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Heterotrissocladius brundini spec. nov. from Norway

(Diptera, Chironomidae)

By Ole A. Sæther and Øyvind A. Schnell

Abstract

Heterotrissocladius brundini spec. nov. is described in all stages and both sexes. It apparently form the plesiomorphic sister species of *H. maeaeri* Brundin.

Introduction

Langton (1984: 88, fig. 28 a) illustrated a pupa of *Heterotrissocladius* with imbedded spines on segments VI-VIII and very large frontal warts. During an investigation of some acidified lakes in the southernmost part of Norway the junior author found all stages of apparently the same species. Later it was found also in western and northwestern Norway.

Methods and morphology

Morphological nomenclature follows Sæther (1980) with the exception that the apical spine of the gonostylus is termed the megaseta. The measurements are given as ranges followed by a mean when four or more measurements are made, followed by the number measured in parentheses (n).

The type material is kept at the Museum of Zoology, University of Bergen (ZMB).

Heterotrissocladius Spärck 1922, emended

Imago – Eyes completely naked, with a few microtrichia between marginal ommatids or pubescent, i. e. with microtrichia between all ommatids, with reticulation between central ommatids. Otherwise as in Sæther (1975: 3).

Pupa – Frontal warts weak to strongly developed. Frontal setae on frontal apotome (most species) or on prefrons (at least *H. latilaminus* Sæther). Caudolateral corners of segments VI-VIII occasionally with inner sclerotization resembling imbedded spines *(H. brundini* spec. nov), these strong on VII, weaker on VI, and only indicated on VIII. Otherwise as in Sæther (1975: 4).

Larva – Anterior parapods with apical claws grading over into basal hair-like spines anteriorly and on a common base. Otherwise as in Sæther (1975: 4).

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Heterotrissocladius brundini spec. nov.
(Figs 1–3)

Heterotrissocladius Pe 1, Langton 1984: 88

Type locality: Norway, Aust-Agder, Birkenes, Lake Repstadvatn.

Type material: Holotype, male, Lake Repstadvatn, Birkenes, Aust-Agder, Norway, 19/9/86, leg. H. Sægrov & Ø. A. Schnell, in coll. Mus. Zool. Univ. of Bergen (ZMB No. 115).

Paratypes: 5 males, 4 females, 2 male pupae, 147 pupal exuviae, 6 larval exuviae, as holotype; 5 pupal exuviae, Lake Store Hovvatn, Birkenes, Aust-Agder, Norway, 6/9/86, Ø. A. Schnell mature female pupa, Lake Jølster, Jølster, Sogn & Fjordane, Norway, 18/8/87, H. Sægrov; mature male pupa, Lake Litlebøvatn, Volda, Møre & Romsdal, Norway 26/7/86, Ø. A. Schnell; Other material (?): Male, Nordseter, Lillehammer, Oppland, Norway, 31/8/86, R. Bergo.

Diagnostic characters

The normal clypeus and cibarial pump combined with the moderately short acrostichals starting some distance from the scutal projection and the few setae on the wing membrane will separate the species from other *Heterotrissocladius* except *H. maeaeri* Brundin. However, the stipes is reduced, the wing slightly darker, the AR lower (0.7–1.1), the LR_1 higher (0.76–0.78) and the number of setae in cell r_{4+5} usually lower (7–18, except in one mature male pupa apparently with about 50 setae and another possible specimen with 45 setae, see remarks) in *H. brundini* spec. nov. The pupa can be separated from other members of the genus by means of the large frontal warts and the imbedded spines on segments VI-VIII. The larva can be distinguished by the narrowly separated two median teeth of the mentum with distinct lateral notches, the brownish black submentum which is conspicously darker than the surrounding areas of the head capsule, and the VM ratio of 1.1–1.5.

Etymology: Named in honour of Prof. emer. Lars Z. Brundin to his 80 year birthday and to signify his eminent contribution to chironomidology and lake typology where *Heterotrissocladius* has occupied a central position.

Description

Male imago (n = 7–9, except when otherwise stated).

