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# NOTES ON THE BOTTOM FAUNA OF TWO SMALL LAKES IN NORTHERN NORWAY

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(Text-figs. 1–5)

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ÖKLAND (1963) has given a review of the quantity of bottom fauna in Norwegian lakes and rivers and points out that no lakes in northern Norway have been studied in this respect. In connection with his graduation thesis on limnological investigations in two lakes in Troms County, cand. real. Reidar Thomassen collected bottom animals and animals from the litoral which he has kindly delivered to me for identification. This collection, although of limited value as it is based only on single samples, constitutes the first quantitative bottom samples taken in northern Norway.

All the limnological data herein are from the study by THOMASSEN (1964).

## DESCRIPTION OF THE LAKES

Lake Rundvann and Lake Rottvann are situated in the Balsfjord district of the County of Troms about 53 km south of the city of Tromsö, at 69° 10′ N and 18° 61′ E. The position of the lakes, together with a bathygraphical map, is shown in Fig. 1.

Lake Rundvann has a maximum length of 710 m, a maximum breadth of 450 m, a maximum depth of 23.5 m, a surface area of 0.17 km², a drainage area of 3.94 km², and an elevation of 148 m above sea level. Lake Rottvann is 417 m long, 117 m wide, has a maximum depth of 4.5 m, a surface area of 0.03 km², a drainage area of 0.19 km², and an elevation at the surface of 152 m above sea level. The distance between the lakes is 190 m.

In the catchment area of Lake Rottvann, the bedrock consists of amphibolite, chlorite-schist, plagioclase-schist, and mica-schist gneiss. The drainage area of Lake Rundvann has in addition a sizable area of marble and a smaller area of morainic drift. Most of the drainage area is covered with birch forests, but there are also large areas of bog with some fir.

The district belongs to an inland climatic region. The temperatures for the spring and summer of 1962 were below normal, while the spring of

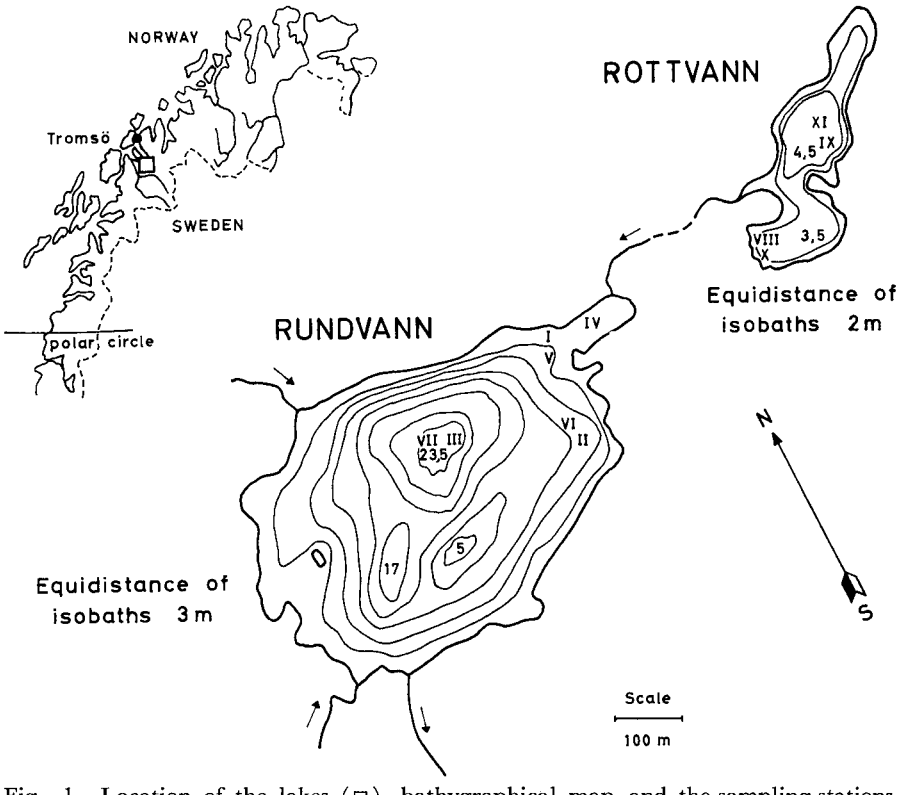


Fig. 1. Location of the lakes (□), bathygraphical map, and the sampling stations (Nos. I–XI).

1963 was remarkably warm. Corresponding to these differences, the ice-cover began to break up on 8 June in 1962, and about 20 May in 1963. Spring full circulation in Lake Rundvann was of very short duration in 1962 because of these weather conditions.

On 11 April 1963, the only observations made during the winter stagnations, Lake Rottvann was totally depleted of oxygen in the bottom water, while Lake Rundvann had a saturation value at the bottom of 41.3%. On 11 June 1962, however, following break-up of the ice-cover, the lowest saturation figure in Lake Rundvann was 21.5%. This low value was certainly a result of the hibernal consumption of oxygen. During the summer observations (except on 11 June 1962), the lowest saturation figures measured were 55.8% in Lake Rundvann and 73.6% in Lake Rottvann.

The active reaction in Lake Rundvann ranged from a value of *p*H 6.8 to *p*H 8.5 in the surface water, and from *p*H 6.9 to *p*H 7.1 in the bottom water. In Lake Rottvann, the variation was from *p*H 6.8 to *p*H 7.4 at the surface and from *p*H 6.5 to *p*H 7.0 at the bottom.

The conductivity figures (in $\varkappa_{18} \cdot 10^6$) in Lake Rundvann mostly range 80-100, but may reach 130 at the bottom during the winter stagnation.

In Lake Rottvann, the conductivity values usually vary from 50 to 70, but reach 122 at the bottom during the winter stagnation.

The Secchi-disc transparency was between 5.50 m and 8.75 m in Lake Rundvann, and between 2.25 m and 4.25 m in Lake Rottvann. The water colour was generally green in Lake Rundvann, and ranged from yellowish green to yellowish brown in Lake Rottvann.

In Lake Rundvann, in addition to *Sphagnum* mats, the predominant higher vegetation consists of *Equisetum fluviatile* and *Potamogeton alpinus*. In Lake Rottvann, *Nuphar pumilum* and *Potamogeton perfoliatus* are the most abundant. On the whole, higher vegetation is not rich.

The zooplankton in both lakes is dominated by *Eudiaptomus graciloides*, *Cyclops scutifer*, and *Daphnia longispina* subsp. *hyalina*. *Kellicottia longispina*, *Bosmina coregoni obtusirostris* var. *arctica*, *Bythotrephes longimanus*, *Heterocope appendiculata*, and *Polyphemus pediculus* (in the litoral) were common in both lakes. In Lake Rottvann, *Holopedium gibberum* and *Chaoborus flavicans* were also found.

The above-mentioned data suggest that Lake Rundvann is an oligotrophic lake. It differs from most Norwegian lakes in that it seems moderately rich in lime and may be reckoned among the A-oligotrophic lakes (STRÖM 1928 p. 103). Lake Rottvann seems to be a dystrophic lake, but richer in lime than is usual in Norwegian dystrophic lakes.

## THE SAMPLES TAKEN

Seven single samples were taken in Lake Rundvann and four single samples in Lake Rottvann. This of course is much too small a number to give significant averages and variation in numbers of bottom animals. All the same, these few samples, together with some imagines and pupal exuviae collected in Lake Rottvann, some bottom animals from the guts of trout, some water mites collected in planktonic samples at the deepest place in Lake Rundvann and at the shore of Lake Rottvann, and bottom animals from other non-quantitative samples, are of certain interest.

The samples were taken by means of a Birge-Ekman grab covering an area of 225 $cm^2$ and having a height of 17 cm (the shovels not included). The mud was filtered through gauze of 0.2 mm mesh.

The sampling localities are indicated on the bathygraphical map (Fig. 1) by Roman numerals.

## THE BOTTOM ANIMALS FOUND

### OLIGOCHAETA

*Tubifex* Lamarck

Lake Rottvann, 13 April 1963: 1 specimen at a depth of 1 m.

*Lumbriculus variegatus* (Müll.)

Lake Rundvann, 23 August 1963: 1 specimen at a depth of 1.5 m.

Lake Rottvann, 13 April 1963: 1 specimen at a depth of 1 m.

The species is known from different waters. UDE (1929 p. 100) mentions that it is especially common in bog lakes and prefers shadowy places.

ALMSTEDT (1946 p. 8), however, claims that the species occurs in nearly all types of biotopes. In Sweden, the species is known from all over the country (Skåne-Lapland) (PIGUET 1919 pp. 795-796, ALMSTEDT 1946 p. 8). The species is not previously reported from Norway.

## AMPHIPODA

*Gammarus lacustris* Sars

Lake Rundvann, 14 April 1963: 5 specimens at a depth of 1 m. 23 August 1963: 6-10 specimens (vial lost) at a depth of 1.5 m.

Lake Rottvann: No specimens found in quantitative samples, but very abundant in the guts of trout.

This species was in older Norwegian literature designated as *G. pulex* (L.), which does not occur in Norway, but is found in Southern Sweden and in Denmark. The only true freshwater *Gammarus* species in Norway is *G. lacustris*. (*G. duebeni*, however, is found in one inland locality, a ditch containing slightly brackish water, near Horten on the western side of the Oslo Fjord (ÖKLAND 1959 pp. 1-14).) The European distribution of *G. lacustris* is given, and its ecology and immigration history discussed by SEGERSTRÅLE (1954 pp. 45-85).

Contrary to the fact that *G. lacustris* does not usually occur in humic waters is the presence of the species in Lake Rottvann. This is probably due to the comparatively high lime content of this lake.

## INSECTA

### Ephemeroptera

*Ephemera vulgata* L.

Lake Rundvann, 4 April 1963: 7 specimens at a depth of 1 m.

On these 7 specimens, 4 specimens of *Epoicocladius ephemera*, an epizoic chironomid, were found (see p. 107).

