternites V–VIII are located in posterior corners of faint polygons (Fig. 13A). Anterior lines of segments light, with few or no spinules. Segments II–VIII emarginate on anteriolateral margins. Number of thorns (small spinule-like thorns in subscripts): II–VIII dorsal: 0_5, 6_4, 6_2, 9_1, 7_0, 6_3, 6_1. III–VIII ventral: 9_1, 11_0, 10_0, 8_1, 9_2, 8_2. Thorns of tergites IV and VIII as in Fig. 13A and C. Thorns of sternites IV and VIII as in Fig. 13B and D. Lengths of bristles on V: $L_1 = 166$, $L_2 = 150$, $L_3 = 168$, $L_4 = 79$, $D_1 = 73$, $D_2 = 99$, $D_3 = 22$, $D_4 = 89$, $D_5 = 14$. Distance between L_1 and L_2 on V 41 on left side, 85 on right side, between L_2 and L_3 118 on left side, 65 on right side. 2 L-bristles on I and 3 on VIII. D_4 on VIII 95 long. Anal bristles 311 long, darker than L-bristles. Anal lobe dark, sclerotized, and rugulose near attachment points of anal bristles. Genital sac of male extending only slightly beyond anal lobes.

LARVA

A number of larvae and pupae of *Diamesa* were found at the same locality, but as there are at least 3 species present in the material and 1 of the other pupae does not seem to be separable from this species, a description of the larva has to be postponed.

TYPE MATERIAL

Holotype with pupal exuvia, male, cold spring, at The Bog near The Pas, Man., 5.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9973). Allotype, female, same data as holotype.

REMARKS

This new species, as both the imago and pupa indicate, is obviously closely related to the species pair *Diamesa aberrata* Lundb. and *Diamesa incallida* (Walk.). *Diamesa aberrata*, however, has an anal point, no indication of a basal lobe on the basistyle, and the dististyle is only slightly curved and practically equal in width throughout (Edwards, 1933, fig. 2C; Wülker, 1959a, fig. 5; Oliver, 1962, fig. 1). The hypopygium of *D. incallida* is similar to that of *D. fonticola* sp.n. in that it has no

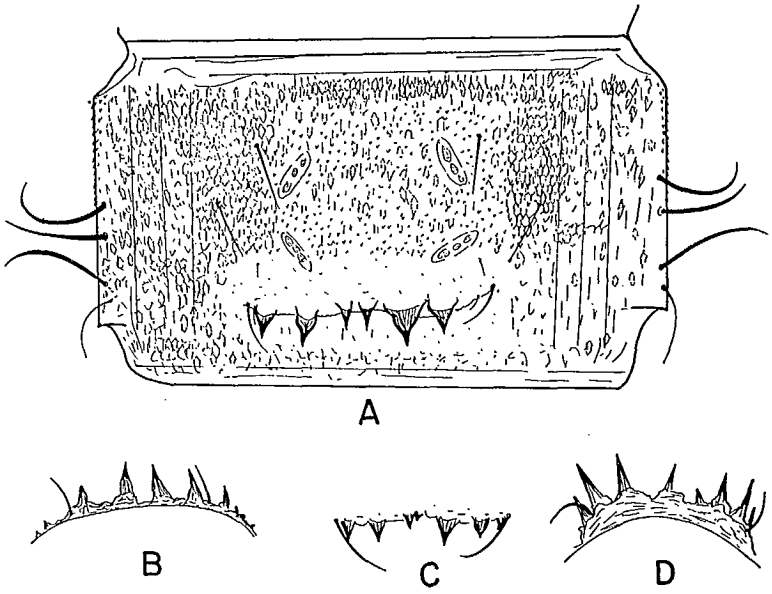

FIG. 13. *Diamesa fonticola* sp.n. Pupa. (A) Tergite IV; (B) Thorns of sternite IV; (C) Thorns of tergite VIII; (D) Thorns of sternite VIII.

anal point, there is some indication of a basal lobe on the basistyle, and the dististyle is curved (Edwards, 1929, fig. 2J; Goetghebuer, 1939a, fig. 31; Pagast, 1947, fig. 28). It differs in the placement of hairs on tergite IX and probably in the shape of the dististyle. The description of *D. incallida* is not complete enough for separating the 2 species with certainty. However, since the pupae also differ slightly, it seems better not to place these specimens in *D. incallida*. The specimen named *D. incallida* by Roback (1957a, p. 5–6, fig. 11–12) is probably neither *D. incallida* nor *D. fonticola* sp.n. More likely it is a new species. *Diamesa simplex* Kieff., incorrectly placed by Andersen (1937, p. 80) as a synonym of *D. aberrata* (cf. Oliver, 1959, p. 63; 1962, p. 4) is another species that probably belongs to the same group as *D. fonticola* sp.n. *Diamesa simplex*, however, has a long anal point.

The pupa of this new species will not key out in Pagast (1947, p. 515–516). It differs from *Diamesa* sp. VII (which according to Wülker [1959a, p. 345] is identical with *D. incallida*) and *D. aberrata* in that it does not have well developed thorns on tergite II. It also differs from the pupae of these 2 species in that its dorsal and ventral thorns are similar. The anal bristles are darker than the L-bristles as in *D. incallida:* the anal lobe near the anal bristles is dark, sclerotized, and rugose as in *D. aberrata* (Wülker, 1959a, p. 346).

Diamesa spinacies sp.n.

The species is characterized by an AR of about 1.12, naked eyes, heart-shaped ta_4, anal point with apical spine, large lobe of tergite IX, large basal lobe of basistyle,

and a dististyle that is more or less parallel-sided and has an apical tooth in addition to the spine. The pupa has thorns on tergites II–VIII and sternites III–VII (VIII), limited shagreenation on II–IX, and 1–3 rows of scales present behind the ventral thorns. The diagnostic features of the larva are labrum with slender S-bristles, S III bifid; labium with 10 pairs of lateral teeth and a simple or notched median tooth, apices of the 5 median teeth forming a straight line; procerci very low and without spurs.

MALE ($n = 1$)

Length 4.5 mm. Wing length about 2.5 mm. Thorax blackish-brown with lighter scutellum, legs, and abdomen. Areas surrounding origins of thoracic and abdominal bristles lighter in colour.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{90}{160}$. Longest bristle of flagellum about 270. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{79}{45}, \frac{32}{41}, \frac{32}{32}, \frac{34}{32}, \frac{32}{32}, \frac{32}{32}, \frac{32}{34}, \frac{34}{34}, \frac{36}{34}, \frac{36}{34}, \frac{36}{32}, \frac{38}{32}, \frac{500}{38}$. AR = 1.12.

Head — Vertex with 32 bristles, the longest 100. Clypeus with 11 bristles, the longest 110. Palp lengths: 79, 126, 113, 142.

Thorax — Pronotum with 6 bristles. Dorsocentrals 7 uniserial in lighter spots, prealars 6 in common light area. Scutellum with 27 bi-triserial bristles.

Wing — VR not measurable. Basal vein with 4 bristles, R with 13, R_1 with about 8, and R_{4+5} with about 6 bristles. Squama with 43 bristles. Altogether about 7 sensory organs.

Halteres — Knob with 4 weak bristles. Stem with about 4 bristles.

Legs — Spur on front tibia 68 long. Spurs on middle tibia 43 and 50 long. Spurs on hind tibia 47 and 90 long. Width of apex of hind tibia 68. Comb with 16 spines 42–78 long. Tarsal spines 30–40 long, longest on p_3, 2 at apex of ta_1 and ta_2 on all legs, 3 additional spines on ta_1 of p_2 and on ta_1 of p_3. ta_4 heart-shaped on all legs. Claw of hind leg 48 long, with 9 apical teeth, and about 8 hairs of various length at base, the longest 26. Empodium 57 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	779	932	621	257	180	90	104	0.67	3.70	2.76	1.80
p_2	842	810	428	261	158	86	95	0.53	3.47	3.86	2.15
p_3	990	1067	621	351	203	99	126	0.58	3.44	3.31	2.36

Abdomen — Tergites with mostly uniformly distributed bristles in lighter sports, the longest about 250.

Hypopygium (Fig. 14) — Anal point relatively long, 131, with a 14 long apical spine and 7 bristles on each side. Caudal lobe of tergite IX long, projecting almost as far posteriorly as anal point. Basistyle with longest bristle of basal lobe reaching 50 in length. Dististyle dark, parallel-sided, with an apical tooth, and a 16 long apical spine.

HR = 1.98; HV = 3.36.

FEMALE

Two immature female pupae were found and 1 larva was reared to the female pupal stage. The females had 10 dorsocentrals, 10 prealars, and about 33 scutellars. These female pupae together with all the larvae may belong to another species as the pupal thoracic horns are different from those of the 3 male exuviae found.

PUPA (The male and female exuviae may belong to 2 different species.)

Length of male 4.9–6.4 mm, mean 5.9 mm (3); of female 5.1–6.2 mm, mean 5.7 (3). Exuviae subluteous.

Cephalothorax — Thoracic horn of male (Fig. 15E) 396–504 (2) long, of female 225–277 (2) long, 18–20 (4) wide in both sexes. The female horn is dark-coloured higher up from base than the male and does not seem to have any small apical teeth. Three bristles present in front of thoracic horn.

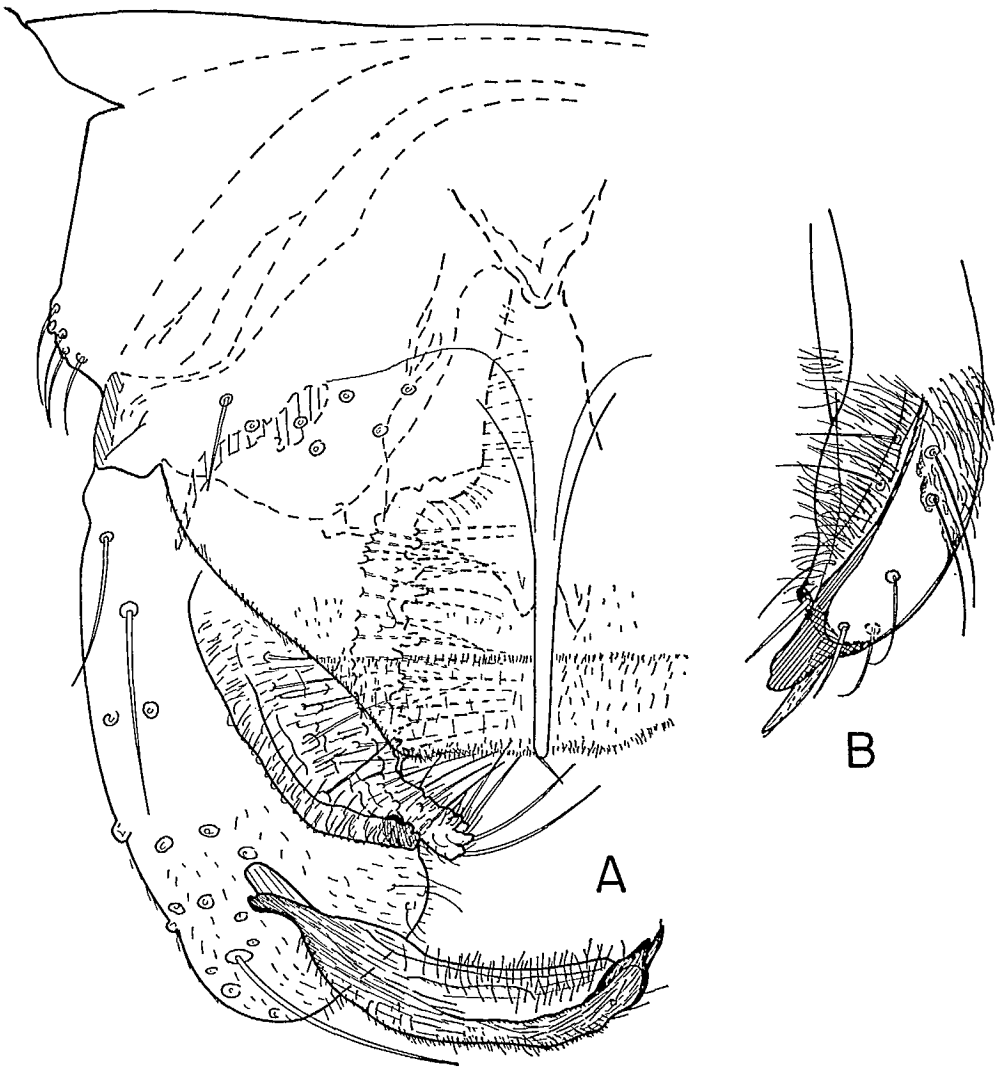

FIG. 14. *Diamesa spinacies* sp.n. ♂. (A) Hypopygium; (B) Apex of dististyle.

Anterior bristle 65–68 (3♂♂) and 63 (1♀) long, located 47–59 (4) from median bristle. Median bristle 230–245 (3♂♂) and 173 (1♀) long, located 23–25 (4) from posterior bristle. Posterior bristle 153–158 (3♂♂) and 135 (1♀) long, located 88–95 (4) from horn. Frontal bristle 209–270 (4) long. Covering case of pedicel (Fig. 15F) with about 20 low tubercles. Thorax relatively smooth, but with a few transverse lines.

Abdomen — Shagreenation not present on segment I. Tergite II with relatively strong, but sparse, shagreenation extending to about the posterior end of anterior muscle marks; tergites III–IX with extensive shagreenation covering half the segments or more with unshagreened areas present laterally and in front of thorns (Fig. 15A). Sternites with finer shagreenation and indications of polygon markings; sternite II fully shagreened; sternites III–V with anteriomedian and lateral shagreenation,

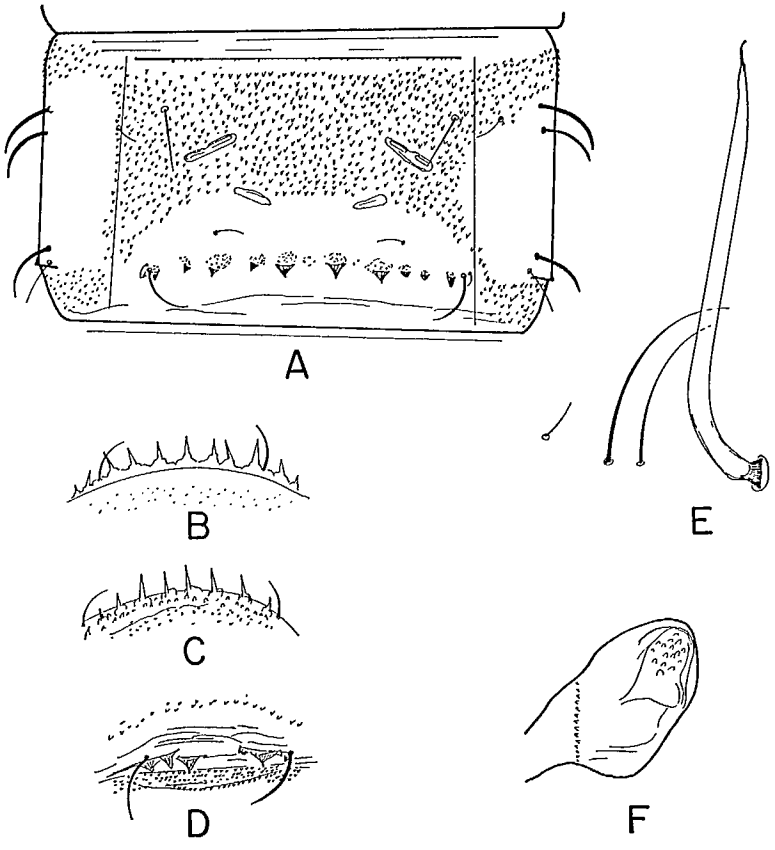

FIG. 15. *Diamesa spinacies* sp.n. Pupa. (A) Tergite IV; (B) Thorns of sternite IV; (C) Thorns of sternite VIII; (D) Thorns of tergite VIII; (E) Thoracic horn of male; (F) Covering case of pedicel.

and with some spinules caudad of thorns; VI–VIII as III–V, but without anteriomedian shagreenation; sternite IX with anteriolateral shagreenation. Anterior lines of segments lighter and less distinct than usual, with only a few spinules, not placed in groups as in *Diamesa davisi* Edw. (Sæther, 1968, p. 443–444). Thorns on tergite II smaller than on the other tergites, sternite III with smaller thorns in the middle. Longest thorns of tergites 55 long, of sternites 90. Thorns brownish-black on tergites, luteous on sternites. Tergite IV as in Fig. 15A, thorns of tergite VIII as in Fig. 15D, and ventral thorns of IV and VIII as in Fig. 15B and C, respectively. Number of thorns as in Table 1. Length of bristles on V (n = 3♂♂, 2♀♀): L_1 = 118–128 (♂), 102–112 (♀); L_2 = 118–158, mean 137 (♂), 89–114(♀); L_3 = 106–146, mean 130 (♂), 114–132 (♀); L_4 = 79–103, mean 92 (♂), 55–77 (♀); D_1 = 59–89; D_2 = 51–95; D_3 = 30–49; D_4 = 83–132, mean 112 (♂), 89–102 (♀); D_5 = 16–24. Distance between L_1 and L_2 on V 18–35, mean 26 (3♂♂), 5–33, mean 23 (3♀♀); between L_2 and L_3 151–229, mean 191 (3♂♂), 148–230, mean 175 (3♀♀). L-bristles 2 on I on 3 on VIII, all abdominal bristles fuscous. D_4 on VIII 122–132 (3♂♂), 104–118 (3♀♀) long. Anal bristles 288–333 (5) long.

LARVA

Length 6.5–9.3 mm, mean 7.9 mm (10). Head capsule length 0.58–0.69 mm, mean 0.64 mm (13). Coloration brown with brownish-black head.

TABLE 1. Thorns of tergites and sternites of pupae of *Diamesa spinacies* sp.n. Small spinule-like thorns given in subscripts.

	Specimen				
		Males		Females	
	Holotype (♂)	2	3	4	5
TERGITES					
II	10_1	9_2	13_0	9_4	10_0
III	11_3	12_0	13_2	15_4	11_1
IV	12_2	12_1	12_3	12_3	10_2
V	9_5	9_4	12_3	12_4	10_5
VI	9_2	10_2	10_4	13_3	12_1
VII	10_0	9_4	10_4	10_2	7_2
VIII	5_4	5_4	8_0	6_3	9_1
STERNITES					
III	7_{10}	9_7	14_6	6_{14}	8_9
IV	11_4	8_{36}	11_8	14_{16}	10_4
V	10_8	14_8	16_{20}	12_{24}	12_{15}
VI	9_{12}	12_{13}	13_{34}	15_{25}	$12_?$
VII	7_{18}	10_{28}	10_{34}	14_{30}	$9_?$
VIII	8_{30}	11_{35}	8_{42}	0	0

Head — Length of antennal segments (n = 15): 59–71, mean 62; 16–20, mean 18; 7–10, mean 8; 3–4, mean 4; 3–5, mean 4. AR = 1.78–2.07, mean 1.92 (15). Basal segment of antenna 18–22, mean 20 (15), wide. Distance from base of antenna to annular organ 6–18, mean 12 (11); to first bristle mark 10–18 (11); to second bristle mark 32–49 (11). Longer blade at apex of basal segment 26–30, mean 27 (9), long, shorter blade 18–24, mean 21 (7), long. Apical style of second segment 9–12, mean 10 (14), long. Second antennal segment apparently with apical annulation as in *D. davisi* Edw. and perhaps *D. hygropetrica* Kieff. (Sæther, 1968, p. 442). Labrum seems to be identical with that of *D. davisi* Edw. (Sæther, 1968, fig. 15H) with S III thin and bifid. Epipharyngeal area and hypopharynx as in *D. hygropetrica* (Potthast, 1915, fig. 141–142). Premandible 81–97, mean 89 (7), long, with 7 digits. Mandible (Fig. 16F–H) 167–187, mean 176 (10), long, with apical and first lateral teeth slightly longer than the three inner teeth and with about 24 bristles in the inner brush. Labium as in Fig. 16A–C.

Prolegs — Anterior prolegs with long unserrated claws and shorter serrated claws. Posterior prolegs 464–585, mean 518 (11), long, with strong blackish claws (Fig. 16E).

Abdomen — Procerci (Fig. 16D) height 9–14, mean 11 (12), width 20–23, mean 22 (12), almost as low as in *D. davisi* Edw. (Sæther, 1968, fig. 15E), without a basal spur, each with 4 apical bristles. 234–302, mean 271 (9), long. Small hair in front of procerci 52–59 long, a second hair placed behind procerci. Anal tubules (Fig. 16E) 225–329, mean 265 (14), long.

TYPE MATERIAL

Holotype, male with pupal exuvia, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9974). Paratypes, female pupa with larval exuvia, 4 pupal exuviae, larva in transition to pupa, 13 larvae, same data as holotype; 3 larvae, small mountain stream, water temp 7.5 C, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther; 3 larvae, mile 87, Kananaskis Road, Alta., 1.VII.1964, D. M. Wood.

REMARKS

The immature stages, especially the larva of *D. spinacies*, indicate that this species is closely related to *D. davisi* Edw. (Sæther, 1968, p. 441–445). The larva is separable from *D. davisi* only by minor differences in the labium, mandible, antenna, and procerci.

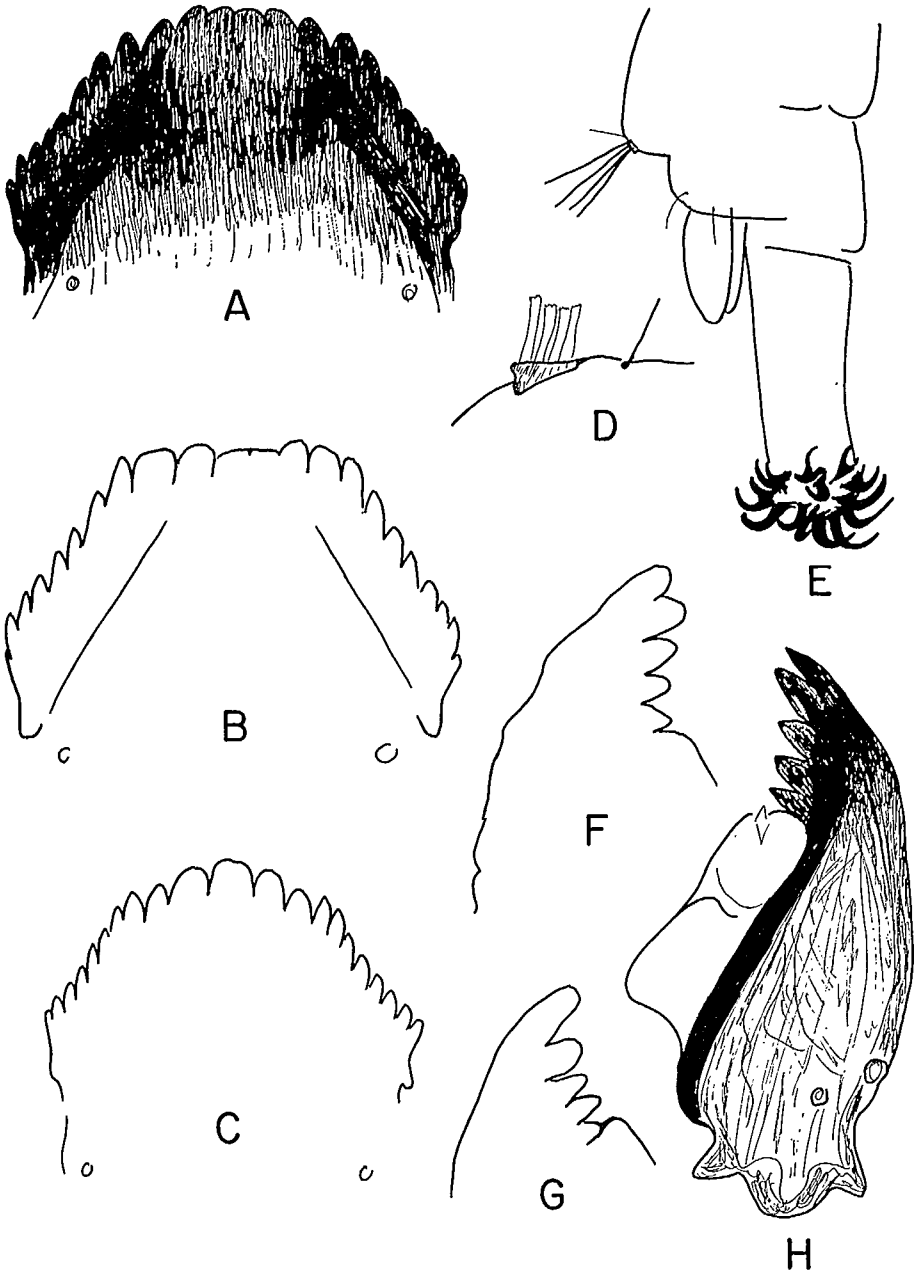

FIG. 16. *Diamesa spinacies* sp.n. Larva. (A) Labium of specimen from Rowe Creek; (B) Labium of specimen from small creek in Waterton; (C) Labium of specimen from Kananaskis Road; (D) Procerci; (E) Posterior end; (F) Apex of mandible of specimen from small creek in Waterton; (G) Apex of mandible of specimen from Rowe Creek; (H) Mandible of specimen from Kananaskis Road.

The differences, especially in the labium and mandibles, between larvae from different populations are probably due to differences in wear and tear as shown in *D. valkanovi* Sæth. and *D. davisi* by Sæther (1968, p. 434–435, 442). The pupa, however, more closely resembles *Diamesa spitzbergensis* Kieff. (Pagast, 1947, p. 526–527), from which it differs by having a more yellowish coloration, more extensive dorsal shagreenation, and better developed thorns on tergite II. *Diamesa davisi* and *D. spitzbergensis* are probably also closely related. The imago of *D. spinacies* sp.n. is not similar to either *D. davisi* or *D. hygropetrica*. It shows, however, some similarities with *Diamesa permacer* (Walk.) (Pagast, 1947, p. 470–471). *Diamesa permacer*, however, has a much shorter anal point and the dististyle lacks an apical tooth of about the same length as the apical spine. The AR is higher than 1 in both species, and the characteristic large lobes of segment IX are present in both species. *Diamesa permacer* is reported to be without a basal lobe on the basistyle (Pagast, 1947, p. 470). However, fig. 27 of Pagast (1947) indicates that at least remnants of a lobe are present.[6] *Diamesa barraudi* Pag. (Pagast, 1947, p. 475, fig. 33) from India seems to have a hypopygium very similar to this new species. It has, however, hairy eyes. *Diamesa spinacies* probably belongs in a group consisting of all the above-mentioned species plus the Japanese *Diamesa alpina* Tok. (Tokunga, 1936, p. 545–546). This group contains aberrant species such as *D. davisi* and *D. alpina*, and the plesiomorphous species, *D. hygropetrica* (Sæther, 1968, p. 447–449). The large differences among the imagines are probably related to the old age of the group as a whole.

Genus *Diamesa* cf. sp. *C.* Colorado (Sæther in print)

The male had hairy eyes, flagellum with 8 segments, heart-shaped ta_4, 20 bristles on squama, and the dististyle shaped about as in *Diamesa ursus* Kieff. (Sæther, 1968, fig. 25).

The pupa seems to be identical with *Diamesa* sp. *C.* from North Boulder Creek, Colorado (Sæther, in print, fig. 18E–J). The tubercles of the covering case of pedicel are slightly shorter than in the Colorado specimen and the number of thorns on tergite I are 14_3 and 7_{10} in the male exuviae and 10_9 in the female exuvia as compared to 6_0 in the Colorado specimen. Sternite III of the female has 3 distinct and 3 minute thorns (3_3).

SPECIMENS EXAMINED

Damaged male pupa, 1 male and 1 female pupal exuvia, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

North Boulder Creek, Colorado (Sæther, in print). New to Canada.

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[6] *Diamesa arctica* (Boh.) (Serra-Tosio, 1967b, fig. 1) has a hypopygium almost identical to that of *D. spinacies* sp.n. It differs, however, in having an AR of 1.7 and a wing length of 4.5 mm, and in lacking an apical spine of the anal point. It also lacks an apical tooth of the dististyle.

Genus *Sympotthastia* Pag.

Sympotthastia sp.

These exuviae may belong to *Sympotthastia zavreli* (Pagast, 1947, p. 510–512) or to *Sympotthastia fulva* (Joh.) (Johannsen, 1937, p. 34; Pagast, 1947, p. 511–512, 569).

PUPA

Length 7.7–8.3 mm.

Cephalothorax — Three bristles in area anterior to where thoracic horn is located in other genera, the middle one 230 long, the other two 120–140 long. Frontal bristles 210–230 long.

Abdomen — Tergites and sternites faintly reticulate with spinules in posterior corner of polygons. Tergite II with faint anterior shagreenation, tergites III–VIII stronger shagreened with faint indications of group shagreenation in anterior parts, i.e., different from *S. zavřeli* Pag. (Pagast, 1947, p. 511), which has extensive group shagreenation. Integument II/III with 6 very faint orally directed points in one specimen, with only 1 point in the other. Anal and integumental rows of anteriorly and posteriorly directed points in other details as in *S. zavřeli*. Length of bristles on V: L_1 = 156–160 (with 3 apical branches), L_2 = 144–150 (with 3–4 apical branches), L_3 = 128–160 (with 3–4 apical branches), L_4 = 120–136 (unbranched), D_1 = 80–90, D_2 = 64–68, D_3 = 56–60, D_4 = 84–92, D_5 = 66–70. (In accordance with Pagast [1947, p. 539] the smallest L-bristle is always regarded as L_4, even when it is located anterior of L_3 as in *Potthastia* and *Sympotthastia*.) No L-bristles with more than 8 apical branches, L-bristles on VII and VIII not darker and shorter than on other segments, i.e., different from *S. zavřeli* where the L-bristles on VII and VIII are darker and ⅔ as long on anterior segments. D_4 bifid, always longer than D_5 and placed rather far from D_5, i.e., different from *S. zavřeli*. D_4 on VIII 106–112 long. Anal bristles about 430 long.

Other details identical with *S. zavřeli* (Pagast, 1947, p. 510–512).

SPECIMENS EXAMINED

2 male exuviae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

The exuviae may belong to *S. zavřeli* although there are many minor differences. More likely they belong to *S. fulva* (Joh.) although they do also differ in some details from the description of *S. fulva* (cf. Johannsen, 1937, fig. 91).

SUBFAMILY ORTHOCLADIINAE

Genus *Cardiocladius* Kieffer, emended

Pronotum with strong lateral bristles, restricted to the area near the lateral margin or extending rather far medially. Prealar bristles 8–10. R and sometimes R_1 with a row of bristles. Inner spur of hind tibia at least one third as long as outer spur. Other characteristics in accordance with the generic description given by Brundin (1956a, p. 66).

Typus generis: *Cardiocladius ceylanicus* Kieff.

Cardiocladius albiplumus sp.n.

This species is characterized by a high AR (about 3.46), antennal plume consisting

of bristles that are greyish-white on about basal ⅔ and black on apical ⅓ (coloration not visible after preparation), outer spur of hind tibia less than half as long as inner spur, and basal lobe of basistyle almost covered by tergite IX.

MALE ($n = 1$)

Length 4.3 mm. Wing length 2.70 mm. Thorax pale luteous, with metanotum and anterior and lateral margins of scutellum darker brown, remainder of scutellum paler than the rest of thorax. Antennal plume consisting of bristles that are greyish-white on about basal ⅔ and black on apical ⅓.

Antenna — Pedical $\frac{\text{length}}{\text{width}}$: $\frac{65}{170}$. Longest bristle on flagellum 745. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{66}{50}, \frac{34}{49}, \frac{28}{45}, \frac{30}{42}, \frac{32}{43}, \frac{33}{41}, \frac{33}{40}, \frac{35}{38}, \frac{37}{38}, \frac{38}{35}, \frac{40}{33}, \frac{39}{32}, \frac{772}{30}$. AR = 3.46.

Head — Vertex with 12 uniserial bristles. Clypeus with 12 bristles. Palp lengths: 68, 157, 154, 243.

Thorax — Pronotum with about 7 bristles, located mostly near the lateral margin. Dorsocentrals uniserial 19–22, prealars 8. Scutellum with 27 scattered bristles.

Wing — VR = 1.16. R with 11 bristles about 43 long. Squama with 30 bristles, the longest 200. 2 (?) sensory organs near Fr.

Halteres — Knob with about 10 macrotrichia each approximately 30 long.

Legs — Bristles mostly uniformly dispersed. Spur on front tibia 78 long. Spurs on middle tibia 38 and 69 long. Spurs on hind tibia 38–59 and 100–109 long. Width of apex of hind tibia 80. Tarsal spines present on ta_1, ta_2, and ta_3 of all legs, 3 on ta_1 of hind leg, 2 on the other legs and segments. Tarsal spines of ta_1 37–42 long, of ta_2 36–40 long, of ta_3 20–31 long. Comb of hind tibia with 13 spines 39–77 long. ta_4 distinctly heart-shaped, 56 in width at apex of ta_4 of p_3. Claw 45 long, with 9 blunt, apical teeth and a few short, mostly dorsal hairs at base.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1024	1186	842	561	413	84	120	0.71	2.59	2.62	1.90
p_2	1055	1170	580	352	240	65	120	0.50	3.61	3.84	1.90
p_3	1201	1372	826	490	320	63	138	0.60	3.36	3.12	2.13

Abdomen — Tergites with uniformly distributed bristles, the longest about 200.

Hypopygium (Fig. 17) — Tergite IX bilobed caudally, with 14 bristles at posterior margin. Basistyle with a projecting, prominent basal lobe almost covered by tergite IX. Apical spine of dististyle 14 long and 4 wide.

HR = 2.12; HV = 2.49.

PUPA AND LARVA

There are several larvae and pupae of *Cardiocladius* collected at the same locality as the male, but as they belong to at least 2 different species, the description of the pupa and the larva of *C. albiplumus* sp.n. will be postponed until further material is gathered.

TYPE MATERIAL

Holotype, male, fast flowing stream, between mile 18 and 19 on Mando logging road, Kenora, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther (CNC type No. 9975).

REMARKS

The only apparent difference between this new species and *Cardiocladius fulvus* (Joh.) (Johannsen, 1908, p. 275; Sublette, 1967b, p. 486–488) are the palp proportions (the third segment is more than three times as long as the second in *C. fulvus*, and slightly shorter than the second in this species), and the ratio of tibial spurs on hind leg (the outer spur is one third as long as the outer in *C. fulvus* and about two fifths as long in this species). *Cardiocladius fulvus* must, however, be considered as a nomen dubium, since both the hypopygium and antenna are missing from the holotype.

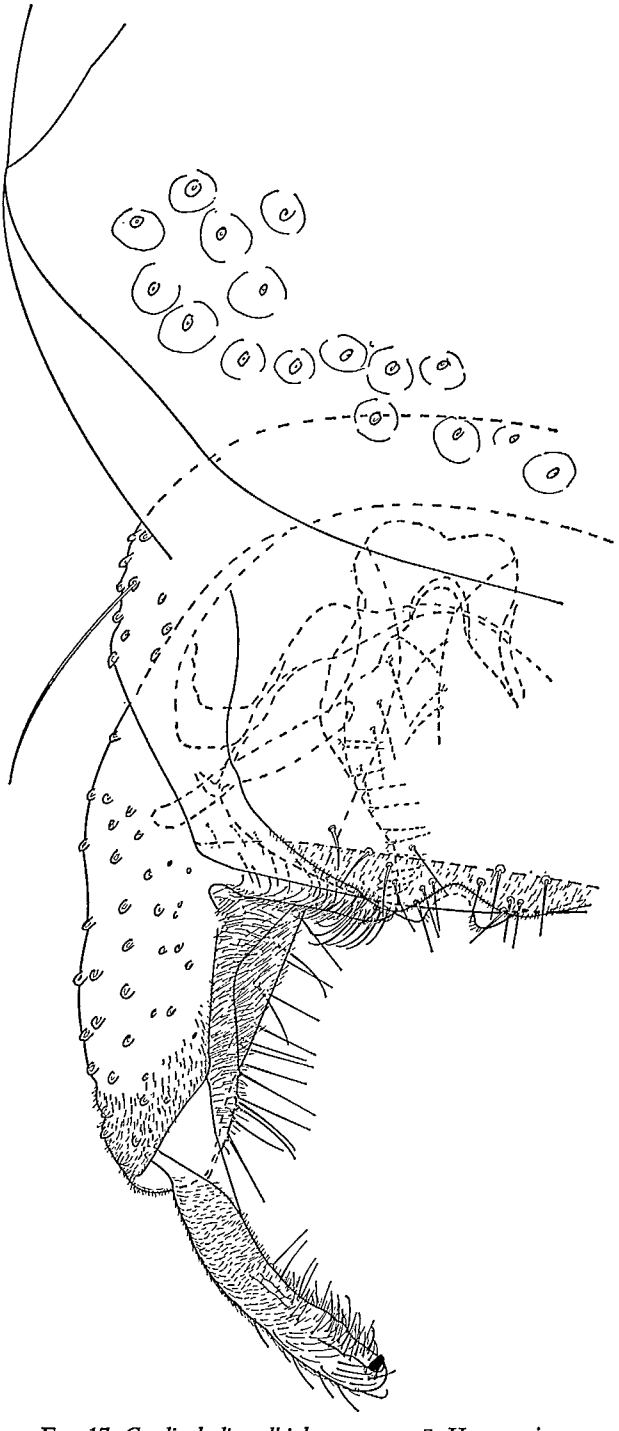

FIG. 17. *Cardiocladius albiplumus* sp.n. ♂. Hypopygium.

Genus *Brillia* Kieffer

Brillia retifinis sp.n.

The pronotum of this species is intermediate between *Brillia modesta* (Meig.) and *Brillia longifurca* Kieff.; the shape of the pronotum is similar to that of *B. modesta*, whereas the arrangement of bristles is more like that of *B. longifurca*. It is also characterized by a low AR of 1.10–1.44, reticulated pedicel, reticulated surface of tergite IX, two lobes on basistyle, and a dististyle with three long bristles at base and 5–9 hairs at apex. The pupa has a long thoracic horn, enlarged and with a deep incision at apex; orally directed spinules near posterior margin of tergite IV–V; anal lobe with 3 anal bristles and about 18–20 filamentous bristles. The larva has an AR of about 1.24, the second antennal segment is about 0.42 as long as the third segment, the labium has 2 broad, median teeth and 5 lateral teeth of which the fourth is minute and the premandible is bifid and half as long as the mandible.

MALE (n = 3, except when otherwise stated)

Length 4.6–5.1 mm. Wing length 2.35–2.77 mm. Thorax pale luteous with 3 darker vittae, abdominal tergites pale, each with an indistinct dark anterior band and 2 dark longitudinal bands, bristles on tergites in lighter spots.

Antenna — Pedicel reticulated, $\frac{\text{length}}{\text{width}}$: $\frac{100\text{–}110}{140\text{–}164}$. Longest bristle of flagellum about 600. $\frac{\text{Length}}{\text{width}}$ of flagellar segments: $\frac{106}{148}, \frac{72}{43}, \frac{27}{37}, \frac{30}{35}, \frac{33}{35}, \frac{36}{36}, \frac{38}{35}, \frac{40}{35}, \frac{42}{34}, \frac{43}{33}, \frac{44}{32}, \frac{45}{33}, \frac{584\text{–}643}{33\text{–}48}$. AR = 1.10, 1.19, and 1.44.

Head — Vertex with 27–35 bristles, the longest 130–150. Clypeus with 20–23 bristles, the longest 150. Palp lengths 64–76, 180–238, 197–218, 171–213.

Thorax (Fig. 18) — Pronotum shape about as in *B. modesta* (Meig.) (Brundin, 1956a, fig. 26), with 10–12 lateral bristles and 10–13 median bristles distributed about as in *B. longifurca* Kieff. (Brundin, 1956a, fig. 27). Dorsocentrals 50–67, prealars 17–22. Scutellum with 36–40 bristles.

Wing — VR = 1.35–1.40. Macrotrichia along margin 30–210 long, on veins and membrane 30–80 long. Basal vein with 13–15 bristles. Squama with 24–26 bristles.

Halteres — Knob with a longitudinal row of 8 uniserial 35 long bristles.

Legs — Spur on front tibia 61–70 long. Spurs on middle tibia both 54–60 long. Spurs on hind tibia 56–61 and 84–85 long. Width of apex of hind tibia 57–62. Comb with 9 spines 42–70 long. Claw 32–40 long, with 3–4 apical teeth.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR(2)
p_1	989	1214	1033	528	379	273	153	0.84–0.86	2.26–2.60	2.06–2.20	1.67–4.44
p_2	1101	1144	555	356	277	189	133	0.47–0.50	2.89–2.97	3.98–4.09	5.00
p_3	1178	1417	767	495	401	251	152	0.53–0.55	2.56–2.61	3.33–3.46	5.00–5.33

Abdomen — Tergites with uniformly distributed bristles, the longest 245–255.

Hypopygium (Fig. 19) — Tergite IX with 28–37 bristles at caudal margin, the longest 110–140. Basistyle with 118–130 long, 20 wide basal lobe, and a small distal lobe. Dististyle with 3 long bristles and several short hairs at base and 5–9 hairs at apex; length of dorsobasal lobe of dististyle measured from forking 70–84. HR = 1.65–1.74; HV = 3.20–3.31.

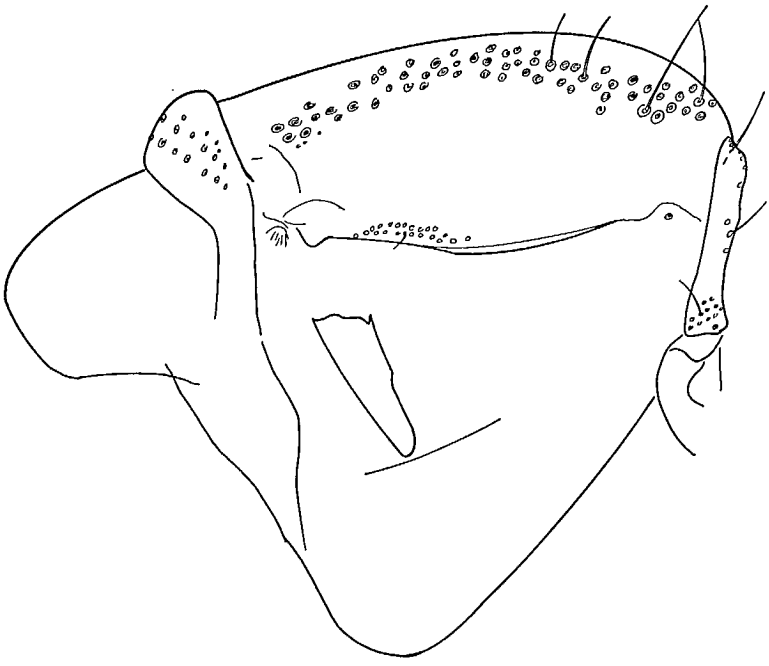

FIG. 18. *Brillia retifinis* sp.n. ♂. Thorax.

PUPA ($n = 1$)

Length 5.2 mm. Exuvia subfuscous, margins of exuvia, base of wing sheaths, and anterior and lateral lines of tergites darker.

Cephalothorax — Thoracic horn (Fig. 20C) enlarged and with a deep incision at apex, 390 long, 68 wide at base of incision, with a few faint spinules. Anterior bristle in front of horn 122 long, located 12 from median bristle and 8 from posterior bristle. Median bristle slightly stronger, about 120 long, located 12 from posterior bristle. Posterior bristle 90 long, located 45 from base of horn. Frontal bristle about 65 long.

Abdomen — Shagreenation and chaetotaxy of tergites as in Fig. 20A–B. Sternites I, II, and IX without shagreenation; III with faint anterior and very faint and sparse lateral shagreenation; IV as III, but spinules somewhat stronger and with an anteriomedian unshagreened part; V with anterior shagreenation slightly less extensive than on IV and without lateral shagreenation; VI with anterior shagreenation as on V; posterior shagreenation as on tergite VI, but posterior points less strong; VII about as tergite VII, but with shagreenation also present in 2 longitudinal bands combining anterior shagreenation and posterior spinules; VIII as tergite VIII, but anterior shagreenation slightly more extensive. Pedes spurii A present on sternites IV–VI; pedes spurii of IV divided into 2 groups of spinules, 1 posteriolateral with spinules 10–18 long and 1 median with spinules 4–12 long; pedes spurii of V also divided into 2 groups, lateral group smaller than on IV, median group more extensive; pedes spurii of VI with 1 extensive group of spinules. Length of bristles on V: $L_1 = 44$, $L_2 = 92$, $L_3 = 54$, $L_4 = 76$, $D_1 = 54$, $D_2 = D_3 = 52$, $D_4 = 72$, $D_5 = 62$. D_4 on VIII 90 long. L-bristles on VII 154–185 long, on VIII 176–225 long. Anal bristles 249 long. Anal lobe with 18–20 bristles in the fringe. Genital sac of male pointed, extending beyond the tips of anal lobes.

LARVA ($n = 1$)

Head capsule length 0.67 mm. Coloration of head brown without black ventral mark, occipital margin black. Mandible black on apical two thirds. Labium black.

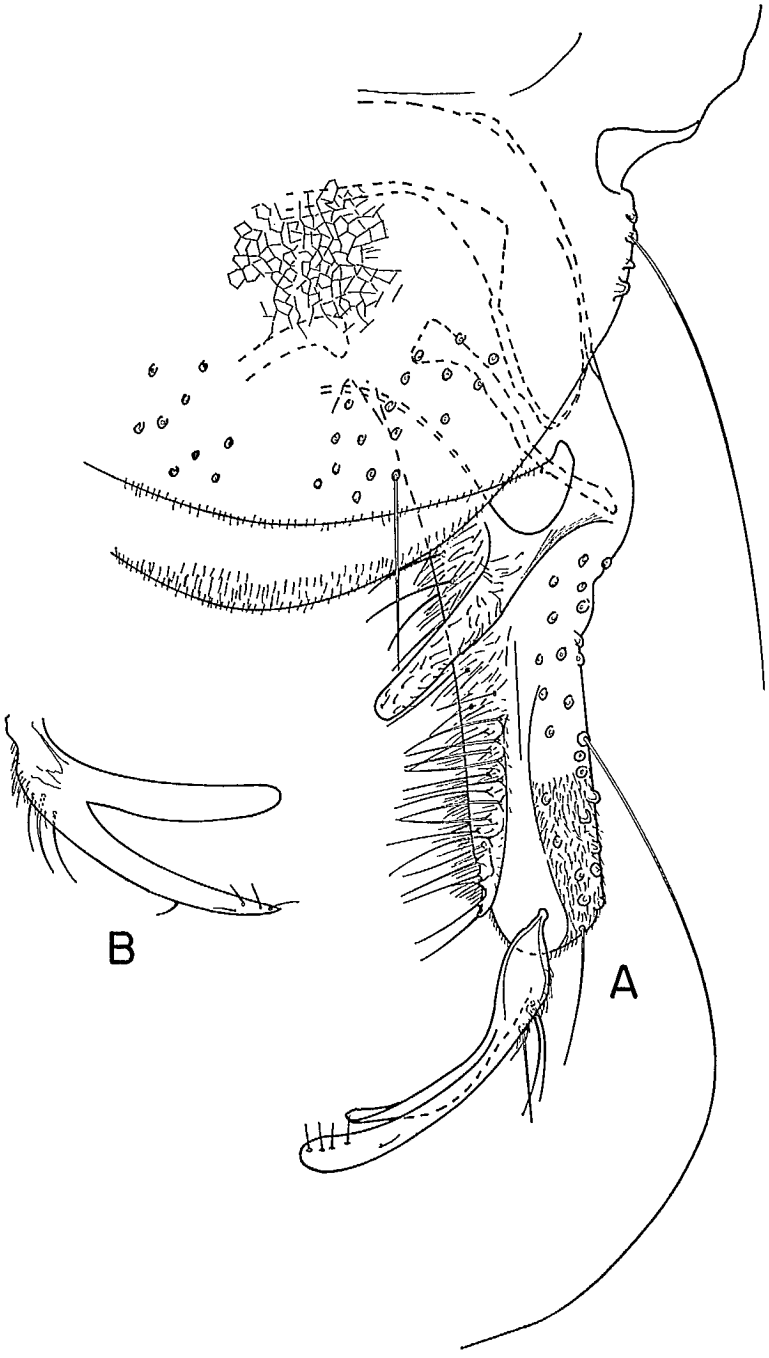

FIG. 19. *Brillia retifinis* sp.n. ♂. (A) Hypopygium; (B) Dististyle, ventral view.

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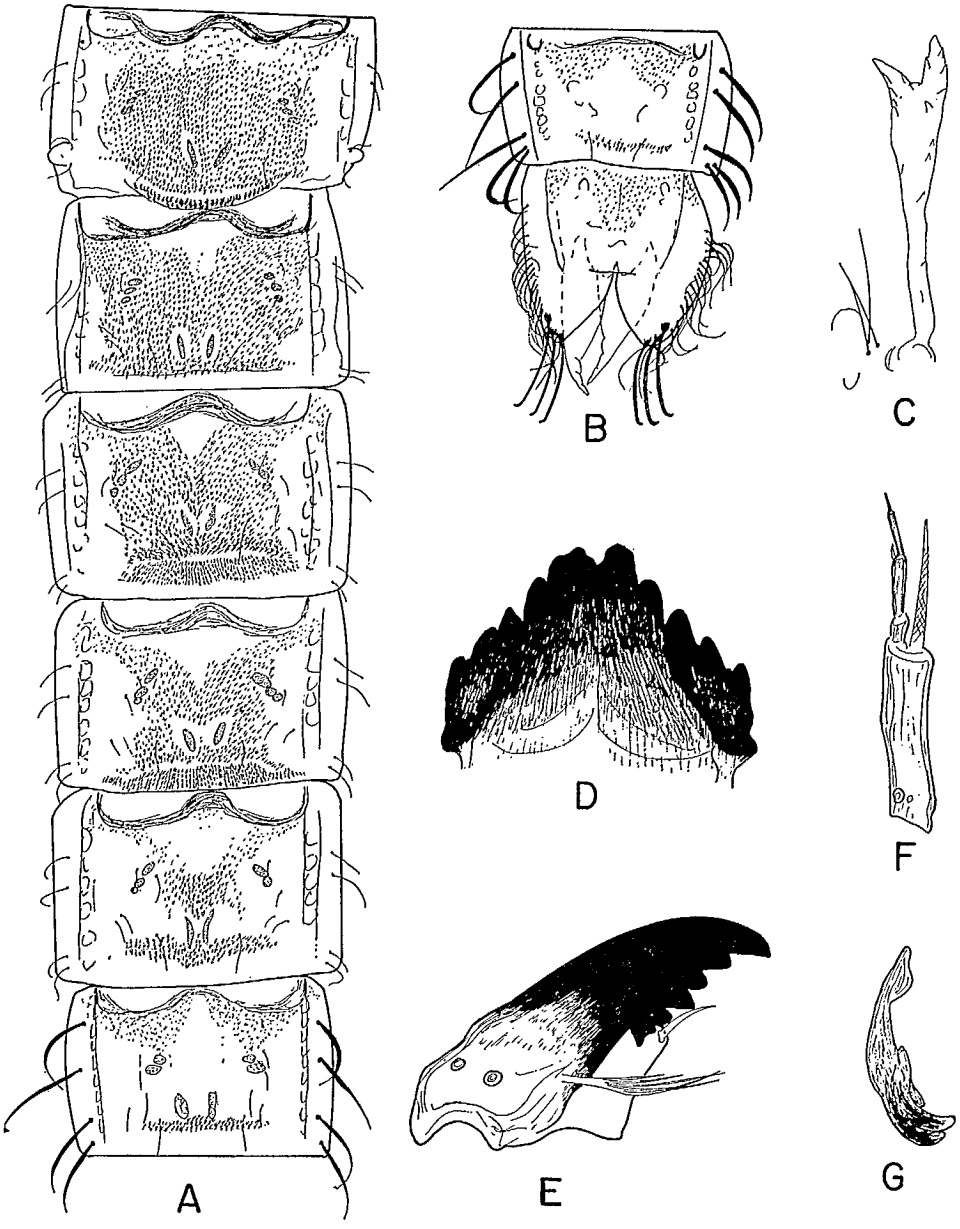

FIG. 20. *Brillia retifinis* sp.n. (A) Tergites II–VII of pupa; (B) Tergites VIII–IX of pupa; (C) Thoracic horn; (D) Labium; (E) Mandible; (F) Antenna; (G) Premandible.

Head — Antenna as in Fig. 20F. Length of antennal segments: 94, 13, 31, 23, 9. AR = 1.24. Basal segment 23 wide; distance from base to annular organ 8, to first bristle mark 11; length of blade at apex 63. Labrum bristles as in *B. modesta* (Meig.) (Thienemann, 1944, fig. 186). Maxilla as in *B. modesta* (Spärck, 1922–23, fig. 2b, as *Brillia bifida* [Kieff.]). Maxillary palp excluding apical

styles and bristles 40 long, 23 wide. Premandible (Fig. 20G) bifid, 106l ong. Mandible (Fig. 20E) 200 long.

Abdomen — Procerci 72 long, 36 wide, with 8 apical bristles about 800 long, and 2 lateral bristles 66 and 126 long.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9976). Paratypes, 2 males, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

This new species seems to be closely related to *Brillia annuliventris* Mall. (Malloch, 1915a, p. 46, fig. 2), but differs in the shape of the basal lobe of the basistyle and in the chaetotaxy of the dististyle. The basistyle of both species has a distal lobe but not as large as that in *Brillia par* Coq. (Sublette, 1966b, fig. 7, 1967b, fig. 7). However, according to the figures drawn by Sublette the latter species has an apical spine on the dististyle. The presence of this apical spine as well as the characteristic larva and pupa, may justify the erection of a new subgenus for *B. par*. Another closely related species seems to be *Brillia parva* Joh. (Sublette, 1967b, p. 493–494, fig. 9). *Brillia parva*, however, has a VR of only 1.22, only 6 prealar bristles, only 1 lobe on the basistyle, and the dististyle lacks the 3 long bristles on its base.

The pupa closely resembles that of *Brillia brevinervis* (Kieff.) (Spärck, 1922–23, fig. 4E), but the 2 apices of the thoracic horn are more pointed in this new species.