Total length 3.93–4.22, 4.03 mm (6). Wing length 2.10–2.19, 2.14 mm (4). Total length/wing length 1.82–1.96, 1.90 (4). Wing length/length of profemur 2.44–2.55, 2.50 (4). Coloration brown with central parts of scutellum conspicuously pale. Wing pale yellowish brown.

Head. Eye with weak microtrichia between all ommatids. AR 0.92–1.05, 0.98 with one antenna of one specimen with an AR of 0.68. Ultimate flagellomere 424–484. 460 μm long with one antenna of one specimen with ultimate flagellomere 381 μm long. Pedicel 129–160, 139 μm wide. Temporal setae 10–17, 14, including 3–5, 4 inner verticals; 2–5, 4 outer verticals; and 5–8, 7 postorbitals. Clypeus 123–138, 132 μm wide; with 6–13, 10 setae. Cibarial pump, tentorium and stipes as in Fig. 1A, of doubtful specimen from Nordseter as in Fig. 1B. Tentorium 150–176, 162 μm long, 35–55, 42 μm wide. Stipes with reduced sclerotization in basal half and reduced median plate; 105–139, 120 μm long; 19–38, 26 μm wide (normal in possible specimen from Nordseter, see remarks). Palp lengths (micrometers): 29–45, 32; 41–62, 51; 109–149, 134; 86–103, 98; 106–138, 125. Third palpal segment with 2–4, 3 (6) sensilla clavata at apex.

Thorax (Fig. 1C). Antepronotum with 6–14, 11 setae. Dorsocentrals 15–25, 18; acrostichals 5–9, 7, starting some distance from scutal projection ranging from 1/3–1/2 the length of scutum, longest acrostichal 38–56, 45 μm long; prealars 7–9,8. Scutellum with 16–23, 19 setae.

Wing (Fig. 1D). VR 1.13–1.19, 1.16 (4). Brachiolum with 1–2, 2 setae; R with 11–15, 13 (6): R_1 with 4–11, 7 (6); R_{4+5} with 7–10, 9 (6); M_{1+2} with 0–8, 2 setae; other veins bare. Cell r_{4+5} with 7–18, 14 (5) setae, apparently with about 50 setae in mature male pupa from Volda; cell m_{1+2} with 0–3, 1 seta; cell an with 0–1, 0 setae. Squama with 18–21, 19 setae.

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Legs. Spur of front tibia 47–56, 50 μm long; spurs of middle tibia 35–38, 36 μm and 21–34, 25 μm long; of hind tibia 50–67, 62 μm and 18–26, 22 μm long.

Width at apex of front tibia 44–50, 47 μm (4); of middle tibia 47–53, 49 μm (4); of hind tibia 56–59, 56 μm (4). Comb with 11–12, 11 setae; shortest seta 21–29, 24 μm long; longest seta 53–70, 61 μm long. Sensilla chaetica absent. Lengths (micrometers) and proportions of legs (n = 4):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
P_1	849-860 857	884-920 905	681-717 696	341-382 360	245-263 258	179-185 181	126-132 127	0.76-0.78 0.77	2.58-2.70 2.66	2.47-2.56 2.53	2.6-3.0 2.8
P_2	801-860 837	777-848 822	406-418 412	227	167-173 170	131	114-120 116	0.49-0.52 0.50	3.10-3.27 3.22	3.88-4.12 4.02	2.0-2.8 2.4
P_3	884-956 935	920-1004 980	568-6.21 599	311-335 323	251-263 260	155-167 158	126-132 131	0.60-0.62 0.61	2.80-2.94 2.89	3.15-3.28 3.20	3.8-4.8 4.2