*E. vulgata* is an euryoecic ubiquity. BRUNDIN (1949) finds the species in oligohumic lakes as well as in mesohumic and moderately polyhumic ones, although in the extremely polyhumic lake, Grimsgöl, it was absent. BREKKE (1938 p. 64) mentions the species from the eastern part of southern Norway. The northernmost occurrence is in the county of South Tröndelag.

*Leptophlebia marginata* (L.)

Lake Rundvann, 14 April 1963: 1 specimen at a depth of 1 m.

Lake Rottvann, 21 June 1962: 1 imago from the surface of the lake together with exuviae of chironomids and of *Chaoborus*.

LUND (1956 p. 88) records the species as common in bog lakes, and BREKKE (1938 p. 64) records it from all over the country. In the county of Troms, it has been found at Bjerkeng in Målselv, in Lake Fjellfröskvann (Balsfjord), and in Lake Prestvann (Tromsö).

*Caenis horaria* (L.)

Lake Rundvann, 28 August 1963: 2 specimens at a depth of 1.5 m.

MACAN (1955 p. 131) mentions that the species is abundant not only in the rich black mud of Esthwaite Water, but also in the peaty substratum of Three Dubs Tarn. BRUNDIN (1949) mentions *Caenis* sp. from the same regions as the lakes in which he found *E. vulgata*. BREKKE (1938 p. 70) reports the species only from the county of South Tröndelag, but it has subsequently been recorded from the Abisko area in Northern Sweden (ULMER 1943 p. 348). ÖKLAND (1964 p. 112) mentions the species from Borrevann in Vestfold, and the species is present in the author's collection from Svinsjöen near Oslo.

*Sialis lutaria* (L.)

Lake Rundvann: 1 larva in the gut of a trout.

Lake Rottvann, 13 April 1963: 1 larva at a depth of 1 m.

According to KIMMINS (1944 pp. 6, 18), the species is most common where there is an abundance of silt. In the mesohumic lake, Stråken, BRUNDIN (1949 p. 290) also found the species in the profundal where the oxygen might have been temporarily low.

*S. lutaria* is widely distributed in most parts of Norway.

## Trichoptera

*Cyrnus flavidus* McLachl.

Lake Rottvann, 13 April 1963: 3 specimens at a depth of 1 m.

In the extremely polyhumic lake, Grimsgöl, BRUNDIN (1949 p. 370) found only 3 species of trichopters of which *C. flavidus* was one. The larvae of *C. flavidus* are known to be able to live at a greater depth than the majority of the Trichoptera larvae (BERG 1938 p. 90), which might mean that they tolerate a low oxygen content.

*Polycentropus flavomaculatus* Pict.

Lake Rundvann, 14 April 1963: 3 specimens at a depth of 1 m. 23 August 1963: 1 specimen at a depth of 1.5 m.

As the preceding species, a very common trichopter.

*Phryganea* sp.

Lake Rottvann, 6 July 1962: 6 exuviae of phryganeidous pupae were found at the surface of the lake.

It is not possible to identify phryganeidous pupae to species, but on the basis of the great sizes measured (25.5 mm, 27 mm, 27 mm, 27.5 mm, 28.5 mm, 30.5 mm) the exuviae probably belong to one of the larger species of *Phryganea*.

## Coleoptera

cf. *Dytiscus* sp.

Lake Rundvann, 23 August 1963: 2 larvae at a depth of 1.5 m. The vial unfortunately lost, but both specimens probably belonged to *Dytiscus*.

Diptera

Fam. Chaoboridae (Corethridae)

*Chaoborus flavicans* (Meig.)

Lake Rottvann, 21 August 1962: 6 young larvae in a planktonic sample. 21 June 1962: 5 exuviae, 2 ♀♀, 2 ♂♂, 1 lacking abdominal segments.

These specimens differ from the typical immature stages of *C. flavicans*. They might merely represent a different form, or possibly a new subspecies or even a species. An examination of the imago, however, is necessary to ascertain the systematic position. Description of the specimens, together with descriptions and redescriptions of immature stages from Danish, Nearctic, and South Norwegian localities, and of the larvae and pupae of *C. flavicans* and *C. alpinus* first described by PEUS (1934, 1938), is given by SÆTHER (in preparation).

Fam. Chironomidae (Tendipedidae)

Subfam. Tanypodinae (Pelopiinae)

*Macropelopia* Thien.

Lake Rundvann, 14 April 1963: 1 larva at a depth of 7 m.

Lake Rottvann, 21 June 1962: 1 larva in a qualitative sample.

Imagines of *Macropelopia* have been collected all over the country, but larvae are recorded only from Lake Nedre Sjodalsvatn in Vågå (SOOTRYEN 1943 p. 10). I have found larvae, however, in material from Lake Skjennungen and Lake Östensjövann near Oslo and Lake Borrevann near Horten (ÖKLAND 1964 p. 135, SÆTHER 1965 p. 50).

*Procladius* Skuse, *Psilotanypus* Kieff.-type

Lake Rundvann, 19 August 1963: 1 larva at a depth of 8 m.

Lake Rottvann, 14 August 1963: 8 larvae at a depth of 5 m.

*Procladius* and *Psilotanypus* cannot be separated by means of larval characters. *Procladius* is nearly always one of the dominating genera in all kinds of waters.

*Procladius* sp. *A*

Lake Rottvann, 21 June 1962: 9 exuviae.

Two types of *Procladius* exuviae were found (sp. *A* and sp. *B*). *A* was of the usual type with about 60 spines on each lobe and with a length of 8-9 mm (Fig. 2 A).

*Procladius* sp. *B*

Lake Rottvann, 21 June 1962: 1 exuvia.

The exuvia measured 5 mm in length and had few spines on the anallobes (Fig. 2 B).

Subfam. Orthocladiinae

*Psectrocladius* (*Psectrocladius*) *fennicus* Storå

Lake Rundvann, 19 August 1962: 1 specimen in transitional state between larva and pupa.

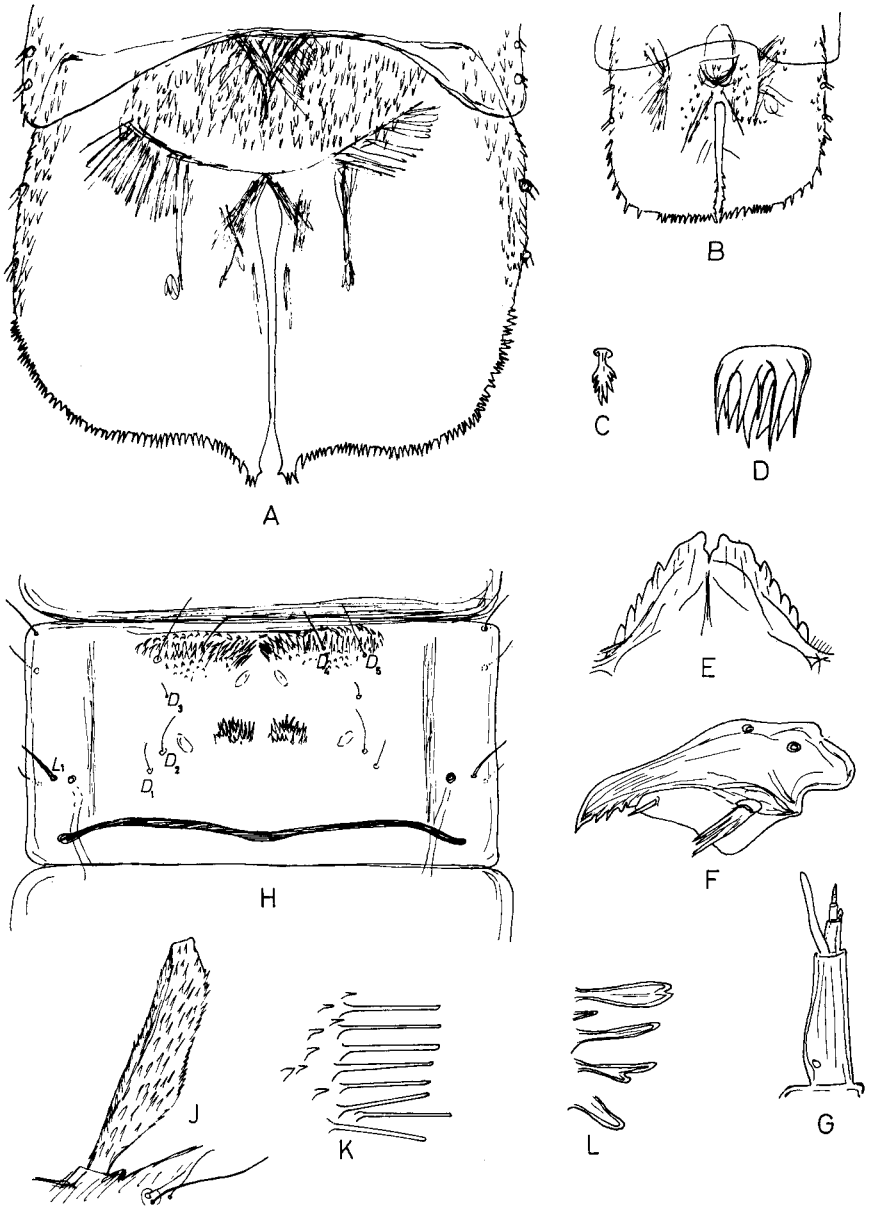


Fig. 2. A. Anal lobe of pupa of *Procladius* sp. *A*. B. Anal lobe of pupa of *Procladius* sp. *B*. (Equal scale in Figs. A and B.)
C–G. *Psectrocladius* (*Psectrocladius*) *fennicus*. (D. Pupa. C and E–G. Larva.) C. Anterior seta of labrum. D. Patch of spinules of tergite V. E. Labium. F. Mandible. G. Antenna.
H–L. *Psectrocladius* (*Psectrocladius*) *barbimanus*. Pupa. H. Tergite IV. J. Respiratory organ. K. Spinules of ventral anal corners of segments IV-VI. L. Spinules of posterior margins of tergites II-VII.