The larva is very similar to that of *B. modesta* (Meig.) (syn. *B. bifida* (Kieff.), but it lacks the black ventral mark on the head (Spärck, 1922–23, p. 70–75; Thienemann, 1944, p. 644–645).

Genus *Trissocladius* (Kieffer) Brundin, emended

(*Trissocladius* (Kieff.) Brund., Sublette 1967b: 494, pro parte)

Pronotum moderately developed or rather broad and collarlike, the lobes in a dorsal view completely separated, in contact only near the mesonotal projection, in broad contact, or joined along a more or less broad suture with a slight anterior notch. Pulvilli minute or absent. Other characteristics in accordance with the generic description given by Brundin (1956a, p. 73).

Typus generis: *Trissocladius brevipalpis* Kieff.

REMARKS

Sublette (1967b, p. 504, and personal communications) places *Trissocladius johannseni* (Subl.) comb.n. (see p. 45) in *Orthocladius* (*s. str.*) mainly because of the pronotal features. The pupa and the larva of *T. johannseni* [described as *Spaniotoma* (*Orthocladius*) *nivoriundus* Joh. (nec Fitch) by Johannsen (1937, p. 64)], however, are very characteristic of *Trissocladius* and can only be separated from *Trissocladius hamiltoni* sp.n. with difficulty. Also the male hypopygium of *T. johannseni* is nearly identical with that of *T. hamiltoni*. Accordingly *johannseni* has to be placed in

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Trissocladius and the genus has to be emended as suggested by Sublette (personal communication).

Sublette (1967b, p. 494–495) enlarges *Trissocladius* to include *Symbiocladius* Kieff. The imagines of *Symbiocladius* seem to be closely related to those of *Trissocladius;* the immature stages are quite divergent from the larvae and pupae of *Trissocladius.* It seems therefore better to keep the two genera separated.

Trissocladius domus (Subl.) comb.n.

Orthocladius nigritus Malloch, 1915b: 525, pro parte.
Orthocladius domus Sublette, 1966b: 594.

Although the species is not present in the collections examined, it has been included here to give the new combination.

Sublette (1966b, p. 594, 1967b, p. 507) mentions that this species is closely related to *T. johannseni* (Subl.) comb.n. Accordingly, if *johannseni* is placed in *Trissocladius* then *domus* should, as Sublette (personal communication) suggests, be placed in *Trissocladius* as well.

DISTRIBUTION
Maryland (Sublette, 1966b, p. 594).

Trissocladius hamiltoni sp.n.

The species is characterized by a high AR (about 2.01–2.26), about 8 dorsocentrals, about 10–15 rather strong acrostichals high up on metanotum, wing with prominent anal lobes, squama with about 36–40 bristles, R_{4+5} with 1–4 apical bristles, BR of front leg about 2.71–3.00, anal point naked apically, with about 11–12 basal bristles on each side, basal lobe of basistyle subdivided, and dististyle broad along its entire length.

The pupa is without shagreenation on tergites VII–VIII except for very faint group shagreenation. It has 4 filamentous bristles on VII, 5 on VIII, and 16–19 hairs on the anterior two thirds of each anal lobe.

The larva has an AR of 1.65–1.73, and the premandible is bifid.

MALE ($n = 2$)

Length 4.1–4.7 mm. Wing length 2.20–2.67 mm. Thorax blackish-brown including scutellum. Halteres subfuscous.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{119}{169}$. Longest bristles of flagellum 665–860. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{77}{52}, \frac{27}{50}, \frac{25}{47}, \frac{26}{45}, \frac{26}{46}, \frac{26}{46}, \frac{27}{47}, \frac{29}{48}, \frac{29}{48}, \frac{31}{48}, \frac{31}{48}, \frac{33}{47}, \frac{818}{47}$. AR = 2.01–2.26.

Head — Vertex with 12 bristles, the longest 122–125. Clypeus with 16–18 bristles, the longest 102–135. Palp lengths: 68–74, 121–166, 111–128, 170–178.

Thorax — Pronotum broad, collarlike, the 2 lobes in broad contact, but seem not to be joined along a suture, with 4–8 lateral bristles. Acrostichals about 10–15 rather strong, but short and located high up on mesonotum, dorsocentrals 8, prealars 4–6. Scutellum with 11–12 uniserial bristles.

Wing — VR = 1.04–1.08. Basal vein with 2 bristles, R with 5, R_{4+5} with 1–4 apical bristles. Squama with 36–40 bristles. Sensory organs 1 on Fr, 1 basal on R_1. Free end of costa 15–20 long. Anal lobe very prominent.

Halteres — Knob with 6 weak bristles.

Legs — Spur on front tibia 78–79 long. Spurs on middle tibia 24 and 30–36 long. Spurs on hind tibia 30–32 and 70 long. Width of apex of hind tibia 58–65. Comb with 11–14 spines 24–50 long. Tarsal spines 26–35 long, 2 on ta_i of p_2 and p_3, 0–1 on ta_2 of p_3. Claw of hind leg 40–45 long, with about 8 apical teeth. Empodium 40–45 long. Pulvilli indistinct, about 20 long.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	890	1074	749	418	331	226	130	0.67–0.72	2.32–2.48	2.60–2.65	2.71–3.00
p_2	945	960	442	272	208	146	112	0.43–0.48	3.14–3.21	4.12–4.57	2.50–2.63
p_3	1046	1135	632	414	294	179	126	0.54–0.58	2.71–2.87	3.28–3.61	4.21–4.40

Bristle ratios of ta_2–ta_5 of p_1: 3.44–3.67, 3.40–3.63, 3.33–3.71, 1.51–2.40.

Abdomen — Bristles of tergites uniformly distributed except for a bare area on posteriomedian part of each segment, longest tergite bristle 221–270 long.

Hypopygium (Fig. 21) — Anal point naked, 30–37 long, with 11–12 basal bristles on each side. Basal lobe of basistyle subdivided. Dististyle rather broad and almost parallel-sided, with an apical tooth, and a 15–17 long apical spine. HR = 2.51–2.71; HV = 4.34–4.61.

PUPA ($n = 2$)

Length 4.8–6.1 mm. Exuvia pale subfuscous. Oral margins of tergites and sternites II–VI with narrow dark brown bands, bands on tergites and sternites VII–VIII luteous.

Cephalothorax — Thoracic horn as in *T. johannseni* (Subl.) comb.n. (syn. *Orthocladius nivoriundus* Joh. nec. Fitch.) (Johannsen, 1937, fig. 231), 320–435 long, 70–73 wide. Anterior bristle in front of horn 108–115 long, located 4–6 from median bristle. Median bristle 100–122 long, located 15 from posterior bristle. Posterior bristle 38–42 long, located 106–110 from horn. Frontal bristle 89–94 long. Frontal plate about as in *Trissocladius distylus* Kieff. (Zavřel, 1937, fig. 2C).

Abdomen — Segment I without shagreenation. Tergite II with faint anteriomedian shagreenation becoming stronger posteriomedian, and with 4–5 rows of posterior orally directed spinules; tergites III–IV as II, but shagreenation more extensive; tergites V–VI with anterior group shagreenation and median and posterior shagreenation, without orally directed spinules; shagreenation on tergites II–VI strongest along median line. Tergites VII–IX with faint anteriomedian group shagreenation; sternite II with anteriomedian group shagreenation, sternites III–IV with faint anteriomedian and lateral group shagreenation, sternites V–VIII with faint anteriomedian shagreenation. Pedes spurii A present on sternites IV–VII. Length of bristles on V: L_1 = 23–36, L_2 = 44–49, L_3 = 24–28, L_4 = 34–47, D_1 = 40–51, D_2 = 26–36, D_3 = 26–40, D_4 = 37–40, D_5 = 30–32. D_4 on VIII 84 long. Segment VII with 4 filamentous bristles 150–180 long and segment VIII with filamentous bristles 180–200 long. Anal lobe with 16–19 hairs in fringe, which occupies anterior two thirds of segment, anal bristles 310–365 long. Genital sac as in *Trissocladius* (*Paratrissocladius*) *fluviatilis* Goetgh. (Zavřel, 1937, fig. 2E), overreaching the anal lobe by about 20.

LARVA ($n = 2$)

Length 4.9–6.3 mm. Head capsule 0.52–0.53 mm long. Occipital margin of head black. Mandibles and premandibles dark brown on apical half.

Head — Antenna about as in *T. johannseni* (Subl.) (Johannsen, 1937, fig. 230, as *Orthocladius nivoriundus*), length of segments: 76, 20, 10, 9, 7. Basal segment of antenna 28 wide, annular organ 5–8 from base, first bristle mark 25–29 from base, second bristle mark 44–45 from base, blade at apex 40 long. Labrum, premandible, and labium as in *T. johannseni* (Johannsen, 1937, fig. 232–233). Premandible 92–94 long. Mandible 181–182 long.

Abdomen — Procerci dark brown sclerotized, 72 long, 52–54 wide, with 7 apical bristles about 920 long and 2 lateral bristles 65–85 and 92–94 long. Bristle caudad of procerci and above posterior prolegs about 430–440 long.

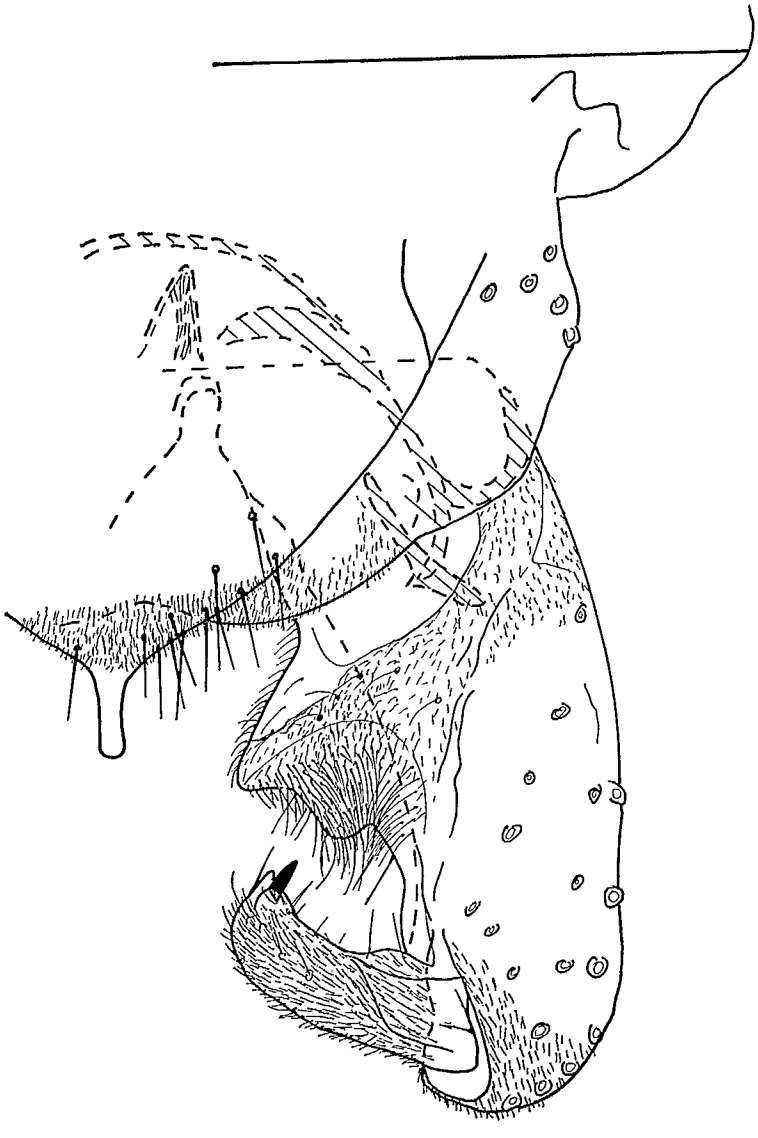

FIG. 21. *Trissocladius hamiltoni* sp.n. ♂. Hypopygium.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, near shore, 0.6 m, Falcon Lake, Man., 16.IV.1967, A. L. Hamilton (CNC No. 9977). Paratype, male with pupal and larval exuviae, Rideau River near Manotick, Ont., 3.IV.1966, A. L. Hamilton.

REMARKS

The species is closely related to *T. johannseni* (Subl.) comb.n. and *Trissocladius grandis* Kieff. *Trissocladius grandis* (Brundin, 1947, p. 27, fig. 53, as *Chaetocladius*

crassistylus sp.n.) is larger, has a shorter anal point, a smaller lobe of basistyle, and a broader dististyle. The exuvia of *T. grandis* (Thienemann, 1944, p. 583) is transparent and the genital sac is of normal *Trissocladius* shape (?). The imago of *T. johannseni* (Johannsen, 1905, p. 275; Sublette, 1967b, p. 504–507) is very similar to this new species. It differs, however, in having a smaller, single basal lobe of basistyle (Sublette, 1967b, fig. 15). *Trissocladius grandis*, *T. johannseni*, and *T. hamiltoni* sp.n. are the only species of *Trissocladius* known to have a prominent anal lobe on the wing. The larva of *T. johannseni* cannot be separated from *T. hamiltoni* sp.n. The pupa has 2 slender filamentous L-bristles on VI, not present in *T. hamiltoni*, and the fringe of the anal lobe extends to the anal bristles (Johannsen, 1937, p. 64–65) instead of being restricted to the anterior two thirds of lobe as in *T. hamiltoni*.

Trissocladius johannseni (Subl.) comb.n.

Orthocladius nivoriundus (Fitch), Johnson 1900: 627, misidentification of *Chironomus* (= *Diamesa*) *nivoriundus* Fitch.

Orthocladius nivoriundus (Fitch), Johannsen 1905: 274.
Orthocladius nivoriundus Joh. (nec Fitch), Johannsen 1934: 348.
Spaniotoma (*Orthocladius*) *nivoriunda* Joh. (nec Fitch), Johannsen 1937: 64.
Trissocladius nivoriundus (Joh.), Thienemann 1944: 585, 588, 634.
Hydrobaenus (*Chaetocladius*) *nivoriundus* (Joh.), Johannsen 1947: 173.
Hydrobaenus (*Hydrobaenus*) *nivoriundus* (Joh.), Johannsen 1952: 23.
Hydrobaenus nivoriundus (Joh.), Roback 1957b: 76, 81.
Orthocladius (*s. str.*) *johannseni* Subl., Sublette 1967b: 504.
nec. *Orthocladius nivoriundus* Fitch, Malloch 1915b: 525.

In addition to the characters mentioned by Sublette and Johannsen this female has about 16 rather strong acrostichals in the middle of the mesonotum.

SPECIMENS EXAMINED

Female with pupal and larval exuviae, Bear Creek, Carlsbad Springs, Ont., 17.IV.1966, A. L. Hamilton.

DISTRIBUTION

New York. New to Canada.

Genus *Heterotrissocladius* Spärck

Heterotrissocladius marcidus (Walk.)

The AR in these 2 males are 1.26 and 1.45; Goetghebuer (1940–50, p. 22) mentions 1.5.

SPECIMENS EXAMINED

2 males, 10 females, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Europe (Brundin, 1949, p. 706; Fittkau et al., 1967, p. 358; Sæther, 1967a, p. 106; Reiss, 1968, p. 232). New to North America.

Genus *Eukiefferiella* Thien.

Eukiefferiella hospita Edw.

The intersex found may belong to another species since the antennal characters cannot be seen on the female-like antennae. The hypopygium of the intersex as well as the associated pupal and larval exuviae, however, is identical with *E. hospita* (Zavřel, 1939; Brundin, 1956a, p. 87, fig. 55).

SPECIMENS EXAMINED

Male, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther; intersex with pupal and larval exuviae, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Europe (Fittkau et al., 1967, p. 357; Reiss, 1968, p. 232). New to North America.

Eukiefferiella paucunca sp.n.

The species is characterized by a low AR (about 0.42–0.57), about 9–12 dorsocentrals, about 4–7 uniserial scutellars, squama with about 4–6 bristles, R_{2+3} fused with R_{4+5}, and hypopygium with an anal point characteristic of the *Eukiefferiella bavarica* group.

The pupa is of the *E. bavarica* subtype, but with a thoracic horn more like the *Eukiefferiella discoloripes* subtype.

The larva belongs to the *E. bavarica* subgroup and has an AR of 1.54–1.75. It differs in that SI is single and the anterior eyespot, though elongate, is relatively much larger than in *E. bavarica* Goetgh.

MALE (n = 5, except when otherwise stated)

Length 2.2–2.6 mm, mean 2.4 mm. Wing length 1.41–1.50 mm, mean 1.46 mm. Coloration brownish with 3 dark vittae on thorax, scutellum and halteres pale.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{93}{114}$ (4). Longest bristle of flagellum about 350–400 long. Flagellar segments (n = 4) $\frac{\text{length}}{\text{width}}$: $\frac{49}{27}$, $\frac{26}{28}$, $\frac{28}{26}$, $\frac{35}{25}$, $\frac{40}{24}$, $\frac{45}{22}$, $\frac{48}{22}$, $\frac{45}{22}$, $\frac{45}{21}$, $\frac{45}{21}$, $\frac{44}{20}$, $\frac{44}{20}$, $\frac{231}{25}$. AR = 0.42–0.57, mean 0.48 (4).

Head — Vertex with 3–6 bristles, the longest 70 (1). Clypeus with 4–8 bristles, the longest 54–78. Palp lengths: 32–43, mean 37; 70–86, mean 79; 74–90, mean 84; 108–120, mean 113 (3).

Thorax — Pronotum with 2–3 bristles. Dorsocentrals 9–12 uniserial, prealars 3–5. Scutellum with 4–7 uniserial bristles.

Wing — VR = 1.36–1.42, mean 1.39. Basal vein with 1 bristle, R with 7–10, R_1 with 3–4, R_{4+} with 4–6 bristles. Squama with 4–6 bristles. Free end of costa 57–70 long. R_{2+3} seems to be fused with R_{4+5}, but none of the wings are in a very good condition.

Legs — Spur on front tibia 32–36 long. Spurs on middle tibia 16–17 and 23–27 long. Spurs on hind tibia 19–26, mean 23 and 32–46, mean 41. Width of apex of hind tibia 33–40, mean 36. Comb with 13 spines 20–44 long. Tarsal spines not present. Claw of hind leg 18–22 long. Empodium about 31 long. Pulvilli very faint, 10 long.

Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	459	531	327	248	171	103	77	0.58–0.65, 0.62	2.07–2.32, 2.20	2.87–3.21, 3.03	1.43–3.33
p_2	491	509	232	130	111	70	65	0.44–0.48, 0.45	3.18–3.38, 3.28	4.10–4.47, 4.31	2.64–3.75
p_3	525	587	327	172	158	84	76	0.55–0.57, 0.56	2.77–3.09, 2.94	3.37–3.42, 3.40	2.22–4.67

Abdomen — Bristles on tergites in anterior rows and very indistinct posterior and lateral rows. The longest bristle of tergites 90–160.

Hypopygium (Fig. 22) — Anal point about 34–44 long, with 1–3 bristles on each side. Apical spine of dististyle 10–12 long. HR = 2.18–2.38, mean 2.26; HV = 3.38–3.79, mean 3.61.

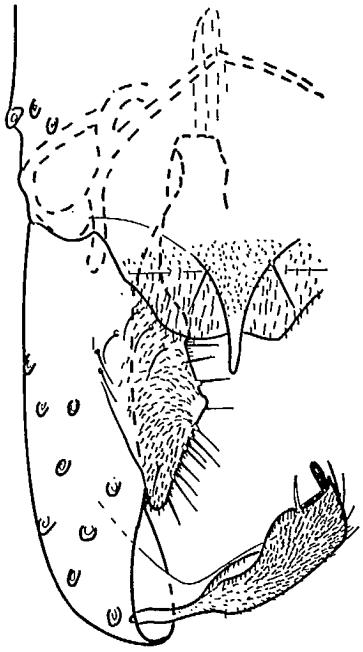

FIG. 22. *Eukiefferiella paucunca* sp.n. ♂. Hypopygium.

FEMALE (measured from 1♀ pupa).

Antenna — Pedicel 46 wide. Flagellum with longest bristle about 80, $\frac{\text{length}}{\text{width}}$: $\frac{36}{25}$, $\frac{28}{18}$, $\frac{31}{15}$, $\frac{33}{15}$, $\frac{65}{20}$. AR = 0.52.

Head — Palp lengths: ca. 31, 41, 54, 85.

Thorax — Pronotum with 2 bristles. Dorsocentrals 12 uniserial, prealars 3. Scutellum with 6 uniserial bristles.

Wing — Basal vein with 1 bristle, R and R_1 altogether with about 11 bristles, R_{4+5} with about 16 bristles. Squama with 6 bristles.

Legs — Spurs on middle tibia 15 and 27 long. Inner spur of hind tibia 32 long. Width of apex of hind tibia 29. Comb with about 10 spines 19–32 long. Claw of hind leg 21 long.

Abdomen — Longest bristle of tergite 125.

PUPA (n = 2, except when otherwise stated)

Length 2.3–3.1 mm, mean 2.6 mm (3). Exuvia pale subfuscous.

Cephalothorax — Thoracic horn (Fig. 23F) 310–330 long, 33–51 wide, bulbous part 85–90 long.

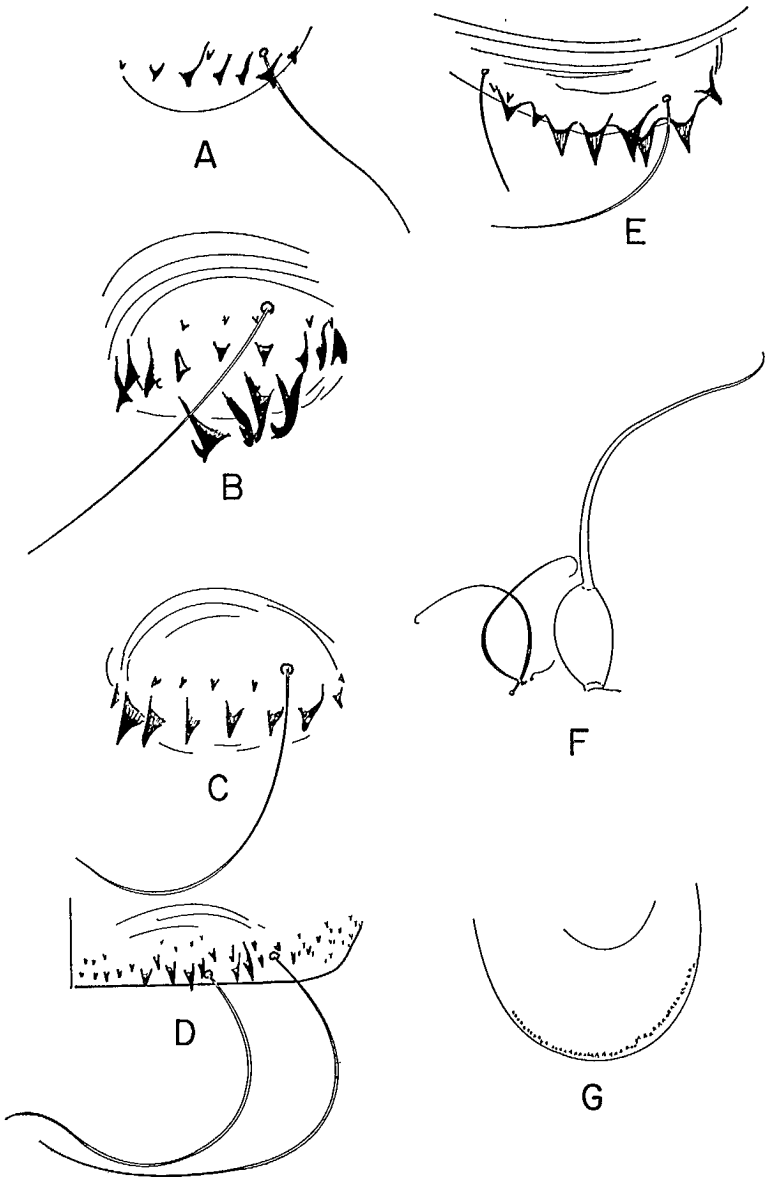

FIG. 23. *Eukiefferiella paucunca* sp.n. Pupa. (A) Spines on tergite II; (B) Spines and hooks on tergite IV; (C) Spines on tergite V; (D) Spines on tergite VIII; (E) Spines on sternite V; (F) Thoracic horn; (G) Apex of wing sheath.

Anterior bristle in front of horn 85–208 (3) long, located 10–22 (3) from median bristle. Median bristle 85–196 (3) long, located 3–10 (3) from posterior bristle. Posterior bristle about 43–120 (3) long, located 26–34 (3) from horn. Frontal bristle 92–102 long.

Abdomen — Shagreenation not present on segment I or on sternites II, III, and IX. Tergites II–IX with very faint anterior group shagreenation. Sternites IV–VIII with very faint lateral group shagreenation. Pedes spurii not present. Tergites I–VIII with 2 groups of posterior spines, faint on I, stronger on II–VIII (Fig 23A–D), the 2 groups joined by some spinules on VIII. Sternites IV–VIII with similar spine groups (Fig. 23E). Tergites III–IV with strong orally directed, bifid, hook-shaped spines, 1–5 behind each group on III, 1–4 behind each group on IV (Fig. 23B). Length of bristles on V: L_1 = 176–180, L_2 = 70–74, L_3 = ca. 40–84, L_4 = 46–52, D_1 = 44–52, D_2 = 40, D_3 or D_5 = 22–30, D_4 = 182–184. D_4 on VIII 90 (♀) and 160–182 (2♂♂). L-bristles 2 on I, 4 on II–VII, 3 on VIII, L_1 the longest on I–VII, L_3 the longest on VIII. Anal lobe with 3 anal bristles 195–220 (3) long, and 1 median anal bristle 190–276 (3) long. Anal segment 1.14 times as long as wide. Genital sac of male extending about 10 beyond tip of anal lobe.

LARVA (n = 6, when not otherwise stated)

Length 3.3–3.7 mm, mean 3.5 mm (4). Head capsule 0.30–0.32 mm, mean 0.31 mm (4) long. Head including occipital margin luteous, most of labium and mandible blackish-brown, premandible and claws of posterior prolegs luteous. Procerci brown.

Head — Antenna (Fig. 24D). Length of antennal segments 54–60, mean 57; 18–20; 3–5; 6–7; 5–6. AR = 1.54–1.75, mean 1.64. Basal segment of antenna 13–15, mean 15 wide; distance from base to annular organ 7–11, to first bristle 32–40; length of first blade at apex 19(?)–32, of second blade 15.

Labrum bristles apparently single. Mandible (Fig. 24B) 84–104, mean 94 long, with 2 spines on inner margin and about 7 bristles in inner brush. Premandible broad, single, 52–54 (2) long. Eyespots (Fig. 24C) with a rather large, elongated anterior eyespot.

Abdomen — Procerci 38–50 long, 20–24 wide, with a very indistinct subterminal tooth, 7–8 apical bristles 500–650, mean 559 long, and 1 lateral bristle 90–160, mean 129 long. Bristle caudad of procerci and above posterior prolegs about 210 long. Posterior prolegs 225–240, mean 235 (4) long. Anal tubules 1 pair 98 (1) long and 1 pair 138 (1) long. Posterior end of larva about as in *E. bavarica* Goetgh. (Thienemann, 1936, fig. 2).

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9978). Allotype, mature female pupa with larval exuvia, Northwest Creek, Heming Lake, Man., 29.VI.1967, A. P. Wiens. Paratypes, male with pupal exuvia, 3 males, 4 larvae, same data as holotype; male, fast flowing stream, between miles 6 and 7 on Mando logging road, Kenora Ont., 23.VIII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

As mentioned by Brundin (1956, p. 88) the species limits of the *bavarica* group have not been fully clarified. The larva, pupa, and imago of this new species are all very similar to *E. bavarica* Goetgh. (Goetghebuer, 1934, p. 343, 1940–50, p. 117; Thienemann, 1936, p. 53–54; Zavřel, 1939). The imagines cannot be separated because of the incomplete description of *E. bavarica*. The pupa of *E. paucunca* sp.n. differs from *E. bavarica* by having a slightly different thoracic horn (cf. Zavřel, 1939, fig. 4L), an indication of posterior groups of spines on tergite I, and bifid, hook-shaped, orally directed spines only on tergites III and IV.

Eukiefferiella vitracies sp.n.

This species is characterized by an AR of about 1.03–1.07, about 8–13 dorsocentrals, about 12–15 bristles on squama, R_{2+3} fused with R_{4+5}, anal point transparent, naked, and with 2–4 bristles basally on each side, and caudal lobe of anal tergite large.

The pupa belongs to the *E. bavarica* group.

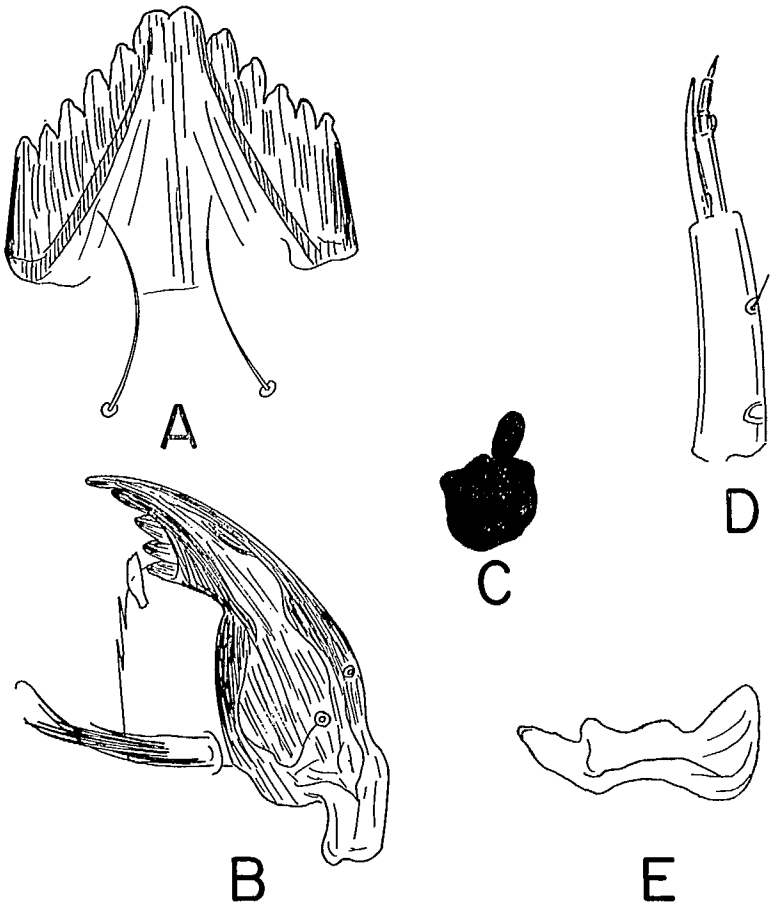

FIG. 24. *Eukiefferiella paucunca* sp.n. Larva. (A) Labium; (B) Mandible; (C) Eyespot; (D) Antenna; (E) Premandible.

MALE (n = 5, except when otherwise stated)

Length 2.7–3.2 mm, mean 2.9 mm. Wing length 1.26–1.42 mm. Thorax luteous with three fuscous vittae, scutellum and halteres pale.

Antenna — Pedical $\frac{\text{length}}{\text{width}}$: $\frac{93}{139}$. Flagellum with the longest bristle 400–450. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{51}{38}$, $\frac{20}{34}$, $\frac{22}{30}$, $\frac{26}{30}$, $\frac{28}{29}$, $\frac{28}{29}$, $\frac{29}{29}$, $\frac{30}{29}$, $\frac{30}{28}$, $\frac{30}{27}$, $\frac{30}{26}$, $\frac{31}{24}$, $\frac{373}{30}$. AR = 1.03–1.07, mean 1.05 (6).

Head — Vertex with 5–8 bristles, the longest 60–90. Clypeus with 7–13 bristles, the longest 70–82. Palp lengths: 34–43, mean 39; 90–104, mean 96; 96–114, mean 105; 112–154, mean 137.

Thorax — Pronotum with 3–4 bristles. Dorsocentrals 8–13 uniserial, prealars 4. Scutellum with 8–10 uniserial bristles.

Wing — VR = 1.29–1.31 (3). Basal vein with 1 bristle, R with 6–8 bristles. Squama with 12–15 bristles. R_{2+3} seems to be fused with R_{4+5}, but none of the wings are in a good condition. Free end of costa 28–40 (2) long.

Legs — Spur on front tibia 41–55 long. Spurs on middle tibia 21–26, mean 23 and 26–34, mean 29 long. Spurs on hind tibia 21–26, mean 23 and 51–60, mean 53 long. Width of apex of hind tibia 37–46, mean 42. Comb with 11–14 spines 20–47 long. Tarsal spines 2 on each of ta_1 and ta_2 of p_2 and p_3 15–26 long on p_2, 20–28 long on p_3. Claw of hind leg 20–23 long with about 4 apical teeth. Empodium 32 long. Pulvilli relatively distinct, about 21 long.

Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	487	569	342	258	203	144	86	0.57–0.63, 0.60	1.92–2.11, 2.02	2.97–3.31, 3.09	2.60–4.09, 3.03
p_2	506	555	234	144	128	85	73	0.40–0.46, 0.42	2.84–3.10, 3.01	4.20–4.75, 4.53	2.00–3.89, 2.86
p_3	521	624	331	196	166	101	82	0.53–0.54, 0.53	2.63–2.79, 2.71	3.41–3.49, 3.46	3.20–4.67, 4.06

Abdomen — Tergites with bristles in anterior and posterior bands, the longest bristle 88–124.

Hypopygium (Fig. 25) — Anal point 38–42 long, very transparent, naked, with 2–4 bristles basally on each side. Caudal lobe of anal tergite very large, naked and slightly bifid at tip. Basal lobe of basistyle angular. Dististyle with an apical spine 14–15 long. HR = 2.27–2.42, mean 2.37; HV = 3.58–3.78, mean 3.68.

FEMALE ($n = 1$)

Length about 2.5 mm. Wing length 1.44 mm. Coloration paler than in the male.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{\text{ca. } 38}{62}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{70}{25}$, $\frac{42}{24}$, $\frac{41}{18}$, $\frac{42}{18}$, $\frac{83}{24}$. AR = 0.44.

Head — Vertex with 8 bristles. Clypeus with 18 bristles. Palp lengths: 42, 96, 114, 152.

Thorax — Pronotum with 5–6 bristles. Dorsocentrals 14–16, prealars 4. Scutellum with 10 bristles.

Wing — VR = 1.32. Basal vein with 2 (?) bristles, R with 13, R_1 with 6, R_{4+5} with about 15 bristles. Squama with 13–14 bristles. Free end of costa 50 long.

Legs — Spur on front tibia 34 long. Spurs on middle tibia 33 and 34 long. Spurs on hind tibia 28 and 52 long. Width of apex of hind tibia 52. Comb with 15 spines 22–48 long. Tarsal spines on ta_1, ta_2, and ta_3 of p_2 and p_3 17–30 long. Claw of hind leg 23 long. Empodium about 40 long. Pulvilli about 30 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	530	585	355	260	180	120	85	0.61	2.28	3.14	2.08
p_2	525	570	235	145	120	77	70	0.41	3.23	4.66	1.92
p_3	525	630	335	195	165	90	75	0.53	2.84	3.45	2.46

PUPA ($n = 5$)

Length 2.9–3.5 mm, mean 3.1 mm. Exuvia subfuscous.

Cephalothorax — Thoracic horn about as in *E. bavarica* Goetgh. (Zavřel, 1939, fig. 41) or between the *E. bavarica* type and the *E. discoloripes* type (Zavřel, 1939, fig. 4K), 436–510, mean 472 long, 56–71, mean 61 wide, bulbous part 124–145, mean 133 long. Anterior bristle in front of horn 180–246 long; median bristle 270–314 long, and posterior bristle 60–130 long and located 40–44 from horn. Distance between anterior and median bristle, between median and posterior bristle, and between posterior and anterior bristle subequal, about 10–14. Frontal bristle 170–193, mean 180 long.

Abdomen — Tergite I without shagreenation, II with anterior and lateral group shagreenation, III–VIII with more extensive group shagreenation, IX with anterior group shagreenation. Sternite I and IX without shagreenation, II–VIII with extensive group shagreenation. Tergites II–VII (VIII) and sternites IV–VIII with posterior spines, more or less distinctly divided into 2 groups on tergites III–VII, not divided on the other tergites and sternites. Tergites III–V with 2–3 orally directed, not bifid, hooks behind each group of spines. Length of bristles on V: L_1 = 52–56, L_2 = 45–50, L_3 = 34–46, L_4 = 35–42, D_1 = 50–60, D_2 = 38–62, D_4 = 22–36, D_5 = 48–60. Distance between L_1 and L_2 on V 1–2, between L_2 and L_3 112–128, mean 119. Length of bristles on VIII: L_1 = ca. 38, L_2 = 148–

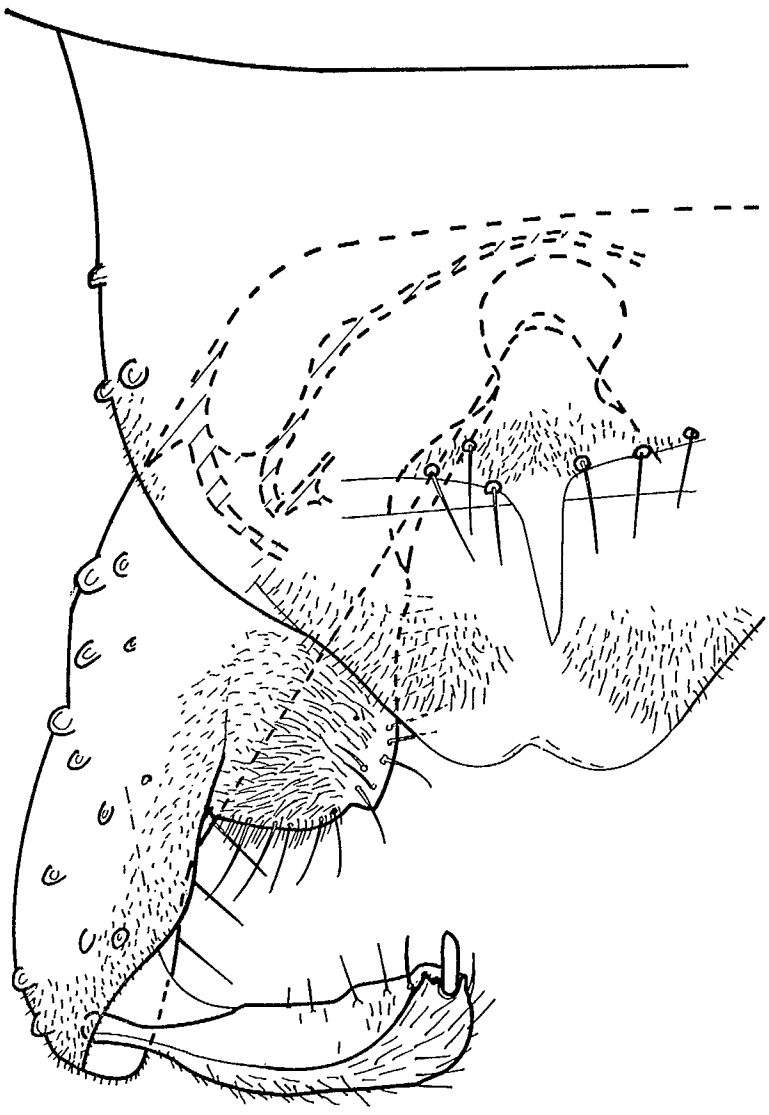

FIG. 25. *Eukiefferiella vitracies* sp.n. ♂. Hypopygium.

190, L_3 = 42–60, D_4 = 158–200. Bristles L_2 and D_4 of VIII brownish and strong. Anal lobe with 3 posterior anal bristles 235–254, mean 242 long, and 1 median anal bristle 266–310, mean 291 long. Median anal bristle darker, but less strong than posterior anal bristles.

TYPE MATERIAL

Holotype, male with pupal exuvia, fast flowing stream, between miles 6 and 7 on Mando logging road, Kenora, Ont., 23.VIII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9979). Allotype, female, same data as holotype. Paratypes, 9 males, 6 pupal exuviae, same data as holotype; 2 males,

fast flowing stream, between miles 18 and 19 on Mando logging road, Kenora, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

This species is easily separated from the rest of the members of the *E. bavarica* group by means of the anal point and the large lobe of tergite IX. The pupa seems to be intermediate between the *E. discoloripes* subtype of Zavřel (1939, p. 10–11) and the *E. bavarica* subtype (Zavřel, 1939, p. 10–11). The coloration of the exuviae is as in the *E. discoloripes* subtype, the shape of horn is close to that of *E. bavarica*, L_2 and D_4 are the only strong, elongate L- and D-bristles, and the spines are about as in *Eukiefferiella atrofasciata* Goetgh. of the *E. discoloripes* subtype (Zavřel, 1939, p. 10–11).

Genus *Synorthocladius* Thien.

Synorthocladius semivirens (Kieff.)

SPECIMENS EXAMINED

Male with pupal and larval exuviae, Northwest Creek, Heming Lake, Man., 29.VI.1967, A. P. Wiens.

DISTRIBUTION

Europe from Scandinavia to the Pyrenees, USA (Roback, 1953, p. 3; Fittkau et al., 1967, p. 368; Sæther, 1968, p. 463). New to Canada.

Genus *Adactylocladius* Sæther

A generic description was not given by Sæther (1968, p. 464–465) as the genus was regarded as monotypical. The material from this investigation seems to show that the Japanese species *Spaniotoma* (*Orthocladius*) *kibunensis* Tok. (Tokunaga, 1939, p. 318–321) belongs to *Adactylocladius*. Two additional new species have been found in Canada.

The following generic description may only be considered as preliminary as the affinity of the larva and the pupa have not been determined by rearing and as some of the species are astonishingly similar to some species of *Eukiefferiella*. It is even possible that when the immature stages are known some species will eventually have to be transferred to *Eukiefferiella*.

MALE

Small to medium species. Coloration brown to black, legs unicoloured.

Antenna — Flagellum with 13 segments. AR less than 1.2.

Head — Eyes naked, not elongated to cuneiform elongated. Vertex with 3–16 bristles, restricted to the area behind the eye or extending to the median line. Clypeus with 5–10 bristles. Palp 4-segmented.

Thorax — Pronotum normally developed, median lobes widely gaping anteriorly, joined along a small median suture posteriorly, with 2–4 strong lateral bristles. Mesonotum with about 8–20 short but distinct acrostichals starting near the pronotum and ending about in the middle of the mesonotum. Dorsocentrals normally developed, about 5–18 uniserial. Prealars 2–6. Scutellum with about 8–10 uniserial bristles or about 20 scattered bristles.

Wing — VR about 1.15–1.20. R_{4+5} ends distinctly proximal of R_4, and R_{2+3} ends closer to R_1 than to R_{4+5}. Costa not or only slightly elongated. R with bristles. Squama with about 5–10 bristles (probably more in *Adactylocladius kibunensis* [Tok.]).

Legs — Smaller outer spur on middle and hind legs sometimes absent. Tarsal spines present. Pulvilli very faint and indistinct.

Hypopygium (Fig. 26, 27) – Anal tergite more or less subdivided with 2 groups of about 1–10 bristles each. Anal point not present. Basal lobe of basistyle triangular to rectangular.

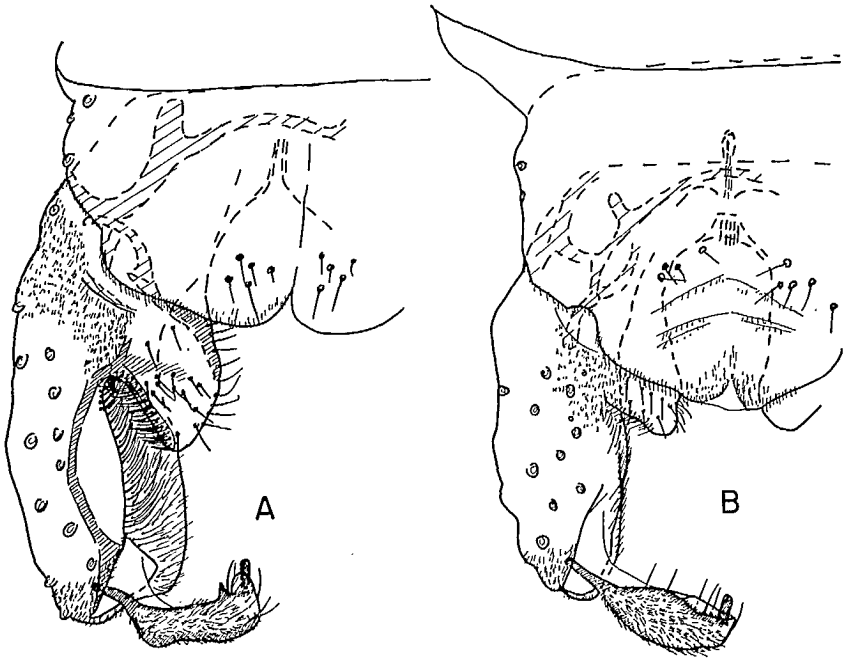

FIG. 26. *Adactylocladius*. (A) *A. finsensis* Sæth. ♂. Hypopygium; (B) *A. rowensis* sp.n. ♂. Hypopygium.

PUPA

(The following generic description is valid only if *Spaniotoma kibunensis* Tok. really belongs to *Adactylocladius* and the exuviae found in this investigation are associated with 1 of the 2 Canadian species.)

Exuvia subfuscous to fuscous, dark brown on cephalothorax and on last segment, sternites transparent.

Cephalothorax — Thoracic horn absent. Three bristles in front of place of horn. Frontal bristles apparently absent. Thorax smooth.

Abdomen (Fig. 28A) — Shagreenation not present on tergite I, tergites II–V almost fully covered with strong shagreenation, tergites VI–VIII with anterior or anteriolateral group shagreenation, tergites VI–VII and sometimes VIII with more or less extensive median or posteriomedian shagreenation. Tergites II–VIII with a posterior band of more or less strong posteriorly directed spinules and integuments IV/V and V/IV with orally directed hooks along almost entire width of caudal margin. Sternites without shagreenation or with very faint shagreenation, most extensive on IV–VI. Segment VIII with a caudolateral spine. Anal segment with 2 semicircular caudolateral expansions each with 3 long, dark brown or black, apically hooked bristles (Fig. 28A).

LARVA (Based on *A. kibunensis* [Tok.])

Coloration bluish with dark brown or black head.

Head — Antenna (Tokunaga, 1939, fig. 103) with 5 segments. Blade of basal segment about as long as segments 2–5 combined. Lauterborn organs small. Labrum bristles single. Dorsal part of

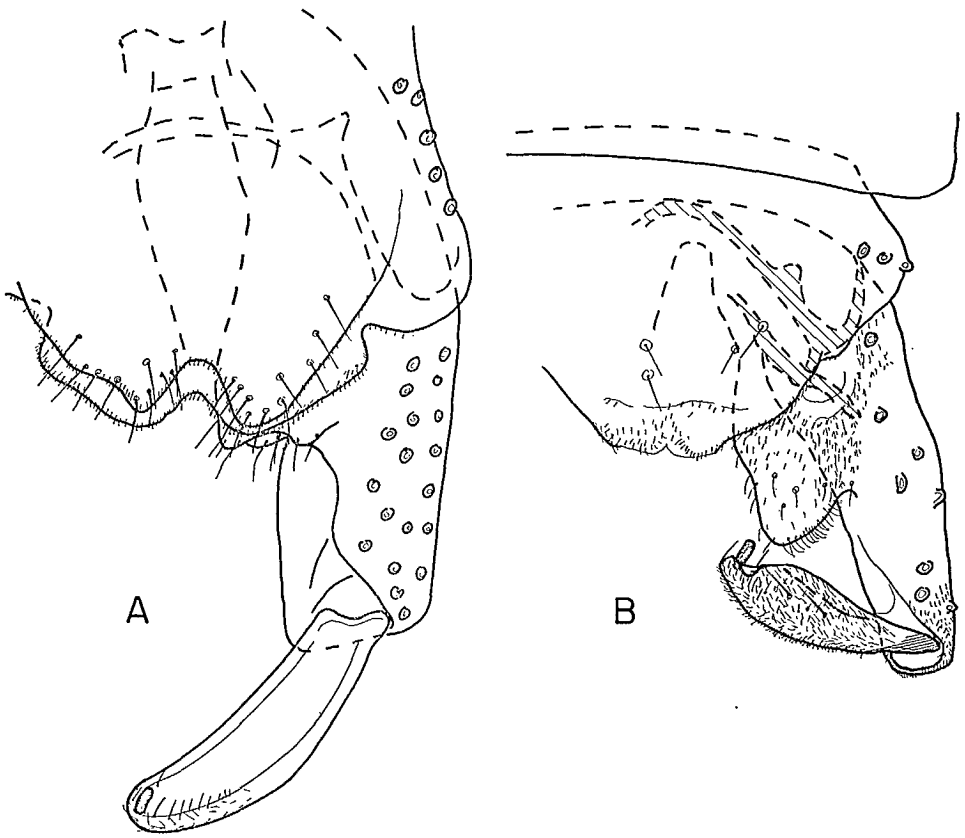

FIG. 27. *Adactylocladius*. (A) *A. kibunensis* (Tok.). ♂. Hypopygium, schematic; (B) *A. unicalcar*. ♂. Hypopygium.

labrum very strongly chitinized. Epipharyngeal area with a comb of 5 large hook-shaped projections, and a large elongated median plate below the ungula (Tokunaga, 1939, fig. 115). Premandible (Tokunaga, 1939, fig. 107) single. Mandible with 4 lateral teeth. Labium (Tokunaga, 1939, fig. 132) with a single or slightly bifid median tooth and 5 lateral teeth.

Abdomen — Procerci sclerotized, short, with 7 apical bristles.

Typus generis: *Adactylocladius finsensis* Sæth. from Norway.

Other species: *Adactylocladius kibunensis* (Tok.) comb.n. (provisional generic placement), *Adactylocladius rowensis* sp.n., *Adactylocladius unicalcar* sp.n.

SYSTEMATICS

Sæther (1968, p. 465) considered this genus to be closely related to *Orthocladius* (Kieff.) Brund., especially to the subgenus *Eudactylocladius* Thien. This was mainly due to the similarities in pronotum and acrostichals. This new material as well as a more detailed examination of *A. finsensis* Sæth. suggests, however, that the genus, though showing some relationships to *Orthocladius*, is closer to *Eukiefferiella* Thien.

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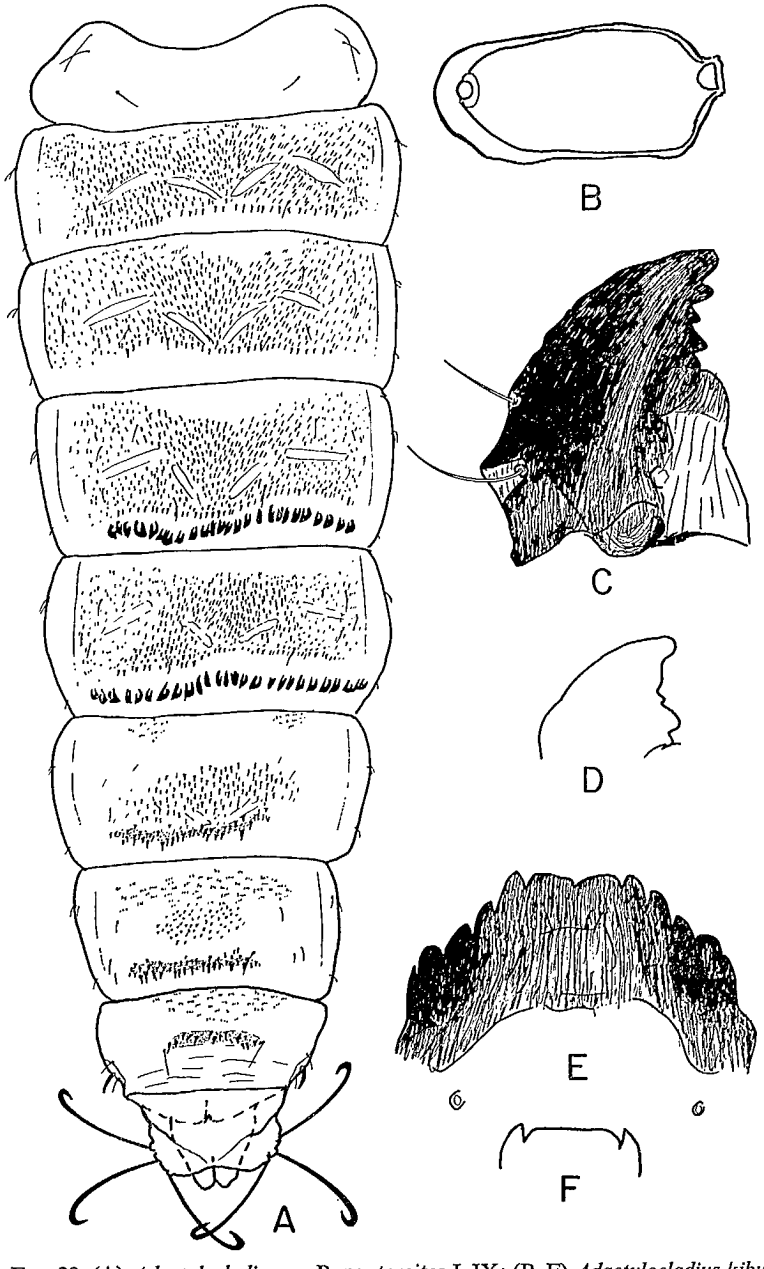

FIG. 28. (A) *Adactylocladius* sp. Pupa, tergites I–IX; (B–F) *Adactylocladius kibunensis* (Tok.): (B) Pupal cocoon; (C) Mandible; (D) Apex of another mandible; (E) Labium; (F) Median teeth of another labium.