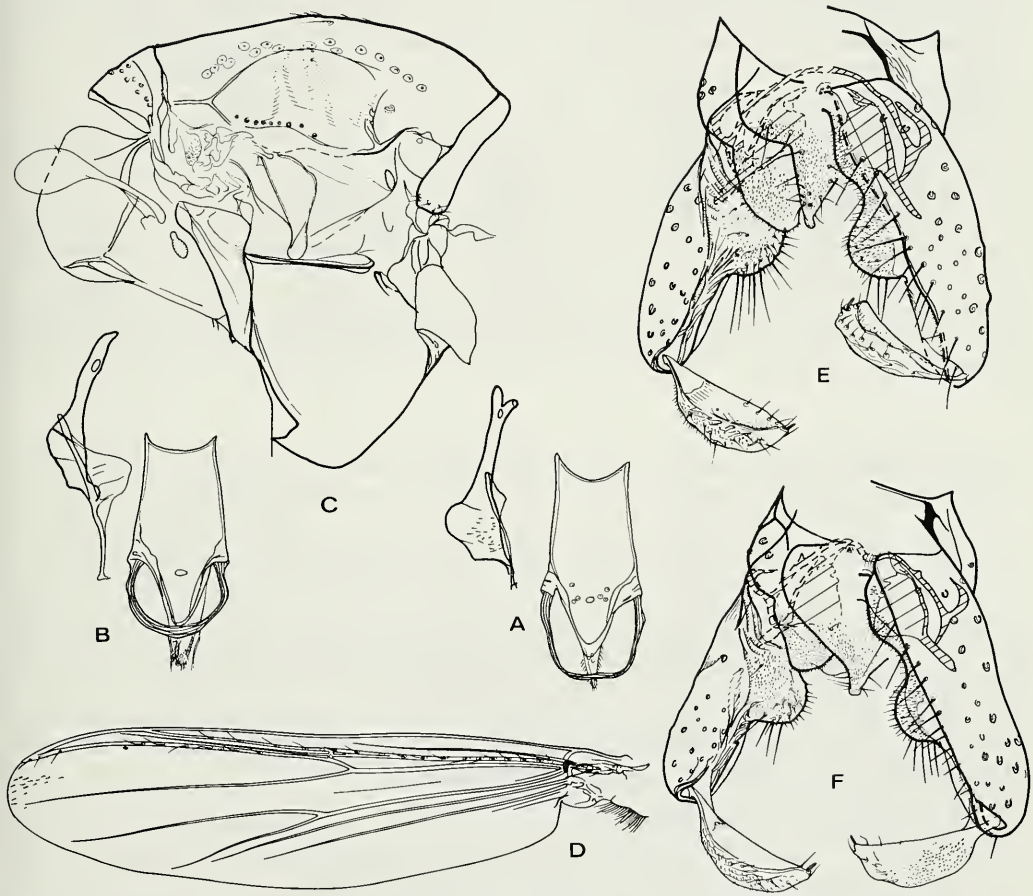

Fig. 1. *Heterotrissocladius* spp, male imago: A, C–E. *H. brundini* spec. nov; B, F. *H. brundini* or *maeaeri* (Brundin); A, B. Cibarial pump, tentorium and stipes; C. Thorax; D. Wing; E–F. Hypopygium.

Hypopygium (Fig. 1E). Anal point 53–70, 63 μm long; tergite IX including anal point with 20–27, 23 setae; laterosternite IX with 4–8, 7 setae. Phallapodeme 117–139, 125 μm long; transverse sternapodeme 106–116, 111 μm (6) long. Virga very weak and inconspicuous, consisting of one or

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two clusters of all together 6–7 spines; 11–15, 13 μm (5) long. Gonocoxite 255–278, 268 μm long; inferior volsella rounded, with long setae on distal side. Gonostylus 117–141, 127 μm long; outer margin rounded; crista dorsalis long, relatively pronounced, rounded near apex; megaseta 10–15, 12 μm long. HR 1.96–2.28, 2.12; HV 2.95–3.46, 3.18.

Female imago (n = 9–11, except where otherwise stated).

Total length 3.28–4.00, 3.61 mm. Wing length 2.11–2.33, 2.18 mm. Total length/wing length 1.51–1.80, 1.66. Wing length/length of profemur 3.01–3.24, 3.12 (8). Coloration as in male.