The larva seems to have measured 7.5 mm; the pupa seems to measure about 5.5 mm. Ratio of antennal segments to each other as 20: 4.5: 2.5: 1.5: 1.5: = 20 : 10; first blade of basal segment in same ratio 13, thus differing from all earlier described larvae of *Psectrocladius* (POTTHAST 1914 pp. 316-325, GOETGHEBUER 1932 pp. 69-70, THIENEMANN 1934 pp. 151-154, 1937 pp. 4-6, 1944 pp. 627-629, THIENEMANN and HARNISCH 1933 pp. 24-30, JOHANNSEN 1937 pp. 66-68, ANDERSEN 1937 pp. 56-58, TSHERNOVSKIJ 1949 pp. 111-115, WÜLKER 1956 pp. 18-19, 21-23, 29-30); second blade of basal segment a little shorter than second segment (as in other *Psectrocladius* species); Lauterborn organs half as long as second segment; ratio of antenna to mandible as 30:43. Point of mandible longer than the distance occupied by the last two teeth, but not so long as the whole range occupied by the teeth. Setae anteriores of labrum with 8 teeth as in 'Poly-Form' larvae (WÜLKER 1956 p. 7). Tubuli anales about four times as long as broad, slightly constricted in the middle, rounded at apex. Procerci with 7 bristles. Other details as in *P. octomaculatus* Wülk. (syn. *P. calcaratus* THIENEMANN 1944 p. 628).

Developing pupa with paired dorsal-median areas of strong spinules on tergites V and VI, with about 12 spinules in each patch. Paired patches on segment IV consisting of only 2 or 3 spines in each area (as mentioned by WÜLKER 1956 p. 22), the number of spines in the patches of segment IV are very often reduced to a few). Posteriorly directed spinules in a transverse band along posterior margins of segments III-VII; those of tergite VII very faint. Abdomen of the exuvia uncoloured, thoracic segments yellowish brown. There seem to be about 35 bristles on anal lobes.

Antenna, mandible, labium, anterior seta of labrum of the larva, and patch of spinules of tergite V of the pupa are shown in Figs. 2 C-G.

The key of THIENEMANN to larvae (1944 pp. 627-629) leads to *P. octomaculatus*. Unlike all described larvae, however, the first blade of the basal antennal segment overreaches segment 5 of the antenna. The key of WÜLKER to pupae (1956 p. 5) leads to *P. fennicus*. The prothoracic organ is missing, but in other mentioned characters the species falls in *P. fennicus*.

WÜLKER (1956 p. 7) divides the species of *Psectrocladius* s. str. into 3 groups, each including 3 categories. The pupa of *P. fennicus* belongs to the 'Meso-Form', while the larva, which has not been previously described, belongs to the 'Poly-Form'.

*P. fennicus* is known from Finland, Sweden, Norway, England, and Ellesmere Island. In Norway, the species has been found in Jotunheimen at Lake Övre Sjodalsvatn (WÜLKER 1956 p. 51, OLIVER 1963 p. 177).

*Psectrocladius* (*Psectrocladius*) *barbimanus* Edw.

Lake Rottvann, 21 June 1962: 13 exuviae.

Length 7.5-8.5 mm. (WÜLKER (1956 p. 5) mentions 6-8 mm.) Exuviae dark luteous. Thoracic respiratory organs (Fig. 2 J) covered with spinules, measuring 0.62 mm, greatest width about 140 μ; 3 bristles anterior to respiratory organ; middle one 0.30 mm, anterior one 0.15 mm, and

Table 1. Variations in patches of spinules and in numbers of bristles on anal lobes of *P. barbimanus* from Lake Rottvann

s = 2 separated patches of spinules on the tergite.
h = 2 half separated patches on the tergite.
o = 1 patch of spinules on the tergite.
The numbers indicate the numbers of spinules in each patch. Spp. 4, 7, 9, and possibly 8 and 10, with 5 terminal bristles on anal lobes, the others with 6 bristles

| Species | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tergite IV | s–18–19 | s–11–12 | h–11–12 | s– 6– 7 | o–46 | o–29 | h–11–13 | o–48 | o–35 | s–14–18 | s–12–16 | s– 9–10 | s–11–11 |
| " V | h–32–34 | h–20–26 | h–21–23 | s–16–17 | o–55 | s–23–39 | o–41 | o–62 | o–55 | s–27–28 | h–23–29 | s–16–18 | o–38 |
| " VI | s–39–41 | h–34–37 | h–33–36 | s–30–36 | s–48–44 | s–19–26 | h–27–28 | h–40–43 | h–38–39 | s–40–42 | h–29–34 | s–24–28 | s–26–26 |
| Number of bristles | 82–88 | 108–113 | 78–86 | 90–94 | 88–90 | 108–109 | 102–98 | 106–99 | 104–100 | 88–88 | 87–88 | 90–96 | 98–98 |

posterior one 0.10 mm in length. Abdominal tergites and sternites except the first sparsely and very finely shagreened. Anterior margins of segments with brown bands. Posterior margins of tergites II-VII with the usual spinules of the *P. psilopterus* group, some with bifid tips (Fig. 4 L); no posterior spinules on tergite VIII; tergites IV-VI with spinules equal in length to the dorsal ones (strongest measuring 60 μ), but less strong (Fig. 2 K). Each lateral margin of segments II to VI with 2 small bristles; each lateral margin of segment VII with 4 filaments measuring about 650 μ; margin of segment VIII with 5 filaments reaching 740 μ. Anal lobes with 5-6 terminal bristles as known in *P. barbimanus* (syn. *P. armatus* And.) (ANDERSEN 1937 p. 58, THIENEMANN 1937 p. 6, WÜLKER 1956 p. 19); bristles measuring about 740 μ. Tergite IV of one specimen of exuviae (sp. 1 in the Table below) appears in Fig. 2 H; bristles of this segment measured as follows: $D_1$ = 59 μ; $D_2$ = 109 μ; $D_3$ = 51 μ; $D_4$ (stronger than the other D-bristles) = 90 μ; $D_5$ = 125 μ; $L_1$ = 106 μ. $D_3$ on segments posterior to IV more on line with $D_4$ and $D_5$ than on the Figure.

BRUNDIN (1949 p. 819) considers the numbers of median patches of spinules on the tergites of *Psectrocladius* pupae as not individually variable. This seems to be true of most species of *Psectrocladius* according to WÜLKER (1956 p. 31). As mentioned by Wülker, however, *P. barbimanus* has a greater variation. The variation in the number of patches and the number of spinules in each patch of these exuviae is apparent from Table 1. Three of the exuviae (spp. 4, 10, and 12) have distinctly separated patches of spinules; 4 specimens (spp. 3, 7, 8, and 9) have not, but none of the exuviae has only one distinct and not half separated patch on all of the tergites IV-VI.

This exuvia of *P. barbimanus* may reach 8.5 mm in length, while WÜLKER (1956 p. 5) mentions 6-8 mm; the number of bristles on the anal lobes varies between 78 and 113, in Wülker's specimens the variation is 59-103. There is however no doubt as to the identification of the species.

*P. barbimanus* is previously known from Greenland, Iceland, Swedish Lapland, England, Holstein, the Alps, and the Pyrenees. (WÜLKER 1956 p. 49). Thus the species is new to Norway.

*Heterotrissocladius määri* Brundin

Lake Rundvann, 19 August 1963: 1 larva at a depth of 8 m.

Length 6 mm. Coloration whitish. Shape of the usual *Heterotrissocladius* type (ZAVŘEL 1935 pp. 8-12). Labrum, epipharyngeal area, and premandibles are shown in Fig. 3 A. Labium and gula fuscous; labium with one, big, median tooth and five lateral teeth (Fig. 3 B). Style at apex of basal segment of antenna longer than segments 2-4 combined (Fig. 3 C); two annular organs in first fifth of basal segment; ratio of antennal segments to each other as 65 : 24 : 6 : 15 : 5 : 4 = 65 : 54. Mandible not quite so long as antenna; mandible as in *marcidus* (Walk.) (= *cubitalis* Kieff.) (POTTHAST 1914 p. 363).

*H. määri* is a northern, cold-stenothermic species, which makes up an important quantitative part in the litoral and upper profundal of the Swedish subarctic lakes, but seems to be lacking in the profundal of the

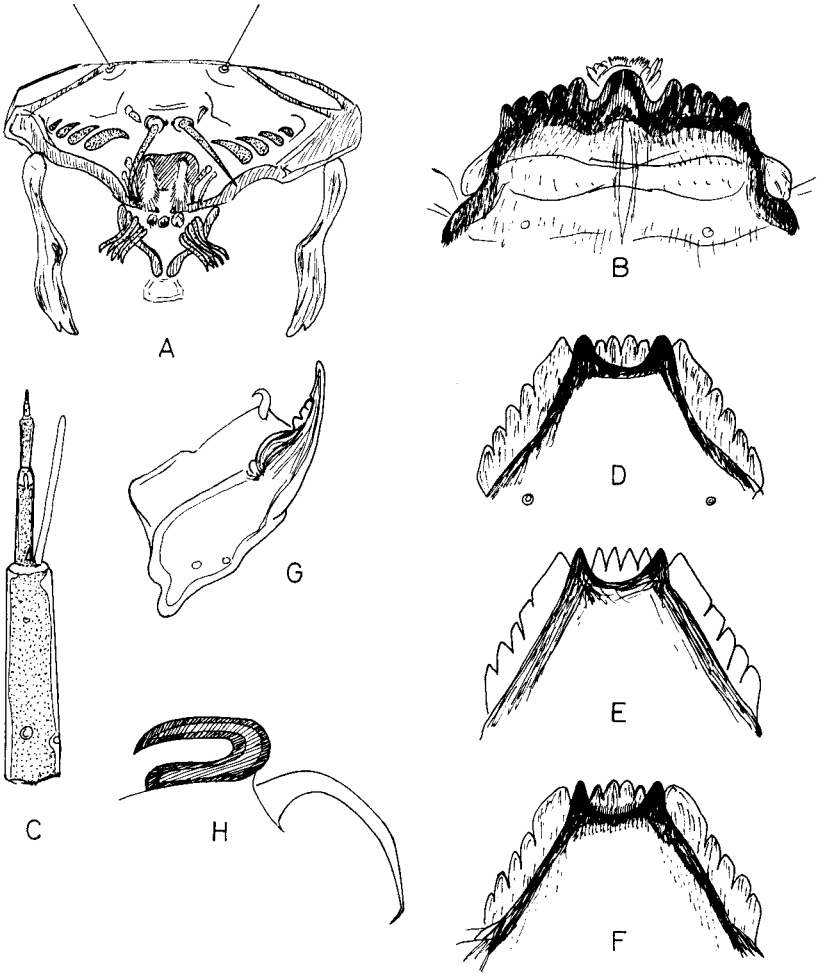


Fig. 3. A–C. *Heterotrissocladius määri*. Larva. A. Labrum, epipharyngeal area, and premandibles. B. Labium. C. Antenna.
D–H. *Epoicocladius ephemerae*. Larva. D. Labium of specimen from River Kögeå. E. Labium of specimen from Lake Borrevann. F. Labium of specimen from Lake Rundvann. G. Mandible. H. The two kinds of claws on posterior prolegs.