The eyes, the AR, the wing venation, the reduced number of bristles on squama, the tibial spurs, and the hypopygium are all characters that cannot be used for separation

of the 2 genera. The pupa resembles *Eukiefferiella* in the presence of orally directed hooks on tergite IV–V, but differs in the absence of a thoracic horn and in the *Heptagyia*-like anal segment. The larva (of *A. kibunensis*) has an indigo blue coloration, single labrum bristles, 5 spines in epipharyngeal comb, single premandible, mandible with 5 relatively small teeth, labium with bifid median teeth and 5 lateral teeth, and procerci short and sclerotized; characters that it has in common with at least some species of *Eukiefferiella*. The larva as well as the male imago, however, also shows relationship with *Cardiocladius* as the larval mouthparts and the male hypopygium are both very similar to those of this genus.

Adactylocladius finsensis Sæth.

The figures of the hypopygium in Sæther (1968, fig. 28A, B, C) are drawn from a damaged specimen where the hypopygium was not in the correct position. Accordingly these figures are misleading. The basal lobe of the basistyle of *Adactylocladius* is easily distorted during slide preparation. Of the 6 specimens of *A. rowensis*, only 2 have a good basal lobe; the 4 others are more or less distorted in a way similar to the drawing of *A. finsensis* (Sæther, 1968, fig. 28A, B, C). A new drawing of a less distorted hypopygium of *A. finsensis* is presented in Fig. 26A. The lobes of the anal tergite were slightly distorted even in this specimen and they may be somewhat longer than shown. The hypopygium is astonishingly similar to that of *Eukiefferiella minor* Edw. as drawn by Brundin (1956a, fig. 48). Also in other details *A. finsensis* is nearly identical with *E. minor*. There is, however, no doubt of the presence of a suture joining the pronotal lobes and the presence of acrostichal bristles in *A. finsensis*.

If, in future, adults reared from larvae and pupae of the *Eukiefferiella* type can be shown to have distinct acrostichals and pronotal lobes partly joined, *Adactylocladius* can probably only be regarded as a subgenus of *Eukiefferiella*.

Adactylocladius kibunensis (Tok.) comb.n.

The description by Tokunaga (1939, p. 318–319) fits *Adactylocladius* in all details except that Tokunaga states that the palp is 5-segmented. However, according to the palp proportions that he has given, the additional segment is the proximal segment, and as mentioned in the introduction (p. 2) this is merely the segmented protuberance on which the palp is placed. Tokunaga (1939, p. 318–319) does not give any drawings of the hypopygium, but mentions that the anal tergite is subdivided with 2 groups of bristles, the anal point is lacking, and the basal lobe of the basistyle is very similar to that of *Spaniotoma* (*Orthocladius*) *kanii* Tok. (Tokunaga, 1939, fig. 36), which again is very similar to the basal lobe of the species described in this paper.

Tokunaga (personal communication) has deposited all specimens of *A. kibunensis* at the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan, but according to the director of the laboratory, Prof. K. Yasumatsu (personal communication) the holotype could not be located. However, 2 larvae and

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2 nearly mature pupae, 1 of them lying in a pupal cocoon containing part of a larval head capsule, were present in the collection and they seem to confirm the relationship between *Adactylocladius* and *Eukiefferiella*.

MALE (prepared from pupa, $n = 1$)

Length 3.5 mm. Coloration brown.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{112}{175}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{62}{26}$, $\frac{30}{40}$, $\frac{30}{38}$, $\frac{30}{39}$, $\frac{32}{39}$, $\frac{32}{39}$, $\frac{34}{38}$, $\frac{37}{37}$, $\frac{40}{37}$, $\frac{42}{37}$, $\frac{49}{37}$, $\frac{57}{36}$, $\frac{523}{34}$. AR = 1.08.

Head — Eyes cuneiform elongate. Vertex with about 16 bristles, the longest about 120, reaching to the median line. Clypeus with 10 bristles, the longest 95. Palp lengths: 60, 104, 122, 142.

Thorax — Pronotum with 4 strong lateral bristles, median lobes very widely gaping anteriorly joined posteriorly along a minute suture. Acrostichals about 20, dorsocentrals about 18, prealars 6. Scutellum with about 20 scattered bristles.

Wing — There seems to be about 13 bristles on R and at least some bristles on R_{4+5} and possibly on R_1. The squama seems to have more than 10 bristles.

Legs — Spur of hind tibia 52 long. Width of apex of hind tibia 41. Tarsal spines on hind leg 32 long. ta_1 and ta_2 of p_2 and p_3 seem to have 2 tarsal spines each. Claw of hind leg 42 long with 3 strong bristles at base and about 6 apical teeth. Empodium 45 long.

Abdomen — Longest tergite bristle 200.

Hypopygium (Fig. 27A) — Anal tergite with 10 weak bristles in each group. Dististyle with an 11 long apical spine. HR = 2.07; HV = 3.10. The relations between caudal part of anal tergite, lobes of anal tergite, and basal lobe of basistyle may be different from that shown in Fig. 27A as the hypopygium is lying inside a pupal exuvia and is somewhat distorted.

PUPA

The pupa does not seem to be separable from *Adactylocladius* sp. (Fig. 28A, p. 60–61) except that the hairs on the abdomen might be a little longer in *A. kibunensis* (Tokunaga, 1939, p. 319–320, fig. 78, 92). The pupal cocoon is shown in Fig. 28B.

LARVA

Thienemann (1944, p. 636) doubts that the larva and pupa described by Tokunaga (1939, p. 319–320) really belong to the same species. There is, however, no doubt that they have been correctly associated; a pupal case, containing a male pupa and part of a larval head capsule, was included in the material on loan from Japan.

The labium does not always have a bifid median tooth. One of the larva had a broad single median tooth (Fig. 28F); the other larva and the rest of the head capsule had a labium where the median tooth was slightly bifid, probably owing to a different degree of wearing (Fig. 28E). In addition, the toothed portion of the mandible is variable (Fig. 28C–D).

Adactylocladius rowensis sp.n.

The species is characterized by an AR of about 0.49–0.61, cuneiform elongated eyes, 9–12 vertex bristles, about 9–11 acrostichals, 5–10 dorsocentrals, about 8–9 scutellars, a VR of about 1.19–1.20, costa very slightly surpassing R_{4+5}, squama with 5–10 bristles, 2 tibial spurs on p_2 and p_3, and 4–8 bristles in each group on the anal tergite.

MALE ($n = 5$, when not otherwise stated)

Length 2.0–3.0 mm, mean 2.5 mm. Wing length 1.41–1.83 mm, mean 1.61 mm. Thorax brownish with 3 darker vittae, scutellum, legs and abdomen paler.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{99}{117}$. Longest bristle of flagellum 400–450. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{50}{30}$, $\frac{28}{28}$, $\frac{30}{26}$, $\frac{35}{25}$, $\frac{37}{24}$, $\frac{39}{24}$, $\frac{41}{24}$, $\frac{42}{24}$, $\frac{43}{23}$, $\frac{43}{22}$, $\frac{43}{22}$, $\frac{43}{21}$, $\frac{260}{26}$. AR=0.49–0.61, mean 0.55.

Head — Eyes cuneiform elongated. Vertex with 9–12 bristles, the longest ca. 60–90 (3), reaching to the median line. Clypeus with 5–6 bristles, the longest 60–82 long. Palp lengths (n = 4): 41–53, mean 44; 72–77, mean 75; 69–86, mean 76; 107–134, mean 118.

Thorax — Pronotum with 3–4 (4) strong lateral bristles. Acrostichals about 9–11 (2), dorsocentrals 5–10, prealars 2–4. Scutellum with 8–9 uniserial bristles.

Wing — VR = 1.19–1.20 (2). Basal vein with 1–2 bristles, R with 4–6, R_{4+5} with 4–5 (2) bristles. Squama with 5–10 bristles. Sensory organs 1 on Fr, 1 about 50 from base of R_1. Free end of costa very short.

Legs—Spur of front tibia 36–46, mean 42, long. Spurs on middle tibia 8–18, mean 13, and 21–24, mean 22, long. Spurs on hind tibia 13–16 and 44–45, mean 47, long, smaller spur absent in 2 of the 5 specimens. Width of apex of hind tibia 32–44, mean 37. Comb with 10–14 (4) spines 20–50 long. Tarsal spines 14–22 long on middle leg, 18–30 long on hind leg. ta_1 of p_2 with 2 tarsal spines, ta_2 of p_2 with 1–2 spines, ta_1 of p_3 with 1–2 spines, ta_2 of p_3 with 0–2 spines. Claw of hind leg 20–28 (3) long with about 3 bristles 10–12 (3) long at base. Empodium 26–33 (3) long. Pulvilli very faint, about 12–14 long.

Lengths (means) and proportions (ranges and means) of legs: (n = 3 on ta_1 and ta_2 of p_2, and on ta_3–ta_5 on p_3, n = 2 on ta_3–ta_5 of p_2, n = 4 on the other segments):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	521	592	385	267	197	125	101	0.61–0.68, 0.65	2.10–2.23, 2.18	2.71–3.14, 2.90	1.38–3.00
p_2	508	491	271	179	151	92	93	0.49–0.61, 0.55	2.36–2.68, 2.52	3.44–4.12, 3.79	1.60–6.31
p_3	601	671	383	238	182	105	106	0.56–0.59, 0.57	2.55–2.68, 2.61	3.11–3.47, 3.32	1.30–4.00

Abdomen — Longest tergite bristle 160–200 (3).

Hypopygium (Fig. 26B) — Anal tergite with 4–8 (4) weak bristles in each group. Lobe of anal tergite large. Dististyle with a 10–12 long apical spine. HR = 2.19–2.38, mean 2.27; HV = 3.53–4.07, mean 3.71 (4).

TYPE MATERIAL

Holotype, male, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9980). Paratypes, 3 males, same data as holotype; male, fast flowing stream, between miles 6 and 7 on Mando logging road, Kenora, Ont. 23.VIII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

Adactylocladius rowensis differs from both *A. finsensis* Sæther and *A. unicalcar* sp.n. by having cuneiform elongated eyes. It also differs from *A. finsensis* in not having a sharp preapical tooth on the dististyle. It differs from *A. unicalcar* in that it has an AR of 0.49–0.61 compared with 0.38, 9–12 vertex bristles in a single row compared with 3 restricted to the area behind the eye, 2 spurs on the hind tibia instead of 1, and 4–8 bristles on each side of the anal tergite instead of 1–2. The hypopygia of *A. rowensis* and *A. unicalcar*, are, however, very similar.

Adactylocladius unicalcar sp. n.

The species is characterized by a low AR (about 0.38), no indication of a dorsal elongation of eye, only 3 vertex bristles behind eyes, at least 8 distinct acrostichals, about 7–8 dorsocentrals, about 10 scutellars, a VR of about 1.15, free end of costa

about 48 long, 1 tibial spur on middle and 1 on hind leg, and 1–2 bristles in each group on the anal tergite.

MALE ($n = 1$)

Length 2.4 mm. Wing length 1.57 mm. Coloration brownish with 3 darker vittae, scutellum, legs, and abdomen paler.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{101}{112}$. Longest bristle of flagellum about 430. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{46}{28}$, $\frac{30}{29}$, $\frac{32}{27}$, $\frac{37}{27}$, $\frac{39}{47}$, $\frac{41}{25}$, $\frac{41}{23}$, $\frac{43}{23}$, $\frac{43}{23}$, $\frac{43}{23}$, $\frac{43}{23}$, $\frac{43}{23}$, $\frac{184}{28}$. AR = 0.38.

Head — Eye rounded, without any indication of a dorsal elongation. Vertex with 3 bristles behind eye. Clypeus with 6 bristles, the longest 65. Palp lengths: 44, 69, 69, 122.

Thorax — Pronotum with about 4 bristles. Acrostichals at least 8, dorsocentrals 7–8, prealars 3. Scutellum with about 10 uniserial bristles.

Wing — VR = 1.15. Basal vein with 1 bristle, R with 6 bristles. Squama with 5–6 bristles. Free end of costa about 48 long.

Legs — Spur on front tibia 39 long. Spur on middle tibia 30 long. Spur on hind tibia 50 long. Width of apex of hind tibia 39. Comb with about 12 spines 24–40 long. Tarsal spines 18–22 long, 2 on ta_1 of p_2 and p_3, 1 on ta_2 of p_2.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	503	524	349	281	184	92	93	0.67	2.12	2.94	2.78
p_2	495	452	262	168	138	67	87	0.58	2.63	3.62	2.89
p_3	556	603	365	230	174	74	99	0.61	2.64	3.18	1.78

Hypopygium (Fig. 27B) — Anal tergite with 1–2 weak bristles in each group. Dististyle with a 12 long apical spine. HR = 2.09; HV = 2.96.

TYPE MATERIAL

Holotype, male, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta. 21.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9981).

REMARKS

The species has only 1 tibial spur on the middle and hind leg as in *A. kibunensis* (Tok.), but differs in that it has a lower AR (0.38 as opposed to 1.12 in *A. kibunensis*), not cuneiform elongated eyes, and it has different leg proportions. The differences and similarities between this species and *A. rowensis* and *A. finsensis* are discussed under *A. rowensis*.

Adactylocladius sp.

The only difference between these exuviae and those of *A. kibunensis* (Tok.) (Tokunaga, 1939, p. 319–320, fig. 78, 92), is the slightly shorter and perhaps fewer hairs on the abdomen.

PUPA ($n = 2$)

Length 3.0–4.0 mm. Coloration subfuscous on the smaller exuvia from Rowe Creek, fuscous on the specimen from the stream near Marion Lake.

Cephalothorax — The 3 bristles anterior to where thoracic horn is located in other genera close together, the base of anterior bristle 0–3 from base of median bristle, and bases of median and posterior bristles adjacent. Anterior bristle about 50–63 long; median bristle black, about 58–106 long; posterior bristle about 53 long.

Abdomen — Shagreenation and chaetotaxy of the tergites as in Fig. 28A. Sternites I, II, and IX without shagreenation. III with very faint anteriolateral shagreenation, IV–VI with very faint shagreenation covering anterior half, VII–VIII with very faint anteriolateral shagreenation. Length of bristles on V: L_1 = ca. 10–19, L_2 = ca. 12–28, L_3 = ca. 10–ca. 16, D_1 = 32–44, D_2 = 36–38, D_3 = 23–30, D_4 = 48–52, D_5 = ca. 20–ca. 30. Distance between L_1 and L_2 on V 0–2.4, between L_2 and L_3 132–176. D_4 on VIII about 65 long. Anal bristles about 200–252 long. Genital sac of the female (?) (Fig. 28A) extending slightly beyond the anal lobes.

Other details as in the generic description (p. 54).

SPECIMENS EXAMINED

Pupal exuvia, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther; pupal exuvia, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

The 2 exuviae may belong to 2 different species. The specimen from Rowe Creek is smaller, paler, and has L_1 and L_2 placed closer together. The differences, however, may be due to intraspecific variation.

The exuvia from Rowe Creek probably belongs to *A. rowensis* sp.n. or *A. unicalcar* sp.n.

Genus *Orthocladius* (v.d. Wulp) Brund.

Subgenus *Euorthocladius* Thien.

Orthocladius (*Euorthocladius*) *rivicola* Kieff.

AR = 1.05; Goetghebuer (1940–50, p. 53) mentions ca. 0.8.

SPECIMENS EXAMINED

2 males with pupal exuviae, 60 pupal exuviae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther; 10 pupal exuviae, small mountain stream, water temp 7.5 C, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Europe (Fittkau et al., 1967, p. 362; Sæther, 1968, p. 464). New to North America.

Subgenus *Orthocladius s. str.*

Orthocladius* (*s. str.*) *annectens sp.n.

The male imago is characterized by a low AR (about 1.19), only 2–3 weak pronotals, suture joining the pronotal lobes very small, about 7–10 uniserial dorsocentrals, only 8–10 bristles on squama, and basalmedian part of basistyle rounded.

The pupa has a smooth thoracic horn, a patch of strong spinules medially on tergites IV–VI, and anal lobes with 2(?)–4 light chitinous points.

The larva has an antenna with broad Lauterborn organs, an epipharyngeal area as in *Orthocladius* (*s. str.*), a mandible with a crenulated outer margin and a labium with a broad median tooth and 6 pairs of lateral teeth.

MALE ($n = 2$)

Length 2.3–2.7 mm. Wing length 1.31–1.60 mm. Thorax luteous with three dark vittae and darker metanotum.

Antenna (Fig. 31A) — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{89}{134}$. Longest bristle of antenna 390. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{55}{35}$, $\frac{28}{31}$, $\frac{27}{29}$, $\frac{31}{30}$, $\frac{34}{31}$, $\frac{33}{31}$, $\frac{32}{31}$, $\frac{33}{32}$, $\frac{33}{30}$, $\frac{33}{29}$, $\frac{32}{26}$, $\frac{32}{26}$, $\frac{468}{28}$. AR = 1.19.

Head — Vertex with 9–10 bristles, the longest 85–90. Clypeus with 7 bristles, the longest 65–70. Palp lengths: 40–47, 68–90, 62–79, 108–123.

Thorax — Pronotum with only 2–3 very weak lateral bristles, suture joining basal part of median lobes very small. Dorsocentrals 7–10 uniserial, acrostichals normal, prealars 3–4. Scutellum with 6 uniserial bristles.

Wing — VR = 1.16–1.18. Basal vein with 1 bristle, R with 3–4. Squama with 8–10 bristles. Sensory organs 1 at Fr, 1 basal on R_1.

Haltere — Knob with about 3 bristles.

Legs — Spur on front tibia 44–50 long. Spurs on middle tibia 18–23 and 19–24 long. Spurs on hind tibia 18–22 and 48–52 long. Width of apex of hind tibia 40–42. Comb with 11 spines 18–42 long. Tarsal spines 13–21 long on p_2, 22–25 long on p_3; ta_1 and ta_2 of p_2 with 2 tarsal spines, ta_1 of p_3 with 1 spine. Claw of hind leg 22–25 long, with 6 apical teeth and about 5 basal hairs, the longest 11–13. Empodium 25–30 long.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	498	643	406	305	208	130	87	0.62–0.64	2.11–2.12	2.77–2.85	2.38–2.74
p_2	513	557	259	173	124	69	74	0.46–0.47	2.95–3.10	4.00–4.25	3.38–3.47
p_3	542	650	379	224	173	89	89	0.58–0.59	2.66–2.82	3.18	3.81–4.34

Abdomen — Tergites with uniformly distributed bristles, the longest 170–190.

Hypopygium (Fig. 29) — Anal point 36–39 long, with 4–5 bristles on each side. Basalmedian part of basistyle rounded, basal lobe more or less scabrous at apex. Dististyle widest in the middle, with an apical spine 10–12 long. HR = 2.25–2.39; HV = 3.27–3.43.

PUPA ($n = 2$)

Length 2.9–3.6 mm. Exuvia pale subfuscous.

Cephalothorax — Thoracic horn (Fig. 30B) smooth, tapering towards apex, rather dark over its whole length, 130–144 long, 16–20 wide near base, 7–8 wide 20 from apex. Anterior bristle in front of horn 55–74 long, located 9–10 from median bristle. Median bristle 100–120 long, located 8 from posterior bristle. Posterior bristle 58–75 long, located 30–32 from horn. Frontal bristles apparently absent.

Abdomen — Shagreenation absent on tergite I and sternites I–III and IX. Shagreenation of tergites II–IV as in Fig. 30A; shagreenation of V–VI as on IV, but the posterior band of anteriorly directed spinules absent on VI; VII–VIII sparsely shagreened without any bands. Sternites IV–VIII seem to have a faint shagreenation with pedes spurii A about as in *Orthocladius breviseta* sp.n. (Fig. 33B). The shagreenation and the bristles, especially those on segments IV–IX, obscured by detritus attached to the exuvia. Patch of spines on tergite IV with 17–25 spines, on V with 19–28, and on VI with 18–28 spines. D_4 on V 40–60 long, on VIII 50–60 long. 2 or 3 (?) lateral bristles on II–VIII. Anal lobes with 2(?)–4 light chitinous points and a few faint, minute points (Fig. 30C). Anal bristles 170–176 long.

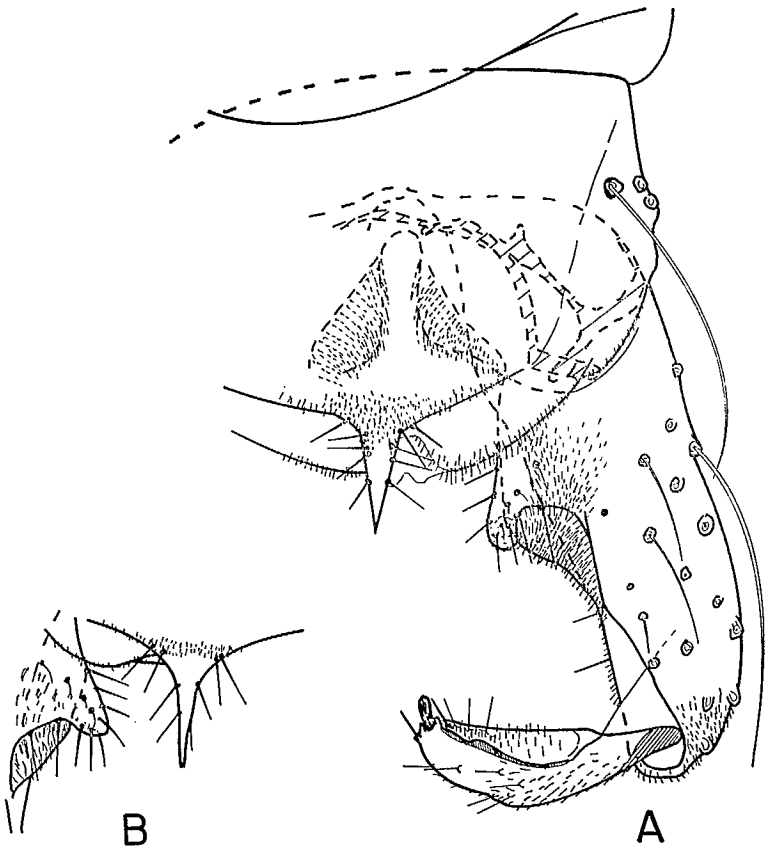

FIG. 29. *Orthocladius* (*s. str.*) *annectens* sp.n. ♂. (A) Hypopygium of male from Duck Mountains (holotype); (B) Anal point and basal lobe of basistyle of male from Kenora (paratype).

LARVA ($n = 2$)

Length of paratype about 3.5 mm. Head capsule length 0.43–0.46 mm. Head luteous, with black occipital margin in holotype, luteous margin in paratype. Mandible black on apical third in holotype, about apical fourth in paratype.

Head — Antenna (Fig. 30E) with broad, distinct Lauterborn organs almost as long as third segment. Length of antennal segments: 53–66, 16–18, 7.5, 5.5, 4.5. AR = 1.65–1.89. (The higher lengths and ratio are those of the paratype.) Basal antennal segment 15–17.5 long, distance from base to annular organ 4–5. Epipharyngeal area and labrum damaged, but apparently similar to other *Orthocladius* (*s. str.*) (Potthast, 1915, p. 266–274; Thienemann and Krüger, 1937, figs. 2, 3B; Thienemann, 1944, p. 649–650). Mandible (Fig. 30D) 140 long in holotype, 146 long in paratype, with a crenulated outer margin similar to that often found in the genus *Cricotopus*, inner brush lost, apical tooth not much longer than first lateral tooth. Premandible (Fig. 30F) single pointed, 85 long in holotype, 78 long in paratype. Labium as in Fig. 30G.

Prolegs — Claws of anterior prolegs yellow, all except the smallest with a row of teeth.

Abdomen — Procerci dark brown, sclerotized, 22–24 long, 20–23 wide; each with 6 apical, 550 long bristles and 2 lateral bristles about 30–40 long.

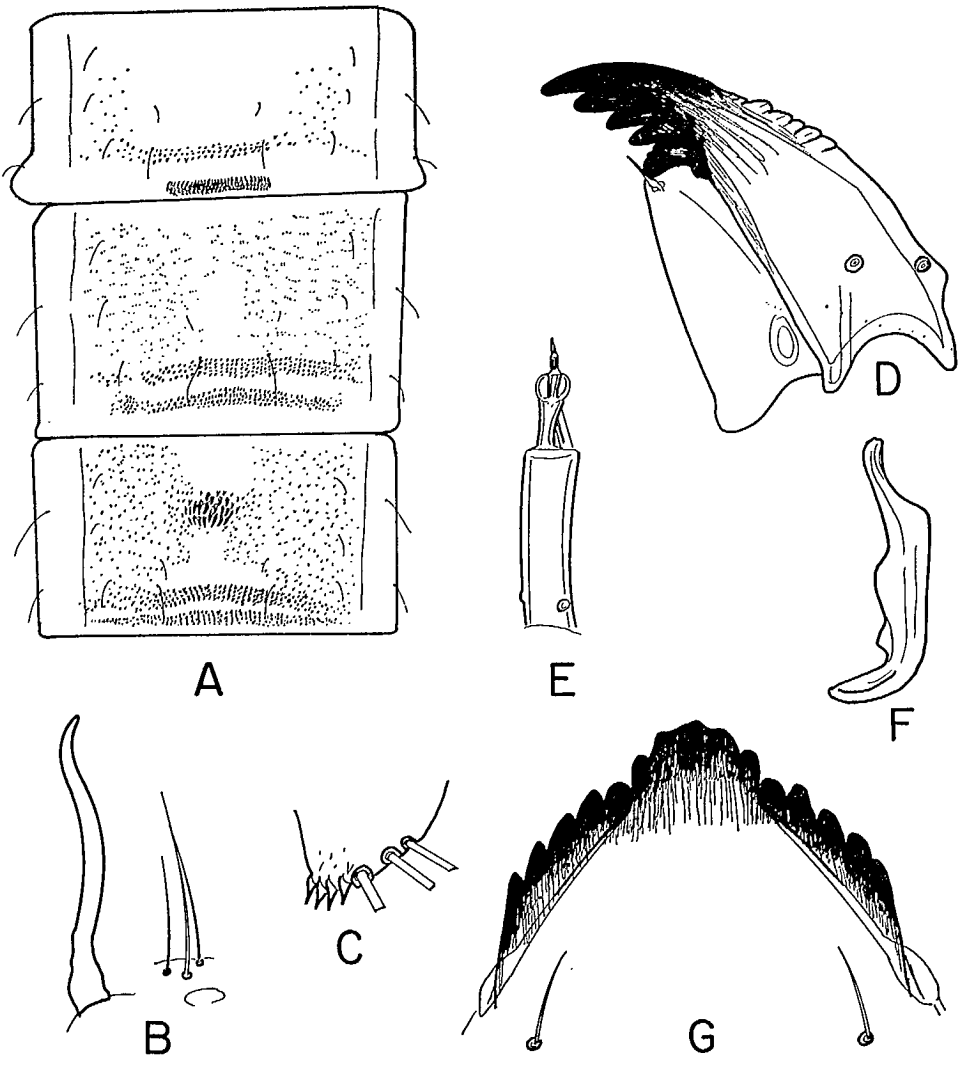

FIG. 30. *Orthocladius* (*s. str.*) *annectens* sp.n. Pupa and larva. (A) Tergites II–IV of pupa; (B) Thoracic horn; (C) Apex of anal lobe of pupa; (D) Mandible; (E) Antenna; (F) Premandible; (G) Labium.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, on submerged birch, Rushing River, Duck Mountains, Man., 31.V.1967, A. L. Hamilton and A. P. Wiens (CNC No. 9982). Paratype, male with pupal and larval exuviae, in colonies of *Aphanocapsa* on lake bottom, small lake, between mile 18 and 19 on Mando logging road, Kenora, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

In some details this species shows relationships with the subgenera *Eudactylocladius* and *Euorthocladius*. The imago has only 2–3 weak pronotal bristles as in *Eudactylocladius* and has also a slight indication of a club-shaped apex of antenna. The remaining

characters of the male imago, however, are typical for *Orthocladius* (*s. str.*). The hypopygium is very similar to that of *Orthocladius excavatus* Brund. and *Orthocladius decoratus* Edw. (Brundin, 1956a, fig. 67–68). The basalmedian part of the basistyle is rounded as in *O. excavatus;* the basal lobe and the dististyle are more similar to that of *O. decoratus*. This species, however, has a much lower AR than the above-mentioned species.

The pupa is unique among *Orthocladius* pupae in that it has a single patch of spines on tergites IV–VI. The thoracic horn is of the same type as that found in *Eudactylocladius* (Thienemann, 1944, p. 573); however, similar horns do occur in some *Orthocladius* (*s. str.*) including "*Rheorthocladius*" sp. A (Thienemann, 1950, fig. 35). The anal lobe with its chitinous points is unique to the *rhyacobius* group of *Orthocladius* (*s. str.*) (Thienemann, 1944, p. 598 as *Rheorthocladius*).

The larva has some *Euorthocladius* characters including the large Lauterborn organs and the comparatively short point of the mandible, and would therefore fall into this genus in Thienemann's key. The back of the mandible is crenulated as is usually the case in *Cricotopus*.

Other examples of incongruity between the morphology of larva, pupa, and imago in *Orthocladius* are *Orthocladius* (*Euorthocladius*) *frigidus* (Zett.) Edw. (Zavřel, 1938, p. 7–9; Brundin, 1956a, p. 103) and "*Orthocladius*" *abiskoensis* Edw. (Thienemann and Krüger, 1937, p. 257–267; Brundin, 1956a, p. 103), both of which show relationships with *Orthocladius* (*s. str.*) and *Euorthocladius*.

VARIATION

The paratype is smaller than the holotype in both the immature and adult stages. However, the anal point, the two basal segments of the larval antenna, and the larval mandible are longer in the paratype. The paratype also differs by having only 2 (?) light chitinous points on the anal lobe as opposed to 4 in the holotype. The larva of the paratype has an occipital margin of the head that is luteous; it is black in the holotype. The last character is even used as a subgeneric character for separating *Eudactylocladius* and *Orthocladius* by Thienemann (1944, p. 649). The 2 specimens, however, seem so similar in other details that a separation is probably not justified.

Orthocladius* (*s. str.*) *breviseta sp.n.

The male is characterized by the low AR (about 1.19), the short suture joining median lobes of pronotum, dorsocentrals reduced in both size and number (about 10 uniserial), squamal bristles few (about 10), hypopygium with basalmedian parts of basistyle pointed, anal point triangular, but with a parallel-sided apical portion, basal lobe rather pointed, and dististyle slightly constricted preapically.

The pupa has a thoracic horn with a few very small scattered spinules, the caudal parts of the abdominal tergites and sternites have dark, sclerotized, ring-shaped structures, and the anal lobe has 3 points resembling broken bristles.

The larva is a typical *Orthocladius* (*s. str.*).

MALE ($n = 1$)

Length 3.2 mm. Wing length 1.78 mm. Thorax luteous, vittae and metanotum darker, scutellum paler.

Antenna (Fig. 31B) — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{102}{131}$. Longest bristle of flagellum about 400. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{59}{36}, \frac{28}{29}, \frac{30}{30}, \frac{34}{33}, \frac{32}{34}, \frac{32}{33}, \frac{33}{31}, \frac{34}{30}, \frac{34}{29}, \frac{33}{27}, \frac{32}{26}, \frac{31}{24}, \frac{491}{27}$. AR = 1.19.

Head — Vertex with 9 bristles, the longest 82. Clypeus with 7 bristles, the longest 72. Palp lengths: 40, 83, 90, 131.

Thorax — Pronotum with 4 bristles, suture joining the median lobes small. Dorsocentrals 10 uniserial very weak, but not decumbant, the longest about 32; acrostichals up to 26 in length; prealars 4. Scutellum with 10 uniserial bristles.

Wing — VR = 1.07. R with 4–5 bristles. Squama with 11 bristles. Sensory organs 1 on Fr, 1 about 5–20 from base of R_1.

Legs — Spur on front tibia 54 long. Spurs on middle tibia 26 and 30 long. Spurs on hind tibia 22 and 55 long. Width of apex of hind tibia 42. Comb with 11 spines 24–45 long. Tarsal spines 22–55 long, ta_1 of p_2 with 2 spines, ta_2 of p_2 and ta_1 of p_3 with 1 spine. Claw of hind leg 26 long, with 6 apical teeth, and about 5 basal hairs, the longest 15. Empodium about 32 long.

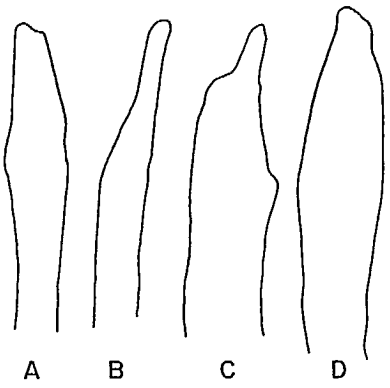

FIG. 31. *Orthocladius* spp. Outlines of apices of male antennae. (A) *O. annectens* sp.n.; (B) *O. breviseta* sp.n.; (C) *O. manitobensis* sp.n.; (D) *O. wiensi* sp.n.

Lengths and proportion of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	630	776	511	362	252	172	101	0.66	3.16	2.75	2.38
p_2	680	645	340	202	158	108	90	0.53	2.98	3.90	2.76
p_3	750	791	443	252	186	124	98	0.56	3.01	3.48	2.96

Abdomen — Tergites with bristles mostly uniformly distributed, but with a posteriomedian bare space. Longest tergite bristle about 135.

Hypopygium (Fig. 32) — Anal point 51 long, triangular, but with a parallel-sided preapical portion; with 4 bristles on each side. Basalmedian part of basistyle pointed, lobe of basistyle relatively pointed. Dististyle slightly constricted preapically, with an apical spine about 10 long. HR = 2.31; HV = 3.56.

PUPA ($n = 1$)

Length 3.4 mm. Exuvia pale subfuscous, attachment points of wing sheath, posterior margins of segments, and posteriomedian part of anal lobes brown.

Cephalothorax — Thoracic horn (Fig. 33C) with minute spinules, 142 long, 24 wide. Anterior bristle in front of horn 160 long, located 7 from median bristle. Median bristle 140 long, located 6 from posterior bristle. Posterior bristle 130 long, located 50 from horn. Frontal bristle 118 long.

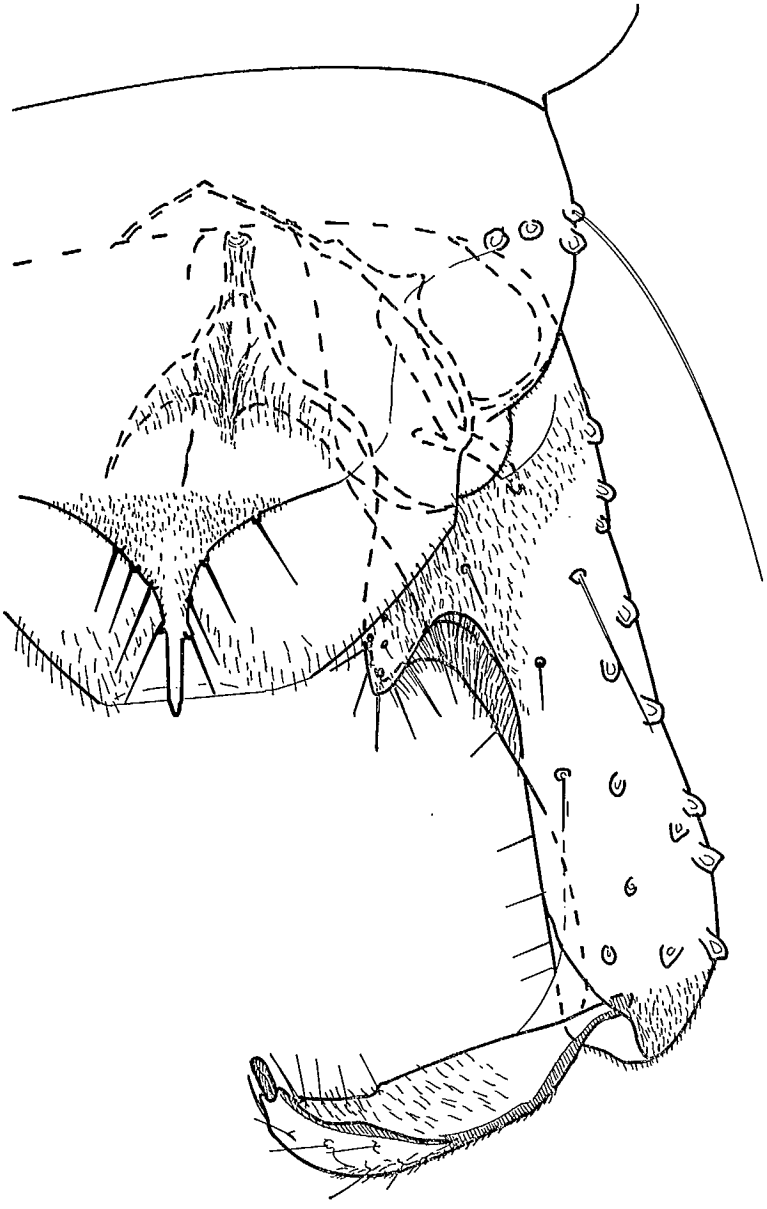

FIG. 32. *Orthocladius* (*s. str.*) *breviseta* sp.n. ♂. Hypopygium.

Abdomen — Shagreenation and chaetotaxy of tergites as in Fig. 33A. Ring structures present on all tergites and sternites except VIII and IX. Sternite I with only a few median and light coloured rings. Tergite VIII with 2 spines lateral of bristle D_4. Sternites I–II and IX without shagreenation; III with more extensive shagreenation than IV, but still with a bare area along median line; IV–V as shown in Fig. 33B; VI–VII as on V, VIII with only anterior group shagreenation. Pedes spurii A present on sternites IV–VII. Length of bristles on V: $L_1 = L_3 = 30$, $L_2 = 70$, $D_1 = D_2 = D_3 = 35$,

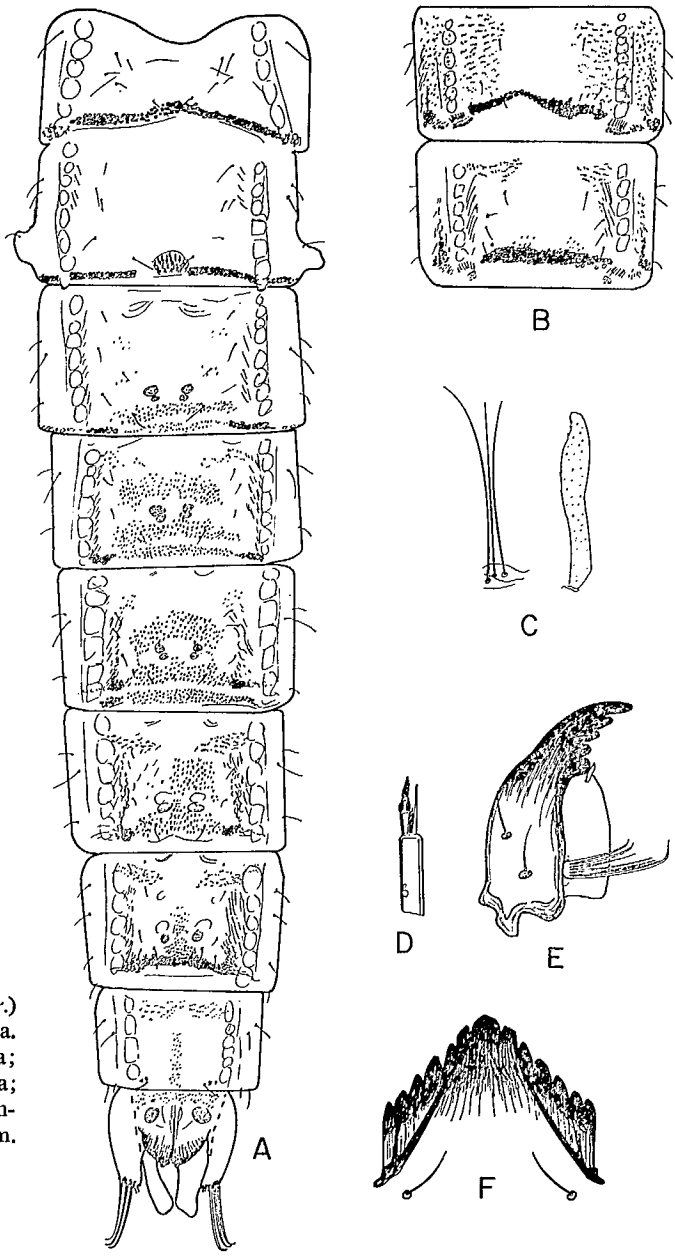

FIG. 33. *Orthocladius* (*s. str.*) *breviseta* sp.n. Pupa and larva. (A) Tergites I–IX of pupa; (B) Sternites IV–V of pupa; (C) Thoracic horn; (D) Antenna; (E) Mandible; (F) Labium.

$D_4 = D_5 = 44$. D_4 on VIII 45 long. Anal lobes with 3 chitinous points resembling broken bristles (Fig. 33A), anal bristles about 150 long.

LARVA ($n = 1$)

Length 3.4 mm. Head capsule 0.34 mm long. Head luteous, occipital margin black. Mandible black on apical half.

Head — Antenna (Fig. 33D) with Lauterborn organs as long as third segment. Lengths of antennal segments: 39, 11, 6.5, 5.5, 3.5. AR = 1.48. Basal antennal segment 13 wide; distance from base to annular organ 5, to first bristle mark 11; blade at apex 22.5 long. Premandible single, pointed, length not measurable. Mandible (Fig. 33E) 121 long, with 6 bristles in inner brush. Labium (Fig. 33F) with a relatively high and narrow median tooth.

Abdomen — Procerci 18 long, 20 wide, with sclerotized brown area on median side, 7 apical bristles 430 long, 2 lateral bristles 32, and 1 bristle 40 long. Posterior prolegs at least 200 long.

TYPE MATERIAL

Holotype, male with pupal and larval exuvia, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9983).

REMARKS

The species is a typical *Orthocladius* (*s. str.*) in all stages. The only uncharacteristic feature is the short dorsocentrals, which are similar to those of *Cricotopus*. The dorsocentrals, however, are not decumbant.

The imago, pupa, and larva all seem to be very closely related to *Orthocladius saxicola* Kieff. *Orthocladius saxicola* (Brundin, 1956a, p. 106, fig. 70), however, is not reported to have reduced dorsocentrals, it has a triangular anal point without the parallel-sided apical portion, and a stronger preapical constriction of the dististyle. The pupa of *O. saxicola* (Potthast, 1915, p. 268–269; Thienemann and Harnisch, 1933, p. 34; Thienemann, 1944, p. 598) also seems to have ring structures on the posterior parts of the abdominal segments (Potthast, 1915, p. 269, fig. 17). *Orthocladius saxicola*, however, has no shagreenation on tergites VII–IX, pedes spurii are not present on sternite VII, and there are no thorns at D_4 on VIII. Some of the shagreenation, however, may have been overlooked in previous descriptions. The larva of *O. saxicola*, as described by Potthast (1915, p. 268–269), is larger, the AR is lower (1.3 as compared with 1.48), and the median labial tooth is broader and lower.

Orthocladius (*s. str.*) *decoratus* (Holmgr.)

SPECIMENS EXAMINED

197 males, 64 females, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Spitsbergen, Bear Island, Fennoscandia, Greenland, and Northern Canada (Oliver, 1962, p. 15, 1963, p. 177). New to Alta.

Orthocladius* (*s. str.*) *manitobensis sp.n.

The male imago is characterized by an AR of about 1.72, suture joining the median lobes of pronotum very small, about 8 dorsocentrals, about 13 bristles on squama, hypopygium with angular basalmedian parts of basistyle, the ventral lobe of basal lobe of basistyle caudad of the dorsal lobe, and dististyle preapically curved.

The pupa has the thoracic horn covered with spinules, strong and rather extensive shagreenation on III–VI, many L-, D-, and V-bristles with 2–3 apical branches, 5

strong L-bristles on VIII, and about 3 chitinous points on anal lobes, 1 point much longer than the others.

The larva is a typical *Orthocladius* (*s. str.*). The AR is 1.85, the mandible has very faint indications of crenulation on the outer margin.

MALE ($n = 1$)

Length 3.4 mm. Wing length 2.00 mm. Thorax including scutellum dark brown.

Antenna (Fig. 31C) — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{122}{160}$. Longest bristle of flagellum about 580. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{66}{44}$, $\frac{27}{36}$, $\frac{27}{37}$, $\frac{28}{40}$, $\frac{28}{42}$, $\frac{27}{43}$, $\frac{28}{43}$, $\frac{29}{44}$, $\frac{31}{42}$, $\frac{30}{41}$, $\frac{32}{39}$, $\frac{33}{38}$, $\frac{639}{39}$. AR = 1.72.

Head — Vertex with 10 bristles, the longest 74. Clypeus with 7 bristles, the longest 74. Palp lengths: 53, 121, 106, 142.

Thorax — Pronotum with 6 rather strong lateral bristles, suture joining the median lobes very small. Dorsocentrals 8 uniserial, prealars 4. Scutellum with 7 uniserial bristles.

Wing — VR = 1.06. Basal vein with 1 bristle, R with 7, R_{4+5} with 1 apical bristle. Squama with 13 bristles.

Legs — Spur on front tibia 65 long. Spurs on middle tibia 25 and 27 long. Spurs on hind tibia 27 and 64 long. Width of apex of hind tibia 42. Comb with 9 spines 22–41 long. Tarsal spines 21–24 long on p_2, 28–29 long on p_3, ta_1 and ta_2 of p_2 and ta_1 of p_3 with 2 spines. Claw of hind leg 32 long, with 8 apical teeth and about 4 basal hairs, the longest hair 27.
Length and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	708	835	623	371	258	162	100	0.75	2.43	2.48	2.43
p_2	736	766	380	232	168	104	88	0.50	3.18	3.95	3.55
p_3	799	894	502	282	231	122	110	0.56	2.95	3.37	4.83

Abdomen — Bristles of tergites mostly uniformly distributed, areas along posterior margins without bristles. Longest tergite bristle 210.

Hypopygium (Fig. 34) — Anal point about 32 long, triangular, pointed, with 4–5 bristles on each side. Basistyle with basalmedian part angular, basal lobe with ventral part caudal of the dorsal part. Dististyle curved apically. HR = 2.21; HV = 3.13.

PUPA ($n = 1$)

Length 4.3 mm. Exuvia pale subfuscous, attachment points of wing sheaths and the anterior and lateral lines of tergites slightly darker.

Cephalothorax — Thoracic horn (Fig. 35A) 260 long, 52 wide, covered with small spines. Anterior bristle in front of horn 108 long, located 16 from median bristle. Median bristle 142 long, located 16 from posterior bristle. Posterior bristle 95 long, located 37 from horn. Frontal bristle pale, 114 long.

Abdomen — Shagreenation not present on segment I and sternite IX. Tergite II–III as in *Orthocladius wiensi* sp.n. (Fig. 37A), tergites IV–V as III, tergites VI–IX as in *O. wiensi* sp.n. (Fig. 37B) except that on VII some of the surface behind D_4 is also shagreened and on VIII there are apparently no thorns. Sternite II with very faint but rather extensive group shagreenation; III as II, but with a bare median space; IV–VI with a few spinules in anteriolateral and posterior group shagreenation, VII with anteriolateral group shagreenation, VIII with very sparse anterior group shagreenation. Pedes spurii A present on sternites IV–VII. Chaetotaxy of abdomen about as in *O. wiensi* sp.n. (Fig. 37A, B). All bristles, however, seem stronger and L-, D-, and V-bristles sometimes have 2–3 apical branches. D_4 on V 34 long, on VIII 42 long. Length of L-bristles on VIII: $L_1 = 94$, $L_2 = 72$, $L_3 = L_4 = 55$, $L_5 = 120$. Anal lobes with 1 large and 2 small pale chitinous points (Fig. 35B). Anal bristles 180 long.

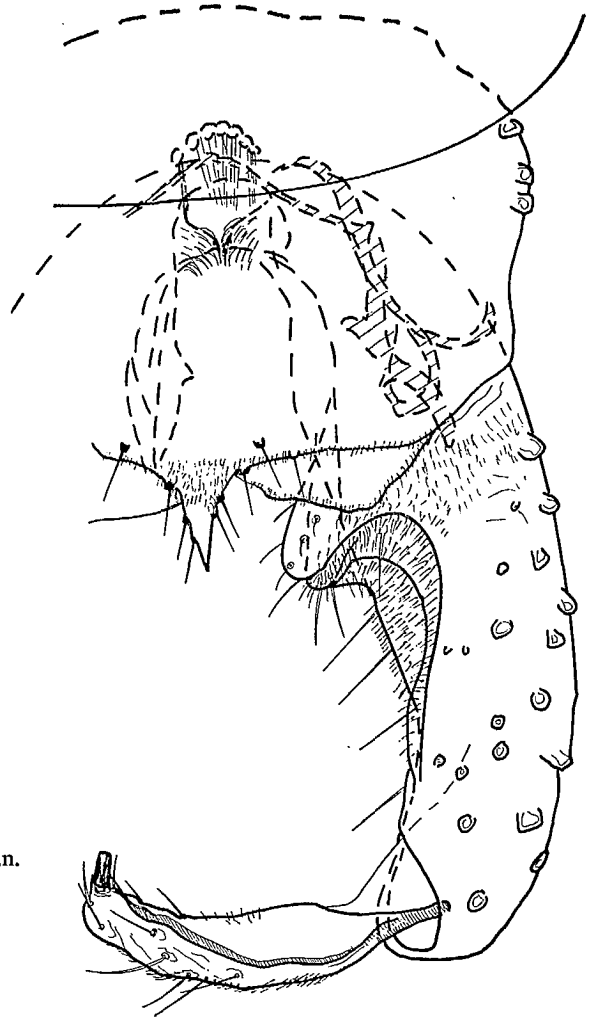

FIG. 34. *Orthocladius manitobensis* sp.n. ♂. Hypopygium.

LARVA ($n = 1$)

Head capsule 0.52 mm long. Head luteous, occipital margin black, mandible blackish-brown on apical third.

Head — Antenna (Fig. 35E) with Lauterborn organs as long as segment 3. Length of antennal segments: 63, 16, 6.5, 6, 6. AR = 1.85. Basal segment 17 wide; distance from base to annular organ 7.5, to first bristle mark 15, to second bristle mark 17; length of blade at apex 30. Maxillary palp 14 long, 15 wide, with hairs and tubercles. Maxilla with 13 bristles. Premandible single pointed, 92 long. Mandible (Fig. 35C) 164 long, with a very faint indication of crenulation on the outer margin, and with 7 bristles in the inner brush, the longest 88. Labium as in *O. wiensi* sp.n. (Fig. 37J).

Abdomen — Procerci 34 long, 26 wide, brownish-black sclerotized on median side, each with 6 apical bristles about 485 long, and 2 lateral bristles 35 and 42 long.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, stream below dam, Lake Riviera, St. Annes, Man., 19.V.1967, A. L. Hamilton and A. P. Wiens (CNC No. 9984).

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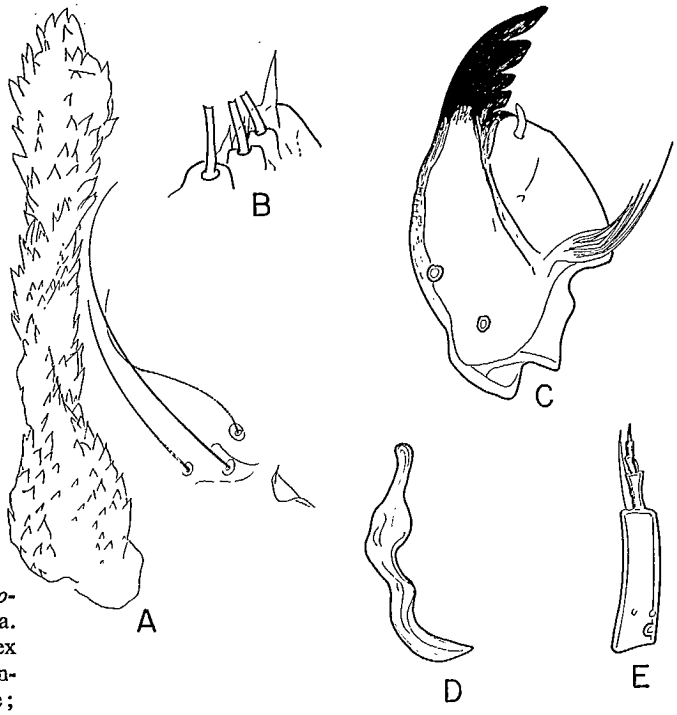

FIG. 35. *Orthocladius manitobensis* sp.n. Pupa and larva. (A) Thoracic horn; (B) Apex of anal lobe of pupa; (C) Mandible; (D) Premandible; (E) Antenna.

REMARKS

The pupa of this species belongs, according to Thienemann's key, to the group consisting of *Orthocladius pedestris* Kieff., *Orthocladius rhyacophilus* Kieff., *Orthocladius rhyacobius* Kieff., *Orthocladius glabripennis* Goetgh., *Orthocladius mitisi* Goetgh., and *Orthocladius obumbratus* Joh. (Thienemann, 1944, p. 599). Of these species the only imagines that have been satisfactorily described are those of *O. rhyacobius* and *O. obumbratus*. However, according to Goetghebuer (1940–50) they all differ from this new species. The hypopygium of *O. rhyacobius* (Brundin, 1947, fig. 41) has a triangular basal lobe with the dorsal part covering the tip of the ventral part and the dististyle is right angled at its apex. *Orthocladius obumbratus* (Sublette, 1967b, fig. 12–14) seems to be more closely related to this new species. It has, however, a different anal point with 10–14 bristles on each side, a smaller dorsal part of basal lobe of basistyle, and a slightly different basistyle. The pupa of *O. obumbratus* also differs from the rest of the above-mentioned species by having a serrate spine on the anal lobe instead of 3 separate chitinous points as in the other species (Johannsen, 1937, p. 71) (see p. 73). Johannsen also mentions that the procerci of the larva are brown, which probably means that the whole procerci are brown in contrast to this new species. *Orthocladius nigritus* Mall. (Malloch, 1915b, p. 525, plate 37, fig. 3), which is also closely related to this new species, seems to have a longer anal point with more numerous bristles on each side and the dorsal part of the basal lobe of the basistyle covers the ventral part.