Head. Flagellomere lengths (micrometers): 83–109, 98; 45–60, 55; 53–64, 59; 56–69, 64; 120–156, 136. Pedicel 68–82, 73 μm wide. AR 0.44–0.55, 0.50. Temporals 9–14, 12; including 4–6, 5 inner verticals; 2–5, 3 outer verticals; and 2–5, 3 postorbitals. Clypeus 138–161, 151 μm wide; 1.85–2.22, 2.06 times as wide as pedicel; with 7–15, 11 setae. Tentorium 138–154, 146 μm (8) long; 18–26, 22 μm (8) wide. Stipes 86–149, 118 μm (8) long; 9–23, 16 μm (8) wide. Palp segments length (micrometers): 26–35, 31; 38–49, 43; 82–103, 94; 68–88, 78 (7); 98–135, 118 (7). Two specimens with fourth and fifth palp segments fused; 120–135 μm long. Third palpal segment with 3–5, 4 sensilla clavata at apex. Coronal suture incomplete; 64–98, 82 μm long.

Thorax. Antepronotum with 8–17, 11 lateral setae. Dorsocentrals 14–29, 19; acrostichals 4–7, 5; prealars 6–10, 8. Scutellum with 16–24, 19 setae.

Wing. VR 1.11–1.16, 1.13. Brachiolum with 2 setae; R with 12–25, 17; R_1 with 5–13, 8; R_{4+5} with 12–33, 24; M_{1+2} with 0–2, 1 setae; other veins bare. Cell r_{4+5} with 23–54, 36; cell m_{1+2} with 4–17, 13 (8) setae; cell an with 2–14, 6 (8) setae. Squama with 15–25, 21 setae.

Legs. Spur on front tibia 41–56, 50 μm long; spurs on middle tibia 30–41, 37 μm and 23–34, 28 μm long; on hind tibia 60–71, 66 μm and 18–26, 24 μm long. Width at apex of front tibia 38–47, 43 μm; of middle tibia 41–53, 48 μm; of hind tibia 49–59, 53 μm. Comb of 7–10, 8 setae; shortest seta 23–34, 29 μm long; longest seta 49–67, 56 μm long. Sensilla chaetica 1–7, 4 at 0.20–0.30, 0.28 (8) to 0.40–0.60, 0.53 on ta_1 of hind leg; apparently absent in mid leg. Lengths (micrometers) and proportions of legs (n = 7–9):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV	BR
P_1	669-753 697	753-848 793	548-624 582	274-321 291	194-217 200	137-151 143	99-131 106	0.72-0.76 0.74	2.68-2.92 2.87	2.47-2.63 2.54	2.1-3.1 2.9
P_2	690-807 716	717-807 749	359-384 377	191-227 203	142-167 149	95-120 106	85-114 99	0.49-0.51 0.50	3.23-3.47 3.31	3.76-4.10 3.89	2.1-3.0 2.5
P_3	784-896 817	884-992 921	548-624 576	293-335 303	227-263 242	135-161 144	99-134 114	0.61-0.65 0.63	2.78-2.98 2.88	2.88-3.10 3.02	2.9-3.9 3.3

Abdomen. Number of setae on tergites I-VIII as: 33–53, 42; 38–46, 42; 26–40, 25; 24–44, 34; 24–38, 31; 19–35, 28; 19–35, 24; 9–26, 16. Number of setae on sternites I-VIII as: 0; 3–7, 5; 5–10, 7; 8–17, 11; 12–20, 15; 14–24, 17; 15–23, 18; 43–71, 56.

Genitalia (Fig. 2). Gonocoxite with 13–20, 16 setae. Tergite IX well divided, with 20–31, 25 setae. Cercus 114–142, 133 μm long. Seminal capsule 76–101, 86 μm (8) long; excluding 11–26, 17 μm long neck; 64–79, 71 μm wide. Notum 105–161, 132 μm long.

Pupa (n = 11, except when otherwise stated)

Total length 3.76–4.78, 4.31 mm (9). Length of thoracic horn/length of anal macrosetae 1.10–1.50, 1.34. Thorax of exuviae pale brownish grey, abdomen nearly transparent.