deeper subarctic lakes. In South and Central Sweden the species is stenobathic in the profundal of oligohumic oligotrophic lakes (BRUNDIN 1949 p. 707).

The species has not previously been reported from Norway, but in the author's collection there are some imagines from Finse (SÆTHER in MS.)

*Heterotrissocladius marcidus* (Walk.) Edw.

Lake Rundvann, 14 April 1963: 1 larva at a depth of 1 m.

Length about 6 mm. Characteristics in accordance with the description of *H. marcidus* (POTTHAST 1914 pp. 362-366, ZAVŘEL 1935 pp. 8-12).

A typical and very common litoral species in Swedish oligotrophic lakes, regularly present in bog lakes as well (BRUNDIN 1949 p. 706).

The species has not previously been recorded from Norway.

*Epoicocladius ephemerae* Kieff.

Lake Rundvann, 14 April 1963: 4 larvae on the extremities of *Ephemera vulgata* found under ice at a depth of 1 m.

Length 3.5-5 mm. Antenna, labrum, premandible, epipharyngeal area, maxilla, eyes, prolegs, procerci, tubuli anales, and abdomen with chaetotaxy as in the specimens described by ŠULC and ZAVŘEL (1924 pp. 362-365, 385-386) and HENSON (1957 pp. 27-31). Labium and mandibles differ however in number of teeth. The labium is strongly arched, so when not flattened out it looks like the labia drawn by ŠULC and ZAVŘEL (1924 Fig. 9) and TSHERNOVSKIJ (1949 Fig. 130). When flattened out, however, fine lateral teeth are revealed on each margin (Fig. 3 F), the first tooth being the largest, that is as in the American species of *Epoicocladius* described by JOHANNSEN (1937 p. 77 Fig. 263) and in the specimen of *E.* cf. *ephemerae* mentioned by ROBACK (1953 pp. 3-4). Specimens in the author's collection from Lake Borrevann on the western side of the Oslo Fjord (ÖKLAND 1964 p. 136) and from the River Kögeå on Zealand in Denmark show the same lateral teeth (Figs. 3 E, D). In Henson's description, the first lateral tooth is not larger than the others. The mandibles have three teeth in the specimens from Lake Rundvann as well as in those from Lake Borrevann and the River Kögeå (Fig. 3 G). As is apparent, however, two of the teeth might easily be overlooked as they are formed only by a pair of incisions. Also, Henson found three mandibular teeth, but the teeth were not formed merely by incisions. In the specimen drawn by TSHERNOVSKIJ (1949 Fig. 130), the mandible has two more distinct teeth, the antenna has five segments, and the chaetotaxy of posterior segments seems to be a little different. Perhaps Tshernovskij's larva does not belong to *E. ephemerae*. The posterior prolegs in the specimens from Lake Rundvann, Lake Borrevann, and the River Kögeå may have five or six black ventral claws, while Šulc and Zavřel's specimens have five black claws (Fig. 3 H), and Henson's specimens had six black claws.

*Epoicocladius ephemerae* has not previously been reported from Norway, but two female imagines from Finse are in the author's collection (SÆTHER in MS.).

Subfam. Chironominae (Tendipedinae)

*Chironomus anthracinus* - type

Lake Rottvann, 21 June 1962: 14 exuviae.

Length 9.5-11 mm. Anal spur is shown in Fig. 4 M.

*C. anthracinus* is a holarctic, circumpolar, eurythermic, and euryoxybiontic species with its greatest abundance in the profundal of medium eutrophic lakes. In the subarctic lakes, where the species is common, the larvae probably live only in the litoral (BRUNDIN 1949 pp. 735-736).

*C. anthracinus* is known from Helgöy in Troms (SOOT-RYEN 1943 p. 13). Larvae or pupae belonging to the *anthracinus* type have been found in

Lake Mjær south of Oslo (JÖRSTAD 1962 p. 94) and by me in Lake Borrevann (ÖKLAND 1964 p. 136), Lake Steinsfjorden about 30 km from Oslo, and Lake Östensjövann.

*Endochironomus albipennis* Meig.

Lake Rottvann, 21 June 1962: A more or less damaged female imago collected together with exuviae of other species.

The species has not previously been reported from Norway.

*Stictochironomus rosenschöldi* Zett.

Lake Rundvann, 12 April 1963: 1 larva at a depth of 1 m. 14 April 1963: 1 larva at a depth of 7 m.

Lake Rottvann, 21 June 1963: 1 exuvia.

According to BRUNDIN (1949 p. 779), the specimens of *Stictochironomus* described by LENZ (1927 pp. 173-178, 1941 pp. 35-39) as belonging to *S. histrio* Fabr. must belong to *S. rosenschöldi*. The 5 mm long larva as well as the exuvia found are in full accordance with the description of *S. rosenschöldi* except for the much shorter length of the exuvia in this specimen (only 5 mm, compare with 9 mm in Lenz's specimens). According to GOETGHEBUER (1937-1954 p. 56), imagines of *S. histrio* measure 6 mm in length, while *S. rosenschöldi* shows a greater variation (3.5-6 mm), suggesting that the exuvia from Lake Rottvann is probably this species.

LENZ (1960 pp. 230-232) gives a description of *Stictochironomus* larvae which is not in accordance with his earlier descriptions, but seems to be based on a mixed collection of *S. rosenschöldi* and probably *S. histrio*. In the author's collection there are mature larvae of *Stictochironomus* from Lake Steinsfjorden, and from Lake Riskadalsvann and Lake Nessavann at Jæren in southwestern Norway, which are all exactly as in Lenz's earlier descriptions, but show greater variation in the number of teeth of the epipharyngeal comb. They deviate, however, from LENZ (1960 Figs. 338-341) in that the premandibles, which were not described by LENZ (1927, 1941), have the inner tooth more pointed and longer than the outer. The distinguishing characters of *S. rosenschöldi*-larvae and *S. histrio*-larvae seem to be as follows:

Antennal ratio as 33 : 10 : 4.5 : 5 : 4.5 : 2. Epipharyngeal comb with 6-13 teeth. Mandible without or with slightly spatulate second tooth, with notches on inner margin, inner tooth almost uncoloured. Premandible with inner tooth pointed and longer than outer .... *S. rosenschöldi* (LENZ 1927, 1941, 1960 Figs. 337, 342-344).

Antennal ratio as 33 : 6 : 4 : 5 : 4 : 1.5. Epipharyngeal comb with 12-15 teeth. Mandible with spatulate second tooth, without notches on inner margin, inner tooth coloured. Premandible with inner tooth rounded and shorter than outer..... *S. histrio*(?) DECKSBACH 1928 pp. 93-95, 1933 pp. 376-377, GRANDILEWSKAJA-DECKSBACH 1931 p. 209, LENZ 1960 Figs. 338-341, 345, 346).

*S. rosenschöldi* is a northern, cold-stenothermic and steno-oxybiontic species with its main extension in oligotrophic lakes of North Europe. In the profundal region of lakes of Central Europe, the species is probably

present as a glacial relict. The species is characteristic of medium oligotrophic and mesotrophic lakes, but might also be found in oligotrophic mesohumic or weakly polyhumic ones (BRUNDIN 1949 pp. 667, 779-780).

In Norway, the imago has been found in Bjerkvik in northern Norway and at Dovre (SOOT-RYEN 1943 p. 16). As mentioned above, the specimens described by LENZ (1927) from Vågå in the Valley of Gudbrandsdalen belong to *S. rosenschöldi*. Lenz found the larvae in Lake Nedre Sjodalsvann, Lake Tjernosen, Lake Birisjöen, Lake Övre Birisjötjern and Lake Ingusjöen. In the author's collection, there are larvae from Lake Steinsfjorden about 30 km from Oslo, and from Lake Riskadalsvann and Lake Nessavann at Jæren in southwestern Norway.

*Microtendipes* sp.

Lake Rottvann, 21 June 1962: 2 exuviae.

Length 9 mm. Exuviae in accordance with the description given by LENZ (1941 pp. 42-43), but differing a little in shape of anal comb (Fig. 4 R).

*Microtendipes pedellus* De Geer is reported from all over southern Norway, but no larval localities are known (SOOT-RYEN 1943 p. 15). *Microtendipes* larvae have, however, been found by JÖRSTAD (1962 pp. 95-96) in Lake Mjær south of Oslo, and by me in material from Lake Borrevann near Horten (ÖKLAND 1964 p. 137) and material from Lake Bjårvatn at Jæren.