According to Sublette (1967b, p. 504) it also has a larger AR (2.75) and a larger wing length (3.23 mm) than *Orthocladius manitobensis* sp.n. and *O. wiensi* sp.n. The new species described below, *O. wiensi*, is probably more closely related to *O. manitobensis* sp.n. than any other described species. The imago of *O. wiensi* differs, among other things, by having an AR of 1.49 (1.79 in *O. manitobensis*), 17–21 bristles on squama (13 in *O. manitobensis*), 11–12 bristles on clypeus (7 in *O. manitobensis*), 11–13 dorsocentrals (8 in *O. manitobensis*), and 11–13 scutellars (7 in *O. manitobensis*). The hypopygia are almost identical, but the dorsal part of the basal lobe of the basistyle covers the ventral part in *O. wiensi* sp.n. The pupa of *O. wiensi* is darker, the frontal bristle is brown and strong, the thoracic horn has minute spinules or none at all, the abdominal bristles are finer and usually not branched, and the chitinous points of the anal lobe are slightly different from those of *O. manitobensis*. The larva of *O. wiensi* has a higher AR than *O. manitobensis* and a distinct notch on the back of the mandible.

Orthocladius (*s. str.*) cf. *obumbratus* Joh.

This female reared from a pupa seems to belong to *O. obumbratus* Joh. according to Johannsen (1937, p. 71) and Sublette (1967b, p. 501–504). Some of the measurements differ but this is probably an artifact resulting from the different methods of preparation. The pupa, as Johannsen (1937, p. 71) states, has a comparatively dark, sclerotized, trifid spine at the apex of the anal lobe rather than 3 pale chitinous points as Thienemann (1944, p. 599) interprets Johannsen's statement.

SPECIMENS EXAMINED

Female with pupal exuvia, break in beaver dam, current very rapid, tributary to south arm of Seine River, northeast of Marchand, Man., 19.V.1967, A. L. Hamilton, A. P. Wiens, and B. Hominick.

DISTRIBUTION

New York, Massachusetts, Colorado, Alaska (Sublette and Sublette, 1965, p. 156). New to Canada.

Orthocladius* (*s. str.*) *wiensi sp.n.

The male is characterized by an AR of about 1.49, suture joining the lobes of pronotum rather small, about 11–13 uniserial dorsocentrals, squama with about 17–21 bristles, hypopygium with angular basalmedian part of basistyle, dorsal part of basal lobe of basistyle covering ventral part, and dististyle preapically curved.

The pupa has a rugose thoracic horn, with or without minute spinules, single or divided brown frontal bristle, strong and rather extensive shagreenation on III–VI, and 2–3 hook-shaped chitinous points on anal lobes.

The larva is a typical *Orthocladius* (*s. str.*). The AR is 2.33, the mandible has a strong notch and indications of crenulations on the outer margin.

MALE ($n = 2$)

Length 3.6–3.8 mm. Wing length 1.92–1.94 mm. Thorax brown with 3 more or less darker vittae, scutellum brown with darker margins.

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Antenna (Fig. 31D) — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{119}{156}$. Longest bristle of flagellum 515–550. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{68}{46}$, $\frac{27}{40}$, $\frac{29}{41}$, $\frac{31}{41}$, $\frac{31}{42}$, $\frac{31}{42}$, $\frac{31}{42}$, $\frac{31}{40}$, $\frac{32}{39}$, $\frac{34}{38}$, $\frac{36}{38}$, $\frac{32}{38}$, $\frac{607}{38}$. AR = 1.49.

Head — Vertex with 13–16 bristles, the longest 90–94. Clypeus with 11–12 bristles, the longest 92–94. Palp lengths: 53–56, 102–110, 80–85, 138–142.

Thorax — Pronotum with 7–8 lateral bristles, suture joining the median lobes relatively small. Dorsocentrals 11–13 uniserial, prealars 5–6. Scutellum with 11–13 uniserial bristles.

Wing — VR = 1.04–1.08. Basal vein with 1 bristle, R with 5–6 bristles. Squama with 17–21 bristles. Sensory organs 1 on Fr, 1 basal on R_1.

Legs — Spur on front tibia 74–78 long. Spurs on middle tibia 30 and 32–35 long. Spurs on hind tibia 30–32 and 77–78 long. Width of apex of hind tibia 52–53. Comb with 11 spines 28–50 long. Tarsal spine 21–28 long, ta_1 of p_2 and p_3 with 2 spines, ta_2 of p_2 with 0–1 spine. Claw of hind leg 35–38 long, with about 7 apical teeth and basal hairs, the longest hair 12–16. Pulvilli very small and indistinct, about 12 long. Empodium about 40 long.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	704	828	553	385	265	163	105	0.66–0.68	2.19–2.36	2.75–2.79	2.24–2.54
p_2	729	724	365	230	171	98	104	0.49–0.52	2.94–3.12	3.91–4.05	2.46–3.60
p_3	770	877	490	315	236	111	116	0.56	2.69–2.73	3.36	3.72–3.75

Abdomen — Bristles mostly uniformly distributed and located in lighter spots, longest bristle 160–190.

Hypopygium (Fig. 36) — Anal point about 34–44 long, triangular, pointed, with 6 bristles on each side. Basistyle with angular basalmedian part, ventral part of basal lobe covered by dorsal part. Dististyle curved preapically, with an apical spine, 12 long. HR = 2.30–2.36; HV = 3.53–3.64.

FEMALE (n = 2, except for BR of p_3 [1])

Length 3.1–3.4 mm. Wing length 2.01–2.27 mm. Coloration as in the male, but the 3 dark vittae on the thorax are slightly more distinct.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{55}{79}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{82}{36}$, $\frac{44}{33}$, $\frac{50}{31}$, $\frac{54}{31}$, $\frac{130}{32}$. AR = 0.51–0.60.

Head — Vertex with 13–14 bristles, the longest 90. Clypeus with 12–16 bristles, the longest 90. Palp lengths: 53–66, 98–120, 82–94, 142–156.

Thorax — Chaetotaxy as in the male, except that there may be 7 prealars.

Wing — VR = 1.04–1.08. Basal vein with 1–2 bristles, R with 12–19, R_1 with 8–12, R_{4+5} with 5 apical bristles. Squama with 19–22 bristles.

Legs — Spur on front tibia 48–53 long. Spurs on middle tibia 26–28 and 27–33. Spurs on hind tibia 24–32 and 70–72. Width of apex of hind tibia 50–55. Comb with 11 spines 28–44 long. Tarsal spines as in male, 22–32 long. Claw of hind leg 30–36 long. Empodium 45 long. Pulvilli 18 long.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	690	782	536	341	230	152	104	0.65–0.72	2.42–2.44	2.66–2.84	1.85–1.86
p_2	736	764	362	216	162	98	100	0.47–0.48	3.19–3.27	4.12–4.16	1.93–2.07
p_3	785	877	515	293	215	114	109	0.57–0.61	2.93–3.27	3.15–3.29	2.62

PUPA (n = 3, except when otherwise stated)

Length 4.3–4.9 mm. Exuvia subfuscous with margins and attachment points of wing sheaths, frontal bristles, sidelines, and anterior lines of abdominal segments fuscous.

Cephalothorax — Thoracic horn (Fig. 37E, F) 346–362 long, 42–52 wide, rugose, or covered with minute spinules. Anterior bristle in front of horn 100–140 long, located 12–17 from median

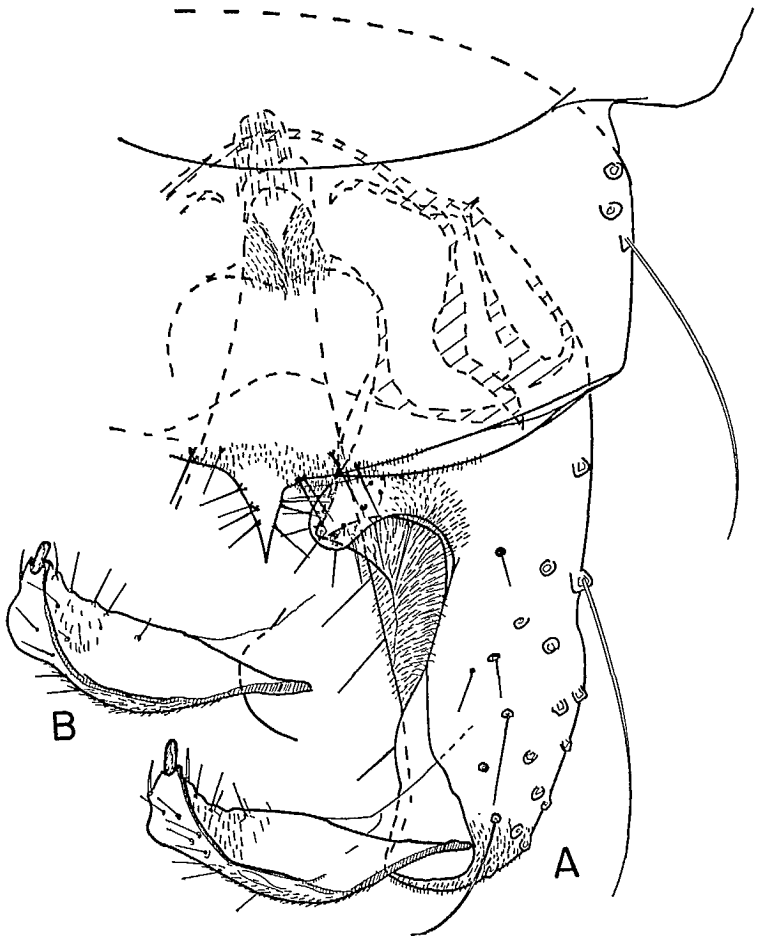

FIG. 36. *Orthocladius wiensi* sp.n. ♂. (A) Hypopygium of holotype; (B) Dististyle of paratype.

bristle. Median bristle 130–165 long, located 12–15 from posterior bristle. Posterior bristle 95–120 long, located 64–72 from horn and 14–22 from anterior bristle. Frontal bristle single or bifid, 166–208 long.

Abdomen — Shagreenation as in Fig. 37A–C and as described for *O. manitobensis* sp.n. except that sternite II has a nonshagreened and posteriomedian space and the anteriomedian shagreenation of sternite III is more extensive than the posteriomedian shagreenation. Chaetotaxy as shown in Fig. 37A, B. A few D-bristles may be bifid. Length of bristles on V ($n = 1$): $L_1 = L_3 = 24$, $L_2 = 62$, $L_4 = 52$, $D_1 = D_2 = D_3 = D_5 = 38$, $D_4 = 52$. Length of bristles on VIII ($n = 1$): $L_1 = L_4 = 60$, $L_2 = 86$, $L_3 = 70$, $L_5 = 88$, $D_4 =$ ca. 50. Anal lobes with 2–3 hook-shaped chitinous points (Fig. 37B, D); anal bristles 180 long.

LARVA ($n = 1$)

Head capsule length 0.57 mm. Head luteous, occipital margin and apical third of mandible black.

Head — Antenna (Fig. 37G) with Lauterborn organs about as long as third segment. Length of antennal segments: 63, 15, 5, 4.5, 4. AR = 2.33. Basal segment 21.5 wide; distance from base to

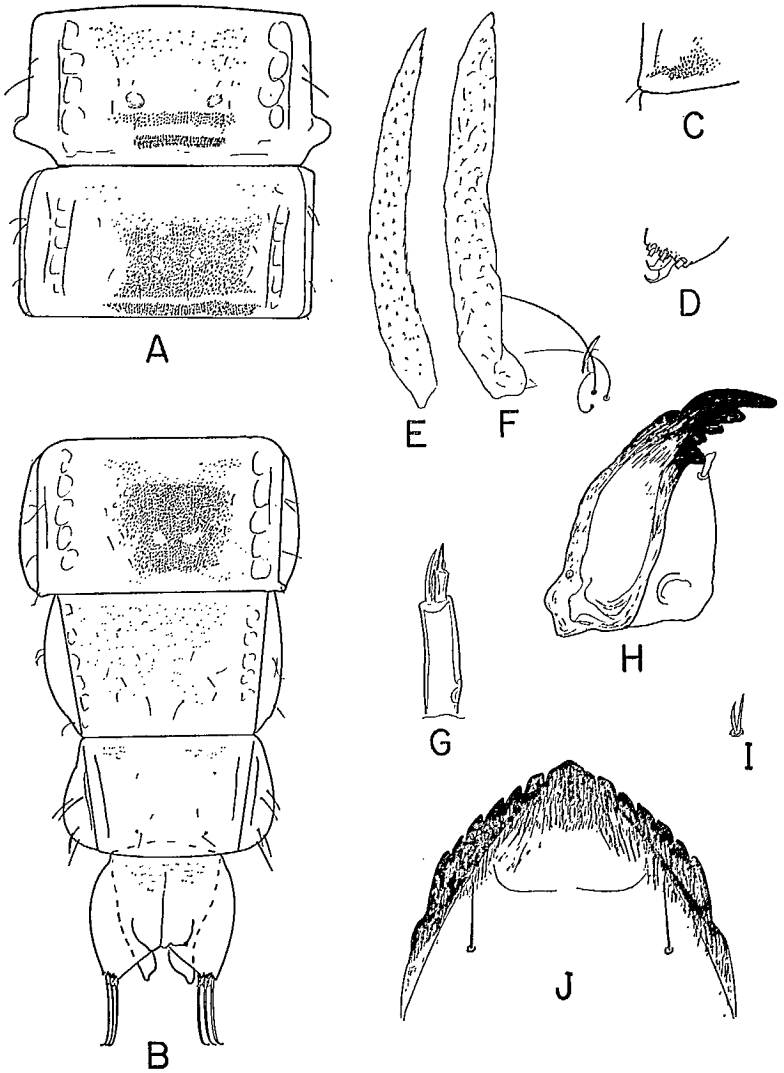

FIG. 37. *Orthocladius wiensi* sp.n. Pupa and larva. (A) Tergites II–III of pupa; (B) Tergites VI–IX of pupa; (C) Pedes spurii A of sternite V; (D) Apex of anal lobe of pupa (holotype); (E) Thoracic horn of paratype; (F) Thoracic horn of holotype; (G) Antenna; (H) Mandible; (I) S I of labrum; (J) Labium.

annular organ 5, to first bristle mark 14, to second 15; length of blade at apex 23, length of apical style of second segment 21. Premandible single and pointed, 87 long. Mandible (Fig. 37H) 162 long, with notch and indications of crenulations on the outer margin, and with 7 bristles in inner brush. Labium as in Fig. 37J.

Abdomen — Posterior parts of larval exuvia lost.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, break in beaver dam, current very rapid, tributary to south arm of Seine River, northeast of Marchand, Man., 19.V.1967, A. L. Hamilton, A. P. Wiens,

and B. Hominick (CNC No. 9985). Allotype, female with pupal exuvia, same data as holotype. Paratypes, male, female with pupal exuvia, same data as holotype.

REMARKS

The species most closely related to *O. wiensi* sp.n. are *O. manitobensis* sp.n. and the other species in this complex (see p. 72). It is even remotely possible that *O. wiensi* and *O. manitobensis* are in fact variants of the same species.

Genus *Syncricotopus* Brund.

Syncricotopus fontinalis sp.n.

The species is characterized by a relatively high AR (about 1.46), about 11 uniserial dorsocentrals, about 7 prealars, about 18–21 bristles on squama, about 8–10 bristles on R, about 2 bristles at apex of R_{4+5}, BR of p_1 relatively high (about 2.8), about 4 bristles on anal tergite, basal lobe of basistyle hook-shaped, and dististyle with a triangular dorsal projection on inner margin, about one third from apex.

MALE ($n = 1$)

Length 4.2 mm. Wing length 2.70 mm. Thorax blackish-brown including scutellum. Wings pale subfuscous.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{123}{162}$. Longest bristle of flagellum 650. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{74}{44}, \frac{32}{38}, \frac{30}{37}, \frac{35}{36}, \frac{38}{36}, \frac{42}{33}, \frac{42}{32}, \frac{43}{33}, \frac{46}{35}, \frac{48}{36}, \frac{48}{35}, \frac{50}{33}, \frac{760}{32}$. AR = 1.46.

Head — Vertex with 2 short bristles near the median line and 7 bristles behind eye, the longest 120. Clypeus with 13 bristles, the longest 125. Palp lengths: 81, 142, 145, 220. Second segment of palp with sensory pit identical to that of *Syncricotopus nivalis* (Goetgh.) (Fittkau, 1954, fig. 2).

Thorax — Pronotum with 6 bristles, lobes not joined. Dorsocentrals about 11, the anterior ones about 60 long, the posterior ones about 150 long; prealars 7 of different lengths (150, 140, 90, 80, 50, 50, and 30). Scutellum with about 16 scattered bristles.

Wing — VR = 1.08. Basal vein with 3 (?) bristles, R with 8–10 bristles, R_{4+5} with 2 apical bristles. Squama with 18–21 bristles. Sensory organs 1 on Fr, 1 basal on R_1. Free end of costa 30 long. Wing venation as in *S. nivalis* (Fittkau, 1954, fig. 3).

Legs — Spur on front tibia 72 long. Spur on middle tibia (only 1 ?) 41 long. Spurs on hind tibia 10 and 92 long. Width of hind tibia 65. Comb with 12 spines 32–69 long. Tarsal spines not present. Claw of hind leg 38 long, with 7 (?) apical teeth, and several hairs at base, the longest 20. Empodium 40 long. Pulvilli very faint, 16 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	1104	1306	883	466	343	227	135	0.68	3.42	2.73	2.79
p_2	903	1159	577	368	264	178	129	0.50	2.81	3.57	3.10
p_3	1288	1411	859	859	417	270	209	0.61	2.72	3.14	3.33

Abdomen — Bristles of tergites and sternites as in *S. nivalis* (Fittkau, 1954, fig. 6A, B). Longest tergite bristle 233.

Hypopygium (Fig. 38) — Anal tergite with 4 caudal bristles, the longest about 50 long. Basistyle with an almost hook-shaped basal lobe. Dististyle with a triangular dorsal projection on inner margin. HR = 2.53; HV = 3.49.

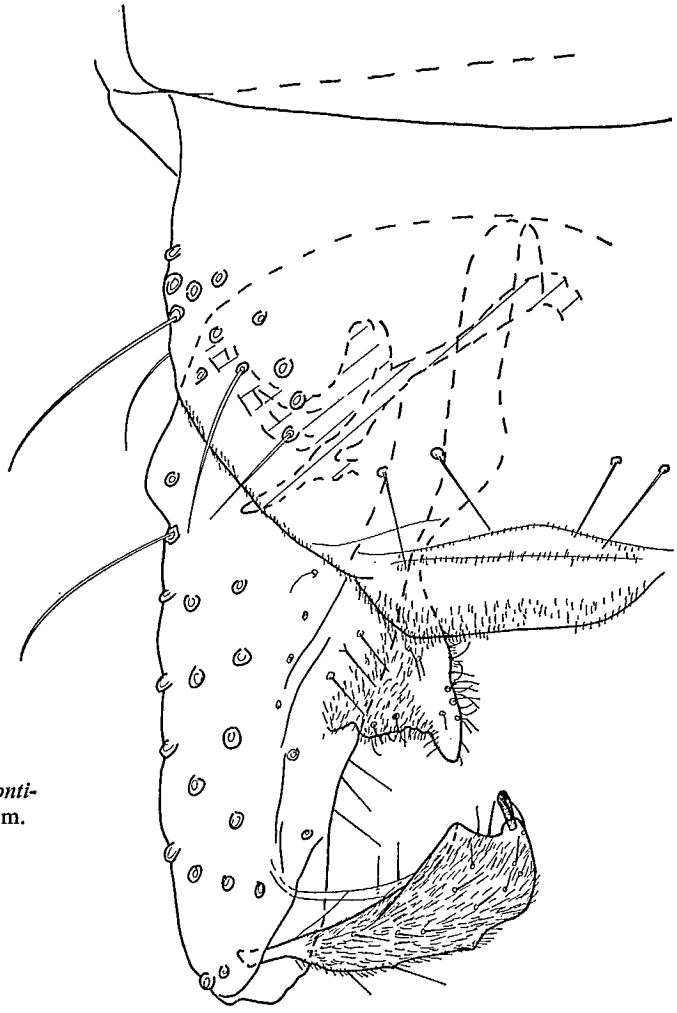

FIG. 38. *Syncricotopus fontinalis* sp.n. ♂. Hypopygium.

TYPE MATERIAL

Holotype, male, cold spring, The Bog at The Pas, Man., 5.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9986).

REMARKS

The species is obviously very closely related to *S. nivalis* (Goetgh.) (Goetghebuer, 1938, p. 61–62; Fittkau, 1954, p. 17–20). It is, however, larger, has a higher AR, 2 vertex bristles near median line (*S. nivalis* has vertex bristles only behind the eyes), longer hairs on legs, only 4 bristles on anal tergite as opposed to 10–12 in *S. nivalis*, and a more pointed dorsal projection on inner margin of dististyle.

Genus *Mesocricotopus* Brund.

Mesocricotopus thienemanni (Goetgh.)

SPECIMENS EXAMINED

Male, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Sweden and the eastern Baltic States (Brundin, 1947, p. 17; Fittkau et al., 1967, p. 360). New to North America.

Genus *Psectrocladius* (Kieff.) Edw.

Subgenus *Monopsectrocladius* Wülk.

Psectrocladius (*Monopsectrocladius*) *calcaratus* Edw.

SPECIMENS EXAMINED

55 males, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Europe (Wülker, 1956, p. 47; Fittkau et al., 1967, p. 365). New to North America.

Subgenus *Psectrocladius s. str.*

Psectrocladius (*s. str.*) *barbimanus* Edw.

The imago, pupa, and larva all key to *Psectrocladius barbimanus* in Wülker (1956, p. 5–8). The variation within *P. barbimanus*, however, is very great as shown by Wülker (1956) and Sæther (1967a, p. 103–105). The hypopygium of these specimens is as in Fig. 39.

SPECIMENS EXAMINED

5 males with pupal and larval exuviae, prairie slough, high salinity (specific conductivity 2300 μmhos at 7.4 C), Stoughton, Sask., 5.V.1967, A. L. Hamilton.

DISTRIBUTION

Spitsbergen, Swedish and Finnish Lapland, Northern Norway, Iceland, England, Holstein, the Alps, and the Pyrenees (Wülker, 1956, p. 49; Hirvenoja, 1967, p. 55; Sæther, 1967a, p. 103). New to North America.

Psectrocladius* (*s. str.*) *semicirculatus sp.n.

This species is characterized by an AR of about 1.46, about 12 bristles on clypeus, about 8 dorsocentrals, about 5 scutellars, about 8 bristles on R, only 1 spur on each tibia, and anal point and basal lobe of *Psectrocladius psilopterus* type, and dististyle almost semicircular.

The pupa is of *P. psilopterus* type.

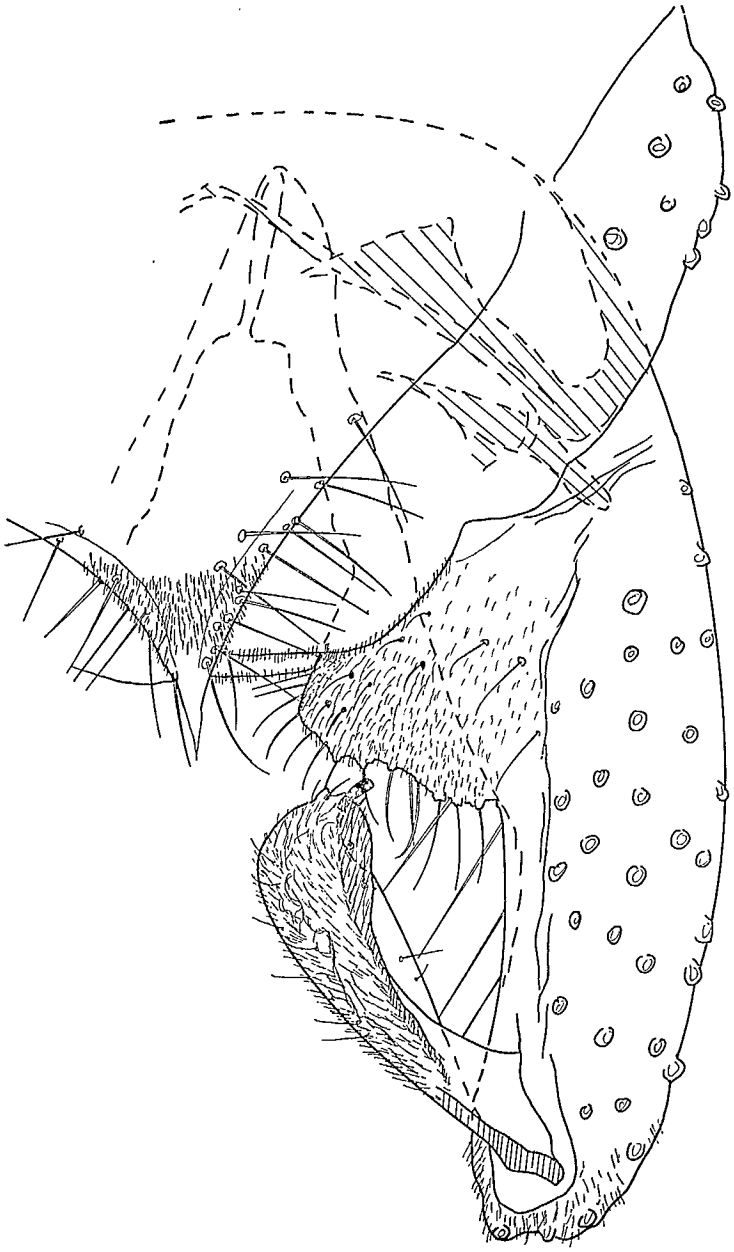

FIG. 39. *Psectrocladius barbimanus* (Edw.) ♂. Hypopygium.

The larva has an AR of about 3.25, seta anteriores palmate, with 6 rays, labium with a broad, bifid, pale median tooth and 5 dark lateral teeth, mandible light with only the apical point and lateral teeth black, and premandible light.

MALE ($n = 1$)

Length 3.5 mm. Wing length not measurable.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{120}{140}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{60}{41}$, $\frac{26}{40}$, $\frac{27}{38}$, $\frac{30}{37}$, $\frac{29}{37}$, $\frac{30}{36}$, $\frac{31}{35}$, $\frac{31}{34}$, $\frac{31}{33}$, $\frac{32}{32}$, $\frac{32}{32}$, $\frac{34}{32}$, $\frac{568}{45}$. AR = 1.46.

Head — Vertex with 15 bristles, the longest 74. Clypeus with 12 bristles, the longest about 60. Palp lengths: 50, 74, 88, 133.

Thorax — Pronotum with 6 bristles. Dorsocentrals 8 uniserial, prealars 4. Scutellum with 5 bristles.

Wing — VR not measurable. Basal vein with 1 bristle, R with about 8 bristles. Squama with 21 bristles.

Legs — Spur on front tibia 64 long, on middle tibia 51, on hind tibia 64 long. Width of apex of hind tibia 50. Comb with 15 spines 27–45 long. Tarsal spines 28–34 long, ta_1 of p_2 and p_3 and ta_2 of p_2 with 2 spines, ta_2 of p_3 with 1 spine. Claw of hind leg 27 long, with 7 apical teeth. Pulvilli about 40 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	538	632	550	332	242	192	82	0.87	2.03	2.13	2.92
p_2	550	620	285	184	140	98	78	0.46	2.91	4.11	3.50
p_3	600	708	414	256	199	134	80	0.58	2.57	3.16	6.11

Abdomen — Tergites with uniformly distributed bristles except that tergite VIII has a bristle-free median band, longest tergite bristle 245.

Hypopygium (Fig. 40) — Anal point about 29 long, with 6–7 lateral bristles. Dististyle straight on inner margin, semicircular on outer margin, with an apical spine 17 long. HR = 2.64; HV = 4.10.

PUPA ($n = 1$)

Length 3.8 mm.

Cephalothorax — Thoracic horn 322 long, 63 wide, with about 15 major spines on outer edge. Anterior bristle in front of horn 84 long, located 17 from the stronger median bristle. Median bristle 167 long, located 14 from posterior bristle. Posterior bristle 59 long, located 80 from horn.

Abdomen — Patch of spines on tergite IV with 7 spines, on tergite V with 10, and on VI with 15 spines. Lengths of bristles on V: $L_1 = 33$, $L_2 = 40$, $D_4 = 52$. Anal lobe with 25 filamentous bristles.

Other characters as in other members of the *psilopterus* group (Johannsen, 1937, p. 67; Thienemann, 1944, p. 593; Brundin, 1949, p. 818 [sub. *Psectrocladius sordidellus* Zett.]; Wülker, 1956, p. 6, 29, 31–47; Roback, 1957b, p. 89–90).

LARVA ($n = 1$)

Antenna (Fig. 41B) with an AR of 3.25. Length of antennal segments: 99, 16, 8, 5.5, 2.5. Basal segment 21 wide, distance from base to annular organ 4, to first bristle mark 2, to second 16. Seta anteriores 6-rayed. Premandible (Fig. 41D) light, 84 long. Mandible (Fig. 41C) 158 long, light with black apical and lateral teeth, with 7 bristles in inner brush. Labium (Fig. 41A) with a broad, bifid, pale median tooth and 5 dark lateral teeth. Paralabial plate with about 10 hairs underneath plate.

TYPE MATERIAL

Holotype, male with pupal and larval exuvia, in *Mougeotia*, 0.1-m depth, Lake 254, Fisheries Research Board of Canada Experimental Lakes Program, Kenora, Ont., 23.V.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9987).

REMARKS

The species is closely related to *Psectrocladius simulans* Joh. (see p. 83) and *Psectrocladius elatus* Rob. (Roback, 1957b, fig. 245). The imago differs from both by having a semicircular dististyle. The pupa cannot be distinguished from that of

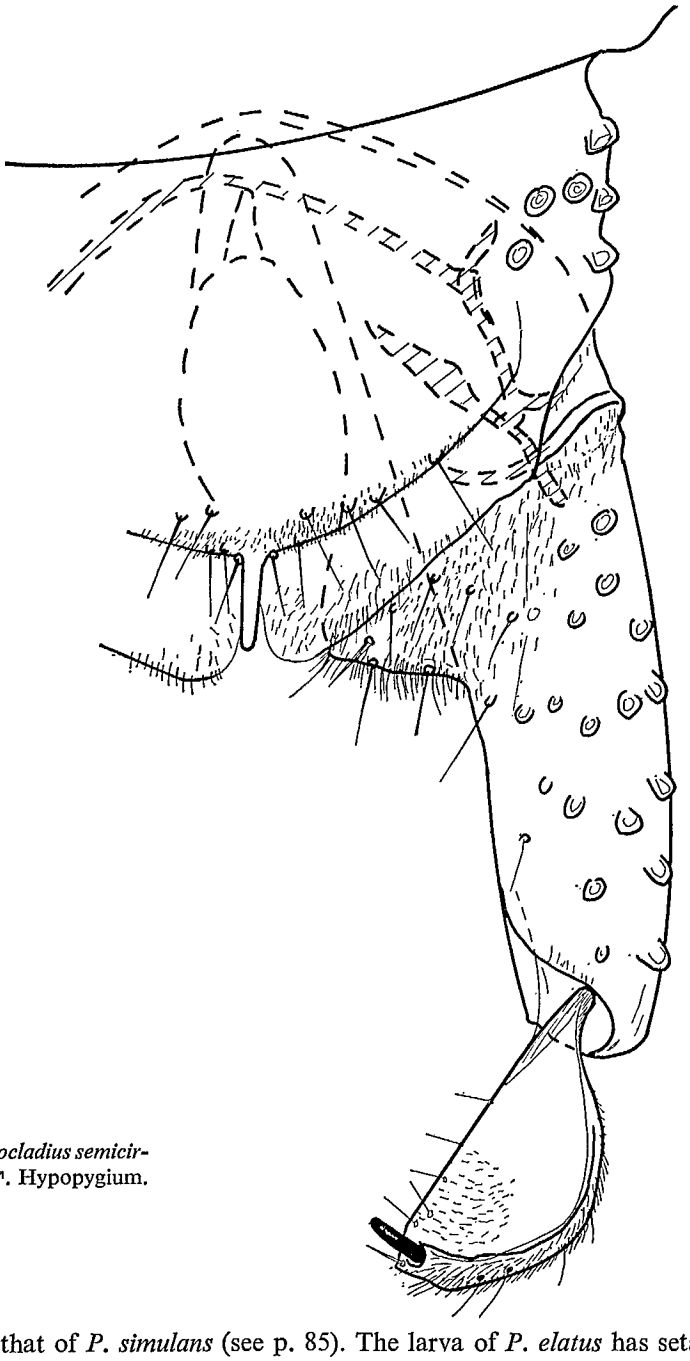

FIG. 40. *Psectrocladius semicirculatus* sp.n. ♂. Hypopygium.

P. elatus or that of *P. simulans* (see p. 85). The larva of *P. elatus* has seta anteriores 7- to 8-rayed, dark premandible, and somewhat different labium (Roback, 1957b, p. 90, fig. 243, 247, 248, 250). The larva of *P. simulans* (see p. 84) has a slightly narrower premandible, 5-rayed seta anteriores, and an AR of 2.38.

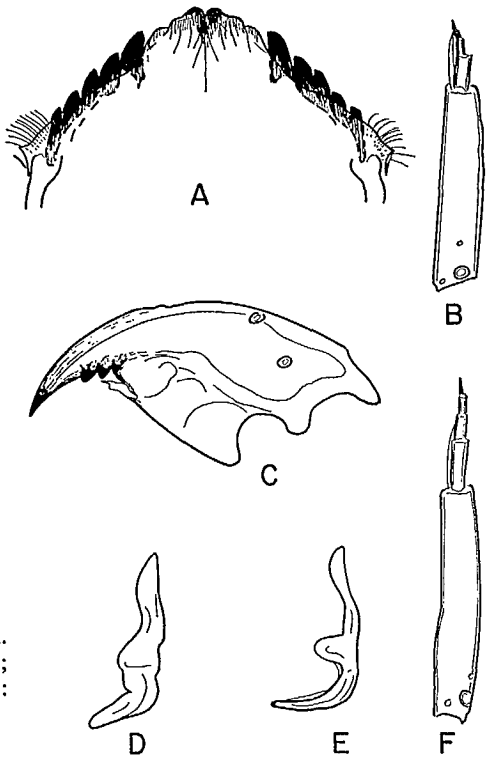

FIG. 41. (A–D) *Psectrocladius semicirculatus* sp.n. Larva: (A) Labium; (B) Antenna; (C) Mandible; (D) Premandible. (E–F) *P. simulans* Joh. Larva: (E) Premandible; (F) Antenna.

Psectrocladius (*s. str.*) *simulans* (Joh.)

MALE ($n = 1$)

Length 2.7 mm. Wing length 1.40 mm. Coloration as mentioned by Johannsen (1937, p. 67).

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{104}{132}$. Longest bristle of flagellum 430. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{52}{35}, \frac{24}{31}, \frac{22}{30}, \frac{24}{30}, \frac{28}{34}, \frac{27}{35}, \frac{28}{35}, \frac{29}{36}, \frac{30}{35}, \frac{30}{34}, \frac{30}{33}, \frac{31}{32}, \frac{406}{30}$. AR = 1.19.

Head — Vertex with 11 bristles, the longest 70. Clypeus with 4 bristles, the longest 60. Palp lengths: 50, 88, 84, 132. Second segment of palp with a small slight apical projection.

Thorax — Pronotum with 5 bristles. Dorsocentrals 8 uniserial, prealars 4. Scutellum with 4 bristles.

Wing — VR = 1.24. Basal vein with 1 bristle, R with 3 bristles. Squama with 16 bristles. Free end of costa 30 long.

Legs — Spur on front tibia 54 long, on middle tibia 50, on hind tibia 53. Width of apex of front tibia 32, of hind tibia 42. Comb with 13 spines 23–44 long. Tarsal spines 22–26 long, ta_1 and ta_2 of p_2 and p_3 with 2 spines. Claw of hind leg 23 long, with about 5 apical teeth. Empodium 45 long. Pulvilli about 35 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	565	590	425	314	216	142	72	0.72	2.12	2.72	2.53
p_2	538	470	256	168	128	83	68	0.54	2.83	3.93	2.53
p_3	590	664	402	238	190	104	70	0.61	2.75	3.12	3.82

Hypopygium (Fig. 42) — Anal point about 27 long, with 6 lateral bristles. HR = 2.51; HV = 3.52. Other details as mentioned by Johannsen (1937, p. 67) and Sublette (1967b, p. 529–532).

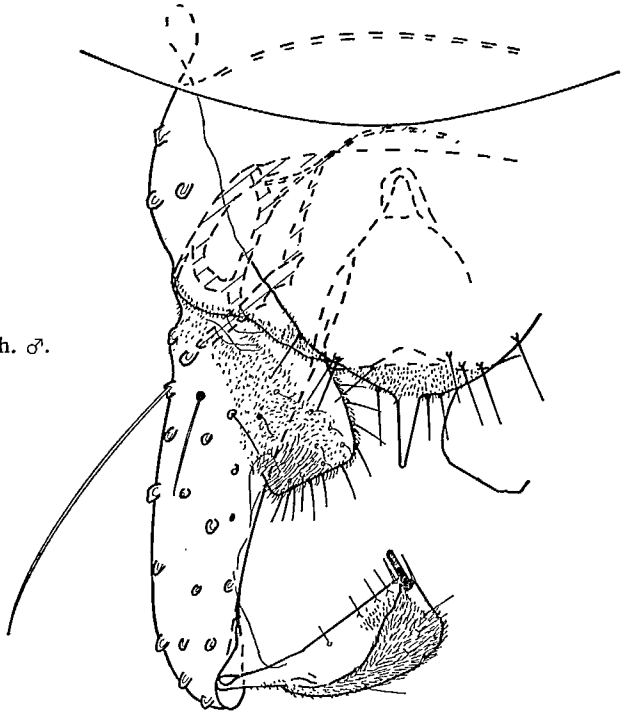

FIG. 42. *Psectrocladius simulans* Joh. ♂. Hypopygium.

PUPA (n = 1)

Length 3.6 mm.

Cephalothorax — Thoracic horn 262 long, 62 wide, outer edge with about 12 major spines. Anterior bristle in front of horn 65 long. Median bristle 160 long.

Abdomen — Patch of spinules on tergite IV with 9 spinules, V with 18, and VI with 20 spinules. D_4 on V 60 long, on VIII 65 long. Anal lobe with 19 filamentous hairs.

Other details as mentioned by Johannsen (1937, p. 67) and Roback (1957b, p. 90).

LARVA (n = 1)

Antenna (Fig. 41F) — AR = 2.38. Length of antennal segments: 114, 24, 10, 9, 8. Basal segment 21 wide, distance from base to annular organ 6, to first bristle mark 10, to second 18. Seta anteriores 5-rayed. Premandible (Fig. 41E) 80 long. Mandible 162 long, inner brush with 7 bristles. Paralabial plate with about 10 hairs underneath.

Other details as mentioned by Johannsen (1937, p. 67) and Roback (1957b, p. 90).

SPECIMENS EXAMINED

Male with pupal and larval exuviae, in ooze and debris, 0.3-m depth, Lake 254, Fisheries Research Board of Canada Experimental Lakes Program, Kenora, Ont., 23.V.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

New York (Sublette and Sublette, 1965, p. 159). New to Canada.

REMARKS

This reared specimen almost certainly belongs to *P. simulans* even if there are some discrepancies. The total length and the wing length are smaller in this specimen,

the VR higher, and the tibial spurs longer. The pupa has fewer spinules in the patches of the tergites and fewer filamentous hairs on the anal lobe, but these differences are not more than Wülker (1956) has shown to be within the limits of variation in other species of *Psectrocladius*. Roback mentioned that these characters could be used to separate the pupae of *P. elatus* Rob. and *P. simulans*. However, in view of the large intraspecific variation it is premature to attempt to use these characters to separate the 2 species. The larva seems to be in accordance with the descriptions of Johannsen and Roback except that the basal segment of the antenna is less than 5 times as long as the second segment; Roback (1957b, p. 90) mentions 7 times.

Wülker (1956, p. 27) mentions *P. simulans* as a possible synonym of *Psectrocladius psilopterus* Kieff. Even though *P. simulans*, *P. elatus*, and *P. semicirculatus* sp.n. are closely related to the European *P. psilopterus* and *Psectrocladius bisetus* Goetgh., it is clear that the Nearctic species are distinct.

Genus *Rheocricotopus* Thienemann et Harnisch, emended

AR variable (ca. 0.5–2.0). Acrostichals starting close to pronotum, very short and indistinct to long and conspicuous. Squama with a more or less reduced fringe to fully fringed. Hind tibia with 2 spurs, the outer small and difficult to distinguish to half as long as inner spur. Anal point with lateral bristles directed obliquely caudad. Dististyle usually with a preapical dorsal projection on inner margin, but occasionally the projection is absent. Other characters as mentioned by Brundin (1956a, p. 118).

Typus generis: *Rheocricotopus effusus* (Walk.) Edw. (*fuscipes* Kieff.).

Rheocricotopus eminellobus sp.n.

The species is characterized by a low AR (about 0.71–0.73), 5–7 dorsocentrals in the male, 7–11 in the female, rather strong acrostichals about 17 long, reduced number (3–4) of bristles on squama, and a prominent basal lobe of basistyle.

The pupa has 4 lamellar L-bristles on VII, 4–5 on VIII, and about 8–10 bristles on anal lobe. It belongs to the *Rheocricotopus effusus* (*fuscipes*) group.

MALE ($n = 2$, except when otherwise stated)

Length 2.3–2.7 mm. Wing length 1.52 mm (1). Thorax brown with 3 darker vittae. Scutellum pale.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{96}{114}$. Longest bristle of flagellum 152 (1). Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{52}{29}, \frac{27}{28}, \frac{31}{26}, \frac{36}{24}, \frac{35}{21}, \frac{35}{20}, \frac{36}{20}, \frac{34}{19}, \frac{35}{20}, \frac{35}{20}, \frac{34}{20}, \frac{34}{20}, \frac{304}{28}$. AR = 0.71–0.73.

Head — Vertex with 3 bristles, the longest about 100 (1). Clypeus with 9 bristles, the longest 74–92. Palp lengths ($n = 4$): 42, 86, 90, 112.

Thorax — Acrostichals rather strong, the longest about 17; dorsocentrals 5–7; prealars 3. Scutellum with 6 (1) bristles.

Wing — VR = 1.13 (1). Basal vein with 1 bristle, R with 3–4 bristles. Squama with 3–4 bristles.

Legs — Spur on front tibia 34–36 long. Spurs on middle tibia 13–14 and 18–20 long. Spurs on hind tibia 19–20 and 38–40 long. Width of apex of hind tibia 65 (1). Tarsal spines absent. Comb with

12 spines 20–42 (1) long. Claw of hind leg 25 (1) long, with about 3 apical teeth. Empodium 32 (1) long. Pulvilli about 20 (1) long.

Lengths and proportions of legs (n = 1):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	485	565	380	230	175	110	75	0.67	2.42	2.76	2.29
p_2	510	510	270	150	115	65	64	0.53	3.27	3.78	0.79
p_3	475	600	330	180	95	80	70	0.55	3.31	3.26	3.64

Abdomen — Tergites with few, scattered bristles, the longest 100–150.

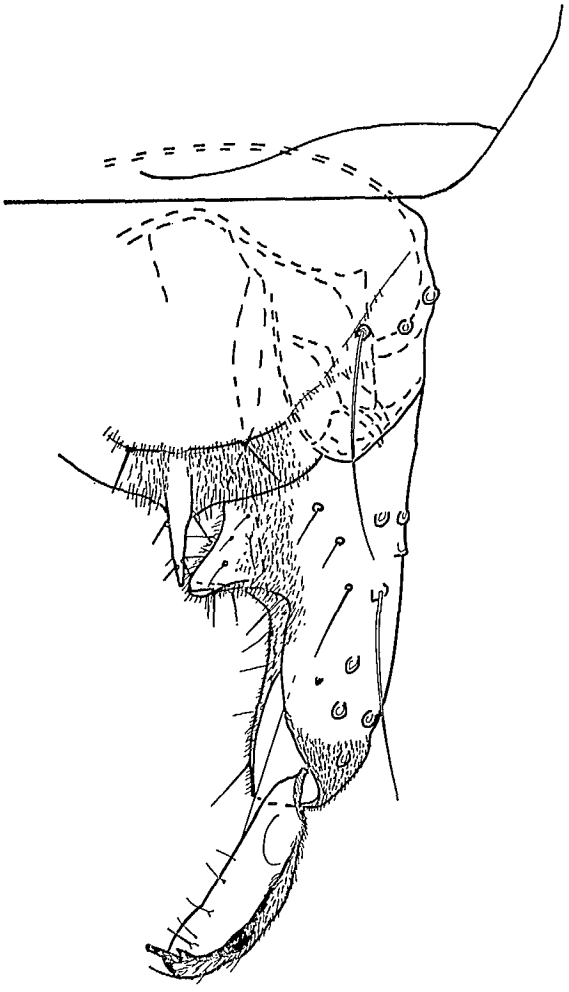

FIG. 43. *Rheocricotopus eminellobus* sp.n. ♂. Hypopygium.

Hypopygium (Fig. 43) — Anal point 36–40 long, with 2–3 lateral bristles and 1 bristle on each side at base. Basistyle with a prominent, somewhat triangular basal lobe. Dististyle with a preapical projection that appears to be rather weak; however, the position of the dististyle on the slide does not permit a satisfactory examination of the character. Apical spine of dististyle 10–12 long. HR = 2.33–2.61; HV = 3.49–3.91.

FEMALE (n = 5, except for AR)

Length 2.7–2.9 mm, mean 2.8 mm. Wing length 1.49–1.64 mm, mean 1.58 mm. Coloration about as in male or a little lighter but with darker vittae.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{48}{56}$. Longest bristle of flagellum 76–84. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{68}{26}$, $\frac{45}{23}$, $\frac{48}{21}$, $\frac{47}{20}$, $\frac{90}{23}$. AR = 0.40–0.45, mean 0.43 (6).

Head — Vertex with 3–5 bristles, the longest 50–58. Clypeus with 10–12 bristles, the longest 70–78. Palp lengths: 44–46, 77–90, 81–96, 148–162.

Thorax — Pronotum with 4–5 bristles. Acrostichals about 13–19, dorsocentrals 7–11 uniserial, prealars 3–5. Scutellum with 7–8 uniserial bristles.

Wing — VR = 1.10–1.17, mean 1.14. Basal vein with 1 bristle, R with 7–11, R_1 with 2–5, R_{4+5} with 7–11 bristles. Squama with 5 bristles. Sensory organs 1 on Fr, 1 basal on R_1. Free end of costa 36–60 long. R_{2+3} ending one third of the distance between the tips of R_1 and R_{4+5}.

Legs — Spur on front tibia 21–23 long. Spurs on middle tibia 12–13 and 14–22 long. Spurs on hind tibia 14–16 and 32–43 long. Width of apex of hind tibia 37–40. Comb with 12–15 spines 20–41 long. Claw of hind leg 16–20 long. Empodium 30–36 long. Pulvilli about 20 long.

Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	457	534	369	219	158	101	71	0.62–0.74, 0.69	2.36–2.51, 2.47	2.55–2.87, 2.69	0.82–2.22, 1.74
p_2	504	520	263	135	101	62	58	0.49–0.53, 0.51	3.48–3.86, 3.61	3.74–4.14, 3.90	1.14–2.78, 1.78
p_3	505	609	338	173	147	74	63	0.50–0.59, 0.55	3.01–3.32, 3.18	3.12–3.64, 3.31	1.18–2.56, 1.75

Abdomen — Longest tergite bristle 102–162.

PUPA (n = 4, except when otherwise stated)

Length 2.6–2.9 mm, mean 2.9 mm. Coloration pale subfuscous.

Cephalothorax — Thoracic horn as in *R. effusus* (Walk.) Edw. (*fuscipes* [Kieff.]) (Thienemann and Harnisch, 1932, fig. 2); 236–264 long, mean 250 (2) in male; 225–255, mean 240 (2) in female; 37–40 (2) wide in male, 44–50 (2) wide in female. Anterior bristle in front of horn 97–140 long, located 7–13 from median bristle. Median bristle 119–170 long, located 1–2 from posterior bristle. Posterior bristle about 38–102 long, located 50–52 from horn. Frontal bristle 70 (1) long in male, 94 (1) long in female.

Abdomen — Segment I and sternite IX without shagreenation. Tergite II with very faint anteriolateral group shagreenation, III with shagreenation covering almost whole tergite, IV–VI covered with spinules, VII covered with spinules in the male, with median and posterior shagreenation in the female, VIII with anteriomedian, median, and posterior shagreenation, tergite IX with anterior shagreenation. Tergites IV–VI each with a round patch of spinules. Tergites II–VI with posterior row of spinules, indicated on VII. Integuments II/III–IV/V with more or less orally directed spinules that on segment II form a median protuberance, which is distinctly marked out laterally. Sternite II with median shagreenation, III covered with spinules, most of IV except median parts shagreened, V shagreened anteriomedially and medially, VI shagreened on most of segment, VII sparsely shagreened, and sternite VIII with anterior shagreenation. Pedes spurii A present on IV–VI, rudimentary on VII. Pedes spurii B normal. Lengths of bristles on V: L_1 = 56–74, L_2 = 62–80, L_3 = 48–68, L_4 = 50–56, D_1 = 35–50, D_2 = 40–52, D_3 = 16–28, D_4 = 48–54, D_5 = 31–40. Distance between L_1 and L_2 on V 28–42, between L_2 and L_3 76–85, between L_3 and L_4 28–44. D_4 on VIII 38–40 (2) long in male, 52–54 (2) in female. VII with 4 lamellar L-bristles 95–122 long, VIII with 4–5 lamellar L-bristles 140–164 long. Anal lobe with 8–10 filamentous bristles 180–280 long. Anal bristles 210–220 long.

TYPE MATERIAL

Holotype, male with pupal exuvia, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther

97967—7

(CNC No. 9988). Allotype, female with pupal exuvia, same data as holotype. Paratypes, female with pupal exuvia, 47 females, male pupa, same data as holotype.

REMARKS

The species differs from previously known members of the genus *Rheocricotopus* by having an AR lower than 1, relatively strong acrostichals, reduced number of bristles on squama, outer spur of hind tibia about half as long as inner spur, and a pupa with only 8–10 filamentous hairs on anal lobe.

Rheocricotopus kenorensis sp.n.

The species is characterized by a relatively high AR (about 1.14–1.24), very weak and short (less than 8 long) acrostichals, 8(?)–14 dorsocentrals, reduced number of bristles on squama, anal tergite extending beyond tip of anal point, basal lobe of basistyle angular, naked dorsally at apex, and dististyle with a toothlike preapical projection.

MALE (n = 3, except when otherwise stated)

Length 3.1–3.3 mm (2). Wing length 1.28–1.31 mm (2). Thorax blackish-brown, abdomen brown with lighter margins.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{103}{136}$. Longest bristle of flagellum 400–425. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{47}{33}$, $\frac{23}{32}$, $\frac{23}{30}$, $\frac{25}{28}$, $\frac{25}{26}$, $\frac{25}{25}$, $\frac{26}{24}$, $\frac{26}{24}$, $\frac{26}{24}$, $\frac{26}{24}$, $\frac{27}{23}$, $\frac{28}{23}$, $\frac{391}{22}$. AR = 1.14–1.24, mean 1.18.

Head — Vertex with 2(?)–3 bristles. Clypeus with 9–11 bristles, the longest 82–86 (2). Palp lengths: 48–50, 69–76, 98–104, 166–169 (2).

Thorax — Pronotum with 7 (2) bristles. Acrostichals very weak and indistinct, less than 8 long; dorsocentrals 8(?)–14 uniserial; prealars 3 (2). Scutellum with about 9–11 (2) uniserial bristles.

Wing — VR = 1.17 (1). Basal vein with 1 (2) bristle, R with 3 (1) bristles. Squama with 7–8 (2) bristles. R_{2+3} apparently ends about midway between R_1 and R_{4+5}; however, the wings are not in a good condition.

Legs — Spur of front tibia 40–42 long. Spurs on middle tibia 13–16 and 14–18 long. Spurs on hind tibia 14–16 and 35–39 long. Width of apex of hind tibia 40–43. Comb with 12 spines 22–47 long. Claw of hind leg 17 long, with 3 (1) apical teeth. Empodium 41–42 (2) long. Pulvilli about 20 (2) long. Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	458	585	357	255	183	123	78	0.58–0.64, 0.61	2.12–2.25, 2.19	2.81–3.13, 2.93	2.25–2.78
p_2	461	477	229	123	87	48	51	0.46–0.50, 0.48	3.60–4.07, 3.78	3.95–4.31, 4.09	1.70–2.70
p_3	468	587	337	183	145	74	65	0.57–0.58, 0.57	2.89–3.08, 2.98	3.11–3.17, 3.13	1.50–3.18

Abdomen — Tergite bristles more dense near the lateral and posterior margins and in a median band, longest bristle 114–118 (2) long. Sternites with a few bristles in median and lateral bands.

Hypopygium (Fig. 44) — Anal tergite extending beyond tip of anal point. Anal point 40–50 (2) long, with 5–6 (1) bristles on each side. Basistyle with an angular basal lobe which is naked dorsally at apex. Dististyle with a toothlike preapical projection and an apical spine 12–14 (2) long. HR = 2.53–2.74, mean 2.66; HV = 4.18–4.36 (2).

TYPE MATERIAL

Holotype, male, fast flowing stream, between miles 18 and 19 on Mando logging road, Kenora, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9989). Paratypes, 2 males, same data as holotype.