Cephalothorax. Frontal warts (Fig. 3A) conspicuous, 82–117, 97 μm high; 35–53, 40 μm (10) wide at base. Frontal setae on frontal apotome; 59–83, 73 μm (8) long. Postorbitals 59–73, 66 μm (4) and 41–56 μm (2) long. Median antepronotals 117–147, 140 μm (9) and 103–132, 120 μm long; lateral antepronotals 73–88, 80 μm and 0–44, 9 μm long (when absent reduced to setal mark). Thoracic horn (Fig. 3B) 290–396, 349 μm long; 44–70, 54 μm (9) wide; 5.44–8.00, 6.57 (9) times as long as wide. Anterior dorsocentral 44–88, 65 μm long; Dc_2 53–117, 88 μm long; Dc_3 32–129, 68 μm long;

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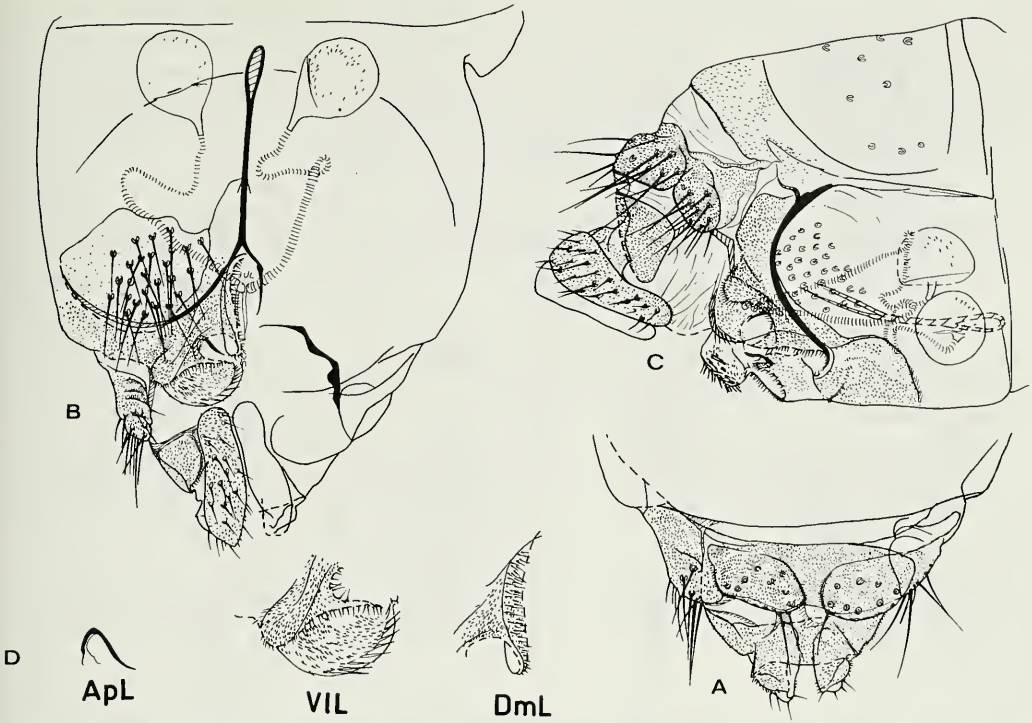

Fig. 2. *Heterotrissocladius brundini* spec. nov, female genitalia: A. Dorsal view; B. Ventral view; C. Lateral view; D. Lobes of gonapophysis VIII (DmL dorsomesal lobe; VlL, ventrolateral lobe; ApL, apodeme lobe).

Dc_4 64–88, 78 μm long. Distance between Dc_1 and Dc_2 18–67, 42 μm; between Dc_2 and Dc_3 15–53, 28 μm; between Dc_3 and Dc_4 23–82, 58 μm. Prealar observed in one specimen, 18 μm long. Wing sheath with fine marginal lines.