*Pagastiella* cf. n. sp.

Lake Rottvann, 21 June 1962: 28 exuviae, 1 damaged male imago.

Pupa — Length 3.5-4 mm. Thoracic segments of exuviae slightly subluteous; abdomen uncoloured or with slight subluteous tint. Cephalic tubercles with broad base reaching 84 μ (Fig. 4 E), with less wide apical part measuring 26 μ and with a strong apical bristle measuring about 125 μ in length. Thoracic respiratory organs lost in all observed specimens. Two strong bristles and 1 very faint bristle oral of attachment point of prothoracic respiratory organs (Fig. 4 F); 2 stronger bristles broken in most specimens, but measuring at least 92 μ in some exuviae, shorter bristle reaching 15 μ in length; distance between bristles about 8 μ. Two uncoloured median dorsal bristles standing about 0.17 mm from apex of cephalic tubercles and measuring 105 μ; 0.32 mm behind these 4 uncoloured bristles reaching 88 μ; 0.44 mm behind these and 0.42 mm from anal margin of thorax 4 dark bristles measuring 40 μ.

Tergite II without oral spinule band, without shagreenation, but with a transverse anal row of strong hooks with anterior directed apices (in some specimens there are 2 rows, the second indistinct); posteriorly directed hook-shaped spinules mostly in 4 transverse bands present orally on tergites III-VIII (indistinct on VII and VIII); anteriorly directed hook-shaped spinules mostly in 3 transverse rows present anally on tergites III-VI (faint on VI); indistinct shagreenation lateral on tergites III-V continues in lateral margins of oral band of spinules; sternites III-VIII with faint oral transverse bands of shagreenation; lateral ventral corner of sternite IV with typical whirl of spinules (LENZ 1954-1960 p. 146

Fig. 63); all spinules almost colourless, but with a very slight yellowish tint. Filaments of segments V-VIII present in following numbers: 3, 3, 4, 5; anal fins with 14-16 filaments in fringe and without dorsal filaments. Tergites II-IV with 3 lateral bristles and 5 dorsal bristles on each lateral margin (Fig. 4 A). Length of bristles on segment IV in μ : $D_1 = 56$; $D_2 = D_3 = D_5 = 44$; $D_4 = 68$; $L_1 = 100$; $L_2$ (stronger than the others) = 84; $L_3 = 116$. Lengths of filaments in μ (lengths as measured in most of the specimens, but variations especially in segments VII and VIII usual): on segment V : $L_1 = L_2 = 180$; $L_3 = 170$; on segment VI : $L_1 = L_2 = 195$; $L_3 = 180$; on segment VII: $L_1 = L_2 = 200$; $L_3 = 215$; $L_4 = 230$; on segment VIII: $L_1 = L_2 = 215$; $L_3$ varying much in length as well as in strength and measuring from 56 μ up to 215 μ; $L_4 = L_5 = 260$ (but also some specimens with considerably longer or shorter $L_4$ and $L_5$); length of filaments in anal fringe about 450 μ. $L_1$ on VIII 30-45 μ from anterior corner; distance from $L_1$ to $L_2$ 60-65 μ; distance from $L_2$ to $L_3$ usually 60-65 μ, in one specimen, however, but only on right margin, this distance is only 10 μ; posterior 3 filaments (2 in the above-mentioned specimen) standing in last 50 μ of the segment. Anal corners of tergite VIII with 2 to 4 longer spines and 1 to 5 very small points, longest spines measuring about 25 μ, with slight yellowish tint (Figs. 4 B, C). Anal lobes about 190 μ in length; genital sac of male overreaching lobes.

The only other exuviae of the subfamily Chironominae with lateral filaments on segments V-VIII in same order as in this species (3, 3, 4, 5) belong to *Pagastiella orophila* Edw. (BRUNDIN 1949 pp. 841-845) and *Endochironomus intextus* (Walk.) Edw. (LENZ 1954-1960 pp. 183, 185). *P. orophila* also has about same length as this species (a little shorter), same type of spines in anal corner of segment VIII, the same variations in shape and number, but dark instead of nearly uncoloured, same number and placement of lateral bristles on segments II-IV, same placement of dorsal bristles, same placement of rows of spinules, but anal spinules are posteriorly directed, oral spinules anteriorly directed. It seems reasonable to place this species, on the basis of the pupa, in the genus *Pagastiella.*

Imago — Length 3.5 mm. Thoracic segments dim fuscous; abdomen greenish subfuscous, 4 last segments more dusky, anal point yet darker; 3 dark longitudinal mesothoracic bands; bristles at thorax (at least dorsolaterals and dorsomedians) in light spots; legs subfuscous, coxa, trochanter, joints except on tarsi, claws and tibial combs and spurs browned; wings uncoloured or whitish. Antennae lost except scapus and first 2 joints of right flagellum; scapus globular, measuring about 130 μ in diameter; first flagellar segment measuring 45 μ in length; second flagellar segment without neck, measuring 20 μ. Lengths of segments of palpi in μ (first-fourth segment) = 56 (?) : 76 : 88 : 112. Largest bristles of palpi about as long as second segment. The pronotum is much reduced and not visible from above (Fig. 4 K). Twelve dorsolateral bristles, as seen by the spots standing in one row except sixth and seventh, and tenth and eleventh next to each other. There seem to be about 5 supraalars. Wings somewhat damaged, but seem to lack macrotrichia; anal lobus indistinct; no bristles observed on squama.

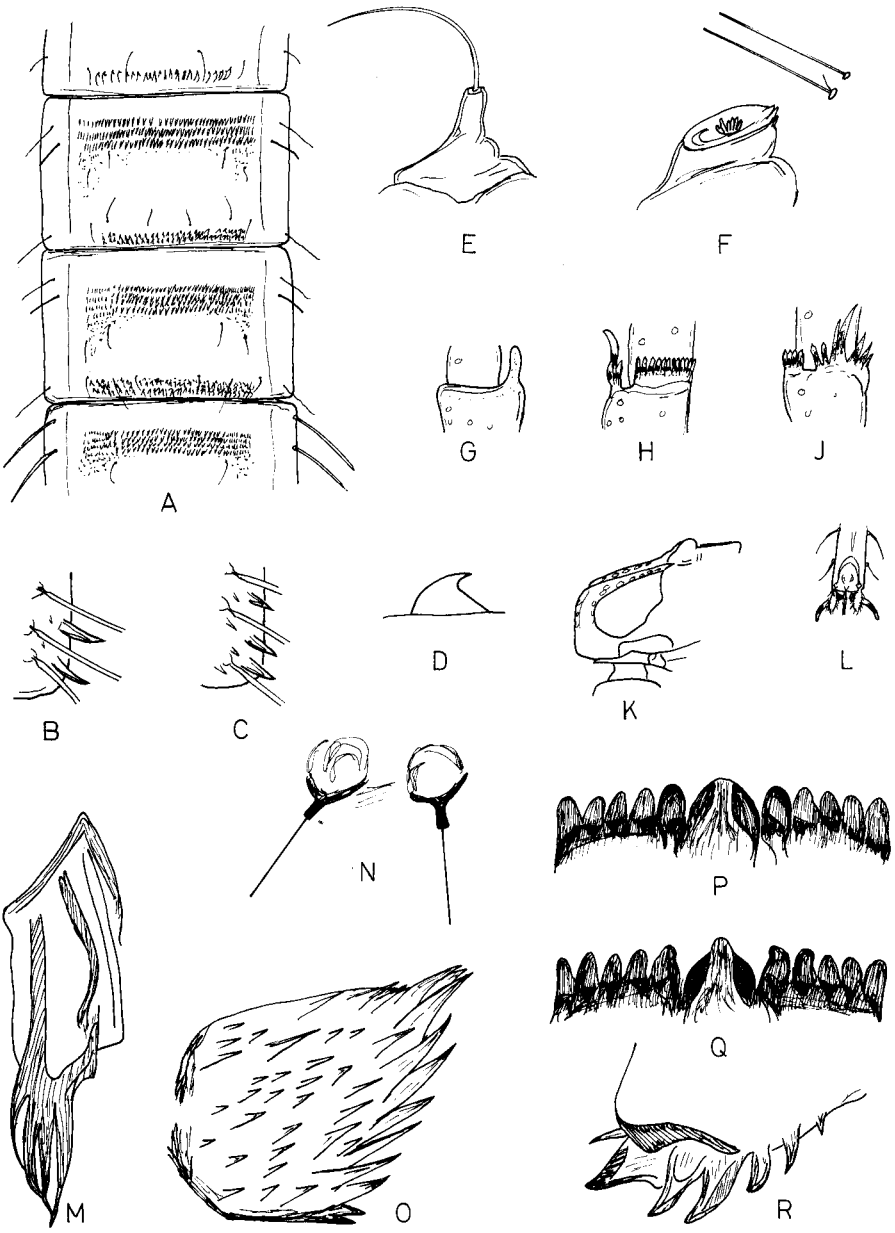


Fig. 4 . A–L. *Pagastiella* cf. n. sp. A–F. Pupa. A. Tergites II-V. B and C. Anal corners of tergite VIII. D. Typical hook from anal row of tergite II. (Other hooks or spinules with same shape.) E. Cephalic tubercle. F. Attachment point of prothoracic respiratory organ. G–L. Imago ♂. G. Spur of front tibia. H. Spur of middle tibia. J. Spur of hind tibia. K. Shape of pronotum and mesonotum. L. Claws, pulvillae, and empodium of front leg.
M. *Chironomus antracinus* type. Anal spur of pupa. N and O. *Tanytarsus heusdenensis - conicomatus* type. Pupa. N. Cephalic tubercle. O. Anal spur.
P and Q. *Microspectra groenlandica* type. Larva. P. Labium of specimen from a depth of 23.5 m. Q. Labium of specimen from a depth of 1 m.
R. *Microtendipes* sp. Anal comb of pupa.