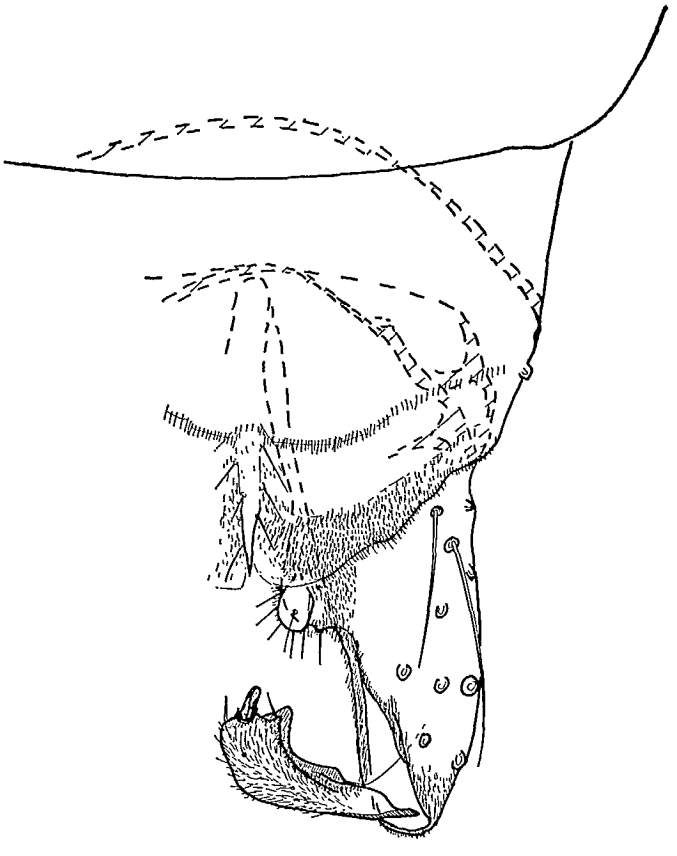

FIG. 44. *Rheocricotopus kenorensis* sp.n. ♂. Hypopygium.

REMARKS

The species is a typical *Rheocricotopus* except for the very reduced, indistinct acrostichals and the somewhat reduced number of bristles on the squama. The species with the most similar hypopygium seems to be *Rheocricotopus gouini* (Goetgh.) (Gouin, 1936, p. 167–170; Goetghebuer, 1940–50, p. 197). *Rheocricotopus gouini*, however, has an AR of 1.8, an LR of 0.75, and the preapical tooth of the dististyle is apparently broader than in this new species.

Rheocricotopus pauciseta sp.n.

The species is characterized by a low AR (0.60–0.83), strong acrostichals about 25 long, about 5–7 dorsocentrals, reduced number (3–7) of bristles on squama, triangular anal point, basal lobe of basistyle divided into two small lobes, the dorsal one naked, and dististyle plump, without a preapical tooth and with a long apical spine.

The pupa has 11–13 bristles on anal lobe and longer pedes spurii B than is usual in *Rheocricotopus*, although they still are slightly smaller than in *Microcricotopus*. The pupa belongs to the *R. effusus* group.

The larva has an AR of 1.55, each median tooth has a small lateral tooth, and the procerci each have 5 apical bristles.

97967—71½

MALE (n = 5, except when otherwise stated)

Length 2.7–2.9 mm, mean 2.8 mm. Wing length 1.59–1.78 mm, mean 1.66 mm (4). Thorax blackish-brown with paler abdomen.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{94}{118}$. Longest antennal bristle about 400. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{54}{29}$, $\frac{27}{28}$, $\frac{31}{28}$, $\frac{37}{27}$, $\frac{39}{25}$, $\frac{40}{24}$, $\frac{40}{24}$, $\frac{38}{24}$, $\frac{40}{23}$, $\frac{38}{23}$, $\frac{38}{21}$, $\frac{37}{20}$, $\frac{319}{27}$. AR = 0.60–0.83, mean 0.68 (6).

Head — Vertex (Fig. 46C) with 3–5 bristles, the longest 50–68. Clypeus with 11–15 bristles, the longest 50–80 (4). Palp lengths: 44–54; 80–102; 84–106; 116–185, mean 123.

Thorax (Fig. 45) — Pronotum with 3–5 bristles. Acrostichals 12(?)–17 (3), the longest about 25; dorsocentrals 5–7 uniserial; prealars 3. Scutellum with 6–7 (4) uniserial bristles.

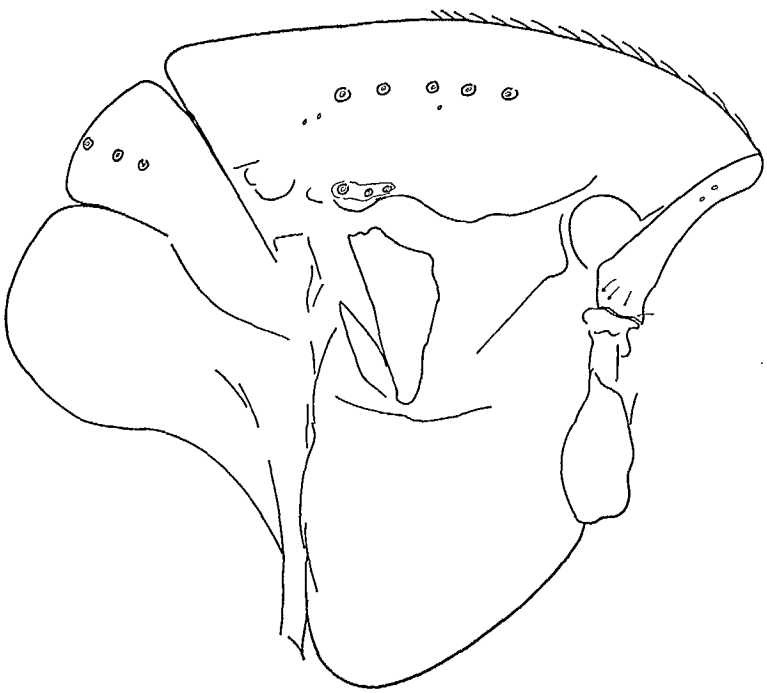

FIG. 45. *Rheocricotopus pauciseta* sp.n. ♂. Thorax.

Wing (Fig. 46A) — VR = 1.13–1.18, mean 1.15. Basal vein with 1 bristle, R with 5–7 bristles. Squama with 3–7 bristles. Free end of costa 30 (1) long.

Legs — Spur on front tibia 32–44 long. Spurs on middle tibia 13–14 and 16–22 long. Spurs on hind tibia 12–18 and 40–43 long. Width of apex of hind tibia 34–39. Comb with 10–13 spines 22–44 long. Claw of hind leg (Fig. 46B) 14–21 long with 4 apical teeth. Empodium about 30 long. Pulvilli (Fig. 46B) about 15 long.

Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	547	655	443	277	192	121	77	0.62–0.74, 0.68	2.32–2.58, 2.47	2.52–2.93, 2.73	2.00–2.86
p_2	566	584	309	171	127	74	63	0.49–0.59, 0.53	3.28–3.52, 3.36	3.53–4.03, 3.73	1.75–3.75
p_3	582	696	388	214	171	92	72	0.53–0.58, 0.56	2.88–3.15, 3.04	3.21–3.52, 3.30	1.67–3.22

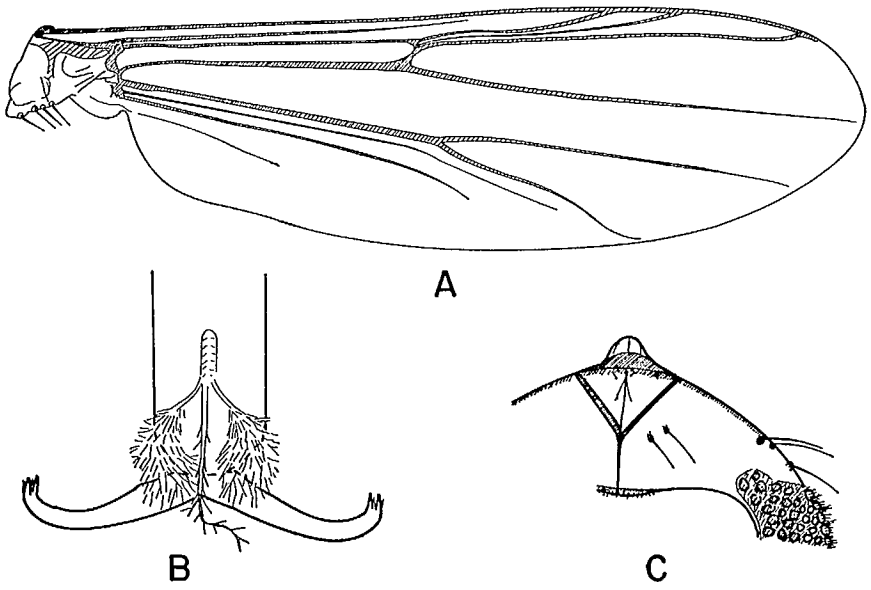

FIG. 46. *Rheocricotopus pauciseta* sp.n. ♂. (A) Wing; (B) Claw, empodium and pulvilli; (C) Vertex.

Abdomen — Tergites with scattered bristles, the longest 106–172.

Hypopygium (Fig. 47) — Anal point triangular, 36–40 (3) long, free part about 18–20 (3) long-3–4 (3) bristles on each side of anal point. Basistyle with basal lobe divided into 2 small lobes, the dorsal one naked. Dististyle plump, broad at apex, without preapical tooth, and with an apical spine 18–20 long. HR = 2.61–2.69, mean 2.64; HV = 3.72–4.48, mean 4.02.

PUPA (n = 2)

Length 3.1–3.4 mm. Exuvia subfuscous.

Cephalothorax — Thoracic horn as in *R. effusus* (Walk.) Edw. (*fuscipes* Kieff.) (Thienemann and Harnisch, 1932, fig. 2), 240–266 long, 48–58 wide. Anterior bristle in front of horn 80–120 long, located 6–10 from median bristle. Median bristle 110–120 long, located 6 from posterior bristle. Posterior bristle 45–74 long, located 42–54 from horn. Frontal bristle 84–100 long.

Abdomen — Shagreenation, spines and pedes spurii A about as in *R. eminellobus* sp.n. (p. 87) except that there is a faint indication of a posterior row of spines on tergite VIII as well, tergite VI is less extensively shagreened, and tergites VII–VIII even lack group shagreenation. The male has stronger shagreenation and spinules than the female. The median patch of spinules on IV–VI, characteristic for the *R. effusus* group, is weaker but otherwise typical in the male pupa, whereas the small female pupa has no spine patch on tergite VI and the patches on IV and V are very rudimentary. Pedes spurii B relatively large, but not so large as in *Microcricotopus*. Length of bristles on V: L_1 = 56–60, L_2 = 58–64, L_3 = 78–83, L_4 = 60–70, D_1 = 40–48, D_2 = 40–44, D_3 = 30–38, D_4 = 60–64, D_5 = 40–56. Distance between L_1 and L_2 on V 36–40, between L_2 and L_3 98–110. D_4 on VIII 50–56 long. VII with 4 lamellar bristles 110–130 long, VIII with 5 lamellar bristles 190–220 long. Anal lobe with 11–13 filamentous hairs 270–280 long. Anal bristles 270–280 long. Genital sac of male extending beyond tips of anal lobes, with a 40 long fingerlike apical projection similar to but more parallel-sided than in *Parakiefferiella torulata* sp.n. (Fig. 77).

LARVA (n = 1, except when otherwise stated)

Head capsule length about 0.4 mm. Head luteous; occipital margin, premandible and apical two thirds of mandible, brown.

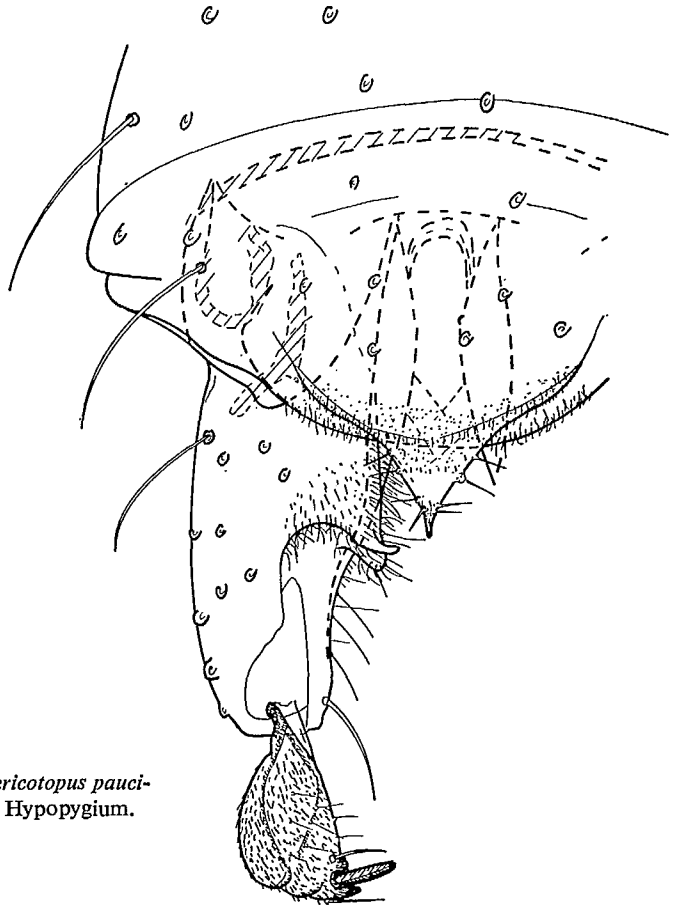

FIG. 47. *Rheocricotopus pauciseta* sp.n. ♂. Hypopygium.

Head — Antenna, labrum, premandible, mandible, and labium as in *Rheocricotopus brunensis* (Goetgh.) (Zavřel, 1938, fig. 1). Length of antennal segments: 62–64 (2), 16, 9, 7, 10. AR = 1.55. Basal segment 13–18 (2) wide, distance from base to annular organ 6–10 (2), a bristle mark 20 from base, blades at apex 16 and 35 long. Lauterborn organs broad, about 14 long. Premandible about 64 long. Mandible 130–132 (2) long, with 7 bristles in inner brush. Labium with all teeth dark, the two large median teeth each with a small lateral tooth.

Abdomen — Procerci brown; about 32 long, 20 wide; each with 5 apical bristles 420 long; 2 lateral bristles, the longest 80; and a basal spur placed somewhat lower than in *R. brunensis* (Zavřel, 1938, fig. 1). Posterior prolegs about 160 long.

TYPE MATERIAL

Holotype, male with pupal and larval exuvia, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9990). Paratypes, 13 males, large mountain streams, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther; 2 males, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther; pupa with larval exuvia, same data as holotype.

REMARKS

The immatures of this new species differ from those of *R. brunensis* (Goetgh.) (Zavřel, 1938, p. 3–6) only in minor details such as the weaker shagreenation and the lower number of fringe hairs on anal lobe of the pupa, and the procerci of the larva, which have 5 apical bristles as in other species of *Rheocricotopus* and not 3 as in *R. brunensis*. The AR, chaetotaxy, and hypopygium of the imago, however, differ from those of *R. brunensis* (Goetghebuer, 1937, p. 275–276, 1940–50, p. 193), as well as from those of all other known members of *Rheocricotopus*.

Genus *Chaetocladius* (Kieff.) Brund.

Chaetocladius oliveri sp.n.

The species is characterized by an AR of 1.80–2.49, 7–12 dorsocentrals, 6–8 scutellars, 8–14 bristles on squama, shorter spur of hind tibia almost half as long as the longer one, pulvilli apparently consisting of 5 bristles, tergite IX dark and heavily sclerotized in front of anal point, 5–10 bristles and some long hairs basal and basilateral on anal point, free end of anal point naked, basal lobe of basistyle with very faint indications of a ventral appendage and with a naked median part, dististyle somewhat club-shaped apically.

MALE

Length 3.2–4.4 mm, mean 3.8 (10). Wing length 2.32–3.18 mm, mean 2.70 (11). Coloration blackish-brown with lighter legs and sternites, scutellum dark.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{130}{160}$ (11). Longest bristle of flagellum 720–850 (4). Flagellar segments $\frac{\text{length}}{\text{width}}$ ($n = 11$): $\frac{72}{44}$, $\frac{34}{41}$, $\frac{32}{40}$, $\frac{28}{38}$, $\frac{28}{36}$, $\frac{28}{35}$, $\frac{27}{33}$, $\frac{28}{32}$, $\frac{29}{31}$, $\frac{28}{30}$, $\frac{29}{29}$, $\frac{30}{28}$, $\frac{828}{31}$. AR = 1.80–2.49, mean 2.05 (16).

Head — Vertex with 11–15 (5) bristles, the longest 94–106 (5) long. Clypeus with 5–16 (5) bristles, the longest 90–114 (5). Palp lengths ($n = 11$): 54–70, mean 62; 117–146, mean 133; 108–142, mean 129; 194–266, mean 220.

Thorax — Pronotum with 5–7 (5) bristles. Acrostichals 20–22 (2), dorsocentrals 7–12 (16) uniserial, prealars 4–5 (16). Scutellum with 6–8 (5) bristles.

Wing — VR = 0.93–1.02, mean 0.98 (11). Basal vein with 1 (5) bristle, R with 6–9 (5) bristles. Squama with 8–14 (5) bristles. Sensory organs very indistinct, 1 in front of Fr, 1 basally on R_1. Free end of costa 13–20 (5) long.

Legs — Spur on front tibia 47–81, mean 69 (11) long. Spurs on middle tibia 18–32, mean 23 (11), and 23–34, mean 27 (11) long. Spurs on hind tibia 24–32, mean 26 (11), and 50–72, mean 61 (11) long. Width of apex of hind tibia 47–63, mean 55 (11). Comb with 14–17 (5) spines, the shortest 24–30 (5), the longest 49–60 (5). Tarsal spines 24–32 (4) long on ta_1, 20–30 (4) long on ta_2, 14–30 (4) long on ta_3, 2 spines on ta_1–ta_3 of p_2 and p_3. Claw of hind leg 28–34 (4) long, with about 5 apical teeth and 4–5 basal bristles, the longest about 23. Empodium about 52 long. Pulvilli about 20 long, apparently consisting of about 5–7 equally long bristles with a common base.

Lengths (means) and proportions (ranges and means) of legs ($n = 11$):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	985	1140	749	419	299	183	129	0.63–0.69, 0.66	2.73–2.96, 2.81	2.68–2.96, 2.84	2.20–2.82, 2.48
p_2	1031	1033	461	292	211	132	110	0.39–0.48, 0.45	3.23–3.51, 3.39	4.22–5.40, 4.59	2.25–3.45, 2.93
p_3	1143	1238	709	403	305	167	121	0.55–0.61, 0.58	2.92–3.30, 3.10	3.06–3.49, 3.32	3.73–5.00, 4.25

Abdomen — Tergites with uniformly distributed bristles, the longest 198–250 (5).

Hypopygium (Fig. 48) — Anal point (Fig. 48A, B) highly variable; 50–61, mean 56 (9) long; basally with 5–10 (11) bristles and some long hairs, and with the free end completely naked. Basal lobe of basistyle with a naked median portion and very faint indications of a ventral appendage. Dististyle somewhat club-shaped, with an apical spine 10–12 (4) long. HR = 2.06–2.20 (10). HV = 3.10–3.55 (10).

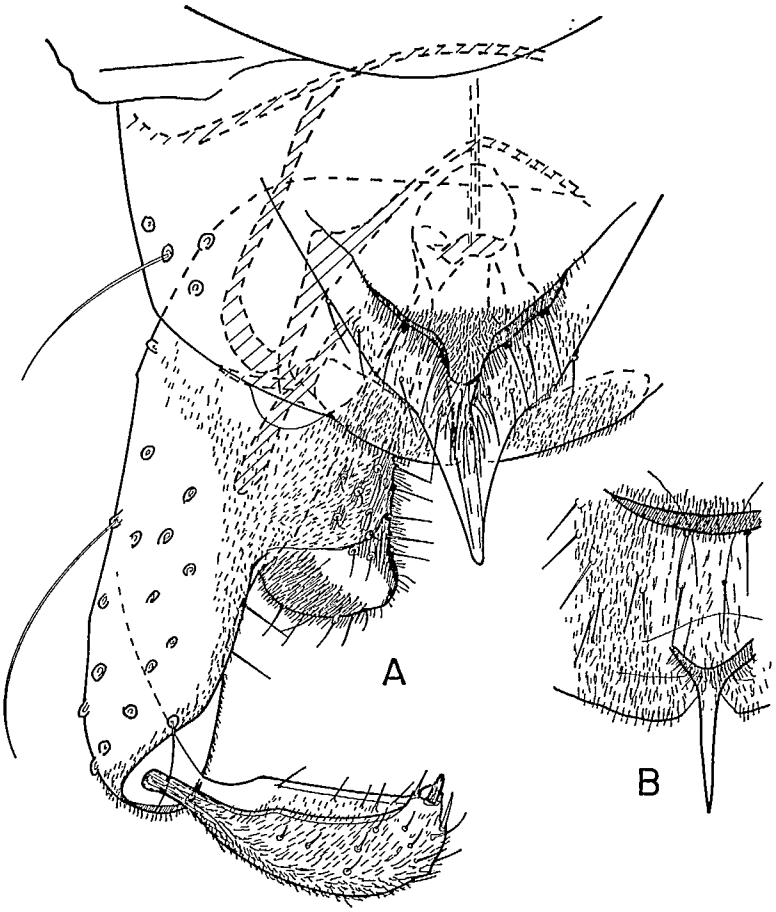

FIG. 48. *Chaetocladius oliveri* sp.n. ♂. (A) Hypopygium of species from Gatineau Park (holotype); (B) Anal point of specimen from Watts Creek.

FEMALE (n = 4)

Length 2.9–3.4 mm, mean 3.1 mm. Wing length 2.14–2.66 mm, mean 2.41. Coloration as in male.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{53}{69}$. Longest bristle of flagellum 135–140. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{110}{33}$, $\frac{68}{29}$, $\frac{70}{29}$, $\frac{75}{28}$, $\frac{117}{28}$. AR = 0.33–0.44, mean 0.37. First flagellar segment with two constrictions 33 and 54 from base, but no division lines visible.

Head — Vertex with 10–15 bristles, the longest 86–97. Clypeus with 10–16 bristles, the longest 97–106. Palp lengths: 52–54, mean 54; 108–208, mean 115; 106–131, mean 116; 180–250, mean 215.

Thorax — Pronotum with 5–6 bristles. Dorsocentrals 11–18 prealars 4. Scutellum with 7–9 bristles.

Wing — VR = 0.94–0.97, mean 0.96. Basal vein with 1–2 bristles, R with 18–23, R_1 with 2–5, R_{4+5} with 18–22 bristles. Squama with 10 bristles. Free end of costa 54–65 long.

Legs — Spur on front tibia 38–45, mean 42 long. Spurs on middle tibia 20–23, mean 22, and 25–29, mean 27 long. Spurs on hind tibia 23–25, mean 24, and 52–54, mean 53 long. Comb with 12–16 spines, the shortest spine 20–27 long, the longest 47–50 long. Tarsal spines 23–32 long on ta_1, 23–27 long on ta_2, 18–25 long on ta_3, 2 spines on ta_1–ta_3 of p_2 and p_3. Claw of hind leg 29–34 long, with about 5 basal bristles, the longest 17. Empodium 51 long. Pulvilli 21 long, consisting of 6 bristles with common base.

Lengths (means) and proportions (ranges and means) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	845	943	587	354	253	154	111	0.61–0.63, 0.62	2.69–2.76, 2.72	3.00–3.08, 3.04	1.63–1.83, 1.72
p_2	856	870	374	255	179	110	102	0.41–0.44, 0.43	3.22–3.32, 3.25	4.51–4.79, 4.61	1.21–1.62, 1.48
p_3	992	1041	594	351	278	143	117	0.55–0.58, 0.57	2.90–3.00, 2.95	3.39–3.46, 3.42	1.71–2.23, 1.93

TYPE MATERIAL

Holotype, male, Gatineau Park, Que., 22.III.1964, D. R. Oliver (CNC No. 9991). Allotype, female, same data as holotype. Paratypes, male, Gatineau Park, Que., 1.III.1964, D. R. Oliver; 5 males, 3 females, Gatineau Park, Que., 15.III.1964, D. R. Oliver; 2 males, same data as holotype; 7 males, Watts Creek, Ont., 5.IV.1964, D. R. Oliver.

REMARKS

This new species resembles *Chaetocladius dissipatus* (Edw.) in having a 5-segmented female flagellum, small pulvilli, and also in the shape of the basal lobe of the basistyle and in the dististyle (Edwards, 1929, p. 338, fig. 2C; Brundin, 1947, fig. 47, 1956, fig. 92). The anal point seems, however, to be quite different. *Chaetocladius piger* (Goetgh.) (Edwards, 1929, p. 337–338, fig. 6D; Goetghebuer, 1940–50, p. 62–63, fig. 122) is probably even more closely related to this new species, but the shape of the dististyle is different and the pulvilli are reported to be absent. Other species that are apparently closely related to *C. oliveri* include *Chaetocladius melaleucus* (Meig.) (Goetghebuer, 1940–50, p. 61, fig. 116) and *Chaetocladius adsimilis* Goetgh. (Goetghebuer, 1933, p. 25, fig. 6, 1940–50, p. 58–59, fig. 104).

VARIATION

The specimens were collected at Watts Creek, Ont. and from Gatineau Park, Que. Eight of the nine males from Gatineau Park have an AR of 1.80–2.03, the ninth has an AR of 2.49. The hypopygium of the latter specimen is missing so the possibility that it belongs to a separate species cannot be ruled out, but the similarity of other characters would suggest that the most likely explanation is that this specimen belongs to a different population of the same species. To test whether or not the AR of this specimen is outside the expected range of variation for a single population a formula for testing extremes (outliers) has been used:

$$r_{11} = \frac{x_2 - x_1}{x_{k-1} - x_1}$$

where k is the number of specimens (Dixon and Massey, 1957, p. 276). The largest AR (2.49) gives $r_{11} = 0.707$ where $(r_{11})_{.95} = 0.512$, i.e., the probability of the specimen with the largest ratio belonging to another population or another species is much

higher than 95%. The highest and the lowest AR of the remaining specimens from Gatineau Park were tested giving $r_{11} = 0.368$ and 0.250, respectively, where $(r_{11})_{.95} = 0.554$; i.e., these fall within the normal population range.

Some measurements on males from Watts Creek and Gatineau Park are compared in Table 2. The specimens from Gatineau Park have an anal point similar to that in Fig. 48A, those from Watts Creek an anal point as shown in Fig. 48B.

TABLE 2. Comparison of three populations of *Chaetocladius oliveri* sp.n. (♂♂). Ranges and means of lengths and proportions. (No. of specimens measured in parentheses.)

		Gatineau Park	
	Watts Creek	Population I	Population II
Total length (*mm*)	3.8–4.4, 4.1 (5)	3.2–3.8, 3.5 (5)	–
Wing length (*mm*)	2.74–2.95, 2.83 (5)	2.32–2.63, 2.48 (5)	3.18
AR	2.01–2.26, 2.17 (7)	1.80–2.03, 1.90 (8)	2.49
ti of p_1 (μ)	1112–1292, 1190 (5)	995–1125, 1049 (5)	1346
ta_1 of p_1 (μ)	702–873, 792 (5)	639–720, 678 (5)	891
HR	2.06–2.20, 2.15 (5)	2.10–2.17, 2.14 (5)	–
HV	3.34–3.71, 3.57 (5)	3.10–3.55, 3.29 (5)	–

Genus *Parachaetocladius* Wülker stat.n.

MALE

Antenna — Without straight apical bristle. AR less than 2. Whorl bristles dense, reaching almost to apex of antenna.

Head (Fig. 49) — Eyes naked, slightly elongated dorsally. Vertex with uniserial bristles, starting near the median line.

Thorax (Fig. 50)—Pronotum well developed, adjacent but not joined, with several lateral setae. Acrostichals not present; dorsocentrals about 10–25, uni-triserial anteriorly, uniserial posteriorly; prealars about 7–9. Anterior mesopleurae and mesosternum below anepisternal suture with bristle groups. Scutellum with about 10–19 uni-biserial bristles.

Wing — Without macrotrichia, but with distinct microtrichia easily distinguishable at 100 times magnification. Anal lobes well developed. R, R_1, and R_{4+5} with bristles. Squama with about 12–13 bristles. Venation of normal *Orthocladius* type. Costa extended very little beyond end of R_{4+5}.

Legs — Tibial spurs of hind leg without projecting spines, the shorter spur about half as long as the longer one. Pulvilli distinct.

Hypopygium (Fig. 51) — Anal tergite rounded at caudal margin, with several long bristles. Anal point not present.

PUPA (Fig. 52)

Thoracic horn, frontal bristles, and pedes spurii absent. Three bristles at the field of thoracic horn. Shagreenation quite evenly distributed on all sternites and tergites. Thorns present at anal margin of tergites I(II)–VIII and sternites III(IV)–VII(VIII). Sex-dimorphism on sternite VIII and in genital sheaths. Anal segment ending in 2 short points, with 3 straight anal bristles.

Typus generis: *Parachaetocladius abnobeus* (Wülker, 1959b, p. 44–49) comb.n.

Other species: *Parachaetocladius hirtipectus* sp.n.

REMARKS

Parachaetocladius was erected by Wülker (1959b, p. 44–49) as a subgenus of *Chaetocladius*. It differs, however, in many particulars, and *Chaetocladius* may not

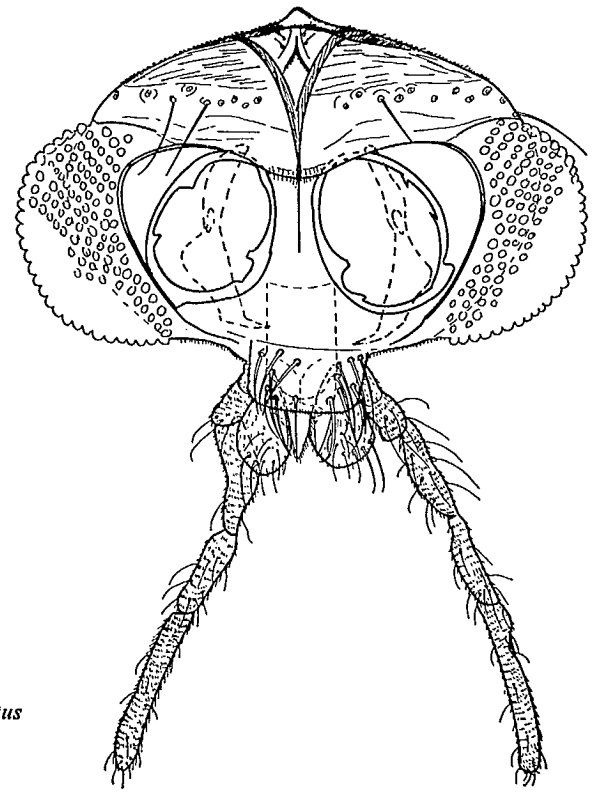

FIG. 49. *Parachaetocladius hirtipectus* sp.n. ♂. Head.

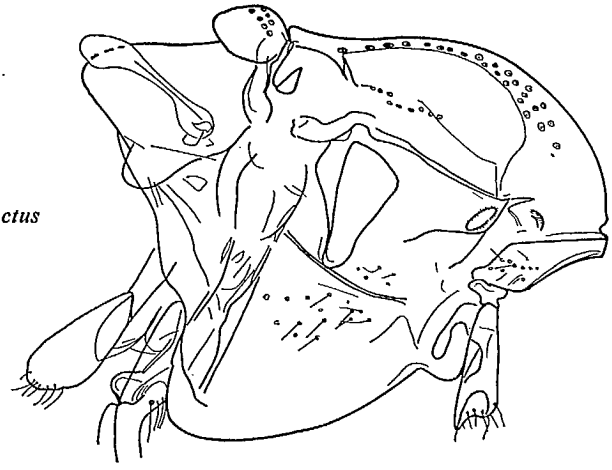

FIG. 50. *Parachaetocladius hirtipectus* sp.n. ♂. Thorax.

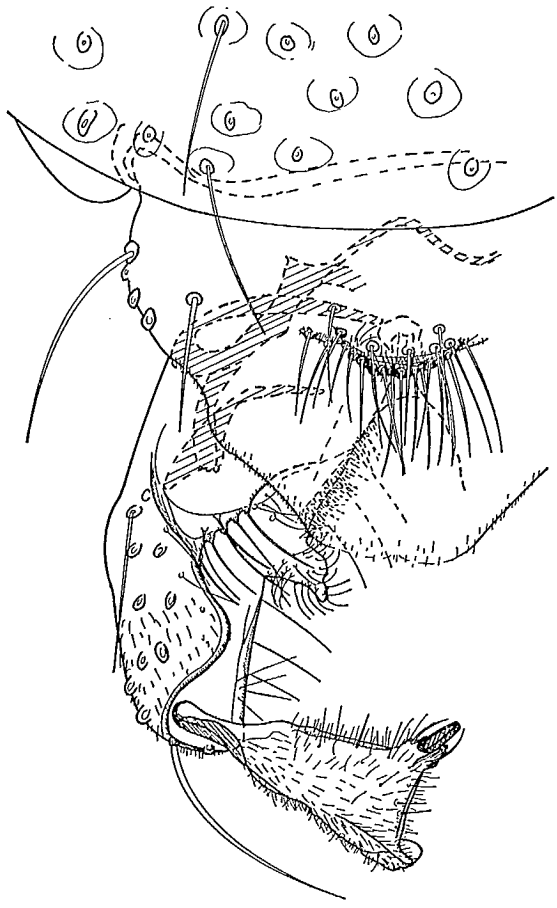

FIG. 51. *Parachaetocladius hirtipectus* sp.n. ♂. Hypopygium.

even be the most closely related genus. Wülker (1959b, p. 44–49) has probably overlooked the bristles on the mesosternum and mesopleura, a feature also found in *Limnophyes*, *Heleniella*, and *Hydrobaenus*. The absence of acrostichals, projecting points on the tibial spurs, and of the anal point are all important features that differ from *Chaetocladius*. Characters that *Parachaetocladius* has in common with at least some species of *Limnophyes* are the long and strong whorl bristles that reach to the tip of the antenna, the absence of a straight apical bristle on the antenna, the strongly developed pronotum, the absence of acrostichals, the presence of bristles on the mesosternum and mesopleurae, the strong microtrichia on wings, the distinct anal lobes, the straight tibial spurs without projecting points, the absence of the anal point, which is replaced by a rounded protuberance with bristles (see *Limnophyes immucronatus* sp.n. Fig. 55), the shape of the basal lobe of the basistyle, and the strong apical spine of the dististyle. *Parachaetocladius* thus probably occupies an intermediate position between *Chaetocladius* and *Limnophyes*, but it is apparently closer to *Limnophyes*.

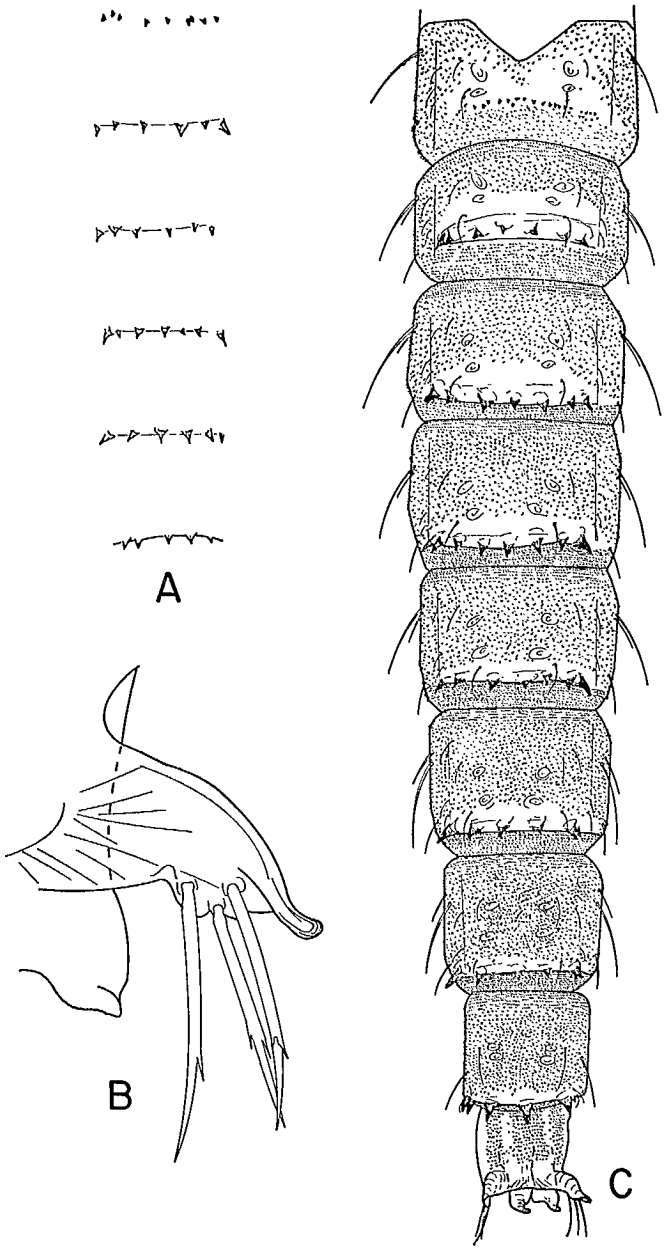

FIG. 52. *Parachaetocladius hirtipectus* sp.n. Pupa. (A) Thorns of sternites III–VIII; (B) Apex of anal lobe; (C) Tergites I–IX.

Parachaetocladius cf. *abnobeus* (Wülk.) comb.n.

No significant dissimilarities between this exuvia and the description of the pupa of *P. abnobeus* (Wülker, 1959b, p. 47–49) could be found. The placement and numbers of abdominal bristles, however, are more like that of *P. hirtipectus* sp.n. The bristles are

longer than mentioned by Wülker, but the L-bristles are much weaker than in *P. hirtipectus* sp.n.

SPECIMEN EXAMINED

Female pupal exuvia, small stream, Mt. St. Hilaire, Que., 1966, R. Mackay.

DISTRIBUTION

Germany (Wülker, 1959b, p. 49). New to North America.

Parachaetocladius hirtipectus sp.n.

The species is characterized by a low AR (about 0.84), high number of dorsocentrals (about 25), biserial scutellars, few bristles on squama (about 12), distinct basal lobe of basistyle, and triangular dististyle.

The pupa has thorns on tergites I–VIII (♂) and on sternites III–VIII, and the L_1-bristles are strong and elongate.

MALE ($n = 1$)

Length 3.3 mm. Wing length 1.53 mm. Thorax blackish-brown with 3 darker vittae on mesonotum; scutellum with margins and lateral areas dark, median area paler. Abdomen with bristles in paler spots. Dististyle dark.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{115}{138}$. Longest bristles of flagellum 540. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{68}{39}$, $\frac{31}{35}$, $\frac{31}{34}$, $\frac{33}{33}$, $\frac{34}{33}$, $\frac{36}{32}$, $\frac{38}{32}$, $\frac{40}{32}$, $\frac{40}{32}$, $\frac{38}{32}$, $\frac{42}{32}$, $\frac{42}{32}$, $\frac{396}{32}$. AR = 0.84.

Head (Fig. 49) — Vertex with 16 bristles, the longest 88. Clypeus with 14 bristles, the longest 80. Palp lengths: 52, 103, 98, 176.

Thorax (Fig. 50) — Pronotum with 11 bristles. Dorsocentrals 25, triserial in front, uniserial posteriorly; prealars 9; anterior mesopleurum with 5 bristles; mesosternum below anepisternal suture with 15 bristles.

Wings — VR not measurable. R with about 22 bristles, R_1 with about 7, R_{4+5} with about 5 apical bristles. Squama with 12 bristles.

Legs — Spur on front tibia 66 long. Spurs on middle tibia 41 and 48 long. Spurs on hind tibia 38 and 74 long. Comb with 9 spines 32–50 long. Tarsal spines 2 on ta_1 of p_2 23 and 30 long, 1 on ta_2 of p_2 16 long, 1 on ta_1 of p_3 30 long. Claw of hind leg 38 long, with 4 apical teeth. Empodium 54 long. Pulvilli 33 long.

Lengths and proportions of legs (measurements of fe and ti only approximate):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	680	830	524	352	232	144	82	0.63	2.51	2.88	2.25
p_2	730	754	306	203	140	98	88	0.41	3.38	4.85	2.88
p_3	804	934	476	318	213	129	102	0.51	2.91	3.65	3.20

Abdomen — Tergites with uniformly distributed bristles, the longest 153.

Hypopygium (Fig. 51) — Anal point not present, in its place on the tergite there is a rounded tubercle covered with 22 long bristles. Basistyle with a distinct, pointed basal lobe. Dististyle triangular, with an apical spine 18 long. HR = 1.64; HV = 2.78.

PUPA ($n = 1$)

Length 4.4 mm. Exuvia luteous. Thorns brown.

Cephalothorax — Anterior bristle on field of thoracic horn 40 long, located 9 from median bristle. Median bristle 49 long, located 9 from posterior bristle. Posterior bristle 99 long, located 14 from anterior bristle.

Abdomen (Fig. 52C) — Shagreenation and thorns of tergites and sternites as in Fig. 52C and 52A and as mentioned by Wülker (1959, p. 47–49) except that thorns are also present on tergite I and sternite III. Length of bristles on V: $L_1 = 194$, $L_2 = 86$, $L_3 = 80$, $D_1 = 114$, $D_2 = 74$, $D_3 = D_5 = 55$, $D_4 = 92$. D_1 and D_4 on VIII 126 and 86 long, respectively. Anal bristles (Fig. 52B) 117–142 long, usually with some lateral points. Genital sac of male (Fig. 52B, C) extending slightly beyond tips of anal lobes.

TYPE MATERIAL

Holotype, male with pupal exuvia, Alloette River, at old crossing ¼ mile south of Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9992).

REMARKS

The species differs from *P. abnobeus* (Wülk.) by its lower AR (0.84 as compared to 1.4–1.6 in *P. abnobeus*), 25 dorsocentrals (10–15 in *P. abnobeus*), 19 biserial scutellars (10–15 irregular uniserial in *P. abnobeus*), and a much more pronounced basal lobe of the basistyle. The pupa has thorns on tergite I and sternite III, and bristle L_1 is strong. In contrast, *P. abnobeus* has no thorns at these positions, and all 3 L-bristles are minute.

Genus *Limnophyes* (Eat.) Brund.

Limnophyes hamiltoni sp.n.

The species is characterized by an AR of about 0.90, flagellum with 13 distinct segments, absence of lancet-shaped bristles, microtrichia on wings, An ending proximal to Fcu, basal lobe of basistyle finger-shaped, and dististyle parallel-sided; strongly constricted apically and haired dorsally.

MALE ($n = 1$)

Length 2.3 mm. Wing length 1.26 mm. Thorax dark brown with lighter abdomen and legs.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}: \frac{90}{120}$. Longest bristle of flagellum 420. Flagellar segments $\frac{\text{length}}{\text{width}}: \frac{43}{34}$, $\frac{22}{31}, \frac{31}{29}, \frac{32}{23}, \frac{31}{22}, \frac{30}{21}, \frac{30}{21}, \frac{31}{21}, \frac{30}{20}, \frac{31}{20}, \frac{30}{20}, \frac{30}{18}, \frac{359}{18}$. AR = 0.90.

Head — Vertex with 5 bristles, 4 behind eye, 1 weak near median line, the longest 79. Clypeus with 13 bristles, the longest 79. Palp lengths: 37, 73, 70, 120.

Thorax (Fig. 53) — Pronotum with 1 strong median bristle and 3 weak lateral bristles. Dorsocentrals 12, prealars 6, supra-alars (?) 1, middle mesopleurals 2, posterior mesopleurals 6, mesosternal bristles below anepisternal suture 2. Scutellum with 4 bristles.

Wing — VR = 1.23. Wing with microtrichia. Basal vein with 1 bristle, R with 3 basal bristles. Squama with 4 bristles. Sensory organs 1 on Fr, 1 on basal ⅛ of R_1. Free end of costa 40 long. R_1 half as long as R_{4+5}. R_{2+3} ending at a point ⅔ of the distance between the tips of R_1 and R_{4+5}. An ends slightly proximal of Fcu.

Legs — Spur of front tibia at least 46 long (outer tip broken). Spurs of middle tibia 20 and 22 long. Spurs of hind tibia at least 50 long and the smaller broken. Width of apex of hind tibia 37. Comb with about 11 spines 22–36 long. Claw of hind leg 30 long, with 4 teeth at apex and 2–3 long hairs at base. Empodium 36 long.

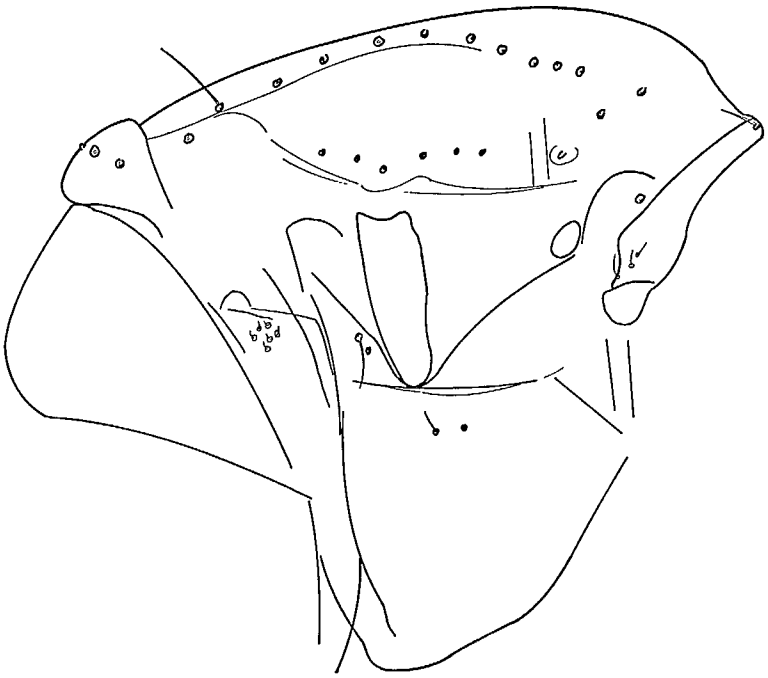

FIG. 53. *Limnophyes hamiltoni* sp.n. ♂. Thorax.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	472	596	296	190	129	61	60	0.50	3.10	3.61	2.25
p_2	466	488	225	122	85	47	52	0.46	3.85	4.24	2.63
p_3	464	581	296	160	142	55	56	0.51	3.25	3.53	3.88

Abdomen — Tergites with uniformly distributed bristles, the longest 110.

Hypopygium (Fig. 54) — Anal point with 6 bristles on each side. Ninth tergite with a swordlike blade arising ventral to the anal point. Basistyle with a finger-shaped dorsal lobe near the middle and a transparent lobe near the base. Dististyle parallel-sided proximally, but constricted near apex, with hairs on both sides, and with an apical spine 16 long. HR = 1.67; HV = 2.99.

TYPE MATERIAL

Holotype, male, at shore, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 13.IX.1965, A. L. Hamilton (CNC No. 9993).

REMARKS

The species is closely related to *Limnophyes smolandicus* Brund. and *Limnophyes vernalis* Brund. (Brundin, 1947, p. 32–33, fig. 59–60). It is, however, smaller than both these species and differs from both in the placement of the finger-shaped lobe of the basistyle. From *L. smolandicus* it differs also by having a distinct separation between flagellar segments 12 and 13, and by having hairs dorsally on the dististyle. From *L. vernalis* it differs by having 4 bristles on the squama (7 in *L. vernalis*), no hairs on R_1, and a more parallel-sided dististyle.

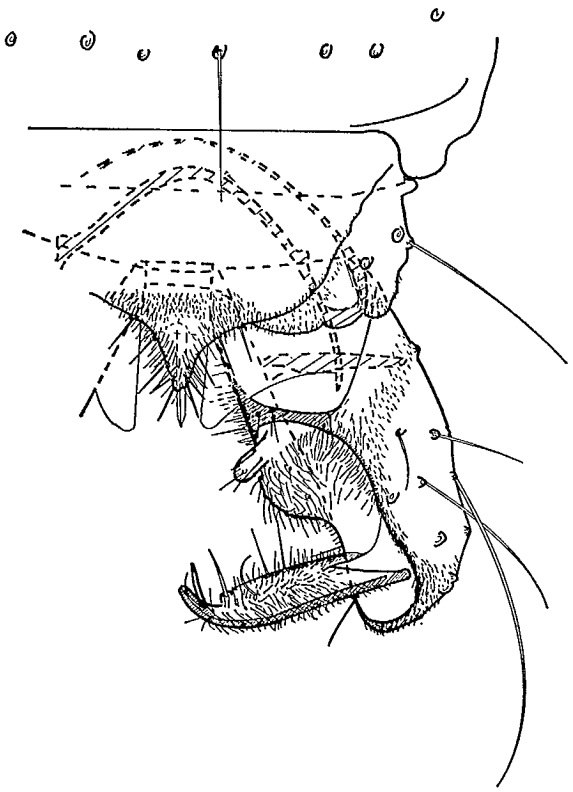

FIG. 54. *Limnophyes hamiltoni* sp.n. ♂. Hypopygium.

Limnophyes immucronatus sp.n.

This small species has a flagellum with only 12 separate segments and the divisions between the 10th and 11th and between the 11th and 12th segments are indistinct. It lacks lancet-shaped bristles on the mesonotum, has 2 bristles on the lower anterior margin of mesosternum, microtrichia on wings, An ending proximal of Fcu, no anal point, finger-shaped lobe in the middle of basistyle covered by a large bifid lobe of anal tergite, and a parallel-sided dististyle with a sharp tooth proximal of the apical spine.

MALE ($n = 1$)

Length 1.8 mm. Wing length 1.34 mm. Thorax dark brown with lighter abdomen, and tergite and hypopygium darker than the rest of abdomen. Halteres brownish.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{78}{98}$. Longest bristle of flagellum 335. Flagellum with 12 segments, divisions between 10th and 11th and between 11th and 12th segment incomplete. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{38}{35}, \frac{26}{26}, \frac{25}{25}, \frac{32}{22}, \frac{34}{21}, \frac{33}{21}, \frac{33}{20}, \frac{33}{19}, \frac{32}{19}, \frac{32}{19}, \frac{32}{17}, \frac{191}{22}$. AR = 1.07. There is, however, a slight constriction about 32 from the base of the apical segment, and if the part below this constriction is regarded as a separate segment then the AR would be 0.76.

Head — Vertex with 4 bristles behind the eye, 1 weak and 3 stronger, the longest 60. Clypeus with 12 bristles, the longest 60. Palp lengths: 26, 62, 63, 78.

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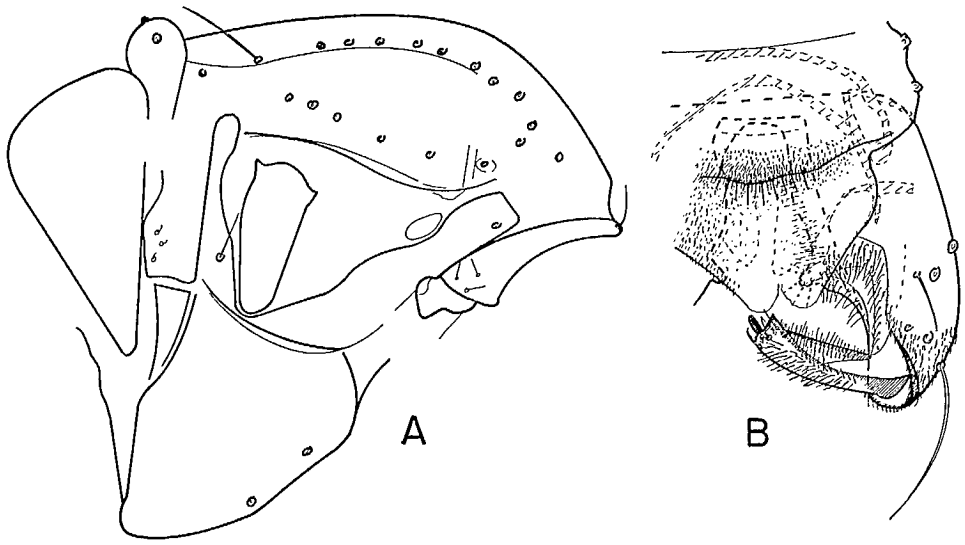

FIG. 55. *Limnophyes immucronatus* sp.n. ♂. (A) Thorax; (B) Hypopygium.

Thorax (Fig. 55A) — Pronotum with 1 strong median bristle and 3 weak lateral bristles. Dorsocentrals 12, supralars (?) 1, prealars 5, median mesopleurals 1, posterior mesopleurals 6, mesosternals 2 at lower anterior margin. Scutellum with 4 bristles.

Wing — VR = 1.34. Wing with microtrichia. Basal vein with 1 bristle, R with at least 1 basal bristle. Squama with 1 or 2 bristles. Sensory organs 1 on Fr, 1 basal on R_1. Free end of costa 28 long. R_1 half as long as R_{4+5}; R_{2+3} ending at ⅔ of the distance between R_1 and R_{4+5}; An ends proximal of Fcu.

Legs — Spur of front tibia 40 long. Spurs of middle tibia both 18 long. Spurs of hind tibia 12 and 38 long. Width of apex of hind tibia 30. Comb with 9 spines 14–32 long. Claw of hind leg 21 long, with 4 apical teeth and 2 long, ventral hairs at base reaching to the tip of claw. Empodium 25 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	372	460	202	134	91	50	49	0.44	3.19	4.12	2.43
p_2	361	403	165	90	51	35	49	0.41	4.13	4.63	2.71
p_3	371	451	241	115	107	44	52	0.53	3.34	3.41	2.86

Abdomen — Tergites with uniformly distributed bristles, the longest 95.

Hypopygium (Fig. 55B) — Anal point not present. Anal tergite with 8 caudal bristles. Basistyle with a finger-shaped dorsal lobe covered by a large bifid lobe of anal tergite. Dististyle parallel-sided with a sharp preapical tooth and an apical spine 11 long. HR = 1.69; HV = 2.78.

TYPE MATERIAL

Holotype, male, at dock, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 8.V.1965, A. L. Hamilton (CNC No. 9994).

REMARKS

Limnophyes eltoni (Edw.) (Edwards, 1922, p. 203; Goetghebuer, 1940–50, p. 133; Oliver, 1962, p. 12) is perhaps the closest relative of this new species. *Limnophyes eltoni*

differs, however, in several particulars such as the presence of lanceolate bristles on mesonotum, lower AR, and ta_4 is only about ⅔ as long as ta_5 on all legs. *Limnophyes eltoni* var. *asquamatus* Anders. (Andersen, 1937, p. 72) also lacks the lanceolate bristles, but it has 3–4 bristles on the squama and the flagellum is distinctly 13-segmented. *Limnophyes septentrionalis* Goetgh., which according to Oliver (1962, p. 12) is very similar to *L. eltoni*, also lacks the lanceolate bristles, but according to Brundin (1947, p. 38) the wing has no microtrichia and An ends distally of Fcu.