Abdomen (Fig. 3 C, D). Shagreen absent on tergite I (T I) and T IX, weak median on T II, more extensive and stronger posterior on TIII–VI, weak anteriomedian on T VII–VIII. Sternites I (S I) and IX bare, S II–III with weak anterior and median shagreen, S IV–VII with weak anterior shagreen and a few posterior spinules as S VI. Pedes spurii A present on sternites IV-VII and occasionally VIII (3 individuals). Pedes spurii B wider than high. Caudal hooklets 20–40, 32 on T II. Sternite VIII of male with 19–33, 27 (7) posterior spines. Caudolateral corners of segments VI–VIII with imbedded spines, distinct on VII, only indicated on VI and VIII. L setae on segments I–VIII as: 1–2 (4): 3: 3: 3: 3: 3: 3–4, 3: 5; 3 lamelliform on VII, 4 lamelliform on VIII, occasionally also fifth L seta on VIII slightly lamelliform. Anal lobe 269–337, 302 μm long; with 19–25, 22 setae in fringe; anal macrosetae 234–293, 261 μm long. Genital sac of male overreaching anal lobe by 88–124, 109 μm (4).

Larva (n = 6, except when otherwise stated)

Total length about 6 mm (larval exuviae). Head capsule length 447–502 μm (3).

Head. Antenna as in Fig. 3 E. Lengths of antennal segments (micrometers): 82–88, 86; 35–41, 36; 3–4, 4; 18–22, 19 (4); 6–9, 7 (4); 4–6, 4 (4). AR 1.07–1.16, 1.12 (4). Basal antennal segment 18–21, 20 μm wide; 4.05–4.32, 4.24 times as long as wide; distance from base to annular organ 9–18, 15 μm; to distal mark of seta 21–35, 31 μm; blade at apex 50–64, 50 μm long; accessory blade 7–9, 9 μm long. Subapical style of second segment 6–9, 7 μm (5) long. Labrum and epipharyngeal areas as in

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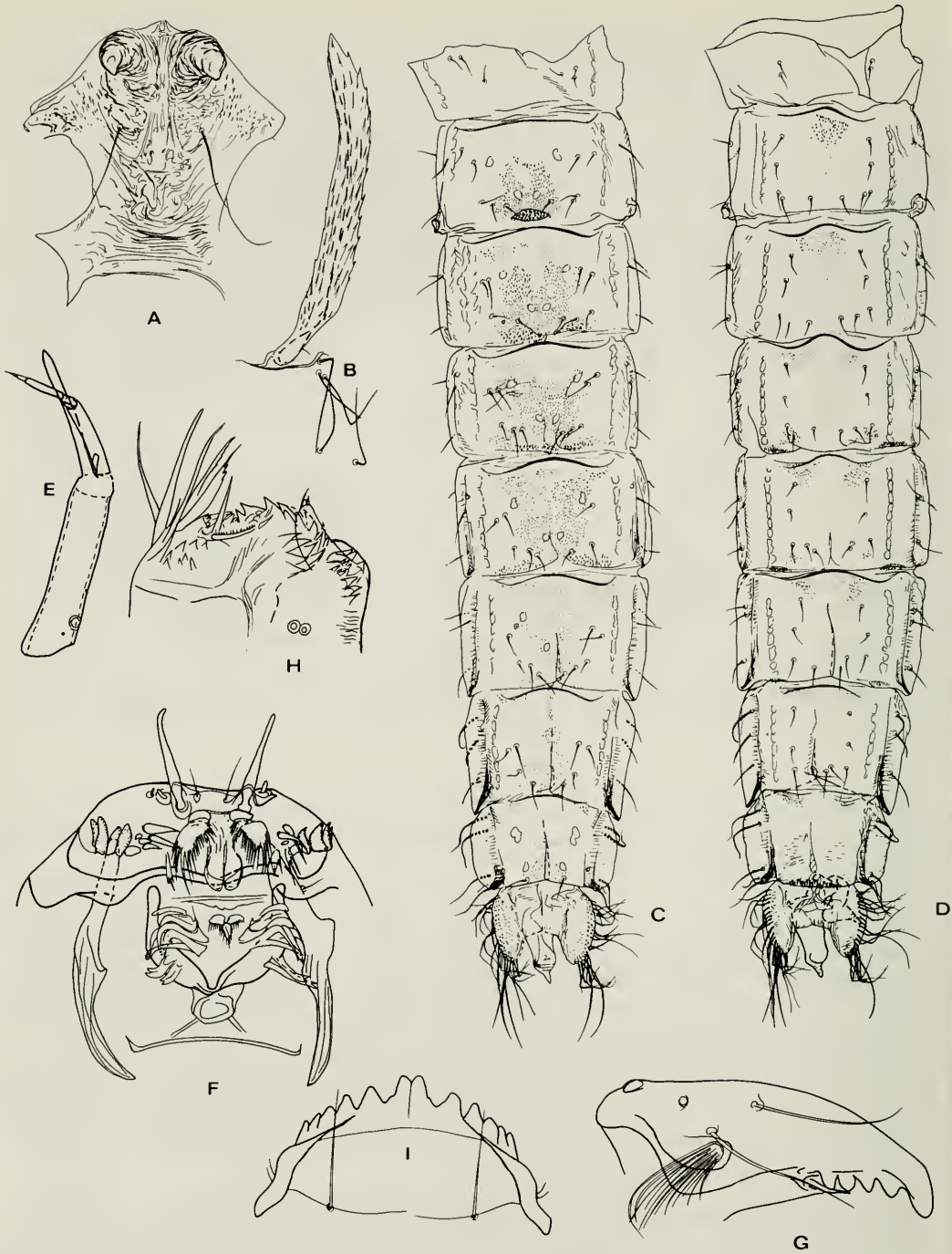