Ratio of lengths of leg joints (fe to $ta_5$) =
$P_1$ - 168 : 117 : 123 : 87 : 71 : 42 : 28
$P_2$ - 158 : 140 : 72 : 47 : 36 : 23 : 22
$P_3$ - 172 : 150 : 90 : 55 : 44 : 28 : 26

LR = 1.05
BV (Pagast) = 1.79
SV (Pagast) = 2.32

Tibiae and tarsi with some bristles measuring 3-4 times the width of joints, most bristles shorter. Front tibia ending in a single spur (Fig. 4 G), differing from that of *P. orophila* (BRUNDIN 1949 Fig. 218), but one of the front legs is missing, and the point at apex of the spur found in *P. orophila* may be broken in the remaining front leg; combs of middle and hind tibiae with free teeth in outer half and with single spurs reaching 27 μ (Figs. 4 H, J), combs of hind tibiae much resembling that of *P. orophila* (BRUNDIN 1949 Fig. 219). Claws, pulvillae, and empodium of front leg are shown in Fig. 6 L.

Abdomen dorsal set with bristles measuring about 130 μ in length on tergite II; about 50 bristles on tergites II-IV. Hypopygium damaged, but there is a big anal point with broad base; basal terminal joints seem to be big, terminal joints especially long; second appendix with some ventral hairs and 1 or 2 long dorsal ones.

The key of GOETGHEBUER (1937-1954 p. 4) leads to the genera *Dolichopelma* Kieff. and *Holtedahlia* Kieff. according to the free teeth in outer half of the combs of $t_2$ and $t_3$. The species seems not closely related to either of these genera, however. Disregarding the free teeth, the key leads to *Pagastiella orophila* Edw. (syn. *Lauterborniella orophilus* Edw.) (GOETGHEBUER 1937-1954 pp. 68-69). *P. orophila* has combs with free teeth in outer two-fifths. The species from Lake Rottvann differs from *P. orophila* in some details. The exuviae are larger, have nearly uncoloured spines in anal corner of segment VIII, 14-16 filaments in anal fringe (10-13 in *P. orophila* (BRUNDIN 1949 p. 843)), anal spinules are anteriorly directed, while oral spinules are posteriorly directed and the prothoracic respiratory organ seems always to be missing on the exuviae (autotomy?). The imago has slightly different combs on the tibiae. The species is probably a new species of *Pagastiella*.

*P. orophila* has been reported from Sweden, England, Wales, Ireland, and Holland. The species may be found in extremely polyhumic bog lakes and has a wide ecological range (BRUNDIN 1949 p. 759).

*Eutanytarsus inermipes* - group. *Micropsectra groenlandica* And. - type

Lake Rundvann, 12 April 1963: 1 larva at a depth of 23.5 m (deepest place). 14 April 1963: 1 larva at a depth of 7 m.

Length 7 mm. Ratio of antennal segments to each other as 68 : 26 : 4 : 3 : 2 = 68 : 35; Lauterborn organs with petioles 4.5 times as long as last three segments; bristle of first segment a little distal to the middle; antennal protuberance 1.5 times as long as wide, almost half as high as first segment; spur on antennal protuberance measuring 24 μ, that is, larger

than in most species of *Micropsectra*, but smaller than in *M. praecox* Meig. (*trivialis* Kieff.) and *T. minusculus* Kieff. (THIENEMANN 1929 p. 98). A similar spur is found in *M. groenlandica* And. (ANDERSEN 1937 p. 34) and *M.* sp. *E* (JOHANNSEN 1937 p. 14). Labium of larva found at a depth of 23.5 m a little different from that of the larva from 7 m depth (Figs. 4 P, Q). Largest eye measuring 44 μ × 28 μ; smallest 32 μ × 20 μ.

The species seems very similar to *M. groenlandica* in measurements of antennae and shape of labium, but differs in having bristle of basal segment in distal half.

*M. groenlandica* is among the most common chironomids in the arctic-subarctic Swedish lakes (BRUNDIN 1949 p. 787). In Norway, it is reported from Lake Fantesteinvatn (BRUNDIN 1956 p. 196) and the Finse area (SÆTHER in MS.). Larvae of *Micropsectra* are known in Norway from the lakes in Gudbrandsdalen examined by LENZ (1927) and from Lake Östensjövann and Lake Borrevann (ÖKLAND 1964 p. 138, SÆTHER 1965 p. 50).

*Eutanytarsus gregarius* - group. *T. heusdenensis* Goetgh. - *conicomatus* Krüg. - type

Lake Rottvann, 21 June 1962: 13 exuviae.

Length of exuviae 6-6.5 mm; breadth about 0.9 mm. Thorax, sheath of wings, margins of segment VIII, and anal lobes brown as in related species. Respiratory organs reaching 1200 μ, long and tapering, maximum breadth (40 μ) about 275 μ from base. Chaetotaxy as in *T. heusdenensis* (KRÜGER 1943 pp. 1098-1106). Patches of strong spinules as in *T. conicomatus* Krüg. (KRÜGER 1943 pp. 1108-1111); ratio of lengths of patches of spinules (segments III: IV: V: VI) = 20 : 18 : 14 : 10; longest spinules on tergite III measuring 65 μ. Shagreenation as in *T. conicomatus*. Row of hooks at posterior margin of tergite II occupying only one-third of width of segment. Cephalic tubercles of pupa with broad base, reaching 100 μ, with cylindrical, brown top measuring 23 μ in length and 11 μ in width and with a strong apical bristle measuring 120 μ in length (Fig. 4 N). Anal spur about as long as broad (90 μ) with 9-12 marginal partly bent spines, and several stout, dorsal spinules (Fig. 4O). Anal lobes with two dorsal filaments and 28-30 filaments on each lateral margin.

*Cladotanytarsus iucundus* Hirvenoja

Lake Rottvann, 21 June 1962: 1 exuvia.

Length 3.9 mm. All details in accordance with the exuviae of *C. iucundus* (HIRVENOJA 1962 Fig. 2 pp. 179-180) except that there are 36 lateral filaments on each anal lobe. *C. iucundus* has previously been reported only from Finnish Lapland (HIRVENOJA 1962 p. 149), but the exuviae found by Thienemann in a pond near Abisko in Swedish Lapland mentioned as *C.* cf. *mancus* Walk. by KRÜGER (1938 p. 220) may be identical with *C. iucundus*.

HYDRACHNELLAE

*Eylais infundibulifera* Koen. 1897

(for list of synonyms see LUNDBLAD 1962 p. 25)

Lake Rottvann, 6 July 1962: 1 specimen among vegetation.

The specimen is closely related to *Eylais infundibulifera infundibulifera* Koen. 1897 (syn.: *E. bifurca* Piers. 1899, *E. incisa* Daday 1901, *E. projectus* Soar 1901) (PIERSIG 1901 pp. 20, 307, 308, DADAY 1901 pp. 82-84, 87-89, 1903 pp. 348-350, 353-355, KOENIKE 1897 pp. 284-285, LUNDBLAD 1920 pp. 153-155, 1929 pp. 7-11, 1962 p. 23. SOAR and WILLIAMSON 1925 pp. 62-64, VIETS 1930 pp. 197-198, 1936 p. 80). It is also closely related to *Eylais infundibulifera acuta* Daday 1901 (DADAY 1901 pp. 84-87, 1903 pp. 350-352, PIERSIG 1901 pp. 308-309, VIETS 1917 p. 157, 1936 pp. 80-81). The form from Lake Rottvann differs from the above-mentioned species especially in the eye bridge, measurements, and bristles of the palps. *Eylais infundibulifera pauciseta* Thor, 1899 (THOR 1899 p. 11) might be identical with the form from Lake Rottvann. The only description given of *E. i. pauciseta*, however, is that the eye plates have a very long process and that the palps have fewer bristles than in the typical form of *E. infundibulifera*. This account cannot be reckoned as a definitive description.

Female: dorsal length about 2960 μ; dorsal breadth about 2570 μ. Body egg-shaped, pointed anterior, rounded posterior. Skin on dorsum striated, sinuous, and for the most part parallel; inner surface of cuticle with finer, more parallel striation running at about right angles to those of outer surface, with numerous papilliform, glandlike bodies. Epimeral-chitin lineated with transversal ridges; that is as in *E. i. infundibulifera*.

Eye capsules very nearly cylindrical in form, outer margin weakly convex and inner weakly concave, slightly angled near insertion of bristles; capsules very nearly parallel; anterior margin of bridge continued into a broad ligulate process which seems to be longer than in *E. i. infundibulifera* and which has an anterior incision; posterior margin of bridge forming a deep bay; area of bristles oval as in *E. i. infundibulifera*; muscle pegs not visible in dorsal view. Measurements of eye bridge (Fig. 5 B) presented in Table 2.