Limnophyes sp.

A female of an unknown *Limnophyes* is illustrated in Fig. 1 and 2B, because of its rather interesting chaetotaxy, especially that on the pronotum. The wing is also rather unusual in that the squama has 1 strong and 1 weak bristle both directed inwards and Rm is almost absent. There is 1 bristle on basal vein, 10 on R, 4 on R_1, and 13 distally on R_{4+5}.

SPECIMENS EXAMINED

Female, small mountain stream, water temp 6.5 C, along road to Takkakaw Falls near Field, B.C., 12.VII.1967, A. L. Hamilton and O. A. Sæther.

Genus *Metriocnemus* (v.d. Wulp) Thien.

Metriocnemus edwardsi Jones

SPECIMENS EXAMINED

Male, at shore, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 10.IV.1965, A. L. Hamilton.

DISTRIBUTION

California (Sublette, 1966b, p. 596). New to Canada.

Genus ***Psilometriocnemus*** gen.n.

MALE

Medium small species. Coloration brownish.

Antenna — Flagellum with 13 segments, last antennal segment without straight apical bristle. AR less than 1.

Head (Fig. 56C) — Eyes naked, elongated dorsally. Vertex with only a few bristles none located near the median line. Clypeus with very few bristles (about 4). Palps 4-segmented.

Thorax — Pronotum normally developed, laterally with a few weak bristles. Mesonotal projection rather strong. Acrostichals not present; dorsocentrals about 10, strong and uniserial; prealars about 3. Scutellum with about 4 uniserial bristles.

Wing — Macrotrichia not present. R and R_{4+5} with a few bristles. Squama fringe strongly reduced. Anal lobes obtusely rounded. Sensory organs 2 near Fr, 1 on R_1 (Fig. 2D). Costa strongly elongated; Fcu slightly distal of Rm; R_{2+3} parallel with R_{4+5}, ending midway between R_1 and R_{4+5}; Cu_1 curved; Cu_2 extending almost to wing margin; An extending well beyond Fcu.

Legs — Spurs of middle tibia small; inner spur of hind tibia almost straight (Fig. 56B), more than twice as long as outer spur and slightly longer than the tibial diameter. Pulvilli very faint and indistinct.

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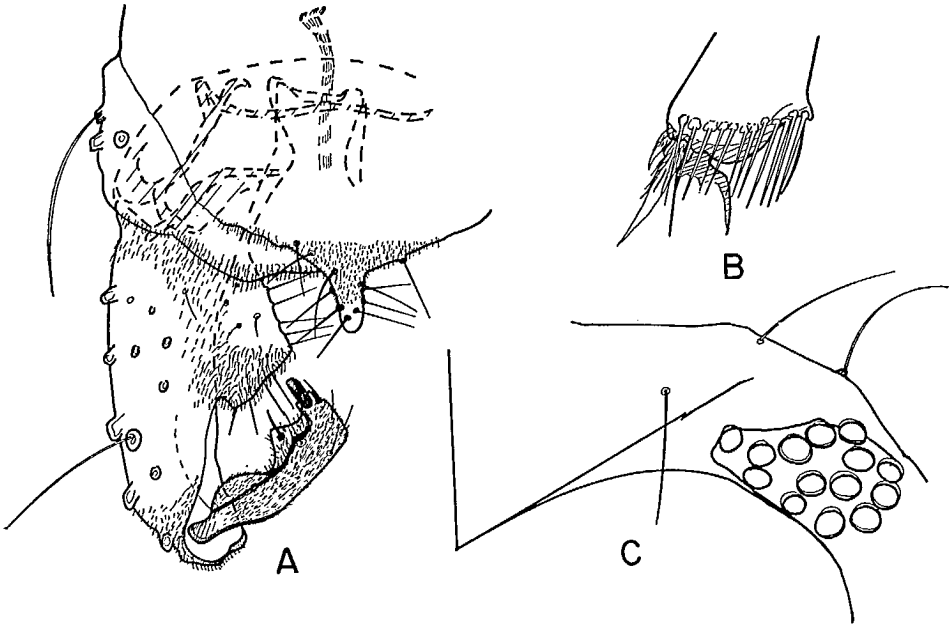

FIG. 56. *Psilometriocnemus triannulatus* gen.n., sp.n. ♂. (A) Hypopygium; (B) Comb and spurs of hind tibia; (C) Vertex.

Hypopygium (Fig. 56A) — Anal point strong, but short, with lateral and dorsal bristles, apex rounded and naked. Basistyle with basal lobe directed obliquely backwards. Dististyle with a dorsal preapical projection.

PUPA

Exuvia transparent.

Cephalothorax — Thoracic horn (Fig. 57B) rather long and slender, with a few scattered spinules over the whole surface. 3 bristles in front of horn. Frontal bristles present. Wing sheaths without row of "pearls."

Abdomen — Spines present posteriorly on tergites II–VIII, posteriorly directed and reduced on II, anteriorly directed on III–VIII, gradually becoming stronger on the more caudal tergites (Fig. 57A). Spines also present posteriorly on sternites II–VIII, reduced on II, posteriorly directed on all sternites. Pedes spurii not present. Bristles of anal lobes about ⅓ as long as the lobes, only slightly curved. Genital sac of male broad, extending beyond tips of anal lobes.

Typus generis: *Psilometriocnemus triannulatus* sp.n.

SYSTEMATICS

This new genus seems to be closely related to *Parametriocnemus* Goetgh. particularly to the species *Parametriocnemus graminicola* (Lundb.). The imago differs from *Parametriocnemus* in that it lacks acrostichals and wing macrotrichia, it has 3 sensory organs on the R veins, and R_{2+3} ends midway between R_1 and R_{4+5}. The pupa of *Psilometriocnemus* differs from that of *Parametriocnemus* in that it does not have a row of "pearls" on the wing sheath, the spines on III–VIII are anteriorly directed and the bristles on the anal lobes are very short, similar to those of *Metriocnemus*.

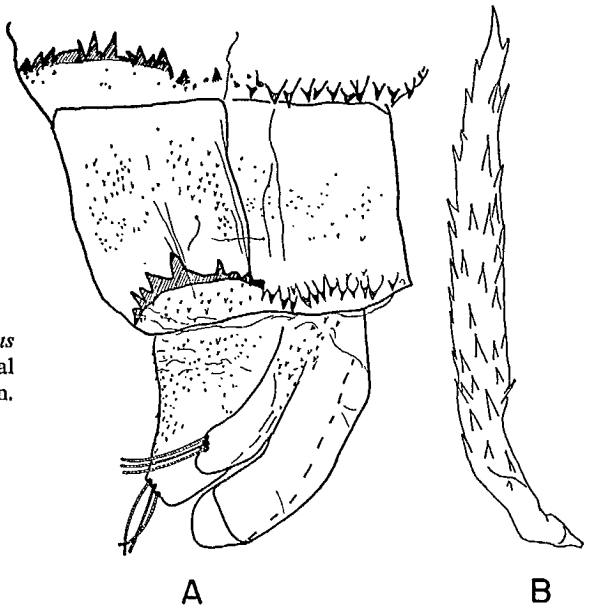

FIG. 57. *Psilometriocnemus triannulatus* gen.n., sp.n. Pupa. (A) Last abdominal segments, lateral view; (B) Thoracic horn.

The pupa also shows some relation to *Heleniella* Gowin. An interesting character is the presence of 3 sensory organs on the wings, a feature that has not been found in other Orthocladiinae but is present in *Prodiamesa* and *Protanypus*. As mentioned on p. 6, this seems to indicate a rather plesiomorphous position. Brundin (1956a, p. 32–33) regards *Metriocnemus* as a relatively plesiomorphous genus somewhat intermediate between the tribes Orthocladiini and Metriocnemini. It is probable that other members of the *Metriocnemus* group are also relatively plesiomorphous, possibly even more so than indicated by Brundin.

Psilometriocnemus triannulatus sp.n.

MALE ($n = 1$)

Length 2.6 mm. Wing length 1.44 mm. Thorax brownish with 3 dark vittae, legs unicoloured.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{98}{\text{ca. } 124}$. Longest bristle of flagellum 405. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{60}{32}$, $\frac{28}{31}$, $\frac{\text{ca. } 36}{\text{ca. } 30}$, $\frac{\text{ca. } 34}{\text{ca. } 27}$, $\frac{36}{26}$, $\frac{40}{26}$, $\frac{40}{28}$, $\frac{40}{30}$, $\frac{42}{31}$, $\frac{41}{31}$, $\frac{41}{30}$, $\frac{42}{28}$, $\frac{294}{36}$. AR = 0.61.

Head (Fig. 56C) — Vertex with 5–6 bristles, the longest 74. Clypeus with 4 bristles in a transverse row, the longest 70. Palp lengths: 32, 80, 85, 141.

Thorax — Pronotum with 3 weak bristles. Dorsocentrals 10, prealars 3. Scutellum with 4 uniserial bristles.

Wing — VR = 1.04. Basal vein with 1 bristle, R with 4, R_{4+5} with 2 apical bristles. Squama with 2 bristles. Sensory organs 2 on Fr, 1 on R_1. Free end of costa 80 long. Rm 66 long. An extending about 95 beyond Fcu.

Haltere — Knob with 5 bristles 18 long.

Legs — Spur of front tibia 41 long. Spurs of middle tibia 14 and 20 long. Spurs of hind tibia (Fig. 56B) 16 and 47 long. Width of apex of hind tibia 44. Comb (Fig. 56B) with 12 spines 24–39 long.

Claw of hind leg 27 long, with 3–4 hairs at base, the longest 21. Empodium about 40 long. Pulvilli faint and indistinct, about 10 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	540	601	331	215	144	100	80	0.55	2.73	3.45	2.33
p_2	540	515	258	141	112	70	66	0.50	3.38	4.09	2.78
p_3	570	632	362	190	159	72	56	0.57	3.28	3.32	3.67

Abdomen — Longest tergite bristle 110.

Hypopygium (Fig. 56A) — Anal point about 38 long, with 6 dorsolateral bristles on each side. Basistyle with basal lobe directed obliquely backwards. Dististyle with inner margin protruding dorsally into a basal lobe and a preapical broad tooth, and with an apical spine 13 long. HR = 2.61; HV = 2.66.

PUPA (n = 1)

Length 2.7 mm. Exuvia transparent except for pale yellow thorns, margins of wing sheath and thorax very pale yellowish. Thorns of tergites slightly darker than the ventral thorns.

Cephalothorax — Thoracic horn (Fig. 57B) 234 long, 22 wide, with a few scattered spinules over the whole surface. Anterior bristle in front of horn lost, located 6–8 from median bristle. Median bristle 54 long, located 3 from posterior bristle. Posterior bristle 52 long, located 63 from horn and 7–11 from anterior bristle. Frontal bristles lost.

Abdomen — Shagreenation not present on segment I, tergites and sternites II–VIII with a transverse band of shagreenation midway along each tergite, broader on the more caudal tergites. Shagreenation also present on the anterior part of tergite and sternite IX (Fig. 57A). Spines present on the posterior part of tergites II–VIII, posteriorly directed and reduced on II, apparently anteriorly directed on III–VIII, gradually becoming stronger on the more caudal tergites (Fig. 57A). Spines also present on posterior part of sternites II–VIII (Fig. 57A), reduced to a few median spines on II, posteriorly directed on all sternites; a few smaller spines present between and anterior to posterior spines, but less numerous than in *Parametriocnemus*. Bristles of abdomen not clearly distinguishable as the exuvia is somewhat distorted, but the L- and D-bristles are apparently about 30–40 long. Anal bristles 75–86 long, about ⅓ as long as the anal lobes (Fig. 57A). Genital sac of male broad, extending beyond tips of anal lobes.

TYPE MATERIAL

Holotype, male with pupal exuvia, Monroe Brook, Mt. Washington, New Hampshire, 13.VI.1967, D. R. Oliver (CNC No. 9995).

Genus *Parametriocnemus* Goetgh.

Parametriocnemus eoclivus sp.n.

This species is characterized by an AR of about 1.18; uni-biserial dorsocentrals (ca. 13–15) in male, uni-triserial dorsocentrals (ca. 27–28) in female, wings of male with macrotrichia on apical third of cell r_{4+5} and near apical margins of cells m_{1+2}, m_{3+4}, and an, sparser on an; wings of female almost fully covered with macrotrichia; anal point strong, but not extending as far caudally as lobes of anal tergite; inner lobe of basistyle rectangular, rounded apically. Pupa with posterior spines on tergites V–VIII and sternites VI–VII (VIII), and in the male very faint indications of spines on tergite IV and sternite V; anal lobe with 6–9 lamellar bristles. Larva with Lauterborn organs as long as antennal segments 3–4 combined, premandible with 2 teeth, seta

anteriores plumose, seta posteriores single, labium with rounded median teeth not lighter than the lateral teeth.

MALE ($n = 1$)

Length 3.8 mm. Wing length 1.87 mm. Thorax very pale luteous with indistinct pale luteous vittae.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{101}{127}$. Longest bristle of flagellum 540. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{62}{36}$, $\frac{25}{33}$, $\frac{29}{32}$, $\frac{34}{32}$, $\frac{34}{29}$, $\frac{34}{27}$, $\frac{34}{25}$, $\frac{34}{32}$, $\frac{34}{33}$, $\frac{34}{32}$, $\frac{32}{26}$, $\frac{32}{29}$, $\frac{493}{29}$. AR = 1.18.

Head — Vertex (Fig. 61D) with 11 bristles. Clypeus with 8 bristles, the longest 92. Palp lengths: 41, 86, 110, 126.

Thorax — Pronotum with 6 bristles. Dorsocentrals 13–15, prealars 5. Scutellum with 8 uniserial bristles.

Wing — VR = 1.15. Macrotrichia present on apical third of cell r_{4+5} (primarily concentrated on apical seventh) and near the apical margins of cells m_{1+2}, m_{3+4}, and an, sparser on an. Basal vein with 1 bristle, R with 17, R_1 with 13, R_{4+5} with 33 bristles. Squama with 6–7 bristles. Sensory organs 1 on Fr, 1 about 150 from base on R_1. Free end of costa about 100 long.

Legs — Spurs of middle tibia 18 and 26 long. Spurs of hind tibia 16 and 56 long. Width of apex of hind tibia 44. Comb with 11 spines 34–59 long. Claw of hind leg 32 long, with a few bristles at base, the longest about 16. Empodium about 48 long. Pulvilli very faint, about 12 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	705	–	–	–	–	–	–	–	–	–	–
p_2	700	620	373	191	141	91	84	0.60	3.34	3.54	2.00
p_3	746	794	482	232	184	110	91	0.61	3.28	3.20	1.91

Hypopygium (Fig. 58) — Anal point about 52 long, with 4–5 lateral bristles, naked at apex. Lobes of anal tergite extending slightly beyond tip of anal point, bifid apically. Basistyle with a rectangular basal lobe rounded at apex. Dististyle with a dorsal ridge, a sharp preapical tooth, and an 11 long apical spine. HR = 2.19; HV = 3.98.

FEMALE ($n = 1$)

Length 3.0 mm. Wing length 1.90 mm. Coloration as in male.

Antenna—Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{61}{\text{ca. } 59}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{81}{34}$, $\frac{59}{30}$, $\frac{67}{27}$, $\frac{70}{23}$, $\frac{97}{30}$. AR=0.37.

Head — Vertex with 11 bristles. Clypeus with about 16 bristles. Palp lengths: 41, 111, 117, 166.

Thorax — Pronotum with about 5 bristles. Dorsocentrals 27–28 uni-triserial, prealars 3–4. Scutellum with 15 mostly uniserial bristles.

Wing — Macrotrichia covering almost whole wing, only c and base of m_{1+2} bare. Basal vein with 1 bristle, R with 24, R_1 with 28 and R_{4+5} with about 85 bristles. Squama with 11–12 bristles. Sensory organs as in male. Free end of costa 110 long.

Legs — Spur of front tibia 41 long. Spurs of middle tibia 23 and 32 long. Spurs of hind tibia 23 and 60 long. Width of apex of hind tibia 46. Comb with about 12 spines 30–52 long. Claw of hind leg 31 long. Empodium 46 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	762	805	557	340	221	128	106	0.69	2.67	2.81	1.92
p_2	746	682	331	189	138	92	87	0.49	3.48	4.31	1.46
p_3	785	859	474	244	182	106	90	0.55	3.41	3.47	2.00

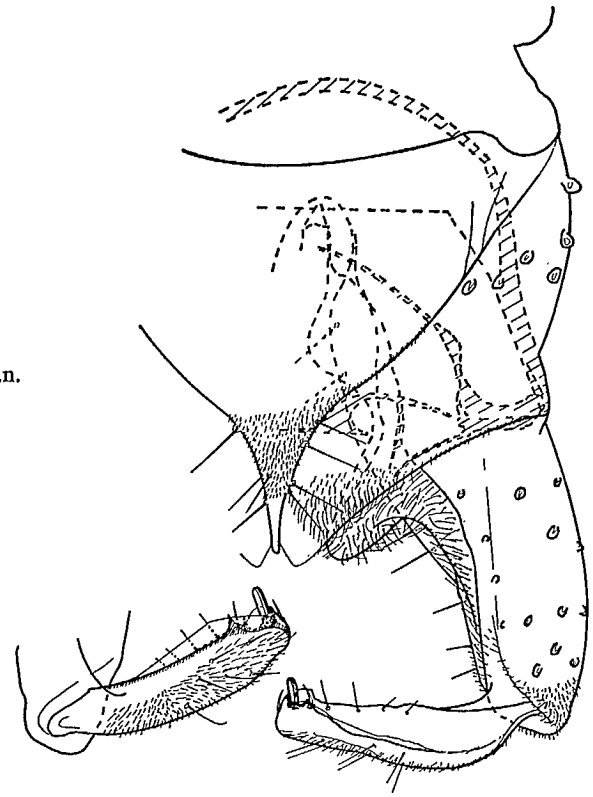

FIG. 58. *Parametriocnemus eoclivus* sp.n. ♂. Hypopygium.

PUPA ($n = 2$)

Length 3.6–3.9 mm. Exuvia transparent.

Cephalothorax — Thoracic horn (Fig. 59C) of *Parametriocnemus borealpinus* Gow. et Thien. type (Kownacka and Kownacki, 1967, fig. 1B), 319–333 long, 32–43 wide. Anterior bristle in front of horn about 100–160 long, located 10 from median bristle. Median bristle 160 long, located 4 from posterior bristle. Posterior bristle about 70–120 long, located 50–58 from horn. Frontal bristles apparently lacking. Wing sheath (Fig. 59B) with 3–4 rows of "pearls."

Abdomen — Shagreenation not present on segment I and on sternites II, III, and IX, also lacking on sternite VIII of female. Tergite II with very faint, but extensive shagreenation covering most of the tergite; tergites III–VII with slightly stronger shagreenation covering whole segment except anterior and lateral margins; tergite VIII with a few median and posterior spinules; tergite IX with faint anterior shagreenation (Fig. 59A). Sternite IV with a few posteriomedian spinules, V with slightly more posteriomedian spinules, VI–VII with faint median and posterior shagreenation, VIII of male with a few spinules in a narrow median to posteriomedian band. Pedes spurii B long, about as in *Parametriocnemus lundbecki* (Joh.) (Fig 64A, B). Pedes spurii A very faint, apparently present on sternites IV–VII, but only visible with interference or phase contrast illumination. Spines present posteriorly on tergites V–VIII, and in the male there is also a faint indication of spines on posterior part of tergite IV. Sternites VI–VIII of male with posterior spines, sternite V of male with rudiments of posterior spines. Sternites VI and VII of female with posterior spines, remaining sternites bare. Length of bristles on V: L_1 = 100–104, L_2 = ca. 100, L_3 = 76–80, D_1 = 80, D_2 = 50–65, D_3 = 30–38, D_4 = ca. 100, D_5 = 80–86. Distance between L_1 and L_2 on V 2–22, between L_2 and L_3 130–154. D_4 on VIII 100–102 long. Anal lobe (Fig. 59A) with 6–9 filamentous hairs restricted to apical half (male) or apical two thirds (female) of margin. Anal bristles 176–178 long. Genital sac of male extending beyond tips of anal lobes.

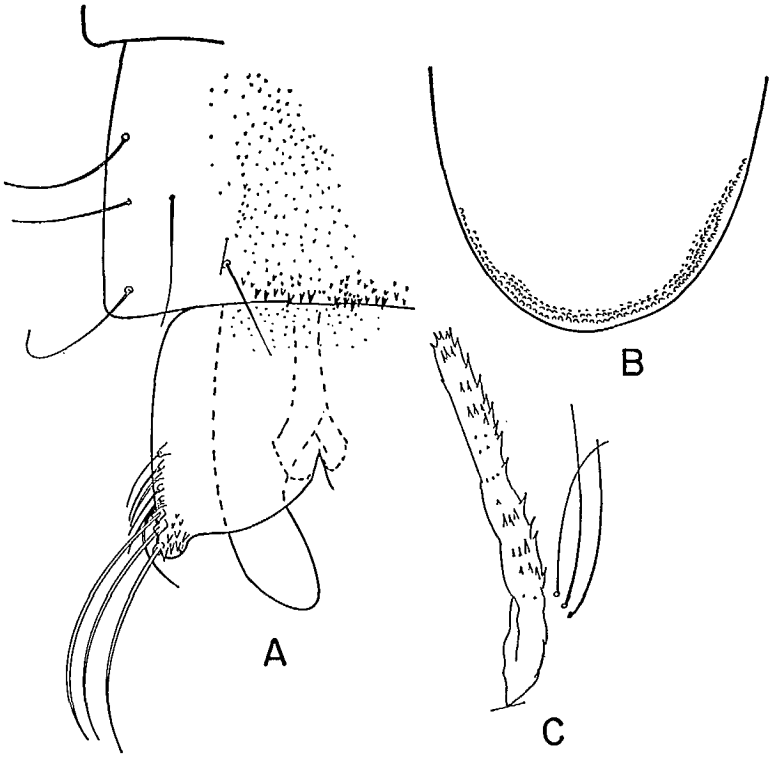

FIG. 59. *Parametriocnemus eoclivus* sp.n. Pupa. (A) Tergites VIII–IX; (B) Apex of wing sheath with rows of "pearls"; (C) Thoracic horn.

LARVA ($n = 2$)

Head capsule length 0.30–0.34 mm. Occipital margin pale. Mandible dark on apical half. Median teeth of labium not distinctly lighter than lateral teeth.

Head — Antenna (Fig. 60B) with Lauterborn organs as long as segment 3 and 4 combined. Length of antennal segments 52, 14, 6, 3–4, 3–4. AR = 1.86–2.00. Basal segment 13 wide; distance from base to annular organ 6, to first bristle mark 14, to second bristle mark 28–29; blades at apex 10 and 26–28 long. Seta anteriores plumose, seta posteriores single, i.e., as in *Parametriocnemus stylatus* (Kieff.) (Kownacka and Kownacki, 1967, fig. 2B). Hypopharynx as in *P. boreoalpinus* Gow. et Thien. (Gowin and Thienemann, 1942, fig. 8). Premandible (Fig. 60C) with 2 teeth, 60–68 long. Mandible 112–114 long, with 7 bristles in inner brush. Labium (Fig. 60A) with rounded median teeth not lighter than lateral teeth, median teeth longer than the first lateral teeth.

Abdomen—Procerci 38 long, 34 wide, each with 6 apical bristles about 330 long, and 2 lateral bristles about 45 and 90 long. Posterior prolegs about 184–194 long.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, Notch Road Spring, Gatineau Park, Que., 16.V. 1967, D. R. Oliver, R. D. Macdonald, and L. Haig-Smillie (CNC No. 9996). Allotype, female with pupal and larval exuviae, same data as holotype.

REMARKS

This species seems to occupy an intermediate position between *P. boreoalpinus* and *P. stylatus*. The basal lobe of the basistyle is of the type found in *P. boreoalpinus*

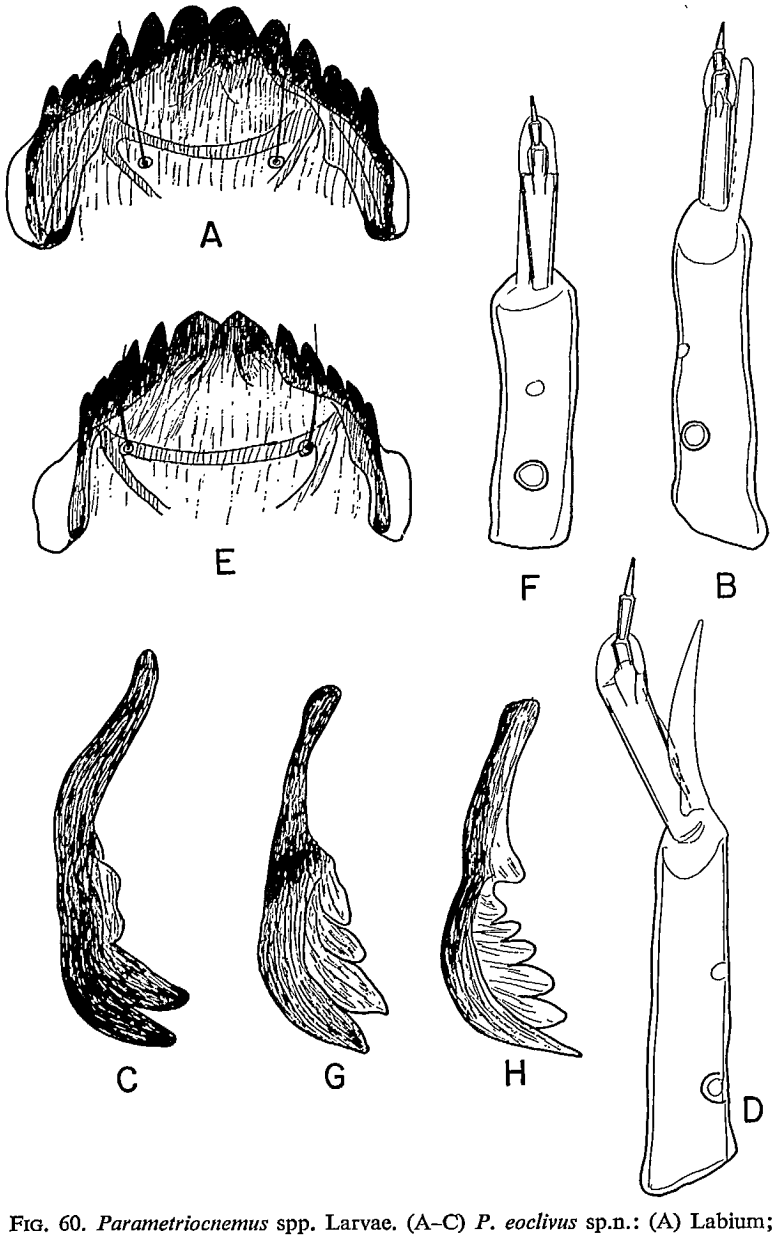

FIG. 60. *Parametriocnemus* spp. Larvae. (A–C) *P. eoclivus* sp.n.: (A) Labium; (B) Antenna; (C) Premandible. (D) *P. lundbecki* (Joh.). Antenna. (E–G) *Parametriocnemus* sp. *A.*: (E) Labium; (F) Antenna; (G) Premandible. (H) *Parametriocnemus* sp. *B.* Premandible.

(Gowin and Thienemann, 1942, fig. 2); the dististyle resembles more that of *P. stylatus* (Brundin, 1956a, fig. 100). The thoracic horn of the pupa is similar to that of *P.*

boreoalpinus; there are filamentous hairs on the anal lobe as in *P. stylatus* (Kownacka and Kownacki, 1967, fig. 2F). The exuvia, however, is more transparent, the spines and shagreenation are less extensive and the male apparently has genital sacs longer than in any other known species of the genus. The larval antenna is somewhat intermediate between those of *P. boreoalpinus* and *P. stylatus*, the labrum bristles and premandible are of the *P. stylatus* type, and the labium seems to differ from both the above species.

Parametriocnemus graminicola (Lundb.)

The specimen found is not fully in accordance with Sublette (1966b, p. 600–602). A detailed description is therefore given.

MALE ($n = 1$)

Length 3.5 mm. Wing length 1.99 mm. Coloration as mentioned by Sublette (1966b, p. 600–602).

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{110}{122}$. Longest bristle of flagellum 490. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{70}{33}, \frac{34}{32}, \frac{35}{31}, \frac{42}{31}, \frac{40}{32}, \frac{40}{30}, \frac{40}{31}, \frac{39}{32}, \frac{39}{31}, \frac{37}{31}, \frac{38}{30}, \frac{38}{30}, \frac{506}{30}$. AR = 1.04.

Head — Vertex (Fig. 61A) with 12 bristles, the longest 115. Clypeus with 11 bristles, the longest 112. Palp lengths: 47, 103, 112, 163.

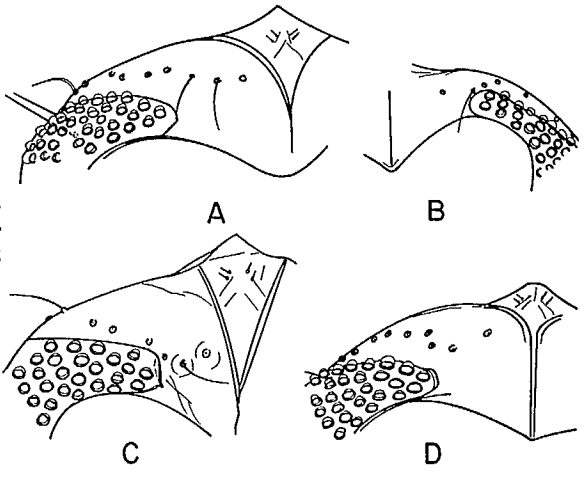

FIG. 61. *Parametriocnemus* spp. Vertex. (A) *P. graminicola* (Lundb.); (B) *P. vespertinus* sp.n.; (C) *P. lundbecki* (Joh.); (D) *P. eoclivus* sp.n.

Thorax — Pronotum as in Fig. 62A, not gradually narrowed apically as Sublette (1966b, p. 600–602) reported on his slightly distorted dry specimen, with 5 lateral bristles. Acrostichals strong, beginning at pronotum; dorsocentrals 12 uniserial, prealars 5 uniserial. Scutellum damaged.

Wing — VR = 1.16 (1.05 in Sublette's specimen). Basal vein with 1 bristle, R with 8–9 bristles, R_1 with 1–2 bristles, R_{4+5} with 10 bristles on apical half, M_{1+2} with about 7 apical bristles. Wing membrane weakly haired on distal 0.20 of cell r_{4+5} and very narrowly along wing margin on m_{1+2} and m_{3+4}. Squama with 7–8 bristles. Sensory organs 1 on Fr and 1 about 60 from base of R_1. Wing venation as mentioned by Sublette (1966b, p. 600–602) except that Fcu is more distal to Rm.

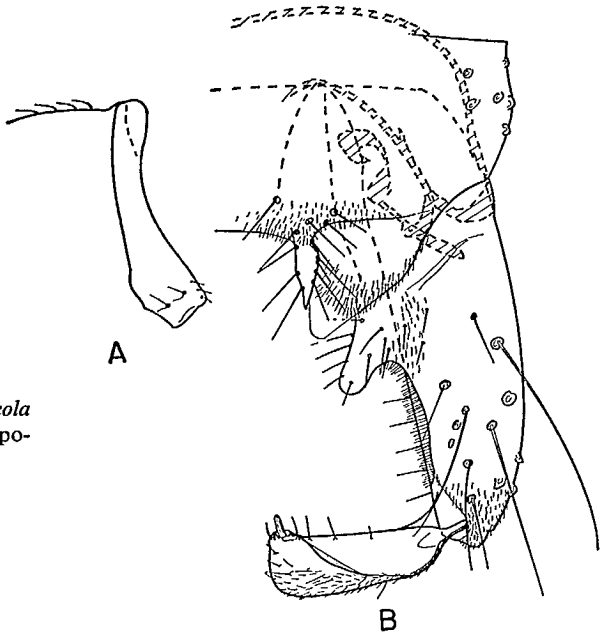

FIG. 62. *Parametriocnemus graminicola* (Lundb.) ♂. (A) Pronotum; (B) Hypopygium.

Legs — Spur of front tibia 58 long. Spurs of middle tibia 22 and 24 long. Spurs of hind tibia 1 lost and the other 62 long. Width of apex of hind tibia 42. Comb with 11 spines 28–50 long. Claw of hind leg 29 long, with about 4 apical teeth. Empodium 38 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	730	828	589	251	221	146	93	0.71	3.02	2.65	2.76
p_2	754	727	374	192	152	100	76	0.51	3.57	3.96	–
p_3	797	871	527	270	202	123	91	0.61	3.20	3.17	3.18

Abdomen — Longest tergite bristle about 235.

Hypopygium (Fig. 62B) — Anal point about 43 long, with 3–5 lateral bristles and 2–3 basal bristles. Dististyle with an apical spine 10 long. HR = 2.41; HV = 3.88.

SPECIMEN EXAMINED

Male, at lighted windows, Waterton Lakes Townsite, Alta., 20.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Greenland (Sublette and Sublette, 1965, p. 156, as *Orthocladius graminicola* [Lundb.]). New to Canada.

REMARKS

The specimen differs from Sublette's redescription of *P. graminicola* (Sublette, 1966b, p. 600–602) in the shape of pronotum, the higher VR, the presence of bristles on the base of the anal point, and by some minor details of the hypopygium.

Parametriocnemus lundbecki (Joh.)

Metriocnemus lundbeckii Johannsen, 1905: 302.
Metriocnemus lundbeckii Joh., Johannsen 1908: 284.
Metriocnemus lundbecki Joh., Malloch 1915b: 498.
Metriocnemus lundbecki Joh., Johannsen 1926: 274.
Metriocnemus lundbeckii Joh., Johannsen 1934: 350.
Metriocnemus lundbecki Joh., Johannsen 1937: 49.
Parametriocnemus lundbecki Joh., Thienemann 1944: 39.
Metriocnemus lundbeckii Joh., Johannsen 1952: 16.
Metriocnemus lundbecki Joh., Roback 1957b: 67.
Metriocnemus lundbecki Joh., Sublette & Sublette 1965: 161.
Parametriocnemus lundbecki (Joh.), Sublette 1967b: 537.
Metriocnemus innocuus Curran, 1930: 33, syn.n.
Metriocnemus innocuus Curr., Johannsen 1934: 350.
Metriocnemus innocuus Curr., Johannsen 1952: 16.
Parametriocnemus innocuus (Curr.), Sublette 1966a: 12.

Parametriocnemus innocuus (Curr.) must be regarded as a junior synonym as the only significant difference between it and *P. lundbecki* lies in the shorter anal point of *P. innocuus*. According to Sublette (1966a, p. 12) this anal point may have been broken off in the preparation of the slide of the holotype. If the anal point was of the same type as that of *P. lundbecki*, then *P. innocuus* is almost certainly a synonym of *P. lundbecki*, if not it may be a separate species. According to Sublette (1967b, p. 541) the 2 species also differ in having a slightly different dististyle. However, as shown below the dististyle of *P. lundbecki* is highly variable as are many other characters of this species.

MALE ($n = 6$, except when otherwise stated)

Length 3.0–3.5 mm, mean 3.3 mm. Wing length 1.65–2.19 mm (5). Coloration as mentioned by Johannsen (1905, p. 302–303) and Sublette (1967b, p. 538).

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{104}{127}$. Longest bristle of flagellum 380–690. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{59}{35}$, $\frac{26}{31}$, $\frac{31}{29}$, $\frac{31}{27}$, $\frac{31}{27}$, $\frac{31}{27}$, $\frac{32}{26}$, $\frac{32}{26}$, $\frac{32}{25}$, $\frac{32}{24}$, $\frac{33}{23}$, $\frac{32}{23}$, $\frac{443}{38}$. AR = 0.90–1.30, mean 1.12.

Head — Vertex (Fig. 61C) with 8–14 bristles, the longest 84–106. Eye seems to have a more or less distinct tooth at apex of dorsal elongation (Fig. 61C). Clypeus with 9–16 bristles, the longest 90–108. Palp lengths: 35–38; 93–130, mean 111; 96–150, mean 121; 140–217, mean 173.

Thorax — Pronotum with 4–10 bristles. Acrostichals at least 4–11 (4), dorsocentrals 10–21 uniserial, biserial, or irregular uni-triserial; prealars 3–6. Scutellum with 7–11 (4) uniserial or 13–17 (2) biserial bristles with those in anterior row much weaker.

Wing — VR = 1.10–1.13, mean 1.12 (5). Basal vein with 1 bristle, R with 16–32 (5) bristles, R_1 with 10–ca. 27 (5) bristles, R_{4+5} with 23–ca. 51 bristles. Free end of costa ca. 50–80 (5) long. Squama with 7–13 bristles. Wing venation and macrotrichia on wings as reported by Johannsen (1905, p. 303, 1934, p. 350) and Sublette (1967b, p. 538).

Legs — Spur of front tibia 39–59, mean 46 long. Spurs of middle tibia 16–19 and 21–30, mean 25 long. Spurs of hind tibia 22–23 and 43–60, mean 50 long. Width of apex of hind tibia 37–52, mean 43. Comb with 9–10 spines, shortest spine 22–34 long, longest spine 45–54 long. Claw of hind leg 22–34 long, with about 3 apical teeth. Empodium 33–56 long. Pulvilli 10–13 (2) long.

Lengths (means) and proportions (ranges and means) of legs

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	687	758	586	316	228	152	91	0.75–0.80, 0.77	2.51–2.64, 2.59	2.38–2.55, 2.47	1.25–2.30
p_2	674	640	371	170	124	79	70	0.56–0.63, 0.58	3.54–3.96, 3.77	3.40–3.62, 3.55	1.77–4.29
p_3	708	786	524	246	195	100	80	0.64–0.72, 0.67	3.11–3.34, 3.25	2.77–2.96, 2.85	1.58–4.82

Abdomen — Longest tergite bristle 120–208.

Hypopygium (Fig. 63) — Anal point 79–90, mean 83 long, with 5–9 weak bristles on each side. Basistyle with a triangular, broad basal lobe, right-angled (Fig. 63C) to rounded (Fig. 63H) apically. Dististyle highly variable (Fig. 63A–G), with a broad transparent preapical tooth, and an apical spine 9–12 long. HR = 2.23–2.66, mean 2.41 (5); HV = 4.21–4.69, mean 4.42 (5).

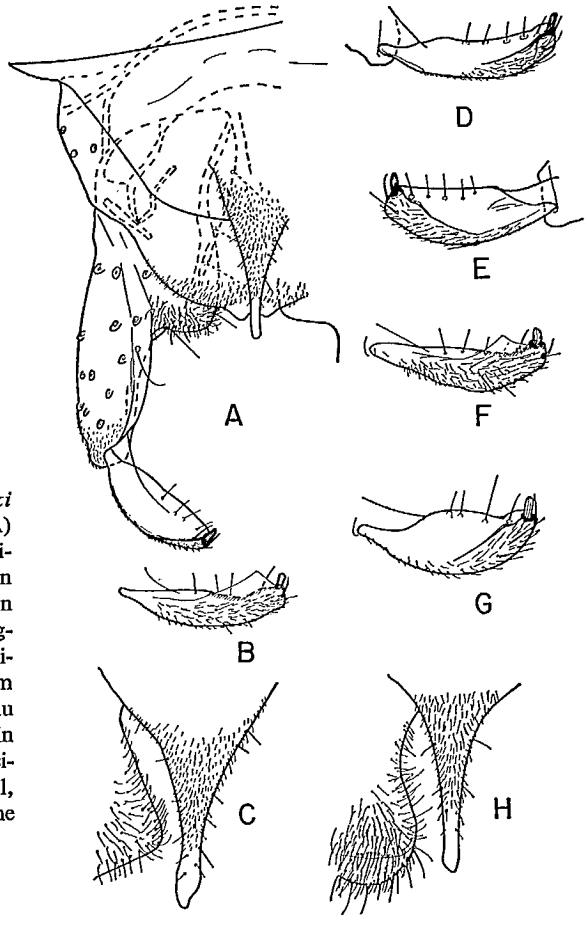

FIG. 63. *Parametriocnemus lundbecki* (Joh.) ♂. Variation hypopygium. (A) Specimen from Rowe Creek; (B) Dististyle of specimen from Rowe Creek in other view; (C) Anal point of specimen from Kenora (miles 6–7 on Mando logging road); (D) Dististyle of same specimen. (E) Dististyle of specimen from stream crossing Notch Road, Gatineau Park; (F) Dististyle of same specimen in different view; (G) Dististyle of specimen from stream near Beamish Hill, Gatineau Park; (H) Anal point of same specimen.

FEMALE (n = 5, except when otherwise stated)

Length 2.4–2.9 mm, mean 2.6 mm. Wing length 1.75–1.88 mm, mean 1.78 mm. Coloration as in male.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{53}{60}$. Longest bristle of flagellum 121–155. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{81}{32}$, $\frac{54}{26}$, $\frac{55}{25}$, $\frac{59}{24}$, $\frac{87}{27}$. AR = 0.32–0.36, mean 0.35 (7).

Head — Vertex with 8–13 bristles, the longest 99–192 (4). Clypeus with 8–12 bristles, the longest 92–128 (4). Palp lengths: 28–39, mean 32; 84–106, mean 95; 103–127, mean 112; 124–180, mean 158.

Thorax — Pronotum with 5–9 bristles. Acrostichals about 16 (2), dorsocentrals 22–31 unitriserial, prealars 3–5. Scutellum with 9–13 strong uniserial bristles and with sometimes (3 of 5 examined specimens) 1–3 weak bristles in a row anterior to the strong bristles.

Wing — VR = 1.02–1.10, mean 1.06. Basal vein with 1 bristle, R with 22–38, R_1 with 19–36, R_{4+5} with 68–105 bristles. Squama with 8–13 bristles. Free end of costa about 96–110 long.

Legs — Spur of front tibia lost or possibly absent in all specimens. Spurs of middle tibia 17–19 and 19–28 mean 23 long. Spurs of hind tibia 17–21 and 44–48 long. Width of apex of hind tibia 45–50. Comb with 10–12 spines, the shortest spine 28–30 long, the longest spine 46–51 long. Claw of hind leg 21–28 long. Empodium about 37 long.

Lengths (means) and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	625	705	522	273	201	135	82	0.72–0.76, 0.74	2.57–2.86, 2.68	2.45–2.62, 2.55	1.00–2.33
p_2	614	607	331	157	115	74	70	0.53–0.56, 0.55	3.55–3.84, 3.73	3.59–3.83, 3.69	1.14–2.35
p_3	660	777	496	224	182	94	78	0.63–0.66, 0.64	3.21–3.44, 3.34	2.81–2.96, 2.89	1.14–4.00

Abdomen — Longest tergite bristle 150–185 (3).

PUPA

Length 3.0–4.2 mm, mean 3.4 mm (14). Exuvia pale subfuscous to subfuscous.

Cephalothorax — Thoracic horn of *P. stylatus* (Kieff.) type (Johannsen, 1937, fig. 166; Kownacka and Kownacki, fig. 2E); 262–335, mean 294 (15) long; 45–66, mean 56 (15) wide. Anterior bristle in front of horn 75–100 (4) long, located 10–19 (5) from median bristle. Median bristle 96–134 (4) long, located 7–10 (5) from posterior bristle. Posterior bristle 34–58 (4) long, located 54–64 (5) from horn. Frontal bristles absent. Wing sheaths with 3–6 rows of "pearls."

Abdomen — Shagreenation not present on tergite I and sternite IX. Tergite II with all but lateral parts of segment shagreened or with less extensive shagreenation, tergites III–VIII almost fully covered by shagreenation, tergite IX with rather extensive shagreenation, anal lobes and apical part without spinules. Sternite I with a few posterior spinules, II with anteriolateral and posterior patches of very faint shagreenation with or without an anterior group of stronger spines (Fig. 64A, B), III with sparse shagreenation on most of segment, IV with anteriomedial and anteriolateral shagreenation, V with faint anterior and central shagreenation, VI with or without anterior shagreenation and with central and posteriomedian shagreenation, VII with median and posteriomedian shagreenation, VIII with median and sparse posteriomedian shagreenation. Spines, similar to those of *P. stylatus*, present near caudal margins of tergites II–VIII, rudimentary spines sometimes present on caudal parts of tergite I. Sternites III–VII (VIII) with spines near caudal margin. Spines very variable in size and numbers (Fig. 64C–G). Integuments of tergites and sternites with or without greyish polygons (Fig. 64C–G). Pedes spurii A very faint, normally visible only on sternite VI, but probably present on IV–VII. Pedes spurii B long (Fig. 64A, B) of normal *Parametriocnemus* type. Length of bristles on V (n = 4–5): L_1 = 40–47, L_2 = 45–66, L_3 = 34–39, D_1 = 31–42, D_2 = 29–54, D_3 = 28–40, D_4 = 44–60, D_5 = 31–44. Distance between L_1 and L_2 1–13, between L_2 and L_3 130–ca. 170. D_4 on VIII 46–ca. 55 long. Anal lobe with a fringe which occupies most of the lobe, but less than that drawn by Johannsen (1937, fig. 168); fringe with 8–10 hairs 106–176 (4) in length. Anal bristles 163–210, mean 190 (15) long. Genital sac of male extending slightly beyond the tips of the anal lobes.

LARVA (n = 2, except when otherwise stated)

Length 2.9–3.2 mm. Head capsule length 0.34–0.36 mm. Coloration as mentioned by Johannsen (1937, p. 49).

Head — Antenna (Fig. 60D) about as drawn by Johannsen (1937, fig. 163), but the Lauterborn organs are slightly larger. Length of antennal segments (n = 1): 53, 17, 9, 7, 6. AR = 1.36–ca. 1.6. Basal segment 16 wide; distance from base to annular organ 3–4, to first bristle mark 7–13, to second bristle mark 21–26; length of blade at apex 27–28. Labrum bristles as in *P. stylatus* (Kieff.) (Kownacka and Kownacki, 1967, fig. 2A). Premandible with 2 larger teeth and 1 smaller tooth, as in *P. stylatus*

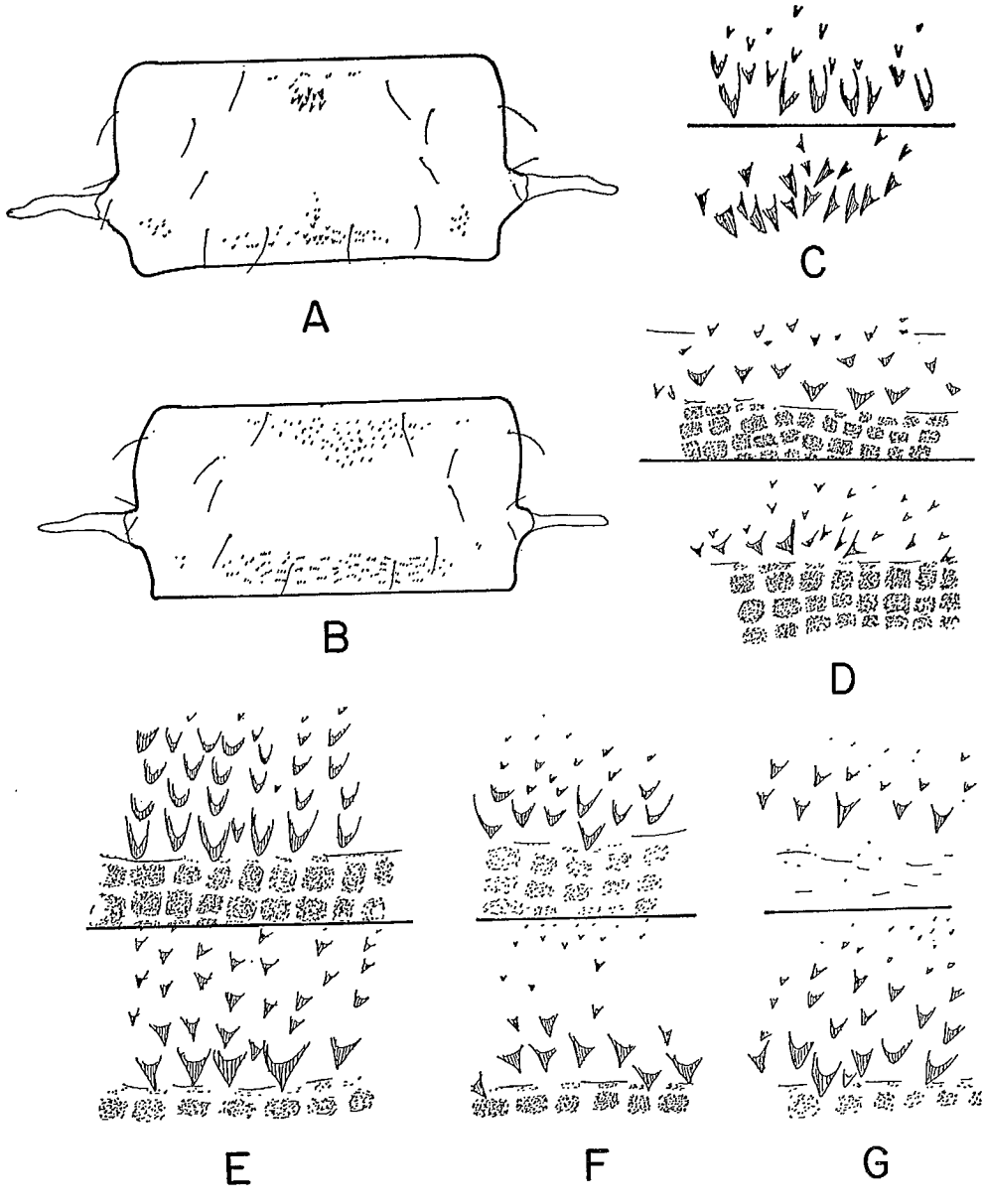

FIG. 64. *Parametriocnemus lundbecki* (Joh.) Pupa. (A–B) Sternite II: (A) Exuvia from Rowe Creek; (B) Exuvia from Kenora (miles 18–19 on Mando logging road). (C–G) Variation of posterior rows of spines and in formation of integumental polygons on tergite V (above the line) and on sternite V (below the line): (C) Exuvia from Rowe Creek; (D) Exuvia from Kenora, same specimen as in B; (E) Exuvia from stream near Beamish Hill, Gatineau Park; (F) Exuvia from stream crossing Notch Road, Gatineau Park; (G) Exuvia from stream below Lake Riviera.

(Kownacka and Kownacki, 1967, fig. 2C); 59–70, mean 64 (3) long. Mandible (Johannsen, 1937, fig. 162) 110–122, mean 116 (3) long. Labium as in *P. stylatus* (Kownacka and Kownacki, 1967, fig. 2C), median teeth not lighter than lateral teeth.

Abdomen — Procerci (Johannsen, 1937, fig. 164) 42–53, mean 49 (3) long; 26–29 (3) wide; with 5–7 apical bristles 360–480 long and 2 lateral bristles about 125–130 and 38–50 long. Anal tubules about 153–182 long. Posterior prolegs 213–220 long.

SPECIMENS EXAMINED

Male with pupal and larval exuviae, stream crossing Notch Road, Gatineau Park, Que., 3.IV.1966, D. R. Oliver; male with pupal and larval exuviae, stream near Beamish Hill, Gatineau Park, Que., 25.IV.1967, D. R. Oliver; pupa with larval exuvia, MacKenzie King Domain, Gatineau Park, Que., 25.IV.1967, D. R. Oliver; 4 males, female with pupal exuvia, 49 pupal exuviae, (Population I in Table 3), fast flowing stream, between miles 18 and 19 on Mando logging road, Kenora, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther; 4 males, 9 females, 32 pupal exuviae, (Population II in Table 3), fast flowing stream, between miles 6 and 7 on Mando logging road, Kenora, Ont., 23.VIII.1967, A. L. Hamilton and O. A. Sæther; female, at lights, Rushing River Campsite, Ont., 22.VIII.1967, A. L. Hamilton and O. A. Sæther; 13 males, 3 females with pupal exuviae, 31 females, 12 pupae, 14 pupal exuviae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther; female with pupal exuvia, female, 6 pupal exuviae, small mountain stream, water temp 7.5 C, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Greenland (?), Michigan, Illinois, New York, Pennsylvania, Florida (Sublette and Sublette, 1965, p. 161, as *Metriocnemus lundbeckii* and *Metriocnemus innocuus*). New to Canada.

REMARKS

Parametriocnemus lundbecki is very closely related to *P. stylatus* (Kieff.). *Parametriocnemus stylatus*, however, has a differently shaped basal lobe of the basistyle and the preapical tooth of the dististyle is much smaller and more pointed (Brundin, 1956a, fig. 100) than in *P. lundbecki*. The immature stages seem to be inseparable, and *P. stylatus* is known to be very variable (Thienemann, 1937b, p. 28–29) so the possibility that *P. stylatus* is a synonym of *P. lundbecki* (Joh.) cannot be quite excluded.

VARIATION

As is apparent from the above description, the variation of this species is very great; the possibility that 2 or even more species are included in the above description cannot be quite excluded. In particular, the specimens from Waterton may belong to another species as they have a lower AR than the others, the pupae differ by having anterior spines on sternite II, and the polygons on the anterior segments are indistinct whereas they are dark and distinct in other specimens. In addition, the larvae of *Parametriocnemus*, sp. *A* and sp. *B* (see below), both found at Waterton, are different from those of *P. lundbecki*. If one of these larvae is eventually shown to belong to the same species as the pupa and the imagines from Waterton, one would have to conclude that the Waterton specimens belong to a separate species. The variation within the same population, however, is also very great and for the moment all specimens found have to be assigned to *P. lundbecki*. A comparison of males and pupae from different localities is given in Table 3.

Parametricnemus vespertinus sp.n.

This species is characterized by a very low AR (about 0.29–0.30), 15–18 strong acrostichals, 26–35 biserial dorsocentrals, wings covered with macrotrichiae except in

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TABLE 3. Comparison of different populations of *Parametriocnemus lundbecki* (Joh.). Ranges and means. (No. of specimens measured in parentheses.)