Fig. 3. *Heterotrissocladius brundini* spec. nov, pupa: A. Frontal apotome; B. Thoracic horn; C. Tergites of male; D. Sternites of male. – larva: E. Antenna; F. Labrum and epipharyngeal area; G. Mandible; H. Maxilla; I. Mentum.

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Fig. 3F. S I broad, finely plumose. Labral lamellae rounded apically. Median spine of pecten epipharyngis narrower than lateral spines. Premandible 79–85, 83 μm (5) long. Mandible (Fig. 3G) 158–176, 168 μm (4) long. Maxilla as in Fig. 3H. Mentum (Fig. 3I) with two close median teeth each with distinct lateral accessory tooth, width of one median tooth including accessory tooth 18–21, 19 μm; ventromental plates 21–26, 25 μm (4) wide; 1.08–1.50, 1.32 times as wide as one median tooth including accessory tooth. Postmentum distinctly darker than surrounding areas of head capsule; 208–229, 222 μm long.

Abdomen. Procercus 38–47, 43 μm high; 29–32, 31 μm wide; anal setae 647–747, 706 μm (5) long. Supraanal seta 234–264, 242 μm long; 0.32–0.35, 0.34 (5) times as long as anal setae. Anal tubules and posterior parapods not measurable.

Remarks

A male imago from Nordseter near Lillehammer is not included in the type material. Judging from the leg proportions and the antennal ratio the specimen belong to *H. brundini*. The normally sclerotized stipes (132 μm long, Fig. 1B) and the more numerous setae on the wing membrane (45 setae in cell r_{4+5}, 7 setae in each of m_{1+2} and m_{3+4}), however, indicate that it belongs to *H. maeaeri*. The hypopygium (Fig. 1F) could belong to any of the two species. Associated pupal material is needed to decide whether the stipes and the wing setation is more variable within *H. brundini* or whether the specimen represents *H. maeaeri* or an additional new species.

The pupa described by Langton (1984: 88) do not quite fit *H. brundini*. The thoracic horn of *Heterotrissocladius* Pe I of Langton is wider (length/width 4.0–5.1), and there are more numerous setae in the anal lobe fringe (26–30). These variations, however, probably is not more than can be expected between various populations.

Ecology and distribution

H. brundini has been found in two acidified lakes in Southern Norway, two lakes in the provinces of Møre & Romsdal and Sogn & Fjordane, and in Lake Assynt in the Sutherland District of Scotland. It could conceivably be an indicator species of oligotrophic acid lakes.