Table 2. Dimensions of the eye bridge. All measurements in μ

| | |
|---|---|
| Entire breadth of eye plates | 366 |
| Length of eye capsules | 219 |
| Maximal breadth of eye capsules | 170 |
| Length of ocular bridge | 43 |
| Breadth of ocular bridge inclusive process | 203 |
| " " " " exclusive " | 133 |
| Length of process measured from anterior margin of eye capsules | 66 |
| Anterior breadth of process | 24 |
| Depth of posterior bay | 90 |

Length of maxillary organ (Fig. 5 A) measured from anterior margin of mouth aperture 395 μ, greatest breadth about 410 μ; mouth aperture circular with a diameter of 199 μ; air-sacs measuring 324 μ, slender, not extending so far as posterior extremity of pharynx, enlargement of extremities scarcely perceptible; pharynx measuring 520 μ; free end measuring

Table 3. Dimensions of the maxillar palp of the female. All measurements in μ. p. = pectinate spines. s. = smooth spines. t. = stout thorns

a. Magnitude

| Segment | P. I | | P. II | | P. III | | P. IV | | P. V | |
|---|---|---|---|---|---|---|---|---|---|---|
| | left | right | left | right | left | right | left | right | left | right |
| Dorsal length ..... | 156 | 156 | 242 | 242 | 199 | 203 | 360 | 360 | 219 | 223 |
| Maximal breadth ..... | 133 | 133 | 168 | 168 | 164 | 166 | 137 | 140 | 64 | 66 |

b. Length and number of spines and thorns

| Segm. | Placement | inner surface | | | outer surface | | |
|---|---|---|---|---|---|---|---|
| | | number | length | shape | number | length | shape |
| P. I | Distal margin ... | 3 | 66–70 | p. | 0 | – | – |
| P. II | Distal margin ... | 5 | 70–86 | p. | 0 | – | – |
| | Other spines: | | | | | | |
| | On extensor half . | 8 | 66–82 | p. | 3–4 | 59–82 | p. |
| | On flexor half ... | 2 | 66 | p. | 0 | – | – |
| P. III | Distal flexor surface ..... | 11 | 35–55 | p. (s.?) | 0 | – | – |
| | Distal extensor corner ..... | 0 | – | – | 1 | – | s. |
| | Other spines: | | | | | | |
| | At distal margin | 1 | 63 | p. | 3 | 66–97 | p. |
| | On extensor half . | 6 | 66–74 | p. | 6 | 66–94 | p. |
| | On flexor half ... | 3–5 | 43–63 | p. | 0 | – | – |
| P. IV | Distal margin ... | 6 | 70–82 | 5p.+1s. | 3 | 66–78 | p. |
| | Other spines: | | | | | | |
| | On flexor half ... | 18 | 43–78 | p. | 9 | 78–94 | p. |
| | On extensor half . | 3 | 70–74 | 2s.+1p. | 2 | 86 | s. |
| P. V | Apex ..... | 4 | 31–35 | t. | 4 | 31–35 | t. |
| | Small thorns behind apex .... | 4–5 | 10–15 | t. | 3–4 | 10–15 | t. |
| | Distal extensor surface behind apex..... | 1 | 35–40 | t. | 2 | 35–40 | t. |
| | Others ..... | 6 | 55–66 | p. | 6 | 55–66 | p. |

238 μ; lower process of maxillary organ measuring 136 μ; a little more than anterior half of maxillary plate covered by closely set large pores. Palpi strongly built (Fig. 5 A); third segment stout with distal flexor surface projecting slightly; fifth segment rather thick and blunt at apex, curving towards flexor surface.

As it will appear from Table 3, P. IV has 5 smooth spines, while in *E. i. infundibulifera* and *E. i. acuta* there are usually 9-10 smooth spines; distal flexor surface of P. III has 14-18 smooth spines in *E. i. acuta*, 12-14 in *E. i. infundibulifera* and 11 in this specimen; the small thorns behind apex of P. V seem to be missing in *E. i. infundibulifera* and are not mentioned in *E. i. acuta*. On the whole there seem to be fewer smooth spines in the form from Lake Rottvann than in the other two forms. The variations within *E. infundibulifera* seem, however, to be very great (LUNDBLAD 1962 p. 23). In two other species of *Eylais*, *discreta* Koen. and *exten-*

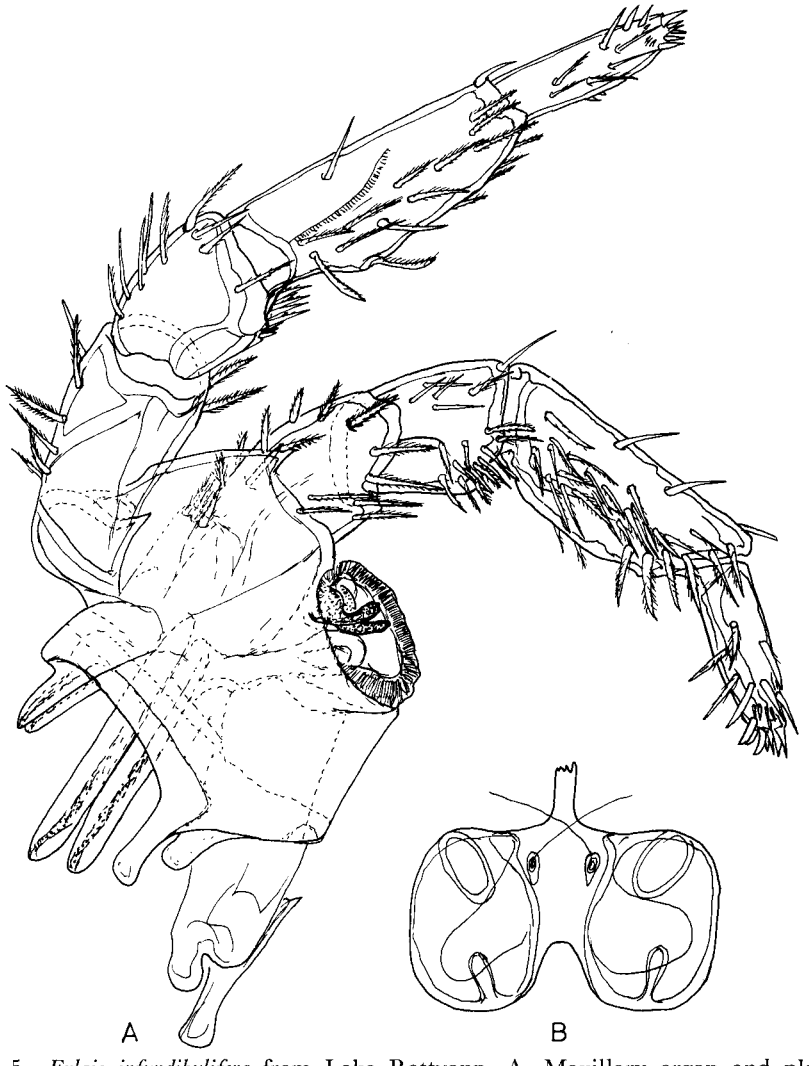


Fig. 5. *Eylais infundibulifera* from Lake Rottvann. A. Maxillary organ and plate, mouth aperture, air-sacs, pharynx, and palpi. B. Eye capsules with eye bridge.

*dens* (Müll.), there is also a very extensive variation (LUNDBLAD 1962 pp. 22-25, VIETS 1949). In *E. extendens*, the number of bristles at the inner surface of P. IV in females varies between 6 and 19; on the outer surface, there are 5-10 bristles (VIETS 1949 pp. 56-57). In the Lake Rottvann form, P. V is distinctly longer than 1/2 P. IV and blunt at apex; in *E. i. infundibulifera*, P. V is shorter than 1/2 P. IV and blunt at apex; in *E. i. acuta*, P. V is longer than 1/2 P. IV and pointed at apex.

Genital plates as in the typical *E. infundibulifera* (LUNDBLAD 1929 Fig. 1); appendices at lateral margin of genital area measuring 102 μ in

Table 4. Dimensions of lengths of leg segments measured along outer dorsal margin, and breadth of leg segments. All measured in μ

| a. Length | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | right | left | right | left | right | left | right | left | right | left | right | left |
| I. B | 123 | 123 | 285 | 277 | 369 | 361 | 431 | 423 | 508 | 500 | 477 | 477 |
| II. B | 138 | 138 | 338 | 346 | 400 | 408 | 431 | 469 | 515 | 538 | 500 | 469 |
| III. B | 138 | 138 | 361 | 346 | 431 | 438 | 492 | 508 | 584 | 584 | 508 | 477 |
| IV. B | 146 | 154 | 392 | 400 | 461 | 461 | 523 | 515 | 623 | 615 | 561 | 538 |

b. Breadth

| | 1 | | | | 2 | | | | 3 | | | | 4 | | | | 5 | | | | 6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | distal | | prox. | | distal | | prox. | | distal | | prox. | | distal | | prox. | | distal | | prox. | | distal | | prox. | |
| | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. | r. | l. |
| I. B | 233 | 237 | 233 | 235 | 227 | 221 | 164 | 168 | 203 | 190 | 168 | 166 | 156 | 150 | 142 | 140 | 125 | 121 | 106 | 104 | 55 | 55 | 78 | 76 |
| II. B | 241 | 241 | 231 | 231 | 231 | 227 | 176 | 178 | 205 | 207 | 172 | 168 | 172 | 180 | 136 | 140 | 127 | 140 | 108 | 110 | 55 | 49 | 76 | 80 |
| III. B | 250 | 242 | 250 | 242 | 215 | 219 | 172 | 168 | 205 | 209 | 152 | 158 | 188 | 186 | 134 | 134 | 138 | 140 | 115 | 119 | 53 | 53 | 78 | 78 |
| IV. B | 254 | 258 | 254 | 258 | 184 | 180 | 156 | 152 | 168 | 174 | 154 | 148 | 156 | 156 | 136 | 136 | 116 | 117 | 133 | 129 | 55 | 55 | 86 | 86 |

Table 5. Length and breadth of epimera in μ

| | maximal length | | maximal breadth | |
|---|---|---|---|---|
| | right | left | right | left |
| Ep. I | 725 | 702 | 323 | 338 |
| Ep. II | 755 | 755 | 325 | 350 |
| Ep. III | 640 | 647 | 445 | 460 |
| Ep. IV | 592 | 600 | 430 | 430 |

maximal length, 18 μ at apex, and 31 μ at base. Anus near middle of ventral surface surrounded by a thick chitinous ring.

The form from Lake Rottvann may turn out to be a new subspecies when more species are collected. At present, however, as *E. infundibulifera* shows such variation, the form can only be considered as an individual deformity.

The larvae of *E. infundibulifera* are parasitic on dytiscids and gyrinids (SPARING 1959 pp. 114, 152). As adults, all species of *Eylais* are strictly dependent upon vegetation and thus occur in greatest numbers where it is rich (LUNDBLAD 1927 p. 433).