	Waterton	Rushing River	Kenora		Gatineau Park
			Population I	Population II	
MALES					
Wing length (*mm*)	1.60–1.86, 1.72 (8)	–	1.53–1.76 (2)	1.52–1.74 (2)	1.77–2.19 (2)
AR	0.92–0.98, 0.95 (8)	–	1.13–1.45, 1.26 (4)	1.16–1.30, 1.24 (4)	1.15–1.30 (2)
Dorsocentrals	12–17, 14 (9)	–	10–19, 15 (4)	13–19, 17 (4)	12–21, 15 (3)
PUPAE					
Length (*mm*)	3.1–3.4, 3.3 (6)	3.7	3.0–3.3, 3.2 (6)	–	3.7–4.2 (2)
Length of horn ( )	262–300, 284 (6)	288	272–309, 291 (6)	–	333–335 (2)
Width of horn ( )	48–61, 53 (6)	46	56–66, 62 (6)	–	45–57 (2)
Length of anal bristles ( )	186–203, 196 (6)	198	163–210, 186 (6)	–	163–195 (2)

c, r, and along R_{4+5} in r_{4+5}, anal point very long, without distinct lateral bristles, basal lobe of basistyle with a naked dorsal part and a haired ventral part, dististyle with a very large preapical projection. Pupa with posterior spines on tergites II–VIII and sternites V–VIII, and with filamentous hairs on anal lobes.

MALE (n = 2, when not otherwise stated)

Length 2.3–2.7 mm (3). Wing length 1.43–1.49 mm. Thorax light fuscous with three darker vittae.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{79}{105}$. Longest bristle of flagellum 320–330. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{49}{25}$, $\frac{27}{25}$, $\frac{30}{22}$, $\frac{37}{19}$, $\frac{37}{19}$, $\frac{40}{19}$, $\frac{40}{19}$, $\frac{41}{18}$, $\frac{41}{18}$, $\frac{39}{18}$, $\frac{41}{17}$, $\frac{41}{17}$, $\frac{137}{27}$. AR = 0.29–0.30.

Head — Vertex (Fig. 61B) with 8–9 (3) bristles, the longest 93–108. Clypeus with 10–13 (3) bristles, the longest 95–105 (3). Palp lengths: 32, 72–80, 79–80, 100–114.

Thorax — Pronotum with 7–9 bristles. Acrostichals 14–18 strong, dorsocentrals 26–35 (3) biserials, prealars 5–7 (3). Scutellum with 6–7 strong bristles and 3–6 weak bristles all in a single row.

Wing — VR = 1.15. Macrotrichia present on whole wing except in c, r, and along R_{4+5} in r_{4+5}. Basal vein with 1 bristle, R with 18–22, R_1 with 12–17, R_{4+5} with 30–39. Squama with 6–7 bristles. Sensory organs 1 on Fr, 1 on R_1, 35 from base. Free end of costa 87–90 long.

Legs — Spur on front tibia 32 long. Spurs of middle tibia 16 and 24 long. Spurs of hind tibia 25 and 45–48 long. Width of apex of hind tibia 37–39. Comb with 8 spines 30–50 long. Claw of hind leg 20–23 long. Empodium 37–38 long. Pulvilli very faint, 10–12 long.

Lengths (means) and proportions (ranges) of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	493	566	370	203	144	95	76	0.65–0.66	2.75–2.77	2.86–2.87	2.67–3.11
p_2	507	512	257	129	99	72	69	0.50	3.43–3.50	3.93–4.00	2.22–3.50
p_3	546	596	392	188	130	79	73	0.64–0.68	3.10–3.44	2.83–3.00	1.70–5.00

Abdomen — Tergite bristles tending to be arranged in anterior, posterior, and lateral rows; tergite V with 20 bristles; longest bristle of tergites 120–130. Sternites with a median band of bristles, about 13 bristles on sternite V.

Hypopygium (Fig. 65) — Anal point 80–91 long, extending beyond the basal lobe of basistyle, without lateral bristles, but with 3–5 long dorsolateral hairs. Basal lobe of basistyle with a naked, somewhat pointed dorsal surface and a hairy ventral surface. Dististyle with a very large preapical projection, apical spine 12 (1) long. HR = 2.14; HV = 3.97–4.25.

PUPA (n = 1)

Length about 2.3 mm. Exuvia subfuscous.

Cephalothorax — Thoracic horn 291 long, 57 wide. Anterior bristle in front of horn about 88 long, located 5 from median bristle. Median bristle about 78 long, located 6 from posterior bristle. Posterior bristle about 32 long, located 77 from horn and 6 from anterior bristle. Wing sheath apparently with row of "pearls."

Abdomen — Shagreenation, segment I apparently bare, tergites II–VIII mostly covered with spinules, sternites IV–VIII with a few posteriomedian spinules and possibly a few spinules near the center of sternite; however, the number of spinules are not clearly visible as the pupa is partly damaged and it was mounted on its side. Spines present posteriorly on tergites II–VIII and sternites V–VIII. Anal segment lost during preparation, but there were at least some filamentous bristles on anal lobes.

LARVA

Two different larvae of *Parametriocnemus* were found together with *P. vespertinus* sp.n. and *P. lundbecki* (Joh.). *Parametriocnemus vespertinus* is in all likelihood identical with *Parametriocnemus* sp. *A* or sp. *B*.

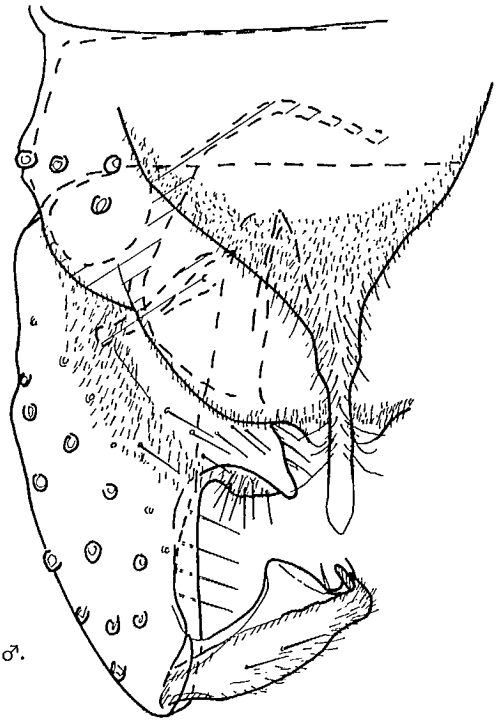

FIG. 65. *Parametriocnemus vespertinus* sp.n. ♂. Hypopygium.

TYPE MATERIAL

Holotype, male, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 9997). Paratypes, male, damaged male pupa, same data as holotype.

REMARKS

This species can be separated from all other known species of *Parametriocnemus* by its low AR and the very characteristic hypopygium. The pupa seems to be of the *P. stylatus* (Kieff.) type.

Parametriocnemus sp. *A*

This larva may belong to *P. vespertinus* sp.n. or possibly to *P. graminicola* (Lundb.). It may also belong to the specimens of *P. lundbecki* (Joh.) found in Rowe Creek as these specimens differ slightly from specimens from other localities (see p. 119).

LARVA (n = 2, except when otherwise stated)

Length 4.1 mm (1). Head capsule length 0.29–0.33 mm. Head subluteous. Mandible dark on apical half. Median teeth of labium lighter than the lateral ones.

Head — Antenna (Fig. 60F) with Lauterborn organs longer than segments 3 and 4 combined. Lengths of antennal segments: 37–42, 17 (1), 4 (1), 4 (1), 3 (1). AR = 1.40 (1). Basal segment 9–13 wide; distance from base to annular organ 13 (1), to first bristle mark 9 (1), to second bristle mark 26 (1). Seta anteriores strong, plumose; seta posteriores single, as in *P. eoclivus* sp.n., *P. lundbecki* (Joh.), and *P. stylatus* (Kieff.) (Kownacka and Kownacki, 1967, fig. 2B). Premandible (Fig. 60G)

with 4 teeth, 47–61 long. Mandible 95–108 long, with about 7 bristles in inner brush. Labium (Fig. 60E) with somewhat pointed teeth, median teeth longer than the first laterals.

Abdomen — Procerci about 30 (1) long, 20 (1) wide, each with 5 or 6 (1) apical bristles about 200 (1) long and 2 lateral bristles 40 (1) and 60 (1) long. Anal tubules 150–165 long.

SPECIMENS EXAMINED

2 larvae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

The larva has antennae of the *P. boreoalpinus* type, labrum bristles of the *P. stylatus* type, and the premandible and labium are of an intermediate type.

Parametriocnemus sp. *B*

The larva may belong to *P. vespertinus* sp.n. or possibly to *P. graminicola* (Lundb.). It may also be identical with *P. boreoalpinus* Gow. et Thien. It is, however, probably not identical with the specimens of *P. lundbecki* (Joh.) found in Rowe Creek.

LARVA (n = 2, when not otherwise stated)

Length 4.5–4.6 mm. Head capsule length 0.26 mm. Head subluteous. Mandible dark on apical half. Median teeth of labium lighter than the lateral ones.

Head — Antenna with Lauterborn organs almost as long as segment 3 and 4 combined. Length of antennal segments: 42, 16–17, 5 (1), 3 (1), 2 (1). AR = 1.50 (1). Basal segment 13–14 wide, distance from base to annular organ 18 (1), length of blade at apex apparently about 20 (1). Labrum bristles, premandible (Fig. 60H), labium, hypopharynx, and mandible as in *P. boreoalpinus* Gow. et Thien. (Gowin and Thienemann, 1942, fig. 5–8; Kownacka and Kownacki, 1967, fig. 1A–D). Premandible 48–52 long. Mandible 94 long.

Abdomen — Procerci 16 (1) long, 16 (1) wide, with apical bristles about 250 (1) long. Anal tubules about 154 (1) long.

Other details as in *P. boreoalpinus* (Gowin and Thienemann, 1942, p. 105–108; Kownacka and Kownacki, 1967, p. 188–189).

SPECIMENS EXAMINED

2 larvae, large mountain stream, Rowe Creek, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

REMARKS

The larva differs from *P. boreoalpinus* only in having an antenna that is shorter than the mandible and with an apparently shorter blade at apex of basal segment. The blade of basal segment, however, may be broken off.

Genus *Paraphaenocladius* Thien.

Paraphaenocladius nasthecus sp.n.

The species is characterized by an AR of about 0.77; about 23 dorsocentrals; about 11 prealars; wings with macrotrichia along all veins except subcosta and M_{1+2} basal of Rm; wing membrane with macrotrichia in most of cell r_{4+5}, in most of that part of m_{1+2} apical of Rm, in more than half m_{3+4} and along margin of an; and dististyle with an apical tooth. The pupa has a thoracic horn with spinules present on

more than apical two thirds, wing sheath with a "nose," but without a row of "pearls," and anal lobes apparently without anal bristles.

MALE (n = 1)

Length 3.0 mm. Wing length 1.56 mm. Thorax luteous with 3 dark vittae, scutellum, legs and halteres pale.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{\text{ca. } 102}{122}$. Longest bristle of flagellum about 400. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{50}{36}, \frac{22}{30}, \frac{26}{30}, \frac{33}{30}, \frac{32}{30}, \frac{35}{31}, \frac{36}{30}, \frac{38}{30}, \frac{36}{28}, \frac{36}{27}, \frac{38}{26}, \frac{37}{26}, \frac{324}{27}$. AR = 0.77.

Head — Vertex with 13–14 bristles, the longest 70. Clypeus with 8 bristles. Palp lengths: 44, 90, 104, 144.

Thorax — Pronotum with 6 bristles. Dorsocentrals 23 uni-biserial, prealars 15. Scutellum with 9 bristles.

Wing (Fig. 66) — VR = 1.13. Bristles present on all veins except subcosta and the part of M_{1+2} basal of Rm. Wing membrane with macrotrichia in most of r_{4+5}, in most of m_{1+2} apical of Rm, in more than half m_{3+4}, and along margin of an. Basal vein with 2 bristles, R with 30, R_1 with 18, and R_{4+5} with 28 bristles. Squama with 5 bristles. Sensory organs 1 on Fr, 1 on R_1 65 from base. Free end of costa 47 long.

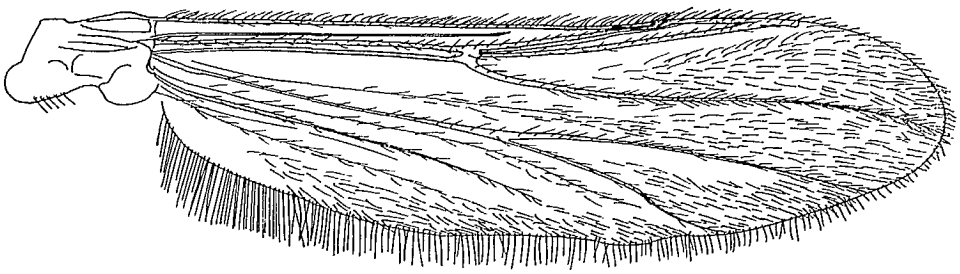

FIG. 66. *Paraphaenocladius nasthecus* sp.n. ♂. Wing.

Legs — Spur of front tibia 53 long. Spurs of middle tibia 21 and 26 long. Spurs of hind tibia 22 and 56 long. Width of apex of hind tibia 30. Comb with 10 spines 27–44 long. Claw of hind leg 28 long. Empodium 43 long. Pulvilli faint, about 13 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	593	615	454	263	188	115	77	0.74	2.58	2.66	2.77
p_2	576	567	288	154	115	72	77	0.51	3.42	3.97	1.88
p_3	615	670	452	222	161	95	85	0.67	3.09	2.84	4.50

Abdomen — Tergites with mostly uniformly distributed bristles in paler spots, the longest 164.

Hypopygium (Fig. 67) — Anal point 80 long, and naked at apex with 6–7 bristles on each side. Dististyle relatively broad at apex, with an apical tooth and an apical spine about 12 long. HR = 2.00; HV = 3.31.

PUPA (n = 1)

Length 3.3 mm. Exuvia transparent.

Cephalothorax — Thoracic horn (Fig. 68C) 188 long, 16 wide, with spinules on more than the apical two thirds. Anterior bristle in front of horn 28 long, located 6 from median bristle. Median bristle about 40 long, located 6 from posterior bristle. Posterior bristle about 36 long, located 56 from

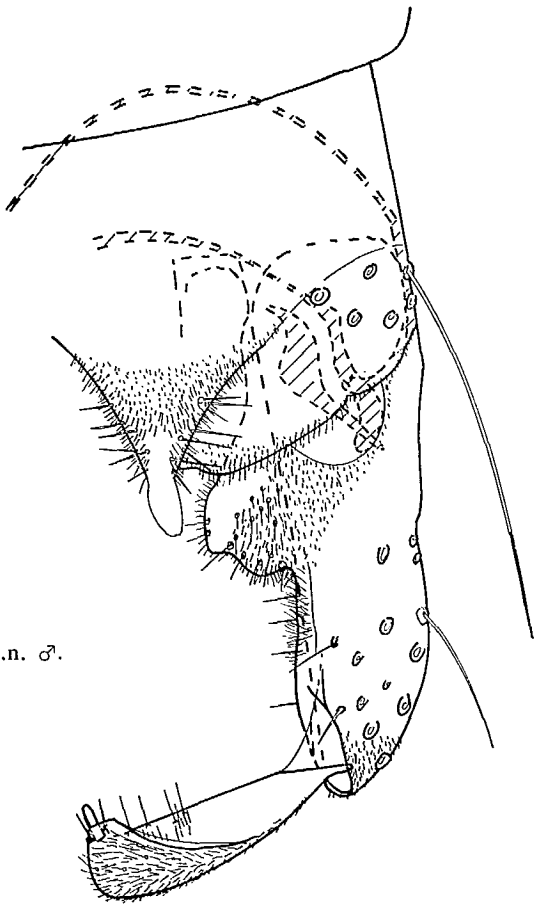

FIG. 67. *Paraphaenocladius nasthecus* sp.n. ♂. Hypopygium.

horn. Wing sheath (Fig. 68B) with a "nose," without a row of "pearls," but with very faint perpendicular lines that are visible only with interference — or phase — contrast illumination.

Abdomen — Shagreenation not present on segment I and sternite II. Tergites II–VIII mostly covered with shagreenation, tergite IX with anteriomedian shagreenation (Fig. 68A). Sternites III–IV with very faint posteriomedian shagreenation; V–VIII with a narrow, longitudinal, median band of shagreenation and a posterior row of spinules. Length of bristles on V: $L_1 = 84$, $L_2 =$ ca. 50, $L_3 =$ ca. 40, $D_1 = 42$, $D_2 = 31$, $D_3 = D_5 = 30$, $D_4 = 42$. D_4 on VIII 35 long. Anal lobes (Fig. 68A) apparently without anal bristles, with slightly more spines at apex than in *Paraphaenocladius impensus* subsp. *monticola* Str. (Strenzke, 1950, fig. 2).

TYPE MATERIAL

Holotype, male with pupal exuvia, ditch beside road, Sandylands Forest Reserve, Man., 21.V. 1967, A. L. Hamilton (CNC No. 9998).

REMARKS

This species may merely be a form of *P. impensus* Walk. as the imagines are nearly identical (Edwards, 1929, p. 314–315; Goetghebuer, 1940–50, p. 7, 20; Brundin, 1956a, p. 136–137). However the wings are less hairy than in *P. impensus* (Goetghebuer, 1940–50, fig. 7), and the dorsodistal tooth of the dististyle is apical whereas in *P. impensus* it is, according to Brundin (1956, fig. 101), preapical. 2 males borrowed from

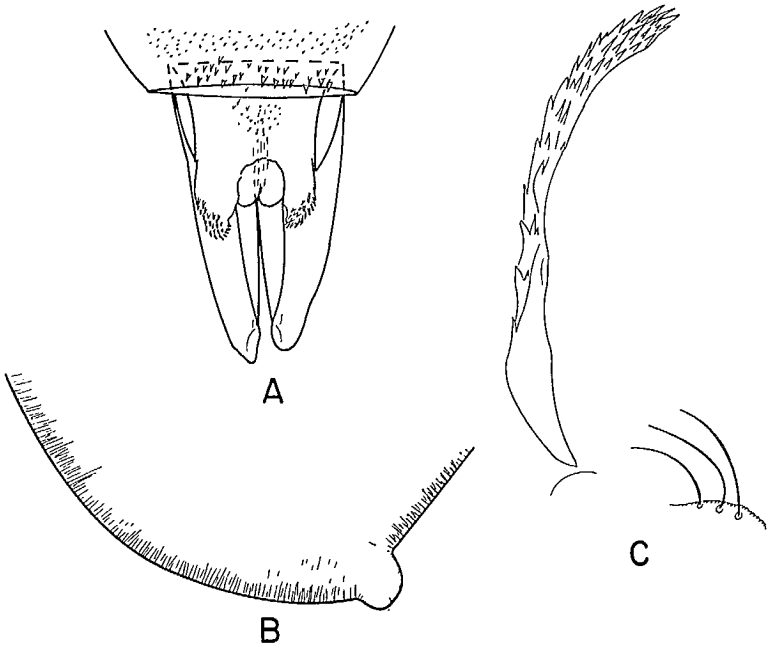

FIG. 68. *Paraphaenocladius nasthecus* sp.n. Pupa. (A) Anal lobe; (B) Apex of wing sheath with "nose"; (C) Thoracic horn.

the Canadian National Collection in Ottawa are particularly interesting. These specimens, collected at Vestmanneyjar, Iceland, are probably *P. impensus*, but they are somewhat intermediate between the continental European form and *P. nasthecus* sp.n. The shape of the dististyle and the various ratios are all very close to this new species; however, the wings are much more hairy with 47 bristles on R, 19 on R_1, 44 on R_{4+5}, 9 on squama, bristles on most of M_{1+2} basal of Rm, and covering most of cells r_{4+5}, m_{1+2}, m_{3+4}, and an. The pupa of *P. nasthecus* differs from *P. impensus* (Thienemann and Strenzke, 1941, p. 141–142; Strenzke, 1950, p. 213, 228) by having spinules on apical two thirds of thoracic horn, no row of "pearls" on wing sheath, shagreenation present on sternites III–VIII and not just V–VIII, stronger spinules present on posterior part of tergite VI as well as on VII–VIII, and apparently no bristles on anal lobe.

Genus *Pseudorthocladius* Goetgh. 1943 (1940–50)

Pseudorthocladius dumicaudus sp.n.

The species is characterized by a high AR (about 1.4), acrostichals that extend more than one third of the way up on mesonotum, dorsocentrals about 17, biserial anteriorly and uniserial posteriorly, scutellar bristles scattered, wing membrane without macrotrichia, squama with about 8 bristles, R_{2+3} ending slightly proximal of the middle of the distance between R_1 and R_{4+5}, and an anal point with an unusually high number of bristles (about 30).

MALE ($n = 1$)

Length 3.2 mm. Wing length 1.82 mm. Thorax brownish-black; halteres, abdomen, and legs brownish.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{99}{122}$. Longest bristle of flagellum about 550. Last segment of flagellum with a straight apical bristle 80 long and several sensory bristles about 70 long. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{56}{35}$, $\frac{21}{35}$, $\frac{24}{33}$, $\frac{26}{32}$, $\frac{30}{33}$, $\frac{31}{33}$, $\frac{32}{34}$, $\frac{33}{34}$, $\frac{33}{35}$, $\frac{34}{34}$, $\frac{34}{35}$, $\frac{35}{35}$, $\frac{531}{34}$. AR = 1.40.

Head — Vertex with 8 bristles, the longest 80. Clypeus with 7 bristles, the longest 95. Palp lengths: 62, 140, 106, 146.

Thorax — Pronotum strong, with 5 bristles. Acrostichals at least 15 beginning at pronotum and continuing more than ⅓ of the way up on mesonotum; dorsocentrals 17, biserial anteriorly uniserial posteriorly; prealars 4 very strong and 7 normal, irregularly uniserial. Scutellum with about 12 scattered bristles.

Wing — VR = 1.13. Membrane without macrotrichia. Basal vein with 1 bristle, R with 21–23 bristles, R_1 with 8, R_{4+5} with 17–19 bristles. Squama with 8 bristles. Sensory organs 1 on membrane proximal of Fr, 1 about 40 from base on R_1. Free end of costa 80 long. R_{4+5} ends somewhat distally of M_{3+4}. R_{2+3} ends slightly proximal of midway between R_1 and R_{4+5}. Cu_1 relatively strongly curved.

Legs — Spur of front tibia 62 long. Spurs of middle tibia 20 and 31 long. Spurs on hind tibia 22 and 80 long. Width of apex of hind tibia 53. Comb with 12 spines 33–52 long. Claw of hind leg 40 long. Empodium 55 long. Pulvilli distinct, about 35 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	761	816	521	294	214	140	84	0.64	2.87	3.03	2.77
p_2	748	736	319	170	126	74	65	0.43	4.14	4.65	3.00
p_3	871	945	527	251	206	114	74	0.56	3.63	3.45	3.93

Abdomen — Tergites with uniformly distributed bristles, the longest bristle 175.

Hypopygium (Fig. 69) — Anal point about 32 long, semicircular, with about 30 bristles, the longest bristle 36. Basistyle with a relatively small basal lobe. Dististyle relatively narrow, with an apical spine 13 long. HR = 2.00; HV = 3.25.

TYPE MATERIAL

Holotype, male, at hut, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 30.VI.1965, A. L. Hamilton (CNC No. 9999).

REMARKS

This new species seems to occupy an intermediate position between *Pseudorthocladius filiformis* (Kieff.) (Edwards, 1929, p. 350; Goetghebuer, 1940–50, p. 73–74) and *Pseudorthocladius pilosipennis* Brund. (Brundin, 1956, p. 139, fig. 102). The wing membrane is naked as in *P. filiformis:* the wing venation is similar to that of *P. pilosipennis.*

Genus *Gymnometriocnemus* Goetgh.

Gymnometriocnemus brumalis (Edw.)

Although there are some small differences between this specimen and the specimens described by Edwards (1929, p. 316, fig. 3G) and Brundin (1956a, p. 143, fig. 105) the specimen probably belongs to *G. brumalis.* The AR is 0.95; Edwards (1929, p. 316, fig. 3G) reports an AR of about 1.3. The tarsal segments on the front and hind leg are lost, but the LR on the middle leg is 0.47. The wing is hairy on the outer half.

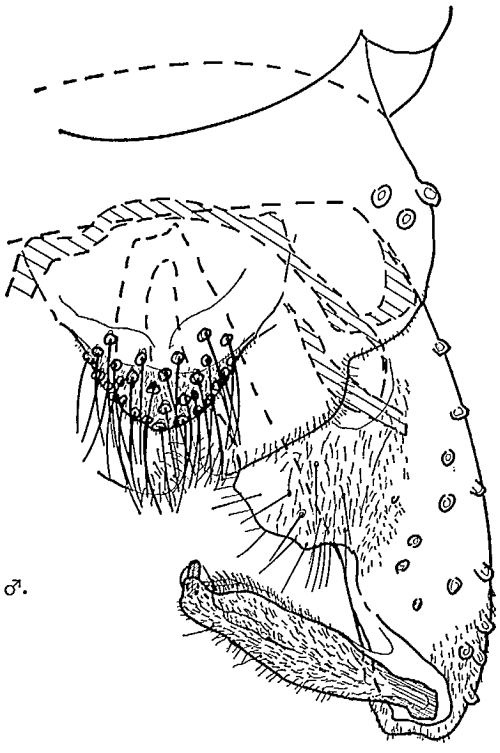

FIG. 69. *Pseudorthocladius dumicaudus* sp.n. ♂.
Hypopygium.

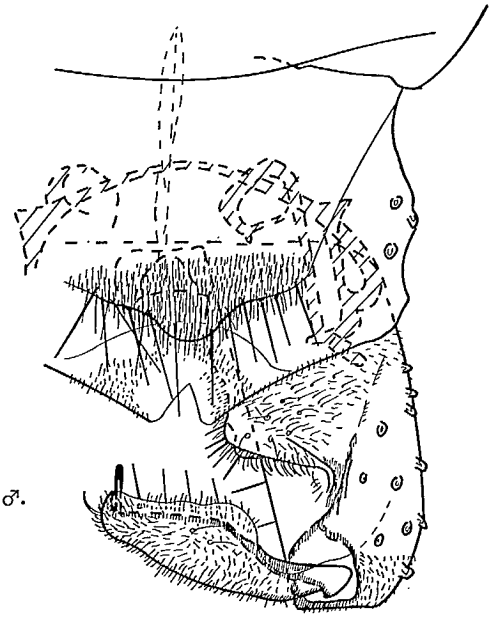

FIG. 70. *Gymnometriocnemus brumalis* Edw. ♂.
Hypopygium.

The small differences in hypopygium between this specimen (Fig. 70) and the specimen drawn by Brundin (1956a, fig. 105) are probably due mainly to their different positions on the slides.

SPECIMENS EXAMINED

Male, small mountain stream, water temp 6.5 C, along road to Takkakaw Falls near Field, B.C., 12.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

England and Sweden (Brundin, 1956a, p. 143). New to North America.

Gymnometriocnemus marionensis sp.n.

The species is characterized by R_{2+3} ending slightly distal of the middle of the distance between R_1 and R_{4+5}, the presence of an anal point, and the slender dististyle with its unusually long apical spine.

MALE ($n = 1$)

Length 3.8 mm. Wing length 1.61 mm. Thorax luteous with 3 brown vittae.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{94}{120}$. Longest bristle of flagellum about 570. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{56}{29}, \frac{28}{26}, \frac{28}{28}, \frac{29}{26}, \frac{31}{24}, \frac{31}{20}, \frac{34}{20}, \frac{34}{19}, \frac{33}{20}, \frac{35}{20}, \frac{34}{19}, \frac{35}{19}, \frac{448}{27}$. AR = 1.11.

Head — Vertex with 8 bristles, the longest 86. Clypeus with 11 bristles, the longest 86. Palp lengths: 38, 128, 98, 130.

Thorax — Pronotum with 4 very weak bristles. Dorsocentrals 14, prealars 7. Scutellum with 6 uniserial bristles.

Wing — VR = 1.24. Macrotrichia on apical third of wing, 30–80 long. Basal vein with 2 bristles, R with 21, R_1 with 15, and R_{4+5} with 23 bristles. Sensory organs 1 on Fr, 1 on R_1 1/5 from base. R_{2+3} proximally running midway between R_1 and R_{4+5}, continuing closer to R_1, and then reversing direction near apex to gradually join C distal of half the distance between R_1 and R_{4+5} (Fig. 71B).

Haltere — Knob with about 3 macrotrichia 16 long.

Legs — Spur of front tibia 32 long. Spurs of middle tibia 20 and 22 long. Spurs of hind tibia 15 and 52 long. Width of apex of hind tibia 38. Comb with 9 spines 30–51 long. Claw of hind leg 25 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	606	719	488	269	168	102	67	0.68	2.99	2.72	3.75
p_2	620	636	328	172	106	72	56	0.52	3.90	3.83	5.00
p_3	672	750	452	217	164	95	60	0.60	3.50	3.15	5.00

Abdomen — Tergites with uniformly distributed bristles, 20–30 bristles on each of tergites II–VIII, longest bristle about 150.

Hypopygium (Fig. 71A) — Anal point with 8 lateral or basal bristles on each side, the longest 40. Dististyle with a 25 long apical spine. HR = 2.02; HV = 4.27.

TYPE MATERIAL

Holotype, male, at shore, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 25.V.1965, A. L. Hamilton (CNC No. 10,000).

REMARKS

The species seems to be most closely related to *Gymnometriocnemus subnudus* (Edw.) (Brundin, 1956a, p. 143, fig. 103). The wing venation, however, is more similar to that of *G. brumalis* (Edw.) (Brundin, 1956a, p. 143. Fig. 105).

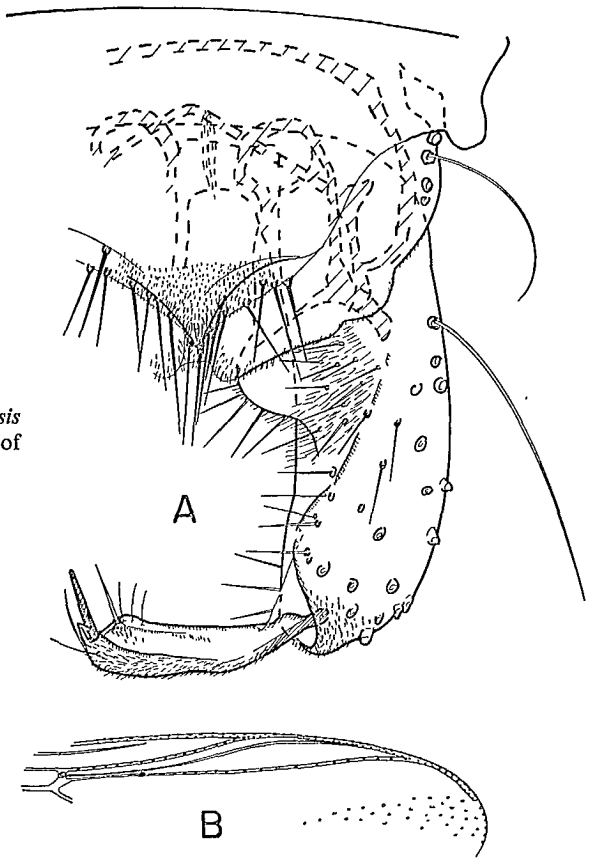

FIG. 71. *Gymnometriocnemus marionensis* sp.n. ♂. (A) Hypopygium; (B) Apex of wing.

Genus *Heleniella* Gowin, emended

AR about 1 or lower. Acrostichals present or absent posteriorly on prescutum, i.e., the 2 prescutellar groups of bristles of each side may or may not meet at the median line. Outer spur of hind tibia minute to slightly more than half as long as inner spur. Pulvilli small or absent. Anal point small or absent. Other characteristics as mentioned by Brundin (1956a, p. 144) and Serra-Tosio (1967a, p. 160–161).

Typus generis: *Heleniella ornaticollis* (Edw.).

Heleniella curtistila sp.n.

The species is characterized by having about 54 pronotals, about 115 dorsocentrals (including orolaterals and prescutellars), about 18 scutellars, outer spur of hind tibia

more than half as long as inner spur, anal point completely absent, and a short dististyle (HR ca. 5.2) with a strong and long apical spine. The pupa is about 2.6–2.9 mm long, has posterior spines on tergites II–VIII and sternites IV–VIII, orally directed spinules on tergites II–V, and the genital sac of the male extends beyond the tips of the anal lobes.

MALE ($n = 1$)

Length about 2.7 mm. Thorax brown.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{80}{92}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{41}{22}$, $\frac{24}{21}$, $\frac{26}{19}$, $\frac{28}{18}$, $\frac{30}{18}$, $\frac{32}{18}$, $\frac{34}{18}$, $\frac{34}{16}$, $\frac{35}{15}$, $\frac{36}{13}$, $\frac{37}{13}$, $\frac{37}{12}$, $\frac{254}{20}$. AR = 0.65.

Head — Vertex with about 14 bristles, the longest 48. Palp lengths: 23, 44, 49, 72.

Thorax (Fig. 72A) — Pronotum with about 54 bristles. Dorsocentrals about 115 consisting of about 18 strong uniserial bristles, one anterior group of orolaterals lateral of the strong bristles consisting of about 50 weaker bristles, and about 46 weaker prescutellar bristles median of the stronger

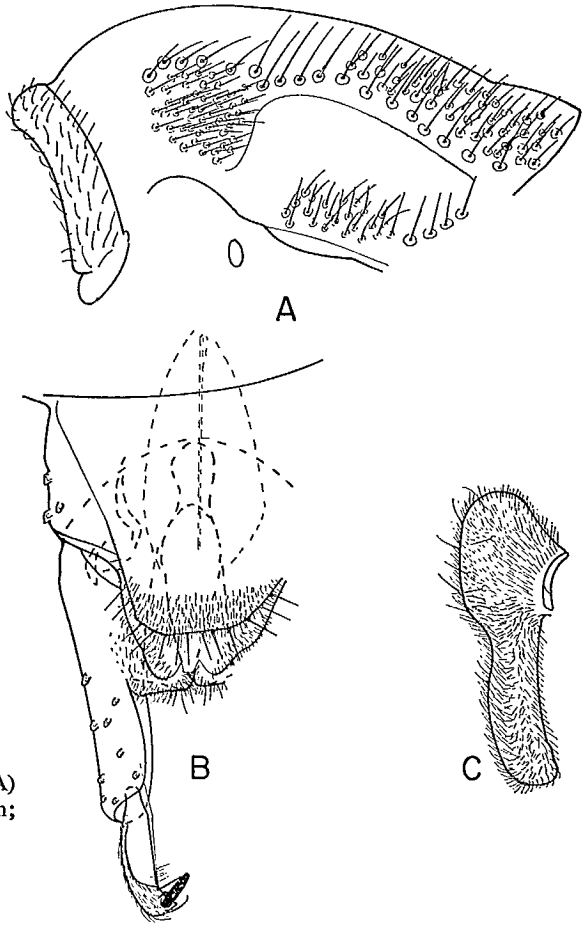

FIG. 72. *Heleniella curtistila* sp.n. (A) Thorax of male; (B) Male hypopygium; (C) Female lamelle of the ovipositor.

bristles, but not reaching the median line. Prealars 4 strong, uniserial, posterior bristles and about 24 weaker anterior bristles. Mesopleural and mesosternal bristles impossible to count as the thorax is damaged. Scutellum with 18 scattered bristles. Metanotum with a few weak bristles.

Wing — Basal vein with 1 bristle. Other details could not be determined.

Legs — Spur of front tibia 33 long. Spurs of middle tibia 13 and 19 long. Spurs of hind tibia 20 and 34 long. Width of apex of hind tibia about 30. Comb with 9 spines 23–38 long. Claw of hind tibia 20 long. Empodium 35 long. Pulvilli about 20 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
p_1	338	444	258	163	121	81	65	0.58	2.42	3.03
p_2	412	421	214	112	89	57	62	0.51	3.27	3.89
p_3	–	470	252	–	–	–	–	0.54	–	–

Hypopygium (Fig. 72B) — Anal point not present. Anal tergite with about 13 bristles. Dististyle short and slender with a 15 long apical spine. HR = 2.90; HV about 5.2.

FEMALE ($n = 1$)

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{48}{56}$. Longest bristle of flagellum 74. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{41}{16}$, $\frac{31}{17}$, $\frac{36}{14}$, $\frac{40}{14}$, $\frac{86}{22}$. AR = 0.61.

Head — Vertex with 11 bristles, the longest about 50.

Thorax — Pronotum with about 48 bristles. Mesopleurals about 31 anterior, about 14 posterior. Mesosternals about 39.

Abdomen — Longest tergite bristle about 160. Lamella of ovipositor as in Fig. 72C.

Other details could not be determined.

PUPA ($n = 4$, when not otherwise stated)

Length 2.6–2.9 mm (3). Exuvia transparent.

Cephalothorax — Thoracic horn (Fig. 73D) 190–227, mean 214 long; 22–26, mean 25 wide. Anterior bristle in front of horn 70–94 long, located 5–7 from median bristle. Median bristle 55–88 long, located 6–7 from posterior bristle. Posterior bristle 65–82 long, located 13–34 from horn. Frontal bristle about 44 (1) long.

Abdomen — Shagreenation not present on tergite I. Shagreenation and spines of tergites II–V and VIII, and of sternites I–V and VIII as in Fig. 73A–C. Segments VI–VII about as V, but posterior rows of spines on sternites gradually become stronger on more caudal segments. Pedes spurii not present. Length of bristles on V ($n = 3$): L_1 = 30–32, L_2 = 42–52, L_3 = 28–30, L_4 = 36–50, D_1 = 34–42, D_2 = 36–44, D_3 = 24–36, D_4 = 64–70, D_5 = 32–40. Distance from L_1 to L_2 24–32 (3) from L_2 to L_3 70–82 (3). D_4 on VIII 62–68 (2) long. Anal bristles 84–97 long. Genital sac of male extending beyond tips of anal lobes (Fig. 73C).

TYPE MATERIAL

Holotype, male prepared from pupa, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 10,001). Allotype, female prepared from pupa, small mountain stream, water temp 7.5 C, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther. Paratypes, damaged male, 3 female pupal exuviae, same data as holotype.

REMARKS

The species differs from the European species (Edwards, 1929, p. 529; Gowin, 1943, p. 116–119, Brundin, 1956a, p. 144–146; Serra-Tosio, 1967a) by not having any indication of an anal point. Another species described below, *Helenìella hirta* sp.n., also lacks an anal point. The dististyle in *H. curtistila* sp.n., however, is shorter and the

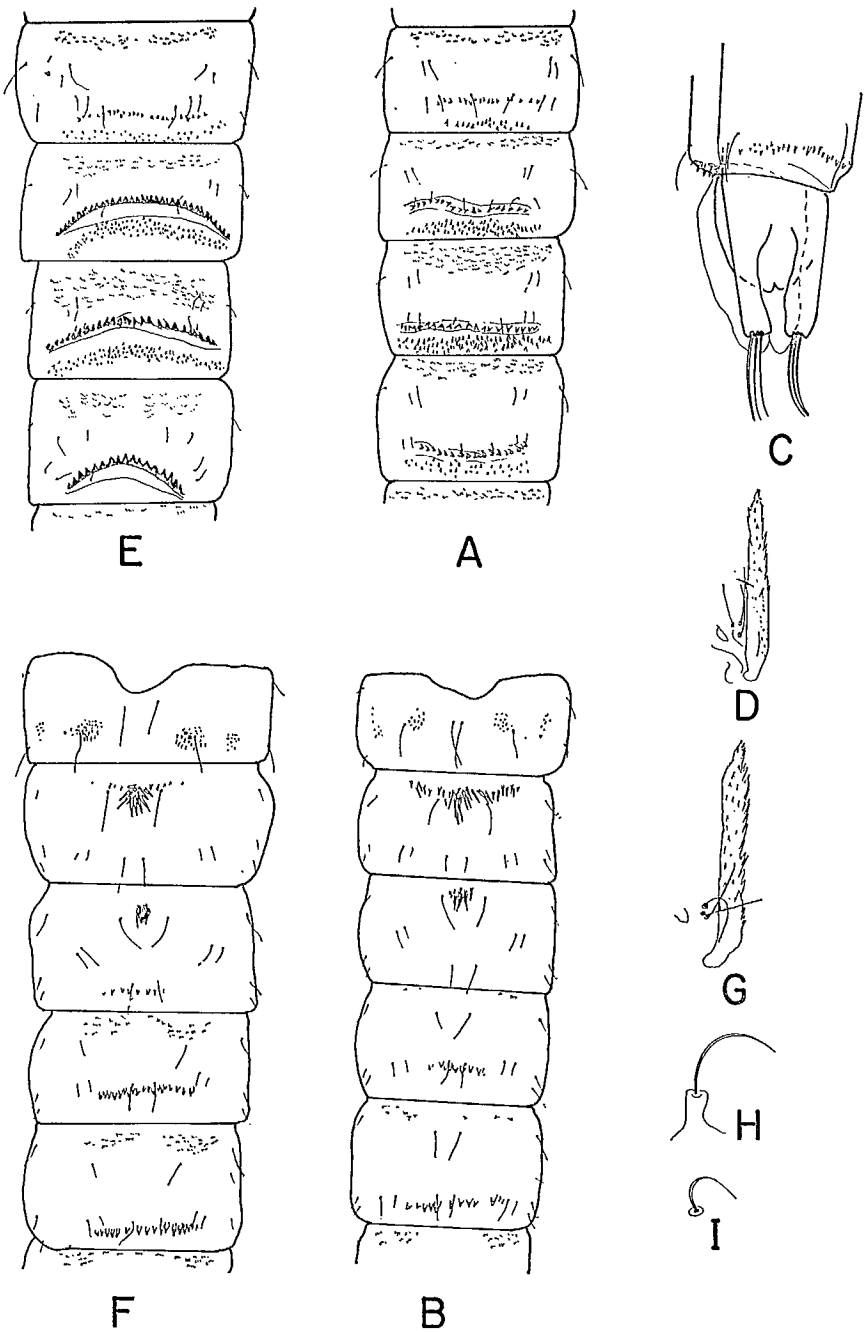

FIG. 73. *Helenıella* spp. Pupa. (A–D) *H. curtistila* sp.n.: (A) Tergites II–V; (B) Sternites I–V; (C) Last abdominal segments, partly lateral view; (D) Thoracic horn. (E–I) *H. hirta* sp.n.: (E) Tergites II–V; (F) Sternites I–V; (G) Thoracic horn; (H) Frontal bristle of female from Costello Creek; (I) Frontal bristle of male from Hermit Trail Stream.

apical spine is relatively stronger and longer than in other species of *Heleniella*. Both new species resemble *Heleniella dorieri* Ser.-Tos. (Serra-Tosio, 1967a, p. 153–157) in having more than 100 dorsocentrals. However, unlike *H. dorieri* they both have fewer than 70 prealars. *Heleniella curtistila* has only about 54 pronotal bristles; *H. hirta* has about 82. According to Brundin (1956a, Fig. 106) *H. ornaticollis* (Edw.) apparently has more than 80 pronotals.

The pupa of *H. curtistila* sp.n. differs from all other species of *Heleniella* by having orally directed spinules behind the spines of tergite V. As in *Heleniella intermedia* Ser.-Tos. (Serra-Tosio, 1967a, fig. 21) and in *H. hirta* sp.n., the genital sac of the male extends beyond the tips of the anal lobes.

Heleniella hirta sp.n.

The species is characterized by a high AR (about 1.04), about 82 pronotals, about 122 dorsocentrals, about 54 prealars, about 35 scutellars, anal point absent, and an HV of about 3.54. The pupa is about 3.6 mm long, has posterior spines on tergites IV-VIII and sternites III–VIII, orally directed spinules on tergites II–IV, and the male genital sac extends beyond the tip of the anal lobes.

MALE ($n = 1$)

Length 2.7 mm. Wing length 1.60 mm. Thorax brown.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{103}{120}$. Longest bristle of flagellum 415. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{62}{29}, \frac{24}{29}, \frac{26}{25}, \frac{32}{25}, \frac{34}{27}, \frac{35}{23}, \frac{34}{22}, \frac{34}{21}, \frac{33}{19}, \frac{33}{19}, \frac{32}{18}, \frac{33}{17}, \frac{414}{26}$. AR = 1.04.

Head — Vertex with 15 bristles, the longest 54. Clypeus with 10 bristles, the longest 73. Palp lengths: 49, 93, 93, 156.

Thorax (Fig. 74) — Pronotum with about 82 bristles. Dorsocentrals about 122 including 48 more or less strong bristles in 2 staggered rows forming the median border of the anterior bristles, the lateral border of the posterior bristles, about 44 orolateral bristles, and about 30 prescutellar bristles. Prescutellar bristles of each side seem to meet at the median line. Prealars 54 including 8 median and 13 posterior bristles that are stronger than the other bristles. Mesopleurals about 38 anteriorly, about 28 posteriorly. Mesosternals 49. Scutellum with about 35 scattered bristles. Metanotum with some weak bristles.

Wing — VR = 1.11. Basal vein with 1 bristle, R with 7 bristles. Free end of costa about 50 long.

Legs — Spur of front tibia 38 long. Spurs of middle tibia 11 and 21 long. Spurs of hind tibia 16 and 32 long. Width of apex of hind tibia 44. Comb with 11 spines 25–39 long. Claw of hind leg 24 long. Empodium 44 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	504	657	380	255	169	96	80	0.59	2.57	3.06	2.75
p_2	584	522	279	150	105	64	73	0.53	3.53	3.96	3.20
p_3	577	635	329	180	137	80	77	0.52	3.25	3.68	2.33

Abdomen — Longest tergite bristle 90.

Hypopygium (Fig. 75) — Anal point not present. Anal tergite with about 14 bristles. Apical spine of dististyle 15 long. HR = 2.43; HV = 3.54.

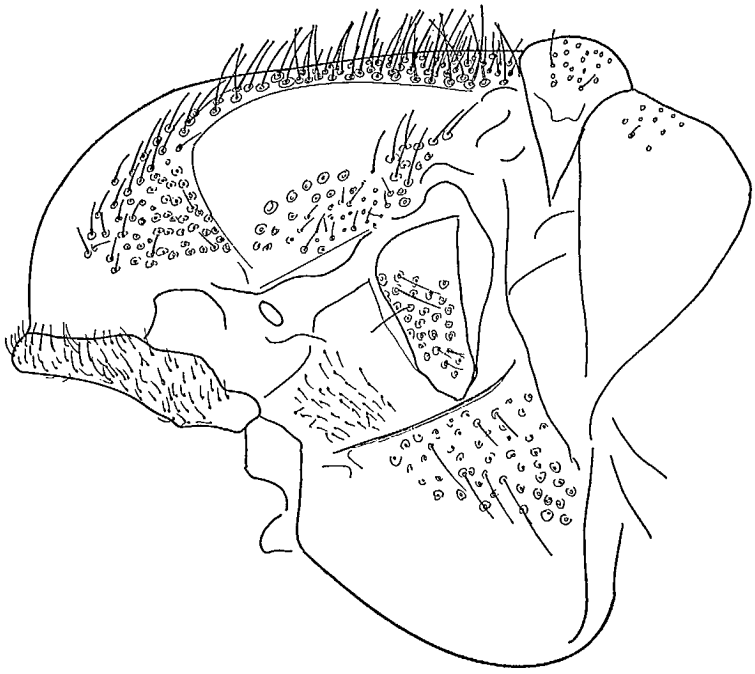

FIG. 74. *Heleniella hirta* sp.n. ♂. Thorax.

FEMALE ($n = 1$, tentatively associated as its pupal exuvia is, except for the frontal bristles, apparently identical with that of the holotype)

Length about 3.6 mm. Coloration brown.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{53}{63}$. Longest bristle of flagellum 90. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{69}{28}$, $\frac{40}{19}$, $\frac{45}{19}$, $\frac{48}{21}$, $\frac{99}{24}$. AR = 0.31.

Head — Vertex with 10 bristles, the longest about 50. Palp lengths: 56, 70, 68, 100.

Thorax — Pronotum with about 84 bristles. Dorsocentrals about 139 with 44 relatively strong bristles, about 55 orolateral bristles, and about 40 prescutellar bristles; prealars about 60; anterior mesopleurals about 50; posterior mesopleurals about 25; mesosternals about 80. Scutellum with about 50 bristles. Metanotum with about 20 weak bristles.

Legs — Length of longest spur and width of hind tibia both 48. Comb with 11 spines 30–50 long. Claw of hind tibia 23 long.

Other details could not be determined.

PUPA ($n = 1$)

Length 3.2 mm. Exuvia transparent.

Cephalothorax — Thoracic horn (Fig. 73G) 243 long, 30 wide. Anterior bristle in front of horn 98 long, located 3 from median bristle. Median bristle 79 long, located 3 from posterior bristle. Posterior bristle 100 long, located 70 from horn. Frontal bristle 40 long in male (Fig. 73I), much longer in the female and placed on a tubercle (Fig. 73H).

Abdomen — Shagreenation not present on tergite I. Shagreenation and spines of tergites II–V and sternites I–V as in Fig. 73E, F. Segments VI–VII about as in segment V, but posterior rows of

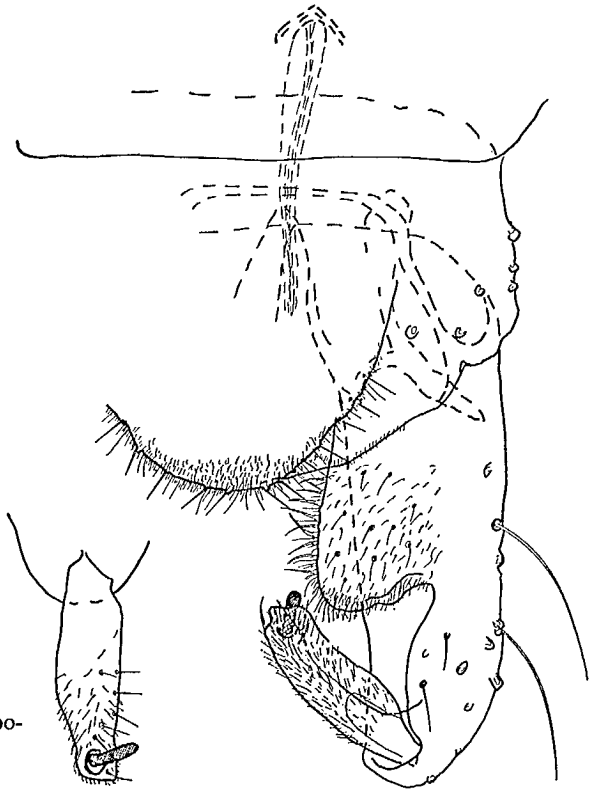

FIG. 75. *Heleniella hirta* sp.n. ♂. Hypopygium.

spines become gradually weaker on tergites, stronger on sternites. Segments VIII–IX about as in *H. curtistila* sp.n. (Fig. 73C). Pedes spurii lacking. Length of bristles on V: $L_1 = 58$, $L_2 = 51$, $L_3 = 42$, $L_4 = 46$, $D_1 = 54$, $D_2 = 52$, $D_3 = 39$, $D_4 = 86$, $D_5 = 54$. Distance between L_1 and L_2 41, between L_2 and L_3 110. D_4 on VIII about 70 long. Anal bristles somewhat thicker than normal, 122 long. Genital sac of male extending beyond tips of anal lobes.

TYPE MATERIAL

Holotype, male with pupal exuvia, Hermit Trail Stream, Gatineau Park, Que., 26.V.1967, D. R. Oliver, R. D. Macdonald, and L. Haig-Smillie (CNC No. 10,002). Allotype, female prepared from pupa, Costello Creek, Algonquin Park, Ont., 1.VI.1966, J. Martin.

REMARKS

The female from Costello Creek might well belong to another species as the exuvia is about 3.7 mm long (3.2 in male) and the frontal bristles are placed on a tubercle. However, in the other details that can be observed on this rather poor specimen, it seems identical with the holotype.

The species is probably more closely related to *H. curtistila* sp.n. than to the European species (see p. 132). The pupa seems to differ from all other known species by having posterior spines on sternite III.

Genus *Saunderia* Subl.

Saunderia marina (Saund.)

This specimen differs from the redescription by Sublette (1967a, p. 321–323) in that the antennal flagellum is composed of 13 segments. Sublette, however, mentions that the basal flagellar segment has a constriction in the middle and evidently represents a fusion of the 2 basal segments.

AR = 0.20. Vertex with 7 bristles. Clypeus with 4 bristles. Dorsocentrals 12. Wing with 8 bristles on R, 2 on R_1, 4 on R_{4+5}, and 2 sensory organs 1 on Fr and 1 about 70 from base of R_1. Anal point with somewhat more numerous and stronger basilateral bristles than shown by Sublette (1967a, fig. 10).

The possibility that this male represents a new species, very closely related to *S. marina*, cannot be quite excluded.

SPECIMENS EXAMINED

Damaged male, on *Enteromorpha*, Otter Point, Vancouver Island, B.C., II.V.1967, R. Ring.

DISTRIBUTION

Departure Bay, Vancouver Island, B.C. (Sublette, 1967a, p. 322).

Genus *Epoicocladius* Zavřel

Epoicocladius flavens (Malloch) comb.n.