Systematics

Sæther (1975: 57–62, fig. 15) does a phylogenetic analysis of *Heterotrissocladius* and related genera. In the scheme of argumentation *H. brundini* will be synapomorphous for trends 57, 58, 59, 60; 9, 10, 11; and 51, 52, showing that the species is a good *Heterotrissocladius*. It is symplesiomorphous for trends 41 and 44, apomorphous for trends 42 (reduced acrostichals) and 43 (reduced number of setae on the wing membrane). The last two trends show parallelisms between the *subpilosus* and the *maeaeri* groups. However, there are no pearl rows on the pupal wing sheaths (trend 37), only 4 filamentous setae on segment VIII of the pupa (trend 39), and no setae dorsad of the genital sac (trend 40), showing that the species belong with the *maeaeri* and *marcidus* groups. However, the pedes spurii A which may occur on sternite VIII and the fifth L seta which in some specimen is somewhat filamentous, indicate a plesiomorphic position within these groups.

The species is synapomorphous with *H. maeaeri* for trends 32 (short acrostichals) and 35 (distribution of L setae in pupa). It is plesiomorphous for trends 33 (PSB), 34 (PSA), 36 (median teeth of mentum), and apomorphous for trends 30 (setae on male tergite IX) and 31 (AR of larva), indicating a placement in the *marcidus* group. However, trends 30 and 31 are not very significant, representing continuous variation and probably good only as specific autapomorphies. Also several additional synapomorphies between *H. maeaeri* and *H. brundini* can be found in the male hypopygium in the shape of the inferior volsella, the inner margin of the gonocoxite and in the shape of the gonostylus. We feel relatively certain about the phylogenetic position of the species as the sister species of *H. maeaeri*.

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There are few problems fitting the imagines and the pupa within the concept of the *maeaeri* group (SÆTHER 1975: 22); the stipes of the imagines and the pedes spurii B of the pupa have to be deleted as distinguishing characters. However, the larva will key to *H. marcidus* (Walker) in the larval key (SÆTHER 1975: 9) because of the two median teeth of the mentum. The median teeth, however, are closer together than in other described species except for *Heterotrissocladius* sp. E from Lake Superior (SÆTHER 1975: 55) which is mentioned as intermediate between the *marcidus* and *maeaeri* groups. *Heterotrissocladius* sp E almost certainly is close to *H. brundini*. A redefinition of the *maeaeri* group to include larvae with median teeth close together and distinct accessory teeth will make a separation between the *maeaeri* and *marcidus* groups still feasible.

The imbedded spines found in the pupa is nearly unique within the orthoclads, otherwise found in some members of *Zalutschia* Lipina only. SÆTHER (1976) did not attempt to classify *Oliveridia* Sæther, *Hydrobaenus* Fries, *Trissocladius* Kieffer and *Zalutschia* combined as a monophyletic group. According to SÆTHER (1977: 82), however, the genera apparently form a monophyletic unit based on the shape of the female gonapophysis VIII. This trend, however, is rather insecure as similar gonapophyses occur elsewhere including in the *Heterotrissocladius* group of genera. It thus is possible that *Zalutschia* is more closely related to the *Heterotrissocladius* group than to *Hydrobaenus*, and that the imbedded spines represent an underlying synapomorphy occurring in some, bot not all members of both *Zalutschia* and *Heterotrissocladius*. We have observed indication of imbedded spines also in some exuviae of *H. marcidus*. On the other hand the imbedded spines merely represent a strengthening of the paratergital margin and could easily be a result of parallel selection.

The larvae of *Heterotrissocladius* all have hair-like spines at base of the anterior parapods similar to those illustrated by STRENZKE (1950 fig. 11) for *Paraphaenocladius* Thienemann, but not found in *Parametriocnemus* Goetghebuer or apparently in the same form in other orthoclads. However, other synapomorphies seem to confirm the relationship shown by SÆTHER (1975 fig. 15) and these spines must be regarded either as secondarily reduced in *Parametriocnemus* or as an underlying synapomorphy for the whole group.

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