LUNDBLAD (1927 pp. 421-422) mentions *E. infundibulifera* in northern Sweden to be characteristic in more or less humic lakes, tarns, and pools. This species is the only regularly occurring species of *Eylais* in the small peat pools at timber line. But the species occurs in greater numbers in lakes and pools in southern Sweden. It thus seems, according to Lundblad, that the species in northern Scandinavia is living under marginal conditions. Contrary to Lundblad's description of *E. infundibulifera* as a species characteristic of humic lakes and pools, CRONHOLM (1946 p. 53) did not find it in the poly- and mesohumic lakes of Aneboda, and found only one specimen in an oligohumic lake. Lettevall (personal communication) has found the species in different lakes in Småland where water colour varied from 30 to 160 mg Pt/l, i.e. mesohumic and polyhumic lakes.

In Norway, the species is reported from Lake Myrtjern near Arendal and the Selsmyr bogs in Gudbrandsdalen, and the variant *E. i. pauciseta* Thor is found in Höla at Mosby near Christiansand (THOR 1899 p. 11, 1901 p. 12).

*Huitfeldtia rectipes* Thor, 1898

Lake Rundvann, 4 September 1962: 1 male specimen in a planktonic sample at deepest place (23.5 m).

19 August 1963: 1 male, 3 females at the same place.

*H. rectipes* is a common and widely distributed species throughout Sweden (LUNDBLAD 1962 pp. 145, 526). In northern Sweden it prefers the smaller bodies of water but also occurs in large lakes and tarns (LUNDBLAD 1927 p. 437). Outside the alpine and subalpine regions of Scandinavia, it lives in the deeper waters of lakes, and is a planktonic form or a bottom form which does not occur near the shore. On the whole, *H. rectipes* is a typical cold-stenothermic species. The larva is parasitic on larvae of chironomids and has been found on *Chironomus anthracinus* K., *C. intermedius* St. and *Pseudochironomus presinatus* Stg. Exuviae of *C. anthracinus* type were found in Lake Rottvann (p. 107).) (LUNDBLAD 1920 pp. 240-242, 1927 pp. 471-474, VIETS 1924 pp. 116-120, 1936 p. 301, THIENEMANN 1950 p. 159, SPARING 1959 p. 132.)

In Norway, the species is known from Lake Digernesvann in Sunnfjord, Lake Tömmervann on Senja, Lake Petersborg Frosketjern, Lake Balsokvann and Lake Lemetvann in Balsfjord, a tarn near Hatten, and Lake Elgsvann in Hattfjelldalen (THOR 1898 pp. 3-5, 1901 p. 31).

In northern Sweden, the species is known from the Sarek Mountains,

Torne Lappmark, Frostviken, and lakes, pools, and tarns in the birch zone (WALTER 1911 p. 603, LUNDBLAD 1927 pp. 471-472, 1962 pp. 145, 256).

*Piona carnea* (Koch, 1836) (syn.: *Nesaea c.* Koch: *Nesaea brevipalpis* + *alpina* Neum. 1880; *Curvipes niger* Thor, 1897)

Lake Rottvann, 6 July 1962: 1 male specimen and 15 nymphs among vegetation.

No species of Hydracarina are exclusively connected with humic lakes. But perhaps the most typical and characteristic species in lakes and pools with quantities of humic substances is *P. carnea* (LUNDBLAD 1920 pp. 243-244, 1927 pp. 421-422, CRONHOLM 1946 p. 53). This species also has larvae which are parasitic on imagines of chironomids (SPARING 1959 pp. 130-132).

In Norway, the species is known from Sörkjosen in Nordreisa near Tromsö, a creek near Væhæ-jok (Nordreisa), a tarn near Lake Josefvann in Balsfjord, Lake Hannesvann and Lake Tömmervann on Senja, various humic lakes in Bjorelvdal (Senja), Lake Vågevann and Lake Eidevann on Skjervöy, Lake Langvann (Bodö), Lake Elgsvann in Hattfjelldal, peat-pools near Sönningen in Skogn, Lake Övre Svarttjern and Lake Nedre Svarttjern near Stören, Lake Kjemsjö (Koppang), Lake Selsvann in Gudbrandsdal, in a creek of Losna (a tributary to the river Gudbrandsdalslågen), a lake at Leangen in Asker, a pool on the island Hovedöya in Oslo, pools near Ljan and a pool at Bygdöy (Oslo), brook at Lake Kleivertjern (Larvik), and various bog lakes near Arendal (THOR 1897a p. 54, 1897b p. 30, 1900 p. 373, 1901 p. 34).

Distribution in Sweden is given by LUNDBLAD (1962 pp. 181, 529).

Nymph of *Tiphys*, *Pionides*, *Acercopsis*, *Pionopsis*, *Pionacercus* or *Pionacercopsis*

One nymph belonging to this group of genera was found together with *P. carnea* in Lake Rottvann on 6 July 1962. The specimen was a little damaged.

## GASTROPODA

*Lymnea peregra* (Müll.) f. *lagotis* (Schrank)

Lake Rundvann: One specimen found near the shore. (The identification of this species was made by cand. real. Jan Ökland.)

*L. peregra* is found all over the country, including the mountain areas. The *lagotis*-forms occur mainly in sheltered localities (ÖKLAND 1964 pp. 149-150).

*Gyraulus acronicus* (Férussac) f. *rossmaessleri* (Schmidt)

Lake Rundvann: 3 specimens from guts of trout.

Lake Rottvann, 13 April 1963: 1 specimen at a depth of 1 m.

MANDAHL-BARTH (1949 p. 101) considers *rossmaessleri* as a separate species, while HUBENDICK (1949 p. 45) regards it as a synonym of *G. acronicus*. The species is found in most parts of Norway (ÖKLAND 1964 p. 161).

## THE BOTTOM FAUNA AS A WHOLE

The bottom fauna does not appear plentiful in either of the lakes. The fauna in Lake Rundvann is perhaps more abundant in species and possibly also richer in individuals. The numbers given, however, are too insignificant to give correct relations of the quantities of bottom animals in the two lakes.

Some of the species found are especially characteristic in lakes of one or two particular types, while some are less abundant in these types, and others are more or less euryoecic ubiquities. The hydrographical properties of the lakes seemed to indicate Lake Rundvann as an oligohumic oligotrophic lake, while Lake Rottvann appeared to be a mesohumic lake. The question then arises: Are these indications in accordance with a division into types on the basis of characteristic bottom organisms? In the following Table, some of the bottom animals occurring are listed and their relation to lake typology indicated.

Table 6. Bottom animals found in relation to lake typology. e = eutrophic, o = oligotrophic, m = mesotrophic, d = dystrophic. Bracketed = abundant in this lake type. Without brackets = very characteristic in this lake type

| Species ocurring in: | Lake Rundvann | Lake Rottvann |
|---|---|---|
| *Lumbriculus variegatus* | (d) | (d) |
| *Gammarus lacustris* | (o) (e) | (o) (e) |
| *Chaoborus flavicans* | | d e |
| *Procladius* sp. | (d) (e) | (d) (e) |
| *Heterotrissocladius määri* | o (d) | |
| *Chironomus anthracinus* | | e (d) (o) |
| *Stictochironomus rosenschöldi* | o m (d) | o m (d) |
| *Micropsectra groenlandica* | o | |
| *Eylais infundibulifera* | | d |
| *Huitfeldtia rectipes* | o (d) | |
| *Piona carnea* | | d |

*Gammarus lacustris*, which is very seldom found in peat pools and other humic waters, occurs in the humic Lake Rottvann. The presence of this species, however, seems connected with a high lime content and not with a particular lake type. As mentioned, Lake Rottvann appears to have higher Ca standard than customary in dystrophic lakes.

*Huitfeldtia rectipes* is a typical cold-stenothermic species. Outside the arctic, subarctic, and alpine regions it is therefore found only in the deeper and consequently usually more oligotrophic lakes. In northern Norway and in northern Sweden, however, it occurs in smaller lakes and peat pools.

As the Table indicates, the species which occur in the lakes and which are not more or less euryoecic ubiquities define Lake Rundvann as an oligotrophic lake, Lake Rottvann as a more or less humic lake. Thus, the lake typology indicated by hydrographical properties coincides with that indicated by the bottom fauna.

## SUMMARY

Lake Rundvann and Lake Rottvann are located in Balsfjord about 53 km south of the city of Tromsö.

Lake Rundvann has a maximum depth of 23.5 m. The conductivity figures (in $\varkappa_{18} \cdot 10^6$) mostly range from 80-110; the lowest $O_2$ saturation figures measured are 21.5% during the winter stagnation, 55.8% during the summer, and the active reaction ranges from *p*H 6.8 to *p*H 8.5. Lake Rundvann seems to be an oligotrophic lake moderately rich in lime.

Lake Rottvann has a maximum depth of 4.5 m. The conductivity figures (in $\varkappa_{18} \cdot 10^6$) range largely from 50-70; the lake is totally depleted of oxygen in the bottom water during the winter stagnation, and the active reaction ranges from *p*H 6.5 to *p*H 7.4. Lake Rottvann seems to be a dystrophic lake, but richer in lime than is usual in Norwegian dystrophic lakes.

Material from these lakes collected by cand. real. Reidar Thomassen was kindly delivered to me for identification.

The following species were new to Norway: *Lumbriculus variegatus*, *Psectrocladius barbimanus*, *Heterotrissocladius määri*, *H. marcidus*, *Epoicocladius ephemerae*, *Endochironomus albipennis*, *Pagastiella* sp., and *Cladotanytarsus iucundus*.

The larva of *Psectrocladius fennicus* is described for the first time.

Exuviae of *Psectrocladius barbimanus* extending the known range of variation are described.

The larva of *Heterotrissocladius määri*, previously incompletely described, is detailed.

Additions to earlier descriptions of larvae of *Epoicocladius ephemerae* are given.

A key to larvae of *Stictochironomus* is given.

Some exuviae and a damaged male imago probably belonging to a new species of *Pagastiella* are described.

A form of *Eylais infundibulifera*, which may be a new subspecies, is described.

The lake typology indicated by hydrographical properties is shown to coincide with that suggested by the bottom fauna.

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