Camptocladius flavens Malloch, 1915b: 511.
Camptocladius ephemerae Kieffer, 1924: 367 syn.n.
Camptocladius (*Epoicocladius*) *ephemerae* Kieff., Šulc & Zavřel 1924: 362, 385.
Epoicocladius ephemerae Kieff., Lipina 1928: 70.
Spaniotoma (*Smittia*) *ephemerae* (Kieff.), Edwards 1929: 358.
Epoicocladius ephemerae Kieff., Shadin 1940: 839.
Smittia (*Epoicocladius*) *ephemerae* (Kieff.), Goetghebuer 1940–50: 79.
Smittia ephemerae (Kieff.), Chernovskii 1949: 149.
Epoicocladius ephemerae (Kieff.), Thienemann 1944: 573, 607.
Epoicocladius ephemerae (Kieff.), Berg, Boisen-Bennike, Jónasson, Keiding, & Nielsen 1948: 180.
Epoicocladius ephemerae Kieff., Brundin 1949: 700.
Epoicocladius ephemerae Kieff., Thienemann 1950: 142.
Hydrobaenus (*Smittia*) *flavens* (Mall.), Johannsen 1952: 21.
Epoicocladius ephemerae (Kieff.), Roback 1953: 3.
Hydrobaenus ephemerae (Kief.), Henson 1955: 131.
Hydrobaenus ephemerae (Kief.), Beales & Henson 1956: 317.
Hydrobaenus (*Smittia*) *ephemerae* (Kief.), Henson 1956: 126.
Epoicocladius ephemerae Kieff., Brundin 1956a: 147.
Hydrobaenus ephemerae (Kieff.), Henson 1957: 25.
Epoicocladius ephemerae (Kieff.), Økland 1964: 136.
Smittia ephemerae (Kieff.), Sublette & Sublette 1965: 162.
Smittia flavens (Mall.), Sublette & Sublette 1965: 162.
Epoicocladius ephemerae (Kieff.), Fittkau, Schlee & Reiss 1967: 357.
Epoicocladius ephemerae (Kieff.), Sæther 1967a: 107.
Epoicocladius ephemerae (Kieff.), Sæther 1968: 470.

SPECIMENS EXAMINED

Male, fast flowing stream, between miles 6 and 7 on Mando logging road, Kenora, Ont., 23.VIII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION

Europe, Kola Peninsula, Michigan, Illinois, Ont. (Malloch, 1915b, p. 511; Shadin, 1940, p. 839; Roback, 1953, p. 3, Fittkau et al., 1967, p. 357; Sæther, 1967a, p. 107, 1968, p. 470).

REMARKS

Although the Nearctic specimens found have a slightly higher AR (Malloch's specimen slightly more than 1, this specimen 1.18) than the European specimens found (about 0.9), there seems to be no doubt of the synonymy of *E. flavens* and *Epoicocladius ephemerae*. Brundin (1956a, p. 147) mentions that the anal point has 2 bristles on each side. The specimens of Henson (1957, p. 34) have 4 bristles on each side of the anal point; this specimen has 3 bristles. The outer margin of the dististyle has a strong elongate bristle originating 0.4 from apex and reaching to the tip. This bristle was probably broken off in the specimens previously described.

Brundin (1956a, p. 147) mentions that the only character that can be used to distinguish between imagines of *Parakiefferiella* and *Epoicocladius* is the different position of R_{2+3}. Other distinguishing characters, however, are that in *Epoicocladius* R_{4+5} ends over or slightly before M_{3+4} and it has small, but distinct pulvilli. Both characters are mentioned by Edwards (1929, p. 358). Pulvilli may, however, also be present in *Parakiefferiella* (see p. 142), but they are less distinct.

Genus *Parakiefferiella* (Thienemann) Brundin, emended

AR = 0.30–1.34. Mesonotum with a tuft of hairs, sometimes with indications of a hump underneath. Free end of costa medium-long to long. Pulvilli minute or absent. Anal point with 2–8 bristles on each side. Other characteristics in accordance with Brundin (1956a, p. 148).

Typus generis: *Parakiefferiella coronata* (Edw.).

Parakiefferiella (*s. str.*) *torulata* sp.n.

This species is characterized by a high AR (about 1.34), a very reduced mesonotal hump bearing a distinct group of small bristles, minute pulvilli, and a triangular anal point with 6–8 bristles on each side. The pupa lacks a thoracic horn, has anal bristles that are almost twice as long as the caudal elongation of the anal lobe, and the shagreenation is strong on tergites II–V but faint and only in small patches on VI–VIII. The larva has an AR of about 1.4, and the seta anteriores are divided into many branches.

MALE ($n = 1$)

Length 3.7 mm. Wing length 1.14 mm. Thorax fuscous with paler scutellum, legs and abdomen.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{97}{142}$. Longest bristle of flagellum about 500. Apex of antenna with a

slight indentation. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{63}{39}, \frac{31}{35}, \frac{28}{37}, \frac{32}{37}, \frac{31}{34}, \frac{34}{35}, \frac{32}{34}, \frac{35}{34}, \frac{35}{33}, \frac{37}{32}, \frac{35}{31}, \frac{34}{31}, \frac{556}{37}$. AR = 1.34.

Head — Vertex with 6 bristles behind eye, the longest 130. Clypeus with 8 bristles, the longest 114. Palp lengths: 49, 78, 88, 130.

Thorax — Pronotum normally developed, with 3 weak lateral bristles. Dorsocentrals 8 uniserial, prealars 3. Scutellum with 6 uniserial bristles. Mesonotal hump very reduced, with a tuft of hairs.

Wing — VR = 1.14. Basal vein with 1 bristle, R with 1 basal bristle. Sensory organs 1 on Fr, 1 about 20 from base of R_1. R_1 slightly less than half as long as R_{4+5}. R_{2+3} ends at ¾ the distance between R_1 and R_{4+5}, An ends about 160 proximal of Fcu, free end of costa about 50 long.

Haltere — Knob with 4 weak bristles.

Legs — Spur of front tibia 49 long. Spurs of middle tibia both 17 long. Spurs of hind tibia 12 and 46 long. Width of apex of hind tibia 42. Comb with 16 spines 19–33 long. Claw of hind leg 29 long, with 4 teeth, and basally with 3 bristles 11 long. Empodium 29 long. Pulvilli faint, 11 long. Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
p_1	642	788	441	306	206	121	87	0.56	2.60	3.24	2.63
p_2	692	676	305	176	143	86	75	0.45	3.49	4.49	3.50
p_3	700	798	416	220	185	96	84	0.52	3.27	3.60	5.83

Hypopygium (Fig. 76) — Anal point about 75 long, relatively pointed, with 6–8 bristles on each side. Basistyle with a rather large basal lobe, naked on median margin, with dense short hairs on caudal margin. Dististyle with a distinct bend about ⅓ from base, club-shaped apically, apical spine 11 long. HR = 2.14; HV = 3.94.

PUPA (n = 1)

Length 4.1 mm. Exuvia pale subluteous with brown base of wingsheath.

Cephalothorax — Thoracic horn lacking. Bristles anterior of horn all about 120 long, standing in a row with distances between anterior and median and between median and posterior bristle both 10.

Abdomen (Fig. 77A) — Shagreenation on tergites as in Fig. 77A, longest spinules (posteriorly on V) 17 long, tergites II–IV with more or less orally bent spinules near posterior margins. Sternites I and IX without shagreenation; II–IV with 6–8 anterior rows of faint spinules, strongest on II–III; V–VIII with 4–5 rows of anteriolateral spinules. Pedes spurii A present on sternites IV–VII, very faint on IV. Length of bristles on V: L_1 = 45, L_2 = 55, L_3 = 52, L_4 = 66, D_1 = 48, D_2 = 52, D_3 = D_4 = 54, D_5 = 46. D_4 on VIII 60 long. Anal lobes with a few spines on outer margin of elongation, anal bristles 95–100 long, extending considerably beyond tips of anal lobes. Genital sac of male with a dorsal elongation (Fig. 77B).

LARVA (n = 1)

Head capsule 0.29 mm long.

Head — Antenna (Fig. 78B) with an AR of 1.39. Length of antennal segments: 49, 17, 6, 4.5, 6.5. Basal segment 11 wide, distance from base to annular organ 4.5, blade at apex 26 long. Labrum with seta anteriores about 8-branched (Fig. 78D). Premandible 58 long. Mandible (Fig. 78C) 110 long, inner brush with 6 or 7 bristles. Maxilla with 7 broad bristles 15–42 long. Maxillary palp 7.5 long including a 5 long apical spine. Labium (Fig. 78A) with a trifid median tooth and 5 lateral teeth.

Abdomen — Lost.

TYPE MATERIAL

Holotype, male with pupal and larval exuviae, *Chara* bottom, depth 0.2 m, ditch, Whiteshell Park, Man., 16.IV.1967, A. L. Hamilton (CNC No. 10,003).

REMARKS

In some respects this species seems to be a rather atypical *Parakiefferiella* and may belong to a new subgenus. In the male the AR and the anal point differ from

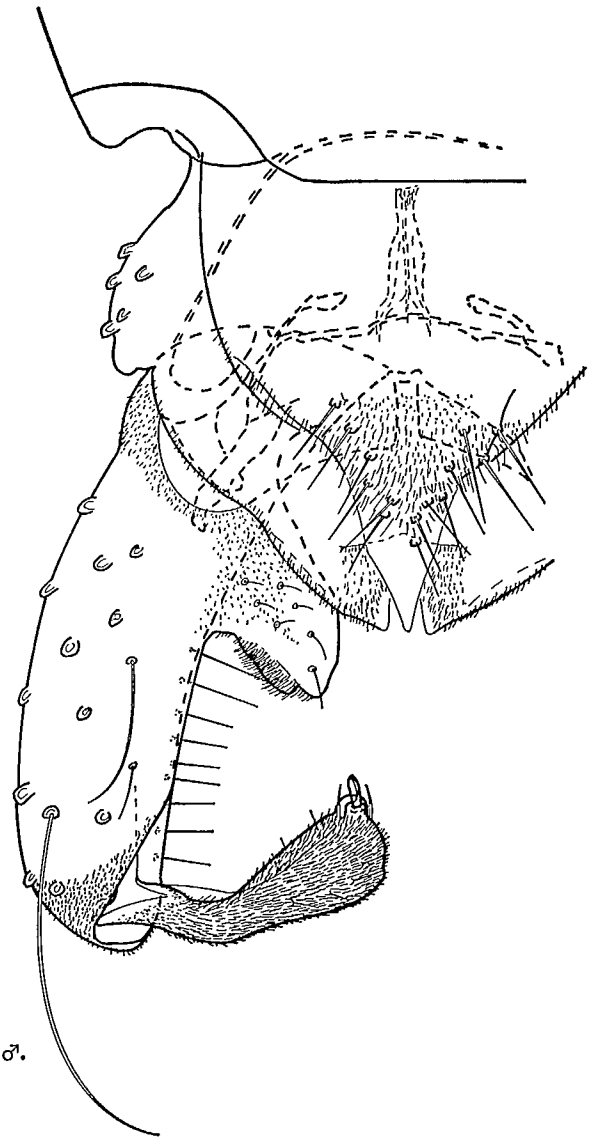

FIG. 76. *Parakiefferiella torulata* sp.n. ♂. Hypopygium.

other *Parakiefferiella*. The tuft of mesonotal hairs and the presence of small pulvilli are not in accordance with Brundin's diagnosis (Brundin, 1956a, p. 148); despite this these features do not seem to be unusual for *Parakiefferiella*. According to Oliver (personal communication) and from material of *Parakiefferiella nigra* Brund. and *Parakiefferiella* cf. *coronata* (Edw.) collected by A. L. Hamilton, the tuft of hairs seems to be characteristic of all species of *Parakiefferiella*. The true nature of this tuft, however, is difficult to observe on unmounted specimens. A smaller or larger hump seems to

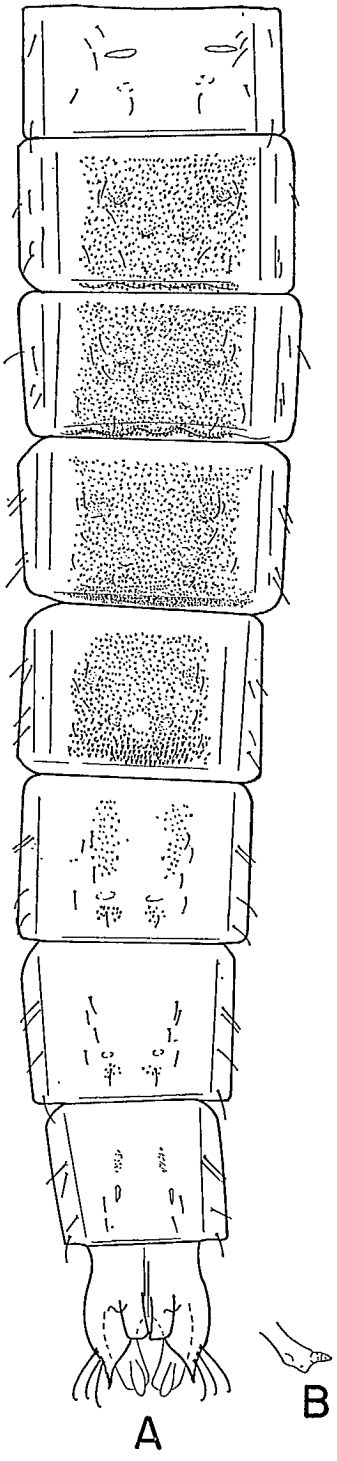

FIG. 77. *Parakiefferiella torulata* sp.n. Pupa. (A) Tergites I–IX; (B) Apex of male genital sac.

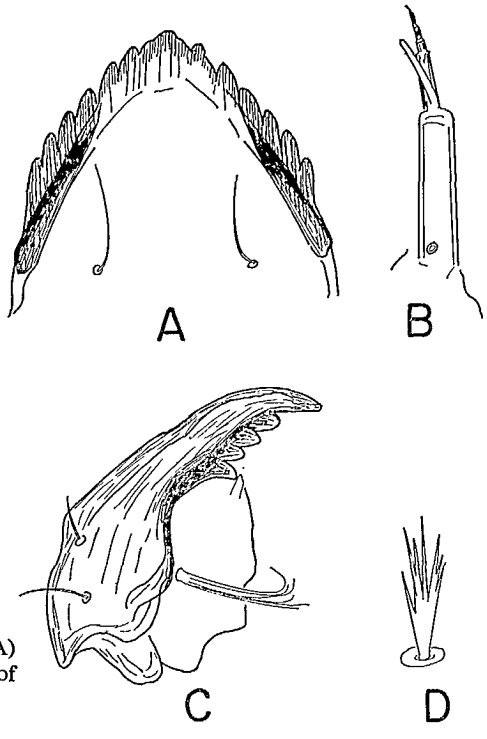

FIG. 78. *Parakiefferiella torulata* sp.n. Larva. (A) Labium; (B) Antenna; (C) Mandible; (D) S I of labrum.

be present underneath the tuft in some species. Hamilton (MS, 1965, p. 87) found pulvilli in *P. nigra* Brund. and they are probably present in all *Parakiefferiella* even though they may be very faint and indistinct.

The pupa is a typical *Parakieeffriella* except that it lacks thoracic horns. The larva is atypical in that it has an AR higher than 1 and branched seta anteriores. If the tentative association of the larvae of *P.* cf. *coronata* and *P. nigra* in Hamilton (MS, 1965, p. 85, 87–88) proves to be correct, there is, however, a much larger variation of the larvae within *Parakiefferiella* (*s. str.*) than indicated by Thienemann (1944, p. 646–647). Both these larvae have antennae with only 4 segments, and *P.* cf. *coronata* has a labium with a broad, pale central plate with 2 minute median teeth, and no lateral teeth.

Genus *Krenosmittia* Thien.

Krenosmittia cf. *boreoalpina* Goetgh.

PUPA (n = 4, when not otherwise stated)

Length 2.1–2.2 mm. Exuvia pale subfuscous.

Cephalothorax — Thoracic horn (Fig. 79) 150–170 long, 32–40 wide, beset with scale-like plates ending in spinules. Median bristle in front of horn 80–90 long. Posterior bristle in front of horn 42–52 long. Frontal bristle 78–84 long.

Abdomen (Brundin, 1956a, fig. 123) — Length of bristles on V: L_1 = 86–108, L_2 = 80–90, L_3 = 50–70, L_4 = 35–50, D_1 = 40–50, D_2 = D_3 = D_5 = 28–45, D_4 = 40–50, V_4 = V_5 = 100–120. Anal

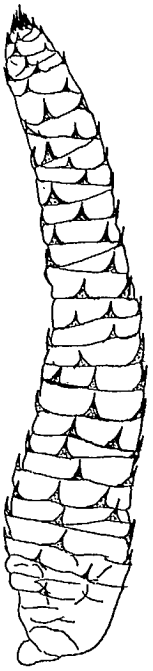

FIG. 79. *Krenosmittia* cf. *boreoalpina* Goetgh. Pupa. Thoracic horn.

TABLE 4. Thorns of tergites and sternites of pupae of *Krenosmittia* cf. *boreoalpina*. Small spinule-like thorns given in subscripts. Specimen 5 is from the Alouette River.

	Specimen					
	Male					Female
	1	2	3	4	5	6
TERGITES						
III	15	18	17	18	17	–
IV	16	15	17_3	17_2	15	13
V	15	16	17	16	15	12
VI	13	11_2	15_2	11	10	13
VII	12	14	10_5	8_4	10	13
VIII	10	10	10	10_2	10	11
STERNITES						
III	7	6_6	7	11_2	–	–
IV	8	9_4	9	14_2	–	6
V	14_2	17_4	14_5	15_{10}	13_8	10_5
VI	11_{15}	14_8	12_5	17_8	13_9	12_3
VII	11_{11}	10_9	10_8	17_6	11_4	11_2
VIII	10_{10}	12_{16}	10_{12}	10_{13}	10_7	0

lobe with 3 median bristles 26–34 (6) long, distance from median bristle to apex of lobe 82–92 (5 ♂♂) and 60 (1 ♀), distance from median bristle to base of anal segment 146–160 (5 ♂♂) and 132 (1 ♀). Variation of thorns on abdomen is given in Table 4.

LARVA ($n = 1$)

The larva of *K. borealpina* has not been described previously.

Length 3.1 mm. Head capsule 0.16 mm long. Coloration whitish with yellowish head.

Head — Length of antennal segments: 26, 12, 2.2, 1.6, 2.2. AR = 1.44. Basal segment 7 wide, distance from base to annular organ apparently 16.

Abdomen — Procerci each with 5 apical bristles 1.25, 0.17, 0.17, 0.08 and 0.08 mm long.

In all other discernible characters the larva is identical with that of *Krenosmittia camptophleps* (Edw.) (*gynocera* Thien. et Krüg., nec Edw.) (Thienemann and Krüger, 1939, p. 253–255, fig. 1, 14–16).

SPECIMENS EXAMINED

Male pupal exuvia, at old crossing, Alouette River, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther; 4 male pupal exuviae, abdomen of female pupal exuvia, larva, small mountain stream, water temp 7.5 C, above highway to Cameron Lake, Waterton National Park, Alta., 21.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION OF *K. boreoalpina*

The high mountains of Southern Norway, The Alps, and The Pyrenees (Brundin, 1956a, p. 160; Fittkau et al., 1967, p. 358). The distribution of *K. boreoalpina* and *K. camptophleps* in Fennoscandia are overlooked in Fittkau et al., (1967, p. 358). New to North America.

REMARKS

The larva of this species differs from that of *K. camptophleps* by having the annular organ on the distal half of the basal segment and by having 5 instead of only 2 apical bristles on the procerci.

Krenosmittia cf. *camptophleps* (Edw.) (*gynocera* Thien. et Krüg. nec. Edw.)

The exuviae found fits the descriptions by Thienemann and Krüger (1939, p. 255, fig. 17–19), Thienemann (1944, p. 563–564), and Brundin (1956a, fig. 122). The thoracic horn has collapsed in both specimens; however, the scale-like plates seem to be less distinct and there seems to be fewer spinules than in *K.* cf. *boreoalpina.*

SPECIMENS EXAMINED

2 male pupal exuviae, small mountain stream, water temp 13 C, Marion Lake, University of British Columbia Forestry Farm, Haney, B.C., 15.VII.1967, A. L. Hamilton and O. A. Sæther.

DISTRIBUTION OF *K. camptophleps*

Swedish Lapland, the high mountains of Norway, England, Belgium, and The Alps (Brundin, 1956a, p. 159). New to North America.

Genus *Pseudosmittia* (Goetgh.) Brund.

Pseudosmittia setavena sp.n.

This species is characterized by a low AR (about 0.34), about 3 bristles basal on R, 1 on R_{4+5}, none on R_1, a normally developed pronotum, and an anal point.

MALE ($n = 1$)

Length 2.2 mm. Wing length 1.33 mm. Thorax brownish-black.

Antenna — Pedicel $\frac{\text{length}}{\text{width}}$: $\frac{84}{102}$. Flagellar segments $\frac{\text{length}}{\text{width}}$: $\frac{42}{28}$, $\frac{27}{31}$, $\frac{32}{28}$, $\frac{32}{23}$, $\frac{36}{23}$, $\frac{38}{22}$, $\frac{40}{21}$, $\frac{41}{21}$, $\frac{43}{21}$, $\frac{41}{20}$, $\frac{47}{19}$, $\frac{47}{19}$, $\frac{159}{22}$. AR = 0.34.

Head — Vertex with 5 bristles, 2 near median line, 3 behind eye. Clypeus damaged. Dorsal view of head except vertex bristles as in *Pseudosmittia ruttneri* Str. (Brundin, 1956a, fig. 134). Palp lengths: 39, 83, 67, 107.

Thorax — Pronotum normally developed with 3 (?) lateral bristles. Dorsocentrals 8 uniserial, prealars about 3. Scutellum with 5 uniserial bristles.

Wing — Very transparent. VR = 1.38. Basal vein with 1 bristle, basal part of R with 3 bristles, R_{4+5} with 1 distal bristle, R_1 without bristles. Sensory organs 1 at Fr, 1 about 1/6 from base on R_1. R_1 is slightly longer than half R_{4+5}; R_{2+3} running much closer to C than to R_{4+5}, coalescing with R_{4+5} at junction with C, i.e., as in *Pseudosmittia oxoniana* Edw. (Brundin, 1956a, p. 169); An ends proximal of Fcu.

Legs — Spur of front tibia 30 long. Spurs of middle tibia 17 and 18 long. Spurs of hind tibia 18 and 38 long. Width of apex of hind tibia 35. Comb with 13 spines 18–32 long. Claw of hind leg about 17 long, with 4 apical teeth and 2 weak basal hairs about 7 long.

Lengths and proportions of legs:

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
p_1	404	488	246	148	106	61	50	0.50	3.12	3.63
p_2	486	492	244	148	104	62	56	0.50	3.30	4.01
p_3	492	526	284	164	148	72	52	0.54	2.99	3.58

Hypopygium (Fig. 80) — Anal point about 25 long, naked, with 16 lateral and caudal bristles. Basistyle with two very weak lobes, the inner lobe almost naked the outer haired. Dististyle slender at base, thicker, preapically, with an apical spine 14 long. HR = 2.18; HV = 3.34.

TYPE MATERIAL

Holotype, male, small mountain stream, water temp 6.5 C, along road to Takkakaw Falls near Field, B.C., 12.VII.1967, A. L. Hamilton and O. A. Sæther (CNC No. 10,004).

REMARKS

This new species probably belongs in the *Pseudosmittia recta* group although it is somewhat intermediate between the *P. recta* and *Pseudosmittia angusta* groups of Brundin (1956a, p. 167–170). The pronotum is normally developed as in the *P. recta* group, but there is an anal point present as in the *P. angusta* group. The wing venation is as in *P. oxoniana* Edw. (Edwards, 1922, p. 204; Brundin, 1956a, p. 169). The hypopygium seems to be very similar to *P. recta* (Edw.) (Edwards, 1929, p. 362–363; fig. 7), but *P. recta* has only 12 flagellar segments, its wings are rather milky, R_{4+5} is bare, and R_{2+3} does not coalesce with R_{4+5} at junction with costa (Edwards, 1929, plate XVIII, fig. 13). The hypopygium of *Pseudosmittia brevicornis* Str. (Strenzke, 1950, p. 281–282) is also similar to that of *P. setavena* sp.n. The lobes of the basistyle, however, are larger, and the dististyle is more bent apically in *P. brevicornis*. In addition it has an AR of only 0.14 and there is 1 bristle on R_1. *Pseudosmittia holsata* Thien. et Str. (Thienemann and Strenzke, 1940, p. 238–240) is also closely related with this new species. Like *P. setavena* it probably belongs to the *P. recta* group and similarly it is also somewhat intermediate between the *P. recta* and *P. angusta* groups. *Pseudosmittia holsata*, however, has no bristles on the radial veins, R_{2+3} ends midway

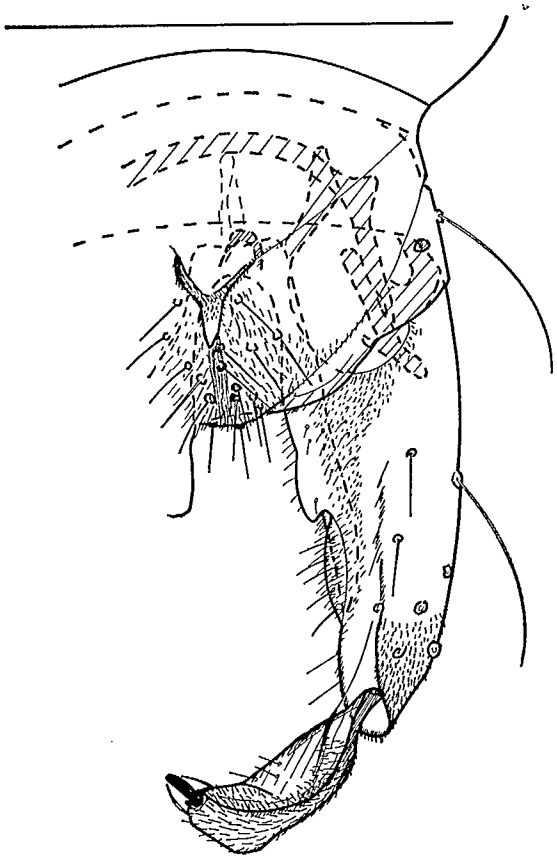

FIG. 80. *Pseudosmittia setavena* sp.n. ♂.
Hypopygium.

between R_1 and R_{4+5}, the bristles caudal of the anal point are fewer and weaker, and the basal lobe of the basistyle is large, rounded, and strongly chitinized.

REMARKS ON ZOOGEOGRAPHY

Beck and Beck (1967) make a comparison between the known Nearctic and the Palaearctic faunas in the tribes Chironomini and Pentaneurini. In the Chironomini there are 112 Nearctic species and 173 Palaearctic species; the Pentaneurini have 57 Nearctic species and 86 Palaearctic species of which only 56 have been assigned to genus. These numbers, however, are likely not a result of a richer European fauna of Chironomini and Pentaneurini. It is more probable that they are only a reflection of the more intensive investigations carried out in Europe. In fact these values, when considered in relation to the number of taxonomic investigations carried out in the 2 respective areas, probably indicate that the North American fauna is richer.

A similar comparison of the subfamilies treated in this paper can be done only for the Podonominae and the Diamesinae. Even after the recent redescriptions and

revisions of the Orthocladiinae by Sublette (1966a, b, 1967a, b), a large number of species are assigned to a few large, unwieldy genera, which can include a dozen or more genera in the sense of Brundin (1956a). However, all the major Palaearctic genera of the subfamilies treated are present in North America (Sublette, 1966a, b, 1967a, b; Hamilton, 1965; Oliver, personal communication; Sæther in print, this Bulletin). Of the Podonominae all genera in the northern hemisphere are Holarctic and so far 10 species are known from North America, 7 from Europe. In the Diamesinae, the monotypic genera *Onychodiamesa*, *Trichodiamesa*, and *Stenotanypus* have not been found in North America. *Trichodiamesa*, however may be a *Prodiamesa*, and *Stenotanypus turfaceus* Kieff. may, according to Brundin (1952, p. 44), be identical with *Lasiodiamesa gracilis* Kieff. The Nearctic genera *Pagastia* and *Hesperodiamesa* have not been recorded from Europe. A few small or poorly defined genera of Orthocladiinae have not as yet been reported from North America. The genera are *Buchonomyia* (monotypic, assigned to Orthocladiinae by Fittkau et al. [1967], but in the original description by Fittkau [1955] assigned to Podonominae), *Propsilocerus* (2 spp.), *Eurycnemus* (monotypic), *Hydrobaenus* (2 spp.), *Parorthocladius* (2 spp.), *Amblycladius* (monotypic, almost certainly a *Chaetocladius* [Oliver, personal communication]), *Tvetenia* (monotypic, also probably a *Chaetocladius* [Oliver, personal communication]), *Dolichoprymna* (monotypic, not well-defined), *Paralimnophyes* (2 spp.), *Georthocladius* (monotypic), *Orthosmittia* (3 spp.), *Parasmittia* (monotypic), *Thalassosmittia* (monotypic), *Lapposmittia* (monotypic), *Acamptocladius* (monotypic, a new species reared from larva may belong to this genus, but as the immatures are very peculiar and the wings of the imago are damaged, the description will be postponed until further material has been gathered), *Mesosmittia* (monotypic), and *Corynoneurella*[7] (monotypic). On the other hand some genera found in North America have not been registered in Europe: *Chasmatonotus* (8 spp.), *Plecopteracoluthus* (monotypic), *Psilometriocnemus* gen.n. (monotypic), *Saunderia* (3 spp.), *Eretmoptera* (monotypic), and *Tethymyia* (monotypic). In summary, a total of 17 European genera of Orthocladiinae, including about 12 that are well defined have not as yet been registered from North America. These 12 genera contain about 18 species. On the other hand 6 North American genera containing some 15 described species have not been reported from Europe. In addition, some of the more plesiomorph genera treated here, such as *Lasiodiamesa*, *Cardiocladius*, and especially *Brillia*, contain a higher number of Nearctic species than Palaearctic species. According to Brundin (1967) the tribes Boreoheptagyini, Diamesinae, and Protanypini are the boreal apomorph sister groups of austral plesiomorph groups. In these instances the bipolar distribution pattern is obviously a consequence of a transtropical dispersal northwards. There are, however, also several examples of bipolarity among chironomid groups caused by transtropical dispersal southwards; the Tanypodinae, for instance, is a chironomid group of boreal origin that is fairly well represented in the southern temperate zone. The most plesiomorph groups among chironomids are according to Brundin (1967) found among cold-adapted mainly austral groups such as the Podonominae, the Aphroteeninae, and the Diamesinae. The transtropical dispersal northwards may have been over a transtropical

[7]According to Schlee (1968, p. 102) *Corynoneurella*, however, should be included in *Corynoneura*.

highland bridge between North and South America, probably during late Cretaceous times (cf. Brundin, 1956b; Darlington, 1957). If this was indeed the case then one would expect that more of the plesiomorphic genera that had migrated over this bridge would occur in North America than in Europe or Asia. In addition since they would have reached North America before Europe, they would have also had a longer period for diversifying into more species.

The differences in the geography of the 2 regions should, at least theoretically, make North America a more likely place for large numbers of plesiomorphic genera to occur. In Europe many of the rheobiontic, rheotactic, and petrophilous torrential forms are restricted to the southern European mountains as it was impossible for them to cross the Central European plain after the Glacial Age. The species that remained in the same area during and after the Ice Age changed less and had a smaller tendency to split into many species than those that dispersed in postglacial times and had to adjust to variable conditions. Since the western Cordilleran mountains form a continuous bridge from north to south in the Nearctic temperate and arctic regions, plesiomorphic southern glacial forms could remain in one area during the Glacial Age and later would have an avenue for postglacial dispersion. Even if new species did originate after glaciation, the dispersion would have taken place under conditions essentially similar to those encountered previously, and, consequently, the plesiomorphic characters would likely be retained.

The absence of a boreo-alpine Nearctic distribution may have resulted in a lower total number of cold-water forms in North America. This is, however, unlikely as there are nonetheless many relatively isolated mountain areas in North America. It is quite possible that a parallel to the European boreo-alpine distribution occurs between the Appalachian hills and mountains in the east and the Cordilleran mountains in the west.

A great many of the species described in this paper seem to be very closely related to European species. They may be said to form species pairs, triplet-species, or species groups together with their European relatives. However, when they are closely related with 2 or more European species, their European relatives as a rule seem to be more similar to each other than to the Nearctic species. This is probably a reflection of a longer isolation between Nearctic and Palaearctic species than between the different European species.

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REFERENCES

ANDERSEN, F. SÖGAARD. 1937. Ueber die Metamorphose der Ceratopogoniden und Chironomiden den Nordost-Grönlands. Meddr. Grönland 116: 1–95.

BEALES, D.S., AND H. HENSON. 1956. The larval stages of *Hydrobaenus ephemerae* (Kieff.) (Diptera, Chironomidae). Proc. Leeds Phil. Lit. Soc. Sci. Sect., 6: 317–324.

BECK, W. M., JR., AND E. C. BECK. 1968. The concept of genus in the family Chironomidae. Ann. Zool. Fennici 5: 14–16.

BERG, K., S. A. BOISEN-BENNIKE, P. M. JÓNASSON, J. KEIDING, and A. NIELSEN. 1948. Biological studies in the river Susaa. Folia Limnol. Scand. 4: 1–318.

BRUNDIN, L. 1947. Zur Kenntnis der schwedischen Chironomiden. Arkiv Zool. 39A(3): 1–95.

1949. Chironomiden und andere Bodentiere der südschwedischen Urgebirgsseen. Ein Beitrag zur Kenntnis der bodenfaunistischen Charakterzüge schwedischer oligotropher Seen. Rept. Inst. Freshwater Res. Drottningholm 30: 1–914.

1952. Zur Kenntnis der Taxonomie und Metamorphose der Chironomidengattungen *Protanypus* Kieff., *Prodiamesa* Kieff. und *Monodiamesa* Kieff. Rept. Inst. Freshwater Res. Drottningholm 33: 39–53.

1956a. Zur Systematik der Orthocladiinae (Dipt. Chironomidae). Rept. Inst. Freshwater Res. Drottningholm 37: 5–185.

1956b. Die bodenfaunistischen Seetypen und ihre Anwendbarkeit auf die Südhalbkugel. Zugleich eine Theorie der produktionsbiologischen Bedeutung der glazialen Erosion. Rept. Inst. Freshwater Res. Drottningholm 37: 186–235.

1967. Transantarctic relationships and their significance, as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteeninae and the austral Heptagyiae. Kungliga Svenska Vetenskapakad. Handl. Ser. 4, 11(1): 1–472.

CHERNOVSKII, A. A. 1949. [Identification of larvae of midge family Tendipedidae.] Opred. Faune SSSR 31: 1–186. (In Russian. Transl. by Natl. Lending Library for Sci. Technol., Boston Spa, Yorkshire, England, 1961 — available as TT62 13587 from Clearinghouse for Scientific and Technical Information.)

COE, R. L. 1950. Family Chironomidae, p. 121–206. *In* R. L. Coe, P. Freeman, and P. F. Mattingly. Diptera. 2. Nematocera: families Tipulidae to Chironomidae. Handbook Identification Brit. Insects 9(2): 1–216.

COQUILLET, D. W. 1905. New nematocerous Diptera from North America. J. N.Y. Entomol. Soc. 13: 56–69.

1908. New genera and species of Diptera. Proc. Entomol. Soc. Wash. 9: 144–148.

CURRAN, C. H. 1930. Report on the Diptera collected at the station for the study of insects, Harriman Interstate Park, N.Y. II. Bull. Am. Museum Nat. Hist. 61(2): 21–115.

DARLINGTON, P. J., JR. 1957. Zoogeography: The geographical distribution of animals. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London. 675 p.

DIXON, W. J. AND F. J. MASSEY. 1957. Introduction to statistical analysis. McGraw Hill Book Company, Inc., New York. 488 p.

EDWARDS, F. W. 1922. Results of the Oxford Expedition to Spitsbergen, 1921. No. 14. Diptera Nematocera. Ann. Mag. Nat. Hist. Ser. 9, 10: 193–215.

1929. British non-biting midges (Diptera, Chironomidae). Trans. Roy. Entomol. Soc. Lond. 77(2): 279–430.

1931. Diptera of Patagonia and South Chile II, 5, Chironomidae, p. 233–331. Trustees of the Brit. Museum London.

1933. Oxford University Expedition to Hudson's Strait, 1931: Diptera Nematocera. With notes on some other species of the genus *Diamesa*. Ann. Mag. Nat. Hist. Ser. 10, 12: 611–620.

1935. Diptera Nematocera from East Greenland. Ann. Mag. Nat. Hist. Ser. 10, 15: 467–473.

1937. On the European Podonominae. *Contribution in* A. Thienemann. Podonominae, eine neue Unterfamilie der Chironomiden. (Chironomiden aus Lappland I.) Intern. Rev. Ges. Hydrobiol. Hydrograph. 35: 64–112.

EDWARDS, F. W., AND A. THIENEMANN. 1938. Neuer Beitrag zur Kenntnis der Podonominae (Dipt. Chironomidae.) Chironomiden aus Lappland IV. Zool. Anz. 122: 152–158.

FITTKAU, E. J. 1954. *Trichocladius nivalis* Goetgh. Chironomidenstudien III. Ber. Limnol. Flussstation Freudenthal 6: 17–27.

1955. *Buchonomyia thienemanni* n. gen. n.sp. Chironomidenstudien IV (Diptera, Chironomidae). Beitr. Entomol. 5: 403–414.

1962. Die Tanypodinae (Diptera, Chironomidae). (Die Tribus Anatopyniini, Macropelopiini und Pentaneurini). Abhandl. Larvalsystematik Insekten 6: 1–453.

FITTKAU, E. J., D. SCHLEE, AND F. REISS. 1967. Chironomidae, p. 346–381. *In* J. Illies [ed.] Limnofauna Europaea. Eine Zusammenstellung aller die europäischen Binnengewässer bewohnenden, mehrzelligen Tierarten, mit Angaben über ihre Verbreitung und Ökologie. Gustav Fischer Verlag, Stuttgart. 474 p.

FREEMAN, P. 1961. The Chironomidae (Diptera) of Australia. Australian J. Zool. 9: 611–737.

FROMMER, S. 1967. Review of the anatomy of adult Chironomidae. Bull. Calif. Mosquito Control Assoc. Technol. Ser. 1: 1–40.

GARRETT, C. B. D. 1925. Seventy new Diptera. Key to Pseudoleria Helomyzidae. Tipulidæ, Chiromidæ, Dixinæ, Orphnephilidæ, Mycetophilidæ. Cranbrook, B.C. 16 p.

GOETGHEBUER, M. 1933. Chironomides du Groenland oriental, du Svalbard et de la Terre de François Joseph. Skrifter Svalbard Ishavet 53: 19–31.

1934. Ceratopogonidae et Chironomides récoltés par M. le Prof. Thienemann dans les environs de Garmisch–Partenkirchen (Haute-Bavière) et par M. Geijskes près de Bâle, dans le Röserenbach. Bull. Ann. Soc. Roy. Entomol. Belg. 74: 334–350.

1936. Tendipedidae (Chironomidae). a. Subfamilie Pelopiinae (Tanypodinae). A. Die Imagines. Fliegen Palaearktischen Reg. 3(13b): 1–50.

1937. Ceratopogonidae et Chironomidae nouveaux ou peu connus d'Europe. (7^{e} Note.) Bull. Ann. Soc. Roy. Entomol. Belg. 77: 273–280.

1938. Ceratopogonidae et Chironomidae nouveaux ou peu connus d'Europe. (Huitième Note.) Bull. Ann. Soc. Roy. Entomol. Belg. 78: 56–64.

1939a. Tendipedidae (Chironomidae). c. Subfamilie Diamesinae. A. Die Imagines. Fliegen Palaearktischen Reg. 3(13d): 1–28.

1939b. Tendipedidae (Chironomidae). d. Subfamilie Podonominae. A. Die Imagines. Fliegen Palaearktischen Reg. 3(13e): 1–5.

1940–50. Tendipedidae (Chironomidae). f. Subfamilie Orthocladiinae. A. Die Imagines. Fliegen Palaearktischen Reg. 3(13g): 1–208.

GOUIN, F. 1936. Metamorphoses de quelques chironomides d'Alsace et de Lorraine avec la description de trois espèces nouvelles par M. Goetghebuer. Rev. Franc. Entomol. 3: 151–173.

GOWIN, F. 1943. Orthocladiinen aus Lunzer Fliessgewässern II. Arch. Hydrobiol. 40: 114–122.

GOWIN, F., AND A. THIENEMANN. 1942. Zwei neue Orthocladiinen-Arten aus Lunz (Niederdonau). Zool. Anz. 140: 101–109.

HAMILTON, A. L. MS, 1965. An analysis of a freshwater benthic community with special reference to the Chironomidae. II. Taxonomy of the Chironomidae of Marion Lake, British Columbia. Ph.D. Thesis. Dept. Zoology, University of British Columbia, Vancouver, B.C. 216 p.

HENRIKSEN, K. L. 1939. A revised list of the insects of Grønland. Meddr. Grönland 119(10): 1–112.

HENRIKSEN, K. L., AND W. LUNDBECK. 1918. Conspectus Faunae Groenlandicae, pars secunda. II Landarthropoder (Insecta et Arachnida). Meddr. Grönland 22: 481–823.

HENSON, H. 1955. On *Hydrobaenus ephemerae* (Kief.). Chironomidae: Diptera. Entomologist 88: 131–136.

1956. Phoresis and parasitism in Ephemeroptera and Diptera. A review. Naturalist, Hull 859: 125–131.

1957. The larvae, pupa, and imago of *Hydrobaenus ephemerae* Kief. (Chironomidae, Diptera). Hydrobiologia 9: 25–37.

HIRVENOJA, M. 1967. Chironomidae and Culicidae (Dipt.) from Spitzbergen. Ann. Entomol. Fennici 33: 52–61.

JOHANNSEN, O. A. 1905. Aquatic nematocerous Diptera. II. Chironomidae. Bull. N.Y. State Museum 86: 76–327.

1908. New North American Chironomidae. Bull. N.Y. State Museum 124: 264–285.

1926. Notes on the synonymy of some New York State Chironomidae. J. N.Y. Entomol. Soc. 34: 273–277.

1934. New species of North American Ceratopogonidae and Chironomidae. J. N.Y. Entomol. Soc. 42: 343–352.

1937. Aquatic Diptera. Part III. Chironomidae: Subfamilies Tanypodinae, Diamesinae, and Orthocladiinae. Mem. Cornell Univ. Agr. Exptl. Sta. 205: 1–84.

1947. A new species of *Hydrobaenus* (*Chaetocladius*) from Connecticut with notes on related forms. (Diptera, Chironomidae.) Entomol. News 58(7): 171–174.

1952. Family Tendipedidae (= Chironomidae) except Tendipedidae, p. 3–26. *In* O. A. Johannsen, and H. K. Townes, Guide to the insects of Connecticut. VI. The Diptera or true flies. 5: Midges and gnats. Tendipedidae (Chironomidae). Bull. Conn. State Geol. Nat. Hist. Surv. 80: 3–147.

JOHNSON, C. W. 1900. Order Diptera, p. 617–700. *In* J. B. Smith [ed.] Insects of New Jersey. A list of the species occurring in New Jersey with notes on those of economic importance. Rept. N.J. State Agr. Exptl. Sta. (1899), 27(suppl.): 1–755.

KIEFFER, J. J. 1924. *Camptocladius ephemerae* n. sp., p. 367. *Cited in* K. Šulc and J. Zavřel. 1924. Über epoikische and parasitische Chironomidenlarven. Acta Soc. Sci. Nat. Moravo-Silesiacae 1: 353–391.

KOWNACKA, M., AND A. KOWNACKI. 1967. [*Parametriocnemus boreoalpinus* Gowin et Thienemann 1942 (Tendipedidae, Diptera) new species from the Tatra Mts.] Acta Hydrobiol. Krakow 9(1–2): 187–191. (In Polish.)

LENZ, F. 1939. Tendipedidae (Chironomidae). d. Subfamilie Podonominae. B. Die Metamorphose der Podonominae. Fliegen Palaearktischen Reg. 3(13e): 5–15.

LINDEBERG, B. 1964. Nomenclature of the wing-venation of the Chironomidae and of some other families of the nematocerous Diptera. Ann. Zool. Fennici 1: 147–152.

1966. Das Flügelgeäder der Chironomiden. Gewässer Abwässer 41/42: 44–47

LIPINA, N. N. 1928. [Larvae and pupa of chironomids; ecology and systematics.] Izd. Nauk Inst. Rybn. Khoz., Moscow. 179 p. (In Russian.)

LUNDBECK, W. 1898. Diptera groenlandica. Videnskabelige Meddr. Dansk Naturhist. Foren. 1898: 236–314.

MALLOCH, J. R. 1915a. Four new North American Diptera. Proc. Biol. Soc. Wash. 28: 45–48.

1915b. The Chironomidae, or midges, of Illinois, with particular reference to the species occurring in the Illinois River. Bull. Ill. State Lab. Nat. Hist. 10: 274–543.

ØKLAND, J. 1964. The eutrophic lake Borrevann (Norway) — an ecological study on shore and bottom fauna with special reference to gastropods, including a hydrographic survey. Folia Limnol. Scand. 13: 1–337.

OLIVER, D. R. 1959. Some Diamesini (Chironomidae) from the Nearctic and Palearctic. Entomol. Tidsskr. 80: 48–64.

1962. A review of the subfamily Orthocladiinae (Chironomidae, Diptera) of Bear Island. Astarte 20: 1–19.

1963. Entomological studies in the Lake Hazen area, Ellesmere Island, including lists of species of Arachnida, Collembola, and Insecta. Arctic 16(3): 175–180.

PAGAST, F. 1947. Systematik und Verbreitung der um die Gattung *Diamesa* gruppierten Chironomiden. Arch. Hydrobiol. 41: 435–596.

POTTHAST, A. 1915. Über die Metamorphose der *Orthocladius*—Gruppe. Arch. Hydrobiol. Suppl. 2: 243–376.

REISS, F. 1968. Ökologische und systematische Untersuchungen an Chironomiden (Diptera) des Bodensees. Ein Beitrag zur lakustrischen Chironomidenfauna des nördlichen Alpenvorlandes. Arch. Hydrobiol. 64: 176–323.

ROBACK, S. S. 1953. Tendipedid larvae from the St. Lawrence River (Diptera: Tendipedidae). Notulae Naturae Acad. Nat. Sci. Phila. 253: 1–4.

1957a. Some Tendipedidae from Utah. Proc. Acad. Nat. Sci. Philadelphia 109: 1–24.

1957b. The immature tendipedids of the Philadelphia area (Diptera: Tendipedidae). Monographs Acad. Nat. Sci. Phila. 9: 1–152.

1966. Notes on Tanypodinae types in European museums (Dipt.: Chironomidae). Entomol. News 77(5): 113–132.

SÆTHER, O. A. 1967a. Notes on the bottom fauna of two small lakes in Northern Norway. Nytt. Mag. Zool. 14: 96–124.

1967b. Descriptions of *Lasiodiamesa bipectinata* spec. nov. and *Parochlus kiefferi* (Garrett) Brundin. (Diptera: Chironomidae). Beitr. Entomol. 17: 235–249.

1968. Chironomids of the Finse area, Norway, with special reference to their distribution in a glacier brook. Arch. Hydrobiol. 64: 426–483.

in print. Chironomids and other invertebrates from North Boulder Creek, Colorado. Univ. Colo. Studies Ser. Biol.

SAY, T. 1823. Descriptions of dipterous insects of the United States. J. Acad. Nat. Sci. Phila. 3: 9–54, 73–104.

SCHLEE, D. 1966. Präparation und Ermittlung von Messwerten an Chironomidae (Diptera). Gewässer. Abwässer., 41/42: 169–193.

1968. Vergleichende Merkmalsanalyse zur Morphologie und Phylogenie der *Corynoneura* —Gruppe (Diptera, Chironomidae). Stuttgarter Beitr. Naturkunde 180: 1–150.

SERRA-TOSIO, B. 1967a. Sur les Orthocladiinae du genre *Heleniella* Gowin (Diptera, Chironomidae). Deut. Entomol. Z. 14: 153–162.

1967b. Note taxonomique sur *Diamesa arctica* (Boheman, 1865) (= *D. poultoni* Edwards, 1922) [Dipt. Chironomidae]. Bull. Soc. Entomol. France 72: 204–208.

SHADIN, V. I. 1940. [The fauna of rivers and water reservoirs. (The problem of reconstruction of the fauna of rivers under the influence of hydrotechnical buildings.)] Tr. Zool. Inst. Akad. Nauk SSSR 5(3–4): 519–992. (In Russian.)

SPÄRCK, R. 1922–23. Beiträge zur Kenntnis der Chironomidenmetamorphose. I–IV. Entomol. Meddr. 14: 32–109.

STAEGER, C. 1845. Grønlands Antliater. Naturh. Tidsskr. (1844–45) (Ser. 2) 1: 346–369.

STEFFAN, A. W. 1965. *Plecopteracoluthus downesi* gen. et sp. nov. (Diptera: Chironomidae), a species whose larvae live phoretically on larvae of Plecoptera. Canadian Entomologist 97: 1323–1344.

STRENZKE, K. 1950. Systematik, Morphologie und Ökologie der terrestrischen Chironomiden. Arch. Hydrobiol. Suppl. 18(2): 207–414.

1960. Metamorphose und Verwandtschaftsbeziehungen der Gattung *Clunio* Hal. (Dipt.) Ann. Zool. Soc. Zool.-Botan. Fennicae Vanamo 22(4): 1–30.

SUBLETTE, J. E. 1966a. Type specimens of Chironomidae (Diptera) in the American Museum of Natural History. J. Kansas Entomol. Soc. 39: 1–32.

1966b. Type specimens of Chironomidae (Diptera) in the U.S. National Museum. J. Kansas Entomol. Soc. 39: 580–667.

1967a. Type specimens of Chironomidae (Diptera) in the Canadian National Collection, Ottawa. J. Kansas Entomol. Soc. 40: 290–331.

1967b. Type specimens of Chironomidae (Diptera) in the Cornell University collection. J. Kansas Entomol. Soc. 40: 477–564.

SUBLETTE, J. E., AND M. S. SUBLETTE. 1965. Family Chironomidae (Tendipedidae), p. 142–181. *In* A. Stone et al. [ed.] A catalog of the Diptera of America north of Mexico. U.S. Dept. Agr., Agr. Handbook 276: 1–1696.

ŠULC, K., AND J. ZAVŘEL. [ed.] 1924. Uber epoikische und parasitische Chironomidenlarven. Acta Soc. Sci. Nat. Moravo-Silesiacae 1: 353–391.

THIENEMANN, A. 1936. Chironomiden-Metamorphosen. XI. Die Gattung *Eukiefferiella*. Stettines Entomol. Ztg. 97: 43–65.

1937a. Podonominae, eine neue Unterfamilie der Chironomiden. (Chironomiden aus Lappland I.) Mit einem Beitrag: F. W. Edwards. On the European Podonominae. Intern. Rev. Ges. Hydrobiol. Hydrograph. 35: 64–112.

1937b. Chironomiden-Metamorphosen (Diptera). XV. Mitteilungen Entomol. Ges. Halle 15: 22–36.

1939. Dritter Beitrag zur Kenntnis der Podonominae (Dipt. Chironomidae). (Chironomiden aus Lappland VI.) Zool. Anz. 128: 161–176.

1944. Bestimmungstabellen für die bis jetzt bekannten Larven und Puppen der Orthocladiinen. Arch. Hydrobiol. 39: 551–664.

1950. Lunzer Chironomiden. Ergebnisse von Untersuchungen der stehenden Gewässer des Lunzer Seengebietes (Niederösterreich). Arch. Hydrobiol. Suppl. 18: 1–202.

THIENEMANN, A., AND O. HARNISCH. 1932. Chironomiden-Metamorphosen. IV. Die Gattung *Cricotopus* v.d. W. Zool. Anz. 99: 135–143.

1933. Chironomiden-Metamorphosen. III. Zur Metamorphose der Orthocladiariae. Deut. Entomol. Z. 1933: 1–38.

THIENEMANN, A., AND F. KRÜGER. 1937. "*Orthocladius*" *abiskoensis* Edw. und *rubicundus* (Mg.) zwei "Puppen-Species" der Chironomiden. (Chironomiden aus Lappland. III.) Zool. Anz. 117: 257–267.

1939. Terrestrische Chironomiden II. Zool. Anz. 127: 246–258.

THIENEMANN, A., AND K. STRENZKE. 1940. *Pseudosmittia holsata*, eine neue Art mit fakultativer Parthenogenese. Zool. Anz. 132: 238–244.

1941. Terrestrische Chironomiden. VII. Die Gattung *Paraphaenocladius* Th. Zool. Anz. 133: 137–146.

TOKUNAGA, M. 1936. Chironomidae from Japan (Diptera), VI Diamesinae. Philippine J. Sci. 59(4): 525–552.

1939. Chironomidae from Japan (Diptera), XI. New or little-known midges, with special reference to the metamorphosis of torrential species. Philippine J. Sci. 69(3): 297–346.

WIRTH, W. W. 1952. Los insectos de las Islas Juan Fernandez. 7. Heleidae and Tendipedidae (Diptera). Rev. Chilena Entomol. 2: 87–104.

WÜLKER, W. 1956. Zur Kenntnis des Gattung *Psectrocladius* Kieff. (Dipt. Chironom.) Individuelle Variabilität, Grenzen und Möglichkeiten der Artentrennung, Ökologie und Verbreitung. Arch. Hydrobiol. Suppl. 24: 1–66.

1959a. Diamesarien-Studien (Dipt. Chironomidae) im Hochschwarzwald. Arch. Hydrobiol. Suppl. 24: 338–360.

1959b. Drei neue Chironomiden-Arten (Dipt.) und ihre Bedeutung für das Konvergenzproblem bei Imagines und Puppen. Arch. Hydrobiol. Suppl. 25: 44–64.

ZAVŘEL, J. 1937. Eine neue *Trissocladius*. Spisy Vydávane Přírodovedeckǒu Fak. Masaryk. Univ. 239: 1–12.

1938. Chironomidarum larvae et nymphae I. Spisy Vydávane Přírodovedeckǒu Fak. Masaryk. Univ. 268: 1–10.

1939. Chironomidarum larvae et nymphae II. Genus *Eukiefferiella* Th. Acta Soc. Sci. Nat. Moravo-Silesiacae 11: 3–39.

1941a. Vergleichend-morphologische Untersuchungen an den Podonominenlarven (Diptera, Chironomidae). I. Labrum und prämandibeln. Zool. Anz. 134: 105–115.

1941b. Chironomidarum larvae et nymphae IV. Genus *Metriocnemus* v.d.W. Acta Soc. Sci. Nat. Moravo-Silesiacae 13: 1–28.

1942. Polypodie der Chironomiden-Puppen. Acta Soc. Sci. Nat. Moravo-Silesiacae. 14: 1–40.

Recent Bulletins of the Fisheries Research Board of Canada

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